A REVISION OF THE PARONYCHIINAE

PROEFSCHRIFT

TER VERKRIJGING VAN DE GRAAD VAN
DOCTOR IN DE WISKUNDE EN NATUURWETENSCHAPPEN
AAN DE RIJKSUNIVERSITEIT TE UTRECHT,
OP GEZAG VAN DE RECTOR MAGNIFICUS,
PROF. DR. A. C. DE VOOYS,
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PROMOTOR: PROF. DR. J. LANJOUW

To the Collectors of this group of genera

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INTRODUCTION

This study was undertaken, in April 1964, at the suggestion of Prof. Dr. J. Lanjouw. The need for such a revision, was, however, stressed by the authors of the subtribe, viz. PAX et K. HOFFMANN, who, while delimiting these genera, remarked that the Systematics of both the (main) genera of this subtribe (viz. *Paronychia* and *Herniaria)* required a thorough study. By that remark they implicitly wanted to convey the difficulties encountered in studying the two genera. As a matter of fact theirs is the only account covering the whole group. There is no previous review of all the species of *Paronychia,* and CORE's account (1941 of the 21 North American species is the only study of this genus. *Herniaria* has been studied by F. N. WILLIAMS (1896) and F. HERMANN (1937), but both the accounts are brief and sketchy reviews, and cannot be described as revisions. The present study was, therefore, undertaken to clear up the taxonomic position of these genera. The study was greatly facilitated by the extensive collections made by various workers (in some areas for the first time in history) in recent years, particularly during the past two or three decades. It is indeed immensely gratifying to note that well over 13500 herbarium sheets (about 10500 of them obtained on loan from nearly 45 herbaria) were available for study. A thorough examination of such a vast collection has necessitated a re-evaluation most of the infra-generic groupings, and, moreover, resulted in a considerable increase in the number of species belonging to the two main genera. Of the nine genera originally included by PAX et HOFFMANN in this subtribe, viz. *Sphaerocoma, Corrigiola, Gymnocarpos, Lochia, Sclerocephalus, Paronychia, Siphonychia, Herniaria* and *Philippiella,* only eight are retained in this account, the ninth (i.e. *Siphonychia)* is merged with *Paronychia.* The latter is subdivided (for the first time) into three subgenera *(Siphonychia, Paronychia* and *Anoplonychia)*; the subgenus *Paronychia* includes 57 species of which all but one belong to the section *Paronychia.* The latter in turn comprises 5 sub-sections and 8 series, all of them being set up for the first time. The second major subgenus, *Anoplonychia,* includes 48 species grouped into two sections

and four subsections. In all there are 29 species being described for the first time (20 in *Paronychia,* 7 in *Herniaria* and 2 in *Corrigiola)* in addition to a number of infra-specific taxa. These figures, however, do not include the taxa published by me in two earlier papers (1966, 1967).

In spite of the extensive collecting, however, most of the new species as well as the infra-specific taxa are known from one or a few gatherings only, and are, accordingly, described in this account as endemics. Obviously, in some of these cases more material is highly desirable. Some regions are still rather poorly known or botanized. This is particularly true of Central and Eastern Turkey, NE Spain, and parts of Morocco, Ethiopia, Peru and Chile. Moreover, leaving aside matters of taxonomic interest, which I have endeavoured to clarify in this account, there still remain some problems which require further investigation. The main genera require population studies, and the evidence available so far for hybridization needs to be substantiated. Similarly, cytotaxonomic and experimental studies are needed to help solve some of the problems concerning the delimitation of the infra-specific taxa, especially in the genus *Herniaria.* Another highly intriguing matter that requires further investigation concerns the correct interpretation of the petals which in most of the genera of this group are filiform structures resembling staminodia, but in two of the genera (viz. *Corrigiola* and *Sphaerocoma*) they are quite well-developed. Yet another issue that still remains to be settled, though on a much broader scale, is the long-standing controversy as to whether or not these genera, along with the other members of the subfamily *Paronychioideae,* are sufficiently distinct from the rest of the family *Caryophyllaceae* so as to justify their inclusion in a separate family. This is a matter that cannot be settled by the study of a small group of genera, or a small tribe of a large family. I have, therefore, not gone into this problem, and have followed the treatment of PAX & HOFFMANN in the disposition of this group of genera.

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THE SUBTRIBE **PARONYCHIINAE**

GENERAL INTRODUCTION:

Historical Review: This subtribe as delimited by PAX et K. HOFFMANN in ENGLER-PRANTL, Nat. Pflanzenfam. ed. 2, 16:298 (1934), and including nine genera (viz. *Sphaerocoma,* T. Anders., *Corrigiola* L., *Gymnocarpos* Forssk., *Lochia* Balf.f., *Paronychia* [Tournef.] Miller, *Siphonychia* Torr. et Gray, *Herniaria* [Bauhin] L., *Sclerocephalus* Boiss. and *Philippiella* Spegazzini) is placed in the subfamily *Paronychioideae,* differ from the two other subfamilies of *Caryophyllaceae* in possessing stipulate leaves. The distinctness of these genera, along with the other members of the subfamily *Paronychioideae,* from the rest of the family *Caryophyllaceae* particularly in regard to the perigynous flowers and the stipulate leaves, was recognized as long ago as 1815 when they were set aside in the family (order or ordo) *Paronychieae* by A. SAINT-HILAIRE (Bull. Soc. philom. 38). In the same year A. L. DE JUSSEAU in Mém. Mus. Hist. Nat. Paris 2: 387, added further evidence justifying the setting up of a

separate family. A few years earlier the tribe *Illecebreae* was proposed by R. BROWN (Prodromus 413. 1810) to include the genera with distinctly perigynous flowers and stipulate leav es, but the tribe itself was placed in the family *Amaranthaceae.* REICHENBACH in 1827 (Mössl. Handb. 1:51) set up a new family *Corrigiolaceae* to accommodate these genera. A. P. DE CANDOLLE in 1829 (Mémoire sur la Famille des *Paronychiées)* gave a detailed account of this group with particular reference to their distinctness from the rest of the family *Caryophyllaceae,* and subdidived the family (*Paronychieae*) into seven tribes, the first two (*Telephieae* and *Illecebreae*) comprising *Corrigiola, Telephium, Herniaria Gymnocarpum* (*Gymnocarpos*), *Anychia; Illecebrum, Paronychia* and *Cardionema.* A few years later FENZL in ENDLICHER, Genera Plantarum (p. 956. 1839) gave a much better and more critical account, and divided the tribe *Illecebreae* R. Brown into two subtribes, viz. *Corrigioleae* and *Euparonychieae,* the former including *Corrigiola* only, and the latter comprising six genera, *Herniaria, Illecebrum, Cardionema, Pentacaena, Paronychia* and *Gymnocarpos.* A new family name, *Illecebraceae,* was published in 1846 by LINDLEY (The Vegetable Kingdom, p. 499), and his treatment was followed by BENTHAM et HOOKER (Genera Plantarum 3(1):12. 1880), distinguishing this family from the *Caryophyllaceae* mainly by the perigynous, apetalous flowers and the one-seeded indehiscent fruit. They divided the family into four tribes *Pollichieae, Paronychieae, Pterantheae* and *Scleranthеae,* the tribe *Paronychiae* comprising seven genera (*Paronychia, Herniaria, Siphonychia, Anychia Corrigiola, Gymnocarpos* and *Sclerocephalus*) with 57-61 species, whereas the remaining ten genera (with about 25 species) were placed in the other tribes. PAX in ENGLER-PRANTL, Nat. Pflanzenfam. ed. 1, 3(1b):88 (1889) placed the tribe *Paronychieae* in the subfamily *Alsinoideae,* and added eight more genera *(Sphaerocoma, Psyllothamnus, Pollichia, Achronychia, Haya, Lochia, Illecebrum* and *Acanthonychia*) to the seven mentioned above. (*Psyllothamnus,* it may be pointed out here, is not distinct from *Sphaerocoma*). The subfamily *Paronychioideae* was set up by VIERHAPPER in 1907 (Österr. Bot. Zeitschr. 57:96), but a detailed account of the subfamily was contributed by PAX et K. HOFFMANN in ENGLER-PRANTL, Nat. Pflanzenfam. ed. 2, 16c:297 (1934). In their excellent treatment the subfamily is divided into five tribes, and the tribe *Paronychieae* redivided into three subtribes, viz. *Paronychiinae, Pollichiinae* and *Illecebrinae.* The subtribe *Paronychiinae* is distinguished from the other subtribes by the strongly curved embryo.

In the present account the treatment of PAX et HOFFMANN has been followed in the disposition of this group of genera. However, out of the nine genera originally included by them in this subtribe, only

eight are retained in this work, and the ninth (*Siphonychia*) is merged with *Paronychia.*

Distribution: The plants belonging to this subtribe are mostly small, prostrate, annual to perennial herbs or, sometimes, rather small undershrubs. *Paronychia* and *Herniaria* are the principal genera, the two together including (109 + 47) = **156** species or nearly 3/4th of the total number. *Paronychia,* with 109 species, is the largest genus, widely distributed in both hemispheres excepting Southern Africa, and Central and South-East Asia.

Herniaria is exclusively an Old world genus occurring in large parts of Africa and Eurasia, excluding China and S.E. Asia. Both these genera are essentially inhabitants of subtropical (warmer) regions, though their area extends to the temperate region.

The third largest genus is *Corrigiola* (11 species) with a highly disjunct range of distribution, viz. from N. Europe to S. Africa in the Old World, and from Mexico to Chile in the New World. Of the remaining five genera only *Gymnocarpos* (2 species, one widely distributed from the Canary Isles through N. Africa and Arabia to West Pakistan, the other found only in NW China and Mongolia) and *Sclerocephalus* (1 species) are widely distributed. The other three have a restricted range. *Sphaerocoma* (2 species) is endemic in NE Sudan, NE Somalia, South Arabia and S. Iran; *Lochia* and *Philippiella* are monotypic genera endemic in the Island Socotra and S. Patagonia (Argentine) respectively.

Duration: Most of the species are small herbs especially in the three main genera *Paronychia, Herniaria* and *Corrigiola. Gymnocarpos, Lochia* and *Sphaerocoma* are undershrubs. Amongst the herbaceous species a large number are perennials, only about 18% being annuals. In some cases, however, the duration shows a high degree of variability even within the same species as, for instance, in *P. arabica* (L.) DC. and *H. glabra* L. In the latter plants producing flowering shoots in the first year may perennate. In such cases, therefore, the duration has no taxonomic significance. In *Corrigiola,* an essentially annual species like *C. litoralis* L. may occasionally produce perennial individuals, and, contrarywise, a perennial species like *C. telephiifolia* Pourr. sometimes includes annual individuals. Such aberrant forms are treated, in this work, as varieties.

GENERAL MORPHOLOGY:

Habit: As stated earlier, most of the plants are small prostrate herbs, often forming mats. This is particularly true of a large number of *Paronychia* species (especially in the subgenus *Anoplonychia*) which usually possess densely congested shoots often entirely covered with leaves, stipules and flower-clusters. The alpine species in both *Paronychia* and *Hernaria* are often pulvinate (or cushion-shaped). The mono-

typic *Philippiella* is another case in point. In *Philippiella patagonica* Spegaz. the shoots are densely tufted with closely imbricated leaves, assuming a moss-like appearance. The sand-inhabiting species, on the other hand, possess elongate, spreading stems. The shrubby genera usually have erect and somewhat tortuously branched stems.

Root: The main root in the perennial species is quite stout, long and usually sparingly branched. The annuals, on the other hand, have a short and slender root. The adventitious roots are occasionally very prominently developed as e.g. in some of the species of the subgenus *Anoplonychia* as well as in two species of *Herniaria (H. capensis* Bartling and *H. parnassica* Heldr. et Sartori).

Stem: In the perennial species the main axis or stem is generally branched from the woody base or caudex (which is usually partly subterranean) and their main branches, which in aspect and function resemble the stem, and are usually called shoots, in turn produce numerous short, and often crowded branches of the second order. Forking or speudodichotomy is found in a small part of the annual species e.g. in *P. canadensis* (L.) Wood (belonging to subgenus and section *Paronychia,* subsection *Anychia*), but even in such cases it is mainly confined to the region of the inflorescence. In most of the woody subshrubs the branches are somewhat tortuous and the bark is often longitudinally fissured.

The caudex is occasionally a bulb-like scaly structure (as in the Chilean species of *Corrigiola*), covered with brownish, scaly stipules.

The shoots are generally covered with short, patent to deflexed hairs, (e.g. in most of the species of *Paronychia* and *Herniaria*), occasionally they are wholly glabrous (e.g. in *Corrigiola*).

Most of the species of *Paronychia, Herniaria* and *Corrigiola* have more or less prostrate shoots. The woody and shrubby genera as well as some of the *Paronychia* species with basally lignified stems (e.g. *P. suffruticosa* (L.) DC., *P. canariensis* (L. fil.) Juss. and *P. virginica* Spreng.) have more or less erect stems.

Anatomy: Only a few species have been anatomically studied, and the data available so far are very scanty. SOLEREDER's (1899) is the only account (slightly elaborated by LÜDERS (1907)) covering all the genera of this subtribe. BRIQUET (1910-1911, p. 402) has made a detailed study of *Paronychia suffruticosa* (L.) DC.

The epidermal hairs are always unicellular. The cortex in *P. suffruticosa* is distinctly chlorenchymatous. The pericycle in *Paronychia, Herniaria, Corrigiola* and *Gymnocarpos* is sclerenchymatous. Calcium oxalate crystals are usually abundantly present in the phelloderm. The vascular bundles are arranged in a ring, but abnormally developed concentric rings have been observed in a few cases, especially in *Corrigiola.* A secondary meristem is developed in at least the two species of this genus studied so far, viz. *C. litoralis* L. and *C. telephiifolia* Pourr. The

cells in most cases are spirally thickened. The cork in *Paronychia* is subepidermal and tannin is present in the epidermal cells.

Leaf: The leaves are generally sessile or subsessile, very rarely petiol ate (as in a few species of *Corrigiola*), usually narrow, viz. oblanceolate or linear-oblong, sometimes obovate to elliptic, often attenuate to the base; apex acute or subobtuse, sometimes (as in *Paronychia* subgenus *Paronychia* and in *Gymnocarpos* and *Lochia*) shortly mucronate or cuspidate; mostly herbaceous, sometimes coriaceous as in *Gymnocarpos, Lochia, Sphaerocoma* (partly) and in most of the species of *Herniaria* subgenus *Heterochiton. Philippiella* and some species of *Paronychia* (subgenus *Anoplonychia*) possess somewhat fleshy leaves. Linear and subchartaceous leaves are met with in some species of *Paronychia subgenus* et section *Paronychia* subsection *Chartaceifoliae.* The leaves are mostly densely covered with short appressed hairs in the species of *Paronychia* and *Hernaria,* but they are wholly glabrous in *Gymnocarpos, Lochia, Sphaerocoma, Sclerocephalus* and *Corrigiola,* the latter being wholly glabrous. In *Herniaria,* too, the leaves are occasionally wholly glabrous as in *H. glabra* L. var. *glaberrima* and var. *glabra,* and subglabrous in a few other species (e.g. in *H. ciliolata Meld.,* H. *bornmülleri* Chaudhri, *H.microcarpa* Presl, *H. caucasica* Rupr. etc.). In a few species of *Paronychia* (like *P. canadensis* (L.) Wood, *P. fastigiata* (Raf.) Fern. and *P. ellenbergii* Chaudhri, too, they are glabrous.

Corrigiola is the only genus showing a spiral (apparently "alternate") arrangement of the leaves, but even in this genus the leaves, occasionally, become subopposite. The spiral ("alternate") arrangement may have developed into the opposite (or nearly opposite) and decussate arrangement which is found in most of the genera of the family *Caryophyllaceae.* Very occasionally the leaves, though essentially in pairs, look as if they are fascicled or clustered on the nodes owing to the development of short, axillary shoots. Such a condition is met with in the subsection *Fasciculatae* of *Paronychia* subgenus and section *Paronychia;* in one species of *Herniaria* subgenus *Heterochiton* (*H. fruticosa* L.) and in *Sphaerocoma hookeri* T. Anders. The venation is pinnate and reticutate, often divergent, sometimes convergent or camptodromous.

Anatomy: The leaf in most of the species studied so far shows a centric structural arrangement. The stomata are present in both sides of the leaf, and in at least two cases (viz. *Gymnocarpos decander* Forssk. and *Paronychia suffruticosa* (L.) DC.) they are nearly sunken. The mesophyll is chlorenchymatous, and the pallisade tissue is abundantly developed. Calcium oxalate crystals often form large, conspicuous masses (or compound crystals) in the mesophyll.

Stipules: The stipules are silvery-scarious, ovate-lanceolate (-triangular) attaining a maximum development and becoming very conspicuous in

Paronychia. They are inter-petiolar, usually two for each pair of leaves, but very occasionally 4 per pair as in *Paronychia* subgenus *Anoplonychia* section *Heterosepalae.* In *Herniaria,* the stipules are usually quite short and inconspicuous, but in one species (*H. pujosii* Sauv. et Vindt, subgenus *Heterochiton*) they are quite prominent, almost like those of *Paronychia.*

Inflorescence: The flowers are basically arranged in simple dichasia, but quite often they are densely aggregated into bigger, sessile or shortly pedunculate compound clusters, culminating in the development of very compact terminal and subterminal to pseudo-axillary glomerules. The simplest cases are met with in some of the annual species of *Paronychia* (e.g. in the subsections *Anychia* and *Chartaceifoliae* of the subgenus and section *Paronychia*) as well as in a few perennials like *P. canariensis* (L. fil.) Juss. and *P. suffruticosa* (L.) DC. and in two species of *Corrigiola* viz. *C. paniculata Peter* and *C. drymarioides* Baker fil. In all such cases the inflorescence is of the lax, repeatedly-forked type. Shortly pedunculate, terminal, almost corymbose clusters are found in *Gymnocarpos, Lochia* and in some of the species of *Corrigiola.* From this type of inflorescence the sessile clusters may be derived, which are provided with shorter bracts and which are a common feature in most of the species of *Herniaria.* In this genus the clusters are lateral or leaf-opposed occupying the place of the smaller of the two opposite leaves; such clusters are also found in a number of species of the subgenus *Paronychia*; in this case they are mostly pseudo-axillary, rarely leaf-opposed. Finally the compact glomerule (often terminal to subterminal and pseudo-axillary) is met with in *Paronychia* subgenus and section *Anoplonychia* as well as in some of the species of the subgenus *Paronychia* (e.g. *P. argentea Lam.*). Such a glomerule is conspicuous by the enlarged, silvery-scarious bracts which conceal the flowers.

Sclerocephalus shows a highly developed form of the (terminal) glomerule, actually composed of numerous, very densely aggregated flowers becoming concrescent with the indurated leaves of the inflorescence region, and almost sunk in the hardened involucre, the whole structure falling off with the short peduncle at maturity. Indurated spiny structures are also found in *Sphaerocoma* but in this case they are actually the transformed (or reduced) sepals of the sterile flowers.

In *Philippiella* the flowers are mostly solitary and terminal.

Bracts: The bracts are usually silvery-scarious and reach their maximum size in a large group of *Paronychia* species where they exceed and often conceal the flowers. In *Herniaria* and *Corrigiola,* however, the bracts are very small and inconspicuous, but in *Lochia* they are quite well-developed, and in one of the two species of *Gymnocarpos,* viz. *G. przewalskii* Bunge ex Maxim. The latter species, in fact, clearly shows the gradual transformation of an ordinary leaf with its two stipules into

a scarious bract, the stipules fusing laterally with the leaf which is strongly reduced in size, the whole ultimately becoming a large scale with a green midrib. Such scarious bracts containing a green midrib are also present in *Sphaerocoma,* especially in *S. aucheri.* Surprisingly enough there are no scarious bracts in the other and more widespread species of *Gymnocarpos, G. decander* Forssk., the flowers being subtended by small, narrow or linear stout leaves. This proves that the scarious bract is in reality a leaf. In some of the species of *Paronychia* also (e.g. subsection *Chartaceifoliae* of the subgenus *Paronychia*) there are no scarious bracts, and the flowers are subtended by ordinary leaves though much reduced in size.

Flowers: The flowers are "complete", actinomorphic, more or less perigynous, and with the solitary exception of those of *Philippiella,* hermaphrodite. The flowers are almost always tetracyclic, the sepals, the petals, the stamens and the carpels all forming one whorl. The petals, however, are sometimes, though very rarely, absent, e.g. in a few species of *Paronychia* subgenus and section *Paronychia,* subsection *Anychia,* and series *Planitoriae* of the subsect. *Paronychia* and in one species of *Herniaria* (*H. hemistemon* Gay).

In most of the species the calyx, corolla and androecium are 5-merous, but the pistil is mostly composed of two (rarely three, in *Corrigiola* and *Gymnocarpos*) united carpels. In some of the species of *Herniaria* (the whole of the subgenus *Heterochiton* as well as section *Paronychiella* of the subgenus *Herniaria*) and in the monotypic *Philippiella* the flowers are tetramerous. The stamens (see below), however, occasionally show a good deal of variation in number.

The flower is basically perigynous, but the perigyny is not uniformly developed within the group or even within the same genus. Accordingly, a wide range of variability is met with in the various genera. In *Corrigiola* and in most of the species of *Herniaria* subgenus *Herniaria* and in *Paronychia* subgenus *Anoplonychia* and series *Planitoriae* the perigynous zone is very weakly developed. But the rest of the species of *Herniaria* (subgenus *Heterochiton*) and *Paronychia* as well as in *Gymnocarpos* and *Lochia* possess a well-developed perigynous region. In fact the latter two genera show perigyny at its (maximum) best.

Sepals: The sepals are generally soft (herbaceous) and, occasionally, somewhat, fleshy, in a large number of species of *Corrigiola, Herniaria, Paronychia* (esp. subgenera *Siphonychia* and *Anoplonychia*), *Philippiella* and *Gymnocarpos.* In the subgenus *Paronychia,* however, they are mostly semi-scarious, and in *Lochia* and *Sphaerocoma* coriaceous (in the latter only the median band is coriaceous). They are usually narrowly oblong or ovate-oblong, or, sometimes elliptic, and obtuse or subobtouse; in *Corrigiola, Herniaria* and a number of species of *Paronychia* they *are* connivent. In about one-half of the species of *Paronychia* they are

provided with a small apical hood, the tip of which goes out at the back into a short or long cusp or awn. Such a hood and cusp is also developed (though rather weakly) in *Gymnocarpos,* in *Lochia* and in the subgenus *Siphonychia* of *Paronychia.* The hoods generally serve as temporary pockets for the anthers. In *Herniaria* subgenus *Heterochiton,* the apex is considerably thickened and often somewhat recurved. Recurved sepals are found also in some species of *Paronychia* subgenus *Anoplonychia* (section *Heterosepalae*), but unlike what is seen in the *Herniaria* species, the apex is not thickened.

The sepals are often 3-nerved, the nerves usually converging to the tip. They are quincuncially imbricate in the 5-merous flowers, but decussate in the 4-merous ones.

Like the receptacle, the sepals are covered with short, sparse or dense, and patent or sometimes appressed hairs. Occasionally, as in *Corrigiola,* in *Lochia* and in a few species of *Herniaria* and *Paronychia* they are glabrous.

Petals: the morphological nature of the petals has, for a long time, been a matter of controversy. LÜDERS (1907) basing his evidence on the highly variable staminal whorls of *Scleranthus,* arrived at the conclusion that the petals (of the subfamily *Paronychioideae)* acutally represent the outer, partly reduced, whorl of the androecium. This view was accepted by PAX & K. HOFFMANN in ENGLER-PRANTL, Pflanzenfam. ed. 2 (1934), and later by FRIEDRICH (1961). But as pointed out long ago by BRIQUET (1911) it depends entirely on one's personal judgment whether one wishes to consider the petals as just an outer sterilized whorl of stamens or as a whorl morphologically distinct from them. There is no conclusive evidence confirming or disproving one of the two viewpoints. PAX & HOFFMANN (op. cit.) regard the petals of the subfamilies *Alsinoideae* and *Silenoideae* (with obdiplostemonous flowers) as genuine petals, but those in the 3rd subfamily, *Paronychioideae* as staminodia. In the subtribe *Paronychiinae,* however, very distinct petaloid structures are developed in *Corrigiola* and in *Sphaerocoma;* to describe such well-developed structures as staminodia, as FRIEDRICH (op cit.), has done, seems rather far-sought. In one species of *Herniaria* (*H. arabica* Handel-Mazz.) the petals are very well-marked and quite distinct from the filaments of the stamens. According to TH. ECKARDT* (1967) p. 340, each petal in *Illecebrum* and *Corriogiola* is supplied with one vascular bundle, closely associated with and almost indistinguishable from the vascular supply of the adjoining sepals.

In *Paronychia kapela* (Hacq.) Kerner, however, Th. Eckardt considers them as staminodia on the grounds that the vascular bundles in this case are too weakly developed to be distinguishable from the vascular bundles of the stamens.

In this work the petals, whether well-developed or appearing in the form of subulate-filiform and inconspicuous structures, will be treated as such (i.e. as distinct petals). Except in *Corrigiola* and *Sphaerocoma,* they are subulate-filiform, sometimes with reddish tips, attached to the rim of the receptacle, and equalling or exceeding the stamens, but shorter than the sepals.

Stamens: The stamens are inserted on the rim of the (usually) cup-shaped receptacle (the perigynous zone) just opposite the sepals. There are mostly five of them, but occasionally four, as e.g. in some of the species of *Herniaria* (section *Paronychiella* and subgenus *Heterochiton* except *H. hemistemon* Gay) and in the monotypic, tetramerous and dioecious genus *Philippiella.* In *Paronychia* two species show a reduction in the number, *P. canadensis* (L.) Wood and *P. mexicana* Hemsley subsp. *monandra* (Brandegee) Chaudhri, the former possesses two stamens, the latter has only one. A few species of *Herniaria* show even more pronounced variability. *H. cinerea* DC. and *H. acrochaeta* (Born-m.) Chaudhri are consistently diandrous, but in *H. hirsuta* L. the number is highly variable, sometimes even on the same plant, the common numbers being 5,4 and 3 in order of frequency. Of the tetramerous species only *H. hemistemon* Gay has two stamens.

Philippiella, being dioecious, presents a highly interesting and rather peculiar situation. The pistillate flowers possess 4 sterile episepalous stamens, with very short filaments and thin, membranous, brownish, sterile anthers. SPEGAZZINI described these (sterile) stamens as petals alternating with the stamens. PAX and HOFFMANN (op. cit.) presumably without examining any material, and basing their views on the available descriptions, went one step further and described the stamens as being 8 in number, in two whorls of 4 each, the inner (episepalous) stamens being sterile, the outer fertile. In reality, however, the pistillate flowers are entirely devoid of fertile stamens. There is no difference at all between the relative positions of the petals and stamens in this genus on the one hand and in the rest of the genera on the other, for its petals are homologous with (occupy the same position as) the petals of *Herniaria* and *Paronychia.*

The filaments are filiform, and attached to the back of the anthers just below the middle. In very rare cases (e.g. in *Corrigiola propinqua* Gay and *Paronychia kotschyana* Chaudhri) there is some variation in the length of the filaments, some of the plants possessing relatively shorter filaments than the other ones.

Pistil: In most of the genera the pistil is bicarpellary (with two marginally united carpels), *Corrigiola* and *Gymnocarpos* with 3 carpels, being the only exceptions. The ovary is, however, always unilocular with generally one -- two in one genus, *Sphaerocoma,* but only one reaches maturity ------- basal, amphitropous ovule. The wall of the ovary is often

membranous and smooth, sometimes as in some of the species of *Paronychia* (subgenus *Paronychia*) and *Herniaria,* more or less papillose, particularly at the top, very rarely, e.g. in *Paronychia argyrocoma* and *P.sessiliflora* Nutt., densely pubescent. The ovary is often ovoid, rarely narrowly ellipsoid (as in *Gymnocarpos* and *Lochia*), usually free from the receptacle, rarely (in *Gymnocarpos*) fused with it at the base.

The style is filiform, elongate and (shortly 2-cleft at the top) crowned by two short stigmas in some of the species of *Paronychia* (subgenus *Siphonychia,* subsection *Chartaceifoliae* of the subgenus *Paronychia;* series *Longistylae* and *Argyrocomae* of the section *Paronychia*) and in *Gymnocarpos* (here, however, with 3 stigmas), *Lochia, Sphaerocoma* and *Sclerocephalus* and section *Paronychiella* of *Herniaria.* In the subgenus *Anoplonychia* (of *Paronychia*) there are two filiform styles, often entirely free and erect, more rarely slightly connate at the base. But in most of the species of the largest subgenus *Paronychia* the style is rather short or of medium length (in relation to the flower and the ovary), rather thick, 2-fid or 2-cleft at the top, crowned by two stigmas which equal or exceed it in length. Such a condition is also met with in a few species of *Herniaria* (e.g. *H. capensis* Bartl., *H. latifolia* Lapeyr., *H. olympica* Gay). A still further reduction in the length of the style has resulted in the development of two subsessile or sessile stigmas, Such a situation is found in the subgenus *Heterochiton* of *Herniaria* as well as in *H. mascatensis* Bornm., *H. boissieri* Gay, *H. incana* Lam., *H. pisidica* Brummitt etc., and also in a few species of *Paronychia* (*P. aretioides* DC., *P. kapela* (Hacq.) Kerner, *P. chartacea* Fernald). In very rare cases the stigma is very short, sessile and bilobed (e.g. in some species of *Herniaria*). In *Corrigiola* the stigmas are often subsessile and divergent. In cases with a distinct style the two stigmas are usually partly fused. An exception, however, is found in *Gymnocarpos* when there are three stigmas. This condition is also, though very rarely, met with in some species of *Herniaria* and *Paronychia,* and has led some taxonomists astray. Rothmaler and Silva's creation of a new species *Paronychia mauritanica,* out of *P. argentea* Lam., on the basis of the presence of three stigmas is a case in point. The ovule is basal and amphitropous in the unilocular ovary.

Pollination and Fertilization: The flowers are, in general, self-pollinated, but in *H. ciliolata* Meld., FROST (1967) has reported ants as pollinating agents. Mostly, however, the flowers are protandrous, and the stamens often cling to the stigma (stigmas) when the flower opens and the style grows up.

Fruit: The fruit in all the genera, except *Corrigiola,* is an utricle, ovoid to narrowly ellipsoid in shape, and with a thin-papery, membranous, often pale or light-brown, smooth or somewhat papillose pericarp, rupturing irregularly at the base. In *Corrigiola,* on the other hand, the fruit

is a trigonous indehiscent nut with a dark-brown to black, very hard and rough, alveolate wall. In every case, however, the fruit is enclosed by the persistent sepals.

Seed: The seed is ovoid-subglobose or somewhat laterally flattened, with a dark-brown, smooth and shining testa and a distinct radicle. The embryo is annular and surrounds a farinaceous endosperm, the two cotyledons are thin and papery.

Dispersal: The dispersal of fruits and seeds is usually effected through the agency of the wind. *Sclerocephalus* and *Sphaerocoma* possess a unique and very efficient way of accomplishing the dispersal in the sandy, arid regions where windy conditions are a regular feature of the climate. The entire indurated glomerule becomes detached (along with the short peduncle) from the shoot, and is dispersed by the wind, the hardened spiny leaves (and sepals) being a good protection against herbivorous animals.

GEOGRAPHICAL DISTRIBUTION: By far the largest number of species of this group is found in or near the Mediterranen region, especially in Greece, Turkey, Syria and Palestine in the East, and in Spain and NW Africa in the West. Two other areas with a heavy concentration of species are in the Americas, viz. in SSE USA, in the North, and in W.-Central S. America in the South. A few species of *Herniaria* are found in South Africa, and some *Corrigiola* species in East Africa and Madagascar. *Herniaria* extends to W. Siberia and Central Asia (*H. glabra* L., *H. caucasica* Rupr. and *H. polygama* Gay), one species, *H. caucasica*, reaching the Chinese border, and two other (*H. hirsuta* L. and *H. cinerea* DC.) extending up to NW mountainous parts of India and up to the easternmost parts of West Pakistan respectively. *Corrigiola* has a very disjunct distribution, 7 species occurring in the Old World, and 4 in the New World (Andes and Chile). *C. litoralis* L., the most widespread species of this genus, extends up to Sweden in the North and the Cape Province in the South. *Gymnocarpos* is another genus with a conspicuously disjunct range of distribution. Of the two species one (*G. decander* Forssk.) is widely distributed in subtropical Africa and SW Asia from the Canary Isles to SW West Pakistan, the other species (*G. przewalskii* Bunge ex Maxim.) is endemic in NW China and Mongolia.

Paronychia, as stated earlier, occurs in both the hemispheres (though not in Southern Africa, Central and SE Asia), and slightly less than 1/2 of the total number of species occur in the New World. The subgenus *Anoplonychia* of *Paronychia* is exclusively an Old World group. Similarly *Herniaria* is wholly confined to the Old World. Of the remaining four genera, only *Sclerocephalus* (one species) is widely distributed in subtropical to tropical Africa and SW Asia. The rest have a very restricted range. *Sphaerocoma* (2 species) occurs from NE Somalia, NE Sudan, Southern Yemen (Aden) to S. Iran and SW-West Pakistan,

Lochia is endemic in Socotra and Abdul Kuri Islands, S. of Aden and E. of Somalia, and *Philippiella* is confined to S. Patagonia (Argentine).
ENDEMISM: This is a group predominantly consisting of species with a small area of distribution. Apart from the three endemic genera mentioned above (*Philippiella, Lochia* and *Sphaerocoma*), *Corrigiola, Herniaria* and *Paronychia* possess a vast number of such species. In *Corrigiola* only *C. litoralis* L. is widely spread, the remaining ten species have a restricted range. In *Herniaria* out of 47 species only 6 have a wider range (namely *H. glabra* L., *H. hirsuta* L., *H. cinerea* DC., *H. incana* Lam., *H. hemistemon* J. Gay and *H. fontanesii* Gay), the percentage of endemics being 87.
In *Paronychia* the percentage is 90, and out of 109 species recognized in this work only eleven are distributed over a wide area. These eleven species are: *P. argentea* Lam., *P. arabica* (L.) DC., *P. polygonifolia* (Vill.) DC., *P. echinulata* Chater, *P. capitata* (L.) Lam., *P. chlorothyrsa* Murb. and *P. kapela* (Hacq.) Kerner in the Old World, and *P. canadensis* (L.) Wood, *P. fastigiata* (Raf.) Fernald, *P. jamesii* Torr. and Gray (North America) and *P. communis* Cambessèdes (S. America) in the New World. The rest of the species have a restricted range of distribu tion. Two species, viz. *P. canariensis* (L. fil.) Juss. and *P. illecebroides* Webb, are confined to small groups of Islands, the Canary and Cabo Verde Isles respectively. In this genus there are four centres of endemism: 1) Turkey and Greece; 2) SSE. Spain and NW. Africa; 3) SSE. USA; 4) W.-Central S.America (Peru, Bolivia, NW Argentine and Chile). Turkey is the richest area of all.
ECOLOGY: Most of the species, especially the perennial ones, belonging to this group of genera are found on stony grounds in steppes, on limestone screes and serpentine slopes and in open pastures. The annual species (e.g. those belonging to *Paronychia* and *Corrigiola*) are usually psammophilous plants, and so are part of the perennials, too, like *Herniaria capensis* Bartl. and *H. maritima* Link, both inhabiting coastal areas. Species which, like *Paronychia montana* (Small) Pax et Hoffm., are confined to shale barrens are very rare.

The perennial species of *Paronychia* and *Herniaria* are mostly found at higher elevations, and often form dense mats. *Paronychia andina* A. Gray reaches an altitude of 5300 m., the highest point reached by any species of this group. In *Herniaria, H. alpina* Villars and *H. cachemiriana* Gay are essentially alpine plants. Most of the species of *Paronychia*

The term endemic is used, in this account, in a narrower sense, meaning with a very restricted range of distribution, often within one floral region or part of it, or confined to one small area.

and *Herniaria* are, however, found at temperate regions, mostly below 2000 m.

The shrubby genera are essentially tropical and subtropical, inhabiting dry arid or semi-arid, usually sandy, areas. *Gymnocarpos przewalskii* Bunge ex Maxim. is the only exception, for it occurs in and around the Gobi Desert in Central Asia, i.e. at a considerable distance from the tropics.

Uses: Most of the species of this group have no economic or medicinal value, and none is known to be cultivated. P. FOURNIER (1948), however, has given a detailed account of the medicinal properties attributed to two species of *Herniaria,* viz. *H. glabra* L. and *H. hirsuta* L. (see under Herniaria). Moreover, these two species are reported to yield saponin as well as a glycosoid Herniarin. The alkaloids Paronychin and Cumarin are also reported to be present in some of the species of *Herniaria.*

KARYOLOGY: Seed samples of 20 different species were obtained from the various Botanical Gardens, and the seedlings were grown in the Botanical Garden of this Institute. However, chromosome counts of only 15 species could be prepared. Four other species have previously been studied by other workers. The results of the present study (mainly carried out by Dr. T. W. J. Gadella in the Cytotaxonomy Section of this Institute) along with the findings of the previous investigators, are listed below. The counts were prepared from the root tips fixed in Karpechenko's fixative, embedded in paraffin and stained according to the Heidenhain's haematoxylin method. Voucher specimens as well as the microscopical preparations have been deposited in the Botanical Museum and Herbarium of this Institute.

	Name of species	Collection number	2n	References and Remarks
1)	*Corrigiola litoralis* L.	C3/Slide no. 650907	18	(Annual).
		C6/Slide no. 651858	16	(Annual).
			18	Blackburn & Morton (1957)
			32	Mesquita Rodrigues quoted by Blackburn & Morton
2)	*C. telephiifolia* Pourr.	CT-1/Sl. no. 651855	32	(Perennial).
			18	Mesquita Rodrigues
3)	*H. alpina* Chaix ap. Villars		18	C. Favarger (1965).
4)	*H. ciliolata* Meld.		108	M. Rodrigues
			126	
			72	Blackburn & Adams (1955).
5)	*H. glabra* L.	H-1-A/Sl. no. 651860	18	(Annual).
		H-1-B/Sl. no. 650912	18	
		H-1-D/Sl. no. 651862	18	
		H-C-1/Sl. no. 651861	18	
		H-1-F/Sl. no. 651863	36	(Perennial).
		H-7-A/Sl. no. 651869	72	*H. glabra* L. var. *setulosa* Beck (Perennial).
6)	*H. hirsuta* L.	H-2-A/Sl. no. 651865	36	(Annual).
		H-7/Sl. no. 651493	36	(Annual).
7)	*H. incana* Lam.	H-8/Sl. no. 651870	18	(Perennial).
8)	*H. latifolia* Lapeyr.	H-6/Sl. no. 651866	54	(Perennial).
9)	*H. polygama* J. Gay	H-9/Sl. no. 651492	36	(Annual).
10)	*Paronychia argentea* Lam.		28	Blackburn & Morton
		P-6-D/Sl. no. 651883	14	(Perennial).
11)	*P. brasiliana* DC.	P-7/651884	36	(Perennial).
12)	*P. capitata* (L.) Lam.		42	Blackburn & Morton
13)	*P. echinulata* Chater		28	Blackburn & Morton
		P-6/Sl. no. 650906	14	(Annual).
		P-1/Sl. no. 650908	24	(Annual).
14)	*P. fastigiata* (Raf.) Fernald	P-2/650911	32	(Annual).
		P-4/650911	32	
		P-4-A/651878	36	
15)	*P. polygonifolia* (Vill.) DC.		14	Blackburn & Morton

It is clear from this list that the basic number in *Corrigiola* is 8 and 9, consistently 9 in *Herniaria,* and 7, 8 and 9 (and 6 or 12?) in *Paronychia*

Only a few species have so far been cytologically studied, and the data available so far are scanty. With the solitary exception of *Herniaria ciliolata* Meld., the karyological findings have not been of much help in delimiting the infra-specific taxa. In *H. ciliolata,* however, three subspecies are recognized mainly on the basis of the findings of cytological

studies. The three taxa differ considerably in the chromosome numbers, and these differences are correlated with appreciable morphological differences, especially in the length of the stems, width of their internodes, leaf-form and texture and the flower size. FROST (1967) has discussed in considerable length the points of differences between the subspecies *ciliolata* on the one hand and subsp. *subciliata* (Bab.) Chaudhri (var. *angustifolia* Pugsley) on the other. The latter possesses a 2n = 72 whereas the former has 2n = 108. The three subspecies are, moreover, geographically segregated. Octoploidy has also been observed in the var. *setulosa* Beck of *Herniaria glabra* L. But this taxon has a very disjunct range of distribution, and, is, therefore, not treated as a subspecies.
Taxonomic Interrelationships: Of the eight genera of this subtribe *Corrigiola* is the most aberrant one, differing markedly from the rest in being entirely glabrous and in possessing spirally arranged soft leaves and a trigonous nut. In so far as these characters are concerned it is undoubtedly the most primitive of all. The spirally arranged ("alternate") leaves, however, occasionally tend to be subopposite (in some of the New World species as well as in *C. telephiifolia*). Moreover, the soft leaves sometimes tend to become very thick and coriaceous (as in *C. crassifolia* Chaudhri, from Chile) resembling those of *Gymnocarpos, Lochia* or some members of the subgenus *Heterochiton* of *Herniaria.* Its tricarpellary pistil is a character which it shares with *Gymnocarpos,* but otherwise there is no clear relationship between the two genera. The distinctly developed petals show a striking resemblance to those found in *Sphaerocoma.* The latter stands apart from the rest by virtue of its biovulate ovary. However, only one ovule ultimately reaches maturity. In view of its close resemblance in habit to *Gymnocarpos* and in its floral characters and the method of fruit and seed dispersal to *Sclerocephalus,* it seems illogical to treat it as fundamentally different from the rest of the genera of this group as was done by Bentham and Hooker who considered it to belong to the family *Caryophyllaceae* while the rest of the genera were placed in the *Illecebraceae.* PAX et HOFFMANN in their treatment of the family *Caryophyllaceae* in ENGLER-PRANTL, Pflanzenfam., ed. 2, vol. 16c (1934), placed *Sphaerocoma* in the tribe *Paronychieae,* but an identical plant, though at that moment bearing a different name (*Hafunia* Chiovenda), was placed in a separate tribe *Pterantheae,* presumably on the basis of CHIOVENDA's description according to which the long bristles which are characteristic for the fruiting stage, would be developed from sterile inflorescence branches and not from the sterile flowers. In the present account they are considered to be the metamorphosed bracts and sepals of the sterile flowers, and not inflorescence branches. As pointed out by GILLETT (1957) *Hafunia globifera* Chiovenda is conspecific with *Spaerocoma hookeri* T. Anderson.

In its tricarpellary pistil *Gymnocarpos* agrees with *Corrigiola,* but otherwise there is no relationship whatsoever between the two. It is apparently closely allied to *Lochia* which it resembles in habit, and in the characters of the inflorescence, the flower and the fruit, but the latter possesses a bicarpellary pistil. *Gymnocarpos* is remarkable in possessing in one of its two species silvery-scarious bracts which owe their origin to the fusion of the scarious stipules with the strongly narrowed leaves to which they belong. It is interesting to note that in the larger of the two species (*G. decander* Forssk.) the flowers are subtended by leaflike bracts whereas in *G. przewalskii* Bunge ex Maxim. these leaflike bracts are replaced by the scarious ones. Both *Gymnocarpos* and *Lochia* show a high degree of perigyny, almost bordering on epigyny. It is, indeed, curious to note that such an extreme form of perigyny should have developed in genera which are suffruticose and which, accordingly, are often regarded as more primitive than the herbaceous plants such as the species of *Herniaria* and of *Paronychia* subgenus *Anoplonychia* which mostly possess but a weakly developed perigynous zone.

Paronychia shows various stages in the development of perigyny, besides possessing a wide range of cymose inflorescences, from the simplest to the most complex. The bracts too vary, from foliaceous to entirely scarious, and the sepals, too, vary widely in size and shape.

Herniaria is obviously closely allied to *Paronychia* though easily distinguishable from the latter in most of its characters. It lacks the conspicuous stipules and bracts which characterize the majority of the *Paronychia* species. However, in those *Paronychia* species where the stipules and/or the bracts are not well-developed, as e.g. in *Paronychia setigera* (Gillies ex Hook. et Arn.) Herm. (which was originally and quite erroneously described as *Herniaria setigera* Gillies ex Hook. et Arn.) and in *P. suffruticosa* (L.) DC., the flowers, especially the strongly cucullate and mucronate sepals provide an easy means for the identification of the genus. There is one species of *Herniaria* subgenus *Heterochiton (H. pujosii* Sauv. and Vindt) which possesses very well-developed stipules, almost like those of *Paronychia,* but here again the floral characters are distinct enough to show that it is a genuine *Herniaria.*

Philippiella is to be regarded as very closely allied to *Herniaria* which it resembles in habit and in a number of other characters, such as those of the stem, the leaves, the stipules, the flowers etc., but it possesses, none the less, some unique features, particularly the solitary, terminal, ebracteate and dioecious flowers and the very peculiar anthers. Incidentally this is the only genus in the whole subtribe showing dioecism.

The variational patterns: The variation within the species occurs either at the boundary lines of the area or just at random. The first case is

illustrated by *Paronychia sessiliflora* Nutt. and by *P. argyrocoma* Nutt., both of which include "paramorph" individuals with similar aberrant characters occurring at the two opposite ends of the area; these groups of individuals deviate from the main population in the length of the sepal awn and the hairs by which they are covered. The second case is examplified by *Paronychia kapela* (Hacq.) Kerner and by *P. chlorothyrsa* Murb., both exhibiting a highly disjunct or discontinuous variability, and in these species the paramorphs with identical characters are distributed at random. Such variants differ considerably from the rest of the population, often in more than one character, and are, taxonomically, of a higher rank than an ordinary "variety", but, unfortunately, cannot be accorded the rank of subspecies on account of their being discontinuous in distribution.

Of all the species or taxa included in this subtribe, *Paronychia arabica* (L.) DC. is the most polymorphic one, a fact well borne out by the recognition of six subspecies showing marked differences in some of the floral characters. In fact between some of the subspecies (e.g. *aurassiaca, cossoniana* and *annua*) there are no intermediates at all, and it is not surprising that they have previously been treated as distinct species. The case of *P. arabica* is, however, a very extreme one, and most of the species are fairly uniform in the composition of their populations, the range of variability mostly being confined to the vegetative characters. In *Herniaria, H. scabrida* Boiss., too, presents an extreme case of polymorphism though on a more limited scale. Whether such variability is caused by polyploidy, hybridization or mutation or by all three is, so far, a matter of conjecture since there is no sufficient experimental evidence to prove or to disprove conclusions which are based exclusively on the examination of herbarium specimens. However, it is reasonable to assume that hybridization, coupled with polyploidy and mutation, may have caused the high degree of polymorphism shown by some of the species. At any rate, in some of the taxa which have been studied cytologically so far, there is hardly any morphological difference between the diploids and the tetraploids, and appreciable morphological changes in particular characters are brought about only when the (chromosome) count is higher than 4 n, that is, at the level of octoploidy or higher. *Herniaria ciliolata* Melderis which has been cytologically and experimentally studied by various workers, illustrates this point. In the present work, the karyological evidence is recognized only as taxonomically important when it has brought about a significant change in the general aspect of a particular population or of a part thereof.

INTER-SPECIFIC HYBRIDIZATION: This is a field which has not been explored experimentally and which evidently requires a thorough study. There is, however, considerable morphological evidence in support of the occurrence of inter-specific hybridization in at least one genus, viz. in *Herniaria.*

BRUMMITT (1967) has already pointed out two such cases, both involving such well-known and distinct species as *H. glabra* L. and *H. hirsuta* L. There are a few other cases in this genus strongly suggesting the possibility of inter-specific hybridization. They have been discussed in the Introductory Chapter on that genus and need not be repeated here. In addition to *Herniaria,* there is some evidence in *Corrigiola* pointing to the possibility of hybridization, especially between *C. litoralis* L. and *C. telephiifolia* Pourr. In fact, the subsp. *foliosa* (Perez-Lara) Chaudhri of *C. litoralis* may well have arisen as a hybrid of these two parents. However, it is definitely fertile and replaces subsp. *litoralis* in S. Spain. There are no such clear-cut cases in *Paronychia,* but the possibility cannot be ruled out entirely in some Turkish taxa, e.g. in *P. kayseri* Chaudhri, though the two probable parents are now geographically far apart.

General Considerations:

This subtribe is undoubtedly a very difficult group, and this is particularly true of the genera *Paronychia* and *Herniaria.* The fact that most of the hitherto known characters of taxonomic importance are confined to the floral parts, which are either too small to be studied easily or concealed by the bracts, makes a proper study especially difficult. No wonder that a lot of taxonomists have, at one time or another, been baffled by some species which do not present any difficulty if the critical characters are properly understood. J. D. HOOKER'S treatment of *Herniaria* in his Flora of British India, for instance, illustrates this difficulty. H. remarked "I am quite unable to discriminate between the species of *Herniaria,* or to refer these (Indian specimens of *H. hirsuta*) to any descriptions of BOISSIER. The *incana* form looks at first sight very distinct, but there appear to be many intermediates". As a matter of fact, however, there are no intermediates at all, and the "*incana* form" really belongs to *H. cachemiriana* Gay (described in 1847), *H. incana* Lam. simply does not occur in West Pakistan or in NW India, and Hooker's *H. hirsuta* comprises two very well-defined and geographically well-separated species, viz. *H. hirsuta* L. and *H. cinerea* DC., the former occurring in the montane regions, the latter in the arid plains. Such difficulties are, of course, bound to crop up in these genera if the plants are studied in the conventional way with the help of a simple hand lens. This hand-lens taxonomy, unfortunately, is, in this case, of very little help. The flowers have to be dissected to ensure a correct interpretation. It is, therefore, not surprising that in a number of floras some very distinct species have either been ignored altogether or are very badly represented. *Paronychia communis* Cambessèdes, *P. chionaea* Boiss. (misunderstood and misrepresented by BOISSIER himself), *P. splendens* Steven, *Herniaria cinerea* DC., *H. permixta* Gussone (*H. hebecarpa* Gay ex Williams), and *Corrigiola capensis* Willd. are some

of the important taxa which have been, in one form or another, grossly misunderstood and misrepresented. In *Herniaria cinerea* DC., for instance, the two essential characteristics of the species, viz. the presence of uncinate hairs on the perigynous zone and that of but two stamens, have, never before, been properly understood, and some of the specimens have been treated as belonging to *H. diandra* Bunge or to a variety *diandra* of *H. hirsuta,* whereas some others have been treated as a variety *hamata* Herm. of *H. hirsuta.*

Not all the species, however, are difficult to study, and even the difficult ones can be understood without much effort provided the critical characters are properly looked into.

Broadly speaking, there has been very little change in the species concept in this group from the time of J. BAUHIN to the present day. Incidentally J. BAUHIN was the first to use binomials in the Linnaean sense. In fact, with regard to this group, LINNEAUS owed almost everything to BAUHIN and to TOURNEFOURT, and apart from his nomenclatural niceties and a few new taxa not mentioned in the earlier works, there is not much that can be described as his original contribution. As a matter of fact he described the *Paronychia* species under three genera, one of them (*Achyranthes*) having absolutely nothing in common with the others. In *Herniaria,* too, his identifications were not all correct. Having received a plant superficially resembling *H. hirsuta* after the publication of the first edition of his Species Plantarum, he referred it to this species (as appears from the label of the specimens preserved in the herbarium of the Linnean Society, London). However, he, very luckily, did not change his description in the second edition. This plant, received from his friend, Mr. Sauvage of Montpellier, in fact, belongs to *H. cinerea* DC. A. P. DE CANDOLLE's account of this group was, perhaps, the best, though he used a slightly narrower species concept than was justified. BOISSIER, too, on the whole, had a very clear eye for the delimitation of his taxa, though, unfortunately, he failed to fully comprehend the *Kapela-Chionaea-Cephalotes* group in *Paronychia.* HERMANN's (1937) account of *Herniaria,* on the whole, forms a good basis for delimiting most of the (then known) species of *Herniaria* (there are, however, two notable exceptions, viz. *H. cinerea* DC., and *H. ciliolata* Meld. or *H. ciliata* Bab., both of which he misunderstood). In *Paronychia* CORE's work (1941) on the North American species is a fine example of the way in which the difficult problem of species delimitation can be solved in a region where most of the species are nearly related endemics, but none the less, distinct enough if properly studied. The species concept employed in this work conforms almost entirely to that of CORE. In the present work the floral characters form the basis for delimiting the various taxa, though quite often they are supplemented by characters

of the vegetative part. Polyploidy has been taken note of only when it is correlated with a significant change in the morphological features of a particular population. The term subspecies is used to describe any group of individuals differing from the main population in more than one character, and, besides, occupying a rather well-defined area. The variants differing in one character like leaf form or flower size are given the rank of a variety no matter whether they occur in one well-defined area or have a disjunct range. The term forma is used for very isolated variations which seem to have no genetic basis, and are probably caused by some environmental factor or factors.

This subtribe as delimited by PAX & HOFFMANN consisted of 9 genera, one of which (*Siphonychia*) has been reduced in this work. The statistics given by PAX & HOFFMANN for the number of species are very misleading and grossly incorrect. In fact PAX had cited in the first edition of ENGLER-PRANTL, Nat. Pflanzenfamilien (1889) for *Paronychia* 40 * species, and this figure has been repeated in the 2nd edition (1934), and surprisingly enough even in ENGLER'S Syllabus, ed. 12, 2:94 (1964). F. HERMANN in 1937 had prepared a good estimate for *Herniaria,* enumerating 33 species, but regretably the figure given in the Syllabus (1964) reads "über 20". Such gross inaccuracies are to be regretted as they naturally cast doubt on the reliability of other data quoted in these works.

In the present work, 109 species are recognised in *Paronychia,* 47 in *Herniaria,* 11 in *Corrigiola,* 2 in each of the genera *Sphaerocoma* and *Gymnocarpos,* whereas the three genera *Sclerocephalus, Lochia* and *Philippiella* are monotypic.

The descriptions given in the taxonomic part apply to the entire population irrespective of the fact whether the type specimen agrees with the rest of the population or not. In fact the type being a part of the whole population, has been considered important only for the nomenclatural purposes. In the descriptions of the various taxa the colour indicated for any particular plant organ evidently refers to that of the dried state, and the colour of such organs or parts may be somewhat different in a living plant. In the latin diagnoses of the S. American species of *Paronychia,* the term glomerule has been used (to describe the flower clusters) in a broad sense.

The exsiccatae have, generally, been cited on a regional basis. The Turkish material, however, has been cited, with some modifications, in accordance with the grid system used in P. H. Davis'Flora of Turkey. As regards the literature references given under the various species or taxa, especially the widely distributed ones, it may be pointed out that

* Incidentally this figure was first quoted by Bentham and Hooker (1880) in the Genera Plantarum.

it has not been possible to cite all the regional floras, and only the larger floras or the relatively easily available works have been cited.

As stated earlier, the present work is based on the study of over 13500 herbarium sheets, and nearly 10500 sheets were obtained on loan from various herbaria listed below. I wish to express my gratitude to the directors and curators of the undermentioned institutes and herbaria. I also wish to thank the directors and other members of the staff of the herbaria at Geneve (G), Barcelona (BC), Madrid (MA), Paris (P), Lyons (LY), Kew Gardens (K), British Museum of Natural History, London (BM) and the Linnean Society, London (LINN) for their hospitality during my visit to these herbaria, in May-June 1967, and for the facilities to examine material there.

Thanks are also due to Dr. P. H. Davis, Department of Botany, University of Edinburgh, and to Dr. R. K. Brummitt, Kew Herbarium, for sending me the material of the Institute of Pharmacognosy, Istanbul University, Turkey, as well as the private collection of Dr. F. Sorger of Linz, and one sheet of the Liverpool University Herbarium respectively. Finally I wish to thank Miss Hanna Czeczott for her help in the study of the type specimens of her two species of *Paronychia.*

B Berlin-Dahlem, Germany: Botanisches Museum.
BC Barcelona, Spain: Instituto Botánico de Barcelona.
BM London, Great Britain: British Museum of Natural History
BPU Budapest, Hungary: Institute of Systematic Botany and Plant Geography.
C Copenhagen, Denmark: Botanical Museum and Herbarium.
CAI Cairo, Egypt, U.A.R.: Department of Botany, Cairo University.
CGE Cambridge, Great Britain: Botany School, University of Cambridge.
COI Coimbra, Portugal: Bot. Institute of the Univ. of Coimbra.
E Edinburgh, Scotland, Great Britain: Royal Botanic Garden.
EA Nairobi, Kenya: The East African Herbarium.
F Chicago, Illinois, U.S.A.: Chicago Natural History Museum.
FI Firenze, Italy: Herbarium Universitatis Florentinae.
G Genève, Switzerland: Conservatoire et Jardin Botaniques.
GB Göteborg, Sweden: Herbarium, Institute of Systematic Botany, University of Göteborg.
GH Cambridge, Massachusetts, U.S.A.: Gray Herbarium of Harvard University.
HAL Halle, Germany: Inst. für Syst. Bot. und Pflanzengeogr. der Martin-Luther Universität.
HBG Hamburg, Germany: Staatsinst. Allgem. Botanik.
HUJ Jerusalem, Israel: Department of Botany, Hebrew University.
JE Jena, Germany: Institut für Spezielle Botanik und Herbarium Haussknecht.

K	Kew, Great Britain: The Herbarium, Royal Botanic Gardens.
L	Leiden, Netherlands: Rijksherbarium.
LD	Lund, Sweden: Botanical Museum.
LE	Leningrad, U.S.S.R.: Herbarium of the Komarov Bot. Inst. Acad. Sci. U.S.S.R.
LIL	Tucuman, Argentine: Instituto Miguel Lillo.
LINN	London, Great Britain: The Linnean Society of London.
LISE	Sacavem, Portugal: Estação Agronomica Nacional, Oiras.
LP	La Plata, Argentine: Museo de La Plata, Division de Plantas Vasculares.
LY	Lyons, France: Herb. de la Facult. Sci., Lyon.
MA	Madrid, Spain: Instituto "Antonio José Cavanilles", Jardin Botanico.
MPU	Montpellier, France: Institut de Botanique, Université de Montpellier.
NY	New York, New York, U.S.A.: The New York Botanical Garden.
P	Paris, France: Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie.
PRE	Pretoria, Republic of South Africa: Botanical Research Institute, National Herbarium.
RB	Rio de Janeiro, Brazil: Jardim Botanico.
S	Stockholm, Sweden: Bot. Depart., Naturhistorska Riksmuseum.
SGO	Santiago, Chile: Museo Nacional de Historia Natural.
SRGH	Salisbury, S. Rhodesia: Federal Museum.
STU	Stuttgart, Ludwigsburg, Germany: Herbarium, Staatliches Museum.
TEX	Austin, Texas, U.S.A.: University of Texas Herbarium.
TGM	Tbilisi, Georgia, U.S.S.R.: Herbarium of the S.N. Djanashia Georgian State Museum.
U	Utrecht, Netherlands: Botanical Museum and Herbarium.
UC	Berkeley, California, U.S.A.: Herbarium of the University of California.
US	Washington, D.C., U.S.A.: U.S. National Museum (Dep. of Botany).
W	Wien, Austria: Naturhistorisches Museum.
WVA	Morgantown, West Virginia; U.S.A.: West Virginia University.
WU	Wien, Austria: Botanisches Inst. und Bot. Gart. Univ. Wien.
Z	Zürich, Switzerland: Bot. Gart. Inst. Syst. Bot. Univ. Zürich.

TAXONOMIC PART

Diagnosis and Key to the genera of the subtribe

PARONYCHIINAE

Subfamily **Paronychioideae** Vierhapper in Österr. Bot. Zeitschr. 57:96 (1907).
Tribe **Paronychieae** Pax in Engler-Prantl, Pflanzenfam. ed. 1, 3(16):88 (1889).
Subtribe **Paronychiinae** Pax et Hoffman in Engler-Prantl, Pflanzenfam. ed. 2, 16c:298 (1934).
Syn.: *Corrigiolaceae* Reichenb. in Mössl, Handb. 1 (1):51 (1827), p.p.
Tribe *Telephieae* DC., p.p. and Trib. *Illecebreae* R.Br., p.p. (sub Ordo *Paronychieae* St. Hil) in Prodr. 3:366-367 (1828).
Telephieae Bartl., Beitr. 2:157 (1830) p.p.
Paronychieae St. Hil. ---- Trib. *Illecebreae* R.Br. ---- Subtrib. *Corrigioleae* Fenzl et Subtrib. *Euparonychieae* Fenzl in Endl., Gen. Pl. 956-957 (1839).
Illecebraceae Lindl. ---- *Paronychieae* Bentham and Hooker, Gen. Plant. 3:13 (1880).
Paronychioideae -- *Paronychieae* Lüders in Engler, Bot. Jahrb. 40 (Beibl. 91):28 (1907).
Caryophyllaceae --- *Corrigiolinae* et *Illecebrinae* Graebn. in Aschers. and Graebn., Syn. 5(1):866 and 870 (respectively) (1919), p.p.
Leaves stipulate, often opposite and somewhat unequal, rarely "alternate"; flowers usually in cymes which are often aggregated in dense clusters, rarely solitary, more or less distinctly perigynous; sepals free; petals usually subulate-filiform, sometimes well-developed; fruit one-seeded utricle, usually with a membranous pericarp, rarely with an indurated one; embryo strongly curved.

Key to the genera

1a) Ovules two (petals 5, well-developed; bracts and sepals of the sterile flowers during the ripening period developing long bristles; leaves linear) ---- undershrubs, Nubian desert to Baluchistan ----- 1. **Sphaerocoma** (2 spp.)

1b) Ovule one

2a) Carpels 3 (stigmas or stigma-lobes 3)

3a) Leaves alternate; sepals obtuse; petals well-developed (but membranous) and oval; style very short with 3 stigmas; fruit a hard, trigonous nut ---- Glabrous herbs ------- 2. **Corrigiola** (11 spp.)

3b) Leaves decussate; sepals very shortly awned; petals subulate-fifliform; style long, nearly reaching the sepal tips; stigmas 3; fruit with a membranous wall --- Low shrubs with knotty branches ..... 3. **Gymnocarpos** (2 spp.)

2b) Carpels 2 (style with two stigmas, or two styles each with one stigma)

4a) Undershrubs with woody and nodose stem; bracts reddish-brown; sepals mucronate; style elongate with two, very short stigmas ----- 4 **Lochia** (1 sp.) (Socotra Isl.)

4b) Herbs with herbaceous or basally woody stems

5a) Flowers in spiny, globose heads, at maturity concrescent with the spiny involucral leaves --- Annual herb in Tropical N. Africa and Arabia -------- 5. **Sclerocephalus** (1 sp.)

5b) Flowers not concrescent with the leaves; no spiny involucre or head developed

6a) Stipules silvery-scarious and quite prominent; flowers with 5 sepals in lateral (or pseudo-axillary) to terminal clusters or glomerules (rarely in diffuse cymes), and often surrounded by large, conspicuous scarious bracts; sepals either hooded and awned at the apex, or sometimes plano-concave but in that case the flowers always enclosed by large scarious bracts. Herbs in subtropical to temperate regions ---- 6. **Paronychia** (109 spp.)

tetramerous); sepals obtuse, without apical hood or awn

terminal to subterminal) clusters, with very short, scarious bracts Herbs in Europe, Africa and W. Asia ---- 7. **Herniaria** (47 spp.)

. . . . . 8. **Philippiella** (1 sp.) Patagonia (Argentine)

1. SPHAEROCOMA

Sphaerocoma T. Anderson in Journ. Linn. Soc. 5:15, t.3 (1860); Bentham et Hooker, Gen. Pl. 1:154 (1862); Boissier, Fl. Or. 1:738 (1867); E. Blatter, Fl. Aden in Records Bot. Surv. India 7:118-119 (1915); Pax et Hoffmann in Engler-Prantl, Pflanz. ed. 2, 16c:298 (1934); J. B. Gillett in Kew Bull. 1957 (3):387 (1958).
Psyllothamnus Oliver in Hooker's Icon. Pl. 15:77, t.1499 (1885).
Hafunia Chiovenda, Flora Somala 1:90, t.3/f.1 (1929); Pax et Hoffm., op. cit.

Small, woody subshrubs with an erect, much-branched stem, the branches sometimes tortuous and the nodes usually much swollen and knotty, glabrous or the younger shoots densely villous. Leaves opposite but slightly unequal, sessile, subterete, for the major part, owing to the development of numerous short axillary shoots, fascicled at the nodes, apex obtuse, often without mucro, but the young ones occasionally with a very short one, glabrous. Stipules ovate-triangular, acute, small and reddish. Inflorescences consisting of densely congested cymes, which are aggregated in lateral, globose or subglobose, reddish-brown, pedunculate glomerules, the latter densely spiny with maturity. Bracts sepaloid,

mucronate-aristate, shorter than the flowers. Flowers with a very short receptacle. Sepals 5, unequal, ovate to ovate-oblong, concave, coriaceous with a broad membranous margin, strongly mucronate-aristate; in the sterile flowers of *S. hookeri* passing into persistent bristles. Petals 5, oblong, obtuse, membranous, whitish, somewhat plicate at the apex, shorter than the sepals, and subhypogynous or only slightly perigynous. Stamens 5, inserted on the cupshaped receptacle, at the base of and opposite the sepals, alternating and laterally fused with the petals; filaments nearly half as long as the petals; anthers almost oblong, pale-yellow. Ovary unilocular, biovulate, the placenta slightly prolonged beyond the insertion of the ovules; style short; stigma bipartite.
Fruit subchartaceous, one-seeded owing to the abortion of one of the two ovules. Seed campylotropous, semi-rotund; radicle inferior.

A small genus with two species, occurring in S. Iran, Arabia and NE Tropical Africa. Type species: *S. hookeri* T. Anders.
Key to the species:
1a) Leaves usually linear or very narrowly subcylindrical, up to 20-30 mm long and mostly 1-1.5 mm wide; peduncles often 10-20 mm long; sterile flowers profusely developed, and their sepals growing out into spines in the fruiting stage; spines (3-)4-7 mm long, straight; stigma 0.35 mm, the lobes divergent-recurved **1. S. hookeri**
1b) Leaves less narrowly subcylindrical to spathulate, up to 8 x 2.25 mm; peduncles mostly quite short, 2-7 mm, and stout; sterile flowers absent or very sparse and the spines, therefore, not present in the fruiting stage; speals strongly mucronate to aristate, the mucro 1-2(-2.5) mm long, rigid and somewhat recurved; stigma 0.25 mm, the lobes spreading but not recurved **2. S. aucheri**

1. **S. hookeri** T. Anders. in Journ. Linn. Soc. 5:16, t.3 (1860).
E. Blatter, op. cit. 7:119 (1915); V. Täckholm, Stud. Fl. Egypt 404 (1956); Gillett, op.cit. 1957(3):388 (1958).
Type: ADEN: xii/1847, *Thomson* 36 (holo. K!).
Syn.: *Psyllothamnus* beevori Oliver in Hook. Ic. Pl. 15:77, tab. 1499 (1885). Type: Aden: *Beevor* (holo.?? not seen).
Hafunia globifera Chiovenda, Fl. Somala 1:90, t.3/f.1 (1929). Type: Somalia, Hafun: 30.i.1924, *N. Puccioni* et *J. Stefanini* 23 (holo. FI!).

A woody undershrub with an erect c. 50 cm tall stem, bearing numerous branches; internodes 1-2 cm long, up to 5 mm in diam.: mostly glabrous, but the upper internodes sometimes densely villous and hoary-white; bark of the older parts often greyish-brown and with many longitudinal fissures; nodes generally much swollen and, owing to the development of numerous, very short, axillary shoots, knotty.

Leaves very narrowly cylindrical or occasionally oblong-spathulate, 7-20(-30) x 1-1.5(-2) mm, fleshy or coriaceous, glabrous, obtuse, mostly without mucro, rarely with a very short one, margin often somewhat incurved and thickened on the under side; stipules c. 1.5 x 1 mm, mostly reddish with a whitish ciliate margin. Flowers aggregated in densely compact, 5-15 mm diam., globose to subglobose, lateral axillary, reddish-brown glomerules with a (5-)10-20 mm long, rather slender, glabrous pecuncle, usually replacing the axillary shoots; the glomerules, on ripening bearing spines, developing from the accrescent sepals of the abortive flowers. Bracts ovate suborbicular, 1-1.6(-2) x 0.6-1 mm, sepaloid, possessing a rigid, foliaceous central strip often terminating in a stout, c. 0.4 mm long mucro; margin densely ciliate; the median part reddish-brown. Flowers 3.5-4.5 mm long, tubular to funnel-shaped; receptacle short, c. 0.5 mm long; sepals unequal, ovate to ovate-oblong, 3-3.5 x 1-1.25 mm, acute to acuminate, the outer with a long (c. 1 mm), rigid awn, the inner broader and with a short mucro, or without any appendix, reddish-brown, almost entirely membranous with a ciliate margin. Petals oblong to oblong-spathulate, up to 2 x 0.75 mm, membranous, whitish to light-brown, somewhat emergent at maturity, the apex turning dark-brown. Filaments 0.8-1 mm, filiform; whitish; anthers c. 0.3 x 0.2 mm. Ovary 0.75-1 x 1 mm, conical to ovoid-rhombic; style 0.4-0.5 mm; stigmas 0.35-0.4 mm, finger-like, divergent-recurved with age. Fruit ovoid-subglobose, c. 1.5 x 1.25 mm, smooth, dark-brown at the top. Seed c. 1.25 x 1 mm, curved or horseshoe-shaped to subglobose.
Fl. 12-4. On littoral sand dunes and hillocks.
Distr.: Southern Yemen (Aden), SE Egypt and E. Somalia.

Key to the subspecies

1a) Stem glabrous throughout; leaves 20-30 mm long, peduncles 10-20 mm long a. subp. **hookeri**

1b) Stem glabrous in the older part only, the younger internodes densely villous; leaves usually less than 10 mm long and 1.5-2 mm wide; peduncles 5-8 mm long b. subsp. **intermedia**

a) subsp. **hookeri:** Stem glabrous throughout; leaves and peduncles linear, up to 20-30 mm and 10-20 mm long respectively; the inflorescences with 4-7 mm long spines (sepals of the abortive flowers). Type: ADEN: xii.1847, *Thomson* 36 (holo. K!).

Throughout the range of the species except in NE Sudan and W. Hejaz. **Aden:** *Thomson* 36 (K, holotype); J. Shamsan: *Schweinfurth* 103 (G, K); ibid.: *Deflers* 520 (E, G, L, W); Aden: *Warming* 153 (K); N. of J. Shamsan: 30.iv. 1886, *Deflers* s.n. (Z, trans. with subsp. *intermedia:* young internodes shortly villous). **Somalia:** Heis: *Glover* et *Gilliland* 692 (K); Hafun: *Puccioni* et *Stefanini* 23 (FI, type of *Hafunia globifera* Chiov.). **Sudan:** J. Elba District: Mersa Abu Naam: *V. Täckholm et al.* 621 (CAI); Suakin el Qadim: *id.* 1313 (CAI).

b) subsp. **intermedia** Gillett in Kew Bull. 1957 (3):388 (1958).
Stem glabrous in the older part only, the younger internodes densely villous; leaves usually less than 10 mm long and 1.5-2 mm wide; peduncles 4-8 mm long; the inflorescences with 2-4 mm long spines (sepals of the abortive flowers).
W. Saudi Arabia (Hejaz) and NE Sudan:
Saudi Arabia: Hejaz: N. of Jedda: *Trott* 51 (K). **Sudan:** Coastal region: J. Elba, Wadi El Sell: 20.i.1933, *J. R. Shabetai* F. 1050 bis (K, holotype); J. Elba District: Littoral plain of Red Sea: *V. Täckholm et al.* 94 (CAI); Ashaweib area: *id.* 1164 (CAI); Wadi Abu Ramad: *id.* 1596 (CAI); Mersa Abu Ramad: *id.* 643, 1115 (CAI); Wadi Laseitit: 7.ii.1962, *id.* (CAI); Hamata: 14.ii.1962, *id.* (CAI); Mersa Halaib: Wadi Kewan: *Drar* 36 (S); Wadi Affingab: *id.* 200 (S); Wadi nr. J. Elba: *Palmer* 142 (K, trans. form); Nubian coast: J. Hotarba: *Schweinfurth* 773 (K, trans. form); ibid., 900-1200 m, 1896, *Bent s.n.* (K, trans. form).

2. **S. aucheri** Boiss., Fl. Or. 1:738 (1877).
Parsa, Fl. Iran 1(2):1237 (1951).

Plate II, Fig. 13-19. p. 42

A bushy subshrub with a woody, much-branched, up to c. 30 cm tall stem, greyish-brown and glabrous in the older parts, but the younger ones hoary-white and densely villous; internodes up to 15 mm long; nodes much swollen and knotty. Leaves linear-subcylindrical to spathulate, up to 8 x 2.25 mm, fleshy or coriaceous, obtuse or rounded, occasionally the young ones very shortly mucronate, on the lower side somewhat grooved; stipules c. 1.6 x 1.25 mm, with a densely ciliate margin. Glomerules 5-15 mm in diam., axillary, with a rather short, 2-7, (in var. *rechingeri* up to 10 mm long), stout, villous to shortly pubescent (or glabrescent) peduncle; sterile flowers in the glomerules sparse or absent, and the long spines, therefore, not developed. Bracts ovate to somewhat oval, 1-2 x 1-2 mm, spaloid, with a rigid, foliaceous central part protruding at the apex and terminating in a short, 0.5-1 mm long mucro (the upper bracts, however, without any mucro), mostly reddish with a densely ciliate margin. Flowers 3.5-4 mm long (c. 2 mm wide), with a short 0.4-0.5 mm high receptacle. Sepals unequal, ovate to ovate-oblong; the outer c. 3.5 x 1.2 mm, with a rigid recurved, 0.3-0.5 mm long awn; the inner c. 3 x 1.5 mm with a very short awn. Petals oblong, 2(-2.25) x 0.75-1 mm, slightly widened at the apex, whitish to light brown; filaments 0.8-1.1 mm long; anthers 0.3-0.4 x 0.25 mm. Ovary c. 0.75 x 0.6 mm, conical, narrowed upwards into a rather thick, 0.4-0.5 mm long style; stigma c. 0.25 mm long, bipartite. Ripe fruit not seen.
Fl. 1-5. On sandy hills near sea-coasts.
Type: S. IRAN: (Persian Gulf): Qeshm (Kischm) Island: *Aucher-Eloy* 4520 (holo. G! iso. FI!).
Distr.: Southeastern Arabia, S. Iran and SW-West Pakistan (Makran).

SE Arabia: Oman: J. Ali nr. Dubai: *G. Popov* GP 101 (EA). **S. IRAN:** Qeshm Island: *Aucher-Eloy* 4520 (FI, G, type); ibid.: *Bornmüller* 1893: 160 (E, FI, JE, W, WU); Prov. Laristan: *id.* 161 (G, JE, LD, WU); Bandar Abbas: *Behboudi* 775 E (W); Jask: *id. 599* E (W); Makran: Chah Bahar: *Sharif* 763 E (W). **West Pakistan:** Baluchistan coast: 1880, *Pierce* (K).

ii) var. **rechingeri** Chaudhri var. nov. a var. *aucheri* pedunculo longiore (usque ad 10 mm longo) et subglabro (non villoso) distinguenda. Peduncles long, up to c. 10 mm, and almost glabrous (densely woolly-villous in the var. *aucheri).*

Type: West Pakistan: Makran: Kappar to Gwadar, 14.iv.1965, *Rechinger* 27904 (holo. W!).

This species differs from *S. hookeri* T. Anders, in lacking the characteristic spines to which the sepals of the sterile flowers grow out in the fruiting stage. Moreover, the leaves are somewhat broader and shorter, the glomerules usually shortly pedunculate, the sepals with recurved awn, the stigma quite short and the stigma-lobes spreading but not recurved.

2. CORRIGIOLA L.

Linn., Gen. Pl. ed. 1,340 (1737), ed. 5, 132 (1754); Bentham & Hooker, Gen. Pl. 3:17 (1880); Pax & Hoffmann in Engler-Prantl, Nat. Pflanzenfam. ed. 2, 16c:298 (1934). *Polygonaria* Heist., Syst. 6 (1748) *Polygonifolia* Vaill. ex Adanson, Famil. 2:272 (1763); O. Kuntze, Rev. Gen. Pl. 1:535 (1891); *Furera* Bubani, Fl. Pyrén. 3:16 (1901).

Glabrous annual, biennial or perennial herbs with diffusely branched decumbent stems. Leaves spirally arranged but appearing alternate or, occasionally, subopposite, sessile to subsessile or very occassionally petiolate, linear-oblanceolate to narrowly elliptic-obovate, stipulate. In florescences either in the form of terminal and lateral clusters composed of cymes, often aggregated at the ends of the branches, or in that of lax, pseudo-axillary and lateral cymes. Flowers small, pentamerous, with a cupshaped, partly perigynous receptacle; sepals 5, glabrous, green, with a white membranous margin, persistent; petals 5, membranous, usually shorter than the sepals; stamens 5; ovary unilocular with a solitary, basal ovule on a long funicle; stigmas 3, subsessile. Fruit a crustaceous, indehiscent, more or less trigonal, one-seeded utricle (achene), enclosed in the persistent calyx: seed with a membranous testa, radicle superior. A small genus with 11 species mainly distributed in Europe, Africa and Chile.

Type species: *C. litoralis* L.

Key to the species:

1a) Leaves sessile or subsessile; cymes condensed into sessile or shortly pedunculate clusters

Name form *corrigia,* a shoe-string, perhaps from the slender stems.

2a) Plants without a distinct scaly (bulbous) caudex
3a) Leaves elliptic to oblong, up to 2.7 x 1 cm; flowers c. 4 mm long ..... 9. **C. madagascariensis**
3b) Leaves either oblanceolate to narrowly obovate or linear; flowers less than 3 mm long
4a) Leaves oblanceolate to narrowly obovate
5a) Mostly annual; flowers 1.25-1.5(-1.75) mm long --- 1. **C. litoralis**
5b) Biennial to perennial; flowers larger (1.75-2.25 mm)
6a) Flower clusters on long, mostly terminal, leafless branches ------ W. Mediteranean ..... 2. **C. telephiifolia**
6b) Clusters for the greater part densely congested at the end of leafy shoots, but some on short leafless branches ----- Cape Prov. and E. Africa ..... 3. **C. capensis**
4b) Leaves more or less linear
7a) Annual; clusters on terminal inflorescences which are usually distinct from the lealy part of the shoot ---- Coastal plains of Palestine and Lebanon .....4. **C. palaestina**
7b) Perennial; flower clusters axillary and terminal, often partly hidden by the leaves ---- Mountains of Colombia and Mexico ------ 5. **C. andina**
2b) Main shoots arising from a prominent bulbous caudex covered with brownish scaly stipules --------- Chilean species
8a) Leaves cariaceous; flowers sessile ..... 8. **C. crassifolia**
8b) Leaves herbaceous; flowers pedicellate
9a) Caudex very conspicuous; stipules connate; flowers mostly in corymbose inflorescences; styles free ..... 6. **C. squamosa**
9b) Caudex not so well-marked; stipules free; flower clusters almost sessile, profusely developed along long, leafless axes, each lateral cluster consisting of several cymes; styles connate for one-third to one-half of their length ..... 7. **C. propingua**
1b) Leaves distinctly petiolate; cymes lax, repeatedly forked
10a) Perennial; petiole 1-4 mm long; flowers 2-2.5 mm; petals 1.4 mm long ..... 10. **C. drymarioides**
10b) Annual; petiole up to 1.5 cm long; flowers 1.5-1.75 mm long; petals not more than 0.5 mm long ---- in relatively lower and drier habitats ..... 11. **C. paniculata**

1. **C. litoralis** L., Sp. Pl. ed. 1, 271 (1753).

DC., Prodr. 3:367 (1828); Koch, Syn. ed. 2, 279 (1843); Boissier, Fl. Or. 1:749(1867); Willkomm & Lange, Prodr. Fl. Hisp. 3:150(1874); Nyman, Consp. 256 (1879); Battandier & Trabut, Fl. Alg. (Dicot.) 169 (1888); Beck, Fl. Nieder Österr. 1:246 (1890); Bonn. et Barr., Cat. Tun. 67 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):183 (1899); Halacsy, Consp. Fl. Graec. 1:574 (1900); Burnat. Fl. Alp. Marit. 3:232

(1902); Rouy, Fl. Fr. 12:11 (1910); Hegi. Illustr. Fl. Mitteleurop. 3:427 (1911); Graebner in Aschers. & Graebn., Syn. 5(1):867 (1919); Hayek, Prodr. Fl. Balcan. 1:175 (1924); Bouloumoy, Fl. Liban & Syr. 1:124 (1930); Dinsmore in Post, Fl. Syr., Pal. & Sin. 1:216 (1932); Thiébaut, Fl. Lib. & Syr. 1:133 (1936); Rechinger, Fl. Aeg. 131 (1943); Clapham, Tutin, Warburg, Fl. Brit. Is. 331 (1952); Illustr. Fl. Brit. Is. 1:93, f.365 (1957); H. Wild in Exell & Wild, Fl. Zamb. 1(2):360, tab. 68 f.B (1961); Maire & Weiller in Maire, Fl. Afr. Nord 9:9, f.1 (1963) pro parte; S. M. Walters in Tutin et al., Fl. Europ. 1:149 (1964); Mouterde, Nouv. Fl. Lib. & Syr. 1:452 (1966); Brummitt in Davis, Fl. Turk. 2:262 (1967).
Syn.: *Polygonifolia litoralis* (L.) O. Kuntze, Rev. Gen. Pl. 1:535 (1891); *Paronychia litoralis* (L.) E. H. L. Krause in Sturm, Fl. Deutschland, ed. 2, 5:25 (1901); *Corrigiola litoralis* subsp. *eu-litoralis* Briquet, Prodr. Fl. Corse 1:480 (1910); Maire et Weiller in Maire, Fl. Afr. Nord 9:11 (1963); *C. psammatrophoides* J. G. Baker in Jorn. Linn. Soc. 20:238 (1883) **(syn. nov.)**.
Type: Central Madagascar: *Baron* 2153 (holo. K! iso. P!).
C. russelliana A. Chevaler in Bull. Mus. Hist. Nat. Paris, sér. 2, 4:316, & 1008 (1938) **(syn. nov.)**. Type: MALI: Niala près Djenne, *Chevalier* 1131 (holo. P!).

A glaucous, annual or in subsp. *litoralis* var. *perennans* and in subsp *foliosa* biennial or perennial herb; with a slender or in subsp. *foliosa* stout tap root and rather slender, decumbent stems, up to c. 40 cm long and much-branched from the base. Leaves sessile or almost so, narrowly oblanceolate, or sometimes narrowly oblong-elliptic, acute to obtuse, narrowed gradually to the base; margin entire or slightly undulate; midrib distinct, but the lateral veins inconspicuous; the cauline leaves up to c. 8 x 2 mm, the radical ones up to c. 21 x 2.5 mm; in subsp. *foliosa* all of the same kind; stipules whitish, asymmetrically ovate-auriculate with a wavy margin, c. 2.5 x 1.25 mm. Flowers aggregated in terminal and pseudo-axillary, sessile or very shortly pedunculate, somewhat corymbose, clusters borne by leafy branches; bracts white, in subsp. *foliosa* with a reddish margin, scarious, narrowly ovate, c. 1 mm long. Flowers with an up to c. 1 mm long pedicel; the flowers themselves 1.25-1.5(-1.75) mm, ovoid to almost globose flowers themselves 1.25-1.5(-1.75) mm, ovoid to almost globose; sepals ovate-oblong, c. 1 x 0.75 mm, obtuse, with a conspicuous membranous margin; petals oblong, 0.7-0.8 x 0.4-0.5 mm, whitish, membranous, shorter than the sepals, though exceeding the stamens; filaments c. 0.5 mm; anthers almost oblong, 0.25(-0.3) x 0.2 mm, orange-yellow to purple; ovary ovoid, with three subsessile, spreading stigmas. Fruit ovoid-globose, 1-1.25 x 0.8-1 mm, trigonous, yellowish-

brown, somewhat rough or granular; seed subglobose, c. 0.75 mm in diam.
Fl. 3-9. On moist sandy soils.
Range: W., C. and S. Europe; E. and SSE. Africa, occasionally in NW. Africa.
Key to the subspecies and varieties:
1a) Plant always perennial with a stout woody tap root; shoots leafy throughout; leaves narrowly oblong-elliptic to oblanceolate, throughout of more or less uniform shape and size, up to 11 x 3.5 (rarely to 17 x 5) mm; bracts with a reddish margin; flowers c. 1.75 mm long ---- subsp. **foliosa**
1b) Plant annual, biennial or perennial, usually annual with a slender tap root; leaves mostly narrowly oblanceolate; the cauline up to c. 8 x 2 mm; the radical ones much longer; bracts whitish; flower 1.25-1.5 mm ..... subsp. **litoralis**
2a) Plants annual ..... var. **litoralis**
2b) Plants biennial to perennial ..... var. **perennans**

a) var. **litoralis:** Syn.: *C. litoralis* L. var. *virescens* Giraudias in Bull. Ass. Pyrén. 15:19 (1904-1905); *C. litoralis* var. *purpurascens* Giraudias, op. cit., & in Fedde's Repert. 8:33 (1910); Graebner in Aschers. & Graebn. Syn., 5(1):869 (1919). *C. litoralis* forma/var. *typica* Graebner in Aschers. & Graebn. op. cit. 869 (1919).
Type: W.-Central Europe (France and Germany), Herb. Linn. 386/1 (LINN!).
Range: Throughout the range of the species except in S. Spain & NNW. Africa.
ENGLAND: S. Devon: Slapton: *Hanbury* 1289 (L); *Milne Redhead* 1960 (L); *Reynolds* 1385 (W); Cornwall: *Fox* 236 (G); **NEDERLAND:** N. Drenthe: *Borssum-Waalkes* 5906 (L); S. Drenthe: *id.* 5283 (L); nr. Ommen: *Kern* 3590 & 5994 (L);Denekamp: *Hoogenraad* 757 (L); ibid.: *Wassink* 5448 (L); Amersfoort: *Bakhuizen* 4972 (U); nr. Nijmegen: *Kern & Reichgeldt* 10886 (L). **BELGIUM:** Limbourg: Hasselt: *Bamps & Magnier* 191 (L); Brabant: Gelrode: *Thielens & Devos* 7 (L); Semoy, Mombro de Gedinne: *Gravet* 270 (G, JE, W). **GERMANY:** Emden: viii. 1946, *Klimmek* (HBG); Essen: *id.* 24 (HBG); Hamburg: viii. 1915, *J. Schmidt* (HBG); Hannover: viii. 1890, *Schmidt* (HBG); Göttingen: ix. 1880, *Weiss* (JE); Rheinprov., Siegburg: *Vigener* 20 (G); Berlin: vii. 1880, *Ruhmer* (G, L, W); Dresden: viii. 1950, *K. Meyer* (JE). **POLAND:** Silesia: *Nerger* 1294 (G, L, WU). **SWITZERLAND:** Basel: *A. de Haller* 842 (G); Vevey (Vaud): 1898, *Schleicher* (G). **FRANCE:** Moselle: Vosges: *Demangeon* 443 (G, L, W); ibid.: *Gérard* 1687 (G, W); Strasbourg: *Colin* 19 (G, L); Haute-Saone: *Vendrely* 449 (JE); Seine-et-Oise: *Drenen* 1107 (W); Indre-et-Loire: Loire: *Blanchot* 1107a (G); Loire Atl.: nr. Nantes: *Stud. biol.* 63/3781 (U); Saone-et-Loire: *Boom & van Ooststroom* 11688 (L); Ain: Dombes: *O. Meylan* 2296 (G); Lyon: viii. 1912, *Reverchon* (JE); Haute-Vienne: *Chatin* 242 (G); Dordogne: *Walther* 426 (HBG); Gironde: viii. 1902, *Pitard* (G); Basses-Pyr.: vi. 1872, *Bordére* (G); Pyr. Occid.: x. 1830, *Endress* (G, HAL, HBG, L, STU); Pyr.-Or.: Port Vendre: vii. 1852,

Huet du Pavillon (G); Perpignon: vi. 1865, *H. Bernet* (G); Var: vi. 1930, *Becherer* (G); Alpes-Maritimes: *Bernardin* 784 (FI). **ITALY:** Hirpinia: Avellino: *Pellanda* 2256 (WU); Barilicata: Prov. Potenza: *Rigo* 508 (W). **SICILY:** Piana dei Greci: *Todaro* 430 (JE, U, W); **SARDINIA:** Pulam: *Müller* (E, JE). **SPAIN:** Barcelona: ix-x. 1868, *Dupuy* (WU); Asturia: Penas de Sta Anna: *Durieu* 334 (FI); Lugo: Villardiaz: viii. 1954, *Carriera* (G). **PORTUGAL:** Prov. Tras-os-Montes: Montalégre: *M. da Silva* 1936 (LISE); Alto Douro: Mirandela: *Beliz et al.* 2036 (LISE); Minho: Barroso: *Cabral & Pedro* 38 (LISE); ibid..: *Pedro & Myre* 454 (LISE); Beira: Bunheiro: *P. Silva* 6578 (LISE); ibid.: *Pedro & Myre* 454 (LISE); Beira: Bunheiro: *P. Silva* 6578 (LISE); Ilhavo: *Afonso* 3905 (LISE); Mortagua: *B. d'Oliveira* 4084 (LISE); Coimbra: 6.x.1950, *J. Matos* (U); Figueira da Foz: *Kostermans & Kruyt* 147 (L, U); ibid.: *M. Silva & M. Rosalia* 2547 (LISE); Ribatejo: Samora Correira: *B. Rainha* 3059 (LISE); Abrantes: ix. 1887, *da Cunha* (LISE); Estremadura: Sarilhos Grandes Vinha: *C. Fontes & M. Silva* 133 (LISE); Valado: *Stud. biol.* 59/874 (U); Montijo: *B. Rainha* 2701 (LISE); Colares: *A. Passos* 416/92 (LISE); Alentejo: Ponte do Sor: *F. Fontes* 7460 (LISE); Odemira: *Rothmaler* 13372 (LISE). **TURKEY:** Istanbul (Constantinople): *Nöe* 235 (STU). **LEBANON:** Beirut: *J. Ball* 2271 (K). **WNW AFRICA: SENEGAL:** Richard-Tell: *R. P. Berhaut* 1430 (P); Matam: *id.* 1430bis (P, Z) (as *C. russelliana*). **MALI:** Djenne: *A. Chevalier* 42945 (P); Niala: *id.* 1131 (P) (both as *C. russelliana* Chev.); Sotuba: *J. & A. Raynal* 5493 & 5566 (Herb. Raynal, Paris). **SOUTHERN AFRICA: ZAMBIA:** Distr. Mongu: *Drummond & Cookson* 6361 (PRE); Distr. Mazabuka: *Angus* 153 (K); Distr. Livingstone: *id.* 1102 (K). **Southern RHODESIA:** along Zambesi River: *C. Wilde* 13077 (PRE); Distr. Bulawayo: *Miller* 5679 (PRE); Distr. Matobo: *id.* 2136 (PRE); Distr. Salisbury: *Eyles* 1965 (PRE); Distr. Inyanga: *Chase* 4335 (PRE); Distr. Umtali: *Drummond* 4860 (PRE); Distr. Ndanga: *Phipps* 196 (PRE); Distr. Nuanetsi: *Drummond* 5812 (PRE). **PORTUGUESE EAST AFRICA:** Tete, nr. Dague: *H. Wild* 2579 (K); Antioka: *Junod* 337 (PRE). **BECHUANALAND:** Pprust-Palapye: *R. Story* 4613 (PRE). **LESOTHO (Basutoland):** Majenod Masern: *Guillarmod* 804 (PRE). **SOUTH AFRICA:** Transvaal: Distr. Zontpansberg: *Codd & Dyer* 4631 (PRE); Kruger National Park: *C. Letty* 42 (PRE); Distr. Barberton: *Young* 170 (PRE); Distr. Pretoria: *id.* 2276 (PRE); ibid.: *Repton* 3506 (PRE); Johannesburg: *Mogg* 14770 (PRE); Distr. Lichtenburg: *Kinges* 1889 (PRE); Distr. Potchefstroom: *Louw* 1638 (PRE); ibid.: *Leendertz* 3833 (PRE); Distr. Graskop: *Thorncroft* 989 (PRE). Orange Free State: Viljoensdrift: *Rogers* 4805 (PRE); Natal: Newcastle: *Medley Wood* 6295 (PRE); Amanzimtote: *id.* 434 (E); Zululand: mt. Kuzi: viii. 1932, *Galpin* (PRE); Weenen City: *Acocks* 10706 (PRE); Cape Province: Port Elizabeth, nr. Kralakamma: *Burchell* 4558/5 (PRE); Distr. Stellenbosch: *Parker* 3787 (PRE); Distr. Postmasburg: *Leistner & Joynt* 2762 (PRE). **SOUTH WEST AFRICA:** Waterberg: *Bradfield* 303 (PRE); Windhoek: *D. v. Vuuren* 1053 (PRE).

b) var. **perennans** Chaudhri nov. var. a var. *litorali* vigendi bienni vel perenni et callibus e caudice lignoso emergentibus distinguenda.

Plant bienniel to perennial; shoots branched from a woody base.

Type: ALGERIA: Environs d'Alger, Birkadem: 26.iii.1853, *G.-L. Durando* (holo. G!). NW. Africa, S. Africa & SW. Africa.

ALGERIA: Env. Alger: 26.iii.1853, *Durando* (G, type). **S. AFRICA:** Transvaal: Distr. Bronkhorstspruit: *Codd* 10126 (PRE), Cape Prov.: Distr. Cape Town: *Pillans* 4045 (PRE). **SW AFRICA:** Waterberg Plateau: xii. 1935, *G. Boss* (PRE).

c) subsp. **foliosa** (Perez-Lara) Chaudhri comb. et stat. nov.:

Perez-Lara's original work could not be traced.

C. telephiifolia Pourr. var. *β foliosa* Perez-Lara* ex Willkomm, Suppl. Fl. Hisp. 216 (1893). Type: S. Spain: Prov. Cadiz, prope Algar, *Perez-Lara* (holo.?? not present in Madrid, MA). NEOTYPE: Prov. Cadiz: Algeciras, *Reverchon* 1887:9 (holo. G! iso. E! JE! W!).

Perennial with a woody tap root and a stout, woody caudex; stems leafy throughout; leaves narrowly oblong-elliptic to oblanceolate, up to 11 x 3.5 (rarely to 17 x 5) mm, throughout of more or less uniform shape and size; stipules somewhat larger than in subsp. *litoralis;* clusters terminal and subterminal only; bracts with a reddish margin; flowers c. 1.75 mm; sepals 1-1.25 x 0.75-0.8 mm, broadly oval-oblong to ovate-oblong, obtuse, with a quite conspicuous membranous margin, almost equalling or only slightly narrower than the purplish median part; petals c. 1 x 0.75 mm, broadly oval-oblong; anthers c. 0.25 x 0.2 mm and purple; fruit dark-brown and very rough.

Distr.: S. Spain, S. Portugal and N. Morocco.

SPAIN: Prov. Malaga: Ronda: *Reverchon* 1889: 9 (JE); Prov. Cadiz Algeciras, *Reverchon* 1887: 9 (E, G, JE, W); ibid.: 1876, *E. Hackel* (W); ibid.: 22.iii.1907, *R. Chodat* (G); Chiclana: 3.iv.1873, *R. Fritze* (JE) (all sub *C. telephiifolia*). **PORTUGAL:** Algarve, nr. Faro: *Bourgeau* 1863 (E); ibid.: *Kostermans & Kruyt* 535 (L, U); Estremadura: *Welwitsch* 140 (FI, JE) & 180 (HAL). **MOROCCO:** Tétuan: *Pitard* 1911: 99 (G); Tanger: *id.* 100 (G); ibid.: *O. Kersten* 34 (JE, Z); Gebel Sugna: *Font Quer* 85 (G) Meknes to Rabat: *H. Romieux* 1232 (G).

2. **C. telephiifolia** Pourret in Mém. Acad. Toulouse 3:316 (1788).

Willkomm et Lange, Prodr. Fl. Hisp. 3:150 (1874); Nyman, Consp. 256 (1879); Batt. et Trab., Fl. Alg. (Dicot.) 169 (1888); Fiori & Paoletti, Fl. Anal. Ital. 1:333 (1898); Burnat, Fl. Alp. Maritim. 3:233 (1902); Gürke in Richter-Gürke, Pl. Europ. 2(2):183 (1899); Rouy, Fl. Fr. 12:11 (1910); Graebner in Aschers. & Graebn., Syn. 5(1):869 (1919); R. Nègre, Pet. Fl. Maroc Occid. 1:202, pl. 32, f.203 (1961); S. M. Walters in Tutin et al., Fl. Europ. 1:149 (1964).

Syn.: *C. litoralis* L. subsp. *telephiifolia* (Pourr.) Briquet, Prodr. Fl. Corse 1:481 (1910); Maire et Weiller, op. cit. 9:11 (1963). *C. telephiifolia* subsp. *paronychioides* Emberger in Bull. Soc. Sci. Nat. Maroc 13: 295 (1934).

Type: Anti-Atlas: Siroua, *Emberger* (holo. RAB or MPU, not seen). **Icon:** R. Nègre, op. cit. Pl. 32, f.203 (1961).

A biennial to mostly perennial or in var. *annua* annual herb, usually with a stout woody tap root, c. 7 mm in diam., and a woody caudex; stems often straggling, prostrate to ascending, stout, up to c. 80 cm long, but in var. *annua* and in var. *imbricata* rather short, much-branched from the base, with (up to c. 7 cm) long, light-green internodes. Leaves sessile, in var. *imbricata* overlapping each other,

* Perez-Lara's original work could not be traced.

obovate to spathulate, fleshy; the cauline 6.5-18 x 3-8.5 mm; the radical ones longer than the cauline ones and narrowly obovate-spathulate, often forming a rosette; stipules ovate-semiauriculate, c. 2 mm long, often with a reddish margin and basal part. Flowers in very profuse, terminal and subterminal clusters on long, entirely leafless, paniculately or corymbosely arranged branches. Flowers ovoid; distinctly pedicellate, 1.5-2.25 mm (x 1.25-1.5 mm), mostly c. 2 mm long, sepals oval-oblong, 1.2-1.4 x 0.8-1 mm, obtuse, with an almost arcuate membranous margin, nearly equalling or somewhat narrower than the ovate to ovate-oblong, fleshy and green median part; petals oblong, 1-1.25 x 0.5-0.55 mm; filaments 0.5-0.75 mm; anthers oblong, c. 0.4 x 0.25 mm, orange-yellow. Fruit 1.3-1.5 x 1.25-1.4 mm, trigonously ovoid-globose, dark-brown and very rough; stigmas appressed.

Fl. 4-8. On sandy and stony ground, alt. c. 100-2000 m.

Range: W. Mediterranean region: S. France, Corsica; Sardinia, Elba (Italy); NE., C. and NW. Spain; Portugal; C. and N. Morocco and N. Algeria.

1a) Plant annual, with rather short stems ---------- var. **annua**

1b) Plant perennial;

2a) Stems short; leaves subimbricate; inflorescences almost sessile ..... var. **imbricata**

2b) Stems often quite long, with spreading branches; leaves not very closely arranged ..... var. **telephiifolia**

a) var. **telephiifolia:** Syn.: *C. litoralis* L. subsp. *telephiifolia* (Pourr.) Briq. var. *genuina* Maire in Maire, Cat. 658 (1929); Maire and Weiller in Maire, Fl. Afr. Afr. Nord 9:11 (1963). *C. telephiifolia* Pourr. subsp. *paronychioides* Emberger in Bull. Soc. Sc. Nat. Maroc 13:295 (1934). Type: Morocco: Anti-Atlas: Siroua, *Emberger* (holo. RAB or MPU, not seen).

Plant perennial with a woody tap root; shoots spreading; branches of the inflorescence often quite long. Type: Pyrenees: *Pourret* (holo. TL or TLM, not seen).

Distr.: Throughout the range of the species.

FRANCE: Dép. Ardèche: *J. Revol* 2 (G); Dép. Gard: vi. 1913, *J. Braun* (Z); Var.: St. Raphael: 1911, *A. H. Blaauw* (U); Lot-et-Garrone: vi. 1875, *Gautier* (W); Aude: *id.* 2466 (Z); ibid.: *Respaud* 2195 (G, JE, W, WU); Pyr. Orient.: Bagnuls-sur-mer: *Penchinat* 50 (JE, L); Port Vendres: *id.* 1194 (G, L); Vernet-les-Bains: *Timbal-Lag & G. Gautier* 2465 (Z); ibid.: *Ozanon* 1178 (G, W, WU); Canet: vi. 1904, *L. Conill* (JE); Perpignan: *Gandoger* 902 (Z). **CORSICA:** Bastia: *Bernard* 137 (G); nr. Olmo: *Stud. biol. Rheno-Trai.* 65/556 (U); Ponte Leccia: *id.* 65/497 (U); Ajaccio: *Chodat* 5 (G); Propriono: ix. 1922, *Schinz* (Z); Propriono to Olmetto: v. 1900, *Rikli* (G); Porto Vecchio: iii. 1907, *Cousturier* (G); Bonifacio: *Reverchon* 268 (G, JE, W, WU). **ITALY: SARDINIA:** Tempio: vi. 1881 & 1882, *Reverchon* (W); Santa Teresa Gallura: *Stud. biol. Rheno-Trai.* 65/310 & 65/313 (U); Gallura: Porto Pollo: *A. Vaccari* 790 (E, WU, forma *compacta*); **ELBA IS.:** Marina di Campo: *Hegnauer* 1961/741 (L). **SPAIN:** Cata-

lonia: Prov. Gerona: nr. Blanes: *W. Koch* 34/145 A (W, Z); S. Climent: *Sennen* 556 (E); Llivia: *id.* 5737 (G); Prov. Teruel: Noguera, Trias: *Reverchon* 1896: 9 (JE, Z); Sierra de Albaracin: *Stud. biol. Rheno-Trai.* 64/409 (U); Sierra de Guadarrama: vi. 1912, *C. Vicioso & F. Beltrais* (G, U); Albacete: Balozote to Alcaraz: *Porta & Rigo* 122 (W, WU, forma *compacta*); Sierra Morena: Orguillo: iv. 1880, *Martinez* (W); Sierra Nevada: Granada: 1837, *E. Boissier* (FI, G); Yunguera to Caratracca: *Huter, Porta & Rigo* 350 (E, G, WU); Rio Grande: Nilsson 872 (LD); NW Spain: Prov. León: Ponferrada: *Rothmaler* 17 (Z). **PORTUGAL:** Prov. Tras-os-Montes: Montalegre: *M. da Silva* 1933 (LISE); Gerez: *A. Moller* 941 (COI, W, WU); Bragança to Rabal: *A. Fernandes et al.* 6397 (COI); Barroso: *Myre & M. Silva* 4 (LISE); Minho: Ponte de Barca; *C. Fontes et al.* 319 (LISE); Duoro: Balsa: *A. Fernandes et al.* 5412 (COI); Porto: v. 1891, *O. Buchtien* (E, JE, W); Beira: Vilar Formosa: *B. Rainha* 717 (LISE); Guarda: *A. Fernandes et al.* 4391 (COI, U); ibid.: *R. & A. Fernandes* 2746 & 2756 (COI); Gouveia: *Garcia* 315 (COI); Serra de Estrella: *F. Fontes & B. Rainha* 2792 (LISE); Covilha: *Rainha* 1138 (G, LISE); Oliveira do Hospital: *J. Matos et al.* 5032 (COI, U); Serta: *A. Fernandes et al.* 4716 (COI, U); Castelo Branco: *id.* 5887 & 6851 (COI); Estremadura: Resimbra: Lagoa de Albufeira: *Rothmaler* 13443 (LISE); Alenteje: Alegrete: *M. Baliz et al.* 923 (COI); Castelo de Vide: *id.* 1479 (COI); Lenhoso de Penha: *A. Fernandes et al.* 7019 (COI); Vila Vicosa, Tapada Real: *Fernandes, A. & Sousa* 1469 & 1902 (COI), Algarve: Picota: *Stud. biol. Rheno-Trai.* 59/599 (U); Silves: *J. Daveau* 177 (COI). **MOROCCO:** El Rif: Tizzi Iffrid: *Font Quer* 169 (G); El Marcha: *Ch. Sauvage* 1627/8313 (G); Moyen Atlas: Bekrit-Koublat, c. 2000 m, *Jahandiez* 602 (G, Z); Daiet Achlef, c. 1750 m. *id.* 426 (E, G); Great Atlas: Jebel Quodat: *Newbold* 16 (BM); Debdon: *J. Briquet* 303 (G). **ALGERIA:** Oran: v. 1912, *Faure* (E); El Goloa: v. 1902, *L. Chevalier* (Z).

b) var. **imbricata** (Lapeyr.) DC., Prodr. 3:367 (1828).

Syn.: *C. imbricata* Lapeyrouse, Hist. Abr. Pl. Pyrén. 169 (1813). Type: Pyr. Or.: Vinca to Nyer, *Lapeyrouse* (holo. TLJ, not seen); *C. telephiifolia* Pourr. race *imbricata* (Lapeyr.) Rouy, Fl. Fr. 12:11 (1910).

Stems rather short; leaves imbricate or subimbricate especially towards the basal part, but sometimes along the whole length, of the shoots; inflorescences almost sessile or with a very short peduncle.

Distr.: Occasionally occurring in Corsica, Sardinia and Spain. **CORSICA:** Propriano: *Henrard & van Ooststroom* 8123 (L). **SARDINIA:** Pulam: *Müller* (JE). **SPAIN:** Catalonia: nr. Lloret: iv. 1877, *F. Tremols* (W).

c) var. **annua** Lange, Pugill. Plant. in Videnskab. Meddel. Naturh. For. Kjöbenh. ser. 2, 7: 96 (1865) as forma. Type: S. Spain: *Lange* (holo. C, not seen). Plant ± annual, with rather small stems. S. Portugal, S. Spain and Corsica.

PORTUGAL: Algarve: Castro Marin: vii. 1848, *Welwitsch* (COI, FI); Monchique: *Bourgeau* 1864 (E, G, JE). **CORSICA:** Biguglia to Bastia: *Mabille* 77 (JE).

3. **C. capensis** Willd. in Linn., Sp. Pl. ed. 4, 1(2):1507 (1798); DC., Prodr. 3:367 (1928).

Misapplied names: *C. litoralis* auct., non L., Sp. Pl. ed. 1,271 (1753). *C. telephiifolia* sensu Harvey and Sonder, Fl. Capensis 1:132 (1894), non Pourr. in Mem. Acad. Toul. 3:316 (1788).

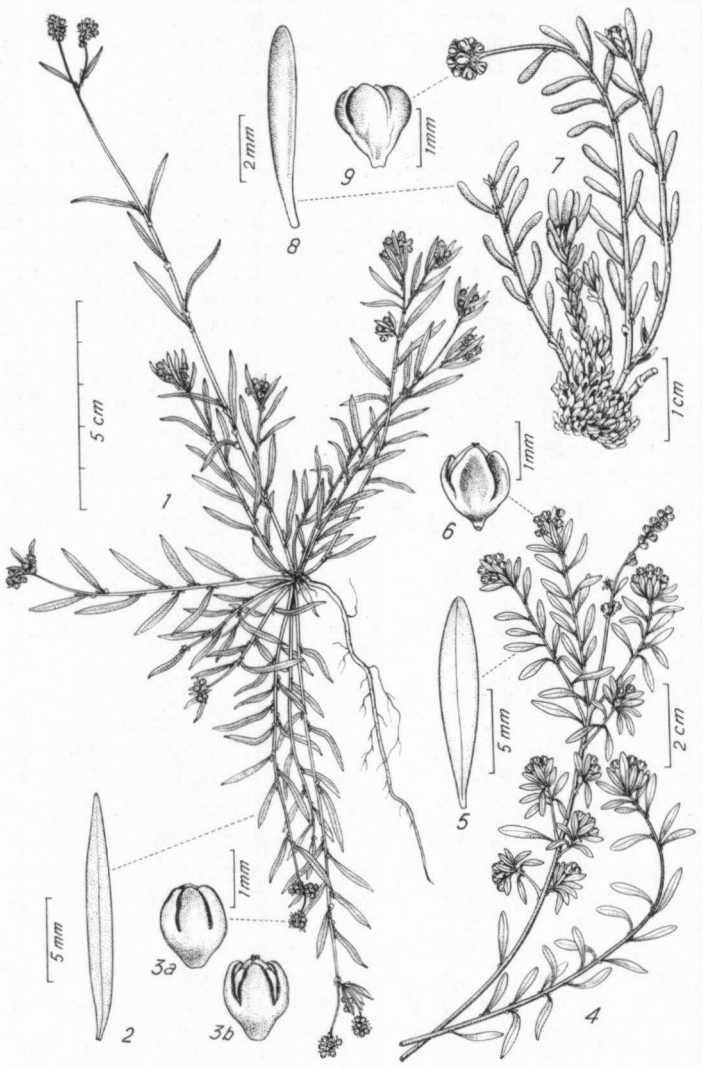

Plate I. Fig. 1-3: **Corrigiola palaestina**; 1: a whole plant; 2: leaf; 3a: flower; 3b: flower with fruit [*M. Zohary* 236(U)]. Fig. 4-6: **C. capensis** (subsp. **capensis**); 4: shoot; 5: leaf; 6: flower with fruit [*Schlechter* 5051(G)]. Fig. 7-9: **C. crassifolia**; 7: whole plant; 8: leaf; 9: flower [x.1912, *G. Geisse*(Z)].

A biennial to perennial herb; stems 15-25(-45) cm long, much-branched from the compact base, and terminating in dense flower clusters; internodes up to c. 1 cm long, pale-green to pinkish-purple, stout and fleshy. Leaves sessile, oblanceolate (sometimes linear-oblong), 7-17(-27) x 2-3(-5) mm, narrowed to the base, obtuse, rather thick; stipules ovate-semiauriculate, 2.75-3.5 x 1-1.5 mm, acute, usually with reddish patches in the middle region, but with a whitish margin. Flower clusters mostly 4-6 mm in diam., mostly on short leafless, occasionally up to c. 6 cm long, branches. Flowers subsessile, 1.75-2 x 1.3-1.4 mm, ovoid; receptacle 0.6-0.7 mm long; sepals ovate, c. 1.25 x 0.8-1 mm, fleshy, subobtuse, usually with a narrow, pinkish, membranous margin; petals 0.8-0.9 x 0.5 mm; filaments 0.5-0.55 mm; anthers 0.2-0.25 x 0.15 mm, orange; stigmas subsessile, 0.15-0.2 mm long, divergent to recurved. Fruit 1.4-1.7 x 1.25-1.4 mm, trigonously ovoid-globose, with a very rough, alveolate pericarp; seed 1.2 x 0.75 mm, ovoid.

a) subsp. **capensis:** Stems up to c. 25 cm long, rather fleshy; leaves oblanceolate, up to c. 17 x 3 mm, obtuse, rather fleshy; flowers in compact clusters in shortly pedunculate, terminal and leafless inflorescence-branches; flowers very shortly stalked; fruit almost without the apical tip. Fl. 8-9.

Type: S. AFRICA: Cape Province: *Willdenow* 6096 (holo. B, photograph seen).

Distr.: WSW Cape Province; probably introduced (?) in S. Greece.

Cape Prov.: Namaqualand, Kanariesfontein, c. 900 m, *Acocks* 19400 (PRE); Clanwilliam, c. 117 m, *R. Schlechter* 5051 (G, PRE, S); Distr. Tulbagh, Roodesand Pass, *Adamson* 1004 (PRE).

b) subsp. **africana** (Turrill) Chaudhri comb. nov.:

C. litoralis L. subsp. *africana* Turrill in Kew Bull. 3:413 (1954). Type: Kenya: Kiambu District, Muguga, vi.1952, *Verdcourt* 663 (holo. K! iso. EA! PRE! UC!).

Biennial to perennial, rarely annual; stems up to 45 cm long; leaves oblanceolate to oblanceolate-oblong, up to c. 27 x 5 mm, obtuse or subobtuse, more or less glaucous, but not quite fleshy, with a distinct midrib; flowers in compact, sessile or shortly pedunculate clusters at the end of leafy axillary branches or, occasionally, on extra-axillary, leafless axes; flowers shortly pedicellate (pedicel up to c. 1 mm long); fruit with a very small but distinct tip (style-base).

A common weed in tea plantations and other cultures and in forests on steep slopes and in clay soils, at alt. c. 1300-3300 m, frequently at higher altitudes. Flowering almost throughout the year.

Distr.: Tanzania, Kenya and Ethiopia.

Tanzania: Distr. Lushoto, Shagai Forest: *Drummond & Hemsley* 2571 (EA); E. of Kilimanjaro: *Haarer* 1741 (EA, PRE). **Kenya:** Masailand, Narok distr.: *Glover, Gwynne & Samuel* 1033 (EA, PRE); Nyeri distr.: *Mathuge* 208 (EA);

Timboroa: *Ivens* 1132 (EA); Molo: *Samita* M/8 (EA); Ol Joro Orok: *Peers* B8 (EA); Limoru: *Wimbush* 1504 (EA, G); Muguga: *Verdcourt* 663 (EA, PRE, UC); Mt. Kenya: N. of Nanyui: *id.* 3537 (EA); S. Kinangop: *Nathras* 906 (EA); Kabete: *id* B 2583 (EA). **Ethiopia:** Galla, Sidama *Vàtova* 1758 (FI); Nollega, Safo: *P. Benedetto* 81 (FI); Shoa: nr. Debra Sina: *Mooney* 7877 (FI); nr. Addis Alem: *Borini* 2 (FI); Addis Ababa: *Negri* 131 (FI); Mata Dalema: *id.* 566 (FI); Addis Ababa to Olettà: *Bartolozzi* 14 (FI); Lötho: Göbhi-Dehl: *Schimper* 413 (G); Debr.-Eski: *id.* 2357 (S); "Abyssinia": *Schimper* 1876 (G, L, S); Acrour, Ilewo: *Schweinfurth* 1028 (G); Eritrea: Hamsen: *Buscalioni* 257 (FI); Asmara: *Chiovenda* 119 (FI); Insaba nr. Keren: *Beccari* 50 (FI); Murat: *Baldrati* 2271 (FI); Acrija: *id.* 4920 (FI); Addiche: *id.* 3938 (FI); Asmara: *id.* 2553 & 3937 (FI); Hamasen: *Fiori* 983 (FI); ibid.: *Pappi* 222/4337 (G); Mai-Bela nr. Asmara: *id.* 5072 (G); Assaorta: mt. Urug: *id.* 3442 (FI); Amasen: nr. Galgaret: *id.* 97 bis (FI); Hamasin, Ponagher: *id.* 201 (FI); Nr. Halai: *id.* 1645 (FI).

Turrill, while describing this taxon under *C. litoralis* L., overlooked the possibility that it might belong under *C. capensis*. The subspecies *africana* has more in common with *C. capensis* than with *C. litoralis*. In fact the only character shared by subsp. *africana* and *C. litoralis* is the texture of the leaves. But the two differ considerably in the general form and size of the leaves and in several other characters such as the habit, the duration, the nature of the stipules, the arrangement of the inflorescences, the flower-size and the structure of the sepals and the fruit. Subsp. *africana* differs from subsp. *capensis* in the general form and texture of the leaves, inhabits regions of a higher elevation (c. 1300-3300 m) and lives in a quite different habitat. But the two agree in duration and in the characters of the stipules, the inflorescences and the flowers.

4.**C. palaestina** Chaudhri n. spec.

Plate I, Fig. 1-3. p. 42

Herba annua; caules usque ad 25 cm longi, diffusi, dense ramificati, colore variantes a viridulo usque ad pallide brunneum vel stramineum, plerumque in inflorescentias breviter pedunculatas exeuntes. Folia plerumque oblique patentia, sessilia, linearia, apicem versus tamen paulo angustata, usque ad 25 mm longa et 2.0 mm, raro 2.5 mm lata, obtusa vel subobtusa, margine integro instructa, viridula vel straminea, costa prominente; stipulae ovatae, basi semisagittatae, usque ad 3.5 mm longae et 1.5 mm latae, acutae, omnino albae. Glomeruli terminales et subterminales, 4-5 mm diam., plerumque in paria ad apicem ramuli aphylli et usque ad 4 cm longi, interdum tamen fere ad nihilum redacti dispositi; bracteae lanceolatae, 0.8-1.0 mm longae et 0.3-0.35 mm latae. Flores subsessiles, ovoidei, 1.5-1.6 mm alti et 1.25 mm diam. sepala ovata vel subovalia, 1.0-1.1 mm longa et 0.75-0.8 mm lata, obtusa, crassa, margine membranaceo angustiore, albo vel plus minusve roseo instructa; petala oblonga, 0.65 mm longa et 0.4 mm lata, alba,

staminibus longiora; stamina filamentis circ. 0.4 mm longis instructa; antherae suboblongae, 0.2-0.25 mm longae et 0.15 mm latae, aurantiae; ovarium ovoideum, circ. 0.5 mm altum et 0.4 mm diam., triquetrum; stigmata 0.15-0.2 mm longa, divergentia et recurvata. Fructus ovoideus, circ. 1.4 mm altus et 1.2 mm diam., triqueter, scabridus, colore varians ab aurantio usque ad saturate brunneum; semen ovoideo-globosum, circ. 0.9 mm altum et 0.75 mm diam.
Fl. & ft. 3-5. On light wet soil of the coastal plains.
Type: PALESTINE: Ramath-Gan, nr. Tel.-Aviv, chalky sandy hill, 7.iii. 1928, *M. Zohary* 236 (holo. U; iso. E! G! LISE!) (as *C. litoralis* L.).
Distr.: Coastal areas of Palestine and Lebanon.
PALESTINE: Ramath-Gan nr. Tel-Aviv, *Zohary* 236 (E, G, LISE, U, type). LEBANON: Beirut (Beyrouth): *E. Peyron* 314 (G.).

This species resembles in general aspect, and particularly in the leaf-form, *C. andina* Triana et Planchon, a perennial montane species of Colombia and Mexico, but *C. andina* possesses mostly lateral flower clusters which are often immersed in the leaves, and has larger flowers. In this species the flower clusters are arranged in terminal, mostly leafless, inflorescences. *C. palaestina* is readily distinguishable from *C. litoralis* L. in the characters of its leaves, inflorescence and flowers. It is really astounding to see this species described in M. Zohary's Flora Palaestina 1:129 (1966), partly as subsp. *litoralis* and partly as subsp. *telephiifolia* of *C. litoralis*. *C. telephiifolia* Pourret, it may be pointed out, is an exclusively W. Mediterranean taxon.

5. **C. andina** Trian. & Planch. in Ann. Sci. Nat. sér. 4, 17:146 (1862).
Type: COLOMBIA: Prov. Bogotá, Andes de Bogotá, 2700 m, 1851-1857, *J. Triana* (holo. P! iso. FI! G!).
Syn.: *C. linearis* Sessé et Mocino, Fl. Mex., ed. 2,78 (1894). Type: Mexico: Sancti Filipe del Obrage, *Sessé et Mocino* (holo.??).

A perennial herb with a woody caudex; stems prostrate, straggling, often light-green, much-branched from the base, up to c. 50 cm long. Leaves sessile, mostly alternate, but towards the end of the shoots (due to the shortening of the internodes) sometimes subopposite, linear to linear-oblong, obtuse, slightly attenuate to the base; the cauline ones usually 20-35 x 1-2 mm, the radical ones occasionally up to c. 8.5 cm long; light-green to somewhat brownish-green; margin somewhat papillose and undulate; stipules ovate-semiauriculate, 3-4 x 1.5 mm, shining, occasionally with reddish patches or streaks, particularly near the base. Flower clusters mostly subterminal and pseudo-axillary, occasionally leaf-opposed, dense, ovoid-globose, 5-6 mm in diam. and 5 to 10 or many-flowered; bracts ovate-sagittate, c. 1.5 x 1.25 mm, somewhat shorter than the flowers, sometimes red-streaked like the stipules. Flowers 1.6-1.8 (-2) x 1.3-1.4 mm, ovoid to nearly globose, shortly

pedicellate; sepals ovate to somewhat oval, 1.25-1.35 x 0.8-1 mm, obtuse, with a distinct membranous margin; petals oblong, c. 0.65 x 0.45 mm, nearly ½ aslong as the sepals, filaments 0.5-0.6 mm; anthers minute, 0.15-0.2 x 0.15 mm, more or less quadangular, orange-yellow to orange-brown: stigmas small, almost capitate. Fruit trigonously ovoid to globose, 1.5-1.6 x 1.25-1.3 mm, dark-brown and very rough, rectangularly alveolate.

Fl. Sept. to June. On high plains and dry hills, alt. c. 600-2700 m. Range: Colombia and Mexico.

COLOMBIA: Prov. Bogotá: Andes de Bogotá: 1851-57, *Triana* (FI, G, P, type); nr. Bogotá: vi. 1908, *Apollineaire* (G); ibid.: x.xi.1909, *id.* (G). **MEXICO:** Puebla: *Nicolas* 5909 (P); Vallée de Mexico: *Bourgeau* 23 (FI, P, UC); ibid., San Augustin: *W. Schaffner* 12 (W); San Luis Potosi: *J. G. Schaffner* 136 (UC), 538 (FI, G); San Luis Potosi: *Parry and Palmer* 54 (E, NY, UC); Zacatecas: *Purpus* 402 (UC); Chihuahua: Cusihuiriachic to Guerrero: *Pringle* 1356 (G, NY, WU); Sierra Madre: *id.* 1671 (G, GH, W, WU); Bejucos, distr. Temascaltepec: *Hinton* 3592 (G).

6. **C. squamosa** Hooker et Arnott in Hooker's Bot. Miscell. 3:337 (1833).

Cl. Gay, Fl. Chil. 2:518 (1847); Reiche, Fl. Chil. 1:208 (1895); C. Munoz Pizarro, Sinop. Fl. Chil. 141 (1959).

A perennial herb with a woody, almost perpendicular main root and a bulbous caudex, which is often c. 2-4 cm in diam. and covered with brownish scaly stipules, and gives off a number of aerial shoots; the latter up to c. 25 cm long, prostrate, terminating in a leafless inflorescence. Leaves sessile, narrowly oblong to oblanceolate (slightly attenuate to the base), sometimes linear (var. *poeppigii*), occasionally elliptic-oblong (var. *latifolia*), 10-17(-24) x (1.75-)2.5-4(-9) mm, obtuse, herbaceous, usually brown or brownish-green, often almost congested; stipules almost auriculate or ovate-auriculate, 2.5-3.5 x 1.5 mm, usually with brown patches, particularly in the middle and basal region, one per leaf, the two basal wings often fused around the leaf-base (the stipules appearing to be perfoliate). Inflorescence corymbose, usually 3-forked, each branch of the fork bearing laterally as well as on the end and on the short secondary branches compact flower clusters which are c. 5-7 mm diam.; occasionally, however, the clusters rather laxly arranged on much longer branches. Flowers shortly pedicellate, cuplike-obovoid when young to ovoid at maturity, (2.25-)2.5(-3) mm high; rounded above but abruptly narrowed at the base; sepals fleshy, ovate to suborbicular, 1.25-1.4 x 1-1.25 mm, subacute to obtuse; petals oval-oblong, 1-1.25(-1.4) x (0.6-)1-1.2 mm, rosy-brown and pinnately veined, usually slightly shorter than or almost equalling the sepals; filaments (0.6-)0.7 mm occasionally much shorter, anthers oblong,

0.4-0.45 x 0.25 mm, orange; ovary c. 1 x 0.6 mm, ovoid-triquetrous; styles 3, (0.35-)0.4-0.45(-0.5) mm including the stigmatic part, the tips recurved with age. Fruit trigonously ovoid, 1.5-1.6 x (1.25-)1.4 mm, orange when young to dark-brown at maturity, rather smooth.

Fl. August-February. In pastures on sandy soils, nr. s.l. to c. 700 m. Endemic in Central (WC.) Chile. Very variable in leaf form; three varieties are clearly recognizable.

1a) Leaves not more than 2.5 mm wide, linear, (1.75-2.25 mm wide, and 8-12 times as long) ..... var. **poeppigii**

1b) Leaves more than 2 mm wide, mostly 3 or more than 3 mm wide

2a) Leaves oblong or elliptic-oblong, 4-9 mm wide, usually less than 2 times as long ..... var. **latifolia**

2b) Leaves narrowly oblong to oblanceolate, 2.5-4 mm wide, often 3-4 times as long ..... var. **squamosa**

a) var. **squamosa:** Leaves narrowly oblong to oblanceolate, 2.5-4 mm wide and often 3-4 times as long.

Type: CHILE: Prov. Valparaiso: Valparaiso, 1831, *Cuming* 689 (Lectotype K! iso. E! FI!).

Distr.: Throughout the range of the species.

CHILE: Valparaiso: 1832, *Bridges* 157 (K), 158 (GH, K); ibid.: 1833, *Cl. Gay* (G); ibid.: 20.ix.1895, *O. Buchtien* (GH, L, S); "Hills above Valparaiso", 1908, *W. Balfour Gourlay* (E); Quintero, "los Medanos", *Bertero* 937 (FI, G, P); Santiago: 1876, *Philippi* (G); Prov. Coquimbo: Loma de Nai Jorge: *Carl & Inga Skottsberg* 857 (GB, S); Ovalle: Bosque Fray Jorge: c. 500 m, *B. Sparre* 2914 (S).

b) var. **latifolia** (Cl. Gay) C. Skottsberg in Acta Hort. Göteberg. 18:134 (1950).

C. latifolia Cl. Gay, Fl. Chil. 2:518 (1847). Type: Chile: Prov. Valparaiso, in arenosis prope Concon, *Cl. Gay* (holo. P!).

Leaves oblong or elliptic-oblong, often 4-9 mm wide, and less than 3 times as long.

Prov. **Coquimbo:** Fray Jorge, Dept. Ovalle: *C. Munoz P.* B-85 and B-167 (GH); Nai Jorge, Las Papas, c. 500 m, *C. Jiles P.* 1738 (S).

c) var. **poeppigii** Chaudhri n. var. a varietatibus aliis adhuc notis foliis linearibus, circ. 1.75-2.25 mm latis distinguenda.

C. collina Pöppig in sched., nom. nud. *C. glomeruliflora* Steudel, Bot. Nom. ed. 2, 1:423 (1840) nom. nud.

Leaves linear, up to c. 24 x 2.25 mm, 1.75-2.25 mm wide, 8-12 times as long as wide. In pastures, alt. up to c. 700 m. Valparaiso and Coquimbo provinces.

Prov. **Valparaiso:** In pascuis siccis circa Concon: *Pöppig* 101 (FI, HAL, L); "Chile", 1828, *Pöppig* (G, **type**) (both as *C. collina* Pöppig): Valparaiso: *Bertero* 936 (G, GH, partly) (as *C. litoralis);* ibid.: *Gaudichaud* 246 (FI, G); iv.-vii. 1856, *W. H. Harvey* (E, GH, K, S); *Cl. Gay* 390 (P); Casa Blanca: v. 1856, *Harvey* (GH, S); Valparaiso: ix: 1895, *O. Buchtien* (E, GH); ibid.: 28.vi.1896, *P. Dusèn* (S); ibid., *Carl & Inga Skottsberg* 915 (GB, S); *Jaffuel & Pirion* 3194 (GH);

Marga-Marga: *id.* 1417 (GH); xii. 1928 & ii. 1929, *G. W. Robinson* (K); *Mathews* 250 (K); Limache: *G. Looser* 958 (GH); ibid.: *A. Garaven*ta 1922 (GH); Prov. Calabagua: Lolol: *E. Bawas* 427 (GH); Aconcagua: C. 700 m, *G. Montero O.* 3237 (GH); Pejerreyes, N. of Ovalle: *Wagenknecht* 5159 (GH); Prov. **Coquimbo:** Dep. Illapel: *W. Blese* 1924 & 2060 (LIL).

7. **C. propinqua** Cl. Gay, Fl. Chil. 2:519 (1846).

Reiche, Fl. Chil. 1:208 (1896); C. Munoz Pizarro, Sinop. Fl. Chil. 141 (1959). Misapplied name: *C. telephiifolia* auct., non Pourr. in Mém. Acad. Toul. 3:316 (1788).

A perennial herb with a woody caudex; stems prostrate, up to c. 55 cm long, with up to c. 7 cm long internodes. Leaves sessile, narrowly oblong to broadly oblanceolate, up to 24 x 5 mm, somewhat narrowed to the base, obtuse, rather thick and green; stipules ovate to semi-auriculate, up to 3 x 1.5 mm, white to brownish. Inflorescence compound spikes on a long, leafless and 2 to 3-forked shoot, the cymes terminal as well as lateral, profuse and densely agglomerated, 6 to 10 or many-flowered, almost sessile. Flowers often with a distinct, 0.5-1 mm long stalk, obovoid-cuplike to ovoid, 2.5 x 2 mm; sepals ovate-triangular to almost oval, up to 1.6 x 1.3 mm, subacute to obtuse, fleshy; petals oval, up to 1.5 x 1-1.25 mm, usually brownish; filaments (0.35-)1 mm; anthers oblong, c. 0.4 x 0.25 mm, orange-brown; stamens often with shorter filaments in some of the fruiting flowers; style 0.4-0.5 mm, bifid to bipartite, with thick, finger-like stigmas hanging down at maturity; the basal part of style (c. 0.2 mm in diam.) forms a rigid protuberance on the fruit. Fruit trigonously ovoid, 1.6-1.75 x 1.5-1.6 mm, orange.

Fl. 9-10. On sandy soils, alt. c. 20 m.

Type: CHILE: In arenosis prope Quillota, *Cl. Gay* (holo. P!).

Endemic in Central West-Central Chile.

Prov. Valparaiso: Quintero: *Werdermann* 22 (E, G, GH, U, UC, Z); ibid.: *Pöppig* 260 (as *C. glomerata* Pöppig) (G, HAL); ibid. *Cuming* 370 (as *C. telephiifolia*) (E, K); ibid. *Looser* 3665 (GH); *Bertero* 936 (E, G, L, mixed with *C. squamosa* var. *poeppigii*); Prov. Aconcagua: Quilimari: *Philippi* 905 (FI, G, P).

This species differs from *C. squamosa* Hook. et Arn. in its considerably longer stems, larger leaves, free stipules (two per leaf), much longer and profuse inflorescences, style distinctly unlobed at the base, trifid above, the basal part forming a thick-rigid protuberance at the top of the fruit.

8. **C. crassifolia** Chaudhri n. spec.

Plate I, Fig. 7-9. p. 42

Herba perennis, caudice tumido et lignoso, stipulis squamatis rubeolis obtecto instructa. Caules prostrati vel plus minusve ascendentes, usque

ad 10 cm longi, robusti et brunneoli. Folia plerumque subopposita, sessila, lineari-oblonga vel lineari-oblanceolata, usque ad 7 mm longa et 1.5 mm lata, coriacea (ut folia specierum aliquarum ad genus *Herniariam* pertinentium); stipulae ovatae, basi sagitatae, usque ad 2.5 mm longae et 1.25 mm latae, plerumque albidae, interdum ad basim rubeolo-maculatae, una pro folio, i.e. stipula dextra et stipula sinistra circum folii basim connatae. Inflorescentiae in ramulis 0.5-3.5 cm longis, dense ramificatis vel furcatis insertae, densiores, e glomerulis rubeolis e floribus 3 vel plus quam 3 compositis constantes. Flores subsessiles, obovoidei, 2,0 mm alti et 0.6 mm diam., rubeoli; sepala crassa, elliptico-oblonga vel subquadrangularia, 1.0-1.25 mm longa et 1.0 mm lata, apice obtusa vel rotundata, margine membranaceo in sepalis exterioribus angustiore quam in sepalis interioribus instructa; petala oblonga vel elliptico-oblonga, circ. 2.0 mm longa et 0.5-0.55 mm lata, roseo-brunnea; stamina filamentis circ. 0.5 mm longis instructa; antherae oblongae, 0.35 mm longae et 0.25 mm latae, aurantiae; ovarium conico-triquetrum, circ. 0.75 mm altum et 0.5 mm diam.; styli 3, subliberi, stigmatibus saturate brunneis inclusis circ. 0.3 mm longi. Fructus trigono-ovoideus. circ. 1.3 mm et 1.1 mm diam., saturate brunneus vel subniger, laevis.
Fl. 10.
Type: CHILE: Illapel, Matanalla, x.1912, *G. Geisse* (holo. Z!).
Endemic; known from a single gathering.
This is a very peculiar species differing from all other species of *Corrigiola* in the structure of its leaves which are linear-oblong or linear-oblanceolate and coriaceous (like those of *GYMNOCARPOS* or *LOCHIA* or of some of the species of *HERNIARIA* subgenus *HETEROCHITON*), all other species possessing herbaceous leaves. Furthermore, this species has sessile or almost sessile flowers, whereas the other species have distinctly (though rather shortly) stalked flowers. Its scaly caudex resembles that of *C. squamosa* Hook. et Arnott, but in other respects the two are quite distinct.

9. **C. madagascariensis** (Baker) H. Perrier in Humbert, Fl. Madagascar, Fam. Caryophyll. no. 73:24 (1950).
Telephium madagascariense G. J. Baker in Journ. Linn. Soc. 21:347 (1884).

A perennial herb with decumbent, 20-30(-40) cm long stems; internodes up to 2 cm long. Leaves shortly petiolate (petiole up to 2 mm long), lamina elliptic to almost oblong, up to 2.7 x 1 cm, obtuse, slightly narrowed or almost rounded at the base; stipules ovate-auriculate, very short, 1.25-1.5 mm long, obtuse, with reddish patches. Cymes terminal, decompound or much-branched (5-10 cm long), rather lax, the branches short-peduncled, mostly leafless (leaves present in

some of the branches), each branch with 3-4 flowers, the latter alternate and rather distant, each subtended by a short, stipule-like, narrowly ovate, 1-1.25 mm long bract. Flowers subsessile, c. 4 x 3.55 mm, broadly ovoid-subglobose; sepals fleshy, ovate-oblong, 3 x 1.5-2 mm, obtuse, with a conspicuous membranous margin; petals broadly oval-oblong, 2-2.25 x 1.5 mm, obtuse, with distinct (reticulate) veins; filaments c. 1.5 mm long; anthers 0.4-0.45 x 0.3 mm, rectangular; ovary triquetrous; style c. 0.5 mm, tripartite; stigmas c. 0.4(-0.5) mm, recurved at the tip. Fruit c. 4 x 3.75 mm, trigonous, almost globose, rough, alveolate and dark-brown.
Fl. 2. Alt. c. 1400 m.
Type (of *Telephium madagascariense*): MADAGASCAR: *Richard Baron* 1909 (holo. BM; iso. P!).
Endemic; reportedly very rare.

MADAGASCAR: *BARON* 1909 (P, type); Ambatolamoy to Antsirabe, E. of Ankaratra, 1400 m, ii. 1927, *H. Perrier de la Bathie* 17887 (P).

10. **C. drymarioides** E. G. Baker fil. in Journ. Linn. Soc. Bot. 40:181 (1911).
H. Wild in Exell and Wild, Fl. Zambes. 1(2):362, t.68/A (1961); Polhill in Kew Bul. 19(2):227-228, f.1/1-3 (1965).
Type: Southern Rhodesia: Chimanimani Mts., c. 2250 m, 26.ix.1906, *Swynnerton* 2159 (holo. BM! iso. K, SRGH). **Icon:** Wild, op. cit.; Polhill, op. cit.

A perennial, rarely biennial, straggling herb with stems up to c. 75 cm long; internodes pale-green, up to 2.5 cm long. Leaves alternate, rarely subopposite, with a 4 mm long petiole; lamina elliptic to somewhat ovate or ovate-suboblong, up to 2.7 x 1.1 cm, acute to subobtuse and very shortly or obscurely mucronate, the veins convergent to the apex; stipules ovate-semiauriculate, up to 3 mm long, whitish when young, but often at maturity with reddish patches on the margin and at the base. Flowers shortly stalked, ellipsoid-ovoid, 2-2.25 x 1.5 mm, arranged in divaricately branched, pedunculate, up to c. 20 cm long cymes often formed laterally, i.e. alternating with or somewhat in between the leaves on the main shoots, usually bifurcating almost immediately after being developed; bracts ovate, c. 1.5 x 1 mm, usually with reddish patches. Receptacle 0.5-0.75 mm long, broadly turbinate; sepals broadly ovate-oval to suborbicular, c. 1.5 x 1.25 mm, with a broad and very conspicuous membranous margin, during the younger stages more or less equalling the median part in width, apex obtuse; petals oblong, c. 1.4 x 0.6 mm, subobtuse, very shortly or slightly apiculate, white to brownish, subequal to the sepals, but longer than the stamens; filaments c. 0.75 mm long; anthers oblong, c. 0.25 x 0.2 mm, and orange; ovary ellipsoid, stigmas subsessile, c. 0.3 mm long, divergent-recurved. Fruit c. 2 x 1.5

mm, ovoid-globose, rather obscurely trigonous, orange and smooth in young stages, but finely granular or rugulose and dark-brown when ripe; seed c. 1.4 x 0.8 mm, ellipsoid.
Fl. (-4)7-10. In submontane (to montane) regions or rocky places in upland grassland and in burnt or otherwise disturbed margins and openings of upland forest, c. (900-)1500-2250 m.
Range: S. Rhodesia and Malawi (Nyasaland).
MALAWI: Distr. Mlange, Luchenya Plateau: *Brass* 16573 (NY); ibid:. *Richards* 16685 (K); Mlanje: *Jackson* 1960 (EA, K); Tuchila Plateau: *Newman & Whitmore* 173 (BM, NY); Little Ruo Plateau: *id.* 318 (BM, NY); Nayawani Forest: *id.* 531 (BM, COI); Mt. Mchese: Nampende Valley: *Chapman* H/728 (K, PRE). **S. RHODESIA:** Distr. Inyanga: *Phipps* 1273 (PRE); ibid.: *Chase* 541 (BM, K); Chimanimani Mts.: *Wild* 3595 (K, S); Nuza: *Gilliland* 1444 (BM, K); Distr. Umtali: Vumba: *Chase* 1183 (BM, K).

This species is closely related to *C. paniculata* Peter, but is distinguishable by its more or less submontane/rocky habitat, its perennial habit, very shortly petiolate (petioles 1-4 mm long) leaves, larger flowers, sepals with a conspicuous membranous margin, petals somewhat shorter than the sepals but distinctly longer than the stamens, and smooth to finely granular fruits.

11. **C. paniculata** Peter, Fl. Deutsch.-Ostafr. in Fedde's Repert. Beih. 40(2), app. 31, t.38/1 (1932).

Turrill in Fl. Trop. E. Afr., Caryophyll.:13 (1956); Polhill in Kew Bull. 19(2):227-228, f.1/4-6 (1965).
Type: N. TANZANIA (Tanganyika): Ngulu (Ngudu?), 11.i.1926, *Peter* 34652 (holo. B!).
Syn.: *C. barotsensis* Wild in Kirkia 4:160 (1964). Type: ZAMBIA (Northern Rhodesia): Barotseland: Machili, 18.i.1961, *Fanshawe* 6147 (holo. SRGH! iso. K!). **Icon:** Peter, op. cit.; Polhill, op. cit.

A small annual herb with prostrate to suberect and slender, up to 42 cm long stems, bearing numerous, obliquely upwards-directed lateral branches with long (up to 4 cm) and slender internodes. Leaves alternate, with an up to c. 1.5 cm long petiole; lamina elliptic or somewhat ovate, narrowed to the apex as well as to the base, up to 4.5 x 1.5 cm, with convergent nerves, the midrib and the two lateral veins conspicuous, apex acute to obtuse, distinctly mucronate, mucro 0.4-0.6 (mostly 0.5) mm; stipules ovate-semisagittate, rather small and inconspicuous, c. 1.75 x 0.75 mm, mostly whitish, but the upper ones like the bracts often with reddish patches at the base. Inflorescences terminal or subterminal to lateral, on long, leafless shoots, long-peduncled, much-branched but lax and few-flowered; bracts resembling the stipules, though much smaller, c. 0.75 x 0.5 mm, ovate. Flowers shortly pedicellate (pedicel 0.5-1 mm long), ovoid, 1.5-1.75 x 1-1.5 mm;

receptacle c. 0.5 mm high, broadly turbinate; sepals narrowly ovate to oval-oblong, 1-1.25 x 0.75 mm, obtuse, with a rather narrow, whitish to orange-coloured membranous margin, the midrib distinct at the back; petals oblong but small, 0.4-0.5 x 0.3 mm, shorter than the stamens; filaments c. 0.5 mm; anthers quadrangular, 0.2-0.25 x 0.15-0.2 mm, orange-yellow; ovary ovoid; stigmas c. 0.2 mm long, subsessile, and recurved. Fruit (1.5-)1.6 x 1.4 mm, ovoid-globose, orange to dark-brown, markedly alveolate; seed subglobose, c. 1 mm in diam.
Fl. 1-4. In dry deciduous woodlands and thickets, on sandy soils, alt. c 900-1400 m.
Range: East Africa: Tanzania and Zambia. **TANZANIA:** Distr. Manyoni: *Polhill & Paulo* 2184 (EA, K, PRE). **ZAMBIA:** Distr. Machili: *Fanshawe* 6147 (K, SRGH); 6275 (K); Distr. Luwingu: *Fanshawe* 8685 (K).

This species is closely related to *C. drymarioides* Bak.f. from which, however, it differs in being annual, inhabiting comparatively drier localities situated between c. 900 and 1400 m, and in possessing distinctly petiolate leaves, smaller stipules, very lax inflorescences, smaller flowers, sepals with a rather narrow membranous margin, very small petals, and densely alveolate fruits. The type, *Peter* 34652(B) is luckily still intact, and not destroyed as was incorrectly assumed by Turrill and later by Polhill. Wild was presumably not aware of the existence of this species while describing his *C. barotsensis*.

Species Excluded:
Corrigiola deltoidea Hook. et Arnott in Bot. of Beachey's Voy. 1:24 (1830) = *Monocasmia* sp.

3. GYMNOCARPOS

Gymnocarpos Forsskal, Fl. Aegypt.-Arab. 65 (1775); Endlicher, Gen. Pl. 958 (1839); Webb et Berthelot, Phytogr. Canar. 1:165 (1840); Bentham and Hooker, Gen. Pl. 3(1):17 (1880); Pax and Hoffm. in Engler-Prantl, Pflanz. ed. 2, 16c:299 (1934); Maire, Fl. Afr. Nord 9:35, f.9 (1963).
Gymnocarpus sensu De Jussieu, Gen. Pl. 314 (1789) (sub Ordo *Portulacaceae*); O. Kuntze in Post and O. Kuntze, Lexic. Gen. Phaner. 260 (1903); Pamp., Fl. Ciren. 188 (1931); *Gymnocarpum* sensu DC., Prodr. 3:369 (1828); Boissier, Fl. Or. 1:747 (1867).
Gymnocarpon Persoon, Syn. Pl. 1:262 (1805); Batt. et Trab., Fl. Alger. (Dicot.) 167 (1888).

Erect shrubs with a thick and long tap root and a tortuous, much-branched, woody, mostly glabrous stem; bark often densely furrowed. Leaves sessile, linear-terete, opposite, sometimes in axillary fascicles, mucronate, entire, glabrous, glaucous, coriaceous. Stipules scarious,

ovate-triangular, acute. Flowers arranged in terminal and axillary dichasia forming more or less compact, shortly pedunculate clusters at the end of the branches. Bracts usually absent, occasionally well developed, and then scarious. Flowers sessile, with a well-developed, obconical-obpyramidal reddish receptacle, more or less fleshy. Sepals 5, narrowly oblong to oblong-lanceolate, slightly hooded and distinctly mucronate. Petals 5, linear-lanceolate, brownish, attached to the receptable, somewhat shorter than the stamens. Stamens 5; filaments linear-subulate, whitish, episepalous, inserted on the receptacle at a very slightly higher level than the petals; anthers oblong and orange. Ovary narrowly ellipsoid-ovoid, slightly sunken into (and fused at the base with) the receptacle, densely papillose, narrowed upwards into a long style which is shortly trifid to tridentate at the tip and more or less equal in length to the sepals; stigmas very short and filiform. Ovule campylotropous, suspended from the erect funicle. Fruit narrowly ellipsoid with a membranous and densely papillose, orange-brown pericarp, dehiscing at the base. Seed suboblong, compressed, with a membranous and smooth testa, and hanging from the tip of the funicle. Embryo horseshoe-shaped surrounding a mealy endosperm; cotyledons narrow and flattened; radicle superior.

A small, mainly tropical, genus with two species, the area of the one extending from the Sind desert in West Pakistan to the Canary Islands, that of the other is situated in Central Asia, mainly in WNW China.
This is a very interesting genus in so far as the character of bracts is concerned. One of its species, *G. przewalskii,* very characteristically shows the gradual transformation of an ordinary leaf into a distinct, scarious bract.

1a) The flowers subtended by bracts which are more or less similar to the leaves, though much smaller; receptacle rather densely papillose; sepals glabrous on the back but papillose at the tip just below the mucro; petals linear-lanceolate ..... **1. G. decander**

1b) The flowers subtended by well-developed, scarious bracts; receptacle not papillose, but either glabrous or covered with short, appressed hairs; sepals mostly with appressed hairs on the back, particularly near the tip; petals linear ..... **2. G. przewalskii**

1. **G. decander** Forssk., Fl. Aegypt.-Arab. 65 (1775).

Desfontaine, Fl. Atl. 1:203 (1798); Viv., Fl., Lib. 13, tab. 10, f.1 (1824); Webb et Berthelot, Phytogr. Canar. 1:166 (1840); Ascherson et Schweinfurth, Illust. Fl. Egypt. 49 (1889); Bonn. et Barr., Cat. Tun. 67 (1896); Muschler, Man. Fl. Egypt 1:354 (1912); Pampanini, Pl. Tripol. 72 (1914); Ceballos et Ortuno, Veg. and Fl. Forest. Canar. occid. 341 (1951); Parsa, Fl. Iran 1(2):1248 (1951); V. Täckholm, Stud. Fl. Egypt, 404 (1956); P. Ozenda, Fl. Sahara septent. et centr.

209, f.51 (1958); Quezel et Santa, Nouv. Fl. Alger. 1:316 (1962); Maire, Fl. Afr. Nord 9:36 (1963); M. Zohary, Fl. Palaestina 1:130, pl. 183 (1966).
Syn.: *Gymnocarpon fruticosum* (Vahl) Persoon, Syn. 1:262 (1805); *Trianthema fruticosa* Vahl, Symb. 1:32 (1790). Type: Egypt: *Forsskal.* (holo. C, not seen); DC., Prodr. 3:369 (1828); Boissier, Fl. Or. 1:748 (1867); Batt. and Trab., Fl. Alg. (Dicot.) 167 (1888); Hochreutiner, Le Sud-Oranais 142/121 (1904); Durand and Barr., Fl. Lib. Prodr. 44 (1910); Pampanini, Fl. Ciren. 188 (1931).
Gymnocarpos salsoloides Webb ex Christ in Engler's Bot. Jahrb. 9:104 (1888); L. Lindinger, Flora der Kanarischen Inseln 158 (1926). Type: CANARY ISLANDS: Fuerteventura, Bourgeau et Bolle (holo. ??).

An erect shrub with a long, very woody tap root (10-12 mm in diam.) and a very woody, much-branched, stem, which is up to c. 45 cm tall and 1-1.5 cm in diam. at the base, with tortuous, rigid branches, often spreading somewhat slantingly upwards; internodes 0.5-3 cm long, glabrous; dark greyish or light brown and densely furrowed. Leaves opposite but forming dense clusters owing to the development of strongly contracted axillary shoots, linear-terete (or semicylindrical), up to c. 15 x 2 mm, slightly narrowed to the base, obtuse to subacute, conspicuously mucronate (mucro 0.2-0.45 mm long), light green to light brown; stipules 1.5-2 x 1.25 mm, whitish with a reddish, coriaceous base and a shortly ciliate margin. Glomerules 5-15 mm in diam., (3-) 7 to 15 flowered on short (5-10 mm long) peduncles at the ends of short, lateral branches; the peduncles usually densely villous or densely covered with short and soft crisped hairs. Bracts foliaceous, subulate, 2-3 mm long, strongly mucronate, provided with stipules and much shorter than the flowers; never scarious. Flowers 5-7 mm long, fleshy; receptacle 2-3 mm long, obconical, reddish, 10-ribbed, often densely papillose; sepals light-green to light reddish-brown, glabrous, shining, tubular when young, but spreading with age, all narrowly oblong, 3-4.5 x 1 mm, cucullate and prominently mucronate (mucro 0.25-0.4 mm, pale-yellowish, papillose at the base), and with a whitish membranous margin; petals linear-lanceolate, 1.25-1.5 mm, brownish, somewhat shorter than the stamens; filaments 1.4-2 mm, anthers c. 0.4 x 0.25 mm; ovary c. 1.5 x 1.2 ovoid-oblong with a long style 2-2.75 mm, shortly trilobate at the tip, equalling for exceeding the stamens. Fruit 2-2.5 x 1.5 mm, narrowly ellipsoid, orange-brown and densely papillose; seed 2-2.25 x 1.1 mm, suboblong, dark-brown.
Fl. 2-5. Dry limestone hills and sandy places, alt. up to c. 1500 m. Type: EGYPT: In desertis Kahirinis orient. (holo. C, not seen; iso. BM!).
Range: West Pakistan (Baluchistan), SSW Iran, Southern Arabia,

Palestine and Jordan, ENE Egypt, N. Libya, Tunisia, Algerian Sahara, E. Morocco and the Canary Islands.

a) forma **decander:**

WEST PAKISTAN: Sind: nr. Hyderabad: *Jafri* 3811 (K); **Baluchistan:** Harnai: *Lace* 3507 (E); nr. Quetta: *Köie* 2988 (W); Gori: *Khairuddin* 115 (W); nr. Nushki: *Crookshank* 91 (K); Chagai: E. of Dalbandin: *Rechinger* 27290 (W); nr. Panjgur: *Popov* 119 & 141 (W); Makran: nr. Turbat: *Rechinger* 27726 (W); "Baluchistan": *Stocks* 722 (K). **AFGHANISTAN:** "Afghanistan": *Griffith* 1622 (Hb. East Ind. Co. 2476) (K); Chourab: *Lindberg* 273 (W); Farah to Jija: *Köie* 4122 (W); Farah to Shin Dand: *Köie* 4123 (W). **IRAN:** Sarhad: Bazman: *Sharif* 555E (W); Khwash to Iranshahr: *Aellen & Esfandiari* 4010 (G,W); mt. Karvandar: *id.* 4043 (G, W); Kerman: nr. Nosratabad Sipi: *Rechinger* 27203 (W); nr. Shahdad: *Bobek* 196 (W); Lar: Hajiabad to Bandar Abbas: *Aellen & Esfandiari* 3357 (G, W); Bonji to Saltan: *Behboudi* 557E (W); Lar to Lenge: *id.* 2200 (W); Kerman/Fars: Chah Choghuk (Cafut) to Tarum: *Aellen & Esfandiari* 3224 (G, W); Fars: nr. Tang-e-Hena: *Bobek* 25 (W); Shiraz, nr. Khafr: *Gauba Sabeti* 2201 (W); Bushehr to Shiraz: *Kotschy* 94 (G, JE, S, W); Baghmani nr. Bushehr: *Köie* 1518 (W); Dalaki to Forrenti: *Stapf* 33 (W); Yazd: nr. Taft c. 2000 m, *Bornmüller* 1892: 3333 (G, JE); ibid.: *Bowles Bot. Exp.* 892 (K); Khuzistan: Borasjan: *Sabeti* 2202 (W); Persian Gulf: *Aucher-Eloy* 5286 (FI, G). **Southern ARABIA: OMAN:** Tawi Husn: *Lee-Oldfield* FNLO 192 (EA); Wadi Ghaur: *Grichard* KG 81 (BM, EA); **SAUDI ARABIA:** Wadi Nejd: *Vesey FitzGerald* 1674/6 (BM); nr. Medina: *id.* 1674/2 (BM). **SYRIA:** "Syria": *Bornmüller* 1897: 234 (G); S. Syria: Wadi Zewerah: 1863-64, *Lowne* 46 (E, K, W). **PALESTINE/TRANSJORDAN:** Jericho: c. -200 m, *Bornm.* 224 (G, JE); Jerusalem to Jericho: *Samuelsson* 2498 (S); Khan Hatrur to Jericho: *id.* 628 (S); Khan Hatrur: *Dinsmore* 894 (E, L); nr. Jerusalem: *Meyers & Dinsmore* M 894 (G, L) & 6894 (LD); Wadi Majib: *Dinsmore* 2894 (L); Wadi Kilt: *Davis* 4051 (E); Dead Sea: St. George's Convent: *Dinsmore* 4894 (S, Z); Wadi Fuqra: *Yehudai* 732 (E, G, L, LD, S, U, W); Wadi Umbagheg: *R. Gabrielith* 79 (K); Petra: *Gillett* 15985 (K); Ghor Ram: *Hunting Aero Survey* 21b (E). **EGYPT: SINAI:** Gierard: *Schimper* 369 (E, G, HAL, L); mt. Sinai: *id.* 369 (FI); El Kuntila: *Drar* 900 (S); Gherat Arab: *Bové* 205 (G, K, L); Wadi Bedr: *Kaiser* 9 & 75 (G, Z); Wadi Asad: *id.* 17 (G, Z); El Raál el Qasèeb: *id.* 41 (G, S); Egypt: Ismailia: *Letourneux* 289 (FI, G, S); Bir el Harras: *Barbey* 993 (G); Gebel Ataqqa: *Davis* 6337 B (E); Wadi Digla: *id.* 6157 B (E); nr. Helwan: *id.* 6261 B (E); ibid.: *Bornmüller* 1908: 10409 (G); env. Cairo: *Ascherson & Schweinfurth* 35 (G); ibid.: *Keller* 186 (G, Z); Mariut: *Boetje v. Ruyven* 124 (L); Alexandria: *Samaritani* 3164 (FI, JE, L, HBG, S, W, WU); ibid.: *Scott Elliot* 3768 (FI). **LIBYA:** Marmarica: El Omaied: *Gauba* 120 (W); Cyrenaica: Derna: *Taubert* 315 (E, G, JE); El Makhili: *Pampanini* 2384 (L); Bir Hsheim: *id.* 2377 (S); nr. Agedabia: *Pampanini & Pichi-Sermolli* 2393 (G); Tripolitania: *Keith* 604, 1202, 1213 (K); *Sandwith* 2114 (K); *B. C. Park* 165 (K). **TUNISIA:** Gabès: *Kralik* 227 (E, FI, G, Z); ibid.: *Pitard* 128 (E, G, L, LD); Gafsa: *Pitard* 1365 & 1940 (G). **ALGERIA:** El Kantara: iv. 1890, *Girod* (G); Oued Biskra: *Balansa* 1014 (E, FI, G, L, S); ibid.: *Schweinfurth* 486 (Z); ibid.: *Th. Stomps* 49 (U); Biskra: *L. Chevallier* 28 (G, JE, HBG, LD, WU); ibid.: *Kuegler* 52 (JE); Hammam Salahin: *Romieux* 224 (G); Sahara: Ghardaia: *Chevalier* 28 bis (FI, JE, LD); nr. El Golea: *K. Meinertzhagen* 370 (K); ibid.: *J. F. Chipp* 16 (K); Oued Sidi Sheikh, Arab, Djefna: *Paris* 60 (FI, JE, LD, W); Prov. Oran: Chellala-Dehrania: *Kralik* 108a (G); Tiloula to Ain Sefra: *Hochreutiner* 287 (G, Z); N. of Ain Sefra: 31.v.1934, *Faure* (S); Ben Zireg: *Romieux* 541 (G, W). **MOROCCO:** Figuig: *Trethewy* 204 (K); Ksar es Souk: *Davis* 603 (E); Beni

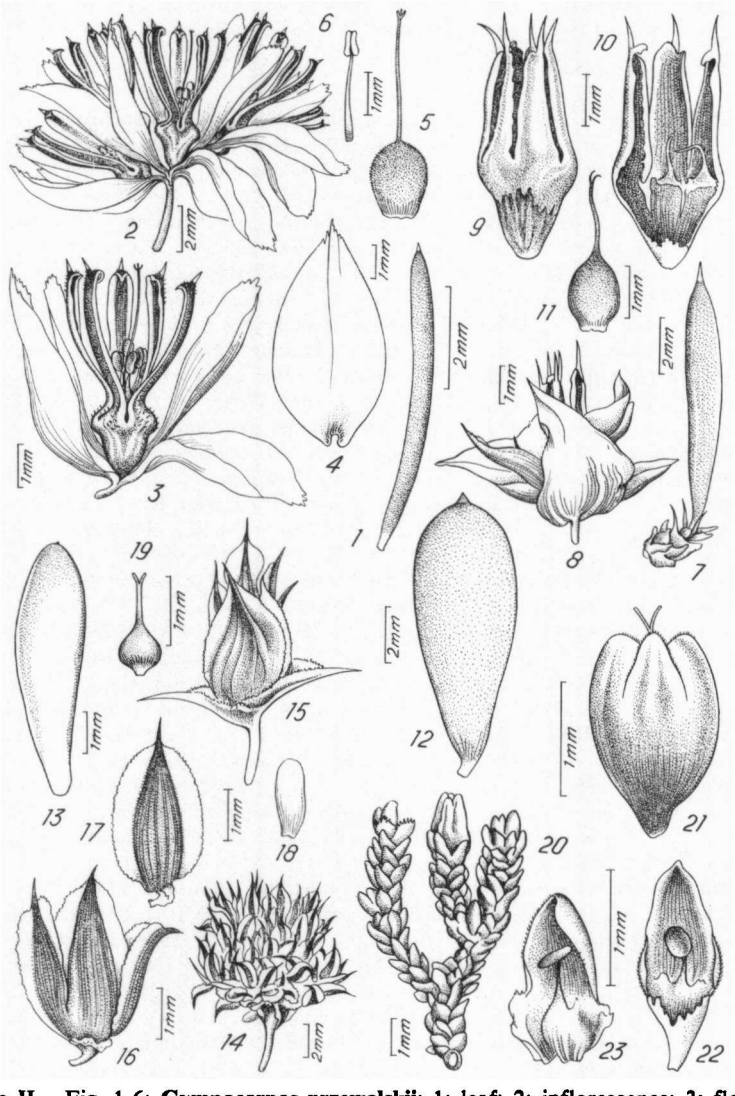

Plate II. Fig. 1-6: **Gymnocarpos przewalskii**; 1: leaf; 2: inflorescence; 3: flower with bracts; 4: bract; 5: fruit and style; 6: stamen [4.vii.1929, *Popov* 78(LE)]. Fig. 7-12: **Lochia bracteata**; 7-11: subsp. **bracteata**: 12: subsp. **abdulkuriana**; 7: leaf; 8: bracts with flower; 9: flower; 10: v.s. flower, inside view; 11: fruit and style; 12: leaf [7-11: *Balfour* f. 429(E); 12: *Ogilvie-Grant-Forbes* Exped. 84(E)]. Fig. 13-19: **Sphaerocoma aucheri**; 13: leaf; 14: inflorescence glomerule; 15: flower; 16: three sepals; 17: one sapal; 18: petal; 19: ovary and style [*Rechinger* 27904 (W)]. Fig. 20-23: **Philippiella patagonica**; 20: shoot; 21: fruiting flower; 22: section of male flower showing a fertile stamen; 23: a sterile stamen of the female flower [20: *P. Dusén* 6230(S); 21 & 23: *Sleumer* 1091 (LIL); 22: *A. Donat* 260 (S).]

Ounof: 18.iv.1936, *E. Wall* (LD); SE Desert: Tinfift: *Maire & Wilczek* 189 (S). **CANARY ISLANDS:** Fuerteventura: Nandia, Barlovento: *Bourgeau* 483 (E, G, W).

b) forma **salsoloides** (Webb ex Christ) Chaudhri comb. nov.
G. salsoloides Webb ex Christ op. cit. Shoots rather short and congested. **CANARY ISLANDS:** Teneriffe: Punta de Teno, *Asplund* 808 (G, S); Nivaria, *Sventenius* 215 (LISE).
Note: The specific epithet originally used by Forsskal-"decandrum" being a neuter, is incompatible with the masculine generic name. The correction ("decander"), first made by Ascherson and Schweinfurth, op. cit., must therefore be accepted.

2. **G. przewalskii** Bunge ex Maximowicz in Bull. Acad. Imp. Sci. St.-Petersb. 26:502 (1880).

Plate II, Fig. 1-6 p. 56

An erect shrub; stem 30-45 cm tall, much-branched from the base as well as higher up. Leaves opposite on the main shoots but fascicled on the branches, up to 15 x 1.5 mm, linear-terete or subcylindrical, mucronate (mucro 0.25-0.45 mm), occasionally slightly grooved on one side; stipules up to 1.75 x 1.25, usually with a coriaceous base. Glomerules 7 to 15-flowered, 10-15 mm in diam., on short (5-10 mm long) peduncles at the end of short branches arising almost all over the stem; peduncles usually villous, but sometimes almost glabrous. Bracts scarious, broadly ovate to suborbicular or nearly elliptic, 4-7 x 2-4 mm, equalling or exceeding the flowers though not fully concealing them, two per flower, sometimes the lowermost with a coriaceous, narrowly ovate-lanceolate central lobe representing the linear-subulate, mucronate leaf, the two stipules of which have been fused with it laterally, the upper (younger) bracts wholly scarious and devoid of the rest of the blade. Flowers sessile, 5-7 mm long; receptacle 2-2.5 mm long, slightly papillose-hirtellous or occasionally with short, fine, appressed hairs particularly on the upper part of the receptacle; sepals narrowly oblong to oblong-lanceolate, 3-4 mm long, cucullate, sharply mucronate (mucro 0.25-0.4 mm), usually covered with short, appressed hairs on the back esp. near the apex just below the mucro, (the mucro too often covered with very short hairs), sometimes almost glabrous; petals filiform, (1.25-) 1.5-1.6(-2) mm, whitish or brown, somewhat shorter than the filaments; the latter linear-lanceolate, 1.5-2.25 mm; whitish; anthers c. 0.4 x 0.25 mm; ovary c. 1 x 0.5 mm, densely papillose, narrowed (upwards) into a (2-)3-3.5 mm long style, reaching the sepal hoods, shortly trilobate at the tip. Fruit narrowly ellipsoid c. 2 x 1.5 mm, light-brown and densely papillose.
Fl. 5-8. Dry steppe and stony river-beds, alt. up to c. 2600 m.

a) var. **przewalskii:** Floral receptacle hirtellous; sepals ± glabrous on the back but with a patch of short hairs near the apex just below the mucro.

Type: NW China: "Mongolia occidentalis": Huangho, in rupibus et arenosis, 15-17.v.1872, *N. M. Przewalski* 45 (holo. LE! iso K! LE!)

Distr.: Mongolia to NW China.

MONGOLIA: Prov. Khobdo, distr. Uiench: *V. I. Grubov* 5333 (LE); Prov. Southern Gobi, distr. Nomgon: *A. A. Yunatov* 15167 (LE). **CHINA:** Inner Mongolia, Bayan-Khoto, E. of Divusumu: 12.iv.1958, *M. P. Petrov* (LE); Central Mongolia, Alashan to Urgu, nr. Nyudun-Khuduk: *Napalkov* 27 (LE); Western Mongolia/Kansu: Huangho (Hwang Ho): *N. M. Przewalski* 45 (LE, Type); Prov. Kansu, Suchzhou to Tsuytsyuan: 4.viii.1875, *Piasezky* (LE); E. of An-hsi, 24.vii. 1958, *M. P. Petrov* (LE); Kuen-Lun, c. 2250-2600 m, *W. J. Roborowski* 198 and 220a (LE); Sinkiang: ("Kashgaria"): Prov. Hsin-Chiang, WNW of Aksu, *A. A. Yunatov* 1041 (LE); Tianshan (Tianchan), *Przewalski* 139 (LE); ibid.: *G. Merzbacher* 442 (LE); ibid.: *H. Appleton* 234 (K); above Kashgar: *M. G. Popov* 78 (LE).

b) var. **scabrida** Chaudhri n. var. a var. *przewalskii* receptaculo et sepalis extus ubique pilis appressis brevibus fere omnino vestitis distinguenda. Receptacle and sepals almost entirely covered with short appressed hairs.

Type: China: Sinkiang ("Turkestania chinensis"), Dochanart range: vi.1903, *G. Merzbacher* 781 (holo, LE!).

Distr.: Endemic in NW China.

CHINA: Sinkiang, Tianshan range: *G. Merzbacher* 427 (LE); Uch-Turgan, Surgun, 16.v.1908, *D. Divnogorskaya* (LE); Kansu: *T. N. Liou* L-2216 (S); Tsinhai, Beishan desert, N. of An-shi: 26.vii.1958, *M. P. Petrov* (LE).

4. LOCHIA

Lochia Balf. fil. in Proc. Roy. Soc. Edinb. 12:409 (1884), and in Trans. Roy. Soc. Edinb. 31:251 (1888); Pax and Hoffm. in Engler-Prantl, Pflanz. ed. 2, 16c:299 (1934).

A small, woody (bushy) subshrub with a much-branched, erect, woody and knotty stem, with branches often spreading and somewhat tortuous. Leaves opposite, most of them fascicled on the young branches, usually subsessile, coriaceous, of various shapes, viz. linear-lanceolate (-oblanceolate), almost cylindrical-oblong and obovate, acute to obtuse, mucronate, entire, glaucous. Stipules small, ovate-triangular, apex acuminate and slightly fimbriated, margin ± entire, reddish, the two (of a pair) often fused at the base. Flowers arranged in densely congested dichasia, which are aggregated into large, reddish, terminal and subterminal, shortly pedunculate, subglobose, strongly contracted corymbs. Bracts scarious, ovate to suborbicular, equalling or exceeding the flowers, reddish. Flowers sessile, somewhat vase-like, with a distinct obconical receptacle, which is shorter than the sepals, and reddish at

the base. Sepals 5, connivent, ovate-suboblong, somewhat narrowed to the apex, usually coriaceous, indurated with age, with a narrow but distinct membranous margin and a shortly cucullate and strongly mucronate top, smooth and glabrous, glaucous-shining, light-green on the outside and reddish on the inside. Petals 5, very small and inconspicuous, lanceolate, red, shorter than the stamens. Stamens 5; filaments filiform, whitish; anthers quite prominent, oblong and orange. Ovary narrowly ellipsoid, papillose at the top; style long, slender; stigma bilobed; ovule single, campylotropous, suspended by the erect funicle. Fruit oblong, obtuse, rupturing irregularly at the base; pericarp membranous, brown, papillose above. Seed much compressed.

A monotypic genus endemic in the islands of SOCOTRA and ABDUL KURI, E. of Somalia and S. of Aden. It is closely related to *Gymnocarpos* Forssk. having an almost identical habit and a similar though bicarpellary gynoecium. The two, however, differ in leaf-shape, and in the characters of the inflorescence and the flowers. The dichasia of *Gymnocarpos* are more or less sessile, the flowers fleshy, the receptacle either papillose or covered with short, fine hairs; the back of the sepals too is papillose or hairy near the apex, and the sepals spreading with age. In *Lochia,* on the other hand, the cymose clusters are shortly pedunculate, the flowers (receptacle and sepals) are glabrous and coriaceous and become much indurated with maturity, and the sepals are strongly connivent. In *Lochia,* moreover, the shoots are entirely glabrous, the inflorescence terminal, the petals and stamens much shorter (than in *Gymnocarpos*), and the ovary is not fused with the receptacle. In *Gymnocarpos,* on the other hand, the upper (younger) internodes and the peduncle of the inflorescence are papillose to villous, the glomerules are mostly lateral, the petals and stamens quite prominent, and the ovary is at the base sunken into the receptacle. The two genera show a strikingly parallel development in habit and in the structure of the gynoecium, which is esp. clear in the fruit.

Lochia bracteata Balf. fil. in Trans. Roy. Soc. Edinb. 31:251, tab. 84 (1888).

Plate II, Fig. 7-12. p. 56

A small subshrub; stem woody, erect, 15-35 cm tall, glabrous, much-branched, the branches very knotty and somewhat tortuously spreading; internodes up to c. 2 cm long, pale-brown in young shoots, dark grey in the older parts. Leaves opposite or in pairs but often fascicled on the nodes of younger branches, subsessile or very shortly petiolate (the stalks 0.75-1.5 mm, whitish and usually persistent), very variable in shape and size, linear-lanceolate(-oblanceolate), almost cylindrical-oblong, or obovate, up to 13 x 4 mm, coriaceous; stipules ovate-

triangular, 1-2 x 1-1.25 mm, reddish, connate at the base. Flowers arranged in densely congested dichasia which are aggregated into many-flowered, terminal and subterminal, shortly pedunculate (peduncle (2-)5-10 mm long), subglobose, reddish, strongly contracted corymbs measuring 10-25 mm in diam. Bracts scarious, broadly ovate to sub-orbicular, occasionally narrowly elliptic-oblong, up to 7 x 5 mm, equalling or exceeding the flowers, though not fully concealing them, mostly reddish with a nearly white, entire margin, connate at the base. Flowers sessile, 4.5-5.75 mm long, somewhat vase-like, swollen just below the middle part and tapering at both ends, mostly glabrous, coriaceous, becoming indurated with age; receptacle obconical, turbinate above, tapering to the base, 2-2.5 mm long and c. 2 mm broad at the swollen part, usually reddish at the base. Sepals ovate-suboblong, 2.5-2.75 mm long without the mucros, connivent at the top, somewhat narrowed to the apex, shortly hooded and strongly mucronate (mucro c. 1 mm long, rigid, smooth and almost erect), with a narrow though distinct membranous margin, coriaceous, light-green, glaucous, smooth and glabrous, rarely slightly ciliate (as in forma *ciliata*) on the thickened basal part of the margin. Petals linear-lanceolate, 0.5-0.65 mm, reddish, much shorter than the stamens. Filaments 1.2-1.35 mm; anthers oblong, orange 0.35 -0.4 x 0.25 mm. Ovary c. 1.5 x 1 mm, narrowly ellipsoid, papillose on the upper part; style 1-1.4 mm long, slender or filiform, equalling the sepals in length and usually bent at the tip; stigma (0.25-)0.3-0.4 mm long, bipartite, the lobes filiform, often somewhat recurved. Fruit 2.25-2.4 x 1.25 mm, narrowly ellipsoid, with obtuse-rounded and papillose top, reddish-brown, rupturing irregularly at the base; seed c. 1.75 x 0.8 mm, ellipsoid, dark-brown. Fl. 12-3. On rocky slopes.

Endemic. Vernacular (local) name: Kalkaho. "A very beautiful undershrub, striking by the contrast of its rich brown inflorescences and bright green leaves". Not common. (Balfour).

a) subsp. **bracteata:** Leaves linear-lanceolate(-oblanceolate), 7-13 x 1-1.5 mm, acute, sharply mucronate, the mucro 0.4-0.65 mm; stipules 1.5-2 mm long; inflorescences 13-18(-20) mm in diam.; bracts up to 7 x 5 mm long, exceeding the flowers; flowers 4.5-5.75(-6) mm long; style c. 1 mm long, stigma-lobes 0.25-0.3 mm long.

Type: SOCOTRA: On the slopes of Haghier Mts., ii-iii.1880, *Bayley Balfour* fil. 429 (holo. E! iso. K!).

SOCOTRA ISLAND only: Glato, *Balfour* 84 (E); Haghier Mts., *id.* 429 (E, K, type).

aa) forma **ciliata** Chaudri f. nov. a forma *bracteata* sepalis basi parce ciliatis instructis distinguenda. Sepals shortly ciliate at the base. SOCOTRA: Haghier Mts.: nr. Ras Shoab, 10.i.1899, *O. Simony* (WU).

b) subsp. **abdulkuriana** Chaudhri nov. subsp. a subspecie *bracteata* foliis latioribus (usque ad 4 mm latis), obtusis, mucrone multo

brevioribus (circ. 1 mm longis), inflorescentiis majoribus (plerumque 20-35 mm diam.), bracteis floribus aequilongis sed eos non omnino obtegentibus, stylo longiore (1.25-1.4 mm longo), stigmatibus etiam longioribus (0.35-0.4 mm longis) distinguenda.
Leaves obovate (-oblanceolate) to almost cylindrical-oblong, up to 13 x 4 mm, obtuse-rounded, shortly mucronate, mucro 0.25-0.3 mm long; stipules c. 1 mm long; inflorescences (15-)20-35 mm in diam.; bracts 4.5-5.5 x 3-5 mm, equalling but not exceeding or concealing the flowers; flowers 4.5-5 mm long; style 1.25-1.4 mm long; stigma-lobes 0.35-0.4 mm long.
Type: Abdul Kuri Island: 1898-99, *Ogilvie-Grant-Forbes Exp.* 84 (holo. E!).
Distr.: Abdul Kuri Island.

Abdul Kuri Is.: *Ogilvie-Grant-Forbes Expedition* 41, 54, 84 (E); Gebel Saleh: 17-21.i.1899, *St. Paulay* (WU).

O. Simony's gathering from Gebel Haghier, nr. Ras Shoab (Socotra) shows a very interesting intermediate stage between the two subspecies. It possesses obovate-oblanceolate to almost oblong-cylindrical leaves. up to 9 x 2.5 mm, obtuse but strongly mucronate, larger flowers (like those of subsp. *bracteata*), sepals ciliated at the base, large bracts, which exceed and almost conceal the flowers (as in subsp. *bracteata*), but the style is rather long, almost like that of subsp. *abdulkuriana.*

5. SCLEROCEPHALUS

Sclerocephalus Boiss., Diagn. Pl. Or. Nov. ser. 1(3):12 (1843); et Fl. Or. 1:748 (1867); Walpers, Repert. 5:75 (1845); Bentham et Hooker, Gen. Pl. 3(1):17 (1880); Pax et K. Hoffmann in Engler-Prantl, Pflanz. ed. 2, 16c:301 (1934); Maire, Fl. Afr. Nord 9:58 (1963).

A small annual herb with a short and slender tap root and stout, stiff, glabrous, much-branched prostrate stems. Leaves ± fleshy or subcoriaceous, linear-terete or subcylindrical, strongly mucronate, stipulate. Stipules scarious, ovate-triangular. Flowers arranged in spherical, pedunculate glomerules, becoming concrescent with the spiny and indurated (floral) leaves in the fruiting stage. Flowers markedly perigynous. Sepals 5, herbaceous, shortly hooded with a spinous and indurated tip, densely woolly at the apex as well as at the base; receptacle concrescent with the adjoining (floral) leaves. Petals absent. Stamens 5, inserted on the rim of the cup-shaped receptacle. Ovary conical(-ovoid); the basal part connate with the receptacle, the upper part free and attenuated into a slender style; stigma bipartite, occasionally, tripartite, the lobes often recurved. Ovule amphitropous, suspended from the tip of the funicle. Fruit sunk in the indurated recep-

tacle; embryo annular; cotyledons compressed; radicale superior.

A monotypic genus distributed from S. Iran to Arabia, Egypt. the N. African Sahara and the Cape Verde Islands.

S. arabicus Boiss., nom. nov. Diagn. 1(3):12 (1843); Fl. Or. 1:748 (1867).

Batt. et Trab., Fl. Alg. (Dicot.) 164 (1888); Bonnet et Barratte, Cat. Tun. 67 (1896); Durand et Barratte, Fl. Lib. Prodr. 45 (1910); Muschler, Man. Fl. Egypt 1:355 (1912); E. Blatter, Fl. Arab. in Records Bot. Survery Ind. 8:394 (1923); Aug. Chevalier, Les Iles du Cap Vert 996 (1935); Parsa, Fl. Iran 1(2); 1250 (1951); V. Dickson, Wild Flowers of Kuwait and Bahrain 83 (1955); V. Täckholm, Stud. Fl. Egypt 405 (1956); P. Ozenda, Fl. Sahara 209, f.51 (1958); Quezel et Santa, Nouv. Fl. Alg. 1:316 (1962); Maire, op. cit. 9:58 (1963); Rechinger, Fl. Lowland Iraq 225 (1964); M. Zohary, Fl. Palaest. 1:135, pl. 193 (1966).

Paronychia sclerocephala Decaisne, Fl. Sinaic. 38 (1834), et in Ann. Sc. Nat. 2(3):262 (1835); Type: EGYPT: SINAI: Bové (holo. P?? not seen). Misapplied name: *S. aucheri* sensu Walpers, Repert. 5:75 (1845).

Icon: Maire, op. cit. 9:59, f.18 (1963); M. Zohary, op. cit. pl. 193 (1966).

An annual green herb with much-branched, prostrate, stout, stiff, glabrous, 5-15(-35) cm long stems; branches somewhat brittle; internodes 10-22 mm long. Leaves sessile, opposite but often in axillary clusters, 5-15(-20) x 1 mm, linear-terete or subcylindrical, entire, acute and strongly mucronate (mucro 0.5-0.6 mm long, rigid, pale-brown); the radical leaves much longer, 20-25 x 2 mm, and usually without mucro; stipules ovate-triangular, 3-3.5 x 1.5-2 mm, acute to acuminate, margin almost entire, occasionally fimbriate at the tip, the two (belonging to the same leaf) often connate at the base; those of the floral leaves usually longer (c. 4 x 0.75 mm) and narrower (narrowly lanceolate). Inflorescence a shortly pedunculate, very compact, spherical glomerule, usually 4 to 7-flowered and 7-12 mm in diam., consisting of strongly contracted cymes; the flowers concrescent with the floral leaves, and all becoming indurated in the fruiting stage, the glomerule thus being transformed into a very spiny structure which eventually is shed with the peduncle; the outer floral leaves, 4-7 mm long and provided with a rigid, c. 1 mm long pale-yellowish spine, are often forming an involucre; scarious bracts not present, the floral stipulate leaves representing the (foliar) bracts. Flowers 4(-4.5) mm long, almost tubular; receptacle 1.5-2 mm long, cup-like, concrescent with floral leaves, forming a strongly hardened structure. Sepals slightly unequal, all narrowly oblong, 2.5-3 mm long, concave with an inflexed membranous margin and a rather coriaceous median part, shortly cucullate, strongly spinose just above the hood (spine 0.75-1 mm, rigid and pale-brown),

on the back near the apex as well as at the base densely covered with crisped, greenish, woolly hairs; indurated with age. Petals absent, Stamens nearly half as long as the sepals; filaments 0.6-0.75 mm; anthers c. 0.25 x 0.2 mm, quadrangular (to subglobose), orange-yellow. Ovary c. 1.5 x 1 mm, conical, tapering upwards into a slender, 0.5-0.7 mm long style; stigma 0.3-0.4 mm, usually bipartite, occassionally tripartite, the lobes often somewhat recurved, equalling or exceeding the stamens. Fruit 2.5(-3) x 1.5-2 mm, ovoid, with a membranous-pellucid pericarp, slightly papillose at the top, rupturing irregularly above; seed c. 2.25 x 1.5 mm, ± reniform, somewhat compressed, dark-brown; radicle superior and prominently jutting out. Fl. (1-)2-5(-7). On dry sandy soils, alt. c. 10-1000 m.

Range: South Iran, S. Iraq, SE Arabia, NE Africa, SW Tunisia, Central Algeria, and the Cape Verde Islands.

IRAN: Prov. Lar: Hajiabad to Bandar Abbas: *Aellen* et *Esfandiari* 3420 (W); Lengeh (Lingeh): *Bornmüller* 1893: 191 (G, JE); Karek Island: *Th. Kotschy* 25a (E, FI, G, JE, L, S). **IRAQ:** Southern Desert: J. Sanam: *Wheeler Haines* 942 (E); Distr. Basra: J. Sanam: *Rechinger* 8587 (W); Safwan: *Rechinger* 8709 (W); SW of Basra: *R.* 14375 and *R.* 14387 (W); SSE Zubair: *R.* 14536 (W). **SYRIA:** El Gantra: iv. 1922, *T. Orre* (S); **PALESTINE:** Dead Sea, nr. Massada: *Rachel Gabrielith* 100 (K). **SAUDI ARABIA:** NE of Jedda: *Trott* 1428 (K); S. of Medina: *id.* 1608 (K); Arafjan: *V. Dickson* 28 (K); Abu Hadriyeh: *id.* 579 (K). **SOUTH-EASTERN ARABIA:** Bahrain: *Ronald Good* 276 and 278 (BM); ibid.: *T. Carpenter* et *R. A. F. Muharraq* 64 (K); Muscat: *Aucher-Eloy* 4513 (FI, G, K); Falaicha Is:. V. *Dickson* 416 (K). **EGYPT:** Sinai: W. El Humur, El Ramia: iv. 1937, *J. R. Shabetai* (K); Southern Desert: Wadi Salib: *Drar* 124 (S); J. Elba, Wadi Rabdit: *id.* 79 (S). **SUDAN:** Nubian coast: 1896, *J. Th. Bent* (K); ibid., J. Asotariba, *Schweinfurth* 771 (K). **ERITREA:** (Ethiopia): Wadi Melekte: *P. R. O. Bally* B 6790 (K). **LIBYA:** Tripolitania: Beni-Ulid: *Grichard* KG/LIB/615 (BM). **TUNISIA:** El Oudiane: *Pitard* 1908: 395 (G); Gafsa: iv. 1909 *id.* (E, L); Krèz: 30.iv.1887, *Letourneux* (FI, S); Degache: 11.ii.1908, *Murbeck* (LD). **ALGERIA:** Sahara: Biskra: iii. 1896, *Murbeck and Olin* (LD); Chetma nr. Ain Salahin: *Chevalier* 411 (FI, JE, LD, WU); Chetma: *Kralik* 38 (FI, G, forma *leianthus* Murbeck); Oued Biskra: *Balansa* 957 (E, G, S); Tassili-n-Ajjer, Ariheret, *Maire* 1050 (G). **CAPE VERDE ISLANDS:** 1897, *Cardoso* (L); Sal: Terra Boa: 21.i.1954, *Lindberg* (LD); Sal: Pedra Lume: *Chevalier* 44278 (COI); Maio: *id.* 44484 (COI); S. Vicente: *Welwitsch* 1091 (BM).

There is one collection from Turkmenistan, (Ashkhabad, vii.1900 *P. Sintenis* (LD), which is the more remarkable as there is no record of this genus from the central, eastern or northern parts of Iran. It may well have been introduced there.

The flowers occasionally have rather sparse woolly hairs on the apex and base of the sepals, and plants with that kind of flowers have been recognized as forma *leianthus* Murbeck, op. cit., but such specimens can hardly be treated as a distinct variety as Maire, op. cit., has done, since in such specimens some of the glomerules may possess conspicuously woolly flowers or sepals.

The plants from the Cape Verde Islands have longer (up to c. 35 cm)

and stouter shoots, longer leaves and somewhat larger stipules; some of the plants seem to be very hardy.

This is an interesting genus particularly on account of its spiny, compact, spherical glomerules which exhibit a very peculiar manner of dispersal, efficiently suited to the dry windy conditions of the deserts and semidesert areas in which this species occurs. This genus is related to *GYMNOCARPOS* on the one hand and to *SPHAEROCOMA* on the other. The leaves are mucronate and the stigma occasionally tripartite thus indicating its affinity with the former, but its globose, compact glomerules resemble those of *Sphaerocoma.* It, however, possesses an entirely different habit and floral structure, and the petals are lacking.

6. PARONYCHIA

INTRODUCTION:

The name PARONYCHIA * was probably introduced in the scientific literature by DIOSCORIDES. PLINY (PLINIUS) too refers to it in his Historia Naturalis 24:119 (1469) (cf. GRAEBNER in A. & G. Syn. 5(1):888 (1919).

A description of a plant to which the name *"Paronychia hispanica"* was applied appeared in CAROLUS CLUSIUs' "Rariorum aliquot stirpium per hispanias observatorium historia" p. 478 (1576). However, it was TOURNEFOURT (1700) who recognized it as a distinct genus in the modern sense, and who described in his "Institutiones Rei Herbariae" 507-508 (1700) 6 species (including the one already named by CLUSIUS). MILLER reproduced these six taxa, in entirety, in his Gardners' Dictionary abridged ed. 4, vol. 3 (1754). As he was the first post-Linnaean (or post-Species Plantarum) author who treated it as a distinct genus, he is to be accepted, in accordance with the rules of Botanical Nomenclature as the author of this genus, a credit that really belongs to TOURNEFOURT. LINNAEUS (1753), however, did not accord it generic status, but, instead, described in the Species Plantarum ed. 1, on p. 206 and p. 90 respectively, 4 of the species, mentioned by TOURNEFOURT, under *Illecebrum (I. paronychia, I. capitatum, I. suffruticosum* and *I. cymosum*) and one under *Queria* (*Q. canadensis*). Two more were added by him, in 1767, in Mantissa Plantarum 1:51, one under *Illecebrum* (*I. arabicum*) and the other under *Achyranthes* (*A. dichotoma*). Most of these species were later transferred to *Paronychia,* viz. by LAMARCK and DE CANDOLLE. LINNÉ the younger added *I. canariense* in Suppl. 161 (1781), later transferred to *Paronychia* by JUSSIEU (in

* Greek name for *whitlow* or *felon,* a disease of the nails, and for plants with whitish scaly parts, once supposed to care it.

1815). LAMARCK's account in Flore Françoise 3.229 (1778) included the descriptions of *P. argentea (Ill. paronychia* L.), *P. capitana (Ill. capitatum* L.), *P. fruticosa* (*Ill. suffruticosum* L.), *P. echinata* and *P. verticillata* (*Ill. verticillatum* L.). DE CANDOLLE transferred *Ill. cymosum* L. and *Ill. arabicum* L. to *Paronychia* in POIRET, Encyclopédie Méthodique Botanique 5:25 (1804), besides correcting the specific epithet of LAMARCK's *P. fruticosa* to *suffruticosa.* In the same account he added 9 new species: *P. brasiliana, P. hispanica, P. serpyllifolia* (Vill.) DC.,*P. capitata* [1]), *P. nivea, P. dichotoma* [2]), *P. striata, P. subulata* and *P. linearia.* The last two species were, later on (in 1828) excluded by him from *Paronychia* (in his Prodromus Systematis Naturalis 3:372) whereas *P. dichotoma* and *P. verticillata* were transferred to *Herniaria* and *Illecebrum* respectively, and *P. striata* [3]) simply not mentioned at all. MICHAUX, in the meantime, described 3 species (in Flora boreali-americana 1:112-114 (1803) under a new genus *Anychia, A. dichotoma* (actually synonymous with LINNE's *Queria canadensis) A. herniarioides* and *A. argyrocoma.* The last two (along with LINNE's *Achyranthes dichotoma*) were transferred to *Paronychia* by NUTTALL in 1818 ("The genera of North American Plants" 1:159-160). *Queria canadensis* L. was transferred by WOOD in 1861 (Class-Book 262).

The first comprehensive account of this genus appeared in DE CANDOLLE's Prodomus (l.c.), in which he briefly described all the species known at that time, *20* und *Paronychia* (including five new species and two imperfectly known ones) and two under *Anychia.* The *Paronychia* species were divided into three sections: 1) *Chaetonychia* (one species, *P. cymosa*); 2) *Eunychia* (16 species); 3) *Acanthonychia* (one species, *P. ramosissima*). Significantly enough, he was not sure of the taxonomic status of the first and 3rd sections, and referred to the possibility that they would have to be treated as distinct genera [4]).

This fine treatment was followed by another excellent and more critical one by FENZL in ENDLICHER's Genera Plantarum 958 (1839). In

[1]) De Candolle evidently misunderstood Linné's *Ill. capitatum,* which had, in fact, already been transferred to *Paronychia* by Lamarck in 1778 (Fl. Fr. 3: 229). De Candolle's use of the epithet *capitata* for a different species was very unfortunate and led many subsequent authors into errors.

[2]) This is probably the present-day *P. virginica* Sprengel, but De Candolle did not mention any locality, and in his subsequent account, in the Prodromus, transferred it to *Herniaria.*

[3]) This is a nomen ambiguum. In Lamarck's Herbarium at Paris (LA-P) there is one specimen with the annotation "P. striata DC., P. alsinifolia", which actually belongs to the present-day *P. fastigiata* (Raf.) Fernald. So as to avoid further confusion it seems better to discard this name. In fact De Candolle himself had omitted it from his account in the Prodromus.

[4]) They are, in fact, two distinct genera, *Chaetonychia* (L.) Sweet and *Cardionema* DC.

this account the genus was divided into six sections (*Anoplonychia, Aconychia, Eunychia, Chaetonychia, Siphonychia* and *Anychia*) whereas section *Acanthonychia* DC. was excluded. This work formed for almost a whole century the basis of nearly all the subsequent taxonomic studies of this genus. In 1934 however, PAX & HOFFMANN modified it and brought the treatment up to date.

E. BOISSIER added six species from the Near East (*P. kurdica, P. macrosepala, P. desertorum, P. flavescens, P. chionaea, P. kochiana*) in his "Diagnoses Plantarum Orientalium Novarum (1843-1849) and two more (*P. bungei* and *P. imbricata,* the latter in collaboration with HAUSSKNECHT) in his Flora Orientalis vol. 1 (1867). In the latter work, however, he reduced *P. flavescens, P. chionaea* and *P. kochiana,* and introduced an element of confusion by lumping together some very good species (with more or less equal and connivent sepals) under a collective and highly ambiguous name, viz. "P. capitata". KERNER, a few years later, corrected this error in a long article, and dealt with most of the then known Old World species in the concluding part in 1877 (Österr. Bot. Zeitschr. 27:13-19). His work formed the basis for a detailed study of the European species by P. GRAEBNER in ASCHERSON & GRAEBNER's Synopsis der Mitteleuropäischen Flora 5(1): 888-900 (1919).

The South American species were dealt with by CAMBESSÈDES who contributed some of the finest descriptions in SAINT-HILAIRE's Flora Brasiliae Meridionalis 2:186 (1829). ROHRBACH reviewed these (South American) species in Linnaea 37:201-212 (1873), but, apart from adding two good species, he did little to clarify the matter. Later on, 5 species were described from Chile by PHILIPPI, and three from Peru by MUSCHLER (1910-11).

The first account of the North American species appeared in 1803 when MICHAUX (op. cit.) described three species under the newly created genus *Anychia.* NUTTALL (op. cit.) (1818) transferred two of them (*A. argyrocoma* and *A. herniarioides*) to *Paronychia.* The third, *A. dichotoma,* remained distinct for well over one hundred years despite the fact that its earlier homonym *Queria canadensis* L. had already been transferred to *Paronychia* by WOOD in 1861. SMALL in 1903 (Flora of S.E. United States, 400) split off the genus *Anychiastrum* to accommodate three species, *P. baldwinii, P. herniarioides,* and *P. riparia,* to which he added in 1910 (Torreya 10:230) a fourth one, *A. montanum.* In 1913 NIEUWLAND (in American Midland Naturalist 3:154-155) transferred these four species to the genus *Plagidia* which had been set up by RAFINESQUE in 1838 (New Flora and Botany of North America 4:42) for *P. rufa,* a species whose identity cannot, now, be ascertained. SMALL created in 1925 (Torreya 25:12) a new monotypic genus *Nyachia* for a species from Florida. This species

N. pulvinata was transferred to *Paronychia* by FERNALD in 1836 (Rhodora 38:418). In 1933 SMALL described yet another genus *Gastronychia* to accommodate *Paronychia herniarioides,* which he had previously referred to his genus *Anychiastrum.* However, as pointed out by FERNALD in 1936 and later by CORE in 1941 (American Midland Naturalist, 26(2):370), SMALL's genera were based on very minor and unstable characters, and cannot be maintained as such. FERNALD (op. cit.) in his article also dealt with two widely distributed but nomenclaturally misinterpreted species viz. *P. canadensis* and *P. fastigiata* and cleared up a lot of confusion both taxonomic as well as nomenclatural. CORE in 1939 (Journ. Elisha Mitchell Soc. 55:339-345) dealt with the genus *Siphonychia,* and two years later revised the North American species of Paronychia (Amer. Midl. Nat. 26(2):369-397), an excellent account indeed.

Siphonychia was considered to be distinct from *Paronychia* on the basis of its cup-shaped receptacle or hypanthium, also known as the perigynous zone, a character also possessed by some of the species of *Paronychia* (see under Pistil). It was merged with *Paronychia* by SHINNERS in 1962 (Sida 1(2):102) a decision followed in the present work.

A very detailed account of most of the North African species appeared in R. MAIRE's Flore de l'Afrique du Nord, 9:12-35 (1963), but it is marred by a number of misidentifications in addition to a very pronounced and highly disconcerting bias in favour of lumping together many species possessing quite different characters but sharing a similar habit or showing a similar aspect.

Finally CHAUDHRI (in 1966) described 15 species from Turkey (in Acta Bot. Neerl. 15(1):193-208 (1966), all endemics.

GENERAL DISCUSSION:

This is a grossly neglected, often misunderstood and misrepresented genus. SMALL's treatment was undoubtedly an extreme form of splitting which no serious student of this group will ever accept. But leaving aside this negative contribution, much of the confusion has resulted from a lack of understanding of the structural characteristics and pecularities of this genus and partly also from an inadequate knowledge of the types. Some of the most glaring cases are briefly described here.

1) DE CANDOLLE was the first to have a thorough understanding of this genus, but, unfortunately, was also the first to introduce an element of confusion when he described in 1804 (Poiret, Encycl. 5:25) his *"P. capitata",* knowing fully well that this name had already been used by LAMARCK in 1778 (Fl. Fr. 3:229) for another species. A little later, however, he recognised this (nomenclatural) error, and in his Prodomus the name was dropped. But, unfortunately, a lot of taxonomists continued to repeat this error, so much so that KERNER (op. cit.) had to write a long article in order to clear up the misunder-

standing. Strangely enough, he was the only taxonomist in the 2nd half of the last century who had a clear understanding of this genus. It must, however, be remembered that this is a very difficult one partly owing to the fact that most of the important characters of the flower are usually concealed by the bracts.

2) A number of species, particularly in the subgenus *Anoplonychia,* resemble each other in habit and general aspect, though differing considerably in their floral characters, and this superficial resemblance has led many taxonomists to serious errors. That BOISSIER, of all persons, should have committed such blunders is, indeed, hard to understand. He had, undoubtedly, an excellent (first hand) knowledge of the plants of the Near East, and the very fact that a number of species still bear the name under which they were described by him, is a sure testimony. In this genus alone there are four good species described by him, three of them in the section *Heterosepalae* Chaudhri, the fourth in the main section *Anoplonychia* of the subgenus of this name. It is in this latter particular group that he found himself baffled and confused. The facts speak for themselves and no commentary is needed to bring home the point. In 1843 he described *P. chionaea* (Diagn. sér. 1(3):9), a very good species characterised by pubescent leaves, equal, connivent and obtuse sepals and erect styles. Six years later he proposed a new species *P. kochiana,* a new name for "*P. capitata* Koch".* This species (*P. kochiana*) was however the same taxon that had previously been described by HACQUET (in 1782) as *Illecebrum kapela,* and much later transferred to *Paronychia* by KERNER, viz. in 1869 (Österr. Bot. Zeitschr. 19:367), and considered to be closely related to *P. serpyllifolia* DC. (now a subsp. of *P. kapela).* A few years later, in 1867, the previously rejected name "*P. capitata* Koch" * reappeared on page 742 of the first volume of his Flora Orientalis, but this time it embraces three other, and very distinct, species (namely *P. cephalotes* (M.B.) Besser (*P. hungarica* Griseb. in BOISSIER's account) and *P. chionaea* of BOISSIER himself, as well as *P. macrosepala* Boiss. (for the Cretan collections cited therein); the latter taxon, however, is a species with distinctly unequal and recurved sepals, which has nothing in common with the other three species. All this confusion was evidently a result of an insufficient study of the group of species in point. As stated earlier, KERNER clarified the matters to a considerable extent in 1877.

3) ROHRBACH was responsible for creating a good deal of confusion in the S. American taxa. As already pointed out while surveying the history of this genus, there is only one review of the South American species, by ROHRBACH, the two separate accounts in MARTIUS, Fl.

Koch had incidentally used Lamarck's name with *P. capitata,* but the description clearly relates to *P. kapela* (or *P. capitata* DC.).

Brasil. (1871) and Linnaea 37 (1872) being two parts of the same work, and both the accounts, to a large extent, are misleading. In MARTIUS' Flora Brasil. he ignored the original description (an excellent one indeed) of *P. camphorosmoides* Cambessèdes and considered it to possess sepals without any hood and apical cusps or mucros, and accordingly put it in the section *Anoplonychia* Fenzl (an exclusively Old-World group). The hoods and the apical cusps or mucros are, no doubt, very small, but they are quite well visible under an ordinary low power lens, and it is the more astounding as CAMBESSÈDES had given a very accurate description of them in 1829, however, 42 years later ROHRBACH could not detect them. As if this was not enough, in the same work re reduced another very good species, *P. communis* Cambessèdes, to the synonymy of *P. chilensis* DC. In Linnaea 37 (1872) he went one step further and made the situation worse by lumping 5 very good species under *P. chilensis* (*P. mexicana* Hemsl., *P. bogotensis* Tr. and Pl., *P. communis* Cambess., *P. coquimbensis* Gay and *P. setigera* (Gill. ex Hook and Arn.) Herm.). The damage caused by his account has been very heavy indeed, and in almost all the herbaria (of the world) specimens of *P. communis* (the most widespread species of all) have been labelled as *P. chilensis*. The latter species it may be pointed out, is confined to Chile, whereas *P. communis* is widely distributed in SSE Brasil, N. Argentine, Uruguay, Paraguay, Bolivia and parts of Ecuador and possibly in Peru as well. Luckily he had given a rather good account of *P. brasiliana* DC.

4) RIVAS GODAY & J. BORJA CARBONALL (1948) reduced *P. rouyana* Coincy to the lowest possible rank, that of a forma, which in my view, is totally unjustified. Even allowing for the fact that the criteria for the evaluation of the rank of a taxon are to some extent subjective, it seems to me that in this particular case the taxon deserves at least a subspecific rank. However, it may be that they did not recognize any other infraspecific rank but that of a forma.

5) WEBER's treatment of *P. pulvinata* A Gray (in Univ. Colorado Stud. ser. Biol. 7:11 (1961) by reducing it to the level of a subsp. under *P. sessiliflora* Nutt. is another instance of improper study of the material. *P. pulvinata* and *P. sessiflora* Nutt. have only one thing in common, the dense cushion-like growth form. Otherwise they do not share any character (apart, of course, from the generic ones), and the foliar and floral structures are entirely different.

6) MAIRE ET WEILLER's account (1963) is the most detailed for most of the N. African and S. European species, but, unfortunately, many of their statements are, in my view, absolutely incorrect and highly misleading. Under *P. capitata* (L.) Lam., for instance, they lumped all species with unequal and divergent or recurved sepals. Besides, there are numerous cases of misidentification.

7) BORHIDI (1964, 1966) reduced *P. chionaea* Boiss. and *P. insularum* Gandoger to the subspecific level under *P. kapela* (Hacq.) Kerner. However, *P. chionaea* and *P. kapela,* though resembling each other in habit, possess an entirely different type of style (erect in the former and much reduced and strongly recurved in the latter) and hence can not be regarded as parts of the same species.

P. insularum Gandoger (*P. macrosepala* Boiss.) possesses unequal and divergent sepals, while *P. kapela* has equal and connivent ones. The two, in fact, belong to different sections of the subgenus *Anoplonychia.* BORHIDI, presumably, relied on HAYEK's work (Prodr. Flor. peninsul. Balcan. 1:173 (1924) in which *P. insularum* was treated as a variety of *P. chionaea.* It is actually a variant of *P. macrosepala* Boiss. and W. GREUTER has already made the necessary combination and name changes.

To sum up, much of the confusion - apart from SMALL's treatment which is undoubtedly an extreme unjustified form of splitting, and is totally rejected here - has resulted from an insufficient knowledge of the critical characters most of which are found in the flowers which unfortunately are quite often concealed by the bracts. The flowers have to be dissected and thoroughly examined in all cases, and this is something which unfortunately has quite often been neglected. The general aspect has often been considered sufficient to delimit the taxa, notwithstanding the fact that the general aspect often characterizes a large group of species, in some cases a subsection or a section (MAIRE & WEILLER lumped all the species with unequal and divergent sepals; BOISSIER had done the same thing with species possessing equal and connivent sepals).

As already pointed out in the General Introduction, the floral characters form in this work the basis for recognizing or delimiting the various taxa, and all the species are characterized by some peculiarity of the sepals and/or styles, but these characters are usually accompanied and supplemented by the characteristics of roots, leaves, stipules, glomerules, bracts etc.

Most of the species accepted in this work, however, are confined to a comparatively small area and are accepted here as good species because they are sufficiently distinct.

GENERAL MORPHOLOGY

Habit and **duration:** The plants belonging to this genus are mostly small and low herbs, often forming compact mats, and usually perennating by a caudex and a woody tap-root. The number of annual species is rather small, and these species are mostly concentrated in ESE. United States (USA). There is only one annual species (*P. camphorosmoides*) in S. America, and only three, viz. *P. echinulata, P. rouyana* and *P.*

arabica, in the Old World, but in one of them (*P. arabica*) the duration is highly variable, and nearly one-half of the entire population of the species perennates. The species belonging to the subgenus *Anoplonychia* are all perennial.

Root: The tap-root in most of the perennial species is woody, long, and often but sparsely branched. The annuals have a rather slender tap-root, bearing numerous, short, lateral rootlets. Adventitious roots are developed in some of the species of the section *Anoplonychia* of the subgenus *Anoplonychia* (the *P. chionaea-kapela* group).

Stem: The stems (in the perennial species) develop from the woody stock or caudex, which represents the basal part of the primary stem, and are usually much-branched from the base, the older, basal (perennating) parts being generally prostrate, but the flowering shoots and their branches are either erect (± ascending, and usually less than c. 30 cm tall) or more or less prostrate, more or less congested and often forming mats. These shoots are usually herbaceous, though somewhat woody at the base. In the annual species they are mostly rather short and erect or suberect.

The tallest species are *P. canariensis* (L.) Juss. and *P. virginica* Spreng., which reach a height of c. 50 cm; both are perennial. The stems are usually covered with short, patent or retrorse hairs, which are often shed when the stems grow old, very rarely they are silky pubescent (e.g. in *P. argyrocoma* (Mich.) Nutt.). Occasionally the shoots are glabrous or nearly so as in most of the species belonging to the subsection *Anychia* of the subgenus *Paronychia.* In the older parts of the stems the nodes are usually swollen and marked by the remnants of leaf-bases and of stipules.

Anatomy: The anatomy has already been discussed in the General Introductory Part, and need not be repeated here.

Branching: The stems are usually branched from the base, and the secondary and tertiary branches (in most of the perennial species) are laterally developed. Pseudo-dichotomies are found mainly in the annual species, rarely in the perennial ones, and (in the latter case) confined to the region of inflorescence only. Even in such pseudo-dichotomous cases, one of the branches is partially or completely suppressed, and the subsequent branches are mostly laterally formed. The pseudo-dichotomous form of branching more or less occurs in some of the North American annuals, such as *P. canadensis* (L.) Wood, *P. fastigiata* (Raf.) Fernald, *P. montana* (Small) Pax et Hoffm. The evidence clearly suggests that the lateral form of branching has been developed from the pseudo-dichotomous.

Leaf: The leaves are opposite, somewhat unequal, sessile or subsessile, entire, often quite small and narrow, mostly elliptical-oblong to-obovate-oblanceolate, usually narrowed to (or at) the base. They have developed

along, three distinct lines: In one group, represented by the subgenera *Paronychia* and *Siphonychia* (comprising 60, species most of them endemic in the New World, only 11 occurring in the Old World, the most common ones being *P. argentea* Lam. and P. *arabica* (L.) DC.), the leaves are mucronate, and the mucro is either short or stout, and more or less spine-like. The leaves are, in this group, mostly oblong-oblanceolate to narrowly elliptic-oblong, and rather rigid, occasionally linear and sub-chartaceous, and but rarely broad and coriaceous.
In the second group, represented by the subgenus *Anoplonychia,* comprising 48 species, and occurring exclusively in the Old World, the leaves are herbaceous, mostly rather fleshy, and never mucronate. The third line of development is represented by only one species, *P. chartacea* Fernald (subgenus *Paronychia,* section *Nyachia*) endemic in Central Florida, U.S.A., and is to be considered an aberrant form within the subgenus *Paronychia.* The leaves are more or less ovate-triangular, with a strongly revolute margin, but without any trace of a mucro.

In the first two groups, which together include all but one species, the leaves are often more or less spreading, but sometimes closely imbricate and ascending. They are usually, wholly or partly, covered with short, appressed hairs, but the hairs quite often fall off with age. In some of the species of the subgenus *Paronychia,* however, the leaves are ± glabrous, this is particularly true of the annuals but it is observed also in some of the perennials provided with linear and subchartaceous leaves.

The leaves are reticulately veined, and the midrib is, usually, quite distinct, especially in the linear, subchartaceous leaves. The lateral veins are often divergent, forming a net-work, occasionally convergent as in *P. canadensis* (L.) Wood.

Stipules: The stipules are very characteristic and conspicuous, silvery-scarious, often ovate-triangular or lanceolate, usually persistent, mostly interpetiolar structures which means that there are two for each pair of leaves; they may, however, be deeply split lengthwise; sometimes (as in section *Heterosepalae* of the subgenus *Anoplonychia)* there are four stipules for each pair of leaves.

Inflorescence: The flowers are basically arranged in simple or, more commonly, compound, terminal, and lateral or pseudo-axillary cymes, often condensed into conspicuous glomerules or pseudocapitulas, at the ends of the (main as well as the lateral) shoots, usually more or less concealed by the large silvery-scarious bracts.

In the simplest cases, found mainly in the annual species (such as *P. canadensis, P. fastigiata, P. montana, P. lindheimeri, P. chorizanthoides* and those of the subgenus *Siphonychia*) but also in some of the perennials e.g. in *P. canariensis* (and to some extent in *P. suffruticosa*) the cymes are typically dichasial, i.e. repeatedly forked, and tending to

form large, corymbose or paniculate clusters. But as happens so often in the branching of the stems, one of the branches of the fork may be partially or wholly suppressed, and the ultimate cymules, accordingly, may be 3-, 2- or even 1-flowered. One rather usual feature of such diffuse cymes is that they are rolled inwards (i.e. their growth is inwards-upwards directed). Such a development may, however, be determined by environmental factors as well as by genetic factors.

The diffuse cymes have progressed along three distinct lines: In one group the cymes are condensed into large, pedunculate corymbose clusters, terminating the (± erect) flowering shoots, as in *P. virginica* Spreng. and *P. erecta* (Chapm.) Shinners.

In the second group the cymes are mainly pseudo-axillary, with very much shortened peduncles, condensed to form very profuse lateral or pseudo-axillary clusters, as, for instance, in *P. setigera, P. communis, P. illecebroides* etc.

These congested pseudo-axillary or lateral clusters have led to the development of large terminal to subterminal compound clusters or compound glomerules, which are characteristic of a large number of species, particularly of the subgenus *Anoplonychia.* In this group the cymes are very much condensed, the peduncles greatly reduced or almost wholly suppressed, the bracts considerably enlarged, and the flower-clusters consequently are densely congested, almost globose, pseudo-axillary and terminal to subterminal, or sometimes only terminal, often, in turn, densely congested or even coalesced into larger and compact compound clusters, which are made still more conspicuous by the enlarged, silvery-white bracts.

Bracts: The flowers are usually subtended by the silvery-scarious, and often very prominent, bracts, varying in form from broadly ovate to almost orbicular or suboblong, mostly exceeding, and more or less concealing the flowers. Such bracts are a usual feature of the subgenus *Anoplonychia* and of a number of species belonging to the subgenus *Paronychia.* But in the latter the bracts are actually enlarged stipules ("stipulary"), the flowers being mostly pseudo-axillary though condensed into compact clusters or glomerules.

In some of the species of the subgenus *Paronychia* (section *Paronychia,* subsection *Chartaceifoliae*), such as *P. setacea, P. chorizanthoides, P. lindheimeri, P. jamesii, P. depressa, P. virginica,* such stipulary bracts do not occur, and the flowers are subtended by ordinary (linear and subchartaceous or rigid but shorter) leaves. In other words the bracts are foliaceous in such cases. These foliaceous bracts represent, in my view, the primitive stage which has gradually developed into the large scarious bracts. As a result of a (gradual) reduction in size and the eventual suppression of the leaf-blade in the floral region, accompanied by a marked enlargement of the stipules, the latter have ob-

tained the shape and function of the bracts. This gradual conversion of the ordinary leaves into semi-scarious structures is well illustrated by some of the (apparently) diseased or abnormally developed shoots of *P. communis* Cambess., a S. American species. The stipules, in such instances, are fused with their leaves, the resultant structure being a peculiar, almost wholly scarious bract but with a distinct, green midrib representing the leaf-blade. In the subgenus *Anoplonychia* (particularly in the section *Anoplonychia*), however, the leaf-blades are entirely missing from the glomerules, and the bracts, in such cases, must have been formed by the enlargement of the stipules. At any rate, the development of large and very conspicuous silvery-scarious bracts is certainly a derived and advanced character, and the species lacking such bracts (and possessing only the foliaceous ones), most of them being annuals (and, moreover, bearing flowers in lax cymes), are definitely simpler, and represent, therefore, an earlier stage in the evolution of this genus.

Flowers: The flowers, like the leaves, have evolved along two main lines, with one aberrant form developing from one of the two. The first kind of flower is characteristic for the subgenus *Paronychia,* occurring in both the "Worlds" as well as in both hemispheres (supplemented in SE. USA by the subgenus *Siphonychia*) and possesses (usually) a well-defined perigynous region or zone and semi-scarious to subcoriaceous sepals with a more or less distinct hood and awn at the apex. The second line is represented by the subgenus *Anoplonychia, confined* to the northern hemisphere of the Old World and is characterized by (typically) herbaceous sepals, which are plano-concave, lack the hood and awn, and the perigynous zone is often rather weakly developed.

The third subgenus *Siphonychia* is an offshoot of the first subgenus (*Paronychia*) and possesses petaloid sepals and a long style in addition to a well-developed receptacle.

Pubescence: In the whole of the subgenus *Anoplonychia* as well as in a few species of the subgenus *Paronychia* (as e.g. *P. argyrocoma*) the flowers are as a rule densely covered with short, appressed hairs. But in the latter subgenus the flowers are quite often, at least partly, covered with patent or spreading hairs, especially on the perigynous zone or the basal parts. Sometimes the hairs are very dense and long, almost woolly, as in *P. microphylla* from S. Peru and N. Chile, but more commonly the hairs become less dense with age. In a number of species belonging to the subgenus *Paronychia* the flowers are more or less glabrous, as e.g. in most of the annual species of the subsection *Anychia* and in some of those belonging to the subsection *Chartaceifoliae* and also in such perennials as *P. franciscana, P. brasiliana, P. muschleri, P. ellenbergii* and *P. suffruticosa* subsp. *suffruticosa.* Sometimes the calyx region is glabrous and the perigynous zone is hairy, as e.g. in *P.*

hieronymi, P. echinulata, P. rouyana, and *P. arabica* subsp. *annua.*

The hairs, whether appressed or spreading, are generally straight, very occasionally they are uncinate (hooked or coiled at the tip) as, for instance, in *P. arabica, P. echinulata, P. rouyana, P. drummondii, P. jonesii, P. americana, P. patula* (the latter two belonging to the subgenus *Siphonychia*), and a large part of *P. cabrerae.* In the last-mentioned species, the uncinate condition is not constant, and, in some of the specimens examined by me, the hairs are all straight. Likewise, in a few exceptional cases, observed in *P. arabica* subsp. *aurasiaca* the hairs are straight. This latter condition is probably due to an intermingling of genes with *P. argentea.*

In both cases the flowers are generally small, ca. 1.5-3 (rarely up to 7) mm high, and relatively smaller in the subgenus *Paronychia,* the largest flowers occurring in the section *Heterosepalae* of the subgenus *Anoplonychia* (e.g. in *P. chlorothyrsa, P. capitata* and *P. macrosepala),* usually more or less concealed by the scarious bracts, shortly pedicellate (subgenus *Paronychia*) or sessile (subgenus *Anoplonychia*), actinomorphic, bisexual, "complete", provided with a cup-shaped receptacle and pentamerous.

Perigynous zone: In the whole genus the flowers are more or less perigynous, but the perigyny is not uniformly developed in all species. It is mostly quite pronounced in the subgenus *Paronychia,* but rather weakly developed in the subgenus *Anoplonychia.* Even in some species of the subgenus *Paronychia* (like *P. brasiliana* and *P. franciscana*) the perigynous zone is almost indistinct, and the same holds good for the monotypic section *Nyachia.* On the other extreme are such species as *P. drummondii, P. peruviana, P. weberbaueri, P. libertadiana* and almost all the species of the subgenus *Siphonychia,* in which the perigynous region is very well-developed, often nearly equalling the sepals in height. This region, in a number of species, is turbinate, and often distinctly 10-ribbed.

As pointed out in the General Introduction, the perigynous zone has developed in the various genera, and also in definite groups of species within this genus, quite independently of other characters. It is, for instance, equally well-marked in some of the annual species of the subgenus *Siphonychia* with diffuse and lax cymes, as well as in such perennial species as *P. weberbaueri* with well-defined terminal glomerules.

The perigynous zone is generally covered with short, fine, mostly straight, patent hairs; the latter are but occasionally uncinate or coiled at the tip, e.g. in *P. arabica, P. echinulata, P. drummondii, P. americana* and *P. patula.*

Sepals: The sepals form the most conspicuous part of the flower; they are always 5 in number, nearly or entirely free, quincuncially imbricate,

semi-scarious or subcoriaceous (as in subgenus *Paronychia*), petaloid (in subgenus *Siphonychia*) or herbaceous and somewhat fleshy (subgenus *Anoplonychia*). They are often linear-oblong to linear-lanceolate, either provided with a small hood-like structure at the apex, the back-tip of which is often prolonged into a short or long, usually slender, awn (as is the case in subgenus *Paronychia*), and with a conspicuous, whitish membranous margin, or (in the subgenus *Anoplonychia*) they are plano-concave and lack a hood as well as an awn. In the latter case they have a very narrow membranous margin and are mostly incurved or connivent (at the apex) in the younger stages and more or less erect or occasionally recurved in the older ones. The membranous margin is sometimes very well-developed, somewhat even broader than the stiff median band, in some of the species of the subgenus *Paronychia* (e.g. in *P. arabica, P. bryoides, P. andina, P. weberbaueri, P. pulvinata, P. hieronymi, P. limaei*), but more frequently the median band is broader than the margin. In all cases, this band is distinctly veined, the sepal as a whole being usually 3-nerved.

The hood is generally quite distinct, sometimes even very conspicuous e.g. in *P. argentea, P. arabica, P. echinulata, P. rouyana, P. suffruticosa;* occasionally it is very rigid and horn-like, as in *P. drummondii* and *P. jonesii,* but in the subsection *Fasciculatae* the hood is very minute, and in the subgenus *Siphonychia* it is almost invisible. The hoods, whenever they are well-developed (as e.g. in *P. suffruticosa*) serve as "pockets" for holding the anthers.

Awn: The awn is a characteristic feature of the sepal in the subgenus *Paronychia.* It is inserted at the back of the hood near the tip, but forms, in fact, a prolongation of the midrib of the sepal. The awns are highly variable in form and structure. The simplest form occurs in some of the annual, North American, species, as e.g. of the subsection *Anychia* (subgenus *Paronychia*) and in the subgenus *Siphonychia.* Here the awn is a minute cusp or mucro, 0.15-0.25(-0.3) mm long, and even almost rudimentary in the subgenus *Siphonychia.* The second form, probably derived from the first, occurs in most of the species of South and Central America; it is c. 0.25-0.5 mm long, rather stiff and somewhat bristly or scabridous, though sometimes very minute and indistinct, as in *P. camphorosmoides,* but more commonly distinct, as in *P. communis, P. chilensis, P. setigera, P. coquimbensis, P. cabrerae* etc. Another form, probably an elongation of the first -- short, smooth, slender and tender -- is met with in such species as e.g. *P. hieronymi, P. limaei,* occasionally rather elongate as in *P. pulvinata.*

The most common and at the same time the most conspicuous form occurs in such species (of section *Paronychia*) as *P. argentea, P. arabica, P. echinulata* in the Old World, and *P. setacea, P. chorizanthoides, P. lindheimeri, P. jamesii, P. depressa* (all in subsection *Chartaceifoliae*),

and *P. franciscana, P. brasiliana, P. muschleri* in the Americas. The awn in this case is a slender, but rather stiff, often smooth, and medium long structure. Finally, the most rigid or stout form, sometimes with a thickened base, usually glabrous, occasionally scabridous, occurs in species like *P. rouyana, P. arabica* subspp. *cossoniana* and *aurasiaca* in the Old World, and *P. sessiliflora, P. wilkinsonii* and *P. virginica* in North America. The stout and rigid awns are generally accompanied by stiff-thickened hoods, and the slender-tender awns with membranous hoods.

In the monotypic section *Nyachia* (subgenus *Paronychia*), which is evidently an aberrant form, the hood is highly pronounced and umbonate, but the awn is indistinct or not developed at all.

In the two subgenera *Paronychia* and *Siphonychia* the sepals are always of equal length, but in the third subgenus (*Anoplonychia*) they are variable and then they can be broadly classified into two main groups: In the first (section *Anoplonychia*), which comprises nearly 3/4 of the species of the subgenus, the flowers are relatively smaller, and the sepals are equal or subequal in length, connivent or incurved at the apex in younger stages to almost erect in the fruiting stage. Among the common species of this group we find *P. kapela, P. chionaea* and *P. cephalotes.* In the second group (section *Heterosepalae*) comprising about 1/4 of the species of this subgenus, the sepals are unequal, mostly even very distinctly so, and the outer sepals are often divergent-recurved or spreading in age.

Petals: As already stated in the General Introduction, the subulate-filiform, staminodium-like structures, alternating with the sepals, and inserted on the perigynous ring, are interpreted here as highly reduced petals. They are generally well-developed in the subgenus *Anoplonychia,* especially in section *Anoplonychia.* In some of the South American species they are brownish or provided with reddish tips. They are absent in a few other species, e.g. in *P. canadensis, P. fastigiata, P. montana, P. baldwinii, P. mexicana, P. franciscana* and *P. brasiliana.*

Stamens: As is characteristic of this group, the stamens are episepalous, i.e. situated opposite the sepals and arise from the perigynous ring (i.e. the rim of the receptacle). They are often five in number, the only exceptions being *P. canadensis* (with 2 stamens), and *P. mexicana* subsp. *monandra* (with one stamen). The filaments are always filiform and whitish structures, attached to the backs of the (dorsifixed) anthers, slightly below the middle part of the connective. The anthers are mostly rectangular-oblong (rarely quadrangular or squarish and minute), and orange-yellow in colour. They usually mature earlier than the stigmas, but are often found clasping the latter so as to ensure autogamy.

Pistil: The pistil is composed of two united (median) carpels. The ovary is often ovoid to subglobose, usually narrowed upwards into the style,

entirely glabrous in the subgenus *Anoplonychia,* but somewhat papillose in the subgenus *Paronychia.* It is always one-celled and one-ovuled.

The style has evolved along three lines, each characteristic of one of the three subgenera, though in the two major ones it often undergoes such a considerable reduction that ultimately a condition may arise in which the stigmas are sessile. In the subgenus *Anoplonychia* there are two styles and these are completely free (long and filiform). In the section *Anoplonychia* they are mostly erect, but in some of its species they are recurved at the tip, and reduced in size. Such short recurved styles are found in *P. kapela* and *P. argyroloba;* the extreme form of reduction is shown by *P. aretioides* DC. in which the stigmas are sessile and strongly recurved. In the section *Heterosepalae* of this subgenus the two styles are from the beginning connate at the base, as e.g. in *P. chabloziana* or they become connate at the base with maturity.

A reduction in size occurs in *P. chlorothyrsa* and in *P. haggariensis,* but the styles are distinct and the stigmatic tips erect though very minute. In the subgenus *Siphonychia* there is a long, filiform style reaching more or less the same level as the sepal tips, and ending in very short and thin stigma-lobes.

The third subgenus *Paronychia* often possesses a rather short, thick style, usually ending in two thick, dark-brown, divergent stigmas which equal it, more or less, in length. As in the subgenus *Anoplonychia,* here too, the style is sometimes so highly reduced that the divergent stigmas become subsessile, so e.g. in *P. suffruticosa, P. brasiliana, P. franciscana.* There are, moreover, three aberrant forms in this subgenus. In series *Longistylae* the style is elongate, quite similar to that of the subgenus *Siphonychia,* and almost reaching the level of the sepal tips. The floral structure, however, is quite different from that of *Siphonychia,* and the presence of an elongated style seems to be a case of parallel development in the two groups. In the second aberrant example, in *P. camphorosmoides* the style is very short (0.05-0.1 mm) and the short stigma minutely bidentate or sulcate at the tip. Finally in the third case (section *Nyachia*) there are two short, filiform and suberect to spreading styles.

The ovule is solitary, amphitropous and basal, erect or suspended by the funicle. The fruit is an utricle, ovoid to almost globose, often enclosed by the persistent sepals. The pericarp is membranous, smooth in the subgenus *Anoplonychia,* but more or less papillose or occasionally somewhat warty in the subgenus *Paronychia,* rupturing irregularly at the base.

The seed is ovoid-subglobose to nearly ellipsoidal, occasionally somewhat reniform, with a smooth dark brown testa. The embryo is annular, enclosing the (starchy) albumen; the radicle ascending or superior.

Karyology: Karyology has already been discussed in the General Introduction. It is interesting to note that the basic chromosome number is not uniform, 7 and 12 in *P. echinulata* Chater, 8 in *P. fastigiata* (Raf.) Fernald and 9 in *P. brasiliana* DC. Tetraploidy is quite frequent, but the higher count of 2n = 42 has been recorded only once, in *P. capitata* (L.) Lam.

GEOGRAPHICAL DISTRIBUTION:

The genus, though in the main a mediterranean one, is distributed over a wide range, in the Americas occurring in both hemispheres, but in the Old World confined to the Northern one. It usually inhabites warm-tempperate regions, though it is occasionally found in the sulbalpine regions. Most of the species (98 out of 109, or nearly 90% of the total) are confined to relatively small areas, and only 11 are widely distributed.

The two main centres of distribution in the Old World are:
one, the southern part of the Balkan, Turkey and the northern parts of the Middle or Near East, Turkey being the richest area in the whole world, and evidently the seat of the gene-pool to which a large number of endemic [1]) species (23 spp.) owe their origin. (Surprisingly enough in the neighbouring Transcaucasus there are only 3 species, two of them being endemics, whereas in Turkey there are all in all 33 species).

The second main centre of distribution lies in ESE Spain and NW Africa (Morocco to Tunisia). These two areas together hold about 50% of the species, and most of them, moreover, occur between 30° and 46° latitude. Only seven species (*P. arabica, P. chlorothyrsa, P. haggariensis, P. somaliensis, P. bryoides, P. canariensis* and *P. illecebroides*), (the latter five of them being endemics), occur in or near the Tropic of Cancer in Africa and the adjoining islands. The Cap Verde Islands and Ethiopia are the regions farthest from the two main centres of distribution in the Old World, Iran and the Madeira Is. being the eastern and western extremities respectively. Of the 59 species occurring in the Old World, only seven (*P. argentea, P. arabica, P. polygonifolia, P. echinulata, P. kapela, P. capitata* and *P. chlorothyrsa*) are widespread, the rest having a restricted range. *P. arabica* is the most widely distributed and the most variable species of the whole genus. It is closely followed by *P. argentea* in its range of distribution, but the latter mainly shows variability in leaf form and stipule size, whereas the former undergoes changes in the flowers (especially the sepals) and also in such characters as duration, leaf, stipule and inflorescence.

50 species (slightly less than 1/2 of the total) occur in the New World, 26 in North America (including one which is essentially a

[1]) The term endemic is here used in a narrow or restricted sense, meaning a very restricted range of distribution, often within one floral region or a part of it, or confined to one small area.

native of Chile, but is recorded also from San Francisco, California), and 24 in South America. In the North, the range lies roughly between 18° and 45° latitude, though most of the species are concentrated in SSE USA, 2 or 3 species extend to the Canadian territory. The most wide-spread are *P. canadensis, P. fastigiata* and *P. jamesii*; the rest show a restricted distribution. In South America the chief centre of distribution lies in Peru, Bolivia, NNW Argentine and Central to Northern Chile (Peru being the richest area), and out of 24 about 20 species are found in this region. The remaining four are endemic in Colombia (1), Ecuador (1) and SE Brasil (2). Only one species, *P. communis* Cambess., is widely distributed.

Ecology: These plants are commonly found in dry stony or rocky places (in calcareous soils) either in mountain steppes or along seacoasts and river-banks. Most of them occur at an altitude of c. 1000-2500 m, though some of them may, occasionally go beyond 3000 m, even up to 5300 m as, for instance, the Peruvian *P. andina.* One species (*P. montana*) is found exclusively on the shaley barrens of the Allegheny Mountains of E. USA. Some species like *P. arabica, P. echinulata, P. macrosepala* and *P. chlorothyrsa* in the Old World, and most of the annual species of North America, are psammophilous. The perennial species are quite often found at higher elevations.

Uses: Contrary to what the name "Paronychia" implies, the species have no medicinal or economic value, and none of them is cultivated.

DIAGNOSIS AND SUBDIVISIONS OF THE GENUS

PARONYCHIA

Paronychia [Tournef.] Miller, Gardn. Dict., abridged ed 4, vol. 3 (1754). Tournefourt, Institutiones Rei Herbariae 507, t.288 (1700); Jussieu in Mém. Mus. Paris 2:389 (1815); De Candolle, Prodr. 3:370-372 (1828) (excluding sections 1 and 3); Mémoire sur la Famille des Paronychiées, no 4 1829(; Fenzl in Endlicher, Genera Plantarum 2:956-958 (1839); Boissier, Flora Orientalis 1:742 (1867); Rohrbach in Martius, Fl. Brasil. 14(2): 251 (1871), et in Linnaea 37:201 (1872); Willkomm et Lange, Prodromus Flora Hisp. 3:155 (1874); Kerner in Osterr. Bot. Zeitschr. 27:13 (1877); Bentham et Hook., Gen. Pl. 3(1):16 (1880); Battandier et Trabut, Fl. Alg. (Dicot.) 165 (1888) p.p.; Pax in Engler-Prantl, Pflanzenfam. ed. 1, 3(1b):90 (1889); Small, Fl. SE. US. 400 (1903); Rouy, Fl. Fr. 12:3 (1910); Briquet in Annuaire Conservat. et Jardin Botanique de Genève 13 & 14me:390-408 (1911); Graebner in Ascherson & Graebner, Synopsis Mitteleurop. Fl. 5(1):888-900 (1919); P. A. Rydberg, Flora of the Rocky Mountains of USA 267 (1922); L. Hau-

man and Luis H. Irigoyen, Catal. Phanerogam. Argentine 2:182 (1923); Rydberg, Flora of the Prairies and Plains of Central North America 315 (1932); Small, Manual of SE Flora 479 (1933); Pax et K. Hoffmann in Engler-Prantl, Pflanzenfam. ed. 2, 16c:299-300 (1934); M. L. Fernald in Rhodora 38:416 (1936); E. L. Core (Revision of the genus *Siphonychia*) in Journ. Elisha Mitchell Sci. Soc. 55:339-345 (1939); id., The North American species of *Paronychia,* in Amer. Midland Naturalist 26(2):369-397 (1941); V. L. Cory in Rhodora 46:278 (1944); Fernald in Gray's Manual of Bot. 612 (1950); Bassett Maguire in H. A. Gleason's New Britton and Brown Illustr. Flora of NE US. 2:118-120 (1952); Maire et Weiller in Maire, Fl. Afr. Nord 9:12-35 (1963); A. O. Chater in Tutin et al., Fl. Europ. 1:150 (1964); M. N. Chaudhri in P. H. Davis, Fl. Turk. 2:250 (1967).

Anychia Michaux, Fl. Bor. Amer. 1:112 (1803); *Paronychia* sect. *Eunychia* DC., Prodr. 3:370 (1828); *Plottzia* Arnott in Lindley, Nat. Syst. ed. 2:441 (1836); *Buinalis* Rafinesque, New Fl. Amer. 4:40 (1836); *Plagidia* Rafinesque, New Fl. Amer. 4:42 (1836); *Siphonychia* Torrey et Gray, Fl. N. Amer. 1:173 (1838); *Forcipella* Small in Bull. Torr. Bot. Club 25:150 (1898), non Baillon ex Engler-Prantl, Pflanzenfam. 4(3b):343 (1895); *Gibbesia* Small, Bull. Torr. Bot. Club 25:621 (1898); *Anychiastrum* Small, Fl. SE. U.S. 400 (1903); *Odontonychia* Small Fl. SE U.S. 401 (1903); *Paronychia* subgenus *Eunychia* (DC.) Rouy, Fl. Fr. 12:4 (1910); Graebner op. cit. 5(1):889 (1919); *Nyachia,* Small in Torreya 25:11 (1925); *Gastronychia* Small, Man. Fl. SE. U.S. 480 (1933).

Perennial or, occasionally, annual herbs, often suffruticose or woody at the base, with a tap root and with prostrate or erect or ascending, much-branched stems. Leaves sessile or subsessile, opposite and somewhat unequal, plane and entire. Stipules ovate-lanceolate, scarious and often conspicuous. Flowers small, with a cup-shaped receptacle (perigynous zone), 5-merous, usually in terminal and lateral or pseudo-axillary, almost spherical, compact clusters or glomerules, rarely in terminal cymes. Bracts often silvery scarious, very conspicuous, usually more or less concealing the flowers. Sepals equal or unequal, narrowly oblong to ovate-lanceolate, either plano-concave or hooded and awned at the apex, with a membranous margin. Petals subulate-filiform, alternating with the sepals and inserted on the perigynous ring, rarely absent. Stamens 5 (very rarely 2 or 1); filaments filiform, inserted on the margin of the receptacle (the perigynous ring), opposite the sepals, almost equalling or shorter than the petals; anthers dorsifixed, bilocular, oblong to squarish; pollen-grains smooth, 8-12 porate. Ovary ovoid, glabrous or somewhat papillose, narrowed upwards to a $\pm$ distinct style, bifid near apex, or with two free styles; ovule amphitropous, basal, suspended by the funicle. Fruit an utricle enclosed

in the persistent calyx, with membranous pericarp, rupturing irregularly (and longitudinally) at the base; seed subellipsoidal to ovoid, subglobose, smooth, dark-brown; radicle ascending or superior.
Type species: *P. argentea* Lam. (*Illecebrum paronychia* L.).

Key to the subgenera:

1a) Sepals petaloid, reddish brown with a whitish margin; sepal hood and apical cusp absent or indistinct; perigynous zone very well-developed (mostly equalling or somewhat longer than the sepals); style elongate, ± reaching the level of the sepal tips, ending in two short and thin stigmas ..... subgenus A. **Siphonychia**

1b) Sepals not petaloid; perigynous zone somewhat shorter than the sepals; style or styles not reaching the level of the tips

2a) Leaves cuspidate or mucronate; sepals semi-scarious or sub-coriaceous, with a distinct hood and a (short or long) awn at the tip ..... subgenus B. **Paronychia**

2b) Leaves never cuspidate or mucronate; sepals entirely herbaceous, plano-concave, without hood or awn ..... subgenus C. **Anoplonychia**

A) Subgenus **Siphonychia** (Torr. et Gray) Chaudhri stat. nov.
Siphonychia Torr. et Gray, Fl. North Amer. 1:173 (1838); Chapman, Fl. S. US. 47 (1860); Bentham et Hooker, Gen. Pl. 3(1):16 (1880); Small, Fl. SE. US 401 (1903); id., Man. SE. Fl. 482 (1933); Pax et Hoffmann in Engler-Prantl, Pflanzenfam. ed. 2, 16c:301 (1934); Core, "A Taxonomic Revision of the Genus *Siphonychia*" in Journ. Mitchell Soc. 55:331 (1939). Syn.: *Buinalis* Raf. New Fl. Amer. 4:40 (1836); O. Kuntze, Rev. Gen. 2:534 (1891), nomen ambiguum; *Forcipella* Small in Bull. Torr. Bot. Club 25:150 (1898), non Baillon ex Engler-Prantl, Pflanzenfam. 4/3b:343 (1895); *Gibbesia* Small in Bull. Torr. Bot. Club 25:621 (1898); *Paronychia* sect. *Gibbesia* (Small) Pax et K. Hoffm. op. cit. 300 (1934); *Odontonychia* Small, Fl. SE. US 401 (1903); *Paronychia* sect. *Siphonychia* Fenzl in Endlicher, Gen. Pl. 958 (1839). General Reference: L. H. Shinners, "*Siphonychia* transferred to *Paronychia*" in Sida 1(2):101 (1962).
Perigynous zone or receptacle often very well-developed, more or less equal in length to the sepals; the latter petaloid and reddish-brown with a white margin; style one, elongate, ± equalling the sepal tips, ending in two very short and thin stigmas.
Type species: *P. americana* (Nutt.) Fenzl. (*Herniaria americana* Nutt.; *Siphonychia americana* (Nutt.) Torr. et Gray).
Other species: *P. patula* Shinners nom. nov. (*Siphonychia diffusa* Chapm.); *P. erecta* (Chapm.) Shinners (*Siphonychia erecta* Chapm.) and *P. rugelii* Shuttleworth ex Chapm.

All are endemic in SE USA, Georgia to Florida and Alabama, occurring on sand dunes. Only *P. erecta* is wholly perennial.

B) Subgenus **Paronychia**

Paronychia sect. *Aconychia* Fenzl in Endlicher, Gen. Pl. 958 (1839); Boissier, Fl. Or. 1:745 (1867); Rohrbach in Linnaea 37:201 (1872); Willkomm et Lange Prodr. Fl. Hisp. 3:155 (1874); Pax in Engler-Prantl, Pflanzenfam. ed. 1, 3 (1b):91 (1889); Gürke in Richter-Gürke, Pl. Europ. 2(2):185 (1899); Halàcsy, Consp. Fl. Graec. 1:570 (1900); Rouy, Fl. Fr. 12:4 (1910); Graebner in Ascherson et Graebner, Synop. 5(1):895 (1919); Pax et K. Hoffm. in Engler-Prantl. Pflanzenfam. ed. 2, 16c:300 (1934); Maire et Weiller in Maire, Fl. Afr. Nord 9:15 (1963).

Paronychia sect. *Anychia* (Michaux) Fenzl, op. cit. 958 (1839); Pax et Hoffmann, op. cit. 16c:300 (1934) ---- (*Anychia* Michaux, Fl. Bor. Amer. 1:112 (1803); *Plagidia* Rafinesque, New Fl. Amer. 4:49 (1836); *Anychiastrum* Small, Fl. SE. US 400 (1903).

Paronychia sect. *Nyachia* (Small) Pax et Hoffman, op. cit. (*Nyachia* Small, in Torreya 25:11 (1925)).

Paronychia sect. *Polygonoideae* (DC.) Pax et K. Hoffm. op. cit.; (*Herniaria* sect. *Polygonoideae* DC., Prodr. 3:368 (1828); *Paronychia* sect. *Pseudoherniaria* Briquet op. cit. 13 et 14:405 (1911)); Maire et Weiller, op. cit. 9:14 (1963).

Leaves cuspidate or mucronate; sepals semi-scarious or subcoriaceous, with a distinct hood and often (short or long) awn at the apex.

Type species: the same as that of the genus.

This is the largest of the three subgenera, and includes 57 species (or slightly more than 1/2 of the total), widely distributed in both the hemispheres of the two Worlds, especially abundant in the New World (46 spp.). Most of the species are perennial herbs. Some of the well-known species are: *P. argentea, P. arabica, P. polygonifolia, P. echinulata* in the Old World and *P. fastigiata, P. canadensis, P. jamesii, P. argyrocoma, P. virginica* (all from North America), and *P. communis, P. brasiliana, P. chilensis, P. andina* (South America).

Key to the sections

1a) Sepals umbonate, i.e. with a prominent hood ("umbo"), but without an apical cusp or awn ..... Section 1. **Nyachia** (only one species in Florida, USA).

1b) Sepals with short cusp or a distinct awn on the back of the hood near the top ..... Section 2. **Paronychia**

Section 1. **Nyachia** (Small) Pax et K. Hoffmann, op. cit. 16c:300 (1934).

Nyachia Small in Torreya 25:11 (1925).

Leaves mostly ovate-triangular, with a strongly revolute margin; cymes

repeatedly branched; bracts minute; flowers 0.6-0.7 mm long, with an inconspicuous or very weakly defined receptacle; sepals strongly hooded (umbonate) but without cusp; petals indistinct; styles two, filiform and spreading. Annual prostrate herbs forming dense mats.
Type species: *P. chartacea* Fernald nom. nov. (*Nyachia pulvinata* Small in Torreya 25:12 (1925); *Paronychia pulvinata* (Small) Pax et K. Hoffmann in Engler-Prantl, Pflanzenfam. ed. 2, 16c:300 (1934), non *P. pulvinata* A. Gray in Proc. Acad. Sci. Philadel. 1863:58 (1864).
This is a monotypic section, endemic in the Lake Region, Central Florida, where it inhabits sandy plains and dunes. It is an aberrant form in so far as the structures of the leaves and the short filiform styles are concerned, but the distinctly cucullate sepals very clearly indicate its affinity with the subgenus *Paronychia.*

Section 2. **Paronychia**
Synonyms and literature: as of the subgenus *Paronychia* excluding section *Nyachia.*
Leaves cuspidate or mucronate; sepals semi-scarious or subcoriaceous, with a distinct hood and either a cusp or a distinct awn at the apex.
Type species: as that of the subgenus *Paronychia.*
This is the largest and by far the most widespread of all the sections of the genus, and it is best represented in the Americas (45 species). Some of the more important species are: *P. fastigiata, P. canadensis, P. jamesii, P. virginica, P. argyrocoma* (from North America) and *P. communis, P. brasiliana, P. setigera, P. microphylla* and *P. andina* (from S. America). In the Old World this section is represented by 11 species, four of them being very widely distributed, the rest with a restricted range. The widespread ones are: *P. argentea, P. arabica, P. echinulata* and *P. polygonifolia.* A detailed account of their distributional range is given under the various subsections.

Key to the subsections

1a) Sepals with a short cusp at the tip (never with a distinct awn)
2a) Leaves for the greater part in axillary fascicles; flowers in lateral pseudo-axillary clusters . . . . . 1. subsection **Fasciculatae**
2b) The leaf-pairs for the greater part separated from each other by distinctly discernible internodes; flowers in lax terminal cymes
3a) Plants dark purple-violet throughout; leaves and sepals coriaceous . . . . . 2. subsection **Polygonoideae** (subshrubs of SE. Spain)
3b) Plants not purple-violet; leaves and sepals not coriaceous; annual to occasionally biennial or perennial herbs of ESE USA . . . . . 3. subsection **Anychia**
1b) Sepals with a distinct awn at the tip
4a) Leaves linear and subchartaceous . . 4. subsection **Chartaceifoliae**

4b) Leaves neither linear nor subchartaceous 5. subsection **Paronychia**

1. Subsectio **Fasciculatae** Chaudhri nov. subsect. a subsectionibus aliis ad sectionem *Paronychiam* pertinentibus foliis maximam partem in fascicula axillaria congestis distinguenda, sepalis breviter cuspidatis (numquam aristatis) cum subsectionibus *Polygonoidearum* et *Anychia* congruens, sed ab eis floribus in glomerules laterales congestis recedens. Leaves rigid, linear-subulate or linear-lanceolate, forming very conspicuous fascicles on the nodes owing to the development of numerous short, axillary shoots. Flowers in small, few-flowered, lateral pseudo-axillary) clusters, often obscured by the prominent leaves. Sepals with an indistinct or very minute hood and apical cusp.

Type species: *P. fasciculata* Chaudhri

Other species: *P. camphorosmoides* Cambessèdes.

This subsection is endemic in SSE Brasil, inhabiting the grasslands. Rohrbach, op. cit., had erroneously excluded *P. camphorosmoides* from the section *Aconychia* Fenzl (= section *Paronychia*) and put it in the section *Anoplonychia* Fenzl. He had, in fact, failed to notice the hood and the minute apical cusp of the sepals.

2. Subsectio **Polygonoideae** (DC.) Chaudhri comb. et stat. nov.
Herniaria sect. *Polygonoideae* DC., Prodr. 3:368 (1828); *Paronychia* sect. *Polygonoid*eae (DC.) Pax et K. Hoffmann in Engler-Prantl, Pflanzenfam. ed. 2, 16c:300 (1934); Maire et Weiller, op. cit. 9:14 (1963); *Paronychia* sect. *Pseudoherniaria* Briquet, op. cit. 13 et 14:405 (1911); Graebner in Aschers. et Graebn., Syn. 5(1):889 (1919).

Plants dark purple-violet throughout; leaves and flowers coriaceous; flowers in lax terminal cymes; bracts very short; sepals with a very well-developed hood but a minute apical cusp; stigma subsessile and bilobed.

Only one species *P. suffruticosa* (L.) DC., endemic in SE Spain.

3. Subsectio **Anychia** (Michaux) Chaudhri comb. et stat. nov.
Anychia Michaux, Fl. Bor. Amer. 1:112 (1803); De Candolle, Prodr. 3:369 (1828); Bentham and Hooker, Gen. Pl. 3:16 (1880); Pax in Engler-Prantl, Pflanzenfam. ed. 1,3(1b):91 (1889); Small, Manual Flora of SE US 480 (1933). *Paronychia* sect. *Anychia* (Michaux) Fenzl, op. cit. 958 (1839); Pax et K. Hoffmann in Engler-Prantl, Pflanzenfam. ed 2, 16c:300 (1934); M. L. Fernald in Rhodora 38:416 (1936). *Plagidia* Rafinesque, New Fl. Amer. 4:42 (1836); O. Kuntze, Rev. Gen. 2:534 (1891). *Anychiastrum* Small, Fl. SE US 400 (1903). Flowers in repeatedly branched terminal (and lateral) cymes; bracts mostly much shorter than the flowers; sepals with a minute cusp at the tip.

Type species: *P. canadensis* (L.) Wood (*Queria canadensis* L.; Syn. *Anychia dichotoma* Michaux).
Other species: *P. fastigiata* (Raf.) Fernald; *P. montana* (Small) Pax et K. Hoffm., *P. baldwinii* Fenzl (including *P. riparia* Chapman).
This subsection is well-represented in ESE USA, despite the fact that it includes only four species. *P. fastigiata* and *P. canadensis* are two of the most widely distributed species of *Paronychia,* both occurring in the whole of Eastern to Mideastern USA, the area of the latter species even extending to Ontario, Canada. *P. montana,* on the other hand, has a restricted range, being confined to the shale barrens and dry woods of the Appalachian Mts. from Pennsylvania to Georgia. *P. baldwinii,* too, has a restricted range, occurring in SE USA, from Virginia to Florida and Alabama inhabiting the dry sandy soils along the river banks and the coastal plains. Of the four species, only a part of *P. baldwinii* (viz. the subsp. *riparia*) perennates; the rest are all annuals.

4. Subsectio **Chartaceifoliae** Chaudhri nov. subsect. sepalis distincte aristatis cum subsectione *Paronychia* congruens, foliis linearibus et subchartaceis vel subrigidis ab subsectione hac recedens.
Leaves linear and subchartaceous or somewhat rigid; flowers in terminal repeatedly-forked, lax or compact cymes; the flowers subtended by ordinary leaves (foliar bracts) though the latter are considerably reduced in size; perigynous zone (or receptacle) very well-developed and usually turbinate; sepal awns long and setaceous or rigid.
Type species: *P. setacea* Torr. et Gray.
Other species: *P. lindheimeri* Engelm. ex A. Gray, *P. chorizanthoides* Small, *P. monticola* Cory, *P. jamesii* Torr. et Gray, *P. depressa* Nutt. ex Torr. et Gray (all with setaceous sepal awns), and *P. virginica* Sprengel, *P. sessiliflora* Nutt., *P. wilkinsonii* S. Watson, *P. albomarginata* Core (the latter four with rigid sepal awns). Most of the species of this subsection have a restricted range of distribution. *P. albomarginata* is endemic in the State of Coahuila, NE Mexico; *P. wilkinsonii* in Chihuahua and SW Texas; *P. setacea, P. lindheimeri, P. chorizanthoides* and *P. monticola* in Texas; *P. virginica* has a slightly wider range, viz. from Maryland in the east to Oklahoma and Central Texas in the south. *P. depressa* is endemic in Central USA, in the states of S. Dakota, Nebraska, Wyoming and Colorado. *P. sessiliflora* is essentially a species of the Rocky Mts., inhabiting bare stony hillsides in Seskatchewan and Alberta (in Canada) to Texas in the southern USA. *P. jamesii* is, however, widespread in the southwestern plains of USA, Nebraska and Wyoming to Texas and Northern Mexico. Only *P. setacea, P. lindheimeri* and *P. chorizanthoides* are annuals, occurring on the dry calcareous soil of limestone hills. *P. monticola* is biennial to perennial,

and like the other perennials inhabits dry gravelly hills and rocky slopes and ledges. This subsection beautifully illustrates the gradual reduction in the number of flowers in each cyme or inflorescence, as well as a gradual contraction or condensation of the inflorescences. The three annual species as well as *P. jamesii* and *P. monticola* have lax inflorescences, but in *P. depressa* the cymes are considerably condensed. The process goes much further in *P. wilkinsonii* and *P. albomarginata,* which possess densely congested cymes. *P. virginica* has developed corymbose inflorescences composed of (compound) cymes, and the maximum reduction is manifested in *P. sessiliflora,* with terminal flowers mostly solitary or in pairs, rarely in rather larger numbers.

5. Subsectio **Paronychia**

Syn.: *Paronychia* sect. *Aconychia* Fenzl op. cit. p.p.

Leaves often narrowly obovate to oblanceolate or elliptic-oblong, and distinctly cuspidate or mucronate; flowers usually arranged in very shortly pedunculate compact clusters, which are densely aggregated at the ends of the shoots or sometimes pseudo-axillary (lateral), very rarely in lax terminal cymes (with very short bracts); bracts usually quite conspicuous and ± concealing the flowers, rarely shorter than the flowers as in *P. echinulata, P. rouyana, P. illecebroides, P. setigera.* Sepals semi-scarious or subcoriaceous, with a well-developed awn and a distinct membranous margin.

Type species: the same as that of the section, subgenus and genus *Paronychia.* The other species are listed under the various series, but some of the better known are *P. argentea* Lam., *P. arabica* (L.) DC., *P. echinulata* Chater, *P. polygonifolia* (Vill.) DC. (all in the Old World) and *P. argyrocoma* Nutt., *P. communis* Cambess., *P. brasiliana* DC., *P. andina* A. Gray and *P. chilensis* DC. (New World). This is the most widely distributed subsection, and includes plants of various habits and appearance, broadly grouped here (for the first time) into eight series, each representing a different line or pattern of evolution of the various parts.

Key to the series

1a) Perigynous zone (receptacle) very slightly developed . . . . . series 5. **Planitoriae**

1b) Perigynous zone well-marked

2a) Sepal hood hon-like and whitish . . . . . series 2. **Corniculatae**

2b) Sepal hood neither horn-like nor whitish

3a) Style elongate, almost reaching the level of the sepal tips, and flowers typically flask-shaped (with a narrow and long calyx region and a swollen receptacle) . . . . . series 1. **Longistylae**

3b) Flowers not flask-shaped and style distinctly shorter than the sepals

4a) Flowers in terminal, paniculately arranged cymes or in almost leafless (stellate) clusters towards the ends of the shoots; (bracts somewhat shorter than the flowers); subshrubs .....
5a) Flowers in terminal, paniculately arranged cymes and shortly pubescent ..... series 3. **Paniculatae** (Canary Is.)
5b) Flowers in almost leafless, somewhat stellate clusters on branches arising from the larger shoots, and densely woolly villous (younger shoots too woolly-villous) ..... series 4. **Villosae**
4b) Flowers in sessile, lateral or pseudo-axillary (leafy) clusters (on the main shoots) or in conspicuous glomerules and concealed by the bracts --- Annual or perennial herbs
6a) Flowers congested in small, ± globose, echinate, lateral glomerules on the main shoots (not concealed by the bracts); annual herbs series 6. **Echinatae**
6b) Flowers either in conspicuous glomerules and then concealed by the bracts or in sessile lateral (pseudo-axillary) clusters (not forming globose glomerules); mostly perennial herbs .....
7a) Shoots, leaves and flowers silky pubescent; ovary densely pubescent .....series 7. **Argyrocomae**
7b) Leaves and flowers never silky pubescent; ovary glabrous and smooth or somewhat papillose ..... series 8. **Paronychia**

Series 1. **Longistylae** Chaudhri nov. series a seriebus aliis quae receptaculo distincto et sepalis cucullo non corniculato instructae sunt floribus ampulliformibus et stylo usque ad apicem floris extendente distinguenda.
Flowers typically flask-shaped, with a narrow (narrowly tubular) calyx region and a swollen receptacle; style elongate, almost reaching the apex of the sepals.
A single species, *P. herniarioides* (Michaux) Nutt., a prostrate annual herb endemic in SE USA, where it inhabits dry sandy ridges and coastal plains from North Carolina to Florida. The elongate style is quite similar to that found in the subgenus *Siphonychia,* but the floral structure is entirely different.

Series 2. **Corniculatae** Chaudhri n. series a seriebus aliis sepalis cucullo corniculato et albido instructis distinguenda.

Sepal hood horn-like and whitish; perigynous zone very well-developed, turbinate and covered with uncinate hairs. Annual herbs.
Type species: *P. drummondii* Torr. et Gray.
Other species: *P. jonesii* M. C. Johnston.
The two species of this series are annual herbs occurring on dry sandy soils in Texas, the latter being confined to the southern parts of Texas, while the former inhabits Central and NE Texas. Both resemble some species of the subgenus *Siphonychia* (*P. americana* and *P. patula,* esp.

the former) in their well-developed receptacle, covered with uncinate hairs, but they differ from them considerably in the structure of the sepals, their hoods and awns. The species of the subgenus *Siphonychia* possess petaloid sepals with an indistinct hood and awn, whereas in this series the sepals are rigid, and the hood horn-like with a prominent stiff awn.

Series 3. **Paniculatae** Chaudhri n. series monotypica in Insulis Canariensibus endemica a seriebus aliis, serie *Villosarum* sola excepta, habitu suffruticoso, ab omnibus cymis inflorescentiam paniculiformem efoliosa aggregatis distinguenda.
(Leaves large, oblong to elliptic or broadly oblanceolate and shortly petiolate (or subsessile)); flowers in long, much-branched, leafless, paniculate cymes towards the ends of the main shoots as well as on their lateral branches; bracts somewhat shorter than the flowers. Subshrubs.

A single species, *P. canariensis* (L.f.) Juss., endemic in the Canary Islands, on humid rocks, and characterised by its paniculate cymes.

Series 4. **Villosae** Chaudhri n. series a seriebus aliis, series *Paniculatarum* sola excepta, habitu suffruticoso et ab omnibus caulibus et floribus primum dense villosis distinguenda.
Younger shoots and flowers densely woolly-villous; flowers in mostly 6-flowered, somewhat stellate, almost leafless, very profuse clusters on short lateral branches towards the ends of the shoots; bracts somewhat shorter than the flowers. Subshrubs.

Only one species, *P. microphylla* Philippi, endemic in S. Peru and N. Chile, on dry rocky slopes, ledges, ravines and gravelly dry streambeds (in sandy loam soil), at altitudes ca. 2200-3500 m.

Series 5. **Planitoriae** Chaudhri n. series a seriebus aliis receptaculo vix excavato distinguenda.
Perigynous zone of the flowers very slightly developed (flowers reddish in the fruiting stage; sepal awn slender).
Type species: *P. brasiliana* DC.
Other species: *P. franciscana* Eastwood.
Both the species are endemic in S. America, though the latter was described from San Francisco (California, USA) where it had been introduced from Chile; here it occurs frequently in the Central provinces as well as in the adjoining Islands (e.g. San Fernandez). In California it is known only from the type locality and the adjoining area. *P. brasiliana* is a common species in a rather restricted area extending from Southern Brasil to Uruguay and NE Argentine. Both are perennial, prostrate herbs.

Series 6. **Echinatae** Chaudhri n. series a seriebus aliis floribus in glomerulos echinatos aggregatis distinguenda.

Flowers in small, compact, sessile, lateral or pseudo-axillary, ± globose, echinate glomerules; bracts somewhat shorter than the flowers; the latter with a swollen-turbinate receptacle covered with short uncinate hairs; sepals coriaceous with a long, and spreading awn.

Type species: *P. echinulata* Chater.

Other species: *P. rouyana* Coincy.

Both the species of this series are annual herbs, with somewhat reddish shoots. *P. echinulata* occurs along the coastal areas of S. Europe, SW. Turkey, Lebanon, NW. Africa and the Madeira Islands. *P. rouyana,* on the other hand, is endemic in E., C. and W. Spain between 39° and 43° latitude. Both inhabit dry sandy and stony places.

Series 7. **Argyrocomae** Chaudhri n. series monotypica in parte orientali Americae Septemtrionalis endemica, foliis et floribus dense sericeis distinguenda. Young shoots, leaves and flowers densely silky pubescent; flowers with whitish, erect, long awns at sepal tips; ovary densely pubescent; style longer than the ovary.

A single species, *P. argyrocoma* (Michaux) Nutt., often forming dense mats, and occurring on rocky slopes and ridges in the E. USA, from Maine to Georgia.

Series 8. **Paronychia**

Flowers either in conspicuous glomerules, and thereby concealed by the bracts, or in lateral or pseudo-axillary, sessile clusters. Perennial herbs.

Type species: the same as that of the subsection and section, subgenus and genus. This is a large and rather heterogeneous group, comprising on the one hand species with very well-developed glomerules (e.g. *P. argentea* Lam. and *P. arabica* (L.) DC.) and on the other hand species in which the bracts are somewhat shorter than the flowers, which are aaranged in congested, lateral or pseudo-axillary clusters (e.g. *P. setigera* and *P. illecebroides*). Most of the species are found in the New World, only seven occurring in the Old World. Of these, three are widely distributed, *P. argentea* Lam. in S. Europe, N. Africa and the Near East in areas close to the Mediterranean on sandy banks and rocky slopes; *P. arabica* (L.) DC. (the most variable species of the genus) throughout N. Africa and the Arabian desert, extending to S. Iran in sandy soils, showing variability in virtually every character, and *P. polygonifolia* (Vill.) DC. The latter is a subalpine species occurring in the mountains of S. Europe, N. Morocco and W. Turkey. The other four are endemic in Turkey (*P. euphratica* Chaudhri), Morocco (*P. velata* (Maire) Chaudhri), Cape. Verde Islands (*P. illecebroides* Webb)

and Ethiopia (*P. bryoides* Salt ex A. Richard).

Of the New World species, all but two occur in S. America. The two N. American species are *P. pulvinata* A. Gray (Central USA) and *P. mexicana* Hemsley (Mexico and S. California). The latter is related to *P. communis* Cambessèdes, which is the most widespread species in S. America with an area extending up to Ecuador in the North and N. Argentine in the South. There are in all 20 species (of this series) in S. America, mainly concentrated in Peru, Bolivia, N. Argentine and C.-N. Chile (16 species: *P. andina* A. Gray, *P. weberbaueri* Chaudhri, *P. limae*i Chaudhri, *P. fusciflora* Chaudhri, *P. libertadiana* Chaudhri, *P. macbridei* Chaudhri, *P. peruviana* Chaudhri (all from Peru); *P. mandoniana* Rohrbach (Bolivia); *P. hieronymi* Pax, *P. cabrerae* Chaudhri (N. Argentine); *P. setigera* (Gillies ex H. et A.) Hermann (from Argentine); *P. chilensis* DC., *P. coquimbensis* Gay, *P. johnstonii* Chaudhri (from Chile); and *P. ellenbergii* Chaudhri (Peru); *P. muschleri* Chaudhri (Peru and Bolivia). Of the remaining four *P. communis* is widespread in a large part of Central S. America and the three others are endemic in Brasil (*P. paranensis* Chaudhri), Ecuador (*P. hartwegiana* Rohrbach) and Colombia (*P. bogotensis* Triana et Planchon). In S. America, Peru with 9 species is the richest area of distribution.

P. pulvinata is remarkable for its very characteristic fleshy leaves with hardly any mucro and solitary terminal flowers, nearly concealed by the leaves. It is an alpine species, occurring at altitudes of 3300-4200 m. *P. andina,* a species with a similar floral arrangement, goes up to 5300 m, the highest limit reached by any species of this genus. Another species having similarly disposed flowers is *P. bryoides* Salt ex A. Richard which is found in Ethiopia; it is the only species of this particular type of floral character in the Old World.

The most important point of morphological interest in this series is the gradual development of distinct and usually conspicuous compound glomerules from simple (mainly lateral) flower clusters (as, for instance, those found in *P. illecebroides, P. setigera, P. hartwegiana, P. chilensis* etc.). The bracts are usually quite short in all these cases, and the dense agglomeration of flowers into definite compound glomerules is accompanied by an enlargement of the bracts. *P. polygonifolia* represents a transitional stage in this respect, and the highest development is reached in *P. argentea* and *P. arabica.*

C) Subgenus **Anoplonychia** (Fenzl) Chaudhri comb. et stat. nov. *Paronychia* sect. *Anoplonychia* Fenzl in Endlicher, Gen. Pl. 958 (1839); Boissier, Fl. Or. 1:742 (1867); Willkomm et Lange, Prodr. Fl. Hisp. 3:157 (1874); Kerner in Österr. Bot. Zeitschr. 27:16 (1877); Pax in Engler-Prantl, Pflanzenfam. ed. 1, 3 (1b):90 (1889); Gürke in Richter-Gürke, Pl. Europ. 2 (2):183 (1899); Halàcsy, Consp. Fl. Graec. 1:569 (1900); Rouy, Fl. Fr. 12:5 (1910); Graebner in Ascherson et Graeb-

ner, Synop. 5(1):889 (1919); Pax et K. Hoffman in Engler-Prantl Pflanzenfam, ed. 2, 16c:300 (1934); Maire et Weiller in Maire, Fl. Afr. Nord 9:27 (1963).

Leaves herbaceous, without cusp or mucro; perigynous zone weakly developed; sepals entirely herbaceous, plano-concave, without hood or awn, connivent to erect, sometimes at the apex recurved with age; styles two, free or, occasionally, connate at the base; ovary and fruit smooth and wholly glabrous.

Type species: *P. kapela* (Hacq.) Kerner . . (*P. capitata* DC., non Lam., and *P. serpyllifolia* (Chaix) DC.).

This subgenus includes 48 spp., all perennials, occurring exclusively in the Northern Hemisphere of the Old World. The species fall broadly into two, rather well-defined, groups, here recognized as representing two sections, one (with 36 species) characterized by ± equal and connivent to erect sepals, the other, consisting of 12 species, possessing markedly unequal sepals which become often recurved with age. All the species of this subgenus form small, compact, dense mats, and most of them are endemics. Only *P. kapela* (Hacq.) Kerner, *P. capitata* (L.) Lam. and *P. chlorothyrsa* Murb. are widely distributed.

Key to the sections

1a) Sepals ± equal, connivent to erect ------ section 1. **Anoplonychia**

1b) Sepals distinctly unequal, often recurved in the fruiting stage ------ section 2. **Heterosepalae**

Section 1. **Anoplonychia**

Sepals ± equal, connivent to erect; styles two, free, often erect, occasionally reduced in size and then the stigmas eventually subsessile and strongly recurved.

Type species: the same as that of the subgenus.

This group consists predominantly of endemic species, with the exception of *P. kapela* (Hacq.) Kerner, nearly all the species have a restricted range of distribution, in a few cases they are known from the type locality only. All the species form small, but dense mats. Some of the relatively wide-spread species are: *P. kapela* (widespread in S. Europe, and extending to N. Morocco); *P. cephalotes* (M.B.) Besser (ESE. Europe or S. Ukraine and E. Balkan); and *P. chionaea* Boiss. (widely distributed in Turkey).

Most of the species are found in Turkey (22), Greece has only four and Transcaucasus one; N. Iraq and W. Iran have two, and NW. Africa two species; S. Spain one (*P. aretioides* DC.) though the area of this species extends to Morocco; and Crimea, finally, possesses two endemics (*P. taurica* Borhidi et Sikura and *P. pontica* (Borhidi) Chaudhri). Turkey is obviously the main centre of speciation.

The section is subdivided into two subsections, differing in the characters of the stipules. The major group, which comprises all but three species of this section, is characterized by the presence of two stipules for every pair of leaves, whereas in the other subsection there are four stipules for every two leaves. This (second) subsection forms a link between the two sections of this subgenus (*Anoplonychia*).

Key to the subsections

1a) Stipules two per pair of leaves ..... subsection **Anoplonychia**
1b) Stipules four per pair of leaves .... subsection **Quadristipulatae**

Subsectio **Anoplonychia**

Leaves obovate to elliptic; stipules two per pair of leaves; glomerules terminal, nearly globose; sepals ± equal, connivent to erect; styles two, elongate.

Type species: the same as that of the section and the subgenus.

This subsection includes 33 species, nearly all of them endemics; the only widely distributed species is *P. kapela* (Hacq.) Kerner. Most of the species (21) are confined to Turkey, the chief centre of distribution for this section. They are: *P. chionaea* Boiss, very widespread in S. to SW. Turkey; *P. sintenesii* Chaudhri in NW. Turkey; *P. carica* Chaudhri; *P. mughlaei* Chaudhri, *P. davisii* Chaudhri, *P. lycica* Chaudhri, *P. adalia* Chaudhri and *P. argyroloba* Stapf in WSW. Turkey; *P. dudleyi* Chaudhri and *P. angorensis* Chaudhri in W.-C. Turkey; *P. paphlagonica* Chaudhri, *P. anatolica* Czeczott, *P. beauverdii* Czeczott, and *P galatica* Chaudhri in N. Turkey; *P. kayseriana* Chaudhri, *P. condensata* Chaudhri and *P. cataonica* Chaudhri in Central Turkey; *P. saxatilis* Chaudhri and *P. turcica* Chaudhri in Eastern Turkey; *P. kotschyana* Chaudhri in SE Turkey and *P. amani* Chaudhri rather sparsely distributed in SE, C, N and NW Turkey.

P. kapela is widespread in S. Europe, but the other 11 species have a restricted range of distribution. *P. aretioides* DC. is endemic in NW Africa; *P. azerbaijanica* Chaudhri occurs only in Soviet Azerbaijan; *P. taurica* Borhidi and *P. pontica* (Borhidi) Chaudhri are in the main Crimean species though occurring in the Northern or Northwestern parts of Turkey as well; *P. cephalotes* (M.B.) Besser occurs in SSW Ukraine to Eastern Balkan States; *P. macedonica* Chaudhri in S. Yugoslavia and NW Greece; *P. albanica* Chaudhri in Albania, and W. and S. Greece; *P. bornmülleri* Chaudhri in Thasos only; and finally *P. rechingeri* Chaudhri in Eastern to NE Greece only.

This group shows two main lines in the development of the style. In most of the species the styles are elongate and erect, but in a few species like *P. aretioides, P. kapela* and *P. argyroloba* they are very short and strongly divergent and recurved. In *P. aretioides* the stigmas

are sessile. *P. kayseriana* with its long but strongly recurved style represents the intermediate stage.

Subsectio **Quadristipulatae** Chaudhri nov. subsect. a subsectione *Anoplonychia* stipulis quoque nodo quattuor distinguenda.
Leaves often oblanceolate to narrowly oblong, stipules 4 per pair of leaves; glomerules terminal and lateral; bracts equalling or exceeding the flowers; sepals subequal, erect or, rarely slightly recurved at the tip.
Type species: *P. boissieri* Rouy
Other species: *P. caespitosa* Stapf and *P. mesopotamica* Chaudhri.
The three species are endemic in S. Turkey, W. Iran and N. Iraq to E.-C. Syria respectively; all are perennials forming small, dense mats. *P. boissieri* and *P. caespitosa* are remarkable in bearing some resemblance to some local forms of *P. kurdica* Boiss (sect. *Heterosepalae*) in general aspect, and thus indicate a parallel development of flowers with markedly unequal and recurved sepals from those with equal or only slightly unequal and erect ones within the various subdivisions of the subgenus *Anoplonychia.*

Sectio 2. **Heterosepalae** Chaudhri nov. sect. a sectione *Anoplonychia* sepalis distincte inaequalibus, in statu frutescente saepe recurvatis distinguenda. Sepals markedly unequal and often recurved with age. Flowers mostly 3-4.5 mm long but occasionally up to c. 7 mm long (the longest in *Paronychia*); stipules mostly four per pair of leaves; glomerules terminal, subterminal and lateral; bracts often equalling or exceeding and ± concealing the flowers, rarely (as in a small part of *P. chlorothyrsa)* somewhat shorter than the flowers; styles usually quite short and slightly connate at the base.
Type species: *P. capitata* (L.) Lam.
Other species: *P. chabloziana* Beauverd, *P. chlorothyrsa* Murbeck, *P. haggariensis* Diels, *P. somaliensis* Baker, *P. jordanica* Chaudhri, *P. macrosepala* Boiss, *P. palaestina* Eig., *P. sinaica* Fresenius, *P. kurdica* Boiss., *P. bungei* Boiss. and *P. splendens* Steven.
This is on the whole a well-defined group; it is also widely distributed despite the fact that out of the 12 species only two (*P. capitata* and *P. chlorothyrsa*) cover a larger area. *P. capitata* is widespread in S. Europe and N. Africa, extending eastwards to N. Egypt and Palestine. *P. chlorothyrsa* is a subtropical to tropical species, widespread in almost the whole of N. Africa, from Libya to Morocco, and extending up to the Canary Islands in the west and Ethiopia (Eritrea) in the east, inhabiting dry sandy soils, mostly at low altitudes, but sometimes up to 2700 m. altitude. *P. capitata,* on the other hand, inhabits dry stony or rocky places between 100 and 2400 m though mostly under 1500 m. *P. chabloziana,* likewise, occurs on rocks, but is confined to Tunisia

(and possibly NE Algeria) only. *P. haggariensis* is restricted to a small area in S. Algeria and NW Chad (Ahagger and Tibesti Mts.) *P. somaliensis* is endemic in Somalia, and *P. jordanica* in Transjordan, Palestine and parts of Syria, both occurring on calcareous rocks. *P. macrosepala* and *P. palaestina* are quite similar in habit though differing considerably in the floral characters. The former is fairly wide-spread within a rather small region extending from SE Greece through Crete and other Aegaean Islands to SW Turkey, Cyprus, Syria and Lebanon, inhabiting rocky places, whereas the latter is confined to the coastal (sandy) areas of Palestine and Lebanon. The other four species constitute a more or less homogenous group, though each is quite distinct and easily distinguishable. *P. sinaica* has a limited range of distribution from E. Egypt to Negev and Jordan, occurring on rocky hillsides. *P. kurdica* is fairly well distributed in most parts of Turkey (except in the western region), NW Syria, N. Iraq, W. and NW Iran and (Soviet) Georgia, Armenia and Azerbaijan. *P. splendens* and *P. bungei* resemble *P. kurdia* in habit, but differ in the characters of their leaves and sepals. *P. splendens* is endemic in Azerbaijan and Armenia; *P. bungei* in S. Iran.

In this section *P. somaliensis* represents (apparently) an independent line of development as it differs from the other species in important characters of the leaf and the sepals and is, therefore, placed in a separate subsection.

Key to the subsections

1a) Leaves linear, subglabrous to entirely glabrous with age; sepals connivent to erect ..... subsection **Rectisepalae**

1b) Leaves oblanceolate, elliptic or obovate, often ± pubescent; sepals recurved with age ..... subsection **Heterosepalae**

Subsection **Heterosepalae**

Leaves oblanceolate, obovate or elliptic, somewhat scabridous to velvety pubescent; sepals recurved with age.

Type species: the same as that of the section.

Other species: 10 species already mentioned under the main section.

Subsectio **Rectisepalae** Chaudhri nov. subsect. monotypica, in Somalia endemica a subsectione *Heterosepalarum* foliis linearibus, sepalis conniventibus vel erectis distinguenda. Shoots ascending, often congested, covered with closely imbricated leaves and stipules, minutely pubescent to subglabrous in age; leaves linear, ascending, on both sides glabrous, with a shortly ciliate margin to wholly glabrous with age; sepals (very shortly appressed pubescent) connivent when young to erect with maturity.

A single species, *P. somaliensis* Baker, endemic in Wagga Mts., Somalia

KEY TO THE SPECIES

(Floral dissection is usually essential for correct identification).

A. Subgenus **SIPHONYCHIA** (Torr et Gray) Chaudhri p. 82.
Sepals petaloid; perigynous region or receptacle often very well-developed.

1a) Flowers arranged in lax, diffuse cymes; receptacle ± longer than the sepals and covered with uncinate hairs

2a) Sepals somewhat broader towards the apex; the latter incurved and mucro or cusp more or less absent ..... 1. **P. americana**

2b) Sepals narrowed at the apex, and the latter with a short but distinct cusp ..... 2. **P. patula**

1b) Flowers in dense cymes forming large corymbose clusters; receptacle ± shorter than the sepals, and covered with straight hairs

3a) Mostly perennial; flowers 2.5-3 mm long, minutely puberulous at the base or entirely glabrous; sepal hood and cusp indistinct ------ 3. **P. erecta**

3b) Annual: flowers 1.5-1.8 mm long; receptacle often densely pubescent; sepals provided with short but distinct hood and apical cusp or awn ..... 4. **P. rugelii**

B. Subgenus **PARONYCHIA:** Sepals semiscarious or subcoriaceous provided with distinct hood, and mostly with a short or long awn.

a) Section **NYACHIA** (Small) Pax et Hoffm. op. cit. p. 83.
Sepals umbonate, i.e. with a prominent convex, cap-like hood at the apex, but without any apical cusp. ..... 5. **P. chartacea**

b) Section **PARONYCHIA:** Sepals hooded and provided with a short or long awn at the tip.

1a) Leaves for the greater part in axillary fascicles

2a) Annual; flowers 1.25-1.35 mm long, obovoid; sepals with indistinct hoods and with a c. 0.05 mm long mucro; petals 0.2-0.25 mm long; ovary ovoid with a sessile 0.05-0.1 mm long sulcate stigma; fruit obovoid ..... 6. **P. camphorosmoides** (S. Brasil)

2b) Mostly perennial; stipules and bracts reddish-brown; flowers 1.8-2 mm long, conical; sepals with a distinct hood and awn; petals 0.6-0.65 mm long; ovary conical; style 0.3 mm long; stigmas filiform; fruit quadrangular ..... 7. **P. fasciculata** (S. Brasil)

1b) Leaves not or only for a small part in axillary fascicles

3a) Plant dark purple-violet and coriaceous throughout ------- 8. **P. suffruticosa** (SE. Spain)

3b) Plants not purple violet

4a) Sepals with a short cusp at the tip (rarely with a short awn but in that case the plant annual, and the flowers glabrous and in lax cymes); flowers in terminal lax cymes; stipules and bracts short

5a) Leaves with ciliate margin ..... 12. **P. baldwinii** (SE USA)
5b) Leaves entirely glabrous
6a) Style elongate ..... 11. **P. montana**
6b) Style short
7a) Stems more or less pubescent; leaves oblanceolate, dull brownish-green ..... 10. **P. fastigiata** (E-Mid-E USA)
7b) Stems glabrous and filiform; leaves oval-elliptic, very thin and deep-green ..... 9. **P. canadensis** (E-Mideast USA)
4b) Sepals with a distinct, short or long awn
8a) Sepal hood whitish and horn-like (rigid)
9a) Sepal awn rigid and almost equalling the (conspicuous) conical tip of the sepal hood; ± erect ------- 24. **P. drummondii** (NE and C Texas)
9b) Sepal awn slender and quite distinct from the weakly-developed tip of the hood; shoots ± prostate ----- 25. **P. jonesii** (SSW Texas)
8b) Sepal hood neither whitish nor hornlike
10a) Shoots, leaves and flowers often densely silky-pubescent; flowers 3.5-5.75 mm long ..... 32. **P. argyrocoma** (E, USA)
10b) Shoots, leaves and flowers not silky-pubescent; flowers up to 4 mm (mostly less than 3.5 mm) long
11a) Style almost reaching the tip of the sepals; leaves subcoriaceous at maturity, often ± oblong to spathulate and shortly pubescent; flowers in small, leafy, mostly lateral clusters and flask-shaped, i.e. with a long, narrow calyx region and a swollen receptacle ---- 23. **P. herniarioides** (Florida, USA)
11b) Style not reaching the tip of the sepals
12a) Leaves linear and subchartaceous; flowers either in lax cymes or in terminal and lateral (pseudo-axillary) clusters
13a) Flowers in lax cymes or in compact clusters
14a) Sepal awns setaceous
15a) Annual
16a) Awn c. $^1/_3$ to ½ as long as the rest of the sepal ------- 13. **P. lindheimeri** (Texas)
16b) Awn more than ½ as long as the rest of the sepal
17a) Awn somewhat shorter than the rest of the sepal, and often spreading; flowers with a turbinate receptacle; bracts foliaceous but shorter than the flowers ------ 14. **P. chorizanthoides** (Texas)
17b) Awn ± equal in length to the rest of the sepal; floral receptacle cup-shaped; bracts often equalling or exceeding the flowers ----- 15. **P. setacea** (Texas)
15b) Mostly perennial (rarely biennial)
18a) Biennial to perennial; shoots and leaves glabrous; flowers with a tubular and glabrous calyx region, the latter distinctly longer than the turbinate, shortly and sparsely hirtellous receptacle;

sepal awns 0.25-0.45 mm long ---- 16. **P. monticola** (SW Texas)

18b) Perennial; shoots and leaves pubescent to puberulous; flowers with a densely hirtellous receptacle, the latter only slightly shorter than the sepals: sepal awns 0.4-0.6 mm long

19a) Stems erect or ascending; bracts foliaceous, often somewhat shorter than the flowers; sepals almost glabrous, awn slender and well-differentiated from the hood -- 17. **P. jamesii** (C and S USA)

19b) Stems wholly prostrate and matted; bracts mostly equalling to somewhat exceeding the flowers; receptacle densely hirtellous; sepals rather sparsely so; awn stiff, scabrous, nearly equalling the well-developed conical hood-tip .... 18. **P. depressa** (C USA)

14b) Sepal awns stout and spine-like; sepals with a stiff median band

20a) Stems erect, 15-50 cm tall (and yellowish-green); cymes large, much-branched, forming conspicuous, corymbose clusters; flowers 3-34 mm long (excluding the sepal awn) -----
19. **P. virginica** (ESE USA)

20b) Stems prostrate or shortly ascending, less than 15 cm long; cymes densely congested; clusters ± sessile, congesetd at the ends of shoots

21a) Leaves aristate; awns 1.5-2 mm long and spreading ------
20. **P. wilkinsonii** (N Mexico and SW Texas)

21b) Leaves minutely cuspidate; cusp 0.25-0.3 mm, erect -----
21. **P. albomarginata** (NE Mexico)

13b) Flowers solitary or in small, terminal clusters (mostly consisting of two flowers) and nearly concealed by the leaves and stipules; plant pulvinate ..... 22. **P. sessiliflora** (C USA)

12b) Leaves not chartaceous

22a) Flowers in lax cymes (with very short bracts); subshrubs

23a) Plant purple-violet; leaves coriaceous, dark-purple or violet-red; usually glabrous; flowers dark purple-violet, with coriaceous and mostly smooth sepals with a 0.15-0.25 mm long whitish and erect mucro; stigma subsessile --------
8. **P. suffruticosa** (SE Spain)

23b) Plant brownish-green; leaves soft or herbaceous (not coriaceous), greenish to dark-brown, shortly pubescent; flowers brownish, shortly pubescent; sepals not coriaceous, with a prominent, finely pubescent awn; style 0.55-0.6 mm long -------
26. **P. canariensis** (Canary Islands)

22b) Flowers not in lax cymes

23a) Perigynous zone weakly-defined (flowers reddish in the fruiting stage; sepal awns slender and setaceous)

24a) Flower clusters ± exposed; sepal awns spreading ------
28. **P. brasiliana** (S. Brasil, Uruguay, N. Argentine)

24b) Flower clusters mostly concealed by the closely approximated

leaves and stipules; sepal awns erect ------
29. **P. franciscana** (Chile and California)

23b) Perigynous zone well-developed
25a) Flowers entirely glabrous
26a) Stems densely congested, leaves oblanceolate, up to 9 x 2.25 mm, pubescent; flowers turbinate-ellipsoid; sepal awns slender and setaceous ..... 37. **P. muschleri** (SE Peru)
26b) Stems spreading; leaves elliptic, up to 15 x 4.5 mm, coriaceous, glabrous on both sides; flowers cylindrical-oblong; sepals too coriaceous, provided with short, stout awns ------
43. **P. ellenbergii** (C. Peru)
25b) Flowers not wholly glabrous (more or less covered with short hairs, or puberulo-pubescent)
27a) Sepals semi-scarious, with a rather tender awn
28a) Leaves without mucro or indistinctly mucronate
29a) Leaves fleshy (elliptic-oblong; stipules conspicuous and almost equalling the leaves; flowers solitary at the end the shoots; plant pulvinate ..... 55. **P. pulvinata** (C. USA)
29b) Leaves not fleshy
30a) Shoots in the upper (younger) part with densely intertwined branches, leafless towards the base; leaves oblanceolate-subspahtulate (1-1.5 mm wide), coriaceous; flowers in well-defined glomerules and concealed by the (stipulary) scarious bracts ------
56. **P. bryoides** (Ehtiopia)
30b) Stems often spreading; leafy throughout; leaves not coriaceous, oblanceolate to oblong (1-3 mm wide); glomerules not well-defined; flowers only partially concealed by bracts -----
57. **P. polygonifolia** (Mts. of S. Europe, N. Morocco and W. Turkey)
28b) Leaf with a distinct mucro
31a) Style longer than the ovary
32a) Flowers reddish and leaves ovate to elliptic, shortly mucronate, very shortly ciliate (flower clusters congested at the end of the shoots ..... 52. **P. fusciflora** (Peru)
32b) Flowers often not reddish (rarely reddish but in that case leaves prominently mucronate and flowers larger and pubescent)
33a) Flowers densely congested at the end of the shoots
34a) Leaves lanceolate, acuminate, pungently mucronate (very shortly strigose and with a slightly inflexed margin). -------
49. **P. mandoniana** (Bolivia)
34b) Leaves mostly elliptic-oblong to almost ovate, acute to obtuse (not acuminate)
35a) Leaves densely scabrous with short, appressed, rather stiff hairs; brownish, with a 0.3-0.35 mm long mucro; flowers turbinate-

elipsoid, covered with patent hairs ----- 53. **P. weberbaueri** (Peru)

35b) Leaves coriaceous, often with a somewhat inrolled margin, a 0.6-0.8 mm long mucro, and smooth upper side; shoots often densely tufted and glabrous .... 54. **P. andina (Peru mostly)**

36a) Shoots densely pubescent; leaves narrowly elliptic to ovate-lanceolate, very shortly mucronate, appressed pubescent to glabrescent, brownish-red with age; flowers solitary as well as in 3-flowered psuedo-axillary clusters at the nodes; dark-brown and shortly pubescent ..... 51. **P. limaei** (Peru)

36b) Shoots puberulous to glabrous; leaves ovate-elliptic to broadly lanceolate, strongly mucronate, subglabrous; flowers in pseudo-axillary and terminal as well as subterminal clusters, congested at the end of the shoots, light-brown, with a shortly pubescent receptacle and slightly puberulous to almost glabrous sepals ---- 50. **P. hieronymi** (NW Argentne)

31b) Style shorter than the ovary

37a) Stems with long (up to 3 cm) and stout internodes; leaves oblong to elliptic-oblong, acute, up to 20 x 5 mm, shortly mucronate; mostly spreading almost at a right angle; petals well-developed; ovary and fruit conical, slightly papillose, narrowed to the top; styles free ..... 35. **P. paranensis** (SE Brasil)

37b) Stems with shorter internodes (not exceeding 2 cm); leaves up to ca. 15 x 4.5 mm, mostly narrowly elliptic-oblanceolate, distinctly mucronate, scrabidous, not spreading at a night angle; petals inconspicuous or absent; ovary ovoid, densely papillose; fruit subglobose, rounded above; style bifid

38a) Calyx tubular-oblong; awns very short, 0.05-0.15 mm; petals absent; anthers 0.25-0.3 x 0.2 mm, oblong; style 0.3-045 mm with a very shortly 2-lobed stigma ----- 33. **P. mexicana** (Mexico)

38b) Calyx region ovoid; sepals incrved at the tip; awns 0.2-0.4 mm long; petals short but distinct; anthers 0.15-0.2 mm in dam, rectangular; style bifid or deeply bilobate ----- 34. **P. communis** (Central S. America)

27b) Sepals with a coriaceous (sometimes fleshy) median band

39a) Younger shoots and flowers densely villous; flowers arranged in almost leafless, stellate, mostly 6-flowered clusters on short branches towards the end of the shoots .... 27. **P. microphylla** (N. Chile and S. Peru)

39b) Shoots and flowers not villous

40a) Flowers in terminal and pseudo-axillary clusters but difinite glomerules not formed

41a) Leaves indistinctly mucronate ..... 36. **P. illecebroides** (Cape Verde Is.)

41b) Leaves distinctly mucronate
42a) Sepals fleshy
43a) Shoots often densely pubescent; leaves up to 15 x 3.75 mm; oblanceolate-oblong to oblong, hirtellous; flowers 2-2.4 mm, turbinaee, mostly almost entirely glabrous; sepals connivent, ovary smooth ..... 38. **P. johnstonii** (N. Chile)
43b) Shoots puberulous or subglabrous; leaves up to 7 x 2.75 mm, elliptic, ± glabrous but with a shortly hairy margin; flowers c. 2.5 mm, oblong with a shortly pubescent receptacle and puberulous sepals; ovary papillose at the top ----
42. **P. bogotensis** (Colombia)
42b) Sepals not fleshy
44a) Flowers entirely glabrous leaves elliptic with glabrous surfaces, stems spreading) ..... 43. **P. ellenbergii** (Peru)
44b) Flowers not glabrous
45a) Flowers with a densely pubescent receptacle but almost glabrous sepals stems spreading, with long, up to 1.7 cm, densely pubescent internodes; leaves up to c. 11 x 4.5 mm, elliptic to elliptic-oblong, scrabous to glabrescent; flowers in 3-flowered clusters or solitary at the nodes; sepal awns slender, stiff, nearly smooth and dark-brown) ..... 44. **P. hartwegiana** (S. Ecuador)
45b) Flowers uniformly pubescent or puberulous to glabrescent
46a) Flowers mostly with uncinate hairs on the perigynous zone; style 0.3-0.35 mm long, bilobed, with almost sessile stigmas -------
46. **P. cabrerae** (N. Argentine)
46b) Flowers with straight hairs
47a) Leaves for the greater part oblanceolate or linear-oblanceolate
48a) Leaves linear-oblanceolate, up to 15 x 0.75 mm, often not rigid, strigose to almost hirsute (shoots long and spreading, with long internodes; flowers mostly 2.7-3.2 mm long, almost concealed by the stipulary) scarious bracts, and densely covered with short, patent to upwards-directed hairs, the basal part, however, subglabrous) ..... 40. **P. conquimbensis** (Chile)
48b) Leaves oblanceolate, up to 10 x 2.50 mm, often rigid and brownish
49a) Shoots and leaves densely hirtellous with short patent hairs; leaves very strongly mucronate and rigid; flowers scabridous or hirtellous, awns prominent; petals distinct ------
41. **P. setigera** (Argentine mostly)
49b) Shoots often slightly pubescent to puberulous; leaves usually puberulous tot subblabrous, rather shortly mucronate; flowers puberulous to subglabrous, sepal awn short, 0.25-0.3 mm; petals almost invisible ..... 39. **P. chilensis** (S-C. Chile)

47b) Leaves elliptic to ovate or ovate-lanceolate
50a) Leaves elliptic, very shortly mucronate, sparsely hairy on the under side, glabrous on the upper one ------ 47. **P. libertadiana** (Peru)
50b) Leaves with a distinct mucro; often rigid
51a) Leaves mostly ovate-elliptic, strongly mucronate, pubescent; flowers 2-2.4 mm with densely villous receptacle; sepal awns 0.4-0.5 mm, slender but stiff; style very shortly bidentate at the tip ..... 48. **P. macbridei** (Peru)
51b) Leaves elliptic to lanceolate, mucro mostly distinct though short, shortly hirtellous to almost glabrous; flowers mostly 2.4-3 mm, pubescent;sepal awns 0.25-0.3 mm long, not quite stiff; style nearly bifid ..... 45. **P. peruviana**
40b) Glomerules very conspicuously developed, terminal, subterminal and pseudo-axillary
52a) Bracts shorter than the flowers, and the latter exposed; plants annual
53a) Leaves minutely mucronate; sepal awns rather slender, straight and spreading ..... 30. **P. echinulata** (Mediterranean)
53b) Leaves distinctly mucronate; sepal awn rigid and hooked ------ 31. **P. rouyana** (E, C. and W. Spain)
52b) Bracts exceeding and ± concealing the flowers; plants mostly perennial
54a) Style equalling or exceeding the ovary in length
55a) Shoots and flowers often densely silky-pubescent; flowers 3.5-5.75 mm long ..... 32. **P. argyrocoma** (E. United States)
55b) Shoots and flowers not silky-pubescent; flowers up ta 3 mm long
56a) Leaves elliptic-oblong to almost ovate
57a) Leaves coriaceous; often with a smooth-glabrous upper side, a somewhat inrolled margin and a very conspecuous mucro; shoots glabrous ..... 54. **P. andina** (Peru mostly)
57b) Leavesc not quite coriaceous, hirtellous, with a short mucro; shoots puberulous ..... 53. **P. weberbaueri** (Peru)
56b) Leaves narrowly oblanceolate or subspathulate, 1-1.5 mm wide ..... 56. **P. bryoides** (Ethiopia)
54b) Style shorter than the ovary
58a) Sepals with a membranous margin broader than the median band; hairs on the perigynous zone uncinate (rarely straight but in that case leaves indistinctly mucronate and sepals provided with a conical awn) ..... 58. **P. arabica** (N. Africa and SW. Asia)
58b) Membranous margin almost equalling or somewhat narrower than the rigid median band; hairs on the perigynous zone straight or partly straight and partly uncinate
59a) Hairs on the flowers partly straight and partly uncinate; (leaves

linear-oblong, up to 14 x 3 mm, with a thickened and papillose margin; flowers 2.5-2.65 mm (without awns), dark-brown, densely pubescent on the receptacle, sparsely so on the sepals; sepals coriaceous, with a very narrow membranous margin) ------- 59. **P. euphrartica** (Turkey)

59b) Hairs on the flowers all straight

60a) Shoots tufted with closely imbricated and ascending leaves and stipules; leaves rigid, linear, 3-4.5 x 0.7-0.85 mm; stipules ± exceeding and almost concealing the leaves; sepal awns short but stout and rigid and somewhat scabrous ---- 60. **P. velata** (Morrocco)

60) Shoots not tufted; leaves ± oblong to obovate-oblanceolate; stipules mostly shorter than the leaves; sepal awns slender and smooth ..... 61. **P. argentea** (Mediterranean region)

C. Subgenus **Anoplonychia** (Fenzl) Chaudhri p. 91: Leaves herbaceous, neither mueronate nor aristate; sepals entirely herbaceous, without hood or awn.

A) Section **Anoplonychia:** Sepals equal or somewhat unequal but connivent or erect

1a) Sepals ± equal (equal or slightly unequal)

2a) Stipules two per pair of leaves

3a) Styles divergent and recurved or absent and then the stigmas divergent and recurved

4a) Leaves 1.5-3 x 0.75-1 (-1.2) mm, closely imbricate and ascending; flowers c. 2 mm long; stigmas ± sessile ..... 62. **P. aretioides** (SE Spain)

4b) Leaves more than 3 mm long and 1.25 mm wide, usually not closely imbricate or ascending; flowers 2-3 mm long; styles distinct

5a) Leaves glabrous on both sides ----- 63. **P. kapela** (SSW Europe)

5b) Leaves distinctly hairy

6a) Styles 0.8-1 mm long (adventitious roots absent; leaves obovate-spathulate, appressed pubescent; stipules shorter than the leaves; glomerules terminal) ..... 65. **P. kayseriana** (Turkey)

6b) Styles less than 0.7 mm long

7a) Adventitious roots prominent; stems congested and caespitose; leaves with short and stiff hairs esp. along the margin; stipules often conspicuous at the shoot-tip; styles strongly recurved ----- 64. **P. argyroloba** (SW Turkey)

7b) Adventitious roots few or absent; stems spreading; leaves ± elliptic, fleshy when fully mature, covered with soft, lustrous hairs; styles recurved at the tips only ..... 66. **P. davisii** (SW Turkey)

3b) Styles erect

8a) Sepals equal

9a) Sepals obtuse or subobtuse

10a) Stipules in the older (basal) parts of the stems mostly somewhat shorter than the leaves

11a) Internodes, leaves and flowers very densely pilose or almost villous ..... 68. **P. mughlaei** (Turkey)

11b) Internodes, leaves and flowers shortly pubescent or puberulous, rarely glabrous

12a) Leaves glabrous on both sides (and often broadly elliptic to obovate or almost rounded) .... 67. **P. rechingeri** (NE Greece)

12b) Leaves often distinctly pubescent, puberulous or glabrescent

13a) Adventitious roots ± conspicuous

14a) Leaves usually substrigose; flowers 2-2.5 mm; sepals with a penicillate tip ..... 70. **P. lycica** (SW Turkey)

14b) Leaves (softly) appressed pubescent; flowers 2.5-3.5 mm; sepals without stiff hairs at the apex

15a) Stems often spreading (or not congested); glomerules 15-20 mm in diam.; leaves narrowly oblong-elliptic; sepals mostly subobtuse ..... 80. **P. taurica** (Crimea)

15b) Stems usually densely congested and caespitose; leaves mostly obovate-spathulate; glomerules 10-15 mm in diam.; sepals mostly obtuse ..... 79. **P. chionaea** (Turkey)

13b) Adventitious roots absent or indistinct

16a) Leaves rigid (5-7 x 2-2.5 (-3) mm), glabrescent ------ 86. **P. paphlagonica** (N. Turkey)

16b) Leaves not rigid; usually pubescent

17a) Leaves often with soft, silvery-shining hairs (usually not appressed in the younger stages), the older ones ± elliptic and fleshy; glomerules terminal (12-18 mm in diam.); flowers 2.6-3.25 mm long; sepals obtuse to subobtuse; styles divergent and recurved with age; fruit fully enclosed by the sepals ------ 66. **P. davisii** (SSW Turkey)

17b) Leaves narrowly oblong to oblanceolate, appressed pubescent; glomerules 5-10 mm in diam., densely crowded; flowers 2-2.5 mm long; sepals obtuse; styles erect; fruit equalling the sepals ..... 77. **P. angorensis** (WC Turkey)

10b) Stipules equalling or exceeding the leaves

18a) Shoots, leaves and flowers puberulous to subglabrous with age (leaves up to 3.25 x 1.4 mm, somewhat thick and ascending; stipules ± equalling the leaves; flowers 2-2.25 mm, fruit equalling the sepals ..... 76. **P. saxatilis** (E. Turkey)

18b) Shoots shortly pubescent or puberulous, but the leaves and flowers often densely pubescent

19a) Adventitious roots present; shoots short and densely tufted with the leaves closely imbricate and clasping the internodes; stipules equalling or slightly exceeding the leaves; fruit equalling the sepals in length ..... 78. **P. sintenisii** (W. Turkey)

19b) Adventitious roots absent; shoots not tufted; stipules distinctly exceeding the leaves; fruit fully enclosed by the sepals
20a) Sepals nearly 2 times longer than the fruit ------ 73. **P. turcica** (E. Turkey)
20b) Sepals only slightly longer than the fruit
21a) Shoots matted; leaves ± elliptic and fleshy; flowers 3-3.25 mm long, often densely pubescent ------ 74. **P. cataonica** (EC Turkey)
21b) Plant often cushion-shaped; leaves ± oblong, not fleshy; flowers 2-2.5 mm long, appressed pubescent ----- 75. **P. condensata** (C. Turkey)
9b) Sepals acute or subacute
22a) Adventitious roots often quite prominent
23a) (Plant light- or greyish-green); leaves 3-6 x 1-1.5 mm, very shortly pubescent to puberulous; sepals acute or subacute ----- 82. **P. pontica** (Crimea)
23b) Leaves 4-6 x 1.5-2.5 mm, obovate-elliptic, fleshy, densely pubescent and ascending; sepals sharply acute (or almost acuminate) ..... 81. **P. kotschyana** (SE Turkey)
22b) Adventitious roots absent or indistinct
24a) Stipules almost exceeding the leaves and usually very conspicuous; leaves often ± carinate and recurved ------ 72. **P. amani** (Turkey)
24b) Stipules of the lower leaves often shorter than the leaves
25a) Leaves 3-5 x 1.5-2 mm, pubescent and rather soft (or not rigid); flowers 2.5-3 mm long; sepals ± oblong, acute and stiffly penicillate, styles c. 0.7 mm long ----- 71. **P. beauverdii** (N. Turkey)
25b) Leaves 4-7 (-10) x 1.5-3 mm, often rather rigid, glabrescent or glabrous on both sides; flowers 3-4 (-4.5) mm; sepals narrowly oblong-lanceolate, acute but not penicillate; styles c. 1 mm long ..... 92. **P. cephalotes** (ESE Europe)
8b) Sepals slightly unequal, especially in the fruiting stage, i.e. the outer sepals 0.25-0.5 mm longer than the inner ones
26a) Stipules somewhat exceeding the leaves (the latter up to 4.5 x 2 mm, elliptic-obovate, closely arranged and recurved; glomerules 5-8 mm in diam., terminal, rather inconspicuous; flowers 2-2.5 mm long; sepals obtuse or subobtuse) ----- 69. **P. adalia** (SW Turkey)
26b) Stipules of the lower leaves often shorter than the leaves
27a) Sepals obtuse or subobtuse
28a) Glomerules 5-10 mm in diam; flowers 2-2.5 mm long; fruit equalling the sepals ..... 77. **P. angorensis** (WC Turkey)
28b) Glomerules 9-13 (-17) mm in diam; flowers 2.75-3.25 mm long; fruit fully enclosed by (i.e. somewhat shorter than) the sepals ..... 88. **P. macedonica** (Macedonia)
27b) Sepals acute or subacute

29a) Stipules almost equalling the leaves

30a) Leaves narrowly oblong to ± oblanceolate, often not fleshy; glomerules 7-12 mm in diam., mostly lateral; flowers 2.5-3.5 mm ..... 85. **P. dudleyi** (C. Turkey)

30b) Leaves elliptic-obovate, fleshy; glomerules 10-15 mm in diam., terminal and subterminal; flowers 3-3.5 mm long ------ 87. **P. tunisiania** (Tunisia and E. Algeria)

29b) Stipules of the lower leaves often distinctly shorter than the leaves

31a) Leaves up to 8 x 4 mm (mostly elliptic-oblong); glomerules terminal and distinct; flowers 3.5-4.5 mm; styles mostly 0.8-1 mm; fruit with a prominent neck ------ 89. **P. albanica** (Albania and Greece)

31b) Leaves mostly up to 6.5 x 3 mm; flowers usually up to 3.5 mm long; styles up to 0.7 mm long; fruit with a short neck

32a) Shoots and leaves very shortly scabrous or hirtellous; leaves mostly elliptic and up to 6.5 x 3 mm (often larger in the flowering region); glomerules densely confluent; ovary conical, c. 1 x 0.5 mm, tapering upwards ------ 91. **P. azerbaijanica** (Soviet Azerbaijan)

32b) Shoots and leaves often softly pubescent (when old); leaves mostly obovate-oblanceolate; ovary ovoid

33a) Leaves often (narrowly) obovate-spathulate, and recurved with age; glomerules 10-15 mm in diam., mostly all terminal; flowers shortly pubescent to puberulous ------ 93. **P. anatolica** (N. Turkey)

33b) Leaves oblanceolate to narrowly elliptic, usually not recurved; flowers very densely pubescent and arranged in terminal, subterminal, but for the greater part lateral thyrsoid clusters, 6-9 mm in diam. ..... 84. **P. galatica** (N. Turkey)

1b) Sepals distinctly unequal, i.e. the outer sepals c. 0.5 mm or more longer than the inner ones (connivent or erect)

36a) Shoots often congested and caespitose, sepals ± connivent ------ 90. **P. carica** (W. Turkey)

36b) Shoots often spreading; sepals ± erect

37a) Leaves rather stiff, mostly narrowly obovate-oblanceolate (or almost spathulate), often with sparsely scabridous or hirtellous surfaces and a shortly hirsute margin ------ 93. **P. bornmülleri** (Thasos Is.)

37b) Leaves fleshy, often elliptic to elliptic-obovate, densely velutinous-pubescent ..... 94. **P. maroccana** (N. Morocco)

2b) Stipules 4 for each pair of leaves; sepals mostly ± erect and slightly unequal

38a) Stipules shorter than the leaves; glomerules c. 5 mm in diam.; flowers 1.5-2.5 mm ..... 97. **P. caespitosa** (W. Iran)

38b) Stipules often equalling or exceeding the leaves

39a) Stems short, 3-4 cm long; leaves 2-2.5 x 0.5 mm, linear-oblong to subcylindrical; glomerules c. 5 mm in diam, terminal; bracts broadly ovate, acute to acuminate, only partially concealing the flowers; the latter 1.75-2 mm long; fruit ± equalling the sepals ..... 96. **P. boissieri** (SE. Turkey)

39b) Shoots 3-7 cm long; leaves 2.5-5 x 1.25-1.75 mm, ± oblong to subspathulate or oblanceolate; glomerules (7-)10-15 mm in diam., terminal and subterminal, densely congested; bracts up to 7 x 4 mm, broadly ovate-suboblong, narrowed to the pointed apex, exceeding and concealing the flowers; the latter (2.25-) 2.5-2.75 mm; fruit c. 2/3 as long as the sepals and enclosed by them ..... 95. **P. mesopotamica** (N. Iraq & Syria)

B) Section **Heterosepalae** Chaudhri p. 94
Sepals markedly unequal, often ± divergent and recurved with age; stipules mostly 4 at each node.

1a) Leaves linear (3-8 x 0.6-1.25 mm); mostly glabrous but with a shortly ciliate margin; flowers very shortly pubescent(-puberulous); sepals ± erect ..... 98. **P. somaliensis** (Somalia)

1b) Leaves and flowers often hairy; sepals ± recurved

2a) Sepals often recurved at the tips only

3a) Sepals spathulate ..... 101. **P. bungei** (S. Iran)

3b) Sepals never spathulate, often linear-oblong to linear-lanceolate

4a) Leaves 2-5 x 0.5-1 mm, linear-oblong, often with a thickened margin and midrib; bracts mostly orbicular ------ 102. **P. sinaica** (Sinai and Jordan)

4b) Leaves without thickened margin and midrib; bracts ± ovate

5a) Leaves oblong-oblanceolate, fleshy when old, obtuse, stipules often distinctly shorter than the leaves; outer sepals linear-oblong, obtuse ..... 99. **P. kurdica**

5b) Leaves obovate to narrowly elliptic, ± acute, rather rigid; stipules almost equalling the leaves, often shortly united at the base; sepals linear to linear-lanceolate, acute ------ 101. **P. splendens** (Armenia & Azerbaijan)

2b) Sepals often much recurved

6a) Flowers in lax and repeatedly branched cymes as well as in glomerules; style 1.2-1.3 mm long, bilobed or bipartite ----- 106. **P. chabloziana** (Tunisia)

6b) Flowers in ± compact glomerules; style less than c. 1 mm long

7a) Shoots usually densely tufted; leaves and stipules often closely imbricate; leaves and sepals fleshy

8a) Flowers 3.25-4.5 mm long; sepals much recurved ------ 104. **P. macrosepala** (E. Mediterranean)

8b) Flowers 3.25-3.5 mm long; sepals but slightly recurved ----- 103. **P. palaestina**

7b) Shoots often not tufted, and leaves and stipules not closely imbricate; leaves usually somewhat rigid (not fleshy)

9a) Leaves 1-1.5 mm wide, quite rigid; outer sepals subacute; anthers up to 0.25 x 0.2 mm; style 0.3-0.4 mm long; fruit up to 1.5 x 1 mm ..... 109. **P. chlorothyrsa**

10b) Flowers 3-4 mm; sepals subobtuse-subacute and slightly recurved ..... 108. **P. haggariensis**

9b) Leaves 1.5-2.5 mm wide, not very rigid, outer sepals obtuse; anthers mostly 0.25-0.35 (-0.5) x 0.25 mm; styles c. 0.4-0.6(-0.8) mm long; fruit 1.75-2 x 1.25-1.5 mm

11a) Leaves mostly oblanceolate; flowers 2.75-3 mm long; sepals rathers thick and somewhat appressed above, or but slightly spreading, filaments 0.8-0.9 mm long; anthers c. 0.5 x 0.25 mm ..... 105. **P. jordanica**

11b) Leaves often narrowly elliptic-oblong to narrowly elliptic-lanceolate; flowers 3-5 mm long; sepals rather stiff with age and usually distinctly recurved; filaments shorter; anthers up to 0.35 x 0.25 mm ..... 107. **P. capitata**

DESCRIPTIONS OF THE SPECIES

Subgenus 1. **Siphonychia** (Torr. & Gray) Chaudhri stat. nov. p. 82

Sepals petaloid, reddish-brown; sepal hood and apical cusp absent or indistinct; perigynous zone very well-developed, mostly equalling or somewhat longer than the sepals; style ± equalling the sepals.

1. **P. americana** (Nuttall) Fenzl ex Walpers, Repert. 1:262 (1842). Shinners in Sida 1 (2):102 (1962).

Herniaria americana Nuttall in Amer. Journ. Sci. 5:291 (1822).
Type: South Carolina, *Nuttall* (holo. NY, not seen).
Syn. *Siphonychia americana* (Nuttall) T. & G., Fl.N.Amer. 1:173 (1838); A. Gray, Genera N.Amer. 2:17, plate 103 (1849); Core in Journ. Mitchell Sci. Soc. 55:342 (1939); *S. urceolata* Shuttleworth in litt.ined.; *P. urceolata* Shuttleworth ex Chapman, Fl. S.US, 47 (1860).

An annual to occasionally biennial herb; stems up to 60 cm long, ± prostrate, diffusely spreading, with up to 4 cm long, stout internodes shortly (retrorsely) pubescent to minutely puberulous, sometimes almost glabrous. Leaves spathulate to oblanceolate, 5-20 x 2-4 mm, obtuse, minutely pubescent especially on the underside, glabrescent in age, margin serrulate and ciliate, somewhat papillose and greenish; basal leaves usually larger and crowded; stipules ovate-lanceolate, 2-5(-7) x 0.6-2 mm. Cymes usually many-flowered, ± compact, forming almost spheroid glomerules c. 3-6 mm in diam., at the ends of short, lateral branches, sometimes rather few-flowered and lax; bracts foliaceous, but in the densely congested or compacted cymes gradually reduced in size, and eventually in the glomerate forms only the stipules, which now are much shorter than the flowers, are left. Flowers subsessile, 1.4-1.6 (mostly 1.5) mm long, urceolate or somewhat vase-like, sometimes almost funnel-shaped, mostly reddish-brown, dansely covered with short hooked hairs on the base; receptacle c. 0.9-1 mm long, with a well-defined perigynous ring zone; sepals somewhat obovate. c. o. 5-0. 65x0.5 mm. with a rather broad, rounded and incurved whitish apex, very rarely with a minute, almost indistinct, cusp at the top; petals 0.3-0.4 mm; filaments 0.5-0.6 mm; style shortly 2-cleft at the top, exserted. Fruit c. 1 x 0.65 mm, avoid-ellipsoid; seed c. 0.85 x 0.6 mm ± oblong.

Fl. 7-12. Dry sand-hills and river banks.
Distr.: South Carolina, Georgia and Florida.

a) **subsp. americana:** Cymes very profuse and mostly many-flowered, forming almost spheroid glomerules.

South Carolina, Georgia and Florida.

Georgia: Richmond Co., *Olney* and *Metcalf* 16 (GH); Berrien Co., *R. M. Harper* 1696 (E. GH); Coffee Co., *R. M. Harper* 700 (E). **Florida:** St. Johns Co., *Rugel* 58 (GH); Volusia Co.,, 6.ix.1943, *E. H. Butts* (GH); *Small* et *al.* 10570 (GH); Wakula Co., *Rugel* 60 (E, GH); Levy Co., xi.1877, *A. P. Garber* (GH); Pasco Co., *J. H. Barnhart* 2605 (G); Higlands Co., *L. J. Brass* 14469 (GH); Lee Co., *A. S. Hitchcock* 285 (GH); Palm Beach Co., *Mrs. C. C. Deam* 1697 (GH); 5.xi.1944, *W. B. Fox* (WVA); *A. H. Curtiss* 5546 (E, G, GH, JE, WU, WVA); Dade Co., *J. K. Small,* 11589 (WVA).

C. C. Deam 1711 (GH) from West Palm Beach, Palm Beach Co. and *A. H. Curtiss,* 342 (GH) Brevard Co., Florida, are transitional forms.

b) **subsp. pauciflora** (Small) Chaudhri, com. et stat. nov.: *Siphonychia pauciflora* Small, Fl. SE U.S., ed. 1, 402 (1903).

Type: "Georgia and Florida", in sandly soil, *Small* (NY, not seen).

Core in Journ. Mitchell Sci. Soc. 55: 343 (1939).

Cymes sparse, few-flowered and lax.

Distr.: Parts of Georgia and Florida.

Georgia: Laurens Co., *R. M. Harper* 1353 (E, G, GH); Bulloch Co., *Harper* 967 (E, GH); Baker Co., *R. F. Thorne* 5725 (GH). **Florida:** Leon Co., v.-vii. 1943, *Rugel* (G); Lafayette Co., *Small et al.* 11474 (GH); St. Johns Co., *Rugel* 59 (GH); Volusia Co., *F. C. Straub* 160 (GH); Highlands Co., *R. F. Thorne* 15254 (GH); and *L. J. Brass* 14470 (GH).

This species is very close to *P. drummondii* T. and G. and *P. jonesii* Johnston, particularly in the form and structure of the sepals, and in the presence of hooked hairs on the base of the flowers. It is interesting to note the presence of an initial stage in the development of the sepal awn, in the form of a minute cusp, on the sepal tips. *Rugal* 58 (GH) and *E. H. Butts* 6.ix. 1943 (GH), both from Florida, well illustrate this rudimentary development.

2. **P. patula** Shinners in Sida 1(2): 102 (1962).

Siphonychia diffusa Chapman, Fl. S.US, ed. 1,47 (1860).

Core in Journ. Elisha Mitchell Sci. Soc. 55:342 (1939).

Syn.: *Buinalis diffusa* (Chapm.) O. Kuntze, Rev.Gen. 2:534 (1891).

An annual herb; stems ± prostrate, up to 50 cm long, with numerous branchlets, very shortly adpressed pubescent; internodes usually 1-2.5 cm long. Leaves ± oblanceolate to somewhat linear-oblong, up to 15 x 2 mm, obtuse to subacute, very shortly adpressed pubescent; stipules lanceolate, up to 3.5 mm long, acuminate, much shorter than the leaves. Cymes densely congested in more or less spheroid clusters,

c. 3-5 mm in diam., often very profusely developed at the ends of short lateral branchlets; bracts foliaceous, shorter than the fully developed flowers. Flowers subsessile, 1.5-1.9 mm long, narrowly tubular, fleshy herbaceous, the lower half reddish-brown, the basal (receptacular) region pubescent with short hooked hairs; sepals linear to narrowly (lanceolate-) oblong, 0.6-0.75 mm long, slightly narrowed at the tip, somewhat concave and slightly hooded and with a short but distinct cusp at the top, nearly white and fleshy; receptacle very well-marked; petals 0.4 mm, with a reddish tip, filaments 0.5-0.55 mm; anthers 0.2 x 0.15 mm, rectangular and dark-brown; ovary ovoid, style 0.9-1 mm long, very shortly or minutely bilobate and almost reaching the apex of the sepals.
Fl. 7-9. Dry sandy fields and woods.
Type: Florida, *Chapman* (holo. NY?); no particular specimen mentioned as type in the original description.
Distr.: Northern and Central Florida, Southern Georgia, SE Alabama, and possibly in E.Louisiana.
Alabama: *Buckley* (GH). **Georgia:** Decatur Co., *R. F. Thorne* 5917 (GH). **Florida:** Escambia Co., *Chapman/Biltmore Herb.* 4598c (L); *Curtiss* 6921 (E, GH, WU); Okaloosa Co, *E. S. Ford* 3877 (GH); Walton Co., *Godfrey* and *Kral* 55136 (GH); Gadsden Co., *Wiegand & Manning* 1163 (GH); Leon Co., *Rugel* 57 (GH, WVA); *R. Ké Godfrey* 53892 and 56089 (GH); Liberty Co., *Godfrey* 52398 (GH), 53577 (WVA); Wakula Co., *id.* 53536 (GH, WVA); Franklin Co., *Chapman/Biltmore Herb.* 4598 & 4598a (GH); Levy Co., *Edward Palmer* 38 (GH); *A. H. Curtiss* 343 (GH, WU); Marion Co., *A. H. Curtiss* 6659 (E, G, GH, WU); *R. Kral* 7674 (GH); Lake Co., *Wilbur & Webster* 2660 (G); *G. V. Nash* 1167 (G, GH); Polk Co., *Godfrey & Kral* 53840 (WVA).
The specific epithet *"diffusa"* could not be reteined when this species was transferred from *Siphonychia* to *Paronychia,* as it had already been used by A. Nelson (*Paronychia diffusa* A. Nelson, Bull. Torr. Bot. Club 26: 237, 1889.).

3. **P. erecta** (Chapman) Shinners in Sida 1(2):102 (1962).
Siphonychia erecta Chapman, Fl. S.US, ed. 1, 47 (1860).
Type: Florida, sands along the west coast, *Chapman* (NY?).
Core in Journ. Mitch. Soc. 55: 343 (1939).
Syn.: *Buinalis erecta* (Chapm.) O. Kuntze, Rev.Gen. 2: 534 (1891).
Odontonychia erecta Small, Fl. SE US, 401 (1903).

A perennial or occasionally biennial herb; stems erect or ascending c. 10-40 cm tall, much-branched from the base, the branches almost simple below, often clustered and stout, with long, up to 2.5 cm, dark-brown internodes, glabrous and glaucous or minutely hirtellous (in var. *corymbosa*), pseudo-dichotomously forked above and crowned by compact glomerules. Leaves spathulate-oblanceolate to almost linear, the cauline ones up to 15 x 2.5(-2.75) mm, (the basal ones larger and relatively narrower, up to 27 x 3 mm, and densely

congested), ± obtuse, attenuate to the base, ascending to erect, rigid, on both sides glabrous or shortly adpressed strigose, (sometimes rather rough); margin strongly ciliate, rarely almost entirely glabrous; stipules large and conspicuous, up to 10 x 3 mm, ovate-lanceolate, often larger in the basal region of the stem. Cymes compound, densely aggregated to form terminal, somewhat globose heads or glomerules, c. (6-)10-15 (-30) mm in diam., mostly very prominent. Bracts foliaceous, shorter than the flowers. Flowers sessile, 2.5-3 mm long, narrowly tubular, pale brown; receptacle c. 0.75-1.25 mm long, distinctly ribbed on the outside, mostly glabrous, sometimes very shortly hirtellous (with straight hairs); sepals narrowly oblong or lanceolate-oblong, 1.75 -2 mm long, slightly narrowed at the tip, obtuse, fleshy-herbaceous and pale-brown, with a white, somewhat inflexed margin, the apex slightly incurved forming a very small hood, cusp or awn indistinct or obscure (almost nil); petals 0.4 mm; filaments (0.65-)1-1.2 mm; anthers 0.3 x 02 mm, dark-brown; ovary c. 0.4 x 0.3 mm, ovoid; style 1.5-1.8 mm long, filiform, shortly bidentate at the tip, and slightly exserted in the ripe flowers. Fruit ovoid-oblong, 1-1.2 x 0.75 mm.

Fl. 6-9. Sand dunes.

Distr.: SE United States: Mississippi, Alabama and Florida.

a) **var. erecta:** Shoots glabrous; leaves on both sides glabrous or with a thin strip of hairs along the midrib on the underside, margin shortly ciliate; flowers with an entirely glabrous base.

Alabama: Baldwin Co., *S. M. Tracy* 8689 (E, G, GH); *Webster* and *Wilbur* 3536 (G, GH).

Florida: Escambia Co., *Chapman/Biltmore Herb.* 4599 a (JE); Okaloosa Co., *Mr. & Mrs. Davis* 11450 (WVA); Santa Rosa Co., *Harper* 3748 (GH); Franklin Co., *A. W. Chapman* (GH); *E. S. Ford* 3139 (GH); *Godfrey et al.* 53404 (WVA); Wakula Co., *Thorne & Davidson* 17289 (GH).

b) **var. corymbosa** (Small) Chaudhri, comb. et stat. nov.

Siphonychia corymbosa Small, Bull. Torr. Bot. Club 24: 337 (1897). Type: Mississippi: Ship Island, vi. 1896, *L. M. Underwood* (holo. NY, not seen); Core in Journ. Mitch. Soc. 55:344 (1939).

Odontonychia corymbosa (Small) Small, Fl. SE US, 402 (1903). Stems hirtellous; leaves strigose and somewhat rough; flowers very shortly ciliate on the receptacle.

Mississippi: Ship Island: v. 1859, *E. Hilgard* (GH); Cat Island Harrison Co.: *Tracy & Lloyd* 76 (E, G, GH); *Tracy, Earle & Seymour* 30/9195 (G, GH, annual-biennial form); Horn Island: Jackson Co.: *S. M. Tracy* 6410 and 7652 (E, GH).

Alabama: Mobile Co.: *R. M. Harper* 3802 (GH).

Florida: Bay Co.: *Godfrey* and *Kral* 54215 (WVA) trans. form); Calhoun Co.: 11.vii.1924, *Small, DeWinkeler & Mosier* (GH); Columbia Co.: *Wiegand & Manning* 1164 (GH, stems pubescent and cymes much-branched).

4. **P. rugelii** Shuttleworth ex Chapman, Fl.S.US, ed. 3, 397 (1897). Shinners in Sida 1(2): 102 (1902).

P. rugelii Shuttleworth ex Chapm., Fl. S.US ed. 1, 47 (1860) in synon. of *Siphonychia rugelii.*

Type: Florida: "Ad fluv. Whittlecouchy, prope Camp Island, Florida or.", vii. 1848, Rugel 54 (holo. NY; iso. E!GH!).

Syn.: *Siphonychia rugelii* (Shuttleworth ined.) Chapman, Fl. S.US, ed. 1, 47 (1860); Core in Journ. Elisha Mitchell Sci.Soc. 55:345 (1939). *Buinalis rugelii* O. Kuntze, Rev, Gen. 2:534 (1891). *Forcipella rugelii* (Shuttleworth) Small, Bull. Torr. Bot. Club 25: 150 (1898). *Gibbesia rugelii* (Shuttleworth) Small, Bull. Torr. Bot. Club, 25:621 (1898).

An annual herb; stem erect, c. 10-40 cm tall, branched somewhat above the base, the main branches pseudo-dichotomously forked, in turn producing numerous lateral shoots, mostly directed upwards and usually terminating in repeatedly forked though rather compact corymbose cymes; internodes up to 4 cm long, stout, ± brown, and densely pubescent with short, retrorse hairs. Leaves linear-oblanceolate to somewhat linear-oblong, 10-20 x 1.5-2.25 mm, acute or subacute, adpressedly strigose-pubescent; stipules ovate-lanceolate, up to 5 x 1.2-2 mm, acuminate, often deeply split. Cymes dichasial, corymbosely arranged and often forming large clusters, the ultimate cymules 2 to 3-flowered, very occasionally the lateral flower-buds abortive and represented by hardened bead-like bodies; bracts foliaceous, shorter than the flowers. Flowers sessile (2.3-)2.5-3(-3.5) mm, narrowly tubular, light brown; receptable c. 0.75-1 mm, dark-brown, pubescent with short, spreading and straight hairs; sepals linear to linear-lanceolate, c. 1.5-2 mm, very slightly hooded but distinctly awned, herbaceous and nearly white; petals 0.5-0.6 mm, with a reddish tip; filaments c. 1 mm long; anthers 0.3 x 0.15-0.2 mm, ± oblong and purple-black; ovary c. 0.5 x 0.4 mm, ovoid; style (1.5-)1.75-2.25 mm, filiform, slightly exserted in a fully ripened flower, shortly bilobate at the top. Fruit almost globose, c. 0.7 x 0.6 mm, the membranous pericarp closely sticking to the seed. Fl. 7-9(-10). Dry sandy fields, in loose sand along the coastal regions. Distr.: SW Georgia and Northern Florida.

a) **var. rugelii:** Cymes rather closely clustered, flowers 2.7-3(-3.5) mm. Distr.: Georgia and Eastern Florida.

Georgia: Montgomery Co., *R. M. Harper* 1990 (GH); Baker Co., *R. F. Thorne & R. A. Davidson* 16403 (GH); Decatur Co., *R. F. Thorne 6585 (GH); A. H. Curtiss* 345 & 6515 (GH).

Florida: Camp Island, *Rugel* 54 (E, GH, isotype); Taylor Co., *R. K. Godfrey* 55800 (GH); Dixie Co., *id.* 57445 (GH); Hernando Co., *R. Kral* 7909 (GH); Pasco Co., *id.* 7261 (GH).

b) **var. interior** (Small) Chaudhri comb. et stat. nov.

Odontonychia interior Small, Man. SE Fl. 483 (1933).

Type: Florida: along the Suwanea River, E. of Old Town, *Small* et *al.* 11465 (NY, not seen);

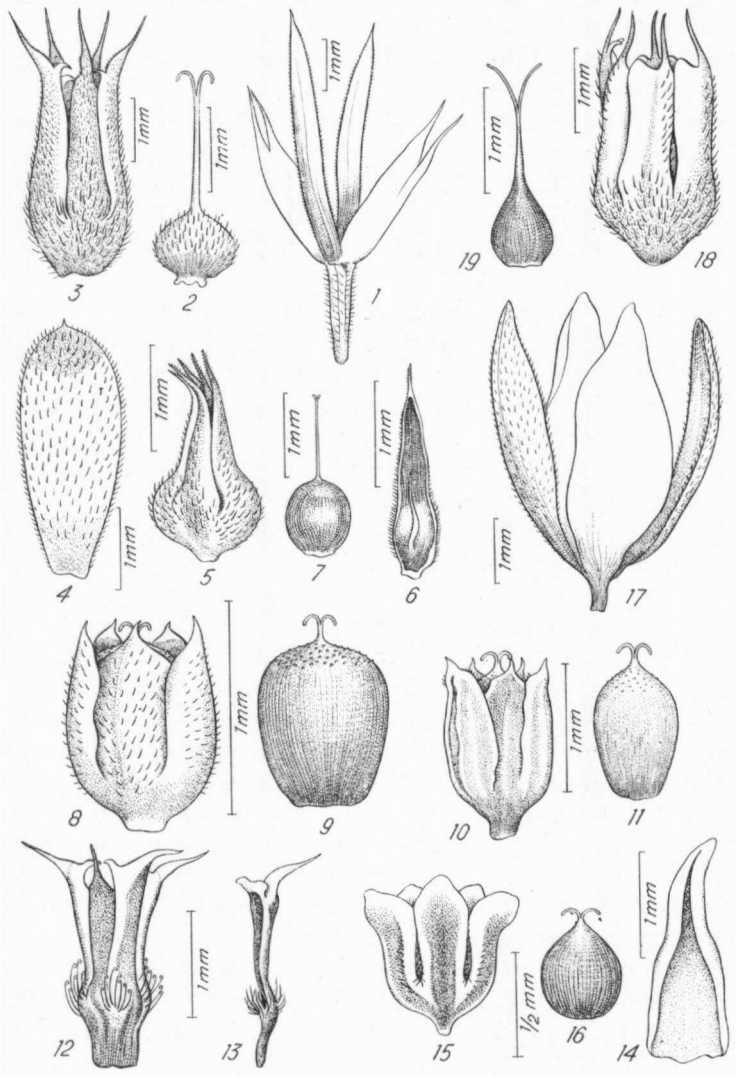

Plate III. Fig. 1-3: **Paronychia sessiliflora**; 1: leaves with stipules; 2: flower; 3: ovary and style [*Rollins et Munoz* 2899(GH)]. Fig. 4-7: **P. herniarioides**; 4: leaf; 5. flower; 6: sepal, inner side; 7: fruit with style [*Wilbur et Webster* 2719 (GH)]. Fig. 8-11: **P. baldwinii**; 8: flower; 9: fruit with style [subsp. **baldwinii**: *Godfrey* 57794(GH)]; 10: flower; 11: fruit and style [subsp. **riparia**: *Fernald et Long* 11334(GH)]. Fig. 12-13: **P. drummondii**; 12: flower; 13: sepal, section showing the hood and awn [*Drummond* 93(FI)]. Fig. 14-16: **P. chartacea**; 14: leaf; 15: flower; 16: fruit with styles [*O. Lakella* 24717(GH)]. Fig. 17-19: **P. pulvinata**; 17: leaves with stipules; 18: flower; 19: ovary and style [*Ripley & Barneby* 7209(NY)]:

Syn.: *Siphonychia interior* (Small) Core, Journ. Elisha Mitchell Sci. Soc. 55: 344 (1939).
Cymes lax and loose, flowers 2.3-2.6 mm long. Distr.: NW Florida and Georgia.
Georgia: Decatur Co., *R. M. Harper* 1234 (GH); **Florida:** Suwanee Co., *Small et al.* 11451 (GH).
Shinners, op. cit., has quite correctly pointed out that the so-called "indurated bracts" are merely diseased or abortive flower-buds. *Curtiss* 345 from Bainbridge Georgia is a good example of such buds. This species differs from *P. erecta* in having distinct awns at the sepal tips besides having rather lax cymes.
Subgenus **Paronychia**: Leaves cuspidate or mucronate; sepals semi-scarious or subcoriaceous, with a distinct hood and (usually) a short or long awn at the tip.
Section **Nyachia** (Small) Pax et Hoffm. p. 83: Sepals umbonate, i.e. with a prominent hood but without an apical cusp or awn.

5. **P. chartacea** Fernald nom. nov. in Rhodora 38:418 (1936).
Core in Amer. Midl. Nat. 26(2): 384 (1941).
Syn.: *Nyachia pulvinata* Small, Torreya 25:12(1925).
Type: Florida: In the scrub between Avon Park and Sebring, 13.xii. 1920, *J. K. Small* 9782 (holo. NY, not seen). *Paronychia pulvinata* (Small) Pax & Hoffm. in Engler & Prantl, Nat. Pflanzenfam. ed. 2,16c: 300 (1934), non *P. pulvinata* Gray in Proc. Acad. Sci. Philadel. 1863: 58 (1864).

Plate III, Fig. 14-16. p. 114

An annual herb; stem 5-20 cm long, much-branched at the base, the branches prostrate, radially spreading and repeatedly (pseudo-dichotomously) forked, often forming dense mats; internodes 5-10 mm long, shortly adpressed pubescent to puberulous. Leaves sessile, mostly triangular-ovate (younger ones suboblong), 1.5-4 x 1-1.5 mm, very thick-coriaceous (with a strongly revolute margin); stipulates ovate-lanceolate, 1-1.5 mm long, much filmbriate, at the base somewhat coriaceous and reddish-brown. Cymes much-branched and very profusely developted all along the branches, particularly towards the upper parts of the shoots. Stipulary bracts very short, much shorter than the flowers, ovate-lanceolate and reddish-brown. Flowers ± sessile, 0.6-0.7 mm long, somewhat tubular-oblong to vase-like to almost campanulate in the fruiting stage, very shortly pubescent to puberulous on the basal part, esp. on the base of sepal margins; receptacle very inconspicuous; sepals 0.5-0.6 mm long, ± oblong, rather coriaceous, strongly hooded, and with a thick, nearly white umbo at the tip, and with a rather thick and nearly white margin towards the base, distinctly 3-nerved, on both

sides brownish; petals absent or rudimentary; filaments 0.3-0.35 mm; anthers 0.25 x 0.2 mm, ± oblong, orange, enclosed in the sepal hood; ovary 0.4 x 0.3 mm, ovoid-ellipsoid, reddish-brown; styles distinct, 0.3-0.35 mm, filiform and spreading. Fruit 0.5 x 0.45 mm, ovoid to almost globose, nearly equalling the sepals, with a very thin, membranous pericarp, which closely sticks to the nearly globose seed, which is 0.45 mm in diam. The central flowers occasionally tetramerous and occasionally with 3 styles. Fl. 7-9. Sand scrubs and dunes.
Type: as that of *Nychia pulvinata* Small.
Distr.: Lake Region in Central Florida.

Florida: Polk Co., *H. J. Koehler* 57 (GH); *O. Lakela* 24549 (GH). Highlands Co., 17.viii.1924, *J. K. Small et al.* (WVA, U); *P. B. M. Thorlin* 8605 (TEX); *L. J. Brass* 15563 (GH); *O. Lakela* 24717 (GH); *R. F. Thorne* 15257 (US). De Soto Co., *Small & DeWinkler* 9803 (GH).
This species is the sole representative of the section *Nyacha* (Small) Pax & Hoffman, and was first described by Small in his monotypic genus *Nyachia.*

Section **Paronychia:** Leaves cuspidate or mucronate; sepapls semi-scarious or subcoriaceous, with a distinct hood and either a cusp or a distinct awn at the apex.
1. Subsect. **Fasciculatae** Chaudhri subsect. nov. p. 85: Leaves in axillary fascicles.

6. **P. camphorosmoides** Cambessèdes in St. Hilaire, Fl. Brasil. merid. 2:187 (1829). Rohrbach in Martius, Fl. Brasil. 14(2):251 (1872).
Syn. *Pentacena camphorosmoides* (Camb.) Walpers, Repert. 1:26 (1842).

Plate V, Fig. 15-17. p. 162

An annual or occasionally, a biennial herb; stem erect, 7-32 cm tall, branched from just above the base, sometimes almost umbranched, branches mostly ascending or upwards-directed, compact, brownish-green to dark-brown, densely leafy, internodes up to 1 cm long, mostly rather short, stout, minutely pubescent. Leaves subsessile, rigid, spreading, and the most conspicuous part of the plant, linear-subulate or linear-lanceolate, (-oblanceolate) 4-10(-13) x 0.5-1.25(-1.5) mm, mostly acuminate, strongly mucronate, on both sides shortly scabrous-pubescent or occasionally subglabrous, margin ciliate and sometimes somewhat thickened, slightly carinate, often forming very conspicuous fascicles at each node due to the development of numerous small, axillary shoots, midribs well-marked towards the base; stipules lanceolate, up to 4 mm long, acuminate, margin finely ciliate, mostly about half as long as the leaves, two per pair of leaves but each

2-partite. Flowers aggregated in 3-6-flowered, rather inconspicuous, lateral to axillary, sessile clusters on the main shoots; bracts ovate-oblong, 1-1.3 x 0.75-1 mm, subobtuse and strongly ciliate, basal part often reddish, somewhat shorter than the flowers. Flowers shortly pedicellate, brownish, 1.25-1.35 mm long, cup-like to turbinate, pubescent on the basal half, almost glabrous above; sepals equal, oblong to ovate-oblong, 0.7-0.75 mm long, acute to nearly obtuse, with a brownish membranous margin, a very small, almost indistinct hood and a very minute scabrous awn or mucro, 0.05 mm, at the tip; spreading in age; petals very minute, 0.2-0.25 mm; filaments 0.3-0.35 mm; anthers subquadrangular 0.15 mm in diam; ovary c. 0.45 x 0.4 mm, ovoid, dark-brown, densely, warty and rough; style almost nil; stigma subsessile, sulcate or shortly bifid, 0.05-0.1 mm. Fruit c. 0.85 -1 x 0.75, obovoid, rounded above and slightly narrowed to the base, ± equalling the calyx, densely papillose-warty on the upper part; seed 0.75-0.85 mm in diam., almost globose.

Fl. Dec.-Feb. Ft. March-May. Grasslands, 750-2100 m.

Type: Brasil: Prov. de Saint Paul (Sao Paulo), *A. de Saint-Hilaire,* Catal. C^2 1513 (holo.P!).

Distr.: Endemic in SE Brasil.

Minas Geraes, Caldas, *G. A. Lindberg* 417 (S). **Sao Paulo:** Serra da Bocaina, 2100 m, *A. C. Brade* 20885 (U); Sao Paulo: *id. 13073* (U); Campos do Jordao, *G. Hashimoto* 33 (RB). **Parana:** Carambehy, *P. Dusen* 11298 (S). **Santa Catarina:** Sombrio, *P. R. Reitz* C 1061 (GH, S); Mafra, 750 m, *id.* 5216 (S).

7. **P. fasciculata** Chaudhri n. spec.

Plate V, Fig. 24-26. p. 162

Herba perennis vel interdum biennis, e basi lignosa subcaespitosa. Caulis primarius 20-25 cm altus, erectus, per totam longitudinem ramificatus; ramuli robusti et foliosi, saturate brunnei, parce pubescentes vel puberuli, dense congesti. Folia patentia, lineari-subulata, usque ad 7 mm longa et 1.5 mm lata, acuminata et mucronulata, coriacea, utrimque glabra, margine saepe incrassato ciliolata, costa prominente, pro parte ad nodos fasciculata; stipulae ad basin connatae, ovato-lanceolatae, usque ad 3 mm longae, acutae, basi rubro-brunneae, foliis multo breviores. Glomeruli in ramulis principalibus laterales, interdum e floribus 3 vel 4 compositi, plerumque tamen ad florem singulum redacti; bracteae ovatae vel suboblongae, circ. 1.4 mm longae et 1.0 mm latae, acutae vel abtusae, plerumque saturate brunneae, floribus breviores. Flores sessiles, conici vel teretes, 1.8-2.0 mm alti, in parte basali semiglobosa viriduli et puberuli, alibi plerumque saturate brunnei et parce pubescentes; sepala lanceolato-oblonga, 1.25-1.35 mm longa, plus minusve truncata, e parte centrali fortiter 3-nervia et margine membranaceo brunneolo composita, apice arista albida et sca-

brido-pubescente, 0.15-0.2 mm longa instructa, conniventia; petala 0.6-0.65 mm longa, apice rubeola; stamina filamento 0.5 mm longo et anthera rectangulari 0.25 mm longa et 0.2 mm lata, aurantia instructa; ovarium rubeolum, circ. 0.75 mm altum et 0.55 mm diam., apice in stylum crassum contractum; stylus 0.15 mm longus in stigmata dua filiformia etiam 0.15 longa, denique divergentia exeuns. Fructus subquadrangularis, 1.25 mm altus et 1.1 mm diam., apice dense verrucosus. Florens mensi Julio.
Type: Brazil, Prov. Minas Geraes: Serra do Curra, Belo Horizonte, 14.vii, 1957, *Luiz Roth* 1680 (holo.RB!).
Distr.: Endemic.

Serra da Piedada, *A. Glaziou* 20336 (C). Goias (Goyaz), *A. Glaziou* 20336 (S).

Resembles P. camphorosmoides Cambessèdes in general appearance, but differs in being mostly perennial, in its (on both sides) ± glabrous leaves, brownish stipules and bracts, almost twice as large and sessile flowers with a conical-cylindrical (instead of obovoid) form, quite distinct, though short, sepal awns and hoods, conspicuous petals, prominent anthers, conical-ovoid (not obovoid) ovary, tapering upwards into a short thick style and filiform stigmas.
2. Subsect. **Polygonoideae** (DC.) Chaudhri p. 85: Plants dark purple-violet throughout; leaves and sepals coriaceous.

8. **P. suffruticosa** (L.) DC. in Poiret, Encycl. 5:25 (1804).

Willkomm & Lange, Prodr. 3:154 (1874); Willk., Suppl. 216 (1893); Gürke in Richter-Gürke, Pl. Europ. 2(2): 189 (1899) sub *Herniaria*; J. Briquet in Annuaire Conserv. et Jard. Bot. Geneve, 13 -14: 390 (1911); R. Maire, Fl. Afr. Nord 9:14 (1963); A. O. Chater in Tutin et al. Fl. Europ. 1:150 (1964).
Basionym: *Illecebrum suffruticosum* L., Sp. Pl., ed. 1, 208 (1753). Type: Linnaeus Herbarium no. 290-2/11 (LINN!).
Syn.: *Paronychia fruticosa* (L.) Lam., Fl. 3:230 (1778). Type: Herb. Lamarck (P!). *Herniaria polygonoides* Cavan., Icon. 2:27, tab. 137 (1793). *H. erecta* Desf., Fl. atl. 1:214 (1798). *H. suffruticosa* (L.) Desf., Tabl. ed. 1, 45 (1804). *H. paniculata* Webb, Iter Hisp. 46 (1838). Type: SE Spain, Sierra de Tela, env. Alicante, vii, 1826, Webb (K!). *Paronychia paniculata* (Webb) Benth. & Hook., Gen. Pl. 3(1): 16 (1880). *Herniaria polygonoides β diffusa* Rouy, Exc. bot. 2:67 (1883). *Paronychia polygonoides* (Cavan.) Gürke op. cit.

Plate IV, Fig. 7-9. p. 130

A small, usually purple-violet bushy herb or subshrub with a long, almost unbranched, woody tap-root; stem very woody at the base (c. 1 cm in diam.), much-branched above, 12-45 cm tall, erect; branches

mostly somewhat upwards-directed, and not much spreading, very leafy, often with rather long, (up to 3 cm), stout internodes, shortly retrorsely pubescent or, occasionally minutely puberulous or glabrous, or (in subspecies *hirsuta*) densely strigose pubescent or somewhat hirsute. Leaves oval-elliptic to elliptic-oblong, sometimes ovate to ovate-elliptic, 5-11(-13) x 3-5(-7) mm, acute to occasionally subobtuse, shortly mucronate, dark-purple or violet-red, coriaceous, often on both sides glabrous, occasionally somewhat hirsate or scabridulous on the under side, margin usually somewhat thickened, pale, papillose, finely serrulate and ciliate, often ± spreading; stipules 3-4.5(-5.5) mm long, lanceolate. Flowers densely clustered in small, repeatedly branched dichasia which, however, are occasionally reduced to monochasia at the extremities of the shoots; the clusters subsessile, terminal and lateral, and very profusely developed on nearly all the shoots in the upper, almost leafless flowering region; bracts ovate, very short 0.7-0.85 x 0.5-0.6 mm, obtuse, with a densely ciliate margin, often reddish at the base. Flowers subsessile, 1.6-2.25 (mostly 1.75-2) mm, dark-purple-violet, mostly glabrous, occasionally shortly hirsute or scabrous; receptacle well developed, 0.6-0.75 mm, sepals equal, coriaceous, broadly oblong-rectangular, 1-1.25 x 0.75-1 mm, with a large and conspicuous stiff-coriaceous hood, but a very minute, nearly white and erect, mucro, 0.15-0.25 mm; the membranous margin somewhat inflexed and rather narrow; petals 0.55-0.6 mm, reddish-brown; filaments 0.45 mm and nearly white; anthers 0.35 x 0.25 mm, oblong and orange; ovary 0.75 x 0.55 mm, mostly ovoid, dark-red, densely papillose; stigma subsessile, 0.25-0.3 mm, long, bilobed, and the lobes divergent in age. Fruit 1 x 0.75 mm, ovoid, with very densely warty-papillose pericarp. Fl. 5-10. Rocky places, 200-1600 m.

Distr.: SE Spain.

a) **subsp. suffruticosa:** Stem and branches minutely pubescent to nearly glabrous; leaves on both sides glabrous; the flowers too glabrous; ovary ovoid.

Prov. Valencia: *Borja* 218 (W); Prov. Albacete: 19.vi.1882, *G. Rouy* (W); Prov. Alicante: 17.vi.1862. *L. Leresche* (L), forma compacta; vii.1826, *Webb* (K); 23.v.1881, *G. Rouy* (COI); Prov. Murcia: *E. Bourgeau* 1339 and 659 (E); *Porta* et *Rigo* 31 (B), *forma diffusa* Rouy; Prov. Cartagena: v-vi.1902, *Ibenez* et *al.* (E); Prov. Almeria: vi.1899, *E. Reverchon* 180 (B, Z); *W. J. Reijnders* 3478 (L); *Porta* et *Rigo* 43 (W); Prov. Jaen: vi.1901, *E. Reverchon* 4726 (B, E, Z); Prov. Granada: 29.vii.1873, *M. Winkler* (W); Prov. Malaga: *Porta* et *Rigo* 424 (HBG); *E. Boissier* in 1837 (E, W.); *Huter, Porta, Rigo* 590 (E, W); 14.vii.1910, *St.-Lager* (L, W); vii.1888, *E. Reverchon* 180 (E).

b) **subsp. hirsuta** Chaudhri nov. ssp. a subsp. *suffruticosa* caule ramulisque dense hirsutis, foliis subtus hirsutis vel hirtellis, floribus extus hirsutis, ovario pyramidato, apicem versus contracto distinguenda. Stem and branches hirsute; leaves hirsute to hirtellous on the under side;

flowers shortly hirsute; ovary conical ovoid, tapering upwards. Type: S. Spain: Prov. Malaga, Alhaurin el Grande, Los Caracolillos, in fissura saxi, 20. v. 1952, *H. Roivainen* (holo. COI!), sub *Herniaria fruticosa* L. Stem densely shortly hirsute; leaves up to 7 x 4 mm, ovate, acute to shortly acuminate and distinctly mucronate, finely hirsute or hirtellous on the under side, and almost glabrous on the upper; margin thickened, pale-yellowish, and densely serrate-ciliate. Flowers 2-2.3 mm long, ± oblong, densely though shortly hirsute on the basal half, but rather sparsely so on the sepal backs; sepals with a very conspicuous hood; petals 0.6-0.65 mm; filaments 0.45 mm; anthers 0.3 x 0.2 mm, orange-yellow; ovary 0.8 x 0.5 mm, subsessile, conical-ovoid, tapering upwards, and densely warty-papillose; stigma subsessile, bilobed, 0.25 mm, the lobes yellowish and divergent.
Differs from the **ssp. suffruticosa** in its densely hirsute stem, under side of the leaves, and flowers and in its longer, conical-ovoid ovary.
Distr.: Known only from a single gathering.

3. Subsect. **Anychia** (Michaux) Chaudhri stat. nov. p. 85
Flowers in repeatedly branched terminal cymes; bracts mostly much shorter than the flowers; sepals with a very short cusp at the tip; mostly annuals.

9. **P. canadensis** (L.) Wood, Class Book 262 (1861).

Core in Amer. Midl. Nat. 26(2):381 (1941); Fernald in Gray's Manual ed. 8, 613 (1950); Maguire in Gleason's New Britton & Brown, Flora of NE US 2:118 (1952); Strausbaugh & Core, Flora of West Virginia 2:358 (1953).
Syn.: *Queria canadensis* L., Sp. Pl., ed. 1, 90 (1753).
Type: "Habitat in Canada, Virginia", Herb. Linneaus no. 114/2 (LINN). *Q. dichotoma* Moench, Meth. 351 (1794). *Q. capillacea* Nutt., Gen. N. Amer. 1:159 (1818); *Anychia dich. toma* Michaux, Fl. Bor. Amer. 1:113 (1803). Type: "In montis Carolinae", *Michaux* (holo. Herb. Michaux P!); *A. canadensis* (L.) Ell., Sketch 1:307 (1824); *A. capillacea* (Nutt.) Eaton, Man., ed. 6, 295 (1883); *A. filiformis* Raf. ex Brit ton, Torr. Bot. Club 13:187 (1886).
A small annual herb; stem suberect, c. 10-40 cm tall, glabrous, simple and unbranched below, in the upper parts repeatedly (pseudo-dichotomously) forked into slender, almost filiform branches with long (1-4 cm) internodes. Leaves ± oval-elliptic to obovate, 5-25 x 2-8(-10) mm, very thin and deep-green,- glabrous, often obtuse, some times acute or subacute, at the base attenuate or narrowed into a short but distinct petiole, on both sides usually brownish-dotted; stipules lanceolate-subulate, up to 3 mm long and rather inconspicuous, Cymes lax, the older ones biparous but gradually becoming reduced to uni-

parous ones and occasionally to a solitary flower as well; bracts stipule-like and very small, much shorter than the flowers. Flowers subsessile, 1-1.25 mm, ± oblong, when young, subglobose in the fruiting stage, glabrous; sepals c. 1 mm long, oblong, obtuse, very slightly cucullate and very minutely apiculate-cuspidate, having a conspicuous membranous margin; petals absent (or indistinct); stamens two, filaments 0.4-0.5 mm long; anthers minute, c. 0.15 mm in diam., subquadrangular and orange-yellow; ovary ovoid, c. 0.4 mm in diam., papillose above; styles short, c. 0.3 mm, somewhat connate at the base, divergent above. Fruit 0.8-1 mm in diam., subglobose or globose, equalling or somewhat exceeding the sepals and enlarging the flower at maturity, densely warty at the top; seed c. 0.7 mm in diam., subglobose.

Fl. 7-9. Dry sandy woodlands, and loamy, wooded slopes.

CANADA: Ontario: Leomington, 30.vii.1892, *J. Macoun* (GH); Amherstburgh 31.vii.1901, *Macoun* (GH).
U.S.A.: New Hampshire: Rockingham Co.: *A. A. Eaton* 475 (GH); **Vermount:** Windham Co.: 22.viii.1902, *W. H. Blanchard* (GH); Bennington Co.: 11.viii.1902, *Blanchard* (GH). **Massachusetts:** Essex Co.: 14.viii.1887, *Sears* (GH); Middlesex Co.: 1.ix.1895, *E. F. Williams* (GH); Boston Co.: ix.1891, *M. L. Fernald* (GH); Norfolk Co.: 10.viii.1912, *G. G. Kennedy* (GH); Hampden Co.: *F. C. Seymour* 349 (GH). **Rhode Island:** Providence Co.: 20.ix.1884 *W. W. Bailey* (GH). **Connecticut:** New London Co.: 11.viii.1906, *R. W. Woodward* (GH); New Haven Co.: 8.vii.1906, *G. H. Bartlett* (GH); Hartford Co.: 15.viii.1901, *C. H. Bissel* (GH); Fairfield Co.: 24.viii.1898, *E. H. Eames* (GH); Windham Co.: 4.vii.1901, *A. W. Driggs* (GH). **New York:** Albany Co.: 5.viii.1911, *S. H. Burnham* (GH); Greene Co.: *H. D. House* 21598 (GH); Seneca Co.: *N. W. Folwell* 321 (GH); Tompkins Co.: *F. P. Metcalf* 6403 (GH); *Wiegand & Metcalf* 2258 (GH); Schuyler Co.: *Wiegand* 8061 (GH). **Pennsylvania:** Susquehanna Co.: *Lucy & Elmira* 8855 (GH); Luzerne Co.: *S. L. Glowenke* 8818 (GH); Northampton Co.: *R. L. Schaeffer, Jr.* 1866 (GH), 4338 (TEX); Philadelphia Co.: *H. A. Lang* 43 (GH); Chester Co.: *F. W. Pennel* 11820 (WVA); Lancaster Co.: 6.ix.1901, *A. A. Heller* (GH); Greene Co.: *S. S. Dickey* 32 (GH); Clinton Co.: *W. E. Westerfield* et *al.* 5711 (WVA); Cumberland Co.: *Wherry* et *al.* 6967 (GH); Somerset Co.: *S. G. Shetler* 189 (NY). **New Jersey:** Hunterdon Co.: *W. M. Benner* 8469 (GH); Monmouth Co.: *B. Long* 58675 (GH); Camden Co.: *Long* 16781, 27076 (GH); Gloucester Co.: *Long* 25939 (GH). **Delaware:** New Castle Co.: 30.vii.1875, *A. Commons* (GH). **District of Columbia:** Washington, vi-vii. 1896, *E. S. Steele* (GH). **Virginia:** Fauquier Co.: *H. A. Allard* 16022/10022 (GH); Frederick Co.: *F. W. Hunnewell* 15431 (GH); Shenandoah Co.: *Allard* 7946 (GH); Culpeppea Co.: *Allard* 8960 (WVA); Fairfax Co.: *Allard* 20706 (WVA); Page Co. *Mr. & Mrs. Steele* 73 (GH); Rockbridge Co.: 13.viii.1924, *J. R. Churchill* (GH, WVA); Bath Co.: *Hunnewell* 4704 (GH); Nelson Co.: *R. S. Freer* 1859 (GH); Carroll Co.: 12.vii.1892, *J. K. Small* (GH); Sussex Co.: *Fernald & Long* 8254 (GH); *Fernald, Griscom & Long* 6593 (GH); Isle of Wight Co.: *Fernald & Long* 14325 (GH). **West Virginia:** Preston Co.: 5.viii. 1956, *R. Snyder* (WVA); Greenbrier Co.: *Hunnewell* 2909 (WVA), 6728 (GH); Hampshire Co.: *Hunnewell* 18155 (GH); Sulphur Mineral Co.: vii.1955, *Melvin Brown* (WVA; Monongalia Co.: *A. H. Anderson & F. Paul Smith* 278 (WVA); Ohio Co.: *Bartholomew* 81 (WVA); Pleasants Co.: *Bartholomew* P-102 (WVA);

Hancock Co.: *Bartholomew* H-36 (WVA); Upshur Co.: *G. B. Rossbach* 1288, 1516 (WVA); Cabell Co.: *F. A. Gilbert* 601 (GH, WVA); Wetzel Co.: *O. Haught* 651 (WVA); Wayne Co.: *I. Lycan* 66 (WVA); Pendleton Co.: *West Va. Univ. Bot. Exped.*, 13.vii.1926 (WVA); Brooke Co.: *Oglebay Plant Club* 130 (WVA); Fayette Co.: *L. W. Nuttall* 798 (WVA); Kenawha Co.: 17.vii.1950, *O. Reed* (WVA); Raleigh Co.: *J. P. Tosh* 840 (WVA); Mason Co.: *Core* 6535 (WVA); Putnam Co.: *Core* 6425 (WVA). **North Carolina:** Yancey Co.: *H. E. Ahles & Duke* 46758 (GH); Haywood Co.: *A. L. Price* 161 (WVA); Buncombe Co.: *Baltimore Herb.* 5419a (GH); *B. L. Robinson* 32 (GH). **Tennessee:** Franklin Co.: *A. Ruth* 397 (partly) (GH); Rutherford Co.: *H. K. Svenson* 63, & 236 (GH). **Kentucky:** Harlan Co.: *T. H. Kearney, Jr.* 10 (GH); Carter Co.: *L. B. Smith* et *al.* 3475 (GH). **Ohio:** Hamilton Co.: vi-vii.1883, *C. G. Lloyd* (GH); Portage Co.: *Robinson & Webb* 1084 (GH); Erie Co.: 7.viii.1895; *E. L. Moseley* (GH). **Michigan:** Washtenaw Co.: *F. J. Hermann* 6943 (GH); St. Joseph Co.: *G. W. Parmelee* 1518 (TEX); Indiana: Franklin Co.: *S. Mocoy* 4163 (WVA); Jackson Co.: *R. M. Kriebel* 2343 (GH); Clark Co.: *C. C. Deam* 27996 (GH); Miami Co.: 1.vii.1942, *C. M. Ek* (LIL). **Illinois:** Henderson Co.: *Eyles & Eyles* 390 (GH); Vermillion Co.: *A. S. Pease* 16346 (GH); Piatt Co.: *Pease* 14093 (GH); Cass Co.: *A. B. Seymour* 1070 (GH); Mason Co.: 17.viii.1904, *H. A. Gleason* (GH); Peoria Co.: *V. H. Chase* 13746 (TEX); Woodford Co.: *Chase* 8285 (LIL); Cook Co.: *A. Chase* 863/4183 (GH). **Wisconsin:** Lacrosse Co.: *T. G. Hartley* 3066 (NY); Iowa Co.: *J. R. Heddle* 2773 (GH, TEX). **Minnesota:** Hauston Co.: *C. O. Rosendahl* 3846 (GH); Fillmore Co.: *Moore, Rosendahl & Huff* 19859 (GH). **Iowa:** Greene Co.: 31.vii.1867, *J. A. Allen* (GH); Decatur C.: 30.viii. 1898, *Fitzpatrick & Fitzpatrick* (GH); Harding Co.: *J. B. Elder* 379 (U); Davis Co.: *A. Hayden* 9161 (GH). **Missouri:** Christian Co.: 1.viii.1895, *J. W. Blankinship* (GH); Shelby Co.: *Palmer & Steyermark* 40872 (LD). **Arkansas:** Washington Co.: summer, 1939-1940, *B. C. Tharp* (GH). **Kansas:** Baldwin Hill: *W. H. Horr* E212 (GH, TEX). **Nebraska:** Cass Co.: 8.viii.1898, *J. L. Sheldon* (WVA).

Distr.: Very widespread in the Eastern USA: S. Ontario (CANADA) to North Carolina and Tennessee in the South and Nebraska and Kansas in the Mid-West. Its occurrence in Florida in the deep south, as suggested by Core, op. cit., however, is very doubtful. The structure of the plant body is appreciably affected by edaphic factors. In loose sandy soils for instance, the stem shows a highly divaricate habit, the branches being repeatedly (pseudo-dichotomously) forked, and much spreading, the cymes quite lax and the cymules sparse, few-flowered and rather distant or at least well-separated. In strongly limy soils, on the other hand, the branches are shorter, stouter, and the cymes too are rather densely congested, (the cymules closer together), very profusely floriferous, and the cymules mostly 3-flowered.

It is closely related to *P. fastigiata,* the other common eastern species, but is readily distinguishable by its glabrous stem, filiform branches, thin elliptic leaves and glabrous, greenish flowers.

10. **P. fastigiata** (Raf.) Fernald in Rhodora 38:421 (1936).

Core in Amer. Midl. Nat. 26(2):376 (1941); Fernald in Gray's Manual ed. 8, 612 (1950); Maguire in Gleason's New B. & B. Flora 2:118 (1952).

Syn.: *Anychia fastigiata* Raf. in Atl. Journ. 16 (1832); *A. polygonoides* Raf. l.c., non *Paronychia polygonoides* (Cav.) Gürke in Richter-Gürke, Pl. Europ. 2(2):189 (1899), & *P. polygonoides* Muschler in Engl. Bot. Jahr. 14:459 (1911).
Type: "Mountains of Alleghany", *Rafinesque* (Hb. ???). *A. conferta* Raf. l.c. ---- "From knobs of Kentucky"; *A lateralis* Raf. l.c. ---- "Arid hills of Kentucky"; *A. dichotoma* auct. mult. non Michaux, Fl. Bor. Amer. 1:113 (1803); *A. nuttallii* Small in Torreya 25:60 (1925). Type: Pennsylvania: Franklin Co.: *Nuttall* (NY, not seen).

A small annual herb; stem ± erect, up to c. 30 cm tall, almost simple and unbranched at the base, much-branched and flabelliform above, the branches rather slender, the primary ramification usually pseudo-dichotomous, the secondary and tertiary branchlets mostly lateral, often densely crowded and profusely floriferous at the top; internodes up to c. 1.5 cm long, shortly retrorsely pubescent. Leaves subsessile, oblanceolate to narrowly elliptic, 5-25 x 2-5 mm, acute to subobtuse and very minutely cuspidate, attenuate to the base, on both sides glabrous, dull brownish-green and sparsely gland-dotted, margin slightly serrulate and ciliate to almost entire; stipules lanceolate-subulate, up to c. 3.5 mm long, acuminate. Cymes copious, repeatedly forked though usually very dense; stipulary bracts almost shorter than the flowers, occasionally ± exceeding them. Flowers subsessile, 1.3 -1.5 mm long, tubular-oblong, often glabrous, sometimes sepals slightly ciliolate; sepals 1-1.2 mm long, linear-oblong, very shortly hooded and abruptly contracted into a minute cusp, rarely, in var. *nuttallii,* with a distinct cusp or a short awn, strongly 3-nerved on the back; petals absent; filaments c. 0.4 mm; anthers minute, c. 0.15 mm in diam., quadrangular and orange-yellow; ovary ovoid; style 0.3-0.35 mm, bifid. Fruit 0.8-0.85 x 0.6-0.7 mm, oblong to somewhat obovoid, with a flat and reddish-brown top, slightly shorter than (or almost equalling) the sepals; pericarp mostly smooth though at the top slightly papillose; seed c. 0.7 x 0.6 mm, subglobose-oblongish.
Fl. (6-)7-10. Open sandy woods, dry slopes and hillsides.
Key to the varieties:

1a) Stipulary bracts, distinctly exceeding the flowers ---- var. **paleacea**
1b) Bracts somewhat shorter than the flowers
2a) Sepals minutely mucronulate ..... var. **fastigiata**
2b) Sepals with a distinct white cusp or a short awn at the tips .... var. **nuttallii**

a) **var. fastigiata:** Bracts somewhat shorter than the flowers, sepals minutely mucronulate.
Distr.: Massachusetts to North Carolina and Tennessee (and probably

up to the northern parts of South Carolina, Georgia and Alabama), Wisconsin to Kansas, Oklahoma and northern Texas.

a) **Massachusetts:** Norfolk Co.: 2.ix.1895, *E. F. Williams* (GH); Essex Co.: 14.viii. 1887, *J. H. Sears* (GH); **Connecticut:** Fairfield Co.: *C. K. Averill* 1787 (GH); Hartford Co.: *C. A. Weatherby* 4992 (GH); **New York:** Saragota Co.: *H. D. House* 13354 (GH); Orange Co.: *H. M. Raup* 7775 (GH). **New Jersey:** Hunterdon Co.: *H. L. Fisher* 1522 (GH); *B. Long* 51364, 38318 (GH); Burlington Co.: *A. Gershoy* 313 (GH); Camden Co.: 23.ix.1921, *A. B. Meredith* (GH); Gloucester Co.: *B. Long* 23725 (GH); Salem Co.: *Long* 28909 (GH); **Delaware:** New Castle Co.: *R. R. Tatnall* 2307 (GH), Kent Co.: *Tatnall* 2342 (GH); **Pennsylvania:** Munroe Co.: 30.viii.1923, *J. R. Churchill* (GH); Lehigh Co.: *H. W. Artz* 12403 (GH); Lancaster Co.: *Heller & Halbach* 656 (GH); Centre Co.: 22.ix.1940, *J. P. Kelly* (GH); *H. A. Wahl* 1382 (GH); Huntington Co.: *W. F. Westerfeld* 6840 (GH); Bedford Co.: *Rossbach* 1218 (WVA); Allegheny Co.: ix.1912, *B. H. Patterson* (WVA); **District of Columbia:** Washington, 17.ix.1896, *E. S. Steele* (GH); **Virginia:** Rockbridge Co.: 17.viii.1924, *J. R. Churchill* (GH); *R. S. Freer* 1832 (GH); *Mr. & Mrs. Steele* 72 (GH); Bedford Co.: 11.vii.1871, *A. H. Curtiss* (GH); Roanoke Co.: *C. E. Wood, Jr.* 3814 (GH); Henrico Co.: *Fernald, Griscom & Long* 6594 (GH); Dinwiddie Co.: *Fernald & Long* 12343 (GH); Nansemond Co.: *Fernald & Long* 10640 (GH); Caroline Co.: *Fernald & Long* 9048 (GH); Fanquier Co.: *H. A. Allard* 5372, 8015 (GH); Montgomery Co.: *C. E. Wood, Jr.* 6699 (GH, WVA); **West Virginia:** Monogalia Co.: *Mr. & Mrs. Davis* 7050 (WVA); Mineral Co.: viii.1955, *M. Brown* (WVA); Harrisson Co.: *R. F. Martin* 353 (WVA); Fayette Co.: *L. W. Nuttall* 776 (WVA); Wirt Co.: *E. A. Bartholomew* W1914-1065 (WVA); McDowell Co.: 14.viii.1961, *D. J. Music* (WVA); Braxton Co.: 2.viii. 1953, *F. J. Boggs* (WVA); Taylor Co.: *Mr. & Mrs. Davis* 853 & 1399 (WVA); Pocahontas Co.: *Mr. & Mrs. Davis* 1423 (WVA); W. of New Creek, *E. B. Harger* 7962 (GH); **North Carolina:** Jackson Co.: v.-vii.1887, *R. Thaxter* (GH); Swain Co.: 15.vii.1891, *Beardslee & Kofoid* (GH, WVA); Haywood Co.: *H. E. Ahles & J. A. Duke* 46703 (GH); North-Carolina-Georgia boundary, Thomas Bald Summit, 19.viii.1893, *J. K. Small* (GH). **Alabama:** /1858, *C. W. Short* (GH). **Tennessee:** Obion Co.: *Eyles & Eyles* 8520 (GH). **Kentucky:** (SE): Harlan Co.: *T. H. Kearney, Jr.* 198 (GH); Union Co.: *H. T. Shacklette* 579 (GH); Ammons, *F. H. Sargent* 113 (GH). **Ohio:** Erie Co.: 6.viii.1895, *E. L. Moseley* (GH). **Indiana:** Shelby Co.: *R. C. Friesner* 17541 (GH, WVA); Greene Co.: *Friesner* 22412 (GH); Vermillion Co.: *F. H. Hermann* 8442 (GH); Clark Co.: *C. C. Deam* 7540, 7585 (GH); Jackson Co.: *R. M. Kriebel* 2344 (GH); French Lick, *F. H. Sargent* 141 (GH). **Illinois:** Mason Co.: 17.viii.1903, *H. A. Gleason* (GH); Grand River, *Gleason* 2495 (GH). **Wisconsin:** Buffalo Co.: *Fassett & Hotchkiss* 3441 (GH). **Iowa:** Davis Co.: *A. Hayden* 9613 (GH); Wapello Co.: *R. A. Davidson* 4064 (TEX). **Missouri:** Boone Co.: *F. Armet* 788 (GH); Dunklin Co.: *B. F. Bush* 493 (WVA); nr. Emma, *C. H. Demetrio* 39 (GH). **Arkansas:** Garland Co.: *V. H. Chase* 9933 (TEX); Drew Co.: *E. J. Palmer* 44243 (TEX). **Kansas:** Cherokee Co.: *A. S. Hitchcock* 801 (GH). **Oklahoma:** Leflov Co.: *G. W. Stevens* 2625, 2755 (GH). **Texas:** Franklin Co.: *L. H. Shinners* 15456 (TEX); Nacogdoches Co.: *B. C. Tharp & W. J. Brown* 53-82 (TEX).

b) **var. paleacea** *Fernald in Rhodora 38:421(1936):* Bracts longer than the flowers.

Type: Delaware: Newcastle Co.: Mt. Cuba, 30.vii.1875, *A. Commons* (GH!)

Distr.: New Jersey to Tennessee, and Illinois to Missouri & Northern Texas. **New Jersey:** Salem Co.: *B. Long* 16552 (GH). **Delaware:** New Castle Co.: 30.vii. 1875, *A. Commons* (GH, TYPE). **Pennsylvania:** Beaver Co.: *J. Bright 19 (WVA);*

Allegheny: 31.vii. 1889, *A. Zeigler* (GH). **Virginia:** Sussex Co.: *Fernald & Long* 10251, 12340, 12341, 12342 (GH). **West Virginia:** Monogalia Co.: *Mr. & Mrs. Davis* 2879 (WVA); Pendleton Co.: *West Va. Univ. Bot. Exped.* 776 (WVA); Ohio Co.: vii. 1936, *E. A. Bartholomew* (WVA). **North Carolina:** Buncombe Co.: *B. L. Robinson* 30 (GH): **Tennessee:** Franklin Co.: *A. Ruth* 397 (partly) (GH); Grundy Co.: *H. K. Svenson* 9109 (GH); Chester Co.: *S. M. Bain* 239 (GH). **Kentucky:** Rockcastle Co.: *L. B. Smith & A. R. Hodgdon* 3721 (GH). **Ohio:** Hamilton Co.: 14.vii.1882, *C. G. Lloyd* (GH). **Indiana:** Posey Co.: *Deam* 25435 (GH); Perry Co.: *Deam* 16587, 25113 (GH). **Illinois:** Mason Co.: *V. H. Chase* 12056 (TEX, W); Jackson Co.: *H. A. Gleason* 2905 (GH). **Missouri:** Washington Co.: *J. A. Steyermark* 12943 (GH); Stoddard Co.: *Steyermark* 11625 (GH); Butler Co.: *Steyermark* 11306, 11472 (GH). **Texas:** Dallas, vi.1873, *J. Reverchon* (GH).

c) **var. nuttallii** *(Small) Fernald in Rhodora 38:419(1936).*

Syn. Anychia nuttallii Small in Torreyea 25:60(1925).

Type: Pennsylvania: Franklin Co. Blue Ridge Summit, *Nuttall* (holo. NY, not seen).

Distr.: New York, Pennsylvania & Northern Virginia to Northern West Va. **New York:** Reusselaer Co.: *H. D. House* 19546 (GH). **Pennsylvania:** Huntington Co.: 10.ix.1918, *Mrs. J. Clemens* (GH); Franklin Co.: /1886, *Edw. Tatnall* (GH). **West Virginia:** Preston Co.: *E. S. Steele* 19a (WVA).

Fernald (Rhodora 38:416-421, 1936) has discussed the nomenclatural problems involved in selecting a proper name for this species. The epithet "fastigiata" was chosen in place of "polygonoides" which could not be transferred to Paronychia since it had already been used by Muschler for a different species of this genus.

This species, like *P. canadensis,* is widely distributed in the eastern to central-eastern United States, extending from Massachusetts to North Carolina & Tennessee (and probably also to the northern parts of South Carolina, Georgia & Alabama) in the south, and from Wisconsin to Kansas, Oklahoma & northern Texas. It, however, does not occur in Florida, and has been confused with *P. baldwinii* (Torr. & Gray) Fenzl by various authors, including Core.

It is readily distinguishable from *P. canadensis* by its rather stiff and minutely pubescent stem, often producing flabelliform branches. *P. canadensis,* on the other hand, possesses a very slender, much-spreading and glabrous stem and broader oval-elliptic leaves. *P. baldwini* can be distinguished by its longer and usually stouter spreading stems, larger leaves and stipules, and very diffuse and profusely developed cymes.

11. **P. montana** (Small) Pax & K. Hoffm. in Engl. & Prantl. Nat. Pflanzenfam. ed. 2, 16c: 300 (1934).

Core in Amer. Midl. Nat. 26 (2): 380 (1941); Strausbaugh et Core in Flora of W. Virginia 2:358 (1953).

Syn.: *Paronychia canadensis β pumila* Wood, Class Book 263 (1861).

Type: Maryland: "High pine wood hill", *Shriver* in 1859 (holo. MO, not seen) *Anychia divaricata* Raf., New Flora 4:42 (1838) as inter-

preted by Steele in Contr. US Nat. Herb. 13:363 (1911), non *Paronychia divaricata* Juss. in Mem. Paris 2:390 (1815). *Anychiastrum montanum* Small in Torreya 10:230 (1910). Type: Pennsylvania: Bedford Co.: *Small* (holo. NY, not seen). *Plagidia montana* (Small) Nieuwl. in Amer. Midl. Nat. 3:155 (1913). *Paronychia fastigiata* var. *pumila* (Wood) Fernald in Rhodora 38:421 (1936). *P. pumila* (Wood) Core in Va. Journ. Sci. 1:113 (1940).

A small annual herb; stem and branches prostrate, up to c. 25 cm long, diffuse, much-branched, the branches repeatedly (pseudo-dichotomously) forked, and spreading all around the base; internodes up to 1.5 cm long, minutely pubescent. Leaves ± oblanceolate (-spathulate) to almost linear-oblong, occasionally narrowly elliptic, 4-10 x 1-3 mm, acute, attenuate to the base, glabrous, often somewhat gland-dotted when young; stipules lanceolate, 1.5-2 mm long, acuminate. Cymes repeatedly forked, and very profuse, terminating the branchlets; bracts ovate-lanceolate, 0.75-1.4 x 0.5 mm, somewhat shorter than the flowers. Flowers 1.4-1.5 mm long, tubular-oblong, subsessile, glabrous, dark-brown; sepals c. 1 x 0.4 mm, ± oblong, shortly hooded and minutely cuspidate-mucronulate, strongly 3-ribbed; petals absent, filaments 0.65-0.7 mm long, subulate; anthers 0.25 (-0.3) x 0.2 mm, orange; ovary ovoid, c. 0.4 mm in diam., pink; style 0.6-0.75 mm long, filiform, longer than the young ovary, bilobate at the top. Fruit 1-1.2 x 0.8-0.9 mm, ellipsoidal, obtuse (but not flattened at the top), papillose-warty and brown at the top; seed c. 1 x 0.8 mm, subglobose.

Fl. 7-9. Shale barrens and slopes as well as dry woods.

Distr.: Pennsylvania to Georgia and Alabama, along the Appalachian shale barrens.

Virginia: Page Co.: *Mr. & Mrs. Steele* 242 (GH); Craig Co.: *id.* 3 (GH); Shenandoah Co.: *E. S. Steele* 38 (GH); *H. A. Allard* 8099 (GH); *F. J. Hermann* 9848 (GH); *Hunnewel & Griscom* 15169 (GH); *E. H. Walker* 1156 (WVA); Massanutten Mts.: *H. A. Allard* 3549, 7900, 7947, 8225, 8231 (GH); Hardy Co.: *Allard* 5524 (GH); Alleghany Co.: 1.vii.1939, *P. D. Strausbaugh* (GH, WVA); Rockingham Co.: *Steele* 17 (TEX, WVA); *Allard* 5529 (GH); *Heller & Halbach* 1090 (GH); Rockbridge Co.: 15.ix.1951. *Octavia Reed* (WVA); Warran Co.: *Baldwin* 5423 (partly, GH); Bath Co.: *Hunnewell* 4781 (KH); Frederick Co.: *Hunnewell* 18059 (GH); Botetourt Co.: *A. B. Massey* 3957 (GH). **West Virginia:** Nr. Romney, *Allard* 12120 (WVA); Mineral Co.: *Steele* 96 (US); Grant Co.: 5.vii.1939; *P. D. Strausbaugh* (WVA, U); Pocahontas Co.: *Hunnewell* 19173 (GH); Pendleton Co.: *Rossbach* 1575 (WVA); *Allard* 21664 (WVA); Hampshire Co.: *W. Frye* 1481, 1486 (WVA); Berkeley Co.: *Core* 5834 (WVA); Morgan Co.: *Mr. & Mrs. Davis* 1378 & 2880 (WVA). **North Carolina:** Henderson Co.: *Wiegand & Manning* 1158 (GH); Cherokee Co.: *Hunnewell* 10330 (GH); **Tennessee:** Washington Co.: *J. Bright* 15732 (TEX); **Georgia:** De Kalb Co.: *Wiegand & Manning* 1157 (GH); **Alabama:** „ALABAMA", *Torrey* (GH).

Very closely related to *P. fastigiata,* but distinguishable by its diffuse

habit, conspicuously long style, prominent anthers and obtuse fruit (not flat-topped) and, moreover, by being restricted to the shale barrens.

12. **P. baldwinii** (Torr. & Gray) Fenzl in Walpers Repert. 1:262 (1842).

Core in Amer. Midl. Nat. 26 (2): 375 (1941); M. L. Fernald in Gray's Manual of Botany, ed. 8:613 (1950).
Basionym: *Anychia baldwinii* Torr. and Gray, Fl. N. Amer. 1:172 (1838). Type: Florida: *Baldwin* (holo. probably NY, not seen). Syn.: *Anychiastrum baldwinii* Small, Fl. SE US: 401 (1903). *Plagidia baldwinii* Nieuwl. in Amer. Midl. Nat. 3:154 (1913).

Plate III, Fig. 8-11. p. 114

An annual, biennial or sometimes perennial herb; stems prostrate, c. 20-70 cm long, much branched; the branches often diffuse, filiform, usually terminated by a repeatedly forked cyme; internodes c. 0.5-4 cm long, minutely puberulous to almost glabrous in age. Leaves subsessile c. 10-25 x 2-6 mm, narrowly elliptic-oblong to ± elliptic-oblanceolate, acute and very shortly cuspidate, surfaces ± glabrous, margins minutely serrulate-ciliate, base somewhat attenuate, (leaves) often quite priminent; stipules lanceolate, acuminate, c. 3-4.5 mm long, often much split, and rather inconspicuous (in comparison with the leaves). Cymes diffuse, lax, mostly biparous, repeatedly forked or dichotomous, often terminating the slender, filiform, lateral branchlets, the cymules usually borne on the tertiary branchlets; bracts stipulary, narrowly lanceolate and c. ½ as long as the flowers. Flowers subsessile, 1.25-1.55 mm long, cylindrical-oblong, shortly ciliate to ± glabrous; sepals 1-1.2 mm long, oval-oblong to oblong, with a distinct (brownish) membranous margin, shortly hooded and minutely cuspidate at the tip, 3-nerved, the nerves prominent on the back; petals 0.5-0.6 mm long, ± equalling the filaments; anthers minute, c. 0.2 x 0.15 mm, orange-yellow; ovary ovoid (-conical), slightly tapering upwards, often reddish-brown and papillose-warty on the top; styles (0.35-)0.4-0.5 mm long, 2-cleft to the middle, sometimes bilobed almost to the base, stigmatic tips divergent. Fruit c. 1 x 0.7-0.75 mm, ellipsoidal or ovoid-ellipsoidal and ± equalling the sepals, often densely papillose at the top; seed 0.75-0.8 x 0.6-0.7 mm, nearly suborbicular-oblong, and dark-brown. Fl. 7-10. Dry sandy soils, low dunes and river banks.
a) **subsp. baldwinii:** Annual or occasionally, biennial; stems usually very shortly, minutely ciliate-puberulous; flowers 1.25-1.4 mm long, shortly cilate to almost glabrous; sepals c. 1 mm long, oval-oblong, with a ciliolate margin; style 0.4-0.5 mm, bifid. Fruit rounded at the top.
Distr.: North Carolina to Alabama and Florida.

North Carolina: Dare Co.: *W. B. Fox* 4147 (WVA); Onslow Co.: *R. L. Wilbur* and *E. O. Beal* 6495 (TEX); **South Carolina:** Georgetown Co.: *R. K. Godfrey* and *R. M. Tryon Jr.* 791 (GH); **Georgia:** Mcintosh Co.: *W. H. Duncan* 20491 (GH); *id. 20393* (GH, TEX); Glynn Co.: *R. M. Harper* 1533 (E, GH); Early Co.: *Thorne & Muenscher* 8533 & 8555 (GH); Decatur Co.: *Thorne* 6525 (GH) *Godfrey* 57794 (GH); *Harper* 1214 (E, GH); **Alabama:** Geneva Co.: *R. M. Harper* 4022 (NY) *(as P. riparia).* **Florida:** Gadsen Co.: *Ford & Arnold* 3616 (GH); Leon Co.: *Godfrey* 52464, 53744 (GH); *Harper* 226 (GH); *Godfrey* 52381 (GH, WVA), Wakula Co.: *Godfrey* 55638 & 58898 (GH); Franklin Co.: *Godfrey* 54122 (GH, NY, WVA); Madison Co.: *R. E. Perdue Jr.* 1832A (GH, U); *Godfrey* et *al.* 53948 (GH, NY); Taylor Co.: *Godfrey* 55801, 55802 (GH); Columbia Co.: *G. V. Nash* 2200 (E, GH); W. of Lake City, *Wiegand & Manning* 1161 (GH, forma rigida, plant biennial to perennial and stems stout); Suwanee Co.: *A. H. Curtiss* 6733 (E, GH); Duval Co.: *Curtiss* 337 (GH); Bradford Co.: *Wiegand & Manning* 1159 (GH); Alachua Co.: *Wiegand & Manning* 1160 (GH); Citrus Co.: *R. Kral* 7892 (GH); Godfrey 57295 (GH); Hernando Co.: *Godfrey* 57460 (GH); Brevard Co.: *E. Palmar* 37 (GH).

b) **subsp. riparia** (Chapman) Chaudhri stat. nov.:

P. riparia Chapm., Fl. S. US. Suppl. 607 (1860); Core in Amer. Midl. Nat. 26 (2): 376 (1941); Fernald in Gray's Manual ed. 8, 613 (1950); B. Maguire in the New B. & B., Flora of NE US 2:118 (1952). Type: Georgia: Banks of Flint River, *Chapman* (probably US or NY, not seen).

Syn.: *Anychiastrum riparium* Small, Fl. SE US 401 (1903).

Pagidia riparia Nieuwl. in Amer. Midl. Nat. 3:155 (1913) Perennial; stems minutely puberulous to ± glabrous; flowers 1.45-1.55 mm long, ± glabrous; sepals 1-1.2 mm long, oblong, with a brownish margin; style 0.35-0.4 mm long, bipartite, the lobes divergent-recurved with maturity; fruit narrowed at the top.

Distr.: Virginia to Northern Florida.

i) **var. riparia: Virginia:** Isle of Wight Co.: *M. L. Fernald* et *al.* 6592 (GH); Sussex Co.: *Fernald* et *Long* 6205 & 7433 (GH); Southampton Co.: *Fernald & Long* 6204 & 11334, 10252, 11032 (GH); *Fernald* et *al.* 5770, 5771 (GH); **North Carolina:** Cartert Co.: *W. B. Fox* et *al.* 1164 GH, WVA) Lenoir Co.: *Randolph* 572 (GH); New Hanover Co.: *Randolph* 1027 (GH); *Godfrey* 6358 (GH); Pender Co.: *Fox & Boyce* 3731 (WVA); **South Carolina:** Williamsburg Co.: *A. E. Radford* 24777 (GH); Myrtle Beach: *Houten & Schoenmakers* 1064 (U); **Georgia:** Pulaski Co.: *Harper* 1387 (E, GH); Montgomery Co.: *Harper* 1869 (E, GH); Dooly Co.: *Harper* 569 (E, GH); Baker Co.: *R. F. Thorne* 4519 & 5725a (GH); Banks of Flint River, *Chapman Herb.* 4297 (GH); *A. H. Curtiss* 341, 6713 (GH). **Florida:** Escambia Co.: *Kral & Godfrey* 6039 (GH).

ii) **var. ciliata** Chaudhri n. var. a. var. riparia floribus sparse puberulis distinguenda. Flowers minutely ((ciliate) puberulous. **Florida:** Leon Co.: *Godfrey* 53630 (WVA) (TYPE); **North Carolina:** Bronswick Co.: *Fox & Wells* 2860 W(VA).

Distribution of the species: Virginia to Florida & Alabama.

4. Subsect. **Chartaceifoliae** Chaudhri subsect. nov. p. 86

Leaves linear and subchartaceous or somewhat rigid; flowers mostly in terminal, repeatedly-forked, lax or compact cymes; sepals with a turbinate perigynous zone; sepal awns long and setaceous or rigid.

13. **P. lindheimeri** Engelm. ex A. Gray in Boston Journ. Nat. Hist. 6:152 (1850).
E. L. Core in Amer. Mid. Nat. 26 (2): 374 (1941).

Plate IV, Fig. 4. p. 130

A small annual herb with a short, slender tap root, and short, slender ± erect and almost glabrous (or minutely puberulous), brownish stem, 15-33 cm long, with 1-2 cm long internodes, much-branched, pseudo-dichotomously as well as laterally, the branches bearing repeatedly forked, diffuse cymes at the top. Leaves sessile, linear to filiform, up to 15 x 0.75 mm, glabrous, acute, the upper (younger) minutely mucronate-cuspidate; stipules lanceolate to ovate in the floral region, up to 5 mm long. Flowers in open, dichotomous cymes, repeatedly branched, and diffusely spreading; bracts foliaceous, often shorter than the flowers, occasionally ± equalling or exceeding them. Flowers sessile, 1.6-2 mm long (without the awns), somewhat vase-like, with a turbinate basal part and tubular-oblong calyx region, receptacle 0.5 -0.7 mm long, obconical, and shortly adpressed pubescent; sepals ± oblong, 1-1.2 mm long, entirely glabrous on the outside, distinctly cucullate, and shortly awned, the awn 0.35-0.6 mm, slender but stiff, pale-yellowish and divergent-spreading, inserted on the very short, thickened apical tip of the sepal; petals 0.75 mm, ± equalling the stamens; filaments 0.65-0.7 mm, anthers 0.25 x 0.2 mm, quadrangular and yellow; ovary ovoid, c. 0.5 x 0.4 mm, reddish-brown; style 0.55 -0.7 mm long, filiform, nearly white, 1/3 (-1/2) bilobate above. Fruit c. 0.8 x 0.7 mm, ovoid-globose, with smooth pericarp.
Fl. 6-10. Rocky places on limestone hills and high prairies.
Type: Texas: Comache Springs, ix. 1849, *Lindheimer* 144 (Lectotype (GH! iso. WVA!).
Distr.: Texas.

a) **var. lindheimeri:** Bracts distinctly shorter than the flowers.
Distr.: W.-Central Texas.

Comanche Springs. *Lindheimer* 144 (GH, WVA); Burnet Co. *G. L. Webster* 1981 (TEX); Travis Co., x.1941, *B. C. Tharp* (GH); *Tharp & Warnock* 45-29 *(GH); B. H. Warnock* W 1073 (GH, WVA); *V. L. Cory* 48022 (GH); Fredericksburg, *G. Thurber* 57 (GH); New Braunfels, ix.1849, *F. Lindheimer* 1105 (GH); Bandera Co.: *C. L. York* 47011 (TEX); "Texas", *F. Lindheimer* 335/Fasc. iii, (GH, W); "New Mexico", *Charles Wright* 1326 (GH, L);

b) **var. longibracteata** Chaudhri n. var. a var. *lindheimeri* bracteis flori aequilongis vel eo longioribus distinguenda.
Type: Texas: Bexar Co., nr. Bracken, 26. vi. 1903, *B. H. A. Groth* 10 (holo. GH).
Distr.: CSC. Texas.
Bexar C., *Groth* 10 (GH;) 29.v.1911, *Mr. & Mrs. J. Clemens* (TEX); Travis Co., *J. Cohn & F. A. Barkley* 13149 (TEX); Bandera Co., *B. C. Tharp* 5780

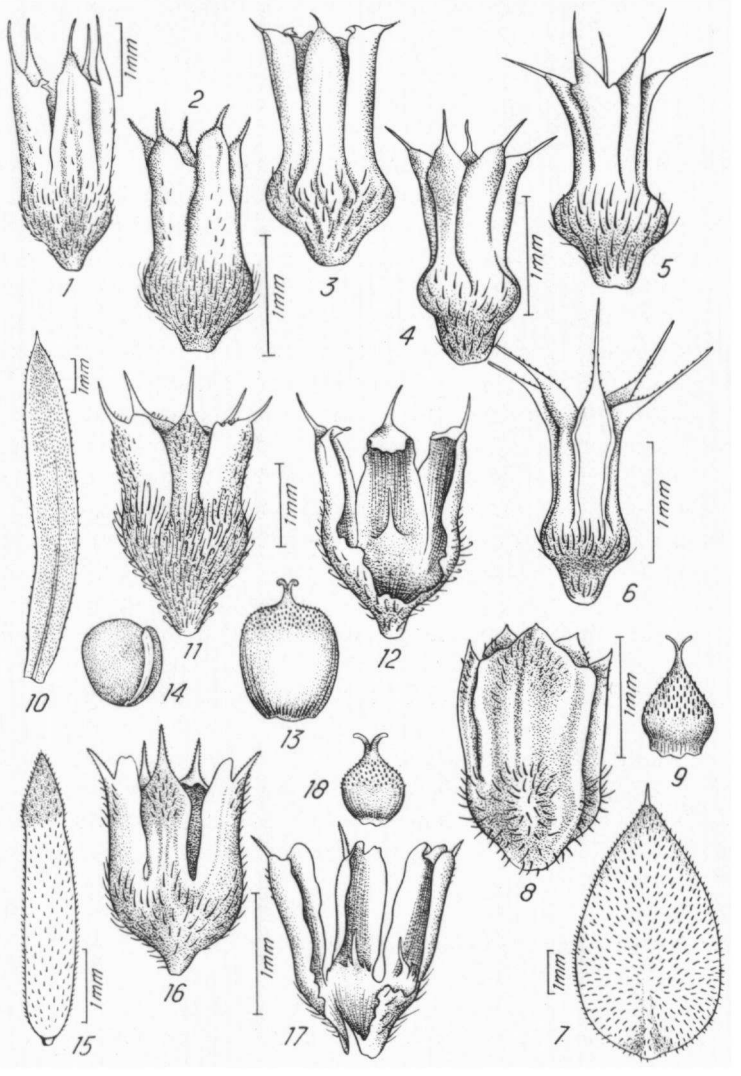

Plate IV. Fig. 1: **P. depressa**; flower [*Palmer* 37580(GH)]. Fig. 2: **P. jamesii**; flower [*Hulbert* 3226(U)]. Fig. 3: **P. monticola**; flower [*Cory* 40432(GH]. Fig: 4: **P. lindheimeri**; flower [*Lindheimer* 144(GH)]. Fig. 5: **P. chorizanthoides**; flower [*Palmer* 1169(GH)]. Fig. 6: **P. setacea**; flower [*Berlandier* 632-2042(GH)]. Fig. 7-9: **P. suffruticosa** subsp. **hirsuta**; 7: leaf; 8: flower; 9: ovary and stigma [20.v. 1952, *Roivainen*(COI)]. Fig. 10-14: **P. euphratica**; 10: leaf; 11: flower; 12: section of flower; 13: fruit; 14: seed [*Sintenis* 2763(JE)]. Fig. 15-18: **P. velata**; 15: leaf; 16: flower; 17: section of flower; 18: ovary [25.vi.1923, *Maire*(S)].

(TEX); Kerr Co., *G. L. Webster* 4311 (TEX, W); *A. A. Heller* 1729 (E, GH, as *P. setacea);* Val Verde Co., 350 m, *Warnock & McBryde* 15121 (TEX).
This species shows a close resemblance to *P. sectacea* T. & G. and *P. chorizanthoides* Small, but is distinguishable by its shorter sepal awns and much less hairy receptacle. *P. chorizanthoides* possesses a strongly swollen receptacle while in *P. setacea* it is only slightly distinct from the calyx. In *P. lindheimeri,* on the other hand, the receptacle is easily distinguishable from the calyx, though not so strongly enlarged as in *P. chorizanthoides.*

14. **P. chorizanthoides** Small in Bull. Torr. Bot. Club 24:336 (1897). Core in Amer. Mid. Nat. 26 (2) 373 (1941).

Plate IV, Fig. 5. p. 130

Annual herb; stems 10-30 cm long, suberect, divaricately (much-) branched, the earlier ramifications pseudo-dichotomous, the subsequent ramifications both pseudo-dichotomous as well as lateral, very diffuse (or much spreading), and profusely floriferous; the internodes 0.5-2 cm long, light-brown and minutely puberulous. Leaves sessile linear, 4-15 x 0.3-0.6 mm, acute, very minutely cuspidate, ± glabrous, mostly ascending, strongly ribbed; stipules lanceolate, 2-6 x 0.5-1 mm, acuminate, mostly shorter than the leaves. Cymes usually diffuse and repeatedly forked; bracts foliaceous, shorter than the flowers. Flowers subsessile, 1.6-1.75 mm (without the awns), ± urn-shaped with a much swollen-turbinate basal part and tubular calyx region; receptacle 0.5-0.6 mm, shortly pubescent on the outside; sepals glabrous 1-1.2 mm long, ± narrowly oblong, with a distinct hood, and a conspicuous 0.55-1 mm long, slender but stiff and divergently spreading awn; petals 0.65-0.7 mm; filaments 0.6-0.65 mm; anthers 0.25-0.3 x 0.2 mm, oblong and orange; ovary nearly globose, c. 0.4 mm in diam. and reddish-brown; style 0.65-0.7 mm long, filiform, about 1/3 bilobate at the tip. Fruit suboblong, 0.8 x 0.5 mm, smooth. Fl. 7-10. Rocky places, in dry and black calcareous soil, ca. 500-750 m.
Type: Central Texas: Burnet Co., Bluffton, W. of Georgetown, 10-15. x. 1879, *Edward Palmer* 1169 (holo. US! iso. E! GH!).
Distr.: Central & Western Texas.
Burnet Co., *E. Palmer* 1169 (E, GH, US, type); 18.vii.1937 *Geo. L. Fisher* (LD); Travis Co., *E. Hall* 50 (GH); Kerr Co., *C. L. Cory* 26224 (GH)) (as *P. wardii* Rydb.); Sutton Co., *V. L. Cory* 46026 (TEX); Edwards Co., *Cory* 35642 (GH) (as *P. texana* Cory).
Closely allied to *P. lindheimeri* Engelm. and *P. setacea* T. & G., but differing from the former in having longer sepal awns and a somewhat longer style and from the latter in having a much enlarged receptacle, a considerably longer style and much shorter foliaceous bracts. It

occupies a somewhat intermediate position between the two other spp. It is interesting to note that G. L. Fisher's gathering from Marble Falls, Burnet Co. (LD) has sterile anthers but is otherwise a typical representative of *P. chorizanthoides*. The possibility of interspecific hybridization between the three closely related spp. cannot be ruled out.

15. **P. setacea** Torr. & A. Gray, Fl. N. Amer. 1:170 (1838). Core in Amer. Mid. Nat. 26(2):374 (1941).

Plate IV, Fig. 6. p. 130

A small anual herb; stem erect, ca. 5-20 cm tall, simple below, pseudodichotomously forked above, the branchlets ending in diffuse cymes; internodes up to 12 mm long, finely pubescent to puberulous. Leaves linear, 5-20 x 0.3-1 mm; upper ones narrower, shorter, minutely cuspidate and strongly ribbed; the basal ones longer, somewhat broader, obtuse and without any cusp or mucro, all ± ascending or erect and glabrous; stipules lanceolate, 3-8 mm long, acuminate; the basal ones usually quite conspicuous. Cymes dichasial and diffuse, though the cymules often rather compact; bracts foliaceous, equalling or exceeding the flowers. Flowers (1.6-) 1.75-2 mm (excluding the awns), subsessile, tubular-oblong to somewhat flask-shaped, often densely pubescent on the basal part; the receptacle not distinctly enlarged or turbinate; sepals narrowly oblong, ± glabrous or slightly ciliate at or near the tips, 1.25 mm long, distinctly ribbed on the back, the membranous margin very narrow, but the hood distinct and the hood-tip well-marked; awn ca. 0.65-1.25 mm (mostly about 1 mm) long, slender but stiff, minutely scabrous to almost smooth, mostly spreading and quite conspicuous; petals 0.6-0.65 mm, nearly equalling the stamens; filaments 0.6 mm; anthers 0.25 x 0.2 mm, quadrangular and orange; ovary ovoid, ca. 0.45 mm in diam., reddish; style 0.45-0.55 mm, bilobate to bifid. Frut ovoid-oblong, 1.0 x 0.8 mm, and smooth.

Fl. 5-11. Limestone barrens and gravelly or sandy slopes.

a) var. **setacea:** Bracts equalling the sepal tips (but not awns) or somewhat shorter.

Type: Texas, San Gelipe, *Drummond* 33, 3rd collection (holo.?? iso. FI!). Distr. Central & mid.-western Texas: Brazos Co., 8 ix. 1946, *H. B. Parks* (TEX); *V. L. Cory* 50593 (NY); Milan Co., 15.vii.1931, *B. C. Tharp* (TEX); Gonzales Co., *Tharp & Barkly* 13879 (TEX); Medina Co., 24.vii.1941 *B. C. Tharp* (TEX); *Berlandier* 632-2042 (GH); Gillespie Co., *G. Jermy* 465 (US). "Texas": San Gelipe, *Drummond* 33 (FI, isotype).

b) var. **longibracteata** Chaudhri n. var. a var. *setacea* bracteis quam flores longioribus distinguenda. Bracts distinctly longer than the flowers. Type: Fayette Co., Muldoon, *A. L. Ripple* 51-915 (holo. TEX!). Distr. Central Texas. Llano

Co., *J. Reverchon* 1493 (GH, WVA); W. of Colorado, *id.* 13 (GH); Menard Co., *E. J. Palmer* 11860 (GH) as *P. scoparia* Small; McCulloch Co., *L. H. Shinners* 30110 (TEX); Kinney Co., *V. L. Cory* 29113 (GH) as *P. lindheimeri;* "Texas", /1843, *F. Lindheimer,* Fasc. i. (GH).

The two varieties seem to be geographically segregated. Moreover, var. *setacea* is somewhat earlier maturing while the other taxon reaches its full maturity in October-November, and possesses lax inflorescence, mostly single-flowered cymes, whereas in the former the cymes are densely congested and the ultimate ones 3-flowered.

P. setacea is closely related to *P. lindheimeri* Engelm. and to *P. chorizanthoides* Small, but is distinguishable from both by its conspicuously longer sepal awns and relatively shorter style. Furthermore, the shoots are often distinctly puberulous and the receptacle is, unlike that of *P. chorizanthoides,* not mutch enlarged. The sepal tips formed by the prolongation of the hood-tips backwards-upwards into the awn, are also very characteristic in this sp. (almost like those of P. depressa) and serve to distinghuish it from *P. lindheimeri* which lacks such tips. Core (op cit.) had incorrectly described the bracts as exceeding the sepals. In the isotype, *Drummond* 33 (FI) (var. *setacea*) the bracts are either somewhat shorter than the sepals or merely equal their tips, but not their awns.

16. **P. monticola** Cory in Rhodora 46:278 (1944).

Plate IV, Fig. 3. p. 130

A biennial or, mostly, perennial herb; stems glabrous, suberect, ca. 10-30 cm tall, branched from above the base, the principal ramifications mostly pseudodichotomous, but the branches of the fork with numerous short lateral branchlets, each terminating in a cymose cluster; internodes 1-3 cm long, glabrous, brown in age. Leaves linear, glabrous, subobtuse and minutely cuspidate; the cauline ones 7-15(-19) x 0.4-0.75(-1) mm; the basal ones usually much larger, up to 25 x 1.5 mm, obtuse and without a mucro or cusp, margin occasionally slightly inrolled, ± ascending, and somewhat shorter than the internodes; stipules lanceolate, ca. 4-11 m long, acuminate, often deeply split; the basal ones larger. Cymes repeatedly forked, and usually very profusely formed at the end of all the branchlets; the cymules rather compact. Bracts foliaceous and mostly shorter than the flowers. Flowers almost sessile, ca. 2.3-3.25 mm long (mostly 2.4-2.7 mm) including the awns, somewhat flask-shaped, with a turbinate base or receptacle, 0.6 -0.75 mm long, shortly and sparsely pubescent to slightly puberulous on the outside; the calyx region tubular-oblong, glabrous (glaucous when young); sepals narrowly oblong, 1.75-2.25 x 0.4-0.7 mm, obtuse, with a narrow membranous margin but well-marked hood and a short,

divergent, 0.25-0.35 (-0.45) mm long awn on the back of the tip; petals 0.8-0.9 mm, with a reddish tip; filaments 1-1.2 mm; anthers 0.3-0.35 x 0.2-0.25 mm, oblong and orange-yellow; ovary ca. 0.35 mm in diam., ovoid, reddish-brown and smooth; style 1.0-1.25 (-1.5) mm, filiform, shortly 2-cleft at the top. Fruit ca. 1.3 x 0.85 mm, oblong, obtuse; seed ca. 1.15 x 0.8 mm, lenticular-oblong. Fl. & ft. 6-9 (-10). Mountain tops, rocky slopes and ledges, and gravel beds of mountain streams.

Type: SW Texas: Brewster Co., Davis Mts., W of Alpine, mountain top, 27.ix. 1942, *V. L. Cory* 40432 (holo. GH! iso. WVA!).

Distr. Endemic in SW Texas and NNE Mexico.

Texas: Crocket Co., *V. L. Cory* 271 (GH) (forma foliosa); Pecos Co., *B. C. Tharp* 43-575, 43-578, 43-580 (TEX); Trans Pecos Region: 10.viii.1935, *L. C. Hinckley* (TEX); Jeff Davis Co., *E. J. Palmer* 30854 & 31858 (TEX); *B. H. Warnock* 21014 (TEX); Brewster Co., *V. L. Cory* 40432 (GH, WVA, type); 18.ix.1918, *M. S. Young (W);* Western Texas to El Paso, *Charles Wright* 26 (GH); "N. Mexico", *C. Wright* 1325 (GH). **Mexico:** Coahuilla: *F. L. Wind & C. H. Mueller* 159 (GH); *C. H. Mueller* 3097 (GH, NY).

Related to *P. jamesii* T. & G., but readily distinguishable by its entirely glabrous leaves, the long tubular calyx, glabrous sepals with a much shorter, divergent awn. The receptacle is, in relation to the sepals, much shorter than in *P. jamesii,* and only slightly ciliate. It differs from *P. lindheimeri* in its distinctly larger flowers and, in addition, by being mostly perennial.

17. **P. jamesii** Torr. & Gray, Fl. N. Amer. 1:170 (1838).

Rydberg, Flora of Rocky Mts. 267 (1922); & Flora of the Prairies and Plains of Central North America 315 (1932); Core in Amer. Midl. Nat. 26 (2): 391 (1941).

Type: Rocky Mts.: "On the Arkansa", *E. P. James* in the summer of 1820, (holo. NY, not seen; iso.??).

Syn.: *P. dichotoma* sensu Torrey in Ann. Lyc. N.Y. 2:206/290? (1828) non Nuttall, Gen. N. Amer. 1:159 (1818) nec DC. in Poiret, Encycl. 5:25 (1804). *P. wardii* Rydb. in Small, Fl. SE US 400 (1903).

Type: Oklahoma: nr. Alva, 14.x.1896, *L. F. Ward* 62 (NY, not seen).

Plate IV, Fig. 2. p. 130

A perennial herb with a woody tap root; stems erect or ascending, up to ca. 35 cm tall, much-branched from the woody base and repeatedly pseudodichotomously branched in the upper part, usually with long (c. 0.5-2 cm), ± stout, green to brownish internodes, very shortly scabrous-pubescent to puberulous, sometimes glabrescent or glabrous with age. Leaves linear, obtuse to subacute, 7-25(-34) x 0.5-1 mm, the upper very shortly mucronate, puberulous, mostly ascending or erect, rarely spreading, often shining and greenish to

light-brown; stipules lanceolate, 5-15 x 1.5-2 mm, acuminate, often clasping the internodes, somewhat shorter than the leaves. Cymes terminal, very profuse, usually congested, biparous, almost corymbose, the branches ascending and the ultimate cymes 3-flowered, or reduced to a single flower, the central flowers quite conspicuous in each group; bracts foliaceous, often somewhat shorter than the flowers. Flowers subsessile, somewhat flask- or vase-shaped with the basal part turbinate, (1.75-)2-2.5(-3) mm, shortly pubescent on the receptacle, the tubular calyx region often almost glabrous, occasionally sparsely hirtellous; receptacle 0.5-0.75 mm; sepals oblong, 1.25-1.5(-2) mm, rather rigid, with a narrow membranous margin but a conspicuous hood and a rather short 0.4-0.6 (-0.75) mm, slender though stiff, yellowish and ± spreading awn; petals 0.75-1 mm, equalling the filaments; anthers oblong, 0.3-0.35 x 0.2-0.25 mm, orange-yellow; ovary ca. 0.5 x 0.4 mm, ovoid and reddish-brown; style ca. (0.6-)1-(-1.4) mm, filiform, and shortly (for about 1/3) 2-cleft at the tip, sometimes 2-fid. Fruit ellipsoid-ovoid, ca. 1 x 0.6 mm.
Fl. 6-10. Limestone rocky ledges, slopes, hilltops and grasslands, alt. ca. 500-2500 m.
Distr.: Nebraska and Colorado to Texas and Mexico.

Key to the varieties:
1a) Flowers ca. 1.5-1.75 mm long ---------- var. **parviflora**
1b) Flowers 2-2.5(-3) mm
2a) Bracts usually exceeding the flowers ---------- var. **praelongifolia**
2b) Bracts usually shorter than the flowers
3a) Stems very shortly pubescent to puberulous; leaves almost glabrous; flowers sparsely hirtellous at the base but with almost smooth sepals ..... var. **jamesii**
3b) Stems densely scabrous pubescent to subhirsute, leaves adpressed pubescent; sepals shortly hirtellous ..... var. **hirsuta**

a) subvar. **jamesii:**

Wyoming: Albany Co.: 31.vii.1884, *G. W. Letterman* (GH); **Nebraska:** Franklin Co.: *J. M. Bates* 3573 (GH); **Colorado:** Larimar Co.: vi. 1898, *C. S. Crandall* (L); Rocky Mts., lat. 40-41 *Geo. Vasey* 67 (GH); Jefferson Co.: *A. A. Beetle* 2086 (GH); Golden City: *Patterson* 13 (GH); *E. L. Greene* 469 (GH, W); Rocky Mts.: *Hall & Harbour* 67 (GH, W); Colorado Springs, viii.1884, *Letterman* (WVA); Pikes Peak, vii.1871, *W. M. Canby* (GH); Baca Co.: *Porter* 4257 (GH, TEX); Baca Co.: *Weber* 4343 (TEX); **Kansas:** Kearny Co.: 15.viii.1950, *Fearing* and *Latham* (GH); Morton Co.: Richfield, 20.ix.1912, *J. M. Rose* (GH); Elsworth Co.: 14.viii.1950, *Fearing* and *Latham* (GH); Ellis Co.: 11.ix.1937, *Wayne Cook* (WVA); Barton Co.: *H. C. Benke* 5138 (GH); Clark Co.: *E. J. Palmer* 41877 (GH);*L. C. Hulbert* 3226 (U). **Oklahoma:** Kingfisher Co.: 30.v. 1896, *L. A. Blankinship* (GH); Custer Co.: *Waterfall* 1506, 5509 (GH); Cleveland Co.: *G. J. Goodman* 2150 (GH); Beckham Co.: *Palmer* 12563 (GH); Caddo Co.: *M. Hopkins* 815 (GH); *Goodman* 4525 (TEX); Comanche Co.:

Hopkins & Nelson 807 (TEX); *J. Clemens* 11572 (GH); Woods Co.: *G. W. Stevens* 1632 (GH); Murray Co.: *G. M. Merril* 1059 (GH); Harman Co.: *Goodman & F. Barkley* 2049 (GH); Cotton Co.: *Waterfall* 7281 (TEX); Texas Co.: *Waterfall* 3123 (GH).**Texas:** Ochletree Co.: *C. S. Wallis* 7875 (TEX); Potter Co.: *York & Rodgers* 44 (TEX); Lubbock Co.: *D. Demaree* 7732 (GH); King Co.: *L. H. Shinners* 20811 (U); Collinsworth Co.: *Tharp & Miller* 51-175 (W); Red River above Burkburnett, *Tharp* 589 (TEX); Dickens Co.: *Lundell* 12985 (TEX); Mitchell Co.: 8.vi.1900, *H. Eggert* (GH, WVA); Hudspeth Co.: *Tharp* 46127 (NY, TEX); Nolan Co.: *Waterfall* 6377, 6738 (GH); Howard Co.: *S. M. Tracy* 8319 (E, GH, TEX); Hood Co.: *Reverchon* 905 (GH); Bailey Co.: *Rowell Jr.* 60-032 (TEX); Dewitt Co.: *Parks* 17328 (GH); Kleberg Co.: *Johnston* 54/1140 (TEX); Collingsworth Co.: *Cory* 50186 (GH); Crockett Co.: *Cory* 18998, 40150 (GH); & 42747 (WVA); *Warnock & McBryde* 15191 (TEX); Sutton Co.: *Cory* 40819 (GH); Archer Co.: *Cory* 15906 (GH); Culberson Co.: *Waterfall* 4187, 5122, 5231 (GH); *Moore & Steyermark* 3612 (GH); Brewster Co.: *Warnock & Hinckley* 46/1055 (TEX); Pecos Co.: *Cory* 1543, 9722 (GH); Jeff Davis Co.: *Cory* 9413 (GH, trans. with var. *praelongifolia*); *Tharp* 3420 (TEX); Edwards Co.: *Cory* 2956 (GH); Presidio Co.: *L. C. Hinckley* 2595 (GH); "New Mexico", El Paso Mts., *C. Wright* 27 (GH), & 870/200 (GH, L). **New Mexico:** *A. Fendler* 69 (GH, trans. with var. *praelongifolia*); Naravisa, 24.viii.1911, *G. L. Fisher* (E, L, LD); San Miguel Co.: *B. Anect* 18 (GH); Chaves Co.: *Waterfall* 6151 (GH, NY); *Earle & Earle* 380 (E); Quay Co.: viii-ix.1942, *K. Bryan* (GH); Grant Co.: *O. B. Metcalfe* 753 (E, GH). **Mexico:** Eastern Coahuilla: *E. G. Marsh* 1333 (GH, TEX); Northern Coahuilla: *R. M. Stewart* 1449, 1648, 1680 (GH); Western Coahuilla: *Stewart* 2157 (GH); Chihuahua: *H. LeSueur* 1536 (GH, TEX); *G. Thurber* 310 (GH).

b) subvar. **subglabra** Chaudhri n. subvar. a subvar. *jamesii* ad quem maxime accedit floribus extus subglabris distinguenda. Stems puberulous but flowers ± glabrous. **New Mexico**: Otero Co.: Sacramento Mts., Fresnal Canyon, ca. 1800 m, *R. C. Barneby* 2575 (NY).

c) var. **hirsuta** Chaudhri n. var., maxime ut var *jamesii* sed ab ea caulibus dense scabrido-pubescentibus, foliis appresse pubescentibus, caulibus scabrido-pubescentibus, sepalis hirtellis distinguenda. Stems densely shortly hirsute; leaves shortly adpressed pubescent; sepals hirtellous.
Type: **SW Texas:** Pecos Co.: S. of Ft. Stockton, ca 1000 m, *Warnock* 13257 (TEX). Distr.: Endemic.
Pecos Co.: Tharp 43-582, 43-583 (TEX); "New Mexico": El Paso, *C. Wright* 28 (GH).

d) var. **parviflora** Chaudhri n. var. a varietatibus aliis floribus minoribus (1.5-1.75 mm altis) distinguenda. Flowers ca. 1.5-1.75 long.
Type: Texas: Brewster Co., Glass Mts., Panther Canyon, *B. H. Warnock* W104 (GH).
Texas: Brewster Co.: *Warnock* W529 (WVA). **Oklahoma:** Beckham Co.: *Palmer* 12563 (GH).

e) var. **praelongifolia** D. S. Correll in Rhodora 68:423 (1966).
The subtending leaves (foliaceous bracts) exceeding the flowers.

Type: Texas: Culberson Co.: Guadalupe Mts., *Lundell* et *al.* 14374 (holo. LL, not seen).

Texas: Dallam Co.: *Turner & Melchert* 4797 (TEX); Jeff Davis Co.: *Moore & Steyermark* 3141 (GH); Trans-Pecos Region: Davis Mts.: vi.1936, *Hinckley* (GH); Brewster Co.: *Cory* 9225 (GH); Hudspeth Co.: *Waterfall* 4788 (GH); Culberson Co.: *T. Melchert* 235 (TEX); Terrel Co.: *Parks, Turner, Warnock* 104 (TEX); Tom Green Co.: *C. Smith* 223 (GH); San Angelo: *Reverchon* 3695 (WVA); Taylor Co.: *Cory* 8686 (GH); *Henderson* 62/896 (TEX); Donley Co.: *Rose-Innes & B. Moon* 1015 (GH, TEX). **Oklahoma:** Washita Co.: *G. W. Stevens* 970 (GH); Cimarron Co.: *Rogers* 4698 (TEX).

This species is very widespread in the southwestern plains region. It is closely related to *P. depressa* which is, however, prostrate-spreading, forming dense mats; *P. jamesii,* on the other hand, is erect or ascending. There is, however, some evidence pointing to the possibility of some sort of gene-exchange between the two.

In some cases the stems are erect or ascending, but the sepals possess well-developed peculiar conical apical tips characteristic of *P. depressa* (though the awns in most cases are longer than the tips) as, for instance, in the following specimens:

Colorado: Bacca Co.: *C. L. Porter* 4257 (GH, TEX); *W. A. Weber* 4343 (TEX); Jefferson Co.: *A. A. Beetle* 2086 (GH). **Kansas:** Kearny Co.: 15.viii.1950, *O. S. Fearing & George Latham* (GH).

18. **P. depressa** Nuttall ex Torr. & Gray, Fl. N. Amer. 1:171 (1838).

Type: "On the barren plains of the Rocky Mts. (lat. 41), and on the plains of Oregon", *Nuttall* (holo. ??; iso. GH!).

Rydberg, Fl. Rocky Mts. 315 (1932); Core in Amer. Midl. Nat. 26 (2):390 (1941); Maguire in New B. & B. Fl. 2:118 (1952).

Syn.: *P. jamesii β depressa* (Nutt.) Torr. & Gray, Fl. N. Amer. 1:171 (1838). *P. diffusa* A Nelson in Bull. Torr. Bot. Club 26:237 (1899). Type: Nelson (holo. NY, not seen.).

P. sessiliflora Nutt. var. *brevicuspis* A. Nelson in Bull. Torr. Bot. Club 26:237 (1899).

Type: Wyoming: Sybille Creek, *Nelson* 349 (holo. NY; iso GH!).

P. brevicuspis (Nelson) Rydberg in Bull. Torr. Bot. Club 33:137 (1906).

P. sessiliflora Nutt. var. *brevispina* A. Nelson in Rydberg, Fl. Color. 122 (1906) in syn.

P. brevispina Rydb., Flora Colorado 122 (1906).

Plate IV, Fig. 1. p. 130

A small perennial herb; stems prostrate, ca. 8-15 cm long, much-branched, the branches usually forming dense mats, often brownish, shortly scabrous-pubescent to puberulous. Leaves linear, 8-15(-23) x 0.5-1 mm, shortly cuspidate, puberulous, stipules lanceolate, up to 8 mm long, acuminate, somewhat shorter than the leaves, but generally

quite conspicuous. Cymes small, few-(3-7) flowered and rather leafy; bracts foliaceous, usually equalling to somewhat exceeding the flowers, occasionally somewhat shorter. Flowers subsessile narrowly oblong, 2.5-3.25 mm long (excluding the awns), respectacle ca. 1 mm long, occasionally somewhat shorter. Flowers subsessile narrowly oblong, berulous, ca. 2 x 0.6-1 mm, oblong to lanceolate-oblong, slightly narrowed upwards, having a rather narrow membranous margin, but a distinct hood prolonged upwards (at the back of the top) into a prominent, thick, conical, (0.25-) 0.35-0.5 mm long and often scabrous and brownish tip, awn ± equalling the tip and stiff, scabrous, yellowish and somewhat spreading; petals ca. 1 mm long, almost equalling the stamens; filaments 0.7-1 mm; anthers 0.3-0.35 x 0.25 mm, quadrangular-oblong, orange-yellow; ovary ca. 0.6 x 0.4 mm, conical-ovoid, reddish; style (0.6-)1-1.25 mm, slender, nearly white, shortly bifid (for about 1/3-1/2 at the tip. Fruit ca. 1.25 x 0.75 mm, ± ovoid, almost smooth.

Fl. 6-8. Dry plains and rocky ridges and hillsides, alt. up to ca. 3000 m. Distr.: SW South Dakota, Western Nebraska, Wyoming, Colorado and W. Kansas.

1a) Stems somewhat spreading; (foliar) bracts shorter than the flowers, at least in the mature shoots ..... var. **diffusa**

1b) Stems matted; (foliar) bracts equalling or somewhat exceeding the flowers.

2a) Sepal awn very short, 0.25-0.3 mm long ..... var. **brevicuspis**

2b) Sepal awn well-developed, ca. 0.35-0.5 mm long .. var. **depressa**

a) var. **depressa: South Dakota:** Lawrence Co.: *Palmer* 37326, 37580 (GH); Black Hills Forest, *Murdoch Jr.* 4061 (GH). **Wyoming:** National Park, 5.viii. 1885, *Letterman* (GH); Powder River, *Goodding* 325 (LD); Weston Co.: 18.vi. 1896, *J. M. Bates* (GH); *A. Nelson* 9485 (GH); Converse Co.: *Nelson* 8373 (GH); Platte Co.: *Nelson* 2769 (GH); *C. L. Porter* 3988 (GH, TEX); Bates Holes: *Payson & Payson* 4771 (GH); Albany Co.: *R. C. Rollins* 997 (GH); *Brenckle* 43034 (W); *Goodman* 5119 (TEX); *F. Petrak* 631 (W). **Colorado:** Colorado Mts., *A. Gray* in 1872 (GH); Ruxton Ridge, *Clements & Clements* 103 (E, GH); Jefferson Co.: 28.vi.1918, *Churchill* (GH).

b) var. **brevicuspis** (Nelson) Chaudhri comb. nov. (*P. sessiliflora* Nutt. var. *brevicuspis* Nelson op. cit.); sepal awn very short 0.25-0.3 mm. **WYOMING**: Sybille Creek, *Nelson* 349 (GH).

c) var. **diffusa** (Nelson) Chaudhri comb. et stat. nov.:

P. diffusa A. Nelson op. cit. Type: Probably Wyoming, *Nelson* (holo. NY, not seen). Leafy bracts somewhat shorter than the flowers, at least in the mature shoots; the latter, more or less, spreading.

Wyoming: Albany Co.: *F. Petrak* 740 (W). **Colorado:** Douglas Co.: *George G. Goodman* 2002 (GH).

This species is closely related to *P. jamesii* Torr. & Gray. In fact Torrey and Gray had considered it a mere variety of *P. jamesii*, citing *P. depressa* Nutt. as a synonym. However, it is a good species differing

from *P. jamesii* in habit and in the structure of the sepals. It possesses wholly prostrate matted stems, whereas in *P. jamesii* the stems are erect or ascending and spreading. The sepals in *P. depressa* possess a peculiar conical tip just above the hood, which is prolonged into the scabrous awn. In *P. jamesii,* on the other hand, the awns are quite slender and well-differentiated from the hood, the hood-tips being either not recognizable at all or very weakly developed.

As already pointed out by Core (op. cit.) *P. diffusa* A. Nelson cannot be maintained as a separate species. It is only a minor variant of the typical *P. depressa,* differing essentially in the characters of the bracts and, to a lesser extent, of the stems as well (shorter bracts and somewhat laxly caespitose stems), and it can, at best, be treated as a variety. Nelson 349, from Sybille Creek, Wyoming, (the type of his "*P. sessiliflora brevicuspis*") is very distinctly a short-awned form of *P. depressa,* and bears no relationship whatsover with *P. sessiliflora* Nutt.

19. **P. virginica** Sprengel, Syst. 1:822 (1825).
Type: See below under *Achyranthes dichotoma* L.

Core in Virginia Journ. Sci. 1:115 (1940); & Amer. Mid. Nat. 26(2): 393 (1941); Bassett Maguire in New Britten & Brown Fl. NE U.S. 2:120 (1952).

Syn.: *Achyranthes dichotoma* L., Mant. 51 (1767).

Type: "Habitat in Virginia", Herb. Linn. 287/11 (LINN). *Illecebrum dichotomum* Willd., SP. Pl. ed. 5, 1:1196 (1797) *Paronychia dichotoma* (L.) Nutt., Gen. N. Amer. 1:159 (1818) non DC in Poiret, Encycl. 5:25 (1804).

T. & G., Fl. N. Amer. 1:171 (1838); Britton & Brown, Ill. Fl. 2:39, fig. 1521 (1897); Small, Fl. SE U.S. 400 (1903).

Plottzia dichotoma Arnott apud Torr. & Gray, Fl. N. Amer. 171 (1838). *Paronychia scoparia* Small in Bull, Torr. Bot. Club 24:335 (1897). Type: Oklahoma: Indian Territory, between Forth Cobb and Fort Arbuckle 1868, *Ed. Palmer* 27 (holo. NY, not seen).

A perennial herb; stems procumbent and leafy below, with usually shortened internodes, simple above, much-branched from the woody base, the branches almost matted, the flowering shoots erect, up to 40 cm high, with stout, long (ca. 5-15 mm), very shortly (pubescent-) puberulous internodes, and branching only in the region of the inflorescence, in a pseudo-dichotomous manner. Leaves ascending, linear-subulate, 15-25(-30) x 0.5-1 mm, acute, shortly mucronate, on both sides glabrous; margin very minutely serrulate and ciliate, often with a conspicuous midrib; stipules lanceolate, up to 12 x 2 mm, long-attenuate, acuminate, entire, shorter than the leaves. Bracts foliaceous, often somewhat shorter than the flowers.

Cymes repeatedly forked, diffuse, but compact-fastigiate, often forming large clusters. Flowers sessile, ca. 3-4 mm long (up to the sepal tips but excluding the awns), nearly oblong-cylindrical, light-brown above, reddish-brown at the base, slightly hirtellous to glabrous; receptable 0.75-1.25 mm, obpyramidal; sepals lanceolate-oblong, 2.25-2.75 mm, with a very narrow membranous margin, a rather small hood, and a stout, 0.45-1.25 mm, scabrous to almost smooth, nearly erect to somewhat spreading awn on the tip, strongly 3-nerved on the back; petals 0.5 mm; filaments 1.5-2 mm; anthers 0.55 x 0.25 mm, oblong and orange-yellow; ovary ca. 0.4 mm in diam., ovoid, reddish and smooth; style 1.5-2 mm, filiform, 1/4-1/3 (its length) bilobate. Fruit ca. 2 x 1.3 mm, prolate, with a smooth, papery pericarp.
Fl. 7-10. Rocky slopes, gravelly limestone soil.
Distr.: Maryland, Virginia, West Virginia, Arkansas, Oklahoma and Texas.

a) var. **virginica:** Flowers 3-3.5 mm long excluding the awns); awns 0.45-0.75 mm, almost smooth or minutely pubescent, and erect or slightly spreading.
Throughout the range of the sp. except in Central Texas.
Maryland: Washington D.C., Falls of the Potomac, 16.vii.1896, *E. S. Steele* (E). **Virginia:** Wythe Co.: *Aikin* (E, KH). **West Virginia:** Harpers Ferry, *Blake* 8064 (GH); Jefferson Co.: *E. T. Wherry* 1047 (FI, GH, U, WVA); Alleghany Co.: *C. E. Wood Jr.* 6832 (GH); Hampshire Co.: *W. M. Frye* 723 (U, WVA&); Grant Co.: 31.viii.1944, *C. R. Orton* (WVA). **Arkansas:** Logan Co.: Magazine Mt., *D. Demaree* 17762 (GH). **Oklahoma:** Arbuckle Mts., *W. E. Emig* 809/193 (GH); Carter Co.: *M. Hopkins* 6352 (NY); Murray Co.: *G. M. Merrill* 1059 (GH). **Texas:** Dallas Co.: *V. L. Cory* 49711 (GH, NY); *L. H. Shinners* 19154 (LD, U); *Reverchon* 390, 1899 (HG); *C. L. Lundell* 13308 (TEX); Torrant Co.: *A. Ruth* 690 (GH); Grayson Co.: 28.viii.1938, *B. C. Tharp* (TEX); *H. Gentry* 72 (TEX); Hood Co. (N.): *Tharp & Tyson* 51-1094 (TEX); Parker Co.: *S. M. Tracy* 8320 (E, GH); Bell Co.: *York & Gertrude* 53198 (WVA); Hays Co.: *J. C. Johnson* 389 (TEX); Travis Co.: *G. L. Webster* 1964 (W); *B. H. Warnock* W1049 (LIL, W, WVA).
b) var. **parksii** (Cory) Chaudhri stat. nov.
(*Paronychia parksii* Cory in Rhodora 46:280 (1944)).
Type: Texas, Kendall Co., N. of Boerne, *Parks* 41046 (holo. GH! iso. WVA!). Flowers 3.75-4 mm; awns 1-1.25 mm, scabrous and spreading. Central Texas only.
Kendall Co.: *H. B. Parks* 41046 (GH, WVA) (type of *P. parksii* Cory); ibid.: *V. L. Cory* 19286 (GH), 45255 (TEX); New Braunfels, *F. Lindheimer* 232 (GH), 1104 (E, FI, GH); Bexar Co.: *Sister Metz* 363 (LD); Fredericksburg, *G. Thurber* 70 (GH); "Texas", *Lindheimer* 173 (WVA).

The flowering shoots are almost always simple in the lower part, branched only at the summit in the region of inflorescence. However, it seems that the habit can be modified by growing the plants from

seed in a garden. *Davis* and *Davis* 6107 (WVA) and *Davis,* 2.vii.1947 (WVA) are very interesting cultivated specimens showing stems which have developted numerous lateral floriferous branches.

Note: For a discussion of the nomenclatural problems see Core, Va. Journ. Sci. 1:114 (1940) and in Amer. Midl. Nat. 26(2):394 (1941).

20. **P. wilkinsonii** S. Watson in Proc. Amer. Acad. 21:454 (1866). Core, op. cit. p. 391 (1941).

A small perennial herb; stems much-branched from the woody base (or caudex), suberect, 4-10 cm high, often densely congested, hirtellous, usually with short, up to 3 mm long, stout internodes mostly concealed by the leaves and the stipules; shoots somewhat brittle, often terminating in large and dense flower clusters. Leaves linear-subulate, 5-9 x 0.75-1.1 mm, pungently mucronate, mostly closely approximated, ascending, rigid, minutely hirtellous to puberulous; midrib indistinct; stipules lanceolate, up to 8 x 1.5 mm, acuminate, often deeply split, ± equalling the leaves and closely approximated like the leaves, but spreading in age. Cymes 3 to 7 (-10)-flowered, densely congested, forming large and conspicuous glomerules, 10-18 mm in diam.; bracts stipulary, lanceolate, almost equalling or somewhat shorter than the flowers.

Flowers almost sessile, 2.75-3.25 mm long (without the awns), somewhat flask-shaped or pitcher-like, wth a swollen-turbinate basal (receptacular) part and tubular calyx, reddish-brown, and densely pubescent with short, hooked hairs on the receptacle and straight and much shorter ones on the calyx; receptacle 1-1.2 mm long; sepals oblong, 1.75-2 mm, with a distinct, nearly white membranous margin, a whitish scabrous hood, and a very prominent, stout and rigid, scabrous, nearly white and divergent awn, (1.25-)1.5-2 mm long or nearly as long as the sepal; petals 0.5 mm; filaments 0.8 mm; anthers 0.5 x 0.25 mm, oblong, orange; ovary almost globose, 0.45 x 0.4 mm, somewhat papillose; style 0.25 mm (excluding the stigmatic part); stigmas 0.5 -0.6 mm long, filiform but rather thick, dark-brown, erect when young, spreading in age. Fruit 1.25 x 1.1 mm, subglobose to somewhat quadrangular and rounded at the top, slightly papillose above; seed 1.2 x 1 mm, almost globose.

Fl. 4-7. Ft. 7-10. Dry rocky hills, gravelly slopes and summits., alt. ca. 1650 m.

Type: Mexico: Chihuahua, Sta. Eulalia Hills, 21.ix.1885, *Wilkinson* (holo. US!).

Distr. Northern Mexico and SW Texas.

Mexico: Western Coahuila, nr. El Tule, *R. M. Stewart* 495 (GH); Chihuahua (NE): Sierra Héchiceros, *id.* 211 (GH); nr. Chihuahua, *C. G. Pringle* 341 (E, GH, JE, L, UC, US, W, WVA); Organos Mts. ca 1650 m, *Harde LeSueur*

1248 (TEX). **SW Texas:** Brewster Co.: S. of Marathon. *L. C. Hinckley* 4654 (US); Glass Mts., Leonard Mt., *B. H. Warnock* 20896 (GH).

21. **P. albomarginata** Core in Madrono 6:21 (1941); id. in Amer. Midl. Nat. 26(2):389 (1941).

Similar to *P. wilkinsonii* Watson in habit, especially in the form and appearence of the shoots and leaves. The leaves are, however, linear to linear-oblong, 3-4 x 0.5-1 mm, subacute and minutely cuspidate (the cusp 0.1-0.25 mm long), very slightly puberulous. Stipules equalling or somewhat exceeding the leaves. Bracts stipulary, ± equalling the flowers. Cymes terminal or subterminal and densely congested at the end of the shoots, 3 to 7-flowered. Flowers almost sessile, 3-3.25 mm long (including the awns), flask-shaped with an obconical-obpyramidal basal (receptacular) part and tubular-oblong calyx; receptacle 0.75-1 mm, shortly pubescent with hooked kairs; sepals oblong, ca. 2 mm long, puberulous, with a conspicuous, white membranous margin, a rather small membranous hood and a short, 0.25-0.3 mm long, nearly white, stout, scabrous and erect awn, the median parts (of the sepals) purple-brown on the inside as well as on the outside; petals 0.7-1 mm long; filaments 0.8-1 mm, anthers 0.45 x 0.25 mm; ovary 1 x 0.65 mm, ovoid, slightly papillose on the upper part; style (unlobed part) 0.3 -0.4 mm and slightly thickened at the base; stigmas 0.5-0.6 mm, filiform, brown, spreading in age.

Fl. 4-8. Grasslands. alt. ca. 2000 m.

Type: Mexico: Coahuila State. Saltillo. 9.iv.1905. *Ed. Palmer* 518 (holo. NY; iso. GH! UC!).

Distr.: Endemic in and around Saltillo, the type locality.

Mexico: State of Coahuila, Saltillo, *Ed. Palmer* 331 (GH), and 518 (GH, UC); nr. Buena Vista, S. of Saltillo, *F. Shreve* and *E. R. Tinkham* 9601 (GH).

Closely resembling *P. wilkinsonii* S. Watson in habit and in the general form of the shoots and flowers, but differing in having somewhat shorter and very minutely cuspidate leaves instead of pungently mucronate ones, and very short and erect sepal awns, 0.25-0.3 mm long instead of (1.25-) 1.5-2 mm long and widely spreading ones of *P. wilkinsonii.*

22. **P. sessiliflora** Nutt., Gen. Amer. 1:160 (1818).

P. A. Rydberg, Fl. Rocky Mts, 267 (1922); and Fl. Central N. Amer. 315 (1932); Core in Amer. Midl. Nat. 26(2):386 (1941). For the varieties *brevicuspis* A. Nelson in Bull. Torr. Bot. Club 26:237 (1899) and *brevispina* A. Nelson in Rydb., Fl. Color. 122 (1906) in syn., cf. *P. depressa.*

Plate III, Fig. 1-3. p. 114

A very compact perennial herb with a woody tap root and a very thick and woody, perpendicular and partly subterranean caudex; stems 5 -15 cm long, much-branched, often densely crowded, forming a pulvinate mat up to 17 cm in diam.; shoots tufted with leaves and stipules; internodes up to 6 mm long, densely hirtellous (covered with short, dense and patent hairs). Leaves linear-subulate, 4-7.5 x 0.5-0.8 mm, subchartaceous, closely imbricate, the lower short, erect and obtuse, the upper longer, ascending to somewhat recurved-spreading at the end of the shoots, acute and shortly cuspidate-mucronate, all with a conspicuous midrib and very finely puberulous to glabrous; stipules lanceolate-subulate, often deeply 2-cleft, mostly somewhat shorter than the leaves, but occasionally slightly exceeding them. Flowers subtended by ordinary leaves, ± equalling the flowers.

Flowers terminal, solitary or in pairs or sometimes, in 3-6(-10)-flowered rather compact, corymbose cymes, sessile, reddish-brown, 2.75 -3.5(-3.75) mm, but mostly 3 mm (excluding the awns), somewhat flask-shaped, pubescent at the base; receptacle ca. 1 mm long, turbinate; sepals ca. 2 mm long, lanceolate-oblong, finely hirtellous to nearly glabrous on the back, 3-nerved, with a narrow membranous margin, a rather small and stiff hood, and a long, stout, scabrous and spreading awn, (mostly 1-1.5(-2) mm long, sometimes shorter, ca. 0.45 -0.75 mm, and somewhat erect) at the tip; sepals often connivent at the tip; petals 0.6-0.7 mm long, shorter than the stamens; filaments 1-1.2 mm; anthers 0.5-0.55 x 0.25-0.3 mm, oblong, yellow; ovary ca. 0.8 mm in diam., ovoid-subglobose, very densely pubescent; style 1.4-1.5 mm, slender-filiform and shortly bilobate at the tip. Fruit 1.3-1.4 x 1-1.25 mm, ovoid-oblong, densely hairy.

Fl. 6-8. Dry stony hillsides, summits and sandstone mesas, alt. ca. 750-3100 m.

Type: North Dakota: "On the highest hills of the Missouri, near Fort Mandan, *Nuttall* (herb.??).

Distr.: Alberta and Seskatchewan to Utah and Nevada in the west and New Mexico and Texas in the South.

CANADA: Alberta: *M. E. Moodie* 1074 (GH); 25.vii.1911, *M. O. Malte* (LD, awns conspicuously long!). **Seskatchewan:** *Macoun* and *Herriot* 70872 (GH). **U.S.A.: North Dakota:** Billings Co.: *V. Facey* 134 (TEX); Adams Co.: 14.vii. 1935, *Stevens* and *Kluender* (W); **Montana:** "Foothills", *F. Lamson Scribner* 221 (GH); Park Co.: *W. N. Suksdorf* 70 (GH). **Wyoming:** Uinta Co.: *R. C. Rollins* and *C. Munoz* 2899 (GH); Carbon Co.: *A. A. Beetle* 4936 (LD); Albany Co.: *F. J. Hermann* 17101 (NY); *A. Nelson* 1638, 7461 (GH) and 7732 (LD, awns short); *J. F. Clovis* 1240 (WVA); *Yuncker* and *Yuncker* 12101 (TEX, awns short). **Nebraska:** Yellewstone, *Hayden* 32 (GH). **Colorado:** Bear River, 40°-41° lat, *G. Vasey* 72 (GH, WVA); Jackson Co.: *Crandall* 98 (GH, awns short); Park Co.: *Mr.* and *Mrs. Davis* 10142 (GH, awns short); "Rocky Mountains", *E. Bourgeau* in 1858 (GH, U); Las Animas Co.: *R. C. Rollins* 1824 (GH); Pueblo Co.: *Ripley* and *Barneby* 7647 (NY); Saguache Co.: *Beaman* and *Erbisch* 1098 (TEX);

W. A. Weber 11062 (LD, awns short); 12.vii.1937 *E. T. Wherry* (GH, awns short); Gunnison Co.: *W. A. Weber* 9146 (TEX); *Ripley* and *Barneby* 7172 (NY); Mesa Co.: vi.1872, *A. Eastwood* (E, leaf-mucro well-developed); South Park: viii.1871, *W. M. Canby* (GH, awns very short). **Utah:** Daggett Co.: *Ripley* and *Barneby* 7911 (NY); Henry Mts.: *B. Maguire* 19310 (GH, awns short); Emery Co.: *Holmgren, Anderson* and *Witte* 10917 (NY); *B. Maguire* 21719 (NY); *R. McVaugh* 14594 (TEX); Garfield Co.: *Cronquist* and *Holmgren* 9431 (NY, awns short); *A. Carter* 1422 (GH, awns very short). **Nevada:** Mt. Irish, *Purpus* 6323 (E). **New Mexico:** "New Mexico", *A. Fendler* 70 (GH). **Oklahoma:** *G. J. Goodman* 5613 (TEX). **Texas:** Hartley Co.: *York* and *Rodgers* 301 (TEX, flowers 3.75-4 mm); Moore Co.: *York* and *Rodgers* 56 (TEX) Roberts Co.: *C. Rowell* 5760 (TEX); Palo Dura Canyon, *Reverchon* 2957 (WVA); Armstrong Co.: *Cory* 13410 (GH); Randall Co.: *E. J. Palmer* 12513 (GH); 9.vi.1901, *H. Eggert* (WVA, awns very long, ca. 1.75-2 mm); Channing, *B. C. Tharp* 4349 (TEX); "Fort Smith to Rio Grande", 35 lat., *Bigelow* in 1853-54 (GH).

This species shows a wide range of variability in the length of the sepal awns, viz. from 0.45 to almost 2 mm long. In this respect it is interesting to note that while the long-awned plants are found in the northern and southern regions, the short-awned forms are mainly concentrated in the central part of the area of distribution.

It shows some affinity with *P. virginica* Sprengel in the floral structure, but the latter has a totally different habit, the shoots being erect and branched only at the top, i.e. in the region of inflorescence.

5. Subsect. **Paronychia:**

Leaves often narrowly obovate to oblanceolate or oblong and distinctly cuspidate or mucronate; bracts usually quite conspicuous; sepals semiscarous or subcoriaceous, with a well-developed awn.

Series 1. **Longistylae** Chaudhri p. 88

Flowers typically flask-shaped, with a narrow (narrowly tubular) calyx region and a swollen, globose receptacle; style elongate, almost reaching the apex of the sepals.

23. **P. herniarioides** (Michx.) Nutt., Genera Amer. 1:159 (1818). Core in Amer. Midl. Nat. 26(2):357 (1941).

Syn.: *Anychia* herniarioides Michx., Fl. Bor. Amer. 1:113 (1803).

Type: In arenosis aridis Carolinae septentrionalis, *Michaux,* (holo. Herb. A. Michaux in P!).

Anychiastrum herniarioides (Michx.) Small, Fl. S. E. US 401 (1903). *Plagidia herniarioides* (Michx.) Nieuwl. in Amer. Mid. Nat. 3:154 (1913). *Gastronychia herniarioides* (Michx.) Small, Man. SE Fl. 480 (1933).

Plate III, Fig. 4-7. p. 114

An annual herb; stems up to 20 cm long, much-branched from the base, prostrate, diffusely and almost radially spreading on the sandy ground, repeatedly forked towards the end, often with up to 22 mm

long, shortly scabrous-pubescent internodes; shoots usually densely leafy; lateral branches mostly crowded and the plants often forming dense mats. Leaves sessile, ± oblong or elliptical-oblong, 3-12(-16) x 1.5-3.5(-5) mm (the lowermost ones somewhat spathulate and larger), obtuse and very shortly cuspidate-mucronate, rather sparsely scabrous-pubescent to finely ciliate, the hairs usually caducous, sometimes almost glabrous or with small patches of short hairs along the midrib only; margin with short stiff hairs (somewhat hirsute); midrib distinct; somewhat fleshy when young but subcoriaceous at maturity; stipules ovate-lanceolate, up to 3x 7 mm, acuminate, much shorter than the leaves. Cymes profuse, compact, small, 3 to 7-flowered towards the end of the shoots. Bracts leaflike, not scarious. Flowers sessile, flask-shaped, 2-2.25 mm long, with a swollen, globose, conspicuous basal (receptacular) part, nearly equalling the calyx region and shortly scabrous-pubescent, 0.75 mm long and 1 mm broad; sepals sparsely (strigose) pubescent on the outside, lanceolate-subulate, 1.25-1.5 mm long (including the awns), with a very narrow membranous margin, very slightly (almost indistinctly) hooded and shortly awned, the awn 0.35-0.4 mm long, erect and scabrous; petals 0.35-0.4 mm, with a reddish tip; filaments 0.65-0.7 mm; anthers 0.25 x 0.15 mm, oblong and orange-brown; ovary quadrangular-subglobose, ca. 0.55 x 0.45 mm; style 0.75-0.8 mm, filiform, almost reaching the sepal tips at maturity and shortly 2-lobate at the top. Fruit ca. 0.7 x 0.6 mm, quadrangular to nearly globose, with very thin membranous pericarp, and resting on a conspicuously swollen receptable.

Fl. 6-8. On dry sandy ridges and in scrub.

Distr.: N. Carolina, Georgia and Florida.

Georgia: Talbot Co.: *R. McVaugh* 5245 (GH); Taylor Co.: *A. Cronquist* 5266 & 5519 (GH); Ben Hill Co.: *Wilbur & Webster* 2719 (GH); Albany Co.: *Eggleston* 5107 (GH); Emanuel Co.: *C. E. Wood Jr. & I. D. Clement* 7573 (GH); *R. M. Harper* 978 (GH); Bullock Co.: *id.* 912 (GH); Tatnall Co.: *A. Cronquist* 5338 (GH). **Florida:** Clay Co.: 21.vii.1940, *W. A. Murrill* (WVA); Gilchrist Co.: *R. K. Godfrey & G. W. Reinert* 61072 (LD); Lake Co.: *G. V. Nash* 1185 (E, GH); De Soto Co.: (North), *H. J. Koehler* 38 (GH); *J. K. Small* 11579 (GH).

Series 2. **Corniculatae** Chaudhri p. 88

Sepal hood horn-like and white.

24. **P. drummondii** Torr. & Gray, Fl. N. Amer. 1:170 (1838). Core in Amer. Midl. Nat. 26(2):372 (1941).

Plate III, Fig. 12-13. p. 114

An annual herb; stem ± erect, 10-35 cm tall, branched just above the base into stout shoots bearing numerous lateral branchlets, each ending in rather densely congested, much-branched cymes; internodes quite long (up to ca. 3 cm), stout, densely covered with short, deflexed to

retrorse hairs. Leaves sessile, oblanceolate-spathulate to narrowly obovate, occasionally suboblong, attenuate to the base, acute to subobtuse; the upper ones 10-17(-20) x 2-3.5 mm, often shortly mucronate, and densely strigose or somewhat scabrid, sometimes on both sides subglabrescent or glabrous; the basal ones usually much larger than the others (20-30 x 4-7 mm) with the midrib prominent near the base, the margin rather papillate and yellowish-green or pale; all leaves subrigid; stipules ovate-lanceolate, 5-10 x 2-5 mm, acuminate, shorter than the leaves. Cymes much-branched, but rather compact, forming terminal or subterminal, almost leafless, dense, clusters, 10-20 mm in diam.; bracts ovate, ca. 2 x 0.75 mm, shorter than the flowers, scarious. Flowers subsessile, (1.5-)2-2.25 mm, contracted in the middle, often dark-brown; receptable 0.5-0.6 mm long, turbinate-swollen and covered with short hooked hairs (sometimes forming a ring around the perigynous zone); sepals obovate-spathulate, (1-)1.25-1.4 mm long, strongly cucullate, the hood nearly white, rigid, broad and forming a conical-triangular cap at the top prolonged outwards into a short, stout, 0.3-0.45 mm long awn; the tip and the awn together ca. 1 mm long; the whole sepal shortly pubescent to ± glabrous and 3-ribbed on the outside; petals (0.4-)0.45-0.5 mm; filaments (0.45-)0.5-0.55 mm; anthers 0.25-0.3 x 0.2 mm, oblong, orange; ovary ca. 0.5 x 0.4 mm; ± ovoid; style 0.45-0.6 mm, shortly bilobate at the tip, sometimes shorter and rather deeply 2-cleft. Fruit ca. (0.6-)0.8 x (0.6)0.7 mm, nearly globose.

1a) Leaves often strigose; flowers (1.75-)2-2.25(-2.5) mm; sepals with a conspicuous hood and awn; receptable densely hairy; style 0.45-0.6 mm and shortly bilobate; ovary slightly papillose ..... subsp. **drummondii**

b) Leaves mostly more or less glabrous; flowers 1.5-1.6(-1.75) mm, often glabrous on the sepals but with a ring of hairs in the perigynous zone; hoodtip short, and the awn 0.25-0.3 mm long; ovary papillose; style up to 0.35 mm and often deeply 2-cleft ..... subsp. **parviflora**

a) subsp. **drummondii**: Shoots erect; leaves mostly strigose; flowers (1.75-)2-2.25(-2.5) mm long; sepals with a conspicuous hood and awn; receptacle densely hairy; ovary only slightly papillose; style 0.45 -0.6 mm long, shortly bilobate.

Type: Texas: *Drummond* 93 (2nd collection) (holo. ??; iso. E! FI! TEX!).

Distr.: Eastern and Central Texas.

Hardin Co.: *Thompson & Turner* 98 (TEX); Lee Co.: *Rowell & Barkley* 17T107 (TEX); idid. *R. R. Innes* 888 (GH); Bexar Co.: *H. B. Parks* 5060 (GH); Harris Co.: *E. Boon* 38 (TEX); *A. Traverse* 774 (TEX); Waller Co.: *E. Hall* 51 (GH); Dimmit Co.: *E. J. Palmer 33752a* (WVA); Milam Co.: *Palmer* 11662 (GH); Austin Co.: *B. H. Warnock* 227 (TEX); Colorado Co.: *B. C. Tharp* 2396 (TEX);

C. Heimsch 487 (TEX); Gonzales Co.: *E. R. Bogusch* 1416 (TEX); San Patricio Co.: *V. L. Cory* 20351 (GH); Aransas Co.: *F. B. Jones* 4083 (TEX); Robertson Co.: *Rowell* 8042 (TEX); "Texas", *F. Lindheimer* 18 (Fasc 1, in 1843) & 222 (Fasc. 2, in 1844) (GH); "Texas", *Drummond* 93 (E, FI, TEX) (ISOTYPE).

b) subsp. **parviflora** Chaudhri n. subsp. a subspecie *drummondii* foliis subglabris, floribus minoribus (1.5-1.75 mm altis), in zona perigyna solum pilosis, sepalis breviter cucullatis, arista circ. 0.25 mm longa instructis, stylo breviore et saepe bifido distinguenda. Shoots suberect, 10-25 cm long, the branches spreading and shortly pubescent. Leaves obovate-oblanceolate, mostly glabrous and shining (the basal leaves sometimes with short, sparse hairs), margin shortly hairy. Flowers 1.5-1.6(-1.75) mm, dark-brown, with short, hooked hairs in five small patches on the perigynous zone but for the rest mostly glabrous; receptacle ca. 0.5 mm; sepals ca. 1(-1.2) mm with distinct though rather short hood and a very short awn 0.25-0.3 mm; ovary densely papillose; style (0.25-)0.3-0.35 mm, usually bipartite, occasionally bifid particularly when shorter (0.25 mm or so), the lobes filiform and divergent; fruit almost globose, 0.6-0.7 mm in diam.

Fl. 5-7. Sandy soil.

Type: NE Texas: Smith Co.: 1.5 mile NW of Lindale, 24.vii.1953, *B. L. Turner* and *B. C. Tharp* 3118 (holo. TEX!).

Distr.: Endemic: NE Texas.

Smith Co.: NW of Lindale, *Turner* and *Tharp* 3138 (TEX, holotype); Henderson Co.: SE of Athens, *Rogers McVaugh* 8386 (GH, TEX); Anderson Co.: NW of Tennessee Colony, *E. G. Marsh Jr.* 146, & 57-94 (TEX).

25. **P. jonesii** M. C. Johnston in Wrightia 2(6):250 (1963).

An annual herb; mature shoots ± prostrate (suberect when young), 10-35 cm long, sprawling-spreading, first ramification always pseudodichtomous, subsequent ones either pseudodichotomous or lateral; internodes up to ca. 3 cm long, shortly pubescent and brown. Leaves oblanceolate-spathulate, obtuse, densely adpressed pubescent; the cauline ones 5-18 x 1.5-3.5 mm (progressively smaller upwards) and very shortly cuspidate; the lower (basal) ones usually much larger, 15 -30 x 3-6 mm, withering in age; stipules up to ca. 7.5 x 2.5 mm, shorter than the leaves. Cymes terminal and subterminal, occasionally lateral to axillary as well, each 3 to 7-flowered, dense, often somewhat intermixed with the leaves; bracts ovate-acuminate, ca. 1.75 x 0.75 mm, with a densely ciliate margin, shorter than the flowers. Flowers 1.75-2 mm, vase-like; receptacle 0.5-0.6 mm long, turbinate, covered with short hooked hairs; sepals 1.25-1.3 mm, spathulate-obovate to suboblong, with a distinct membranous margin, a conspicuous hood but a small apical tip and a short (0.3-0.45 mm long), somewhat slender and divergent awn, which is often quite distinct from the apical tip; petals 0.45-0.5 mm; filaments 0.55-1 mm; anthers 0.25 x 0.2 mm;

ovary c. 0.5 x 0.35 mm, conical, brown, tapering upwards into a long, 0.7-0.8 mm long style, almost equalling the sepals and shortly forked at the tip. Fruit ca. 0.75 x 0.65 globose, with smooth and papery pericarp, filled by the globose seed.
Fl. 5-9. Loose-sandy open grounds.
Type: SE Texas: Kleberg Co.: Laureles Division of King Ranch, E. of Mortilla Camphouse, 15.iv.1954, *M. C. Johnston* 54439 (holo. TEX!).
Distr.: Southeastern Texas.
Cypress City nr. Houston, *J. Ball 703* (GH) & 1227 (WVA); Kleberg Co.: *M. C. Johnston* 54439 (TEX); *F. B. Jones* 1781, 3821, 4857 (TEX); Nueces Co.: *Jones* 1946, 3077 (TEX); *Cory* 20491 (GH); Brookes Co.: *Cory* 14149 (GH); nr. Hebbronville, 25.vi.1941, *B. C. Tharp* (GH); Hidalgo Co.: *Robert Runyon* 2635 (W, WVA).

Closely related to *P. drummondii,* but differing in its ± prostrate shoots, distinctly smaller leaves, smaller flower-clusters, sepals with a much smaller hood-tip and an awn which is quite distinct from this tip, and in its longer style. In *P. drummondii* the shoots are ± erect, the leaves considerably larger, the flower-clusters very compact and large, sepals with a very conspicuous hood-tip, an awn not much distinct from the tip, and a somewhat shorter style.

Series 3. **Paniculatae** Chaudhri p. 89
Flowers in terminal, paniculately arranged cymes.

26. **P. canariensis** (Linn. fil.) Juss in Mém. Mus. Paris 2:390 (1815).
P. Barker Webb et S. Berthelot, Hist. Natur. Isles Canaries 3:163 tab. 20 (1842); J. Bornmüller; Ergebn. bot. Reise Madeira & Canar. Ins. in Engl. Bot. Jahrb. 33:418 (1904); J. Pitard & J. Proust, Les Iles Canarias, Flore de l'Archipel, (1909), Paris; L. Lindinger; Flora der Kanarischen Inseln, Hamburg, 158 (1926); L. Ceballos & F. Ortuno; Veget. et Flor. Forest. Canar. Occid., Madrid, 341 (1951).
Basionym: *Illecebrum canariense* Linn. fil., Suppl. 161 (1781).
Type: Fr. Masson collection in the younger Linne's Herbarium, nos. 426/11 & 426/12 (LINN!).
Syn.: *Paronychia smithii* Choisy ex DC., Prodr. 3:371 (1828).
Type: Is. Canarias., /1815, *Chr. Smith* (G-DC!).
P. orthoclada Webb in sched. (the large-leaved form).

A subshrub with stout and woody, erect, 25-55 cm long stems. Branches mostly confined to the upper part of the shoots, often diffusely spreading; internodes usually long, 5-23 mm, shortly pubescent, the younger part very densely so but the older part occasionally merely puberulous. Leaves with a ca. 1 mm long petiole; blade greenish to dark-brown, mostly elliptic-oblong to narrowly oblong or even broadly oblanceolate, 7-18 x 2-6 mm, acute to shortly acuminate, very shortly mucronate, surfaces often minutely pubescent to puberulous, occa-

sionally almost glabrous (but somewhat coarse) with age, margin ciliate and slightly pale in color and papillose, often narrowed to the base, usually shed in the lower part of the stem; stipules 3-4.5 mm long, narrowly ovate to lanceolate, sharply acute, usually 1/3 (or somewhat less than 1/3) as long as the leaves, often with a reddish base. Flowers arranged towards the ends of the main as well as lateral axes, in long, much-branched, leafless, paniculiform inflorescences consisting of dichasial cymes; the ultimate branchlets of the cymes often monochasial, the branches either lax and spreading or (occasionally) with rather short peduncles and consequently congested; bracts four per flower, subovate, 2-2.75 x 1-1.5 mm, acute, with a finely ciliate margin and reddish, subcoriaceous base (like the stipules), ± equalling or slightly shorter than the flowers.

Flowers with 0.25-0.75 mm long, (longer in the central flowers) minutely pubescent and ± brown pedicel, cylindrical, shortly pubescent and brownish, 2.25-2.65 mm long; perigynous region ca. 0.5 mm long; sepals 1.5-1.6 mm long, narrowly oblong to lanceolate, obtuse, with a minute and rather inconspicuous hood, a rather narrow membranous margin, and a slender, finely pubescent awn with a reddish and stiff base (0.35-0.6(-0.75) mm long) often erect to slightly inwards-directed; petals 0.45 mm, brownish; filaments 0.55-0.6 mm and whitish; anthers 0.25-0.3 x 0.2 mm; ovary ovoid, ca. 0.6 x 0.45 mm, brownish and papillose; styles 0.55-0.6 mm, nearly halfway or slightly deeper split; stigmas thick, divergent with age. Fruit ca. 1 x 0.85 mm, ovoid to almost globose, slightly papillose at the top; seed ca. 0.9 x 0.75 mm, ovoid, with a pointed chalazal end.

Fl. 2-6. On humid rocks, cliffs and roadsides, alt 300-800 (-1400) m.

a) var. **canariensis**: Syn.: *P. canariensis* Juss. var. *expansa* Pitard op. cit. Cymes diffuse. Coastal areas of Gran Canaria, Tenerife, Gomera and La Palma.

Gran Canaria: Moya, *M. Fleischer* and *E. Fleischer-Haigton* 400, 401 (U). **Tenerife:** Tegueste, *Bourgeau* 1334 (E, JE, S); ibid. *Bornmüller* 617, 618 (LD); La Florida, *O. Burchard* 154 (E, S. Z); Icod de los Vinas, *F. Börgesen* 145, 317 (K); ibid., *Cath. Cool & A. den Tex-Boissevain* 272 (U); Taganana, *Pitard* 489 (L, P, S); Garachico, *id.* 72 (L, P); Laguno La Mina, *id.* 1674 (P); Tacoronte, *E. Asplund* 356 (K, S); Buenavista, *id.* 554 & 1010 (S); El Fraile, *id.* 1009 (S); Dante to Garchico, *R. P. Murray* 15 (S); Barranco Hondo, Santa Ursula, *E. Asplund* 218 ((K, S). **Gomera:** Monteforte, *K. Lems* 2315 (L); Carbonero, *Pitard* 1507 (P). **La Palma:** Barranco del Rio, *Bornmüller* 2313 (JE, LD, STU, Z); ibid. *Pitard* 488 (L, P); ibid., *T. S. Sprague & J. Hutchinson* 230 (K); Barranco de los Augustios, *Pitard* 1504 & 1506 (P); Ternesa, *id.* 1505 (P); Barranco del Carmen, *Sprague* and *Hutchinson* 169 & 181 (K); El Capadero, *id.* 400 (K); Santa Cruz, *Bornmüller* 2314 (LD, S).

b) var. **orthoclada** Christ in Engl. Bot. Jahrb. 9:104 (1888). (*P. orthoclada* Webb in sched.).

Type: Ins. Hierro: Villa de Valverde, *Bourgeau* 724 (holo??).

Syn: *P. canariensis* Juss. forma *congesta* Bornm. op. cit.
Cymes much contracted and congested.
Inland rocky places.
Hierro: Valverde, *H. de la Perraudière* 780 & 1341 (JE). **Gomera:** San Sebastian, *Bornmüller* 2311 (Z); Cumbre de los Carbonesos, 870 m, *O. Burchard* 72 (S). **La Palma:** La Caldera, *T. Husnot* 529 (P, W); Tenera, *Sprague* and *Hutchinson* 464 (K). **Tenerife:** Nivaria, Taganana, *E. R. Sventenius* 20 (LIL, LISE); *E. Bourgeau* 185 (E, W, Z).

Series 4. **Villosae** Chaudhri p. 89
Shoots and flowers densely villous.

27. **P. microphylla** Philippi, Voy. Prov. Tarapaca in Ann. Mus. Nac. Chil. Bot. 1891:26 (1891).
K. Reiche, Fl. Chil. 1:210 (1896).

Plate VI, Fig. 7-9. p. 173

A somewhat bushy herb; stems 15-40 cm high, strongly lignified at the base, but with rather slender, profusely floriferous shoots; much-branched, often leafless, brownish and almost glabrous towards the basal region, but the upper parts densely villous and with up to 17 mm long, rather slender, pink internodes. Leaves narrowly elliptic-oblong to lanceolate, occasionally narrowly ovate, 3.5-8 x 1.5-2.25 mm, sharply acute and often shortly mucronate, on both sides shortly adpressed pubescent to puberulous and glabrescent with age, margin slightly denticulate-serrate; rigid and brownish-green; stipules ovate-lanceolate, up to 3.25 mm long, acute, much shorter than the leaves. Flowers in (3-) 6(-10)-flowered, somewhat stellate, almost leafless, lateral clusters, profusely formed towards the top of the shoots; bracts ovate, 2 x 0.75-1 mm, obtuse, with a red-lined margin, almost equalling or somewhat shorter than the flowers. Flowers shortly pedicellate, 1.75-2.25(-2.4) mm (including the awns), mostly 2 mm, broadly oblong, very densely covered with 0.6-1 mm long, thin, soft-woolly, patent hairs, especially towards the base; receptacle rather short, 0.4-0.5 mm long; sepals oblong, 1.25 x 0.5-0.6(-0.9) mm, usually with a narrow membranous margin, a rather small hood, and a (0.25-)0.3-0.45 mm long, slender but stiff, erect to slightly outwards-directed, almost smooth, pink-brown awn; petals (0.6) 1 mm with a reddish tip; filaments 0.45-0.5 mm; anthers 0.3 x 0.2 mm, quadrangular; ovary conical-ovoid, ca. 0.75 x 0.5 mm, tapering upwards into a rather thick, ca. 0.45 mm long style, bifid; stigmas ± erect. Fruit (0.8-)1 x (0.6-)0.75-0.8 mm, ovoid, somewhat papillose on the upper part; seed 0.8-0.9 x 0.65 mm, ovoid.
Fl. 7-4. Sandy loam on dry rocky slopes, ledges and ravines, and in gravelly dry stream-beds, alt. ca 2200-3500 m.
Type: N. Chile, Usmagama, iii.1885, *Carlos Rahmer* (holo. SGO, 48929). Distr.: Endemic in S. (Lower) Peru and Northern Chile.

a) var. **microphylla:** Leaves up to 4 x 1.5 mm, narrowly ovate, strongly mucronate; sepals up to 0.9 mm broad; awn 0.25-0.3 mm.
b) var. **arequepensis:** Leaves 8 x 2.25 mm, narrowly elliptic-oblong to lanceolate, shortly mucronate; sepals up to 0.6 mm broad; awn 0.35 0.45 mm long.

a) var. **microphylla**: Stems very knotty; leaves narrowly ovate, up to 4 x 1.5 mm, strongly mucronate (mucro 0.3-0.4 mm), very rigid and often clustered or crowded; flower-clusters rather few-flowered and mostly lateral; sepals ca. 1.25 x 0.9 mm, with a conspicuous membranous margin and a short 0.25-0.3 mm long awn; the hood also prominent; stigma occasionally trilobed.
Distr.: N. Chile only.

Chile: Prov. Tarapacá: Dept. Tarapacá: Cord. Quebrada de Quipisca, Noasa, ca. 3500 m, *E. Werderman* 1061 (GH, U).

b) var. **arequepensis** Chaudhri n. var. a var. *microphylla* caulibus saepe patentibus, non fortiter nodosis foliis majoribus et pro rato angustioribus (usque ad 8.0 mm longis et 2.35 mm latis), mucrone breviore (circ. 0.25 mm longo) instructis, sepalis angustioribus (usque ad 0.6 mm latis), margine membranaceo angustiore, cucullo minore sed arista longiore (circ. 0.35-0.45 mm longa) instructis distinguenda.
Stems often spreading and not very knotty; leaves up to 8 x 2.25 mm, narrowly elliptic-oblong to lanceolate, shortly mucronate (mucro ca. 0.25 mm), sepals up to 0.6 mm broad and usually with a narrower membranous margin and a somewhat smaller hood but with a prominent 0.35-0.45 mm long awn.
Type: Dep. Arequipa: Cerrillo Lavandia, nr. Laspinas, N. of Arequipa, 2200 m, 15.ix.1938, *W. J. Eyerdam* and *A. A. Beetle* 22161 (holo. GH! iso. S! UC!).
Distr.: S. Peru.

North. Arequipa, Dept. Hardenbarg: Yura, *L. Rutten* 1014 (U); Dept. Arequipa: Chachari Mts: N. of Arequipa, *Mr.* and *Mrs. Hinkley* 75 (GH, S); nr. Arequipa, *F. W. Pennell* 13159 & 13203 (GH); Tiabaya, *Pennell* 13078 (GH); Tingo, *Pennell* 13136 (GH, S); ibid., *C. Vargas* 7961 (GH); nr. Laspinas, *W. J. Eyerdam* and *A. A. Beetle* 22161 (GH, S, UC); S. of Arequipa, *Eyerdam* and *Beetle* 22125 (GH, S, UC).

This is a very characteristic species, distinguished by its villous stems, coriaceous, often sharply mucronate, ovate-lanceolate leaves, almost stellate flower-clusters and densely villous flowers. It occupies a somewhat isolated position amongst the South American spp. of *Paronychia.*

Series 5. **Planitoriae** Chaudhri p. 89
Perigynous zone (receptacle) of the flowers very slightly developed.

28. **P. brasiliana** DC. in Poiret Encycl. 5:23 (1804).
Type: Uruguay: Montevideo, *Commerson* (holo. G!).

Rohrbach in Martinus, Fl. Brasil. 14(2):253, tab. 57, fig. 2 (1872), et in Linnaea 37:202 (1873).

Syn.: *P. bonariensis* DC., Prodr. 3:370 (1828).

Type: Argentine: Buenos Aires (Bonaria), *Commerson* ix.1767, (holo. G-DC! iso! P!).

A perennial herb with a long, woody tap root, and prostrate stems, up to 27 cm long, diffusely spreading, much-branched from the base; internodes up to 12 mm long, often glabrous throughout, very occasionally slightly puberulous, especially near the nodes. Leaves sessile, narrowly elliptic-oblong to ± oblanceolate, sometimes linear-oblong, attenuate to the base, up to 8.5 x 2.5 mm, acute and distinctly mucronate (mucro 0.5-0.75(-1) mm long), densely and adpressedly strigose and somewhat scabrous; stipules 4(-5) x 1.5-2 mm, narrowly ovate-lanceolate, acuminate, margin entire, mostly half as long as the leaves. Flower-clusters pseudo-axillary, usually very profusely developed all along the shoots, 3-10-flowered. Bracts ovate-lanceolate, acuminate, almost equalling the flowers. Flowers shortly pedicellate, 1.5 -1.75 mm (excluding the awns), oblong, rounded at the base, dark-brown when ripe, glabrous, rarely with a few short cilia at the base of the sepal margins; receptacle very short, 0.4-0.45 mm long; sepals 1-1.35 mm long (without the awn), oblong, with a narrow membranous margin, a well-marked stiff hood, and a somewhat outwardly directed or spreading, 0.7-0.85(-1) mm long, slender and smooth awn, and with a conspicuous midrib. Petals absent. Filaments 0.45 mm long; anthers very minute, ca. 0.15 mm diam., almost rounded, orange. Ovary ovoid, ca. 0.5 x 0.45 mm; style ca. 0.3 mm (including the stigmas), nearly 2/3 of its length split into filiform and divergent (subsessile) stigmas. Fruit 1 x 0.85 mm, somewhat qudrangular-obovoid, with a flat, almost rounded top and slightly narrowed at the base, dark-brown, somewhat papillose in the upper part; seed 0.9 x 0.8 mm, subglobose.

Fl. Sept-March. Meadows, alt. nr. s.l. (5-20 m).

Distr.: S. Brasil, Uruguay and NE Argentine. Introduced in S. Africa (Cape Prov.) and ESE Australia.

a) var. **brasiliana:**

Brasil: "St. Paul" (Sao Paulo), *Glaziou* 19398 (C).**Uruguay:** Dept. Montevideo, *G. Herter* 232 (UC) and 232a (U). **Argentine:** Prov. Misiones: /1907, *E. L. Ekman* (LD, S); Prov. Corrientes, ii.1881, *Lorentz* (Z); Prov. Entre Rios: *T. Meyer* 10489 (LIL); *H. A. Fabris* 421 (LIL); *A. L. Cabrera* and *A. Corte* 9612 (C, LP); Prov. Buenos Aires: *A. L. Cabrera* 2203 and 2387 (LP); *Cabrera* 2861, 5257, 7276, 10257 (LP); *Venturi* 86 (LIL); *A. Krapovickas* 35 (LIL); *C. A. O'Donell* 127 (LIL); *A. G. Schulz* 5588 and 5635 (LIL); *R. Huidobro* 1217 and 1251 (LIL); *Corn Osten* 218 (GH); Prov. Córdoba: *T. Stuckert* 14460 (LIL).

b) var. **pubescens** Chaudhri n. var. a var. *brasiliana* caulium ramificationibus retrorse pubescentibus distinguenda.

The branchlets shortly and retrorsely pubescent; (in the rest of the species ± glabrous).
Type: Argentine: Prov. Buenos Aires: Monte Hermoso, /1916, *E. Carette* (LP).
Introduced: South Africa: Cape Prov., Chapman Peak, 29.ix.1937, *Erik Wall* (S); **Australia**: Canberra, along the Molonglo River, 6.xii. 1949, *Gauba* (W); Queensland: Crows Nest R. R. Station, 18.ii.1944, *Mary Strong Clemens* 43720 (LIL).

Rohrbach (op.cit.) had also included in this species some Chilean plants with somewhat similar floral characters; these plants, however, possess a number of distinctive characters which are sufficient to remove them to a separate species described much later, in 1901, from California as *P. franciscana* Eastwood. Hooker and Arnott were the first to notice the differences between the two groups, but, unfortunately, they (in Hooker's Bot. Miscell. 3:337, 1833) confused the Chilean plants with *P. polygonifolia* (Vill.) DC., an Old World species confined to the Mediterranean region, which, moreover, has but very little in common with them. They are closely allied to *P. brasiliana,* but posses congested stems with much shorter and stouter internodes, swollen nodes, the younger shoots, moreover, are often shortly pubescent, the leaves rather thick, uniformly oblanceolate and densely adpressed pubescent and closely approximated, especially towards the end of the shoots, stipules which are much larger than in this species and which usually conceal the internodes, flower-clusters which are often densely congested and nearly concealed by the leaves, the stipules and the bracts, and finally sepal awns, which are somewhat shorter and always erect (not spreading or outwards-directed).

29. **P. franciscana** Eastwood, Bull. Torr. Bot. Club 28:288 (1901).
Type: California: San Francisco, Presidio, 22.iv.1887, *E. L. Greene* (Lectotype UC!).
Core in Amer. Mid. Nat. 26(2):387 (1941).
Misapplied names: *P. chilensis* auct., non DC, Prodr. 3:370 (1828). *P. brasiliana* sensu Rohrbach in Linnaea 37:202 (1873) p.p., non DC. in Poiret, Encycl. 5:23 (1804).
A perennial herb with a woody tap root; stems 15-35 cm long, much-branched from a compact base, prostrate; branches often crowded forming dense mats; shoots densely covered with leaves and stipules, particularly in the upper part; the basal part often leafless and showing distinctly knotted nodes with persistent stipule-bases; internodes 2-12 mm long, stout, very shortly pubescent on the underside or almost glabrous, mostly shorter than the leaves and the stipules. Leaves sessile, ± oblanceolate to narrowly elliptic-oblong, 4-10 x 1.5-2.5 mm, acute, shortly mucronate, attenuate to the base, rather thick, densely

adpressed pubescent; stipules ovate-lanceolate, up to 6 x 2.25 mm, often clasping the internodes.
Flowers arranged in few-flowered, pseudo-axillary, compact cymes, usually densely congested in age, and nearly covered by the leaves and the stipulary bracts. True bracts absent. Flowers subsessile, 1.65 -1.75 mm long (excluding the awns), oblong, turning reddish-brown with maturity, usually slightly pubescent near the tip of the sepals, but sometimes wholly glabrous; receptacle almost indistinct; sepals 1.25-1.4 x 0.45-0.55 mm, oblong, shortly cucullate, with a 0.45-0.7 mm long, slender and smooth, erect awn at the tip and a rather narrow membranous margin. Petals absent. Filaments 0.4 mm long; anthers minute, subquadrangular, 0.15 mm in diam., orange; ovary ovoid; styles ± free, 0.25-0.3 mm (including the stigmatic part), stigmas almost sessile and divergent; fruit quadrangular to almost globose, 1.25 x 1.1 mm, with a papillose top; seed 1.2 x 1 mm, nearly globose.
Fl. 4-6 in Calfornia, 10-12 in Chile. Open grassy slopes and sandy hillsides, mostly along the coasts; alt. ca. 100-1500 m.
Distr.: Localized in California to the neighbourhood of San Francisco, but quite wide-spread in Central Chile and the adjoining islands (Juan Fernandez).

San Francisco: San Francisco: 22.iv.1887, *E. L. Greene* (GH, UC, US, lectotype); ix.1901, *I. S. Brandegee* (UC); *Alice Eastwod* 259 (GH, UC); *Michener* and *Bioletti* 195 (GH); *A. A. Heller* 5677 (E, GH, L); Presidio: *L. S. Rose* 32255 (L), 35123 (LD, W), 38218 (UC, US, WVA); Mt. Davidson, ca. 160 m, *Rose* 41072 (TEX); Bernal Heights, ca. 130 m, *Rose* 47100 (LD); Marin Co.: NE of San Rafael, *J. T. Howell* 16259 (UC). **Chile:** Prov. Coquimbo: SW of Ovalle, *R. Wagenknecht* 5178 (HG); Valparaiso: *Cumming* 435 (E, GH); Prov. Aconcagua: SE of Valparaiso, *F. Jaffuel* and *A. Pirion* 3257 (GH); nr. Santiago, 500 m, *Jaffuel* 312, 445 (GH); Juan Fernandez Island: *Skottsberg* 15, 19 (S); Prov. Colchagua: San Fernando, *G. Montero* 19 (GH); Prov. Concepción: Concepción, *F. Jaffuel* 4009 (GH); La Florida, *E. Bawas* 98 (GH); Corral, *R. A. Philippi* 640 (S); Estacion Malvilla, Llolleo, *G. Looser* 1457 (GH); Prov. Valdivia: Morro Gonzales, *W. Lechler* 242 (FI, G).

This species is a native of Chile, and its limited distribution in the vicinity of San Francisco clearly indicates that it must have been introduced there probably in the second half or the last quarter of the past century. In fact the lectotype (E. L. Greene, 22.iv.1887) is the earliest collection from that region. Surprisingly enough none of the North American authors detected this point.

Closely related to *P. brasiliana* DC., particularly in the form and structure of the flowers, but differing in the more or less compect habit, very knotty and densely tufted shoots, with closely approximated leaves and stipules, on the underside somewhat pubescent shoots, larger and conspicuous stipules, near the tip slightly pubescent sepals, shorter and erect sepal awns, and ± distinct styles.

Series 6. **Echinatae** Chaudhri p. 90
Flowers arranged in globose, pseudo-axillary (lateral), echinate glomerules not concealed by the bracts.

30. **P. echinulata** Chater in Feddes Repert. 69:52 (1964).
Chater in Tutin et al., Fl. Europ. 1:150 (1964); M. Zohary, Fl. Palaest. 1:132 (1966); M. N. Chaudhri in Davis, Fl. Turk. 2:254 (1967).
Type: Spain, prov. Malaga, inter Casarabonella et Alora, *Huter Porta and Rigo* 865 (holo. K! iso. E! STU! Z!).
Syn.: *P. echinata* Lam., Fl. Fr. 3:232 (1778); De Candolle in Poiret, Encycl. 5:23 (1804); Prodr. 3:370 (1828); Boissier, Fl. Or. 1:747 (1867); Willk. et Lange, Prodr. 3:155 (1874); Nyman, Consp. 255 (1879); Battandier et Trabut, Fl. Alg. 165 (1888); Bonn. et Barr., Cat. Tun. 65 (1896); Fiori & Paoletti, Fl. Anal. Ital. 1:334 (1898); Gürke in Richter-Gürke, Pl. Europ. 2(2):185 (1899); Halacsy, Consp. Fl. Gr. 1:571 (1900); Rouy, Fl. Fr. 12:4 (1910); Briquet, Prodr. Fl. Corse 1:483 (1910); Graebner in Aschers. & Graebn., Syn. 5(1):898 (1919); Hayek, Prodr. Fl. Balcan. 1:174 (1924); Dinsmore in Post, Fl. Syr., Pal. & Sin. 1:215 (1932); Jehand. et Maire, Cat. Marocc. 215, 877 (1932); Maire & Weiller in Maire, Fl. Afr. Nord 9:26 (1963); P. Mouterde, Nouv. Fl. Lib. & Syr. 1:457 (1966).
Type: S. France, Lamarck (holo. Hb. Lamarck P-LA!).
Syn.: *Illecebrum echinatum* (Lam.) Poiret, Voy. Barb. 2:128 (1789); Desfontaine, Fl. Atl. 1:204 (1798).
Chaetonychia echinata (Lam.) Sampaio, Lista Herb. Portug. 78 (1913); *Plottzia echinata* (Lam.) Sampaio, Apend. List Herb. Port. 8 (1914); Misapplied name: *Illecebrum cymosum* sensu Sibth. et Smith, Fl. Graec. Prodr. 1:163 (1806), non L., Sp. Pl. ed. 1, 206 (1753).
A small annual herb; stem 3-20(-38) cm high, erect or ascending, branched near the base, shortly and retrorsely pubescent, often having stout, reddish and up to 2.5 cm long internodes. Leaves elliptic-oblong to elliptic, occasionally ± oblanceolate, 4-8.5 x 1.5-3.5 mm, subsessile, mostly acute, sometimes ± obtuse, very shortly mucronate, reddish, glabrous; margin serrulate-denticulate and usually pale and papillose; stipules lanceolate, 2.5-4 mm long, much shorter than the leaves. Flowers in small, pseudo-axillary (lateral), densely congested, stellate to almost globose, sessile clusters, c. 3-6.5 mm in diam., and mostly 7-12-flowered, often forming conspicuous (lateral) glomerules in the fruiting stage; bracts lanceolate, 2-2.5 mm long, somewhat shorter than the flowers. Flowers shortly pedicellate, (1.4-)1.5-2 mm long (excluding the awns), contracted just below the middle, and usually with a well-marked, swollen perigynous region covered with short, hooked (uncinate) hairs; sepals equal, coriaceous, sub-spathulate

to narrowly oblong, with a truncate-obtuse and strongly cucullate apex, and a prominent, (0.4-)0.6-1 mm long, stout, straight and spreading awn on the back of the top, the membranous margin distinct thought narrower than the stiff median band; petals 0.5-0.6 mm long, with reddish tips; filaments 0.45-0.5 mm; anthers minute, 0.25 x 0.2 mm, rectangular and orange-yellow; ovary ovoid-globose, 0.3-0.4 mm in diam., densely papillose; style 0.35-0.45 mm, shortly bilobate at the tip. Fruit 0.8-0.9 mm in diam., ± globose, densely papillose in the upper half; seed 0.7-0.75 mm in diam., subglobose.
Fl. 4-5; ft. 5-7. Dry sandy and stony places, alt up to 1500 m; mainly along the coastal areas of S. Europe, Madeira Is., NW Africa, SW Turkey and Lebanon.
a) var. **echinulata**: Flowers 1.6-2 mm; sepal awns 0.6-1 mm.
b) var. **minutiflora**: Flowers 1.4-1.5 mm; sepal awns 0.4-0.55 mm long.
a) var. **echinulata**:
Syn.: *P. echinata* Lam. var. genuina Maire et Weiller in Maire, Fl. Afr. Nord 9:27 (1963).
Stem up to 38 cm high; leaves up to 8.5 x 3.5 mm; flowers 1.6-2 mm (without the awns); sepal awn 0.6-1 mm long, often quite stout.
Distr.: Throughout the range of the species except in some parts of W. Morocco.

France: Dep. Var.: *Huet* 660 (L);; *C. Chambeiron* 3381 (JE); v-vi.1906, *C. Bertrand* (JE). **Corsica:** Bastia, *P. Mabille* 126 (E, JE); Ile Rousse, 13.iv.1911, *A. Thellung*: (Z); Evisa, *E. Reverchon* 470 (E, W); Ajaccio to Parata, v.1931, *A. Meebold* (K); Calvi, *C. H. Wyatt* 79 (K); Porto, *J. Chevalier* 3018 (Z); Bonifacio, *Kralik* 583 (K). **Italy:** Isola del Giglio: iii.1894, *E. Levier* (FI). **Sardinia:** Santa Teresa Gallura, 27.v.1881, *E. Reverchon* (STU, G); nr. Pulam, iv.1828, *Müller* (E, JE, L, W); Cagliari, 6.vi.193&2, *E. Schmidt* (Z). **Sicily:** Palermo, Gibilrossa, *Todaro* 1260 (COI, JE, W); Madonie, /1860, *Citarda* (JE). **Pantellaria:** Spadillo, 27.v.1960, *S. M. Davies* (K). **Spain:** Balearic Islands: Menorca, Alayor, 20.v.1873, *J. J. Rodriguez* (STU, Z); Andalousia: Grazalema, *E. Reverchon* 551 (E, W, Z); Granada: Prov. Malaga, Casorablancle to Alora, *Huter, Porta, Rigo* 865 (E, K, STU, Z) (Type of *P. echinulata*); Granada: Silla del Moro, *E. Ellman & N. Y. Sandwith* 728 (K); Gibraltar & San Roque: /1849, *Boissier & Reuter* (K); Cadiz: Chiclana, 3.iv.1873, *R. Fritze* (JE, W); Picacho de Alcala de las Gazules, *N. Y. Sandwith* 6238 (K); Huelva: nr. Beas, *H. D. Ripley* 23 (K). **Portugal:** Tras-os-Montes e Alto Douro, *P. Silva* et *al.* 5689 (LISE); Beira: *M. Ferreira* 1461 (COI, W); *J. L. Mendes Pinheiro* 1740 (COI); 29.iv.1943, *Francisco de Sousa* (U); *A. Fernandes* et *al.* 5781 (COI); Ribatejo: *P. Silva* et *M. Silva* 5087 (LISE); Estremadura: *P. Silva et al.* 5048 (LISE); *M. da Silva* 262 (LISE); *G. Pedro et al.* 168 (LISE); *Fontes et al.* 1366 (LISE); iv.1890, *A. R. P. Continho* (COI); Alentejo: *A. Luisier 108* (COI); *Garcia et Sousa* 1212 (COI); *B. Rainha* 3393 & 3618 (LISE); *A. Fernades et al.* 7514 (COI); Algarve: *E. Bourgeau* 1867 (E); *Stud. biol. Rheno-Trai.* 382/1959 (U); *A. Kostermans & W. Kruyt* 642 (L, U). **Madeira:** *R. F. Lowe* 593 (JE); *G. Mandon* 105 (JE, S, W); *J. Bornmüller* 629 (JE, S, Z). **Morocco:** nr. Tanger *Schousboe* 54 (JE, S); W. of Tetuan, 22.v.1934, *Erik Wall* (S); Atlas Medius Dj. Tazekka, ca. 1500 m, 22.v.1934, *E. Wall* (S); Maasiz to Tedders, ca. 300 m, *G. Samuelsson* 7301 (S) (trans. with var. *minutiflora;* sepal awns short but flowers

large). **Algeria:** Oran: *G. Samuelsson* 7025 (S); Santa-Cruz, 20.v.1917, *A. Faure* (S); Dj. Santo, vi.1917, *Ch. d'Alleizette* (Z); Alger: *A. Bourlier fil.* 429 (S); Prov. Alger: Dj. Tizi-Ouzou, vi.1854, *E. Cosson* (S); Ain-el-Turk *B. Balansa* 595 (E); "Gorges de la Chiffa", 600 m, 25.v.1929, *R. Maire* (S). **Turkey:** Vil. Muğla: Bodrum, 100 m, *Davis* 40910 (E). **Lebanon:** Beirut, v.1877, *J. Ball* 1951 (E); Ain Zahalta, 1200-1300 m, vi.1910, *J. Bornmüller* 11497 (E, JE).
It may be found also in SE Greece, SW Italy, Tunisia and the Canary Isles.

b) var. **minutiflora** (Lindb.) Chaudhri comb. n. (var. *minutiflora* H. Lindberg, Iter Medit. in Acta Soc. Sci. Fennicae 47, f. 16 (1932) sub *P. echinata* Lam.).
Stem up to 13 cm high; leaves up to 6 x 2.25 mm; flowers 1.4-1.5 mm; sepal awn 0.4-0.55 mm long and usually slender.
Type: Morocco occid., prope opp. Rabat, in silva Mamora, 2. v. 1926, *Harald Lindberg* 1609 (holo. S! iso. K!).
Distr.: Endemic in W. Morocco.
Morocco (W): nr. Rabat, *H. Lindberg* 1609 (K, S); E. of Salè, nr. Mamora forest, *G. Samuelsson* 6283 (S); Ain Jorra, nr. Mamora, *E. Jahandiez* 251 (E, Z); Zemmour, Harcha, *Jahandiez* 134 (E).

Note: The rejection of Lamarck's epithet on the grounds that it is a superfluous and, hence, an illegitimate name, is very unfortunate and all the more regretable as it has been validly accepted and used for almost two hundred years. The only fault that can be ascribed to Lamarck is that he did not qualify Linnaeus' synonymy. In point of fact the real source of confusion lies in the Linnean protologue for his *Illecebrum cymosum* (in the 2nd edition of the Species Plantarum), and Linneaus, by citing Boccones' synonymy (under *Ill. cymosum*) had, obviously, mixed up the two species. In fact in the Linnean Herb. (LINN) both the plants (*Ill. cymosum* L. or the present day *Chaetonychia cymosa* (L). Sweet and *P. echinata* Lam. or *P. echinulata* Chater of today) are stitched together.

31. **P. rouyana** Coincy in Morot, Journ. Bot. (Paris) 8:65 (1894).
Gürke in Richter-Gürke, Pl. Europ. 2(2):185 (1899); A. O. Chater in Tutin et al., Fl. Europ. 1:150 (1964).
Syn.: *P. echinata* Lam., forma *rouyana* R. Goday et J. Borja Carbonall in An. Jard. Bot. Madrid 8:463 (1948).

A small reddish annual herb; stem 5-10 cm long, erect or ascending, branching just above the base, and mostly pseudo-dichotomously; internodes brown-green to reddish with age, up to 1.7 cm long, very shortly and retrorsely pubescent, the upper side usually glabrescent with age. Leaves ± narrowly oblong, occasionally oblanceolate, and somewhat narrowed at the base, 5-11 x 1.3-2 mm, brown-green to reddish, apex acute and distinctly mucronate (mucro 0.3-0.4 mm), on both sides glabrous, margin serrate-denticulate and very shortly ciliate,

sometimes slightly papillose and pale; stipules lanceolate, 2-3 mm long; Flower-clusters lateral or pseudo-axillary, 5-6 mm in diam., often 9 to 12-flowered, stellate, compact and sessile; bracts narrowly ovate-triangular, 1-1.35 mm long, acuminate, margin densely ciliate, much shorter than the flowers. Flowers shortly pedicellate, 1.7-2 mm long (excluding the awns), somewhat cylindrical but with a conspicuous turbinate base; brown-green to reddish in age, shortly pubescent with hooked and crisped hairs on the perigynous part, and entirely glabrous in the upper part; sepals equal, very stiff-coriaceous, ± (narrowly) oblong, with a rather inconspicuous, narrow, nearly white, membranous margin, a rather small hood at the apex; the latter prolonged outwards and upwards into a long (c. 1-1.45 mm long), very stout, rigid and spreading awn, broader at the base, but narrower towards the hooked tip, often light-green to reddish in age; petals 0.5 mm long with a reddish tip, equalling the nearly white filaments; anthers very minute, 0.15 mm in diam. more or less rectangular and orange-yellow; ovary ± globose-ovoid, c. 0.5 mm in diam., densely papillose above; style 0.45 mm long with a shortly bifid stigma. Fruit 1 x 0.8-0.85 mm, somewhat quadrangular-subglobose, slightly papillose at the top; seed 0.9 x 0.75 mm, nearly globose.

Fl. 6-7; ft. 7. Stony places. alt. ca. 800-1500 m.

Type: W. Spain: Plasencia, 1.vi.1887, *Rouy* (holo. P!).

Distr.: E., C., & W. Spain, between 39 & 43° latitude.

Prov. Toledo: Montes de Toledo, ca. 830 m, *N. Y. Sandwith* 5569 (K); Prov. Teruel: Sierra del Pinar d'Albarracin, vii.1894, *E. Reverchon* 551 (P); Plasencia: Plasencia, 1.vi.1887, *Rouy* (P) (Type).

Closely related to *P. echinulata* Chater, but differing in its narrowly oblong and strongly mucronate leaves, shorter stipules and bracts, very rigid, stout and longer sepal awns with a hooked tip, very stiff sepals, very minute (0.15 mm in diam.) and more or less rectangular anthers, somewhat quadrangular fruit which is only slightly papillose on the top, and finally in its slightly larger seeds. In *P. echinulata,* on the hand, the leaves are elliptic-oblong, broader and very shortly mucronate, the sepals only slightly coriaceous, and the awn rather slender and straight, the anthers 0.25 x 0.2 mm, rectangular, the fruit globose and densely papillose. The two spp. are, moreover, geographically distinct.

Rivas Goday et Borja Carbonall's action (op. cit.) in reducing this species to the rank of a mere forma is totally unjustified. It should have been treated at least as a subspecies even if the distinguishing characters were, in their view, not fully constant. But I think that the form of the leaf and the structure of the sepals and their awns are fairly constant, and are to be regarded as justifying a distinct species.

Series 7. **Argyrocomae** Chaudhri p. 90
Leaves and flowers densely silky-pubescent.

32. **P. argyrocoma** (Michaux) Nutt., Gen. Amer. 1:160 (1818).
Fernald in Rhodora 8:103 (1906); Core in Amer. Midl. Nat. 26 (2):388 (1941); B. Maguire in H. A. Gleason's New Britton & Brown Flora of the NE USA & Canada 2:118 (1952); Strausbaugh et Core, Flora of W. Va. 2:358 (1953).
Basionym: *Anychia argyrocoma* Michaux, Fl. Bor. Amer. 1:114 (1803).
Type: In rupibus montium superioris Carolinae, *Michaux* (Herb. Michaux, P!).

A perennial herb with a woody tap root; stems 5-26 cm long, usually prostrate, much-branched from the base, the branches often forming a dense mat; internodes up to 2 cm long, densely adpressed pubescent with deflexed to retrorse silky white hairs. Leaves up to c. 23 x 2 mm, linear to linear-lanceolate-oblanceolate, acute and shortly mucronate, usually flat though the margin occasionally inrolled, densely adpressed silky-pubescent to almost glabrous; stipules up to c. 8 x 2 mm, lanceolate, acute, entire, shorter than the leaves. Flowers arranged in very compact, terminal cymes forming conspicuous glomerules 1-2 cm in diam.; bracts (scarious) c. 5 x 1.5-2 mm, ovate-lanceolate, entire, mostly almost completely concealing the flowers. Flowers 3.5-5.75 mm long (including the awns), sessile, narrowly oblong, densely adpressed silky-pubescent; receptacle 0.5-0.75 mm long; sepals 2-3 mm long (without the awn), linear-oblong with a narrow (though distinct) membranous margin, a small hood, and a stout though slender, white, erect and scabrous-pubescent or somewhat bristly awn which is 0.75-2 mm long; petals c. 0.5 mm long, hardly distinct; filaments c. 1.5 mm long; anthers 0.4 x 0.2 mm, oblong and orange-yellow; ovary c. 1 x 0.6 mm, ovoid-ellipsoid, densely pubescent; style 1.5-2 mm long, shortly bilobate at the tip, filiform; fruit c. 1.8 x 1 mm, oblong, pubescent at the top. Fl. 7-9. Rocky slopes, ridges and exposed summits, alt up to c. 2000 m, or (300-)900-2000 m.

a) var. **argyrocoma:** Leaves silky pubescent; flowers 4-5.75 mm long; awns scabrous-pubescent.
Distr.: Throughout the range of the species except near the northern and southern boundaries of the latter: Virginia, West Virginia, North Carolina, Tennessee.

West Virginia: Jefferson Co.: *F. Bartley & L. E. Wicks* 40 (WVA); Grant Co.: *Mr. & Mrs. Davis* 3251 (WVA); Pendleton Co.: *H. A. Allard* 2139 (GH) & 19556, 19730 (WVA); *Rossbach* et *al.* 3939 (WVA); *F. Bartley* 1952 (U, W); *W. Va. Univ. Bot. Exp.* 734 (WVA). **Virginia:** Amherst Co.: *R. S. Freer* 211 & 1800 (GH); Roanoke Co.: *C. E. Wood Jr.* 6056 (GH); Franklin Co.: *Wherry & Adams* 2745 (GH); *R. McVaugh* 5436 (GH); Lee Co.: *L. G. Carr* 904

(GH); Rockingham Co.: *F. W. Hunnewell 16225* (GH). **North Carolina:** Buncombe Co.: *D. Correll* 209 (WVA); Surry Co.: *W. B. Fox* 853 (GH, WVA); Ashe Co.: *Fox & Godfrey* 3344 (WVA); Caldwell Co.: *J. K. Small & A. A. Heller* 146 (E, W); Watauga Co.: Blowing Rock: *A. B. Seymour* 7/91817 (GH, TEX); *L. F. & F. R. Randolph* 1166 (GH); *F. W. Hunnewell* 9260 (WVA); Haywood Co.: *H. D. House* 3654 (GH). **Tennessee:** Wolf Creek, *A. Ruth* 747 (E); Buffalo Rock, vii.1894, *A. Ruth* (E).

b) var. Albimontana Fernald op. cit.:

Syn.: P. argyrocoma (Michaux) Nutt. subsp. albimontana (Fern.) Maguire op. cit.

Leaves glabrescent or sparsely pubescent, usually with involute margin; flowers 3.5-4.5 mm long; awns glabrescent.

Type: New Hampshire; White Mts., "Slides", Clinton, *E. Tuckerman* (holo. GH!);

Distr.: Maine, New Hampshire, Massachusetts, and parts of N. Carolina, Tennessee & Georgia.

Maine: Mt. Aribon: 28.vii.1914, *A. Kirk* (GH); Oxford Co.: /1902, *E. Schneider* (GH); **New Hampshire:** White Mts: vi.-viii.1876, *Flint & Huntington* (W, WVA); Willey Slide, *J. M. Greenman* 1012 (GH); Mt. Willard, *C. E. Faxon* 76 (GH); Tate Mt., *H. E. Sargent* 3 (GH); Mt. Chocorua, vii.1894, *B. L. Robinson* (GH); **Vermont:** "Vermont", /1881, *C. E. Ridler* (LD); **Massachusetts:** Newbury Port, vi.1884, *Castelhun & Robinson* (GH); **Washington (D.C.):** Klickitat Co.: vii. 1909, *W. N. Suksdorf* (L); **North Carolina:** Avery Co.: Grandfather Mts., *E. S. Steele* 78 (GH); *F. W. Hunnewell* 9252 (WVA); *F. H. Sargent* 6877 (LD); **Tennessee:** Cumberland Co.: *Sharp & Woods* 7438 (GH, U, WVA); French Broad River, viii.1895, *A. Ruth* (JE); **Georgia:** Lumpkin-Union Co.: *D. Eyles* 7208 (GH).

The main population of this species consists of individuals possessing densely silky-pubescent leaves and inhabits the central part of the area covered by this species, viz., Virginia, West Virginia and a large part of North Carolina, but in the northern part of the area (like Maine, New Hampshire, Massachusetts etc.) as well as in the southern part, i.e. the southeastern parts of North Carolina and Tennessee and the north of Georgia, it is represented by populations consisting of individuals having glabrous or sparingly pubescent leaves. It is interesting to note that there is no geographical link between the populations in the northern part and those in the southernmost part of the area.

Series 8. **Paronychia:**

Flowers either in conspicuous glomerules, and thereby concealed by the scarious bracts, or in pseudo-axillary (lateral), sessile clusters.

33. **P. mexicana** Hemsley, Diagn. Pl. Nov. 36 (1878.

Type: Mexico (central): In regione San Luis Potosi, alt. 2000-2600 m, 1878, *C. C. Parry & Ed. Palmer* 65 (holo. K! iso. E! GH!). E. L. Core in Amer. Midl, Nat. 26(2):388 (1941).

Plate V, Fig. 21-23. p. 162

A perennial herb with a woody tap root; stems up to 17 cm long, prostrate, much branched over their whole length, the branches often crowded, sometimes almost matted; internodes mostly up to 12 mm (rarely up to 23 mm) long, densely pubescent with short, patent to deflexed hairs; nodes often swollen by the persistent bases of leaves and stipules. Leaves usually in axillary fascicles, oblanceolate to linear-lanceolate, sometimes obovate to narrowly elliptic, up to 13 x 2(-3) mm, acute to shortly acuminate and distinctly mucronate, densely scabrous-pubescent or subhirsute, occassionally on both sides glabrescent or glabrous; venation convergent, rather rigid, mostly brown and longer than the internodes; stipules ovate-lanceolate, up to 6 x 2 mm, acuminate, with a subentire margin, shorter than the leaves. Flowers arranged in 3-7(-10)-flowered, compact, pseudo-axillary (lateral), clusters, the latter sometimes densely congested; bracts stipulary, lanceolate, acuminate, with a ciliate margin, and somewhat exceeding but not quite concealing the flowers. Flowers subsessile, 1.5-2.25 mm long, somewhat cup-shaped, having a tubular-oblong calyx and an obconical basal (receptacular) part, densely hirtellous with short patent hairs; receptacle greenish, c. 0.75 (rarely 1) mm long, obconical, much narrowed to the base, strongly 10-ribbed; sepals oblong, 1-1.25 mm, obtuse, with a distinct membranous margin but a poorly developed hood and a very minute (0.05) 0.1-0.15 mm long, stiff, scabrous, nearly white, more or less erect awn, sepals mostly brownish and strongly 3-ribbed. Petals absent. Stamens mostly 5, but sometimes only one; filaments 0.5 mm long, anthers 0.25-0.3 x 0.2 mm, rectangular-oblong and orange-yellow; ovary c. 5 x 0.45 mm, ovoid, densely papillose; style 0.3-0.45 mm long; stigma very shortly 2-lobed. Fruit c. 1.25 x 1-1.1 mm, almost globose, papillose on the top; seed subglobose, c. 1.1 x 1 mm.

Fl. & ft. 6-10. Dry rocky slopes, alt. 2000-2750 m.

Range: Confined to Mexico, in (southern) Baja California, Durango, Nuevo Leon, Zacatecas, S. Luis Potosi, Guanajuato, Hidalgo, Mexico and Puebla states.

A) ssp. **mexicana:** Stamens 5.

Distr.: Central Mexico.

Zacatecas: Zacatecas, *C. G. Pringle* 1763, 3931 (GH, UC); Concepcion del Oro, *E. Palmer* 287 (GH). **San Luis Potosi:** San Luis Potosi, *Parry* et *Palmer* 65 (E, GH, type); *J. G. Schaffner* 133, 535/133 (GH, LD). **Guanajuato:** Guanajuato, *L. A. Kenoyer* 1808 (GH, forma glabrescens). **Hidalgo:** Pachuca, 2750 m, *Pringle* 6921 (E, GH, JE, UC); Distr. Pachuca S.E. of Epazoyucan, 2500-2700 m, *H. E. Moore Jr.* 3065 (GH); Metepec Station, 2700 m, *Pringle* 13178 (GH, L); **Mexico:** Sierra de las Cruces, *Pringle* 7387 (JE).

B) ssp. **monandra** (Brandegee) Chaudhri, comb. et stat. nov.: (*P. monandra* T. S. Brandegee, Proc. Cal. Acad. ser. 2, 3:115 (1891).

Type: Cape region of Baja California, presumably collected by Brandegee himself (holo. UC, not seen).

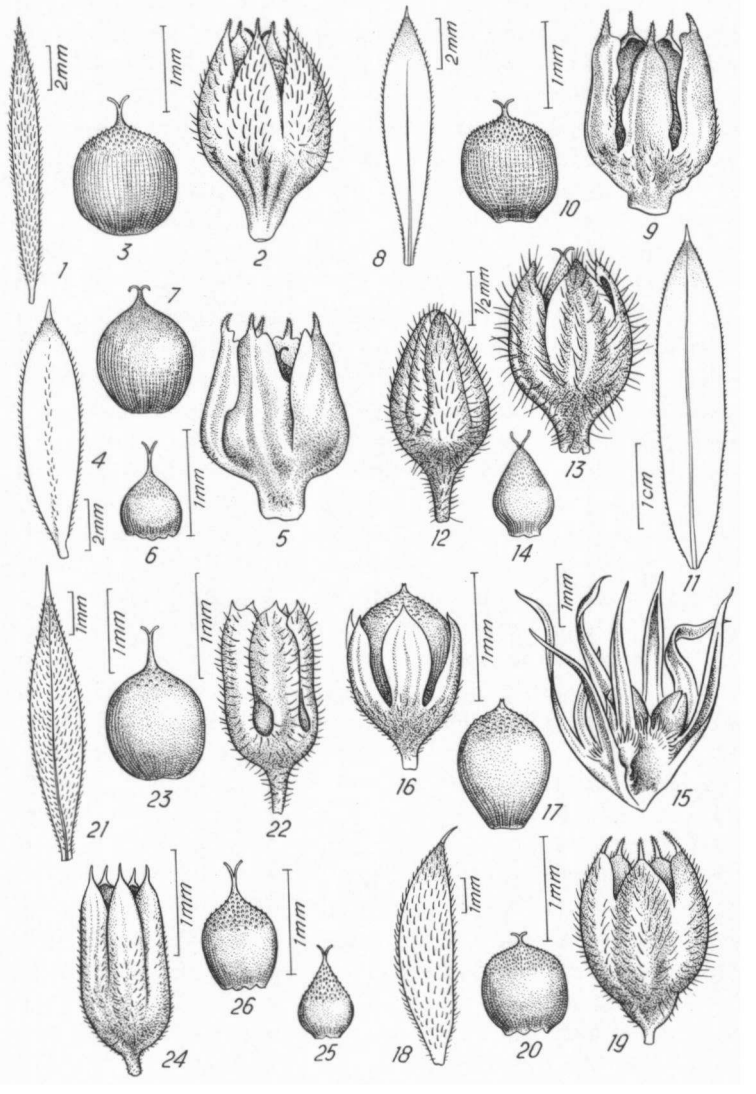

Plate V. Fig. 1-3: **P. coquimbensis**; 1: leaf; 2: flower; 3: fruit [ix.1928, *Günther & Buchtien*(C)]. Fig. 4-7: **P. johnstonii**; 4: leaf; 5: flower; 6: ovary and style; 7: fruit [*Johnston* 5184(GH)]. Fig. 8-10: **P. chilensis**; 8: leaf; 9: flower; 10: fruit [*Pöppig* 80(LD)]. Fig. 11-14: **P. paranensis**; 11: leaf; 12: flower (young); 13: ripe flower with fruit; 14: ovary and styles [*Hatschbach* 6483(LIL)]. Fig. 15-17: **P. camphorosmoides**; 15: part of a shoot; 16: flower; 17: fruit [*Reitz* C1061 (GH)]. Fig. 18-20: **P. communis**; 18: leaf; 19: flower; 20: fruit [*Hauny* 39(U)]. Fig. 21-23: **P. mexicana**; 21: leaf; 22: flower; 23: fruit and style [*Parry & Palmer* 65(GH)]. Fig. 24-26: **P. fasciculata**; 24: flower; 25: ovary and style; 26: fruit [*Luiz Roth* 1680(RB)].

Stamen always 1.
Distr.: The peripheral areas surrounding the central region of Mexico, & SSE Baja California.
a) var. **monandra**: Leaves mostly narrowly oblanceolate, sharply acute and strongly mucronate (mucro 0.5-1 mm), densely hirtellous to almost hirsute.
Distr.: Throughout the range of the ssp. except in the southern part. **Baja California:** Sierra de la Laguna x.1893, *T. S. Brandegee* (GH, UC); The Laguna Mts., *Marcus E. Jones* 27045 (GH, UC). **Durango:** Durango, *E. Palmer* 783 (GH, UC). **Nuevo Leon:** Cañon de los Capulinas, above San Enrique, *C. H. Mueller* 2394 (GH).
b) var. **popocatepetliana** Chaudhri n. var. a var. *monandra* foliis latioribus (obovatis vel anguste ellipticis), mucrone minore instructis, subglabris distinguenda.
Leaves obovate to narrowly elliptic, acute and minutely mucronate, almost glabrous.
Type: Puebla: Popocatepetl, xi.1905, *C. A. Purpus* 1799 (holo. UC! iso. GH!).
This species resembles *P. communis* Cambess. in general appearance, but differs in the form and structure of the sepals, the minute awns, larger anthers, and the well-marked style with the shortly bifid stigma.

34. **P. communis** Cambessèdes in St. Hilaire, Fl. Brasil. 2:186 (1829).
Misapplied name: *P. chilensis* sensu Rohrbach et auct. al non DC., Prodr. 3:370 (1828).
Rohrbach in Martius, Fl. Brasil. 14(2):252, tab. 57, f.1 (1872) sub *P. chilensis* DC, et in Linnaea 37:205 (1873) sub *P. chilensis* DC. p.p.

Plate V, Fig. 18-20. p. 162

A perennial or rarely, annual or biennial herb with prostrate stems, which are 15-45 cm long, much-branched from the base, with the branches often diffusely spreading and densely leafy; internodes up to c. 20 mm long, stout, more or less densely pubescent and glabrescent with age. Leaves subsessile narrowly elliptic-oblanceolate to ± elliptic-oblong, up to 15 x 4.5 mm acute to acuminate and often shortly mucronate, sometimes pungently so (mucro 0.4-0.6(-1) mm long), usually adpressed hirsute and scabridous, occasionally on both sides glabrescent to glabrous and with a shortly hairy margin; stipules up to c. 5 mm long, ovate-lanceolate, acuminate, deeply split, margin slightly ciliate. Flowers solitary axillary as well as in 3-(-7)-flowered pseudo-axillary (lateral) clusters; bracts (stipulary) lanceolate, mostly somewhat exceeding the flowers. Flowers shortly pedicellate, (1.25-) 1.6-2.4 mm long, ellipsoid to obovoid, turbinate at the top and abruptly narrowed at the base, densely covered with fine though rather stiff and patent hairs; receptacle 0.4-0.5 mm long, often greenish and

strongly ribbed; sepals brownish, 1-1.2 x 0.4-0.45 mm, narrowly oblong, concave, with a distinct membranous margin, a rather poorly defined hood, and shortly awned,the awns being 0.2-0.3(-0.4) mm long, bristly-scabrous, rather stiff, nearly white and ± erect; sepals often incurved at the tips and strongly 3-ribbed on the back; petals 0.4-0.45 mm, brownish; filaments 0.45-0.5 mm, nearly white; anthers minute, 0.15-0.2 mm in diam., subquadrangular and orange; ovary ovoid, c. 0.5 x 0.4 mm, densely papillose; style (0.3-)0.35(-0.4) mm, (including the stigmas), often c. 1/3(-1/2) bifid into subfiliform and erect to spreading stigma-lobes. Fruit 1-1.2 x 1 mm, ovoid-subglobose to sub-quadrangular, flat-rounded at the top, densely papillose in the upper part; seed c. 1 x 1 mm, globose.

Fl. Sept.-April. Rocky flats, ca. 600-3800 m. mostly in temperate or subalpine regions.

1a) Leaves oblanceolate, sharply acuminate and pungently mucronate ..... var. **pungentifolia**

1b) Leaves narrowly elliptic-oblong, acute and often shortly mucronate.

2a) Flowers often up to c. 2 mm long; sepal awns up to c. 0.3 mm long ..... var. **communis**

2b) Flowers 2-2.4 mm long; sepal awns 0.35-0.4 mm ..... var. **chicligastensis**

a) var. **communis:** Type: SE. Brasil: Sao Paulo, *St. Hilaire* in 1816-21 voy., 1511 (& 2030bis) (lecto.-holo. P!);

ai) forma **communis:** Leaves adpressed hirsute or subhirsute.

Very widespread in N. & C. Argentine, Paraguay, SSE Brasil, Bolivia and parts of Peru and Ecuador.

ARGENTINE: Prov. Córdoba: *T. Stuckert* 10665 (LIL); *Corn. Osten* 13146 (S); *T. Meyer & H. Sleumer* Mey 15717 (LIL); Prov. La Rioja: *R. Hauy (or Hany)* 39 (GH, L, LP, U); *J. Morello* 5317 (LP); Prov. Catamarca: *Pedro Jorgensen* 1117 (GH, UC); *V. Carenzo & P. R. Legname* 1210 (LIL); *V. Carenzo* 887 (LIL); *Leon Castllon* 908 (LIL); Prov. Tucuman: *C. Cristobal* 304 (LIL); *J. Araque & F. A. Barkley* 19AR154 (LIL); *A. Lourteig* 512 (LIL,U); *S. Venturi* 5884, 6030 (GH, LIL); *Pedro Jorgensen* 79 (GH); *Leon Monetti* 1675 (LIL); *M. Lillo* 3601, 3636, 2212 (LIL); *B. Sparre* 599 & 688 (S); Prov. Salta: *B. Sparre* 1211 (S); *O. Borsini* 506 (LIL); S. A. Pierotti 1018 (LIL, S); Prov. Jujuy: C. A. O'Donell 4664 & 4828 (LIL); *A. L. Cabrera* 14676 (LP); *Carenzo & Legname* 710 (LIL); *Schreiter* 3167 (LIL); Prov. Chaco: *T. Rojas* 11721 (LIL, S); *A. G. Schulz* 520 & 3632 (LP); Prov. Entre Rios: *T. Meyer* 11051 (LIL); Prov. Corrientes: *S. A. Pierotti* 5572 (LIL); *A. L. Cabrera* 11692 (LP); *Tito S. Ibarrola* 3726 (LIL); *Rosengurtt* B-3709 (S); *G. J. Schwarz* 8177 (LIL); Prov. Misiones: *E. Schwindt* 1332 (LIL); *J. E. Montes* 674a (LIL) & 4232 (LP); *E. L. Ekman* 1874 (LD, S); *G. J. Schwarz* 10829 (LIL). **PARAGUAY:** *B. Balansa* 1941 (LD, S) (trans. with var. *pungentifolia); Pedro Jorgensen* 4720 (C, S); *E. Hassler* 4439 & 6249 (GH, S) & 12422 (C, E, G, L, LIL, S); *K. Fiebrig* 922 (E) & 843 (E, GH, L) (the latter trans. with var. *pungentifolia); Sparre & Vervoorst* 318, 662, 1563 (LIL); *T. Rojas* 12926 (LIL). **BRASIL:** Rio Grande do Sul: *A. Bornmüller* 563 (GH, U); *Gust.*

O. A. Malme 32 (S); *B. Rambo* 40234, 42540, 45739 (LIL, W); Santa Catarina: *P. R. Reitz* 6059 (UC); *R. Reitz & R. Kein* 5327 (S, UC); Parana: *P. Dusén* 247 (S); *id.* 835a (GH) & 6650, 7086 (GH, S); Sao Paulo: *Glaziou* 16357 (C); *J. E. Leite* 3414 (GH, LIL); Minas Gerais: *Widgren* in 1945 (LD, S); *A. F. Regnell* 3/1647 (C, S) forma annua! **BOLIVIA:** *Steinbach* 3815 (LIL) & 5005 (GH); *G. Mandon* 992 (S); *W. J. Eyerdam* 25034 (UC); *Miguel Bang* 524 E, S, as *P. setigera); O. Buchtien* 4150 (GH, S, as *P. setigera*) & 7295 (GH) & 546 (C, E, LD); *C. Hammarlund* 483 (S). **ECUADOR:** Prov. Azuay, *Manuel A. Giler* 28 (UC); Quito, *J. N. Rose* 23541 (GH,; ibid. *Spruce* 6117 (E); ibid. *W. Jameson* 541 (E).

aii) forma **subglabra** Chodat et Hassler in Bull, Herb. Boiss. ser. 2, 3: 791 (1903).

Leaves glabrescent.

Type: Paraguay: In arenosis pr. flumen Capibary, *E. Hassler* 4439 (G!), (in GH, & S exsiccatae the leaves are hairy as in the rest of the species).

Argentine: Chaco: *T. Rojas* 11840 (LIL); Misiones: *G. J. Schwarz* 5874 (LIL).

b) var. **pungentifolia** Chaudhri n. var. a varietatibus aliis adhuc notis foliis oblanceolatis, acuminaris et aristulatis distinguenda.

Leavaes ± oblanceolate, acuminate and very pungently mucronate-aristulate.

Type: Brasil: Rio Grande do Sul: S. Leopoldo, *B. Rambo* 43913 (holo. LIL!).Distr.: Endemic in Prov. Rio Grande do Sul, and parts of Montenegro.

Rio Grande do Sul: *B. Rambo* 43913, (LIL) & 45246 (LIL, TEX, W); *E. Henz* 35752 (LIL); *Malme* 558 (S); *Palacios-Cuezzo* 629 (LIL); *B. Rambo* 34715 (S), 42775 (LIL) both trans. forms; *Palacios-Cuezzo* 887 (LIL, trans.); **Montenegro:** *Henz* 32997 (W). Santa Catarina: *Reitz & Klein* 46 (S, trans).

c) var. **chicligastensis** Chaudhri n. var. forma foliorum cum. var. *communi* congruens sed floribus majoribus (2.0-2.4 mm altis), sepalis arista longiore (0.35-0.40 mm longa) instructis ab ea distinguenda.

Leaves often ± glabrescent; flowers 2-2.4 mm long; sepal awns 0.35 -0.4 mm.

Type: Argentine: Prov. Tucuman: Dep. Chicligasta: *T. Meyer* 14120 (holo. LIL!).

Distr.: Endemic.

Dep. Chicligasta: *O. Borsini* 875 (LIL); *T. Meyer* 14120 (LIL); *C. A. O'Donell* 4207 (LIL); Dep. Bunuyacu: *O. Borsini* 880 (LIL).

35. **P. paranensis** Chaudhri n. spec.

Plate V, Fig. 11-14, p. 162

Herba perennis. Caules divergentes, usque ad 50 cm longi et 2 mm diam., viriduli; internodia usque ad 3 cm longa, primum pilis retrorsis mollibus et brevibus densius vestita, denique in latere ad lucem obverso glabrescentia. Folia plerumque patentia, oblonga vel elliptico-oblonga, usque ad 20 mm longa et 5 mm lata, utroque extremo paulum angus-

tata, acuta et mucrone 0.4-0.75 mm longo instructa, strigulosa sed denique glabrescentia, margine ciliolata, costa basim versus saepe prominente; stipulae ovato-lanceolatae, usque ad 6 mm longae, acuminatae, saepe fere usque ad basim partitae. Glomeruli in ramulis superioribus profusi, laterales, e floribus 3-10 compositi; bracteae scariosae, lanceolatae et acuminatae, floribus paulo longiores sed eos non omnio obtegentes. Flores subsessiles, 2.0-2.25 mm alti, suburceolati, abrupte angustati in receptaculum obconicum 0.5-0.7 mm altum, pilis patentibus brevibus dense vestiti; sepala anguste oblonga, 1.0-1.25 mm longa et 0.45 mm lata, margine membranaceo conspicuo, parte mediana 3-nervia, cucullo, parvo et arista albida et hirtella, 0.25-0.3 mm longa instructa; petala 0.6-0.65 mm longa, apice rubeola; stamina filamento albido circ. 0.4 mm longo et anthera oblonga, 0.3 mm longa et 0.2 mm lata, aurantia instructa; ovarium conicum, 0.65 mm altum et 0.55 mm diam., pallide aurantium et parce papillosum; styli duo vel raro tres, subliberi, 0.25-0.3 mm longi et in stigma parvum divergens exeuntes. Fructus conico-ovoideus, circ. 1.3 mm altus et 1.0 mm diam., apice paulum angustatus et hic parce papillosus. Florens mense Octobri.

Type: Brasil: Parana: Ponta Grossa, Barra Rio Pittangui, 12.x.1959. *G. Hatschbach* 6483 (as *P. chilensis* DC.) (holo. LIL! iso. L!).

Distr.: Endemic; known only from the type locality.

Very closely resembling *P. communis* Cambess. particularly in the structure of the sepals, but differing in its much longer and stouter stems with longer internodes, its larger leaves, which are rather peculiarly arranged all along the branches and usually on both sides ± pubescent to glabrous, and with a shortly ciliate (not hirsute) margin, in the characterictic flower-clusters, conspicuous petals, larger oblong anthers, ± conical (not globose) ovary and fruit, and esspecially in its two more or less free styles.

36. **P. illecebroides** (Smith) Webb in W. J. Hooker, Niger Flora 106, t. 7 (1849).

Aug. Chevalier, Flore de l'Archipel (Les Iles du Cap. Vert) 996 (1935).

Basionym: *Herniaria illecebroides* Chr. Smith in Tuck. Voy. 250 (1818).

Type: (of *H. illecebroides):* "Cab. Virid", 10.iv.1816, *C. Smith* 3 (holo. BM!).

Icon: Hooker's Icon. Plant. 4:t.756 (1848).

A somewhat bushy herb with a thick woody tap root and c. 20-45 cm long, stout stems, often much-branched and spreading from a compact and woody base; shoots prostrate to suberect, usually with rather long (4-24 mm long) stout, shortly retrorsely pubescent inter-

nodes which, occasionally, become puberulous in age. Leaves sessile, linear-oblong to oblanceolate, sometimes linear-lanceolate, mostly 4-12 x 0.75-1.5 mm, very occasionally oval-elliptic to elliptic-oblong and 4-7.5 x 2-3 mm, apex generally acute and minutely mucronate, on both sides very shortly pubescent becoming almost puberulous in age; subcoriaceous and often dark-brown; margin finely serrulate; stipules narrowly ovate-lanceolate, 2-4(-5) mm long, c. 1/3-1/2-(-2/3) as long as the leaves. Flowers in small pseudo-axillary clusters which are usually 2-4 mm in diam., but sometimes become very dense and large (5-10 mm in diam.); bracts ovate, 1.5-2 x 0.75-1 mm, subobtuse, stipulary, somewhat shorter than the flowers. Flowers subsessile, 1.5-2.35 mm (including the awns), mostly 2-2.25 mm, cylindrical, greenish- to dark-brown, (often with a pinkish and distinct perigynous region), subcoriaceous in age, shortly pubescent; sepals narrowly oblong, obtuse, with a rather narrow membranous margin, a small hood and a short (0.25-0.35 mm long, erect, stout, and nearly smooth) awn at the tip; petals 0.4 mm; filaments 0.5 mm; anthers 0.25-3 x 0.2-0.25 mm; ovary ovoid, c. 0.5 mm in diam.; style (unlobed part) 0.2-0.25 mm, and stigmas 0.25-0.3 mm, dark-brown, erect to somewhat divergent. Fruit almost oblong to ovoid-globose, 0.75-0.8 x 0.6 mm, densely papillose in the upper half; seed ± globose, 0.65 x 0.6 mm.

1a) Leaves linear-oblong to oblanceolate or linear-lanceolate, acute ..... var. **illecebroides**

1b) Leaves elliptic to elliptic-oblong, mostly obtuse ..... var. **nicolauensis**

A) var. **illecebroides:** Leaves 4-12 x 0.75-1.5 mm, linear-oblong to oblanceolate, sometimes linear-lanceolate, acute.

Fl. & fr. 7-12 mostly.

Range: Throughout Cape Verde Islands except in S. Nicolau.

a) forma **illecebroides:** Hairs on the perigynous region of the flower straight.

S. Antao: V. Maria Pia, vii.1892, *J. Cardoso* 8 & 49 (L, Z); Rib. Paul Pombas, ix.1934, *Aug. Chevalier* 45299 (P), 45306 (COI, P); Cova, 1300 m, *id.* 4556 (P), 45581 (COI, P); **S. Vicente:** Mindelo, -/1861, *Welwitsch* 1067 & 1067b (BM, K); Mte. Verde, *Aug. Chevalier* 45756, 45776, 45795 (P); **Fogo:** c. 2000 m, *id.* 44881, 44885 (COI, P).

b) forma **hamata** Chaudhri nov. forma a forma *illecebroides* pilis in floris regione perigyna insertis uncinatis vel apice contortis distinguenda.

Hairs on the perigynous region hooked or coiled at the tip.

Type: In montibus ins. S. Vincente, i.1851, *J. A. Schmidt* sn (HAL).

B) var. **nicolauensis** Chaudhri nov. var. a var. *illecebroides* foliis laterioribus (ellipticis vel elliptico-oblongis), apice plerumque obtusis distinguenda: Leaves elliptic to elliptic-oblong, mostly obtuse, 4-7.5 x

2-3 mm; (perigynous region often pinkish and quite distinct from the sepals).

Endemic in S. Nicolau Island.

S. NICOLAU: Monte Gordo, 26.ii.1864, *T. Lowe* (BM, hotoype); Voltas above Thome Pires, 22.ii.1864, *Lowe* (BM, P).

This species resembles *P. polygonifolia* (Vill.) DC. in habit as well as in the character of pseudo-axillary (lateral) flower-clusters (or the weakly defined glomerules), but differs in the structure of the shoots, leaves and sepals. The habit of this species is that of a somewhat bushy herb with a very woody root or base, and very stout stems; the leaves are usually quite narrow, linear-oblong to oblanceolate or even lanceolate, and sub-coriaceous; the sepals too are subcoriaceous with age, and possess a quite narrow membranous margin (broad in the other sp.). The bracts in this species are somewhat shorter than the flowers, and the clusters are larger and often very compact. In *P. polygonifolia,* on the other hand, the stipules and the bracts are quite prominent, and the flowers are almost concealed by the bracts.

J. A. Schmidt's collection from S. Vicente Island (HAL) is very remarkable in having hooked hairs on the perigynous region of the flowers, while in the rest of the population of this species the hairs are all straight. It may well have been caused by the infiltration of one or more genes from *P. arabica* (L.) DC. (characterized by uncinate hairs on the flowers) which is quite wide-spread in N. Africa. Curiously enough, a duplicate of the same collection (S) does not have any hooked hairs.

In Hooker's Icones (op. cit.) the opened flower (f. 4) is shown with 10 fertile stamens, which is incorrect. Similarly the bract is figured with a strongly ciliate-fimbriate margin, a point not borne out by the facts. The bracts are actually stipulary in nature, and the margin is very slightly or finely ciliate like that of the stipules.

37. **P. muschleri** Chaudhri nom. n.

P. rigida Mischler in Engl. Bot. Jahrb. 45:458 (1910-11), non Moench, Meth. 315 (1794).

Plate VI, Fig. 16-18. p. 173

A small perennial herb with a woody tap root; stems prostrate, congested, basally very woody and much-branched, 5-15(-20) cm long, usually with rather short, 5-9 mm long, internodes, very shortly and retrorsely pubescent to glabrescent with age. Leaves narrowly obovate-oblanceolate to narrowly elliptic-oblong, 5-9 x 1.5-2.25 mm, acute and shortly mucronate (mucro 0.3-0.45 mm and pale), usually on both sides ± glabrous, very occasionally sparsely pubescent especially on the under side, margin very shortly ciliate; stipules ovate-lanceolate,

4-5 mm long, mostly somewhat shorter than the leaves, acute to acuminate, margin finely ciliate. Flowers arranged in 3 to 7-flowered lateral or pseudo-axillary clusters, often very profuse and congested with the leaves; bracts up to c. 3 x 1.25 mm, ovate-lanceolate, acuminate, with a ciliate margin, somewhat exceeding but not quite concealing the flowers. Flowers 1.5-2(-2.25) mm long (including the awns), ellipsoid-turbinate, swollen just below the middle and somewhat tapering at both ends, mostly glabrous, sometimes with very small patches of short, fine hairs on the base of the sepal margins (or on the perigynous zone), green to brown with age; receptacle obconical, c. 0.5 mm long, strongly ribbed; sepals oblong to ovate-oblong, 0.65-0.75 x 0.55 mm, slightly narrowed to the apex, rather thin, strongly 3-nerved on the back and with a distinct membranous margin, a small, membranous hood, and a short awn, the awn (0.35-)0.45-0.6 mm long, slender, smooth and ± erect; petals c. 0.45 mm, with reddish tip; filaments 0.4(-0.45) mm and nearly white; anthers minute, c. 0.2 x 0.15 mm, quadrangular and orange-brown; ovary conical-ovoid, c. 0.5 x 0.4 mm; style c. 0.35 mm (including the stigmatic part), nearly bifid into two divergent stigma-lobes. Fruit c. 1 x 0.85 mm, ovoid to subglobose, slightly papillose on the upper part; seed c. 0.75 x 0.65 mm, subglobose.

Fl. Jan.-April. Limestone rocks in the alpine to subalpine regions; alt. ca. 2000-4500 m.

Type: Peru: Poto, Prov. Sandia, in formatione aperta, alt. ca. 4500 m, *Weberbauer* 984 (holo. B, presumably destroyed; iso. ??).

Distr.: Peru and Bolivia.

Peru: Dep. Puno, Chuquibambilla, *F. W. Pennel* 13406 (GH, K, S); Prov. Calea: Dep. Cuzco, *Marin* 625 (LIL); Prov. Cuzco: Urubamba, 2000 m, *H. Ellenberg* 1181 (U); Escallonia, NW of Yanahuara 3200 m, *Ellenberg* 1084 (U); nr. Lake Titicaca, *Tutin* 962 (BM). **Bolivia:** Dep. La Paz, *Otto Buchtien* 249 (GH, K) and 546 (S, Z); Dep. La Paz: Lourdes, nr. La Paz, *A. Krapovickas* and *A. M. Fuchs* 6795 (LIL); Prov. Larecaja, vic. Sorata, Challapampa, *G. Mandon* 992 (GH).

A very distinct species characterized by its ± glabrous leaves, glabrous and turbinate flowers, and the short, smooth, slender and erect sepal awns. Rather distantly related to *P. brasiliana* DC. and *P. franciscana* Eastw. which, however, possess pubescent leaves, longer stipules, weakly developed perigynous zone, larger and reddish sepals with a long, very conspicuous awn, and sessile or subsessile stigmas.

38. **P. johnstonii** Chaudhri n. spec.

Plate V, Fig. 4-7. p. 162

Herba perennis, radice perpendiculari lignoso et caudice lignoso, circ. 2.5 cm diam., pro parte subterraneo instructa. Caules prostrati,

8-25 (35) cm longi, foliosi et dense ramificati; internodia viridi-brunnea, robusta, usque ad 1.5 cm longa, pilis retrorsis dense pubescentia, interdum praesertim in latere ad lucem obverso glabrescentia. Folia plus minusve patentia, majorem partem ad nodos incrassatos fasciculata, oblanceolato-oblonga vel oblonga, interdum lineari-oblonga, raro elliptico-oblonga, 10-15 cm longa et 2.0-3.75 mm lata, in var. *scabrida* tamen maxime 6.5 mm longa, acuta vel breviter acuminata et mucronata, brunneolo-viridia, saepe utrimque sparse hirtella, in var. *scabrida* dense strigosa, margine ciliata; stipulae ovato-lanceolatae, usque ad 6 mm longae et 2 mm latae, acuminatae, basi pallida et subcoriacea persistente. Glomeruli laterales, plerumque e floribus 3, rarius usque ad 7 compositi vel ad florem singulum redacti; bracteae lanceolatae, usque ad 3.5 mm longae, acuminatae, saepe incisae, floribus paulo longiores sed eos non omnino obtegentes. Flores subsessiles, turbinati, utroque extremo contracti, plerumque fere omnino glabri, receptaculo tamen interdum sparse puberulo, in var. *scabrida* sepalis ad apicem pubescentibus, plerumque virides et carnosi; receptaculum plerumque circ. 1 mm altum, interdum tamen multo brevius, obconicum, ad basim abruptius contractum; sepala plus minusve conniventia, anguste ovato-deltoidea, 1.25-1.3 mm longa, carnosa, margine membranaceo angusto, cucullo parvo et membranaceo et arista rigida, albida et hirtella, 0.2-0.25 mm longa instructa, nervis indistinctis; petala 0.4-0.45 mm longa; stamina filamento (0.5-) 0.6 mm longo et anthera rectangulari (0.25-) 0.3 mm longa et 0.2 (0.25) mm lata, luteo-aurantia instructa; ovarium ovoideo-conicum, circ. 0.75 mm altum et 0.6 mm diam., laeve; stylus 0.2-0.24 (0.27) mm longus, in stigmata dua divergentia et recurvata, 0.1-0.12 (0.14) mm longa exeuns. Fructus subglobosus, 1.1-1.25 mm diam., pericarpio tenuissimo sublaevi instructus; semen globosum, 1 .0-1.1 mm diam.

Fl. & ft. Nov.-Dec. Moist grassy slopes and ridges along the coast. Type: Northern Chile: Prov. Antofagasta, Depart. Taltal, Aguada de Cachinalcito, 28.xi.1925, *Ivan M. Johnston* 5184 (holo. GH! iso. S!). Distr.: Endemic in Northern Chile.

a) var. **johnstonii**: Leaves up to 15 mm long, oblanceolate to elliptic-oblong, mostly on both sides glabrescent and with a hirtellous margin; sepals subglabrous.

b) var. **scabrida** Chaudhri nov. var. a var. *johnstonii* foliis minoribus (usque ad 6.5 mm longis) sed pro rato paulo longioribus, utrimque dense strigosis, sepalis ad apicem distincte pubescentibus distinguenda. Leaves up to 6.5 mm long, ± elliptic to obliquely oblong with densely adpressed hirsute surfaces; sepals distinctly pubescent near the apex. Type: Prov. Antofagasta, Pept. Taltal: Vicinity of Aguada de Miguel Diaz 1-4.xii. 1925, *Ivan M. Johnston* 5356 (holo. GH!).

This species differs from the two other Chilean species, viz. *P. chi-*

lensis DC. and *P. coquimbensis* Gay, in the characters of the leaves and flowers, its fleshy and connivent sepals with rather indistinct nerves and mostly entirely glabrous back, its ovary and its subglobose fruits and seeds.

39. **P. chilensis** DC., Prodr. 3:370 (1828).

Plate V, Fig. 8-10. p. 162

A perennial herb with stout, prostrate, up to 28 cm long stems, branched from the woody and compact base; internodes up to 1 cm long, mostly slightly pubescent to puberulous on the under side to ± glabrous in age, nodes often somewhat swollen; the younger shoots densely leafy. Leaves subsessile, oblanceolate, up to 10 x 2.25 mm, subcoriaceous, brownish, on both sides finely puberulous or almost glabrous, occasionally densely scabrous-pubescent or subhirsute, margin shortly ciliate, acute, distinctly (though shortly) mucronate, densely congested towards the end of the branches; stipules up to 5.25 mm long, lanceolate, acuminate, margin entire, often split at the tip, the persistent base coriaceous, pale. Flowers axillary as well as arranged in 3 to 9-flowered pseudo-axillary (lateral) clusters; bracts ovate-lanceolate, up to 3 mm long, acuminate, with ciliate margin. Flowers subsessile, 2.25-2.4 mm long including the awns, turbinate to somewhat cuplike, narrowed at the base, mostly minutely puberulous to subglabrous, subcoriaceous; receptacle 0.8-1 mm long, obconical, strongly 10-ribbed and light-green; sepals oblong, 1-1.3 mm long, obtuse, strongly 3-nerved, reddish-brown on the inside, and with a narrow, finely ciliate membranous margin, a short and stiff hood, and a 0.25-0.3 mm long, pale, suberect, somewhat scabrous awn; petals almost indistinct, 0.25-0.3 mm; filaments 0.55-0.6 mm; anthers quadrangular, 0.2 mm in diam., orange-brown; ovary ovoid, 0.5-0.6 mm in diam., pale-brown, densely papillose at the top; style (0.25-)0.3-0.35(-0.4) mm, mostly 1/3 to 1/2 split into thick and divergent stigmas. Fruit 1.3-1.4 x 1.1-1.25 mm, subglobose, papillose-warty at the top; seed c. 1.25 x 1 mm, subglobose.

Fl. and ft. 11-12. Rocky places.

Type: Southern Chile: Concepción, *D'Urville* (holo. G-DC!).

Distr.: Endemic in Southern and Central Chile.

1a) Stems densely pubescent with ± patent hairs; style 0.25-0.3 mm long, bipartite ..... subsp. **subandina**

1b) Stems minutely puberulous to ± glabrous; style 0.3-0.4 mm, bifid to bilobate; stigmas divergent ..... subsp. **chilensis**

2a) Leaves narrowly oblong and densely scabrous .... var. **mutica**

2b) Leaves oblanceolate, puberulous to almost glabrous ..... var. **chilensis**

Concepción, San Miguel, *Ernesto Bawas* 104 (GH); "Chile", *Cuming* 817 (E); "Chile austr.", Antuco, *Pöppig* 80/759 (G, HAL, LD); Coquimbo, *A. W. Hill* 410 (K) (forma linearifolia; leaves linear and narrow).

b) var. **mutica** (Phil.) Reiche, Fl. Chil. 1:209 (1896).

P. mutica Philippi in Linnaea 33:79 (1864-65).

Type: Prov. Aconcagua, prope Los Molles, xi. 1862, *Landbeck* (holo. SGO. 48928!). Stems ± glabrous; leaves narrowly oblong, densely scabrous or subhirsute; flowers in 3 to 7-flowered pseudo-axillary clusters; shortly adpressed pubescent; style 0.35-0.4 mm and shortly bifid.

Distr.: Endemic.

c) subsp. **subandina** (Phil.) Chaudhri stat. nov.:

P. subandina Philippi in Annal. Univ. Chil. 85:323 (1894).

Type: Dept. Ovalle, in valle fluminis Torca, 1889-90, *Guillermo Geisse* (holo. SGO. 48927!).

Syn.: *P. chilensis* DC. var. *subandina* (Phil.) Reiche op. cit.

Stems densely pubescent with ± patent, soft hairs; leaves shortly adpressed pubescent; flowers cup-like 2.25-2.4 mm, shortly adpressed pubescent; style 0.25-0.3(-0.35) mm, bipartite; ovary ovoid-ellipsoid, narrowed to the top, slightly papillose in the upper part.

Distr.: Endemic.

Note: Philippi's taxa are being described here from small fragments of shoots of the types received through the courtesy of the Curator, Museum of Natural History, Santiago, Chile. It may, however, be pointed out, in this connection, that these taxa require further study and that some more material is highly desirable.

40. **P. coquimbensis** Cl. Gay in Fl. Chil. 2:521 (1846).

Syn.: *P. chilensis* DC. var. *coquimbensis* (Gay) Reiche, Fl. Chil. 1:209 (1896).

Plate V, Fig. 1-3. p. 162

A perennial herb with a woody tap root; stems woody and somewhat rhizomatous at the base, ± prostrate, much-branched and spreading, up to c. 35 cm long; internodes long (up to c. 23 mm), densely pubescent or, occasionally, glabrescent with age. Leaves subsessile, linear-oblanceolate, up to 15 x 1.75 mm, acute and shortly mucronate (mucro 0.3-0.5(-0.75) mm), attenuate to the base, densely strigose to subhirsute; stipules lanceolate, up to 8 mm long, acute to acuminate and often deepy split, shorter than the leaves, margin slightly ciliate. Flowers arranged in mostly 3-flowered, pseudo-axillary (lateral) dichasial clusters as well as solitary between two branchlets, occasionally in larger (7-flowered) clusters, often almost concealed by 3-3.5 mm long, lanceolate-acuminate, stipulary bracts (with ciliate margins). Flowers subsessile, (2.4-)2.7-3.2 mm long, ellipsoid to cup-like, light-

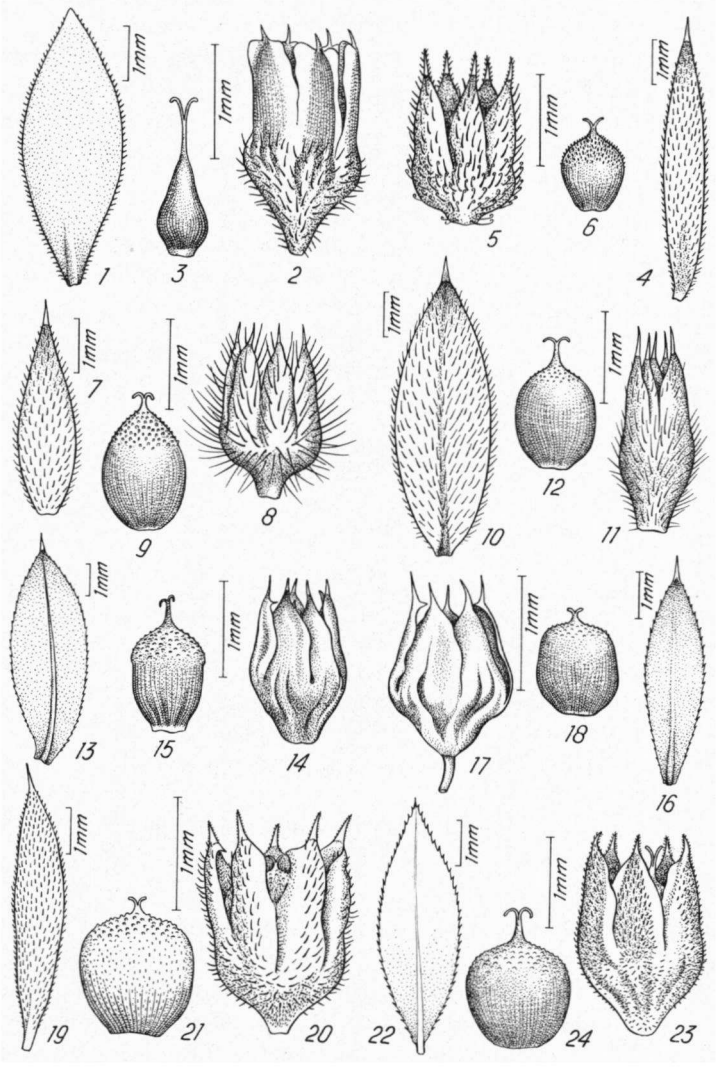

Plate VI. Fig. 1-3: **P. peruviana**; 1: leaf; 2: flower; 3: ovary and style [*Ellenberg* 262(U)]. Fig. 4-6: **P. cabrerae**; 4: leaf; 5: flower; 6: fruit [*Cabrera 15210* (LP)]. Fig. 7-9: **P. microphylla**; 7: leaf; 8: flower; 9: fruit [*Rutten* 1014(U)]. Fig. 10-12: **P. hartwegiana**; 10: leaf; 11: flower; 12: fruit [*Fosberg & Giller* 23082(S)]. Fig. 13-15: **P. ellenbergii**; 13: leaf; 14: flower; 15: fruit [*Ellenberg* 1033(U)]. Fig. 16-18: **P. muschleri**; 16: leaf; 17: flower; 18: fruit [*Marin* 625(LIL)]. Fig. 19-21: **P. setigera**; 19: leaf; 20: flower; 21: fruit [*Schwabe & Fabris* 2034(LP)]. Fig. 22-24: **P. bogotensis**; 22: leaf; 23: flower; 24: fruit with style [*Killip et al.* 38016 (W)].

green, rather densely pubescent with short, patent to acroscopic hairs, particularly on the calyx; receptacle 1-1.25 mm long, obconical, greenish, strongly ribbed, mostly subglabrous, occasionally minutely pubescent; sepals 1.3-1.5 x 0.6-0.7 mm, narrowly ovate to suboblong, fleshy, strongly 3-nerved on the back, usually having a narrow though distinct membranous margin, a rather poorly defined hood, and a short 0.25-0.35 mm long, stiff, scabrous, nearly white and erect awn on the back of the tip; petals 0.5-0.55 mm with reddish tips; filaments c. 0.5 mm and whitish; anthers 0.3 x 0.2 mm, quadrangular and orange-brown; ovary c. 0.75 x 0.55 mm, ovoid, densely papillose at the top; style with a thick basal part, 0.25-0.3 mm, and filiform, 0.2-0.25 mm long, dark-brown stigma-lobes ± spreading with maturity. Fruit 1.25-1.5 x 1-1.2 mm, ovoid to quadrangular-subglobose, densely warty-papillose in the upper part; seed c. 1.25 x 1 mm, ovoid-subglobose. Fl. 9-10.

Type: Chile: Prov. & dep. Coquimbo, *Cl. Gay* (holo. P!).

Distr.: Endemic in Central Chile.

a) var. **coquimbensis**: Leaves mostly acute and shortly mucronate, mucro 0.3-0.5(-0.75) mm long.

Prov. Coquimbo: Coquimbo, *M. Ci. Gay* (GH); Concon: *Pöppig* 171 (G); In pascuis secus flumen Quillota, x.1829, Hb. *Bertero* 1219 (HAL) p.p.; Prov. Valparaiso: Valparaiso, 12.x.1895, *Otto Buchtien* (L); ix.1928, *Ernesto Günther & O. Buchtien* (C).

b) var. **appressa** (Philippi) Chaudhri comb. et stat. nov.:

P. appressa Phil. in Linnaea 33:79 (1864-65).

Type: Central Chile: Prov. Coquimbo: nr. Illapel, xii. 1862, *Landbeck* (holo. SGO no. 39106!).

Leaves sharply acuminate and strongly mucronate, mucro c. 1-1.5 mm long.

Distr.: Endemic.

A very distinct species. Rohrbach had recognized it as a separate species in his account of the genus in Martius, Fl. Brasil. op. cit., but shortly afterwards in Linnaea 37:208 (1873) he treated it as a synonym of *P. chilensis* DC. K. Reiche, op. cit., considered it a variety of *P. chilensis*. But it is very easily distinguishable from *P. chilensis* by its long, spreading stems (with long internodes), quite long (up to 15 x 1.75 mm) linear-oblanceolate leaves, longer stipules and much larger (2.7-3.2 mm) flowers with ± fleshy sepals and a usually subglabrous basal part.

41. **P. setigera** (Gillies ex Hooker et Arnott) F. Hermann in Fedde's Repert. 42:224 (1937).

Basionym: *Herniaria setigera* Gillies ex Hooker et Arnott in Hooker, Bot. Misc. 3:337 (1833).

Type (of *H. setigera*): Argentine: Prov. San Luis, El Aguadita, nr. La Punta de San Luis, *Gillies* s.n. (holo. K!).
Syn.: *P. australis* Gillies, nomen tantum.
P. andina Philippi in Anal. Univ. Santiago 36(2):172 (1870), non A. Gray (1854).
Type: Andes, inter Mendoza et Chile portezuelo del portillo, Mendoza. Reed, i. 1870 (holo. SGO, a fragment SGO. 48917 seen).
P. subandina Gandoger in Bull. Soc. Bot. Fr. 65:28(1918), non Philippi (1894).
Type: Argentine: Prov. Córdoba, Córdoba, 17.xii.1898, *T. Stuckert* 5551 (holo. LY! iso. LIL!).

Plate VI, Fig. 19-21. p. 173

A small perennial herb with a long woody tap root, and light green to brownish, prostrate, 5-30 cm long, suffruticose stems, more or less densely leafy and much-branched from the woody base; internodes up to 1.4 cm long, usually much shorter, stout, shortly but densely scabridulous. Leaves subsessile up to 9 x 2.5 mm, very rigid, brownish-green to dark-brown, mostly oblanceolate but sometimes lanceolate, acute to acuminate, and very strongly mucronate-aristate, (mucro (0.3-) 0.4-0.75(-1.5) mm), narrowed to the base, shortly scabridulous to occasionally slightly puberulous, often slantingly upwards-directed, and forming axillary fascicles; stipules up to 4.5 mm long, lanceolate, acute to acuminate, with a slightly ciliate margin, much shorter than the leaves. Flowers axillary as well in 3 to 7-flowered pseudo-axillary clusters, sometimes very profuse; bracts stipulary, ovate-lanceolate, somewhat shorter than the flowers. Flowers mostly subsessile, including the awns (1.25-)2-2.4(-3) mm long, cylindrical-oblong to somewhat cup-shaped, rather densely and very shortly scabridulous; receptacle 0.35-0.5 mm long. almost rounded at the base, pale-green; sepals often brown, (1-)1.25-1.5 mm long, oblong, coriaceous, usually with a narrow membranous margin, a stiff hood, and a (0.15)0.25-0.5(-1) mm long, stiff, scabrid, erect and nearly white awn (very variable in length), midribs quite distinct; petals 0.4-0.45 mm with reddish tips, ± equalling the filaments; anthers minute, 0.2 x 0.15-0.2 mm, quadrangular; ovary 0.6-0.75 x 0.5 mm, ovoid, densely papillose-warty; style (0.25-)0.3-0.35 mm long, nearly halfway split into suberect to distinctly divergent stigma-lobes, the latter almost sessile and quite prominent. Fruit subglobose, 1.25(-1.7) x 1.1(-1.3), densely papillose-warty at the top; seed c. 1 x 1 mm, almost globose.
Fl. & ft. Dec.-April. Dry rocky places, alt. ca. 200-2550 m.
Distr.: Almost throughout Argentine, NW Uruguay and SSE Brasil.
A) Subsp. **setigera:** Leaves usually broadly oblanceolate, mostly shortly mucronate when old; flowers 2-2.4(-3) mm long including the awns;

sepals 1.25-1.5 mm long, and awns (0.25-)0.3-0.45(-1) mm long; style often very short; the stigma-lobes ± subsessile, thick and spreading in age. Distr. E. C. & S. Argentine, NW Uruguay, SSE Brasil.

B) Subsp. **cordobensis** ssp nov.: Leaves often narrowly oblanceolate, sharply acuminate and very strongly mucronate-aristate, often clustered in axillary fascicles; flowers small, (1.25)1.5-1.6(-1.8) mm long; sepals c. 1 mm long with a minute, 0.15-0.2 mm long awn; style usually distinct, 0.25-0.3 mm, with very short, 2-lobed stigma, the latter ± filiform, suberect to somewhat spreading.

1) var. **setigera:** Flowers 2.2.4-(2.5) mm long, awns (0.25-)0.3-0.45 (-0.55) mm. Distr.: Throughout the range of the subsp. *setigera* except in Prov. Buenos Aires, Uruguay and Brasil.

1a) subvar. **setigera:**

Argentine: Prov. **Buenos Aires:** Sierra Bravard: Pigué, xi.1928, *A. C. Scala* (LP) (transitional with var. *longiseta*); Prov. **Córdoba:** Dep. Colón: *T. Meyer* 13620 (LIL); Dep. Punilla: *T. Meyer & H. Sleumer* Mey. 15377 (LIL); S. of Cordoba, *T. Stuckert* 5551 (LIL) (type of *P. subandina* Gandoger); *Cuezzo & Balegno* 2134 (LIL); **Pampa San Luis,** *T. Stuckert* 20875 (G); Prov. **Mendoza:** Dep. Luján: *E. M. Garcia* 369 (LIL); Dep. Tunuyán: *F. A. Barkley* 20Mz190 (LIL); ibid., *J. M. Araque & F. A. Barkley* 20Mz210 (LIL); ibid., *P. Paci* 733 (LIL) (transitionnal with subsp. *cordobensis*); Dep. Tunuyán: *Ruiz Leal* 1110, 1072, 8620, 2827 (LIL); Northern **Patagonia:** Rio Negro, *Wilkes Expedition* in 1838-42 (GH); Eastern Patagonia: Puerto Madryn, *P. Dusén* 5279 (S); Puerto Cracken, *Dusén* 5369 (S); Central Patagonia: Prov. Chubut: *N. J. Aurelius* 11 (S); Southern Patagonia: Prov. Santa Cruz: *O'Donell* 3576 (LIL). **Chile:** Valle de Patagonia: Prov. Santa Cruz: *O'Donell* 3576 (LIL). **Chile:** Valle de Marga Marga, 40 km E. of Valparaiso, *Felix Jaffuel* 332 (GH).

1b) subvar. **subglabra** Chaudhri nov. subvar. a subvar. *setigera* foliis subglabris distinguenda.: Leaves subglabrous.

Type: Prov. Mendoza: Dep. Tunuyán: Las Heras, *Ruiz Leal* 5248 (LIL).

Prov. Córdoba: Pampa de Ochula, *A. Burkart* 10265 (LIL).

2) var. **longiseta** Chaudhri n. var. a var. *setigera* floribus paulo majoribus (2,5-3.0 mm altis), sepalis arista longiore (0.5-1.0 mm longa) instructis distinguenda.: Flowers 2.5-3 mm long; awns 0.5-1 mm long.

Type: Prov. Buenos Aires: Balcarce, Sierra del Volcan, E. of Balcarce, 3.xi.1946, *B. Sparre* 276A (holo. S!).

Distr.: Buenos Aires (Argentine), N. Uruguay and SSE Brasil.

Argentine: Prov. Buenos Aires: *B. Sparre* 5281, 5332, 5448 (LIL); *C. L. Sotelo* 30 (LIL); *P. Boffa* 314 (LP); *A. L. Cabrera* 5207 (LP) (the last one transitional with var. *setigera).* **Uruguay:** Dep. Artigas nr. Artigas, *H. H. Bartlett* 21060 (GH). **Brasil:** Quarai, *B. Rambo* 26088 (LIL); Prov. Grande do Sul, Uruguayana, *Palacios-Cuezzo* 168 (LIL); Cacapava do Sul, *Palacios-Cuezzo* 1444 (LIL) (the last mentined traditional with var. *setigera).*

3) subsp. **cordobensis** Chaudhri n. subsp. a subsp. *setigera* foliis plerumque haud late sed anguste oblanceolatis, plerumque distincte aristulatis, floribus minoribus (plerumque 1.5-1.6 mm altis), sepalis mucrone

brevi (0.15-0.20 mm longa) instructis distinguenda.: Leaves often narrowly oblanceolate, sharply acuminate and very strongly mucronate-aristate, often clustered in axillary fascicles; flowers small, (1.25-)1.5-1.6(-1.8) mm long; sepals c. 1mm long, usually with a minute, 0.15-0.2 mm awn; style usually distinct, 0.25-0.3 mm, with very short stigmata, the latter ± filiform, nearly erect to somewhat spreading.

Type: Prov. Cordoba: Dep. Punilla, Mallin, ca. 900 m, 19.ii.1951, *J. Gutiérrez* 309 (holo. LIL!).

Distr.: Northern and Central Argentine: N. Córdoba, SE. Catamarca, Santiago del Estero, Santa Fe, and Entre Rios.

Prov. **Córdoba:** Dep. Santa Maria, *J. Gutiérrez* 267 (LIL); Dep. Punilla: *C. A. O'Donell & J. M. Rodriguez* 449 (LIL); Dep. Capital: *O'Donell & Rodriguez* 332 (LIL); Córdoba, *T. Stuckert* 4982 (LIL); Dep. Colón: *T. Meyer* 12977, 13460 (LIL); San Alberto, *T. Meyer 13921* (LIL); Sierra Chica: *Castellanos* 3174 (LIL); Sierra Chica, Estancia la Reduccion, *A. Burkart* 7178 (GH) (mixed with subsp. *setigera*); Dormido, Tulumba, *A. Loti* 3788 (LIL); San Justo: *T. Stuckert* 7098, 9932 (LIL); Ochoa to Sante Maria, *Stuckert* 12397 (LIL); Estancio Rio, *Stuckert* 16511 (LIL); Dep. San Javier, *A. Bridarolli* 1330 (LP); Dep. Chaco, *A. G. Schulz* 2621 (LP); Dep. Alta Gracia, *Maria M. Job* 2876 (LP); Prov. **San Luis:** Merlo, *Digilio-Grassi* 2133 (LIL); Bosque de Caldéu, *J. R. Guinazu* 194 (LP). Prov. **Mendoza:** Dep. Tunuyan, *O. Paci* 733 (LIL); Dep. Luján, *J. Araque & F. A. Barkley* 20Mz282 (LIL); ibid. *Palacios, Cuezzo & Balegno* 1791 (LIL); Villavicencio, *A. Burkart* et *al.* 14035 (LIL); Dep. Tupergato, *O. Paci & O. Melis* 93 (LIL); Prov. **Catamarca:** Dep. El Alto *C. Cristóbal* 323 (LIL); Quebrada del Tala, *L. Castillon* 1745 (LIL); Prov. **Santiago del Estero:** Ojo de Agua, *Pecho Garcia* 908 (LIL); Quebrada del Tala, *B. Balengo* 1342 (LIL); Dep. Choya, *A. R. Cuezzo* 2421 (LIL); Prov. **Santa Fe:** Dep. San Cristobal, *B. Balegno* 615 & 731 (LIL); Dep. Castellanos, *B. Balegno* 849 (LIL); Prov. **Entre Rios:** Dep. Villiguoy, *T. Meyer* 11265 (LIL).

This species is very widespread in Argentine, and highly variable in such characters as leaf form, length of the mucro, number of flowers per cluster, shape and size of the flowers, length of sepal awn and of the style. The two subspp. differ markedly in the form and size of the flowers and of the sepal awn length, but there are several intermediates. Besides, both posses indentical stem and leaf characters and a similar pubescence. The two overlap each other in the provinces of Córdoba, Mendoza and San Luis, otherwise they are geographically distinct. Gillies' second sheet in Kew Herb., incidentally, belongs to the subsp. *cordobensis* though both may have been collected in the same locality.

P. setigera resembles *P. chilensis* DC. in habit, but the two differ considerably in the structure of the leaves, the nature of the pubescence and the form of the flowers. The leaves in this species are very rigid, often strongly mucronate and densely covered with very short, ± patent hairs, and hence scabrous. The stems, too, are scabrous, whereas in *P. chilensis* they are often very slightly pubescent to puberulous on the under side to ± glabrous with age, and the leaves are usually shortly

mucronate and finely puberulous to almost glabrous. The flowers are scabrous in this species and often minutely puberulous to nearly glabrous in *P. chilensis*. The sepal awn is usually quite well-marked in *P. setigera*, but shorter in *P. chilensis*, petals are quite distinct in the present species, but almost invisible in *P. chilensis*. The latter, moreover, is endemic in Southern and Central Chile. There is, in the material studied by me, only one specimen of *P. setigera* from Chile, viz. Jaffuel 332 (GH), gathered in Valle de Marga Marga, E, of Valparaiso.

42. **P. bogotensis** Tr. et Planch. in Ann. Sc. Nat. ser. 4, 17:147 (1862).

Plate VI, Fig. 22-26. p. 173

A small, perennial, suffruticose herb with a thick woody caudex and a long woody tap root; stems ± prostrate, up to 35 cm long, spreading from the base and much-branched over their whole length; internodes 4-10 mm long, stout, shortly puberulous to almost glabrous in age, branches often leafless in the basal part, and usually pale brown. Leaves subsessile, elliptic, up to 7 x 2.75 mm, subcoriaceous, brownish-green, on both sides ± glabrous and with a shortly hairy margin, apex acute and shortly mucronate, narrowed at the base, often clustered towards the end of shoots as well as on the short axillary branchlets; stipules lanceolate, up to 4 x 1.5 mm, somewhat shorter than the leaves. Flowers axillary as well as in 3-flowered pseudo-axillary, lateral clusters; stipulary bracts almost equalling or somewhat shorter than the flowers. Flowers cylindrical-oblong, c. 2.5 mm long including the awns, brownish-green, usually with a shortly pubescent basal part (receptacle) and puberulous calyx; receptacle c. 0.7 mm long, obconical; sepals 1.25-1.35 mm long (without the awn), ± ovate-oblong, obtuse, greenish, thick-fleshy, with a conspicuous pinkish membranous margin, a rather small, membranous hood, and (0.3-)0.4 mm long, rather slender but stiff and scabrous, erect awn; petals 0.6-0.65 mm long with reddish tips; filaments 0.45-0.5 mm; anthers c. 0.2 mm in diam., more or less rectangular; ovary subglobose to ovoid, c. 0.4 x 0.6 mm, brown, papillose at the top; style 0.5-0.55 mm long, slightly less than halfway split into two filiform, suberect to somewhat divergent stigmas. Fruit 1-1.25 x 0.8-1 mm, quadrangular-subglobose, rounded at both ends, dark-brown, slightly papillose at the top; seed c. 1 x 0.75 mm, subglobose. Fl. & ft. Nov.-April. Subparamo slopes and ridges, alt. ca. 2700-3300 m.

Type: Colombia: Bogotá, Andes de Bogotá, La Pena, ca. 2700 m, 1851-57, *Triana* s.n. (holo. P! iso. FI!).

Distr.: Endemic in Colombia, around Bogotá.

Dep. Cundinamarca, Subana de Bogota, N. of Usaquen, ca. 2700 m, *Fosberg & Drew* 22313 (UC); Monserrate, nr. Bogota, 3000-3300 m, *Killip, Garcia, Gutierrez* 38016 (LIL, UC, W); Suba, 2700 m, *Martin Schneider* 316 (S).
Rohrbach in Linnaea 37:207 (1873) merged this species with *P. chilensis* DC., but the similarity between the two is only superficial. *P. bogotensis* differs from *P. chilensis* DC. in its elliptic, subcoriaceous, on both sides glabrous leaves, its cylindrical flowers with fleshy and ± puberulous sepals, its very distinct petals (exceeding the stamens) and its longer style with filiform stigmas, and its at the top very slightly papillose fruit. In *P. chilensis,* the leaves are oblanceolate, the flowers ± ellipsoid-turbinate, mostly subglabrous, the petals very short or nearly invisible, the style too is quite short, the stigmas are thick and divergent, and the fruit is densely warty-papillose.

43. **P. ellenbergii** Chaudhri n. spec.

Plate VI, Fig. 13-15. p. 173

Herba perennis. Caules prostrati et divergentes, usque ad 45 cm longi, brunneoli; internodia usque ad 3.5 cm longa, robusta, pilis retrorsis dense pubescentia. Folia plerumque patentia, anguste elliptica, usque ad 15 mm longa et 4.5 mm lata, acuta et mucronata, basim versus attenuata, utrimque glabra et nitida, margine serrulata et ciliolata, subcoriacea, sicc. colore variantia a brunneolo-viridi usque ad saturate brunneum; stipulae cuiusque folii ad basim saepe connatae, ovato-lanceolatae, usque ad 6 mm longae et 2.5 mm latae, acutae vel acuminatae, foliis breviores. Glomeruli laterales, 3-flori vel ad florem singulum redacti, a bracteis lanceolatis, 3.0-3.5 mm longis, scariosis fere omnino obtecti. Flores subsessiles, anguste ellipsoidei, pedicello incluso circ. 2.0 mm alti, subcoriacei, roseolo-brunnei, toti glabri; receptaculum turbinatum, circ. 0.7 mm altum; sepala oblonga, 0.6-0.75 mm lata et arista excluso 1.0-1.2 mm longa, parte centrali rigida a margine membranaceo ea angustiore circumdata, breviter cucullata et arista erecta, glabra, brunneola, 0.3-0.35 mm longa instructa; petala 0.6-0.65 mm longa, staminibus paulo longiora; stamina filamento 0.55 mm longo et anthera rectangulari, 0.25 mm longa et 0.15 mm lata, brunneo-aurantia instructa; ovarium ovoideo-subglobosum, parum papillosum; stylus circ. 0.3 mm longus in stigmata filiformia, divergentia et recurvata, 0.15 (0.2) mm longa exeuns. Fructus anguste ellipsoideus et quadrangularis, circ. 1.2 mm altus et 0.8 mm diam., ad apicem parce papillosus.
Fl. & fr. 4. Alpine rocky flats and slopes of the Andes, among bushes, alt. ca. 3400 m.
Type: S. Peru: Prov. Cuzco, Collutaro, ESE of Cuzco, 3400 m, 14.iv. 1957, *H. Ellenberg* 1033 holo. U).
Distr.: Known only from the type locality.

Related to *P. hartwegiana* Rohrb. in habit, but easily distinguishable by its longer internodes, larger and entirely glabrous, subcoriaceous leaves, wholly glabrous flowers, shorter sepal awns, and oblong fruit. It also shows affinity with *P. muschleri* Chaudhri, which, however, possesses a more compact habit, rather smaller, herbaceous (never coriaceous) leaves and sepals, and longer, slender sepal awns.

44. **P. hartwegiana** Rohrbach in Linnaea 37:204 (1873).

Plate VI, Fig. 10-12. p. 173

A perennial herb with a thick woody base and long, woody tap root; stems 20-45 cm long, dark-brown, much-branched from the woody base, spreading and suberect or somewhat ascending; internodes up to 1.7 cm long, stout, densely retrorsely pubescent. Leaves subsessile, spreading, elliptic to elliptic-oblong, up to 11 x 4.5 mm, acute and shortly mucronate, on both sides scabrous-pubescent or subhirsute, particularly along the midrib of the lower one, the upper side often glabrescent with age; margin serrate and scabrous-ciliate, dark-brown; stipules ovate-suboblong, up to 5 x 1.5 mm, acute to obtuse, often bipartite, shorter than the leaves. Flowers in 3-flowered, pseudo-axillary (lateral), sessile clusters as well as solitary axillary. Bracts ovate-oblong, c. 1.5 x 0.75 mm, obtuse, shorter than the flowers. Flowers subsessile, cylindrical-oblong, 2-2.3 mm long (including the awns), dark-brown, densely pubescent on the receptacle but very slightly so or nearly glabrous on the back of the sepals; receptacle c. 0.75 mm long, obconical; sepals $\pm$ oblong, 1-1.2 mm long; the membranous margin distinct, though narrower than the 3-nerved and stiff median band; hood also stiff; awn 0.4-0.5 mm long, slender but stiff, erect, dark-brown, mostly glabrous or at the base very slightly hairy; petals 0.6 mm long; filaments 0.45 mm; anthers 0.25 x 0.2 mm, rectangular, orange-yellow; ovary ovoid, c. 0.5 x 0.4 mm, dark-brown, somewhat papillose; style 0.4-0.45 mm long, the tip shortly split into 0.15-0.2 mm long, thin and spreading stigmas. Fruit ovoid, c. 1 x 0.75 mm, slightly papillose at the upper end; seed c. 0.85 x 0.7 mm, ovoid.
Fl. Oct.-February. Open gravelly flats, ca. 1800 m.

Type: S. Ecuador: ad ripas fluminis prope urbem Loxa, -/1842, *Hartweg* 829 (holo. B, destroyed; neo. G! iso. FI!).
Distr.: Endemic in S. Ecuador.

Prov. Loja: vicinity of Loja, *J. N. Rose* 23262 (GH); S. of Vilcabamba, 1800-1850 m, *F. R. Fosberg & M. A. Giler* 23082 (S).

45. **P. peruviana** Chaudhri n. spec.

Plate VI, Fig. 1-3. p. 173

Herba perennis parva et compacta, radice perpendiculari longo et lignoso instructa. Caules suberecti, 3.5-7.0 cm longi, per totam longitudinem ramificati, basi lignosi; internodia usque ad 6 mm longa, plerumque robusta, dense pubescentia vel interdum puberula. Folia plerumque elliptica, interdum oblonga vel ovato-lanceolata 4-6 mm longa et 1.25-2.25 mm lata, acuta et mucronulata, rigida, utrimque parce hirtella vel subglabra, margine ciliata, interdum subcarinata; stipulae ovatae vel suboblongae, usque ad 3.5 mm longae, subacutae vel subobtusae, plerumque foliis breviores. Glomeruli laterales, saepe ad apicem caulis dense congesti, e floribus 3-7 compositi; bracteae scariosae, ovatae vel suboblongae, circ. 3 mm longae et 1.5 mm latae, floribus paulo longiores et eos fere omnino obtegentes. Flores subsessiles, ellipsoideo-turbinati, (2.25-)2.4-3.0 mm alti, receptaculo dense pubescente, sepalis sparse pubescentibus; receptaculum obconicum, 1.0-1.2 mm altum et 1.5 mm diam., basim versus angustatum, altitudine longitudini sepalorum fere aequali; sepala oblonga, (1.25-) 1.4 mm longa, ad apicem paulum angustata, truncata, margine membranaceo parti medianae rigidulae fere aequilato, cucullo membranaceo parvo et arista erecta, 0.25-0.3 mm longa, gracili, albida et parce hirtella instructa; petala 0.8 mm longa, apice rubeola; stamina filamento 0.6 mm longo et anthera rectangulari 0.3 mm longa et 0.2 mm lata, aurantia instructa; ovarium conicum, circ. 0.75 mm altum et 0.5 mm diam., laeve, apice in stylum contractum; stylus 0.28-0.3 mm longis in stigmata crassa, ei paulo breviora, denique divergentia exeuns. Fructus maturus non visus.

Fl. 1-3. Alpine rocks, alt. ca. 4000 m.

Type: S. Peru, Checayani, NE of Azangaro, ca. 3950 m, 26.iii.1957, *H. Ellenberg* 262 (holo. U!).

Distr. SSE Peru and W. Bolivia.

Peru: Yanakarea Lake, NE of Checayani, 4030 m, *Ellenberg* 555 (U); Dept. Puno: Huerta, N of Puno, 4100 m, *Ellenberg* 281 (U); Juliaca, ca. 4000 m, *Dora Stafford* 451 (K); Peru-Bolivia: Lake Titicaca, Vilque, *A. W. Hill* 415 (K).

46. **P. cabrerae** Chaudhri n. spec.

Plate VI, Fig. 4-6. p. 173

Herba perennis parva, radice perpendiculari subsimplici, longo et lignoso instructa. Caules prostrati vel parum ascendentes, 6-17 cm longi, basi contracti et hic lignosi et dense ramificati; ramuli saepe divergentes; internodia usque ad 22 mm longa, breviter sed dense pubescentia. Folia lineari-lanceolata vel lineari-oblanceolata, usque ad 12 mm longa et 1.8 mm lata, utroque extremo parum angustata, acuta et mucronata (mucrone 0.4-0.6 mm longo, robusto, dilute aurantio instructa), primum utrimque sparse pubescentia vel puberula, deinde

glabrescentia, margine ciliata, pro parte in fascicula axillaria saepe sessilia congesta; stipulae ovato-lanceolatae, usque ad 5 mm longae, acutae vel acuminatae, margine parce ciliatae, foliis breviores. Glomeruli laterales, plerumque e floribus 3-7, rarius usque ad 10 compositi, interdum ad florem singulum redacti; bracteae ovatae, usque ad 3 mm longae et 1.5 mm latae, scariosae, floribus aequilongae vel eis paulo longiores. Flores pedicello brunneolo et glabro, 0.4-0.6 mm longo instructi, teretes, 1.75-2.0 mm alti, pilis plus minusve patentibus, mollibus, plerumque uncinatis dense obtecti, griseo-viriduli vel interdum roseoli; receptaculum obconicum, 0.5-0.55 mm altum; sepala anguste oblonga vel ovato-oblonga, apice paulum angustata, plerumque e parte centrali rigida et margine membranaceo angusto composita, cucullo breviore et arista robustiore, 0.35-0.45(-0.55) mm longa, pallida, scabrida, erecta vel paulo divergente instructa; petala minuta, 0.3 mm longa; stamina e filamento circ. 0.4 mm longo et anthera rectangulari, circ. 0.2 mm longo latoque, aurantio composita; ovarium ovoideum, circ. 0.5 mm altum et 0.45 mm diam; stigmata subsessilia, 0.3-0.35 mm longa, divergentia. Fructus subglobosus et quandrangularis, circ. 1.0 mm altus et 0.9 mm diam.; ad basim parum contractus, apicem versus sparse papillosus. Florens mensibus 1-3. Habitat zonam alpinam ad altitudines inter 2800 et 4500 m.

Type: NNW Argentine: Prov. Jujuy: Dept. Humahuaca, Azul Pampa, c. 3700 m, 17.ii.1963, *A. L. Cabrera* 15210 (holo. LP!).

Distr.: NNW Argentine and S. Bolivia.

Argentine: Prov. Jujuy: Dept. Rinconada, *H. Schwabe* 775 (LP); Dep. Tumbaya, *H. Sleumer* 3317 (LIL); Santa Catalina, *Gerling* 176 (LP); ibid., i.1901, *Fr. Claren* (S); Dep. Yami, *A. L. Cabrera* 15381 (LP); Prov. Tucuman: Dep. Tafi, *S. Venturi* 4447 (LIL); Prov. Catamarca: Dep. Belén, *H. Sleumer & F. Vervoorst* 2537 (LIL) mixed with *Cardionema* sp. **Bolivia:** Tarija, c. 4000-4500 m, 6.i.1902. *Rob. E. Fries* 1017a (S).

Resembles *P. hieronymi* Pax somewhat in habit, but differs in having narrowly oblong-lanceolate to oblanceolate, shortly mucronate and finely ciliate or puberulous leaves, oblong-cylindrical flowers often on the outside densely pubescent (the hairs being mostly hooked at the tips), sepals with a stiff-rigid median band, the awn ± scabrous, the stigmas almost sessile. It also bears some resemblance to *P. microphylla* Phil., but the latter possesses densely villous shoots and flowers, very large and many-flowered, dense clusters, and a distinct style. It has, moreover, a somewhat bushy habit with long, stout spreading stems.

47. **P. libertadiana** Chaudhri n. spec.

Herba perennis parva, rubeolo-brunnea. Caules prostrati, usque ad 11 cm longi, per totam longitudinem ramificati; ramuli plus minusve devergentes; internodia 2-9 mm longa, robusta, rubeolo-brunnea, pilis

deflexis brevissimis hirtella. Folia sessilia vel subsessilia, elliptica vel interdum obovata, usque ad 4 mm longa et 2.25 mm lata, utroque extremo abruptius contracta, apice acuta et in mucronem gracilem, 0.3-0.35 mm longum exeuntia, subtus pilis appressis brevibus vestita, supra omnino glabra, margine parce ciliata. Stipulae lanceolatae, usque ad 4 mm longae, acuminatae, foliis subaequilongae, ad apicem ramulorum prominentes. Glomeruli terminales et laterales, sessiles, e floribus 3-10 compositi vel ad florem singulum redacti, cum foliis intermixti; bracteae scariosae, circ. 3 mm longae, floribus paulo longiores sed eos non omnino obtegentes. Flores subsessiles, ellipsoidei, aristis sepalorum inclusis 2.0-2.25 mm alti et ad medium 1.0-1.15 mm diam., basi contracti, pilis acroscopis brevibus et tenuibus vestiti; receptaculum cir. 0.75 mm altum, turbinato-obconicum; sepala ovato-oblonga vel lanceolata, circ. 1.0 mm longa, apicem versus leviter angustata, margine membranaceo angustiore circumdata, cucullo minuto sed arista suberecta gracili, 0.5-0.55 mm longa, brunnea, sublaevi instructa. Petala 0.6-0.65 mm longa, rubeolo-brunnea. Stamina filamento albido 0.5-0.55 mm longo et anthera rectangulari 0.25-0.3 mm longa et 0.2 mm lata, violacea instructa. Ovarium ovoideum, circ. O.5 mm diam., laeve; stylus 0.45-0.5 mm longus; stigmata brevissima, saturate brunnea, divergentia. Fructus subglobosus, circ. 1.0 mm altus et 0.85 mm diam., pericarpio tenuissimo, albido, laevi instructus. Fl. and ft. 8. Limestone, alt. 3970 m.

Type: Peru: Prov. Huamachuco, Department of La Libertad, Rio Maranon canyon, summit above Aricapampa, road to Huamachuco, limestone area, alt. 3970 m, 10.viii.1964, *Paul C. Hutchison et al.* 6269 (holo. F!).

Distr.: Endemic; known only from a single gathering.

This species resembles *P. limaei* Chaudhri in habit, but its leaves are hairy on the under side and glabrous on the upper side (not hairy on both sides as in *P. limaei*), its flowers are distinctly smaller (2-2.25 mm instead of 2.25-2.4 mm long) and also differ in shape, viz. ellipsoid and not flask-like as in *P. limaei,* its sepals are shorter and provided with a rather narrower membranous margin, its style too is shorter and provided with short stigmas unlike the other species in which the stigmas are nearly as long as the style.

48. **P. macbridei** Chaudhri n. spec.

Plate VII, Fig. 19-21. p. 185

Herba perennis parva. Caules prostrati vel parum ascendentes, ad basim lignosi, per totam longitudinem ramificati; ramuli divergentes; internodia robusta, usque ad 1.7 cm longa, inferiora tamen semper breviora, omnia dense pubescentia, brunneola. Folia elliptica vel ovata,

3.0-6.5 mm longa et 1.5-2.25 mm lata, acuta vel acuminata et mucronata, ad basim abruptius angustata, rigida, plerumque brunnea, apresse pubescentia vel interdum subglabra, in statu junior subhirtella; stipulae lanceolatae, usque ad 5 mm longae, subacuminatae, plerumque foliis breviores. Cymae terminales et axillares omnes ad florem singulum redactae et in inflorescentiam spiciformen 3-6 mm diam. aggregatae; inflorescentiae haec ad apicem caulium congestae; bracteae scariosae, suboblongae, 2.25-2.50 mm longae et circ. 1.5 latae, obtusae, flores fere omnino obtegentes. Flores distincte pedicellati, subampulliformes, i.e. e receptaculo turbinato et calyce tereti eo angustiore compositi, sepalorum aristis inclusis 2.0-2.4 mm alti; receptaculum dense villosum; sepala anguste oblonga, aristis exclusis circ. 1.2 mm longa, apicem versus paulo angustata, margine membranaceo pallido, parte mediana multo angustiore instructa, parte mediana rigida, brunneoloviridi vel rubra, apice truncata et hic cucullo parvo et arista gracili sed rigida, brunneola et parce hirtella, 0.4-0.5 mm longa instructa, extus dense pubescentia; petala 0.55-0.6 mm longa, staminibus fere aequilonga; stamina filamento 0.45 mm longo et anthera rectangulari, 0.25-0.3 mm longa et circ. 0.2 mm lata, aurantia instructa; ovarium ovoideum, 0.45-0.5 mm altum et 0.35-0.45 mm diam. brunneolum, parce papillosum, apice in stylum contractum; stylus robustior, 0.25-0.3 mm longus, in stigmata dua 0.15-0.2 mm longa exeuns. Fructus subglobosus, circ. 0.8 mm diam., apice parce papillosus; semen subglobosum, circ. 0.75 mm diam. Florens et fructificans mense Aprili.
Type: Peru: Huanuco, alt. ca. 2300 m, 5-8.iv.1923, *J. Francis Macbride* 3243 (holo. G! iso. F!).
Distr.: Known only from a single gathering.

Resembles *P. mandoniana* Rohrbach in the form and arrangement of the flowers, but differs markedly in its ± spreading and densely pubescent stems (congested and puberulous in *P. mandoniana),* broader, elliptic to ovate leaves (lanceolate in *P. mandoniana*), larger and mostly lateral flower-clusters, densely villous flowers (minutely pubescent in *P. mandioniana,* sepals with a longer and stiffer awn, and much narrower membranous margin, longer petals, a shorter style, minute stigmas, and globose fruits and seeds.

49. **P. mandoniana** Rohrbach in Linnaea 37:208 (1873).

Plate VII, Fig. 15-18. p. 185

A very small perennial herb; stem somewhat rhizomatous, much-branched from the partly subterranean base, 4-6 cm long, branches densely congested, prostrate to somewhat ascending or suberect, with short (1-5 mm long), stout internodes, shorter towards the basal region,

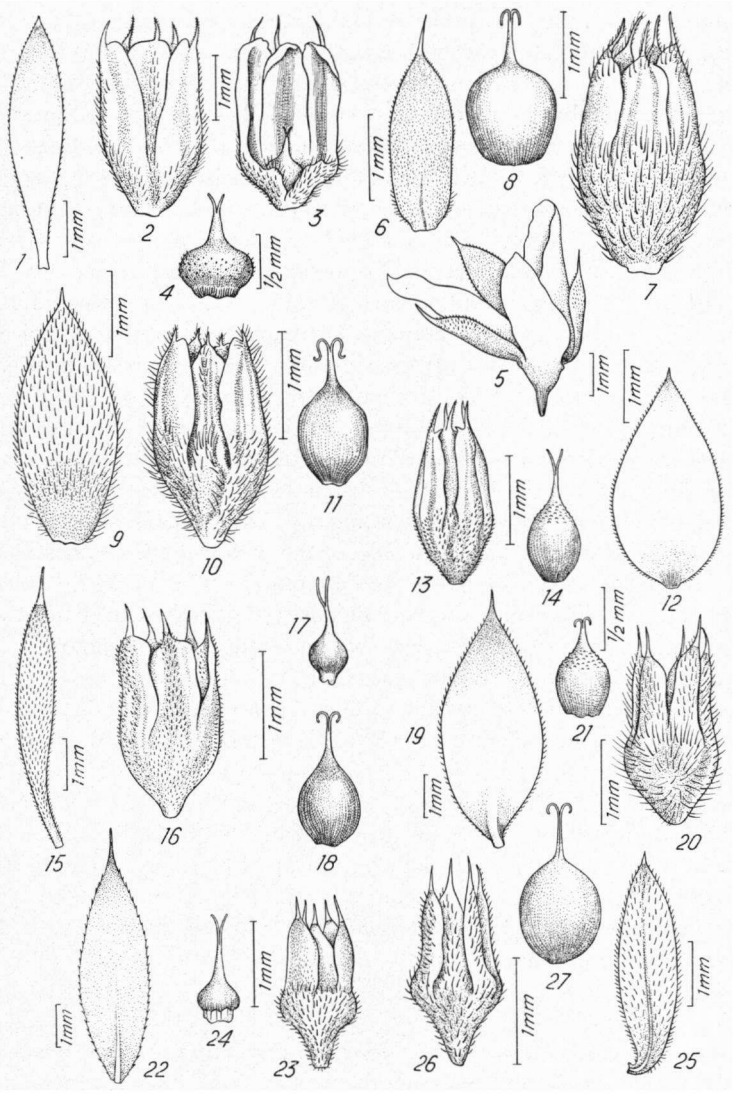

Plate VII: Fig. 1-4: **P. bryoides**; 1. leaf; 2: flower; 3: section of a flower; 4: ovary and style [*Pichi-Sermolli* 2710(FI)]. Fig. 5-8: **P. andina**; 5: leaves with stipules; 6: leaf, upper side; 7: flower; 8: fruit and style [*Tovar* 214(UC)]. Fig. 9-11: **P. weberbaueri**; 9: leaf; 10: flower; 11: fruit [*Weberbauer* 2702(G)]. Fig. 12-14: **P. fusciflora**; 12: leaf; 13: flower; 14: fruit and style [*Ellenberg* 1960(U)]. Fig. 15-18: **P. mandonia**; 15: leaf; 16: flower; 17: ovary and style; 18: fruit [*Mandon* 994(G)]. Fig. 19-21: **P. macbridei**; 19: leaf; 20: flower; 21: fruit and style [*Macbride* 3243(G)]. Fig. 22-24: **P. hieronymi**; 22: leaf; 23: flower; 24; ovary and style [*Sleumer* 179(LIL)]. Fig. 25-27: **P. limaei**; 25: leaf; 26:: flower; 27: and style [*Goodspeed et al.* 11510(UC)].

minutely pubescent to puberulous. Leaves subsessile rather rigid, spreading, lanceolate, rarely narrowly elliptic, 3-6 x 0.7-1.25 mm, acute to acuminate and pungently mucronate, narrowed at the base, very shortly scabrous-pubescent to -puberulous, margin often slightly inflexed; stipules narrowly ovate-lanceolate, up to 4 mm long, acute to shortly acuminate, shorter than the leaves, and usually with a subcoriaceous, pale, persistent base. Flowers mostly solitary, but aggregated in small, terminal and subterminal, dense glomerules, 4-7 mm diam., and nearly concealed by the ovate-lanceolate, acute, 3 x 1.25-1.3 mm stipulary bracts. Flowers subsessile, 1.75-2 mm (including the awns), ± oblong with a somewhat turbinate-urceolate receptacle; minutely scabrous-pubescent to occasionally puberulous, brownish-green; receptacle obconical, 0.55-0.65 mm long, strongly 10-ribbed; sepals 1-1.2 mm long, narrowly oblong to lanceolate-oblong, obtuse, with a conspicuously broad, pinkish-white membranous margin, a distinct hood, and a 0.3-0.35 mm long, rather tender and erect awn; petals 0.35-0.4 mm, pale-brown with a red tip; filaments 0.3 mm; anthers 0.25-0.3 x 0.2 mm; ovary subsessile, c. 0.5 x 0.35 mm, ellipsoid, somewhat scabrous-warty; style 0.7-0.8 mm long, 1/3 to 1/2 its length lobed into two filiform, brownish stigmas, recurved in age. Fruit ovoid-suboblong, c. 0.8 x 0.6 mm, dark-brown, with a pale pericarp.
Fl. & ft. Jan. In alpine rocky places, alt. ca. 4000 m.
Type: Bolivia: Prov. Omasuyes, viciniis Achacache, cerro de Avichaca, in petrosis reg. alp. 4000 m, i. 1861, G. Mandon (holo. B, destroyed; iso.-neo. G!).

50. **P. hieronymi** Pax in Engl. Bot. Jahrb. 18:34 (1894).
L. Hauman et L. H. Irigoyen, Cat. Phanerog. Argent. 2:182 (1923).
Syn.: *P. chilensis* DC. var. *hieronymi* (Pax) Hosseus in Bol. Acad. Nac. Cien. Cordoba 26:84 (1921).

Plate VII, Fig. 22-24. p. 185

A small, perennial herb with a long, woody tap root; the basal part of the stem somewhat rhizomatous, woody and much-branched, the shoots prostrate, 4-10 cm long, often densely congested, brownish; internodes 2-8 mm long, puberulous to subglabrous with age. Leaves sessile, ovate to broadly lanceolate, up to 7(-8.5) x 2.5(-3) mm, attenuate to the acute or acuminate apex, mostly strongly mucronate, the mucro 0.4-0.6(-1) mm, stout and pale, on both sides glabrous; margin shortly ciliate, leaves usually brownish-green to brown, sometimes subcoriaceous and stiff; stipules up to 4(-6) mm long, ovate-oblong, subacute to subobtuse, mostly shorter than the leaves. Flowers arranged in pseudo-axillary, subterminal and terminal, 3 to 7-(-13)-flow-

ered clusters, which are 5(-7) mm in diam., and often congested towards the end of shoots; stipulary bracts c. 2.5 x 1 mm, ovate-suboblong to oblong, obtuse, often slightly exceeding the flowers but not quite concealing them. Flowers shortly pedicellate, ellipsoid-turbinate, (1.75-)2-2.4(-3) mm long with a prominently swollen perigynous region; light-brown, shortly pubescent on the receptacle, the calyx region usually slightly puberulous to glabrous or, occasionally, very shortly pubescent; receptacle c. 0.75(-1) mm long, obconical; sepals often semi-scarious, 1-1.2(-1.5) mm long, ± oblong, with a conspicuous membranous margin, a rather small and membranous hood and a pale, erect and slightly puberulous, 0.3-0.45(-1) mm long awn; petals 0.75(-0.9) mm with a reddish tip; filaments 0.45(-0.6) mm; anthers 0.35 x 0.2-0.25 mm, oblong and orange; ovary ovoid, c. 0.5 x 0.6 mm, smooth, with a thick, long style, 0.6-0.7(-0.9) mm, nearly 1/3 to 1/2 its length split but the stigmas only c. 0.2 mm long, the branches often curling down in the fruiting stage. Fruit quadrangular to nearly ovoid, c. 1 x 0.8 mm, almost flat above and rounded below, smooth and dark-brown.

Fl. Dec-March. Alpine meadows, alt. ca. 2500-4800 m.

Type: Argentine, locality unspecified, *Hieronymus* in iii.1873, (holo. B, destroyed).

Neotype: Prov. Salta, Nevado del Castillo, 19-23.iii.1873, *G. Hieronymus et P. G. Lorentz* 28 (G!).

a) var. **hieronymi:** Leaves up to 7 x 2.5 mm, mostly acute, with 0.4-0.6 mm long mucro; stipules up to 4 mm long; flowers (1.75-)2-2.4 mm; sepals ± puberulous to subglabrous on the back, awns 0.3-0.4 mm long.

Distr.: Provinces of Tucuman, Salta and some parts of Jujuy.

Prov. **Tucuman:** Dep. Tafi: *L. Castillon* 515a & 2841 (LIL); Dep. Tafi: H. *Sleumer* 179 (LIL); *C. Cristobal* 297 (LIL); *Schreiter* 6766 (LIL); *M. Lillo* 2972, 4238, 3474, 3077, 3072 (LIL); *Schreiter* 1351 (LIL). Prov. **Salta:** Dep. Caldera *H. Sleumer & F. Vervoorst* 2882 LIL); Nevado des Castillo, *G. Hyronymus & P. G. Lorentz* 28 (G) NEOTYPE. Prov. **Jujuy:** Dep. Humahuaca, *A. L. Cabrera* 15476 (LP); Dep. Rinconada, *Cabrera* 7763 (LP); Tres Cruces *A. Soriano* 633 (LP); Dep. Volcán: Mula Muerta, *L. Castillon* 131 & 9317 (LIL) (trans. with var. *jujuyensesj*.

b) var. **jujuyensis** Chaudhri n. var. a var. *hieronymi* foliis paulo majoribus (usque ad 8.5 mm longis et 3 mm latis), plerumque acuminatis et insuper mucrone longiore (0.6-1.0 mm longo) instructis, stipules longioribus (usque ad 6 mm longis), floribus majoribus (plerumque 2.7-3.25 mm altis), sepalis extus pubescentibus et arista longiore (0.5-1.0 mm longa) instructis distinguenda. Leaves up to 8.5 x 3 mm, mostly acuminate and pungently mucronate, mucro 0.6-1 mm; stipules up to 6 mm long; flowers (2.5-)2.7-3.25 mm long including the awns, (sepals c. 1.5 mm long, awns 0.5-1 mm, petals 0.8-0.9 mm, filaments 0.6 mm, style c. 1 mm); sepals ± pubescent on the back.

Type: Prov. Jujuy, Loma del Tambo, Volcan, 2500 m, 22.ii.1924, *Schreiter* 2715 (holo. LIL!). Endemic.
Distribution of the species: Endemic in NNW Argentine & S. Bolivia.

This is a very well-defined species, which shows but very little affinity with *P. chilensis* DC. Indeed, it is hard to understand why Hosseus has reduced it to a variety under *P. chilensis,* since these two species have hardly anything in common, the structure of the leaves and flowers is entirely different.

P. hieronymi, however, is closely related to *P. limaei* Chaudhri especially in the characters of the flowers and fruit, but is distinguishable by its very characteristic ovate-elliptic, and strongly mucronate, on both sides glabrous leaves. In *P. limaei,* on the other hand, the leaves are pubescent and very shortly mucronate. Moreover, the shoots of *P. limaei* are generally reddish-brown and shortly pubescent, whereas in *P. hieronymi* they are puberulous to glabrescent; the flowers in *P. limaei* are densely pubescent, while in *P. hieronymi* the receptacle is shortly ciliate whereas the sepals are often glabrous.

51. **P. limaei** Chaudhri n. spec.

Plate VII, Fig. 25-27. p. 185

Herba perennis, dense implecta, plerumque 10-18 cm diam. Caules prostrati, usque ad 18 cm longi, dense ramificati, dilute brunnei; internodia usque ad 6 mm longa, dense pubescentia. Folia oblonga vel ovato-lanceolata, usque ad 4 mm longa et 1.5-2.0 mm lata, acuta et saepe mucronulata, ad basim abruptius angustata, appresse pubescentia vel interdum subglabra, rigidula, viridula et denique brunneolo-rubra; stipulae oblongae vel ovato-oblongae, 2.5-3.0 mm longae, obtusae, foliis paulo breviores. Glomeruli laterales, triflori vel ad florem singulum redacti; bracteae scariosae, suboblongae, circ. 2.5 mm longae et 1.5 mm latae, obtusae, floribus paulo longiores sed eos non omnino obtegentes. Flores subsessiles, subampulliformes, i.e. e receptaculo tumido, turbinato-obconico, circ. 1.0 mm alto et calyce tereti angustiore compositi, 2.25-2.4 mm alti, saturate brunnei, breviter appresse pubescentes; sepala oblonga vel ovato-oblonga, arista non inclusa 1.25-1.4 mm longa, semiscariosa, margine membranaceo lato, cucullo membranaceo non clare delimitato et arista erecta, gracili, parce puberula vel subglabra, 0.3-0.45 mm longa instructa, parte centrali saepe puberula; petala filamentis similiora, 0.75-0.8 mm longa, brunneola; stamina filamento albido circ. 0.65 mm longa et anthera oblonga, circ. 0.3 mm longa et 0.2 mm lata instructa; ovarium ovoideum, 0.4-0.5 mm diam., apicem versus attenuatum, sublaeve; stylus circ. 0.5 mm longus in stigmata dua filiformia, circ. 0.3 mm longa, saturate brunnea exeuns. Fructus non visus.

Fl. 2-4. Rocky places in alpine region, ca. 2800-3250 m.
Type: Peru: Dept. Lima: Prov. Huarochiri, Infiernillo, alt. 3250 m, 23.iv.1939, *T. H. Goodspeed et al.* 11510 (holo. UC! iso. GH!).
Distr.: Endemic.

Prov. Lima: Rimae Valley, 2800 m, Rante-Hirsch P205 (F).

Closely resembling *P. hieronymi* Pax in the form of the flowers, but distinguishable by its densely pubescent shoots, smaller, very shortly mucronate and pubescent leaves, and pubescent flowers.

52. **P. fusciflora** Chaudhri n. spec.

Plate VII, Fig. 12-14. p. 185

Herba perennis parva et compacta, radice perpendiculari lignoso instructa. Caules prostrati, usque ad 12 mm longi, per totam longitudinem densius ramificati; internodia 2-5 mm longa, robusta, tota rubro-purpurea, pilis plus minusve patentibus sparse puberula, denique glabrescentia. Folia sessilia, ovata vel elliptica, usque ad 4 mm longa et 1.5 mm lata, acuta et mucronulata (mucrone 0.2-0.25 mm longo instructa), utrimque sparse puberula, margine ciliolata; stipulae cuiusque folii ad basim connatae, ovato-lanceolatae, usque ad 3.0 mm longae et 1.25 mm latae, acutae vel acuminatae, foliis paulo breviores, internodia amplectentes, ad basim plus minusve coriaceae et hac parte persistente. Glomeruli ad apicem ramulorum congesti, aliqui tamen interdum ab aliis distincte separati, omnes e floribus 3-7 vel rarius usque ad 10 compositi, 3-5 mm diam.; bracteae lanceolato-oblongae, circ. 2.75 mm longae et 1.0 mm diam., subobtusae, floribus longiores et eos omnino obtegentes. Flores sessiles, anguste ellipsoidei, 2.25-2.4 mm alti, parte basali obconica saepe saturate purpurea et breviter pubescente; sepala oblonga vel subovata, 1.2 mm longa et 0.4-0.5 mm lata, apice leviter angustata, parce puberula vel subglabra, semiscariosa, margine membranaceo lato, cucullo brevi et arista erecta gracili, glabra, saturate brunnea, 0.45-0.5 mm longa instructa; petala 0.6-0.65 mm longa; stamina filamento 0.45-0.5 mm longo et anthera oblonga, 0.25 mm longa et 0.15 mm lata, aurantia instructa; ovarium ovoideum, circ. 0.5 mm altum et 0.4 mm diam., apice parce papillosum; stylus circ. 0.33 mm longus in stigmata dua, filiformia, eo subaequilonga, divergentia exeuns. Fructus ovoideo-ellipsoideus, circ. 1.0 mm altus et 0.55 mm diam.
Fl. 6. Paramos; alt. ca. 4000 m.
Type: Northern Peru: Ishcaivilca above Sunchubamba, 4000 m, 11.vi. 1957, *H. Ellenberg* 1960 (holo. U!).
Distr.: Endemic, known only from the type locality.

This species shows a superficial resemblance to *P. andina* A. Gray subsp. *purpurea* Chaudhri but is distinguishable in the characters of

leaves, flower-clusters and especially of the flowers. The leaves in this species are very minutely mucronulate and sparsely puberulous (not sharply mucronate and glabrous on the upper side, as is the case in the other taxon), the flowers are very shortly pubescent or puberulous on the receptacle and almost glabrous on the sepals back. In the other taxon the flowers are uniformly pubescent and much larger in size.

53. **P. weberbaueri** Chaudhri nom. nov.
P. polygonoides Muschler in Engl. Bot. Jahrb. 45:459 (1910-11), non *P. polygonoides* (Cav.) Gürke in Richter-Gürke, Pl. Europ. 2(2):189 (1899).

Plate VII, Fig. 9-11. p. 185

A small perennial herb; stem woody and somewhat rhizomatous at the base, partly subterranean, c. 8.5 cm long, giving off branches from near the top, shoots ± ascending or suberect, densely congested, internodes 1-3 mm long, puberulous to subglabrous and reddish in age, terminating in conspicuous glomerules. Leaves brownish, stiff, elliptic-oblong to nearly ovate, 2.75-3.5 x 1.3-1.6 mm, acute, with 0.3-0.35 mm long, stout mucro, densely hirtellous on both sides; margin slightly hirsute; stipules suboblong, 3-3.5 x 2-2.5 mm, obtuse, mostly ± equalling the leaves, exceeding them at the shoot tips. Glomerules terminal, 6-10 mm in diam., profuse and congested; bracts stipulary, up to 3.8 x 2.7 mm, broadly oval-oblong, obtuse, concealing the axillary flowers. Flowers subsessile, narrowly ellipsoid to urceolate (swollen in the middle and somewhat tapering at both ends), brownish, 2.25-2.35 mm long (including the awns), shortly and densely hirtellous; receptacle well-developed, 0.7-0.8 mm long, obconical, brownish; sepals 1.25-1.4 mm long, ± oblong, obtuse, semiscarious, with a pale membranous margin broader than the median, brownish, lanceolate-triangular band, a rather small hood, and a very short, 0.25-0.3 mm, erect to somewhat inwards-directed, tender, nearly white and pubescent awn; petals 0.65 mm, with a reddish tip; filaments 0.6 mm, anthers 0.4-0.45 x 0.25 mm, orange-brown; ovary subquadrangular, c. 0.5 mm in diam. and smooth; style c. 1 mm long, or 2 times longer than the ovary, and nearly halfway split into two long, filiform, dark-brown, in the fruiting stage divergent stigmas. Fruit c. 1.25 x 1 mm, ovoid-subglobose, brownish and smooth.
Type: Peru: Prov. Cajatambo, Ocros, alt. ca. 3500 m, *A. Weberbauer* 2702 (holo. B, destroyed; iso.-neo. G!).
Distr.: Endemic.
Closely allied to *P. andina* A. Gray in some of the floral characters, but the two possess, especially with regard to the pubescence, texture,

and mucro, entirely different type of leaves. Moreover, the two spp. differ in the form or shape of the flowers, turbinate-ellipsoid and covered with patent hairs in this species and oblong and adpressed pubescent in *P. andina.*

54. **P. andina** A. Gray in Bot. Unit. St. Exped. 1:128 (1854). Rohrbach in Linnaea 37:211 (1873).

Syn.: *P. membranacea* Muschler in Engl. Bot. Jahrb. 45:459 (1910-11).
Type: Peru: Ocros, Chonta, 4400 m, *Weberbauer* 2784 (holo. B. destroyed; iso. G!).

Plate VII, Fig. 5-8. p. 185

A small, often more or less pulvinate perennial herb with a very woody tap root and a woody, prostrate stem, much-branched from the compact, partly subterranean base (caudex); branches up to 16 cm long, often caespitose or pulvinate, usually having 1-2 mm long (very occasionally up to 5 mm long) glabrous internodes, which are mostly concealed by the leaves and the stipules. Leaves sessile, elliptic-oblong to almost ovate, 2.5-4 x 1.25-2 mm, closely imbricate, coriaceous, often concave with the margin somewhat rolled inwards, glaucous-green, glabrous or sometimes puberulous, especially on the under side, the margin, however, always ciliate, the apex acute to subobtuse and conspicuously mucronate, the mucro usually 0.6-0.8 mm long (rarely much shorter), stout and spinelike; midrib indistinct; stipules ovate to ± oblong, but gradually widening towards the end of the shoot, 2-3 (-4) x 1.5-2(-2.5) mm, ± obtuse to subacute and usually bipartite, often almost equalling or somewhat shorter than the leaves, though fully equalling or exceeding and concealing the leaves towards the end of branches. Flowers densely aggregated into subglobose terminal or subterminal glomerules, 3-6(-10) mm diam. often 3 to 7-flowered, occasionally however solitary axillary flowers are present as well; bracts almost suboblong to suborbicular, 2.5-3.5(-4) x 1.5-3 mm, obtuse, entire, concealing the flowers. Flowers subsessile, (2-)2.25-2.5(-3.25) mm long, ± oblong, semiscarious, often shortly pubescent with somewhat upwards-directed hairs, the pubescence may be very dense on the receptacle and rather sparse on the sepals; receptacle 0.5-0.6(-1) mm long, somewhat narrowed to the base; sepals ± oblong, 1.3-1.5 (-2) mm long (0.5-0.75 mm wide), concave, with prominent membranous margins, which are of nearly the same width as the median, strongly 3-nerved band, or slightly broader, the hood too membranous but not well-defined; the apex obtuse-truncate; the awn 0.3-0.35 mm long, ± scabrous, nearly white and erect; petals c. 0.7(-1) mm, usually with a broad brownish base and a reddish tip, ± equalling the stamens; filaments c. 0.5(-09) mm; anthers 0.25-0.35 x 0.2 mm, oblong-

rectangular and orange; ovary 0.5-0.6 x 0.45-0.5 mm, conical, tapering upwards into a long and thick, (0.4-) 0.5-0.65 (-0.8) mm long (including the stigmatic part) style, often for nearly 1/3 to 1/2 of its length split into two filiform, erect to spreading dark-brown stigmas. Fruit quadrangular to subglobose, 1.1-1.25 x 0.85-1 mm, smooth; seed subglobose, c. 1 x 0.85 mm.
Fl. Oct.-July. Alpine slopes, alt. ca. 3000-5300 m.
Type: Peru: Banos (casa Cancha, Alpamarca), nr. Andes, /1838-42, *Wilkes Expedition* (holo. GH!).
1a) Stems ± spreading; internodes reddish; stipules deeply bipartite and with a subcoriaceous, persistent base; flowers 3-3.25 mm and reddish ..... subsp. **purpurea**
1b) Stems mostly fastigiate or compact, caespitose and pulvinate; internodes greenish; stipules rather shortly split; flowers 2-2.4 mm, greennish-white or whitish
2a) Stems pulvinate and densely congested; leaves elliptic-oblong, conspicuously mucronate and glabrous; stipules ± equalling the leaves; bracts concealing the flowers; flowers 2.25-2.4 mm—— subsp. **andina**
2b) Stems not pulvinate, somewhat spreading; leaves ovate-elliptic, shortly mucronate and puberulous at least in the younger stages; stipules mostly shorter than the leaves; bracts not quite concealing the flowers; flowers c. 2 mm long ..... subsp. **boliviana**

a) subsp. **andina:** Stems densely pulvinate; leaves subcoriaceous, elliptic-oblong, conspicuously mucronate, and, at least on the upper side, wholly glabrous; stipules ± equalling the leaves and bilobate; bracts mostly exceeding and concealing the flowers; flowers 2.25-2.4 (-3) mm; receptacle 0.5-0.6 mm; awns 0.3-0.35 mm; membranous margin somewhat broader than the median band; petals 0.7 mm, filaments 0.5 mm, anthers 0.25 x 0.2 mm, style 0.5-0.6(-0.7) mm long; ovary whitish.
Distr.: Almost throughout the range of the species.

Peru: Rio Blanco, 4900 m, *J. F. Macbride* 3048 (S); Viso, 3000 m, *Macbride & Featherstone* 624 (S)); Dep. Junin, *A. L. Cabrera* 10961 (LIL); Dep. Huancayo, ± 5000 m, *J. Soukup* 3599 (LIL); Prov. & dep. Huancavelica, *O. Tovar* 214 (UC); Prov. Colea: Cuzco, *Marin* 1319 (LIL); Dep. Cuzco, *A. Weberbauer* 6919 (GH) forma laxa; Cuzco: Dep. Puno, Prov. Carabaya, *C. Vargas* 7015 (LIL); Mine Rio Pallanga, N. of La Viuda, 4900 m, *H. Ellenberg* 2174 (U); **Bolivia:** Prov. Larecaja, Mt. Chimburu, nr. Combaya, *G. Mandon* 995 (S).

b) subsp. **boliviana** Chaudhri nov. subsp. a subsp. *andina* habitu non pulvinata, foliis ovato-ellipticis, mucrone minore instructis, minime in statu juniore sparse puberulis, stipulis plerumque quam folia brevioribus, floribus circ. 2 mm altis, non totaliter sub bractea latentibus distinguenda. Stems somewhat spreading from a compact base; leaves rather thick, ovate-elliptic, very shortly mucronate, finely puberulous in younger stages; stipules mostly shorter than the leaves; bracts not

quite concealing the flowers; flowers c. 2 mm; awns 0.3-0.35 mm; membranous margin nearly equalling the median band (though not exceeding); style c. 0.4 mm, nearly bifid into stigmas.
Type: Bolivia: La Paz: Chacachaya, 30 km from La Paz, ca. 4800 m, xii.1934, *Otto Buchtien* 9392 (holo. G! iso. E! GH!). (as *P. microphylla* Phil.).

c) subsp. **purpurea** Chaudhri nov. subsp. a subsp. *andina* caulibus haud fastigiatis sed prostratis, ex internodiis rubeolis compositis, stipulis bipartitis, basi subcoriacea persistente instructis, floribus circ. 3-3.25 mm altis, rubeolis distinguenda. Stems spreading, internodes reddish; leaves stiff, elliptic to elliptic-oblong, shortly mucronate, sparsely puberulous on the under side near the tip; stipules lanceolate-oblong, ± acute, bipartite, connate at the base forming very conspicuous subcoriaceous, pale, persistent bases, almost equalling or somewhat shorter than the leaves; glomerules 8-10 mm in diam.; flowers red, 3-3.25 mm (including the awns); receptacle c. 1 mm long, obconical; sepals 1.7-2 mm, membranous margins reddish, awns c. 0.3 mm; petals c. 1 mm long; filaments 0.9-1 mm, anthers 0.3-0.35 x 0.2 mm; ovary c. 0.6 x 0.5 mm, ovoid, reddish; style c. 0.8 mm, nearly 1/3 of its length bilobate into thick, dark-brown stigmas.
Type: Peru: Yanashallas, 35 km W of Huallanca, 78.25° W, 8.3° S, ca. 5300 m, 2.x.1922, *Macbride & Featherstone* (holo. G!).

This subsp. resembles *P. fusciflora* Chaudhri in having reddish flowers and deeply split stipules, but the glabrous stems, rigid leaves often with typically *P. andina*-like mucro (though rather shorter in length), ± pubescent sepals and scabrous awns, and finally smooth ovary link it with the main population of *P. andina* rather than with *P. fusciflora.*

55. **P. pulvinata** A. Gray in Proc. Acad. Sc. Phil. 1863:58 (1864). Rydberg, Flora of the Rocky Mts. 267 (1922); Core in Amer. Mid. Nat. 26(2):385 (1941).
Syn. *P. sessiliflora* Nuttall subsp. *pulvinata* (Gray) W. A. Weber in Univ. Colorado Stud. ser. Biol. 7:11(1961).

Plate III, Fig. 17-19. p. 114

A small perennial herb; stems arising from a thick woody caudex (c. 1.5 cm in diam.), very densely caespitose and forming dense cushion-like tufts, 5-10 cm long, densely covered with leaves and stipules; internodes up to 5 mm long, very shortly pubescent. Leaves narrowly elliptic-oblong or ± oblong, occasionally narrowly elliptic-oblanceolate, 2-5 x 1.25-1.75 (-2) mm, fleshy, usually on both sides glabrous, sometimes sparsely puberulous, margins finely ciliate and somewhat scabrous, apex obtuse to subacute, but without mucro, slightly attenuate to the

base, almost nerveless (or the midrib indistinct), closely imbricate and ascending; stipules ovate, mostly subobtuse, entire, slightly shorter than the leaves to equalling them. Flowers mostly solitary at the end of the shoots and almost concealed by the leaves; foliaceous bracts somewhat exceeding the flowers. Flowers almost sessile, 2.5-2.75 mm long, ellipsoidal-oblong, nearly white, densely adpressed-pubescent on the receptacle but rather sparsely and shortly so on the sepal backs; receptacle c. 1 mm long, somewhat turbinate; sepals 1.5-1.65 mm long, narrowly oblong to ovate-oblong, semiscarious with a conspicuously broad membranous margin equalling or somewhat broader than the light-green, 3-nerved median band, hood small and membranous, awn rather tender, nearly white, erect, slightly scabrous-pubescent, mostly 0.3-0.6 mm long, sometimes up to 1 mm long; petals c. 1 mm, ± equalling the filaments; anthers 0.3-0.35 x 0.2-0.25 mm, oblong and orange-yellow; ovary c. 0.75 x 0.5 mm, glabrous, conical-ovoid, tapering upwards into a nearly white 0.85-1 mm long style, shortly 2-cleft at the tip. Fruit c. 1.5 x 1 mm, ovoid, smooth.

Fl. & ft. 7-8. Rocky slopes and summit screes in the alpine region, alt. ca. 3300-4200 m.

Type: Colorado: Rocky Mts.: at the head-waters of Clear Creek and the alpine ridges lying east of "Middle Park", /1861, *C. C. Parry* 297 (holo.-lecto GH!).

Distr. Colorado, Wyoming & Utah.

a) var. **pulvinata: Colorado:** Mount Garfield, *Clements & Clements* 494 (E, GH); Gunnison Co.: *Beaman & Erbisch* 1284 (TEX); *Ripley & Barneby* 7209 (NY); El Paso Co.: 8.viii.1903, *J. L. Sheldon* (WVA, awns c. 0.25-0.3 mm); 27.vii.1935, *H. L. Zobel* (LD); Lake Co.: 1.vii.1886, *W. Trelease* (WVA); Jackson Co.: vii.1894, *C. F. Baker* (JE, LD); *C. S. Sargent* 99 (GH); Jefferson Co.: /1871, *E. L. Greene* (GH); Boulder Co.: *L. K. Skinkle* 73 (WVA); *W. A. Weber* 5529 (TEX); Park Co.: *Weber, Rollins, Livingstone* 6488 (GH); Rocky Mts., lat. 39-41, *Hall & Harbour* 66 (GH, W); *C. C. Parry* in 1872 (E, GH); Headwaters of Clear Creek, E. of "Middle Park", *C. C. Parry* 297 in 1861 (holotype) & in 1862 (GH); Gray's Peak: *H. N. Patterson* 14 (GH, W); 23.vii.1885, *G. H. Letterman* (GH); **Wyoming:** Summit of Snowy Range, above Brooklyn Lake, *Yuncker & Yuncker* 12033 TEX); La Plata Mines: *E. Nelson* 5241 (GH); South Park nr. Alpine, *Wolf & Rothrock* 46 (GH); (awns c. 0.25-0.3 mm); Albany Co.: *F. J. Hermann* 17732 (NY); **Utah:** Summit Co.: *Payson & Payson* 5042 (GH); *Goodman & Hitchcock* 1518 (GH).

b) var. **longiaristata** Chaudhri nov. var. a var. *pulvinata* sepalis arista longiore (circ. 1 mm longa) instructis distinguenda. Awns c. 1 mm long, (whereas in the rest of the population 0.3-0.6 mm only). **Utah:** Uinta, c. 3900 m, *S. Watson* 1006 (GH); Duchesne Co.: Uinta Mts., Mt. Emmons, ca. 3650 m, *F. J. Hermann* 5041 (GH, TYPE).

This is a very distinct species showing some resemblance to a Peruvian species, viz. *P. andina* A. Gray, in its floral structure and pulvinate habit, but *P. andina* possesses very characteristically mucronate and rather rigid leaves, while in this species the leaves are fleshy and without

mucro. W. A. Weber, op. cit., reduced it to a subspecies of *P. sessiliflora* on the grounds that both have the same habit and that the leaves of *P. pulvinata,* when grown under artificial conditions in a glasshouse, become linear-subulate, like those of *P. sessiliflora.* He further remarked that "since there are no other characteristics available to separate the two taxa, *P. pulvinata* may be regarded as an ecad or environmental modification of *P. sessiliflora*".

I entirely disagree with this interpretation. In fact, apart from the almost identical pulvinate habit (a feature shared by most of the alpine spp.) there is absolutely nothing in common between the two spp. Even a cursory examination is enough to recognize their sharp differences. *P. sessiliflora* possesses linear-subulate, rigid and subchartaceous, shortly cuspidate less than 1 mm broad leaves, and with a very distinct midrib. *P. pulvinata,* on the other hand, has elliptical-oblong, fleshy leaves, 1.25-2 mm broad, mostly obtuse and without mucro, and almost nerveless. The stipules in the former are lanceolate, deeply split (lengthwise), whereas in *P. pulvinata* they are ovate, obtuse and entire. The flowers are also quite different in the two spp., much shorter in *P. pulvinata,* with semiscarious sepals, a broad, nearly white membranous margin (equalling or somewhat broader than the median band), and a tender, nearly white awn, while in *P. sessiliflora* the sepals are rigid with a narrower membranous margin and very stiff and stout, spreading awn. The petals are shorter and the anthers considerably larger in *P. sessiflora*; the ovary densely pubescent and ovoid-subglobose, obtuse, rounded above, while in *P. pulvinata* it is conical, tapering upwards into the style and glabrous.

As stated above, *P. pulvinata* shows affinities with the Peruvian P. *andina* A. Gray in its floral structure and habit, whereas *P. sessiliflora* bears some resemblance to *P. virginica* in so far as the floral structure is concerned, but has an entirely different habit.

56. **P. bryoides** Hochst. ex A. Richard, Fl. Abyssanica 1:302 (1847) G. Cufodontis, Plant. Aethiop. Bull. Jard. Bot. Brussels 22 (Suppl.) :99(1953).

Plate VII, Fig. 1-4. p. 185

A compact, densely branched (somewhat bushy) perennial herb; stems suberect, very woody (3-5 mm wide) at the base, 10-20 cm long, leafless towards the base, and densely leafy and floriferous towards the ends, much-branched, mostly laterally, but sometimes in a pseudo-dichotomous manner, often producing short adventitious roots from the lower nodes; shoots usually densely intertwined, (and even almost caespitose); internodes 1-5 mm long, mostly quite short, stout, brownish and ± glabrous; the lower nodes often marked by the persistent bases

of the stipules. Leaves sessile, oblanceolate-subspathulate to narrowly elliptic 3-5.5 x 1.5 mm, narrowed to the base, apex acute and minutely mucronulate, margin finely serrate-denticulate, on both sides glabrous, light brown (to pinkish), coriaceous, the upper ones closely approximated and ascending, slightly carinate, deciduous below for about 1/2-2/3 of the length of the shoots; stipules 3-4 mm long, narrowly ovate, acute, almost equalling the leaves and ascending margin finely ciliate. Glomerules terminal and subterminal, 5-8 mm in diam., profusely crowded; bracts (stipulary) 3 x 1.75 mm, ± ovate, acute, exceeding and nearly concealing the flowers. Flowers subsessile, 2.3-2.6 mm long (including the awns), almost ellipsoid-turbinate, swollen just below the middle and tapering at both ends, shortly pubescent on the perigynous (strongly 10-ribbed) region and the basal parts of the midribs of the sepals; sepals semiscarious, connivent, oblong to ovate-oblong, 1.4-1.5 x 0.75-1 mm, with a broad membranous margin (almost twice as wide as the brownish median strip), apex obtuse and distinctly hooded (hood white and membranous) and with a short, (0.3-)0.45 mm long, slender, pale, minutely puberulous, erect awn on the back near the tip; petals 0.7 mm long, dark-brown; filaments 0.5 mm and nearly white; anthers nearly rectangular, 0.2-0.25 mm in diam., orange-brown; ovary c. 0.5 x 0.6 mm, subovoid; style c. 0.5-0.6 mm long (including the stigmatic part), nearly bifid into dark-brown, divergent-spreading stigmas. Fruit ovoid, c. 1 x 0.75 mm, somewhat papillose at the top.

Fl. 2-4. Rocky/stony places, alt. 4250-4475 m.

Type: Ethiopia (Abyssinia): "In cacumine montis Silke" 18.ii.1840, *W. Schimper* 661 (Lecto. L! iso. FI! HAL! JE! S! STU! W!).

Distr.: Endemic.

Ethiopia: Amhara: Semien-Cresta merid., Mt. Selchi, alt. 4250-4475 m, 10.iv. 1937, R. *Pichi-Sermolli* 2710 (FI).

This is a remarkable species showing a close resemblance to some species of Peru, like *P. andina* A. Gray and *P. weberbaueri* Chaudhri in its floral characters, but, curiously enough, it occupies a totally isolated position among the Old World species.

57. **P. polygonifolia** (Villars) DC. in Lam. & DC., Fl. Fr. ed. 3, 3:403 (1805).

Basionym: *Illecebrum polygonifolium* Villars, Fl. Delph. 21 (1785), et Hist. Pl. Dauph. 2:557,t.16 (1787). Type: Probably at Grenoble (GRM), not seen.

Boissier, Fl. Or. 1:746 (1867); Willk. et Lange, Prodr. Fl. Hisp. 3:156 (1874); Nyman, Conspectus Fl. Europ. 255 (1879); Fiori & Paoletti, Fl. anal. Ital. 1:334 (1898); Gürke in Richter-Gürke, Pl. Europ. 2(2): 185 (1899); Halacsy, Consp. Fl. Graec. 1:571 (1900); Briquet, Prodr.

Fl. Corse 1:482 (1910); Rouy, Fl. Fr. 12:5 (1910); Graebner in Aschers. & Graebn., Syn. 5(1):897 (1919); R. Maire et Weiller in Maire, Fl. Afr. Nord 9:18, f.4 (1963); A. O. Chater in Tutin et al., Fl. Europ. 1:150 (1964); M. N. Chaudhri in P. H. Davis, Fl. Turk. 2:253 (1967).

Syn.: *Illecebrum alpinum* Villars, Hist. Pl. Dauph. 1:379 (1786); *Paronychia trinervia* Dulac, Fl. Hautes-Pyrén. 364 (1867).

Chaetonychia polygonifolia Sampaio, Lista Herb. Portug. 78 (1913); *Plottzia polygonifolia* Sampaio, Apend. Lista Herb. Portug. 8 (1914).

A perennial herb with a woody tap root; stems 10—25 cm long, prostrate, much-branched and often compact or congested close to the base, but the branches usually spreading; internodes short, 2-8 mm long, shortly pubescent to puberulous or almost glabrous, particularly on the upper side. Leaves narrowly obovate-oblanceolate to narrowly elliptic-oblong, 3-9 x 1-2(-3) mm, acute to subobtuse, usually without mucro, sometimes with a very minute, rather indistinct one, on both sides glabrous; margin minutely ciliate (and serrulate) to glabrous, base attenuate, often crowded; stipules narrowly ovate-lanceolate, mostly 3-4(-5) mm long, somewhat shorter than the leaves, occasionally almost equalling them. Glomerules mostly lateral (or pseudo-axillary) and usually much congested, not well-defined, rather small, 4-7 mm in diam.; bracts stipulary, 2-3(-4) mm long, ovate-lanceolate, ± exceeding the flowers but not quite concealing them. Flowers subsessile, 1.35-2 (-2.25) mm (including the short awns), shortly pubescent on the base, and rather sparsely puberulous on the back of the sepals; sepals 0.75-1 (-1.35) mm long, ± oblong, with a small hood and a broad membranous margin, often almost equalling the brown, 3-nerved, median band, and with a short, slender, mostly slightly pubescent, 0.25-0.35 (-0.4) mm long awn; petals 0.3-0.35 mm with a reddish-brown tip; filaments 0.45 mm; anthers 0.2-0.25 x 0.2 mm, more or less rectangular and orange; ovary ovoid; style 0.3-0.5 mm, mostly bifid, rather thick at the base (branches erect). Fruit almost globose, 1-1.15 mm in diam.; seed 0.85-1 mm in diam., nearly globose.

Fl. 6-9. Subalpine to alpine rocky slopes and summits, alt. ca. 1500-3300 m.

Distr.: Mts. of Italy, SE. France, Pyrenees, NW & S. Spain, C. Portugal, Northern Morocco, Greece and W. Turkey.

1a) Leaves narrowly elliptic (to oblanceolate), with a distinctly serrate margin; sepal awns densely hirtellous ..... **var. serratifolia**

1b) Leaves narrowly obovate/broadly oblanceolate with an entire, subglabrous margin; sepal awns very slightly pubescent to almost glabrous

2a) Bracts distinctly exceeding the flowers; flowers 1.35-1.6 mm long,

sepals c. 0.75 mm long, awn 0.25-0.3 mm; style 0.3-0.35 mm ——— var. **polygonifolia**

2b) Bracts only slightly exceeding the flowers; flowers 1.6-2 mm, sepals c. 1 mm long, awn 0.3-0.35 mm; style 0.4-0.5 mm long ——— var. **velucensis**

a) var. **polygonifolia**:

Syn.: *P. polygonifolia* var. *genuina* Maire et Weiller in Maire, op. cit.

Distr.: Italy, S & SW France, NNE Spain, (the Pyrenees region).

Italy: Piemonte: *L. Vaccari* 38 (E); 2.ix. 1904, *Vaccari* (W); Vales, Mt. Cenis, ix.1956, *Huet du Pavillon* (L); Val de Cogne, 18.viii.1866, *J. Ball* (E); Alpes de Tende, 1.viii.1879, *J. Vetter* (Z); Valdieri, 18.vii.1876, *J. Vetter* (Z); Thermas Valderias, vii. 1866, *J. Ball* (E). **France:** Alpes maritimes, Vinadio, *H. G. Reichenbach* 2450 (L); Dep. Savoie: Maurienne, *E. Didier* 979 (exs. C. Billot) (JE); Dep. Isère: Grand-Galbert d'Ornon, *J. Perret* 782bis (Z); Dep. Hautes-Alpes: Lautaret, *Chanrion* 782 (Z); Monetier-les-Bains, 31.vii.1915, *A. Faure* (Z); Pyrenees-Orientalis: vi.vii/1930 & /1931, *Braun-Blanquet*, G. & I (Z); Mont Louis, P. F. *van Heerdt* 244 (U); *Sandwith & Ellman* 160(K); Superbolquère, *K. H. Rechinger & H. Sleumer* 723 (L); Col de Pimorens, *Stud. biol. Rheno-Tria.* 1947:825 (U); Pic de Ceciré, *id.* 1947:990 (U); Hautes-Pyrenées: Gèdre: *Bordère* 661 (F. Schultz Herb.) (L, W). **Spain:** Pyrenées centrales, Castaneze, 10.ix.1852, *Huet du Pavillon* (L); Pyr. d'Aragon: 24.vi.1870, *L. Leresche* (L); Prov. Logroño: Puerto de Piqueras, *N. Y. Sandwith* 5263 (K).

b) var. **velucensis** Boiss.; Fl. Or. 1:746 (1867). (*P. Polygonifolia* race *velucensis* (Boiss.) Rouy, op. cit.)

Type: Greece: "In regione superiori montis Veluchi Aetoliae, *Guicciardi et Samarit.*" (G-Boiss.).

Distr.: NW. & S. Spain, Portugal, Morocco, Corsica, Greece & Turkey.

France: Corsica: Col de Verglio, *P. Aellen* 121 (Z);

Spain: Prov. Leon. Part Ponferrade, Sierra Comporomo, *W. Rothmaler* 16b (Z); Sierra de Gredos: *D. W. Dresser* 801 & 989 (E); Sierra Nevada: Penon de San Francisco, *Porta & Rigo* 567 (HBG, JE); Picacho de Veleta, *Huter, Porta, Rigo* 866 (E).

Portugal: Serra da Estreta: *A. Fernandes* et *al.* 3821, 4470, 4472, 4494, 4529, 6074 & 6798 (COI); *C. Fontes* et *al.* 1306 (LISE); *W. Rothmaler* 13692 (LISE).

Morocco: Mt. Tidiguin, 2400 m, *Font Quer* 127 (S, Z); trans. with var. *serratifolia;* Reraya, Ouerkerin e. 3090 m, 24.vii.1923, *R. de Litardière* (P).

Turkey: Bursa. Uludag, 3.vii.1914, *Başarman* (ISTE), "Olympo Bithyn." *Pichler* 57 (COI, JE, STU); Izmir: Tmolus, Bozdağ Yaila, 25.vii.1854 *Balansa* (C, E, JE, Z); Kütahya: Simav, 1900-2100 m, *Coode & Jones* 2709 (E) Burdur: Burdur: to Antalya, v.1938, *Heilbronn* (ISTE).

Greece: Mt. Korax, viii.1896, *Tuntas & Leonis* (W).

c) var. **serratifolia** Chaudhri n. var. a varietatibus aliis adhuc notis foliis plerumque anguste ellipticis usque ad oblanceolatis, acutis, margine distincte serrato instructis, sepalis arista dense hirtella instructis distinguenda. Leaves mostly narrowly elliptic (to oblanceolate) acute, with serrate margins; flowers 2-2.25 mm long (including the awns); awns c. 0.3 mm and densely hirtellous; sepals 1.25-1.35 mm long; flower-clusters usually few-flowered and rather inconspicuous.

Type: Morocco: Great Atlas Mts. above Refuge Neltner, ca. 3300 m, 24.viii.1951, *O. Polunin* 2149 (BM).
Distr.: Endemic.
R. Maire's var. *elegantior* (in M. Cat. 2937 (1939), & op. cit.) described as possessing large glomerules, c. 10 mm in diam., large and broad bracts, sepals with large/broad hoods and much hairy on the outside, and awns 0.5 mm long, and reported from Morocco, is most probably *P. argentea* and not *P. polygonifolia.*

58. **P. arabica** (L.) DC. in Poiret, Encycl. 5:24 (1804).
G. Delile, Descript. Egypt. Hist. Nat. 2:187 (1812); De Candolle, Hort. Monsp. 130 (1813); Prodr. 3:370 (1828); Boissier, Fl. Or. 1:746 (1867); Battandier & Trabut, Fl. Alg. Dicot., 166 (1888); Bonn. & Barr., Cat. Tun. 66 (1896); Durand & Barr., Prodr. Fl. Lib. 44 (1910); Muschler. Man. Fl. Egypt 1:353, 354 (1912); Pampanini, Fl. Ciren. 189 (1931); Dinsmore in Post, Fl. Syr. Pal. Sin. 1:214 (1932); O. Schwartz, Fl. Trop. Arab. 53 (1939); A. Parsa, Fl. Iran 1(2):1246 (1951); V. Täckholm, Stud. Fl. Egypt 403, 404 (1956); P. Ozenda, Fl. Sahara Sept, & Centr. 209, f. 50 (1958); Rechinger, Fl. Lowland Iraq 222 (1964); P. Mouterde, Nouv. Fl. Lib. & Syr. 1:456 (1966); M. Zohary, Fl. Palaest. 1:132 (1966).
Basionym.: *Illecebrum arabicum* L., Mant. 1:51 (1767). Type: cultivated in Hort. Uppsal., Hb. Linneaus cat. no. 290/19 (LINN!).
Syn.: *Corrigiola albella* Forssk., Fl. Aeg.-Arab. 207 (1775). Type: Egypt/Arabia: *Forsskal* (holo. C, not seen).
Herniaria lenticulata Forssk., op. cit. 52 (1775), non L., Sp. Pl. 218 (1753). Type: Egypt/Arabia: *Forsskal* (holo C, not seen).
Illecebrum longisetum Bertoloni, Fl. Ital. 2:733 (1835). Type: Probably cultivated in Italy or introduced, *Moris* (holo. ??).
Paronychia longiseta (Bertoloni) Webb & Berthelot, Phyt. Canar. 3:163 (1840). *P. desertorum* Boiss., Diagn. Pl. Or. Nov. ser. 1(3):11 (1843). Type: Add rupes Hauara Arabiae Petreae, *Schimper* 245 (holo. G!).

Plate VIII, Fig. 1-22. p. 201

An annual or perennial herb; stems prostrate, often diffusely spreading, 4-40 cm long, much-branched from the base, usually with numerous short lateral branches producing a large number of glomerules; internodes mostly up to c. 3 cm long, shortly pubescent to puberulous. Leaves narrowly oblong-elliptic to oblanceolate-obovate, occasionally linear-oblong to linear-oblanceolate, 4-11 x 1.5-2.5 mm, mostly acute and shortly mucronate, attenuate to the base, usually ± glabrous, rarely finely puberulous, margin shortly serrulate and ciliate; stipules lanceolate, usually shorter than the leaves, occasionally closely imbricate in the lower (basal) region, and somewhat exceeding the leaves. Glo-

merules psuedo-axillary and terminal, often densely congested along the short lateral branches, 3-7 mm in diam.; bracts ovate-lanceolate to suboblong, up to 3.5 x 1.5 mm, mostly subobtuse, exceeding the flowers, occasionally completely concealing them. Flowers (1.3-) 1.5-2.5 mm, somewhat cylindrical-oblong with the basal part often somewhat dilated and usually densely covered with short, upwards-directed, hooked hairs; perigynous zone usually well-marked; sepals oblong to obovate-oblong, 1-1.5 mm, with a nearly white, conspicuous membranous margin, mostly (distinctly) broader than the narrow median band, rarely almost equalling it; apex obtuse to truncate, strongly hooded and tipped by a prominent, (0.25-)0.35-0.8(-1.5) mm long, smooth, erect to spreading awn; petals 0.5-0.6 mm, equalling the filaments; anthers 0.25-0.35 (-0.4) x 0.2-0.25 mm; ovary ± ovoid, c. 0.7 x 0.5 mm, densely papillose at the top; style (including the stigmatic part) 0.25-0.4 mm, often bilobed, stigmas subsessile, quite prominent and divergent. Fruit 1-1.25 x 0.75-1 mm, ovoid-oblong, papillose on the upper part.

Fl. 2-5. Sand and gravel soils, alt.: mostly from sea level to c. 500 m, rarely up to 1600 m.

A Saharo-Sindian element, widely distributed throughout N. Africa, the Arabian-Iraqian deserts and the adjoining part of S. Iran. It is the most variable species of this genus, and, for that matter, of the entire subtribe, and exhibits marked variability in duration, leaf form, length of stipules, size and form of the glomerules, bracts, flower-size, and the form of the sepals as well as the structure of their awns and the anthers. Six subspp. are recognized based mainly on the characters of leaves, bracts, sepals and their awns.

KEY to the subspecies:

1a) Leaves without a mucro or with the mucro more or less indistinct sepal awn conical and much thickened at the base — subsp. **aurasiaca**

1b) Leaves with a distinct mucro, sepal awn not conical

2a) Membranous margin of the sepal more or less equalling the median band in width (and leaves linear, acuminate and strongly mucronate) ..... subsp. **tibestica**

2b) Membranous margin broader than the median band

3a) Bracts large (acute-acuminate), much exceeding and almost wholly concealing the flowers; sepal awn setaceous ..... ssp. **annua**

3b) Bracts (± obtuse) somewhat longer than the flowers but not concealing them; sepal awn stout and thick

4a) Sepals ± pubescent on the back; awn stout, rigid and thorn-like at maturity; median band of the sepal subcoriaceous --- ssp. **cossoniana**

4b) Sepals ± smooth or almost glabrous on the back; awn not very rigid

5a) Stipules shorter than the leaves during the normal flowering

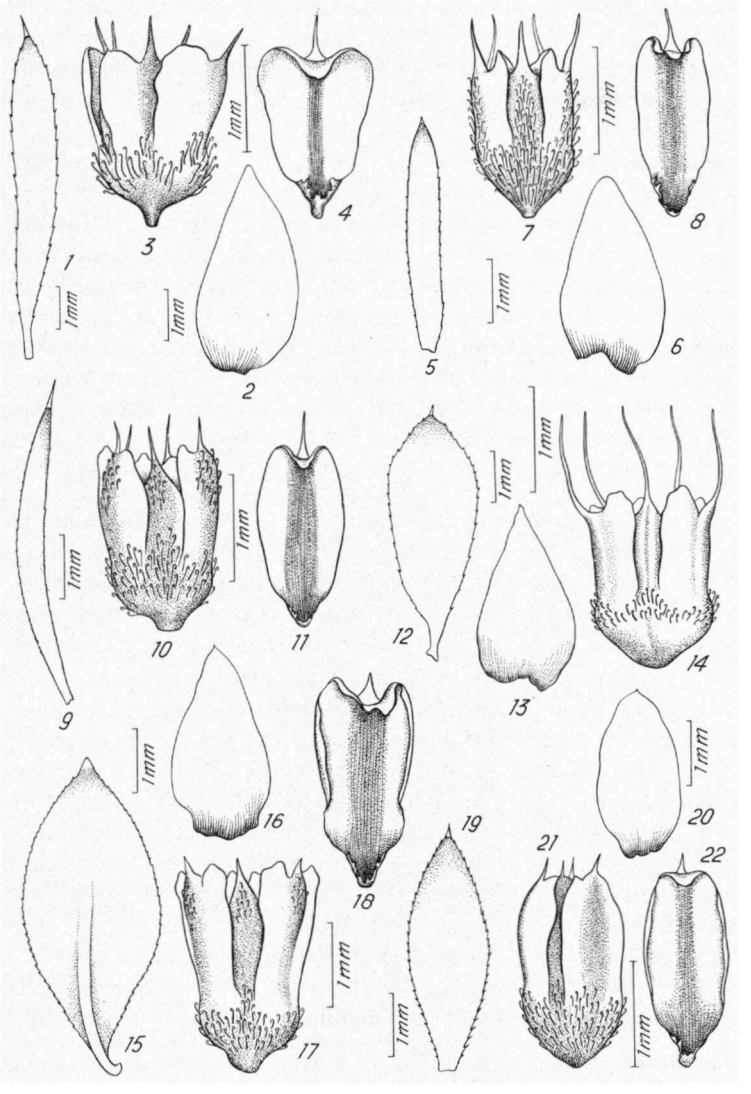

Plate VIII. **P. arabica**(L.)DC.: fig. 1-4: subsp. **breviseta**; 1: leaf; 2: bract; 3: flower; 4: sepal, inner side [*Bornmüller* 187(G)]; fig. 5-8: subsp. **cossoniana**; 5: leaf; 6: bract; 7: flower; 8: sepal, inner side [*Balansa* 700(FI)]; fig. 9-11: subsp. **tibestica**; 9: leaf; 10: flower; 11: sepal, inner side [*Hinchingbrookt* 24(K)]; fig. 12-14: subsp. **annua**; 12: leaf; 13: bract; 14: flower [*Pampanini* 2301(FI)]; fig. 15-18: subsp. **aurasiaca**; 15: leaf; 16: bract; 17: flower; 18: sepal, inner side [*Balansa* 1003(FI))]; fig. 19-22: subsp. **arabica**; 19: leaf; 20: bract; 21: flower; 22: sepal, inner side [*Bornmüller* 1042(LD)].

and fruiting period; awns c. 0.4 mm (or 0.35-0.5 mm) and stout --- ..... ssp. **breviseta**
5b) Stipules at the basal part of the stems often exceeding the leaves; awns 0.25-0.35 mm, rather tender ..... ssp. **arabica**

A) subsp. **arabica:**
Icon: Delile, op. cit.
Syn.: *Herniaria lenticulata* Forssk., Fl. Aeg.-Arab. 52 (1775) non L., Sp. Pl. 218 (1753)). *Paronychia arabica* (L.) Del. var. *a* Delile, Descript. Egypt. Hist. Nat. 2:187 (1812); *P. desertorum* Boiss., Diagn. Pl. Orient. Nov. ser. 1(3):11 (1843) et in Fl. Or. 1:746 (1867); *P. lenticulata* (Forssk.) Aschers. & Schweinf. in Österr. Bot. Zeitschr. 39:300 (1889); *P. arabica* (L.) DC. subsp. *lenticulata* (Forssk.) Maire et Weiller, op. cit., 22 (1963). *P. arabica* (L.) DC. var. *desertorum* (Boiss.) Durd. et Barr., Fl. Lib. Prodr. 44 (1910).
Fig. 19-22.

A biennial or perennial and, occasionally, annual herb, stems much-branched from a usually compact base, diffusely spreading and prostrate, shortly though densely pubescent, towards the base often with closely approximated leaves and stipules. Leaves narrowly obovate-oblanceolate to linear-oblong, sometimes narrowly elliptic-oblong, up to c. 11 x 2 mm, ± acute and often mucronulate, attenuate to the base, on both sides minutely puberulous to glabrous; margin serrulate and ciliate; stipules ovate-lanceolate, subacute, in the lower (basal) parts of the shoots, equalling or somewhat exceeding the leaves, but usually somewhat shorter higher up. Glomerules often densely crowded on the shorter lateral branches, rather small, 3-5 mm in diam.; bracts up to c. 3.5 x 1.5 mm, broadly ovate, ± obtuse, exceeding the flowers but not quite concealing them. Flowers 1.3-2 mm, contracted in the middle, receptacle usually well-marked and densely pubescent; sepals glabrous on the back and with a broad membranous margin and a short, tender awn 0.25-0.35 mm; petals shorter than the stamens; anthers c. 0.3 x 0.25 mm; ovary ovoid and densely papillose; style c. 0.25 mm, bilobed.

a) var. **arabica:** Internodes up to c. 2.8 cm long (or less than 3 cm), usually much shorter; leaves up to c. 11 x 2 mm and rather thick; stipules ± equalling or somewhat exceeding the leaves in the basal part of the shoot; glomerules often congested on the short, lateral branches.
Distr.: Throughout the range of the subsp. except in some parts of S. Libya & N. Niger.
JORDAN: ("Arabia Petraea"): iii.1846, *E. Boissier* (as *P. desertorum)* (E, FI, JE, L, S); Haura, iii.1835, *Schimper* 245 (E, FI, STU); **PALESTINE:** Negev: Wadi Ajrim: 25.iv.1946, *D. Zohary* (HUJ); **EGYPT:** Sinai: S. of El-Kuntilla: 2. iv. 1936, *Eig. etal.* (HUJ); S. of El Arish, 4.iv.1939, *Drar* (S); Isthmic Desert: *Drar* 696, 729 (S); Wadi-el-Ga: *F. Grote* 139 (G); Ismailia: 19.iv.1909, *Adr. Fiori*

(FI); Ismailia to Suez: *Bornmüller* 1908: 10429 (JE); Suez: *Bornmüller* 10427 (G), 10428 (LD); Cairo to Suez: *Drar* 14 (S); *Davis* 10258, 10332 (E); Lower Egypt: *Davis* 8260, 8536, 10313 (E); Wadi el Tell-Kebir: *Schweinfurth* 758 (G); Qubba: *Schweinfurth* 188 (Z); El Marg: *Emile Burdet* 99 (G) (forma annua); Wadi, Fi, SE Cairo: *Burdet* 100 (Z); nr. Cairo: *Bornmüller* 1908: 10422 (E), 10424 (Z); *G. F. Scott Elliot* 3295 (FI, forma annua); *Boetje-van-Ruyven* 18 (L, forma annua); *A. Keller* 239 (Z); *A. Letourneux* 289a (FI); *W. Barbey* 179 (Z); Gebel Ahmar: 26.iv.1879, *F. E. Cramer* (G); *E. Sickenberger* 489 (Z); *Aucher-Eloy* 2808 (FI). **LIBYA:** Tripolitania: Wadi Nasic: 12.v.1932, *Bargagli-Petrucci* (FI). **ALGERIA**: El Golea: *T. F. Chipp* 152 (K); Hoggar Mts. (Ahaggar): *R. Meinertzhagen* 23 (BM, K); Arak Gorge: *Meinertzhagen* 168 (BM, K); Oued Tammanrasset, c. 1650 m, *Meinertzhagen* 110 (BM, K); Oued Ilamane: *Hunting Tech. Services* 12 (FI) (E); Hamada Tindouf, ii.1957, *Puigandean* (P.) **MALI:** Mt. Tefedest, Tin Ikert, 1200-1300 m, *R. Maire* 1026 (G); **MAURITANIA:** Fort Trinquet: *Moralès-Agacino & Ch. Rungs* 106 (S).

b) var. **elongata** Chaudhri n. var. a var. *arabica* internodiis longioribus (usque ad 4.5 mm longis), folliis tenuioribus, stipulis quam folia multo brevioribus (usque ad 4 mm longis), glomerulis plerumque distantibus distinguenda.: Internodes much elongated, up to c. 4.5 cm long; leaves rather thin, and linear oblanceolate, up to 13 x 2.75 mm; stipules up to 4 mm long, much shorter than the leaves; glomerules pseudo-axillary, mostly distant. Type: (CENTRAL SAHARA): **NIGER:** Mouydir Mts.: Tahount Arak, Oued Arak, 25.ii.1923, *K. Gram* 501 (holo. S!). Distr.: N. Niger & S. Libya (Fezzán).

Lybia: N. Fezzán: Gargaf, N. of Barch, *Roberto Corti* 1198 & 1199 (the latter annual form) (FI).

B) subsp. **annua** (Delile) Maire et Weiller, op. cit. 22 (1963).

Basionym: *P. arabica* (L.) Del. var. *β annua* Del., Fl. Aegypt. 2:187 (1812).

Syn.: *Corrigiola albella* Forssk., Fl. Aeg.-Arab. 207 (1775).

Illecebrum longisetum Bertoloni, Fl. Ital. 2:733 (1835); *Paronychia longiseta* (Bert.) Webb & Berth., Phyt. Canar. 1:163 (1840).

P. arabica (L.) DC. var. *longiseta* (Bert.) Aschers. & Schweinf. in Öster. Bot. Zeitschr. 39:301 (1889).

Fig. 12-14.

A small, annual herb; stems prostrate, much-branched from the base, densely and shortly pubescent. Leaves narrowly obovate to oblanceolate, ± obtuse and rather abruptly and shortly mucronate; base attenuate, on both sides glabrous or sometimes very minutely puberulous; margin shortly serrate and ciliate; stipules ovate-lanceolate, and distinctly shorter than the leaves. Glomerules pseudo-axillary, often very profuse and densely congested 5-7 mm in diam.; bracts c. 3 x 1.5 mm, ovate, acuminate, usually ± concealing the flowers.

Flowers c. 1.75 mm (without the awns); receptacle shortly pubescent, and not much swollen; sepals c. 1 mm long, with a broad, nearly white, inflexed membranous margin; awns mostly c. 1 mm long, slender and setaceous, smooth, usually more or less spreading, sometimes ± erect and then shorter. Ovary ovoid and densely papillose above; styles c. 0.3 mm, ± free and divergent.

a) var. **annua:** Syn. *P. arabica* (L.) DC. var. *macrostegia* Boiss, Fl. Or. 1:746 (1867). Lectotype: Egypt, *Samaritani* 3166 (G!).

Glomerules rather small (c. 5 mm in diam.), and densely congested; sepal awn (0.8-)1-1.25 mm long, ± spreading.

Distr.: Throughout the range of the subsp. except in Tripolitania.

PALESTINE: Negev: Beersheba: *Samuelsson* 3003 (LD, S); Philistaea: *Samuelsson* 3060 (S); Lydda: 10.ii.1926, *N. Naftolsky* (HUJ); Wadi Nafkh: 1.iv. 1945. *N. Tadmor* (HUJ, forma linearifolia); Tiberia: *A. Bertschinger* 7462 (Z); **TRANSJORDAN:** Wadi Ram: *Davis* 10440 (E); **EGYPT:** Sinai: S. of El-Arish: 21.iii. 1928, *G. Täckholm* (S, awns rather short); Wadi Ain el Gadirat: *M. Drar* 87A (S) awns rather short); 6.iv.1939, *Drar* (S); Teh.: *Hb. Post* 185 (G); Burq el Aral: 7.v.1948, *V. Täckholm* (S); Aboukir; *Schweinfurth* 344 (G); Alexandria: *Samaritani* 3166 (FI, G, HBG, JE, LD, S, W. Z); *Gaillardot* 177 JE); El-Maks to Mariut: *Bornmüller* 10418 (G, JE, LD, S); nr. Mariut: *Bornmüller* 10419 (E, G, Z); Ramle: *Letourneux* 25 (E, W); Mariut: *Barbey* 178 (G). **LIBYA:** Marmarica: *E. Gauba* 121 (W); Cyrenaica: Tobruk: /1918, *F. Cassinera* (FI); Nr. Derna: *Sandwith* 2500 (K); *Pampanini and Pichi-Sermolli* 2317 (FI); Cyrenaica (Miscellaneous places): *Pampanini and Pichi-Sermolli* 2313, 2314, 2315, 2316, 2318 (FI); Marsa Susa: *A. Vaccari* 165 (FI, forma latifolia); Cirene to Marauca: *Dept. Agricult., Cyrenaica* 154 (FI); Benghasi *G. Ruhmer* 59 (E, FI, G, HBG, JE, LD, S, STU, W, Z); Cyrenaica: *R. Pampanini* 2299 to 2312, 2319 (FI); Tripolitania: Tarhuna: *Pampanini* 507, 555, 876, 986, 1055, 1546, 1547, 1829, 1844, 1899, 2026, 2304, 2409, 2507, (FI); Mesellata: *Pampanini*: 2743, 2878, 3388 (FI); Tripoli: *Pamanipni* 3586 (FI); Gharian: *Pampanini* 3642 (FI); Gargaresh: *Bornmüller* 1933: 638 (S, Z). **TUNISIA:** Gabès: *Pitard* 1907: 121 (L).

b) var. **tripolitana** Dur. et Barr., Fl. Lib. Prodr. 44 (1910).

Lectotype: Tripoli: *P. Taubert* 22 (holo. G! iso. E! JE!). Maire et Weiller, op. cit., 22 (1963).

Syn.: *P. eosina* Beauverd in Bull. Bot. Geneve, 9:159 (1922).

Type: The same as that of var. *tripolitana.*

Glomerules larger (c. 7 in diam.), more or less distinct; sepal awn 0.5-0.8 mm long, ± erect. Plants resemble *P. argentea* Lam. in general aspect.

TRIPOLI: *P. Taubert* 22 (E, G, JE, LECTOTYPE); Garian, 6-700 m, *Bornmüller* 1933: 639 (Z); Sirle: *A. Vaccari* 52 (FI); Tripolitania: *Pampanini* 83, 117, 149, 328 (trans.), 399, 643 (trans.), 1181, 1272, 1522, 1847, 1884, 3327, 3540, 3583, 4428 (FI). **TUNISIA:** El Hamdan, nr. Gabès: *Pitard* 122 (L), 972 (G); Sfax: *Pitard* 596 (L). **EGYPT:** Sinai: El-Arish: 20.iii.1928, *G. Täckholm* (S, as *P. argentea);* El-Husein, nr. Gaza: *J. Whiting* 1339 (E); **PALESTINE:** Negev: 26.iii. 1942, *D. Zohary* (HUJ); 30.iv.1925, *N. Naftolsky* (HUJ); Jaffa: *Meyers & Dinsmore* 3339 (G), 5339 (LD, S, Z); Ramath-Gan: *M. Zohary* et *al.* 44 (as *P. argentea*) (C, E, FI, G, S, Z).

C) subsp. **breviseta** (Aschers. et Schweinf.) Chaudhri stat. nov.

Syn.: *P. longiseta* (Bertoloni) Webb var. *breviseta* Aschers. in Österr. Bot. Zeitschr. 39:255 (1889); *P. arabica* (L.) DC. var. *breviseta* Aschers. & Schweinf. ibid. 39:301 (1889). K. H. Rechinger, Flora of Lowland Iraq 222 (1964).

Fig. 1-4.

Annual or occasionally perennial; stems prostrate, rather slender,

usually diffusely spreading, sometimes with densely congested branches; internodes up to 2 cm long, shortly pubescent to puberulous. Leaves oblanceolate, 5-12(-19) x 1.5-2 mm, apex almost obtuse and shortly mucronate, attenuate to the base, on both sides glabrous, margin thinly serrulate and ciliate; stipules narrowly ovate-lanceolate, acuminate, mostly much shorter than the leaves. Glomerules usually pseudo-axillary and congested on the short lateral shoots, 3-5 mm in diam; bracts ovate, acute, somewhat exceeding but only partly concealing the flowers. Flowers 1.5-2 mm (mostly 1.75 mm) without the awns which are 0.35-0.5 (mostly 0.4) mm, stout, nearly erect to slightly spreading; receptable ± distinct from the sepals and often strongly pubescent; sepals slightly hairy towards the tips to almost glabrous on the back, the membranous margin nearly 1 1/2-2 times broader than the green median band; petals shorter than the stamens; anthers 0.25 x 2 mm; styles 0.25-0.3 mm, almost free; ovary ovoid-subglobose and densely papillose.

Type: S. Persia, Prov. Fars: Dalaki, iv. 1868, *Haussknecht* sn, (holo. JE!).

Distr.: S. Persia (Iran) and the Gulf Islands, Lower Iraq, Arabian Peninsula and Jordan.

a) var. **breviseta:** The membranous margin of the sepal distinctly broader than the median band; plants annual.

IRAN: Prov. Kerman: *K. H. & F. Rechinger* 7491 (W); W. of Borojan: *H. C. Stutz* 921 (W); Minab: *Behboudi* 463E (W); Prov. Lar. *Behboudi* 2230 (W); Bandar Abbas: *Gauba Sabeti* 2229 (W); *Bornmüller* 185 & 186 (E, FI, G, JE, LD, Z); Bushehr: *M. Köie* 114 (C, W); Persian Gulf: *Aucher-Eloy* 4518 (FI); Hormus Island: *Bornmüller* 182 (G, JE, LD, Z); Kishm Island: *Bornmüller* 187 (FI, G, JE). **SOUTHERN ARABIA:** OMAN: *K. Grichard* KG101 (EA); *F. N. Lee-Oldfield* 41, 189, 240, 252 (EA); QATAR: *G. Peper* GP 578 (EA); BAHRAIN ISLANDS: *Ronald Good* 264, 265, 266 (K); *J. Fernandez* 256 (K); **SAUDI ARABIA:** *V. Dickson* 603, 697 (K); **KUWAIT:** *V. Dickson* 330, 711 (K); **IRAQ:** E. of Jabal Hamrin: 27.iii.1957 *Guest, Rawi & Rechinger* (K); Northern Desert; Abu Ghraib: *F. A. Barkley* 331r5372 (K); Distr. Baghdad: E. of Falluja: *Rechinger* 8137 (W); *Martin L. Grant* 15653 (W); W. of Karbala: 9.iii.1947: *Gillet & Rawi* (K); Southern Desert: nr. Zubair, *Wheeler Haines* 1016 (E); Distr. Basra: *Rechinger* 8252, 14328, 14347, 14354, 14488, 14499 (W); SW of As-Salman: *Rechinger* 13758 (W); WNW of Ansab: 24.iv.1957, *Guest, Rawi & Rechinger* (K); Western Desert: Wadi Hauran: 25.iii.1947, *Gillet & Rawi* (K); Jadida, W. of Nukhaib, 19.iv.1961, *Ali Rawi* (K); Montafah: *H. Field & Yusuf Lazar* 102 (G). **LEBANON:** Grand Liban: Tripoli: iv.1936, *A. Holleman-Haye* (U). **JORDAN:** Azraq Druz, nr. Ain Beida: *Townsend* 65/381 (K); nr. Tell Qorma: *Townsend* 65/289 (K); Petra: *Gillet* 15983 (K). **PALESTINE:** NEGEV: NW of El-Kuntilla, 500 m, 2.iv.1936, *Eig* et *al.* (HUJ).

b) var. **latimarginata** Chaudhri n. var. a var. *breviseta* sepalis margine membranaceo parti medianae aequilato vel ea paulo latiore distinguenda. Membranous margin of the sepal equalling or slightly exceeding the median band of the sepals in width; plants perennial.

Distr.: Iraq: Western and Southern Deserts.

IRAQ: Ramadi to Rutba: *Rechinger* 12701 (W, TYPE); Faluja Desert: *Wheeler Haines* 134 (E); Distr. Basra, Zubair *Rechinger* 15426 (W).

D) subsp. **cossoniana** (J. Gay) Maire et Weiller, op. cit. 21 (1963).

P. cossoniana J. Gay ex Cosson in Bull. Soc. Bot. France, 4:486 (1857). Type: Algeria: Environs Sidi Khalifa, Saida, *B. Balansa* 700 (holo. P! iso. FI!).

Bonn. et Barr., Cat. Tun. 66 (1896).

P. arabica (L.) DC. var. *cossoniana* (J. Gay) Durand et Barr., Fl. Lib. Prodr. 44 (1910).

Fig. 5-8.

A small, perennial herb; stems mostly congested, sometimes spreading, shortly pubescent to puberulous. Leaves oblanceolate to linear-oblong, acute and shortly mucronate; stipules shorter than the leaves. Glomerules c. 5 mm in diam., not well-defined, formed by densely congested and often fused flower-clusters; bracts ovate-oblong, mostly obtuse, equalling or slightly exceeding the flowers but not concealing them. Flowers 1.5-2(-2.5) mm, covered with hooked hairs, the pubescence dense at the base but rather sparse and consisting of shorter hairs on the sepals; sepal awn 0.5-1(1.5) mm long, stout and spreading; membranous margin somewhat broader than the median band; petals 0.5-0.6 mm, with reddish tip, filaments c. 0.5 mm; anthers 0.35-0.4 x 0.25 mm; style 0.4-0.5 mm (including the stigmatic part), deeply 2-lobed; stigmas large, thick and subsessile; ovary densely papillose.

a) var. **cossoniana**: Sepal awn 0.4-0.8 mm (mostly 0.5-0.6 mm).

Distr.: Throughout the range of the subsp. except in NNE Algeria. **LIBYA:** Tripoli: *P. Taubert* 23 (G, JE); *Bornmüller* 1933:640 (JE). **TUNISIA:** Gabès: *Kralik* 61 (E, FI)); *Pitard* 3020, 3021 (G); Gabes to El Hamdan: *Pitard* 3022 (G); Matmama: *Pitard* 1130 (G); El Oudiane: *Pitard* 2922 (G); Gafsa: *Pitard* 379, 380 (L); 1037 (W), 1038, 1039 (G); Tozeur to Nefta: *Stuhlmann* 6 (HBG). **ALGERIA:** Prov. Constantine 8.iv.1858, *Cosson* (G); *E. G. Paris* 59 (JE, LD); El Kantara: *H. Romieux* 539 (G); **SAHARA**: Laghouat: *L. Chevallier* 175 (FI, JE, LD, STU); Laghouat to Tadjemont, ca. 930 m, *Alston & Simpson* 90 (BM); Prov. Oran: Saida: *Balansa* 700 (E, FI, type); Chellala Dahrania: *Kralik* 209 (E, FI); Ain Bin Khelil: 29.iv.1862, *Cosson* (S); Tiout: *Romieux* 536 (G); Ben Zireg: *Romieux* 538 (G); Ain Sefra: *Battandier & Trabut* 424 (L, Z); v.1922, *Ch. d'Alleizette* (LD); Beni-Ounif, c. 1000 m, 25.iv.1938, *A. Faure* (LIL). **MOROCCO:** Dj. El Maiz: *Samuelsson* 6897 (S); Safsafat, E. of Taza: 21.v.1934, *E. Wall* (S, awns short); Anti-Atlas: Ouaramzat: *Jahandiez* 185 (G, Z, awns short). **SPAIN**: Malaga: *Joh. Lange* (JE), NEW RECORD FOR EUROPE. Introduced: **France:** Port Javénal, nr. Montpellier, /1854, *Gadron* (FI).

b) var. **longiaristata** Chaudri n. var. a var. *cossoniana* sepalis arista longiore (circ. 1.0-1.5 mm longa) instructis distinguenda. Awns c. 1-1.5 mm long. NNE Algeria

Oued Biskra: *Balansa* 1002 (E, FI); *Schweinfurth* 517 (Z); Biskra: *L. Chevallier* 27, **type** (holo. G) (FI, G, JE, Z, LD); 3.iii.1852, *Jamin* (FI, G); Biskra to Ham-

mam Salahin: 9.iv.1936, *Murbeck* (LD); Hammam Salahin: *Kuegler* 57 & 58 (JE, forma *angustifolia* Thellung, Fl. Adv. Montpell. 235 (1912) as subvar.).

E) subsp. **aurasiaca** (Webb) Maire et Weiller op. cit. 21 (1963).

P. aurasiaca Webb ex Cosson in Bull. soc. Bot. France, 11:160 (1864).

Batt. et Trab., Fl. Alg. 166 (1888); Bonn. et Barr., Cat. Tun. 66 (1896).

Fig. 15-18.

A perennial herb; stems prostrate, somewhat spreading from the compact base, very shortly pubescent. Leaves up to c. 8 x 3 mm, elliptic-oblong to obovate, obtuse, with indistinct mucro. Flowers in densely congested and weakly defined glomerules; bracts equalling the flowers. Flowers 2-2.5 mm long (without the awns), densely covered at the base with hooked hairs but the hairs shorter and only partly hooked on the sepal or very rarely all straight; sepal awns 0.3-0.5 mm, conical and rigid, scabrous at the base, somewhat spreading; the membranous margin somewhat broader than the median band or almost equalling it; petals 0.5-0.6 mm, with reddish tip; filaments c. 0.5 mm; anthers 0.35-0.4 x 0.25 mm; ovary densely papillose; style 0.3-0.4 mm, split almost to the base into the divergent stigmata.

Type: Algeria: Dj. Tougour, nr. Batna: *B. Balansa* 1003 (holo. P! iso. FI).

Distr.: W. Tunisia & N. Algeria.

i) var. **aurasiaca:** Hairs on the bases of flowers hooked. NNE. Algeria & W. Tunisia.

TUNISIA: Maktar: 29.v.1896. *Murbeck* (LD); **ALGERIA:** SE of Constantine: *V. Reboud* 4526 (FI); Dj. Tougour, nr. Batna: *Balansa* 1003 (FI, P, type); Lalla Whadidja: 27.vi.1887, *A. Chabert* (FI); Dj. Aizer: 30.vii.1888, *Chabert* (FI); Djurdjura, c. 1600 m, 8.vi.1930, *R. Maire* (FI); Raselma to Bedeau: 25.iv.1919, *A. Faure* (LD).

ii) var. **inarmata** Chaudhri n. var. a var. *aurasiaca* sepalis pilis rectis haud uncinatis instructis distinguenda.

Hairs on the flowers straight or uncoiled. NW. Algeria: Environs de Magenta, c. 850 m, 31.v.1938, *A. Faure* (E, TYPE); Bedeau, 15.v. 1921, *Faure* (LD).

In this taxon, the straight hairs might well have been produced as a consequence of the infiltration of genes from *P. argentea.*

F) subsp. **tibestica** Quezel, Inst. Res. Saharien, Univ. Alger. Mem. 4:133 (1958). A perennial herb with a long, thick and woody tap root; stems densely branched from the base, 2-8 cm long, ± prostrate, diffusely spreading; internodes pink, up to 9 mm long, shortly pubescent to almost glabrous. Leaves narrow, linear to almost subulate, sometimes linear-oblanceolate, stout and rigid, up to 7 x 0.8 mm, acuminate and

pungently mucronate, slightly puberulous to almost glabrous on both sides, margin minutely serrulate and ciliate to smooth; mostly somewhat ascending at the basal part of the shoots, often imbricate; stipules up to 5 mm long, acuminate, towards the base ± equalling the leaves, but higher up somewhat shorter, often with reddish-lined margins. Glomerules very profuse and congested at the ends of the shoots, 4-5 mm in diam.; bracts 2.5 x 1 mm, ovate-lanceolate, acute, with a reddish margin, somewhat exceeding flowers but not concealing them. Flowers (1.6-)1.75-2 mm (excluding the awns), tubular-oblong, reddish-brown in age; receptacle not swollen or distinct from the sepals, shortly pubescent; sepals 1.25-1.4 mm long, ± oblong, slightly pubescent on the outside, the membranous margin ± equalling or somewhat narrower than the brownish median band, awn (0.3-)0.4-0.5 mm, nearly white, smooth, slender and erect; petals 0.5 mm, slightly shorter than the filaments, anthers 0.3 x 0.25 mm; ovary-ovoid papillose above; styles 0.25-0.3 mm (including the thick stigmas), almost free or slightly fused at the base, suberect to somewhat spreading. Fig. 9-11.
Fl. 3-8. On volcanic lava rocks, alt. ca. 1700-2000 m.
Described from the Koussi region, but without any specification of the type. The following specimen is chosen by me as the lectotype.
Tibesti: Volcan de l'Emi-Koussi, 1912-17, *Mission Tilho* (P).
Distr.: N. Chad & S. Libya (Fezzan).

a) var. **tibestica:** Shoots distinctly pubescent; leaves strongly mucronate; flowers 1.75-2 mm, sepal awns 0,4-0.5 mm long.
Distr.: Tibesti, N. Chad only.

Emi-Koussi, *Mission Tilho* in 1912-17 (P), lectotype; Trouan Natron, c. 2000 m, *Hinchingbrookt* 24 (K); Tarso Tousside, c. 1650-2000 m, *A. T. & P. A. J. Groves* 54 (K).

b) var. **fezzanica** Chaudhri n. var. a var. *tibestica* non distincte pubescentibus, mucrolatis, floribus minoribus (1.6-1.7 mm altis), sepalis arista breviore (0.3 mm longa) instructis distinguenda.
Stems minutely pubescent to almost glabrous; leaves mucronulate; flowers 1.6-1.7 mm; sepal awns 0.3 mm.
Type: S. Libya: N. Fezzan, Wadi Zigza, ca. 400 m, 15.iv.1933, *Roberto Corti* 1196 (holo, FI!).
Distr. Endemic in Fezzan.

It is a transitional form linking subsp. *tibestica* with subsp. *arabica.* It possesses very short sepal awns, like ssp. *arabica,* but shares all its other characters with the main population of ssp. *tibestica,* e.g. those of leaves, flowers and sepals. This ssp. is unique in *P. arabica* because the membranous margin of the sepals is equal or somewhat narrower than the median band. Its nearest ally is ssp. *arabica,* from which, however,

it is easily distinguishable by its relatively longer and erect sepal awns and the pubescent sepals with prominent brownish median band, and the not distinguishably swollen receptacle (the flowers not being contracted in the middle). Ssp. *cossoniana* possesses much stouter and more or less distinctly spreading sepal awns, and is, thus, easily distinguishable from this subspecies.

59. **P. euphratica** (Chaudhri) Chaudhri. stat. nov.

P. arabica (L.) DC. ssp. *euphratica* Chaudhri in Notes R.B.G Edinb. 28:27 (1967).

M. N. Chaudhri in P. H. Davis, Flora of Turkey, 2:253 (1967).

P. torgesiana Hausskn. in sched. ined.

Plate IV, Fig. 10-14. p. 130

A perennial and compact herb with a long, woody tap root; stems much-branched from the woody base; branches c. 10 cm long, sub-erect or somewhat ascending, profusely floriferous; internodes up to 1 cm long, stout, shortly pubescent. Leaves narrowly (or linear-) oblong to sometimes oblanceolate, up to 14 x 2(-3) mm, apex acute and shortly though distinctly mucronate, brownish-green, rather thick, often very minutely scabridulous or puberulous to nearly glabrous, margin thickened, papillose and finely ciliate; stipules narrowly ovate-lanceolate, 5-8 mm long, acuminate, shorter than the leaves. Glomerules terminal and subterminal, mostly c. 10 mm in diam., but often fused into much larger ones; bracts oblong-lanceolate, 6-7 x 2.5 mm, subacute to subobtuse, much exceeding and concealing the flowers. Flowers subsessile, 2.5-2.65 mm (excluding the awns), somewhat cylindrical-oblong, narrowed at the base, dark-brown; often densely pubescent on the receptacle and the basal part of the sepals, but rather sparsely so on the upper part; pubescence heterotrichus; receptacle well-developed, 1-1.25 mm long, nearly equalling the calyx; sepals ± oblong, 1.3-1.5 mm long, coriaceous with a narrow membranous margin, mostly 1/3 of that of the median band in width; apex truncate, strongly cucullate and with a 0.5-0.6 long, slender, nearly white, smooth, sub-erect to slightly divergent awn on the tip; petals and filaments 0.5-0.6 mm, nearly white, anthers 0.4 en 0.25 mm, oblong, orange; ovary ovoid-conical c. 0.6 x 0.45 mm, densely papillose; style c. 0.3 mm, bifid to bipartite into thick and spreading stigmas. Fruit c. 1.5 x 1.25 mm, ± quadrangular, dark-brown and papillose at the top; seed c. 1.25 mm in diam., ovoid-subglobose.

Fl. & ft. 6. Rocky places.

Type: Turkey, Prov. Erzincan: Kemaliye (Egin), Salachlü, in collibus nudis 25.vi.1890, *P. Sintenis* 2763 (holo. JE! iso. G! K!).

Distr. Endemic.

Prov. Sivas: Göl Dağ, *J. Bornmüller* 1893: 3290 (JE).

60. **P. velata** (Maire) Chaudhri, comb. et stat. nov.

Basionym: *P. argentea* Lam. var. *velata* Maire in Maire, Cat. 656 (1929).

Syn.: *P. arabica* (L.) DC, ssp. *velata* (Maire) Maire et Weiller in Maire, Fl. Afr. Nord 9:20 (1963).

Plate IV, Fig. 15-18. p. 130

A small perennial herb with a long woody tap root and rather short, 5-7 cm long, stems much-branched from the woody base, prostrate to shortly ascending, the branches somewhat intertwined, congested, and densely covered with very conspicuous stipules; internodes mostly very short (c. 1 mm long), stout and bead-like, but somewhat longer (up to 4 mm) and less stout towards the ends of shoots, shortly pubescent to almost glabrous, often concealed by the closely imbricated leaves and stipules. Leaves linear or linear-oblong to occasionally linear-lanceolate, 3-4.5 x 0.7-0.85 mm, acute, almost indistinctly mucronulate, minutely puberulous to nearly glabrous in age, though rather scabrous, mostly brownish, rigid and ascending; stipules lanceolate to lanceolate-oblong, up to 5.5 mm long, acute to acuminate, closely approximated, somewhat exceeding and nearly concealing the leaves, very prominent throughout. Flowers arranged in rather small terminal or subterminal and lateral (pseudo-axillary) glomerules, 5-8 mm in diam., and densely congested at the ends of shoots; bracts sub-oblong, 3-3.5 x 1.4 mm, subobtuse, longer than the flowers and nearly concealing them. Flowers subsessile, 1.75-2 mm (excluding the awns), cylindrical-oblong, abruptly narrowed at the base, mostly brownish, densely adpressed pubescent on the receptacle, but less so on the sepal backs, the hairs being straight (uncoiled) and acroscopic throughout; sepals narrowly oblong, 1.2-1.45 mm long, with the nearly white membranous margin somewhat narrower or equalling (but not broader than) the brown and stiff median band, hood also membranous and rather retuse, the awn 0.4-0.5 mm, stout and rigid, nearly white, somewhat scabrous, erect to slightly spreading with age; petals 0.3 mm, almost indistinct; filaments 0.55 mm long; anthers 0.4 x 0.25 mm, rectangular; ovary 0.5 x 0.45 mm, ovoid, densely papillose; stigmas subsessile 0.25-0.3 mm, thick and divergent. Ripe fruit not seen. Fl. 6. Rocky places, alt. ca. 1900 m.

Type: Morocco: Moyen Atlas, nr. Ari Hebbri, basalt, 1900 m, 25.vi. 1923, *R. Maire* s.n. (holo. MPU! iso. S!).

Distr. Endemic.

This species occupies a position in between *P. argentea* Lam. and *P. arabica* (L.) DC.; it resembles the former in the straight hairs on the flowers and in the sepals which are provided with a median band which is somewhat broader than the membranous margin; with *P. arabica* it shares the characters of the leaves, the stout sepal awns, and the papil-

lose ovary; but its very conspicuous stipules, the linear and very minutely mucronulate leaves and the scabrous sepal awns distinguish it from both the species.

61. **P. argentea** Lam., Fl. Fr. 3:230 (1778).

De Candolle, Prodr. 3:371 (1828); Boissier, Fl. Or. 1:745 (1867); Willkomm and Lange, Prodr. Fl. Hisp. 3:156 (1874); Nyman, Consp. 255 (1879), and Suppl. 125 (1889); Battandier et Trabut, Fl. Alg. 165 (1888); Bonn. et Barr., Cat. Tun. 65 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):185 (1899); Halacsy, Consp. Fl. Graec. 1:570 (1900); Rouy, Fl. Fr. 12:5 (1910); Briquet, Prodr. Fl. Corse 1:481 (1910)); Graebner in Achers. & Graebn., Syn. 5(1):896 (1919) (sub *P. paronychia*); Fiori, Fl. Anal. Ital. 448 (1923); Pampanini, Fl. Cyren. 188 (1931); Dinsmore in Post, Fl. Syr. Pal. Sin. 1:214 (1932); Rechinger, Fl. Aeg. 130 (1943); Maire et Weiller in Maire, Fl. Afr. Nord 9:15 (1963); A. O. Chater in Tutin et al., Fl. Europ. 1:150 (1964); M. N. Chaudhri in Davis, Fl. Turk. 2:252 (1967).

Syn.: *Illecebrum Paronychia* L., Sp. Pl. ed. 1, 206 (1753), Lectotype: Hort. Cliff. 41, Linnaeus Herb. 290/14 (LINN!); Sibth. & Smith, Fl. Gr. 3:40, tab. 246 (1819); Bertoloni, Fl. Ital. 2:731 (1835); *Illecebrum argenteum* Pourr. in Mem. Acad. Toul. 3:321 (1788); *Paronychia nitida* Gaertn., Fruct. Sem. Pl. 2:218, t. 128 (1791); *P. glomerata* Moench, Meth. 315 (1794); *Illecebrum italicum* Villars in Schrader, Journ. für Bot. 1801:411 (1801); *Paronychia hispanica* DC. in Poiret, Encycl 5:24 (1804). Type: Herb Lamarck (P-LA!, though without locality, collector's name and date); *Illecebrum mauritanicum* Willd. ex Schultes in Roemer & Schult., Syst. 5:516 (1819). Type: Algeria or Morocco, *Broussonet* (probably B, not seen); *P. italica* (Vill.) Schultes in Roemer & Schult., Syst. 5:518 (1819); *Chaetonychia paronychia* Sampaio, Lista Herb. Portug. 78 (1913); *Plottzia paronychia* Sampaio, Apend. Lista Herb. Portug. 8 (1914); *Paronychia paronychia* (L.) Graebner in Aschers. & Graebn., Syn. 5(1):896 (1919); *P. mauritanica* (Willd. ap. Roem. et Schult.) Rothmaler et P. Silva in Agron. Lusitan. 1(1):382 (1939).

A perennial or, occasionally, biennial herb; stems 3-50 cm long, prostrate, much-branched from the somewhat woody base, often having rather long (up to 3.5 cm) internodes, retrorsely puberulo-pubescent and sometimes almost glabrous; branches usually profusely floriferous. Leaves subsessile, 5-15 x 1.5-5 mm, ± oblong to broadly oblanceolate, attenuate to the base, occasionally suborbicular to elliptic-obovate, or linear-oblanceolate, apex acute to ± obtuse, shortly though distinctly mucronate, margin serrulate and finely ciliate, on both sides glabrous, very rarely finely ciliolate in the younger stages; stipules up to 8 x 3

mm, ovate-lanceolate, mostly shorter than the leaves. Glomerules 10-15 (-25) mm in diam., lateral and terminal, globose, and profuse though often not congested; some of the flowers intermixed with the leaves; bracts ovate-oblong, up to 5 x 3 mm, acute to nearly obtuse, concealing the flowers. Flowers subsessile, c. 2 mm (excluding the awns), cylindrical, shortly pubescent on the outside with straight hairs, very occasionally almost glabrous; sepals narrowly oblong, with a conspicuous, nearly white, membranous margin, somewhat narrower than --- almost equalling in younger stages --- the strongly 3-nerved, brownish, median band, apex strongly hooded and having a short (0.3-)0.4-0.65(-0.8) mm long, rather slender though stiff, straight awn at the back; petals 0.45-0.5 mm, slightly shorter than the filaments; anthers 0.35-0.4 x 0.25 mm; ovary ovoid, papillose at the top; style c. 0.35 mm, nearly half-way split into two rather thick stigmas; fruit 1-1.25 x 1 mm, subquadrangular or obovoid-subglobose (slightly narrower towards the base), papillose on the upper side. Fl. 3-6. Dry sandy banks and rocky slopes, alt. up to 1300 m.

Distribution: S. Europe, N. Africa, the Canarias, and the E. Mediterranean region. An essentially Mediterranean element.

Variable in leaf form and stipule size, but fairly constant in most other characters.

1a) Stipules very prominent, equalling or somewhat exceeding the leaves ..... var. **scariosissima**

1b) Stipules shorter than the leaves

2a) Leaves suborbicular to broadly oval-obovate, 2-3 times as long as broad ..... var. **rotundata**

2b) Leaves often oblong to linear-oblanceolate, more than 3 times as long as broad

3a) Leaves linear-oblanceolate ..... var. **angustifolia**

3b) Leaves, oblong to broadly oblanceolate ..... var. **argentea**

a) var. **argentea:** Leaves narrowly oblong to broadly oblanceolate; stipules distinctly shorter than the leaves.

Syn.: *P. hispanica* DC. var. *α frutescens* DC. in Poiret, Encycl. 5:24 (1804).

P. hispanica DC. var. *β oblonga* DC. in Poiret, Encycl. 5:24 (1804). Roemer et Schultes, Syst. 5:519 (1819).

P. argentea Lam. var. *α hispanica* DC. in Lam. et DC., Fl. Fr. 3:404 (1805).

P. argentea Lam. var. *mauritanica* (Willd.) DC., Prodr. 3:371 (1828). J. Ball, Spicil. Fl. Maroc. 640 (1878); Batt. & Trab., Fl. Alg. Dicot. 166 (1888); Maire et Weiller in Maire, Fl. Afr. Nord 9:17 (1963).

P. argentea Lam. var *typica* Fiori, Fl. Anal. Ital. 448 (1923).

P. argentea Lam. var. *suffruticosa* Maire et Wilczek in Maire, Cat. 1970 ter (1936), & Fl. Afr. Nord 9:17 (1963).

FRANCE: Dep. Var.: *J. Müller* 217 (FI); Bouches du Rhône: v.1878, *A. Autheman* (W); Hérault: *R. Neyra* 1772 (F. Schultz Hb.) COI); 7.iv.1902, *E. Mandon* (JE); Aude: 25.v.1886, *G. Gautier* (W); Pyr. Orient: *Penchinat* 52 (HBG, JE, L) & 557 (JE) (both in F. Schultz Hb.); *G. Rouy* 1117 (Z); *A. Guillon* 3306 (FI, Z); vi.1830, *Endress* (E, HBG, L). **Corsica:** St. Florent: *J. W. Bijl* 23 (U); Calvi: *J. Chevalier* 3017 (FI, Z); Ponte Leccia: *Stud. biol. Rheno-Trai.* 65/495 (U); Corte: 5.vi.1914, *K. Ronniger* (W); Porto: *P. Aellen* 123 (Z); Bonifacio to Pertusato: *P. van Royen* 2782 (L); Bonifacio: *E. Reverchon* 1880: 320 (W); *Stud. biol. Rheno-Trai.* 61/13 (U); Les Calanche nr. Piana: *Stud. biol. Rheno-Trai.* 61/679 (U). **Sardinia:** Santa Teresa Gallura: *Reverchon* 144 (E, W); Liscia to S. Teresa Gallura: *Stud. biol. Rheno-Trai.* 65/314b(U); Gullura, Porto Pollo: *A. Vaccari* 37 (E, FI, Z); Porto Torres: 17.iii.1912, *Adr. Fiori* (FI); Isola S. Antioco: 26.iv.1894, *U. Martelli* (FI); Cagliari: iv.1827, *Müller* (HBG, JE). **ITALY:** (SW): Campania: Napoli: iii.1896, *Fulvio Amigoni* (FI); (S): Reggio di Calabria: 6.iii.1906, *Adr. Fiori* (FI). **Sicily:** Messina: Galati di Marina: *Huter, Porta, Rigo* 71 (E); Palermo: *Bianca* 168 (E, JE, W); *H. Ross* 132 (E, FI, JE, Z); Mt. Etna: 31.v.1877, *J. Arcangeli* (E, FI); Catania: 15.iv.1954, *Höpflinger* (HBG); Syracuse (Siracusa): 9.iv.1882, *Karl Richter* (W); Agrigento: 8.v.1873, *S. Sommier* (FI). **Pantellaria:** 18.iii.1906, *S. Sommier* (FI, forma subglabra). **SPAIN: Balearic Islands:** Minorca: *E. W. Kennedy* 30 (K); Mallorca: *Kennedy* 63 (K); *E. Welti-Hug* 197 (Z); *H. Bianor* 545 (E); Ibiza: *C. Rutten-Pekelharing* 755 (U). Catalonia: Costa Brava: *L. S. Rodrigués Lopes* 84 (U); Barcelona: *F. Sennen* 6566 (FI); *Stud. biol. Rheno-Trai.* 51/45, 51/52 (U); Tibidabo: *E. Martienssen* 5 (HBG); Tarragona: *B. K. Boom* 11248 (L); Miranda: 19.vii.1878, *E. Levier* (FI); Léon: *Rothmaler* 15 (Z); Madrid: *H. Lindberg* 142 (W); Castellon: *Stud. biol. Rheno-Trai.* 57/43 (U); Valencia: 23.v.1890, *St.-Lager* (W); Alicante: *Stud. biol. Rheno-Trai.* 62/506 (U); Sierra Morena: Ciudad Real: *Stud. biol.* 51/1233 (U); Cordoba: *Ellman & Hubbard* 22 (K); Granada: *Ellman & Sandwith* 609 (K); Calavera-la-Reina: *Bourgeau* 2453 (E, JE); Almeria: *Huter, Porta, Rigo* 867 (E); Cabo de Gata: 10.iv.1896, *Gandoger* (E); Malaga: *Porta & Rigo* 180 (HBG); 15.vii.1910, *St.-Lager* (W); Gibraltar (Calpes): *J. Ball* 197a (E); Algeciras: 5.v.1881, *Reverchon* (W); Cadiz: *J. Ball* 197d (E); *Stud. biol.* 62/1169 (U). **PORTUGAL:** Tras-os-Montes: v.1884, *A. Moller* (COI); *A. A. Taborda Moraes* 181 (COI); Minho: *A. R. da Cunha* 145 (COI); Douro: *J. Matos* et *al.* 4817 (COI, U); *A. Fernandes* et *al.* 4722 (COI, U); iv.1891. *O. Buchtien* (JE, L, W. Z); v.1896, *M. Ferreira* (COI); Beira: vi. 1890, *Ferreira* (COI); *R. Fernandes & Sousa* 3257 (COI); *Bento Rainha* 1577 U); *J. de Mendonca* 100 (COI); *A. Fernandes* et *al.* 5886 (COI); Estremadura: *A. Kostermans & W. Kruyt* 248 (L, U); *M. Ferreira* 23 (COI); *A. Fernandes* et *al.* 5779 (COI); *J. Matos* et *al.* 4621 (COI, U); *A. Moller* 134 (COI, W); *F. Fontes & B. Rainha* 4173 (U); Alentejo: vi.1914, *M. Ferreira* (COI); vi.1891, *A. Moller* (COI); *Garcia & Sousa* 1005 (COI); Algarve: *José Brandeiro* 100b (COI), *Stud. biol. Rheno-Trai.* 59/232 (U); *J. Sinclair* 4721 (E, trans. with var. *scariosissima).* **Canary Islands:** Gran Canaria: *Bourgeau* 725 (BM); *M. Despréaux* 293 (G). **MOROCCO:** Tanger: *Pitard* 571 & 572 (P); Tetuan: *Pitard* 574 & 575 (P); Er Rif: Axdir: *Font Quer* 170 (G); Olad-Settut: *Sennen & Mauricio* 9652 (G); Env. Berkane: *J. Briquet* 964 (G); Env. Taourirt: *Briquet* 679, 752 811 (G); Env. Debdon: *Briquet* 300 (G); nr. Meknes: *A. W. Tretheway* 301 (K); nr. Rabat: *H. A. Romieux* 1240 (G); Env. Casablanca: *Ch. Duffour* 7463 (P); Safi: *Tretheway* 122 (K); Marrakesh: *Tretheway* 49 (K); Env. Mogador: iv. 1887, *Ibrahim* (G, P-CO); v.1867, *Balansa* (G); Ichonkak (Ijonkak): c. 1350 m, *E. K. Balls* B. 2521 (E, K, S); Qurika: *Balls* B. 2539 (E, K, S); Bir Jedid: *Samuelsson* 6345 (S). **ALGERIA:** Atlas Sahara: Dj. Aissa: 20.iv.1936, *Allan Uggla* (S); Prov. Oran: nr. Oran: *G. L. Durando* 10 (G); iv.1922, *Ch. d'Alleizette* (S,

Z); *Samuelsson* 6212 (S, forma subglabra); Sidi-bel-Abbas: v.1876, *A. Warion* (FI); *La Macta:* iv.1910/1911/1912, *A. Faure* (E, G, JE, W); Prov. Algers: nr. Alger: *Hochreutiner* 33 (G, W, Z); *Ch. Romain* 1116 (G, JE, S, W); *J. Jamin* 28 (E, G); *Alp. Meyer* 3306bis (FI, G); Blidah: *M. Buysman* 188 (U); Médea: 20.iii.1892, *A. Chabert* (FI, G); Prov. Constantine: Kabylie: *H. A. Romieux* 226 (G); Sidi Mecid.: *E. G. Paris* 241 (FI); Bone: *Alph. Meyer* 189 (FI); La Calle: *A. Clave* 449 (G); Biskra: 3.v.1904, *Carl Knetsch* (Z); Fort National: *Alston & Simpson* 37623 (S). **TUNISIA:** Cap Bon: 11.iv.1936, *A. Cuénod* (G); nr. Carthage: *Romieux* 41 (G); Zaghouan: *Pitard* 1255 (G); El Kef: *Pitard* 1465 (G). **LIBIA:** Cyrenaica: *G. Ruhmer* 58 (E, HBG, JE, S, Z); *Sandwith* 2230 (K); *Pampanini* 2323, (L, W) 2327 (G, S). **EGYPT:** Khan Yunis: *Samuelsson* 3024 (S, forma compacta); Gaza: *V. Alonzo* 87 (S). **JORDAN:** Petra: *Davis* 8752 (E, K); Mt. Hor: *V. Alonzo* 87 (S). **JORDAN:** Petra: *Davis* 8752 (E, K); Mt. Hor: *Davis* 8568 *Davis* 8568 (E, K); Wadi Heidan: *Davis* 9559 (E); Madaba: *Meyers & Dinsmore* M80 (E, G, L); Mt. Jabor: *Meyers & Dinsmore* 6080 (E, S); Amann: *V. E. Buxton* 23 & 42 (K); *Dinsmore* 16080 (S); Wadi Zerqa: *Hunting Aero Survey* 143b (E); Qasr Azraq: *Gillett* 15665 (K); W of H5: *Rechinger* 27066 (W, forma sublabra). **PALESTINE:** Jerusalem: *Aucher-Eloy* 2807 (G); *A. Burdet* 36 (G); Ramle: *J. Ball* 635 (S); Jebal Montar: *Dinsmore* B. 2080 (E); Jaffa: *Meyers & Dinsmore 4080* (E, G); *Bornmüller* 1897:227 (E, G, JE, Z); & 228 (E, JE, as forma stenophylla Bornm.); Nazareth: *Bornmüller* 229 (G); Tiberias: *H. Field & Yusuf Lazar* 271 (G, K); Bet Masir: *Meyers & Dinsmore* B. 8080 (S); Acre: *Davis* 4101 (E). **LEBANON:** Saida (Sidon): *Gaillardot* 2404 (JE); Beirut: *E. Peyron* 166 (G); Broumana: *H. F. Mooney* 4695 (K); Harissa: *O. Polunin* 5275 (E, K); Reyfoun: *Samuelsson* 2034 (S); Bsherri: *Kotschy* 326 (S); Tripolis: *Blanche* 3 (G). **SYRIA:** Jebel-ed-Druz 9.v.1933, *Erik Wall* (E); Hauran: *Rechinger* 13084 (W); W of Damascus: *Rechinger* 13146 (W); Anti-lebanon: Deir-Atiah: *Barkoudah* 351 (U); Jebel Khasioun: *Samuelsson* 1684 (S); Homs (Emessa): *J. & F. Bornmüller* 11500 (E, G, JE); Env. Hama: *Haradjian* 1817 & 1881 (E, G, W); Jebel Sannin: *A. Kneucker* 125 (JE); Aleppo: *Kotschy* 60 (G, HAL); *Bornmüller* 1893: 162 (JE); Jebel Muharsan, nr. Aleppo: *Haussknecht* 90 (JE); nr. Latakia: *Haradjian* 2686 (E, G, W); along river Afrin: *Haradjian* 4296 (G, W); Latakia to Yayladaghi: *H. Halbaek* 213 (K). **TURKEY:** Vil. Izmir: vi.1946, *Başarman* (ISTE); Muğla: *Davis* 41345 (E); Aydon: *Demiriz* 1900 (ISTE); Içel: *Demiriz* 3237 (ISTE); Adana: *Balls* B. 2091 (S); Seyhan: *Coode & Jones* 324 (E); Içel: *Davis & Hedge* 26389 (E, U); *Demiriz* 294 (ISTE); *Coode & Jones* 1092 (E); Mersin: *A. Péronin* 28 (S); *Siehe* 105 (E, G, JE); Hatay: *Coode & Jones* 687 (E); *Haradjian* 3980 (G, W); Urfa: *Sintenis* 1888: 458 (E, JE). **CYPRUS:** Cap Andreas: *Sintenis & Rigo* 235 (G); Lefkonico: *Sintenis* 1880:235 (S); Rizeparpaso: *Davis* 2275K (E); Morphou: *Davis* 2124 (E, trans. with var. *rotundata);* Nicosia to Famagusta: *E. Chapman* 718 (K); Platres to Troödos: *Kennedy* 417 (K); Mt. Troödos: *Kennedy* 1831 (K); Larnaka: *J. Ball* 2428 (E); *E. Deschamps* 140a (G); Nagia Napa: *J. Holmboe* 39 (C, S). **AEGAEN ISLANDS:** Ródhos: *Davis* 40254 (E, K); *A. v. Sterneck* 440 (W); *C. Egli* 2291 (Z); Kárpatos: *Pichler* 133 (G, Z); Kos: *Forsyth Major* 683 (E, P); Naxos: *Chr. Leonis* 57 (W), 284 (E, HBG); *Davis* 1577 (E).

The difference between var. *frutescens* DC. and var. *oblonga* DC. is but gradual. As a matter of fact, most of the plants of var. *agentea* are somewhat woody or suffruticose at the base, and procumbent. Maire & Wilczek's var. *suffruticosa* is quite obviously a later homonym for DC's var. *frutescens*.

A lot of confusion has resulted from the various interpretations given

to *Illecebrum mauritanicum* Willd. ex Roemer & Schult., Syst. 5:516 (1819). The original description was clear enough "foliis oblongis utrinque acutis, floribus congestis axillaribus, bracteis ovatis, caule filiformi procumbente" ---, and fits in well with that of *P. argentea* Lam. var. *argentea* (though the shoots of the latter are generally rather stout and not filiform). De Candolle in his Prodromus, however, added his own version --- "foliis latioribus, capitulis magis distantibus".
The confusion was further accentuated by Maire et Weiller (op. cit.) who, for the first time, introduced a new element by describing the calyx as "entirely glabrous". They presumably attempted to incorporate J. Ball's unnamed variety (p. 641,1.c.) ("sepalis glabris vix cucullatis") in the var. *mauritanica,* but the occasional appearance of almost hairless flowers is certainly not a very unusual feature in *P. argentea* irrespective of the other variations, and is met with, though very infrequently, in nearly all the varieties. W. Rothmaler & A. Pinto da Silva (op. cit.) went to the extreme by giving it (i.e. var. *mauritanica)* the status of a distinct species on the basis of the presumably glabrous sepals and the supposed occurrence of trifid style (or of 3 stigmas). The latter characteristic is an abnormality that is occasionally found in many species of *Paronychia* and *Herniaria,* and must not be considered to be a normal feature of any particular taxon belonging to these genera. Surprisingly enough Lamarck himself (op. cit.) had incorrectly described the style as trifid.
There is yet another source of confusion. J. Ball, op. cit., named a new variety, *"velutina",* describing some peculiar forms as "foliis et caulibus pube brevi cinerea vestitis. Caules saepe tantum latere superiore velutini". Maire & Weiller, op. cit. p. 16, rephrased the description as "stems and leaves densely pubescent". I, however, could not find even a single specimen (out of over a thousand examined) with pubescent leaves. The surface of the leaves is sometimes, very minutely puberulous in the younger stages, but to describe this condition as pubescent would be a total distortion of the facts. Post (in his Flora) had also described some plants as forming a var. *velutina* Post and having "leaves velvety, linear-oblong, acute, crowded, flowers in terminal heads". But they, too, are indistinguishable from var. *argentea.*

b) var. **rotundata** (DC). Chaudhri n. comb.
P. hispanica var. *rotundata* DC. in Poiret., Encycl. 5:24 (1804); Roem. et Schult., Syst. 5:519 (1819). (Type: See below).
Syn.: *P. argentea* Lam. var. *latifolia* Béguinot et Vaccari, Mem. R. Acad. Sci., Lett., Art. Modena, ser. 3, 12:12 (1914). Type: Greece: Rodhos: 9.ii.1914, *Vaccari* 1105 (holo, FI! iso. K!). Rechinger, Fl. Aeg. 130 (1943).
i) subvar. **rotundata:** Awns of the sepals 0.4-0.6 mm long.

Spain: Prov. Cadiz: N. of Tarifa, 29.iv.1957, *Stud. biol. Rheno-Trai.* 954 (U, NEOTYPE of the var.). **Morocco:** Sale: *E. Jahandiez* 26 (Z); **Algeria:** Alger: *Fauche* (G); **Palestine:** Beersheba: *B. T. Lowne* in 1863-64 (E, W); Sharon Plain, nr. Hadera, 10.iii.1953, *I. Baldinger* (HUJ); Athlit *Rifka Aaronsohn & V. Täckholm* 134 (S); **Lebanon:** Hermel-Charbino: *Davis* 5835 (E); **Cyprus:** Skali (Akamos): *Meikle* 2082 (K); **Turkey:** Prov. Muğla: Yatağan: *Davis & Polunin* 25559 (BM, E); **Greece:** Rodhos: *A. Vaccari* 1105 (FI, K, TYPE of var. *latifolia*).

Note: De Candolle's type for this variety was a specimen in Herb. de Jussieu in Paris (P), collected from near Cadiz (Spain). I, however, could not find this specimen there, and hence a neotype from nearly the same locality is being designated.

ii) subvar. **aristulata** Chaudhri n. subvar. a subvar. *rotundata* sepalis arista breviore (0.30-0.35 mm longa) instructis distinguenda. Awns of the sepals 0.3-0.35 mm long.

Morocco: Dj. Aziwel: / 1883, *Ibrahim* (G, holotype).

c) var. **angustifolia** Chaudhri nov. var. a varietatibus aliis foliis angustioribus (ter longioribus quam latis) distinguenda. Leaves linear-oblanceolate, up to c. 7 x 1.6 mm.

Type: Spain: Prov. Malaga: Ronda, ca, 700 m, 7.v.1924, *Ellman & Hubbard* 211 (K, holotype).

Distr.: S. Spain, S. Portugal & NNE. Morocco.

Spain: Almeria: *J. Ball* 198-b (partly) (E); Malaga: Ronda: *Ellman & Hubbard* 211 (K, type); **Portugal:** Prov. Algarve: Faro: *J. d'Ascensao Guimaraes* 100 a (COI); **Morocco:** Env. Oudja. 640 m, *J. Briquet* 1418 (G).

d) var. **scariosissima** Post in Journ. Linn. Soc. 24:423 (1888).

Dinsmore in Post, Fl. Syr. Pal. Sin. 1:214 (1932); Chaudhri in Davis Fl. Turk. 2:253 (1967). Stipules very prominent, equalling to exceeding and almost concealing the leaves.

Type: Turkey: Hatay: Antakia, viii.1886, *Post* (holo. G!).

Distr.: Scattered in Eastern Mediterranean and Morocco (NNW).

Palestine: Jaffa, *N. Bové* 396 (G); **Cyprus:** Platres, ca. 1250 m, *Kennedy* 1158 (K); **Morocco:** Tanger: viii.1831, *Schousboe* (P); Bou Azza: *Pitard* 2668 (K); Casablanca: *Pitard* 2674 (K, P).

Subgenus **Anoplonychia** (Fenzl) Chaudhri stat. nov. p. 91

Leaves herbaceous, without cusp or mucro; perigynous zone weakly developed; sepals entirely herbaceous, plano-concave, without hood or awn.

1. Sectio **Anoplonychia:** Sepals equal or slightly unequal, connivent to erect.

Subsect. 1. **Anoplonychia:** Stipules two for each pair of leaves; sepals connivent.

62. **P. aretioides** DC., Prodr. 3:371 (1828).

Willk. et Lange, Prodr. Fl. Hisp. 3:157 (1874); A. O. Chater in Tutin et al., Fl. Europ. 1:150 (1964).

Syn.: *Illecebrum aretioides* Pourr. ex DC., Prodr. 3:371 (1828). *P. serpyllifolia* DC. var. *aretioides* Boiss., Voy. Bot. Esp. 2:220, tab. 62B (1845). **Icon**: Boissier, op. cit., tab. 62, fig. b.

A small perennial, herb; stems 4-8(-15) cm long, ± prostrate, usually densely tufted and congested but occasionally spreading, much-branched from the base; branches with closely imbricated leaves and stipules, terminating in conspicuous glomerules; internodes up to 3 mm long, densely velutino-pubescent when young and ± glabrous when older, often concealed by the leaves and the stipules. Leaves sessile, oblong or narrowly elliptic-oblong, 1.5-3 x 0.75-1(-1.2) mm, mostly obtuse, closely imbricated, ascending, densely adpressed pubescent; stipules narrowly ovate-oblong, subobtuse, equalling or slightly exceeding the leaves. Flowers arranged in terminal to subterminal, small clusters, 3-5 mm in diam, and often 7-flowered, but densely aggregated into conspicuous, terminal glomerules 5-8 (-13) mm in diam.; bracts suborbicular, c. 4 x 3 mm, very obtuse-rounded, usually rolled around the flowers and concealing them, occasionally obliquely oblong to reniform and c. 4.5 x 2.75 mm. Flowers 1.75-2.2 mm long, mostly c. 2 mm, ellipsoid-oblong, slightly narrowed at the base, densely pilose to velutino-pubescent; sepals ± equal, the outer somewhat spathulate-oblong, the inner linear-oblong, with obtuse and incurved apex, and very narrow nearly white membranous margins; petals c. 0.6 mm long, and somewhat longer than the stamens, anthers 0.4-0.45 x 0.25 mm, oblong, and orange-brown; ovary ovoid, c. 0.65 x 0.45 mm; stigmas ± sessile, c. 0.25 mm long, brown, and divergent-recurved; Fruit c. 1 x 0.75 mm, ovoid.

Fl. 5-7. Ft. 7. Dry stony places, alt. 1000-2000 m, mostly around 1100 m.

Type: Spain: Prov. Valencia, -/1815, *L. Dufour* 608 (as *Illecebrum aretioides* Pourret ined.) (holo. G-DC!).

Distr.: Endemic in E. and S. Spain.

Spain (SE): Valencia: Sierra de Vernisa près S. Felipe de Xativa, *Bourgeau* 1713 (E); Prov. Valencia: Sierra de Ayora, Pico de Caroche, 1100 m, *C. Vicioso* 2460 (COI); Sierra de Corbera, *Stud. biol. Rheno-Trai.* 1951/748 (U). Prov. Albacete: Chinchilla, *Bourgeau* 658 (E). Prov. Alicante: Mont. Mariola supra Alcoy, 15.v. 1878, *Hegelmaier* (STU, W). Prov. Albacete et Murcia: *Porta* et *Rigo* 380 (JE, STU, W, Z). Prov. Murcia; Sierra de las Cabras, *id.* 187 (E, HBG, W). Prov. Jaén: Cazorla, 1200 m, *Reverchon* 1238 (E, JE, STU). Prov. Almeria: Velez-Rubio, *E. Ellman & N.Y. Sandwith* 527 (K, LIL). Prov. Granada: Huescar, *Bourgeau* 1340 (E); Dilar, *id.* 34 (JE, W); nr. Granada: *W. J. Reijnders* 3525 (L).

63. **P. kapela** (Hacquet) Kerner in Österr. Bot. Zeitschr. 19:367 (1869); 26:394 (1876); & 27:13 (1877).

Kerner in Österr. Bot. Zeitschr. 27:17 (1877); Fiori & Paoletti, Fl. Anal. It. 1:334 (1898), Append. 67 (1907); Briquet in Burnat, Fl.

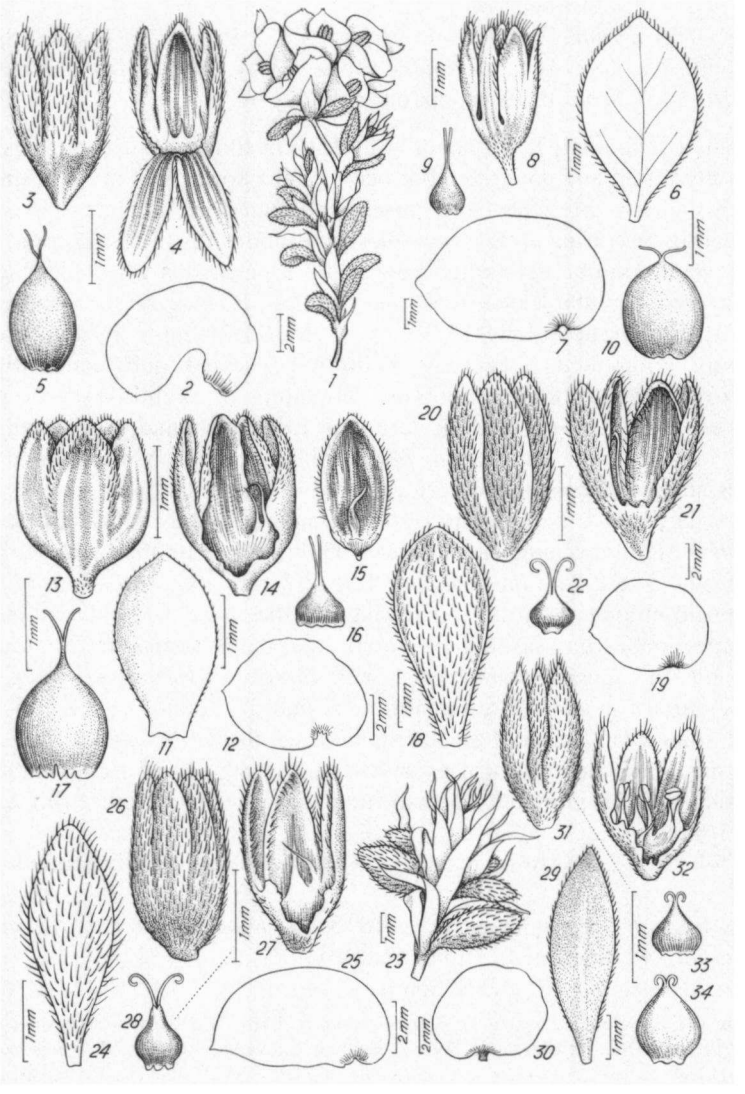

Plate IX. Fig. 1-5: **P. chionaea**; 1: shoot; 2: bract; 3: flower; 4: flower opened, inside view of the sepals; 5: fruit and style [*Davis* 13522(E)]. Fig. 6-10: **P. rechingeri**; 6: leaf; 7: bract; 8: flower; 9: ovary and styles; 10: [*Rechinger* 10902 (W)]. Fig. 11-17: **P. saxatilis**; 11: leaf; 12: bract; 13: flower; 14: section of flower; 15: sepal, inner side; 16: ovary and styles; 17: fruit [*Davis & Polunin* 23702(K)]. Fig. 18-22: **P. kayseri**; 18: leaf; 19: bract; 20: flower; 21: sepals, inside view; 22: ovary and styles [*Davis, Dodds & Cetik* D.19299(K)]. Fig. 23-28: **P. argyroloba**; 23: young shoot; 24: leaf; 25: bract; 26: flower; 27: v.s. flower showing the inner side of the sepals; 28: ovary and styles [1.viii.1882, *Luschan* (WU)]. Fig. 29-34: **P. kapela**; 29: leaf; 30: bract; 31: flower; 32: v.s. flower; 33: ovary and styles; 34: fruit [29:19.v.192 *Korb* (W); 30 33: 27.vi.1927, *id.* (W); 34: *R. Pekel-Haring* 84(U)].

Alpes-Marit. 3:224 (1899); Hegi, Illustr. Fl. Mitt. Europ. 3:428 f. 7 (1912); P. Graebner in Aschers. et Graebn. Synop. 5:890 (1919); R. Maire, Fl. Afr. Nord, 9:33 (1963); A. O. Chater in Tutin et al. Fl. Europ. 1:150 (1964).

Basionym: *Illecebrum kapela* Hacquet, Pl. Alp. Carn. 8, tab. 2, fig. 1 (1782). Type: Probably in the Herbarium of the Bot. Inst. Univ. of Ljubljana, (LJU), Yugoslavia; not seen.

Syn.: *Illecebrum lugdunénse* Vill. in Schrad. Journ. 1801:412, tab. 4 (1801). *Paronychia capitata* DC. in Poiret, Encycl. 5:25 (1804), non (L.) Lam., Fl. Fr. 3:229 (1778). Type: In Herb. Lamarck (P-LA!).

Koch, Syn. ed. 1,255, (1837); ed. 2,1:280 (1843); *P. serpyllifolia* DC. var. *Hacquetii* Bartling, Beitr. Fl. Öst. Küstenl. 65 (1825). *P. serpyllifolia* sensu Mert. et Koch in Röhl. Deutschl. Fl. ed. 3, 280 (1826), non (Chaix) DC. in Poiret, Encycl. 5:24 (1804). *Illecebrum serpyllifolium* sensu Host, Fl. Austr. 1:311 (1827) non Chaix. *Paronychia imbricata* Reichenbach, Fl. Germ. Excurs. 564 (1832), non Boiss. et Hausskn. in Boiss., Fl. Or. 1:744 (1867). Rohlena, Sitzb. Böhm. Ges. Wiss. 17:30 (1903); Nym. Consp. 255 (1878), & Suppl. 125 (1889). *P. serpyllifolia* (Chaix.) DC. *β kapela* Griseb., Spicileg. Fl. Rumel. Bithyn. 1:215 (1843). *P. kochiana* Boiss., Diagn., ser. 1(10):13 (1849) pro parte.

"Hab. in Illyria (Koch), Apennino Neapolitano, Asia minori in monte Cadmo (Boiss.)."

P. lugdunensis (Vill.) Aschers & Graebn. op. cit.

Misapplied names: *Illecebrum Paronychia* sensu Host, Syn. Fl. Austr. 124 (1797); & *Ill. Paronychia* sensu Wulf., Fl. Nor. 299 (1858) non L., Sp. Pl. ed. 1, 206 (1753). *Paronychia argentea* sensu Neilr., Veget. Croat. 197 (1868) non Lam., Fl. Fr. 3:230 (1778).

Plate IX, Fig. 29-34. p. 218

A small perennial herb; adventitious roots often quite distinct; stems 5-25 cm long, mostly prostrate, congested and matted, usually with a woody-suffructicose base giving off numerous short, leafy and tufted flowering branches, very minutely pubescent (-puberulous) to glabrous in age. Leaves sessile, ± elliptic to elliptical-obovate, sometimes suborbicular, very occasionally narrowly elliptic-oblong, (2-)3-5 x (1-)1.5-2.5(-3.25) mm, mostly ± obtuse, narrowed at the base, glabrous on both sides (very rarely sparsely adpressed pubescent near the tip on the under sides in younger stages); margin ciliate; often crowded or closely approximated, slightly carinate and somewhat recurved or almost flattened (in ssp. *serpyllifolia*); stipules lanceolate, often somewhat shorter than the leaves or, occasionally, slightly exceeding them. Glomerules, terminal, globose (5-)8-15 mm in diam., very profuse and conspicuous; bracts, broadly oval to almost orbicular, obtuse, nearly

2 x larger than the flowers and concealing them. Flowers ellipsoid-oblong, (1.7-)2-3(-3.25) mm long, often densely adpressed pubescent, very occasionally puberulous to subglabrous on the sepals; sepals equal, linear-oblong (to oblong-lanceolate) with an obtuse and much ciliate (-penicillate) and usually incurved apex; petals (0.)0.9-1.2 mm long, somewhat longer than the stamens; filaments 0.5-0.75 mm long; anthers 0.3-0.4 x 0.2-0.25 mm, orange; ovary ovoid, 0.65 x 0.55 mm, with two (0.3-)0.35-0.45 mm long styles, the stigmas strongly divergent-recurved in age. Fruit 1.5 x 1 mm, ovoid-subglobose, almost equalling the sepals. Fl. 5-8. Calcareous rocks, alt. ca. 700-2850 m.

Very variable in the form and arrangement of the leaves and stipules. Three well-defined polymorphs are recognized as distinct from the main population of the species, one at the level of a subspecies, the other two of varietal rank.

Key to the subspecies and varieties:

1a) Stems prostrate and often matted; leaves oval to obovate to almost orbicular, mostly less than 1½ times as long as broad, or only slightly longer than wide (c. 2-3.5 mm broad), usually all flattened in one plane; margin strongly ciliate; flowers c. 2-2.5 mm long --- subsp. ..... **serpyllifolia**

1b) Stems prostrate or, occasionally, somewhat ascending, flowering branches usually ± spreading; leaves (narrowly) elliptic to narrowly obovate-spathulate, often somewhat recurved and slightly carinate; margin ciliate; mostly 2 x as long as broad (1.5-2 mm broad); flowers (1.75)2.5-3 mm ..... subsp. **kapela**

2a) Glomerules 5-7 mm in diam., rather inconspicuous, terminal and distinct ..... var. **durmitorea**

2b) Glomerules mostly 8-15 mm in diam., prominent and congested

3a) Leaves closely inbricate; stipules ± exceeding the leaves .... var. **pseudo-aretioides**

3b) Leaves not quite imbricate; stipules somewhat shorter than the leaves ..... var. **kapela**

a) **var.** and **forma kapela:** Distribution: Throughout the range of the sp. except in SW Alps, Pyrenees & N. Spain.

Greece: Scardus, *A. H. Grisebach* (K). **Albania:** Distr. Zadrima, m. Vels, *A. Baldacci* 58 (E). **Yugoslavia:** Montenegro: mt. Rumia, *Baldacci* 103 (W); Dolovi, *id.* 127 (FI, W, Z); mt. Lovtschen, 1600 m, 6.viii.1868, *Pichler* (JE, STU); Njegus, vii.1897, *Sagorski* (JE); Hercegovina: Trebinje, mt. Glira, vi. 1908, *Sagorski* (JE); mt. Plasa Pl., c. 1700, *G. de Beck* 152 (JE, LD, W, WU); Dalmatia: mt. Biokovo, *Pichler* 61 (E, JE, L, W); nr. Omis, *Rutten-Pekelharing* 84 (U); nr. Klis, *A. K. Jackson & W. B. Turrill* 188 (K); mt. Clissa (Klissa), Spalato, 19.v. 1926, *Ernst Korb* (W); mt. Marian, 12.v.1895, *G. A. Poscharsky* (COI, Z); Bosnia: Kupres, *F. Meyer* 12 (HBG); Cvrstnica, 1900 m, 9.viii.1896, *F. Fiala* (WU); Croatia: Velebit, mt. Lubicko, Ostaria, 24.vii.1881, *Vinc. de Borbás* (Z); mt. Lymbico, Ostonia, vi.1906, *Sagorski* (JE); Fiume (Rijeka): *Nöe* 155, & 656 (L). **Italy:** Abruzzi: mt. Morrone nr. Sulmone, *E. & A., Huet du Pavillon*

316 (K); Fta Cerreto ,(Assergi), *Richard Saligman* 77 (K); mt. Majella, c. 2000-2500 m, *G. Rigo* 612 (W); 27.vii.1874, *Porta & Rigo* (E, STU, W); Campo de Grove, 1600 m, vii.1903, *M. Guadagno* (W); Gran Sasso d'Italia, 28.vi.1875, *C. Marchesetti* (FI); Roccapia, nr. "Piano di Cinquemiglia", 10.vii.1882, *E. Levier* (COI); Prov. Chieti, mt. Majella, *L. Vaccari* 1448 (Z). **France:** Dep. Savoie: Saint Jean de Maurienne, *E. Didier* 386 bis (JE); *id.* 2265 (JE) (trans. form); Isère: Le Frécy to Bourg d'Oisans, 21.viii.1874, *P. Tillet* (COI); Hautes Alpes: Briancon: vii.1867, *E. Reverchon* (JE); Dauphin: Gap, *E. A. Burle* (JE, STU) (trans. form); 10.vi.1872, *Reverchon* (E) trans. with subsp. *serpyllifolia;* Basses-Alpes: Argenton, *Reverchon & A. Derbez* 257 (E, STU) Val. d'Laverq, Méolans, *Thiébaut* 2031 (Z) (trans. form). **Spain::** Burgos: Sierra Obarenes, *H. Elias* 4990 (F. Sennen Pl. Esp.) (COI); Old Castille: mt. Valverde, nr. Miranda, *F. Sennen & Elias* 61 (JE, W); Murcia: Sierra Padron de Bien Servida, 1800-2000 m, *Porta & Rigo* 290 (JE, W). **Morocco:** Dj. Zerka, vi.1909, *M. Gandoger* (G).

aa **Forma rotundifolia** Beck in Glasnik Muz. Bosn. Herceg, 18:477 (1906): **Hercegovina:** nr. Mostar. *H. Raap* 293 (W, Z).

b) **var. durmitorea** Rohlena in Sitzb. Böhm. Ges. Wiss. 1911 (1):27 (1912).

P. imbricata Reichb. var. *durmitorea* Rohlena, op. cit. 1903 (17):30 (1903). Stems ± glabrous; leaves very closely arranged; glomerules small, c. 5-7 mm, in diam.

Described from Montenegro (Yugoslavia), Mt. Durmitor, ca. 2000 m; Type?? (Herbarium unknown).

Distr.: Yugoslavia: Montenegro, Hercegovina, & Croatia.

Montenegro: Cattaro to Cettinje, *F. C. Crawford* 91 (E); Titograd, 27.iv.1952, *Kaiser* (HBG); Hercegovina: mt. Porim, Ruiste, c. 1000 m, *H. Raap* 72 (JE, W, Z); Croatia: Spasovac, *L. Rossi* 6058 (HBG, JE); Ins. Juraj (or Juray?). 1.vii. 1896, *Rossi* (HBG, JE); Zeugg, 17,viv.1911, *J. Tuzson* (BUD).

c) **var. pseudo-aretioides** (Emberger et Maire) Chaudhri, stat. nov.: Syn.:*P. pseudo-aretioides* Emb. et Maire in Mém. Soc. Sci. Natur. Maroc, 21-22:27-28 (1929); *P. kapela* (Hacq.) Kerner subsp. *pseudo-aretioides* (Emb. et Maire) Maire in J. et M., Cat. Maroc, 216 (1932); Maire et Weiller in Maire Fl. Afr. Nord. 9:35 (1963).

A small compact herb; stems prostrate, often quite short, with closely imbricated leaves and stipules; leaves 2-3 x 1-1.3 mm, ± narrowly elliptic and strongly recurved; stipules somewhat exceeding the leaves; glomerules densely congested; flowers 1.75-2.5 mm long, ellipsoid, pilose to densely adpressed pubescent; sepals with a prominently penicillate apex.

Type: Marocco: In Atlantis Medii monte Tichchout: Lalla-Oumel-Bent, 2700-2850 m, 2.vii.1927, *R. Maire* (holo. MPU!).

Distr.: Scattered in Marocco, Spain, S. France and Italy.

Morocco: Moyen Atlas mt. Tichchout, Lalla Oum-el-Bent, 2.vii.1927, *Maire* (MPU). **Spain:** Distr. Logrono/Soria: Sierra de la Urbion, 1700 m, *D. W. Dresser* 612 (E); Prov. Lérida: Rio Segre, *Stud. biol. Rheno-Tr.* 67/865 (U). **France:** Dep. Vaucluse: mont Ventoux: 15.vii.1867, *L. Leresche* (JE) 25.vi.1877; *Reverchon* (STU); *J. Souster* 1338 (K); Dep. Var.: La Ste Baume, c. 1000 m, *Hekking* 45 (U). **Italy:** Abruzzi: Mt. Sirente, c. 1750 m, 3.viii.1924, *Furrer* (Z); Mt. Majella, c. 1000-1300 m, 27.vii. *Porta & Rigo* (W).

d) **subsp. serpyllifolia** (Chaix) Graebner in A. & G., Syn. 5(1):892 (1919).

Basionym: *Illecebrum serpyllifolium* Chaix ap. Villars, Hist. Pl. Dauph. 2:558 (1787). Type: Probably at Grenoble (GRM, not seen).

Syn.: *P. serpyllifolia* (Chaix) DC. in Poiret., Encycl. 5:24 (1804). DC., Prodr. 3:371 (1828); Peterm., Deutschl. Fl., tab. 30, fig. a-g (1846-49); Kerner in Österr. Bot. Zeitschr. 27:16 (1877); Nym. Consp. 255 (1878), Suppl. 125 (1889). Gürke in Richter-Gürke, Pl. Europ. 2(2): 184 (1899). *P. capitata* DC. ß *serpyllifolia* Koch, Syn. ed. 1, 255 (1837); *P. kapela* b. *serpyllifolia* Wohlfarth in Hallier-Wohlf., Syn. 1:905 (1890).

P. imbricata Reichenb. race *P. serpyllifolia* Rouy, Fl. Fr. 12:6 (1910).

Stems prostrate, often matted; leaves broadly oval to obovate to almost orbicular, mostly less than 1½ times as long as broad, (often slightly longer than wide), up to 3.5 mm broad (2-3.5 mm), densely crowded, usually all flattened, margins strongly ciliate; flowers 2-2.5 mm.

Distr.: SW Alps. Pyrenees, & N. Spain.

Italy: Alpes Cottiae: Nr. Oulx, *Mattirolo* 16 (HBG); Alpes (Alpi) Graie: Berdonnecclia, *Robert Keller* 33 (Z).

France: Alpes Maritimes: Roya, Tenda, c. 920 m, *W. Koch* 55/143 (W); Villeneuve d'Entraunes, 20.vi.1890, *G. Vidal* (JE); Puget Théniers, 21.vi.1884, *H. de Maupassant* (Z) trans. form.; Boglio (Benil), 4.viii.1876, *Burnat & Vetter* (Z) trans. form; Pyr. Orient.: Cerdagne, Nuria, 2200 m, vii.1929, *Braun-Blanquet* (Z); St. Béat, *P. van Royen* 1963 (L); Pyr. Central: M. Port de Cambriel, viii.1831, *Endress* (HAL, L); Hautes Pyrenees: Gèdre, 1500 m, vii.1881, *Bordère* (HAL, HBG, JE, STU, W, Z); Heas, viii.1882, *id.* (JE); Gavarnie, 21.viii.1962, *F. Klimmek* (HBG); Pyr. Occid.; Eaux Bonnes, Gourzy, 24.vii.1861, *J. Ball* (E); Col de Tortes, 26.vii.1861, *Ball* (E). **Spain:** Pyr. Or. above Villafranche, c. 1100 m, *Ellman & Sandwith* 127 (K); Pyr.: Castaneza, vi.1925. *A. Meebold* (K); nr. Aquila, above Segre-dal, *Rutten-Pekelharing* 75 (U); La Furketa de Tentenera, 12.viii. 1861, *Ball* (E); Pena de Oroel, *Willkomm* 148 (295) (E); nr. Montserrat, c. 1000-1200 m, *Stud. biol. Rheno-Trai.* 1951:321 (U), trans. with subsp. *kapela;* Prov. Lérida: Rio Segre, *id.* 67/832 (U); Val d'Aran, nr. Tredos, *id.* 67/2670 (U).

64. **P. argyroloba** Stapf in Denk. Akad. Wiss. Wien, Math.-Nat. Kl. 51:356 (1886).

M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:256 (1967).

Plate IX, Fig. 23-28. p. 218

A small, rather compact perennial herb with conspicuous adventitious roots; stems woody, congested at the base, c. 5-8 (-20) cm long, prostrate, intertwined, usually having very short internodes and finely pubescent to puberulous or almost glabrous in age. Leaves 3-6 x 1.5-2.5 mm, obovate-oblanceolate to occasionally narrowly oblong, subacute to obtuse, rather hirsute when young (particularly along the margin and at the under side) to adpressed pubescent in the older leaves, often recurved; stipules lanceolate, almost equalling the leaves and at the

shoot tips even exceeding them. Glomerules terminal, profuse and often crowded, 10-15 mm in diam.; bracts 6-7 x 3-4 mm, mostly ± oblong, sometimes almost orbicular or broadly and obliquely ovate, acute to obtuse, concealing the flowers.
Flowers 2-2.5(-3) mm long, oblong, adpressed pubescent; sepals ± equal, oblong, obtuse to subacute, incurved or connivent; petals 0.7 mm, somewhat longer than the stamens; ovary ovoid, c. 0.7 x 0.5 mm; styles 0.55-0.65 mm long, divergent-recurved at the tips. Fruit 1.75-2 x 1-1.2 mm, ellipsoid, nearly equalling the sepals, though enclosed by them. Fl. 6-8. Rocky slopes, 1000-1500 m.
Type: SW Turkey: (Antalya): Lycia, Owadjik. 1.viii.1882, Luschan (holo. WU!).
Distr.: Endemic in SW Turkey.

Burder: Bucak, 1000 m, *P. B. Smith* 149 E); Isparta: Distr. Sütcülar, Cimen Ova on Sarp Dağ, 1500, *Davis* 15798 (E).

Resembling *P. kapela* (Hacq.) Kerner in the character of the divergent-recurved styles, but its rough-hairy leaves readily distinguish it from the former. Also resembling, to some extent, *P. davisii* Chaudhri, but in this case too the leaves form a good distinguishing character; moreover it has a rather compact habit, much shorter stems, and smaller glomerules and flowers.

65. **P. kayseriana** Chaudhri n. spec.

Plate IX, Fig. 18-22. p. 218

Herba perennis parva et compacta. Caules plus minusve prostrati, sine radicibus adventitiis, 5-13 cm longi, basi lignosi et hic dense ramificati, ramulis saepe dense congestis sed apicibus leviter divergentibus, profuse floriferis; internodia usque ad 8 mm longa, breviter puberula. Folia obovato-spathulata, 3-5 mm longa et 1.25-2.25 mm lata, obtusa, appresse pubescentia; stipulae lanceolatae, 2.5-4 mm longae, plerumque foliis breviores. Glomeruli profusi, ad apicem ramulorum congesti, 8-12 mm diam.; bracteae late oblongae, 5.5-6.5 mm longae et 4.0-4.5 mm latae, obtusae, flores omnino obtegentes. Flores 2.5 mm alti, appresse pubescentes; sepala aequalia, oblonga, obtusa; petala circ. 0.75 mm longa, staminibus longiora; antherae immaturae, pallidae; ovarium ovoideum, circ. 0.6 mm altum et 0.5 mm diam.; styli 0.8-1.0 mm longi, e basi erecta divergentes et recurvantes. Fructus maturus non visus. Florens mensibus 6 et 7.
Type: Turkey: Prov. Kayseri: Bakir Dağ, above Kisğe, 1400 m, 28.vi 1952, *Davis, Dodds, Çetik* D. 19299 (holo. K! iso. E!).
Distr.: Known only from a single gathering.
The taxonomic position of this species is obscure. It resembles *P. argyroloba* Stapf in its distinctly divergent and recurved styles, but

otherwise there is very little in common between the two. Even the styles are much longer in this sp. Moreover, adventitious roots which are quite conspicuous in *P. argyroloba,* are totally absent in this species. The leaves are softly adpressed pubescent, and not scabridulous (as is the case in *P. argyroloba*) particularly along the margin and on the under side.

From *P. condensata* Chaudhri, the other sp. of this subsection occurring in this region, it is distinguishable by its obovate-spathulate leaves, somewhat shorter stipules, larger, terminal glomerules, and longer, divergent- recurved styles. The imperfectly developed anthers suggest that it may be a species hybrid, but the two species which can be taken into consideration as possible parents, viz. *P. condensata* and *P. argyroloba* are geographically so far apart that hybridization seems almost excluded.

66. **P. davisii** Chaudhri in Acta Bot. Neerl. 15(1):197, f.2 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:256 (1967).

Plate X, Fig. 8-12. p. 228

A perennial herb, stems somewhat sprawling from a woody (and compact) base; adventitious roots absent; stems prostrate, branched from the woody base, 5-20 cm long, flowering branches longer than the non-floriferous ones and spreading, finely pubescent to puberulous, becoming ± glabrous in age. Leaves narrowly oblong to oblanceolate and recurved in younger stages to ± elliptic to obovate, 3-4 x 1.5-2 mm, and rather fleshy in the older part of the shoots, mostly obtuse, densely pilose and lustrous, the hairs being silvery-shining; stipules narrowly lanceolate, acuminate, shorter than the leaves. Glomerules terminal and distinct, 11-18 mm in diam.; bracts mostly oblong to rounded-orbicular, c. 6.5 x 4.5 mm, obtuse, concealing the flowers. Flowers 2.6 - 3.25 mm long, densely pilose-pubescent, hairs lustrous-shining; sepals ± equal, linear-oblong, with an obtuse to subobtuse and ciliate apex; petals 0.8-0.9 mm long, longer than the stamens; ovary c. 0.6 x 0.4-0.5 mm, conical-ovoid, with two erects styles (0.45-)0.5-0.55 mm long, tips of styles often divergent-recurved in age; fruit c. 2 x 1 mm, bottle-shaped, tapering upwards and almost equalling the sepals; seed c. 1.3 x 0.75 mm, almost oblong.

Fl. 7-8. Rocky slopes and screes, alt. ca. 2200-2300 m.

Type: SW Turkey: Vil. Antalya: Tahtali Dağ (Kemer), alt. 2200 m, 16.viii.1947, *P. H. Davis* 14121 (holo. E! iso. K!).

Distr.: Endemic.

Vil. Antalya: Tahtali Dağ, 2300 m, *Davis* 15042 (K).

Related to *P. angorensis* Chaudhri and *P. argyroloba* Stapf, but distinguishable from both by its lax habit, ± spreading flowering stems,

rather fleshy and elliptic to obovate (mature) leaves covered with a lustrous pubescence and by its bottle-shaped fruit with its thick tapering neck. In *P. angorensis* the stems are shorter and congested, the leaves smaller and narrower, the glomerules, too, smaller but very profuse and congested, the bracts broadly ovate to obliquely oblong and acute, the flowers 2-2.5 mm, the styles longer and erect and the fruit equalling the sepals and possessing a very short neck. *P. argyroloba* is readily distinguishable by its profuse adventitious roots (absent in *P. davisii),* subhirsute leaves, prominent stipules at the shoot tips, and by the strongly recurved styles (in *P. davisii* only the style tips are recurved).

67. **P. rechingeri** Chaudhri n. spec.

Plate IX, Fig. 6-10. p. 218

Herba perennis, radice perpendiculari lignoso instructa. Caules plus minusve prostrati, 10-25 cm longi, radicibus adventitiis brevioribus muniti, basi leviter contracti et hic lignosi, ramulis divergentibus, foliosis, puberulis vel subglabris. Folia elliptica vel obovata, interdum suborbicularia, 3-6 mm longa et 1.5-3 mm lata, acuta vel obtusa, ad basin abruptius contracta, utrimque glabra sed margine et apice pilis acroscopis robustioribus instructa; stipulae cuiusque folii duae, basi solum adnatae, lanceolatae, 2.5-4.5 mm longae, acutae, foliis plerumque breviores. Glomeruli profusi, ad apicem ramulorum congesti, 10-14 mm diam.; bracteae suborbiculares, usque ad 6.5 mm longae et 5.0 mm latae, obtusae, flores omnino obtegentes. Flores anguste ellipsoidei, 3.0-3.25 mm alti, basi in stipitem brevem attenuati; sepala aequalia, anguste oblonga, obtusa vel subobtusa, extus minute puberula vel subglabra sed margine et apice ciliolata, fortiter 3-nervia; petala 1.0-1.1 mm longa, brunneola; stamina filamentis 1.0 mm longis et antheris oblongis, 0.35-0.4 mm longis et 0.25 mm latis, luteo-aurantiis instructa; ovarium conicum, 0.75 mm altum et 0.6 mm diam.; styli duo, 0.75-0.9 mm longi, erecti. Fructus ovoideus, 1.75-2.0 mm altus et 1.5 mm diam., a sepalis inclusus.

Fl. 6-8. Stony places, alt. ca. 1800-2900 m.

Type: NE Greece: Macedonia orientalis: In monte Boz-Dagh, prope Serrai (Seres), alt. c. 1800 m, 15. vii, 1936, *K. H. & F. Rechinger* 10902 (holo. W!).

Distr.: Endemic in NE Greece.

Macedonia orientalis: In monte Pangaeon, *K. H. & F. Rechinger* 10245 (W); Pangaeon, W. of Kavalla, 1900 m, *J. D. A. Stainton* 7779 (K, W); Mt. Olympus: S. of Skala, 2600 m, *C. N. Goulimy* 215 (K); nr. Sholio, c. 2900 m, *J. Th. de Smidt* 246 (U).

This is a very interesting species, resembling *P. kapela* (Hacq.) Kerner in general appearance, but distinguishable by its very characteristic long

and erect styles instead of short and typically recurved as in *P. kapela*. The broad leaves are also a characteristic feature of this species.

68. **P. mughlaei** Chaudhri in Acta Bot. Neerl. (15(1):197, f. 14 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:256 (1967).

Plate XII, Fig. 13-17. p. 244

A perennial, laxly caespitose herb; stems much branched from the woody and rather compact base, 8-15 cm long, prostrate with rather inconspicuous adventitious roots, branches often spreading; internodes 5-10(-15) mm long, densely pilose to pubescent (hairs 0.3-0.5 mm long, dense and patent). Leaves ± obovate, 4-6 x 1.5-2.5 mm, obtuse, narrowed at the base, rather thick and densely adpressed pilose; stipules oblong-lanceolate, acute, often shorter than the leaves. Glomerules terminal, 10-12 mm in diam., profuse, usually distinct but occasionally congested; bracts 5-7 x 3-3.5 mm, broadly and obliquely ovate to oblong and concealing the flowers. Flowers 3-3.25 mm, ellipsoid-oblong, densely (adpressed) pilose-villous; sepals ± equal, narrowly oblong to somewhat spathulate-oblong, slightly broader at the obtuse, incurved and pilose apex, margin often inflexed, sepals connivent above; petals c. 1 mm long, somewhat longer than the stamens; ovary, ovoid, 0.7 x 0.6 mm; styles 0.7-0.75 mm long, erect. Fruit c. 2 x 1.3 mm, bottle shaped, tapering upwards, and nearly equalling the sepals. Fl. 5-8. Limestone rocks and screes, alt. ca. 1000-2150 m.

Type: WSW Turkey: Prov. Muğla, Muğla to Kale, 16 km from Muğla, 1250 m, 28.v.1962, *Dudley* D. 35084 (holo. E!).

Prov. Denizli: Boz Dağ ca. 1800-2150 m, *Davis* 13393 (E, U); Prov. Antalya: Akseki to Manavgat, 1000 m, *Demiriz* 4573 (ISTE); Burdur: 15 km E. of Salda Gölü, *F. Sorger* T-63-20-23 (Hb. Sorger, Linz); Prov. Içel/Seyhan: Bürücek, Kücük Kur, 1800 m, *E. K. Balls* 1345 (BM, E, K).

This species occupies a somewhat isolated position amongst the group related to *P. chionaea* Boiss.

69. **P. adalia** Chaudhri in Notes R.B.G. Edinburgh 28:28 (1967). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:261 (1967).

Plate XIII, Fig. 30-32. p. 254

A small, laxly caespitose perennial herb with a long, woody tap root; adventitious roots almost absent; stems prostrate to shortly ascending, c. 4-8 cm long, woody, much branched at the base, flowering shoots ascending and spreading; internodes short, 1-3 mm long, mostly finely puberulous. Leaves elliptic to obovate, up to 4.5 x 2 mm, obtuse or subobtuse, adpressed pubescent, closely arranged and recurved, sometimes very closely imbricate and ± ascending, mostly rather thick-fleshy; stipules lanceolate, slightly longer than the leaves. Glomerules

terminal, 5-8 mm in diam., rather inconspicuous; bracts broadly ovate to suborbicular, 3.5-4 x 2-3 mm, exceeding the flowers.
Flowers 2-2.5 mm long, ellipsoid, pilose to pubescent; sepals equal or subequal, the two outer ones slightly longer, narrowly oblong to almost narrowly elliptic, occasionally ± spathulate, obtuse or subobtuse and ciliate, the inner ones oblong, obtuse and concave, all incurved or connivent; anthers 0.3 x 0.2 mm, oblong, orange; styles 0.4 mm long, erect. Ripe fruit not seen.
Fl. 5-6. Stony slopes; alt. ca. 1000-1900 m.
Type: SW Turkey: Prov. and distr. Antalya, Susuzdağ, c. 1900 m, 28.v.1965, *F. Sorger T-63-35-34* (holo. Hb. Sorger, Linz).
Distr. Endemic in SW Turkey.
Prov. Kütahya: Distr. Kütahya, N. of Afyon, *F. Sorger* T-64-46-36 (Hb. Sorger) Prov. Antalya: Çevizli to Akseki, *H. Demiriz* 4546 (ISTE) Akseki to Manavgat, *id.* 4573 (ISTE); SW of Avlan Gölü, 80 km SW Antalya, c. 1000 m, *E. Hennipman* et *al.* 750 (K).
Bears some resemblance to *P. carica* Chaudhri, but is distinguishable by its smaller and rather inconspicuous glomerules (5-8 mm in diam), closely arranged and often recurved leaves, which are usually exceeded by the stipules. *P. carica,* moreover, possesses 3-3.5 mm long flowers, with unequal sepals, the outer ones (linear-oblong and acute) c. 0.5-0.75 mm longer than the innermost, whereas in *P. adalia* the flowers are 2-2.5 mm, the sepals equal or but slightly subequal, the outer two/three being only slightly longer than the inner ones. *P. adalia* differs from *P. mughlaei* in the characters of glomerules, leaves, stipules and sepals. *P. mughlaei* is, furthermore, characterized by densely pilose shoots, leaves and flowers, while *P. adalia* possesses finely puberulous shoots and shortly pubescent leaves.

70. **P. lycia** Chaudhri in Acta Bot. Neerl. 15(1):196, f. 3 (1966).
M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:259 (1967).

Plate X, Fig. 13-16. p. 228

A very small, compact, perennial herb; main root woody, long and almost unbranched, adventitious roots quite abundant; stems prostrate, 3-6 cm long, much branched from the base, branches caespitose, hirtellous (covered with short, patent hairs). Leaves elliptic-obovate, 3-5 x 1.5-2 mm, acute to ± obtuse, narrowed at the base, surfaces scabrous-pubescent (younger leaves scabridulous), margin hirtellous or subhirsute; stipules lanceolate, mostly shorter than the leaves. Glomerules terminal and profuse, 8-13 mm in diam., bracts 4-5 x 3-4 mm, suborbicular and concealing the flowers.
Flowers 2-2.5 mm long, oblong, adpressed pubescent to puberulous; sepals equal, oblong, rather thick, with an obtuse and prominently penicillate apex and a conspicuous, inflexed, membranous margin;

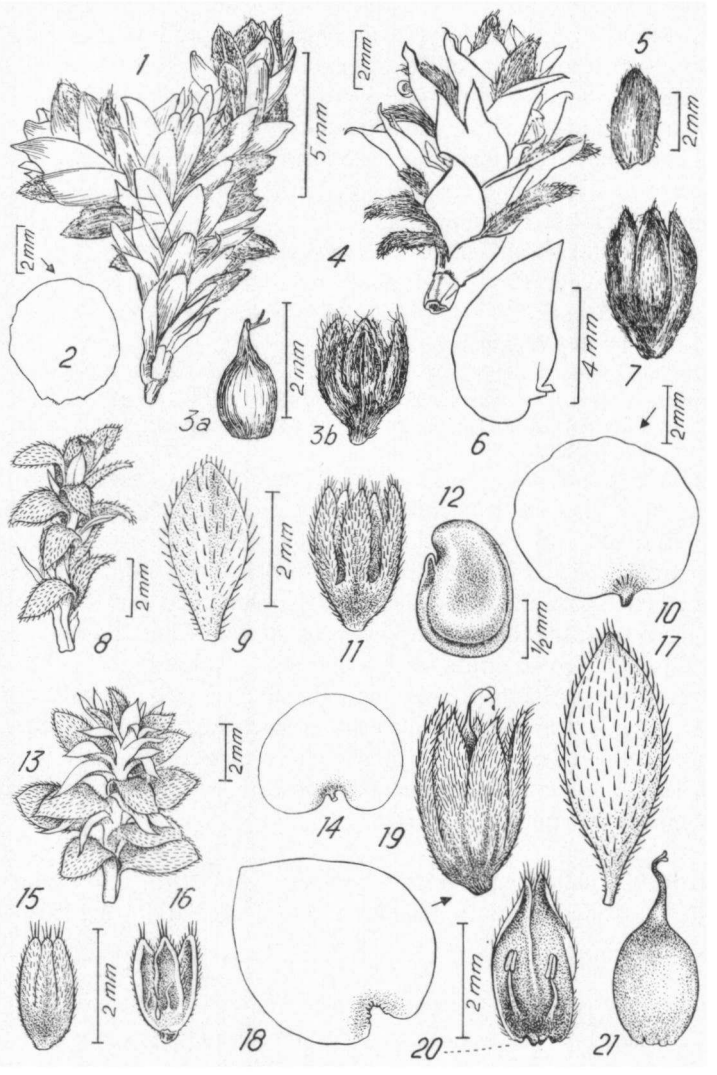

Plate X. Fig. 1-3: **P. sintenisii**; 1: shoot; 2: bract; 3: fruit and flower [*Sintenis* 418(LD)]. Fig. 4-7: **P. angorensis**; 4: shoot; 5: leaf; 6: bract; 7: flower [*Davis* 13103(U)]. Fig. 8-12: **P. davisii**; 8: shoot; 9: leaf; 10: bract; 11: flower; 12: seed [*Davis* 14121(E)]. Fig. 13-16: **P. lycica**; 13: shoot; 14: bract; 15: flower; 16: v.s. flower, inside view of the sepals [*Davis* 15389(E)]. Fig. 17-21: **P. kotschyana**; 17: leaf; 18: bract; 19: flower; 20: section of flower; 21: fruit [*Kotschy* 66(S)].

petals 1 mm long, ± equalling or slightly longer than the stamens; anthers 0.4 x 0.25 mm, orange; ovary ovoid, 0.6 x 0.5 mm, with two erect, 0.6-0.7 mm long styles. Fruit almost equalling the sepals.
Fl. 7-8. Rocks, alt. ca. 1700 m.
Type: SW Turkey: Prov. Antalya: distr. Lycia, Çalbali Dağ nr, Çukur Ardiç Yayla, alt. 1700 m, 15.vii.1949, *P. H. Davis* 15389 (holo. E!).
Distr.: Endemic.
Prov. Antalya: Tahtali Dağ: Cukur Ardiç Yayla, v.ii.1949, *A. Atilla* (ISTE),
The affinities of this species are uncertain. Slightly resembling *P. beauverdii* Czeczott (a species from northern Turkey) in the structure of the leaves, but the latter species lacks adventitious roots and possesses acute sepals, whereas in this species the sepals are obtuse. The two also differ in the form of bracts.
It occupies a somewhat isolated position among the group of species related to *P. chionaea.*

71. **P. beauverdii** Czeczott in Acta Soc. Bot. Pol. 9:35 (1932).
M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:260 (1967).

Plate XIII, Fig. 1-6. p. 254

A perennial herb with a woody tap root; adventitious roots absent; stems ± erect or ascending, c. 10 cm tall, woody and leafless at the base, rather sparsely branched, ± puberulous. Leaves narrowly elliptic to broadly oblanceolate, 3-5 x 1.5-2 mm, acute, narrowed to the base, mostly adpressed pubescent, slightly scabrous in the younger stages; stipules lanceolate, often somewhat shorter than the leaves (except at the shoot tips). Glomerules terminal and subterminal, 9-14 mm in diam.; bracts ± oblong to broadly ovate, 5 x 3.5 mm, acute, concealing the flowers.
Flowers 2.5-3 mm long, mostly puberulous to glabrescent, sometimes finely adpressed pubescent; sepals ± equal, narrowly oblong with an acute and stiffly penicillate-apiculate apex, and a conspicuous membranous margin, strongly 3-nerved; petals 0.75 mm long, slightly exceeding the stamens; ovary c. 0.75 x 0.45 mm, ovoid-conical; styles c. 0.7 mm long and erect, the tips divergent-recurved in the fruiting stage. Fruit 1.5-1.75 x 1-1.25 mm, ovoid-subglobose, nearly 2/3 as long as the sepals.
Fl. 6-8. Dry sloping pastures, 1000-1500 m.
Type: N. Turkey: (Prov. Çankiri) Galatia, supra oppidulum Arab. in graminosis siccis ad latera meridionalia montis Eldiven-Dagh, alt. ca. 1300 m, 17.vii.1925, *H. Czeczott* 440 (holo. WA, a fragment seen).
Distr.: Endemic in N. and C. Turkey.
Kastamonu/Cankirii Koçhisar nr. Ilgaz 1000 m, *J.* and *F. Bornmüller* 1929; 13924 (S); Sivas, Sivas, 1300-1500 m, vii.1934, *A. Rosenbohm* (HBG); Niğde: Fertek (?), 1300, vi.1913, *W. Siehe* 592 (E).

It resembles *P. galatica* Chaudhri in its leaf characters, but *P. galatica* possesses smaller and mostly (lateral-) axillary glomerules, densely pubescent flowers with subequal to unequal, lanceolate sepals with a sharply acute apex. In this species on the other hand, the glomerules are terminal and subterminal and larger, the flowers smaller, often puberulous or glabrescent, the sepals equal or very slightly unequal (i.e. ± equal), strongly 3-nerved, narrowly oblong, and rather abruptly acuminate and the apex, besides, being prominently penicillate-apiculate.

72. **P. amani** Chaudhri in Acta Bot. Neerl. 15(1):198, f.5 (1966).
M. N. Chaudhri in P. H. Davis, Flora or Turkey 2:257 (1967).

Plate XI, Fig. 1-4. p. 232

A perennial herb with a long and woody tap root; adventitious roots very short and inconspicuous; stems ± prostrate, densely caespitose, 7-15 cm long, much branched at the base; shoots densely leafy and knotty; internodes very short 1-2(-5) mm long, puberulous to almost glabrous and often concealed by the leaves and stipules. Leaves elliptic to, occasionally, spathulate, 2.5-4 x 1.5-2.25 mm, mostly obtuse, rather thick, carinate, much recurved, adpressed pubescent in the younger stages to finely puberulous or almost glabrous with age, often very closely arranged; stipules 4-5 mm long, lanceolate, distinctly longer than the leaves. Glomerules terminal and profuse, 10-17 mm in diam.; bracts 7-8 x 5-7 mm, broadly ovate to suborbicular, exceeding and concealing the flowers. Flowers (2-)3-3.25 mm long, ellipsoid-oblong, shortly adpressed pubescent to puberulous; sepals equal, narrowly oblong to lanceolate, acute, 3-nerved; petals 1-1.1 mm, slightly shorter than the filaments; anthers 0.45 x 0.25 mm, oblong and orange; ovary c. 1 x 0.5 mm, conical-ovoid; styles c. 0.8 mm long, erect. Fruit c. 2.5 (including the neck) x 1.5 mm, ellipsoid-oblong to bottle-shaped, tapering upwards, almost equalling the sepals; seed somewhat kidney-shaped, c. 1.6 x 1 mm. Fl. 5-8. Rocky places.
Type: Turkey ("Syria borealis"): Prov. Hatay: mons Amanus, region d'Hasan Veyli, ca. 1200-1800 m, vii.1908, *M. Haradjian* 2276 (as *P. kurdica* Boiss.) (holo. G! iso. W!).
Distr.: Scattered in Turkey; NW Syria.
a) **var. amani**: Flowers 3-3.25 mm long; sepals slightly exceeding the fruit.
Distr.: N., C., and S. Turkey and NW Syria.

Turkey: Prov. Sinop: Ayancik, /1952, *Ismail Akbas* (E); Prov. Kastamonu: Tosya, 20.v.1892, *P. Sintenis* 3947 bis (mixed with *P. anatolica* and *P. kurdica*) (JE); Prov. Bursa, Uludağ, Karçukuru, 2.viii.1944, *M. Başarman* (ISTE) (mte, Olympo), vii.1873, *Pichler* 86 (G-B); Prov. Kirşehir: Bozcali Dağ, NW of Kirşehir, 1500 m, *F. Sorger* T-64-20-37 (Hb. Sorger, Linz); Prov. Kayseri: Kayseri,

vii.1941, *Heilbronn and Başarman* (G); Prov. Isparta: nr. Isparta, /1938, *Heilbronn* (ISTE). Syria: Amanus Mts.: Ascent to Achagi Zarkoun from Karakisieh, 1500-1800 m, 30.vi.1942, *A. Eig* and *M. Zohary* (HUJ).

b) **var. minutiflora** Chaudhri n. var. a var. *amani* floribus 2 mm altis, fructu sepalis aequilongo distinguenda. Flowers 2 mm long; fruit equalling the sepals.

Type: Turkey: Prov: Sivas, v-vii,1894(?), *Pére Gerard de Cêsarée* (holo. G!).

Distr.: Endemic, known only from the type locality.

Related to *P. chionaea* Boiss., but differing in the characters of leaves, stipules and sepals. The leaves in this species are carinate and strongly recurved, the stipules much longer than the leaves, and the sepals distinctly acute; in *P. chionaea,* on the other hand, the leaves are recurved and not carinate, the stipules in the older part of the stems equalling the leaves or somewhat shorter, and the sepals have an obtuse apex.

73. **P. turcica** Chaudhri in Acta Bot. Neerl. 15(1):195, f.9 (1966). M. N. Chaudhri in P. H. Davis, Fl. of Turkey 2:257 (1967).

Plate XI, Fig. 13-16. p. 232

A small perennial herb, tap root woody and long; adventitious roots absent; stems woody at the base, prostrate, 8-14 cm long; shoots densely leafy and profusely floriferous; internodes very short, 1-2 mm long, finely puberulous, mostly concealed by the leaves and stipules. Leaves elliptic to ± obovate, 3-3.5 x 2 mm, obtuse, thick, closely approximated, finely adpressed pubescent to puberulous; margin ciliate; stipules lanceolate, 5-6 mm long, exceeding the leaves. Glomerules terminal, 13-18 mm in diam, very profuse and congested; bracts broadly ovate to almost oblong, 7-8 x 3-4 mm, acute, concealing the flowers. Flowers 2.75-3 mm long, prolate, adpressed pubescent to occasionally puberulous; sepals equal, thickish, oblong (up to 1 mm broad), obtuse and incurved at the apex; petals 0.75 mm long, slightly shorter than the stamens; anthers 0.45 x 0.25 mm, oblong and orange; ovary ovoid, c. 0.6 x 0.5 mm; styles c. 1 mm long, erect. Fruit 1.5-1.75 x 1.25 mm, ovoid, about 1/2 as long as the sepals.

Fl. 6-8. Alt. 3000 m.

Type: E. Turkey: Prov. Bitlis/Van: mt. SE of Pelli by 10 km, alt. 3000 m, 8.vii.1954, *Davis* and *O. Polunin* D. 22565 (holo. E!).

Distr.: Endemic in E. Turkey; known only from a single gathering. Affinities obscure.

74. **P. cataonica** Chaudhri in Acta Bot. Neerl. 15(1):195, f.7 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:258 (1967).

Plate XI, Fig. 10-12. p. 232

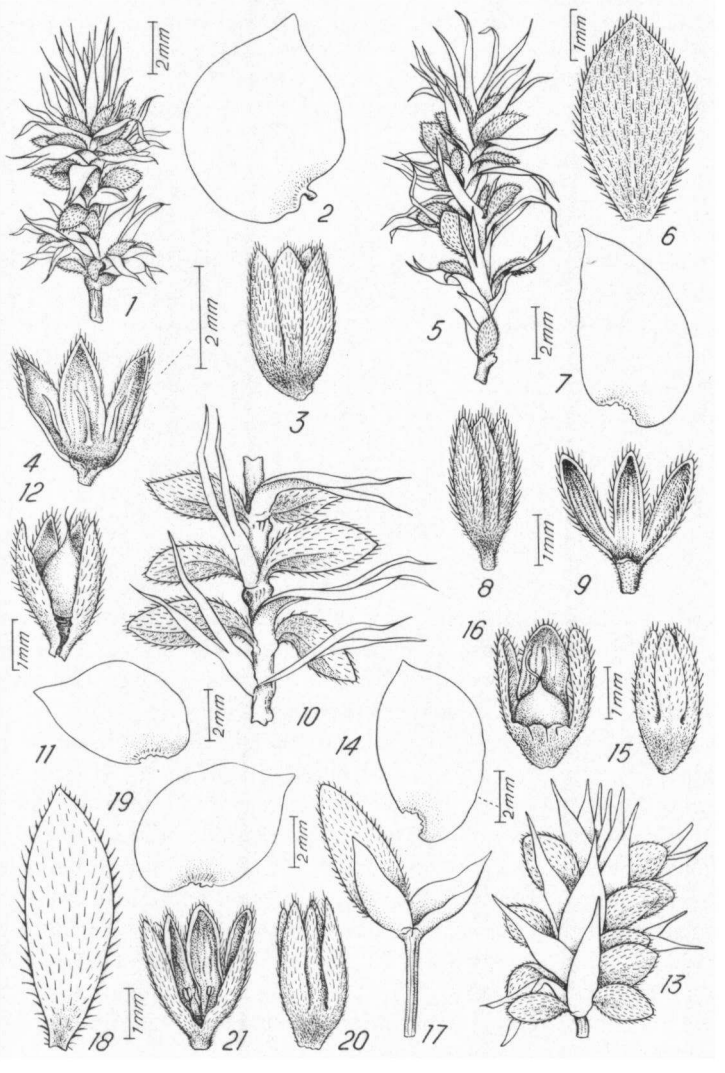

Plate XI. Fig. 1-4: **P. amani;** 1: shoot; 2: bract; 3: flower; 4: section of flower showing the inner side of the sepals [*Haradjian* 2276(G)]. Fig. 5-9: **P. chionaea** Boiss. subsp. **kemaliya**; 5: shoot; 6: leaf; 7: bract; 8: flower; 9: section of flower, inside view of the sepals [*Sintenis* 2495(LD)]. Fig. 10-12: **P. cataonica;** 10: shoot; 11: bract; 12: flower (dissected) [*Stainton & Henderson* 5489(U)]. Fig. 13-16: **P. turcica;** 13: shoot; 14: bract; 15: flower; 16: v.s. flower [*Davis & Polunin* D. 22565(E)]. Fig. 17-21: **P. paphlagonica;** 17: a part of shoot; 18: leaf; 19: bract; 20: flower; 21: flower dissected [*Davis* 21774a(E)].

A perennial herb with a woody base and a long woody tap root; adventitious roots absent; stems c. 7-14 cm long, prostrate, much branched, the branches densely tufted and very profusely floriferous and shortly pubescent to puberulous. Leaves 3-4.5 x 1.5-2 mm, elliptic-obovate to ± oblong, subacute to subobtuse, fleshy, densely adpressed pubescent; stipules 4-5.5 mm long, lanceolate, exceeding the leaves, rather pale, and often split almost to the base. Glomerules terminal, subterminal and axillary, 8-12 mm in diam., very abundant and densely congested, nearly obscuring the other parts; bracts broadly and obliquely ovate, 5-6 x 3-3.5 mm, mostly concealing the flowers. Flowers 3-3.25 mm, ± oblong, pilose to pubescent; sepals ± equal, narrowly oblong, obtuse to subobtuse (-subacute), fleshy; petals c. 0.9 mm, somewhat shorter than the stamens; filaments c. 1 mm; anthers 0.4 x 0.25 mm, oblong and orange; ovary c. 0.6 x 0.4 mm, ovoid; styles 0.65-0.75 mm, erect. Fruit c. 2 x 1 mm, ellipsoid to somewhat bottle-shaped, i.e. tapering upwards into a rather thick neck, almost equalling the sepals; seed c. 1.5 x 1 mm. ovoid. Fl. 5-7. Barren stony slopes and calcareous waste grounds, alt. 1100-1400 m.

Type: Turkey: Prov. Malatya: Malatya to Maraş, 70 km from Malatya, alt. c. 1400 m, 9.vi.1960, *Stainton* and *Henderson* 5489 (holo. U! iso. E!).

Distr.: Endemic in the provinces of Malatya and Elaziğ.

Prov. Malatya: Gürün to Darende, 100 m, *Davis* 21937 (E); Prov. Elaziğ: 40 km SW of Elaziğ, 1200 m, *E. Hennipman* et *al.* 1460 (K, U).

Bears a superficial resemblance to *P. dudleyi* Chaudhri, especially in habit and general aspect, but differs in having rather fleshy, elliptic-obovate leaves on the older part of the stems, stipules exceeding the leaves, flowers densely pilose to pubescent and having ± equal, fleshy, oblong, obtuse, to subobtuse sepals, equalling the fruit or only slightly exceeding it; *P. dudleyi,* on the other hand, possesses narrowly oblong to oblanceolate and often recurved leaves, stipules equalling or somewhat shorter than the leaves, shortly adpressed pubescent flowers, sepals lanceolate, sharply acute and subequal to unequal in age, and a fruit which is shorter than the sepals.

75. **P. condensata** Chaudhri in Acta Bot. Neerl. 15(1):199, f.11 (1966).
M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:259 (1967).

Plate XII, Fig. 1-4. p. 244

A pulvinate herb with a woody, much-branched tap root; adventitious roots absent; stems woody at the base, prostrate, much branched, the branches densely intertwined and profusely floriferous; internodes rather short, 2-6 mm long, shortly pubescent or puberulous. Leaves ± oblong to narrowly elliptic, sometimes obovate-spathulate, 2-3(-4) x

1-1.5(-2) mm, ± obtuse, often adpressed pubescent, occasionally somewhat scabrous; stipules 3-4 mm long, lanceolate, longer than the leaves and very conspicuous. Glomerules lateral and terminal, 5-8 mm in diam., very profuse and congested; bracts 4-5.5 x 3-4 mm, broadly ovate to almost orbicular, acute, twice as long as the flowers. Flowers 2-2.5 mm long, oblong, adpressed pubescent; sepals equal, oblong, obtuse to subobtuse; petals 0.75-0.8 mm; filaments 0.6 mm and anthers 0.4 x 0.2 mm; overy ovoid, c. 0.5 x 0.4 mm; styles 0.6-0.7 mm long, erect with the tips somewhat divergent. Fruit c. 1.75 x 1.25 mm, ellipsoid-oblong, ± equalling the sepals.

Fl. 5-7. Chalky slopes and steppes, 1100-1400 m.

Type: Turkey: Prov. Niğde; Niğde, alt. 1100 m, 6-7.vi.1897, *W. Siehe* 83 (as *P. argyroloba* Stapf) (holo. JE! iso. G! WU!).

Nevşehir: Ürgüp to Akköy, 1400 m, *Coode* and *Jones* 1304 (E); SE of Ürgüp, Nevşehir-Kayseri road, *F. Sorger* T-64-32-60 (Hb. Sorger, Linz!).

Related to *P. anatolica* Czeczott and to *P. angorensis* Chaudhri, but readily distinguishable by its pulvinate habit, very profuse glomerules and conspicuous stipules. *P. anatolica,* moreover, possesses distinctly subequal and acute sepals in rather larger flowers, larger glomerules and bracts, and often obovate-spathulate or oblanceolate leaves, quite unlike the present species. *P. angorensis* is characterized by strongly recurved leaves which are often somewhat longer than the stipules, terminal glomerules and obliquely oblong to rounded bracts. In this species, on the other hand, the leaves are mostly not recurved, the stipules generally longer than the leaves, the glomerules mostly lateral and terminal and the bracts often broadly ovate and acute. The three spp. are geographically much apart from each other.

76. **P. saxatilis** Chaudhri n. spec.

Plate IX, Fig. 11-17. p. 218

Herba perennis parva. Caules basi dense congesti, primum leviter ascendentes vel fere prostrati, deinde semper prostrati, lignosi et efoliati, sine radicibus adventitiis; ramuli juniores leviter ascendentes, breviores (2-4 cm longi), foliosi et in glomerulos magnos exeuntes; internodia usque ad 4 mm longa sed plerumque multo breviora, parce puberula vel glabra. Folia saepe leviter ascendentia, obovato-spathulata vel suboblonga, usque ad 3.25 mm longa et 1.40 mm lata, subobtusa, plerumque carnosiora, leviter carinata, utrimque parce puberula vel subglabra, margine minute ciliolata; stipulae cuiusque folii duae, saepe usque ad medium connatae, ovato-lanceolatae, 1.5-3.5 mm longae, acuminatae, foliis plus minusve aequilongae vel rarius eis paulo longiores. Glomeruli terminales, globosi, 8-14 mm diam., e floribus plurimis compositi; bracteae plerumque suborbiculares et circ. 5 mm longae et latae, interdum tamen

suboblongae, casu quo circ. 5.5 mm longae et 4 mm latae, flores omnino obtegentes. Flores anguste ellipsoidei, 2.0-2.25 mm alti, parce puberuli; sepala aequalia, suboblonga, obtusa, margine ciliolata, fortiter 3-nervia; petala 0.5 mm longa, staminibus breviora; stamina filamentis 0.7 mm longis et antheris oblongis, 0.3 mm longis et 0.2 mm latis, luteo-aurantiis instructa; ovarium ovoideum, 0.65 mm altum et 0.55 mm diam.; styli duo, 0.55 mm longi, erecti vel paulo divergentes. Fructus subglobosus, 1.4 mm altus et 1.25 mm diam., sepalorum apices plus minusve attingens.

Fl. and ft. 7. Rocky limestone slopes, alt. ca. 3200 m.

Type: E. Turkey: Prov. Van. distr. Baskale: Ispiriz Dağ, 3200 m, dry rocky S. slope (limestone), 31.vii.1954, *Davis & O. Polunin* 23702 (holo. K!).

Distr.: Endemic in E. Turkey.

The affinities of this species are obscure. The only other species of this section occurring in this region, viz. *P. turcica* Chaudhri, differs considerably from this species in having somewhat larger, pubescent leaves, longer stipules (much exceeding the leaves), larger bracts and flowers, and a fruit which is nearly half as long as the sepals. In this species, the leaves are smaller in size and puberulous, the stipules, mostly equalling the leaves, the bracts orbicular and smaller, flowers too smaller and the sepals ± equalling the fruit.

77. **P. angorensis** Chaudhri in Acta Bot. Neerl. 15(1):195, f.12 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:259 (1967).

Plate X, Fig. 4-7. p. 228

A small, compact, perennial herb, with a woody, long and almost unbranched tap root; adventitious roots absent; stem strongly lignified at the base, prostrate to shortly ascending, c. 6-8 cm long, much branched, densely caespitose, all shoots densely leafy, finely (ciliate-) puberulous. Leaves 2-4.5(-6) x 1-1.5 mm, narrowly oblong to oblanceolate, mostly ± obtuse, shortly adpressed pubescent, and much recurved; stipules lanceolate, almost equalling or somewhat shorter than the leaves. Glomerules terminal, very profuse and crowded, 5-10 mm in diam.; bracts 4-5 x 3-3.5 mm, obliquely oblong to almost orbicular, acute, usually concealing the flowers. Flowers 2-2.5(-2.75) mm long, ellipsoid-oblong, adpressed pubescent; sepals mostly ± equal (occasionally subequal), narrowly oblong with obtuse to subobtuse and ciliate apex; petals 1-1.2 mm, slightly exceeding the stamens; anthers oblong, 0.4 x 0.25 mm and orange; ovary c. 0.65 x 0.45 mm, ovoid-conical; styles c. 0.7 mm long, erect. Fruit c. 2 x 1.4 mm, ovoid-oblong, and equalling the sepals, styles somewhat exserted at maturity.

Fl. 6-7. Shaley slopes and mountain steppes; alt. ca. 1100-1900 m.

Type: Turkey: Vilayet Ankara: Beynam, 5.vii.1947, *P. H. Davis* 13103 (holo. U! iso. E!).

Vil. Ankara: Beynam, 23.vi.1951, *M. J. A. de Koster* et *al.* (U); Vil. Kütahya: Gediz to Kütahya, 11 m, *H. Demiriz* 2113 (ISTE); Murat Dağ, above Gediz, 1900 m, *Davis & Coode D.* 36806 (E).
Distr.: Endemic.
Related to *P. davisii* Chaudhri, but readily distinguishable by its very densely caespitose shoots, smaller and strongly recurved leaves, smaller, very profuse glomerules, considerably smaller flowers, erect styles, and finally by its fruit being as long as the sepals (and not completely enclosed by them, as is the case in *P. davisii*).

78. **P. sintenisii** Chaudhri in Acta Bot. Neerl. 15(1):196, f.13 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:256) (1967).

Plate X, Fig. 1-3. p. 228

A small perennial herb with a woody caudex; adventitious roots rather short; stems 4-10 cm long, prostrate, densely compact and caespitose, often with a leafless and subterranean basal part, densely leafy above and densely covered with closely imbricated leaves and stipules; internodes quite short, 1-3 mm long, finely puberulous to glabrous, usually concealed by the leaves and stipules in the upper part. Leaves spathulate to narrowly obovate, 3-4 x 1-1.5 mm, narrowed to the base, obtuse, densely imbricate and ± ascending, adpressed pubescent; stipules narrowly oblong, equalling to slightly exceeding the leaves, and very conspicuous. Glomerules 7-9 mm in diam., terminal, profuse and congested; bracts orbicular, 4x 4 mm, concealing the flowers. Flowers 2-2.5 mm long, prolate, densely pilose-pubescent; sepals equal, oblong, with an obtuse and penicillate apex; petals 1 mm long, slightly longer than the stamens; ovary ovoid to conical, 0.75 x 0.5 mm, with two, erect, 0.5-0.6 mm long styles. Fruit 1.5 x 1.25 mm, ellipsoid to bottle-shaped, tapering upwards, equalling the sepals; styles often exserted at maturity. Fl. 7-8. Rocky places.
Type: W. Turkey: Prov. Balikesir: Mt. Ida, 1.viii.1883, *P. Sintenis* 418a (holo. LD! iso. E! G! W!).
Distr.: Endemic in NW Turkey.
Related to *P. chionaea* Boiss., but differing in its general aspect in addition to a number of other characters, particularly in its quite short stems, mostly densely covered with closely imbricated and ascending leaves and stipules, the latter being the more conspicuous of the two; in *P. chionaea,* on the other hand, the leaves are often much recurved and larger. The two also differ in the nature of the bracts, glomerules, sepals and fruits. In this species the bracts are orbicular and rather small, the glomerules also quite small, c. 7-9 mm in diam., the sepals have a prominently penicillate apex and the fruit equals the sepals. In *P. chionaea* the bracts are broadly ovate to almost oblong and larger, the glomerules much bigger, 10-15 mm in diam., the sepal apex

generally not penicillate and the fruit often enclosed by the sepals.

79. **P. chionaea** Boiss., Diagn. 1(3):9 (1843).

Kerner in Österr. Bot. Zeitschr. 27:19 (1877); Gürke in Richter-Gürke, Pl. Europ. 2(2):184 (1899); Dinsmore in Post, Fl, Syr., Pal. & Sinai 1:212 (1932); J. Bornmüller, Symb. Fl. Anatol., Feddes Repert. Beih. 89 (1):119 (1940); M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:258 (1967).

Syn.: *P. serpyllifolia* DC. var. *bithynica* Griseb., Spicil. Fl. Rum. Bithyn 215 (1843). *P. kapela* (Hacq.) Kerner subsp. *chionaea* (Boiss.) Borhidi in Feddes Repert 69:53 (1964). A. O. Chater in Tutin et al. Fl. Europ. 1:150 (1964).

Misapplied name: *P. capitata* sensu Boiss., Fl. Or. 1:743 (1867) p.p., et auct. al., non (L) Lam. Fl. Fr. 3:229 (1778) nec DC. in Poiret, Encycl. 5:25 (1804).

Plate IX, Fig. 1-5. p. 218

A small perennial herb forming small mats; adventitious roots usually quite conspicuous; stems prostrate, c. 5-10(-15) cm long, often very congested, very rarely spreading, branched from the woody base, often very leafy, internodes mostly short and shortly pubescent to puberulous. Leaves often ± spathulate-obovate, 3-5(-6) x 1.5-2(-3) mm, ± obtuse, adpressed pubescent to almost puberulous, rather thick, often strongly recurved and turning golden with age; stipules lanceolate, usually almost equalling the leaves or somewhat shorter in the older (basal) part of the stems, very occasionally ± exceeding them. Glomerules 10-15(-18) mm in diam.; bracts obliquely oblong (6-9 x 4 mm) to broadly ovate (6 x 4-5 mm) or suborbicular, c. twice as large as the flowers and concealing them. Flowers 2.5-3.5(-3.75) mm long, densely adpressed pubescent, sepals equal, narrowly oblong, obtuse, incurved at the apex; petals 0.8-1.25 mm long, equalling to exceeding the stamens; filaments 0.7-1 mm, anthers 0.4 x 0.25 mm; ovary 0.75 x 0.5 mm, conical-ovoid, tapering upwards, styles 0.6-0.7 mm long and erect. Fruits c. 2 x 1.25 mm, ellipsoid-oblong, almost equalling the sepals.

Fruit c. 2 x 1.25 mm, ellipsoid-oblong almost equalling the sepals. Fl. 6-8. Rocky places, alt. ca. 950-2800 m.

1a) stems compact and caespitose; leaves spathulate-obovate and recurved; stipules mostly somewhat shorter than the leaves; sepals obtuse ..... ssp. **chionaea**

1b) stems spreading; leaves obovate to elliptic, not recurved; stipules ± exceeding the leaves; sepals ± acute ..... ssp. **kemaliya**

A) subsp. **chionaea**: a) var. **chionaea**: stems densely caespitose; leaves spathulate-obovate, much recurved; stipules almost equalling or somewhat shorter than the leaves in the older (basal) part of the stems;

bracts obliquely oblong or broadly ovate; flowers 2.5-3.5(-3.75) mm long, densely adpressed pubescent; sepals narrowly oblong and obtuse Type: W. Turkey (Bursa): In regione alpina montium Anatoliae, Olym po Bithyno; (**Manisa**) Sipylo supra Magnesiam, vi. 1846, *E. Boissier* (Lecto.-holo. G.-B!).

Distr.: Throughout the range of the sp. except in E. Turkey.

Turkey: Vil. Bolu: Bolu-Abant, vii.1954, *Metin Bara & Ayhan Soyerman* (ISTE); Vil. Amasya: Ak Dağ, nr. Amasya, 1800-1900 m, *J. Bornmüller* 1889: 1061 b (JE); Vil. Canakkale: Mt. Ida (Kaz Dağı), mt. Kopu Dağ, *Sintenis* 1883: 418 (G, LD); Vil. Kütahya: nr. Emet, 1100 m, *Davis & Coode D.* 36531 (E, K); Gediz to Cavdarhisar, *Davis & Coode* D. 36990 (E, K); Kütahya to Gediz, *Demiriz* 1809 and 1813 (ISTE); Vil. Afyon Karahisar/Konya: Sultan Dağ, 3.vi.1935, *Erik Wall* (S); Aksehir: *Bornm.* 1899:4495, 4496 (G, JE, S); Vil. Denizli: Usak to Civril, *Demiriz* 1839 (ISTE); Denizli to Acipayam Pass, 1200 m, *Demiriz* 1859 (ISTE); Suleymanlar, *Davis* 13465 (E, K, U); Vil. Muğla: Sandras Dağ, nr. Gökçe Ova, 1700 m, *Davis* 13522 (E, K, U); Vil. Isparta: Dedagöl Dağ 220 m, *Davis* 16004 (E, U) and 16042 (E, K); W. of Beysehir Göl, *Sorger* T-65-43-12 (Hb. Sorger, Linz); Vil, Burdur: Burdur to Bucak, c. 1300 m, *Demiriz* 3667 (ISTE) Vil. Antalya: Kemer: Tahtali Dağ, 2300 m, *Davis* 15052 (E); Gebiz, Bozburun Dağ, *Davis* 15568 (E, K); Antalaya, Gömbe, *Sorger* T-63-28-63 (Hb. Sorger, Linz); Vil. Niğde, AlaDağ, *Gibson* UT 163 (E); Bulghar Dağ, Gyzii Tepe, *Kotschy* 219a (G) Vil. Maras: Berit Dağ, 2800 m, *Davis Dodds & Cetik D.* 20355 (E, U). **Greece:** Insula Samos, *Forsyth Major* 398 (G, Z); **Albania/Yugoslavia:** Gjalica, 2200-2300 m, *F. Lempberg* 333 (E); Stogowo Planina, *id.* 735 (E).

b) var. **latifolia** Chaudhri n. var. a. var. *chionaea* foliis majoribus et imprimis latioribus, glomerulis majoribus (usque ad 18 mm diam.) distinguenda. Glomerules up to 18 mm in diam. and leaves up to 7 x 3.5 mm.

Differs from the rest in having distinctly larger glomerules and larger and especially broader leaves.

Type: Vil. Adana: (Turkey): Distr. Feke: Bakir Dağ, Sencan dere, 1800 m, *Davis, Dodds, Çetik* D. 19397 (U; iso. E!).

Endemic.

B) subsp. **kemaliya** (Chaudhri) Chaudhri stat. nov.:
P. kemaliya Chaudhri in Acta Bot. Neerl. 15(1):199, f.4 (1966); M. N. Chaudhri in P. H. Davis, Flora of Turkey, 2:258 (1967).

Plate XI, Fig. 5-9. p. 232

Procumbent herb with long and conspicuous adventitious roots; shoots spreading; leaves obovate to elliptic, 3-6 x 1.5-2.5 mm, acute to ± obtuse, adpressed pubescent, with well-marked veins; stipules lanceolate, 4-6.5 mm long, somewhat exceeding the leaves, often deeply split, almost 2-partite; glomerules terminal and profuse, 12-15 mm in diam., bracts up to 7 x 5 mm, broadly and obliquely ovate to almost rounded; flowers 3-3.5 mm, shortly pubescent to puberulous; sepals equal, narrowly oblong, acute to subacute, strongly 3-nerved.

Fl. 6-7. Rocks.

Type: Turkey: Vil. Erzincan: nr. Kemaliye (Egin), Jokardidagh, 6.vi. 1890, *P. Sintenis 2495* (holo. LD! iso. G! JE! Z!).
Distr.: Endemic.
Differs from the subsp. *chionaea* in having a lax habit, obovate to elliptic (not spathulate) leaves, longer, pale and deeply split stipules often ± exceeding the leaves, and sepals with an acute to subacute apex.
Range of the species: Turkey and parts of S. Balkan.
The lectotype is not quite representative of the main population. The flowers are usually less than 3.5 mm long (mostly 2.5-3.25 mm) whereas in the type they are 3.5-3.75 mm long. The leaves and the glomerules, too, are somewhat larger in the type than in the rest of the population. It is interesting to note that plants from North-Central Turkey (Bornmüller 1061b, 4495, 4496) have undeveloped anthers and may well represent apomictic populations. They occasionally show somewhat subequal sepals.

80. **P. taurica** Borhidi et Sikura in Acta Bot. Acad. Sc. Hung. 7:3 (1961).
A. O. Chater in Tutin et al. Fl. Europ. 1:150 (1964); A. Borhihi in Acta Bot. Acad. Sc. Hung. 12:38 (1966).
A perennial herb with a woody and compact base, adventitious roots often quite distinct; stems 5-22 cm long, prostrate to somewhat ascending, usually leafless and short-jointed towards the base; flowering shoots often somewhat longer than the sterile ones, and usually spreading, very occasionally the branches almost caespitose; internodes of the flowering stems up to 1 cm long, shortly pubescent and more or less glabrescent with age. Leaves narrowly elliptic to narrowly oblong, 3-6(-7) x 1-2 mm, mostly obtuse, finely ciliate or adpressed pubescent and gradually glabrescent and recurved in age; stipules lanceolate, often 2-fid, shorter than the leaves. Glomerules terminal and often quite distinct, 13-20 mm in diam., globose, occasionally congested, bracts broadly oval-oblong (and up to 9 x 5.5 mm) to orbicular (and c. 6 x 6 mm), obtuse to acute, much exceeding and concealing the flowers. Flowers 3-3.5 mm long, tubular-oblong, slightly narrowed at the base, shortly adpressed pubescent; sepals equal, linear-oblong to lanceloate, mostly subobtuse and incurved at the apex; petals 0.75 mm long, filaments 1 mm long; anthers 0.35 x 0.25 mm and orange-yellow; ovary 1 x 0.75 mm, conical-ovoid, narrowed upwards; styles two, 0.75-0.8 mm long, nearly equalling the ovary and erect; fruit ovoid-suboblong, 2 x 1.5 mm, tapering upwards and enclosed by the sepals.
Fl. 6-8. Rocky places, alt. ca. 330-1200 m.
Type: (U.S.S.R.) Ukraine: Crimea: Tauria, Montes Ai-Petri, supra opp. Mischor, alt. 1200 m, *Borhidi* et *Sikura* (holo. BUD, not seen).
Distr.: Crimean Peninsula and N. Turkey.

a) var. **taurica**: Bracts oval-oblong, ± acute and rather large.
Crimea: Montes Jaila: Chatyr Dagh nr. Alusta 1000 m, 18.ii.1961, *R. Moldvai* (BUD); Montes Ai-Petri, 20.vii.1929, *W. Wassiljev* (Z); Krasnij Kamen, 12 km NNE of Yalta, 1200 m, 8.viii.1964, *A. O. Chater* 94 (E); **Turkey:** Yozgat: Yozgat, vi.1960, *E. W. Curtis* 208 (E) (trans. form, contains both forms of bracts).
b. var. **orbicularis** Chaudhri n. var. a var. *taurica* bracteis minoribus et pro rato latioribus (6 mm longis et 6 mm latis), apice obtusis vel rotundatis distinguenda. Bracts c. 6 x 6 mm, orbicular with a rounded or obtuse apex.
Crimea: Southern coast: Kikineis, vi.1883, *M. Wetschky* (W); Simferopol: "Berge bei Neusatz", 10.vi.1895, *A. Callier* 54 (BUD, JE, W, Z); nr. Simferopol, 330 m, *P. H. Davis* 33565 (E; isotype K).

Note: Borhidi's var. *wulffiana*, described as possessing 1.5-2 mm long flowers, most probably belongs to *P. pantica* (Borh.) Chaudh. The type, unluckily, could not be seen.

81. **P. kotschyana** Chaudhri in Acta Bot. Neerl. 15(1):198, f.1 (1966). M. N. Chaudhri, in P. H. Davis, Flora of Turkey 2:257 (1967).

Plate X, Fig. 17-21. p. 228

A perennial herb with a woody and much-branched tap root; adventitious roots often quite conspicuous; stems 10-20 cm long, prostrate, much-branched from the compact and woody base, and the branches somewhat spreading, usually with closely imbricated leaves and stipules; internodes quite short and puberulous to almost glabrous in age. Leaves obovate to almost elliptic, sometimes oblanceolate, 4-6 x 1.5-2.5 mm, narrowed at the base, subacute to obtuse, fleshy, closely imbricate, mostly somewhat ascending, pilose to densely pubescent; stipules 4-5 mm long, narrowly ovate to nearly oblong, somewhat shorter than the leaves. Glomerules terminal and usually distinct, 14-19 mm (mostly 15-16 mm) in diam.; bracts broadly and obliquely ovate to ± oblong, 7-9 x 6-7 mm, much larger than the flowers and concealing them. Flowers c. 3.5 mm long, ellipsoid-oblong, pilose to densely adpressed pubescent; sepals equal, narrowly ovate to lanceolate, sharply acute, and strongly 3-nerved, occasionally somewhat broader and 5-nerved; petals 1.25-1.3 mm long, equalling to slightly exceeding the stamens; anthers oblong, 0.45 x 0.25 mm, and orange-brown; ovary ovoid to conical, c. 1 x 0.6 mm, styles c. 0.6 mm, erect. Fruit c. 2 x 1.4 mm (excluding the neck), bottle-shaped, tapering upwards to c. 0.75 mm long neck, equalling the sepals, the styles often exserted at maturity. Fl. 6-7. Calcareous rocks, alt. ca. 700-1800 m.
Type: Turkey ("Syria borealis): Vil. Hatay: mt. Amanus, prope Beilan, alt. 700 m, 23.vi.1862, *Th. Kotschy* 66 (as *P. chionaea* Boiss.) (holo. S! iso. C! JE! L!).
Distr.: Endemic. Amanus and Cassius Mts. and NW Syria.

Vil. Hatay: mt. Cassius, v.vii.1846, *Ed. Boissier* (G) (as *P. chionaea* Boiss.): mt. Cassius, 1300-1800 m, *M. Haradjian* 3136 (E, G, S, W); mt. Amanus, ca. 700 mm, *Th. Kotschy* 66 (C, JE, L, S) TYPE. "Syria" (probably Amanus Mts.), /1787, *Labillardière* (G); NW Syria: J. Ansarieh: Nebi Younès above Slenfe, 1370 m, *G. Samuelsson* 5806 (S).

There is some variation in the relative lengths of the petals and the stamens. Plants from the Amanus range have the petals somewhat longer than the stamens, whereas those from the Cassius range possess filaments which are slightly longer than the petals and rather larger anthers and glomerules. The Syrian plants from J. Ansarieh possess somewhat broader sepals, often 2.6-2.7 mm long and 1-1.2 mm broad, and usually almost inconspicuous adventitious roots.

This species is related to and has often been confused with *P. chionaea* Boiss., but the resemblance is only superficial. It has longer, often spreading stems, covered with closely imbricated leaves and stipules; the leaves are fleshy and ascending, whereas in *P. chionaea* they are usually much recurved and smaller; the bracts are much larger in this species; the sepals are lanceolate and sharply acute, while in *P. chionaea* they are narrowly oblong and obtuse; the fruit is bottle-shaped in *P. kotschyana,* with a long neck and with exserted styles, in *P. chionaea* on the other hand, it is ovoid, and enclosed by the sepals.

82. **P. pontica** (Borhidi) Chaudhri comb. et stat. nov.

P. cephalotes (M. Bieb.) Besser subsp. *pontica* Borhidi in Acta Bot. Acad. Sc. Hung. 12:39 (1966).

Plate XIII, Fig. 25-29. p. 254

A small, often matted, grey or light green perennial herb with long adventitious roots; stems c. 3-18 cm long, prostrate to somewhat ascending in the flowering regions, much-branched from the woody base, usually leafless below, but the younger shoots densely leafy and often densely congested; internodes 1-5 mm long, much shorter (almost bead-like) towards the lower (basal) parts of the stems, finely pubescent. Leaves mostly linear to linear-oblong, sometimes oblanceolate or even lanceolate-oblanceolate, 3-6 x 1-1.5 mm, acute to obtuse, often finely (adpressed) pubescent, gradually becoming puberulous in age, margin finely ciliate; stipules lanceolate, 3-4 mm long, mostly shorter than the leaves, often split almost to the base. Glomerules terminal and often quite distinct, 10-15(-18) mm in diam., very occasionally crowded; bracts oblong to broadly and obliquely ovate or suborbicular, 6-8 x 3.75-5.25 mm, ± acute and concealing the flowers. Flowers 3-3.5 mm long, narrowly oblong (though narrowed at the base), finely puberulous; sepals equal, narrowly oblong, acute to subobtuse, connivent above; rather thick, 3-nerved; petals 1-1.1 mm long ± equalling the stamens; anthers 0.35-0.4 x 0.25 mm, oblong and orange;

ovary 0.8-1 x 0.6 mm, conical-ovoid, narrowed upwards, with two erect, 0.7-0.8 mm long styles. Ripe fruit not seen.
Fl. 6. Rocky slopes.
Type: Crimea: Tauria: prope "Pertschem ad Sudak", *A. Callier,* Iter Tauricum (in 1900?) (holo. BPU, not seen).
Distr.: Crimea and NW Turkey.
Crimea: mt. Pertschem, nr. Sudak, vi.1896, *A. Callier* 93 (BUD, E, JE, W, Z) and 4725 (E, JE, Z). **Turkey:** Vil. Bilecik: Sügüt to Eskisehir, nr. Oluklu, 13.vi. 1954 *H. Demiriz* 1767 (ISTE).
Closely similar to ***P. taurica*** Borhidi et Sikura in habit, but is readily distinguishable by its grey or light green colours, very profuse adventitious roots, smaller and narrower leaves 3-6 x 1-1.5 mm, and often finely pubescent, rather smaller glomerules, oblong and acute bracts and mostly acute sepals. Contrary to what Borhidi had assumed while treating it as a subspecies of *P. cephalotes* (M. Bieb.). Besser, it shows very little affinity with *P. cephalotes.*

83. **P. anatolica** Czeczott in Acta Soc. Bot. Polon. 9(1-2):34 (1932); et in Fedde, Repert. Beih. 107:148 (1938-39).
M. N. Chaudhri in Davis, Flora of Turkey 2:258 (1967).
Misapplied name: *P. cephalotes* auct., non (M. Bieb.) Besser, Enum. Hort. Crem. 4 (1830).

Plate XIII, Fig. 7-10. p. 254

A small, compact, perennial herb with a woody base; adventitious roots usually absent, sometimes quite distinct; stems c. 5-10 cm long, procumbent, caespitose, much-branched from the base, shortly pubescent to puberulous. Leaves obovate-spathulate to oblanceolate, 4-6 (-10) x 1.5-2(-2.5) mm, mostly subobtuse, adpressed pubescent to puberulous, very occasionally almost glabrous; stipules lanceolate, often somewhat shorter than the leaves, sometimes exceeding them. Glomerules terminal and subterminal, profuse, densely congested or even coalesced at the ends of shoots, 10-15 mm in diam., bracts broadly ovate to ± oblong, sometimes almost rounded, c. 7 x 4 mm, acute and concealing the flowers. Flowers 2.75-3.5(-4.5) mm long, narrowly oblong, adpressed pubescent to puberulous; sepals subequal, linear-oblong to lanceolate, acute; petals c. 0.7 mm long, equalling or somewhat shorter than the stamens; ovary, ovoid-conical, c. 0.6 x 0.5 mm, with two erect c. 0.65 mm long styles. Fruit ovoid to bottle-shaped, 2-2.25 x 1.25 mm, tapering upwards, length nearly 2/3 of that of the sepals and enclosed by them or sometimes more or less equalling them.
Fl. 57-. Rocky limestone slopes, alt. ca. 800-1550 m.
Type: N. Turkey: Paphlagonia: supra oppidulum Tukht, in montosis loco Chirchir-Bunar, alt. ca. 1550 m, 13.vii.1925, *H. Czeczott* 437 (holo. WA, a fragment seen).

1a) Adventitious roots absent; sepals slightly exceeding and enclosing the fruit ..... ssp. **anatolica**
1b) Adventitious roots quite distinct; fruit equalling the sepals ---- ..... ssp. **balansae**

1) subsp. **anatolica**: 1a) var. **anatolica**: Stipules in the older (basal) part of the shoots, somewhat shorter than the leaves.
Distr.: NC Turkey.
Vil. Kastamonu: Tosya. 10.vi.1892, *P. Sintenis* 3947 (G, JE, Z) Cankiri: nr. Cankiri, Cakmakli-dere, c. 800 m, *J. & F. Bornmüller* 1929: *13915* (LD, Z); Corum Corum to Merzifon, 900 m, *Coode & Jones* 1850 (E); Amasya; NW of Amasya, *Manissadjian* 655 (G, S, Z); Ak Dağ, nr. Amasya, 19.vi.1889, *J. Bornmüller* 316d (JE); "Galatia". in valle "Yaila-shai", 900 m, *H. Czeczott* 438 (K).
1b) var. **orientalis** Chaudhri n. var. a var. *anatolica* stipulis quam folia semper longioribus distinguenda.
Stipules always exceeding the leaves.
Type: Pontus australis, in monte Tchamlü-bel, inter Sivas et Tokat, alt. ca. 1200-1300 m, 31.v.1890, *J. Bornmüller* 1977 (holo. JE! iso. G!).
Distr.: Endemic.

2) subsp. **balansae** Chaudhri in Notes R.B.G. Edinb. 28:28 (1967).
M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:259 (1967).
Perennial herb with conspicuous adventitious roots; stems laxly caespitose, woody at the base; leaves 3.5-4.5 x 1-1.5 mm, oblanceolate-spathulate, obtuse, adpressed pubescent to puberulous, often recurved; stipules lanceolate, somewhat shorter than the leaves; glomerules terminal and distinct, 7-10 mm in diam.; flowers 3-3.5 mm long, adpressed pubescent; sepals subequal, lanceolate, with acute and apiculate-penicillate apex; the styles often ± exserted and fruit equalling the sepals.
Type: Turkey: Vil. Izmir: sommet du Tmolus occid. Yaila de Bozdagh, 23.vii.1854, *Balansa* 374 bis (as *P. chionaea* Boiss.) (holo. G! iso. S!); Bozdağ, vi.1946, *Başarman* (ISTE).
P. anatolica bears a superficial resemblance to *P. chionaea* Boiss., but is readily distinguishable by its lanceolate, sharply acute and subequal sepals (as contrasted with the equal, narrowly oblong and obtuse ones of *P. chionaea*); in the typical form it is, moreover, devoid of adventitious roots.

84. **P. galatica** Chaudhri in Acta Bot. Neerl. 15(1):194, f.10 (1966).
M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:260 (1967).

Plate XII, Fig. 9-12. p. 244

A small, perennial herb with a woody base; adventitious roots absent; stems procumbent to shortly ascending, c. 6-15 cm long, much branched; the branches spreading; internodes 5-9 mm long, shortly pubescent. Leaves oblanceolate to narrowly elliptic, 3-6 x 1.5-2 mm, attenuate to

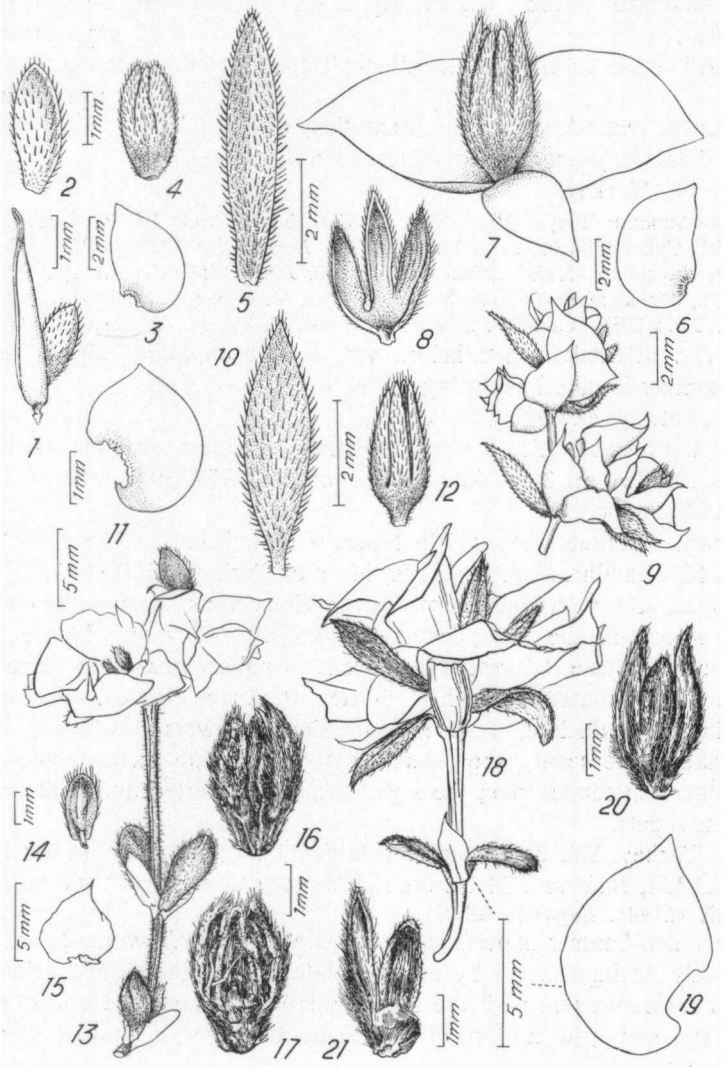

Plate XII. Fig. 1-4: **P. condensata**; 1: leaf with stipule; 2: leaf; 3: bract; 4: flower [*Siehe* 83(JE)]. Fig. 5-8: **P. dudleyi**; 5: leaf; 6: bract; 7: flower with bracts; 8: section of flower showing the inner side of the sepals [*Dudley* D. 36024(U)]. Fig. 9-12: **P. galatica**; 9: shoot; 10: leaf; 11: bract; 12: flower [*Davis* 21508(U)]. Fig. 13-17: **P. mughlaei**; 13: shoot; 14: leaf; 15: bract; 16: flower; 17: v.s. flower [*Dudley* D. 35084(E)]. Fig. 18-21: **P. carica**; 18: shoot; 19: bract; 20-21: sectional view of flower, outside and inside respectively [30.v.1935, *Erik Wall* (S)].

the base, acute, scabrous/strigose in younger stages to (softly) adpressed pubescent in age, margin strongly ciliate; stipules lanceolate, 3-4 mm long, often bipartite or 2-fid and shorter than the leaves. Flowers arranged in repeatedly branched thyrsoid inflorescences, the ultimate clusters or glomerules axillary and lateral as well as terminal, 6-9 mm in diam., often very profuse and crowded at the ends of the shoots; bracts 5 x 3-4 mm, broadly and obliquely ovate to ± oblate or almost rounded; acute, exceeding the flowers and partially concealing them. Flowers 2.75-3.25 mm long, pilose to densely pubescent; sepals subequal to unequal in the fruiting stage, particularly so in the central flowers, lanceolate and acute; petals 0.6-0.75 mm long, slightly shorter than the stamens; anthers 0.45 x 0.25 mm, oblong and orange; ovary ovoid-conical, c. 0.75 x 0.5 mm, styles c. 0.7 mm long, erect. Fruit ovoid, nearly 2/3 the length of the sepals and enclosed by them.
Fl. 6-7. Eroded gypseous hills, alt. 800-1500 m.
Type: N. Turkey: Çankiri. 800 m, 5.vi.1954, *P. H. Davis* 21508 (holo. U! iso. E! K).
Distr.: Endemic in N. Turkey.
Yozgat: Yildizeli to Akdağmadeni, 1500 m, *Coode & Jones* 2005 (E); *J. Bornmüller* 1890: 1978 (JE).
It resembles *P. beauverdii* Czeczott in its foliar characters, but is readily distinguishable by its much-branched thyrsoid inflorescences consisting of smaller though very profuse, lateral and terminal, densely congested glomerules, and by the densely pubescent and only partially concealed flowers with subequal to unequal, lanceolate and sharply acute sepals; in *P. beauverdii,* on the other hand, the glomerules are terminal, well-defined, compact, and often distinct, the bracts wholly concealing the flowers, the latter usually finely puberulous to glabrescent, the sepals equal (or subequal), ± narrowly oblong, rather abruptly acute, strongly 3-nerved, and with a conspicuous membranous margin and a stiffly penicillate tip.

85. **P. dudleyi** Chaudhri in Acta Bot. Neerl. 15(1):194 f.8 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:260 (1967).

Plate XII, Fig. 5-8. p. 244

A perennial herb with a much-branched main root and very short or indistinct adventitious roots; stems prostrate, c. 8 cm long, much-branched, the branches intertwined and very profusely floriferous, finely pubescent to almost glabrous in age. Leaves narrowly oblong to ± oblanceolate, 3-6 x 1-2 mm, obtuse or subacute, pubescent to puberulous, somewhat recurved or spreading; stipules lanceolate 3-4 mm long, often almost equalling the leaves or somewhat shorter. Glomerules 7-12 mm in diam., terminal and axillary, very numerous and densely congested, nearly obscuring the other parts; bracts oblong to obliquely

ovate-suborbicular, 4-5 x 3-4 mm, exceeding though not quite concealing the flowers, mostly rolled around them. Flowers 1.5-3.5 mm long, ellipsoid, adpressed pubescent; sepals subequal in the younger stages to unequal in the fruiting stage, lanceolate, distinctly acute, connivent to erect; petals 0.8-0.9 mm long, longer than the stamens; anthers nearly white; small, usually badly developed; ovary c. 0.85 x 0.6 mm, ovoid to conical; styles 0.6-0.7 mm long, erect. Fruit c. 2 x 1 mm, ovoid, tapering upwards and enclosed by the sepals.
Fl. 6-7. Limestone hills, alt. ca. 800-1200 m.
Type: Turkey: Eskişehir, Ankara to Sivrihisar, 20-30 miles from Polatli, alt. 1000 m, 21.vi.1962, *Dudley* D. 36024 (holo. U, iso. E!).
Distr.: Endemic.
Vil. Ankara: Candiri, *T. Baytop* 11287 (E); Vil. Eskişehir: Haymana to Sivrihisar, 1120 m, *Demiriz* 2968 (ISTE); Vil. Afyon Karahisar: S. of Emir Dağ, 1200 m, *Coode & Jones* 2315 (E); Vil. Uşak: S. of Uşak, towards Sivasli, 800 m, *Coode & Jones* 2383 (E); Vil. Konya: Cihanbeyli, *Davis & Dodds* D. 18634 (K).
It resembles *P. cataonica* Chaudhri in general appearance, but the two differ considerably in the form and structure of the leaves, stipules and flowers. The leaves in *P. cataonica* are elliptic-obovate, fleshy and pilose to pubescent; in *P. dudleyi* they are narrowly oblong to oblanceolate, pubescent to puberulous, and recurved. *P. cataonica* possesses palish stipules distinctly longer than the leaves, whereas in this species they are almost equalling or shorter than the leaves. The flowers in *P. cataonica* are pilose to densely pubescent, the sepals fleshy, equal, narrowly oblong, obtuse or subobtuse; in *P. dudleyi,* on the other hand, the flowers are shortly adpressed pubescent, the sepals subequal to unequal with age (distinctly unequal in the central flowers), lanceolate and acute.
It may well be an apomictic species. I saw only one specimen amongst the isotypes (E) bearing fertile or fully ripe anthers, in all other specimens, including the holotype and most of the isotypes, the anthers were not fully developed.

86. **P. paphlagonica** Chaudhri in Acta Bot. Neerl. 15(1):196, f.6 (1966).
M. N. Chaudhri in P.H. Davis, Flora of Turkey 2:261 (1967).

Plate XI, Fig. 17-21. p. 232

A perennial herb with a woody caudex; main root woody, long and almost unbranched; adventitious roots absent; stems 7-10 cm long, prostrate, much-branched from the contracted woody base, finely pubescent to puberulous, becoming more or less glabrous in age, rather diffusely spreading and mostly consisting of 5-10 mm long internodes. Leaves elliptic to ± oblong, 5-7 x 2-2.5(-3) mm, mostly obtuse, though

acute in younger leaves, somewhat rigid, on both sides rather sparsely (strigose) pubescent to almost glabrous; margin hairy; stipules lanceolate, 3-4-(5) mm long, often deeply split, mostly shorter than the leaves, occasionally equalling or somewhat exceeding them. Glomerules terminal, subterminal and lateral, 9-13(-15) mm in diam., very profuse and densely congested or fused at the end of the shoots; bracts broadly and obliquely ovate to suborbicular, 6-7(-8) x 4-5 mm, acute, concealing the flowers. Flowers 3-3.25 mm long, sparsely adpressed pubescent to puberulous, sometimes nearly glabrous; sepals equal (occasionally subequal), ± oblong, with an obtuse to subobtuse-subacute and penicillate apex; petals 1-1.2 mm long, slightly longer than the stamens; anthers 0.4 x 0.25 mm; ovary c. 0.75 x 0.6 mm, conical; styles (0.5-)0.65-0.75 mm long, erect. Fruit ovoid, c. 2 x 1.25 mm, enclosed by the connivent sepals.

Fl. 6-7. Marl hills, alt. 900-100 m.

a) ssp. **paphlagonica**: stems ± spreading; leaves 5-7 x 2-2.5(-3) mm, elliptic-oblong; stipules 3-4 mm long, mostly shorter than the leaves; sepals equal, with obtuse to subobtuse apex; styles 0.65-0.75 mm long. Type: N. Turkey: Kastamonu: Kastamonu, 1100 m, *Davis* 21774 a (holo. E!).

b) subsp. **caespitosa** Chaudhri n. subsp. a subspecie *paphlagonica* caulibus fastigiatis, foliis paulo minoribus (longitudine 5 mm non excedentibus), stipulis haud raro quam folia longioribus, sepalis acutis vel subacutis, stylis paulo brevioribus (0.5-0.6 mm longis) distinguenda. Stems caespitose; leaves mostly ± elliptic, up to 5 x 2 mm; stipules 3-5 mm long, equalling or somewhat exceeding the leaves; glomerules 10-15 mm in diam. bracts 7-8 x 4 mm, obliquely ovate to almost oval; sepals subequal, acute to subacute and often stiffly penicillate; ovary c. 1 x 0.75 mm, narrowed to the top; styles 0.5-0.6 mm long.

Type: Kastamonu: Kastamonu, 900 m, 8.vi.1954, *Davis* 21686 (holo. E!).

Distr. of the species: Endemic in N. Turkey.

Rather distantly resembling *P. cephalotes* (M. Bieb.) Besser in its foliar characters, but in other features the two are entirely distinct; they possess, for instance, a different floral structure, esp. a different kind of style.

This species very clearly demonstrates the large range of variability which is often met within the genera of the Turkish flora. The two subspecies live under the same climatic and edaphic conditions, and yet exhibit pronounced differences in the development of their stipules and sepals.

87. **P. tunisiania** Chaudhri n. spec.

Plate XIV, Fig. 18-22. p. 260

Herba perennis parva et compacta, radice perpendiculari subsimplici longo et lignoso instructa. Caules prostrati, 4-7 cm longi, dense ramificati; ramuli caespitosi, saepe profuse floriferi; internodia 1-8 mm longa, robusta, puberula. Folia patentia vel recurvata, elliptica, elliptico-obovata vel suboblonga, usque ad 5 mm longa et 2.5 mm lata, acuta vel obtusa, crassiora, appresse pubescentia; stipulae lanceolatae, usque ad 4 mm longae, acuminatae, plerumque foliis paulo breviores, apicem ramulorum versus tamen eis aequilongae vel longiores. Glomeruli profusi, ad apicem ramulorum congesti, globosi, 10-15 mm diam.; bracteae suborbiculares vel interdum oblique oblongae, usque ad 7 mm longae et 5.5 latae, subobtusae, flores omnino obtegentes. Flores anguste ellipsoidei, (2.5-) 3.0-3.25 mm alti, appresse pubescentes; sepala aequalia vel subaequalia, lanceolata, plerumque acuta, rarius subobtusa, saepe conniventia, in statu frutescente interdum erecta, crassiora; petala 1.0-1.2 mm longa, staminibus subaequilonga; stamina filamentis 1.0 mm longis et antheris oblongis, 0.4-0.5 mm longis et 0.25 mm latis, aurantiis instructa; ovarium ovoideum, 0.6 mm altum et 0.45 mm diam; styli duo, 0.55 mm longi, erecti. Fructus ovoideo-ellipsoideus, usque ad 1.65 mm altus et 1.35 mm diam., sepalis tertia parte brevior et ab eis inclusus. Florens et fructificans mensibus 5 et 6. Fl. & ft. 5-6. Rocky places.

Type: Tunisia: Dj. Meghila, Kef Tella, in pinetis, 16.v.1887, *A. Letourneux* (holo. P!).

Distr.: Endemic in W. Tunisia & NE Algeria.

Tunisia: Dj. Tiouchcha, 22.v.1887, *A. Letourneux* (P); Haidra, 28.vi.1884 *id.* (P); **Algeria:** Kabaylie: Kerrata, v. 1897, *E. Reverchon* 183 bis (E), mixed with *P. capitata* (L.) Lam.

These plants have previously been referred to *P. kapela* (Hacq.) Kern. subsp. *serphyllifolia* (DC.) Aschers. & Graebn., but are distinguishable by the long and distinctly erect styles. *P. tunisiana* and *P. maroccana* differ from each other in habit (stems spreading in *P. maroccana,* caespitose and densely crowded in this species), the nature of the glomerules (distinct in *P. maroccana,* congested in this species), and the flower size and sepal structure. The flowers in *P. maroccana* are considerably longer and the sepals distinctly unequal in age, whereas in *P. tunisiana* the sepals are equal (to subequal in the fruiting stage), and the flowers somewhat shorter.

88. **P. macedonica** Chaudhri n. spec.

Plate XIV, Fig. 32-36. p. 260

Herba perennis compacta, radice perpendiculari lignoso instructa. Caules prostrati, radicibus adventitiis brevibus et vix conspicuis muniti, 5-12(-18) cm longi, ad basim lignosi, ramulis plus minusve implexis, fere caespitosis, foliosis et profuse floriferis, breviter pubescentibus.

Folia oblonga vel parte apicali dilatata, casu quo oblanceolata vel spathulata, in subspecie *tobolkaei* lineari-lanceolata vel lineari-oblonga, 2-5(-7) mm longa et 1.01.5(2.0) mm lata, plerumque subobtusa, appresse pubescentia vel subglabra, saepe recurvata, interdum tamen ascendentia; folia veteriora incrassata; stipulae suboblongae vel ovato-lanceolate, 2.0-4.5 longae, saepe bifidae, plerumque foliis paulo breviores sed interdum eis subaequilongae. Glomeruli profusi, ad apicem ramulorum congesti, 9-13 mm, in var. *floribunda* tamen usque ad 17 mm diam.; bracteae suborbiculares, 5-6 mm longae et 4 mm latae, obtusae, flores omnino obtegentes. Flores anguste ellipsoidei, 2.75-3.25 mm alti, dense et plus minusve appresse pubescentes; sepala subaequalia vel in subspecie *macedonica* var. *linearisepala* in statum frutescente praesertim in cymarum floribus centralibus inaequalia, obtusa vel subobtusa et distincte ciliata; exteriora anguste oblonga; interiora anguste ovato-oblonga et exterioribus breviora, in subspecie *macedonica* var. *linearisepala* tamen omnia linearia et subobtusa vel subacuta; petala circ. 1.25 mm longa, pallide brunnea, stamina filamentis circ. 0.75 mm longis et antheris 0.4 mm longis et 0.25 mm latis, aurantiis instructa; ovarium conico-ovoideum, 0.6-0.7 mm altum et 0.5 mm diam.; styli duo, circ. 0.65 mm longi, erecti. Fructus elliptico-ovoideus, circ. 1.65 mm altus et 1.2 mm diam., apice angustatus, a sepalis inclusus.

Fl. 5-7. Rocky places, alt. ca. 200-1500 m, mostly at lower elevations.

Type: NW Greece: Macedonia occidentalis: Distr. Kozani; Montes Vourinon, in saxosis calc. supra bara adversus Siatista, ca. 800-900 m, 4.vii,1956, *K. H. Rechinger* 17610 (holo. W!).

Distribution: N. Greece & SSE Yugoslavia.

Key to the subspecies and varieties:

1a) Shoots densely covered with leaves and stipules; leaves ascending and closely imbricate, linear-oblong to linear-lanceolate, up to 1 mm wide; ovary conical-pyramidal, c. 1 x 0.4 mm; styles 0.45-0.55 (or c. 0.5) mm; fruit flask-shaped, narrowed into a long, narrow neck ---- ..... ssp. **tobolkana**

1b) Leaves not closely imbricate, more than 1 mm wide, ovary ovoid, 0.6-0.7 x 0.5 mm; fruit ovoid-oblong with a short neck; styles c. 0.65 mm ..... subsp. **macedonica**

2a) Sepals linear, subobtuse to subacute, distinctly unequal in the fruiting stage ..... var. **linearisepala**

2b) Sepals narrowly oblong, obtuse to subobtuse, and mostly equal or but slightly unequal

3a) Glomerules 9-13 mm in diam., styles erect .... var. **macedonica**

3b) Glomerules often larger, up to c. 17 mm in diam., styles somewhat recurved at the tip ..... **var. floribunda**

A) subsp.**macedonica**: a) var. **macedonica:**

S. Yugoslavia: Macedonia: Distr. Üsküb (Skopje), nr. Raduse, c. 500 m, vi.1917. *J. Bornmüller* 449 (HBG, JE); mte Wodno, Gorn-Wodno, 600 m, *Bornmüller* 3634 (JE); Kisela-Woda, c. 280 m, *id.* 452 (HBG, JE); Drenovo, Doluklisura, 200-300 m, *id.* 3629 & 3631 (JE) Demir-Kapu, along river Wardar, 500 m, *id.* 446 (JE). **Greece:** W. Macedonia: Mt. Vermion, Kozani to Veroia, ca. 1200-1500 m, *Rechinger* 19831 (W); Servia, SE of Kozani, *id.* 19842 (W); Mt. Vourinon, *id.* 17610 (W) TYPE; NW Macedonia: Kastoria, c. 800 m, *A. H. G. Alston & N. Y. Sandwith* 1023 (K); Thessalonica: Kalampaka, 15.v.1896, *P. Sintenis* 1373 (JE); Attica: m. Cithaerone, 25.v.1880, *De Heldreich* (E).

b) var. **floribunda** Chaudhri n. var. a varietatibus aliis glomerulis majoribus (usque ad 17 mm diam.) et stylis recurvatis distinguenda. Glomerules large and very conspicuous, up to c. 17 mm in diam.; styles recurved at the tip.

Type: Macedonia occidentalis: Distr. Kozani, in monte Vourinon, in declivibus orientalibus supra Tservena, ca. 1400 m, 7.vii.1956, *Rechinger* 17687 (W.). Endemic.

c) var. **linearisepala** Chaudhri n. var. a var. *macedonica* sepalis in statu frutescente distincte inaequalibus, linearibus et subacutis vel subobtusis distinguenda. Sepals linear, subacute to subobtuse, distinctly unequal in the fruiting stage.

Type: Yugoslavia: W. Macedonia: Treska Gorge, *Rev. & Mrs. Thompson* 561 (holo. K!).

B) subsp. **tobolkana** Chaudhri n. subsp. a subspecie *macedonica* caulibus foliis et stipulis dense imbricatis instructis, foliis angustioribus (latitudine 1 mm haud excedentibus), ovario graciliore (circ. 1.0 mm alto et 0.4 mm diam.), stylis brevioribus (0.45-0.55 mm longis), fructu apice longius protracto distinguenda. Shoots covered with closely approximated leaves and stipules; leaves mostly ascending and closely imbricate, up to c. 1 mm wide, linear-oblong to linear-lanceolate; ovary conical-pyramidal, c. 1 x 0.4 mm; styles c. 0.5 (or 0.45-0.55) mm; fruit flask-shaped, narrowed upwards to a long, narrow and prominent neck.

Type: S. Yugoslavia: Macedonia: Veles: In rupestribus aridis faucium rivuli Tobolka, c. 200 m, 28.v.1917, *J. Bornmüller* 447 (holo. JE!). Endemic.

89. **P. albanica** Chaudhri n. spec.

P. taurica Borhidi et Sikura var. *kümmerlei* Borhidi in Acta Bot. Acad. Sc. Hung. 12:40 (1966).

Plate XIV, Fig. 27-31. p. 260

Herba perennis parva. Caules plus minusve prostrati, 3.5-10 cm longi, radicibus adventitiis non valde conspicuis instructi, basi distincte lignescentes et ibi contracti; ramuli plus minusve divergentes, dense foliosi, puberuli vel subglabri. Folia plerumque patentia, elliptica vel

oblongo-elliptica, usque ad 8 mm longa et 4 mm lata, in subspecie *graeca* plerumque apicem versus dilata, casu quo plus minusve obovato-spathulata, acuta vel plus minusve obtusa, appresse pubescentia, primum scabridiora, interdum leviter carinata; stipulae ovato-lanceolate, 3.0-5.5 mm longae, acuminatae, saepe fere bipartitae, plerumque foliis breviores. Glomeruli profusi, ad apicem ramulorum congesti, (10-)13-20 mm diam.; bracteae oblique ovatae, (5-)7-10 mm longae et 4-6 mm latae, apicem acutum versus plus minusve acuminatae, floribus multo longiores et eos omnino obtegentes. Flores anguste ellipsoidei sed basim versus leviter contracti, (3.25-)3.5-4.5 mm alti, plerumque appresse pubescentes, interdum scabridi; sepala subaequalia (exteriora quam interiora paulo longiora), forma variantia ab oblongo-lanceolata usque ad lineari-lanceolatam, subacutae, margine membranaceo angustissimo instructa; petala 0.8-1.1 mm longa, pallide brunnea, staminibus saepe paulo breviora; stamina filamentis 0.8-1.1 mm longis et antheris aurantiis 0.35-0.4 mm longis et 0.25 mm latis instructa; ovarium ovoideo-conicum, 0.75 mm altum et 0.6 mm diam.; styli duo (0.6-)0.8-1.0(-1.2) mm longi, erecti, sepalorum apices fere attingentes. Fructus ovoideo-ampulliformis, i.e. apicem in collum conspicuum contractus, 2.0-2.25 mm altus et 1.3 mm diam. Flores mensibus (5-)6-8. Habitat montium culmina, alt. 1200-1500 m.

Fl. (5-)6-8. Mountain tops, alt. ca. 1200-2500 m.

Type: Albania: "Südl. Dragas: Tal der Mlika (Brodska)", c. 1200 m, 2.viii.1936, *Fritz Lempberg* 354 (holo. E!).

Distr.: Endemic in Albania, Greece and probably S. Yugoslavia.

Key to the subspecies:

1a) Leaves up to 8 x 3.5 mm, mostly ± elliptic; glomerules 13-20 mm in diam.; flowers 3.5-4.5 mm; styles 0.8-1 mm long ..... **subsp. albanica**

1b) Leaves up to 5 x 2.5 mm, mostly obovate (-elliptic); glomerules 10-12(-14) mm; flowers 3-3.25 mm; styles 0.6-0.7 mm ..... **subsp. graeca**

A) subsp. **albanica**: Adventitious roots rather inconspicuous; stems laxly caespitose; leaves up to 8 x 3.5 mm, elliptic to elliptic-oblong; glomerules 13-20 mm in diam.; bracts 7-10 x 4-6 mm, obliquely ovate, acuminate; flowers 3.5-4.5 mm; sepals subequal, acute, adpressed pubescent; petals 0.8-1.1 mm; filaments 1-1.1 mm; anthers 0.35-0.4 x 0.25 mm; styles 0.8-1(-1.2) mm long; fruit 2-2.25 x 1.3 mm.

Distr.: Endemic in Albania.

Albania: Inter opp. Prizren et Debrajacentes ad pagum Podbregja, c. 1200 m, 1.vii.1918, *J. B. Kümmerle* (K); mt. Ljubitrn (Scardus), ca. 2500 m, 15.vii.1890. *J. Dörfler* (W); m. Kuruna, distr. Ljaskovik, 9.vii.1896, *A. Baldacci* 158 (Z); distr. Mali Lunxheries, summit of Strakareci, c. 1700 m, *Alston & Sandwith* 1672 (K).

B) subsp. **graeca** Chaudhri n. subsp. a subsp. *albanica* radicibus adventitiis inconspicuis, ramulis saepe caespitosis, foliis plus minusve obovatis, maxime 5 mm longis et 2.5 mm latis, acutis, glomerulis plerumque minoribus (10-12, raro usque ad 14 mm diam.), bracteis minoribus et pro rato paulo latioribus (5-6 mm longis et 3-4 mm latis), floribus paulo minoribus (3.0-3.5 mm altis), sepalis plerumque scabrido-pubescentibus, filamentis paulo brevioribus (0.8-0.9 mm longis), antheris minoribus (0.3 mm longis et 0.2 mm latis), stylis brevioribus (0.6-0.7 mm longis) distinguenda.

Adventitious roots ± absent; stems often densely compact and caespitose; leaves up to 5 x 2.5 mm, obovate to nearly elliptic; glomerules 10-12(-14) mm; bracts 5-6 x 3-4 mm, obliquely ovate, acute; flowers 3-3.25 mm long; sepals subequal, ± acute, mostly scabrous pubescent; petals 1-1.1 mm, filaments 0.8-0.9 mm, anthers 0.3 x 0.2 mm; styles 0.6-0.7 mm; fruit c. 2 x 1.5 mm.

Type: S. Greece: Lakonika: Mt. Taygeto, in reg. sup. Neraidovouni, vii.1897, *De Heldreich & H. Zahn* (holo. Z!).

Distr.: Central and South Greece.

Attika: m. Parnethis c. 1500 m.v. 1895, *Heldrich* 1236 (as *P. chionaea* Boiss.) (BPU, JE, STU, W. Z); Ins. Euboea: *Rechinger* 2638 (W).

90. **P. carica** Chaudhri in Acta Bot. Neerl. 15 (1):199, f.15 (1966). M. N. Chaudhri in P. H. Davis, Flora of Turkey 2:261 (1967).

Plate XII, Fig. 18-21. p. 244

A perennial, compact herb; adventitious roots present though not very conspicuous; stems much-branched from the woody, subterranean base, prostrate, densely intertwined 6-14 cm long, shortly pubescent to finely puberulous. Leaves 3-6 x 1.5-2 mm, obovate to narrowly elliptic-oblanceolate, acute to obtuse, adpressed pubescent, recurved and turning golden in age; stipules lanceolate, mostly somewhat shorter than the leaves in the older part of the stems, rarely exceeding them. Glomerules terminal, congested, 10-14 mm in diam., bracts c. 6 x 5 mm, obliquely ovate, concealing the flowers. Flowers 3-3.5 mm long, ellipsoid-oblong, pilose to densely pubescent; sepals connivent to erect, ± unequal, the two outer 0.5-0.75 mm longer than the inner ones, the outer 2.5-3 mm long, linear-oblong, acute, the median similar but slightly shorter, and the two innermost 1,75-2.5 mm, oblong, obtuse, concave or boat-shaped with an inflexed membranous margin; petals c. 1 mm, ± equalling the stamens; anthers 0.45 x 0.25 mm, oblong, orange-brown; ovary conical to ovoid, c. 1 x 0.6 mm; styles 0.9-1 mm, erect. Ripe fruit not seen.

Fl. 5-7. Calcareous rocky places, alt. ca. 800-1400 m.

a) var. **carica**: Stipules in the older, basal part of the stems somewhat shorter than the leaves; leaves mostly obovate to oblanceolate.

Type: W. Turkey: Vil. Denizli: Baba Dağ, S. of Denizli, 800 m, 30.v. 1935, *Erik Wall* (as *P. chionaea* Boiss.) (holo. S! iso. LD!).
Distr.: Endemic in W. Turkey.
Smyrna: *E. Whittall* 511 (E).
Greece: Is. Khios (Chios), /1853, *Pauli* 536 (JE).

b) var. **stipulata** Chaudhri nov. var. a var. *carica* stipulis quam foli longioribus vel minime eis aequilongis, foliis saepe oblongo-ellipticis vel subspathulatis distinguenda. Stipules always equalling or exceeding the leaves; leaves often narrowly elliptic to almost spathulate.
Type: (Turkey): Vil. Isparta: Anamas Dağ, NW of Beyşehir Göl, 140C m, 5.vi.1964, *F. Sorger* T-64-41-38 (Hb. Sorger, Linz!).
Endemic. Vil. Konya: 20 km W of Konya, *Sorger* T-62-62-23 (Hb. Sorger, Linz).
This species shows a striking resemblance to *P. chionaea* Boiss. in habit and general appearance, but differs markedly in the floral characters, especially in the unequal sepals which moreover possess an entirely different shape, the two outer sepals usually being c. 0.5-0.75 mm longer than the inner ones and linear-oblong and acute, whereas the inner ones are oblong, obtuse and concave.

91. **P. azerbaijanica** Chaudhri n. spec.

P. cephalotes (M. Bieb.) Besser subsp. *pontica* Borhidi var. *hirta* Borhidi in Acta Bot. Acad. Sc. Hung. 12:40 (1966).

Plate XIII, Fig. 11-15. p. 254

Herba perennis parva et compacta, caudice lignoso subterraneo et radice perpendiculari lignoso instructa. Caules prostrati, 6-10 cm longi, sine radicibus adventitiis, ramulis floriferis brevioribus, etiam prostratis vel plus minusve ascendentibus instructi; internodia 2-6 mm longa, breviter scabrido-pubescentia vel puberula. Folia sessilia, elliptica vel obovato-spathulata, 3-6.5 mm longa et 1.5-3 mm lata, sed in zona florifera saepe majora, acuta vel subobtusa, basim versus angustata, minute scabrido-pubescentia, puberula vel ultimo glabrescentia, margine ciliolato instructa; stipulae anguste ovato-lanceolatae, foliis saepe aequilongae vel eis paulo breviores, saepe profunde fissae. Glomeruli ad apicem ramulorum congesti et plerumque confluentes, 10-15(-18) mm diam.; bracteae late et oblique ovatae vel suborbiculares, 5-7 mm longae et 4-6 mm latae, acutae vel breviter acuminatae, flores omnino obtegentes. Flores anguste ellipsoidei, 3.0-3.5 mm alti, appresse puberuli; sepala subaequalia vel interdum praesertim in cymarum floribus centralibus inaequalia, lanceolata, acuta, 3-nervia; petala 0.7 mm long, staminibus paulo breviora; antherae 0.4 mm longae et 0.25 mm latae, aurantiae; ovarium conicum, 1.0 mm altum et 0.5 mm diam., apicem versus contractum; styli 0.6-0.7 mm longi, erecti.
Fl. 4-6. Stony slopes, alt. ca. 750 m.

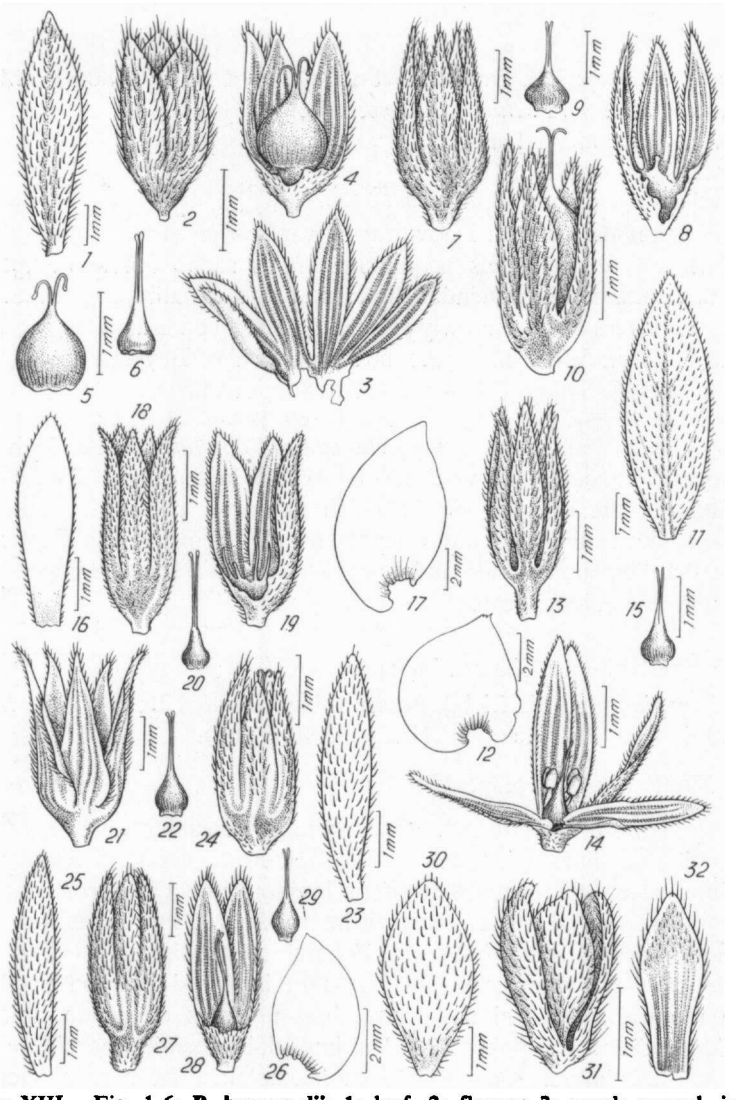

Plate XIII. Fig. 1-6: **P. beauverdii**; 1: leaf; 2: flower; 3: sepals spread, inside view; 4: section of flower with fruit; 5: fruit; 6: ovary and styles [*Czeczott* 440 (WA)]. Fig. 7-10: **P. anatolica**; 7: flower; 8: v.s. flower; 9: ovary and styles [subsp. **anatolica**: *Sintenis* 3947(Z)]; 10: flower [subsp. **balansae**: *Balansa* 374 bis (G)]. Fig. 11-15: **P. azerbaijanica**; 11: leaf; 12: bract; 13: flower; 14: flower dissected; 15: ovary and styles [19.v.1948, *Grossheim et al.* (TGM)]. Fig. 16-24: **P. cephalotes**; 16-20: subsp. **cephalotes**; 16: leaf; 17: bract; 18: flower; 19: section of flower showing the inner side of the sepals; 20: ovary and styles [*M. v. Bieberstein* (LE)]; 21-22: subsp. **bulgarica**; 21: flower; 22: ovary and styles [15.vii. 1930, *Karl Ronniger* (W)]; 23-24: subsp. **thracica**; 23: leaf; 24: flower [*K. H. & F. Rechinger* 9350(W)]. 25-29: **P. pontica**; 25: leaf; 26: bract; 27: flower; 28: section of flower, inside view of the sepals; 29: ovary and styles [2.vi.1896, *Callier* (W)]. Fig. 30-32: **P. adalia**; 30: leaf; 31: flower; 32: sepal, inner side [*Sorger* T-63-35-34 (Hb. Sorger, Linz)].

Type U.S.S.R.: Azerbaijan: Nagorno-Karabakh: distr. Gadrut, c. 750 m 19.v.1948, *A. A. Grossheim* et *al.* (holo. TGM!).
Distribution: Endemic in Soviet Azerbaijan.

Azerbaijan: Karabakh: Prov. Yelisavetpol, distr. Karyagino, *G. Woronow* 592 &569 (TGM); Karabakh: distr. Vank-Dizak, nr. Dommi, 28.vi.1937, *T. Heldeman & M. Ragimov* (BM).

Resembles *P. cephalotes* (M. Bieb.) Besser in the structure of the sepals, but is distinguished by its finely scabrous-pubescent, elliptic to obovate-spathulate leaves, shorter petals and distinctly shorter styles nearly equalling the conical ovary (never longer than the ovary as is the case in *P. cephalotes*).

92. **P. cephalotes** (M. Bieb.) Besser, Enum. Hort. Cremenec. 4 (1830).

Steven in Bull. Soc. Mosc. 29(3):184 (1856); Boissier, Fl. Or. 1:743 (1867); Kerner in Österr. Bot. Zeitschr. 27:20 (1877); Gürke in Richter-Gürke, Pl. Europ. 2(2):184 (1899); Graebner in A. & G., Syn. 5(1):894 (1919); S. Javorka, Magyar Fl. Hung. 1:319 (1925); A. Hayek, Prodr. Fl. Balkan 1:174 (1924); B. K. Schischkin in Komarov, Fl. U.R.S.S. 6:565 (1936); Chater in Tutin et al. Fl. Europ. 1:150 (1964); Borhidi in Acta Bot. Acad. Sci. Hung. 12:33 (1966).

Syn.: *Illecebrum cephalotes* M. Bieberstein, Fl. Taur.-Cauc. Suppl. 169 (1819). *Illecebrum capitatum* M. Bieb., Fl. Taur.-Cauc. 1:174 (1808), non L. Sp. Pl. 206 (1753). Type: "ex Tauria", Herb. M. Bieberstein (LE!). *Paronychia hungarica* Griseb., Spicileg. Fl. Rum. Bithyn. 1:215 (1843). Type: Hungary: Adlersberg, pr. Buda, *Grisebach* (holo. GOET, not seen).

Misapplied names: *Illecebrum Paronychia* Habl., Taur. 150, ex M. Bieberstein, Fl. Taur.-Cauc. 1:175 (1808) non L., Sp. Pl. 206 (1753). *Paronychia capitata* sensu Reichenb., Fl. Germ. Excurs. 564 (1832), non (L.) Lam. Fl. Fr. 3:229 (1778) nec DC. in Poiret, Encycl. 5:25 (1804). *P. capitata* sensu Fenzl in Ledeb., Fl. Ross. 2:163 (1844) p.p., non (L.) Lam. nec DC. *P. capitata* sensu Schur, Enum. Pl. Transs. 223 (1866), non (L.) Lam. nec DC. *P. kapela* Kerner in Österr. Bot. Zeitschr. 19:376 (1869) ex descr. p.p. non Hacquet sub *Illecebro.*
P. kapela Kerner in Österr. Bot. Zeitschr. 19:376 (1869) ex descr. p.p. non Hacquet sub *Illecebro.*

Plate XIII, Fig. 1-6. p. 254

A perennial herb; adventitious roots usually absent; stems much-branched from the woody base, mostly prostrate, c. 5-20 cm long, branches often somewhat spreading, shortly pubescent to almost glabrous with age. Leaves ± oblong-elliptic to narrowly lanceolate-

oblanceolate, 4-7(-10) x 1.5-2(-3) mm, acute to obtuse, mostly on both sides glabrous, sometimes sparsely adpressed pubescent to subglabrous, especially on the underside; margin hairy; stipules lanceolate, often deeply split, somewhat shorter than the leaves. Glomerules terminal (-subterminal) and usually densely crowded, 12-20 mm in diam.; bracts broadly ovate to nearly oblong 5-6 x 4 mm, acute, concealing the flowers. Flowers (2.5-)3-4(-4.5) mm, adpressed pubescent, occasionally subglabrous; sepals narrowly oblong-lanceolate, acute, often ± equal, sometimes ± unequal in the fruiting stage (especially in the central flowers of the dichasia), 3-nerved, suberect, not incurved at apex in the fruiting stage; petals 1-1.5 mm, equalling or slightly exceeding the stamens, anthers 0.4 x 0.25 mm, oblong; ovary ovoid-conical, with two erect styles c. (0.75-) 1 mm long; mostly longer than the ovary; fruit c. 2 x 1.25 mm, ovoid-oblong, narrowed to the top, nearly half as long or slightly more than half as long as the sepals.
Fl. 5-8. Rocky (dolomite) places, alt. ca. 200-1900 m.
Distribution: E. & SE. Europe (Balkan, Ukraine), N. Turkey.

1a) Leaves densely adpressed pubescent ..... subsp. **thracica**
1b) Leaves (when fully developed) often subglabrous
2a) Stems usually with very short (c. 1-2 mm long) internodes; leaves linear, up to 6 x 1.25 mm; sepals glabrous on the back and distinctly unequal in the fruiting stage ..... subsp. **bulgarica**
2b) Stems usually with slightly longer (more than 2 mm long) internodes; leaves ± elliptic-oblong to broadly oblanceolate, or narrowly oblong, often more than c. 1.5 mm wide; sepals equal or subequal, and usually adpressed pubescent at the back ..... subsp. **cephalotes**

A) subsp. **cephalotes**: Distribution: S. Ukraine, Rumania, Hungary, most of Bulgaria, E. & SE. Yugoslavia, N. Greece and N. Turkey.
1a) Adventitious roots present though not very conspicuous; leaves on the older part of the stems often recurved; glomerules rather small, 10-14 mm in diam. ..... var. **recurvans**
1b) Adventitious roots entirely absent; leaves but rarely recurved; glomerules larger
2a) Flowers 2.25-2.5 mm long ..... var. **minutiflora**
2b) Flowers 3-4 mm long
3a) Leaves usually 2.5-3(-3.5) mm in width, oblong or oblong-elliptic ..... var. **simonkaiana**
3b) Leaves often less than 2.5 mm in width
4a) Leaves up to 5 x 2 mm ..... var. **cephalotes**
4b) Leaves 7-10 x 2-2.5 mm ..... var. **soói**

a) var. **cephalotes**: Scattered throughout the range of the species.

U.S.S.R.: Ukraine: Odessa, *Láng* et *Szovits* 54 (HAL, L); Alexandfeld, 30.v.1912, *I. Paczorski* (BPU). **Rumania:** Transsilvania: Torda, 15.vi.1905, *Lajos Richter* (Z); vii.1910, *E. R. Missbach* (Z) (trans. with var. *soói*). **Hungary:** Buda, 21.vi.

1871, *D. A. J. Tauscha* (JE); nr. Vac, 28.v.1921, *J. Tuzson* (BPU); Budapest, Budaörs, c. 340 m, 30.iv.1934, *Andreánsky & Kárpáti* (BPU); Comit. Pest, mt. Nagyszénás, Nagykovácsi, 500 m, 3.vi.1933, *Kárpáti* (BPU) transitional with var. *soói).* **Albania:** Treska, v.1905, *L. Adamovic* (Z). **Greece:** Thracia occid., Derbend, N. of Alexandrupolis, *Rechinger* 22249 (W).

b) var. **simonkaiana** Borhidi in Acta Sci. Hung. 12:39 (1966).

Type: Rumania: Brasov, *Simonkai* (BP, not seen).

Syn.: *P. cephalotes* var. *ucrainica* Borhidi, op. cit. Type: Ukraine: Odessa, *Kulikowsky* 337 (Fl. Pol. exs.) (holo. BP, not seen).

Distr.: Rumania. Hungary, E. Yugoslavia & N. Greece.

Rumania: Brasov, c. 600 m, v.1902, *Römer* (Z); Kronstadt, c. 950 m, *C. Baenitz* 7793 (L, STU); vi.1912, *J. Bornmüller* (JE); Brasov, vii.1896, *Sagorski* (JE); v. 1900, *S. Kupcok* (COI, E); Torda-Hasadeh, 14.vii.1905, *E. Rado* (BPU). **Hungary:** Budapest: vi.1876, *Porutin,* (COI, JE, L); Comit. Alba, Orás, 29.vi.1877, *J. A. Tauscher* (E, L, Z); mt. Nagyszál, Vác. 17.v. 1931, *G. W. Andreánszky* (BPU); **Yugoslavia:** Serbia: Prokulpje, *G. Jlic* (JE, Z); Nis, 10.vi.1896, *V. Moravac* (JE); Tirot, vii.1878, S. *Ubavkic* (JE). **Greece:** Macedonia: Kavalla to Lekhani, c. 600-900 m, *Rechinger* 15603 (W); Macedonia: Bozdagh, W. of Drama, *J. D. A. Stainton* 7483 (W). Note: Borhidi's var. *ucrainica* does not seem to be distinct from var. *simonkaiana.* The type, unfortunately, could not be seen.

c) var. **soói** Borhidi, op. cit.:

Type: Hungary: In mt. Hárashatárhegy supra Budapest, *Jávorka* (BP, not seen).

Distr.: Rumania, Hungary, ESE Yugoslavia, Bulgaria & N. Greece.

Rumania: Transilvania: Turda, c. 400 m, *Al. Borza* 762 (Z); Brasov (Kronstadt) c. 900 m, 18.vi. 1876, *J. Barth* (Z); Hungary: (Central): nr. Budapest, Mt. Lohegy, 10.vi.1934, *Andréansky* (BPU); Mt. Somlohegy, nr. Polgárdi, vi.1911, *J. Tuzson* (BPU); Pilisszentiván, 250-400 m, *F. Filarszky & S. Jávorka* 738 (E, Z); Pilisszentiván to Pilsvörösvar, 20.v.1929, *Karl Ronniger* (W) trans, with var. *simonkaiana;* Comit. Pest: Szent-Iván, *A. de Degen* 3640 (E, L, W, Z) trans. with var. *simonkaiana:* Csolnok, Gran, 5.vii.1877, *I. Grundl* 409 (C. Baenitz Hb. Europ.) (W, Z); Palota, Vesznrem, 15.vii.1906, *J. Schneider* (W). **Yugoslavia:** Serbia: Prlita, Zaicar, vii.1880, *S. Petrovic* (W); Nis, 28.vii.1887, *Bornm.* (W); Pirot, v.1894, *L. Adamovic* (Z). **Bulgaria:** Lontscha: Kuselata, -/1894 *Urumoff* (W). **Greece:** Thessalonica: Kiel-tépé, vi.1890, *Abdur Rahman Nadji* (W).

d) var. **minutiflora** Chaudhri nov. var. a varietatibus aliis ad subspeciem hanc pertinentibus floribus minoribus (2.2-2.5 mm altis) distinguenda.

Leaves linear-oblong to oblanceolate, often sparsely scabrous-pubescent to subglabrous; flowers 2.25-2.5 mm long.

Turkey: (European): Tekir: vi.1907, *V. Stribrny* (E, TYPE); **Bulgaria:** Geren: 1.vi.1899, *Stribrny* (E).

e) var. **recurvans** Chaudhri n. var. a varietatibus aliis ad subspeciem hanc pertinentibus presentis radicum adventitiorum, foliis in parte veteriore caulium saepe recurvatis, glomerulis minoribus (circ. 10-14 mm diam.) distinguenda.

Adventitious roots present though not very conspicuous; leaves narrowly oblong to broadly oblanceolate, subglabrous to glabrous, often much recurved with age; glomerules rather small, c. 10-14 mm in diam.,

terminal and mostly distinct or not congested; flowers 3-3.5 mm, adpressed pubescent; sepals equal or rarely slightly unequal.
Type: U.S.S.R.: Ukraine: Prov. Donetz, prope oppidum Mariupol in decl. calc. ad flumen Kalczik, 20.v.1926, *I. Kowalenko* 50 (holo. W! iso. E!).
Distr.: Ukraine, N. Turkey & "Syria" (probably Amanus or Cassius Mts.)
Ukraine: Prov. Donetz, Mariupol, J. *Kowalenko* 50 (E, W). **N. Turkey:** Amasya: Akdag, nr. Amasya, 1900 m, 18.viii.1899, *J. Bornmüller* (JE); "Syria" (probably S. Turkey, Amanus or Cassius Mts. ranges), *Aucher-Eloy* 2805 (G).
B) subsp. **bulgarica** Chaudhri n. subsp. a subspecie *cephaloti* caulibus ex internodiis brevioribus (1-2 mm longis), foliis linearibus usque ad 6.0 mm longis et 1.25 mm latis, sepalis subglabris et minime in fructu clare inaequalibus distinguenda, a subspecie *thracica* Chaudhri caulibus sparse pubescentibus, foliis in statu matura glabris diversa. Stems very woody at the base, nodose, (internodes c. 1-4 mm long, mostly 1-2 mm), minutely pubescent to subglabrous with age; leaves linear, up to 6 x 1.25 mm, ± obtuse, glabrous on both sides, and with a ciliate margin, often very closely arranged and crowded; glomerules 10-18 mm in diam., terminal and profuse; bracts broadly and obliquely ovate, acute. Flowers 3-4 mm long; sepals subequal in the younger stages. but becoming distinctly unequal with maturity, glabrous on the outside, and having a sharply acute (almost acuminate), slightly subrecurved, apex and a conspicuous membranous margin.
Fl. 6-7. Sandy places, at about sea level.
Type: E. Bulgaria: Distr. Varna: Gebedze, 15.vii.1930, *Karl Ronniger* (holo. W!).
Distr.: Endemic in ENE Bulgaria.
Differs from the subsp. *cephalotes* in having mostly very short-jointed, almost bead-like shoots, very narrow, linear leaves, and in the fruiting stage ± unequal sepals with a glabrous back, a ciliate margin, and sharply pointed ± recurved apex. Moreover, it inhabits sandy localities at sea level, whereas the subsp. *cephalotes* occurs ond dolomite rocks.
Bulgaria: Distr. Stalin (Varna): Dikli Tas, nr. Beloslav, *N. Vihodzevssky* 351 (COI, JE, W); Gebedze, 15.vii.1930, *Karl Ronniger* (W, holotype); Gebedze ("Gebesche"): *Joh. Hruby* 316 (LD).
C) subsp. **thracica** Chaudhri n. subsp. a subspeciebus aliis caulibus scabridis et foliis dense strigosis distinguenda.
Perennial with a woody and very compact base; stems 5-10 cm long, prostrate to suberect or somewhat ascending, densely scabrous-pubescent to finely puberulous with age. Leaves narrowly oblong to lanceolate-oblanceolate, sometimes narrowly elliptic, 5-9 x 1.25-2 mm, acute, adpressed pubescent, sometimes scabrous, margin strongly ciliate; stipules 3-5 mm long, lanceolate, shorter than the leaves. Glomerules terminal as well as lateral, often coalesced at the ends of

the flowering shoots (forming larger and compact masses), 9-14 mm in diam.; bracts obliquely ovate-oblong (or suboblong), up to c. 7 x 4 mm, acute to acuminate, and much exceeding and concealing the flowers. Flowers (2.75-)3-3.5(-3.75) mm, narrowly ellipsoid-oblong, densely adpressed pubescent, sometimes rather scabrous; sepals subequal in younger stages to unequal in the fruiting stage, connivent to erect, lanceolate with a subacute to subobtuse and penicillate apex; petals c. 0.75 mm; filaments 0.8-1 mm; anthers c. 0.4 x 0.25 mm; ovary c. 0.75 x 0.5 -0.75 mm, ovoid conical; styles 0.7-0.75 mm. Fruit ovoid, 1.5-2 x 1-1.25 mm, about (1/2-) 2/3 as long as the sepals. Fl. 5-6. Stony places, alt. c. 60-100 m.

Type: Greece: Thracia occid., in fauce fluvii Nestos (Mesta), prope Toxotai (Oktschilar), in saxosis, substr. calc., alt. c. 60-100 m, 12.vi. 1936, *K. H. & F. Rechinger* 9350 (holo. W!).

Distr.: Endemic in NE Greece.

Thrace: Makri, nr. Alexandrupolis, *K. H. & F. Rechinger* 5970 (W).

Differs from the subsp. *cephalotes* in having usually densely scabrous-pubescent shoots, densely pubescent leaves, shorter petals (0.7-0.75 mm instead of 1-1.1 mm), shorter styles (0.7-0.75 mm instead of 0.8-1 mm), narrowly oblong-lanceolate and ± subacute sepals, and a fruit which has almost 2/3 the length of the sepals instead of being nearly half as long as the latter.

Note: Borhidi's identifications are not quite reliable. Owing to the non-availability of the type specimen of his var *macrocephala*, described as bearing large glomerules, flowers 3-3.5 mm long, and leaves hairy on both sides, I am unable to determine its exact status.

93. **P. bornmülleri** Chaudhri n. spec.

Plate XIV, Fig. 23-26. p. 260

Herba perennis parva, radice perpendiculari lignoso instructa. Caules plus minusve prostrati, sine radicibus adventitiis, basi lignosi et hic dense ramificati, diffuse divergentes, 6-10 cm longi; internodia 3-8 mm longa, breviter pubescentia. Folia saepe patentia, obovato-oblanceolata, 6-8 mm longa et 1.3-3.0 mm lata, apicem ramulorum versus majora et basim ramulorum versus minora, plerumque subobtusa, basim versus angustata, utrimque sparsius scabrido-pubescentia vel interdum parce hirsuta, margine pilis patentibus robustis hirtello; stipulae ovato-lanceolatae, 3-4 mm longae, foliis multo breviores. Glomeruli terminales et axillares, distincte separati; bracteae oblique oblongae, ovatae vel sub-orbiculares, circ. 5 mm longae et 3.5 mm latae, acutae, flores omnino obtegentes. Flores anguste ellipsoidei, 3.5-4.0 mm alti, basi breviter stipitati, appresse scabrido-pubescentes; sepala erecta, inaequalia, exterioria interioribus paulo longiora, oblonga et apice acuta; interiora interioribus paulo longiora, oblonga et apice acuta; interiora lanceolato-oblonga, apice acuta et ibi hirtella; petala 0.9-1.0 mm longa;

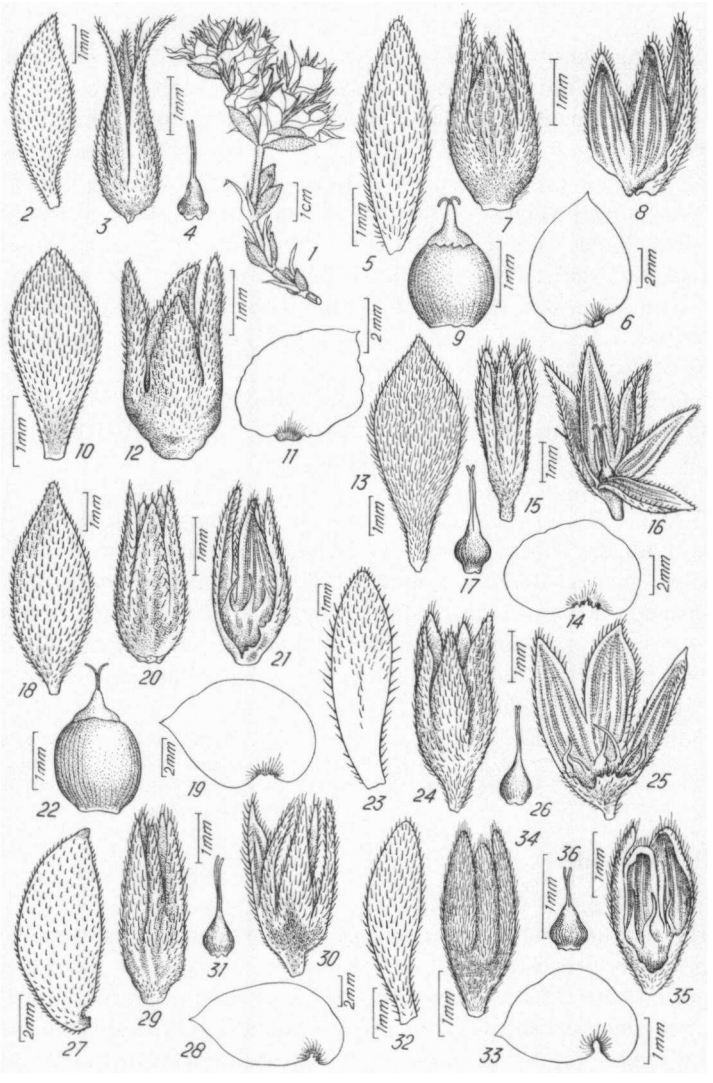

Plate XIV. Fig. 1-4: **P. splendens**; 1: shoot; 2: leaf; 3: flower; 4: ovary and styles [10.v.1914, *Grossheim* (TGM)]. Fig. 5-9: **P. jordanica**; 5: leaf; 6: bract; 7: flower; 8: section of flower, inside view of the sepals; 9: fruit [*Bornmüller* 226(JE)]. Fig. 10-12: **P. palaestina**; 10: leaf; 11: bract; 12: flower [29.v.1926, *Eig & Zohary* (HUJ)]. Fig. 13-17: **P. maroccana**; 13: leaf; 14: bract; 15: flower; 16: flower dissected, inside view of the sepals; 17: ovary and styles [*Font Quer* 86 (Z)]. Fig. 18-22: **P. tunisiana**; 18: leaf; 19: bract; 20: flower; 21: v.s. flower, inner side of the sepals; 22: fruit [16.v.1887, *Letourneux* (P)]. Fig. 23-26: **P. bornmülleri**; 23: laef; 24: flower; 25: v.s. flower, inner side of the sepals; 26: ovary and styles [*Sintenis & Bornmüller* 631(W)]. Fig. 27-31: **P. albanica**; 27: leaf; 28: bract; 29: flower; 20: flower dissected; 31: ovary and styles [*Lempberg* 354(E)]. Fig. 32-36: **P. macedonica**; 32: leaf; 33: bract; 34: flower; 35: v.s. flower, inner side of the sepals; 36: ovary and styles [*Rechinger* 17610(W)].

stamina filamentis circ. 1.1 mm longis et antheris 0.4 mm longis et 0.25 mm latis instructa; ovarium conico-ovoideum, circ. 1 mm altum et 0.65 mm diam.; styli circ. 0.9 mm longi, erecti. Fructus maturus nondum visus. Flores mensibus 5 et 6.
Type: Greece: Insula Thasos: Theologos, in marmareis, 30.v.1891, *P. Sintenis & J. Bornmüller* 631 (holo. W!).
Distr.: Endemic.
This species shows some resemblance to *P. cephalotes* (M. Bieb.) Besser subsp. *thracica* Chaudhri but the two differ considerably in habit as well as in the structure of leaves, stipules, glomerules and sepals. This species possesses lax, diffuse stems (instead of being crowded as in the other taxon), spreading obovate, on both sides scabrous leaves with a ± hirsute margin, much shorter stipules, distinct glomerules (not congested) and distinctly unequal, even in the younger stages erect sepals.

94. **P. maroccana** Chaudhri nov. spec.
P. kapela (Hacq.) Kerner subsp. *serpyllifolia* (DC.) Aschers. et Gr. var. *hirta* Emberg. et Maire Cat. no 22 bis (1930).

Plate XIV, Fig. 13-17. p. 260

Herba perennis parva, radice perpendiculari longo et lignoso instructa. Caules diffuse divergentes, 6-11 cm longi, basi lignosi et hic dense ramificati, ramulis floriferis ascendentibus, laxioribus; internodia 1-8 mm longa (inferiora tamen multo breviora), nodosa, pilis retrorsis pubescentia. Folia plerumque patentia, elliptico-obovata, 3-7 mm longa et 1.5-3.0 mm lata, plerumque acuta, basi angustata, leviter incrassata, pilis appressis vel patentibus pubescentia; stipulae cuiusque folii duae, ovato-lanceolatae, usque ad 4 mm longae, acuminatae, foliis breviores, basi saepe persistente. Glomeruli plures ad apicem ramulorum inserti, plerumque omnes distincte separati, 8-11 mm diam.; bractae sub-orbiculares vel subreniformes, 5-7 mm longae et 4-5 mm latae, flores omnino obtegentes. Flores anguste ellipsoidei, 3.25-4.25 mm alti, basi angustati, appresse pubescentes; sepala carnosa, subaequalia vel ad extremum inaequalia, lineari-oblonga vel interdum spathulata, acuta vel subobtusa, margine dense ciliata, primum erecta, ad extremum paulo divergentia; petala 1.3 mm longa, staminibus subaequilonga, stamina filamentis 1.1 mm longis et antheris oblongis, 0.45 mm longis et 0.25 mm latis, aurantiis instructa; ovarium conicum, 0.7 mm altum et 0.45 mm diam.; styli duo, 0.75 mm longi, erecti. Fructus maturus non visus. Florens mensi 6. Habitat montium summos, alt. 1900-2100 m.
Type: N. Morocco: In glareosis calc. cacuminis Yebel Kelti, alt. 1900 m, 18.vi.1928, *Font Quer* 86 (holo. BM! iso. Z!).
Distr.: Endemic in N. Morocco.
Mt. Tisuka, 2100 m, *Font Quer* 87 (BM, Z).

It shows no relationship whatsoever with *P. kapela* (Hacq.) Kerner subsp. *serpyllifolia* (DC.) Aschers. et Graebn. under which Emberger & Maire, op. cit., had placed it; this error was repeated by Maire et Weiller in Maire's Fl. Afr. Nord, 9:34 (1963).
P. kapela is characterised by glabrous leaves, equal sepals, and short, divergent-recurved styles and stigmas, whereas in this species the leaves are densely pilose to pubescent, the sepals unequal in age, and the styles long and distinctly erect.
Subsectio 2. **Quadristipulatae** Chaudhri subsectio nov. p. 94
Stipules four on each node, and sepals erect.

95. **P. mesopotamica** Chaudhri n. spec.

Plate XV, Fig. 17-21. p. 263

Herba perennis parva et compacta. Caules prostrati, 3-7 cm longi, basi lignosi, per totam longitudinem ramificati, subcaespitosi; ramuli divergentes, dense foliosi et saepe a foliis stipulisque omnino obtecti, profuse floriferi; internodia 2-4 mm longa, breviter retrorse pubescentia. Folia oblonga vel oblanceolato-spathulata, 2.5-5.0 mm longa et 1.25-1.75 mm lata, plerumque obtusa; folia inferiora carnosa, aliis paulo minora, ascendentia et imbricata, velutino-pubescentia; superiora plerumque majora et oblanceolato-spathulata, parum divergentia, dense pubescentia, tenuiora; stipulae anguste ovatae vel lanceolatae, 3-5 mm longae et 1.0-1.5 mm latae, acuminatae, margine ciliolatae, saepe foliis paulo longiores, interdum eis aequilongae et in subspecie *syriaca* eis paulo breviores, plerumque imbricatae, cuiusque folii duae. Glomeruli ad apicem ramulorum dense congesti vel confluentes, (7-)10-15 mm diam.; bracteae late ovatae vel suboblongae, (4-)6-7 mm longae et 3.5-4.0 mm latae, apicem acutum versus contractae, floribus longiores et eos omnino obtegentes, in subspecie *syriaca* tamen saepe suborbiculares et breviores. Flores anguste ellipsoidei, (2.25-)2.5-2.75 mm alti, dense et appresse pubescentes; sepala carnosa, aequalia vel subaequalia, plerumque anguste oblonga, subobtusa, conniventia vel erecta; petala 0.7-0.75 mm longa; stamina filamentis quam petala aequilongis et antheris 0.4 mm longis et 0.25 mm latis, aurantiis instructa; ovarium subovoideum. circ. 0.6 mm altum et 0.4 mm diam.; styli 0.5-0.55 mm vel in subspecie *syriaca* circ. 0.4 mm longi, erecti. Fructus ovoideus, circ. 1.4 mm altus et 1.25 mm diam., quam sepala fere tertia parte brevior et ab eis omnino inclusus, circum collum annulo notatus.
Fl. and fr. 6-7. Rocky places, c. 1300-1500 m.
a) subsp. **mesopotamica:** Stipules somewhat exceeding the leaves, glomerules larger, c. 10-15 mm in diam., and densely congested; bracts obliquely ovate to nearly oblong, tapering towards the apex, up to 7 x 4 mm; flowers 2.5-2.75 mm; styles 0.5-0.55 mm.

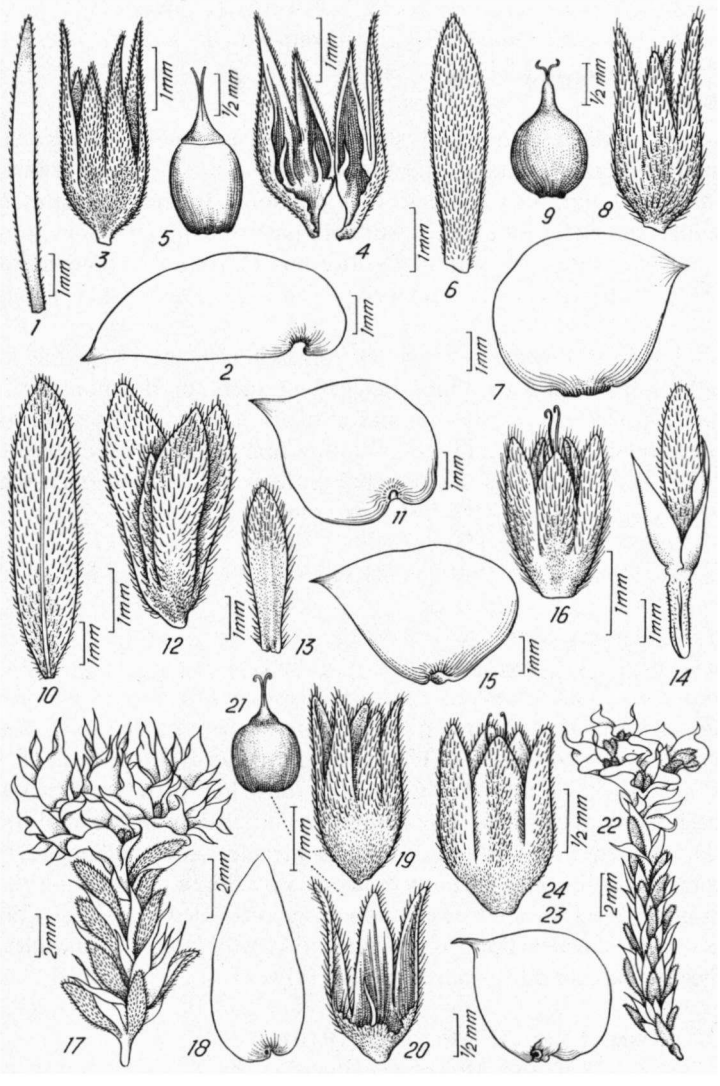

Plate XV. Fig. 1-5: **P. somaliensis**; 1: leaf; 2: bract; 3: flower; 4: flower dissected, inside view; 5: fruit [v.1895, *Edith Cole* (K)]. Fig. 6-9: **P. sinaica**; 6: leaf; 7: bract; 8: flower; 9: fruit [*Drar* 502(S)]. Fig. 10-13: **P. bungei**; 10: leaf; 11: bract; 12: flower; 13: sepal, inner side [*Aellen & Esfandiari* 3480(W)]. Fig. 14-16: **P. caespitosa**; 14: leaf with stipules; 15: bract; 16: flower [20.vi.1904, *Th. Strauss* (JE)]. Fig. 17-21: **P. mesopotamica**; (subsp. **mesopotamica**); 17: shoot; 18: bract; 19: flower; 20: v.s. flower, inner side of the sepals; 21: fruit [*Wheeler Haines* 452 bis(E)]. Fig. 22-24: **P. boissieri**; 22: shoot; 23: bract; 24: flower [23.vi.1865, *Haussknecht* (JE)].

Type: N. Iraq, Sarsang, on rocks beside shady gorge, 1300 m, 5.vii. 1955, *R. Wheeler Haines* 452 bis, mixed with *P. kurdica* Boiss. (holo. E).
Distr.: Iraq.

b) subsp. **syriaca** Chaudhri n. subsp. a subspecie *mesopotamica* stipulis in ramulis floriferis quam folia brevioribus, glomerules minoribus (plerumque 7-10 mm, raro usque ad 15 mm diam.), bracteis plerumque suborbicularibus, interdum tamen suboblongis, maxime 5.0 mm longis et 3.6 mm latis, breviter acuminatis, floribus plerumque paulo minoribus (2.25-2.5 mm altis), stylis brevioribus (circ. 0.4 mm longis) distinguenda.
Stipules on the flowering branches somewhat shorter than the leaves, though ± equalling to almost exceeding them in the non-floriferous region; glomerules c. 7-10(-15) mm in diam.; bracts mostly suborbicular to occasionally oblong, up to 5 x 3.6 mm, shortly pointed; flowers 2.25-2.5(-2.75) mm, the outer sepals mostly ± oblong, occasionnally somewhat spathulate; styles c. 0.4 mm long.
Fl. 6. Rocky places, ca. 1500 m.
Type: Syria: Sekel, c. 1500 m, 21.vi.1943, *P. H. Davis* 6453A (holo. E!).
Distr.: Endemic in Syria.

SYRIA: Antilebanon: Deir Atiah, *Y I. Barkoudah* 352 (U); Deir Mat Musa (Akark), *Davis* 5502 (E); Syrian Desert: Rat'Tush nr. Qaryatein, *Davis* 5652 (E).
Range of the species: Iraq and Syria. This species is allied to *P. boissieri* Rouy (*P. imbricata* Boiss. et Hausskn.) and *P. caespitosa* Stapf. *P. boissieri* is, however, confined to Gaziantep only, and prossesses very short, diffusely spreading stems, much smaller and closely imbricated, oblong leaves, smaller, terminal and distinct glomerules, and smaller bracts and flowers, the latter only partially concealed by the bracts. *P. caespitosa* is endemic in W. Iran, and possesses densely crowded stems, ± oblanceolate leaves, shorter stipules, smaller and mostly lateral glomerules, and smaller bracts, not quite concealing the flowers.

96. **P. boissieri** Rouy, Fl. Fr. 12:5 (1910).
Syn.:*P. imbricata* Boiss. et Hausskn. in Boiss., Fl. Or. 1:744 (1867), non Reichenbach, Fl. Germ. Excurs. 564 (1832).
Type: Turkey ("Syria bor."): In fissuris rupium calcarearum ad Tullus prope Aintab (Gaziantep), 25.vi.1865, *C. Haussknecht* (holo. G! iso. JE). J. E. Dinsmore in G. E. Post, Fl. Syr. Palest, and Sinai, 1:212 (1932); M. N. Chaudhri in P. H. Davis, Fl. Turk. 2:255 (1967). *P. boissieri* *) Chaudhri in Acta Bot. Neerl. 16(1):32 (1967).

*) While proposing the new name for this species I was not aware of the fact that Rouy had already published this name in a short footnote in his Flora.

Plate XV, Fig. 22-24. p. 263

A very small perennial herb with a woody tap root; stems much branched from the woody and compact base, quite short, 3-4 cm tall, somewhat ascending or suberect, covered with closely imbricated leaves and stipules; internodes very short and minutely adpressed pubescent, pale orange. Leaves linear-oblong to subcylindrical, 2-2.5 x 0.5 mm, obtuse, thick-fleshy, closely imbricated and ascending, minutely adpressed-puberulous; stipules lanceolate, acuminate, somewhat exceeding the leaves. Glomerules terminal and distinct, c. 5 mm in diam., subglobose; bracts broadly ovate, acute to acuminate, somewhat longer than the flowers but not concealing them. Flowers 1.75-2 mm long, oblong, very shortly adpressed pubescent; sepals subequal, thick-fleshy, erect, oblong, obtuse to sub-obtuse; petals 0.5-0.7 mm long, ± equalling the stamens; ovary ovoid, with short, 0.3 mm long, erect styles. Fruit 1.35 x 0.8 mm, ovoid-oblong, narrowed at the top, ± equalling the sepals. Fl. and ft. 6. In fissures of calcareous rocks.
Distr.: Endemic, and known only from the type locality. In fact, Haussknecht's is the only record of this species, and it has not been collected since then.
Turkey: Vil. Gaziantep: nr. Gaziantep (Aintab), vi.1865, *C. Haussknecht* (G, JE).

97. **P. caespitosa** Stapf in Denkschr. Akad. Wissensch. Wien 2:290 (1886).

A. Parsa, Fl. de l'Iran, 1(2):1243 (1951) sub *P. imbricata* Boiss. et Hausskn.

Plate XV, Fig. 14-16. p. 263

A small perennial herb; stems c. 4-8 cm long, much-branched from the woody and partly subterranean base, ± prostrate, and the branches often so densely crowded that they form a compact mat; internodes 2-4 mm long, shortly scabrous-pubescent. Leaves ± oblanceolate-oblong to oblanceolate-spathulate, 3-4 x 1-1.5 mm, obtuse, rather thick, those on the basal part of the shoots usually fleshy, closely imbricate and velvety-pubescent, but the upper ones often somewhat larger, darker-green, distinctly-scabrid (i.e. covered with short, patent, stiffish hairs), spreading in age; stipules ovate-lanceolate, mostly somewhat shorter than the leaves; occasionally almost equalling them. Glomerules axillary, terminal and subterminal, c. 5 mm in diam., ovoid, often merging together into large, compact masses; bracts broadly ovate and acute to almost orbicular-rounded and obtuse, 4-5 x 3-4 mm, often exceeding the flowers, though not quite concealing them. Flowers 1.5-

2.5(-2.75) mm long, oblong, adpressed pubescent, occasionally somewhat scabridous (with patent, short and stiff hairs); sepals rather thick, subequal (or, sometimes, unequal), the two outermost somewhat longer, narrowly oblong and obtuse, the inner subacute, usually all erect, occasionally the outer slightly spreading and recurved; petals 1 mm long, ± equalling the stamens; filaments 0.75 mm; anthers 0.3 x 0.2 mm; ovary ovoid-conical, with two short, c. 0.4 mm long, and erect styles. Fruit c. 1.5 x 0.8 mm, ovoid-prolate, almost equalling the sepals, and the styles somewhat exserted.

Fl. 5-7. Ft. 7. Rocky places and dry river beds, alt. ca. 1500-2200 m.

Type: W. Persia: In fissuris rupium ad Jalpan, 21.vi.1882, *Th. Pichler* (holo. WU! iso. G!).

Distr.: W. to NW. Iran.

Jalpan, nr. Hamadan, 21.vi.1882. *Th. Pichler* (G, WU); Pasquave, 4.vii.1914, *Hjalmar Pravitz* 41 (S); Kohrud, 20.vi.1904, *Th. Strauss* (JE); Kuh-Gamsar, 24. vi.1904, *id.* (JE); Khurramabad: Mt. Elwend (Alvend), 1.vi.1910, *Th. Strauss* (JE); Sultanabad, /1902, *Th. Strauss* (JE); Mowdere, v.1890, *id.* (JE) Elburs Mts.: Distr. Keredj, *K. H. Rechinger* 552 (W); NW Teheran, *P. Aellen* 1469 (W).

Closely related to, and in some cases almost indistinguishable from, *P. kurdica* Boiss, but the latter possesses larger and terminal glomerules, narrowly ovate bracts which are often concealing the flowers, and the outer sepals always recurved at the tips, whereas in this species the glomerules are smaller, axillary as well as terminal and subterminal, often developed all over the shoots, the bracts broadly ovate to almost orbicular, not completely concealing the flowers, and the sepals are mostly all erect, though occasionally the outer ones are somewhat spreading or subrecurved. Moreover, the fruit in this species is nearly as long as the sepals, and the styles are somewhat exserted, whereas in *P. kurdica* the fruit is much shorter than the sepals and (along with the styles) always enclosed by them. There is, however, a possibility of an exchange of genes between the two spp.; it would be interesting to see whether the two really do hybridize under natural conditions.

2. Sectio **Heterosepalae** Chaudhri sect. nov. p. 92

Sepals distinctly unequal, often recurved in the fruiting stage.

Subsectio 1. **Rectisepalae** Chaudhri subsect. nov. p. 95

Sepals connivent or erect.

98. **P. somaliensis** Baker in Kew Bull. 1895:226 (1895).

Plate XV, Fig. 1-5. p. 263

A small compact perennial herb with a long, woody and sparingly branched tap root; stems suberect, 4-8 cm tall, much-branched from the woody base, branches ascending, often congested and very nearly caespitose, usually densely covered with closely arranged leaves and

stipules; internodes 1-5 mm long, very short and bead-like towards the basal parts of the shoots, longer above, minutely retrorsely pubescent to puberulous or nearly glabrous in age. Leaves linear, 3-8 x 0.6-1.25 mm, acute, mostly on both sides glabrous and with a shortly ciliate margin, or wholly glabrous in age, rather rigid, ± ascending, slightly carinate or concave; stipules lanceolate, 3-5 mm long, acuminate, mostly shorter than the leaves. Glomerules terminal and profuse, 8-12 mm in diam., almost globose; bracts ± ovate to obliquely oblong, 6-7 x 3-4 mm, acute to shortly acuminate and concealing the flowers. Flowers 3-3.75 mm long, minutely adpressed pubescent; sepals connivent when young, ± erect with maturity, lanceolate, acute to acuminate, distinctly unequal, the outer two/three 0.5-0.75 mm longer than the inner ones; petals 0.6-0.65 mm, shorter than the stamens; filaments 0.75 mm; anthers 0.25-0.3 x 0.2 mm, oblong and orange; ovary conical-ovoid, 0.6 x 0.45 mm, tapering upwards; styles two, 0.55-0.6 mm and erect. Fruit 1.5 x 1 mm, ellipsoid-ovoid, nearly 1/2 as long as the sepals.
Fl. & ft. 5-6.

Type: Somalia (Somaliland): Golis range at Wardie, v.1895, *Miss Edith Cole* (holo. K! iso. BM!).

Distr.: Endemic in Somalia.

Somalia: Wardie, vi.1895, *Mrs. E. Lort Phillips* (K); Wagga Mts., *id.* (BM); Soksada & Upper Sheik, ii.1897, *id.* (BM).

The affinities of this species are obscure; its very characteristic, linear, rigid, and almost glabrous and ascending to erect leaves, the minutely pubescent and connivent to erect sepals readily distinguish it from the other members of this section; in particular from P. capitata (L.) Lam.

Subsectio 2. **Heterosepalae.**
Sepals recurved in the fruiting stage.

99. **P. kurdica** Boiss., Diagn. ser. 1(3):10 (1843).

Type: Iraq: ad rupes calc. cacuminis m. Gara Kurdistan, 27.vii 1841, *Th. Kotschy* 334 (holo. G! iso. HAL, JE, S).

Boissier, Fl. Or. 1:744 (1867); Suppl. 122 (1888); Grossh., Sosnov et Schischkin, Fl. Tiflis. 1:199, fig. 82 (1925); Dinsmore in Post, Fl. Syr. Palest. & Sinai, 1:213 (1932); B. K. Schichkin in Komarov, Fl. U.R.S.S. 6:566 (1936); J. Bornmüller, Symb. Fl. Anatol, in Feddes Repert. Beih 89(1):119 (1940); A. Parsa, Fl. Iran 1(2):1244 (1951); K. H. Rechinger, Fl. Lowl. Iraq 222 1964); P. Mouterde, Nouv. Fl. Liban & Syr. 1:455 (1966); M. N. Chaudhri in Davis, Flora of Turkey 2:254 (1967).
Syn.: *Illecebrum cephalotes* M. Bieb., Fl. Taur.-Cauc., Suppl. 169 (1819) p.p. quoad pl. caucas. *Paronychia hispida* Steud. in sched., Kot-

schy Pl. Syr. exs. 159 (1841-43); *P. capitata* Lam. var. *α pubescens* Fenzl in Ledeb. Fl. Ross. 2:163 (Iusus 3) (1843).
Misapplied name: *P. nivea* sensu C. A. Meyer, Verz. Pfl. Cauc. 154 (1831), non DC. in Poiret., Encycl. 5:25 (1804).
A small perennial herb with a woody base; stems, c. 5-15 cm long, prostrate or shortly ascending to suberect, much-branched from the woody base, the branches often compact and profusely floriferous, shortly pubescent with ± patent hairs. Leaves narrowly oblong to (mostly) oblanceolate, 3.5-7(-9) x 1-2 mm, and ± obtuse, the basal ones usually fleshy and adpressed pubescent, the upper rather scabrous-pubescent; stipules ovate-lanceolate, mostly shorter than the leaves, four for each pair of leaves. Glomerules terminal as well as lateral to axillary, (5-)10-15 mm in diam., often very copious and densely congested; bracts obliquely ovate, 4-6 x 3-4 mm, acuminate, nearly 2 x longer than the flowers and usually concealing them. Flowers (2-) 3-4(-4.5) mm long, adpressed pubescent; sepals rather fleshy, distinctly unequal, the outer (two/three) linear-oblong, obtuse to subobtuse and more or less recurved at the tip, and longer than the inner, lanceolate-acute sepals; petals c. 0.75 mm long, almost equalling the filaments; anthers c. 0.35 x 0.25 mm, oblong-rectangular and orange-yellow; ovary ovoid-conical, narrowed to the top; styles c. 0.4 mm long and erect. Fruit c. 1.5 x 1 mm, ovoid-oblong with a distinct ring-like mark on the neck, seed c. 1.25 x 0.85 mm, bean-shaped.
Fl. 5-7. Rocky places, alt. ca. 100-2300 m, mostly above 500 m or around 1000 m.
Very variable in the form and size of the flowers, esp. of the sepals. The bracts seem to develop rather slowly in the earlier stages, and attain their full size towards the period of floral maturity. Two subspecies are recognized, based mainly on the form of the sepals and the size of the flowers.
1a) Flowers 3.5-4.5(-5) mm long, the outer sepals linear-lanceolate, sharply acute and much recurved ..... subsp. **montis-munzur**
1b) Flowers usually up to 3.5 mm long; the outer sepals narrowly oblong-lanceolate, obtuse, recurved at the tips only .. subsp. **P. kurdica**
2a) Leaves often imbricate; glomerules mostly small, c. 5 mm in diam.; flowers 2-2.5(-3) um; bracts almost orbicular and acute
3a) Glomerules densely congested and very conspicuous ---- ..... var. **haussknechtii**
3b) Glomerules not congested, few-flowered and inconspicuous ---- ..... var. **imbricata**
2b) Leaves often more or less free from each other; glomerules (5-) 10-15 mm in diam.; bracts obliquely ovate, acuminate; flowers (2.5)-3 -3.5(-4) mm ..... var. **kurdica**
4a) Internodes rather slender, 1-1.9 cm long ..... subvar. **laxa**

4b) Internodes often stout and less than c. 1 cm long
5a) Shoots usually very brittle ..... subvar. **fragilis**
5b) Shoots often not brittle
6a) Bracts completely concealing the flowers, and the glomerules quite large and coalesced ..... subvar. **kurdica**
6b) Glomerules quite small; flowers often ± exposed ---- ..... subvar. **viridescens**

A) subsp. **kurdica:**

a) subvar. **kurdica:**

U.S.S.R.: Georgia: Tbilisi (Tiflis), *A. H. & V. F. Brotherus* 187 (G-B); ibid., 550-700 m, *Davis* 33742 & 33899 (E); *G. Woronow* 2973 (S, TGM, W); Prov. Tbilisi: Acholtzich to Kissotib, 27.vii.1923, *W. Kozlowsky* (TGM); Distr. Akhalzikhe, *D. Sosnowsky* et *al.*, 24.vii.1936 (TGM); **Armenia:** Prov. Erivan: distr. Nakhichevan, 26.v.1914, *Woronow* (W); **Azerbaijan:** Distr. Zuvant, 17.v.1935, *A. Grossheim & C. Gurvitsch* (S); Dzhulfa, 29.v.1932, *T. Heideman & H. Aliw* (TGM); Prov. Gomdzha, 13.vi.1927, *D. Sosnowsky* (TGM); Kirovabad (Elisabethpol), v.1835, *R. F. Hohenacker* (as *Illecebrum cephalotes* M. Bieb.) (E, L, STU). **Turkey:** Bilecik: Bilecik, 320 m. *Demiriz* 1735 (ISTE); Ankara: N. of Ankara, *H. Czeczott* 160 (Z); Nallihan, 640 m, *Davis & Coode*, D. 37049 (E); Mt. Koyash, *Davis* 13144 (E); Dikmen Dagh, *J. & F. Bornmüller* 1929: 13966 (S); Vil Cankiri, 800 m, *J. & F. Bornmüller* 1929:13916 (G, S, Z); Kalecik, *id.* 13925 (Z); Vil. Amasya: Amasya, 400 m, *J. Bornmüller* 1889: 316 (G, HBG, JE, S, W); Erbaa, *Tobey* 686 (E); Vil. Gümüşane: Gümüşane, *P. Sintenis* 1894:7293 (E, G, JE, L, STU); Bayburt, *Sintenis* 7293b (JE); Vil. Coruh: Katibkhan to Artvin, 200 m, *Holmberg* 2254 (S, W); Vil. Erzurum: Erzurum to Ispir, vi.1853, *Huet du Pavillon* (G); N. of Tortum, 1500 m, *Davis* 47559 (E); Vil. Kars: above Kağizman, 1450 m, *Davis* 46845 (E); Vil. Nigge: Hasan Dağ, *Davis, Dodds, Cetik* D. 18896 & D. 19033 (E, U); Vil. Malatya: Malatya, /1932, *Ajtai-Kovách* (W); Divriki, 1000 m, *J. Bornmüller* 1893: 3291 (G, JE); Vil. Diyarbakir: Maden-Ergani, 1000 m, *Davis & Hedge* D. 29067 (U); Vil. Tunceli: Pertek to Hozat, 1100 m, *Davis & Hedge* D. 31009 (U); Ovacik, 1400 m, *id.* D. 31459 (U); Elazig, vii.1944, *Fatma Saye* (ISTE); Harput, *Sintenis* 1889: 531 (JE); Kemaliye, *Sintenis* 1890: 2472 & 2764 (G, JE); Vil. Siirt: Siirt to Baykan, *Davis* 43069 (E); Vil. Bitlis: Baykan to Bitlis, *Davis* 43156 (E); Vil. Van: Van to Erçek, 2100 m, *Davis* 44414 (E); N. of Şatak, *Davis & Polunin* D. 23102 (U); Vil. Isparta: Isparta, /1938 *M. Başarman* (ISTE); Vil. Konya: Konya to Cihanbeyli, S. of Tutup, 1000 m, *Demiriz* 2728 (E, ISTE)); Vil. Seyhan: Akher Dağ, *E. K. Balls* 1113 (E, K); Vil. Adana: Bahçe, Haruniye, 500 m, *Davis & Hedge* D. 26755 (E); Vil. Maras: Pazarcik, Narli to Karabiyikli, *Davis & Hedge* D. 27775 (U); Vil. Hatay: Iskenderun, Arsuz, *Demiriz* 892 (ISTE); Vil. Mardin: Mardin to Nusaybin, 850 m, *Davis & Hedge* D. 28495 (E, U); Mardin, *Sintenis* 1127 (E, G, JE, STU); Midyat to Gercus, 110 m, *Davis* 42925 (E); Girze to Silopi 400 m, *Davis* 42728 (E); Vil. Hakkari: nr. Hakkari, 1400 m, *Davis* 45451 (E); Hakkari to Cukurca, 1200 m, *Davis* 44795 (E); Hakkari to Van, 1200 m, *id.* 44938 (E). **Iran:** Western Azerbaijan: N. of Khoy, 1600 m, *Martin L. Grant* 16182 (W); Urmia, *B. Gilliat-Smith* 2259 & 2267 (K); Lake Rezaiyeh, 1300 m, *M. Jacobs* 6887 (K, L, W); NW of Khoy, 1700-1800 m, *Rechinger* 32699 (W); nr. Tabriz, *B. Gilliat-Smith* 2133 (K); *Mirdamadi* 2228 (W); Marand Mts., *Sharif* 6484E (W); Mianeh, v. 1000 m, *E. S. Brown* 2750 A (K;) Northern Iran: nr. Rudbar c. 300 m, *J. & A. Bornmüller* 1902: 6482 (E, G, JE); Ferasad, Totschal mts., 1600 m, *id.* 6479 (Z); Patschinar, 600-700 m, *id.* 6481 (Z); nr. Karaj,

Rechinger 822 (W); nr. Teheran, *Th. Kotschy* 44 (G); Elburz Mts. Firuz Kuh, c. 2100 m, *Furse & Synge* 477 (K); Elburz Mts., *Rechinger* 362 (K), & 496 (S, W); Western Iran: Prov. Kermanshah: Kuh-i-Parau, *M. Jacobs* 6751 (K, L, W); Prov. Lorestan: *Walther N. Koelz* 18243 (W); Prov. Isfahan: nr. Isfahan, *Cowan & Darlington* 667 & 1120 (K); SW. Iran: Prov. Fars: NW of Shiraz, c. 2300 m, *Martin L. Grant* 17681 (W); Mullahzadeh, nr. Shiraz, *O. Stapf* 34 (W); Siwaend, *Stapf* 35 (W); Bushehr (Abushir) to Shiraz, *Th. Kotschy* 97 (G, JE, S). **Iraq:** NE of Baghdad, *W. Edgar Evans* M/241 (E); Distr. Diyala, nr. Mandali, *Rechinger* 12799 (W); Jabal Hamrin, *Bornmüller* 1893: 990 (G, JE); Khanaquin, *E. R. Guest* 1834 (Rustam Herb.) (K); Kurdistan: Distr. Kirkuk, E. of Kirkuk, 500 m, *Rechinger* 9998 (W); E. of Chemchemal, 3.vi.1948, *Gillet & Rawi* (K); Gara Kurdistan, *Th. Kotschy* 334 (G, HAL, JE, S) TYPE; Kuh-Sefin, nr. Shaklava, *Bornmüller* 1893: 991 (STU, Z); Distr. Sulaimanya: nr. Penjwin, 1400-1600 m, *Rechinger* 10469 & 12301 (W); Kuh Sanjaq, 7.v.1959, *Rawi, Nuri, Kass* (K); Erbil to Altun Köprü, *Haussknecht* 223 (G); Distr. Erbil: nr. Pushtashan, *Rechinger* 11738 (W); Ankova, *Bornmüller* 992 (G, JE); nr. Pir Omar Gudrun, *Hausknecht* 224 (G, JE); Zewiya, nr. Omar Gudrun, 6.vi.1948, *A. Rawi* (K); Distr. Mosul: N. of Mosul, *E. R. Guest* 3660 (S); Mosul to Zakho, *Rechinger* 12171 (W); Prov. Hakari: nr. Zakho, *Rechinger* 10749 & 12122 (W); nr. Sharanish, *Rechinger* 12116 (W); nr. Balad Sinjar, *H. Field & Y. Lazar* 602 (K); Jabal Sinjar, *Haussknecht* (G, Z). **Syria:** Aleppo, *Th. Kotschy* 159 (as *P. hispida* Steud.) (G, JE, S); Aleppo to Hama, 500 m, *G. Samuelsson* 3687 (S); Aleppo to Antakya, *Samuelsson* 3882 (S) (trans. with var. *haussknechtii*). **Lebanon:** Hermel to Churbino,, *Davis* 5832 (E).

b) subvar. **fragilis** Chaudhri in Acta Bot. Neerl. 15(1):201, f.16 (1966), as variety.

Shoots quite brittle, and often having rather simple, 3-flowered, pseudoaxillary dichasial clusters.

Type: Turkey: Prov. Ankara, above Tuz-Gölü, 25 km N. of Koçhisar, 900 m, *McNeill* 326 (holo. E! iso. K!). Endemic.

c) subvar. **laxa** Chaudhri n. subvar. a subvarietatibus aliis internodiis longioribus (1.0-1.9 cm longis) distinguenda. Internodes rather slender and 1-1.9 cm.

Type: W. Iran: Kuh Tsihal Khatun, v. 1902, *Th. Strauss* (JE!). Endemic.

d) subvar. **viridescens** Chaudhri n. subvar. maxime ut subvar. *kurdica* sed glomerulis non totis distinctis, floribus non totis a bracteis obtectis ab ea distinguenda.

Glomerules rather small, bracts not quite concealing the flowers, and the sepals often ± exposed, the whole plant thus appearing greenish. Endemic.

Iran: Kermanshah to Nehawend: Kuh-e-Shires, N. of Harsin, 19.v.1904, *Th. Strauss* (JE, TYPE); Bisitun, 24.iv.1903, *Th. Strauss* (JE).

e) var. **imbricata** Chaudhri n. var. a var. *kurdica* foliis plurimus imbricatis, glomerulis minoribus (circ. 5 mm diam.) non dense congestis et paucifloris distinguenda. Leaves imbricate and ascending in the non-floriferous regions of the shoots; glomerules small, c. 5 mm in diam., mostly terminal and distinct; bracts almost orbicular, shortly pointed on one side, and often not quite concealing the flowers; flowers 2-2.5 mm long, sepals usually only slightly unequal.

Type: Iraq: Distr. Kirkuk: Jarma, c. 800 m, 22.v.1955, *R. Wheeler Haines* 277 (holo. E!). Endemic.

f) var. **haussknechtii** (Chaudhri) Chaudhri, stat. nov.:

P. kurdica Boiss. subsp. *hausknechtii* Chaudhri in Acta Bot. Neerl. 15(1):200, f.17 (1966).

A densely compact and caespitose herb; leaves often imbricate; glomerules c. 5 mm in diam., but densely congested into much larger masses; bracts somewhat exceeding but not concealing the flowers; flowers mostly 2-2.5 mm, and sepals often slightly unequal.

Type: Turkey: Vil. Maras: ("Syr. bor."): mt. Saffdagh, 27.vi.1865, *Haussknecht* (holo. JE!). Endemic.

Gaziantep: Gaziantep, *Haradjian* 144 (G); *Haradjian* 1253 is transitional with var. *kurdica.*

B) subsp. **montis-munzur** Chaudhri in Acta Bot. Neerl. 15(1):200, f.18 (1966). Flowers 3.5-4.5(-5) mm long; sepals linear-lanceolate, sharply acute, and strongly recurved.

Type: Turkey: Vil. Tunceli: Munzur Dağ above Ovacik, 1900 m, *Davis & Hedge* D. 31180 (holo. U! iso. E!).

Vil. Erzincan: Kemaliye, *P. Sintenis* 1890:2323 (JE).

Endemic. This subspecies differs markedly from subsp. *kurdica* in the structure of the sepals, but there are several intermediates, indicating its link with the main population of *P. kurdica.*

Distribution of the species: WSW. Asia: North, W. and SW. Iran, C. and N. Iraq, Georgia, Azerbaijan, Armenia, almost the whole of Turkey (except the extreme West) and NW. Syria and some parts of Lebanon.

100. **P. splendens** Steven in Bull. Soc. Imp. Nat. Moscau 29(3):184 (1856).

Misapplied name: *P. kurdica* auct., non Boiss., Diagn. 1(3):10 (1843).

Plate XIV, Fig. 1-4. p. 260

A small perennial herb with a woody tap root; stems with a somewhat woody base, much-branched, suberect, the flowering branches somewhat ascending, c. 4-9 cm long, internodes usually short, stout and puberulous. Leaves rather rigid, narrowly obovate to ± elliptic-oblonceolate, 3-7 x 1.5-2.25 mm, acute, narrowed to the base, on both sides puberulous (occasionally slightly scabrous or hirtellous) to almost glabrous, margin ciliate; stipules lanceolate, 3.5-5(-6) mm, often deeply split, usually almost equalling or somewhat shorter than the leaves, sometimes ± exceeding them, two for each pair of leaves. Glomerules rather small (c. 4-7 mm in diam.) but very profuse, mostly lateral (pseudo-axillary) and very densely congested all along the shoots; bracts obliquely ovate, 4-5 x 2-3 mm, acute to acuminate, usually exceeding but not completely concealing the flowers, occasionally somewhat

shorter. Flowers (2.5-)3-4.5(-5) mm long, vase-like, with a swollen base, rather sparsely pubescent; sepals distinctly unequal, two long, one of mediam size and the two innermost shortest, all narrowly linear-lanceolate, acuminate, the outer slightly recurved at the tip; petals c. 0.75 mm long; filaments 0.8-0.9 mm, anthers 0.4-0.45 x 0.25 mm, oblong, yellow; ovary ovoid-conical c. 1 x 0.6 mm, with two free and erect, 0.9-1 mm long styles; Fruit c. 1.25 x 1 mm, ovoid, nearly 2/3 the length of the sepals.

Fl. 5-8. Rocky slopes, alt. ca, 1600-2000 m.

Distr.: Southern transcaucasion region: Soviet & Iranian Azerbaijan, Soviet Armenia and the easternmost part of Turkey.

1a) var. **splendens:** Flowers 2.5-3.5 mm long; bracts exceeding the flowers in the fruiting stage.

Type: Azerbaijan: Nachitshevan, 12.vi.1829, *Szovits* 396 (as *P. capitata* Koch) (Lectotype LE!).

Distr.: Throughout the range of the sp. except in and around Erivan.

Soviet Azerbaijan: Nachitshevan, *Szovits* 396 (LE) Lectotype; Ditsr. Nachitshevan, nr. Aznabjurt, 27.vii.1937, *S. Zakarjan* (TGM); **Iranian Azerbaijan:** (without any specific locality) *Szovits* (S); **Turkish Armenia:** Prov. Agri: Dogubayazit, 2000 m, *Rechinger* 14980 (W); 35 km E. of Dogubayazit, 1600 m, *Davis* 43873 (E).

1b) var. **erivanensis** Chaudhri nov. var. a var. *splendente* floribus majoribus (3.5-4.5 et interdum usque ad 5.0 mm altis), bracteis quam sepala paulo brevioribus distinguenda. Flowers 3.5-4.5(-5) mm; bracts somewhat shorter than the flowers (or sepal tips).

Type: Prov. and distr. Erivan: Sardarak, 25.viii.1910, *E. Koenig* (holo TGM); Distr.: Endemic.

Prov. and distr. Erivan: Arazdayan, mons Dagna, 10.v.1914, *A. Grossheim* (TGM); Arazdayan to Mikoyan, 29.v.1960, *A. Takhtajan* et *al.* (W); Sardarak, 25.viii.1910, *E. Koenig* (TGM)-TYPE. Iranian Azerbaijan: E. of Makon, *Bowles Bot. Expedit.* 2583 (K) trans. form!

This is a very distinct species, though closely allied to *P. kurdica* Boiss. from which, however, it is easily distinguishable by its very characteristic leaves, stipules, sepals and styles. The leaves in this species are rigid, narrowly obovate and acute, often (rather abruptly) contracted to a much narrowed base, somewhat scabrous-pubescent to occasionally almost glabrous. In *P. kurdica,* on the other hand, the leaves are oblanceolate-oblong, obtuse, often fleshy, particularly towards the basal part of the shoots, and usually adpressed pubescent. The stipules in this species are two for each pair of leaves and 2-partite, and almost equalling they leaves (sometimes even exceeding them slightly); in *P. kurdica* the are four for each pair of leaves and distinctly shorter than the leaves. The outer sepals in *P. splendens* are narrowly lanceolate and acuminate, whereas in *P. kurdica* they are linear-oblong and obtuse. The styles of *P. splendens* are clearly longer (and occasionally exserted).

Chr. van Steven while describing this species had included two other plants besides the lectotype, one collected by Hohenacker in the prov. Lenkoren, and the other gathered by Szovits from Seidchashi. This later specimen is mounted on the same sheets as Szovits 396 (the lectotype of *P. splendens*) and definitely belongs to *P. kurdica* Boiss. I did not see the first or Hohenacker collection, but that, too, may well belong to *P. kurdica*. It is, therefore, not quite surprising to note that this species had been almost entirely ignored by most of the writers working on the plants of this region. In fact, Boissier did not consider it worth mentioning even as a synonym of his *P. kurdica* in the Flora Orientalis. Maybe that he did not have the relevant material at his disposal. But the writers of the Flora of Armenia and Azerbaijan, or for that matter, the Flora of U.S.S.R., who did have some material pertaining to this species, failed to take any notice of it, and relegated it to the synonymy of *P. kurdica*. *P. splendens* is very variable in the size of flowers and bracts and, sometimes, of the stipules as well. Plants from Nakhichevan and Dogubayazit generally have shorter flowers (more or less concealed by the bracts in the fruiting stage) than those from Erivan, which are, moreover, somewhat longer than the bracts, the sepal tips being distinctly exposed.

101. **P. bungei** Boiss., Fl. Or. 1:744 (1867).
A. Parsa, Fl. de l'Iran 1(2):1264 (1951).

Plate XV, Fig. 10-13. p. 263

A small perennial herb, stems much-branched from the woody base, prostrate or occasionally suberect, c. 4-10 cm long, densely tomentose-pubescent and densely covered with short, patent hairs. Leaves oblong-spathulate or sometimes, ± elliptic-obovate, 3-10 x 2-3 mm, obtuse, rather thick, and densely adpressed pubescent; stipules 3-4 mm long, narrowly ovate-lanceolate, acute to acuminate, shorter than the leaves. Glomerules terminal and subterminal, often densely congested at the ends of the shoots, 5-12 mm in diam., bracts 4-5 x 3-4 mm, broadly and obliquely ovate, acute to acuminate, mostly concealing the flowers in fully developed shoots. Flowers (2.5-)3-4(-4.5) mm long, tubular-oblong, densely adpressed tomentose; the perigynous region rather inconspicuous; sepals somewhat fleshy, unequal, the two outer (and longer) ones spathulate, obtuse and subrecurved at the tips, the inner narrowly oblong and concave; petals c. 1 mm long, ± equalling or slightly overtopping the stamens; ovary ovoid-conical, nearly 1 mm long (1 x 0.5); styles two, 0.5-0.7 mm long, erect, with small divergent stigmas. Fruit ovoid, 2 x 1 mm, tapering upwards into a short narrow neck.
Fl. 4-6. On limestone rocks, alt. ca. 500-2000 m.
Type: S. Persia: Prov. Kerman, Kerman, iv. 1859, *Bunge* (holo. G-BOISS.!).

Distr.: Endemic in Southern Persia.

Prov. Kerman: Kerman, 2000 m, *J. Bornmüller* 3338 (G, JE); Kerman to Bam, *P. Aellan* and *E. Esfandiari* 3600 (W); Kerman/Fars: Chah Choghuk to Tarum, *id.* 7492 (W); Prov. Fars: Jahrum, *Walter Koelz* 14644 (W); Talimansur Bakhtiari, *W. Koelz* 15101 (E, W); Prov. Lar: Hajiabad, nr. Tarum, *Aellen & Esfandiari* 3480 (G, W); Hajiabad to Bandar Abbas, *id.* 3315 (W); Chah-Bazan, 500 m, *M. Köie* 284 (W).

This species is closely related to *P. kurdica* Boiss. but is distinguishable from the latter by its tomentose stems, oblong-spathulate and usually larger leaves, and by the spathulate sepals.

102. **P. sinaica** Fresenius, Beitr. Fl. Aegypt. & Arab., Mus. Senckenb. Frankfurt 1:180 (1834).

Type: Egypt: "Gipfel des Sinai, 700o', *Rüppell* (holo. FR, not seen).

Boissier, Fl. Or. 1:744 (1867); Dinsmore in Post, Fl. Pal., Syr. and Sinai 1:213 (1932); Muschler, Man. Fl. Egypt, 1:354 (1912); V. Täckholm, Stud. Fl. Egypt. 404(1956); Zohary Fl. Pal. 1:131, pl. 185 (1966).

Syn.: *P. flavescens* Boiss., Diagn. ser. 1(10):14 (1849).

Type: Arabia Petraea ad fines Palestinae v. 1846, *E. Boiss.* (holo. G!).

Plate XV, Fig. 6-9. p. 263

A very small, compact, perennial herb with a woody tap root; stems woody at the base, often densely caespitose, and covered with numerous glomerules, prostrate to shortly ascending c. 4-8 cm long; internodes usually short, stout and somewhat scabrously hirtellous. Leaves mostly linear-oblong, 2-5 x 0.5-1 mm, obtuse to subacute, rather rigid, the midrib and the margin often thickened, mostly velutino-pubescent, occasionally hirtellous; stipules ovate-lanceolate, somewhat shorter than the leaves. Glomerules terminal, subterminal as well as lateral, 5-7(-10) mm in diam., very copious and often fused into large, caespitose masses covering almost the entire plant, bracts suborbicular to orbicular, shortly acuminate to obtuse, often rolled around the flowers and mostly ± exceeding and concealing them. Flowers 2.5-3.5(-4) mm, cylindrical-oblong to nearly vase-like, densely adpressed pubescent; sepals distinctly unequal, usually two longer, one of median length, two innermost shortest, rather thick, linear-oblong to linear-lanceolate, the outer often obtuse to subacute and recurved at the tip; petals 0.6 mm long, almost equalling the stamens; anthers c. 0.2 x 0.15 mm, quadrangular and orange-yellow; ovary ovoid-conical, tapering upwards into a rather short style, 0.35-0.4 mm long and bilobed almost to the base. Fruit c. 1.4 x 1.25 mm, seed with a pointed chalazal region. Fl. 4-5(-6). Rocky hillsides c. 1000-1300 m.

Distr.: Endemic: E. Egypt, Sinai, Negev and Jordan.

Boissier had based his *P. flavescens* solely on the character of the bracts,

which are rounded in shape and pale yellowish in colour. Later, however, in his Fl. Orientalis, op. cit., he reduced it to varietal level under *P. sinaica.* The supposed yellowish colour of the bracts actually results from the ageing of the mounted specimens rather than from any natural (genic or environmental) causes. The shape or outline of the bracts remains the only character which may be used for distinguishing the two varieties.

1a) var. **sinaica**: Bracts suborbicular and shortly acuminate.

Distr.: Sinai, E. Egypt and S. Jordan.

E. Egypt: Wadi Ghisli, S. of Galala, 1000 m, v.1887 *G. Schweinfurth* (L); Wadi Abu Sateri, N. of Galala, 1000 m, 17.iv.1887, *id.* (G); **Sinai Peninsula:** Gebel Katherina, *M. Drar* 501 and 502 (S); Isthmic Desert; El Themed, *id.* 719 (S); Darb el Hagg, Sudur el Heitan, *id.* 697 (S); El Kuntilla, S. of El Gedirat, *id.* 902 (S); Ab Hashiah, *Kaiser* 51 (G); Moharq, *Kaiser* 144 (G); Wadi Barak, *Post Herb.* 186 (G); **Palestine:** Negev: Wadi Asluj, 15.vi.1928, *A. Eig* et *al.* (HUJ); Negev: Wadi Sini,. S. of Qasr-Rashid-Beek, 29.iii.1942. *D. Zohary* (HUJ). **Transjordan:** Arabia Petraea; Wadi Hebran, *W. Schimper* 135 (E, FI, G, JE, L, S, STU, W); H4 to H5, *H. Field & Yusuf Lazar* 146 (K); H5, 163 km E. of Amman, *Rechinger* 12890 (W).

1b) var. **flavescens** Boiss., Fl. Or. 1:744 (1867): Bracts orbicular and subobtuse.

Distr.: N. Negev and W. and N. Jordan.

Plants from Northern Sinai show intermediate forms, and mostly possess both types of bracts.

Transjordan: Arabia Petraea, ad fines Palestinae, v. 1846, *E. Boissier* (G); Petra to the foot of Mt. Hor, *Davis* 9074 (E, K); Mt. Hor, 1000-1300 m, *Davis* 8557 (E, K); Wadi Musa-Siq, *Davis* 9494 (E, K); Azraq, *C.C. Townsend* 65/147 (K).

This species resembles *P. kurdica* Boiss. in its floral structure, but differs in general aspect as well as in the craracteristics of shoots, leaves, glomerules and bracts. The leaves in this species are quite small, mostly narrowly oblong and rather rigid, often with thickened margin and midrib, whereas in *P. kurdica* they are mostly oblong-oblanceolate and fleshy (esp. towards the basal part of the shoots) but never rigid or thickened; the glomerules in *P. sinaica* are small, terminal and lateral, very profuse and often covering the whole of the plant, and the shoots consequently becoming densely covered with them, but in *P. kurdica* they are generally much larger and often confluent towards the end of the shoots. The bracts in *P. kurdica* are mostly ± ovate-suboblong and acuminate, whereas in *P. sinaica* they are suborbicular to orbicular and acute to obtuse. The two also differ in the structure of the anthers, very small c. 0.2 x 0.15 mm and quadrangular in *P. sinaica* and relatively larger, c. 0.35 x 0.25 mm and rectangular-oblong in *P. kurdica.* The two spp. can, however, be very easily distinguished by their general aspect. They are, furthermore, geographically well segregated.

M. Zohary's (op. cit.) var. *negevensis,* most probably, belongs to *P. jordanica* Chaudhri. The type (Negev: *Naftalsky,* (HUJ)), however, could not be seen.

103. **P. palaestina** Eig, Agr. Records no. 2. P.Z.E. Inst. Agr. Nat. Hist., Tel Aviv, Palestine, 205 (1929).

Dinsmore in Post, Fl. Syr. Pal. and Sinai 1:213 (1932); Zohary, Fl. Pal. 1:130, pl. 184 (1966).

Plate XIV, Fig. 10-12. p. 260

A densely caespitose perennial herb forming very dense mats or low cushions, c. 10-20 cm in diam.; stems 5-12 cm long, prostrate, branched from the base, the branches spreading in all directions and forming together with the shoots an almost circular, densely compact structure; the shoots often woody towards the base and covered with closely imbricated leaves and stipules and producing densely crowded or fused glomerules; internodes short, 3-7 mm long, very minutely puberulous to glabrous in age, mostly concealed by the stipules and glomerules. Leaves obovate to ± elliptic or elliptic-obovate, 3-5 x 1.5-2 mm, narrowed at the base, mostly obtuse, fleshy, adpressed pubescent; stipules ovate-lanceolate, 3-4.5 mm long, almost equalling the leaves. Glomerules mostly terminal and subterminal, very profuse and densely aggregated at the end of the branches, 5-8 mm in diam., ovoid, very conspicuous, often covering almost the entire plant; bracts obliquely ovate-suboblong to occassionally suborbicular, 4-5 x 3-4 mm, exceeding the flowers. Flowers 3.25-3.5(-4) mm long, oblong-prolate, adpressed pubescent; sepals fleshy, all unequal, the outer two/three linear-oblong, obtuse c. 3 mm long, the inner c. 2 mm long, narrowly ovate-lanceolate, acute, with inflexed margins, the outer often spreading at the tip in the fruiting stage; petals and filaments 0.6-0.7 mm long; anthers 0.4 x 0.25 mm, and orange; ovary conical-ovoid, c. 0.6 x 0.35 mm, tapering upwards, and having short erect 0.3-0.4 mm long styles. Fruit c. 1.5 x 1.25 mm, ovoid to almost globose, with a short, narrow neck; seed c. 1.25 x 1 mm, lenticular.

Fl. 5-6. Sandy, stony places along the sea shore.

Type: Palestine: Acre Plain, Acre (Acco), nr. Herzlia, N. of Tel-Aviv 29.v./vi.1926, *A. Eig. & M. Zohary* (holo, HUJ!).

Distr.: Endemic in Palestine and Lebanon.

Palestine: Acco, 11.v.1932, *G. Samuelsson* 1023 (S); Sharon Plain, Herzlia Coast, 1.v.1928, *A. Eig.* et *al.* (HUJ,); Sharon Plain, Natanya, facing Kurkar Plain, 15.vi.1937, *Eig.* et *al.* (HUJ). **Lebanon:** Hera, 11.v.1932, *G. Samuelsson* (S).

Closely related to *P. macrosepala* Boiss., from which it is distinguishable by its pulvinate growth, very conspicuous stipules and glomerules, slightly recurved sepals, conical ovary and shorter styles.

Contrary to what Eig suggested when he described this species, it has very little affinity with *P. boissieri* Rouy (*P. imbricata* Boiss. et Haussknecht). The latter possesses very short stems, often diffusely spreading

from the base and terminating in small glomerules, small narrowly oblong leaves, stipules which usually are exceeding the leaves, and the leaves as well as the stipules ascending, much smaller bracts and flowers, and the sepals only slightly unequal (never distinctly unequal) and always erect. In this species the stems are always compact and ceaspitose forming mats or cushions, the glomerules are very profuse and densely congested, the bracts larger, flowers too larger and with distinctly unequal sepals.

The Peruvian species referred to by Eig, resembling (to some extent) *P. palaestina* in general aspect is *P. andina* A. Gray, which, however, possesses cucullate and awned sepals and mucronate leaves, and belongs, therefore, to the other subgenus *(Paronychia).*

104. **P. macrosepala** Boiss., Diagn. sér. 1(3):11 (1843).

Boissier, Fl. Or. 1:745 (1867); Gürke in Richter-Gürke, Pl. Europ. 2(2):184 (1899); Halacsy, Consp. Fl. Graec. 1:570 (1900); Hayek, Prodr. 1:174 (1924); Dinsmore in Post, Fl. Syr. Pal. Sin. 1:213 (1932); Rechinger, Fl. Aeg. 130 (1943); W. Greuter in Candollea 20: 176 (1965); P. Mouterde, Nouvel. Fl. Liban et Syr. 1:456 (1966); M. N. Chaudhri in Davis, Fl. Turk. 2:254 (1967). **Icon:** Greuter in Candollea 20:178 (1965).

Type: "Hab. in Graecia ubi legi vere 1842, loco in schedulis non commemorato", Boissier.

Syn.: *Illecebrum capitatum* sensu Sibth. et Sm., Fl. Graec. 3:41, tab. 247 (1819) non Linn., Sp. Pl. 207 (1753). *Paronychia euboea* Beauverd et Topali in Candollea 7:256, tab. 5, f.1-9 (1937); Type: Euboea: "Ravins sur Steni, Mt. Dirphys, ca. 1000 m," 23.vi.1935, *Beauverd* and *Topali* 759 (G!). *P. capitata* (L.) Lam. ssp. *macrosepala* (Boiss.) Maire et Weiller in Maire, Fl. Afr. Nord 9:29 (1963).

Misapplied name: *P. capitata* auct. non (L.) Lam., Fl. Fr. 3:229 (1778)

A small perennial herb with procumbent, more or less ceaspitose stems, with densely congested or fused glomerules; stems 2-10 cm long, woody at the base, much-branched, usually with short, minutely puberulous internodes; often ± concealed by the closely arranged leaves and stipules; stems occasionally pulvinate, the branches densely covered with leaves, stipules and glomerules. Leaves elliptic to narrowly obovate-oblanceolate, 3-5(-6) x 1.5-2.25 mm, subacute to obtuse, fleshy, densely adpressed pubescent, sometimes turning golden with age; stipules narrowly ovate-lanceolate, 3-5 mm long, mostly somewhat shorter than the leaves. Glomerules terminal and pseudo-axillary, 7-12 mm in diam., often very profuse and densely crowded or fused forming large, caespitose, compact masses, covering almost the whole plant and more or less obscuring the other parts; bracts obliquely ovate, 4.5-6 x 3-4 mm.

acuminate, exceeding but not completely concealing the flowers. Flowers (2.25-)3.25-4.5(-5) mm long, narrowly oblong when young, adpressed pubescent; sepals fleshy, very unequal, the outer two/three mostly linear-oblong, 3-4 mm long, ± obtuse and recurved in age, the inner narrowly ovate-lanceolate, concave, acute, erect and usually c. 1 mm shorter than the outer ones, the latter very occasionally acute, and sometimes almost erect or only slightly recurved; petals mostly 0.7-0.8 (-1) mm, almost equalling the stamens; anthers 0.4 x 0.25 mm and orange; ovary c. 0.75 x 0.5 mm, conical to ovoid, with two, 0.6-0.75 mm long, free and erect styles. Fruit c. 1.5 x 1.25 mm, ovoid-oblong, with a short, rather thick neck, pale-brown.

Fl. 4-6(-7). Stony, rocky places, usually near the sea coasts, alt. sea level to c. 2300 m.

Key to the varieties:

1a) Stems ± spreading; glomerules terminal and distinct; bracts usually concealing the flowers; outer sepals linear to linear-lanceolate (subulate) and acute; plants often occurring at higher altitudes, ca. 1800-2300 m ..... **var. cretica**

1b) Stems crowded; glomerules terminal as well as pseudo-axillary, densely congested; bracts often only partly concealing the flowers; outer sepals linear-oblong, ± obtuse in the fruiting stage; plants mostly found at lower altitudes ——

2a) Stems densely pulvinate and covered with closely imbricated leaves and stipules; glomerules rather small; flowers 3-4 mm long, and sepals in most of the flowers ± erect or only slightly recurved ..... var. **insularum**

2b) Stems laxly caespitose or somewhat matted but not quite pulvinate; glomerules often large and densely congested or fused; flowers usually 3.5-4.5 mm long; outer sepals distinctly recurved —— var. **macrosepala**

a) var. **macrosepala:**

Lectotype: Greece: Attika: pr. Ampelokipos, in collibus saxosis, in consortio P. capitatae sed praecocior, 28.iv.1856, *De Heldreich* 561 (Herb. Graec. Norm.) (Lecto. G! iso. JE! L! W!).

Distr.: Throughout the range of the species.

Greece: Attika: Ampelokipos, *De Heldreich* 561 (G, JE, L, W) & 2862 (G); Lykabetto, v. 1885, *C. Haussknecht* (JE); Phalerum, vi. 1885, *id.* (JE); Lavrion, 10, v. 1885, *Haussknecht* (JE); Ergastiria, Lavrion, *De Heldreich* 930 (E, JE, W, Z); Korinthia: Korinthos, *Th. G. Orphanides* 2699 (G); *S. C. Atchley* 1622 (K); Nauplia (Navplion): 28.iv.1885, *Haussknecht* (JE); Euboea (Evvoia): Mt. Dirphys, Beauverd 759 (G), type of *P. euboea* Beauverd & Top.; Insula Thasos, 300 m, iv. 1909, *Dimonie* (E); Insula Mytilini (Lesbos): *K. H. & F. Rechinger* 5866b (W); Insula Chios (Khios): *id.* 5372 (W); Cyclades (Kikladhes): Insula Tinos, iv. 1889, *Heldreich & Halacsy* (E, JE) Teni, *Sartori* 2862 (G); Syros, 10.vi.1889, *Heldreich & Halacsy* (E); Insula Syra, *De Heldreich* 2862 (G); Insula Naxos: *Rechinger* 2279 (W); Insula Kato-Kuphonisis, *K. H. & F. Rechinger* 4991 (W);

Glaronisi: *Id.* 4998 (W); Insula Amorgos: *id.* 5163 (W); Anhydros (Amorgopulos): *id.* 5227 (W); Insula Astropalia (Stampalia), *id.* 7566 (W); Ophidusa, *id.* 7773 (W); Insula Anaphis (Anafi), 18.v.1934, *F. Wettstein* (W); Sporadhes/Dodecanese: Patmos nr Scala, *E. Gathorne-Hardy* 162 (E); Khalki (Halki): nr. Put, *Gathorne-Hardy* 743 (E); *Forsyth Major* 308 (G, Z) **(forma angustifolia)**; Insula Saria: *Forsyth Major* 506 (G); Karpathos: Menetes to Pigadia, *K. H. & F. Rechinger* 8118 (W); Othos, *Pichler* 134 (Z); Finike, *Davis* 18093 (E, K); Kassos: pr. Phrys, *Forsyth Major* 899 (G); **Crete:** Distr. Canea: *Davis* 1351 K (E, K); Distr. Kissamos, *Rechinger* 12125 (W); Distr. Hierapetra: *Rechinger* 13035 & 13243 (W); Sitia: *id.* 12835 (W); Distr. Mirabello, p. Nicolaos, *Gandoger* 1308 (K). **Turkey:** Thrace: Gallipoli, (Gelibolu), *C. M. Ingoldby* 312 (K); Izmir, v. 1935 *Erik Wall* (S); Muğla: distr. Marmaris, *Davis* 41334 (E); Antalya; (Adalia) *E. Bourgeau* 156 (G); Antalya: *D. E. S. Truman* 89 (E, K); *Tengwall* 529 (S). **Cyprus:** Kyrenia Range, *Davis* 2901 K (E); Distr. Morphou, *Davis* 2526 (E); Akamos: *Davis* 3318 K (E); & *E. W. Kennedy* 1647 (K); Buffawento, *Kennedy* 1545 (K); Cape Gata, *Davis* 3567 K (E); Distr.: Larnaca, Skorinou, *Davis* 2678 (E); Rizokarpaso, *Davis* 2350 K (E); Peyia, Kalifes: *R. D. Meikle* 3050 (K). **Syria:** *Aucher-Eloy* 2806 (G); Lebanon: Tripolis, *E. Blanche* 70 (G); Beirut *Post* 47 & 48 (Post Herb, G); **Palestine:** Tsor Plain, S. of Gesher Asiv, 3.v.1956, *G. Orshan* (HUJ).

b) var. **insularum** (Gandoger) W. Greuter in Candollea 20:175 (1965). Syn.: *P. insularum* Gandoger in Bull. Soc. Bot. Fr. 62:153 (1915). *P. chionaea* Boiss. var. *insularum* (Gand.) Hayek, Prodr. Fl. Balc. 1:173 (1924). *P. kapela* (Hacq.) ssp. *insularum* (Gand.) Borhidi in Acta Bot. Acad. Sc. Hung. 12:38 (1966).

An often pulvinate herb; stems short and covered with closely imbricated leaves and stipules; glomerules rather small but densely congested; flowers 3-4 mm long; (outer) sepals usually ± erect or only slightly recurved.

Type: Crete: (prov. Sphakia): in arenosis insularium Gavdo et Elapho et in insulis parvis provinciae Sitia, *Gandoger* (holo. LY, not seen). Distr.: Scattered in E. Crete, Karpathos, Rhodos and the adjoining Aegaean Islands.

Crete: Distr.: Sitia: *Rechinger* 12964 (W); Sidero, *id.* 12615 (W); Achladi, *id.* 12785 (W) trans. form; Toplu, *id.* 12670 (W) trans.; Distr.: Hierapetra: Insulae Mikronisi, *id.* 13104 (W) trans. form; **Karpathos:** *K. H. & F. Rechinger* 8163 (W); Finike, *Davis* 18093 (E) trans. form; **Rodhos:** Bastia, *E. Bourgeau* 55 (E) & 126 (G); **Chalki:** Mt. Druvura, *Hoffman-Grobety* 24 (G); Zafrana: *K. H. & F. Rechinger* 7645 (W) trans. form; **Chios:** *Pauli* 104 (JE) trans. form.

A rather weakly defined variety as the representatives are often but difficult to separate from the main population (var. *macrosepala*). In point of fact, even the typical specimens possess mixed types of flowers, the lateral flowers mostly having ± erect sepals whereas in the central ones the outer sepals are often much recurved.

It seems the development of a pulvinate form is not always correlated with the shortening of the flowers. Davis 18093 from Karpathos and Pauli 104 from Chios are very strongly pulvinate, but possess mixed flowers, and the sepals in most of them become recurved in age. Greuter described the sepals as "often connivent at apices", but this is incorrect.

They are connivent only during the earlier stages, but invariably spread with maturity, and are often either erect or somewhat recurved. He, while reducing Gandoger's *P. insularum* to varietal rank, proposed Cousturier 5542 (from Gaidaronosi, Prov. Ierapetra) as the lectotype. But Gandoger's original type is, most propably, still intact, and hence must be given precedence over all other collections, Unluckily, I could not see this type during my visit to Gandoger's Herbarium in Lyons in May, 1967, and was informed that the said type had been sent on loan to the Mus. Nat. Hist. Wien in 1961. Presumably the plant must have been misplaced somewhere, but there seems no reason to suppose that it has been lost or destroyed.

c) var. **cretica** Chaudhri nov. var. a varietatibus aliis adhuc notis caulibus prostratis vel paulo ascendentibus, glomerulis omnibus terminalibus, bracteis plerumque flores totos obtegentibus, sepalis exterioribus angustioribus et insuper acutis distinguenda. Stems prostrate to shortly ascending or suberect, ± spreading from the woody and compact base; glomerules 10-12 mm in diam., terminal and distinct (i.e. not congested); bracts 4.5-5 x 3.5-4 mm, obliquely ovate-acute to almost orbicular and obtuse, usually concealing the flowers; flowers 2.25-3.5(-4) mm long, outer sepals linear to linear-lanceolate (subulate), acute, ± erect to spreading in the fruiting stage. Plants often occurring at higher elevations, ca. 1800-2300 m.

Type: Crete: Distr. Lassithi, in saxosis calc. montis Aphendi Christos, c. 1800-2000 m, 12.vii.1942, *K. H. Rechinger* 14526 (holo. W!).

Distr.: Endemic; mts. of E. Crete.

Prov. Témenos: mons Juktas, 6.vi.1899, *A. Baldacci* 4 (W); Prov. Mirabello: Mirabello, *Sieber* (K, L); Mt. Lakous, 1.vi.1883, *Reverchon* 37 (Z).

A well-defined variety, distinguished by its spreading or shortly ascending stems, distinct glomerules, smaller and somewhat rounded bracts, and linear to linear-lanceolate and acute sepals. The flowers are generally quite small, 2.25-3.25 mm, but their size increases at higher altitudes.

105. **P. jordanica** Chaudhri n. spec.

Plate XIV, Fig. 5-9. p. 260

Herba perennis parva et compacta. Caules plus minusve prostrati, usque ad 9 cm longi, basi lignosi et hic dense ramificati; ramuli saepe congesti et profuse floriferi; internodia 3-8 mm longa, breviter pubescentia vel puberula. Folia in var. *jordanica* plerumque oblanceolata et in var. *latifolia* elliptica, 4-8 mm longa et 1.5-2.0 mm lata, acuta, basin versus angustata, primum dense strigosa et deinde appresse pubescentia vel in var. *latifolia* velutina, interdum tamen puberela, in var. *latifolia* carnosa; folia in caulis parte basali inserta aliis saepe paulo minora; stipulae

anguste ovatae, 3-4 mm longae, acutae, plerumque quam folia dimidia parte vel tertia parte breviora. Glomeruli profusi, terminales et laterales, glomerulis lateralibus praesertim apicem ramulorum versus dense congestis, (8-)10-15 mm diam.; bracteae late ovatae vel suborbiculares, usque ad 7 mm longae et 5 mm latae, plerumque acutae sed interdum obtusae, flores omnino obtegentes. Flores anguste ellipsoidei, 2.75-3(4) mm alti, dense appresse pubescentes; sepala inaequalia, plerumque dua longiora et unum longitudine intermedium; exteriora anguste oblonga et obtusa; alia ovato-lanceolata et acuta, in statu frutescente plerumque conniventia vel paulo divergentia; exteriora insuper apice recurvata; omnia carnosa; petala 0.8 mm longa, filamentis sub aequilonga; stamina filamentis 0.8-0.9 mm longis et antheris oblongis, 0.5 mm longis et 0.25 mm latis, aurantiis instructa; ovarium plus minusve conico-ampulliforme, i.e. apicem versus angustatum, 0.75-1.0 mm altum et 0.5 mm diam.; styli 0.5-0.6 mm longi, erecti. Fructus ovoideus, 1.75-2.0 mm altus et 1.5 mm diam., circum collum annulo conspicuo notatus.
Fl. 3-4. Ft. 4. Calcareous rocks.

a) var. **jordanica**: Leaves mostly ± oblanceolate; glomerules 10-15 mm in diam.
Type: Palestine: Galilaea, in saxosis ad Nazareth, 27-29.iv.1897, *J. Bornmüller* 226 (holo. JE; iso. E, G, S, Z) as *P. kurdica* Boiss.

Distr.: **Palestine**, Nablus, iv 1928, *Paul Range* 576 (Z); as *P. argentea* Lam. Mt. Duarantania (Quarantania?), alt.-100 m, 1.iv.1913, *Fred. S. Meyers* et *J. E. Dinsmore* B 2617 (E); Negev, W. of Beersheba, 27.iii.1942 *D. Zohary* (HUJ) (trans. form); Jebel, Canaan, *P. H. Davis* 5146 (E) (trans. form).

b) var. **latifolia** Chaudhri n. var. a var. *jordanica* foliis latioribus, crassioribus et molliter pubescentibus, glomerulis plerumque minoribus (8-10 mm diam.) distinguenda.
Leaves elliptic, thick and mostly velvety; glomerules (5-)8-10(-12) mm. Plants occuring at higher altitudes, ca. 1000-1450 m.
Type: Transjordan: Above Ein Musa, 1450 m, 19.iv.1945, *P. H. Davis* 8870 (holo. E).
Distr.: Jordan and Syria.

Jordan: Mt. Hor, 1000-1300 m, *P. H. Davis* 8555 (E); **Syria:** N. Palmyra, *P. H. Davis* 6114 A (E); Palmyra: Dj. Abiad, *Blanche* 3190 (G-Boiss.)

Range of the species: Palestine, Jordan and Syria.
This species occupies a position in between *P. capitata* (L.) Lam. and *P. kurdica* Boiss., and combines several characteristics of both spp. However, it differs from both by its floral characters, esp. those of the sepals and stamens. The elliptic (thick) leaves, though present mostly in the var. *jordanica,* provide additional distinguishing character.

106. **P. chabloziana** Beauverd in Bull. Soc. Bot. Genève 13:236 (1921).

Syn.: *P. capitata* (L.) Lam. ssp. *chlorothyrsa* (Murbeck) Maire et Weiller var. *chabloziana* (Beauverd) Maire et Weiller, Fl. Afr. Nord 9:31 (1963).

A perennial herb, stems prostrate to suberect, c. 10-15 cm long, much-branched from the woody and partly subterranean base; branches erect or ascending, usually congested; the internodes 2-15 mm long, stout, densely covered with short, retrorse hairs. Leaves sessile, elliptic to broadly oblanceolate(-obovate), 5-9 x 2-3 mm, ± acute, rather thick, often shortly adpressed pubescent, occasionally somewhat scabrous; stipules lanceolate, up to 4.5 mm long, acuminate, considerably shorter than the leaves. Flowers arranged in terminal, long-peduncled, lax, panicles consisting of dichasia (the central flowers being quite distinct) as well as in terminal and subterminal glomerules, 8-15 mm in diam., at the ends of the lateral shoots; bracts variable in shape, almost orbicular to obliquely oblong and even ovate, up to 7 x 3.5-4.5 mm, mostly ± obtuse to shortly pointed, those in the glomerules concealing the flowers, but those in the cymes only partially so, and the central flowers in the dichasia usually somewhat exposed. Flowers 3-4.5(-5) mm long, oblong, shortly adpressed pubescent; sepals somewhat fleshy, unequal, linear-oblong, the outer obtuse, the inner subacute, the outer in the fruiting stage often slightly spreading at the tips; petals c. 1 mm long, filiform, longer than the stamens; filaments c. 0.5 mm long; anthers 0.45 x 0.25 mm, oblong, orange and rather thin; ovary c. 0.75 x 0.5 mm, ovoid, tapering upwards; style 1.2-1.3 mm long, 0.85-1 mm bilobed and the lobes erect. Fruit ± oblong to subglobose, c. 1.5 x 1.15 mm, nearly half as long as the sepals, the stigmatic tips always erect and reaching the top of the shorter sepals; seed c. 1.25 x 1 mm, subglobose, with a pointed chalazal tip.

Fl. and ft. 6. Rocky places.

Type: Tunisia: "dans les fissures de rochers au sud d'Ouesta", vi. 1921 *A. Chabloz* (holo. G!).

Distr.: Endemic.

Differs from *P. capitata (L.)* Lam. in many important characters: the inflorescences consist of lax, dichasial cymes, though some glomerules too are formed, the sepals are mostly only slightly spreading and are rather thick, the petals and stamens are considerably longer, the anthers much larger, and the style conspicuously longer than in *P. capitata.* In fact, the only characteristic shared by the two spp. in the marked inequality of the sepals, a feature shown by all the spp. of this section.

107. **P. capitata** (L.) Lam., Fl. Fr. 3:229 (1778).

Kerner in Österr. Bot. Zeitschr. 27:21 (1877); Nyman, Consp. 255 (1879); Gürke in Richter-Gürke, Pl. Europ. 2(2):184 (1899); Halacsy, Consp. Fl. Graec. 1:570 (1900); Fiori in Fiori & Paoletti, Fl.

anal. Ital. Append. (vol. 4):67 (1907); Rouy, Fl. Fr. 12:6 (1910); Graebner in Aschers. & Graebn., Syn. 5(1):894 (1919); Dinsmore in Post, Fl. Syr., Pal. & Sin. 1:213 (1932); Maire et Weiller in Maire, Fl. Afr. Nord 9:27 (1963) p.p.; Chater in Tutin et al., Fl. Europ. 1:150 (1964).

Basionym: *Illecebrum capitatum* L., Sp. Pl., ed. 1, 207 (1753).

Type: S. Europe, Linneaus Herb. no. 290/17 (LINN!).

Syn.: *Illecebrum herniarioides* Pourrett in Mèm. Acad. Toulouse 3:321 (1788). Type: S. France, *Pourrett,* (probably in TL or TLM, not seen). *Paronychia rigida* Moench, Meth. 315 (1794). *P. nivea* DC. in Poiret, Encycl. 5:25 (1804). Type: Spain, 1815, *M. Leon Dufour* 28 (G-DC!); De Candolle, Prodr. 3:371 (1828); Gren. & Godr., Fl. Fr. 1:611 (1848); Willk. & Lange, Prodr. Fl. Hisp. 3:156 (1874); Battandier in Batt. & Trabut, Fl. Alg. (Dicot.) 166 (1888); Fiori & Paoletti, Fl. anal. Ital. 1:334 (1898). *Illecebrum niveum* (DC.) Persoon, Syn. 1:261 (1805). *Paronychia capitata* (L.) Lam. subsp. *rifea* Sennen & Mauricio, Cat Rif. Or. 23 (1934). Type: Morocco: Melilla a Beni-Sicar, 18.v.1933, *Sennen & Mauricio* 8788 (BM! P!). *P. capitata* (L.) Lam. subsp. *nivea* (DC.) Maire & Weiller in Maire, op. cit., 9:31 (1963).

Plate XVI, Fig. 1-8. p. 287

A small perennial herb; stems much-branched from the woody base, prostrate; the branches laxly caespitose and often forming small, dense mats, 5-10(-15) cm long, with 2-10 mm long internodes, usually densely pubescent with short patent to retrorse hairs, sometimes scabridous, occasionally minutely puberulous. Leaves narrowly elliptic-oblong to lanceolate, sometimes linear-oblanceolate, 3-10(-12) x 1.5-2.5 (-3) mm, acute to subobtuse, attenuate to the base, often slightly carinate and ± recurved, on both sides adpressed (strigose-)pubescent, sometimes very sparsely and softly pubescent esp. towards the base of the stems, occasionally ± glabrous, but the margin strongly ciliate or somewhat scabrous; stipules up to 6 x 1.5-2 mm, narrowly lanceolate, acuminate, often shorter than the leaves, at the basal part of the stems very rarely exceeding them. Glomerules terminal (and subterminal), (5-) 10-15(-18) mm in diam., often densely congested; bracts broadly and obliquely ovate to suborbicular, 5-8 x 4.5 mm, acute to subobtuse, exceeding and usually wholly concealing the flowers. Flowers (2.5-)3-5 (-6.5) mm long, tubular-oblong to almost campanulate in age, densely (strigose-)pubescent or, occasionally, glabrescent on the sepal backs; receptacle very short, c. 0.5 mm long; sepals very unequal, the two outermost often c. 0.5-1.5 mm longer than the inner (though all gradingly somewhat unequal), all linear to linear-lanceolate, with subobtuse to acute, ciliate apex, distinctly 3-nerved, the outer usually recurved, rather stiff in age; petals ± equalling to slightly exceeding the stamens;

anthers 0.25-0.35 x 0.2-0.25 mm, quadrangular to oblong; ovary, ovoid-conical, narrowed to the top; styles 0.4-0.6(-0.85) mm, long, erect and filiform; the small, brownish stigmatic tips somewhat divergent. Fruit. c. 2 x 1.25 mm, ellipsoid-oblong, enclosed by the sepals, usually having a ring-like mark near the top; seed c. 1.3 x 1 mm, lenticular-oblong.

Fl. 3-6. Dry stony or rocky places, alt. ca. 100-2400 m, mostly under 1500 m.

Distr.: S. Europe, N. Africa, Palestine. Mediterranean element.

Key to the subspecies:

1a) Leaves 3-10(-12) x 1.5-2.5(-3) mm, narrowly elliptic-oblong, on both sides adpressed pubescent; glomerules well-defined, compact, 10-15 mm in diam.; bracts concealing the flowers; flowers 3.5-5(-6.5) mm long, strigose-pubescent to ± glabrous on the outside; sepals strongly unequal, the outer divergent-recurved in the fruiting stage ..... ssp. **capitata**

1b) Leaves up to 5 x 1.6 mm, narrowly elliptic to oblanceolate, ± fleshy, densely adpressed pubescent; flowers arranged in rather lax, thyrsoid and glomeroid clusters, 5-10 mm in diam.; bracts ± equalling to somewhat exceeding, but not concealing the flowers; flowers 2.5-3.25 (-3.5) mm long, adpressed pubescent; sepals rather fleshy, mostly but slightly unequal, lanceolate with an acute and subrecurved apex ---- ssp. **atlantica**

A) subsp. **capitata:** (*P. capitata* (L.) Lam. ssp. *nivea* (DC.) Maire et Weiller in Maire, Fl. Afr. Nord 9:31 (1963).

Leaves 3-10(-12) x 1.5-2.5(-3) mm, narrowly elliptic-oblong to lanceolate, surfaces adpressed pubescent to occasionally ± glabrous, margins strongly ciliate, occasionally slightly hirsute, (leaves) rather stiff-rigid; glomerules 10-15(-18) mm in diam. densely compact and terminal; bracts completely concealing the flowers; flowers (3-)3.5-5(-6.5) mm, strigose-pubescent to ± glabrous on the outside; sepals usually markedle unequal, narrowly lanceolate to linear-oblong, 3-nerved, the outer often recurved in the fruiting stage. Very variable in the pubescence of the leaves and the sepals; five varieties are recognized:

Key to the varieties:

1a) Leaves scabrid-hirsute; flowers 5-6.5 mm long; sepals scabrous or, more or less, hirsute, and the outer ones strongly recurved ..... var. **scabrida**

1b) Leaves and sepals not scabrid, often adpressed pubescent to nearly glabrous; flowers 3-4.5(-5) mm long

2a) Styles 0.65-0.85 mm long ..... var. **longistyla**

2b) Styles 0.4-0.6 mm long

3a) Stems minutely puberulous; leaves often entirely glabrous ---- var. **tarhunensis**

3b) Stems shortly pubescent; leaves never wholly glabrous
4a) Leaves glabrous except for the ciliate margin; sepals sub-glabrous on the back ..... **var. libyca**
4b) Leaves shortly adpressed pubescent; sepals more or less pubescent on the outside ..... **var. capitata**

a) var. **capitata:**

Syn.: *P. nivea* DC. var. *genuina* Fiori et Paoletti, Fl. anal. Ital. 1:334 (1898). *P. nivea* DC. var. *davei Sennen* in Bol. Soc. Arag. Cienc. 15:230 (1916). Type: Spain: Catalonia, Tibidabo to Bellesguart, nr. Bonanova, *Sennen* (BC). *P. capitata* (L.) Lam. subsp. *nivea* (DC.) Maire et Weiller, var. *eucapitata* Maire et Weiller op. cit. 9:32 (1963).

Distr.: Throughout the range of the species.

Yugoslavia: (NW): Fiume, v. 1839, Nöe 5 (L); **Italy:** Layulla San Giarvmo, Ventimiglia, *G. Kükenthal* 6 (JE); Prov. Savona, *M. Leuzinger* 49 (Z); Liguria Occid., Albenga, v. 1892, *G. Gentile* (JE); Sicily, /1860, *Citarda* (JE). **France:** St. Jean de Vedas, 30.v.1879, *A. Barrandon* (W); Villeneuve, Avingnon,, 21.v. 1859, *J.-C. Ducommun* (JE); Gardiole, *J. W. Pfaeltzer* 150 (U); Dep. Bouches du Rhône, 21.v.1883, *Huet* (L, W, Z); Herault: *R. Neyra* 1976 (F. Schultz Herb.) (COI, HAL); bid., *V. Thomas* 208 (U); 30 iv. 1961, *Th. de Smidt* (U); ibid., v. 1931, and iv. 1932, *Braun-Blanquet* (Z); Aude: Narbonne, *L. Doin* 1945 (E, JE, W); Pyr. Or., Perpignon, /v. 1839, *J. Kugel* (E); Corsica: /1856, *Bamberger* (STU). **Spain:** Catalonia: Barcelona, Tibidabo, *F. Sennen* 1656 (JE); Tarrega, *P. Buwalda* 2468 (L); Calatayud, 18.iv.1911, *Vicioso* (U); N. of Tarragona, *Stud. biol. Rheno-Trai.* 171/62 (U); Tarragona to Tortosa, *id.*, 173/57 (U); Prov. Teruel: 1.vii.1924, *H. Zerny* (W); vi. 1894, *E. Reverchon* 958 (JE, Z); Guadalajura, v. 1877, *F. Fernandez* (W); Madrid: 3.v.1896, *M. Gandoger* (E); Aranjuez, *Stud. biol. Rheno-Trai.* 1460/51 (U); Cabanes to Castellon, *id.* 228/51 (U); Tortosa to Valencia, *id.* 237/62 (U); Prov. Valencia: *id.* 704/51 (U); Mts. Mongo, *Porta* et *Rigo* 3 (HBG, JE, W); *Stud. biol. Rheno-Trai.* 442/62 (U); Prov. Murcia: *id.* 608/62 & 957/51 (U); Cartagena: *E. Bourgeau* 1341 (E); Prov. Jaen: *V. H. Heywood* 3022 (W); Prov. Granada: v. 1900, *E. Reverchon* 1163 (E, JE, Z); Prov. Almeria: vi. 1899, *id.* 1163 (STU, W); "Spain": In reg. calid., v. 1837, *E. Boissier* (E, HAL, STU, W); Balearic Islands: Cabrera Isl., *Palau Ferrer* 35 (COI, LISE); Majorca (Mallorca): 12.iv.1873, *F. Hegelmaier* (STU); Menorca: *P. Ferrer* 728 (COI). **Morocco:** Melilla: iv. 1908, *M. Gandoger* (L); *Sennen* et *Mauricio* 8788 (BM, P); Atlas Rifain, *E. Jahandiez* 259 (E); Atlas Medius: *G. Samuelsson* 7566 (S); Atlas Major: *id.* 6599 (S); *D. H. N. Spence* S. 21 (E) trans. with ssp. *atlantica;* Moyen Atlas (Atlas Medius): Bekrit, *E. Jahandiez* 782 (E, Z) trans. with ssp. *atlantica;* "Marocco Oriental", *M. Gerbinot* et *al.* 895 (S). **Algeria:** Prov. Oran: Rio Salado, *J. Vosseler* D. 5901 (STU); Prov. Oran, Ain Sefra, *Hochreutiner* 248 (Z); "Algiers": iv. 1832, *W. Schimper* (E, HAL, HBG, L, STU, Z); Kabylie: Bougie, vii. 1896, *E. Reverchon* (E); Constantine: *E. G. Paris* 242 (STU); El Kantara: 20.iii.1900, *H. Bretzl* (S). **Tunisia:** Sousse, *C. J. Pitard* 120 (L, Z); Gabes *id.* 783 (L). **Libya:** Tripolitania: Messelata: *R. Pampanini* 3185 (FI). **Egypt:** Mariut, iii.1877 & iii. 1878, *A. Letourneux* 26 (E, S, W).

b) var. **libyca** Borzi et Mattai in Bull. Sco. Bot. It. 142 (1913).

Leaves rather rigid or somewhat coriaceous, with the exception of a strongly ciliate margin entirely glabrous; sepals sparsely pubescent to

glabrous on the back but with a ciliate margin; the outer sepals usually only slightly recurved; flowers mostly 3-3.5(-4) mm. Described from Libya; type not seen.

Spain: Tajo de Ronda, *J. Ball* 199 (E). **Algeria:** nr. Alger, *P. Jamin* 161 (E); Kabylie, Kerrata, 800 m, *Reverchon* 183 (E, JE, S, Z); Dj. Tougour, Batna, iv. 1912, *S. A. Roth* (Z). **Tunisia:** El Djem, *Pitard* 595 (L). **Libya:** Tripolitania, Tripolis, *Bornmüller* 1933: 640 b (JE). **Jordan:** Maquita, *Hunting Technical Services* 1540 (E). **Palestine:** Jerusalem, *Dinsmore* 2080 (E).

c) var. **tarhunensis** (Pamp.) Chaudhri, comb. nov.

P. chlorothyrsa Murbeck var. *tarhunensis* Pamp. in Bull. Soc. Bot. Ital 13 (1914). Shoots minutely puberulous; branches diffusely spreading; leaves entirely glabrous, and strongly carinate; flowers 3 mm long; sepals ± erect; narrowly lanceolate, acute, with glabrous back and cilate margin; Type: Libya: Tripolitania: Tarhuna, E. of Kasr Tarhuna, 28.iii.1913, *R. Rampanini* 4430 (holo. FI!).

Distr.: Endemic.

Note: R. Pampanini 3185 (FI), from Mesellata, Tripolitania, described by him, and later by Maire and Weiller, op. cit., as *forma intermedia* Pampanini sub var. *tarhunensis,* is a typical form of var. *capitata,* and neither of Pampanini's specimens has any relation whatsoever with *P. chlorothryrsa* Murbeck.

d) var. **longistyla** Emberger et Maire in Emb. et Maire, cat. no. 23 (1930); Maire et Weiller, op. cit., 9:32 (1963).

Leaves narrowly oblong, densely adpressed pubescent, glomerules very densely congested, often forming large, compact masses; styles 0.65-0.85 mm long. Described from SW. Morocco; type not seen.

Distr.: Endemic.

WSW Morocco: Agadir: *A. W. Tretheway* 182 (K); Agadir, 13.iv.1931, *R. Maire* (S); Ahl Sahel, nr. Tiznit, 11.iv.1934, *R. Maire* (S); Agadir, N'Frir, nr. Fonti *E. Wilczek* et *al.* 345 (Z).

e) var. **scabrida** Chaudhri n. var. a var. *capitata* foliis scabrido-hirsutis, floribus majoribus (5-6.5 mm altis), sepalis extus scabridis, exterioribus insuper apice subobtusis et saepe recurvatis distinguenda.

Shoots densely strigose-pubescent; leaves scabrid or somewhat hirsute; flowers 5-6.5 mm long, sepals scabrid on the outside, rather rigid in age, the outer ones with a subobtuse, penicillate apex and often strongly recurved.

Type: Greece: Attika: Mt. Parnis, nr. Metochi, 400 m, *Zerlentis* 1437 (holo. E!).

Distr.: Greece and parts of Palestine.

Greece: Athens, vi. 1876, *Th. Pichler* (G, STU); Athens, Pentelikon, 20.iii.1921, *M. Schwarzenbach* (Z); Mt. Parnis, *Zerlentis* 1437 (E), type.

Palestine: Jerusalem, 760 m, *J. E. Dinsmore* 11950 (S).

B) subsp. **atlantica** (Ball) Chaudhri, comb. et stat, nov.:

P. capitata (L.)Lam. var. *atlantica* Ball, Spicil. Fl. Maroc. in Journ. Linn. Soc. 16:64 (1878).

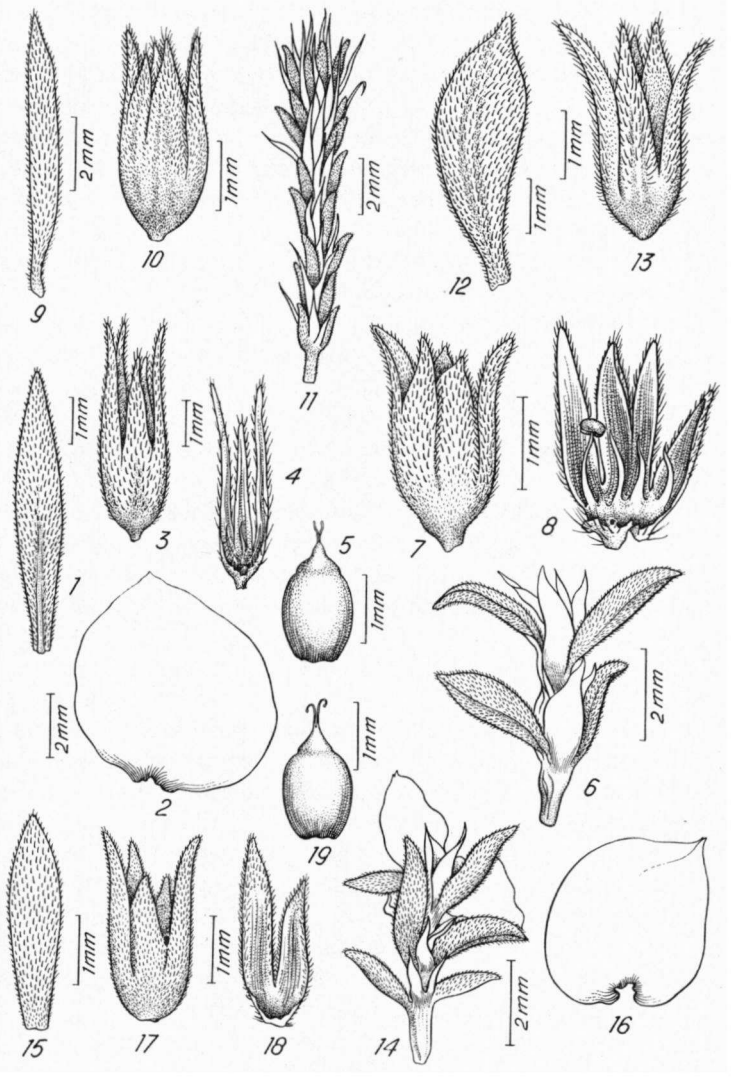

Plate XVI. Fig. 1-8: **P. capitata**; 1-5: subsp. **capitata**; 1: leaf; 2: bract; 3: flower; 4: flower, inner side of the sepals; 5: fruit [*L. Doin* 1945(E)]; 6-8: subsp. **atlantica**; 6: shoot; 7: flower; 8: flower dissected, inside view [15.v.1937, *O. Cyrén*(S)]. Fig. 9-11: **P. chlorothyrsa**; 9-10: subsp. **canariensis**; 9: leaf; 10: flower [10.iv.1896, *Kuegler* (JE)]; 11: subsp. **chlorothyrsa** var. **coarctata**; a shoot [*A. Charoy* 991 (P-CO)]. Fig. 12-18: **P. haggariensis**; 12-13: ssp. **haggariensis** var. **latifolia**; 12: leaf; 13: flower; 14-18: subsp. **sahariensis**; 14: shoot; 15: leaf; 16: bract; 17: flower; 18: section of flower, inner side of two sepals [12-13: 1912-1917, *Mission Tilho* (P); 14-18: *Hunting Tech. Services* 19(H5)(E)].

Leaves up to 5 x 1.6 mm, narrowly elliptic to oblanceolate, acute, ± fleshy, densely adpressed verlutino-pubescent; flowers arranged in usually small (5-10 mm in diam.), rather laxly thyrsoid and glomerulose clusters; bracts equalling or somewhat exceeding the flowers but not concealing them completely; flowers 2.5-3(-3.5) mm long, adpressed velutino-pubescent; sepals somewhat fleshy, often slightly unequal, lanceolate, with acute and subrecurved apex; anthers 0.35 x 0.25 mm; styles 0.5-0.6 mm long.
Type: Marocco: "Ex rupibus Atlantis Majoris, in convalle Aït Mesan" 2000 m, 13-16.v.1871, J. Ball (holo. K! iso. P!).
Distr.: Endemic in WSW Morocoo.

Grand Atlas: Tizi-n-Test, ca. 2300 m, 15.v.1937, *Otto Cyren* (S); 2000 m, *G. Samuelsson* 6578 (S); 7.iv.1936, *E. Wall* (S).

108. **P. haggariensis** Diels in Engl. Bot. Jahrb. 54 (Beibl. 120):78 (1917).
Syn.: *P. chlorothyrsa* Murb. var. *haggariensis* (Diels) Maire in Maire, Cat. 657 (1929). *P. capitata* (L.) Lam. ssp. *chlorothyrsa* (Murb.) Maire et Weiller, var. *haggariensis* (Diels) Maire in Fl. Afr. Nord 9:29 (1963).
Type: Algeria (S): Ahaggar, Ideles, 1400 m, 29.iii.1914, *G. Schweppenburg* 165 (holo. B, destroyed).

Plate XVI, Fig. 12-18. p. 287

A small perennial herb, stems 3-6 cm long, prostrate, much-branched from the woody base, and the branches often densely congested; internodes up to 7 mm long, stout, shortly pubescent. Leaves narrowly elliptic-oblanceolate to occasionally obovate, 3-5.5 x 1-1.5(-2.25) mm, mostly subacute, narrowed to the base, rigid, somewhat concave and carinate, strongly recurved or spreading, densely and softly (shortly) adpressed pubescent; stipules narrowly ovate-lanceolate, mostly up to 2.8 mm long, acute, with finely ciliate margins, usually much shorter than the leaves. Glomerules 7-10 mm in diam., often congested; bracts mostly suborbicular, sometimes orbicular, 5-5.5 x 4-4.5 mm, mm, ± concealing the flowers. Flowers narrowly oblong, (2.65-)3-4 mm long, shortly and densely pubescent (the outer sepals even on the inside near the tip); sepals distinctly unequal, the outer linear to linear-oblong, mostly subobtuse to subacute, recurved in age, the inner sharply acute; petals 0.5 mm; filament 0.45 mm; anthers 0.2-0.25 x 0.2 mm, more or less rectangular, orange-brown; ovary ovoid, c. 0.5 x 0.4 mm; styles 0.3-0.4 mm long, erect to slightly divergent at the tip. Fruit ovoid-suboblong, 1.4-1.5 x 1 mm, narrowed to the top; seed c. 1.15 x 0.65 mm, nearly oblong. Fl. 3-11.
Distr.: Southern Algeria and NW Chad.
A) subsp. **haggariensis**: Leaves narrowly elliptic-oblanceolate to

obovate, up to 5.5 x 2.25 mm, rigid; bracts suborbicular up to 5.5 x 4.5 mm; flowers 3-4 mm long; sepals recurved in age, the outer linear, subobtuse to subacute, pubescent even on the inside near the tip; nerves more or less distinct; petals 0.5 mm; filaments 0.45 mm; anthers 0.2-0.25 x 0.2 mm; styles mostly 0.35 mm long.

a) var. **haggariensis:** Leaves ± oblanceolate, up to 1.5 mm broad. Neotype: Condia du Hoggar: Tamachek: Ayouf Nekeli, 2.xi.1927, *Th. Monod* 174 (Mission Sahar. Augieras-Draper) (P!).

Distr.: S. Algeria (Ahaggar Mts.) and parts of Tibesti (Chad.).

Algeria: Ahaggar, *Th. Monod* 174 (P); **Chad:** Tibesti: Kourkoubon, 1912-1917, *Mission Tilho* (P).

b) var. **latifolia** n. var. a var. *haggariensi* foliis obovatis (usque ad 2.25 mm latis) distinguenda. Leaves ± obovate up to 2.25 mm broad.

Type: Chad: Tibesti: Emi Koussi, 1912-1917, *Mission Tilho* (holo. P!)

Distr.: Endemic.

B) subsp. **sahariensis** Chaudhri n. subsp. a subspecie *haggariensi* caulibus dense fastigiatis, sparse et molliter pubescentibus, ex internodiis brevioribus (2-3 mm longis) compositis, foliis minoribus (2.0-3.5 mm longis et 0.6-1.2 mm latis), crassioribus, breviter et molliter pubescentibus, glomerulis semper dense congestis, bracteis minoribus (4.5 mm longis et 4.0 mm latis), floribus paulo minoribus, sepalorum nervis utrimque indistinctis, petalis, filamentis et stylo paulo longioribus distinguenda. Shoots densely caespitose; internodes 2-3 mm long minutely and softly pubescent; leaves 2-3.5 x 0.6-1.2 mm, ± narrowly oblong, acute to subtuse, shortly and softly pubescent, and very thick; glomerules densely congested and nearly obscuring the other parts; bracts 4-5 x 3 mm, mostly orbicular, sometimes broadly ovate; flowers 2.65 (-3.25) mm long, softly pubescent; sepals very thick, linear-oblong, acute, erect to subrecurved at the tip, nerves on both sides indistinct; petals 0.6-0.7 mm; filaments 0.5 mm; anthers 0.2 x 0.15 mm; styles 0.4 mm long.

Type: Hoggar Mts (Algerian Sahara): Oued Ilamane, granite rock scree, Spring 1955, *Hunting Technical Services* 19 (H5) (holo. E!).

Distr.: Known only from a single gathering.

109. **P. chlorothyrsa** Murbeck in Acta Univ. Lund. (Contr. Fl. Tunis. 1) 33:48, tab. 2, fig. 13-14 (1897).

Type: Tunisia: El Hafay, in alveo exsiccato, 15.iv.1896, *Sv. Murbeck* (Lectotype S!).

J. A. Battandier, Supplement, Fl. Alger, 31 (1910); R. Pampanini, Prodr. Fl. Cyrenaica 190 (1931); P. Ozenda Fl. Sahara sept. et centr. 209, fig. 50 (1958); R. Negre; Fl. Maroc. occid. 1:294 (1961).

Syn.:*P. macrosepala* sensu Ball, Journ. of Bot. 204 (1875), et Spicileg. Marocc. in Journ. Linn. Soc. 16:641 (1878), non Boiss., Diagn. 1(3):11

(1843). *P. nivea* DC. var. *macrosepala* (Boiss.) Batt. in Batt. et Trab. Fl. Alg. 166 (1888). *P. capitata* (L.) Lam. ssp. *chlorothyrsa* (Murb.) Maire et Weiller, Fl. Afr. Nord. 9:28 (1963) p.p. (excluding var. *atlantica* Ball).

Plate XVI, Fig. 9-11. p. 287

A small annual or mostly perennial herb with a somewhat woody tap root and prostrate (occasionally suberect), c. 3-13 cm long, stems, much-branched and the branches more or less diffusely spreading from the woody and compact base, and often terminating in large and conspicuous glomerules; internodes 3-13 mm long, shortly pubescent with patent to deflexed hairs. Leaves sessile, lanceolate to oblanceolate, slightly falcate, sometimes linear-oblong, 4-8 x 1-1.5 mm, ± acute, minutely scabrous-pubescent to velutino-puberulous, rather rigid, and often spreading; stipules narrowly lanceolate, 3-5 mm long, acuminate, margin ciliate, mostly shorter than the leaves. Glomerules terminal and subterminal, thyrsoid, 7-12(-15) mm in diam., often densely congested at the ends of the shoots and forming large, compact and almost globose heads, 15-18 mm in diam., occasionally (in var. *erythraea*) the flowers solitary and axillary; bracts obliquely ovate, 5-7 x 3-4.5 mm, tapering to the acute apex, often somewhat shorter than the flowers, but sometimes concealing them completely. Flowers (2.5-)4-7 mm long, shortly pubescent, sometimes rather scabrously so; perigynous zone very short, almost indistinct; sepals linear, acute, very unequal, the outer two/three c. 1-2 mm longer than the inner ones, and often strongly recurved in age; petals 0.5-0.6 mm long, ± equalling the stamens; anthers minute, 0.2-0.25 x 0.15 mm, rectangular and orange; ovary c. 0.5 x 0.4 mm, conical-ovoid, styles 0.3-0.35 mm long, filiform, erect to divergent-recurved in age. Fruit c. 1.5 x 1 mm, ellipsoid-oblong, somewhat narrowed to the top.

Fl. 2-5(-8). In dry sandy soils and dry cavities, up to 2700 m, but commonly occurring at lower elevations.

Distr.: Scattered throughout N. Africa.

Key to the subspecies:

1a) Flowers (3.25-)4-7 mm long; outer sepals often strongly recurved ..... ssp. **chlorothyrsa**

1b) Flowers 2.5-3.5 mm long; outer sepals slightly recurved at the tips or nearly straight ..... ssp. **canariensis**

A) subsp. **chlorothyrsa**: Very variable in the size of the bracts and, to a lesser extent, of the stipules; occasionally even the duration of the life cycle undergoes a change. Five varieties are recognized here:

Key to the varieties:

1a) Plant annual ..... var. **erythraea**

1b) Plants perennial

2a) Leaves and stipules closely imbricate and ascending; stipules somewhat exceeding the leaves ..... **var. coarctata**
2b) Leaves and stipules usually more distant (or not closely arranged), and the stipules mostly shorter than the leaves
3a) Bracts exceeding and concealing the flowers .... **var. bracteosa**
3b) Bracts not completely concealing the flowers
4a) Bracts almost equalling or somewhat shorter than the flower ------ ..... **var. chlorothyrsa**
4b) Bracts much shorter than the flowers, often but 1/3 of their length ..... **var. querioides**

a) var. **chlorothyrsa:** Syn.: *P. chlorothyrsa* Murb. var. *genuina* Batt., Suppl. Fl. Alg. 31 (1910). Type: Tunisia: El Hafay, in alveo exsiccato, 15.iv.1896. *Sv. Murbeck* (Lectotype S!).

Bracts almost equalling or somewhat shorter than the flowers.

Distr.: Almost throughout the range of the species.

Morocco: Häha, Tamanar: *Jahandiez* 45 (Z); Mardochèe: Dj. Tafraout and Kirkar, /1876, *Cosson* (P): Oukacha: *Pitard* 2673 (K); El Ardja: *Pitard* 3247 (P). **Algeria:** Prov. Oran: Chellala-Dahrania, 14.v.1856, *Cosson* (S, trans. with var. *coarctata);* Ain Sefissifa, 5.v.1856, *Cosson* (P); Sahara (?): Bou Saada: *Alston* and *Simpson* 161 (K); Biskra *Schweinfurth* 514 (Z); Oued Biskra: *Murbeck* 17 (P, S); nr. Biskra: *Kuegler* 56 (JE); El Kantara: iv. 1899, *Dellmer* (JE); Oued Ziririne Herouan: *Petit Logranye* 157 (P); Ahaggar: Oued Temourom, v. 1912, *M. R. Chudeun* (P); Central Sahara: Taharaneb, c. 1900 m. *Meinertzhagen* 137 (K). **Tunisia:** Gafsa: *Pitard* 378 (L, W); El Hafay, 15.iv.1896, *Sv. Murbeck* (S, lectotype); Oudref, iii. 1907, *Pitard* (E, trans. with var. *querioides*). **Lower Egypt:** Amria ridge: *Davis* 8428 (K). **Eritrea:** Assaorta: Bosco del Caribozzo, c. 2700 m, *A. Pappi* 2855 (EA).

b) var. **querioides** (Ball) Batt., Suppl. Fl. Alg. 31 (1910).

Syn.: *P. macrosepala* Boiss. var. *querioides* Ball. in Journ. of Bot. 204 (1875) et Spicil. Fl. Marocc. 642 (1878).

Bracts much shorter than the flowers.

Type: Morocco: "Regione inferiori Atlantis Majoris in convalle Aït Mesan, c. 1400 m, 12-17.v.1871, *J. Ball* (holo. K!).

Distr.: Morocco and Algerian Sahara.

i) subvar. **querioides**: Internodes rather short; flower clusters (glomerules) compact and 3 to 7-flowered.

Algeria: Sahara: Laghouat, i.v. 1873, *George Maw* (E). **Morocco:** Grand Atlas: Aït Mesan: v. 1871, *Ball* (K, type).

ii) subvar. **dichotoma** Batt., Suppl. Fl. Alger. 31 (1910) (as var.).

Syn.: *P. chlorothyrsa* Murb. var. *laxa* Beauverd in Bull. Soc. Bot Genève , 13:238 (1922). Type: Algeria: Oran: ad radices montis „Santa Cruz", *Reuter* (G.).

Internodes long (up to c. 3 cm); flowers in lax, few (3-)-flowered cymes.

Type: (of subvar. *dichotoma* Batt.): Algeria: Dj. bou Kherouf: *Clary* (holo. probably AL, not seen).

c) var. **bracteosa** Batt., op. cit.: Bracts exceeding and concealing the

flowers.Type: Algeria: Chiffa gorge, Oued Djemma, *Battandier*? (holo. AL, not seen).

Distr.: Scattered in N. Africa.

Morocco: Mogador: 2.iv.1948, *Mission bot.* et *forest.* 896 (LISE); Grand Atlas: nr. Asni, c. 1200 m, *H. Lindberg* 3283 (K); nr. Seksaoua, 26-27.v.1871 *Ball* (K); Ichonkak, c. 1350 m, *E. K. Balls* B 2520 (E, K, S); Mt. Djebilet, 11.iv.1931, *R. Maire* (S). **Algeria:** Oued Biskra: 13.iv.1912, *Thellung* (Z). **Tunisia:** Gabès: Raz el Oued: *Pitard* 666 (JE, L). **Libya/Egypt:** El Omaied, *E. Gauba* 122 (W). **Chad:** Tibesti: Tarso Toussidé: 25.viii.1957, *A. T. Grove* (K).

d) var. **erythraea** (Fiori) Chaudhri, comb. et stat. nov.:

P. erythraea Fiori in Nuov. Giorn. Bot. Ital. n.s., 19:439 (1912). Type: Eritrea: Acchelè-Guzai, Adi-Caièb, Mai-Affileta, 2200 m, 14.iii. 1909, *Adr. Fiori* 993 (holo. FI!).

G. Cufodontis, Bull. Jardin Bot.'Brussels 22 suppl.: 99 (1953).

A small annual herb, with very short, 4-5 cm long, ± erect and shortly pubescent stems, linear to linear-lanceolate, rather rigid and scabrous-pubescent leaves; flowers arranged in small, terminal and subterminal, 7 to 10-flowered glomerules, 4-8 mm in diam., as well as in pseudo-axillary 3-flowered dichasial clusters, or solitary, mostly only partially concealed by the bracts; (flowers) 3.25-4 mm long, adpressed pubescent with linear-lanceolate, very unequal, suberect to slightly spreading sepals.

Distr.: Endemic.

e) var. **coarctata** Chaudhri n. var. a varietatibus perennibus aliis ad subspeciem hanc pertinentibus foliis et stipulis imbricatis, stipulis quam folia longioribus distinguenda.

(*P. sedifolia* R. Brown ap. Salt, Abyss. 2, Append. 376 (1816), **nomen nudum.** Type: "Abyssinia", sine loco, Salt (holo. BM!).

Roem. and Schultes, Syst. 5:523 (1819), without description; G. Cufodontis, op. cit., remarked, "species male cognita, forsam ad *P bryoidem* referenda".

Stems short, 2-6 cm long, tufted; leaves and stipules closely imbricate and ascending; leaves linear-oblong, 2-5 mm long, often fleshy in the basal parts of the stems; stipules linear-lanceolate, 2.5-6 mm long, acuminate, somewhat exceeding the leaves, esp. in the non-floriferous region of the stems.

Fl. 3-6.

Type: Algeria: Prov. Alger, Env. d'Aumale, Ain Cazdarth/Beni Mansour, 25.vi.1866, *Alcide Charoy* 991 (holo. P-CO!).

Distr.: Scattered in N. Algeria, NE Libya, and Ethiopia.

Libya: Cyrenaica: Msus, 20.iii1933, *R. Pampanini* 2344 (W); **Ethiopia:** "Abyssinia", *Salt.* (BM).

B) subsp. **canariensis** Chaudhri n. subsp. a subspecie *chlorothyrsa* floribus minoribus (2.5-3.5 mm altis), sepalis exterioribus numquam fortiter recurvatis, plerumque subrectis distinguenda.

Plate XVI, Fig. 9-10. p. 287

Stems prostrate to suberect, 3-9 cm long, often ± spreading; internodes up to c. 8 mm long, retrorsely pubescent; leaves narrowly oblanceolate to lanceolate, sometimes narrowly oblong, 4-8 x 1-1.5 mm, acute, adpressed pubescent; stipules narrowly lanceolate, up to 5 x 1 mm, shorter than the leaves; glomerules terminal and subterminal, 9-13(-15) mm in diam., congested at the ends of the shoots; bracts up to 6.5 x 5 mm, almost orbicular, acute, and concealing the flowers; flowers 2.5-3.5 mm long, shortly adpressed pubescent; sepals linear-lanceolate, sharply acute, often slightly unequal, usually erect with subrecurved apex; petals ± equalling the stamens; fruit ovoid-oblong, c. 1.5 x 1 mm, styles (0.35-)0.4-0.35 mm, erect to divergent.
Fl. 2-5.
Type: CANARY ISLANDS: Gran Canaria: Las Palmas, 10.iv.1896, *Kuegler* (holo. JE).
Distr.: Endemic in Gran Canaria of the Canary Islands.
GRAN CANARIA: Las Palmas, Castillo del Bey: *Bourgeau* 725 (E); San Cristobal: *Pitard* 73 (L); Tafira: *P. T. Husnot* 530 (W); Canaria niagria: Auvalle de Mogán, ca. 250-300 m. *O. Burchard* 317 (JE).

SPECIES IMPERFECTLY KNOWN AND NAMES OF UNCERTAIN APPLICATION

Paronychia alsinefolia Juss., Mèm. Mus. 2:390 (1815). The name is listed by Jusseau without any description. Probably referable to *Polycarpea.*

P. arragonica Schultes in Roemer et Schultes, Syst. 5:520 (1819); *Illecebrum arragonicum* Vest ex Schultes in Roem. et Schult., Syst. op. cit. The description is very inadequate and the floral characters are unknown. However, the other characters given in the short description pertaining to the leaves (lanceolate, acute and pubescent) are similar to those of *P. capitata* (L.) Lam., Fl. Fr. 3:229 (1778).

P. birmanica Gandoger in Bull. Soc. Bot. France 65:28 (1918). The type, *Mokin* 1028 from Minbu, Burma, is not present (under *PARONYCHIA*) in the Gandoger's Herb. (LY). Gandoger described it as resembling *'P. corymbosa* Lam.' and there is a definite *Polycarpaea corymbosa* Lam., but no such species (described by Lamarck) in *Paronychia.* In fact *Paronychia* does not extend beyond Iran (Persia), and its occurrence in Burma is extremely unlikely.

P. brevistipulata Lange in Vidensk. Meddel. Naturhist. Foren. Kjöbenhavn ser. 2, 7:99 (1865), reported from S. Spain, Sierra Elvira (Granada) is described as possessing densely caespitose, prostrate to suberect, much-branched and glabrous stems terminating in repeatedly forked cymes; leaves lanceolate cuspidate, rather thick and minutely

papillose-scabrous; stipules considerably shorter than the leaves; cymes 3-5 mm long (or in diam.?), with pubescent peduncles; flowers campanulate-ovate, glabrous; sepals oval, subobtuse, very shortly and abruptly acuminate at the tip. The only species of this genus occurring in that region bearing the flowers in open cymes is *P. suffruticosa* (L.) DC., which, however, can be very easily distinguished by means of its violet-red and coriaceous shoots, leaves and flowers. However, *P. brevistipulata* Lange agrees with this species in the characters of the (usually) glabrous stems, minutely papillose-scabrous leaves, small stipules, and glabrous flowers arranged in repeatedly forked cymes.

P. cuspidata Rafin., Autikon Bot. 153 (1840), described as possessing prostrate, dichotomous, filiform and glabrous stems, linear-cuneate and cuspidate leaves, and few-flowered axillary clusters. In the absence of the type specimen it is very difficult to match any specimen with this description.

P. dendroides Gandoger in Bull. Soc. Bot. France 65:29 (1918). Type: Canary Islands: Ins. Lanzarote, Diama, *Pitard* 69, and described as possessing erect stems, obovate-oblong and tomentose leaves, densely capitate (agglomerated), c. 2 mm long flowers. There is no mention of the structure of the sepals as to whether cucullate and mucronate or plano-concave. There is only one perennial species (in addition to the local, endemic *P. canariensis* (L. fil.) Juss.) occurring in the Canary Isles, *P. chlorothyrsa* Murbeck (subsp. *canariensis* Chaudhri), previously referred to as *P. capitata* (L.) Lam. It bears dense glomerules but possesses linear or narrowly oblong and shortly adpressed pubescent leaves and very short prostrate stems. The type specimen of *P. dendroides (Pitard* 69) could not be found in Gandoger's herbarium (LY) under *Paronychia.*

P. longifolia Steudel, Nomencl. ed. 2, 2:269 (1841) (nomen nudum), reported from Chile. Probably referable to *P. coquimbensis* Gay, Fl. Chil. 2:521 (1846). The latter species possesses narrow, long, linear leaves.

P. oblongella Gandoger op. cit. (1918). Type: Canary Islands: Gran Canaria, S. Cristobal, *Pitard* 494, and described as bearing linear-oblong, greenish leaves, diffuse and herbaceous stems, lax, paniculate cymes, and flowers c. 1.5 mm long. Probably belonging to *P. canariensis* (L. fil.) Juss., but the type could not be traced in Gandoger's Herbarium (LY) under *Paronychia.*

P. pauciflora Larrañaga * ex Escritos D. A. Larrañaga (Publ. Inst.

* It is really unfortunate that Larrañaga's work should have remained unpublished for more than one hundred years. His herbarium, it seems, has been destroyed. I am grateful to Dr. C. D. Legrand for supplying me the relevant information about him and his work. Dr. Blanca R. Arrillaga very kindly sent me the microphotographs of Larrañaga's account of the two species of *Paronychia.*

Hist. Geogr. Urug.) 2:108 (1923). The description is very brief — 'caulibus prostratis, foliis ovalibus pubescentibus, floribus axillaribus subsolitariis calicibus aristatis'. The aristate sepals are a characteristic feature of *P. brasiliana* DC., but the flowers in this species generally form dense, pseudo-axillary clusters. The other species commonly met with in Uruguay, bearing elliptic, pubescent leaves and few-flowered pseudo-axillary clusters is *P. communis* Cambessèdes, but the sepals in this species are very shortly awned. *P. pauciflora* may belong to either of the two, though more likely to *P. brasiliana* DC.

P. punctoria Larrañaga op. cit. In this case too, the description is very short and inadequate — 'caulibus prostratis, foliis subulatis, capitulis axillaribus, calicibus mucronatis'. The subulate leaves are indicative of *P. setigera* (Gillies ex Hook. et Arn.) F. Hermann in Fedde's Repert. 42:224 (1937).

P. saguntina Pau in Bol. Soc. Arag. 13:43 (1914). Described from Spain. The description reads — 'annua, caulibus glabris, foliis Spergulariae subulatis mucronatis, stipulis lanceolatis longe acutatis, sepalis anguste scariose marginatis, seta brevi. A *Par. cossoniana* Gay sepalis anguste marginatis diversa'. Most probably an annual form of *P. argentea* Lam.

marginatis diversa'. Most probably an annual form of *P. argentea* Lam.

P. tenuifolia (Willd.) DC., Prodr. 3:372 (1828); *Illecebrum tenuifolium* Willd., Enumer. Hort. Berol. Suppl. 1:12 (1809). The description is very vague — 'caule ramoso diffuso pilosiusculo, foliis lineari-lanceolatis subciliatis, floribus axillaribus, stipulis longioribus'. Probably referable to *Polycarpaea tenuifolia* DC., Prodr. 3:374 (1828). In fact De Candolle (in Prodr. 3:372) and Schultes (in Roemer & Schult., Syst. 5:516 (1819) have, both, put it under the imperfectly known species.

Note: Species already excluded in Steudel's Nomenclator Botanicus, 2:268-269 (1841), all of them being cases of misidentification, have not been considered here.

EXCLUDED SPECIES

P. alpina E. H. L. Krause in Sturm, Fl. Deutschl., ed. 2, 5:26 (1901) = *Herniaria alpina* Chaix ap. Vill.

P. arbuscula C. Gay, Fl. Chil. 2:520 (1846) = *Spergularia arbuscula* (Gay) I. M. Johnston in Contr. Gray Herb. n. s. 85:40 (1929).

P. aristata DC. in Poiret, Encycl. 5:26 (1804) = *Polycarpaea aristata* C. Smith ex DC., Prodr. 3:373 (1828). Reported from the Canary Isles.

P. benghalensis Roemer et Schultes, Syst. 5:521 (1819) = *Achyranthes benghalensis* Lam., Encycl. 1:459 (1785).

P. confertissima D. Parodi in Anal. Soc. Cient. Argent. 6:44 (1878) = *Cardionema ramosissima* (Weinm.) Nelson & Macbride in Bot. Gaz. 56:473 (1913).

P. cymosa (L.) DC. in Poiret, Encycl. 5:26 (1804) = *Chaetonychia cymosa* (L.) Sweet, Hort. Brit. ed. 3, 263 (1839). Its resemblance to *Paronychia* is only superficial, and there is no real affinity between the two. Indeed, it is hard to understand why it has been treated as a part of this genus in a number of floras, including the Flora Europea 1:150 (1964). As a matter of fact De Candolle himself was not sure whether it really belonged to *Paronychia,* and in his Prodromus (3:370) there is a distinct mark of interrogation --- *P (?) cymosa.* At any rate the characters of the sepals and the seed (with anatropous ovule, laterally placed, straight (upright) embryo and inferior radicle) are distinct enough to exclude it from *Paronychia,* as has, rightly, been done by, among others, Willkomm & Lange (1874), Pax et Hoffmann (1934) and Maire et Weiller (1963).

P. divaricata Juss. in Mèm. Mus. Par. 2:390 (1815) = *Polycarpaea teneriffae* Lam. in Journ. Nat. Hist. Par. 2:8, tab. 25 (1792).

P. herniaria E. H. L. Krause in Sturm, Fl. Deutschl. ed. 2, 5:26 (1901) = *Herniaria glabra* L.

P. hirsuta Krause op. cit. p. 25 = *Herniaria hirsuta* L.

P. incana E. H. L. Krause op cit. = *Herniaria incana* Lam., Encycl. 3:124 (1789).

P. lanuginosa Poiret, Encycl. Suppl. 4:303 (1816) = Probably *Gomphrena* sp.

P. linearifolia DC. in Poiret, 5:26 (1804) = *Polycarpaea linearifolia* DC., Prodr. 3:374 (1828).

P. litoralis Krause op. cit. = *Corrigiola litoralis* L.

P. manicata Skottsberg in Acta Hort. Gotoburg. 17:50 (1947) = *Sanctambrosia manicata* Skottsb.

P. polycnemoides Schlecht. in Linnaea 13:407 (1809) = *Pentacaena polycnemoides* Bart. in Presl, Rel. Haenk. 2:5, t. 49, f. 1 (1839).

P. pubescens DC. in Lam. & DC., Fl.Fr. 3:403 (1815) = *Herniaria latifolia* Lapeyr.

P. pusilla Greene in Pittonia 1:302 (1889) = *Herniaria cinerea* DC.

P. ramosissima (Weinm.) DC., Prodr. 3:372 (1828) = *Cardionema ramosissima* (Weinm.) Nels. et MacBride in Bot. Gaz. 56:473 (1913).

P. rosetta Cambes. in Saint-Hilaire, Fl. Bras. Mer. 2:188 (1829) = *Cardionema rosetta* Nelson et Macbride op. cit.

P. sclerocephala Decaisne, Fl. Sin. 38 (1834) = *Sclerocephalus arabicus* (Decaisne) Boiss.

P. striata DC. in Poiret, Encycl. 5:25 (1804) p.p. = *Polycarpon tetraphyllum* L. Syst. ed. 10, 881 (1758).

P. subulata DC. in Poiret, Encycl. 5:25 (1804) = *Polycarpaea corymbosa* Lam., Illustr. 2:129 (1792).
P. verticillata Lam., Fl. Fr. 3:231 (1778); et DC. in Poiret, Encycl. 5:23 (1804) = *Illecebrum verticillatum* L., Sp. Pl. 206 (1753).

HERNIARIA *

Historical Review: This genus was first described by J. BAUHIN in 1651 (Hist. Pl. Univ. 3:378-379). He was incidentally the first to use binomials in the Linnaean sense, the specific epithets being written in the margin of the page. He gave a detailed account of *H. glabra* and *H. hirsuta,* and his illustration of the latter species is still cited in the Flora URSS, and is certainly good enough for the purpose of identification. TOURNEFOURT added two more species, *H. fruticosa* and *H. alsinesfolia,* in his Institutiones Rei Herbariae. LINNEAUS added one more name, *H. lenticulata* in the Species Plantarum 208 (1753), but was not quite sure of its taxonomic status. That plant is actually *Cressa cretica* (a member of the family *Convolvulaceae*) and no *Herniaria.* A few years later he described *H. fruticosa* in his Centuria Plantarum 1:8 (1755), a species endemic in E. Spain. Two more species were described by LAMARCK (*H. incana* and *H. alpestris,* the latter synonymous with *H. alpina* Villars), and ONE EACH by VILLARS (*H. alpina*), LINK (*H. maritima*), LAPEYROUSE (*H. latifolia*), PRESL (*H. microcarpa*) and DE CANDOLLE (*H. cinerea*). The first comprehensive account, however, appeared, in 1828, in DE CANDOLLE's Prodromus (3:367). Eleven species were described in that account, under two sections, *Herniaria* and *Polygonoideae,* the latter a monotypic one (created for *H. polygonoides* Cavan.), the former including *H. cinerea* DC., *H. virescens* Salzman ex DC., *H. glabra* L., *H. hirsuta* L., *H. incana* Lam., *H. besseri* Fischer ex Horn., *H. macrocarpa* Sbith., *H. alpina* Villars, *H. americana* Nutt. and *H. fruticosa* L. Besides, there were three species of doubtful status, viz., *H. dichotoma* DC., *H. lenticulata* Thunb. and *H. illecebroides* Smith. Of these fourteen taxa, only six (*H. cinerea, H. glabra, H. hirsuta, H. incana, H. alpina* and *H. fruticosa*) were treated in subsequent works as good species; the rest were either reduced (*H. virescens* to a variety of *H. cinerea* DC.; *H. besseri* and *H. macrocarpa* to synonyms of *H. incana* Lam., and *H. lenticulata* Thunberg rejected as later homonym as well as a nomen ambiguum) or transferred to an-

* The name *Herniaria* derived from the word 'hernia', and meaning a rupture of the abdominal wall through which part of the intestine protrudes, was first used by DODOENS in his Stirpium Historiae Pemptades (Antwerp, 1583).

other genus (*H. americana* Nutt., *H. polygonoides* Cav. and *H. illecebroides* Smith to *Paronychia*). Only *H. dichotoma* DC. remained a doubtful taxon, though probably referable to some species of *Paronychia*. J. GAY contributed six very good new species (*H. boissieri, H. cachemiriana, H. olympica, H. polygama, H. fontanesii,* and *H. hemistemon*) in DUCHARTRE's Revue Botanique 2:370-372 (1845). Five more species were added by HELDREICH and SARTORI (*H. parnassica*), BOISSIER (*H. scabrida* and *H. argaea*), BOISSIER and REUTER (*H. baetica*) and RUPRECHT (*H. caucasica*) respectively; of these two (*H. baetica* and *H. scabrida*) were from Spain, the rest from the Orient. A concise account of the Oriental species appeared in BOISSIER's Fl. Or. 1:739 (1867), and the Spanish taxa were described in considerable length by WILLKOMM and LANGE in Prodr. Fl. Hisp. 3:150 (1874). All these taxa were reviewed and concisely described by WILLIAMS, in 1896 (Bull. Herb. Boiss. 4: 556-570), on the whole a good work, though some of the species were very badly treated (five species were lumped under *H. glabra; H. incana* split up into 3 species).

GRAEBNER and MATTFELD in ASCHERSON and GRAEBNER, Syn. 5(1):8 (1919), split off the tetramerous species, with more or less fleshly leaves and sepals, into a separate genus *Heterochiton*. PAX et K. HOFFMANN, in ENGLER-PRANTL, Nat. Pflanzenfam. ed. 2, 16c:301 (1934) returned it to *Herniaria* as a section, which by F. HERMANN in 1937 (Fedde's Repert. 42:205) was raised to the rank of a subgenus. This latter assessment is followed in the present work.

HERMANN in the afore-mentioned account briefly reviewed nearly all the known species, and summed up 33 species (including 7 of his own), and for the first time keyed out their more important characteristics.

SAUVAGE and VINDT added, in 1956 (Bull. Soc. Sci. Nat. Maroc 36:194) a very remarkable species, *H. pujosii,* belonging to the subgenus *Heterochiton,* possessing very conspicuous stipules, almost like those found in *Paronychia*. Most of the North African and S. European species were described at length by MAIRE and WEILLER in MAIRE's Flore de l'Afrique du Nord 9:37-58 (1963), but as in the case of *Paronychia,* their work is marred by a strong bias for lumping and in addition by numerous misidentifications. *H. cinerea* DC. was treated partly as a variety of *H. hirsuta* L. and partly of *H. incana* Lam., *H. cyrenaica* Hermann, likewise, was treated as a variety of *H. glabra* L. and as a subspecies of *H. incana* Lam. Apart from *H. cinerea* DC. and *H. cyrenaica* Hermann, the four other subspecies included in *H. incana* Lam. are all very distinct species.

Finally, BRUMMITT and HEYWOOD in 1964 (Fedde's Repert. 69: 24) revised the two species of the subgenus *Heterochiton* occurring in

Europe (*H. fruticosa* L. and *H. fontanesii* Gay); and a little later BRUMMITT described two more species from Turkey.
In the present account 47 species are recognized (seven of them being new to science, whereas two others were originally described as varieties).

MORPHOLOGY

Habit and **Duration:** The plants belonging to this genus are very small, low, often prostrate and compact, annual or perennial herbs, in the latter case usually perennating by means of a caudex and a more or less woody tap root. Adventitious roots are formed but rarely, as, for instance, in *H. capensis* Bartling and *H. parnassica* Heldr. and Sart.
Stem: The stem and shoots are mostly prostrate, and branched from the base; the younger shoots often slender and much-spreading, giving off numerous short, lateral branchlets, usually densely covered with flower-clusters. The branching is almost always lateral. Shoots are generally densely covered with very short, patent to deflexed hairs, or sometimes nearly glabrous. In the subgenus *Heterochiton* the nodes are often distinctly swollen.
Leaves: The leaves are sessile or subsessile, plane, entire, usually opposite and somewhat unequal, or the lower (older) ones opposite and the upper (younger) ones alternate owing to the suppression of one of the pair; this is mostly so at the base of a flower-cluster, in which case the branch arising from the axil of the remaining leaf forms the contraction of the shoot; very occasionally the leaves form (axillary) fascicles on the nodes (e.g. in *H. fruticosa* L. of the subgenus *Heterochiton*); they are often soft, sometimes (as in the subgenus *Heterochiton)* thick and fleshy or more or less coriaceous with a slightly thickened margin; mostly obovate or broadly oblanceolate-subspathulate to nearly elliptic, sometimes rhombic to suborbicular, rarely linear-oblong or subterete, very rarely ovate-triangular, mostly obtuse at the top and narrowed to the base; often covered with closely appressed or forwards-directed short, either soft or stiff and stout hairs, sometimes they are, especially on the upper side, subglabrous or more or less glabrescent with age, rarely they are entirely glabrous. The venation is divergent and reticulate, the midrib quite distinct, but the lateral veins usually hardly conspicuous.
Stipules: The stipules are interpetiolar, two per pair of leaves, usually small, and hardly conspicuous, scarious, often ovate-triangular to semi-orbicular, acute to obtuse, usually with a densely ciliate margin and apex, mostly whitish, sometimes with purple patches (as in *H. fruticosa* L., *H. fontanesii* Gay and *H. scabrida* Boiss.), often much shorter than the leaves, very rarely (as in *H. pujosii* Sauv. and Vindt) quite prominent and almost like those of *Paronychia.*

Bracts: The bracts are scarious and quite similar to the stipules in form and structure though smaller in size, and much shorter than the flowers.

Inflorenscence: The flowers are quite often densely aggregated in mostly leaf-opposed or lateral, sometimes apparently axillary (i.e. pseudo-axillary), very compact, small but very profuse, more or less sessile clusters, the latter are usually invested on numerous short, lateral branches and often congested towards the end of the shoots; very occasionally they form terminal to subterminal few-flowered clusters (e.g. in *H. alpina* Villars); in a very few species the floriferous region is almost entirely leafless, as e.g. in *H. baetica* Boiss. and Reuter and in *H. canariensis* Chaudhri.

Flowers: The flowers are bisexual, actinomorphic, 'complete' and often slightly perigynous, small c. 1.25-2.5 mm long, subsessile or very shortly pedicellate, usually narrowly cylindrical-oblong, with a more or less tubular calyx and an obconical obovoid, sometimes ellipsoid to turbinate or obpyriform receptacle, often densely covered with short or somewhat longer, patent or spreading hairs, hirsute or hispidous (as e.g. in *H. incana* Lam., *H. rhiphaea* Font Quer, *H. hirsuta* L., *H. permixta* Gussone, *H. erckertii* Hermann, *H. cinerea* DC.), or only mildly so (as in *H. abyssinica* Chaudhri, *H. alpina* Villars, *H olympica* Gay, *H. parnassica* Heldr. and Sartori, partly in *H. scabrida* Boiss.), sometimes the hairs are very short though very densely formed (as in *H. maritima* Link, *H. baetica* Boiss. and Reuter and partly in *H. scabrida* Boiss.); occasionally the flowers are more or less glabrous as e.g. in *H. glabra* L., *H. bornmülleri* Chaudhri, *H. microcarpa* Presl, and *H. ciliolata* Melderis. The hairs on the floral receptable are generally straight, but occasionally, as in the subgenus *Heterochiton* and in two species of the subgenus *Herniaria (H. polygama* Gay and *H. cinerea* DC.), the hairs are uncinate (or coiled at the tip). In *H. cinerea* DC., a very widespread but highly misunderstood and misrepresented species, all the hairs on the flowers (covering the sepals and receptacle) are uncinate in the younger stages, but those on the upper parts of the sepals gradually straighten up with age, and at maturity only the lower half remains covered with uncinate hairs.

The flowers are usually 5-merous (excepting, of course, the bicarpellary pistil) in the subgenus *Herniaria* section *Herniaria,* but tetramerous in the section *Paronychiella* and in the whole of the subgenus *Heterochiton.* Flowers are often but slightly perigynous, but occasionally the perigynous zone is very well-developed, particularly in some of the perennial species, as, for instance, *H. microcarpa* Presl., *H. bornmülleri* Chaudhri, *H. caucasica* Ruprecht, *H. olympica* J. Gay, *H. pisidica* Brummitt.

Sepals: The sepals are, as in the rest of the group, quincuncially im-

bricate when pentamerous, and when tetramerous decussately imbricate; plano-concave, mostly soft, occasionally somewhat fleshy, sometimes with a thickened and rather rigid apex as in some species of the subgenus *Heterochiton* (e.g. *H. arabica* Hand.-Mazz., *H. fontanesii* Gay, *H. hemistemon* Gay), rarely with a minute apical cusp as in *H. mauritanica* Murb. They are mostly equal to subequal in length, but unequal in all but one species (*H. canariensis* Chaudhri) of the subgenus *Heterochiton* and also in some of the species of the subgenus *Herniaria* (e.g. in *H. cinerea* DC., *H. erckertii* Hermann, *H. lusitanica* Chaudhri, *H. acrochaeta* (Bornm.) Chaudhri) but the degree of inequality within individuals of the same species is generally extremely variable, and in any species all transitions from subequal to unequal length may be met with. The sepals are usually connivent to erect, but occasionally the apices are somewhat spreading or recurved, so e.g. in most of the species of the subgenus *Heterochiton* and sometimes also in one species of the subgenus *Herniaria* (viz. *H. lusitanica* Chaudhri).

Petals: The petals are subulate-filiform, often quite inconspicuous structures, attached to the perigynous ring (the rim of the receptacle), and alternating with the sepals. Sometimes, however, they are quite prominent, as in *H. arabica* Hand.-Mazz., where they almost reach the sepal tips.

Stamens: The stamens are usually 5 or 4 depending on the construction of the flower (that is, whether it is 5-merous or 4-merous), but in some of the species of the subgenus and section *Herniaria,* the number is variable. In *H. cinerea* DC. and *H. acrochaeta* (Bornm.) Chaudhri it is consistently two, and in *H. hirsuta* L. two to five, 5, 4 and 3 being, in the order of frequency, the most common numbers. The filaments are filiform, inserted on the perigynous ring just opposite the sepals. The anthers are bilobed, often oblong, or suboblong, sometimes shorter and subquadrangular or squarish, mostly orange-yellow in colour. The pollen grains are smooth, without any ornamentation.

Pistil: Ovary: The ovary is usually ovoid-subglobose, sometimes narrowed to the top (as in *H. pearsonii* Chaudhri a species from the Cape Province), unilocular with one basal, amphitropous ovule. It is mostly smooth and glabrous, occasionally papillose at the top (e.g. in *H. schlechteri* Herm., *H. grimmii* Herm.).

The **style** is very well-marked in the section **Paronychiella** (subgenus *Herniaria*) as well as in some other members of this subgenus (e.g. in *H. olympica* Gay, *H. caucasica* Ruprecht, *H. cachemiriana* Gay, *H. latifolia* Lapeyr., *H. capensis* Bartling). In most of the (other) species of this subgenus, however, the style is very short, and often nearly as long as or shorter than the stigmas. In a few cases the reduction has gone still further and the stigma is more or less sessile and bilobed

as, for instance, in *H. abyssinica* Chaudhri, *H. schlechteri* Herm., *H. baetica* Boiss. et Reuter. In other cases there are two sessile stigmas as in *H. incana* Lam., *H. pisidica* Brummitt, *H. regnieri* Br.-Bl. et Maire, *H. boissieri* Gay and *H. maskatensis* Bornm. In most of the species of the subgenus *Heterochiton* the stigmas are elongate, dark-brown, and arise from the notched, clavate top of the ovary; they are, moreover, often divergent with age. Finally, in two cases, the styles are free, viz. in *H. erckertii* Hermann (with very short ones) and *H. hemistemon* Gay (elongate and filiform).

Fruit: The fruit is narrowly ellipsoid to subglobose, with a membranous, usually smooth but occasionally papillose, pale-brownish pericarp rupturing irregularly and longitudinally at the base. The fruit is enclosed within the persistent calyx.

Seed: The seed is mostly ovoid to somewhat lenticular, with a dark-brown, smooth and shining testa, and at the base attached to the funicle; the embryo is annular, enclosing or surrounding the farinaceous albumen; the cotyledons are linear, and the radicle descending or inferior.

Uses: These plants have no ornamental value, and none of the species is cultivated. However, FOURNER (1948) has described in considerable length the medicinal properties of two common species, *H. glabra* L. and *H. hirsuta* L., and has ascribed such properties as antispasmodic, antiopthalmic, astringent and expectorant to this genus.

Ecology: Most of the species of *Herniaria* are perennial, and only about 1/4th of the total or 10-11 species are annual. In *H. glabra* L. about 60 % of the population perennates, the rest are either annuals or biennials, and in *H. lusitanica* Chaudhri too the duration is variable; this is essentially an annual species, but a few of the individuals are undoubtly biennial or perennial. The annual species usually inhabit dry and arid zones (*H. cinerea* DC.) or coastal sands (*H. algarvica* Chaudhri), but sometimes they are found in submontane or temperate regions (*H. hirsuta* L. and part of *H. glabra* L.). Most of the perennial species are montane or submontane (e.g. *H. cachemiriana* Gay, *H. alpina* Vill., *H. olympic* Gay, *H. latifolia* Lapeyr., *H. caucasica* Ruprecht, *H. argaea* Boiss., *H. parnassica* Heldr. and Sart., *H. bornmülleri* Chaudhri, *H. microcarpa* Presl, *H. regnieri* Br.-Bl. et Maire, *H. abyssinica* Chaudhri, *H. grimmii* Hermann, *H. saxatilis* Brummitt, *H. rhiphaea* Font Quer. Some of the species, however, thrive equally well at somewhat lower altitudes, e.g. *H. scabrida* Boiss., *H. erckertii* Herm., *H. glabra* L. and *H. hirsuta* L. and *H. incana* Lam. Some are almost exclusively coastal species, inhabiting maritime sand-dunes, as, e.g. *H. maritima* Link, *H. cilolata* Meld. and *H. capensis* Bartl. The subgenus *Heterochiton* is essentially a group of arid zones or deserts, (*H. hemistenon* Gay, *H. arabica* Hand.-Mazz., *H. ericifolia*

Townsend and a large part of *H. fontanesii* Gay) but some of the species and some parts of the population of the same species may occur at somewhat higher altitudes (*H. mauritanica* Murb., *H. fruticosa* L., *H. pujosii* Sauv. and Vindt).

Distribution:
Of the 47 species only 6 (or about 13 %) are widely distributed, their area extending beyond the limits of one floral region, the rest (87 %) are all endemics, confined to a small area or with a very restricted range of distribution. The six widespread species are: *H. glabra* L., *H. hirsuta* L., *H. cinerea* DC., *H. incana* Lam., *H. fontanesii* J. Gay and *H. hemistemon* Gay. *H. glabra* L. is the most widespread species of all, extending from Finland and Sweden in the North to W. Siberia in the East and Iran in the South. It is, however, in the main a S. European species, though very abundant in Turkey as well. In N. Africa it is found only near the Mediterranean coast. Another very widespread species of the temperate zone is *H. hirsuta* L. It is very frequent in Central and S. Europe but its area extends to W. Pakistan and the WNW montane region of India in the East and to Ethiopia in the South and N. Morocco in the West. Its wide range clearly indicates that it must have been very widespread in the temperate regions throughout the Near East and W. Asia on the one hand and N. Africa on the other, though now it is mainly concentrated in Central and S. Europe and Turkey. *H. cinera* DC., by contrast, is a species of the warmer subtropical regions, very abundant in North Africa and W. Asia, from W. Pakistan to the Canary and Madeira Islands, but its area extends to SSE Greece and coastal areas of S. France as well as to some parts of Spain and Portugal. *H. incana* Lam. is an East and S. European species, very abundant in ESE Europe, Turkey and the coastal areas of the Mediterranean countries. *H. fontanesii* Gay and *H. hemistemon* Gay are (both) arid or semi-arid zone species, occurring in the deserts of Iraq, Syria, Jordan, Egypt and much of N. Africa. *H. hemistemon* is a Near-Eastern species with an area stretching from S. Iran to NE Algeria. *H. fontanesii,* on the other hand, is a NW African species, occurring from Libya to Morocco, the Canary Is. and SE Spain.
The distribution of the endemic species: 5 species *(H. capensis* Bartl., *H. pearsonii* Chaudhri, *H. schlechteri* Hermann, *H. grimmii* Herm. and *H. erckertii* Hermann) are endemic in **S. Africa** and only the last mentioned covers a somewhat larger area; the first three are confined to the Cape Province, and the fourth occurs in Lesotho (Basutoland). The rest of the species are distributed as follows: 2a) **Africa East** (Ethiopia): one *(H. abyssinica* Chaudhri); 2b) **Africa North.** 8 *((H cyrenaica* Herm., in Libya; *H. permixta* Gussone in N. Algeria; E. Morocco and Sicily; *H. oranensis* Chaudhri in NW. Algeria; *H. regnieri*

Br.-Bl. and Maire, *H. rhiphaea* Font Quer in N. Morocco; the other three species belonging to the subgenus *Heterochiton* are *H. pujosii* Sauv. and Vindt in Morocco, *H. mauritanica* Murb. in N. Algeria and *(H. ericifolia* in NW Libya); 3) **Canary Islands:** one *(H. canariensis* Chaudhri); 4) **Spain and Portugal:** 7 *(H. boissieri* Gay in SSE Spain and N. Morocco; *H. baetica* Boiss. et Reuter in SE Spain; *H. scabrida* Boiss. almost throughout Spain and Portugal in the serpentine areas; *H. algarvica* Chaudhri in S. Portugal; *H. lusitanica* Chaudhri throughout Portugal and W-C. Spain; *H. maritima* Link in SW Portugal; *H. fruticosa* L. in E. Spain; another species occurring in coastal WNW Portugal, *H. ciliolata* Meld. is described below). 5) **W. Europe** (coastal areas): one (*H. ciliolata* Melderis extending from SW England to W. France and WNW Portugal). 6) **The Pyrenees:** One *H. latifolia* Lapeyrouse). 7) **The Alps:** one *(H. alpina* Villars, also accurring in E. Pyrenees). 8) **Italy:** one *(H. bornmülleri* Chaudhri in Eastern Italy). 9) **Sicily:** 2 *(H. microcarpa* Presl and *H. permixta* Gussone, the latter already described from N. Africa). 10) **Greece:** 3 (*H. parnassica* Heldr. and Sartori; *H. nigrimontium* Hermann and *H. degenii* (Herm.) Chaudhri, the last from Samothrake Island). 11) **Turkey:** 4 (*H. olympica* Gay from W. Turkey; *H. pisidica* Brummitt and *H. saxatilis* Brummitt from SW Turkey; *H. argaea* Boiss. from Central and SE Turkey). 12) **Palestine:** one *(H. acrochaeta* (Bornm.) Chaudhri). 13) **Syria and W. Iraq:** one *(H. arabica* Handel-Mazzetti). 14) **Transcaucasia:** one (*H. caucasia* Ruprecht, extending up to Central Asia). 15) **S. Russia:** one *(H. polygama* Gay). 16) **Kashmir: NNW W. Pak. and Afghanistan:** one *(H. cachemiriana* Gay). 17) **S. E. Arabia:** one *(H. maskatensis* Bornmüller). Quite evidently the main centre of variation lies in NW Africa, but the latter is closely followed by Spain and Portugal in the West, Turkey and Greece in the East, and S. Africa in the South.

Karyology:

The Karyology of 7 species has already been discussed in the General Introduction on p. 20. The basic number for all the species is 9. *H. alpina* Villars and *H. incana* Lam. are diploid, and this applies also to the annual forms of *H. glabra* L., but in this species the perennial forms show a tetraploid number, while for the var. *setulosa* Beck even the octoploid condition has been recorded. *H. hirsuta* L. is always tetraploid. *H. polygama* J. Gay, too, is tetraploid. *H. latifolia* Lapeyr. showed an odd count of 2n=54; this species, therefore, is hexaploid. The highest counts have been recorded for *H. ciliolata* Melderis, which proves to be 12- or 14-ploid. As pointed out in the General Introduction, the data available so far are too inadequate to be of significant value for the delimitation of infra-specific taxa. Only two species

H. glabra L. and *H. ciliolata* Meld. have been experimentally studied, but it is only in *H. ciliolata* that polyploidy seems to have produced appreciable morphological changes.

Hybridization: BRUMMITT (1967) has already cited two cases pointing to the possibility of hybridization in this genus. There are, however, a few more cases which may have been caused by hybridization. All of them are listed below.

1. Two gatherings from **Turkey,** pointed out by BRUMMITT, the first from Eastern Turkey, Prov. Bitlis, South of Kambos Dağ, 1250 m, open community, stony pasture, 16.viii. 1956, *McNeill* 597 bis (mixed with *H. glabra* L.) (E). It is almost identical with *H. glabra* L. (with which it is mixed) in habit as well as in the structure of the leaves and the flowers, but possesses shortly hirtellous stems, besides having leaves with short acroscopic hairs on the margin, particularly near the apex, the younger ones even with short appressed hairs on the under side, the sepals covered with very short sparse hairs especially towards the tip, and are provided with a ciliolate margin. The fruit is undeveloped. The second collection from WSW Turkey, Prov. Antalya, N. foot of Ak Dağ, 1850 m, turfy flat hollow (S of Geyik Dağ) 30.viii, 1947, *Davis* 14649 (K). This is also mixed with *H. glabra* L. with which it agrees in habit and in the characters of the flowerclusters. However, unlike *H. glabra* L., it possesses sparsely hirtellous shoots, and leaves with a ciliate margin and sepals covered with short, sparse, spreading hairs and provided with a ciliolate margin. No fruits are formed. Both these cases are here described as hybrids between *H. glabra* L. and *H. hirsuta* L.

2. **S. Spain:** Prov. Jaèn, Sierra de Segura, Cerro de Puente Hondo, alt. 1000 m, in subseral facies of Pinetum pinastri, on dry sandy soil, 28.vi. 1955, V. *H. Heywood* 3047 (LIVU). This specimen resembles *H. lusitanica* Chaudhri in general floral characters (the shape and arrangement of the clusters and form of flowers), but differs in being perennial, and possessing somewhat fleshy leaves, occasionally 4-merous flowers (though mostly 5-merous) and rather fleshy and glabrescent sepals. Fruit not formed. It may well be a hybrid of *H. lusitanica* with *H. glabra* L. The latter is often perennial in Spain.

3. **S. Spain:** Prov. Cadiz, in arenosis, prope 'Jeres', 26.iii.1879, *Perez-Lara* (W). This specimen resembles *H. lusitanica* Chaudhri in habit but its flowers are covered with uncinate (patent) hairs on the perigynous zone, and the outer sepals are distinctly recurved at the apex. Stamens 5. Fruit and seed fully developed. This may be a hybrid of *H. lusitanica* with *H. cinerea* DC. which always possesses uncinate hairs on the perigynous zone of the flower.

4. **NE Spain:** Aragon: Teruel, vii. 1909, *F. Sennen* (BC). This plant agrees with *H. fruticosa* L. in the arrangement and structure of

the flowers, but its older leaves are considerably longer than they are in the main population of *H. fruticosa* L. (that is up to 3.6 x 1.5-1.75 mm instead of 2 x 1.3 mm). Fruit fully developed. It may be a hybrid of *H. fruticosa* L. with *H. fontanesii* Gay, with the latter it agrees in the characters of the leaves. Nos. 3 and 4 are described as varieties.

Diagnosis and subdivisions of the genus HERNIARIA

HERNIARIA [J. Bauhin] L.

J. Bauhin, Hist. Plant. Univer. 3:378-379 (1651); Tournefourt, Institutiones Rei Herbariae 507, tab. 288 (1700); Linneaus, Gen. Pl. ed. 1:34, no. 93 (1737); ed. 5:103 (1754); Sp. Pl. ed. 1:218 (1753); De Candolle, Prodr. 3:367 (1828); J. Gay in Duchartre, Revue Botanique 2:370-372 (1847); Boissier, Fl. Or. 1:739 (1867); Willkomm and Lange, Prodr. Fl. Hisp. 3:150 (1874); Bentham and Hooker, Gen. Pl. 3:16 (1880); F. N. Williams, A Systematic Revision of *Herniaria* in Bull. Herb. Boiss. 4:556 (1896); Graebner in Ascherson and Graebner, Syn. 5(1):871 (1919); Pax and K. Hoffmann in Engler-Prantl, Pflanzenfam. ed. 2, 16c:300 (1934); F. Hermann, Übersicht über die *Herniaria*-Arten des Berliner Herbars, in Fedde's Repert. 42:203 (1937); Maire et Weiller in Maire, Fl. Afr. Nord 9:37 (1963); Brummitt and Heywood in Fedde's Repert. 69(1):24 (1964); et in Tutin et al. Fl. Europ. 1:151 (1964); Brummitt in Davis, Fl. Turk. 2:245 (1967). Syn.: *Heterochiton* Graebner et Mattfeld in Ascherson and Graebner, Syn. 5(1):870 (1919).

Annual or, mostly, perennial, small, compact herbs; stems often prostrate, much-branched from the base, and bearing numerous short branches usually covered with dense flower clusters, shortly hirsute, hirtellous or subglabrous. Leaves mostly opposite and somewhat unequal, or the lower opposite and the upper alternate, rarely in axillary fascicles, sessile or subsessile, small, entire, variable in form, obovate to oblanceolate or narrowly elliptic, covered with short appressed hairs or only along the margin hairy and for the rest (esp. the upper side) subglabrous, sometimes entirely glabrous; usually soft, occasionally somewhat thick and fleshy (e.g. in the subgenus *Heterochiton*); stipules scarious, small, often inconspicuous, ovate-triangular with a ciliate margin, two per pair of leaves. Flowers often densely aggregated in very profuse, small, sessile, leaf-opposed (or lateral) clusters, usually congested on the short lateral branches. Bracts similar to the stipules in form and structure, though smaller in size, much shorter than the flowers. Flowers small, subsessile, bisexual, tetracyclic, mostly pentamerous, though occasionally 4-merous (section *Paronychiella* and subgenus

Heterochiton); perigynous zone slightly developed (annual species) or well-marked (perennials), covered with short patent hairs or sometimes more or less glabrous; sepals usually soft, 5 or 4, quincuncially imbricate when 5, mostly plano-concave and connivent to erect, equal or unequal, sometimes with a thickened and subrecurved apex (as in subgenus *Heterochiton*); petals 5 or 4, subulate-filiform, often inconspicuous, very occasionally well-marked, attached to the rim of the receptacle, alternating with the sepals; stamens 5 or 4, rarely 2, inserted on the rim of the receptacle, filaments filiform, anthers oblong or quadrangular and orange-yellow; ovary avoid, unilocular; style usually short and occasionally entirely suppressed, sometimes quite distinct and elongate, very rarely two styles; stigmas occasionally sessile, if a style is present, as long as or longer than the latter; ovule solitary, basal, amphitropous. Fruit enclosed by the persistent calyx, free from the receptacle, ovoid to narrowly ellipsoid, with a membranous pericarp, rupturing irregularly at the base; seed somewhat lenticular to ovoid, dark-brown, smooth and shining, erect, at the base attached to the funicle; embryo annular surrounding the farinaceous albumen; cotyledons linear; radicle descending.
Type species: *H. glabra* L.

Key to the subgenera:

1a) Calyx pentamerous, rarely tetramerous, but in that case the style distinctly elongate; leaves and sepals soft or sometimes slightly fleshy, often with distinct nerves ..... subgenus **Herniaria**

1b) Calyx always tetramerous; (styles or) stigmas (somewhat clavate) arising from the notched top of the ovary; leaves and sepals thick and fleshy or coriaceous, with indistinct nerves ---- ..... subgenus **Heterochiton**

A. Subgenus **Herniaria:** Syn.: *Herniaria* subgenus *Homochiton* Maire et Weiller op. cit. p. 39. Leaves and sepals soft or sometimes slightly fleshy, usually with distinct nerves; sepals connivent to erect, equal or rarely unequal; style distinct and as long as or shorter than the stigmas, or the stigmas sometimes subsessile. Annual to perennial herbs.

Key to the sections:

1a) Calyx pentamerous; style (short and) distinctly shorter than the sepals ..... section **Herniaria**

1b) Calyx tetramerous; style distinctly elongate, equalling to somewhat exceeding the sepals, or exserted, in the fruiting stage ---- ..... section **Paronychiella**

1. Section **Herniaria**

Syn: Sect. *Enherniaria* Williams in Bull. Herb. Boiss. 4:558 (1896); Graebner in Ascherson and Graebner, Syn. 5(1):872 (1919); Pax et

K. Hoffm. in Engler-Prantl. Nat. Pflanzenfam. ed. 2, 16c:301 (1934); F. Hermann, op. cit. 42:205 (1937); Maire et Weiller, op. cit. 9:39 (1963). Sect. *Paronychiella* Williams op. cit. p.p.; Pax et K. Hoffm. op. cit.

Sepals and petals 5; sepals equal or occasionally unequal, but connivent to erect; style short, often bifid to bilobate, or the stigmas sometimes more or less sessile.

Key to the subsections:

1a) Shoots, leaves and flowers more or less green (light-, dull-, greyish- or deep-green); style present or absent, if absent the stigmas divergent ..... subsection **Herniaria**

1b) Plant (shoots, leaves, flowers) purple throughout: stigmas always sessile, filiform and erect ..... subsection **Purpureae** (one species in Muscat, SE Arabia)

1a. Subsection **Herniaria:** Sepals and petals 5; sepals equal or sometimes unequal, connivent to erect; style often quite short, as long as or longer than the stigmas, occasionally the stigmas sessile and divergent. Annual to perennial greenish herbs.

Type species: *H. glabra* L. This subsection includes 35 species (including the type species) distributed throughout the range of the genus. However, only four species (*H. glabra* L., *H. hirsuta* L., *H. cinerea* DC. and *H. incana* Lam.) are distributed over a wider area, and the rest are all more or less pronounced endemics, i.e. species with a restricted range of distribution. The main centres of endemism have already been listed in the introduction to this genus. *H. boissieri* Gay is remarkable for its curly and velvety pubescence. It is endemic in SE Spain and N. Morocco. *H. olympica* Gay very occasionally possesses tetramerous flowers, and may well have led to the development of tetramerous species like *H. degenii* (Hermann) Chaudhri.

1b. Subsection **Purpureae** Chaudhri subsect. nov., adhuc monotypica a subsectione *Herniaria* caulibus, foliis floribusque purpureis, foliis lamina late obovata vel suborbiculari, basi in pseudopetiolum contracta instructis, stigmatibus sessilibus semper filiformibus et erectis distinguenda. Plant (shoots, leaves, flowers) purple thoughout; leaves with a broadly obovate to suborbicular lamina (or the main part), abruptly contracted at the base into a very narrow, stalk-like basal part c. 1 mm long; stigmas sessile, filiform and erect. A monotypic subsection. The type species *H. maskatensis* Bornmüller is characterized by its remarkable purple colour and the peculiarly shaped leaves. Both these characters are unique for this species, and not met with in the rest of the genus. The species is endemic in Muscat, SE. Arabia.

B. Section **Paronychiella** (Williams) emend. F. Hermann, op. cit. p. 205. Flowers tetramerous; style elongate, often exserted in the fruiting stage. Annual herbs in ESE Europe (S. Russia and SE Greece).

Type species: *H. polygama* J. Gay. Other species: *H. nigrimontium* F. Hermann and *H. degenii* (Herm.) Chaudhri. Of the three species only *H. polygama* is well distributed in Southern Russia, the other two being confined to NNE Greece. *H. degenii* is, in fact, found only in the Island Samothrake.

C. **Subgenus Heterochiton** (Graebn. et Mattfeld) F. Hermann, op. cit.; Maire et Weiller, op. cit. *Heterochiton* Graebner et Mattfeld in Ascherson and Graebner, Syn. 5(1):870 (1919); *Herniaria* Sect. *Heterochiton* (Graebn. et Mattf.) Pax et K. Hoffm., op. cit. Leaves thick and fleshy or coriaceous, with indistinct nerves, sometimes with a thickened and papillose margin, occasionally in axillary fascicles, flowers tetramerous; perigynous zone very well-developed, turbinate, and covered with a ring of uncinate hairs; sepals (mostly) unequal, the outer often with a thickened and subrecurved apex; styles or if the latter are absent, the stigmas arising from the notched top of the ovary. Perennial psammophilous herbs mainly distributed in the subtropical to tropical N. Africa and the Near East, extending in the West to Spain and the Canary Isles. Type species: *H. fontanesii* J. Gay. Other species: *H. mauritanica* Murb., *H. hemistenon* Gay, *H. arabica* Handel-Mazz., *H. ericifolia* Towns., *H. fruticosa* L., *H. canariensis* Chaudhri, *H. pujosii* Sauv. et Vindt.

H. fontanesii and *H. hemistemon* are distributed over a wide range, the latter extending from S. Iran to NE Algeria, the former from Libya or W. Egypt to the Canary Isles and northwards to SE Spain and coastal parts of Sicily. *H. fruticosa* occurs only in ESE Spain, *H. mauritanica* in N. Algeria and W. Tunisia, *H. ericifolia* in NW. Libya, *H. pujosii* in Morocco, *H. canariensis* in the Canary Isles and *H. arabica* in W. Iraq and Syria. *H. pujosii* is remarkable for its conspicuous stipules (the only species of the genus possessing such large ones) almost like those found in *Paronychia*. However, the floral structure (of this species) is quite similar to that of *H. fruticosa* L.

KEY TO THE SPECIES

A. Subgenus **Herniaria:**

Section **Herniaria:** Calyx pentamerous

1a) Flowers ± glabrous or with sparsely hirtellous sepals; shoots puberulous or almost glabrous; leaves entirely glabrous on both sides

2a) Sepals sparsely hirtellous; style distinctly elongate 7. **H. caucasica** (Transcaucasus and C. Asia)

2b) Sepals ± glabrous on the outside

3a) Annual; flowers almost glabrous, but the sepals tipped with a minute white hair; sepals unequal; stamens two; fruit shorter than the sepals ..... 16. **H. acrochaeta** (Palestine)

3b) Mostly perennial, rarely annual but in that case the sepals not

tipped with a short hair; stamens 5; fruit equalling to exceeding the sepals

4a) Flowers mostly 1.25-1.5 mm long; leaves narrowly obovate-elliptic, attenuate to the base; fruit usually distinctly exceeding the sepals ..... 1. **H. glabra** (Europe & W. Asia)

4b) Flowers more than c. 1.5 mm long; leaves rhombic to suborbicular or broadly obovate

5a) Stems spreading and shortly pubescent or puberulous

6a) Stems retrorsely pubescent (mostly on two sides); leaves elliptic rhombic to suborbicular, up to 7 x 3 mm; flowers 1.5-2 mm; sepals with a ciliolate margin; style distinct though deeply 2-cleft; fruit c. 1.25 x 0.6 mm ---- 2.**H. ciliolata** (NW Portugal to SW England)

6b) Stems puberulous; leaves obovate to elliptic-suborbicular, mostly up to 5 x 2.5 mm; flowers 2-2.4 mm with a prominent receptacle, more or less equalling the sepals; stigma subsessile and bilobed; fruit 1.35-1.5 x 1 mm ..... 3. **H. microcarpa** (Sicily)

5b) Stems densely pulvinate and almost glabrous ..... 4. **H. bornmülleri** (SE Italy)

1b) Flowers often more or less densely covered with (stout or fine) patent hairs

7a) Plants annual

8a) Sepals mostly unequal

9a) Leaves often hirsute; hairs on the perigynous zone always uncinate; stamens two ..... 17. **H. cinerea** (W. Asia & N. Afr.)

9b) Leaves covered with closely appressed, very short and fine hairs; hairs on the receptacle mostly straight; stamens 5 ..... 14. **H. lusitanica**

8b) Sepals equal or subequal, and often with stiffly spreading hairs

10a) Hairs on the sepal tips usually well-marked; leaves oblanceolate to obliquely oblong-elliptic and hirsute at least in younger stages; sepals hirsute but the perigynous zone often subglabrous ---- ..... 13. **H. hirsuta** (Europe and W. Asia)

10b) Hairs on the sepal tips not different from the other ones

11a) Leaves broadly obovate to suborbicular, abruptly narrowed at the base, rather thick, the mature ones often on both sides glabrous; flowers in large clusters, 1.25-1.5 mm, obpyriform-obovoid, covered with short, stiff patent hairs of uniform length; stigmas almost sessile ..... 10. **H. micrantha** (Cyprus & WSW Turkey)

11b) Leaves often on both sides hairy; flowers covered with rather long and patent (sometimes loosely spreading or curled) hairs; usually c. 1.5 mm or longer

12a) Shoots densely covered with short, patent hairs; leaves with

rather long and stout, appressed hairs; stipules up to c. 2 mm long; clusters 3 to 6 flowered; flowers c. 2 mm, densely hispidous with stout, long, stiffly spreading hairs; anthers c. 0.4 x 0.25 mm ..... 21. **H. rhiphaea** (N. Morocco)

12b) Shoots with strongly deflexed or retrorse hairs; leaves often appressed pubescent to glabrescent; clusters very dense and large

13a) Leaves almost orbicular to obovate; abruptly contracted at the base, not exceeding 4 x 2.5 mm, covered with crisped hairs; sepals too with crisped hairs .... 15. **H. algarvica** (S. Portugal)

13b) Leaves somewhat strigose to adpressed pubescent; sepals covered with patent hairs

14a) Leaves obovate-elliptic, up to 7 x 3 mm, adpressed pubescent; flowers 1.75-2.25 mm; fruit enclosed by the sepals; stigmas erect ..... 19. **H. schlechteri** (S. Africa)

14b) Leaves mostly oblong-elliptic, up to 9 x 4 mm, strigose to glabrescent; flowers 1.5-1.8 mm, in large and very densely congested clusters; fruit exceeding the sepals; stigmas divergent .... 20. **H. saxatilis** (SW Turkey)

7b) Plants perennial

15a) Style elongate

16a) Mature leaves ± glabrous at least on the upper side

17a) Shoots shortly hirtellous to almost glabrous with age

18a) Shoots often densely congested and caespitose, shortly pubescent; mature leaves with ± glabrous surfaces and hairy margins; flowers 2-3 mm, mostly in terminal and subterminal, few-flowered clusters, and covered with short, stout, patent hairs 5. **H. alpina** (Alps & the Pyrenees)

18b) Shoots not caespitose but ± spreading from a compact base, almost glabrous

19a) Leaves with stout hairs on the margin; flowers c. 2 mm, in small, pseudo-axillary, leafy clusters; sepals covered with long, stout rather loosely spreading hairs .... 6. **H. olympica** (W. Turkey)

19b) Leaves almost entirely glabrous at maturity; flowers 1.75-2 mm, in dense, leaf-opposed clusters; sepals shortly hirtellous on the outside and with a ciliolate margin ..... 7. **H. caucasica** (Transcaucasus)

17b) Shoots densely covered with patent to deflexed hairs

20a) Leaves elliptic-obovate to obliquely oblong; flowers 1.8-2.25 mm, ellipsoid to obpyriform, turbinate when ripe, covered with rather loosely spreading though stout hairs; stigmas divergent with age ..... 31. **H. cachemiriana** (Kashmir, NNW-West Pakistan, Afghanistan)

31. **H. cachemiriana** (Kashmir, NNW-West Pakistan, Afghanistan)

20b) Leaves broadly elliptic-oblong to almost orbicular; flowers 2-

2.25 (2.5) mm, ± cylindrical and densely covered with stiffly spreading, almost bristly hairs; stigmas often ± erect ..... 32. **H. latifolia** (Pyrenees)

16b) Leaves on both sides ± uniformly hairy

21a) Adventitious roots profuse and conspicuous; shoots long and much spreading (creeping), with long internodes; flowers ovoid, 1.5-2 mm, covered with very short and dense hairs (velutinous to substrigose with age) ..... 33. **H. capensis** (coastal sands of the Cape Province)

21b) Adventitious roots absent; shoots quite short

22a) Leaves mostly opposite, up to 4 x 2.5 mm, obovate to elliptic, shortly adpressed pubescent with crisped hairs; clusters small 3 to 6-flowered; flowers 2-2.25 mm, obpyriform to ellipsoid, with stout patent hairs; receptacle prominent; anthers c. 0.25 mm in diam.; style bilobed to bifid ---- 35. **H. grimmii** (Mts. of S. Africa)

22b) Leaves mostly alternate, up to 5 x 2 mm, obovate, somewhat strigose; stipules and bracts with a reddish margin; clusters 4 to 7-flowered and profuse; flowers c. 2 mm, narrowly ellipsoid, villous to densely pubescent, with patent but fine hairs; anthers 0.35-0.4 x 0.25 mm, oblong; ovary/fruit narrowed upwards to the style, the latter minutely bidendate at the tip ..... 34. **H. pearsonii** (Cape Province)

15b) Style very short or the stigma/stigmas sessile

23a) Mature leaves ± glabrous at least on the upper side

24a) Flowers covered with very short and sparse hairs ..... 26. **H. oranensis** (NW Algeria)

24b) Flowers densely covered with short or long hairs

25a) Adventitious roots usually very conspicuous; shoots with closely appressed, strongly retrorse hairs; leaves up to 8 x 4.25 mm, mostly broadly obovate to suborbicular, hairs on the leaf-margin strongly curved forwards, closely appressed to the margin; flower clusters large; stigma ± sessile and bilobed ..... 9. **H. parnassica** (Greece)

25b) Adventitious roots absent; shoots puberulous; leaves up to 6.5 x 3 mm, obovate to elliptic, margin with spreading or acroscopic hairs; clusters rather small; style short though distinct ..... 8. **H. argaea** (C. & SE. Turkey)

26a) Shoots often densely congested and caespitose; flowers covered with stout but rather loosely spreading to upwards-directed hairs; sepals rather thick or somewhat fleshy

27a) Leaves not exceeding 4 x 2.5 mm, elliptic to suborbicular, fleshy, ± glabrous with age; flowers 1.5-1.75 (-2 mm), obpyriform-obovoid; stigmas sessile and divergent; fruit slightly exceeding the sepals ..... 22. **H. regnieri** (Morocco)

27b) Leaves up to 5.5 x 2.5 mm, elliptic-obovate, rigid, on the upper side ± glabrous, margin shortly hairy; flowers 1.75-2.25 mm, oblong-ellipsoid; stigma ± sessile, bilobed; fruit somewhat shorter than the sepals ..... 12. **H. abyssinica** (Ethiopia)

26b) Shoots often spreading from a compact base; flowers with stiffly spreading rough hairs

28a) Sepals distinctly unequal; styles very short though distinct, with dot-like erect stigmas ..... 18. **H. erckertii** (S. Africa)

28b) Sepals equal or subequal

29a) Shoots densely covered with short, patent hairs; flowers 1.75-2 mm; stigma ± sessile, lobes divergent ..... 25. **H. cyrenaica** (NE Libya)

29b) Shoots puberulous; flowers mostly c. 1.75 mm long; style short but distinct; fruit equalling to exceeding the sepals .... 11. **H. permixta** (N. Algeria & Sicily)

23b) Leaves uniformly hairy; flowers densely covered with short or sometimes long hairs

30a) Shoots tufted and provided with closely imbricated and ascending leaves, not exceeding c. 2.5 x 1.5 mm, and covered with closely appressed silky hairs ..... 29. **H. boissieri** (SE Spain & N. Morocco)

30b) Shoots not tufted; leaves not imbricate, often spreading and more than c. 2.5 mm long

31a) Plant wholly purple-green to -brown; leaves rhombic-deltoid, velutinous; flowers 1-1.25 mm long, obovoid; stigmas sessile and erect ..... 36. **H. maskatensis** (SE Arabia)

31b) Plants not purple-green or brown

32a) Leaves broadly elliptic to suborbicular

33a) Light-green subshrub with long, suffruticose stems provided with swollen nodes and long, stout internodes; stipules 1.75-2.5 mm long; flowers 1.5-2 mm, in large, many-flowered dense clusters ..... 23. **H. maritima** (maritime sands of SW Portugal)

33b) Grey-green herb with a woody caudex; stipules not exceeding 1.25 mm; flowers 2-2.5 mm, in lax, 2 to 6 flowered, almost leafless 1.25 mm; flowers 2-2.5 mm, in lax, 2 to 6 flowered, almost leafless clusters towards the end of the shoots ..... 28. **H. baetica** (mountains of SE Spain)

32b) Leaves narrowly oblong, or elliptic-oblong to oblanceolate

34a) Woody caudex or stock very prominent; plants greyish-green

35a) Leaves often hirsute to hispid; flowers 2-2.5 mm, mostly bristly hispid ..... 30. **H. incana** (S. & E. Europe and Turkey)

35b) Leaves covered with closely appressed soft hairs or glabrescent; flowers 1.5-1.75(-2) mm, covered with very short, patent hairs ..... 29. **H. pisidica** (SW Turkey)

34b) Woody caudex not well-marked; plants light- or deep-green (leaves narrowly elliptic-oblong to oblanceolate, rather rigid, often sparsely covered with short, stout hairs, sometimes glabrescent; flowers 1.5-1.6(1.75) mm, densely covered with short (sometimes rather long) patent hairs ..... 24. **H. scabrida** (serpentine areas of Spain and Portugal)

B. Section **Paronychiella:** Leaves and sepals soft (herbaceous); calyx tetramerous, style elongate, equalling or slightly exceeding the sepals in the fruiting stage.

1a) Hairs on the perigynous zone uncinate; fruit exceeding the sepals ..... 37. **H. polygama** (Russia)

1b) Hairs on the perigynous zone straight; fruit ± equalling the sepals

2a) Leaves mostly on both sides glabrous and with a shortly ciliate margin; stipules with a very slightly ciliate margin; flowers covered with short, fine and patent hairs (sometimes entirely glabrous); sepals subequal to unequal ..... 38. **H. nigrimontium** (Albania/Yugoslavia and NE Greece)

2b) Leaves strigose in younger stages; stipules with a densely ciliate margin; flowers hispid with long, stout, stiffly spreading hairs; sepals equal ..... 39. **H. degenii** (Samothrake)

C. Subgenus **Heterochiton.** Leaves and sepals often ± fleshy or coriaceous; flowers tetramerous

1a) Leaves conspicuously fascicled or clustered on the nodes (usually ovate-triangular to oblong-oval, mostly up to c. 2 x 1.3 mm) ---- ..... 42. **H. fruticosa** (ESE Spain)

1b) Leaves for the greater part not fascicled on the nodes

2a) Leaves closely imbricated and ascending, esp. in the older parts of the shoots

3a) Stipules distinctly longer than the leaves; outer sepals erect ---- ..... 41. **H. pujosii** (Morocco)

3b) Stipules shorter than the leaves; outer sepals spreading with age ..... 43. **H. ericifolia** (NW Librya)

2b) Leaves mostly not closely imbricate, often ± spreading

4a) Flowers c. 1.25-1.4 mm; sepals equal (leaves linear-oblanceolate to terete-subcylindrical ..... 40. **H. canariensis** (Canary Is.)

4b) Flowers more than c. 1.5 mm long; sepals subequal to often markedly unequal

5a) Leaves ± oblong to obovate or broadly oblanceolate

6a) Leaves ± oblong, abruptly rounded at the base, appressed pubescent; sepals markedly unequal, at the top papillose and somewhat recurved but not much thickened or horn-like; the inner sepals c. 1/3 as long as the outer; stamens two, with minute anthers; petals absent .... 46. **H. hemistemon** (Near East and N. Africa)

6b) Leaves obovate or broadly oblanceolate, narrowed to the base, often hispid; sepals mostly slightly unequal, their top very rough, much-thickened and horn-like; stamens 4, with prominent anthers; petals quite distinct ..... 47. **H. arabica** (W. Iraq and Syria)

5b) Leaves mostly subspathulate to narrowly elliptic

7a) Shoots puberulous; leaves and sepals entirely glabrous; stipules white; (branches densely leafy; leaves up to 5 x 2.5 mm, often much-recurved) ..... 45. **H. mauritanica** (N. Algeria)

7b) Shoots retrorsely pubescent; leaves finely puberulous to velvety-pubescent with crisped hairs; stipules smaller, mostly with purple patches; sepals papillose to shortly pubescent .. 44. **H. fontanesii** (NNW Africa and SE Spain).

DESCRIPTIONS OF THE SPECIES

1. **H. glabra** L., Sp. Pl. ed. 1, 218 (1753).

J. Bauhin, Hist. Plant. 3:378 (1651); DC., Prodr. 3:367 (1828); Koch, Syn. ed. 2, 280 (1843); Fenzl in Ledeb., Fl. Ross. 2:159 (1843); Boissier, Fl. Or. 1:740 (1867); Willk. & Lange, Prodr. 3:152 (1874); Nyman, Consp. 256 (1879); Battandier in Batt. & Trab., Fl. Alg. (Dicot.) 167 (1888); Beck, Fl. Nieder-Österr. 1:347 (1890); Bonn. & Barr., Cat. Tun. 65 (1896); Gürke in Richter-Gürke, Pl. Europ. 2 (2):187 (1899) p.p.; Halacsy, Consp. Fl. Gr. 1:573 (1900); Briquet in Burnat, Fl. Alpes-Marit. 3:228 (1902); Rouy, Fl. Fr. 12:8 (1910); Hegi, Illustr. Fl. Mitteleurop. 3:432, pl. 108, f. 5 (1911); Graebn. in Aschers & Graebn., Syn. 5 (1):873 (1919); Hayek, Prodr. Fl. Balcan. 1:172 (1924); Pugsley, Journ. Bot. (London) 68:214-218 (1930), Bouloumoy, Fl. Liban & Syr. 1:123, pl. 62, f. 3 (1930); Dinsmore in Post, Fl. Syr., Pal. & Sin. 1:211 (1932); Thiébaut, Fl. Libano-Syr. 1:131 (1936); Schischkin in Komarov, Fl. U.R.S.S. 6:567. f. 5 (1936); Parsa, Fl. de l'Iran 1(2):1240 (1951); Clapham et al., Fl. Brit. Is. 333 (1952); Maire & Weiller, Fl. Afr. Nord 9:39, f. 10 (1963) p.p. Brummitt in Tutin et al., Fl. Europ. 1:151 (1964); & in Davis, Fl. Turk. 2:246 (1967); Mouterde, Nouv. Fl. Lib. & Syr. 1:454 (1966).

Syn.: *H. vulgaris* Hill, Veg. Syst. 26:9 (1775). *H. vulgaris* Sprengel, Syst. 1:929 (1825) p.p. *H. rotundifolia* Vis. in Flora 12, Ergänzungsbl. 1:9 (1829): Type: Yugoslavia: Dalmatia: In maritimis graminosis ins. Apsyrtidis prope Lossin, *Visiani* (Hb?). *H. vulgaris* Sprengel var. *glabra* (L.) Griesslich, Kl. Bot. Schrift. 210 (1836). *H. germanica* Döll var. *glabra* (L.) Döll, Rhein. Fl. 619 (1843). *H. arenaria* O. Kuntze var. *glabra* (L.) Kuntze, Taschenfl. Leipzig 224 (1867). *H. glabra* L. var. *α typica* Fiori & Paoletti, Fl. Anal. Ital. 1:335(1898). *H. ceretanica* Sennen in Bol. Soc. Arag. 15:263 (1916); et in Bol. Soc. Iber. Cien. Nat. 27-28:68 (1928). Type: Cerdagne, Les Escaldes, Sareja,

Sennen 4526 (holo. BC; iso. G!). *H. ceretana* Sennen in Bull. Soc. Bot. France 73:650 (1927); et in Bol. Soc. Iber. 27:68 (1928) Type: Cerdagne, Estavar, 23.vi.1926, *Sennen* 5736 (holo. BC; iso. G!). Soc. Iber. Cien. Nat. 27-28:68 (1928). Type: Cerdagne, Les Escaldes, Sareja, *Sennen* 4526 (holo. BC; iso. G!). *H. ceretana* Sennen in Bull. Soc. Bot. France 73:650 (1927); et in Bol. Soc. Iber. 27:68 (1928). Type: Cerdagne, Estavar, 23. vi. 1926, *Sennen* 5736 (holo. BC; iso. G!).
H. glabra L. subsp. *ceretana* Sennen in Bull. Soc. Bot. Fr. 74:368 (1927). *H. uretanica* Sennen in Bol. Soc. Iber. 27:68 (1928) in syn. *H. graebneri* Hermann nom. nov. in Fedde's Repert. 42:215 (1937). *H. glabra* L. subsp. *microcarpos* Hermann op. cit. non *H. microcarpa* Presl (1822).
An Annual or, mostly, perennial, often light or yellowish green herb; stem branched from the base, the branches spreading, 5-35 cm long; internodes up to c. 1 cm long, usually very shortly puberulous, becoming glabrous with age. Leaves sessile to subpetiolate, up to 7 x 3 mm, narrowly obovate-elliptic to occasionally suborbicular, obtuse, rather thick, on both sides glabrous; the margin in young leaves occasionally with a few short, rather stout hairs, especially near the apex; stipules oval to ovate, 1-1.5 mm long, with a densely ciliate margin. Flower-clusters mostly leaf-opposed, sometimes pseudo-axillary as well, 6 to 10-flowered, often densely congested on the branches of the second order. Flowers sessile, 1.25-1.5 (-1.75) mm, usually entirely glabrous, occasionally very slightly puberulous on the basal (perigynous) region; sepals narrowly oblong, obtuse, incurved when young; petals 0.45-0.5 mm; filaments 0.4 mm; anthers 0.25 x 0.2 mm, quadrangular and orange; style 0.2-0.25 mm, bilobed, with almost sessile and somewhat spreading stigmas. Fruit ovoid to globose, usually exceeding the sepals. Fl. 6-8. Stony places, alt. 1200-2800 m.

Key to the varieties:
1a) Flowers c. 1.5-1.75 mm long ..... var. **magniflora**
1b) Flowers mostly 1.25-1.5 mm
2a) Stem and branches very shortly ciliated or puberulous
3a) Leaves with short but distinct hairs on the margin ---- var. **setulosa**
3b) Leaves entirely glabrous or in the younger stages, very slightly ciliate on the margin near the apex, and glabrous with age ---- ..... var. **glabra**
2b) Stem and branches almost wholly glabrous; leaves and flowers entirely glabrous ..... var. **glaberrima**

a) var. **glabra:** Syn.: *H. glabra* L. b. *puberula* Peterm., Anal. Pflanzenschl. 152 (1846); Gürke in Richter-Gürke, Pl. Europ. 2(2):187 (1899). *H. glabra* L. var. *parviflora* Lange Pugill. Pl. in Videnskab.

3:152 (1865); Willk. & Lange, op. cit. 3:152 (1874); Williams op. cit. 4:564 (1896). Type: Madrid: *Lange* (C, not seen). *H. glabra* var. *decipiens* Pomel ex Batt. in Batt. & Trab., Fl. Alg. 168 (1888). Type: Algeria: Oued Ghar Roulen, *Pomel* (P!). *H. glabra* L. var. *typica* Beck, Fl. Nieder Österr. 347 (1890).

Stems and branches shortly puberulous; leaves glabrous or sometimes in the younger stages with a few minute hairs on the margin near the apex, but glabrous with age; flowers very slightly puberulous on the perigynous zone, but with glabrous sepals.

Mostly Northern and Central Europe but extending to Turkey.

England: Norfolk: ix. 1955, *Hubbard* (K); ibid. vii. 1920, *M. Cobble* (K); W. Suffolk: *Townsend* 56/26 (K); Middlesex: 14iviii.1949, *Lousley* (K). **Holland:** Amersfoort: *Oudemans* 218 (U); Utrecht: 5.ix.1962, *E. Arnolds* (U); Prov. Overijssel: *P. van Royen* 57 (U); ibid. 23.v.1949, *M. van Egmond & van Royen* (LISE, U, W); Prov. Gelderland: Nijmegen: *Bakhuizen* 4487 (U). **Belgium:** Ville sur Haine (Ht): *A. Martinis* 37 (JE); *Lejeune & Courtois* 432 (P). **France:** Leer: 29.v.1961, *Klimmek* (HBG); Doubs: *Paillot* 201 (JE); Allier: Moulins: viii.1890, *Bourdot* (Z); Rhone: Perrache: *Boullu* 1877 (JE); Arnas: *Gandoger* 375 (COI, JE). **Finland:** Kilinkallio: 5.viii.1962, *V. Välimäki* (COI); nr. Mikkeli: *Laimi Pantsar* 1168 (COI); ibid., 11.ix.1947, *J. Taapken* (L). **Sweden:** nr. Uppsala: *P. van Royen* 2143 (U); ibid., *Zetterstadt* 1114 (B, JE, W); Södermanland: Strängnäs: *V. Samuelsson* 773 (LISE, W); Skane: NE of Niklasberg: *Mattisson* 3733 (W); Gothembourg: 20.viii.1943, *H. Fries* (LISE). **Denmark:** Haredal: Skörping: 27.vi.1893, *J. Hartz* (COI). **Germany:** Schleswig-Holstein: vii.1912, *E. Ohl* (Z); Hamburg: viii.1915, *J. Schmidt* (HBG); Mainz: *A. Vigener* 9 (W); Rhein Prov.: Neuss: vii.1946, *Klimmek* (HBG); Baden: Karlsruhe: 12.ix.1905, *Thellung* (Z); Bayern: Reichelsdorfer: *Chr. Scherzer* 628 (STU); Thüringia: Weimar: vi.-vii.1924, *O. Schwarz* (JE); Saale-Ufey: Bürkh: viii.1937, *Bornmüller* (B); Sachsen: Leipzig: *F. Richter* 16585 (B); Dresden: 2.viii.1905, *O. T. Schmidt* (HBG); Brandenburg: Berlin: viii.1918, *R. Gross* (B); Potsdam: *Bornmüller* 1884:717 (B); Müncheberg: *Borssum Waalkes* 5910 (L). **Czechoslovakia:** Bohemia, Chrudim: vii.1886, *Jos. Zitko* (B); SW of Brno, 7.vii.1937, *W. T. Stearn* (K). **Poland:** Krakow: 8.viii.1956, *A. Jasiewicz* (W) Nowy Sacz: *Staszkiewicz* 527 (U). **Soviet Union:** Lithuania: Distr. Vilna: *T. Symonowiczowna* 168 (JE). **Rumania:** Bukowina, Gura-Humora: viii.1889, *Dörfler* (W). **Hungary:** Bakabánya, Pukanec: vii.1898, *Sam. Kupcok* (Z): Magyarfalva: ix.1907, *L. Keller* W). **Austria:** Nieder-*Österreich:* Floridsdorf: *Woloszczak* 65 (B, W); Wien: 24.vi.1911, *Zerny* W); Tirol: Tschirganter Bergstürn: *Stud. biol. Rheno-Trai* 53/265 (U). **Switserland:**: Zürich: *Leuzinger* 45 (Z); Heidenbiel-Raron: *H. Frey* 561 (Z); St. Margrethan: *Sulger-Buel* 853 (Z);;Bülach: vi.1931, *Däniker et al.* (Z); Einsiedeln: vii.1903, *Thellung* (Z); Valais: St.Bernard vii.1872, *Vetter* (Z); **Italy:** mt. Brenner: vi.1874, *de Helreich* (W); Aosta: Turin (Torino); *Höpflinger* 1826 (HBG, LISE);St.Giacomo: vii.1884, *Beyer* (B); Acceglio to *Höpflinger* 1826 (HBG, LISE); St. Giacomo: vii.1884, *Beyer* (B); Acceglio to Stroppo: vii.1892, *id.* (B); Abruzzi: Val Cortina: vi.1928, *Furrer* (Z). **Yugoslavia:** Croatia: Velebit Mts.: 30.vii.1890, *Beyer* (B); Dalmatia: Lapad Peninsula: *Jackson & Turrill* 145 (K); Lokrum (Lacroma); *id.* 363 (K); Biokovo Mts.: *Bornmüller* 1886:1799 (B); Macedonia: Veles: *Bürgeff* 214 (JE). **Bulgaria:** Jirnovo: *Urumoff* 66 (W); nr. Varna: *Gilliat-Smith* 523, & 576 (K). **Greece:** Thrace: *Tedd* 1619 (K); *Alston & Sandwith* 831 (K); Macedonia: Struma Plain: *Harris* 178 (K); Parnassos: *Maire & Petitmengin* 373 (W, Z). **Turkey:** Amasya: *Bornmüller* 1889:314 & 314b (B). **Soviet Union:** Central Asia: Uzbekistan: Prov. Hissar: *Bornmüller* 1913:845 (B); Prov. Semireczje: Distr. Lepsinsk Tarbagatai: 17.vi.1915,

Saposhnikov & Tripolitova (S); Kasan: Distr. Smiazchyk: viii.1884, *S. Korzchinsky* (G); Siberia occidentalis: *Mameev* 705 (K).

b) var. **glaberrima** Fenzl op. cit.: Syn.: *H. glabra* L. var. *genuina* Willk. et Lange, Prodr. 3:152 (1874); Williams, op. cit. 4:564 (1896). *H. glabra* var. *guadarramica* Sennen in Bull. Inst. Catal. Hist. Nat. 32: 97 (1936). Type: Madrid: Sierra de Guadarrama, à Navacerrada, 1820 m, vii. 1929,*Sennen, Jerónino and Mauricio* 7128 (holo. BC; iso. G!). **Afghanistan:** Chiva: *K. Lindberg* 707 (W). **Iran:** Prov. Gorgan: *Sharif* 273 (W); Elburs Mts.: *Gauba* 1433 (B); *Kotschy* 271 (E, G); *Bornmüller, J. & A.* 1902:6470 & 6471 (B); Prov. Mazanderan: *Rechinger, K. H. & F.* 6311 (W); *Gilliat-Smith* 2577 (BM); Tehran to Tabriz: *Bowles Bot. Exp.* 2387 (BM); mt. Elwend: *Pichler* in 1882 (B, BM, W, Z); nr. Hamadan: vi.1902, *Strauss* (JE). **Iraq:** Distr. Sulaimaniya: Penjwin: *R.* 12231 (W); Distr. Erbil: Nowanda: *R.* 11358 (W). **Turkey:** Vil. Bursa: Uludağ: vi.-vii.1944, *Başarman* (ISTE); Bolu: Ala Dağ: *Khan et al.* 467 (E); Kastamonu: *Davis* 21704 (E); Ilgaz Dağ: *Bornm.* 1890:1983 (B), *& Bornm. J. & F.*, 1929:13912 (B); Corum: Köse Dağ: *Coode, Jones & Tobey* 1917 (E); Gümüsane: *Sint.* 1894:5940 (JE); Kars: Gölebert nr. Ardahan: *Davis & Hedge* D.30418 (E); Kütahya: Murat Dağ: *Coode & Jones* 2516 (E); Konia: Sultan Dağ, Akşehir: *Bornm.* 1899:4490 (G); Ankara: Karagöl: *Coode & Jones* 2189 (E); Gerede to Ankara: *McNeill* 199 (E); Dikmen Dağ: *J. & F. Bornm.* 1929:13917 (B); Kara Dağ: *Bornm.* 1890:3146 (B); Niğde: Hasan Dağ: *Davis, Dodds, Çetik* D. 18977 (E); Kayseri: Erciyas Dağ (mt. Argaea): *Bornm.* 1984 (B, G, JE); Bakir Dağ: *Davis, Dodds, Çetik* D.19470 (E); Erzerum: Ilica to Tercan: *Davis & Hedge* D.30840 (E); Bitlis: *McNeill* 597 (E); Van: Satak: *Davis & Polunin* D. 23053 (S); Muğla to Antalya: *Davis* 13765 & 13869 (E); Antalya: Ak Dağ: *Davis* 14653 (E); Distr. Gebiz: *Davis* 15693 (E); Içel: Bulghar Dağ: *Siehe* 1896:496 (JE); Seyhan: Bürücek: 5.vi.1954, *Attila* (ISTE); Akher Dağ: *Haradjian* 1640 (G); Urfa: Siverek to Diyarbakir: *Daves & Hedge* D.28317 (E). **Syria:** Jebel el Ansariya: *Haradjian* 3471 & 3472 (G, W); Reyfoun: *Samuelsson* 2013 (S); Jebel-ed-Drouz: *id.* 4527 (S); Antilibanon:*Peyron* 1807/1809 (G); ibid. *Gaillardot* 1821 (G, JE). **Lebanon:** Jebel Sanin: *Bornm.* 1897:220 (B, G); Jebel Baruk: *Bornm. J. & F.* 1910:11502 (B); ibid. *Ball* 2056 (E); Eden: *Blanche* 3186 (G, JE). **Soviet Union:** Ukraine: Distr. Melitopol: 3.vii.1920, *M. Schalyt* (B, forma *stenophylla* Zapalowicz, Consp. Fl. Galic. 3:7 (1911).). **Greece:** Florina: *R.* 15768 (W). **Switserland:** Wallis: Folluterres to Martigny, 13.vii.1922, *Stud. biol. Rheno-Trai.* (U); Rhaetica: Schuls-Gulania: *R. La Nicca & Br.-Bl.* 948 (U, Z); Lagobianco, Bernina: 31.vii.1921, *Marie Pluss* (Z). **Italy:** Brenner: *C. Hennig* 2973 (B). **Spain:** Prov. Jaen: *Blanco* 373 (FI); Sierra de Segura: *Heywood* 2662 (W); Sierra de Villa verde, Alcaras to Rioper: *Bourgeau* 660 (FI, LD, Z, as *H. scabrida* Boiss.); Sierra Nevada: *id.* 1345 (FI, as *H. scabrida*); Sierra de Guadarrama: *Sennen et al.* 7128 (G). **Algeria:** Prov. Oran: Jebel Aissa: *Hochreutiner* 349 (G). **Morocco:** Atlas Rifain: Beni-Bughrab: vi.1934, *Sennen & Mauricio* (BM); Beni-Ammart: vii.1932, *id.* (BM).

c) var. **setulosa** Beck, op. cit. 347 (1890).

Syn.: *H. glabra* L. var. *subciliata* auct. mult. (J. Lange, Willk. et Lange, Gürke, Graebner, etc.), non Babington, Primitiae Fl. Sarn. 39 (1839). *H. glabra* var. *ciliata* sensu Wirtgen, Fl. Preuss. Rheinpr. 181 (1857), non Babington, Trans. Linn. Soc. 17:453 (1836).

H. microcarpa sensu Pugsley, Journ. Bot. 68:217 (1930), non Presl, Del. Prag. 65 (1822). *H. glabra* L. subsp. *microcarpos* Hermann, Fedde's Repert. 42:215 (1937); Bornmüller, Fedde's Repert. Beih. 89

(17):117 (1940); Maire et Weiller, op. cit. 9:40 (1963), non Presl (1822). *H. glabra* L. var. *nebrodensis* Hermann op. cit. 217 (1937) et auct. al., non *H. nebrodensis* Jan ex Gussone, Fl. Sic. Syn. 1:291 (1842). Leaves with short but stout and distinct hairs on the margin, particularly on the young shoots.

S. Europe, close to the Mediterranean.

France: Drome, nr. Saint-Vallier: *Chabert* 2467 (Z); Basses Alpes: Argenton, 20.v.1885, *Reverchon* (W, Z); Var: vi.1880, *Autheman* (W); Montrieux: vi.1916, *Beger* (B). **Switzerland:** Wallis: nr. Sion: *Stud. biol. Rheno-Trai.* 58/105 (U); *H. Frey* 73 (Z); Zermatt: Findelen: viii.1922, *Thellung* (Z); Tourbillon, Sitten: vi.1916, *W. Koch* (Z). **Italy:** Alpes Cottiae: Chianor: vii.1894, *Beyer* (B); Liguria: Riv. di Levante: v.1909, *Bornmüller* (B); Prov. Rome: 23.iv.1882, *P. Canepa* (COI, Z); Alta valle Tiberina: vi.1935, *Pichi-Sermolli* (W); Calabria: San Giovanni Fiore: *Bornm.* 1933:114 (B & Z). **Sicily:** *Citarda* in 1860 (JE). **Yugoslavia:** Istria: Novi: 27.xi. 1948, *Marchesetti* (FI); Pola: iv.1899, *K. Untchj* (B); W. Bosnia: Grahovo: vii.1904, *Handel-Mazzetti* (Z); Hercegovina: Mostar: *Raap* 74 (JE, W, Z); Ragusa: v. 1909, *Adamovic (Z);* Ragusa to Parmo: *Bornm.* 1886:1141 (B); Lüssin Is.: v.1911, *Bornm.* (B, JE); Dubrovnik: *Thiersch-Patzki* 16642 (B). **Rumania:** Cluj: *I. Prodan* 952 (Z). **Czechoslovakia:** Bohemia central: Ondrejov: viii.1915, *J. Rohlena* (B). **Turkey:** Bursa: Uludağ: v.1944, *Başarman* (ISTE). **Syria:** Hauran, inter Damascus & Daraa: *R.* 13030 (W). **Algeria:** Jebel Beni-Smir: vi.1918, *Maire* (G).

d) var. **magniflora** Chaudhri nov. var. a varietatibus aliis adhuc notis floribus majoribus (plerumque 1.5-1.75 mm altis) distinguenda.: Flowers (1.4-) 1.5-1.75 mm long; fruit equalling or somewhat exceeding the sepals; stigmas almost sessile, prominent and divergent. Plants mostly perennial, occasionally annual to biennial; leaves with a hairy as well as a glabrous margin. Fl. 5-8.

Distr.: France, Italy and Yugoslavia. May well be a polyploid form.

France: Allier: Moulins: 23.vii.1891, *Lassimonne* (COI); Loire: Neanches: viii.-1874, *J. Hervier* (COI); Alpes Maritimes: St. -Martin to Vésubie: 7.vii.1960. *Klimmek* (HBG). **Italy:** Ligurische Alpen: S. Teuda, *O. Fiedler* 9459 (B, holotype); Piemonte: Val Miniera: vii.1908, *L. Vaccari* (FI); Imprunneta nr. Firenze: vi.1891, *U. Martelli* (Z). **Sicily:** Madone: mt. S. Salvatore, vii. 1873, *Strobl* (W). **Yugoslavia:** Dalmatia: Vermal, Cattaro: v.1905, *J. Schneider* (W).

This species shows extreme variability in duration. Annual forms occur in Northern and most parts of Central Europe, but the perennial or biennial to perennial forms are very widespread in S. Europe. Of the nearly 450 specimens examined by me, 60 % of the total were wholly perennials, 16 % annuals and about 24 % seemed to be biennials. Pugsley's account (op. cit.) on this point is very inacuurate and highly misleading, and has caused a lot of confusion. He regarded the annual forms as typical *H. glabra* and the perennial as *H. microcarpa* Presl. An almost similar view was held by Hermann (1937) who, however, treated the perennial, late maturing forms as subsp. *microcarpa (microcarpos),* whereas the annual, early maturing individuals were considered to constitute the subsp. *glabra. H. microcarpa* Presl is,

however, a quite distinct species differing from *H. glabra* in the characters of habit, stem, leaves, flowers and fruit in addition to being wholly perennial. It has, moreover, a very restricted range of distribution being confined to Sicily, SE Italy and parts of N. Africa.

The duration in *H. glabra* is so variable that no taxonomic significance can be attached to it. In fact in all the four varieties recognized in this account both forms occur. The perennial individuals are generally met with at higher (ca. 1500-2500 m) altitudes, but in Turkey both forms may occur at about 1200 m, though the annuals are definitely more abundant at lower elevations.

Two varieties have so far been cytologically investigated; var. *glabra* is diploid and tetraploid (2n = 18,36) and var. *setulosa* is octoploid (2n = 72).

As already pointed out in the Introduction to this genus, there is some evidence strongly suggesting the possibility of interspecific hybridization, especially between the individuals belonging to this species and those of *H. hirsuta* L. Two cases are described here as the product of such a hybridization.

1) **H. glabra x H. hirsuta** (both parents annual):

A very small annual plant; shoots (hirtellous) covered with very short, soft, patent hairs; leaves (obovate) mostly on both sides glabrous (the young ones occasionally with short appressed hairs on the underside), and a shortly hairy margin; flowers c. 1 mm long, covered with very short, sparse hairs especially towards the tip of the sepals. Fruit not developed.

This plant resembles *H. glabra* L. in all respects except that the shoots, leaf-margins and flowers (esp. the sepals) are covered with very short hairs.

Type: E. Turkey; Prov. Bitlis; Bitlis Gorge below Tuta, S. of Kambos Dağ, 1250 m, stony pasture, 16 VIII 1956, *McNeill* 597 bis (mixed with *H. glabra* L.) (holo. E.).

2) **H. glabra x H. hirsuta** (one parent, *H. glabra*, perennial, the other annual).

Perennial; stem much-branched from the base, and shoots bearing numerous lateral branches densely covered with leaves and flower clusters; internodes slightly hirtellous to almost glabrous; leaves obovate, rather thick, mostly with glabrous surfaces but a shortly hairy margin (hairs short and acroscopic) especially near the apex; flowers 1.35-1.75 mm, with a glabrous perigynous zone but the sepals covered with very short, sparse, patent to ascending hairs, particularly towards the apex and along the margin. Fruit not developed.

Type: Turkey: Vil. Antalya: N. foot of Ak Dağ, 1950 m, S. of Geyik Dağ, 30 VIII 1947, *P. H. Davis 14649* (holo. K.).

2. **H. ciliolata** Melderis in Watsonia 4:42 (1957).
Brummitt in Tutin et al., Fl. Europ. 1:151 (1964).
Syn.: *H. ciliata* Babington in Trans. Linn. Soc. 17:453 (1836), non Clairville, Man. Herb. 71 (1811); Willk. & Lange, Prodr. 3:151 (1874); Clapham et al., Fl. Brit. Is. 333, f. 32 A (1952). Type: Cornwall, Lizard Point, *W. Borrer* (Lectotype CGE!). *H. maritima* Link *β ciliata* (Bab.) Daveau in Bol. Soc. Broter. 10:95 (1892). Rouy, Fl. Fr. 12:8 (1910); Coutinho, Fl. Portug. (Vasc.) (1913); Graebner in Aschers. & Graebn., Syn. 5(1):878 (1919). *H. glabra* L. var. *ciliata* (Bab.) Williams in Bull. Herb. Boiss. 4.564 (1896). **Icon:** Furth, Illustr. Brit. Plant. 281, f. 299 (1930); S. J. Roles, Illustr. Fl. Brit. Is. 1:93, f. 367 (1957).

A perennial herb, often with a woody caudex; stems much-branched from the base, up to c. 30 cm. long, prostrate, usually with stout, long (up to 2 cm long) and somewhat purplish-green internodes, very shortly retrorsely pubescent on all sides in the younger stages to almost glabrous on the upper and lower sides with age (only the lateral sides remaining hairy in the older shoots); nodes often swollen and prominent. Leaves elliptic-rhombic to suborbicular, occasionally elliptic-suboblong, up to 7 x 3 mm., mostly obtuse, rather abruptly contracted or rounded at the base, fleshy, often light-green, glabrous but with a hairy margin, hairs 0.3-0.4 mm long, acroscopic, falling off with age; stipules ovate to suborbicular, 1.75-2 x 1.25 mm., usually with a coriaceous base and a densely ciliate margin and apex. Flower-clusters (4-) 7 to 15 (-18)-flowered, mostly leaf-opposed, sometimes pseudo-axillary as well, very profuse, more or less distinct on the larger branches, but densely congested on the shorter ones. Flowers subsessile, 1.5-2 mm., obpyriform to somewhat cup-like, narrowed to the base; sepals elliptical-oblong 0.8-1 x 0.5-0.6 mm, obtuse, often glabrous on the back, but the margin finely ciliate, usually with a minute apical hair (0.2-0.3 mm.), strongly 3-nerved, with a prominent membranous margin; petals 0.7-0.75 mm.; filaments 0.5-0.6 mm.; anthers 0.3 x 0.2 mm., oblong, purplish-orange; style c. 0.25 mm. long, often deeply 2-lobed or bipartite, with thick, subsessile and divergent stigmas. Fruit c. 1.25 x 0.6 mm., ellipsoid, equalling to slightly exceeding the sepals. Fl. 5-8. Coastal dunes.
Range: SW England, Channel Islands, WSW France, and W Portugal (N. of Tagus).

1a) Stems often very stout, up to c. 30 cm long; leaves up to 7 x 3 mm; flowers 1.75-2 mm; style rather deeply bipartite —— subsp. **robusta**
1b) Stems usually up to c. 20 cm long, not very stout; leaves up to 5 x 2.75 mm; flowers 1.5-1.75 mm
2a) Leaves broadly elliptic-rhombic to suborbicular ——
subsp. **ciliolata**
2b) Leaves oblanceolate to narrowly elliptic ..... subsp. **subciliata**

a) subsp. **ciliolata:** Distr.: SW England and Guernsey & Alderney (Channel) Islands.

Cornwall: Lizard Point: vii.1880, *J. Groves* (COI); v. -& x. 1886, *E. S. Marshall* (JE); 28.v.1900, *W. F. Miller* (Z); vii.1891, *E. D. Bostock* (W); *G. C. Druce* 2104 (K). **Guernsey Isl.:** *H. C. Watson* 397 (COI). **Alderney Isl.:** *Jackson* 427 (K).

b) subsp. **subciliata** (Bab.) Chaudhri comb. nov.:

H. glabra L. var. *subciliata* Babington, Primitiae Fl. Sarn. 39 (1839). Type: Jersey Isl.: St. Aubins Bay, *Babington* (holo. CGE!).

Syn.: *H. ciliata* Bab. var. *angustifolia* Pugsley in Journ. Bot. Lond. 52:330 (1914). Type: Jersey: St. Aubins Bay: *Pugsley* (BM!).

Jersey Isl.: *Bel* Royal: 3.vi.1901, *P. M. Playfair* (COI); St. Aubins Bay: vii.1865, *G. E. Hunt* (K).

c) subsp. **robusta** Chaudhri n. subsp. a subspeciebus aliis caulibus crassioribus et longioribus (usque ad 30 cm longis, foliis majoribus (usque ad 7 mm longis et 3 mm latis), floribus paulo majoribus (circ. 1.75-2.0 mm altis), stylo bipartito distinguenda. Stems up to c. 30 cm long and stout; leaves up to 7 x 3 mm, thick-fleshy; flowers 1.75-2 mm; sepals with a densely ciliate margin; style bipartite. Portugal and SW France. Type: Portugal: Beira litoral: Aveiro, *J. Matos et al.* 4836 (holo. U!).

Portugal: Prov. Estremadura: Cascais: iii.1943, *G. Pedro et al.* (LISE, without flowers); S. Pedro de Unel: vii.1938, *P. Silva* (LISE); S. la Cruz: viii.1899, *Zimmerman* (COI); Cabo Carveiro: *A. Fernandes et al.* 7168 (COI); Berlenga Is.: vi.1924, *Mendonça* (COI); Prov. Beira: Fegueira da Foz: *Mendonça* 515 (LD); Pinhal de Leiria: *G. Felgueiras* 196 (COI); Pombal-Lourical, vii.1890, *Moller* (COI); nr. Coimbra: vi.1876, *J. Henriques* (COI); Porto, Foz, vii.1891, *O. Buchtien* (C. Baenitz Hb. Europ. 7205) (B, LD,, STU); Ilhavo: vi.1937 *M. S. Afonso* (LISE); Aveiro: *F. Fontes et al.* 2660 (LISE); *J. Matos et al.* 4836 (U), 4818 (COI, LD), 5058 (COI); S. Pedro (Marinha Grande): *J. Matos et B. Gomes* 97 (COI); Duoro litoral: Paova de Varzim: x.1879, *M. Padrao* (COI); Minho: Caminha: *M. da Silva* 1119 (LISE).

France: Dep. Landes: *Cl. Leredde* 816 (K); Dep. Gironde: Arcachon, Cap Feret: *Neyrout* 3268 (B); ibid.: *Klimmek* 3 (HBG); Pyla: 4.vii.1962, *id.* (HBG); Dep. Charente. Inf.: Boyardville: vi.1890, *Copineau* (COI); Finistère: *Le Cesve* 5211 (L).

3. **H. microcarpa** Presl, Delic. Prag. 65 (1822).

Type: Sicily: In aridis apricis montium la Nivera et Cozzo de Suarenti, *Presl* (holo. PR, not seen).

Syn.: *H. nebrodensis* Jan, Elench. Pl. 4 (1826) (nomen nudum) ex Gussone, Fl. Sicul. Syn. 1:291 (1842). Type: Sicily, *Jan* (Hb.?).

H. glabra L. subsp. *nebrodensis* (Jan) Nyman, Consp. 3:677 (1881) in obs. *H. glabra* L. var. *β atrovirens* G. Strobl, Flora des Etna in Österr. Bot. Zeitschr. 35:171 (1885); Maire et Weiller in Maire, Fl. Afr. Nord 9:41 (1963). *H. glabra* L. var. *nebrodensis* (Jan) Gürke in Richter-Gürke, Pl. Europ. 2(2):188 (1899). *H. incana* Lam. forma/race C *nebrodensis* (Jan) Graebner in Aschers. et Graebner,

Syn. 5(1):855 (1919). *H. glaberrima* (Emberger) Maire in Bull. Soc. Hist. Nat. Afr. Nord 34:182 (1945) et in Fl. Afr. Nord 9:50 (1963). *H. regnieri* Br. Bl. et Maire var. *glaberrima* Emberger in Emberger, Mat. no. 191 (1934). Type: N. Africa: Morocco: 'Sommet du Mont Siroua', ca. 3000 m, *Gattefossè et Werner* (holo. MPU!).

Plate XVII, Fig. 16-18. p. 324

A perennial, suffruticose herb with a very woody base; adventitious roots usually present though short and sparse; stem partly subterranean, much-branched from the base; shoots spreading, prostrate up to c. 14 cm (rarely up to 26 cm) long, with usually up to c. 1 cm long, stout internodes, often dark-brown and very shortly (retrorsely) puberulous. Leaves obovate, mostly up to 5 x 2.5 cm, obtuse, narrowed to the base, on both sides glabrous, along the margin with short (0.2-0.25 mm long), acroscopic hairs but occasionally entirely glabrous, mostly dark-brown; stipules ovate-triangular to semi-orbicular, 1.25-1.5 mm long, acute to obtuse with a densely ciliate margin. Flower clusters 7 to 13-flowered, mostly leaf-opposed, though some pseudoaxillary as well, congested on the short, lateral branches. Flowers 2-2.25 (-2.4) mm long, somewhat cylindrical, with a long and prominent, obconical receptacle, c. 1 mm long, almost equalling the sepals; glabrous; calyx region tubular, often entirely glabrous but sometimes with short, sparse, spreading hairs, esp. near the apex of the sepals; sepals oblong 1-1.25 mm long (c. 0.45 mm wide), obtuse, with a very conspicuous membranous margin, the apex too more or less membranous and somewhat incurved; petals c. 0.5 mm; filaments 0.4-0.45 mm; anthers 0.25 x 0.2 mm, nearly oblong, orange; style very short, with a prominent, subsessile c. 0.2 mm long, bilobed stigma, the lobes thick and slightly spreading. Fruit ovoid-conical, somewhat narrowed to the top, 1.35-1.5 x 1 mm, equalling to very slightly exceeding the sepals, smooth.

Fl. 7. Rocky places, alt. 1900-3000 m.

Distr.: Sicily, SE Italy and N. Africa.

Sicily: In summis culminibus Madoniarum, monte S. Salvatore, Pizzo di Palermo, 1910 m., et Pizzo Antonna, 1975 m., 15-22.vii.1873, *P. Gabriel Strobl* (W); *Parlatore* (P). SE Italy: Abruzzi, monte Amaro, vii.1872, *Sommier* (FI) Majella: 1923,*Martelli* (FI).

Differs from *H. glabra* L. in its strongly lignified stem, obovate leaves with a usually hairy margin, much larger flowers with a prominent receptacle which almost equals the sepals, the conspicuous membranous margin of the latter, almost sessile and bilobed stigma and the ovoid-obconical fruit.

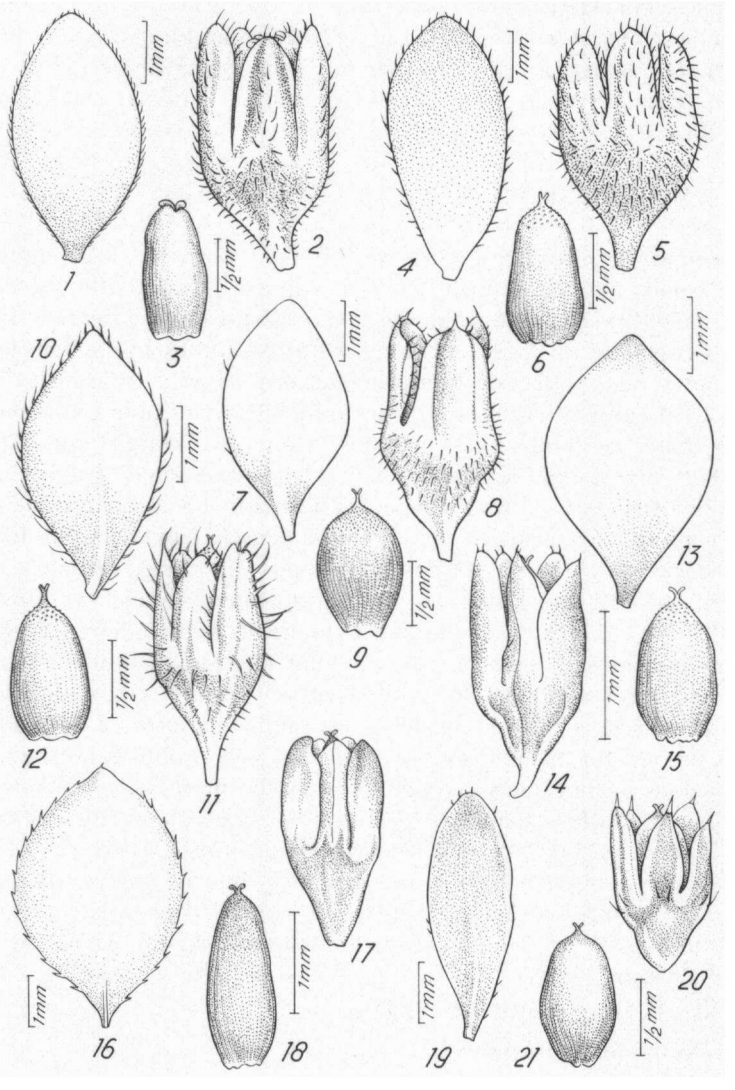

Plate XVII. Fig. 1-3: **Herniaria parnassica**; 1: leaf; 2: flower; 3: fruit [*Rechinger* 18430(W)]. Fig. 4-6: **H. argaea**; 4: leaf; 5: flower; 6: fruit [*Bornmüller* 1982 (B)]. Fig. 7-9: **H. caucasica**; 7: leaf; 8: flower; 9: fruit [*Holmberg* 2377(LD)]. Fig. 10-12: **H. olympica**; 10: leaf; 11: flower; 12: fruit [viii.1945, *Başarman* (ISTE)]. Fig. 13-15: **H. bornmülleri**; 13: leaf; 14: flower; 15: fruit [*Bornmüller* 70 (B)]. Fig. 16-18: **H. microcarpa**; 16: leaf; 17: flower; 18: fruit [vii.1873, *G. Strobl* (W)]. Fig. 19-21: **H. acrochaeta**; 19: leaf; 20: flower; 21: fruit [*Dinsmore* 3257(B)].

4. **H. bornmülleri** Chaudhri n. spec.

H. parnassica sensu Hermann in Fedde's Repert. 42:222 (1937), non Heldr. et Sartori ex Boiss., Diagn. 3(1):95 (1853).

Plate XVII, Fig. 13-15. p. 324

Herba plerumque perennis, interdum tamen annua vel biennis, parva, pulvinata, subviridis vel luteo-viridis, caudice lignoso instructa. Caules saepe dense fastigiati, 5-12 cm longi, a basi usque ad apicem ramificati; ramuli saepe foliis et florum glomerulis dense obtecti; internodia plerumque 3-6 mm longa, primum minute puberula, demum glabrescentia. Folia obovata vel elliptica plerumque circ. 3.5 mm longa et 2.0 mm lata, rarius usque ad 7 mm longa et 3.5 mm lata, plerumque subobtusa, basin versus angustata, crassa, utrimque glabra, margine praesertim apicem versus parce ciliolato sed ultimo glabrescente; stipulae ovato-deltoideae, 1.0-1.5 mm longae, acutae usque ad obtusae, margine dense ciliatae. Glomeruli in ramulis axillaribus inserti, aliqui foliis oppositi, aliqui psedo-axillares, plerumque e floribus 7-12, rarius usque ad 18 compositi, plerumque magni, profusi et dense congesti, saepe subvirides. Flores fere sessiles, 2.0-2.25 mm, rarius usque ad 2.4 mm alti, subcylindrici, zona perigyna prominente; sepala oblonga, 1.0-1.3 mm longa et 0.4-0.5 mm lata, apicem versus paulum angustata, subobtusa, margine membranaceo plerumque ciliolato instructa, interdum tamen omnino glabra, crassa; petala circ. 0.45 mm longa; stamina filimentis 0.45-0.5 mm longis instructa; antherae quadrangulares, 0.25 mm longae et 0.2 mm latae, aurantiae; stylus stigmate incluso (0.2) 0.25-0.3 mm longus, robustior; stigma bipartitum, lobis suberectis vel paulo divergentibus. Fructus anguste ellipsoideus usque ad ellipsoideus, 1.0-1.25 mm altus et 0.75-0.8 mm diam., longitudine sepala saepe excedens, laevis.

Fl. 7-8. Subalpine to alpine region, alt. ca. 1700-2300 m.

Type: ITALY: Abruzzi: La Majella, ca. 2200 m, 26.vii.1924, *Bornmüller* 70 (as *H. parnassica* Heldr. & Sart. forma *odorans*) (holo. B!). Endemic in Prov. Abruzzi, SE Italy.

Monte Velino, supra Massa d'Albe, 3.viii.1882 *E. Levier* (COI); Majella: vii.1909, *Guadagno* (W); Mt. Sirente, Ovdudoli, 2.viii.1924, *E. Furrer* (Z); Mt. Ciana Laghetta (Gorzano-Rette), c. 2300 m, 19.vii.1927, *Furrer* (Z, forma annua); Campo Imperatore, 31.vii.1922, *Furrer* (Z, forma annua); Mt. Sirente, Grat: 3.viii.1924, *Furrer* (Z).

This species resembles *H. caucasica* Ruprecht, a species occurring in the transcaucasian region and in Central Asia, but is distinguishable by its pulvinate habit, and by the ± glabrous flowers.

It was incorrectly determined as *H. parnassica* by Bornmüller as well as by Hermann. In fact, the two spp. show very little affinity with each other *H. parnassica* generally possesses very profuse adventitious roots (entirely absent in this species), quite broad leaves with a mar-

gin having very closely appressed hairs (almost wholly glabrous in this species), and a ± sessile bilobed stigma. In this species, on the other hand, there is a well-developed style, and the flowers are almost glabrous quite unlike those of *H. parnassica* in which the flowers often are covered with 0.2-0.35 mm long, rather loosely spreading hairs.

5. **H. alpina** Chaix in Vill., Hist. Pl. Dauph. 1:379 (1786); Villars, Hist. Pl. Dauph. 2:556 (1787).

Williams in Bull. Herb. Boiss. 4:560 (1896); Schinz & Keller, Fl. Schweiz, ed. 3, 1 (Exk. fl.):205 (1909), & 2 (Krit. fl.):109 (1914); Rouy, Fl. Fr. 12:10 (1910); Hegi, Illustr. Fl. Mitteleurop. 3:431, f. 623 g-k (1911); Graebner in Aschers. & Graebn., Syn. 5(1):886 (1919); Brummitt in Tutin et al., Fl. Europ. 1:15 (1964).

Syn.: *H. alpestris* Lam., Encycl. 3:125 (1789) (There is no type or any other specimen under this name in Herb. Lamarck, P-LA).

H. ciliata Clairv., Man. Herb. 71 (1811). Type: Switzerland: Valais: *De Clairville* (holo. ? iso. (?) Z!).

H. alpina α typica Giori & Paoletti, Fl. Anal. Ital. 1:335 (1898).

Icon: Hegi, op. cit. 3:431, f. 623 g-k (1911).

A perennial herb; stems often densely congested and caespitose, much-branched, 7-25 cm long, woody at the base, very leafy, with usually quite short (up to c. 5 mm long) internodes, very shortly pubescent with patent or retrorse hairs. Leaves elliptic-obovate, mostly up to 5 x 2 mm, on both sides rather sparsely pubescent in the younger stages to subglabrous with age, margin with short (0.25-0.4 mm long), patent hairs; stipules ovate-triangular, 1.5-2 mm long, with a densely ciliate margin. Flowers in 2 to 4 (-6)-flowered, mostly 2 to 3-flowered, terminal (to subterminal) clusters, or sometimes solitary, subsessile, ellipsoid to cylindrical, 2-3 mm long, covered with 0.3-0.5 mm long, stout, patent hairs, somewhat shorter on the (prominent) perigynous region; sepals equal, up to c. 1.5 x 0.7 mm, the outer oblong, obtuse, the inner narrowly ovate, subobtuse to subacute, and with a distinct membranous margin; petals 0.6-0.7 mm; filaments 0.5 mm; anthers 0.3 x 0.2 mm, oblong, violet to orange-brown at maturity; style 0.25-0.3 mm, often deeply 2-lobed, rarely almost to the base, stigmas prominent and mostly divergent. Fruit ellipsoid-ovoid to sometimes subglobose, c. 1.25 x 1 mm, nearly equalling the sepals, almost smooth.

Fl. 7-8. Alpine regions, alt. 1700-3200 m.

Range: France (Hte Savoie, Savoie, Hte Alpes, Basses Alpes, and Pyr. Or., S. Switzerland, NNW Italy and WSW Austria (Tirol).

1a) Shoots often densely congested and caespitose, up to c. 15 cm long; internodes up to c. 5 mm ..... var. **alpina**

2a) Flowers 2-2.75(-3) mm, with 0.35-0.5 mm long patent hairs ---- subvar. **alpina**

2b) Flowers 1.75-2 mm, with shorter (0.2-0.3 mm long) and softer hairs, occasionally puberulous; plants often pulvinate ..... subvar. **puberula**

1b) Shoots ± spreading, 15-30 cm long; internodes 5-10 mm long

3a) Shoots very-woody at the base, up to c. 30 cm long, much spreading; leaves up to 5 x 2 mm, the younger ones softly pubescent --- var. **sempronia**

3b) Shoots not quite woody at the base, up to c. 15 cm long, but slightly divergent (umbellate); leaves up to 7 x 3 mm, sparsely covered with 0.4-0.5 mm long, stiff hairs, sparse on the surface, patent along the margin ..... var. **foliosa**

a) subvar. **alpina:** forma **alpina:**

France: Hte Savoie: Col du mt. Cenis: *Jacobs* 3879 (L); Savoie: La Grande Chélbe: vii-ix.1878, *Chabert* (FI); Bonneval sur Arc: *Stud. biol. Rheno-Trai.* 60/213 (U); Hautes Alpes: La Grave: *Ozanon* 273 (JE); Col du Lautaret: vii.1959, *Klimmek* (HBG); Basses Alpes: Col la Noire à Maurin: viii.1898, *Vidal* (HBG); Pyr. Orient.: Cambredases.: *G. & J. Br. -Bl.* vi-vii.1930 (Z); mt. Louis: vii.1872, *Bordère* (JE).
Switzerland: Val Piora: *W. Koch* 727 (Z); Vallée de Bagnes: *L. Marret* 273 (COI); Wallis: Simplon: vii.1943, *Landolt* (Z); Blindental: viii.1915, *E. Burnat et al.* (Z); Zermatt: vii.1914, *Bornm.* (B); nr. Brique: vii.1878, *Vetter* (Z). **Italy:** mt. Rosa: viii.1898, *S. Sommier* (FI); Valle d'Aosta: vii.1935, *U. Losacco* (FI); Alpi Graie: *R. Keller* 1078 (Z); mt. Cenis: *Ad. Pellat* 783 (FI, Z); mt. Cenisio-Solendo: vii.1920, *Ferrari* (FI, Z); Oulx: vii.1931, *Fontana & Oreglia* (HBG); Rodoret Alps: *Rostan* 142 (B); Val d'Aosta: mt. Dondena: *L. Vaccari* 39 (FI, Z); Val Savarenche: vii.1904, *id.* (FI); Piccolo S. Bernardo: viii.1901, *id.* (FI); Val de Cogne, Zersiva, 3200-3500 m, viii.1909, *id.* (FI); Ceresola Reale: vii.1910, *Vaccari & Wilczek* (FI); Alpes Cottiae: Val Pellire: vii.1892, *Beyer* (B); Alto Adige viii.1951, *Zenari* (FI).. **Austria:** Tirol: Valle Umbail in Praegraten: *Ausserdorfer & Huter* 2865 (B, FI, W, Z); Distr. Windischmatrei: viii.1873, *Ausserdorfer* (B, FI, W, Z); Praegraten: viii.1894 & vii.1895, *Huter* (B, HBG); Umbattal, Clara Hütte: viii.1909, *Vetter* (W).

aa) forma **congesta** Chaudhri f. nov. a forma *alpina* glomerulis numerosioribus et dense congestis distinguenda. Flower-clusters very profuse and densely congested.

Switzerland: Findeln, nr. Zermatt; 2200 m, viii.1888, *W. Bernoulli* (Z, Type); Rothorn: vii.1925, *Marie Pluss* (Z).

b) subvar. **puberula** Chaudhri n. subvar. a subvar. *alpina* habitu saepe pulvinato, floribus minoribus (1.75-2.0 mm altis), extus pilis mollibus 0.2-0.3 mm longis vestitis distinguenda. Plant often densely pulvinate; flowers 1.75-2 mm, covered with short, 0.2-0.3 mm, rather soft hairs.

Switzerland: nr. Findeln glacier: vii.1925, *Marie Pluss* (Z); W. of Zermatt, ft. of Matterhorn, 2000 m, *Stud. biol. Rheno-Trai.* 58/465 (U); SW of Zermatt: Schwarz See, Nikolaital, 2700 m, *id.* 58/668 (U, holotype). **Italy:** Aosta: mt. Crammont, 2767 m, viii.1881, *S. Sommier* (FI); ibid., viii.1904, *L. Vaccari* (FI).

c) var. **sempronia** Williams op. cit.:
Syn.: *H. alpina* var. *β* Gaudin, Fl. Helvet. 2:245 (1828); *H. alpina α typica,* b. *sempronia* Fiori in Fiori & Paoletti, Fl. Anal. Ital. Append. 67 (1907).

Stems up to 30 cm long, spreading; leaves up to 5 x 2 mm, the younger ones mostly pubescent, forming fascicles in the axils of older leaves.
Type: Switzerland: Simplon, Ganterberg: *Gaudin* (holo. LAU, not seen).
Switzerland: Mattmark see, 2100 m, viii.1910, *Keller* (Z). **Italy:** Colle del Frejus: viii.1889, *E. Ferrari* (FI).

d) var. **foliosa** Chaudhri n. var. a var. *alpina* caulibus basi paulo lignescentibus, plus minusve patentibus, ex internodiis longioribus (usque ad 14 mm longis) compositis, foliis paulo majoribus (usque ad 7 mm longis et 3 mm latis) et sparse hirsutis distinguenda. Plant brownish-green; stem much-branched from the base; shoots up to c. 15 cm long, but slightly divergent; internodes slender, up to 1.4 cm long, covered with short, patent hairs. Leaves obovate-spathulate, up to 7 x 3 mm, very conspicuous towards the end of shoots, ± hirsute with 0.4-0.5 mm, stiff, sparse hairs. Flowers 2.5-3 mm, with a prominent receptacle almost equalling or only slightly shorter than the sepals, the latter covered with 0.4-0.5 mm long, stiff and spreading hairs; styles 0.3 mm, nearly free, suberect.
Type: ITALY: Valdostana: Cogne dal Chalet de Laukan (or Lauzan?), alt. 2500 m 31.vii.1904, *Lino Vaccari* (holo. FI!).
Endemic. Known only from the single type gathering.

6. **H. olympica** J. Gay in Duchartre, Rev. Bat. 2:370 (1847).
Boissier, Fl. Or. 1:742 (1867); Brummitt in Davis, Fl. Turk. 2:249 (1967).

Plate XVII, Fig. 10-12. p. 324

A small, rather compact perennial or, occasionally, biennial herb; stems up to c. 15 cm long, prostrate, woody at the base, much-branched, mostly shortly pubescent to almost glabrous with age. Leaves obovate-oblanceolate to nearly elliptic, up to c. 5 x 2.5 mm, narrowed to the base, mostly obtuse, often on both sides glabrous, sometimes sparsely strigulose, especially in the younger leaves; margin usually with short (0.3-0.4 mm long) and rather stout, acroscopic hairs; stipules ovate to semi-orbicular, 1.5-2 mm long, acute to obtuse, with a very profusely ciliate margin. Flower clusters 3 to 10 flowered, often pseudo-axillary, intermixed with the leaves, occasionally leaf-opposed as well, often very numerous, some of the flowers solitary. Flowers subsessile, usually 5-merous, very occasionally 4-merous, c. 2 mm (or 1.75-2) mm long, cylindrical; sepals equal, c. 1.25 mm long, the outer

oblong, obtuse, inner ovate-oblong, subacute-subobtuse, all with 0.5-0.6 mm long stout spreading hairs; petals 0.5-0.6 mm; filaments 0.4-0.45 mm; anthers 0.35(0.4) x 0.2 mm, oblong, orange (-yellow); ovary ovoid when young, c. 0.5 mm in diam.; style 0.25-0.35 mm long, bilobate; stigmas often suberect but sometimes spreading, usually slightly exserted in the fruiting stage. Fruit 1.25-1.40 x 0.75-0.8 mm, narrowly ellipsoid or somewhat bottle-shaped, narrowed upwards into the style, almost equalling the sepals, slightly papillose at the top. Fl. 7-8. Open rocky slopes & summits, alt. ca. 1900-2500 m.
Type: WNW TURKEY: Bursa: 'In Bithyniae summo monte Olympo', viii. 1842, *Boissier* (holo. G-Boiss.!).
Range: Endemic in WNW Turkey, and (probably) in E. Greece & SSW Bulgaria. Hermann op. cit. 203 (1937) recorded it from Ali Botus, SSW Bulgaria.

Turkey: Vil. Bursa: ('Bithynia'): mt. Kitirlidagh, nr. Bursa: *Pichler* 56 (FI, W). Bursa: *Uludağ:* viii.1945, *Başarman* (ISTE); Aras: viii.1945, *Başarman* (ISTE), stigmas divergent); Softaboğan: 2.vii.1944, *Başarman* (ISTE); Vil. Canakkale: Mt. Ida (Kaz Dağı): *Sintenis* 1069 (LD, as *H. parnassica);* Vil. Kütahya: Simav: *Coode & Jones* 2707 (E); Vil. Antalya: v.1938, *Başarman* (ISTE). **Greece:** 'Greece'.: *Aucher-Eloy* 2 (as *H. vulgaris* var.) (P).

This species shows remarkable plasticity in its calyx and androecium; the sepals are generally five in number, but very occasionally (as in some flowers of Pichler 69 (W), and Başarman, v. 1938, from Antalya (ISTE) some of the flowers are tetramerous and possess 4 sepals, 4 petals, and 4 stamens; nevertheless, in all such specimens most of the flowers are pentamerous. In fact, in Pichler 69 duplicate from Firenze (FI) all the flowers are uniformly pentamerous.

7. **H. caucasica** Ruprecht, Fl. Caucasi in Mém. Acad. Impér. Sci. St. Pétersb. 15(2,1):241 (1869).

R. Buser in Boissier, Fl. Or. Suppl. 121 (1888); Williams, op. cit. 560 (1896); Schischkin in Komarov, Fl. U.R.S.S. 6:567, tab. 34, f. 1 (1936).
Icon: Fl. U.R.S.S.
Type: Caucasus orient.: In m. Borbalo, alt. 1500 m (?), Chewsuria et Pschawia, ix. 1860, *Ruprecht* (holo. LE, not seen); PARATYPE: Caucasus orient Dagestania australis versus fontes fluvii Samur, 10. vii.1860, *Ruprecht* (G-B!).
Syn.: *H. glabra* L. var. *scabriuscula* Fenzl in Ledeb. Fl. Ross. 2:159 (1843). *H. zervudachii* Handel-Mazz., Ann. Nat. Hofmus. Wien 23: 149 (1909). Type: N. Turkey: Trabzon/Giresun: In catena montium ad septent. flum. Charshut inter vicos Fol et Eseli, ad occid. a monte Orükbeli, ca. 1850 m, *Handel-Mazzetti* 1137 (WU!).

Plate XVII, Fig. 7-9. p. 324

A usually perennial, rarely annual herb with a woody caudex; stems prostrate, up to c. 15 cm long, woody at the strongly contracted base, shoots spreading; internodes up to c. 11 mm long, puberulous or shortly and retrorsely pubescent, occasionally almost glabrous. Leaves obovate to nearly elliptic, up to 5-6 x 2.5 mm, rather thick, obtuse, narrowed to the base, mostly entirely glabrous, though the younger ones with a (especially near the apex) shortly ciliate margin; stipules ovate-triangular 1-1.25 m long, acute, with a ciliate margin. Flower-clusters often 4 to 12-flowered, leaf-opposed, some of the flowers solitary and pseudo-axillary, the clusters usually distinct on the main shoots, but congested on the lateral ones. Flowers almost sessile, (1.6-)1.75-2.25 mm, cuplike-cylindrical, with a tubular calyx and an obconical receptacle, much narrowed at the base, often hirtellous (or puberulous) with 0.2-0.3 mm long, thin hairs; receptacle 5-ribbed; sepals 1-1.4 mm long, equal, the outer oblong, obtuse, the inner ovate, subacute, all with a distinctly ciliate margin and shortly penicillate apex; petals 0.4-0.5 mm long; filaments 0.4-0.45 mm; anthers 0.25-0.35 x 0.2 mm, oblong, orange-yellow; style 0.25-0.35 mm long, bifid to bilobate into somewhat spreading (occasionally almost erect) and (at maturity) slightly exserted stigmas. Fruit 1-1.5 x 0.75-1 mm, ellipsoid to ovoid, mostly equalling the sepals, slightly papillose at the top; seed c. 0.8 x 0.75 mm, nearly globose and dark-brown.

Fl. 7-8. Rocky places, ca. 1500-2800 m.

Distr. N. Turkey, Transcaucasia, Central Asia and N. Iran.

Turkey: Trabzon/Giresun: Efkiar et Topuk: *Handel-Mazzetti* 488 (WU); Fol to Eseli, nr. mt. Orükbeli, *Handel-Mazzetti* 1137 (WU, type of *H. zervudachii);* Prov. Giresun: Balaban-dağlari (Kilinç Tepe), ca. 2800 m, *Davis, Dodds, Çetik* D.20618 (E, K) (forma annua); Prov. Batum: Distr. Artwin: *Otto R. Holmberg* 2377 (LD). **Caucasia:** Dagestania australis versus fontes fluvii Samur 10.vii.1860, *Ruprecht* (G-Boiss.). **Central Asia:** Kazakhastan: Prahevacok to Kapkak, *Brotherus* 541 (G); ibid. nr. Santass, /1866, *Krassnow* (G). **Mongolia:** borealis: *E. Klementz* 76 (LE). **Iran:** Prov. Mazanderan: *Rechinger* 922 (W, mixed with *H. glabra* L.); Elburs Mts.: *Gauba* 1434 (B).

This species resembles *H. argaea* Boiss. in general aspect, but is distinguishable by its usually entirely glabrous leaves, puberulous or shortly hirtellous flowers, and its very distinct style.

8. **H. argaea** Boiss., Fl. Or. 1:741 (1867).
Brummitt in Davis, Fl. Turk. 2:247 (1967).

Plate XVII, Fig. 4-6. p. 324

A perennial, biennial-perennial or, rarely, annual herb; stems up to c. 15 cm long, prostrate, spreading from a compact base, very shortly pubescent to puberulous. Leaves obovate to more or less elliptic, up to c. 6.5 x 3 mm, obtuse, attenuate to the base, somewhat fleshy, often on both sides nearly glabrous, but with short (0.25-0.4 mm),

stout, acroscopic hairs along the margin, particulary in the younger stages; stipules ovate-triangular, up to c. 1.5 x 1.25 mm, acute to subobtuse, with a densely ciliate margin. Flower-clusters 7 to 10(-15)-flowered, occasionally 3 to 7-flowered, mostly leaf-opposed or lateral, densely congested on the branches. Flowers subsessile, 1.75-2 mm, cuplike to somewhat cylindrical, with a tubular calyx region and obconical receptacle, abruptly narrowed to the base; sepals usually covered with short (0.25-0.35 mm), stout, rather loosely spreading hairs; perigynous region puberulous (or strigulose), 5-ribbed, and almost equalling the sepals; sepals oblong, 0.9-1 x 0.6-0.75 mm, obtuse, rather thick; petals 0.45-0.55 mm; filaments 0.4-0.45 mm, obtuse, c. 0.25 x 0.2 mm, suboblong, orange; style short, c. 0.2 mm, often with bifid (rarely trifid) stigma, the lobes somewhat spreading. Fruit 1-1.5 x 0.75-1 mm, ellipsoid to ovoid, equalling or, sometimes, slightly exceeding the sepals; papillose at the top; seed c. 0.8 x 0.75 mm, subglobose, swollen in the middle and dark-brown.
Fl. 6-8. Rocky places, alt. ca. 2400-3300 m.
Type: Turkey: Prov. Kayseri: 'in regione alpina montis Argaei Cappadociae', *Balansa* 324 (holo. G-Boiss.!).
Endemic in the Central & SE regions of Turkey.

Prov. Kayseri (Cappadocia): in saxosis summi jugi mts. Argaei (Erciyas Dağ), 2400-2800 m, *Bornmüller* 1982 (B, G, JE, LD, S, Z), & 3110 (B, G, JE, LD). Prov. Hakkari Kara Dağ, c, 3350 m, *Davis & Polunin* D. 24473 (E).

This species resembles *H. caucasica* Ruprecht in habit, but the latter has a distinctly elongated style, and the sepals are often minutely puberulous on the back. Brummitt (op. cit.) has called attention to its relationship with *H. parnassica* Heldr. & Sart., but the latter is easily distinguishable by its very characteristic adventitious roots as well as by the peculiar pubescence on the shoots and on the leaf margin (very closely appressed hairs along the leaf-margin and on the shoots). Moreover, the leaves in *H. parnassica* are usually suborbicular or broadly obovate, up to c. 8 x 4.25 mm (in this species up to c. 6.5 x 3 mm with stout, spreading hairs on the margin), the flower clusters are much larger, style almost absent, and the stigma bilobed. In *H. argaea,* on the other hand, there is a distinct, though quite short style.

9. **H. parnassica** Heldr. et Sartori in Boiss., Diagn. Pl. Or. Nov. ser. 2, 3(1):95 (1854).

Boissier, Fl. Or. 1:740 (1867); Williams op. cit. 562 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):187 (1899); Halacsy, Consp. Fl. Gr. 1:573 (1900); Hayek, Prodr. Fl. Galcan. 1:172 (1924); Brummitt in Tutin et al. Fl. Europ. 1:151 (1964).
Type: GREECE: In regione alpina Parnassi, 11.viii.1846, & 8.viii.

1852, *Sartori et De Heldreich* 1786 (two sheets bearing the same number, one each by Sartori and De Heldreich) (Lectotype Heldr. 1786, G-Boiss.!).
Syn.: *H. hirsuta* L. var. *leiophylla* Griseb., Spicil. 1:216 (1843). Type: Macedonia, *Grisebach* (GOET, not seen).

Plate XVII, Fig. 1-3. p. 324

A perennial herb with a woody base; adventitious roots often well-developed; stems partly subterranean, up to c. 20 cm long, prostrate or creeping, much-branched with the branches spreading from the compact base, usually very shortly pubescent with retrorse, closely appressed hairs, occasionally almost glabrous. Leaves obovate to suborbicular, sometimes elliptic, up to c. 8 x 4.25 mm, obtuse, narrowed at the base, often glabrous on both sides, margin usually with short (0.25-0.35 mm long), strongly arcuate hairs, but becoming glabrous with age; stipules 1.25-1.5 mm long, often densely ciliated. Flower clusters 7 to 15 (22)-flowered, mostly leaf-opposed, though pseudo-axillary ones are found as well, distinct on the main shoots, but crowded on the branches. Flowers ± sessile, (1.25-)1.5-2 mm long, cup-like-cylindrical, with short (0.2-0.35 mm long), rather loosely spreading (rather soft) hairs, occasionally nearly glabrous; sepals equal, oblong, c. 1 mm long, obtuse to subobtuse, with a distinct membranous margin; anthers 0.25-0.35 x 0.2 mm, oblong and orange-brown; style almost absent, and the stigma therefore sessile, 0.15-0.25 mm, bilobed, the lobes thick and often divergent. Fruit (0.75-)1-1.25 x 0.6-0.7 mm, narrowly ellipsoid to ovoid-globose, equalling or somewhat exceeding the sepals, papillose at the top. Fl. 6-8. On (schistaceous and serpentine) rocky slopes and summits, alt. (500-)1000-2700 m.
a) subsp. **parnassica:** Adventitious roots distinct; shoots often densely retrorsely (pubescent with closely appressed short hairs); leaves 4-8 x 2-4.25 mm, glabrous but the margin with arcuate hairs; flowers 1.6-2 mm, more or less cup-like; sepals mostly with loosely spreading short hairs; stigma-lobes c. 0.15-0.25 mm; Fruit 1-1.25 x 0.7, narrowly ellipsoid.
Type: GREECE: Parnassos, 8.viii.1852, *Heldreich* 1786 (lectotye G!).
Distr.: Albania & Greece.

Greece: Macedonia occid., Distr. Kozani: *Rechinger* 17548 (W); Distr. Grevena: *Rechinger* 18430 (W); Epirus: Distr. Joanina: *Rechinger* 18317, 18416 (W); ibid. *Baldacci* 11 (W); Smolika: *Rechinger* 20963 (W); nr. Smoretria (Guias): *Baldacci* 130 (W); mt. Peristeri: 17.vii.1893, *Halacsy* (W); Thesalia: Mt. Olympos: vii.1927, *Handel-Mazzettti* (K); Pindus: nr. Kastania: vii.1893, *H. Hartl* (W); Trygona, nr. Pinios river, *Rechinger* 23118 (W); Sermeniko: mt. Ghavellu: *Sintenis* 1160 (B, JE, LD, W); mt. Zygos: *Maire & Petitmengin* 1740 (W); Agrapha

(Dolopia): mt. Karava: vii.1885, *Haussknecht* (JE); ibid. vii.1885, *Heldreich* (LD, W); Mt. Tymphresto (Veluchi): viii.1879, *Heldreich* (W); mt. Parnassos: *Heldreich* 45 (G, JE, W); ibid., *Orphanides* 416 (G, FI, W), & 2552 (G); ibid., viii. 1855, *Guicciardi* (FI L, LD, Z); Aitolia: mt. Korax: 13.v.1899, *Chr. Leonis* (W); Peloponnisos: Achaia: *Bornmüller* 1926:273 (B).

b) subsp. **cretica** Chaudhri nov. subsp. a subsp. *parnassica* caulibus arrhizis vel radicibus minutis instructis, saepe glabris vel minute puberulis, foliis minoribus et pro rato angustioribus (3-4 mm longis et 2-2.5 mm latis), glabris vel hirtellis, floribus paulo minoribus (plerumque 1.25-1.6 mm altis), obpyriformibus, glabris vel minute hirtellis, stigmate subcapitato, fructu minore et pro rato breviore distinguenda: Adventitious roots absent or inconspicuous; shoots often glabrous or only slightly puberulous; leaves smaller and narrower, 3-4 x 2-2.5 mm, mostly entirely glabrous, rarely hirtellous; flowers 1.25-1.6(-1.75) mm, obpyriform, often glabrous, sometimes slightly hirtellous; stigma-lobes c. 0.15 mm almost capitate, fruit c. 0.75 x 0.6 mm, ovoid-globose, ± smooth;

Type: CRETE: Distr.: Lassithi, in argillosis montis Aphendi Christos supra Aphendami, ca. 1900 m, *Rechinger* 14350 (holo. W!).

Endemic in Crete.

bi) var. **cretica:** Leaves glabrous.

Kissamos: mt. Volokia: 6.vi.1884, *Reverchon* (W); mt. Ida: 15.viii. 1870, *Heldreich* (W); Distr. Mylopotamos, m. Psiloriti: *Baldacci* 55 (W); ibid.: *Rechinger* 14320 (LD, W); Distr. Sphakia: Levka Ori: *Rechinger* 13847 (W); Distr. Selinos: Levka Ori; Omalos: *Rechinger* 13705 (W); Distr. Lassithi: mt. Aphendi Christos: *Rechinger* 14350 (W, type); mts. Spherioutias & Lassithi: *Heldrich* 1497 (G-Boiss).

Throughout the range of the subspecies.

bii) var. **hirtella** Chaudhri n. var. a var. *cretica* caulibus, foliis et floribus distincte hirtellis distinguenda: Leaves distinctly and uniformly hirtellous on the sides as well as on the margin; shoots and flowers, too, markedly hirtellous; the hairs in all cases very fine, thin and shining.

Distr. Monophatsi: mont. Asterusi, inter Lukia et Kapetaniana, ca. 500 m, *Rechinger* 14150 (W, holotype). Distr. Hierapetra: In sax. calc. montis Aphendi Kavusi, ca. 1400 m, *Rechinger* 13209 (W).

10. **H. micrantha** Jackson & Turrill in Kew Bull. 1939:478 (1939). Brummitt in Davis, Fl. Turk. 2:247 (1967).

Plate XX, Fig. 14-16. p. 357

An annual to biennial, rarely perennial herb; stems prostrate, 3-21 cm long, often somewhat spreading from a compact base, more or less pink-green; internodes up to c. 1 cm long, shortly pubescent, but often puberulous or glabrous with age. Leaves mostly up to c. 6 x 2.5 (rarely up to 8 x 4) mm, obovate to suborbicular, obtuse, abruptly narrowed

at the base, often rather thick and glabrescent, though the younger ones rather sparsely hirtellous with short (o.25-0.4 mm) stout hairs on the margin as well on both sides esp. near the apex; stipules ovate-triangular, up to c. 1.25 x 1 mm, with a densely ciliated margin. Flower clusters often quite conspicuous, 3-5 mm in diam., and (7-)10 to 15-flowered, leaf-opposed, very densely congested all along the lateral branches, often slightly pink. Flowers 1.25-1.5 mm, obpyriform, hirtellous or subhirsute with (0.2-0.35 mm) long, stiffly spreading, nearly white hairs; sepals equal, pinkish-green and fleshy, 0.75-1 x 0.4-0.5 mm, 3-nerved, the outer oblong, obtuse, the inner narrowly ovate, subacute; receptacle prominently 5-ribbed, each rib being a continuation of the median nerve of the sepals; petals and filaments almost equal, 0.4-0.5 mm; anthers minute, c. 0.2 x 0.15 mm, subquadrangular to suborbicular, orange; stigmas almost sessile, 0.1-0.2 mm, divergent; Fruit 0.8-1.2 x 0.6 mm, narrowly ellipsoid, often slightly exceeding the sepals; ± smooth.
Fl. 5-7. Open rocky places, alt. ca. 700-2000 m.
Type: CYPRUS: Kryos Potamos, *Kennedy* 419 (holo. K!).
Range: Cyprus, SW Turkey, and the eastern Aegaean Islands (Samos & Ikaria).

Cyprus: Mt. Troodos: *Haradjian* 512 (G, S); Kannoures Spring; 22.vi.1939, *H. Lindberg* (S, forma glabrifolia); ibid. *Kennedy* 1162 (K); Khionistra: *Kennedy* 420, 1161, 1163, 1244 (K); Pass Prodromos to Troodos: *Davis* 3519K (E); nr. Prodomos: *J. P. Young* 7261 & 7343 (K); ibid. *Meikle* 2782 (K); Kryos Potamos: *Kennedy* 1164, 1165, 1224, 1224 bis, 1245, & 1255 (K); ibid. *Davis* 3524K (E). **Turkey:** Turkey in Europe: Suzak Tepe Civari, Yanik Osman Sahasi: 18.viii.1951, *Ismail Akbas* (E); Vil. Canakkale: Balikesir: Mt. Ida (Kaz Dağı): *Sintenis* 825 (E, LD); Vil. Izmir (Smyrna): mt. Karatcham: *Bornmüller* 1906:9198 (as *H. argaea* Boiss) (E, G, JE, LD, S, Z); nr. Burnabad: *Bornmüller* 9196 (B); mt. Yamanlardagh: *Bornmüller* 9199 (B); mt. Dyo-Adelphia (Iki-Karadash): *Bornmüller* 9193 (B); Vil. Kütahya: nr. Simav: *Coode & Jones* 2642 (E); Vil. Konya: Sultan Dağ nr. Aksehir, *Bornm.* 1899:4494 (B, E, G, JE); Vil. Antalya: Takhatali Dağ: *Bornmüller* 1906:9198b (B). **Aegaean Islands:** SAMOS: mt. Kierki, c. 700-900 m, *Rechinger* 1930 (W). **Ikaria:** Hag. Kyrikos: 24-25.vi.1932, *Rechinger* (W).

An eastern-Mediterranean element. It shows some resemblance to *H. hirsuta* L., but differs in its obovate (instead of oblanceolate) leaves, on both sides ± glabrous and with a slightly hairy margin, very dense and large flower clusters, smaller and obpyriform, uniformly hairy flowers, subsessile stigmas and narrowly ellipsoid fruit.

11. **H. permixta** Gussone, Fl. Sicul. Synop. 1:292 (1842).
Battandier in Batt. et Trab., Fl. Alg. Dicot. 168 (1888).
H. permixta Jan, Elenchus Pl. 5 (1826) (??) nomen nudum.
Syn.: *H. hebecarpa* J. Gay ex Williams in Bull. Herb. Baiss. 4:563 (1896). Type: N. Algeria: nr. Blidah, 1845, *Durieu* (holo. K!).

H. parnassica Heldr. et Sartori subsp. *permixta* (Jan) Nyman, Consp. 256 (1879). *H. glabra* var. *hirtocalyx* Strobl in Osterr. Bot. Zeitschr. 35:171 (1885). *H. glabra* var. *permixta* (Jan) Tornab. F. Aetn. 2:258 (1890). Gürke in Richter-Gürke, Pl. Europ. 2(2):188 (1890).
H. incana Lam. subsp. *permixta* (Jan) Maire in Jahand. et Maire, Cat. Maroc. 217 (1932); Maire & Weiller in Maire, Fl. Afr. Nord 9:46 (1963).

Plate XX, Fig. 11-13. p. 357

A perennial, rarely annual or biennial herb with a woody caudex and thick and woody tap root (c. 4 mm in diam.); adventitious roots rather short and inconspicuous (developing mainly from the lower nodes); stems prostrate, up to c. 25 cm long, stout, spreading from the woody and compact base, usually minutely pubescent to puberulous with short retrorse hairs. Leaves obovate to elliptic, mostly up to 7 x 3.5 (rarely up to 11 x 4.5) mm, obtuse, narrowed to the base, on the upper side often glabrous, on the lower sparsely hirsute in younger stages and glabrescent with age; margin shortly hirsute with 0.3-0.4 mm long, stiff, acroscopic hairs; stipules ovate-triangular 1.5-1.75 mm long, with a ciliate margin. Flower clusters often quite large, c. 4 mm in diam., (6-) 9 to 12 (-18)-flowered (occasionally 3 to 6-flowered), mostly leaf-opposed and congested on the lateral branches, sometimes flowers solitary. The flowers themselves subsessile, 1.5-2(-2.25) mm, mostly c. 1.75 mm long, obovoid-obconical to almost cylindrical-cup-like, densely hispid-hirsute with 0.3-0.45 mm long stiff, patent hairs; sepals 1-1.25 mm long, the outer oblong, obtuse, the inner ovate (-oval) acute; petals c. 0.45 mm; filaments 0.3-0.45 mm; anthers minute, 0.2-0.25 x 0.15-0.2 mm, subquadrangular, orange-brown; style 0.15-0.2 (-0.25) mm (including the stigmatic part), bipartite, with subsessile and suberect to divergent stigmas. Fruit c. 1.25 x 0.8 mm, ellipsoid (-oblong), slightly narrowed to the top, equalling to slightly exceeding the sepals, pericarp somewhat papillose at the top; seed ovoid-globose, 0.8-0.9 x 0.75 mm. Fl. 6-8. Rocky places, alt. c. 2000-3000 m.

Type: Sicily: *Gussone* (holo. NAP, not seen).

Range: S. Italy, Sicily, N. Algeria and N. Morocco.

Italy: Prov. Potenza (Basilicata): mt. Serino: *G. Rigo* 509 (W, as *H. incana*). **Sicily:** Mt. Etna 300 m: 12.vii.1855, *E. & A. Huet du Pavillon* (Z); ibid.: 14-16.viii.1873, *P. Gabriel Strobl* (W); Etna, Prov. Catania: *Brummitt* 64/134 'Hortul, Panormitan': *Citarda* in 1860 (JE). **Algeria:** Dj. Tougour près Batna: *Balansa* 1030 (partly, mixed with *H. incana*) (FI, G, S); Kabylie: 19.ix.1899, *A. Chabert* (FI); ibid.: 8.vii. 1909 m, *Saint-Lager* (G); Prov. Algers: nr. Blidah: 14.vii.1854, *Munby* (G). **Morocco:** El Rif: mt. Tisuka: *Font Quer* 89 (as *H. latifolia* Lapeyr. var. *regnieri* (Gr.-Bl. & Maire) P. & F. Quer) (G, S, Z); ibid., Jebel Lerz, c. 1950 m: *Font Quer* 176 (as *H. regnieri*) (G, forma annua).

A very distinct and well-defined species. Its nearest relative is *H. hirsuta* L., but the two are very easily distinguishable by their habit, life span, leaves, flower-clusters, flowers and fruit. It is hard to understand why it had been treated as a mere variety of *H. glabra* or as a mere subsp. of *H. incana,* both of which have very little in common with this species.

Gussone gave Jan's reference while describing this species, but the identity of Jan's *H. permixta* (a nomen nudum) is very difficult to ascertain. His original type is untraceable, but two of his specimens (one in W and the other in G, bearing the dates 1827 and 1829 respectively) labelled as *'H. permixta mihi,* Cat. 229, Sicilia, definitely belong to *H. hirsuta* L. var. *subglabrifolia* Zapalow. (a form with rather large, elliptic-oblong glabrescent leaves).

12. **H. abyssinica** Chaudhri spec. nov.

Plate XVIII, Fig. 4-6. p. 345

Herba perennis, saepe dense ramificata, radice perpendiculari longa et lignosa et caudice subterraneo, plus minusve rhizomatoso, fortiter lignoso instructa. Caules usque ad 10 cm longi; internodia 3-8 mm longa, pilis brevissimis (0.15-0.20 mm longis), patentibus vel parum deflexis obtecta vel interdum scabridula. Folia obovato-elliptica, 3.0-5.5 mm longa et 1.5-2.5 mm lata, apice acuta usque ad obtusa, rigidiora, utrimque glabra vel subtus praesertim ad costam interdum parce strigulosa; stipulae ovatae, 1.5-2.0 mm longae, acutae usque ad obtusae, margine dense ciliatae. Glomeruli aliqui foliis oppositi, aliqui pseudo-axillares, plerumque e floribus 3-6 compositi, ad apicem caulium et ramulorum congesti et saepe profusi. Flores subsessiles, ellipsoidei, ad basin parum angustati, 1.75-2.25 sed plerumque circ. 2.0 mm alti, pilis robustis sed nihilominus mollioribus, albis 0.3-0.4 mm vel rarius usque ad 0.45 mm longis, plus minusve acroscopis dense vestiti; pars perigyna 0.5-0.7 mm alta; sepala aequilonga, 1.0-1.25 mm longa, crassa, exteriora oblonga et obtusa, interiora anguste ovata et subacuta; petala circ. 0.5 mm longa; stamina filamentis 0.4 mm longis instructa; antherae quadrangulares, 0.2 mm longae et 0.15 mm latae, aurantiae; stigma subsessile, 0.15-0.2 mm longum, bipartitum, lobis paulum divergentibus. Fructus elongato-ellipsoideus, 1.2-1.3 mm altus et 0.85 mm diam. ,sepalis subaequilongus, apice papillosus; semen ovoideum, circ. 0.9 mm altus et 0.75 mm diam. Fl. 8-10. Mountains, alt. ca. 3500-3850 m.

Type: Abyssinia: S. of mt. Silke, nr. Cosso Berri, 11.006-12.006, 4.x.1850, *W. Schimper* 2429 (Holo. S!).

Endemic in Abyssinia (ETHIOPIA).

ABYSSINIA: In monte Bachit prope Demerki, 15.viii.1831, *Schim-*

per 1413 (G, S); 'Abyssinia': 1855, *Schimper* (G).

This species resembles *H. permixta* Gussone in the structure of the leaves, but it differs in having a ± compact habit, oblong-ellipsoid flowers covered with rather soft, acroscopic hairs, rather thick sepals and a ± sessile, bilobate to bipartite stigma. In *H. permixta,* on the other hand, the shoots are often spreading, the flowers densely hispid-hirsute, the sepals rather stiff, the style short but distinct, going out into two divergent stigmas.

13. **H. hirsuta** L., Sp. Pl. ed. 1, 218 (1753).

J. Bauhin, Historia Plant. 3:379 (1651); DC., Prodr. 3:367 (1828); Koch, Syn. ed. 2, 280 (1843); Boiss., Fl.Or. 1:740 (1867); Willk. & Lange, Prodr. Fl. Hisp. 3:153 (1874); Nyman, Consp. 256 (1879); Batt. in Batt. & Trab., Fl. Alg. Dicot), 168 (1888); Beck, Fl. Nieder Österr. 1:347 (1890); Gürke in Richter-Gürke, Pl. Europ. 2(2):186 (1899); Halacsy, Consp. Fl. Gr. 1:573 (1900); Schinz & Keller, Fl. Schweiz ed. 3, 1 (Exk. fl.):205 (1909); Rouy, Fl. Fr. 12:9 (1910); Briquet, Prodr. Fl. Corse 1:484 (1910) (excluding var. *cinerea*); Hegi, Illustr. Fl. Mitteleurop. 3:432 (1911); Graebner in Asch. & Graebn., Syn. 5(1):879 (1919); Hayek, Prodr. Fl. Balcan, 1:171 (1924) Bouloumoy, Fl. Liban & Syr. 1:123, pl. 62, f. 5 (1930); Dinsmore in Post, Fl. Syr. Pal. & Sin. 1:211 (1932); Thiébaut, Fl. Lib. & Syr. 1:132 (1936); Maire & Weiller in Maire, Fl. Afr. Nord 9:43, f. 11 (1963) p.p., excluding var. *cinerea;* Brummitt in Tutin et al., Fl. Europ. 1:152 (1964) p.p., et in Davis, Fl. Turk. 2:248 (1967) (excluding *H. cinerea* DC. in both cases); Mouterde, Nouv. Fl. Liban & Syr. 1:453 (1966).

Syn.:*Herniaria vulgaris* Sprengel, Syst. 1:929 (1825) p.p. *H. vulgaris* var. *hirsuta* (L.) Griesselich, Kl. Bot. Schrift. 210 (1836). *H. germanica* b. *hirsuta* Döll, Rhein. Fl. 619 (1843). *H. hirsuta* L. var. *a parviflora* Fenzl in Ledeb., Fl. Ross. 2:160 (1843). *H. arenaria* var. *hirsuta* (L.) O. Kuntze, Taschenfl. Leipzig 224 (1867). *H. glabra* L. var. *hirsuta* (L.) O. Kuntze in Acta Hort. Petrop. 10:230 (1887); Fiori & Paoletti, Fl. Anal. Ital. 1:335 (1898). *H. hirsuta* L. Race/Subsp.? *euhirsuta* Graebner in Aschers. & Graebn. Syn. 5(1):881 (1919).

Plate XVIII, Fig. 10-12. p. 345

An annual herb, stem prostrate, up to c. 20 cm long, with numerous alternating branches, the latter often profusely bearing flower clusters; internodes mostly up to c. 7 mm (rarely up to 12 mm) long, rather slender, densely covered with short, patent hairs. Leaves alternate on the flowering branches, but opposite in the basal part of the stem; oblanceolate to oblong-elliptic, often rather obliquely so, obtuse, 4-8 (-11) x 1.5-2.5(-4.5) mm, attenuate to the base, covered with short,

stiff, appressed hairs, occasionally glabrescent with age; margin shortly hirsute; stipules ovate-triangular, up to c. 1.25 x 0.75 mm, with a densely ciliate margin. Flower-clusters leaf-opposed, globose or stellate, c. 3 mm in diam., mostly 7 to 12-flowered, densely congested on the short, lateral branches. Flowers sessile, 1.25-1.6 mm, covered with short, 0.25-0.4 mm long, stiffly spreading straight hairs; perigynous zone subglabrous; sepals oblong, obtuse to subacute, usually with stiff hairs at the tip, mostly equal, sometimes (as in var. *antalyaca*) somewhat unequal, esp. in the central flower of the dichasium; petals 0.5-0.6 mm long; stamens 2-5, mostly in the order of frequency 5, 4, 3 and 2; filaments 0.3-0.4 mm; anthers minute, 0.15-0.2 mm in diam.; style 0.15-0.2 mm (including the stigmatic part), bilobed, with slightly spreading stigmas. Fruit ovoid-subglobose, completely enclosed by the sepals, slightly papillose at the top.

Fl. 4-9. Stony places, alt. s. 1 to c. 2000 m.

Range: Essentially a European (C, W, and S) species, but extending to the temperate parts of Turkey, Iran, Afghanistan and West Pakistan in Asia, and to Ethiopia in Africa; also recorded from the coastal areas of Palestine, Algeria and N. Morocco.

1a) Leaves at least in the younger stages covered with short, stiff hairs; sepals with short, stiffly spreading hairs .... subsp. **hirsuta**

2a) Flowers 1.75-2 mm long ..... var. **antalyaca**

2b) Flowers 1.25-0.6 mm long

3a) Leaves at maturity usually ± glabrous; flowers covered with very short, patent hairs ..... var. **subglabrifolia**

3b) Leaves shortly hirsute or occasionally glabrescent; flowers (esp. the sepals) covered with short, stiff, spreading hairs ---- var. **hirsuta**

1b) Leaves mostly entirely glabrous; sepals almost glabrous on the outside (but tipped with a minute hair) ..... subs. **aprutia**

A) subsp. **hirsuta.**

a) var. **hirsuta:** forma **hirsuta:** Throughout the range of the species.

Belgium: Prov. Brabant: *Dieudonne* 130 (JE, W). **France:** Dép. Orne: *H. Beaudouin* 2470 (JE, W); Dép. Sarthe: 17.viii.1886, *Nanteuil* (Z); Dép. Indre et Loire: 26.vii.1847, *Blanchet* (JE); Dép. Doubs: *Paillot* 448 (JE); Dép. Ain: *Stauffer* 966 (Z); Dép. Isèrê: viii.1876, *Tillet* (COI); Dép. Allier-Isèrê: *Lassimonne* 584 (COI); Dép. Dordogne: 6.viii.1962, *K. Walther* (HBG); Dép. Alpes-Maritimes: 16.vii.1957, *Klimmek* (HBG); Dép. Var: *Huet du Pavillon* 1065 (B, JE, W); Dép. Gard: 13.iv.1913, *J. Braun & E. Furrer* (Z); Dép. Herault: 10.vii.1934, *Braun-Blanquet* (Z, as *H. cinerea*); Dép. Aude: *Stud. biol. Rheno-Trai.* 47/633 (U); Dép. Pyr. Or.: *Penchinat* 554 bis (Flora exs. C. Billot) (JE). **Corsica:** Evisa: *Aellen* 226 (Z); Porto: *id.* 224 (Z); ibid. *Reverchon* 438 (W); Bonifacio: *Stephani* 646 (Z, as *H. cinerea*). **Spain:** Prov. Barcelona: Casteldefels: *Sennen* 3942 (COI); Prov. Valencia: *Reverchon* 636 (as *H. ciliata* Bab.) (W,Z); Catalonia: Tibidabo: *Sennen* 1388 (JE); Prov. Almeria: Cabo de Gata: *Ripley* 229 (K). **Portugal:** Prov. Estremadura: Cintra: *B. Rainha* 164 (LISE); Bombarral: *Rainha* 1522 (LISE); Lisbon: *A. R. da Cuha* 729 (COI); Prov. Algarve: Faro: *J. Bran-*

deiro 1191 (COI, W, Z), 1396 (COI) (both as *H. cinerea*). **Italy:** Pedemont., Alp. Graia: 1.viii.1889, *R. Beyer* (B); Susa: 14.vii.1891, *id.* (B); Liguria: Riv. di Ponente: vii.1893, *Beyer* (B); Prov. Lombardia: x.1878, *Otto Penzig* (Z); Prov. Venetia: 22.vi.1870, *Porta* (JE); ibid.: vii.1878, *Rigo* (HBG); Giglio Island: iii.1894, *Levier* (FI); nr. Neaples, Ischia Island: 14.iv.1937, *Bornmüller* (B); Calabria: *Bornmüller* 115 (B, Z). **Sicily:** Palermo: *Todaro* 1516 (COI, JE, as *H. cinerea*); Messina: *H. Ross* 630 (B, as *H. glabra* var. *hirsuta* f. *cinerea*); Taarmina: *O. Fiedler* 12881 (B). **Sardinia:** Alghera: *Nicotra* (B). **Switzerland:** Zürich: vii.1902 & viii.1917, *A. Thellung* (Z); Branson vii.1853, *Huet du Pavillon* (STU); Fully: 24.v.1916, *H. Gams* (Z). **Austria:** South Tirol: Riva: ix.1897, *Karl Rechinger* (LD); Burgenland: viii.1932, *J. Vetter* (W); Wien vii.1919, *E. Korb* (W); Marchfeld: ix.1919, *Korb* (W). **Germany:** Prov. Brandenburg: Potsdam: vii.1873, *A. Falcke* (JE); Cottbus: viii.1909, *Roman Schulz* (B); Prov. Sachsen: Hessen: viii.1884, *M. Drude* (JE); Ober-Schlesien: Rybnik: 6.ix.1873, *R. Fritze* (W, Z); Nordrhein-Westfalen: Köln: *Th. Müller* 16726 (B); Hessen: Frankfurt: vii.1860, *Baenitz* (JE, Z); Darmstadt: *Schaffner* 554 (Fl. exs. C. Billot) (JE); Rheinland: Mainz: *Lehmann* 359 (Wirtgen Hb.) (JE, STU); ibid. *Wirtgen* 394 (JE); Baden: viii.1904, *Thellung* (Z); Bayern: Mütterstadt: *Koch* 259 (F. Schultz Hb. norm) (B, JE, W); Assenheim to Schauerheim: *C. H. Schultz* 259 bis (JE); Äcker: *A. Ade* 1612 (STU). **Czechoslovakia:** Pressburg (Bratislava): ix.1874, *Wiesbauer* (JE). **Poland:** Silesia: *K. Richter* 198 (Z); Lublin: vii.1920, *H. Kopoznca* (Z). **Hungary:** Comit. Pozsony: Bazin: *Zigmundik* 140/2 (B, W, Z); Comit. Györ: Kismoriczhida: *S. Polgar* 140/1 (B, W, Z); Magyarfalva: *Woloszczak* 64 (COI, W). **Yugoslavia:** Istria: vi.1899, *K. Untchj* (B); Lapad Peninsula: *Jackson & Turrill* 332 (K); Dalmatia: vi.1926, *E. Korb* (W); mt. Marian: v.1870, *Pichler* (W); v. 1909 *Adamovic* (Z); Crnaegora vii.1890, *Baldacci* (Z); Montenegro: vi.1872, *J. Pantocsek* (B); Macedonia: Struma Pl.: *Turrill* 90 (K); Distr. Doiran: *Bornmüller* 3625 (B, JE); ibid. *Rechinger, K. H. & F.*, 9141 (W); mt. Astri: *Bornm:* 430 (B, JE). **Albania/Yugoslavia:** Distr. Scutari: Vraka: *Baldacci* 246 (G). **Bulgaria:** Central Rodope: *Turrill* 1708 (K); Varna: *Gilliat-Smith* 1003 (K); ibid. ix.1889, *Bornmüller* (JE). **Greece:** Thracia: *Sint. & Bornm.* 85 (B, mixed with *H. cinerea*); Macedonia: Kavalla: *id.* 1891:180 (B); ibid. *Rechinger* 22458 (W); Lithokori: *Sint. & Bornm.* 1178 (B, W); Alsar: *Scheer* 12/27 (B); Mulyani & Pontiko Islands: *Hill, Sandwith, Turrill* 2387 (K); Chalkidike Peninsula: *R.* 17264 (W); Thasos Island: *Bornm.* 85b (B, K); Thessalia: Kalampaka: *Sint.* 1896:1056 (JE); Agrapha (Dolopia) & Pentelikan: vi-vii.1885, *Haussknecht* (JE); Attica: Lavrion: v. 1885, *Haussknecht* (JE); Athens: *Heldreich* 3780 (G); Aetolia: 27.v.1926, *Bornm.* (B, as *H. cinerea*); Methana: Argolidis: v.1885, *Heldreich* (W); Peloponnisus: Achaia: *Bornm.* 1926:270 (B, Z); Laconia: *R.* 20300 (W); mt. Taygeto: *H. Zahn* 1429, 1430, 1431, 1432 (W); mt. Malevo: *Orphanides* 3288 (G); Ypati, Octa: *Balls & Gourley* B. 3214 (K); Kephalonia Isl.: *Bornm.* 271, 276 (B); Corcyra Isl.: *Tunias* 1638 (W); *Cyclades* (Kiklades: Cythno (Kythno): iv. 1900, *Tuntas* (W); Cea (Kea): v.1898, *Heldreich* (W); Andros: vii.1886, *id.* (W); Mykonos: vii.1901, *id.* (W, as *H. virescens* Salzm.); Naxos: vii.1897, *Leonis* (W, Z, as *H. cinerea*); ibid.: *R.* 2278 (W); Mykonos: *R.* 326 (W) Thera: iv.1911, *Halacsy* (W); Ios: *R.* 225b (W); Samos: *R.* 2075 (W); Skopelos: *R.* 984 (W); Euboea: *R.* 16171 (G, W); Mytilini (Lesvos): *K. H. & F. R.* 5782, 5932a (W); Lemnos: *R.* 1317 (W); Samothrake *K. H. & F. R.* 9994 (W). **Crete:** Kissamos: *Reverchon* 16 (as *H. cinerea*) (COI, JE, W); La Caneé: 10.v.1883, *Reverchon* (as *H. cinerea*) (JE, W, Z). **Turkey:** Vil. Canakkale: Dardanelles: *Sint.* 1883:1070 (BM); Vil. Istanbul *Nöie* 161, 191 (G); Rumelihasar: 25.v.1944, *Başarman* (ISTE); Kocaelo (Izmit): *Demiriz* 4829 (ISTE); Bursa: Uludağ: v.1944 & ix.1944, *Başarman* (ISTE); ibid.: *Demiriz* 1619 (ISTE); Bilecik: Bilicik: *Davis &*

Coode D.36514 (E); Amasya: Amasya: *Bornm.* 1890:1917 (B); Tokat: Tokat: *Bornm.* 1889:1545 (B); Izmir: Bunarbashi: *id.* 1906:9200 (B); Yamanlardağ: *Dudley* D.34889 (E); ibid. *Schwarz* 273, 687 (B); Burnabad: *id.* 304, 578 (B, as *H. odorata*); Bilecik: Sögüt to Eskişehir: *Demiriz* 1766 (ISTF); Konya: Akşehir: Sultandağ: *Bornm.* 1899:4491 (B); Kayseri: Bakir Dağ above Kisğe: *Davis, Dodds, Cetik* D.19249 (E); Elazig: Maden: *Davis* 22057 (BM, E); Isparta: Dedegoldağ: *Davis* 15868 (E); Niğde: Hasan Dağ: *Davis, Dodds, Cetik* D.18920 (E); Maraş: nr. Maraş 18.viii.1965, *Hausknecht* (JE). **Cyprus:** mt. Troodos: *Kennedy* 1833, 1834 (K); Khionistra: *id.* 1223 (K); Agros: *Davis* 18867K (E); Mesopothamos: *Davis* 3451K (E); Platres: *id.* 3477K (E); ibid. *Kennedy* 1547 (K, seems to be perennating, forma **perennans** f. nov.); ibid. *Kennedy* 1547 bis (K); Platres to Troodos: *id.* 421 (K); Platres: *id.* 1160 (K). **Lebanon:** Beirut: *Blanche* 795 (G); ibid. 27.iv.1888, *Peyron* (G). **Palestine:** Ramleh: *Dinsmore* 1257 (E); Herzlia: *Zohary & Feinbrun* 43 (B, C, E, G, Z); Jaffa: *Bornm.* 1897:219 (B, G, JE); Sarona: *Dinsmore* B.3180 (S), 5257 (B, JE, K). **Afghanistan:** Prov. Kabul: Kabul: *Rechinger* 17097 (W); NE: Salang: *R.* 31670 (W); Porande range, nr. Basarak: *Gilli* 1398 (W); Gulbahar: *Neubauer* 370 (W). **Kashmir:** Martand: *Drummond* 3980 (K). **India:** Chamba State: vii.1899, *Duthie* (K). **Africa: Morocco:** Larache (El Araix): *Font Quer* 188 (as *H. annua* Lag. var. *virescens* (Salz.) Ball); Mehdia. 2.iv.1924, *W. Dutoit* (G). **Algeria:** Cap Matifou, nr. Alger: 15.iii,1900, *Selim Birger* (S); Constantine: *S. Choulette* 223 (G). **Ethiopia (Abyssinia):** Distr. Memsach mt. Kubbi: *Schimper* 744 (G, STU); Saganeiti, nr. Addingofon: *Schweinfurth & D. Riva* 1284 (G); val. Dégerra: *id.* 1246 (G).

aa) forma **pauciflora** Rohlena in Mag. Bot. Lap. 3:321 (1904) (as variety). Flowers in few-flowered, mostly pseudo-axillary and rather inconspicuous clusters. Described from Montenegro, but no type specimen mentioned. ---- Parts of Yugoslavia, Turkey, Iran and West Pakistan.

Turkey: Vil. Amasya: Amasya: *Bornmüller* 1889:315b (B). **Iran:** Hasanbeili: 18.ix.1884, *J. A. Knapp* (JE). **West Pakistan:** Kishenganga Valley: *Jan Mohammad* 38 (G.)

b) var. **subglabrifolia** Zapalowicz, Consp. Fl. Galic. crit. 3:8 (1911) (as forma); Rechinger, Fl. Aeg. 129 (1943).

Leaves often ± glabrous on both sides; flowers covered with very short, patent hairs in the calyx region.

Type: ??

Parts of Italy, Hungary, Yugoslavia, Greece and Turkey.

Italy: Neapal to Camaldoli: iv.1882, *Karl Richter* (W); Naples (Napoli): iv.1898, *Haussknecht* (JE). **Hungary:** Blumenau, prope Posoniung: vi. 1882, *H. Braun* (W). **Greece:** Sporades: Skopelos/Stropelos Is.: *Rechinger* 984 (W). **Turkey:** Rumeli Hisar, 13.iv.1905, *Hb. Post* (G); Halki: 19.vi.1904, *Aznavour* in Herb. Post (G).

c) var. **antalyaca** Chaudhri n. var. a varietatibus aliis floribus majoribus (1.75-2.0 mm altis) distinguenda: Flowers 1.75-2 mm long· sepals mostly unequal, stamens usually 3, sometimes 5.

Turkey: Vil. Antalya: Antalya (Adalia): *Tengwall* 672 (S, holotype).

B) subsp. **aprutia** Chaudhri n. subsp. a subsp. *hirsuta* foliis plerumque totidem glabris, sepalis apice in pilum singulum exeuntibus sed ceterum

ubique subglabris distinguenda. Shoots covered with very short, patent hairs; leaves elliptic to obovate-oblanceolate, up to c. 5 x 2.5 mm, rather thick, mostly entirely glabrous, occasionally with a few short, white hairs near the apex; clusters (4-)6 to 12-flowered, leaf-opposed, densely congested on the short, lateral branches; flowers 1.2-1.4 mm; sepals 0.75-0.8 mm long, equal, ± oblong, obtuse to subacute; glabrous on the outside, but with a very shortly ciliolate margin, and tipped with a short (0.25-0.3 mm), white, tender hair; stamens 2; anthers 0.15-0.2 mm in diam., quadrangular, orange-brown; style 0.1-0.15 mm, with a very small (c. 0.1 mm), bilobed, ± erect stigma. Fruit ellipsoid-oblong, 0.8-1 x 0.4-0.5 mm, almost smooth (or very slightly papillose) and equalling the sepals.
Fl. 6. Alt. c. 100 m.
Type: E. Italy: Abruzzi, Chieti, in arvis, c. 100 m, 29. vi. 1872, *S. Sommier* (holo. FI!).
Endemic; known only from the single type gathering.

14. **H. lusitanica** Chaudhri spec. nov.

Plate XVIII, Fig. 13-19. p. 345

Herba in subspecie *lusitanica* annua et in subspecies *berlengiana* et *segurana* biennis vel perennis. Caules prostrati, usque ad 21 cm longi, valde ramificati; ramuli alternantes, e caulium basibus porrigentes; ramuli ordinis secundae florum glomerulis obtecti; internodia usque ad 16 mm longa, dilute viridia, pilis mollibus 0.25-0.35 mm longis, patentibus vel deflexis obtecta, in subspecies *berlengiana* et *segurana* tamen primum puberula et deinde glabrescentia. Folia plurima alternantia, oblonga vel late oblanceolata, usque ad 9 mm longa et 3 mm lata, obtusa, in subspecie *lusitanica* pilis brevissimis (0.2-0.25 mm longis), appressis vestita, in subspecie *berlengiana,* primumpilis brevibus et contortis obtecta et deinde glabrescentia, margine in subspecie *lusitanica* apicem versus pilis arcuatis instructo, in subspecie *berlengiana* ciliolato; stipulae ovato-deltoideae, usque ad 1.5 mm longae et 1 mm latae, acutae, margine ciliolatae; stipulae foliorum superiorum interdum colore rubeolo imbutae. Bracteae etiam rubeolae. Glomeruli foliis oppositi, in subspecie *lusitanica* e floribus 6-15, in subspecie *berlengiana* e floribus 4-7, raro usque ad 10 compositi, profusi et in ramulis axillaribus saepe dense congesti. Flores subsessiles, anguste ellipsoideae, in subspecie *lusitanica* et plerumque 1.75-2.0 mm alti, in subspecie *berlengiana* ovoideo-cupulares et multo minores (1.0-1.5 mm alti), in subspecie *lusitanica* ad medium pilis gracilibus 0.3-0.45 mm longis dense, apicem et basin versus parce vestiti, in subspecie *berlengiana* nunc pilis acroscopis brevibus et mollibus parce instructi et apicem versus interdum pilis longioribus muniti, nunc subglabri;

sepala in subspecies *lusitanica* et *segurana* plerumque paulum inaequalia, distincte inaequalia tamen in dichasiorum floribus centralibus, in subspecie *berlengiana* subaequalia, apicem floris versus saepe convergentia, in subspecie *lusitanica* numquam, in subspecie *berlengiana* semper in pilum brevem exeuntia, in subspecies *lusitanica* et *segurana* exteriora subspathula vel oblongo, usque ad 1.45 mm lata et obtusa, interiora oblonga, usque ad 1.0 mm longa et 0.4 mm lata et subobtusa, exteriora insuper in fructu apice paulum recurvata, in subspecie *berlengiana* omnia ovato-oblonga, apicem versus paulum sed abruptius angustata et apice ipso in pilum brevem exeuntia. Stamina 5, filamentis 0.35-0.4 mm longis instructa; antherae fere oblongo-quadrangulares, 0.25 mm longae et 0.15-0.2 mm latae, primum violaceae, deinde aurantiae; stylus stigmate incluso 0.15-0.2 mm longus; stigma bipartitum, lobis erectis vel paulum divergentibus. Fructus in subspecie *lusitanica* ovoideus, 0.75 mm altus et 0.35 mm diam. in subspecie *berlengiana* pro rato latior, in subspecie *segurara* non visus, glaber, omnino a sepalis obtectus. Fl. 5-8.

Type: Portugal: (NE of Coimbra), Oliveira do Hospital, 16.vi.1954, *J. Matos, A. Matos & A. Marques* 5034 (holo. COI!).

Range: Portugal, N. & C. Spain.

Key to the subspecies and varieties:

1a) Flowers 1-1.5 mm long ..... subsp. **berlengiana**

1b) Flowers 1.75-2 mm long

2a) Perennial ..... subsp. **segurana**

2b) Annual ..... subsp. **lusitanica**

3a) Flowers with uncinate hairs on the perigynous zone ..... var. **gaditana**

3b) Flowers always with straight hairs on the perigynous zone

4b) Leaves oblong to elliptic, up to 12 x 4 mm; stipules up to 2 x 1.9 mm ..... var. **latifolia**

4a) Leaves up to 9 x 3 mm, broadly oblanceolate-oblong; stipules up to 1.5 x 1 mm ..... var. **lusitanica**

A) subsp. **lusitanica:** Annual; stems up to 20 cm long, with internodes up to 1.6 cm; leaves ± oblong to oblanceolate, up to 9 x 3 mm, covered with closely appressed short hairs; stipules up to c. 1.5 x 1 mm; flowers 1.75-2 mm, covered with 0.3-0.45 mm long, fine, patent hairs; sepals ± unequal, the outer subspathulate, 1.3-1.4 mm, the inner oblong, c. 1 mm, all without apical hairs; fruit c. 0.75 x 0.55 mm, ovoid, shorter than the sepals.

a) var. **lusitanica,** i) subvar. **lusitanica.** Stems prostrate, with light- to greyish-green shoots and leaves; flowers covered with fine (thin), patent hairs. Throughout the range of the subsp. except in some parts of Prov. Alentejo (Portugal) and W. Cáceres (Spain).

Portugal: Without locality, *A. de Carvalho* 315 (COI); Prov. Tras-os-Montes: Montalegre: *M. da Silva* 1891 (LISE); Duoro: Aronca, Serra de Freita (Gralheira): *J. Paira et al.* 8260 (COI); Thomar to Gayalvo: v.1914, *Ferreira* (COI); Viseu: vii.1896, *id.* (COI); Serra de Estrella vi. 1882, *id.* (COI); Fornes d'Algodr., Villa Cha: viii.1892, *id.* (COI); Ribeira, Oliveira do Hospital: *J. Matos et al.* 5018 (U); Sernache do Bom Jardin: *A. C. do Carmo & J. Vicente* 165 (COI); Coimbra: vii.1877, *A. Moller* (COI); Ponte de S. Gens: *A. Fernandes et al.* 5982 (COI); Povvoa de Lanhoso: vii. 1894, *Sampaio* (COI); Estremadura: Salregal: *A. Fernandes et al.* 3874 (COI); Cintra: vi. 1842, *Welwitsch* (COI); Lisbon: /1860, *P. Cautinho* (COI); Alentejo: Portalegre: *Nuno Folgre* 6 (LISE, forma gracilis, shoots slender and flowers small); Serra 'Ossa: v.1891, *Moller* (COI); Trafaria: vii.1889, *J. Daveau* (COI); env, Evora: *id.* 166 (COI); Mértola: *A. Fernandes et al.* 7508 (COI); Algarve: Monchique: 17.vi.1853, *Bourgeau (JE).* **Spain:** Prov. Galicia: Santiago de Compostela: vi.1945, *Vicitez* (LISE); Zamora: Kwadelago: vi.1948, *Losa* (LISE); Cáceres: Banos de Montemayor: 10.vi.1945, *A. Caballero* (MA); El Escorial: *Font Quer* 304 (MA); Madrid: nr. Madrid: *Atchley* 282 (K); Toledo: San Pablo de los Montes: v.1925, *Martinez* (MA); Ciudad Real: Serra del Almendral: v. 1935, *Gz. Albo* (MA).

ii) subvar. **fernandesii** Chaudhri nov. subvar. a subvar. *lusitanica* floribus pilis rigidioribus obtectis distinguenda. Shoots often pink- or purple-green; flowers usually somewhat purple and covered with stout and long but rather soft, acroscopic or patent hairs.

SE Portugal and W Spain.

Portugal: Alentejo: Castelo de Vide: *A. Fernandes et al.* 7024 (COI, type). **Spain:** Cáceres: Guadalupe: vi. 1946, *C. Vicioso* (MA); Sierra de Montanchez: vii.1946, *id.* (MA).

b) var. **latifolia** Chaudhri nov. par. a varietatibus aliis adhuc notis foliis majoribus et praesertim latioribus (usque ad 12 mm longis et 4 mm latis), stipulis majoribus (usque ad 2.0 mm longis et 1.9 mm latis) et sepalis exterioribus latioribus distinguenda. Leaves oblong to elliptic, up to 12 x 4 mm; stipules up to 2 x 1.9 mm, often with a subcoriaceous base; flowers sparsely covered with rather short hairs; sepals markedly unequal, the outer subspathulate, c. 1.4 x 0.6 mm.

Portugal: Prov. Tras-os-Montes: Bragança, vi. 1877, *M. Ferreira* (COI, type) Prov. Algarve: Faro: *J. d'A. Guimaraes* (COI).

c) var. **gaditana** Chaudhri nov. var. a varietatibus aliis adhuc notis floris receptaculo pilis uncinitis obtecto et sepalis exterioribus apice recurvatis distinguenda. Flowers covered with uncinate (and patent) hairs on the perigynous zone; the outer sepals recurved at the apex. Possibly a hybrid of this species with *H. cinerea* DC.

S. Spain: Prov. Cadiz, in arenosis prope 'Jeres', 26.iii.1879, *Perez-Lara* (holo. W.).

B) subsp. **berlengiana** Chaudhri n. subsp. a subspecie *lusitanica* tempore vigendi bienni vel perenni, caulibus brevioribus, longitudine 5 cm non excedentibus et ex internodiis brevioribus (3-6 mm) constantibus, primum puberulis, demum glabrescentibus, foliis obovatis, usque ad 4 mm longis et 2.25 mm latis, primum pilis contortis brevibus obtectis et demum glabrescentibus, margine ciliolatis, stipules mino-

ribus (0.8 mm longis et 0.6 mm latis), glomerulis e floribus paucioribus (4-7) compositis, floribus ovoideo-cupularibus et multo minoribus (1.0-1.4 mm altis), nunc pilis acroscopis brevibus et mollibus parce vestitis et apicem versus interdum pilis longioribus munitis, nunc subglabris, sepalis subaequalibus, ovato-oblongis et apice paulum sed abruptius angustatis et ibi in pilum brevem exeuntibus, fructu pro rato latiore distinguenda.
Biennial (to perennial); stems up to c. 5 cm long, rather slender, with 3-6 mm long internodes, puberulous or almost glabrous with maturity. Leaves obovate, up to c. 4 x 2.25 mm, covered with short, crisped hairs when young to ± glabrous with age; margin finely ciliate; stipules c. 0.8 x 0.6 mm; flowers 1-1.4 mm, obovoid-cuplike, arranged in 4 to 7 (10)-flowered clusters; sepals ± equal, oval-oblong, slightly and rather abruptly narrowed at the apex, and tipped with a short hair, covered with very short, sparse, upwards-directed, soft hairs, somewhat longer towards the apex, occasionally almost glabrous. Fruit c. 0.6 x 0.5 mm, ovoid, almost equalling the sepals.
Fl. 5-6. Endemic in Berlenga, Velha and Farilhoes Islands, Prov. Estremadura.

Portugal: Prov. Estremadura: Berlenga Is.: *P. Silva et al.* 4455 (LISE holotype); ibid.: 24.vi.1924, *A. Mendonça* (COI); Velha: *J. Daveau* 45 (COI).

C) subsp. **segurana** Chaudhri nov. subsp. a subspecie *lusitanica* tempore vigendi perenni, caulium ramulis aliis omnino sterilibus, aliis profuse floriferis, foliis carnosioribus et utrimque subglabris, floribus maximam partem 5-meris, sepalis carnosioribus nunc pilis brevibus parce obtectis nunc fere glabris distinguenda; forsitan hybrida inter *H. lusitanicam* et *H. glabra* L. Perennial; some of the shoots wholly sterile, others profusely floriferous; the leaves rather fleshy in texture and with subglabrous surfaces; flowers mostly 5-merous, but occasionally 4-merous; sepals rather fleshy and sparsely covered with short hairs or, sometimes, nearly glabrous. Pistil not fully developed.
Type: SE Spain: Prov. Jaen: Sierra de Segura, Cerro de Puente Hon do, 1000 m, on dry sandy soil, 28.vi.1955, V. H. Heywood 3047 (holo. LIVU). Probably a hybrid of *H. lusitanica* with *H. glabra* L.

This species is widely distributed in Portugal, and has, often, been confused with *H. hirsuta* L. and with *H. cinerea* DC. as it has an almost similar habit. It differs from *H. hirsuta* in its hirtellous leaves, the (± ellipsoid) flowers covered with fine, soft hairs (not hispidous), the usually ± unequal sepals without the apical stiff hairs, the outer being subspathulate, and in the fruit much shorter than the sepals. It differs from *H. cinerea* in possessing straight (uncoiled) hairs on the flowers, five stamens instead of two, and a very short style.

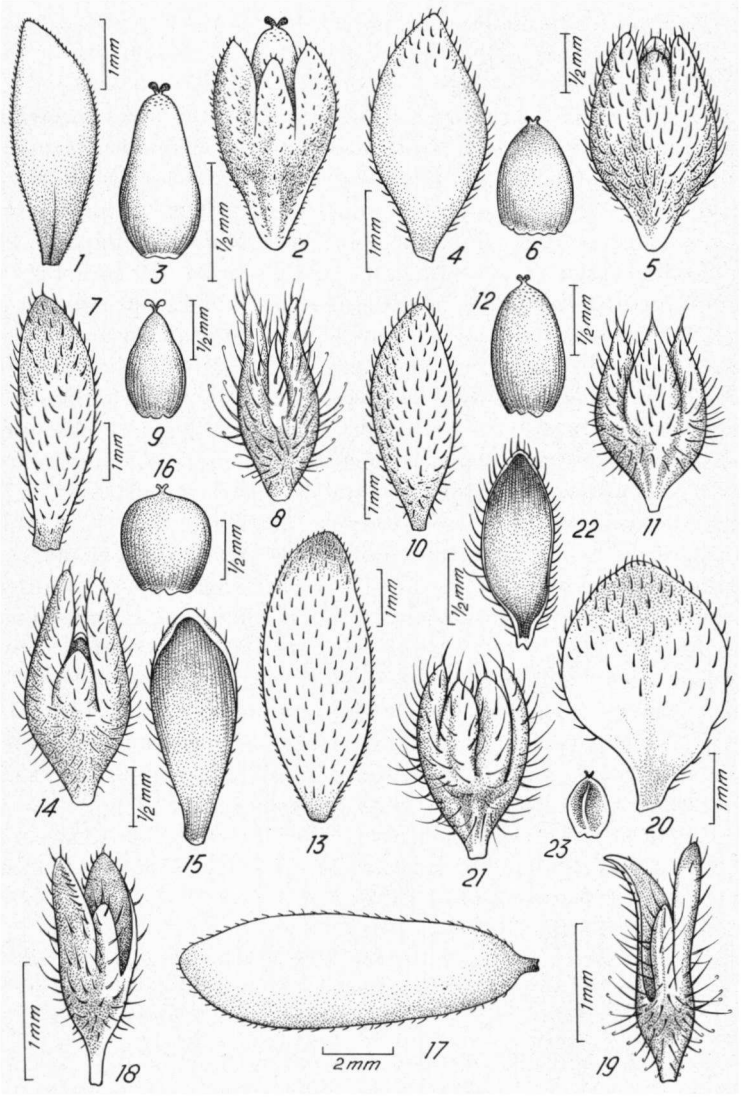

Plate XVIII. Fig. 1-3: **H. oranensis;** 1: leaf; 2: flower; 3: fruit [5. v. 1911, *Faure* (G)]. Fig. 4-6: **H. abyssinica;** 4: leaf; 5: flower; 6: fruit [*Schimper* 2429(S)]. Fig. 7-9: **H. cinerea;** 7: leaf; 8: flower; 9: fruit [*Rechinger, K. H. & F.* 7996(W)]. Fig. 10-12: **H. hirsuta;** 10: leaf; 11: flower; 12: fruit [*Stud.biol.* 47/633(U)]. Fig. 13-19: **H. lusitanica;** 13: leaf; 14: flower; 15: sepal, inner side; 16: fruit [var. **lusitanica;** *J. Matos et al.* 5034(COI)]; 17: leaf; 18: flower [var. **latifolia:** vi. 1877, *Ferreira* (COI)]; 19: flower [var. **gaditana:** 26. iii. 1879, *Perez-Lara* (W)]. Fig. 20-23: **H. algarvica;** 20: leaf; 21: flower; 22: sepal, inner side; 23: fruit [*Rothmaler* 13365(B)].

15. **H. algarvica** Chaudhri spec. nov.

Plate XVIII, Fig. 20-23. p. 345

Herba annua parva sed dense ramificata. Caules prostrati et dense congesti, 5-10 cm longi, valde ramificati; ramuli a florum glomerulis dense obtecti; internodia usque ad 5 mm longa, dilute brunnea, pilis mollibus, 0.2-0.4 mm longis, patentibus vel plus minusve deflexis obtecta. Folia suborbicularia vel obovato-spathulata, usque ad 4.0 mm longa et 2.5 mm lata, obtusa, basin versus subito contracta, crassiora, utrimque pilis 0.3-0.5 mm longis, curvatis vel contortis obtecta, demum saepe brunnescentia et glabrescentia; stipulae ovato-deltoideae, circ. 1.5 mm longae et 1.0 mm latae, acutae, margine ciliatae. Glomeruli foliis oppositi, e floribus 6-12 compositi, plerumque magni, profusi et dense congesti, partes alias fere obscurantes. Flores subsessiles, plus minusve anguste ellipsoidei, 1.5-1.75 mm alti, pilis acroscopis, plus minusve patentibus, rectis vel contortis, 0.3-0.6 mm longis, apicem floris versus saepe paulo longioribus dense obtecti, zona perigyna tamen plerumque subglabra; sepala paulum inaequalia, exteriora oblongo-spathulata, 1.0-1.25 mm longa, obtusa, fortiter 3-nervia, nervis apicem versus convergentibus, interiora anguste oblonga, subobtusa; petala 0.5-0.55 mm longa; stamina 5, filamentis 0.4 mm longis instructa; antherae oblongae, 0.25 mm longae et 0.15-0.2 mm latae, primum violaceae, deinde luteoaurantiae; stylus brevissimus, stigmate incluso 0.15-0.2 mm longus; stigma bipartitum lobis plus minusve divergentibus. Fructus fusiformis, 1.25 mm altus et 0.5 mm diam., glaber, a sepalis inclusus. Fl. 5-6. Sandy places.

Type: PORTUGAL: Prov. Algarve, Vila do Bispo, in arenaceis promontorii Cabo de S. Vicente, ca. 100 m, 25.vi.1938, *W. Rothmaler* 13365 (as *H. hirsuta* L.) (holo. LISE! iso. B!).

Endemic in S. Portugal.

Prov. Algarve: Sagres: *P. Silva et al.* 660 (LISE); ibid., *Stud. biol. Rheno-Trai.* 59/247 (U); Cabo de S. Vicente: *P. Silva et al.* 4323 (LISE); ibid.: *A. Fernandes et al.* 7372 (COI) Lagos: *Bourgeau* 1868 (P). Prov. Estremadura: Sines: *A. Fernandes et al.* 3600 (COI).

This species is readily distinguishable from the other spp. occurring in the same part of Portugal by its very characteristic, almost orbicular leaves which are, like the flowers, densely covered with curved or curled hairs, and, furthermore, by its very compact, mat-forming habit.

16. **H. acrochaeta** (Bornmüller) Chaudhri comb. et stat. nov. *H. glabra* L. var. *acrochaeta* Bornm. in Mitt. Thür. Bot. Ver. 30:75 (1913).

Plate XVII, Fig. 19-21. p. 324

A small annual, deep-green herb; stems prostrate, up to c. 10 cm long, much-branched along their whole length; the branches densely leavy and often densely congested; internodes up to 5 mm long, almost entirely glabrous. Leaves mostly alternate, oblanceolate to narrowly oblong, up to 6 x 1.5 mm, often attenuate to the base, somewhat fleshy, mostly almost entirely glabrous, occasionally the margin sparsely ciliolate, the apex subacute to obtuse; stipules ovate-triangular, up to c. 1.25 x 0.6 mm, acute, margin almost entire and without ciliae. Flower-clusters leaf-opposed, 7 to 10 (-20)-flowered, very profuse and densely congested on the lateral shoots. Flowers sessile, 1.4-1.5 mm, ellipsoid; sepals very shortly and sparsely hirtellous (hairs being 0.15-0.25 mm and patent) to almost glabrous on the outside, each (sepal) with a minute (0.15-0.25 mm), erect, white hair at the apex, and 1.0-1.1 x 0.4 mm, subequal (to occasionally distinctly unequal), the two outer slightly longer than the inner three, the outer narrowly oblong, obtuse, the inner lanceolate, acute, all 3-nerved; receptacle rather short, 0.4-0.5 mm; petals 0.5 mm; filaments 0.35-0.4 mm; anthers 0.2 x 0.15 mm, quadrangular, orange, stamens two; style 0.2-0.25 mm, bipartite (cleft almost to the base) or, sometimes, two distinctly free styles; stigmas thick and divergent. Fruit 0.9-1 x 0.5-0.6 mm, ellipsoid (-oblong) nearly equalling (or slightly shorter than) the sepals. Fl. 7. Damp places.

Type: Palestine: Sarona: 'Aujah River, Alt. 5 m, 12.vii.1912, *J. E. Dinsmore* 3257 (holo. B! iso. JE!).

Endemic. Resembling *H. hirsuta* L. and *H. cinerea* DC. in habit, the former, moreover, in the hair-tipped sepals, and the latter, in the presence of two stamens, but it is distinguishable from *H. hirsuta* by its ± glabrous stems and leaves, very short and scarce, hairs on the sepal backs, the two stamens, and a prominent style; from *H. cinerea* in the presence of straight hairs on the sepals.

17. **H. cinerea** DC. in Lam., Fl. Fr. Suppl. 375 (1815).

De Candolle, Mém. Fam. Paronych. 10, tab. 3 (1829); Boissier, Fl. Or. 1:739 (1867); Willk. & Lange, Prodr. Fl. Hisp. 3:153 (1874); Nyman, Consp. 256 (1879); Batt. & Trab., Fl. Alg. (Dicot) 167 (1888); Bonn. et Barr., Cat. Tun. 64 (1896); Williams in Bull. Herb. Boiss. 4:565 (1896); Gürke in Richter-Gürke, Pl. Europ. 2 (2):188 (1899); Halácsy, Consp. Fl. Graec. 1:572 (1900); Rouy, Fl. Fr. 12:9 (1910); Durand & Barratte, Fl. Lib. Prodr. 43 (1910); Muschler, Man. Fl. Egypt, 1:351 (1912); Hayek, Prodr. Fl. Balcan. 1:172 (1924); L. Lindinger, Fl. Kanar. Ins. 158 (1926); L. Bouloumoy, Fl. Liban & Syr. 1:123, pl. 62, f. 6 (1930), Pampanini, Fl. Ciren. 190 (1931); Dinsmore in Post, Fl. Syr., Pal. & Sin. 1:211 (1932);

J. Thiébaut, Fl. Libano-Syr. 1:132 (1936); P. Mouterde, Nouv. Fl. Liban. & Syr. 1:453 (1966).
Type: Env. Montpellier: Inter Crès & Castelnau, *M. Pouzin* (holo. G-DC.! though without the name of the collector or of locality).
Syn.: *H. annua* Lagasca, Genera et Sp. Nov. 12 (1816). Type: Spain, probably Madrid, *Lagasca* (holo. ?, the type could not be traced in MA). *H. virescens* Salzm. ex DC., Prodr. 3:367 (1828): Type: Morocco: Tanger, 1825, *Salzmann* (holo. G-DC!). *H. flavescens* Lowe in Trans. Cambr. Phil. Soc. 21:6 (1838), et in Manual Fl. Madeira 1:297 (1868); Type: Madeira: v. 1828, *Lowe* 715 (holo. K!). *H. diandra* Bunge, Del. Sem. Hort. bot. Dorpat. 7 (1843), et in Mém. Sav. Etr. St.-Petersb. 7:296 (1847). Type: Soviet Union: *Alexander Lehmann* (holo. ? not present in LE). *H. hirsuta* L. var. *β hispida* Fenzl in Ledeb., Fl. Ross. 2:160 (1843). *H. cinerea* DC. var. *diandra* (Bunge) Boiss., Fl. Or. 1:740 (1867); Williams, op. cit. 4:566 (1896); Rouy, Fl. Fr. 12:9 (1910); Maire & Weiller in Maire, op. cit. 9:46 (1963) (as forma). *H. hirsuta* L. var. *cinerea* (DC.) Loret et Barrandon, Fl. Montpellier 243 (1876); Briquet in Burn., Fl. Alpes-Marit. 3:229 (1902) & in Prodr. Fl. Corse 1:484 (1910); Hermann in Fedde's Rep. 42:215 (1937); Maire & Weiller in Maire, op. cit. 9:44 (sub. *H. hirsuta*), & 45 (sub *H. incana*) (1963). *H. hirsuta* L. *β* (subspecies ? or race) *cinerea* (DC). Graebner in Aschers. & Graebn., Syn. 5 (1):882 (1919). *H. hirsuta* L. var. *hamata* Hermann in Ann. Naturhist. Mus. Wien 51:393 (1940-41); Parsa, Fl. Iran 1 (2):1241 (1951); V. Täckholm, Stud. Fl. Egypt 402 (1956) (incorrectly described as var. *cinerea* Herm.). Type: (of var. *hamata* Herm.): Greece: Aegaean Island KOS: *K. H. & F. Rechinger* 7996 (holo. W! iso. K!). *H. glabra* L. *β hirsuta* b. *cinerea* Fiori & Paoletti, Fl. Anal. Ital. 1:335 (1898).

Plate XVIII, Fig. 7-9. p. 345

An often light-green annual herb; stem prostrate, up to c. 20 cm long, branched from the base; internodes mostly up to 7 mm long, densely covered with short, patent hairs. Leaves usually oblanceolate to narrowly obovate, occasionally narrowly oblong, mostly up to 7 x 2.5 (rarely to 11 x 3) mm, attenuate to the base, the younger ones generally hirsute, the older often glabrescent; margin hirtellous; stipules ovate-triangular, acute, with a ciliate margin. Flower-clusters usually 7 to 10-flowered, leaf-opposed, densely congested on the short lateral branches. Flowers sessile, narrowly ellipsoid, 1.4-2.25 (-2.5) mm long, densely hispid with 0.4-0.75 mm, long stiff and patent hairs, the hairs longer and often straight on the upper part of the sepals, but somewhat shorter and uncinate, and not so stiff (though patent) on the basal part; sepals subequal in the younger stages to distinctly

unequal with maturity, the two outer narrowly oblong, obtuse, the inner three lanceolate and acute; petals c. 0.6 mm; stamens two, situated opposite the two outermost sepals; filaments 0.3-0.4 mm; anthers minute, c. 0.2 x 0.15 mm, almost quadrangular; violet when young, orange-yellow at maturity; style 0.2-0.5 mm (including the stigmatic part), bilobed; stigmas subsessile and divergent. Fruit narrowly ellipsoid, somewhat narrowed at the top, 0.75-1 x 0.6 mm, papillose on the top, enclosed by the sepals.

Fl. 2-7. Dry places, alt. up to 2300 m, but often at lower altitudes.

1a) Shoots minutely puberulous; leaves entirely glabrous; flowers finely hirtellous on the perigynous zone; sepals subglabrous ---- subsp. **euphratica**

1b) Shoots covered with short, patent hairs; leaves hirsute to glabrescent; flowers densely covered with stiff, spreading hairs, those on the perigynous region uncinate or coiled at the tip ..... subsp. **cinerea**

2a) Flowers 1.5-2.25 mm long ..... var. **cinerea**

3a) Internodes usually short; leaves up to 7 x 2.5 mm, flowers in dense, many-flowered clusters ..... subvar. **cinerea**

3b) Internodes long and slender; leaves (narrowly) oblanceolate, up to 11 x 3 mm, subglabrous; flower-clusters small, 3 to 6-flowered and distant ..... subvar. **laxa**

2b) Flowers 1.25-1.5 (-1.75) mm, covered with short and soft hairs ..... var. **virescens**

a) subvar. **cinera**: **West Pakistan:** Distr. Shahpur: 14.iv.1904, *Kabir* (G, K); Distr. Peshawar: *Rechinger* 30277 (W); Distr. Kohat: *R.* 30399 (W); ibid.: *Drummond* 864, 865 (K); Distr. Bannu: *R.* 30039 (W); Baluchistan; Distr. Quetta: *R.* 27324, *R.* 28393, *R.* 28785, *R.* 29637 (W); Distr. Kalat: *R.* 28376 (W); ibid.: *Jafri & Akbar* 1828 (K); 'Baluchistan': *Stocks* 743 (G, K). **Afghanistan:** Kandhar: *Kerstan* 366 (W); Kandhar to Girishk: *id.* 319 (W); Prov. Kabul: *Neubauer* 368, 369, 3184, 3193 (W); ibid: *Gilli* 1397, 1399, 1409, 1401, 1403 (W); ibid: *Volk* 2088 (W); E. Afghanistan: *Volk* 1918 (W); N. Afghanistan: *Volk* 2658 (W); NE: Gilli 1404 (W); Kabul to Paghman: *R.* 19317 (W); Nuristan: *Edelberg* 164 (W); 'Afghanistan': *Griffith* 1623, 1624 (K), 2478/1 (C, FI, L, LD, S); Prov. Qatagnam *R.* 16073, *R.* 16099, *R.* 16575 (W); Prov. Mazar-e-Sharif: *R.* 16380 (W); nr. Soviet border: *Köie* 4115 (W); Iranian Border: *Köie* 4114 (W). **Iran:** Prov. Kerman: *Bornmüller* 3335, 3336 (B); *Aellen & Esfandiari* 3801 (W); Prov. Kerman/Fars: *Aellen & Esfandiari* 3189b (W); Prov. Fars: *Stapf* 36, 37 (W); *Bornmüller* 172 (B); Prov. Laristan: *Bornmüller* 173, 174, 175 (B); Prov. Khorasan: *R.* 7489 (W); ibid. *Aellen* 7222 (W); Prov. Gorgan: *Sharif* 275 (G, W); Prov. Manzanderan: *Wendelbo* 1504 (W); N. Iran: Teheran: *Bornmüller* 3342 (B); ibid.: *Bowles Bot. Exp.* 1073 (K); Elburs Mts.: *R.* 654 (W); Rasht to Teheran: *J. & A. Bornmülier* 6474, 6475 (B); W. Azerbaijan: *Martin Grant* 16235/190 (W); *Bowles Exp.* 1493 (K); S. Lorestan: *Jacobs* 6372 (W); Kermanshah: *P. Furse* 1943 (N). **Soviet Transcaucasia: Azerbaijan:** Baku: *J. & A. Bornmüller* 6476 (B); *Holmberg* 16 & 367 (S); *R.* 2185 (W). **Iraq:** Jabal Hamrin: *Sutherland* 116 (K); Distr. Baghdad: *R.* 13414, 13456, 13477 (W); *Bornmüller* 948 (B); *Wheeler Haines* 103, 142 (E); *Polunin* 5009 (E); Babylon: *Nöie* 211, 267 (G); Distr. Kut-al-Imara:

R. 9223 (W); Distr. Amara: *R.* 14284, 14300 (W); *Edgar Evans* M/229 (E); Distr. Basra: *R.* 8412, 14435, 14467, 14571 (W); *Baghdad Univ. Bot. Dept.* 8457 (W); Southern Desert: *R.* 13774; *R.* 13825, 13866, 15838 (W); Distr. Diwaniya: *R.* 13567, 13644 (W); Western Desert: *R.* 9928 & 12539 (trans. with var. *virescens*); *R.* 2630 (W). **Syria:** Palmyra Desert: *Blanche* 3188 (G); *Samuelsson* 3586 (S); Homs: *Blanche* 3187 (G); Chanchar & Kousseir: v.vi.1933, *Wall* (S); Jabal Karn: *Dinsmore* 11510, 13180 (S); nr. Qaryein: *Davis* 5697 (E, K); Antilibnon: *Gaillardot* 1820 (G, JE); *Peyron* 1073 (G); nr. Damascus: *Peyron* 1749 (G); *Bornmüller, J. & F.* 11503 (B, E); *Barkoudah* 353 (U). **Turkey:** Vil. Mardin: *Sintenis* 1593 (LD); *Davis & Hedge* D.28654 (E, K); Vil. Gaziantep: Distr. Birecik: Kefre: *Sinténis* 1592 (LD); Vil. Maraş: Distr. Pazarcik: *Davis & Hedge* D.27785 (E); Vil. Içel: *Balansa* 992 (G); Vil. Izmir: Izmir: iii.1827, *Fleischer* (E, JE, Z); Burnabad: *Bornmüller* 9197 (B). **Greece:** Thrace *Sintenis & Bornmüller* 85 (partly) (B, mixed with *H. hirsuta*); *R.* 22351 (W); Attica: *De Heldreich* 538 (JE, W); iv-v.1885, *Haussknecht* (JE); mt. Elymetti: 6.vii.1888, *Halacsy* (W). **Crete:** Hierapetra: *R.* 13047 (K, W). **Aegaean Islands:** Cythno (Kythnos): iv.1900, *Tuntas* (W); Syra (Syros): 15.v.1848, *Orphanides* (W); Heraklia: *K. H. & F. Rechinger* 4886b (W); Kos. *K. H. & Fé Rechinger* 7996 (K, W, type of var. *hamata* Hermann); Lemnos: *R.* 1317 bis (W, mixed with *H. hirsuta*). **Cyprus:** Lefkonico: *Sintenis & Rigo* 234 (K, LD); Morphou: *Davis* 2534 (E, K); Nicosia to Famagusta: *Chapman* 714 (K); Larnaca: *id.* 448 (K); Skali (Akamos): *Meikle* 2103 (K). **Palestine:** Tiberias: *Field & Lazar* 274 (G, as *H. hemistemon*); Athlit: *Aaronsohn & V. Täckholm* 140 (S); Samaria: *Meyers & Dinsmore* B153 (E, G); Jaffa: *id.* 8153 (E); Askalan: *id.* 7180 (E, G, LD as *H. hemistemon*); Jerusalem: *Bornmüller* 2153 (E); Mt. Scopus: 28.iv.1932, *Wall* (S); Jericho: *Bornmüller* 218 (B). **Jordan:** E. of Amman: *R.* 12952, (W); W. of Azraq: *Townsend* 65/262 (K); Petra: *Dinsmore* 11180 (S); Wadi Musa: *Davis* 8705 (E, K). **Saudi Arabia:** *T. Carpenter & Moharraq* 132 (K). **Bahrain:** *Ronald Good* 267 (K). **Egypt:** Sinai, Mitla Pass: *Drar* 607 (S); Lower Egypt; Bir Digea: *Davis* 10578 (K); Alexandria: *Cadet de Fontenay* 58 (G); *Samaritani* 3231 (G, P, S). **Libya:** Marmarica: *Gauba* 123 (W); Leptis Magna *Guichard* KG/LIB/219 (BM); Tripolitania: Tripoli: *Taubert* 28 (E, G, JE); *Bornmüller* 625, 626, 627 (B); Syrte: *Sandwith* 2698 (K. **Tunisia:** Gabès: *Kralik* 60 (E); El Hamdou: *Pitard* 124 (B, K); Dj. Djeloud: *Pitard* 1156 (G, as *H. hirsuta*). **Algeria:** Prov. Constantine: iv.1912, *Thellung* (Z); Sahara: El Kantara: iii.1925, *L. Vaccari* (FI); Oued Biskra: *Kuegler* 54 (JE); Laghouat to Tadjemont: *Alston & Simpson* 100 (K); Ain Sefra: 6.iv.1910, *Schibler* (Z); Prov. Alger: *Bové* 99 (G); Prov. Oran: env, Oran: iv.1921, *Faure* (Z); Tircount: *Hochreutiner* 447 (Z); Tlemcen: 1.vi.1925, *Faure* (U). **Morocco:** Env. Oudja: 21.v.1930, *Faure* (G, S, Z); ibid. *Briquet* 1417 (G); Oudja to Taza: *Romieux* 1233 (G); env, Debdou: *Briquet* 40, 146 (G); Jabal Malmusi: *Font Quer* 174 (BM); nr. Melilla: vi.1931, *Sennen & Mauricio* (BM); Tizi Ksar es Souk: iv.1927, *Humbert* (S); Dj. Tannezart: *Gerbinot et al.* 897 (S); Great Atlas: Reraia valley: *Lindberg* 3426 (S); Ijonkak: *Balls* B.2522 (BM, E, S); Azilal: *H. Lynes* 173 (BM); Casablanca: *Pitard* 2683 (P); Settat: *id.* 2682 (P); Safi: *Jahandiez* 70 (G); nr. Mogadar: 5.iv.1936, *A. Uggla* (S); env. Agadir: v.1877, *Ibrahim* (G); Fonti: 3.vi.1888, *Ibrahim* (G). **Canary Islands:** Lanzarote: *Pitard* 74 (G, Z); Teneriffe: *Bourgeau* 723 (E, G, trans. with var. *virescens*); *E. Asplund* 974, 992 (S). **Madeira Islands** Desêrtas: *N. Mason* 63 (G, trans. with var. *virescens*); 'Madeira': *Lowe* 47, 795 (BM). **Portugal:** Algarve: Faro: *Kostermans & Kruyt* 539 (U). **Spain:** Prov. Granada: *Pedro del Campo* 36 (P); *Ellman & Hubbard* 787 (K); Prov. Jaèn: *Stud. biol. Rheno-Trai.* 1173 (U); Prov. Toledo: *id.*, iv.1951 (U); La Puebla de Don Fadrique: *Reverchon* 1188 (Z); Prov. Murcia: *Guirao* 1344 (P); *Gandoger* 353 (JE); Prov. Valencia:

Ball 202 (P); Prov. Zaragoza: *C. Vicioso* 1129 (JE); Prov. Tarragona: *Stud. biol. Rheno-Trai.* 62/196 (U); Prov. Barcelona: vi.1881, *Siegfried* (Z). **Balearic Islands:** Ibiza: *E. Welti-Hug* 697 (Z). **France:** Dep. Hérault: NW of Montpellier: *Leeuwenberg* 1524 (U, mixed with *H. hirsuta*); Vic-Mireval: 25.iv.1915, *Braun-Chur* (Z). **Italy: Sardinia:** Cagliari: 20.iv.1884, *P. Magnus* (HBG). **Sicily:** Favignana Island: 5.v.1855, *E. & A. Huet du Pavillon* (K). **Malta:** Gaulos Island: 19.iv.1874, *J. F. Duthie* (K).

b) subvar. **laxa** Chaudhri n. subvar. a subvar. *cinerea* internodiis longis et gracilibus, foliis majoribus (usque ad 11 mm longis et 3 mm latis) et subglabris, glomerulis haud congestis et e floribus paucioribus (3-6) compositis distinguenda: Internodes long and slender; leaves up to 11 x 3 mm, narrow, long, oblanceolate, with glabrous surfaces; flowers in small, few (3-6)-flowered, leaf-opposed and distant clusters. Type: Iran: nr. Shiraz: 16.vi.1885, *O. Stapf* 38 (W).

c) var. **virescens** (Salzmann) Ball, Spicil Maroc in Journ. Iinn. Soc. 16:639 (1878) (sub *H. annua* Lag.); Batt. & Trab. op. cit.

Syn.: *H. virescens* Salzmann ex DC., Prodr. 3:367 (1821). Type: W. Morocco: Tanger, 1825, *Salzmann* (holo. G-DC!). H. cinerea DC. var. *virescens* (Salzm.) Williams op. cit. 4:565 (1896). *H. hirsuta* L. subsp./race *cinerea* (DC.) Graebner in A. & G. op cit., forma *virescens* (Salzm.) Graebner op. cit. 5(1):882 (1919).

Distr.: W. Morocco, Canary & Madeira Islands, parts of SW Iraq, and Egypt.

Morocco: Dj. Iguiguil, Mardochée: 1875, *M. Beaumier* (G). **Canary Islands:** Teneriffe: Crotava: iv.1894, *Kraeplin* (HBG). **Madeira Islands:** 1856, *N. Mason* (Z); Porto Santo: *Mandon* 106 (G, JE, Z, trans. form). **Egypt:** nr. Mariut, Amria: *Bornmüller* 10415 (B). **Iraq:** Southern Desert: Jalib Bakur, 95 km SSE of A-Salman: *Rechinger* 13837 (W).

B) subsp. **euphratica** Chaudhri nov. subsp. a subsp. *cinerea* caulibus minute puberulis, foliis omnino glabris, floribus in zona perigyna, extus minute hirtellis sepalis subglabris distinguenda.

A small, pale-green herb; shoots up to c. 7 cm long, very finely puberulous; leaves oblanceolate, up to 11 x 2.25 mm, obtuse, entirely glabrous and rather thick; flower-clusters inconspicuous, mostly pseudo-axillary, few-flowered and distant; flowers minutely hirtellous on the perigynous zone, sepals glabrous and markedly unequal.

Type: S. TURKEY: Vil. Gaziantep, distr. Nisib: Nisib to Birecik, c. 5 km from the Euphrates, alt. 400 m, edge of field on marly soil, 14.v.1957, *Davis & Hedge* D. 27953 (holo. E!).

A very widespread and distinct species, but unfortunately a highly misunderstood and misrepresented one. Two of its essential characteristics, viz. the presence of uncinate hairs on the perigynous zone of the flower and the two stamens, have never been properly understood. Consequently, some of the individuals have been described as *H. diandra* Bunge, some others as var. *hamata* Hermann of *H. hirsuta* L. In fact it is easily distinguishable from *H. hirsuta* by its uncinate hairs

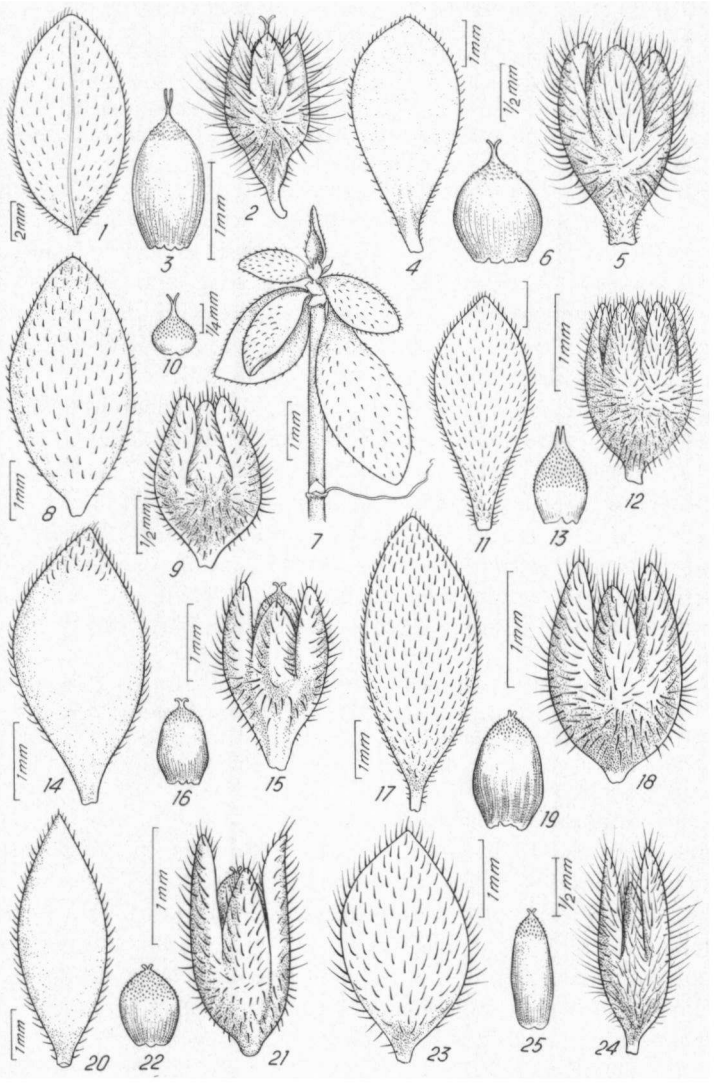

Plate XIX. Fig. 1-3: **H. latifolia**; 1: leaf; 2: flower; 3: fruit [*H. Elias* 1059 (JE)]. Fig. 4-6: **H. cachemiriana**; 4: leaf; 5: flower; 6: fruit [*Stainton* 3139(W)]. Fig. 7-10: **H. capensis**; 7: part of a shoot; 8: leaf; 9: flower; 10: ovary and style [*Schlechter* 1488(Z)]. Fig. 11-13: **H. pearsonii**; 11: leaf; 12: flower; 13: ovary and style [*Pearson* 4/3179(K)]. Fig. 14-16: **H. grimmii**; 14: leaf; 15: flower; 16: fruit [*Galpin* 6819(PRE)]. Fig. 17-19: **H. schlechteri**; 17: leaf; 18: flower; 19: fruit [*Schlechter* 1820(Z)]. Fig. 20-25: **H. erckertii**; 20: leaf; 21: flower; 22: fruit [subsp. **erckertii**: *Dieterlen* 152(PRE)]; 23: leaf; 24: flower; 25: fruit [subsp. **pulvinata**: *Mogg* 16946(PRE)].

on the perigynous zone as well as by the characters of the two stamens and a distinct though short style.

18. **H. erckertii** Hermann, Fedde's Repert. 42:219 (1937).

Plate XIX, Fig. 20-25. p. 352

A biennial or (mostly) perennial herb; stems prostrate, much-branched from the base, 10-20 cm long; internodes up to c. 10 mm long, often shortly hirtellous with patent hairs to puberulous; the lateral branches often densely covered with flower clusters. Leaves narrowly elliptic to obovate-oblanceolate, mostly up to c. 6.5 x 2.5 (rarely to c. 10 x 3.5) mm, rigid, acute, sparsely subhirsute in the younger stages to mostly glabrescent with age; margin shortly subhirsute with 0.3-0.5 mm long hairs, occasionally entirely glabrous; stipules ovate-triangular, 1.5-2 x 1-1.25 mm, acute, with a ciliate margin. Flower clusters (5-) 7 to 12-flowered, mostly leaf-opposed, occasionally pseudo-axillary, usually very profuse, densely congested on the lateral branches. Flowers sessile, (1.5-) 1.75-2 (-2.5) mm, narrowly oblong, mostly densely hirsute with 0.3-0.45 (-0.7) mm long hairs (sometimes covered with silky hairs), the hairs shorter at the base; sepals 1.25-1.4 x 0.4-0.45 mm, unequal, the two outermost 0.2-0.45 mm longer than the rest, and narrowly oblong, obtuse to subacute, the inner narrowly ovate to lanceolate and acute, the outer sepals moreover, in the fruiting stage, often slightly recurved at the tip; petals and filaments 0.3-0.4 mm long, almost equal in length; anthers c. 0.2 x 0.15 mm, quadrangular, orange-brown; styles two, distinct though very short, 0.15-0.2 mm, with small, dotlike, erect to divergent stigmas; Fruit c. 1.25 (or 1-1.5) x 0.75 mm, (ellipsoid-) oblong, almost equalling the sepals, papillose on the top; seed c. 0.75 x 0.5 mm, semi-orbicular. Fl. 9-12 (-4). Limestone slopes, gravelly flats, 'grassveld', alt. c. 1000-2000 m.

1a) Shoots densely congested; leaves covered with 0.5-0.6 (-0.7) mm long, soft, silky white hairs in the younger stages, but glabrescent with age; flowers with 0.5-0.6 mm long silky hairs ..... subsp. **pulvinata**

1b) Shoots often ± spreading; leaves hirtellous when young, but glabrescent with age, and the margin with stout, patent hairs; flowers covered with short (0.3-0.45 mm) patent hairs ..... subsp. **erckertii**

2a) Flowers 1.25-1.5 mm long ..... var. **dinteri**

2b) Flowers 1.75-2 (-2.5) mm long

3a) Leaves often with a hairy (sub-hirsute) margin; flowers densely hirsute with 0.3-0.45 mm long, stiff, patent hairs ---- var. **erckertii**

3b) Leaves often sub-glabrous; flowers generally shortly hirtellous to puberulous (with 0.2-0.3 mm long, soft hairs) ---- var. **dewetii**

A) subsp. **erckertii:**

a) var. **erckertii**: Type: (SOUTH AFRICA): *LESOTHO* (Basutoland): Léribé, *A. Dieterlen* 152 (as *H. hirsuta* L.) (holo. B, destroyed; ISO./NEOTYPE PRE!).

Lesotho (Basutoland): Distr. Thahaneng: *Watt & Branderyk* 2422 (PRE); Thaba Basin: *H. A. Junod* 1857 (Z). **S. Africa: Orange Free State:** Senekal: *A. P. Goosseus* 794 (PRE); Kroonstadt: *J. W. Pont* 419 (PRE, Z); Fauresmith: *Pont 1661* (U); *M. Henrici* 2895 (K). **Transvaal:** Standerton: *R. Leendertz* 3994 (PRE); Bethal: *id.* 3659 (PRE); Johannesburg: *id.* 1720 (PRE); ibid., *Moss* 2045 (BM, Z), & 9697 (K), 9802, 15960 (BM); ibid., *Gilfielan* 6170 (K); Vaal River nr. Hebron: *Flanagan* 1478 (PRE); Lydenburg: *F. A. Rogers* 14630 (Z); Lichtenburg: *H. Kinges* 1885 (PRE); Distr. Mafeking: *J. Burtt-Davy* 11075 (PRE); Bankfontein: *Burtt-Davy* 1715 (PRE). **Cape Prov.:** Distr. Bloemhof: *Burtt-Davy* 13114 (PRE); Distr. Postmasburg: *Leistner* 844 (PRE); Kimberley: *Acocks* 70 (PRE); Barkly West: *Acocks* 1436 (PRE). Kokstadt (Rohstadt?): *Mogg* 4833 (PRE); Distr. Indwe: *T. R. Sim* 20380 (PRE); Barkley East: iv.1898, *Sim* (PRE); Queenstown: *E. E. Galpin* 2155 (PRE); Witbergen: *Zeyher* 117.11 (S); Taba Uncha: *Zeyher* 611 (BM, S).

b) var. **dewetii** Hermann. op. cit. 219 (1937). Leaves often subglabrous; flowers shortly hirtellous to puberulous.

Cape Prov.: Nr. Middelburg Rly. Station: *H. G. Flanagan* 1393 (PRE, iso.-neotype); Distr. Middelburg: *Theron* 796 (PRE); Graaf Reinet: Miss *Bowker* 12 (K). **Orange Free State:** Distr. Philippolis: *C. A. Smith* 4351 (PRE); Fauresmith: *Pole-Evans* 1614 (PRE).**Natal:** Port Natal: *Drège* in 1839 (G). **Transvaal:** Magersfontein: xi.1918, *M. Wilman* (PRE).

c) var. **dinteri** Chaudhri, n. var. a varietatibus aliis floribus minoribus (1.25-1.5 mm altis), extus pilis 0.3-0.4 mm longis vestitis distinguenda. Flowers small, 1.25-1.5 mm long, covered with short hairs, 0.3-0.4 mm.

S. Africa: Bloemfontein: *Gust. Ad. Welti* in 1925 (Z). **South West Africa:** Hereroland, Orunnbo nr. Nosob, 13.xii.1899, *K. Dinter* 1270 (Z, Holotype).

B) subsp. **pulvinata** Chaudhri n. subsp. a subsp. *erckertii* caulibus pulvinatis, plerumque brevioribus (usque ad 7 cm longis), ex internodiis brevioribus (usque ad 6 mm longis) compositis, foliis minoribus sed pro rato latioribus (usque ad 4 mm longis et 2 mm latis), primum sericeis, floribus extus etiam sericeis distinguenda. Pulvinate perennial herb; stems up to c. 7 cm long; internodes up to c. 6 mm long, very shortly pubescent. Leaves elliptic to obovate, up to c. 4 x 2 mm, acute, covered with 0.5-0.6 (-0.7) mm long, silky, white hairs when young, but becoming glabrescent to glabrous with age, with a distinctly hairy margin, mostly purplish-green, and rather rigid. Flower-clusters 5 to 9-flowered, pseudo-axillary as well as leaf-opposed, crowded towards the end of the shoots. Flowers 1.75-2 mm, narrowly ellipsoid, purplish, covered with 0.5-0.6 (0.7) mm long, soft, silky, white, acroscopic to patent hairs; sepals subequal (when young) to unequal in the fruiting stage, the outer (two) oblong, obtuse, the inner narrowly ovate, acute; anthers minute, 0.15-0.2 mm in diam., quadrangular,

purplish-orange; stigmas subsessile, c. 0.15 mm, somewhat spreading. Fruit 1.25-1.5 x 0.75 mm, narrowly ellipsoid, almost equalling the sepals. Fl. 8. Mountain tops, alt. c. 1900 m.
Type: S. AFRICA: E. Transvaal: Distr. Middelburg, Sekhukumi Mts., Tautesberg summit, alt. c. 1900 m, 2.ix.1936, *A. O. D. Mogg* 16946 (holo. PRE!).

19. **H. schlechteri** Hermann, Fedde's Repert. 42:220 (1937).

Plate XIX, Fig. 17-19. p. 352

A small, annual (or occasionally biennial) herb; stems prostrate, 5-8 cm long, spreading from the base, somewhat purplish-green, shortly but densely pubescent with fine, retrorse hairs. Leaves sessile, obovate-elliptic, up to 7 x 3 mm, subacute to obtuse, rather thick, shortly adpressed pubescent; stipules ovate-triangular, 1.5-1.75 x 1 mm, acute with a ciliate margin. Flower-clusters 6 to 10-flowered, mostly leaf-opposed, very profuse, ± contiguous and densely congested on the short, lateral branches as well as at the ends of the main shoots. Flowers sessile, ellipsoid-oblong, 1.75-2.25 mm, densely covered with patent, fine, (0.3)-0.4-0.45 mm long hairs, on the basal part with shorter hairs; sepals c. 1.25 x 0.5 mm, equal when young, but slightly unequal in the fruiting stage, the outer then ovate-oblong, subobtuse, the inner narrowly ovate with acute and penicillate tip; petals, 0.45-0.5 mm; filaments 0.3-0.35 mm; anthers minute, c. 0.2 x 0.2 mm, quadrangular, orange-brown. Fruit ellipsoid (-oblong), 1-1.25 x 0.6-0.8 mm, rather densely papillose at the top; style 0.15-0.2 mm, bipartite or almost completely split, erect; occasionally the stigmas subsessile.
Fl. 9-11.
Type: S. AFRICA: In collibus prope Riversdale, alt. c. 130 m, 19.xi. 1892, *R. Schlechter* 1820 (as *H. hirsuta* L.) (holo. B, destroyed; isoneo-type Z!).
Endemic in the Southern Cape Province.

Riversdale Div.: nr. Riversdale: *J. Muir* 4495 (PRE); Swellendam: Mund 1806 (as *H. lenticulata* Thunb.) (S); The Poort, Bredasdorp: *Acock* 1511 (S); Humewood: *M. F. Daly* 1067 (Z); Top of Kelberg: *Hutchinson* 1632 (K); Hessaquas Kloof: *Zeyher* 2487 (S).

20. **H. saxatilis** Brummitt in Notes R. B. G. Edinb. 28:25 (1967). Brummitt in Davis, Fl. Turk, 2:249 (1967).

Plate XX, Fig. 1-3. p. 357

An annual or, occasionally, biennial pale-green herb; stems 8-15 cm long, much-branched from the base, branches often densely covered with flower clusters; internodes stout, up to 11 mm long, shortly pubescent with strongly deflexed hairs. Leaves oblong-elliptic to obo-

vate-spathulate, up to 9 x 4 mm, obtuse, covered with short (0.4-0.45 mm long), rather stiff, appressed hairs in the younger stages, but glabrescent with age; margin with short, stout, and spreading hairs; stipules ovate-triangular, up to 2.2 mm long, acute, with a reddish margin. Flower clusters (4-) 10 to 12-flowered, usually large, mostly leaf-opposed, very profuse and densely congested on the lateral branches. Flowers subsessile, 1.5-1.8 mm, densely hirtellous with 0.4-0.5 (-0.6) mm long hairs, the latter somewhat longer towards the top and much shorter in the perigynous zone; sepals equal, 0.7-0.8 mm long, the outer oblong, obtuse to subobtuse, inner narrowly ovate-lanceolate, acute-subacute, petals 0.45-0.5 mm; filaments c. 0.4 mm; anthers 0.15-0.2 mm in diam., quadrangular, and yellow; stigma subsessile, bilobed, the lobes c. 0.2 mm, divergent. Fruit c. 1.25 x 0.6 mm, more or less oblong, exceeding the sepals at maturity, papillose at the top. Fl. 7-8. Scree and dry stream bed, ca. 1550-2000 m.
Type: TURKEY: Vil. Denizli: Babadağ, alt. c. 2000 m, 23.viii.1950, *Davis* 18413 (holo. K! iso. E!).
Endemic in SW Turkey.
Vil. Muğla: Kara Tepe nr. Seki Yaila, alt. c. 1550 m, *Davis* 13870 (E).

This species is closely similar to *H. cinerea* DC. in habit and general appearance, but differs in the very short, deflexed hairs on the shoots (patent in *H. cinerea)*, the often more or less glabrous mature leaves, somewhat larger stipules, flowers covered with straight hairs (uncinate in the other sp.), five stamens (two in *H. cinerea*), a conspicuously bilobed stigma, and a fruit which often exceeds the sepals at maturity, at least in the type specimen. *H. latifolia* Lapeyr., a species occurring in N. Spain, is easily distinguishable by the distinctly elongate style, whereas in this sp. the stigma is almost sessile. The two species resemble each other only in the glabrous leaves and the shape of the flower.

21. **H. rhiphaea** Font Quer, Iter Maroc. 1927, no. 175 (1928) in obs. Syn.: *H. atlantica* Sennen et Mauricio, Cat. Rif. 23 (1933) nom. nud. *H. incana* Lam. subsp. *rhiphaea* (Font Quer) Maire, Fl. Afr. Nord 9:47 (1963).

Plate XX, Fig. 4-7. p. 357

A biennial herb; stems prostrate, up to c. 17 cm long, much-branched and branches spreading from the base; internodes stout, up to c. 1.5 cm long, densely spreading pubescent with 0.3-0.4 mm long, rather soft, patent hairs. Leaves elliptic-oblong to obovate-oblanceolate, 4-7 x 1.75-3.25 mm, mostly obtuse, attenuate to the base, often villous to densely pubescent with 0.5-0.6 mm long, closely appressed hairs, sometimes hirsute, the younger ones forming axillary fascicles

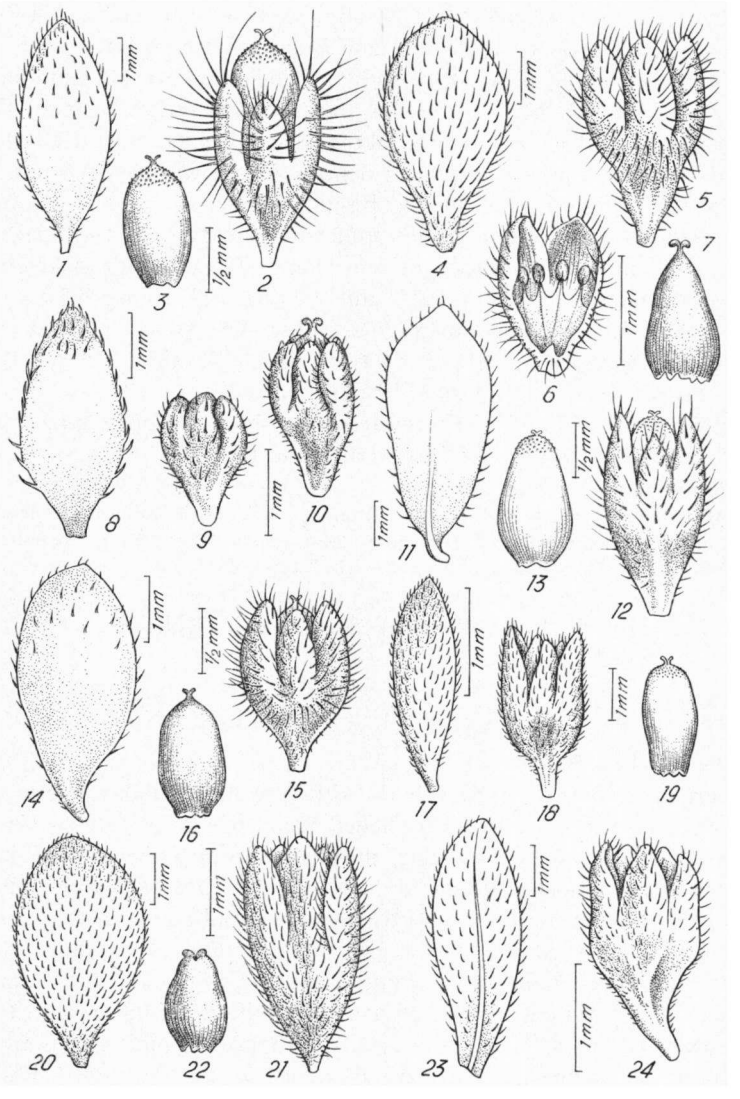

Plate XX. Fig. 1-3: **H. saxatilis**; 1: leaf; 2: flower; 3: fruit [*Davis* 18413(E)]. Fig. 4-7: **H. rhiphaea**; 4: leaf; 5: flower; 6: section of flower; 7: fruit [*Font Quer* 175(B)]. Fig. 8-10: **H. regnieri**; 8: leaf; 9: flower; 10: ripe flower with fruit [7. vii. 1924, *Maire* (FI)]. Fig. 11-13: **H. permixta**; 11: leaf; 12: flower; 13: fruit [viii. 1873, *G. Strobl* (W)]. Fig. 14-16: **H. micrantha**; 14: leaf; 15: flower; 16: fruit [*Bornmüller* 4494(E)]. Fig. 17-19: **H. boissieri**; 17: leaf; 18: flower; 19: fruit [*Huter, Porta & Rigo* 597 (JE)]. Fig. 20-22: **H. baetica**; 20: leaf; 21: flower; 22: fruit [*Porta et Rigo* 179(LD)]. Fig. 23-24: **H. pisidica**; 23: leaf; 24: flower [*Davis* 15805(E)].

in the axils of the older leaves; stipules ovate-triangular, 1.4-2 mm long, with a slightly ciliate margin. Flower clusters 3 to 7-flowered, leaf-opposed, very profuse, distinct on the main shoots but densely congested on the lateral branches, occasionally purplish-green. Flowers shortly stalked, c. 2 mm, obovoid to cuplike, narrowed downwards to a prominent receptacle, densely hispid with 0.4-0.6 mm long hairs, the latter shorter on the basal part; sepals equal, ± oblong, 1 x 0.4-0.6 mm, obtuse, often somewhat incurved at the apex, and with a distinct membranous margin; petals 0.6-0.7 mm; filaments c. 0.4 mm; anthers c. 0.4 x 0.25 mm, oblong and orange-brown; style very short and bipartite, the stigmas subsessile, rather thick, 0.15-0.2 mm long, divergent. Fruit 1.25 x 0.6-0.7 mm, ellipsoid.

Fl. 6. Sandy, stony places, alt. 1100-1600 m.

Type: MOROCCO: El Rif: In arenosis supra Targuist, alt. c. 1100 m, 5.vi.1927, *Font Quer* 175 (holo. BC! iso. B!).

Endemic in N. Morocco.

N. Morocco: Targuist: Bab-Izugan, 1400 m, 10.vi.1935, *Sennen & Mauricio* (BC, as *H. africana* (Batt.) Sennen et Mauricio); Atlas Rifain: Beni-Seddat, 1600 m, 22.vi.1933, *Sennen & Mauricio* (BC, type of *H. atlantica* Sennen).

22. **H. regnieri** Braun-Blanquet & Maire in Bull. Soc. Hist. Nat. Afr. Nord 16:28 (1925).

Syn.: *H. incana* Lam. subsp. *regnieri* (Br.-Bl. et Maire) Maire in Jahand. et Maire, Cat. Maroc. 217 (1932), Fl. Afr. Nord 9:47 (1963).

Plate XX, Fig. 4-7. p. 357

A perennial, often compact herb with a woody caudex; stems prostrate, 5-15 cm long, much-branched from the base, usually densely leafy; internodes 4-10 mm long, purplish, shortly pubescent to puberulous. Leaves mostly elliptic to suborbicular, 3-4 x 2 mm, obtuse, fleshy, with a purple tinge, shortly adpressed pubescent in the younger stages to almost glabrous with age; margin often with short, rather stout acroscopic hairs; the young leaves forming axillary fascicles; stipules ovate-triangular, c. 1.25 x 1 mm, with a ciliate margin. Flower clusters 5 to 10 (-12)-flowered, leaf-opposed, pink-green, usually profuse and congested towards the end of the branches. Flowers subsessile, 1.5-1.75 (-2) mm, obovoid-obpyriform to cup-like, rounded above (in the calyx region) and narrowed to the base, covered with 0.3-0.4 mm, stout but rather soft, loosely spreading to somewhat acroscopic hairs, much shorter on the basal (receptacular) part; sepals oblong to oval, 0.8-1 x 0.5-0.6 mm, obtuse, fleshy, connivent to incurved when young, petals 0.4 mm; filaments 0.5 mm; anthers c. 0.3 x 0.2 mm, almost oblong and orange; stigmas subsessile, c. 0.25 mm long, rather thick, divergent; Fruit ellipsoid to oblong, 1.25 x 0.5-0.6 mm, equalling or somewhat exceeding the sepals.

Fl. 6-7. Stony places, alt. ca. 2100-2900 m.
Type: MOROCCO: In Atlantis Majoris ditione Glaoua, Tizi-n-Telouet, in pascuis, alt. 2490-2900 m, 7.vii.1924, *R. Maire* (holo. MPU; iso. FI!P!).
Range: Morocco and S. Spain.

Morocco: Atlas Magnum: In convalle fl. Aït Messane, supra pag. Awound/Assound ca. 2100 m, *H. Lindberg* 3779 (LD); Tizi-n-Telouet, Glaoua, 2400-2900 m, 7.vii.1924, *R. Maire* (FI, P, isotypes). **Spain:** Malaga, Yunquera: *N. Hjalmar Nilsson* 806 (LD) (New record for Europe).

Related to *H. scabrida* Boiss. and *H. maritima* Link, but differing in its more compact growth, smaller, fleshy leaves which are almost glabrous at maturity, and by the loosely spreading, rather stout but soft hairs on the sepals. Its affinities with *H. incana* Lam. are very remote and confined to the structure of the pistil; *H. incana* is readily distinguishable by the scabridous leaves and hispid flowers apart from having a characteristic greyish appearance and a very prominent caudex.

23. **H. maritima** Link in Schrader, Journ. Bot. 1:57 (1800), & in Schrader, Neu. Journ. Bot. 1(2):136 (1806). Brummitt in Fl. Europ. 1:151 (1964).
Syn.: *H. incana* Lam. var. *β maritima* J. Gay in sched. ined.
H. maritima Link var. *α genuina* Daveau in Bol. Soc. Broter. 10:94 (1892).*H. glabra* var. *maritima* (Link) Williams in Bull. Herb. Boiss. 4:564 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):188 (1899).
Misapplied name: *H. ciliata* sensu Coutinho Willk. & Lange, Prodr. 3:152 (1874); Willkomm, Suppl. 217 (1893) pro parte, non Babington in Trans. Linn. Soc. 17:453 (1836), nec Clairville (1811).

A perennial herb; stems prostrate, stout, with a lignified base, up to c. 30 cm long, much-branched from the woody base, usually leafless in the basal (older) region; internodes often long (up to c. 2.5 cm), stout, pale-green and nodes thick, swollen; shortly pubescent with patent to somewhat deflexed hairs. Leaves broadly elliptic-rhombic to suborbicular, occasionally oblong, up to c. 7 x 3.5 mm, fleshy, densely adpressed pubescent on both sides, the older often glabrescent on the upper side, subacute to obtuse; stipules ovate-triangular, 1.75-2.5 mm long, with a densely ciliate margin, often coriaceous and reddish at the base, the upper (younger) occasionally almost entirely purplish; bracts, too, purple-red at the base. Flower-clusters (4) 7 to 15 (-18)-flowered, leaf-opposed as well as pseudo-axillary, often distant on the larger branches, but densely congested on the short, lateral ones. Flowers sessile, 1.5-2 mm, obovoid-obpyriform, sometimes ellipsoid, densely covered with somewhat appressed, acroscopic,

but sometimes spreading, rather soft though stout, (0.2-) 0.3-0.5 mm long hairs, occasionally scabridous; sepals oval-elliptic to subspathulate, c. 1 x 0.6 mm, obtuse, often incurved at the apex and concave; petals 0.65-0.7 mm; filaments c. 0.6 mm; anthers 0.4 x 0.25 mm, oblong, purplish-orange; style 0.25-0.3 mm (including the stigmatic part), bipartite, with large, thick, almost sessile, divergent stigmas. Fruit c. 1.25 x 0.75 mm, ovoid-ellipsoid, equalling the sepals.
Fl. 5-8. Maritime sand dunes.
Type: Portugal: Fort St. Juliano (or Juliao?), W. of Lisbon ('3 stunden von Lissabon'), *Link* (holo. probably B, destroyed).
Endemic in W. Portugal, S. of Tagus or 39° parallel.

Portugal: Estremadura: Callares: 17.v.1905, *Kuegler* (JE); Cascais: *J. Daveau* (COI); Trafaria: *Daveau* 97a (COI), 2736 (JE, LD, W, Z), & 2829 (B, JE); ibid.: *J. Pedro et al.* 10 (LISE); Sezimbra: *M. Silva & V. Louranco* 260 (LISE); Setubal: *Rothmaler* 13519 (B, LISE, forma *pubescens;* flowers shortly puberulo-pubescent) ibid.: *Bento Rainha* 535 (LISE, forma *compacta;* shoots short and densely congested); Baixo Alentejo: Alcacer do Sal: *C. Fontes & M. Silva* 1711 A (LISE); ibid.: *P. Silva et al.* 4410 (LISE); Odemira *Rothmaler* 15996 (B, LISE).

24. **H. scabrida** Boiss., Elenschus 42 (1838).

Boissier, Voy. Bot. Espagne 2:217, tab. 62a (1839); Willk. & Lange, Prodr. Fl. Hisp. 3:152 (1874); Williams in Bull. Herb. Boiss. 4:563 (1896); Brummitt in Tutin et al., Fl. Europ. 1:152 (1964).
Type: 'Hab. in Hispania australi, interiori prope Matritum, *Carreno* sub *H. hirsuta*' (holo. G).
Syn.: *H. glabra* L. var. *scabrida* (Boiss.) P. Coutinho, Fl. Portug. (Vasc.) 202 (1913). *H. hybernonis* Elias et Sennen in Bol. Soc. Iber. Cien. Nat. 27-28:68 (1928). Type: N. Spain: Burgos: Montanana, 20.vii.1919, *Elias* 3858 (holo. BC! iso. COI!).
H. unomunoana Sennen in Butl. Inst. Catal. Hist. Nat. 32:97 (1932). Type: See under var. *unomunoana.*
Icon: Boissier, Voy. Bot. Esp. 2:217, tab. 62a (1839).

A perennial herb; stems prostrate, up to c. 45 cm long, often spreading from a woody caudex; internodes stout, up to c. 2 cm long, covered with short (0.2-0.3 mm), patent to deflexed, usually soft, sometimes slightly scabridous hairs. Leaves narrowly elliptic to almost oblong, up to c. 6.5 x 3 mm, subacute to subobtuse, often rather rigid, densely covered with stout, appressed 0.3-0.45 mm long hairs, those on the margin somewhat spreading, occasionally puberulous to subglabrous, often pale green; the younger ones forming axillary fascicles; stipules ovate-triangular, c. 1.5 x 1 mm, acute, with a ciliate margin, the upper (younger) ones usually with purple-red spots, and the bracts often almost wholly red. Flower clusters (4-) 6 to 12-or many flowered, generally large, leaf-opposed, very profuse and densely crowded on

the short lateral branches. Flowers sessile, (1.25-) 1.5-1.6 (-1.75) mm, obpyriform; sepals equal, oblong, 0.6-0.9 x 0.4-0.5 mm, obtuse, the inner somewhat concave and incurved, usually all densely covered with very short (0.15-0.3 mm), rather soft, spreading hairs, occasionally with somewhat longer (0.4-0.5 mm), but less dense, stiff and patent hairs; petals 0.4-0.45 mm; filaments 0.5-0.55 mm; anthers 0.3 x 0.2 mm, nearly oblong, orange-yellow to-brown. Fruit ovoid, 1-1.25 x 0.75 mm, equalling or somewhat exceeding the sepals.

Fl. 5-8. Dry stony places, alt. 200-1000 m.

Key to the subspp. and varieties:

1a) Flowers densely covered with short (0.2-0.3 mm) patent hairs; style (including the stigmatic part) 0.2-0.3 mm long ..... subsp. **scabrida**

2a) Flowers 1-1.3 (-1.4) mm, shortly velvety-pubescent ..... var. **unomunoana**

2b) Flowers 1.4-1.75 mm long, covered with short, dense, patent hairs or, occasionally, glabrescent

3a) Leaves finely hirtellous to glabrescent; flowers mostly 1.5-1.75 mm, sparsely covered with short hairs ..... var. **glabrescens**

3b) Leaves often covered with short, rather stout, appressed hairs; Flowers densely covered with short (0.2-0.3 mm) hairs ..... var. **scabrida**

1b) Flowers with long (0.4-0.5 mm) stout, spreading hairs; style very short, stigma subsessile, 0.15-0.2 mm long, stigma-lobes almost capitate ..... subsp. **guadarramica**

4a) Flowers covered with stiff spreading hairs ..... var. **alemtejica**

4b) Flowers with loosely spreading (somewhat curled) hairs — var. **guadarramica**

a) var. **scabrida:**

France: Dep. Loire Atlantique: Arthon-en-Retz, 36 km W. of Nantes: *Stud. biol. Rheno-Trai.* 63/3740 (U, new record for France). **Spain:** Prov. Leon: V. de Vierzo: 18.vi.1909, *Gandoger* (G); Prov. Burgos: Montana: *H. Elias* 3858 (COI, type of *H. hyberonis* Elias et Sennen), 4284 (MA); Miranda de Ebro: *M. Losa* 7464 (FI, Z); Arlanzon river: *Sandwith* 5658 (K); Prov. Soria: Nodalo: vii.1936, *C. Vicioso* (MA); Prov. Zaragoza: Calatayud: 27.vi.1910, *Vicioso* (MA); Prov. Teruel: above Albarracin: *Stud. biol. Rheno-Trai.* 62/1563 (U); Prov. Valladolid: Olmedo: *D. Gutirez* (MA); Prov. Salamanca: Pena de Francia: vii.1946, *A. Caballero* (MA, trans. with var. *glabrescens*); Prov. Madrid: Sierra de Guadarrama, c. 1830 m, *Sennen et al.* 7126 (MA); Prov. Malaga: v.1837, *Boissier* (K); Sierra de Mijas, supra Alhaurin: *Huter, Porta, Rigo* 591 (FI); Yunquera: vi.1878, *Hegelmaier* (W). **Portugal:** Tras-os-Montes: Bragança: vi.1879, *Ferreira* (COI); Ponte de Recongos: *F. Fontes et al.* 2556 (LISE); Serra de Montemura *id.* 2620 (LISE); Alto Douro: Pinhao: *J. Paira et al.* 8203 (COI); Miranda do Douro: vi. 1888, *Mariz* (COI); Doural Litoral: Serra do Marao: *P. Silva et al.* 5622a (LISE); Porto: *Fonseca* 75 (COI); Beira: Guarda: *Mendoça* 3271 (COI); ibid.: *R. Fernandes & A. Fernandes* 2713 (COI); Viseu: vii.1886, *Ferreira* (COI); Vilar Formoso: *B. Rainha* 2937 (LISE); Pene Verde: *stud. biol. Rheno-Trai.* 66/1594 (U); Coimbra: *A. Fernandes et al.* 6686 (COI); Pamphilhosa: ix.1887, *J. Hen-*

rigues (COI); Serra de Estrella: above Gouveia: *de Smidt* 66/P3 (U); Rio Paivó: *A. Fernandes et al.* 5372 (COI); Alentejo: Serra de S. Mamede *C. Fontes et al.* 241 (LISE); Portalegre: *Rothmaler* 15420 (LISE); Estremadura: Berlenga Is.: *P. Silva et al.* 4455 (LISE); Velha Is.: *Daveau* 45 (COI); S. Fiel: /1901, *Zimmerman* (COI).

b) var. **glabrescens** Boiss., Voy, Bot. Esp. 2:217 (1839):

Syn.: *H. glabra* L. var. *scabrescens* R. de Roem. in Willk. et Lange, Prodr. Fl. Hisp. 3:152 (1874); Willk., Suppl. 217 (1893); Williams op. cit. 4:564 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):188 (1899). Type: Spain: *Willkomm* 1845: 1153 (holo. probably COI, not seen).

Shoots stout, elongate; leaves usually subglabrous to glabrous, and with a very shortly hairy margin; flowers 1.5-1.75 mm, sparsely puberulous; fruit often distinctly exceeding the sepals; stigma-lobes 0.25-0.3 mm, usually conspicuous and divergent. Type: Malaga: Sierra Tejeda v. 1837, *Boissier* (holo. G).

Scattered in N., W., and SE Spain as well as in NE Portugal.

Spain: Prov. Burgos: nr. Arando de Duero, v. 1952, *R. Butcher* (K); Prov. Soria: Montenegro de Cameros: vi.1925, *A. Caballero* (MA); Prov. Salamanca: La Alberca: vi.1946, *id.* (MA); Prov. Granada: Sierra Nevada: Dehesa de S. Geronimo: *Huter, Porta & Rigo;* 1879:596 (G, as *H. glabra* L. var. *scabrescens* R. de Roem). **Portugal:** Prov. Minho: Marg do Rio Minho: *A. R. da Cunha* 147 (COI); Beira: Santa Comba-Dad; 200 m, viii.1941, *A. P. da Silva* (LISE); Linhares: vii.1890, *Ferreira* (COI); Serra de Estrella: viii.1881, *J. Henrigues* (COI); Oliveira do Conde: vi.1886, *Moller* (COI); Ceia, S. Ramao: *F. Fontes & B. Rainha* 2776 (LISE); Castello Brancho: *da Cunha* 14 (COI).

This taxon shows an extreme variability in its indumentum, and in some cases (e.g. *Huter et al.* 596 (G) from Granada, and *da Cunha* 147 (COI) from Minho) one branch is covered with short hairs, while another one from the same shoot is entirely glabrous. No wonder that most of the authors have considered it a variety (*scabrescens* R. de Roem.) of *H. glabra.* But the floral characters are distinct enough to distinguish it from *H. glabra.*

c) var. **unomunoana** (Sennen) Chaudhri stat. nov.:

H. unomunoana Sennen op. cit.

Type: Spain: nr. Madrid: 24.vii.1929, *Sennen & Jerónimo* 7127 (holo. BC.; iso G!).

Syn.: *H. scabrida* var. *grisea* Reuter ap. Williams op. cit. nomen nudum. Type: SE Spain; Prov. Malaga: nr. Yunquera: *Boissier et Reuter* in 1849 (holo. K!).

Plant often deep-green; shoots slender, rather short; leaves small, adpressed velvety-pubescent; flowers 1-1.3 mm (or up to c. 1.4 mm), mostly c. 1.25 mm, very shortly velutino-pubescent to -puberulous.

Central Spain and E. Portugal.

Spain: Chamartin, près Madrid: *Bourgeau* 2269 (FI, P); ibid.: *Sennen & Jerónimo* 7127 (G); Escorial: Gerro de los Avantos: *Ellman & Hubbard* 1022 (K). **Portugal:**

Beira: Vilar Formoso: vi. 1890, *Ferreira* (COI); ibid.: *J. G. Garcia* 369 (COI); Guarda: vii.1885, *Ferreira* (COI); Gouveia: *id.* vii.1905 (COI); Estremadura: Sezimbra: *Rothmaler* 13426 (LISE; Alentejo: Vendas Novas: *Garcia & Souza* 984 (COI).

B) subsp. **guadarramica** Chaudhri n. subsp. a subsp. *scabrida* foliis aut sericeis (var. *guadarramica*) aut strigosis (var. *alemtejica*), floribus pilis longioribus (0.4-0.5 mm longis) obtectis, stigmatibus subsessilibus et brevioribus (0.15-0.2 mm longis) distinguenda. Leaves usually densely covered with silky, soft, closely appressed hairs (though rather stout in var. *alemtejica*); flowers 1.35-1.6 (-1.75) mm, densely covered with c. 0.5 mm long, mostly silky, soft and loosely spreading or somewhat curled hairs (stout and stiffly spreading in var. *alemtejica*); stigmas almost sessile, often nearly capitate. Central and SW Spain, and SE Portugal.

i) var. **guadarramica:** Plants often light (greyish-) green; leaves densely covered with closely appressed, silky-soft hairs; flowers 1.35-1.6 mm long, densely covered with c. 0.5 mm long, rather loosely spreading or somewhat curled hairs; stigmas (stigma-lobes) almost capitate. Type: SPAIN: Sierra de Guadarrama, Cercedilla: vii.1914, *C. Vicioso* (holo. MA!).

Plate XXI, Fig. 1-3. p. 384

Endemic in Sierra de Guadarrama.

Sierra de Guadarrama: vii.1914, *C. Vicioso* (MA, type) & vii.1916 (FI); El Escorial, nr. Madrid: vii.1916, *id.* (MA); ibid.: *Vicioso* 2946 (F. Sennen Pl. Esp. (MA).

ii) var. **alemtejica** Chaudhri n. var. a var. *guadarramica* floribus pilis regidioribus obtectis distinguenda.

Leaves usually covered with stout, appressed hairs; flowers 1.6-1.75 mm, covered with 0.4-0.5 mm long, stout, stiffly spreading hairs; stigmas somewhat spreading.

Type: PORTUGAL: Prov. Alto Alemtejo: Elva: *P. Silva et al.* 5357 (holo. LISE!). SE Portugal and SW Spain.

Portugal: Alentejo: Elva: *P. Silva et al.* 5357 (LISE, type); Degolados to Campo Maior: *A. Fernandes et al.* 8642 (COI); Evora; v.1891, *Moller* (COI); Vendas Novas: *Garcia et Sousa* 1209 (COI, trans. form); Estremadura: Herdade da Ramalha: *A. Fernandes et Sousa* 1850 (COI); Beira: Serra de Lousa vi.1879, *Moller* (COI). **Spain:** Cáceres: Cercanias del rio Guadarranque: 25.v.1949, *Caballera* (MA); Córdoba: Sierra Morena: *Sandwith* 6154 (K); Granada: Sierra Nevada: 25.vii.1930, *C. Vicioso* (MA, trans. form).

25. **H. cyrenaica** Hermann in Fedde's Repert. 42-221 (1937).

Type: Libya: Cyrenaica: Benghasi, 27.i.1883, *G. Ruhmer* 56 (as *H. hemistemon*) (holo. B, destroyed; iso. G!JE!LD!W!Z! neotype LD, the upper specimen).

Syn.: *H. glabra* L. var. *cyrenaica* Pampanini, Archiv. Bot. 12:10 (1936). Type: Cyrenaica: Benghasi: *Pampanini* 2418 (holo. FI! iso. G!).

Type: Cyrenaica: Benghasi: *Pampanini* 2418 (holo. FI! iso. G!).

H. incana Lam. subsp. *cyrenaica* (Herm.) Maire et Weiller in Maire, Fl. Afr. Nord 9:48 (1963).

A perennial herb with a woody caudex; stems prostrate, 10-22 cm long, much-branched from the base; internodes long (up to c. 1.2 cm), stout, purplish, densely covered with stiff, short and patent hairs (and thus hispidulous). Leaves obovate-oblanceolate to narrowly elliptic mostly up to 6 (-8) x 3 mm, acute to obtuse, narrowed to the base, on both sides hirtellous or hispidulous on the under side, especially in younger stages, but often subglabrous or glabrous with age; margin shortly hirsute with stiffly spreading hairs, rarely entirely glabrous; stipules up to c. 1.5 mm long, with a densely ciliate apex and margin. Flowers subsessile, in 7 to 10 or many-flowered, leaf-opposed, usually very profuse clusters, often densely congested on the short lateral branches, but sometimes solitary, (1.5-) 1.75-2 (-2.5) mm, ± cylindrical, often scabridous or hirtellous, being densely covered with short, 0.2-0.3 (-0.35) mm, stiff, patent and bristly hairs; sepals oblong to spathulate-oblong, 1-1.2 mm long (0.5-0.6 mm wide), obtuse, ± equal, the inner occasionally somewhat shorter in the central flowers, often somewhat incurved; petals 0.4-0.45 mm; filaments 0.5-0.6 mm; anthers 0.25-0.3 x 0.2 mm, oblong, orange-brown; ovary (young) 0.4-0.5 mm in diam., ovoid-globose, papillose at the top; stigma subsessile, c. 0.2 mm, bi-partite, the lobes divergent; ripe fruit not seen. Fl. 3-5.

a) var. **cyrenaica:** Shoots with short, patent hairs; leaves with stiff hairs along the margin; sepals densely hispidulous.

Cyrenaica: Benghasi: Ruhmer 56 (as *H. hemistemon*) (G, HBG, JE, LD, W, Z); ibid.: *Pampanini* 2417, & 2419 (FI); 2418 (FI, G, type of *H. glabra* var. *cyrenaica* Pampanini); ibid.: *Sandwith* 2228 (K); Cyrene: *Pampanini* 2421 (FI); Tecasis: *id.* 2420 (FI); Cyrenaica: *Pampanini & Pichi-Sermoli* 2422 (FI); *Sandwith* 2304 (K); *H. G. Keith* 382 (K).

b) var. **subglabra** Chaudhri n. var. a var. *cyrenaica* caulibus minute hirtellis sed partibus aliis omnibus glabris distinguenda. Shoots very slightly hirtellous, but leaves and flowers glabrous. Type: mixed with the type of var. *cyrenaica* (LD), the lower specimen. Endemic in Benghasi.

This is a well-marked species, and it is therefore astounding to see that such a good species has been treated in Maire & Weiller's account (op. cit.) partly as a variety of *H. glabra* and partly as a subsp. of *H. incana.* Their treatment, in fact, clearly reflects their confused thinking, an obvious consequence of an imperfect understanding of this difficult genus. In point of fact this species has no affinity whatsoever with *H. glabra,* and but little relationship with *H. incana.* It, however, shows some resemblance to *H. scabrida* Boiss., but is distinguishable by the characteristic hairiness of its shoots, leaves and

flowers. The shoots are covered with dense, patent hairs, the leaves on both sides with rigid, rough hairs when young, and the flowers (cylindrical, not obpyriform as they are in *H. scabrida*) with rough, bristly hairs. Besides, it possesses a more or less sessile, and bipartite stigma, and a papillose ovary.

It is a pity that Ruhmer's specimen is not properly developed; it was collected very early in the season, and consequently, is not a typical representative of the main population.

26. **H. oranensis** Chaudhri n. spec.; forsitan *H. glabra* L. var. *scaberrima* Hermann in Fedde's Repert. 42:221 (1937), sed in absentia typi varietas haec non certe identificanda; *H. glabra* L. var. *scabrescens* R. de Roem. forma *scabriflora* Faure et Maire in Maire, Fl. Afr. Nord 9:42 (1963), sine descriptione latina.

Plate XVIII, Fig. 1-3. p. 345

Herba perennis vel annua (var. *subglabrifolia),* olivacea, caudice lignoso instructa; caules prostrati, usque ad 33 cm longi, a basi usque ad apicem dense ramificati; internodia usque ad 15 mm longa, robusta, plerumque colore rubeolo imbuta, pilis retrorsis hirtella. Folia oblanceolato-obovata vel obliquius oblonga, usque ad 5 mm longa et 1.75 mm lata, acuta usque ad obtusa, in var. *oranensi* utrimque hirtella vel appresse pubescentia, in var. *sublabrifolia* subglabra, margine pilis 0.2-0.3 mm longis, acroscopis, plerumque olivaceis obtecta; stipulae ovato-deltoideae, usque ad 1.0 mm longae et 0.5 mm latae, acutae, margine parce ciliatae. Glomeruli foliis oppositi, e floribus (5) 10-15 (19) compositi, in ramulis lateralibus ubique e caulibus emergentibus dense congesti. Flores subsessiles, cupuliformes usque ad obpyriformi-obovoidei, 1.25-1.4 mm alti, pilis 0.15-0.2 (0.3) mm longis, patentibus vel plus minusve acroscopis obtecti; sepala oblonga vel ovato-oblonga, 0.6-0.75 mm longa et 0.45 mm lata, subobtusa, apice paulo incurvata, interdum in pilum brevissimum sed rigidiorum exeuntia; petala 0.4-0.45 mm longa; stamina filamentis 0.55-0.6 mm longis instructa; antherae oblongae, 0.25 mm longae et 0.2 mm latae, luteo-aurantiae; stigma subsessile, circ. 0.15 mm longum, bipartitum, lobis appressis vel paulo divergentibus. Fructus anguste ellipsoideus, 0.75-0.8 (1.0) mm longus et 0.5 mm diam., apice paulo angustatus, plerumque longitudine sepalis aequalis vel ea paulo excedens, sublaevis. Fl. 4-6.

Type: ALGERIA: Prov. Oran: Environs d'Oran, 5.v.1911, *A. Faure* (holo. G!).

Endemic in NW Algeria.

Prov. *ORAN:* Oran, 5.v.1912, *Faure* (E); La Macta, 28.iv.1912, *id.* (E); Env. Oran: 5.v.1911, *Ch. d'Alleizette* (P); Dj. Ksel, près Geryville,

30.v.1856, *Cosson* (P) (all as *H. glabra* L.).
a) var. *oranensis:* Perennial; leaves often covered with short, appressed hairs.
b) var. **subglabrifolia** Chaudhri n. var. a var. *oranensi* tempore vigendi annuo, foliis utrimque subglabris et laevibus distinguenda. Annual; leaves on both sides subglabrous and smooth.
Type: *Algeria:* Environs de Tiaret, ca. 1100 m, 10.vi.1919, *A. Faure* (holo. S!).

27. **H. boissieri** J. Gay in Duchartre, Rev. Bot. 2:370 (1847). Willk. & Lange, Prodr. Fl. Hisp. 3:152 (1874); Maire & Weiller in Maire, Fl. Afr. Nord 9:49, f. 13 (1963); Brummitt in Tutin et al. Fl. Europ. 1:151 (1964).
Type: SE Spain: Sierra Nevada, alt. 8.000-10.000 m. v. 1837, *Boissier* (holo. G).
Syn.: *H. frigida* J. Gay ex G. Kunze in Flora 29:650 (1846) nomen nudum; Williams, op. cit. 560 (1896); Gürke op. cit. 186 (1899). Misapplied name: *H. alpina* sensu Boiss., Voy. Bot. Esp. 2:218 (1839), non Chaix in Villars, Hist. Pl. Dauph. 1:379 (1786).

Plate XX, Fig. 17-19. p. 357

A small, densely branched perennial herb; stem 5-15 cm long, with a woody, partly subterranean caudex, much-branched, the branches usually almost caespitose, younger branches densely covered with leaves and flower-clusters; internodes often quite short, not exceeding 4 mm, very shortly pubescent. Leaves elliptic to oblong-spathulate, up to 2.5 x 1.5 mm, obtuse to subobtuse, fleshy, densely adpressed velvety-pubescent with short, closely appressed, silky hairs, (leaves) often closely arranged, very conspicuous, light-green when young to pale-golden with marurity; stipules lanceolate-triangular, up to 2 x 1.25 mm, with a rather slightly ciliate margin. Flower clusters (4-) 6 to 12-flowered, pseudo-axillary as well as terminal, very profuse and densely congested towards the end of the shoots. Flowers sessile to subsessile, 1.25-1.6 mm long, cup-like to obovoid-obpyriform, almost globose in the calyx region and narrowed to the base, densely velutinous pubescent with closely appressed, short, silky hairs; sepals ± oblong, obtuse to subobtuse, 0.75-1 x 0.4-0.5 mm; petals 0.35-0.4 mm, equalling the filaments; anthers 0.2-0.25 x 0.15-0.2 mm, quadrangular-oblong, orange-brown; stigmas (0.2-)0.15-0.2 mm, ± sessile, divergent to occasionally capitate. Fruit 0.75-1 x 0.5-0.75 mm, ellipsoid to ovoid-globose, equalling or slightly exceeding the sepals; seed 0.5 x 0.4 mm. Fl. 7-8. Alpine regions, alt. ca. 2300-3000 m.
a) subsp. **boissieri:** Shoots up to 8-10 cm long; flowers 1.25-1.45 mm; sepals up to 0.75 x 0.4 mm; anthers 0.2 x 0.15 mm; stigmas 0.15-

0.2 mm, prominent and divergent. Fruit 0.75-0.8 x 0.5 mm. Distr.: SSE Spain: Sierra Nevada.

Sierra Nevada: Picacho de Veleta: *Bourgeau* 1343 (FI); ibid.: 12.vii.1878, *C. F. Hegelmaier* (JE, W); ibid.: *Huter, Porta, Rigo* 597 (FI,JE, W); Penon de S. Francesco & Picacho: *Porta & Rigo* 566 (JE); Cueva de Panderone: *P. del Campo* 35 (FI); ibid.: 31.vii.1876, *E. Hackel* (FI, W); ibid.: *N. Hjalmar Nilsson* 1717 (LD); Prov. Granada: *Stud. biol. Rheno-Trai.* 67/1389, 67/1853, 67/1856, 67/1876, 67/1892 (U).

b) subsp. **maroccana** (Font Quer) Chaudhri stat. nov. *H. frigida* Gay var. *maroccana* Font Quer in Cavanillesia 3:57 (1930). Maire et Weiller in Maire, op. cit. 9:50 (1963).

Shoots up to 15 cm long; flowers 1.5-1.6 mm; sepals 0.8-1 x 0.45 mm; anthers 0.25 x 0.2 mm, dark-brown; stigmas 0.1-0.15 mm, capitate and appressed on the top of the ovary. Fruit 0.8-1 x 0.65-0.75 mm, ovoid-globose.

N. Morocco: montis Tidiguin (Ktama), alt. 2350 m, 17.vii.1929, *Font Quer* 142 (holo. probably BC; iso. FI! S! Z!).

Endemic in N. Morocco.

28. **H. baetica** Boiss. et Reuter in Boiss., Diagn. Pl. Or. Nov. Ser. 2, 3 (1):95 (1854).

Willk. & Lange, Prodr. Fl. Hisp. 3:153 (1874); Williams, op. cit. 559 (1896); Gürke in Richter-Gürke, Pl. Europ. 2(2):186 (1899); Brummitt in Tutin et al., Fl. Europ. 1:152 (1964).

Misapplied name: *H. incana* sensu Boiss., Voy. Bot. Esp. 2:218 (1839), non Lam., Encycl. Méthod. Bot. 3:124 (1789).

Plate XX, Fig. 20-22. p. 357

A perennial, greyish-green herb with a strongly lignified caudex or rhizome; stems prostrate, 20-30 (-50) cm long, much-branched and spreading from the base; internodes up to 1.5 cm long, densely covered with short, soft, patent hairs. Leaves elliptic-oblong to broadly obovate or suborbicular, up to 7 x 4.5 mm, densely adpressed pubescent with closely appressed hairs, obtuse, slightly narrowed to the base, mostly opposite; stipules ovate-triangular, 1-1.25 x 0.8 mm, acute, with a slightly ciliate margin. Flowers in few (2 to 6-) flowered terminal and subterminal clusters, towards the ends of branches often forming long, dense, almost leafless, spike-like structures, occasionally leaf-opposed and sometimes solitary. Flowers subsessile, 2-2.5 mm long, ellipsoid-cuplike, densely covered with short (0.3-0.4 mm long), soft, white, ± patent hairs; perigynous region 5-ribbed; sepals oblong, 1.3-1.4 x 1 mm, obtuse, with a distinct membranous margin; petals 0.7-0.75 mm; filaments 0.5-0.55 mm; anthers c. 0.3 x 0.2 mm, oblong, orange; ovary c. 0.75 x 0.6 mm when young; stigma ± sessile, 0.15-0.2 mm, bipartite, the lobes often somewhat spreading. Fruit. c. 1.25 x 1

mm, ovoid, papillose at the top. Fl. (5-) 6-7. Rocky places, alt. 700-1800 m.

Type: SSE Spain: Prov. Malaga: Sierra Bermeja: Estepona, v. 1837, *E. Boissier* (holo. G! iso. K! P!), (in G mixed with *H. incana* Lam.). Endemic in SSE Spain.

Prov. Jaen: Sierra de Castril: *Reverchon* 1326 (as *H. incana)* (MA, P); Granada: Sierra Tejeda: *Huter, Porta & Rigo* 595 (FI, G, W); ibid.: *Porta & Rigo* 179 (B, FI, JE, LD); Sierra de Eestrepona (Estepona): v.1837, *Boissier* (G, mixed with *H. incana* Lam. (K, P).

It resembles *H. incana* Lam. in habit, but differs in its broadly obovate-elliptic to suborbicular leaves covered with closely appressed soft hairs, much smaller stipules, few-flowered, almost leaf-less clusters, flowers densely covered with short and soft hairs (rough in *H. incana*) and in possessing a ± sessile and bipartite stigma.

29. **H. pisidica** Brummitt in Notes R. B. G. Edinb. 28:24 (1967). Brummitt in Davis, Fl. Turk. 2:249 (1967).

Plate XX, Fig. 23-24. p. 357

A perennial herb with a woody caudex; stems up to c. 15 cm long, prostrate and spreading, with numerous, short, lateral branches towards the end, but sparingly branched near the base; internodes up to c. 1.2 cm long, shortly pubescent to puberulous. Leaves obovate-spathulate or, sometimes, nearly elliptic, up to 7 x 2.75 mm, subacute to obtuse, rather thick, shortly and densely appressed pubescent in the younger stages to almost glabrous with age, margin shortly ciliate with curved hairs; stipules ovate-triangular, up to c. 1 x 0.75 mm, acute, with a ciliate margin. Flower clusters (2) 3 to 6 (9)-flowered, leaf-opposed, profuse towards the end of the shoots though not quite congested. Flowers subsessile, 1.5-1.75 (-2) mm, turbinate to cup-like, with a distinct, obconical, strongly 5-ribbed perigynous region, almost equalling (or slightly shorter than) the sepals, covered with very short 0.15-0.3 mm long, stiff patent hairs on the sepals; the latter often incurved when young, but erect with age, fleshy, 1 x 0.45-0.6 mm, the outer oblong, obtuse, the inner narrowly ovate, subacute; petals c. 0.4 mm; filaments c. 0.45 mm; anthers c. 0.25 (-0.3) x 0.2 mm, ovoid-oblong, orange; ovary ovoid, 0.5 x 0.4 mm, papillose at the top; stigmas ± sessile, c. 0.2 mm long, thick, very divergent, almost appressed at the ovary. Ripe fruit not seen. Fl. 7. Alt. 1500 m.

Type: TURKEY: Vil. Isparta: Distr. Sutçuler: Cimen ova on W side of Sarp Dağ, alt. 1500 m, 28.vii.1949, *Davis* 15805 (holo. K! iso. E!).

Endemic. Closely resembling *H. incana* Lam, var. *angustifolia* Fenzl (with narrower, pubescent to subglabrous leaves, and smaller flowers) in habit and general aspect as well as in the form and structure of the flowers, but distinguishable by its very shortly pubescent stems,

obovate-spathulate, puberulous leaves, much smaller stipules, few-flowered clusters and flowers covered with much shorter hairs. Perhaps more material may provide further information as to the degree of their affinity.

30. **H. incana** Lam., Encycl. 3:124 (1789).

Marschall v. Bieberstein, Fl. Taur.-Cauc. 3:173 (1819); De Candolle, Prodr. 3:368 (1828); Fenzl in Ledeb., Fl. Ross. 2:160 (1843); Boissier, Fl. Or. 1:741 (1867); Willk. & Lange, Prodr. Fl. Hisp. 3:153 (1874); Nyman, Consp. 256 (1879); Williams, op. cit. 559 (1896); Gürke in Richter-Gürke, Pl. Europ. 2 (2):186 (1899); Halacsy, Consp. Fl. Graec. 1:572 (1900); Rouy, Fl. Fr. 12:10 (1910); Schinz & Keller, Fl. Schw., ed. 3, 2 (Krit. fl.):109 (1914); Graebner in Aschers. & Graebn., Syn. 5 (1):883 (1919); Hayek, Prodr. Fl. Balcan. 1:172 (1924) pro parte; L. Bouloumoy, Fl. Lib. & Syr. 1:123, pl. 62, f. 4 (1930); Dinsmore in Post, Fl. Syr. Pal. & Sin., 1:212 (1932); J. Thiébaut, Fl. Libano-Syr. 1:131 (1936); Schischkin in Komarov, Fl. U.R.S.S. 6:568, f. 3 (1936); Parsa, Fl. Iran 1 (2):1242 (1951); Maire & Weiller, in Maire, Fl. Afr. Nord, 9:45 1963 (excluding all other subspecies as well as var. *cinerea*); Brummitt in Tutin et al., Fl. Europ. 1:152 (1964), & in Davis, Fl. Turk. 2:248 (1967); P. Mouterde, Nouv. Fl. Lib. & Syr. 1:454 (1966).

Syn.: *H. macrocarpa* Sibth. et Sm., Prodr. Fl. Graeca 1:167 (1806): Type: 'Ad viam inter Smyrnam et Bursam, et in Laconia', *Sibthorp* (holo. OXF, not seen); *H. millegrana* Besser, Cat. Hort. Crem, 68 (1816); *H. besseri* Fisch. in Horneym. Hort. Hafn. Suppl. 127 (1819); De Candolle, Prodr. 3:368 (1828); *H. multicaulis* Kit. ex Kan. in Verh. zool. bot. Ges. Wien 13:540 (1863): Type: Hungary: Aracs Füred et in Tihany, *Marschall & Schultes* (Hb. ?); *H. densiflora* Williams in Bull. Herb. Boiss. 4:562 (1896): Type: Lebanon: Bukaa, vi. 1887, *Post* 484 (holo. BM!); Dinsmore in Post, op. cit. 1:211 (1932); *H. alpina* Villars *β incana* Fiori & Paoletti, Fl. Anal. Ital. 1:335 (1898); *H. incana* Lam. subsp. *eu-incana* Maire et Weiller, op. cit. 48 (1963). *Misapplied names*: *H. hirsuta* sensu M. Bieb., Fl. Taur.-Cauc. 1:179 (1808) non L., Sp. Pl. 218 (1753); *H. alpina* sensu Loisel. ex DC., Prodr. 3:368 (1828) non Chaix in Vill., Hist. Pl. Dauph. 1:379 (1786); *H. lenticulata* auct. non Linn., Sp. Pl. 218 (1753); *H. fruticosa* sensu Host, Fl. Austr. 1:318 (1827) non L., Cent. Pl. 1:8 (1755).

A perennial, greyish-green herb with a stout woody caudex; stems prostrate, up to c. 30 cm long, often spreading; internodes usually rather long (up to 1.7 cm) and stout, shortly spreading pubescent with patent to retrorse hairs. Leaves oblanceolate to narrowly oblong and sometimes elliptic-obovate, 5-10 (-14) x 2-4 mm, often densely hispid, the older ones glabrescent, or, sometimes, adpressed pubescent

and almost glabrous with age; stipules ovate-triangular, 1.25-2 x 1 mm, acute, with a ciliate margin. Flower-clusters leaf-opposed, mostly (2-) 4 to 8 (-12)-flowered (occasionally 3 to 6-flowered), very profuse and often densely congested towards the end of the shoots. Flowers subsessile, (1.5-) 2-2.5 (-3) mm, ellipsoid-cuplike, densely hispid with 0.35-0.75 mm long hairs; receptacle usually prominent, obconical, somewhat shorter than the sepals; the latter equal or sometimes subequal 1.25-1.5 x 0.5-0.75 mm; the outer ± oblong, obtuse, the inner narrowly ovate, subobtuse, often erect to somewhat connivent, very rarely slightly spreading or subrecurved at the tip; petals 0.6-0.7 mm; filaments 0.5-0.6 mm; anthers 0.3-0.4 x 0.25 mm, quadrangular-oblong, orange-yellow; ovary (young) 0.5-0.6 x 0.4 mm, ovoid, with two ± sessile, 0.2-0.25 mm long, rather thick, and divergent stigmas. Fruit 1-1.25 x 1 mm, ovoid, somewhat shorter than the sepals, smooth; seed 0.8-0.9 x 0.8 mm, ovoid.

Fl. 5-8. Stony places, alt. 150-2500 m, often at higher elevations.

a) var. **incana:**

Syn.: *H. incana* β latifolia Fenzl in Ledeb., Fl. Ross. 2:161 (1843). *H. incana* Lam. var. *africana* Batt. in Bull. Soc. Bot. Fr. 41.512 (1894). Type: Algeria Dj. Rovis, *Julien* (holo. ? P!). *H. incana* Lam. var. β *macrocarpa* (Sibth. & Sm.) Williams op. cit. *H. incana* subsp. *africana* (Batt.) Sennen & Mauricio, Cat. Rif. Or. 23 (1933).

Leaves ± oblong to obovate-spathulate, pubescent (when young) to hispid; clusters often few-flowered; flowers 2-2.5 (-3) mm, densely hispid with 0.4-0.75 mm long hairs.

Type: S. France: Bourg-d'Oisans, *M. Liottard* (holo. P-LA!).

Range: S. and parts of E. Europe, W. Asia and NW Africa.

France: Isère: *Gandoger* 376 (B, COI, JE); Savoie: 2.vii.1859, *E. de la Bathie Perrier (LISE);* Hautes Alpes: *M. Jacobs* 3996 (L); 30.v.1869, *Reverchon* (HBG, JE): *Chaboisseau & Faure* 1629 (Z); Var: v.1864, *Ducommun* (B); Bouches-du-Rhone: *L. Samat* 5886 (Z); Gard: *Tuezkiewicz* 3086 (JE); Hérault: *H. Sleumer* 1268 (L); *Rechinger & Sleumer* 168 (L); vi.1905, *A. Thellung* (Z); Lozère: 16.viii. 1913, *Jos Braun* (Z); Charente Inf.: vii.1929, *Ch. d'Alleizette* (BC, trans. with var. *augustifolia*). **Italy:** Pedemontana: nr. Susa: *Rostan* 143 (B, K); Alpes Cottiae: 22.vii.1892, *R. Beyer* (B); Mt. Cenisio: 8.viii.1889, *H. Beaudouin* (Z); Abruzzi (Aprutio): vi.1905, *L. Vaccari* (FI); Campo di Giove: *Bornmüller* 1924:72 (B). **Yugoslavia:** Istria: 27.iv.1874, *C. Marchesetti* (COI); Fiume (Rijeka): 27.vi.1869, *Anna Maria Smith nata Glennie* (HAL), STU); Croatia: 6.vii.1878, *Vukotinovic* (B, Z); Bosnia: vi.1904, *C. Knetsch* (Z); *Gilliat-Smith* 2796 (K); Dalmatia: 18.v.1895, *Poscharsky* (COI); *Bornmüller* 1886:1874 (B); *Pichler* 63a (B, JE, W); *Bornmüller* 1798 (B); 24.vii.1905, *A. de Degen* (B); Hercegovina: *Bornmüller* 1433 (B); *H. Raap* 73 (COI, JE, W, Z); Montenegro: *Cook et al.* 355 (K); Macedonia: *Pichi-Sermolli* 12519, 12520 (FI); *Bornmüller* 1917:436 (B); 8.vi.1954, *H. Seitter* (Z); *J. Dörfler* 166 (W); *Bornmüller* 433, 434, 437 (B); Serbia: vii.1895 & vi.1896, *Adamovic* (JE & B respectively); 8.v.1904, *Jovanovic* (Z). **Albania:** *Baldacci* 192 (FI, W); *Lempberg* 764 (K). **Hungary:** v.1870, *Tauscher* (W, Z) & v.1880 (Z). **Rumania:** vi.1894, *Baenitz* (B, L, STU); *Al. Borza* 953 (Z). **Bulgaria:**

N. Vihodzevssky 147 (COI, JE, W); *Gilliat-Smith* 656 (K); *C. K. Schneider* 218 (K); *Urumoff* 58 (W). **Greece:** Thrace: *Rechinger* 22280 (W); *H. G. Tedd* 669 (K); Macedonia: *Rechinger* 17569 (W); *Alston & Sandwith* 1013 (K); Epirus: 11.vi.1892, *Halacsy* (W); *Rechinger* 21139 (W); mt. Olympos: *Orphanides* 3672 (G); *Sintenis* 1889:1920 (W); mt. Kithairin: *S. C. Atchley* 1983 (K); Pindus Mts.: *Balls & Gourlay* B. 3216 & B 3867 (K); Parnassos: *Guicciardi* 303 bis (G); *Atchley* 2319 (K); *Guicciardi* 354 (JE, L, W); *Chr. Leonis* 82 (W); *Thessalia: De Heldreich* 97 (W); Agrapha (Dolopia): vi-vii.1885, *Haussknecht* (JE); mt. Kiona: vii.1888, *Halácsy* (W); Thessalia: *Sintenis* 1896:353 (JE); mt. Pateras: *Tuntas* 959 (W); Acarnania: *Maire & Petitmengin* 229 (W); Achaia: 5.vi.1893, *Halácsy* (W); Laconia: *Orphanides* 22 (G, LISE, W). **Mytilini** (Lesbos): *K. H. & F. Rechinger* 5575 (W). **Turkey:** Gallipoli: *C. M. Ingoldby* 317 (K); Bursa: vi. 1946, *Başarman* (ISTE): *Demiriz* 3017 (E); *Bornmüller* 1899:4493 (B, G); Bilecik: *Bornmüller* 1929:13908 (B); *Davis & Coode* D. 36511 (E); Demiriz 1744 (E); Bolu: *Wagenitz & Beug* 240 (B); Kastamonu: Tosya: *Sintenis* 3948 (G, JE); Çankiri: *J. & F. Bornmüller* 13909 & 13910 (B); Ankara: *Bornmüller* 1892: 3213 (B, G, JE, Z); *Demiriz* 2935 & 2862 (E); *Khan et al.* 718 (E); Samsun: *Tobey* 950 (E); *Molloy* 31 (K); Amasya: *Bornmüller* 1889:315 (B); *id.* 315d (B); Tokat/Sivas: *Bornmüller* 1890:1981 (B); Kars: *Davis & Hedge* D.30687 (E) & D.30418 (K) (trans. with var. *angustifolia*); Manisa: *Balansa:* 375 (C, G, JE, S, Z); *Bornmüller* 1906:9191 (B); Izmir: *Bornmüller* 9192 & 9194 (B); *O. Schwarz* 607 & 843 (B); Kütahya: *Demiriz* 2072 (E); *id.* 2185 (E); Eskişehir: *Coode & Jones* 2243 (E); Afyon Karahisar: *Coode & Jones* 2314 (E); Konya: *Bornmüller* 1899: 4492 (B); *Davis & Dodds* D.18658 (E); Kayseri: *Bornmüller* 1890:1980 (B, JE); *Davis, Dodds & Çetik* D.19224, D.19252, D.19362 (E); Sivas: vii.1934, *Rosenbohm* (HBG); Maraş: *Post* 526 (E, Hb. Post); Elazig: *Davis & Hedge* D.29099 (E); Bitlis: *Davis & Polunin* D. 22256 (E); Van: *Davis & Polunin* D.22934 (E); Muğla: *Davis* 13845 & 14024 (E); Denizli: *Dudley* D.35596 (E); Burdur: v.1950, *Attila & Heilbronn* (ISTE); *Tengwall* 628 (S); Antalya: *Davis* 14535 & 15396 (E); Isparta: *Davis* 15824 (E); Konya: *Péronin* 160 (S); Niğde: *W. Siehe* 597 (E, Z); Içel: Bal*ansa* 993 (G); Seyhan: *Siehe* 310 (BM, E, JE); Hatay: *Kotschy* 67 (C, G, JE, S); *Samuelsson* 5453 (S). **Syria:** Amanus Mts.: *Haradjian* 2178, 2179, (G), 2358 (E, G, W), 3702 (G, W); Sakal: *Davis* 6460A (E, K); Antilibnon: *Peyron* 1240 (G). **Lebanon:** Jebel-Sannin: *Bornmüller* 1897:221 (B, G); ibid.: *Kneucker* 163 (JE); nr. Ain Zehalteh: *J. Ball* 2153 (E); Bscherri: *Bornmüller, J & F.* 1910: 11504 (B); Hadet-el-Djoubbeh: *Samuelsson* 5953 (S). **Iran:** Azerbaijan: nr. Rezaiyeh: *P. Furse* 2242 (K); Urmia (Rezaiyeh): *Gilliat-Smith* 2322 (K); Kandavan: *Gauba* 1432 (B); Elburs Mts.: *J. & A. Bornmüller* 1902:6472 & 6473 (B); Prov. Mazanderan: *Sharif* 274 (W); *Rechinger* 920 (BM, W); *Behboudi* 140E (W); *Aellen* 1036 (W); *Aellen & Behboudi* 1488 (W); Prov. Damghan-Semnan: *Aellen & Behboudi* 1475 (W); Neiriz-Bustan: *Sabeti* 170 (W); Prov. Shahrud-Bustam: *Aellen & Esfandiari* 5481 (G, W); *Rechinger, K. H. & F.* 6247 (W); Prov. Gorgan: *K. H. & F. Rechinger* 6154b (W); Prov. Yehlah: *N. Lindsay* 1130 (BM). **Soviet Union:** Turkmenistan: Ashkhabad: *Litwinow* 846 (G), & 847 (B, G, W); Azerbaijan: Prov. Baku: *Holmberg* 847 (S); Kirovabad: v-vi.1835, *R. F. Hohenacker* (G, L, STU, W); Nakhichevan: 22.v.1934, *Grossheim & Gurvitsh* (S); Georgia: Tbilisi: *Holmberg* 1284 (S). **N. Africa: Algeria:** C. Aurès, Szaq: 3.vii. 1920, *Maire* (P); Dj. Tougour nr. Batna: *Balansa* 1930 (partly) (E, G, FI, mixed with *H. permixta*). **Spain** (S): Granada: Sierra d'Estepona: v. 1837, *E. Boissier* (G, mixed with *H. baetica*). Introduced in Germany: vii.1895, *O. Jaap* (HBG) & vii.1947. *Klimmek* (HBG).

b) var. **villosa** n. var. a varietatibus aliis adhuc notis foliis floribusque

pilis sericeis longis et albis obtectis distinguenda. Leaves and flowers covered with long, silky, white hairs.
Yugoslavia: Dalmatia: Duare, c. 570 m, *C. J. Rutten-Pekelharing* 141 (U).
c) var. **angustifolia** Fenzl. in Ledeb., Fl. Ross. 2:160 (1843).
Syn.: *H. besseri* Fisch. in Horneym. Hort. Hafn. Suppl. 127 (1819); *H. incana* Lam. var. *besseri* (Fisch.) Gürke in Richter-Gürke, Pl. Europ. 2 (2):186 (1899). *H. multicualis* Kit. ex Kan. op. cit. 13:540 (1863).
Leaves oblanceolate to narrowly oblong, often adpressed pubescent; flower-clusters usually many-flowered and large; flowers smaller than in the var. *incana,* 1.5-2 mm, covered with short (0.25-0.4 mm), patent and rather soft hairs.
Type: Fenzl did not specify any plant for this taxon, but referred to Besser's Enumerat. (Cat. Hort. Crem. nr. 296, p. 12 (1811). *Kotschy* 201 (W; iso. E), from Crimea, is, therefore, designated as the neotype.
Distr.: SW Russia (Astrakhan, Saratowa, Ukraine, Odessa); Hungary; Austria; parts of E. Bulgaria; S. Serbia and Macedonia (Yugoslavia), and Macedonia in Greece. Also found, occasionally, in N. Africa and S. France.

Soviet Union: Astrakhan: vi.1884 & vi.1897, *A. Becker* (JE); Ukraine: Luhensx: 21.vii.1925, *Pidopliczka* (HBG); Dryepropetrovik: 10.v.1944, *Grebe* (B); Crimea: Distr. Odessa: 1.vi.1895, *Callier* (W); *Kulikowsky* 1163 (COI); ibid.: *Kotschy* 201 (E, W). **Hungary:** Budapest: 21.vii.1895, *Missbach* (HBG, JE); Buda: mt. Gerhardi: 18.vi.1878, *Richter Lajos* (B, JE, L, W, Z); S. Gerardi: *Woloszczak* 63b (COI, JE, L, W). **Austria:** 'Breiten See im Marchfelde', ix.1909 & vi.1916, *J. Vetter* (W). **Bulgaria:** Varna: viii.1886, *Bornmüller* (B); Jurnowo: *Urumoff* 77 (W). **Yugoslavia:** S. Serbia: 16.vii.1887, *Bornmüller* (B); Macedonia: *L. Schultze-Jena* 161 (B); Distr. Doiran: *Bornmüller* 1916:3623 (JE); ibid.: *K. H. & F. Rechinger* 9121 (W). **Greece:** Macedonia: Kavalla: *K. H. & F. Rechinger* 10123 (W); mt. Olympos: *Sintenis & Bornmüller* 1891:1179 (B, P); Thessalia: Malakass: *Sintenis* 1896:967 (JE); Kalabaka: *Rechinger* 21701 (W). **Algeria:** Oran: vi.1910, *Faure* (E). **France:** Hautes Alpes: env. Gap.: 17.vii.1927, *Ch. d'Alleizette* (HBG); Bouches-du Rhone: Pas des Lanciers: vi.1880, *Autheman* (W, Z).

Note: There are three specimens in Hb. Lamarck (P-LA), all mounted on the same sheet, of which two possess narrow, linear-oblong to oblanceolate leaves, whereas the third has broader, narrowly obovate ones. This third plant is taken up here as the type of the species since it agrees with the description given by Lamarck in his Encyclopedia, op. cit.

H. incana Lam. is a very well-marked and easily recognizable species, in spite of the fact that it is very widely distributed and, accordingly, shows a good deal of variation in the form, size and pubescence of the leaves and the flowers. Maire & Weiller's account of this species (op. cit.) is very inaccurate and even misleading. This species in

their view, includes nearly 2/3 of *H. cinerea* DC. (the remaining part is allotted to *H. hirsuta*), a part of *H. hirsuta* L., and the whole of *H. permixta* Gussone, *H. rhiphaea* Font Quer, *H. regnieri* Br. Bl. & Maire, and *H. cyrenaica* Hermann. As a matter of fact all of them are very distinct spp. and quite different from *H. incana.* Their relationship with *H. incana,* if any, has been dealt with under the respective spp. and need not be repeated here.

31. **H. cachemiriana** J. Gay in Duchartre, Rev. Bot. 2:370 (1847). Type: KASHMIR: Islamabad: *V. Jacquemont* 414 & **748** (Lectotype P!). Walpers, Annal. Bot. 1:79 (1848).
Syn.: *H. afghana* F. Hermann, Fedde's Repert. 42:220 (1937). Type: Afghanistan: *Griffith* 2478 (Hb. of the late East India Company) (holo. B, destroyed; iso.-neotype K! S!).

Plate XIX, Fig. 4-6. p. 352

A perennial herb with a woody caudex; stems prostrate, up to 23 cm long, spreading, usually with quite long (up to 2.5 cm) and stout internodes, shortly and densely pubescent with 0.2-0.4 mm long, soft, patent to deflexed hairs. Leaves elliptic-obovate to obliquely oblong, sometimes almost orbicular, mostly up to 9 x 4.5 (rarely up to 13 x 6 mm), acute to obtuse, strigose or strigose-pubescent in younger stages to glabrescent (-glabrous) with age, especially on the upper side, but the margin often somewhat (shortly) hirsute with 0.35-0.5 mm long, rather stout, acroscopic hairs; stipules ovate-triangular, 1.75-2 mm long, acute, with a ciliate margin. Flower-clusters 6 to 10 (-15)-flowered, generally 5-6 mm in diam., leaf-opposed, greyish-green, often very profuse and densely congested all along the branches. Flowers subsessile, (1.6-) 1.8-2.25 (-3) mm, subcylindrical to ellipsoid-obpyriform (-turbinate), often with a prominent, obconical perigynous zone, densely hirsute with (0.25) 0.4-0.6 (1.2) mm long, rather loosely spreading though stout hairs shorter on the basal part; sepals equal, c. 1.5 x 0.6 mm, the outer oblong, obtuse, the inner elliptic, subacute, with a distinct membranous margin; petals 0.6-0.65 mm; filaments 0.4-0.5 mm; anthers 0.25-0.3 x 0.2 mm, quadrangular-oblong and orange-yellow; ovary (young) 0.5-0.6 mm in diam., ovoid; style 0.25-0.45 mm (including the stigmatic-part) (mostly up to c. 0.35 mm) long and 0.15-0.2 mm thick at the base, bifid to bilobate in the upper part, with large and prominent stigmas, often divergent with age. Fruit ovoid, 1.25-1.4 x 0.8 mm, almost equalling the sepals.
Fl. 6-8 alt. c. 1600-3900 m.
a) var. **cachemiriana:** Leaves often glabrous esp. on the upper side (sometimes with short appressed hairs); flowers with 0.4-0.6 mm long hairs. Distr.: Throughout the range of the species.

Kashmir: Takht-i-Suliman, nr. Srinagar: *P. M. Pinteld* 97 (BM); Srinagar: *B. O. Conventry* 17/658 (K); Kunawar: *Drummond* 22389, 22390 & 24853 (K); Kajnag range, 11000-12000 ft.: *Duthie* 11079 (K); Lambal: *Fuller* 195 (K); Upper Chenab Valley: *Baden-Powell* 304 (K); nr. Shupiyan: *Drummond* 3957 (K); ibid. *C. B. Clark* 28617B (BM); 'Kashmir': *Falconer* 267 (K, P); Islamabad: *Jacquemont* 414 & 748 (P). **West Pakistan:** 'Himal. bor. occ. reg. temp.': *Thomson* (in Hb. Ind. Or. Hook. fil & Thomson) (G, L, S); Kaghan: *Duthie* 22121 (K); Swat: Bahrein: *Stewart* 24489 (W); ibid. *S. Ali* 26037 (BM, W); ibid. *A. Rahman* 15 (BM); ibid. *R. J. Rodin* 5592 (G); Kalam: *Rechinger* 19391 (W); Madyan to Kolalai: *Rechinger* 30705 (W); E. of Kolalai: *Rechinger* 30730 (W); Chitral: Mirga: *Harriss* 16566 (BM); NE of Drosh, 10,000 ft.: *Stainton* 3139 (W); Dir: Lowari Top, 11,000 ft.: *Salim* 111 (K). **Afghanistan:** Ali Khel to Dre Kalla: *Rechinger* 32270 (W); Nidjrao: *Volk* 2322 (W); Bagrami: *Neubauer* 265 (W); Nuristan: *Neubauer* 961 (W); ibid. *Edelberg* 895, & 2028 (W); ibid. *G. Kerstan* 1021 (W); Panjshir: *Köie* 2958 (W); Gulbahar: *Volk* 233 (W); Paghman range: *Volk* 2217 (W); ibid. *Neubauer* 367 (W); *Gilli* 1405, 1406 & 1407 (W); ibid. *W. Koelz* 12081 (W); Daulatshah: *Koelz* 11658 (W); Kurram Valley: *Aitchison* 585-842 (BM, G, K, P); Bharowar: *Griffith* 1626 (G, K); 'Kurram Valley': *Griffith* 2478 (K, S) (Type of *H. afghana* Herm.). **Iran** (NNE): Prov. Yehlah (Yehlach): *N. Lindsay* 1394 (BM). Prov. Gorgan: *Sharif* 272 (W, forma glabrifolia; leaves thick-fleshy, up to 4.5 x 2.25 mm, ± glabrous with age).

b) var. **hispida** Chaudhri n. var. a var. *cachemiriana* foliis dense hirsutis, floribus extus pilis 0.7-1.2 mm longis dense hispido-hirsutis, fructu ellipsoideo distinguenda. Leaves densely hirsute; flowers densely hispid-hirsute with 0.7-1.2 mm long patent hairs; central flowers up to 3 mm long with an obconical receptacle; stamens not ripe; style 0.3-0.4 mm; fruit ellipsoid, tapering upwards.
Type: NE Afghanistan: Nuristan: Kuschtos, c. 1800 m, *Neubauer* 4576 (holo. W). Endemic.

Griffith 2478 (K, S), the type of Hermann's *H. afghana,* is quite similar to the other plants of *H. cachemiriana,* though it represents a younger stage of development. Hermann had distinguished his *H. afghana* from this sp. by means of the length of the style, which, according to Hermann, is 2-4 times as long as thick in *H. cachemiriana,* and 5-8 times in *H. afghana.* But the style in the type specimen of *H. afghana* is c. 0.3 mm long, whereas in *H. cachemiriana* it is 0.25-0.45 mm long, mostly 0.3-0.35 mm, the relative thickness is almost the same, viz. 0.15-0.2 mm at the base. In fact, the longest and the thickest style is found in such plants as Edelberg 2028, from Nuristan, Afghanistan, and Rechinger 30730, from Swat, West Pakistan (both from W), which are typical representatives of *H. cachemiriana.* The second character, that is, the presence of longer and stouter hairs on the leaves and flowers can, at best, be treated as of varietal importance since some of the specimens of *H. cachemiriana* have leaves and flowers which are hirsute to hispid during the earlier (younger) stages. But even in such cases the flowers possess an obconical receptacular part, tapering to the base (and not rounded, as was suggested by

Hermann). Moreover, the style is almost of the same size as in the rest of the population. The new variety is, therefore, being treated as quite distinct from Hermann's *H. afghana,* which I consider to be identical with var. *cachemiriana.*

32. **H. latifolia** Lapeyr., Hist. Abrég. pl. Pyr. 127 (1813).
Willk. & Lange, Prodr. Fl. Hisp. 3:151 (1874); Williams op. cit. 561 (1896); Rouy, Fl. Fr. 12:10 (1910); Brummitt in Tutin et al., Fl. Europ. 1:151 (1964).
Type: Pyrénées: *Lapeyrouse* (TLJ, not seen).
Syn.: *Paronychia pubescens* DC. in Lam. & DC., Fl. Fr. 5:403 (1805).
H. pyrenaica J. Gay in Ann. Sc. Nat. ser. 1, 26-224 (1832).
Type: Vallon d'Arise, Pic du Midi de Bigorre: *Moulins* (Hb. Gay in K!).

Plate XIX, Fig. 1-3. p. 352

A perennial, rarely annual or biennial, herb with a woody caudex; adventitious roots somewhat distinct; stems prostrate, 15-30 (-40) cm long, much-branched, the branches spreading from the base; internodes up to 1.2 cm long, densely covered with 0.3-0.4 mm, patent to somewhat deflexed, rather soft hairs. Leaves broadly elliptic-oblong to suborbicular occasionally even obovate, mostly up to 8 x 4.5 (rarely to 11 x 6.5) mm, rounded at the base, the younger ones hirsute or hispid with c. 0.4 mm long, stiff, appressed hairs, but the older ones often glabrescent; margin with 0.4-0.45 mm long, stout, acroscopic hairs; stipules broadly ovate-triangular, 1.5-2 mm long, with a densely ciliate margin. Flower clusters (3-) 6 to 12-flowered, leaf-opposed, often greyish-green, very profuse and densely congested on the branches. Flowers subsessile, 2-2.25 (-2.5) mm, cylindrical to ellipsoid, densely covered with 0.5-0.75 mm long, stout, patent, almost bristly hairs; sepals oblong though slightly narrowed at the apex, 1.25-1.4 mm long. obtuse to subobtuse; petals 0.65-0.75 mm; filaments 0.4-0.5 mm; anthers 0.3-0.35 x 0.2 mm, oblong, orange; style (0.25-) -0.3-0.35 mm bilobate or bifid, stigmas usually erect, occasionally divergent, often somewhat exserted in the fruiting stage. Fruit 1.25-1.4 x 1 mm, ellipsoid, almost equalling the sepals, papillose at the top.
Fl. 6-8. Mountains, ca. 1000-2000 m.
Range: The Pyrénées and NNW & C. Spain.

France: Hautes-Pyrénées: Gèdre: *Bordère* 22 (JE, HBG); *id.* 82 (JE, LD); Gavarnie: vii.1900 & vii.1902, *Bordère* (Z & LD, respectively); Cauterets: *E. J. Neyraut* 4727 (B, JE, Z); *Héas:* 26.vii.1962, *H. Oberli* (HBG); Asblancs nr. Barrèges: *A. de Franqueville* 555 (JE); Port d'Ossau, nr. Spanish frontier: *Hutchinson et al.* 318 (K). **Spain:** Santander: 8.ix.1944, *C. Vicioso* (MA); Prov. Logrono: Mausilla: *F. Càmara* 9870 (LISE, MA); Soria: Coveleda: 11.vii.1935, *L. Ceballos & C. Vicioso* (MA); Palencia: vii.1950, *Losa & Meutsewat* (LISE); Léon: 14.viii.1945,

C. Vicioso (MA); Castille: Bujedo: *Hno. Elias 1059* (JE, MA); Cerro del Agiola, Sierra da Guadarrama: 21.vi.1851-52, *Joh. Lange* (JE, W); Cercedilla: vii.1916, *C. Vicioso* (MA); Madrid: vi.1916 & vi.1918, *Vicioso* (MA).

Williams (op. cit.) gave an incorrect description of the style, viz. 'styli 2 liberi, subrecti'. In fact the style is always unlobed for nearly 1/2 or more of its length. His var β is hardly distinguishable from the other representatives of this species.

33. **H. capensis** Bartling in Linnaea 7:624 (1832).
Hermann op. cit. 220 (1937).

Type: S. Africa: Cape Province: Caledonbad, 1828-29, *Zeyher* (holo. ? not seen).

Syn.: *H. lenticulata* Thunberg, Prodr. Pl. Cap. 48 (1794), non L., Sp. Pl. 1:218 (1753). Type: Cape Province: *Thunberg* (UPS, not seen). *H. incana* Lam. β ? *capensis* Persoon, Synop. 1:292 (1805). Type: as of *H. lenticulata* Thunberg. *H. arenicola* Adamson in Journ. S. Afr. Bot. 5:34 (1939). Type: Cape Prov., Muizenberg: *Adamson* 1242 (holo. BOL, not seen).

Plate XIX, Fig. 7-10. p. 352

A perennial herb with very profuse and prominent adventitious roots; stems prostrate or creeping and much spreading, up to c. 45 cm long, usually with long (up to c. 2.8 cm) and stout internodes, rooting at the nodes, very shortly retrorsely pubescent. Leaves sessile to subsessile, up to 6 x 3 mm, elliptic to obovate, acute to obtuse, shortly adpressed pubescent, rather thick, light-green to pale; stipules 1-1.5 mm long, ovate-triangular, acute, with densely ciliate margins. Flower-clusters 6 to 10 (-12)-flowered, occasionally 1 to 3-flowered, pseudo-axillary as well as leaf-opposed, profuse, and often contiguous on the lateral shoots. Flowers ellipsoid to ovoid, 1.5-2 mm, usually with short (0.25-0.35 mm long), patent hairs (or shortly velutinous when young to somewhat hirtellous with age); sepals rather thick, 1-1.4 x 0.45-0.75 mm, the outer elliptic-oblong, $\pm$ obtuse, the inner narrowly ovate to elliptic, acute, $\pm$ equal (or equal to occasionally subequal); petals 0.45-0.55 mm, filiform; filaments almost of the same length but linear-lanceolate; anthers c. 0.3 x 0.2 mm, nearly oblong, orange-brown; ovary subglobose c. 0.4 x 0.35 mm when young; style 0.3-0.35 mm long, rather thick at the base, and shortly (c. 1/3 of its length) bidentate at the tip, with small, dot-like and erect stigmas. Fruit 1.25-1.4 x 1 mm, ovoid to nearly oblong.

Fl. 9-11. Coastal dunes, on loose sand, alt. up to c. 1000 m.

Endemic in the Cape Province.

Cape Town (Kaapstad): /1826-29, *L. F. H. Ludwig* (STU); *Ecklon & Zeyher* 64.9 (S); Cap Bonne-Espérance: ii.1849, *Drège* (FI); Stellenbosch Div., Belleville: *F. A. Rogers* 17276 (Z); Stikland, between Strand & Paarl Roads: *J. P. H.*

Acock 1022 (S); Distr. Swartklip, Cape Flats: *R. S. Adamson* 4572 (PRE, as *H. arenicola*); Caledon: *Ecklon* in 1829 (S); Muizenberg: *R. Schlechter* 1488 (as *H. hirsuta* L.) (E, G, PRE, S, Z); Distr. Swellendam; Port Brandfort: Adamson 4613 (PRE, as *H. arenicola* Adams.); Swellendam to George: *Ecklon & Zeyher* 91 (S); Smultis Farm: *E. Wall* 1628/1 (S); Graaf Reinet: *Ecklon & Zeyher* 88 (S) & 1805 (L); Cape Peninsula: *T. M. Salter* 310/12 (BM, K) & 7124 (K); ibid. *A. H. Wolley Dod* 3593 (K).

Bartling's original description is very short and ambiguous, and in some points (as e.g. 'ramis adscendentibus') even inaccurate. He, moreover, did not give any reference either to Thunberg's *H. lenticulata,* or to Persoon's var. (?) *capensis* of *H. incana* Lam. But since he cited Zeyher's plant as the type, the previous works of Thunberg and Persoon become irrelevant. Adamson (op. cit. p. 33) rejected Bartling's name for this taxon on the grounds that Bartling's description applies to an 'inland species, and not to this particular one'. Adamson, however, did not specify the other 'inland sp.', though his remark that it had been collected from several inland stations (but not from the Cape Province) obviously means that it was *H. erckertii* Hermann. This latter species actually does occur in the Cape Province, and, moreover, possesses prostrate stems. Adamson's contention is, therefore, untenable. *H. capensis,* on the other hand, had been collected even from such inland places as Graaff Reinet which is quite far from the coast. It must, however, be remembered in this connection, that a large part of the Cape Province had more or less sandy habitats, but that the situation has been radically changed by the human interference and rapid colonization, with the consequence that the sandy soils have gradually disappeared from most of the 'inland' areas.

Zeyer's plant (the type of *H. capensis*), unfortunately, could not be traced (---- it is not present in GOET ----), but there is another collection by Ecklon (S) made in 1829 from the same locality. Besides, Ecklon & Zeyer, who had done much of the collecting together, in their list of the plants gathered from S. Africa ('Enumeratio Plantarum Africae Australis Extratropicae', Hamburg, p. 283 (1836)) have described the localities of *H. capensis* Bartling (no. 1805 in their list) as 'in dunarum sabulosis planitiei inter 'Hottentottsholland et Simonstown (Cap), and 'prope Graafreynet et Caledon'. Their no. 1806 (gathered from Swellendam) is described as *'H. lenticulata* Thunb.', but this is now known as *H. schlechteri* Hermann.

34. **H. pearsonii** Chaudhri n. spec.

Plate XIX, Fig. 11-13. p. 352

Herba perennis parva, caudice crasso et lignoso instructa. Caules prostrati, usque ad 10 cm longi, per totam lingitudinem ramificati; internodia usque ad 5 mm longa, robusta, pilis patentibus brevibus et

mollibus dense vestita. Folia alternantia, sessilia, oblanceolata, 3.5-5.0 mm longa et 1.5-2.0 mm lata, plerumque subacuta, basis versus angustata, hirtella, viridula; stipulae ovato-deltoideae, circ. 2 mm longae et 1 mm latae, acuminatae, margine dense ciliatae et hic saepe rubeolae. Glomeruli profusi, foliis oppositi, e floribus 4-7 compositi; bracteae ovato-lanceolatae, usque ad 1.5 mm longae et 0.6 mm latae, acuminatae et ut stipulae margine rubeolo instructae. Flores sessiles, anguste ellipsoidei, circ. 2 mm alti, ad basim paulum angustati, pilis patentibus mollibus, 0.3-0.4 mm longis dense vestiti; sepala anguste oblonga, circ. 1.25 mm longa, subobtusa vel subacuta; petala filamentis similiora, circ. 0.7 mm longa; stamina filamento circ. 0.45 mm longo et anthera rectangulari-oblonga, 0.35-0.4 mm longa et 0.2-0.25 mm lata, aurantia instructa. Fructus immaturus solum visus, in statu hoc ovoideus, circ. 1.2 mm altus et 0.65 mm in diam., apice papillosus et hic in stylum 0.25-0.3 mm longum, apice in stigmata brevia divisum exeuns. Florens mensibus 11 et 12.
Type: S. AFRICA: Cape Region: Veld Leeuwfontein, 28.xi.1908, *H. H. W. Pearson* 4/3179 (holo. K!).

This species resembles *H. schlechteri* Hermann in the shape of the flowers, but differs in being perennial, as well as in the structure of the stamens (especially in the large anthers), in the ovary and fruit and in the style. It also resembles *H. capensis* Bartl. in its distinct though minutely bidentate style, but differs in its rather compact habit (with shorter stems) in addition to being devoid of the adventitious roots which are a characteristic feature of *H. capensis*. Moreover, it possesses ellipsoid-oblong and densely villous to pubescent flowers, and a very typical ovary and fruit tapering upwards (not rounded, as in *H. capensis*).

35. **H. grimmii Hermann,** Fedde's Repert. 42:220 (1937).

Plate XIX, Fig. 14-16. p. 352

A perennial herb with a thick and woody caudex; stems up to 7 cm long, prostrate, ± spreading, shortly pubescent. Leaves sessile, obovate-elliptic, mostly opposite, up to 4 x 2.5mm, acute to subobtuse, shortly adpressed pubescent with usually arcuate-crisped hairs, quite distinct along the margin; stipules ovate-triangular, c. 1.5 x 1 mm, acute, with a densely ciliated margin. Flowers arranged in rather small, 3 to 6-flowered clusters, leaf-opposed as well as pseudo-axillary, sometimes solitary as well, 2-2.5 mm long, obovoid-obpyriform to nearly ellipsoid, narrowed downwards; receptacle obconical, c. 1 mm long, almost equalling the sepals, often subglabrous; sepals narrowly elliptical-oblong, 1.25 x 0.5-0.6 mm, subobtuse to subacute, equal or occasionally subequal, rather densely covered with (0.25-) 0.4-0.45

.nm long, stiff and patent hairs; sepals strongly 3-nerved (convergent at the apex), and with a distinct membranous margin; petals 0.65-0.7 mm long, filiform; filaments 0.5-0.55 mm, linear-lanceolate; anthers quadrangular, c. 0.25 mm in diam., orange. Fruit ellipsoid, c. 1.25 x 0.8 mm, somewhat papillose at the top; style (including the stigmas) 0.25-0.3 mm, shortly bilobed (c. 1/3-1/2 of its length) with small, dot-like, often divergent stigmas, occasionally suberect. Fl. & fr. March. Alpine regions.
Type: S. AFRICA: Wittebergen: BenDhin, Distr. Barkly East, alt. c. 3100 m, *E. E. Galpin* 6819 (as *H. hirsuta* L.) (holo. B, destroyed; iso.-neotype PRE! iso. K!). Endemic.

Subsection **Purpureae** Chaudhri subsect. nov. p. 308
Plants purple-green throughout.

36. **H. maskatensis** Bornm. in Mitt. Thür. bot. Ver. 6:51 (1894). O. Schwartz, Fl. der Trop. Arab. 53 (1939).

Plate XXI, Fig. 4-7. p. 384

A small perennial, purple-green herb with a woody tap root; stems c. 15 cm long, prostrate, much-branched from the woody base; younger shoots densely leafy; internodes stout, up to 11 mm long, purple-brown to purple-green, on all sides densely covered with short (0.2-0.25 mm long), soft, white, patent to retrorse hairs. Leaves up to 3.5 x 2.8 mm, rhombic-deltoid to obovate-orbicular, almost rounded in the upper part, and at the base abruptly contracted (or attenuated) into a very narrow, c. 1 mm long, stalk-like part, fleshy, dark-purple, densely adpressed velutinous pubescent; stipules ovate-triangular, c. 0.75 x 0.6 mm, dark-purple. Flowers mostly in 3 to 7-flowered, pseudo-axillary as well as leaf-opposed clusters, occasionally solitary and axillary or leaf-opposed, 1-1.25 mm long, obovoid-obconical, rounded above, and abruptly narrowed into a very short, subsessile base, dark-purple, shortly adpressed pubescent; sepals oblong-oval to suborbicular 0.5-0.6 x 0.4-0.45 mm, obtuse, equal, somewhat incurved at the apex; petals 0.4-0.45 mm; filaments 0.45-0.5 mm; anthers c. 0.25 x 0.2 mm, quadrangular, orange-brown; ovary ovoid-globose, c. 0.5 mm in diam.; stigmas sessile, c. 0.15-0.2 mm long, erect, brown. Fruit c. 0.75 x 0.5 mm, ovoid, subglobose, almost equalling the sepals, papillose at the top; seed c. 0.6 x 0.5 mm, ovoid-globose, dark-brown, without rim. Fl. Jan. On rocky places.
Type: (Southeastern Arabia): MUSCAT: in rupibus, 24.i.1893, *Bornmüller* 181 (holo. B! iso. G! JE!).
Endemic in Muscat and Oman.
MUSCAT: Bornmüller 181 (B, G, JE, type); *OMAN: A. S. G. Jayakar* 4 (BM).

2. Section **Paronychiella** (Williams) emend. Hermann p. 308
Calyx tetramerous; style distinctly elongate, equalling to somewhat exceeding the sepals (or exserted) in the fruiting stage.

37. **H. polygama** J. Gay in Duchartre, Rev. Bot. 2:371 (1847).
B. K. Schischkin in Komarov, Fl. U.R.S.S., 6:571, f. 4 (1936); Brummitt in Tutin et al., Fl. Europ. 1:152 (1964). **Icon:** Schischkin in Komarov, op. cit.
Syn.: *H. odorata* Andrz. in Hohenack. Pl. exs. 1839, in sched., nomen nudum. Misapplied name:? *H. fruticosa* sensu Falk, Beitr. 2:139 (1786), non L. Cent. Pl. 1:8 (1755).

Plate XXI, Fig. 9-11. p. 384

An annual herb; stems prostrate and rather slender, 10-20 cm long, and producing numerous (alternating), often profusely floriferous branches; internodes rather long and slender, mostly up to c. 10 mm (rarely up to 18 mm) long, shortly pubescent to puberulous (covered with very short, strongly recurved retrorse, soft hairs). Leaves usually up to 9 x 3 mm (occasionally somewhat larger), narrowly obovate-oblanceolate to sometimes oblong, obtuse, narrowed to the base, on both sides subglabrous but the margin shortly ciliate; stipules narrowly ovate-triangular, up to c. 1.5 x 0.75 mm, acute, with a slightly ciliate margin. Flower clusters (6-) 10 to 12 or more-flowered, usually large and many-flowered, leaf-opposed, profusely and densely congested on the lateral branches. Flowers very shortly stalked or subsessile, 1.4-1.5 (-1.75) mm, narrowly oblong-cylindrical to somewhat cup-like, narrowed at the base, and puberulous, the hairs fine, soft (0.25-0.4 mm long), patent, coiled at the tip in the perigynous region and on the basal parts of the sepals, sometimes even on the whole sepal shortly and sparsely hirtellous; sepals mostly equal, rarely slightly unequal, c. 1 mm long, narrowly oblong, 3-nerved, rather abruptly narrowed at the subacute to subobtuse and somewhat incurved apex, occasionally tipped with a minute hair; petals 0.5-0.6 mm; filaments c. 0.4 mm; anthers c. 0.25 x 0.2 mm quadrangular, orange; style 0.3-0.4 mm long, slender, shortly (c. 1/3) bilobed at the tip, often exceeding the sepals in the fruiting stage, the stigmatic tips divergent. Fruit c. 1 x 0.5 mm, oblong, equalling or slightly exceeding the sepals, smooth. Fl. 6-9.
Described from S. Russia. Lectotype: Ukraine: Kiev, *Hohenacker* in 1839 (L) as *H. odorata* Andrz. Range of the sp.: Western Siberia, C. & S. Russia, Ukraine and probably Rumania.
Western Siberia: Distr. Barnaul: 26.vii.1913, *P. Krylov* (S). **C-SE. Russia:** Gouvern. Saratov: Sarepta, *A. Becker* vii.1882 (LD) & vi.1896 (B, JE); Astrakhan: vii.1877, *Becker* (W). **Ukraine:** Kiev: *R. F. Hohenacker* in 1839 (as *H. odorata* Andrz.) (L, LECTOTYPE); 3.viii.1886, *Barbey* (Z); Bojarka, *N. Zinger* 3638 (B, COI, JE, W, Z); Dnjipropetrovsk, /1943, *Grebe* (B). Prov. Czernigow: Distr.

Oster: *A. Racoczi* 226 (COI); Kirovgrad: 12.vii.1873, *Lindeman* (W, Z); Mariopol, Budionowka, *Rauh* 297/294? (B).

38. **H. nigrimontium** Hermann in Fedde's Repert. 42:223 (1937). Brummitt in Tutin et al. Fl. Europ. 1:152 (1964).

Plate XXI, Fig. 12-14. p. 384

Annual to sometimes biennial herb; stems 10-20 cm long, prostrate, much branched along their whole length; internodes up to 15 mm long, covered with very short, soft, retrorse hairs; branches often with very conspicuous flower-clusters. Leaves obovate-oblanceolate, up to 8 x 3 mm, narrowed to the base, obtuse, on both sides subglabrous and with a shortly ciliate margin, occasionally entirely glabrous, mostly alternate; stipules ovate-triangular, 0.75-1.5 (-2) mm long, acute, with a slightly ciliate margin. Flower clusters 6 to many-flowered, usually 3-4 mm diam., leaf-opposed, densely congested on the lateral branches, occasionally 3-flowered (or reduced to a single flower) and pseudo-axillary. Flowers subsessile, 1.5-1.6 (-1.75) mm, narrowly ellipsoid oblong to cylindrical, narrowed at the base, covered with short (0.25-0.3 (-0.4) mm), patent and straight hairs or, sometimes, entirely glabrous; sepals subequal to unequal, narrowly oblong-lanceolate, the outer c. 1 mm long, subobtuse, rarely slightly recurved at the tip, the inner c. 0.7 mm, subacute to acute, sometimes tipped with a minute hair; petals 0.45-0.5 mm; filaments 0.35-0.4 mm; anthers c. 0.2 x 0.15 mm; style 0.25-0.3 mm long, rather slender, very shortly 2-lobed, sometimes slightly exceeding the sepals at maturity; stigmas somewhat spreading. Fruit c. 1 x 0.6 mm, ellipsoid, smooth, mostly somewhat shorter than the sepals, occasionally equalling them. Fl. 6-9. Rocky places, alt. c. 1600-2000 m.

a) var. **nigromontium:** Mature stems often shortly pubescent to puberulous; leaf margin shortly ciliate; stipules up to 1.5 x 0.8 mm; flowers 1.5-1.6 mm, covered with short, patent hairs.

Type: Yugoslavia (Albania): 'In campis Korita dictis sub m. Hum Orahovski distr. Kurci', 5.vii.1898, *Antonio Baldacci* 165 (as *H. glabra* L., mixed with *H. glabra* L. var. *setulosa* Beck) (holo. B, destroyed, NEOTYPE G!).

Distr.: S. Yugoslavia, N. Greece and probably NNE Albania.

'Ottoman Empire': Sommet du petit Khorladj (?), 12.viii.1888, *Abd.-ur-Rahman Nadji* (as *H. parnassica* Heldr.) (W); Greece: NW Macedonia: Kaimaktchalan, c. 40.55°N, 21.48°E, 1800-2000 m., *H. Humbert & S. Topali* 481 (G).

b) var. **purnardaghii** Chaudhri nov. var. a var. *nigrimontium* caulibus maturis saepe subglabris, foliis omnino glabris, stipulis paulo majoribus et pro rato latioribus (circa. 1.5-2 mm longis et 1.0-1.25 mm latis), floribus paulo majoribus (circa. 1.6-1.75 mm, raro usque ad

2.0 mm altis) et omnino glabris distinguenda. Mature stems often subglabrous; leaves entirely glabrous; stipules 1.5-2 x 1-1.25 mm. Flowers 1.6-1.75 (-2) mm long and entirely glabrous.
Type: NE Greece: Macedonia orientalis; In monte Pangaeon (Purnar-Dagh), alt. c. 1600 m, 26-27.vi.1936, *K. H. & F. Rechinger* 10219 (holo. W). Endemic.

This sp. differs from *H. polygama* J. Gay in the straight hairs on the flowers, the subequal to unequal sepals, the somewhat shorter style, and the fruit generally being somewhat shorter than the sepals or nearly equalling them but never exceeding them like that of *H. polygama*. The flowers are, moreover, somewhat longer in *H. nigrimontium*.

39. **H. degenii** (Hermann) Chaudhri stat. nov.
H. nigrimontium Herm. var. *degenii* Herm. in Fedde's Repert. 42:272 (1937).

Plate XXI, Fig. 15-17. p. 384

A small, grey to light-green, annual herb; stems c. 2-10 cm long, prostrate, branched from the base, the branches often densely covered with flower clusters and usually densely congested; internodes up to 9 mm long, covered with short (0.2-0.3 mm) retrorse, soft hairs. Leaves obovate to oblanceolate, up to 7 x 2 mm, narrowed to the base, obtuse, strigose in the younger stages (or hirtellous esp. on the under side) to glabrous with age; margin with short, stout spreading or acroscopic hairs; stipules ovate-triangular, c. 1 x 0.6 mm, acute, with a densely ciliate margin. Flower clusters often (6-) many-flowered, mostly c. 4 mm in diam., leaf-opposed, but occasionally pseudo-axillary as well, very profuse and densely congested on the branchlets as well as towards the end of the shoots. Flowers subsessile, 1.5-1.8 (-2) mm long, cup-like-cylindrical to somewhat obconical, narrowed at the base, densely hispid with 0.3-0.45 mm long hairs, the hairs shorter towards the flower base; sepals equal, 1-1.2 x 0.4-0.5 mm, the outer oblong, obtuse to subobotuse, the inner narrowly ovate, acute; petals c. 0.45 mm long; filaments 0.35 mm; anthers c. 0.2 x 0.15 mm; style (0.2) 0.25-0.3 mm long, shortly bilobed at the tip, in the fruiting stage slightly exceeding the sepals; the stigmatic tips spreading. Fruit 1-1.25 x 0.6-0.75 mm, ellipsoid, smooth, almost equalling the sepals. Fl. 6. Rocky places, alt. 1400-1600 m.
Type: Greece: Samothrake Island: In regione alpina montis Phengari, in rupium fissuris cacuminis Hagios Sophia, alt. c. 1600 m, 28.vi.1890, *A. de Degen* (holo. in Hb. Halacsy, W! iso. B! JE!).
Endemic. In monte Phengari, in sax., c. 1400 m, *K. H. & F. Rechinger* 9894 (W).
This species differs from *H. nigrimontium* Herm. in the strigose young-

er leaves, the stipules with a densely ciliate margin, and particularly in the cup-like (cylindrical) flowers with their very dense indumentum consisting of long, stout and bristly hairs.

Subgenus **Heterochiton** (Graebn. et Mattf.) Hermann p. 309
Calyx tetramerous; stigmas clavate; leaves and sepals thick and fleshy or coriaceous, with indistinct nerves.

40. **H. canariensis** Chaudhri spec. nov.

Plate XXI, Fig. 18-20. p. 384

Herba perennis, caudice lignoso instructa. Caules prostrati, ad basin lignosi, a basi usque ad apicem dense ramificati, usque ad 15 cm longi; ramuli profuse floriferi; internodia dilute brunnea, puberula sed demum plus minusve glabrescentia. Folia lineari-lanceolata, interdum fortiter involuta, usque ad 4.5 mm longa et 1.0 mm lata, obtusa, basin versus paulo angustata, interdum minute cuspidata, crassa, dilute brunnea, utrimque glabra; folia plurima in axillis fasciculata, in regione florifera a floribus obscurata; stipulae ovato-deltoideae, usque ad 1 mm longae et 0.5 mm latae, acutae, margine ciliatae, saepe leviter rubeolo-striatae. Bracteae foliis paulo breviores, plerumque violaceo-nigrae. Glomeruli plerumque e floribus 7-15, interdum plus quam 15 compositi, saepe in inflorescentias foliis oppositas densas, folia obscurantes congesti. Flores sessiles, 1.25-1.4 mm alti, ad medium paulo contracti, zona perigyna paulo inflata, pilis plerumque rectis sed interdum uncinatis, 0.25-0.35 mm longis parce hirtella; sepala aequilonga vel subaequilonga, crassa, extus subglabra, margine tamen ciliolata, exteriora oblongo-subspathulata, apice obtusa vel rotundada, incrassata, paulo recurvata et minute cuspidata, interiora oblonga, concava, breviter cucullata et interdum minute cuspidata, margine membranaceo distincto instructa; petala 0.6-0.65 mm longa; stamina filamentis circ. 0.5 mm longis instructa; antherae oblongae, 0.25-0.3 mm longae et 0.15-0.2 mm latae, aurantiae; stigmata sessilia, 0.25-0.3 mm longa, parum divergentia. Fructus ovoideus, circ. 0.75 mm longus et 0.55 mm diam.; semen subglobosum, circ. 0.5 mm longus et 0.45 mm diam.
Fl. and fr. 4. Dry sandy places.
Type: Canary Islands: TENERIFE: Nivaria, Guimar, c. 30 m, loco arenoso, sicco, aprico, 23.iv.1944, *E. R. Sventenius* 115 (as *H. fruticosa* L.) (holo. LISE).
Endemic. Resembles *H. fontanesii* J. Gay in habit and in the structure of the leaves, but is readily distinguishable by its much smaller flowers (arranged in very conspicuous clusters) and its equal (or subequal) sepals.

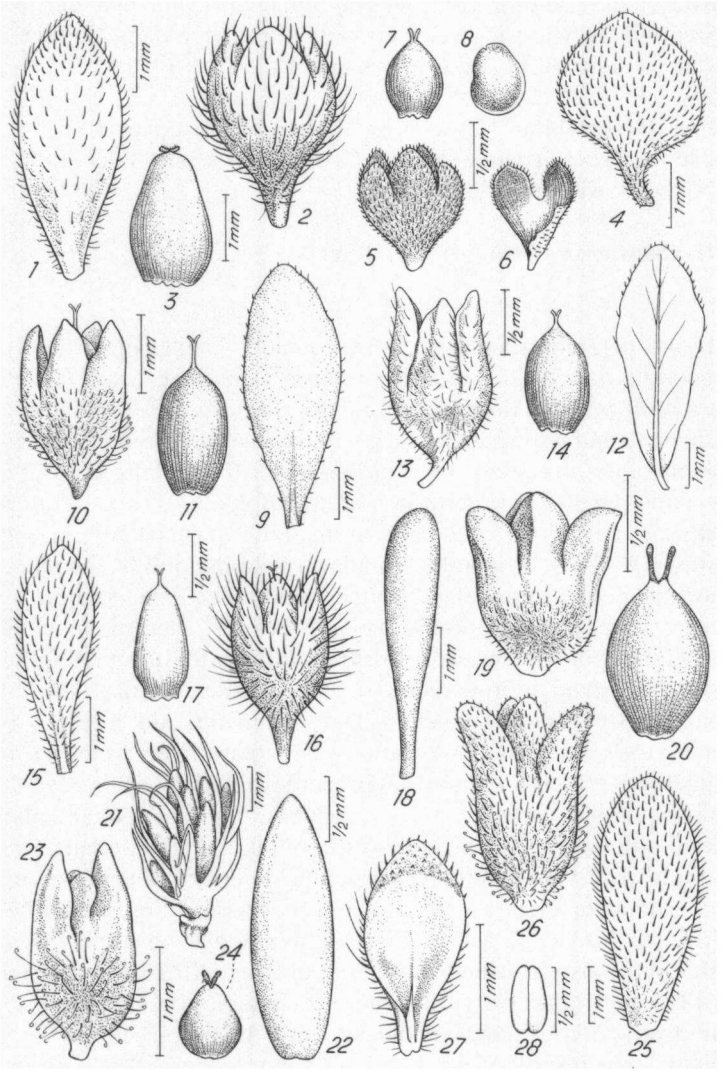

Plate XXI. Fig. 1-3: **H. scabrida** subsp. **guadarramica;** 1: leaf; 2: flower; 3: fruit [vii. 1916, *Vicioso* (FI)]. Fig. 4-8: **H. maskatensis;** 4: leaf; 5: flower; 6: section of flower; 7: fruit and stigmas; 8: seed [*Bornmüller* 181(B)]. Fig. 9-11: **H. polygama;** 9: leaf; 10: flower; 11: fruit with style [*N. Zinger* 3638(W)]. Fig. 12-14: **H. nigrimontium;** 12: leaf; 13: flower; 14: fruit [*Baldacci* 165(G)]. Fig. 15-17: **H. degenii;** 15: leaf; 16: flower; 17: fruit with style [28. vi. 1890, *A. de Degen* (W)]. Fig. 18-20: **H. canariensis;** 18: leaf; 19: flower; 20: fruit with stigmas [*Sventenius* 115(LISE)]. Fig. 21-24: **H. pujosii;** 21: part of a shoot; 22: leaf; 23: flower; 24: fruit with stigmas [*Pujos* 903 ter(G)]. Fig. 25-28: **H. arabica;** 25: leaf; 26: flower; 27: sepal, inner side; 28: anther [*Gillett & Rawi* 6799(W)].

41. **H. pujosii** Sauv. et Vindt in Bull. Soc. Sc. Nat. et Phys. Maroc. 36:194 (1956).

Plate XXI, Fig. 21-24. p. 384

A small, perennial herb with a woody tap root; stem very woody at the base, prostrate, much-branched, branches short, up to c. 5 cm long, rather tortuous and intertwined, often quite congested and brittle, and with very short, 1-2 (-4) mm long, stout internodes, densely pubescent with short, retrorsely appressed hairs. Leaves 1.5-2 (-2.5) x 0.75 mm, lanceolate-triangular, ± obtuse, mostly glabrous, rather thick-coriaceous, slightly concave on the upper side, and somewhat convex on the lower, closely (imbricately) arranged, mostly ascending though slightly recurved with age; stipules narrowly lanceolate, 1.75-3 mm (mostly 2-2.5 mm in the lower regions), one-nerved, with a densely ciliate margin, usually nearly white, occasionally purplish at the base, exceeding the leaves, prominently so at the shoot tips. Flowers agglomerated at the ends of the short, lateral shoots, but the clusters often few (4 to 7)-flowered, and usually mixed with the cauline leaves; bracts c. 1.25 mm long, narrowly ovate-lanceolate, acuminate, with a ciliate margin, purplish at the base, and shorter than the flowers. Flowers almost sessile, 1.7-1.85 (mostly c. 1.75) mm long, narrowly ellipsoid, often rather pale, the perigynous region densely covered with fine, patent, 0.4-0.45 (-0.5) mm long hairs which are coiled at the tip; sepals glabrous on the back, unequal, erect, fleshy and pale, the two outer c. 1 mm long, ovate-oblong, having thickened, nearly white and very shortly pointed apex, the inner 0.6-0.7 mm long, ovate, concave, with a prominent, white, inflexed membranous margin and a somewhat hooded apex; petals 0.55-0.6 mm; filaments c. 0.4 mm; anthers 0.25-0.3 x 0.2 mm, oblong, orange; stigmas c. 0.25 mm long, rather thick and brown, erect to slightly spreading. Fruit 0.7-0.75 x 0.6-0.65 mm, ovoid, somewhat narrowed at the obtuse top; seed c. 0.55 x 0.5 mm, ovoid-subglobose.

Fl. 6-12. Gypsaceous soils, in ravines.

Type: ALGERIA: Hauts Plateaux: environs de Berguennt, viii-ix. 1954, *A. Pujos* (holo. RAB, not seen; iso. MPU?).

Distr.: Endemic in NW Algeria and E. Morocco.

Morocco: Moyen Atlas (Centr./NE), env. de Skoura, 12.xii.1956, *A. Pujos* 903 ter (G, MA). **Algeria:** Prov. Oran: Dj. Labeth, Dj. Amour, Aflou, v-vi.1880, *A. Roux* (P).

This is a very remarkable species. It possesses very prominent stipules almost like those of *Paronychia*. Curiously enough this unique feature is not found in any other species of *Herniaria*. However, the floral characters are very similar to those of *H. fruticosa* L.

42. **H. fruticosa** L., Cent. Pl. 1:8 (1755).

Willk. et Lange, Prodr. Fl. Hisp. 3:151 (1874); Brummitt & Heywood, Revision of subgen. *Heterochiton* in Europe, Fedde's Repert. 69:24 (1964). Syn.: *Heterochiton fruticosa* (L.) Graebn. & Mattf. in Ascherson & Graebn., Syn. 5 (1):870 (1919).

A perennial herb with a woody caudex; stem prostrate to occasionally suberect, often very woody at the base; branches ± congested, up to c. 30 cm long, usually with swollen nodes and fascicled leaves in the axils; internodes up to 6 mm long, densely covered with short, soft, patent to somewhat deflexed hairs. Leaves ovate-triangular to almost oblong-oval, up to c. 2 (-3.6) x 1.3 (-1.75) mm, obtuse, fleshy, finely puberulous, especially along the margin, to almost glabrous, usually in fascicles on the nodes, sometimes with a thickened margin; stipules ovate-triangular, up to 1.75 x 0.75 mm, with a densely ciliate margin, the younger ones red-purple in the middle and the older ones often nearly white or, occasionally, purplish throughout. Flower clusters (3) 7 to many-flowered, terminal and lateral, often densely congested towards the end of the shoots. Flowers sessile, (1.75-) 2-2.25 mm long, oblong, often shortly but densely spreading pubescent on the basal part, the hairs being very fine, soft, 0.3-0.6 mm long, patent and usually heterotrichous, some being hooked, some straight; sepals glabrescent, fleshy, erect, unequal, the two outer spathulate-obovate to oblong, obtuse, enclosing the inner ones, the latter broadly oval and with a prominent, inflexed membranous margin, a somewhat hooded apex, and with distinct purple spots or patches on the margin near the base, sometimes very conspicuously so; petals c. 0.6 mm, brownish at the base; filaments 0.4-0.45 mm; anthers 0.4-0.5 x 0.25 oblong, orange; stigmas 0.25-0.3 mm, almost clavate, thick, brown, divergent from the notched top of the ovary. Fruit c. 1 x 0.6 mm, ellipsoid.

Fl. 5-8. On gypsaceous soils.

1a) Leaves mostly ovate-triangular, up to 2.5 x 1.3 mm

2a) Stems prostrate; stipules of the leaves on the basal part of the shoots nearly white or with a purple tinge near the base, almost white above; flower clusters often densely congested; sepals usually with very small purple spots on the margin ..... var. **fruticosa**

2b) Stems somewhat suberect; stipules mostly purple-violet throughout; flower clusters often rather lax; sepals with prominent purple patches or spots on the margin ..... var. **erecta**

1b) Leaves mostly oblong, up to 3.6 x 1.75 mm ..... var. **longifolia**

a) var. **fruticosa:** Type: Spain: Herb. Linneaus 312/3-4 (LINN).

Syn.: *H. fruticosa* L. var. *recurvifolia* Willkomm in Linnaea 30:99 (1859). Type: NE Spain: Catalonia: Balaguer, Sentin, Gerp, Tremp etc., *Costa* (holo. probably in COI, not seen).

H. verticillata Pourret ex Willk. et Lange, op. cit.

Distr.: Throughout the range of the species, except in some parts of SE Spain (Murcia).

Prov. Gerona: 10.vii.1872 & iv.1891, *F. Trèmols* (LD); Cap de Creus: vii.1874 & 1878, *id.* (FI, JE, Z); Prov. Lerida: Gerp, 10.vii.1871, *M. Compano* (FI); Prov. Huesca: Fraga: *Pinto da Silva* EPI-23 (LISE); Prov. Zaragoza: nr. Zaragoza, *Sandwith* 5076 (K); 8.vii.1870, *L. Leresche* (Z); Borja: *Willkomm* 435 (P); Calatayud: *B. Vicioso* 679 (JE, MA); Prov. Teruel: Castelserás: *Loscos* 35 (FI); Valacloche, 800 m, *Reverchon* 852 (FI, HBG, LD, Z); *id.* 3639 (JE); Castellon: 22.iv. 1851, *P. Bubani* (FI); Prov. Madrid: Ciempozuelos: *Bourgeau* 2270 (FI, JE, Z); Aranjuez: 12.vi.1876, *M. Winkler* (W); Rivas et Aranjuez: vi.1841, *Reuter* (FI, L); Prov. Toledo: Aranjuez: *Stud. biol. Rheno-Trai.* 1394 (U); Prov. New Castille: Mendavia: *Hno. Elias* 3262 (as var. *parcepilosa*) (COI, LD, MA); Prov. Ciudad Real: Ruidera: /1936, *Gz. Albo* (MA); Prov. Alicante: Elche: 9.vi.1947, *C. Vicioso* (MA, trans. with var. *erecta*); Prov. Murcia: Lorca: *Ellman & Sandwith* 1014 (K).

Note: Willkomm's var. *recurvifolia* is hardly distinguishable from var. *fruticosa*. The description given by Willkomm (op. cit.) applies equally well to the representatives of var. *fruticosa*. In fact even in the typical forms of var. *fruticosa* some of the leaves are quite often spreading or recurved with age.

b) var. **erecta** Willk.: *H. fruticosa* L. var. *erecta* Willkomm in Linnaea 30:99 (1859); Willk. & Lange, Prodr. 3:151 (1874).

Syn. *H. fruticosa* L. subsp. *erecta* (Willk.) Batt. in Batt. & Trab. Fl. Alg. (Dicot.) 168 (1888), p.p. quoad syn., excl. descr.; Brummitt & Heywood, op. cit. 30 (1964). Type: SE Spain: Prov. Murcia: In collibu argylloso-gypsaceis prope Algezares, 1851 et 1852, *Guirao* (lecto. MA!). Distr.: Endemic in Prov. Murcia.

Murcia: Algezar: vi.1852, *A. Guirao* (MA, P, LECTOTYPE); Sierra de la Fuensanta: *Bourgeau* 661 (FI, LD); Beniajan: 17.xi.1851, *Joh. Lange* (FI, JE); Murcia to Beniajan: *Ellman & Sandwith* 465 (K); Fortuna: *H. D. Ripley* 231 (K).

c) var. **longifolia** Chaudhri nov. var. a var. *fruticosa* foliis longioribus (3.6 mm longis et 1.5-1.75 mm latis) et plerumque oblongis distinguenda; forsitan hybrida inter *H. fruticosum* et *H. fontanesii,* ad quem foliorum forma accedit; flos tamen ei *H. fruticosae* similior.

Leaves up to 3.6 mm long (and 1.5-1.75 mm wide), mostly oblong and obtuse.

Type: NE Spain: Aragon: Teruel, viii.1909, *F. Sennen* (BC, mixed with var. *fruticosa*).

Endemic. It may well be a hybrid with *H. fontanesii* as it shows considerable similarity with the latter in the foliar characters though possessing a distinctly *H. fruticosa*-like flowers. But the fruit is fully developed.

Range of the species: NE, C, and SE Spain.

43. **H. ericifolia** Townsend in Kew Bull. 20(3):427 (1966).

A perennial herb; stems prostrate, up to c. 15 cm long, much-

branched along their whole length, the older shoots leafless towards the woody and nodose-knotty basal part, but densely leafy above, and profusely floriferous at the end, branches rather irregularly though closely spreading; internodes quite short, 1-3 mm long, stout, shortly and retrorsely velvety-pubescent to puberulous. Leaves lanceolate-triangular, mostly up to 2 x 0.8 mm (very occasionally up to 3 mm long), acute, fleshy to somewhat rigid; closely imbricate and in the lower non-floriferous region ascending, but somewhat spreading or even slightly recurved towards the top, sometimes in axillary fascicles, often minutely papillose-hairy in younger stages to glabrous with age, the older turning pale brown; margin occasionally somewhat inrolled; stipules lanceolate, c. 1 x 0.5 mm, acute, with a densely ciliate margin, usually purplish-red. Flower clusters 7 to many-flowered, often densely aggregated towards the end of the shoots and forming very compact masses. Flowers subsessile, 1.5-1.8 (mostly c. 1.6) mm long, oblong to campanulate, the perigynous region densely covered with fine, patent and hooked hairs; sepals fleshy, often glabrous, sometimes papillose on the tip, unequal, the two outer obovate-subspathulate to almost oblong, 1.1-1.25 mm long, usually with a thickened and somewhat rough and obtuse apex (sometimes minutely cuspidate at the top), spreading with age, the inner 0.7-1 mm long, narrowly oblong, concave, with a distinct, nearly white and inflexed, membranous margin, and slightly hooded apex; petals c. 0.75 mm; filaments 0.6-0.65 mm; anthers c. 0.45 x 0.2 mm, oblong, orange-yellow; ovary ovoid, 0.6-0.8 x 0.45-0.65 mm, nearly white, with obtuse top; stigmas ± sessile, 0.4-0.45 mm long, rather thick, brown and spreading. Fl. 5. Stony places.
Type: LIBYA: Tripolitania: Ruins of Sabratha, in tufts on bare stony ground, 2.v.1965, *N. H. Sinnott* 524 (holo. K!). Endemic.
Closely resembling *H. fontanesii* J. Gay in some of the floral characters, but distinguishable by its imbricate and ascending lower leaves, and by its obtuse to almost rounded ovary. In *H. fontanesii,* on the other hand, the leaves are often fascicled and spreading, and the ovary is notched at the top.

44. **H. fontanesii** J. Gay in Duchartre, Rév. Bot. 2:371 (1847).

Durand & Barratte, Prodr. Fl. Lib. 43 (1910); Pampanini, Fl. Ciren. 191 (1931); V. Täckholm, Stud. Fl. Egypt 403 (1956); P. Ozenda, Fl. Sahara sept. & centr. 209 (1958); P. Quezel & S. Santa, Nouv. Fl. Alg. 1:317, f. 810 (1962); Maire et Weiller in Maire, Fl. Afr. Nord 9:51, f. 15 (1963); Brummitt in Tutin et al., Fl. Europ. 1:152 (1964). Syn.: *H. fruticosa* L. subsp. *erecta* (Willk.) Batt. Trab., Fl. Alg. (Dicot) 168 (1888) pro parte; *H. empedocleana* Lojacono Pojero, Nat. Sicil. An. Terzo 1883-84: 282 (1884). Type:

Sicily: nr. Porto Empedocle, Lojacono Pojero? (holo. PAL, not seen); Lojacono Pojero, Fl. Sicula 2:264 (1904).
H. teknensis Sauvage in Bull. Soc. Sci. Nat. Maroc. 25-27:367 (1949) (without latin description). *Heterochiton fontanesii* (J. Gay) Graebn. & Mattf. in Aschers. & Graebn., Syn. 5(1):870 (1919). **Icon:** Maire, Fl. Afr. Nord 9:51, fig. 15 (1963).
Misapplied name: *H. fruticosa* sensu Desfontaines, Fl. Atl. 1:213 (1798); Bonn. et Barr., Cat. Tun. 65 (1896); non L., Cent. 1:8 (1755).
A perennial herb with a thick and woody tap root; stems very woody (c. 1.5 cm in diam.) at the base, prostrate to very occasionally suberect, much-branched, the branches spreading, up to c. 30 cm long; internodes stout, up to 9 mm long, shortly pubescent with retrorse hairs. Leaves narrowly oblong-subspathulate to oblong-oblanceolate or narrowly elliptic, opposite, partly forming axillary fascicles, often up to 4.5 (rarely to 8) x 2 mm, fleshy to rather rigid, usually finely puberulous or papillose and scabrous, sometimes covered with closely appressed, arcuate velvety hairs, obtuse, margin often somewhat thickened and slightly inrolled with age; stipules lanceolate, 1.5-2 x 0.75-1 mm, with a densely ciliate margin, mostly purplish in the middle, the margin being white or pale, sometimes wholly dark-purple. Flower clusters 3 to 7-flowered, leaf-opposed and pseudo-axillary, densely congested towards the end of the branches, occasionally much larger and many-flowered; bracts resembling stipules though much shorter. Flowers sessile, (1.5) 2-2.25 (-2.5) mm, vase-like, perigynous region turbinate and densely covered with 0.4-0.5 mm long, soft, patent and hooked hairs; sepals slightly papillose and rough to almost smooth on the back but with short rather thick and erect, papillose-hairs on the apex or on the apical part of the margin, occasionally with short, appressed hairs on the back, unequal, the two outer c. 1.5 x 0.8-1 mm, spathulate-obovate, rigid, with a recurved apex (sometimes only slightly so), the inner ovate-oblong, concave, with a distinct, inflexed, membranous margin, and sometimes an apiculate apex and occasionally with purple spots on the margin near the base; petals 0.75-0.8 mm; filaments 0.5-0.6 mm; anthers 0.35-0.4 x 0.2 mm, oblong and orange; ovary (young) c. 0.5 mm in diam., ovoid; stigmas 0.3-0.4 mm, rather thick, brown and spreading-divergent from the notched top of the ovary. Fruit c. 1.25 x 0.75 mm, ellipsoid. Fl. 4-7. Dry sandy places.

1a) Stems with patent hairs; leaves and sepals covered with crisped, silky hairs; outer sepals near the base usually with dark-purple spots on the margin ..... subsp. **almeriana**
1b) Stems with retrorse hairs; leaves and sepals almost glabrous or slightly papillose, sometimes with short crisped hairs; outer sepals without purple patches ..... subsp. **fontanesii**

2a) Flowers 1.5-1.6 mm long ..... var. **gracilis**
2b) Flowers 1.75-2.5 (mostly 2-2.25) mm
3a) Leaves densely pubescent with closely appressed, arcuate hairs ..... var. **pubescens**
3b) Leaves somewhat papillose (esp. along the margin) or puberulous to almost glabrous ..... var. **fontanesii**
4a) Stems pulvinate ..... subvar. **pulvinata**
4b) Stems usually not pulvinate but spreading
5a) Stems shortly pubescent with retrorse hairs; leaves and sepals puberulous or somewhat papillose esp. nr. the tip ..... subvar. **fontanesii**
5b) Stems slightly puberulous; leaves and sepals ± glabrous ..... subvar. **glabrescens**

A. subsp. **fontanesii:** var. **fontanesii**
a) subvar. **fontanesii:**

Syn.: *H. fruticosa* L. subsp. *erecta* Batt. var. *glabra* Batt. in B. & T., Fl. Alg. 168 (1888). *H. fontanesii* J. Gay var. *eu-fontanesii* in Maire, Cat. 1207 (1932).

Distr.: Libya, Tunisia, Algeria.

Libya: Marmarcia: El Omaied, *E. Gauba* 125 (W); Cyrenaica: Derna to El Mekhili: *Pampanini & Pichi-Sermolli* 2437, 2438 (FI); El Mekhili: *Pampanini* 2432 (FI, G); & 2431 (partly); nr. Ajedabia: *Pampanini* 2425, 2426, 2427 (FI); ibid., *Pampanini & Pichi-Sermolli* 2435, 2436 (FI); Syrte: nr. El Agheila: *Pampanini* 2428 (FI); *Agr. Dep. Cyren.* 186 (FI). Tripolitania: Misrarath: *Pampanini* 2558,3022, 3077, 3166, 3284, 3337 (FI); Garian: *Pampanini* 3835, 3938 (FI); *H. G. Keith* 623 (K); W. of Homs: *Sandwith* 2045 (K); Tarhuna: *Sandwith* 2746 (K); *Pampanini* 598, 849, 1107, 1366 ,1476, 1669, 1917, 1999, 1887, 2217, 2399, 2402 (FI); Tripoli: *P. Taubert* 139 (G); *Bornmüller* 1933:628, 629, 630, 631 (B, Z); Sidi ben Nur: *Maire & Weiller* 1304 (FI). **Tunisia:** Prov. Gabès: iv.-v.1896, *Murbeck* (LD); *Pitard* 125 (G, L); *id.* 1035, 2231, 2232, 2233 (G); nr. El Hamma: *Pitard* 3027, 3028, 3029, 3030 (G); Gafsa: *Pitard* 1227 (G, L); Graiba: 18.iii. 1925, *E. Wall* (S). **Algeria:** Prov. Constantine: 18.vi.1853, *Cosson* (S); Oued Biskra: *Balansa* 874 (E, FI, G, JE, LD); Biskra: *L. Chevallier* 29 (FI, G, JE); Touggourt: *Alston & Simpson* 37319 (BM, leaves somewhat closely imbricated); Bou Saada: *Alston & Simpson* 37165 (BM); Prov. Oran: Beni Mansour: *Battandier & Trabaut* 580 (G); Ain Sefra: vi.1911, *A. Faure* (G); Djelfa: /1854, *Reboud* (G). *Canary Islands:* Fuerteventura: Puerto de Cabros, iv.1912, *O. Burchard* 360 (partly) (JE).

β) subvar. **glabrescens** (Pampanini) Chaudhri comb. et stat. nov.:

Syn.: *H. hemistemon* J. Gay var. *glabrescens* Pamp., B. Soc. Bot. Ital. 13 (1914); Maire & Weiller in Maire, Fl. Afr. Nord 9:56 (1963).

Stems minutely puberulous to almost glabrous; leaves and sepals subglabrous to glabrous.

Libya (Tripolitania) & Canary Islands.

Libya: Tripolitania: Mesellata (Misrata): Gherrim, Sindara, 15.iv.1913, *Pampanini* 3337 (FI, TYPE); Sabratha: 18.iii.1931, *Zodda* (FI). **Canary Islands:** *Findley and Depreaux* (K).

γ) subvar. **pulvinata** Chaudhri n. subvar. a subvarietatibus adhuc notis caulibus brevioribus (usque ad 7 cm longis) et suberectis distinguenda.

Stems densely pulvinate, up to c. 7 cm long and suberect.

LIBYA: ('Egypt'): Marmarica: El Omaied, *E. Gauba* 125 (W, holotype). Endemic.

b) var. **gracilis** Maire in Maire, Cat. 1207 (1932): Flowers quite small, 1.5-1.6 mm long.

Type: Morocco: Anti-Atlas: Icafen, 19.iv.1931, *Maire* (holo. MPU? iso. P!).

Algeria: S. Oran: Dj. Aissa: *Battandier and Trabut* 423 (G); Prov. Constantine: *Guyon* (G). **Tunisia:** nr. Gabès: *Pitard* 383 (G).

c) var. **pubescens** Battandier in Batt. and Trab., Fl. Alg. (Dicot) 168 (1888), sub *H. fruticosa* L. subsp. *erecta* Batt.

Type: Algeria: Battandier? (probably AL, not seen).

Syn.: *H. fontanesii* Gay var. *gayana* Maire in Maire, Cat. 2229 ter (1937). *H. fontanesii* Gay var. *clastrieri* Maire in sched. Type: Algeria: Aurès: Ghoufi, v. 1936, *Maire* (P!).

Leaves densely pubescent with closely appressed, arcuate, silky hairs.

Distr.: Algeria and E. Morocco, and some parts of Libya and Tunisia.

Libya: Wadi Farigh: *Pampanini and Pichi-Sermolli* 2434 (FI); E. of Ajidabia: *Pampanini and Pichi-Sermolli* 2432 (FI). **Tunisia:** Dj. Kiroun: *Kralik* 219a (FI, G, S). **Algeria:** El Kantara: *Kuegler* 55 (JE); nr. Biskra: 11.iv.1912, *Jos. Braun* (Z); 21.iii.1900, *Hugo Bretzl* (S); 13.iii.1896, *E. Olin* (LD); E. of Tougourt: *Th. Stomps* 55 (U); Sahara: Laghouat: iv. 1873, *George Maw* (E, trans. with subsp. *almeriana*); Od Rir: *Reboud* 660 (FI, trans. with subsp. *almeriana*); Fontaine Gazelles: iii.1896, *Murbeck and Olin* (LD); Prov. Oran: Ben Zireg: *H. Romieux* 542 (G); Sidi Khalifa: 25.v.1852, *Cosson* (W); Nemours, nr. Phare: 29.v.1936, *Faure* (E, LISE, S, U); Env. Nemours: 16.iv.1941, *Faure* (LISE); Raselma to Bedeau: 15.iv.1925, *Faure* (LD). **Morocco:** Guercif: *Jahandiez* 301 (G, Z); ibid., *Samuelsson* 7595 (S); Bou Denib: iv.1923, *H. Humbert* (FI); E. Morocco: *Pitard* 3252, 3253, 3254 (P).

B) subsp. **almeriana** Brummitt and Heywood in Fedde's Repert. 69 (1):31 (1964), et in Tutin et al., Fl. Europ. 1:152 (1964).

Stems densely covered with short, patent to slightly deflexed hairs; leaves and sepals with crisped, silky hairs; stipules mostly purplish; outer sepals with purple spots near the base of the margin. Hills of SE Spain and N. Morocco.

Type: SE Spain: Almeria, in collibus aridis glareosis, 10-100 m, iv. 1890, *Porta and Rigo* 191 (holo. LIVU; iso. B! BM! JE! K! LD! W! sub *H. fruticosa* L.).

Spain: Murcia: Fortuna: *H. D. Ripley* 232 (K); Granada: Almeria: *Porta and Rigo* 191 (B, BM, JE, K, LD, W); *id.* 592 (FI); Cuevas: *Sennen* 7397 (FI); Cabo de Gata: *N. Hjalmar Nilsson* 417 (LD). **Morocco:** El Rif: Marsa Saguira: *Font Quer* 173 (MA, trans. with subsp. *fontanesii* var. *pubescens*); Cudia Arneb: Beni Bu-lahi, *Font Quer* 141 (MA, S, Z, trans. form); Berkane: 17.v.1933, *Faure* (E, trans. form); Hte. Moulouya: Midelt, valle Oued Outat, c. 1350 m, *Jahandiez* 147 (E).

Range of the species: NNW Africa (Libya, Tunisia, N. Algeria, NNE Morocco), Canary Islands, SE Spain and S. Sicily.

45. **H. mauritanica** Murbeck, Contr. Fl. N.-Ouest Afr. in Lund Univ. Arskr. 33:47, tab. 2, f. 7-9 (1897).

P. Quezel and S. Santa, Nouv. Fl. Alger. 1:317 (1962); Maire and Weiller in Maire, Fl. Afr. Nord 9:57 (1963).

Syn.: *H. fruticosa* L. subsp. *fontanesii* Batt. in Batt. and Trab., Fl. Alg. 168 (1888), non J. Gay in Duchartre, Rev. Bot. 2:371 (1847).

A perennial herb, densely branched and almost matted; stems prostrate, congested and caespitose, woody and much-branched from the base; branches up to 15 cm long and densely leafy; internodes up to 4 mm long, puberulous. Leaves oval to oblong, up to 5 x 2.5 mm, subacute to obtuse, often fleshy, usually entirely glabrous and glaucous, much recurved, the upper side somewhat concave, mostly in axillary clusters though opposite as well; stipules lanceolate, up to 2.4 x 1.4 mm, mostly nearly white, often bipartite. Flower clusters terminal as well as lateral, large, 13 to many-flowered, often densely congested towards the end of the branches; bracts purplish at the base. Flowers subsessile, 1.7-2 (2.25) mm, oblong to campanulate; perigynous region rather small but densely covered with 0.4-0.45 mm long, soft, silky-shining, patent and hooked hairs; sepals entirely glabrous, unequal, the two outer obovate-spathulate to oval, often concave, with a much-thickened and very shortly and abruptly cuspidate apex, the inner ones oblong, boat-shaped, with a prominent, inflexed membranous margin and a hooded apex, outer sepals slightly divergent with age; petals and filaments almost equal in length (c. 0.5 mm); anthers 0.3-0.35 x 0.2 mm oblong and orange; ovary (young) 0.5-0.6 x 0.45 mm ovoid, with a notched top; stigmas 0.2-0.25 mm, rather thick, brown, suberect to spreading. Fruit c. 1 x 0.6 mm, ellipsoid.

Fl. 4-5. Ft. 6-7. On gyosaceous soils, alt. up. to c. 950 m.

Type: Algeria: Prov. Oran: Chott-el-Chergui à Sidi Khalifa cercle de Saida, 11.v.1852, *Balansa* 585 (as *H. fruticosa* var.) (lectotype G; iso. E! FI!). Endemic in N. Algeria and W. Tunisia.

a) forma **mauritanica:**

Algeria: Prov. Oran: Chott-el Chergui, Sidi Khalifa nr. Saida, *Balansa* 585 (E, FI, G, TYPE); Khalifa to Kreider, 29.v. 1852, *E. Cosson* (JE); Le Kreider: *Battandier and Trabaut* 141 (JE, L, LD); *Hochreutiner* 166 (Z); 5.vi.1894, *J. Vosseler* (STU); Sahara: El Haouita, 'Mouila': *L. Chevallier* 280 (JE, P); Djelfa: *O. Reboud* 178 (G); Medeah to Laghouat: *Guyon* (G); Metlili: iv.1883, *A. Letourneaux* (FI); Oued Biskra: *Ch. Schmitt* 40 (G); Prov. Constantine: Constantine — Batna Road, 8.iv.1912, *A. Thellung* (Z). **Tunisia:** El Guettar: 20.v.1887, *Mission Scientifique du Tunisie* (P). S. Tunisia: *A. Letourneaux* in 1887 (FI).

b) forma **subrosea** Chaudhri nov. forma a forma *mauritanica*

bracteis floribusque subroseae distinguenda. Bracts almost wholly purple, and flowers pink.
Algeria: Prov. Constantine; Melila, 17.vi.1853, *Cosson* (P).

A very distinct species, differing from *H. fontanesii* J. Gay in its almost matted habit, glaucous and glabrous, elliptic and recurved leaves, somewhat larger and nearly white stipules, bigger flower flusters and entirely glabrous sepals.

46. **H. hemistemon** J. Gay in Duchartre, Rév. Bot. 2:371 (1847).

Boissier, Fl. Or. 1:742 (1867); Muschler, Manual Fl. Egypt. 1:351 (1912); Pampanini, Fl. Ciren. 191 (1931); Dinsmore in Post, Fl. Syr. Pal. and Sin. 1:212 (1932); J. Thiébaut, Fl. Lib-Syr. 1:131 (1936); A. Parsa, Fl. Iran, 1 (2):1242 (1951); V. Täckholm, Stud. Fl. Egypt 402 (1956); Maire and Weiller in Maire, Fl. Afr. Nord 9:54 f. 16 (1963); Rechinger, Fl. Lowland Iraq 224 (1964); P. Mouterde, Nouv. Fl. Lib. and Syr. 1:455 (1966); M. Zohary, Fl. Palaest. 1:134 (1966). **Icon:** Maire et Weiller, op. cit. fig. 16 (1963).
Syn.: *H. fruticosa* L. var. *hemistemon* (Gay) Barratte in Bonn. et Barr., Cat. Tun. 65 (1896); *H. sphacelata* Hochst. in sched.
Misapplied name: *H. fruticosa* sensu Delile, Fl. Aegypt. 57 (1812), non L., Cent. Pl. 1:8 (1755).

A perennial herb (rarely annual to biennial) with a woody, and long tap root; stem prostrate, woody at the base, much-branched, the branches often spreading around the base, though rather congested, up to c. 21 cm long, somewhat brittle, very shortly retrorsely pubescent to puberulous. Leaves mostly opposite, oblong-elliptic, usually up to 6 x 3 mm (rarely to 9 x 4.5 mm), obtuse, abruptly rounded at the base, adpressed pubescent; stipules c. 1.25 x 0.75 mm, ovate-triangular, the lower (older) more or less white, the upper (younger) ones almost wholly purple. Bracts up to c. 0.7 x 0.5 mm, purple. Flower clusters leaf-opposed, often 7 to 10-flowered, almost spikate, and densely congested. Flowers subsessile, (1.5-) 2-2.25 (-2.5) mm, almost funnel-like; perigynous region turbinate and densely hairy (with 0.4-0.5 mm long, patent, soft and hooked hairs) particularly on two protuberances just below the inner sepals; sepals somewhat papillose or slightly hirtellous on the back, but having short, rather thick hairs on the apical part of the margin, much unequal, the two outer deltoid-spathulate, much narrowed downwards (to the base), c. 1.4 x 1 mm, thickened, rough, recurved at the obtuse apex, the inner c. 1/3 as long as the outer, ovate-oblong, concave-boatlike, with a prominent membranous margin and an apiculate apex; petals absent; stamens 2, situated opposite the inner sepals, filaments 0.4-0.45 mm; anthers 0.25 x 0.15-0.2 mm, oblong-quadrangular, orange; styles two, 0.25-0.35 mm, filform, pale-brown and suberect. Fruit c. 1 x 0.5 mm,

ovoid-ellipsoid, narrowed to the top.
Fl. 2-4. Gypsaceous sandy soils.
Type: SINAI: 'Arabia Petraea': Hauara ad Ras Hammam, 16.iii. 1835, *W. Schimper* 195 (LECTOTYPE G! iso. E! FI!).

1a) Stipules and bracts almost white throughout ---- var. **albostipulata**
1b) Stipules of the lower leaves almost white, but those of the upper leaves (along with the bracts) wholle purple
2a) Flowers 1.8-2.5 mm long, mostly 2-2.25 mm; outer sepals distinctly recurved at the apex ..... var. **hemistomon**
2b) Flowers 1.4-1.7 mm, mostly 1.5-1.6 mm; outer sepals suberect or slightly recurved at the top ..... var. **parviflora**

a) var. **hemistemon:**
Syn.: *H. hemistemon* var. *eu-hemistemon* Maire in Maire, Cat. 1970 bis (1936); *H. hemistemon* var. *pallescens* Maire, Bull. Soc. H. N. Afr. Nord 27:79 (1936) et in Maire, Cat. 1970 bis (1936); Maire et Weiller in Maire, Fl. Afr. Nord 9:58 (1963). Type (of var. *pallescens* Maire)): Algeria: Oasis Mraier, 22.iv.1933, *Maire* (holo. AL or MPU; iso P!); Paratype: Marocco: In lapidosis arenosis Anti-Atlantis, prope Bou-Isakaren, c. 400-500 m, iii.1935, *G. Malencon* (P!).
Distr.: Throughout the range of the species.

S. Iran: Prov. Laristan: Bandar Abbas: *Bornmüller* 1893:177 (B); Lingeh: *Bornmüller* 176 (B); Prov. Fars: Bushehr: *O. Stapf* 39 (W); *Bornmüller* 178 (B, JE); *Walter Koelz* 14857 (W); *M. Köie* 274 (C, E, W); Kharg Island: *Martin L. Grant* 17040 (W). **Iraq:** Southern Desert: Distr. Basra: *Baghdad Univ. Bot. Depart.* 8567 (W); *Rechinger* 8636, 14554, 14572 (W); Rumaila: *Rechinger* 15465 (W); nr. Saudi border: *Rechinger* 9349 (W); nr. As Salman: *Rechinger* 13854, 13877, 15837 (W); Nakhaila: *Rechinger* 8843 (W); Distr. Diwaniya: *Rechinger* 9277, 13700 (W); Distr. Karbala: *Rechinger* 8350 (W); Distr. Baghdad *Rechinger and Wheeler Haines* 8274 (W); Falluja Desert: *Haines* 192 (E, K); E. of Falluja: *Martin L. Grant* 15655 (W); Abu Gharaib to Falluja: *A. Rawi* 15110 (W); W. of Abu Gharaib: *Polunin et al.* 36 (E, G, W); Jabal Hamrin: *G. K. Sutherland* 115 (BM). **Arabia:** Arafjan: *V. Dickson* 51 & 130 (K); Bahrain Island: *J. Fernandez* 39 & 459 (K); *Ronald Good* 268, 269, 270 (K); QATAR: *Ronald Codrai* 27 (K); Dubai: *Mrs. F. Holmes* H341 (K). **Syria:** Palmyra Desert: Palmyra: *Dinsmore* 11510 (S, mixed with *H. arabica*); *Samuelsson* 3471 (S); *Davis* 5914 (E, K); Qaryatain: *Davis* 5711 (E, K); NW of Ain el Beida, c. 500 m, *Samuelsson* 3570 (S). **Palestine:** Jerusalem to Jericho: *Samuelsson* 624, 802, 2669 (S); *I. Amdursky and A. Grizi* 318 (B, G); *Bornmüller* 1897:223 (B, G, JE); Jericho: *Bornmüller* 222 (B, E, G, Z); Jerusalem: *P. Range* 572 (Z); Dead Sea, alt. c. —394 m, *Dinsmore* 3180 (E); Negev: Wadi Asluj: 16.iv.1949, *D. Yaffe* (C); Beersheba: *Davis* 4965 (E, K); Beersheba to Asby: *Davis* 4999 (E, K); Wadi Kelt: *Davis* 4019 (E, K). **Jordan:** Azraq to El Hasim: *Hunting Aero Survey* 117b (E, trans. with var. *parviflora*); nr. Azraq: *Townsend* 65/24, 65/182 (K); Wadi Rajil: *Townsend* 65/279 (K). **Jordan/Sinai:** Arabia Petraea: /1846, *Pinard* (FI, G). **Sinai:** Hauara, Ras Hamam: *Schimper* 195 (E, FI, G, L); Nekhl to Mitla Hills: *Davis* 10461 (E, K); Isthmic Desert: Nekhl: *Drar* 709 (S); Mitla Pass: *Drar* 644 (S); Wadi Homr: *Post* 184 (G); Wadi Charandal to Wadi Wardan: *A. Kneuker* 205 (Z). **Lower Egypt:** Helwan: *Davis* 6246B and 10513 (E, K); *Schweinfurth* 29.iii.1899 (B, JE); Amria: *Davis* 8405 (E, K); *Bornmüller* 1908:10414 (B);

Mariut: *Davis* 6477B (E, K); El Maks to Mariut: *Bornmüller* 10412 (B, E, G, JE, LD, Z); Wadi Dugla: *Boetje-van Ruyven* 42 (L); Wadi Dugla to Wadi Hoff: *A. Burdet* 206 (G Z); nr. Cairo: *A. Keller* 108 & 329 (G); Alexandria: *Samaritani* 3165 (FI, L, S); *C. Gaillardot* 176 bis (JE); Ramlé: *Gaillardot* 176 (JE). **Libya:** Marmarica: *E. Gauba* 124 (W); Cyrenaica: *Pampanini* 2430, 2431 (FI); Benghasi: *V. Zanon* 150 bis (FI); Wadi Faregh: SE of Agedabia: *Sandwith* 2167 (K), S. of El-Agheila: *Pampanini and Pichi-Sermolli* 2433 (FI); Tripolitania: Syrte: *Sandwith* 2699 (K). **Tunisia:** nr. Gabès *L. Kralik* 219 (E, FI, G, Z); El.-Hamma: *Pitard* 3031 (G); Teboulbon: *Pitard* 3026 (G); Oudref: *Pitard* 3024 (G); Menara: *Pitard* 3025 (G); Nefzaoua: *Pitard* 1931 (G); El Hamdon: *Pitard* 1929 (G); nr. Gafsa: *Pitard* 1928 (G, W). **Algeria:** Biskra (Sahara): *Kuegler* 53 (JE).

b) **parviflora** var. Chaudhri nov. var. a varietatibus aliis adhuc notis floribus minoribus (1.4-1.7 mm altis), sepalis exterioribus suberectis vel apice parum recurvatis distinguenda. Flowers 1.4-1.7 mm long, mostly 1.5-1.6 mm; outer sepals suberect to slightly recurved at the tip.

Type: LIBYA: CYRENAICA: Bomba: *P. Taubert* 677 (G).

Distr.: Libya and Tunisia.

Lybia: Wadi Faregh: *Pampanini* 2428 (FI); 18.iv.1928, *G. Krueger* (FI). **Tunisia:** nr. Gabès: *Pitard* 384 (E, G, JE); Metouia: *Pitard* 126 (G); Menara: *Pitard* 1930 (G, L).

c) var. **albostipulata** Chaudhri nov. var. a varietatibus aliis adhuc notis stipulis et bracteis ubique albidis distinguenda: Stipules and bracts entirely white throughout.

Endemic in Southern Desert of Iraq.

Iraq: Distr. Bara: nr. Kuwait border, Chilawa, 112 km SSW of Basra, *Rechinger* 14408 (W, holotype); Zubair: *Bagdad Univ. Bot. Depart.* 15408 (W).

47. **H. arabica** Hand.-Mazz. in Ann. Natur hist. Hofmus, Wien 26:145 (1912).

Rechinger, Flora of Lowland Iraq 224 (1964); P. Mouterde, Nouv. Fl. Liban and Syr. 1:454 (1966).

Plate XXI, Fig. 25-28. p. 384

A perennial or, rarely, biennial herb with a woody, long and almost unbranched tap root; stem strongly smelling of cumarin, prostrate, up to c. 12 cm long, much-branched from the woody base, and the branches often spreading around the base, but becoming densely congested with age; internodes up to 9 mm long, densely covered with short, patent or somewhat deflexed hairs, often soft, occasionally rough. Leaves mostly opposite, oblanceolate to narrowly obovate, up to 7 x 2.75 mm, obtuse, narrowed to the base, often hispidulous; margin usually thickened with age; stipules, ovate-triangular, c. 1.5 x 1 mm, with a densely ciliate margin, the younger ones often purple. Flower clusters mostly leaf-opposed, very occasionally solitary axillary, 3 to 7 (10)-flowered, often very profusely formed and densely congested, in the upper parts light-green. Flowers subsessile, (1.75-)

2-2.25 (-2.75) mm, narrowly ellipsoid-oblong to campanulate with maturity; perigynous region densely covered with fine, 0.4-0.5 mm long, hooked, patent hairs; sepals with short, stiff hairs on the outside near the apex, and with much shorter ones on the back, subequal to unequal, the outer c. 1.5 x 1 mm, obovate, obtuse, the apical part of the margin often much thickened, rough and nearly white, recurved at maturity, the inner sepals c. 1 x 0.5 mm, narrowly ovate-oblong, concave, with a broad, inflexed membranous margin and a slightly hooded, apiculate apex; petals quite conspicuous, c. 0.8 mm long, linear-lanceolate with a broad base; stamens four; filaments 0.4-0.45 mm, filiform; anthers 0.4-0.45 x 0.2 mm, oblong and orange-yellow; ovary c. 0.5 x 0.4 mm, ovoid; stigmas c. 0.25 mm, suberect. Fruit c. 1 x 0.6-0.7 mm, ovoid. Fl. 4-6. Gypsaceous sandy soils, alt. c. 60-600 m.

Type: IRAQ: Abukemal to Ramadi, at Kaijim, below Abukemal, c. 120-180 m, 4.iv.1910, *Handel-Mazetti* 649 (holo. WU!).

Distr.: Endemic; Iraqi and Syrian Deserts.

Iraq: Abukemal to Ramadi, *Handel-Mazzetti* 649 (WU, holotype); W. of Ramadi, 20.iv.1959, *Rawi and Nuri* (K); Ramadi to Hit, *Gillett and Rawi* 6799 (K, W); SW of Rutba, c. 600 m, 7.vi.1957, *A. Rawi* (K). **Syria:** Abukemal, nr. Iraqi border, *H. Helbach* 254A (K); T3 to T2, *H. Field and Yusuf Lazar* 357 (K); nr. T3, *Field and Lazar* 227 (G, K); nr. Palmyra, *Dinsmore* 11510 (partly) (G, S); *Davis* 5853B (E, K); 4.v.1900, *Post* (G); Meragha to Isriye, 3.v.1900, *Post* (B); NE of Damascus, 21.v.1961, *Kasy* (W mixed with *H. cinerea* DC.).

This species is distinguishable from its nearest relative, *H. hemistemon* J. Gay, by its very characteristic, hispidulous indumentum, particularly on the leaves and sepals (in *H. hemistemon* the leaves are always softly pubescent and the sepals glabrous on the back, papillose on the top) as well as by its oblanceolate-obovate leaves, the outer sepals often only slightly larger than the inner, the outer having a very much thickened apex, by the prominent petals (absent in *H. hemistemon*), four stamens instead of two, larger anthers and shorter stigmas.

SPECIES IMPERFECTLY KNOWN AND NAMES OF UNCERTAIN APPLICATION:

Herniaria bollei F. Hermann in Fedde's Repert. 42:221 (1937); (Subgenus *Heterochiton*). The description is quite clear: Perennial, stems retrorsely velutinous; leaves soft (herbaceous), frondose, plane, glabrous or glabrescent, rotund-spathulate, attenuated to short but distinct petiole, with conspicuous midrib and lateral veins; outer sepals soft (herbaceous), frondose, rotund-spathulate; stamens 4. Type: Canary Islands (Macaronesia): Fuerteventura, peninsula Handia, iv.1852, *C. Bolle* (as *H. fontanesii* J. Gay) (C. Bolle Herb. atlanticum; holo.

B, destroyed). I could not see any plant matching this description. However, in one specimen (*Findley* and *Deperaux*, K) belonging to *H. fontanesii* Gay, the normally fleshy and almost nerveless, glabrous leaves seem to show the veins after having been crushed or somehow pressed. Sepals, too, are almost glabrous but otherwise possessing all the characters of a typical *H. fontanesii*. It seems, therefore,quite likely that Bolle's plant was merely a deformed specimen belonging to *H. fontanesii*.

H. hartungii Parlatore ex C. Bot. Jahrb. 14:234 (1892). The description is insufficiently short: 'Stems prostrate, pubescenthirsute; leaves linear-lanceolate, margins, shortly ciliate; glomerules few-flowered; calyx ovate, sepals small, covered with short hairs.

Habitat in Insula Fuertaventura. Species melius observanda nam specimen, quod possideo, valde infirmum, tamen per foliorum et calicum pubecentiam videtur distincta.' Type: Canary Is.: Fuertaventura, G. *Hartung* (holo. ? untraceable). It is not at all clear whether the flowers are tetramerous or pentamerous. The hairy nature of the shoots and the sepals, however, indicates that it may well belong to *H. cinerea* DC.

H. corrigioloides M. Lojacono Pojero, Fl. Sicula 2(2):262 (1904). Perennial; shoots intertwined, shortly puberulous; leaves elliptic, glabrous; flowers in spikate-clusters; sepals smooth. Type: Sicily: Mt. Salvatore, *Lojacono Pojero* (holo. PAL, not seen). Probably not distinct from *H. microcarpa* Presl though the leaves are described as glabrous.

H. dichotoma DC., Prodr. 3:368 (1828). The latin description is very vague: 'Caule erecto pluries dichotomo herbaceo, foliis distantibus oblongis muticis ramisque pube brevi subpulverulentis, floribus cymosis'. In fact De Candolle himself was not sure of the taxonomic status of this taxon, and described it under 'species non satis notae', and added 'patr. ign.'. A few years earlier (in Poiret, Encycl. 5:25 (1804)) he had already described this taxon under *Paronychia*. De Candolle cited a specimen in Herb. Jussieu (P), but I could find no such specimen there.

H. laxa Rafinesque, Autikon Bot. 151 (1840). The type is untraceable but the description agrees with that of *H. incana* Lam. var. *angustifolia* Fenzl.

H. lenticularis Hill, Veg. Syst. 26:9 (1775). This is probably the same taxon as *H. lenticulata* L. (which is actually *Cressa cretica* L.).

H. orientalis F. Hermann op. cit. 220 (1937). Apparently a hirsute (and perennial?) herb with obtuse or rounded, greyish leaves covered with short, closely appressed hairs, and more or less sessile or capitate stigmas. Type: Turkey: Sazilar, 7.iv.1901, *Warburg et Endlich* Iter Phrygium 42 (as *H. hirsuta* L.) (holo. B, destroyed).

EXCLUDED SPECIES

Herniaria alsineifolia Miller, Gard. Dict. ed. 8, no. 31 (1768). = *Polycarpon tetraphyllum* L. var. *alsinifolium* Arc., Camp. Fl. Ital. ed. 1:112 (1882).

H. erecta Desfontaine, Fl. Atl. 1:214 (1798) = *Paronychia suffruticosa* (L.) DC. in Poiret, Encycl. 5:25 (1804).

H. joanneana Roem. et Schult. Syst. 6:297 (1820) = (??) *Paronychia suffruticosa* (L.) DC. op. cit.

H. illecebroides C. Smith in Tuckey, Exped. Congo 250 (1818); et ex DC., Prodr. 3:369 (1828) = *Paronychia illecebroides* (C. Smith) Webb in Hooker Niger Fl. 106, tab. 7 (1849).

H. lenticulata L., Sp. Pl. 218 (1753) = *Cressa cretica* L.

H. lenticulata Forsk., Fl. Aegypt-Arab. 52 (1775) = *Paronychia arabica* (L.) DC. in Poiret, Encycl. 5:24 (1804).

H. paniculata Webb, Iter Hisp. 46 (1838) = *Paronychia suffruticosa* (L.) DC.

H. polygonoides Cavan., Icon. Pl. 2:27, tab. 137 (1793) = *Paronychia suffruticosa* (L.) DC. op. cit.

H. suffruticosa Desf., Tabl. ed. 1:456 (1804) = *Paronychia suffruticosa* (L.) DC. op. cit.

8. PHILIPPIELLA

Philippiella Spegazzini in Rev. Facult. Agron. and Verterin. La Plata 30-31:566 (1897); Skottsberg in Svensk. Vetenskaps Akad. Handl. 56 (5):218 (1916); Pax et Hoffmann in Engler-Prantl, Pflanz., ed. 2, 16c:301 (1934).

A small densely pulvinate, dioecious, perennial herb. Stem and branches glabrous, shoots very densely clumped together, often with a leafless, nodose basal region but towards the top, on account of the usually very short internodes, covered with closely imbricated leaves. Leaves opposite, ascending and mostly closely imbricate, sessile, somewhat fleshy, oblong to ovate-oblong, obtuse, glabrous, slightly carinate. Stipules ovate-oblong, subobtuse, with a finely ciliate margin, two per pair of leaves and often nearly 2/3 of their length. Flowers mostly solitary and terminal (at the ends of almost all the shoots), subsessile, ebracteate, tetramerous, glabrous in the outside, usually with a well-developed receptacle. Sepals 4, in two whorls (2 + 2), equal (or subequal), fleshy, glabrous on the back but with a ciliate margin, the outer ones oblong, the inner ovate to ovate-oblong, obtuse, concave with an inflexed membranous margin, strongly 3-nerved on the outside, the nerves convergent at the tip, sometimes forming a minute and obscure cusp at the back of the top. Petals 4, subulate, longer than the stamens, and alternating with the sepals. Stamens 4, inserted on

the rim of the cup-shaped receptacle opposite the sepals; filaments short; anthers oblong, membranous and sterile in the female flowers, but fertile and disc-shaped in male flowers. Ovary ovoid-subglobose; ovule campylotropous; style 2-fid, with divergent and usually exserted stigmas. Fruit narrowly ellipsoid to ovoid, ± equalling the sepals, pericarp almost smooth, rupturing at the base. Seed subellipsoid to obovoid; embryo annular; radicle inferior.

A monotypic dioecious genus endemic in S. Patagonia (Argentine).

Ph. patagonica Spegazzini, op. cit.
Skottsberg, op. cit. (1916).

Plate II, Fig. 20-23. p. 56

A very small, densely pulvinate dioecious, perennial herb, often forming very dense and compact, spherical to hemispherical masses, c. 3.5-10 cm in diam.; stem 3-10 cm tall, suberect to erect, much-branched from the subterranean woody base as well as in the aerial part, usually leafless and very knotty towards the base, the branches very densely congested, all growing upwards, the younger branches tufted with closely imbricated leaves towards the end, and yellowish-green at the top, the whole plant often with a levelled or hemispherical top; internodes very short, mostly 1-1.5 mm long, glabrous, the lower nodes marked with remnants of leaves and of lateral shoots. Leaves 1-2 x 0.7-1 mm, sessile, oblong to nearly ovate (-triangular) -subob-long, glabrous, rather fleshy, opposite-decussate, ascending, closely imbricate, green to pale- or light-green; stipules, broadly ovate-oblong, up to c. 1.3 x 1 mm, obtuse or subobtuse, with a finely ciliate margin, shorter than the leaves (mostly c. 2/3 of their length). Male and female flowers on separate plants, solitary (rarely two) and terminal at the ends of nearly all the shoots, tetramerous, (1.6-) 1.75-2.25 (mostly c. 2) x 1.2-1.25 mm, subsessile, cylindrical-oblong narrowed at the base, glabrous on the outside (very occasionally minutely puberulous on the perigynous zone), with a well-developed, obconical receptacle c. 0.75 mm long; sepals 4, decussate-imbricate or 2 + 2 (the two outer surrounding the inner two), equal (or ± equal), c. 1-1.25 x 0.75-1.1 mm, the outer oblong, the inner ovate to ovate-oblong, ob-tuse, concave, slightly 'hooded', (all) glabrous on the outside but with a ciliate, white, membranous margin, often strongly 3-nerved on the back, the nerves convergent at the tip, sometimes forming a minute, obscure cusp at the back-top. Petals 4, 0.7-1 mm in the female flower, 0.5 mm in the male, subulate, longer than the stamens and alternating with the sepals. Stamens 4, situated opposite the sepals; filaments 0.35-0.4 mm long in the female flowers, 0.45-0.5 mm in the male ones, filiform; anthers fully ripe in the male flowers only, and 0.25-0.3 mm

in diam., ± disc-shaped (-rounded), monothecous, filaments dorsifixed the female flowers with sterile, membranous, pale-brown, ± oblong, 0.3-0.4 (-0.5) x 0.2-0.25 (-0.3) mm; ovary subglobose, 0.45-0.5 mm in diam., somewhat papillose at the top; style (0.35-) 0.45-0.55 mm long in the female flowers (but much shorter, 0.25-0.3 mm in the male ones), nearly bifid to occasionally bipartite, with prominent, brown stigmas (c. 0.25-0.3 mm long), spreading and exserted with age (erect in the male flowers). Fruit 1.3-1.5 x 1-1.2 mm, ellipsoid to ovoid-oblong, ripening in the female flowers only, ± equalling the sepals, free from the receptacle, slightly papillose at the top, pale, rupturing at the base; seed 1.25-1.3 x 1 mm, suboblong to obovoid.
Fl. Dec.-Jan. (-March). On stony ground in dry steppe, alt. c. 300-400 m.
Type: ARGENTINE: PATAGONIA: Prov. Santa Cruz, Rio Gallegos, viii.1882, *C. Spegazzini* (holo. LP! iso. K!) (Plant collected very early in the season, and accordingly with highly undeveloped flowers).
Distr.: Endemic in C. and S. Patagonia.

Patagonia: Female: *H. Sleumer* 1019 (LIL); Rio Callegos: *id.* 773 (LIL, S); San Julian to R. Deseado: Spring 1899, *C. Ameghino* (LP); Rio Chico: i.1897 and i.1898, *id.* (LP); Rio Santa Cruz: *P. Dusén* 6230 (K, S); Rio Gios: *C. Skottsberg* 693 (LD, S); Prov. Santa Cruz: El Cerrito Hotel, 400 m, *H. Sleumer* 1091 (LIL); Rio Callegos: *id.* 773 (LIL, S). Male: Prov. Santa Cruz: Tehuelches, c. 300 m, *A. Donat* 260 (S).

This is a very interesting dioecious genus showing close affinity with *HERNIARIA*, an Old World genus, in the characters of shoots, leaves, stipules, flowers, fruit and seed, though possessing a very peculiar pulvinate habit and bearing male and female flowers on separate plants. Spegazzini mistook the usually short-filamented, membranous and sterile stamen of the female flower of which he said that they are situated opposite the sepals, for petals, and incorrectly described them as 'squamula hyalina ovata vel elliptica', and the 'stamens' as alternating with the sepals. As a matter of fact the petals are typically subulate as in *HERNIARIA* or *PARONYCHIA*. Pax and Hoffmann added yet another element of confusion by describing the petals as absent, and the stamens as 8, in two whorls, the outer 4 episepalous and sterile, the inner 4 fertile. Most probably, they did not have any material at hand while writing the description of this genus. In point of fact, the only difference between this genus on the one hand and *HERNIARIA* and *PARONYCHIA* on the other is found in the dioecious nature of this genus, i.e. in the fact that the male and female flowers occur on different plants, and that the stamens of the female flowers remain sterile, the anthers being converted into thin, membranous structures.

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INDEX OF EXSICCATAE

The numbers in brackets correspond with the following species numbers. Collections with dates but without numbers have also been listed, though once per collector for each taxon. They are indicated by the species numbers.

1. *Sphaerocoma hookeri* T. Anders.
   a) subsp. *hookeri*
   b) subsp. *intermedia* Gillett
2. *Sph. aucheri* Boiss.
   a) var. *aucheri*
   b) var. *rechingeri* Chaudh.
3. *Corrigiola litoralis* L.
   a) subsp. litoralis; var. *litoralis*
   b) var. *perannans* Chaudh.
   c) subsp. *foliosa* (Perez-Lara) Chaudh.
4. *C. telephiifolia* Pourret
   a) var. *telephiifolia*
   b) var. *imbricata* (Lapeyr.) DC.
   c) var. *annua* Lange
5. *C. capensis* Willd.
   a) subsp. *capensis*
   b) subsp. *africana* (Turrill) Chaudh.
6. *C. palaestina* Chaudh.
7. *C. andina* Triana and Planchon
8. *C. squamosa* Hook. et Arnott
   a) var. *squamosa*
   b) var. *latifolia* (Cl. Gay) Skottsberg
   c) var. *poeppigii* Chaudh.
9. *C. propinqua* Cl. Gay
10. *C. crassifolia* Chaudh.
11. *C. madagascariensis* (Baker) H. Perrier
12. *C. drymarioides* Baker fil.
13. *C. paniculata* Peter
14. *Gymnocarpos decander* Forssk.
    a) forma *decander*
    b) forma *salsoloides* (Webb ex Christ) Chaudh.
15. *G. przewalskii* Bunge ex Maximowicz
    a) var. *przewalskii*
    b) var. *scabrida* Chaudh.
16. *Lochia bracteata* Balf. fil.
    a) subsp. *bracteata*
    b) subsp. *abdulkuriana* Chaudh.
17. *Sclerocephalus arabicus* Boiss.
18. *Paronychia* (subgen. *Siphonychia*) *americana* (Nutt.) Fenzl
    a) subsp. *americana*
    b) subsp. *pauciflora* (Small) Chaudh.
19. *P. patula* Shinners
20. *P. erecta* (Chapman) Shinners
    a) var. *erecta*
    b) var. *corymbosa* (Small) Chaudh.
22. *P.* (subgenus *Paronychia*) *chartacea* Fernald
23. *P. camphorosmoides* Cambessèdes
24. *P. fasciculata* Chaudh.
25. *P. suffruticosa* (L.) DC.
    a) subsp. *suffruticosa*
    b) subsp. *hirsuta* Chaudh.
26. *P. canadensis* (L.) Wood
27. *P. fastigiata* (Raf.) Fernald
    a) var. *fastigiata*
    b) var. *paleacea* Fernald
    c) var. *nuttallii* (Small) Fernald
28. *P. montana* (Small) Pax et K. Hoffm.
29. *P. baldwinii* (Torr. & Gray) Fenzl
    a) subp. *baldwinii*
    b) subsp. *riparia* (Chapman) Chaudh.
    c) var. *ciliata* Chaudh.
30. *P. lindheimeri* Engelm. ex A. Gray
    a) var. *lindheimeri*
    b) var. *longibracteata* Chaudh.
31. *P. chorizanthoides* Small
32. *P. setacea* Torr. & Gray
    a) var. *setacea*
    b) var. *longibracteata* Chaudh.
33. *P. monticola* Cory
34. *P. jamesii* Torr. & Gray
    a) subvar. *jamesii*
    b) subvar. *subglabra* Chaudh.
    c) var. *hirsuta* Chaudh.
    d) var. *parviflora* Chaudh.
    e) var. *praelongifolia* Correll

35. *P. depressa* Nutt. ex Torr. & Gray
    a) var. *depressa*
    b) var. *brevicuspus* (Nelson) Chaudh.
    c) var. *diffusa* (Nelson) Chaudh.
36. *P. virginica* Sprengel
    a) var. *virginica*
    b) var. *parksii* (Cory) Chaudh.
37. *P. wilkinsonii* S. Watson
38. *P. albomarginata* Core
39. *P. sessiliflora* Nutt.
40. *P. herniarioides* (Michaux) Nutt.
41. *P. drummondii* Torr. and Gray
    a) subsp. *drummondii*
    b) subsp. *parviflora* Chaudh.
42. *P. jonesii* Johnston
43. *P. canariensis* (Linn. fil.) Juss.
    a) var. *canariensis*
    b) var. *orthoclada* Christ
44. *P. microphylla* Philippi
    a) var. *microphylla*
    b) var. *arequepensis* Chaudh.
45. *P. brasiliana* DC.
    a) var. *brasiliana*
    b) var. *pubescens* Chaudh.
46. *P. franciscana* Eastwood
47. *P. echinulata* Chater
    a) var. *echinulata*
    b) var. *minutiflora* (Lindberg) Chaudh.
48. *P. rouyana* Coincy
49. *P. argyrocoma* (Michaux) Nutt.
    a) var. *argyrocoma*
    b) var. *albimontana* Fernald
50. *P. mexicana* Hemsley
    a) subsp. *mexicana*
    b) subsp. (and var.) *monandra* (Brandegee) Chaudh.
    c) var. *popocatepetliana* Chaudh.
51. *P. communis* Cambessèdes
    a) forma *communis*
    b) forma *subglabra* Chodat et Hassler
    c) var. *pungentifolia* Chaudh.
    d) var. *chicligastensis* Chaudh.
52. *P. paranensis* Chaudh.
53. *P. illecebroides* (Smith) Webb
    a) forma *illecebroides*
    b) forma *hamata* Chaudh.
    c) var. *nicolauensis* Chaudh.
54. *P. muschleri* Chaudh.
55. *P. johnstonii* Chaudh.
    5) var. *johnstonii*
    b) var. *scabrida* Chaudh.
56. *P. chilensis* DC.
    a) var. *chilensis*
    b) var. *mutica* (Philip.) Reiche
    c) subsp. *subandina* (Philip.) Chaudh.
57. *P. coquimbensis* Cl. Gay
    a) var. *coquimbensis*
    b) var. *appressa* (Philip.) Chaudh.
58. *P. setigera* (Gillies ex Hooker et Arnott) F. Hermann
    a) subvar. *setigera*
    b) subvar. *subglabra* Chaudh.
    c) var. *longiseta* Chaudh.
    d) subsp. *cordobensis* Chaudh.
59. *P. bogotensis* Triana et Planch.
60. *P. ellenbergii* Chaudh.
61. *P. hartwegiana* Rohrbach
62. *P. peruviana* Chaudh.
63. *P. cabrerae* Chaudh.
64. *P. libertadiana* Chaudh.
65. *P. macbridei* Chaudh.
66. *P. mandoniana* Rohrbach
67. *P. hieronymi* Pax
    a) var. *hieronymi*
    b) var. *jujuyensis* Chaudh.
68. *P. limaei* Chaudh.
69. *P. fusciflora* Chaudh.
70. *P. weberbaueri* Chaudh.
71. *P. andina* A. Gray
    a) subsp. *andina*
    b) subsp. *boliviana* Chaudh.
    c) subsp. *purpurea* Chaudh.
72. *P. pulvinata* A. Gray
    a) var. *pulvinata*
    b) var. *longiaristata* Chaudh.
73. *P. bryoides* Hochst. ex A. Richard
74. *P. polygonifolia* (Villars) DC.
    a) var. *polygonifolia*
    b) var. *velucensis* Boiss.
    c) var. *serratifolia* Chaudh.
75. *P. arabica* (L.) DC.
    a) susp. *arabica;* var. *arabica*
    b) var. *elongata* Chaudh.
    c) subsp. *annua* (Delile) Maire et Weiller; var. *annua*
    d) var. *tripolitana* Durand & Barr.

e) subsp. *breviseta* (Aschers. & Schweinf.) Chaudh.; var. *breviseta*
f) var. *latimarginata* Chaudh.
g) *subsp. cossoniana* (J. Gay) Maire et Weiller; var. *cossoniana*
h) var. *longiaristata* Chaudh.
i) subsp. *aurasiaca* (Webb) Maire et Weiller; var. *aurasiaca*
j) var. *inarmata* Chaudh.
k) subsp. *tibestica* Quezel; var. *tibestica*
l) var. *fezzanica* Chaudh.

76. *P. euphratica* (Chaudhri) Chaudh.
77. *P. velata* (Maire) Chaudh.
78. *P. argentea* Lam.
a) var. *argentea*
bi) var. *rotundata* (DC.) Chaudh.; subvar. *roturdata*
bii) subvar. *aristulata* Chaudh.
c) var. *angustifolia* Chaudh.
d) var. *scariosissima* Post
79. *Paronychia* (subgenus *Anoplonychia) aretioides* DC.
80. *P. kapela* (Hacq.) Kerner
ai) var. *kapela;* forma *kapela*
aii) forma *rotundifolia* Beck
b) var. *durmitorea* Rohlena
c) var. *pseudo-aretioides* (Emb. et Maire) Chaudh.
d) subsp. *serpyllifolia* (Chaix) Graebn.
81. *P. argyroloba* Stapf
82. *P. kayseriana* Chaudh.
83. *P. davisii* Chaudh.
84. *P. rechingeri* Chaudh.
85. *P. mughlaei* Chaudh.
86. *P. adalia* Chaudh.
87. *P. lycica* Chaudh.
88. *P. beauverdii* Czeczott
89. *P. amani* Chaudh.
a) var. *amani*
b) var. *minutiflora* Chaudh.
90. *P. turcica* Chaudh.
91. *P. cataonica* Chaudh.
92. *P. condensata* Chaudh.
93. *P. saxatilis* Chaudh.
94. *P. angorensis* Chaudh.
95. *P. sintenisii* Chaudh.
96. *P. chionaea* Boiss.
a) subsp. *chionaea;* var. *chionaea*
b) var. *latifolia* Chaudh.
c) subsp. *kemaliya* Chaudh.
97. *P. taurica* Borhidi et Sikura
a) var. *taurica*
b) var. *orbicularis* Chaudh.
98. *P. kotschyana* Chaudh.
99. *P. pontica* (Borhidi) Chaudh.
100. *P. anatolica* Czeczott
a) subsp. *anatolica;* var. *anatolica*
b) var. *orientalis* Chaudh.
c) subsp. *balansae* Chaudh.
101. *P. galatica* Chaudh.
102. *P. dudleyi* Chaudh.
103. *P. paphlagonica* Chaudh.
a) subsp. *paphlagonica*
b) subsp. *caespitosa* Chaudh.
104. *P. tunisiana* Chaudh.
105. *P. macedonica* Chaudh.
a) subsp. *macedonica*; var. *macedonica*
b) var. *floribunda* Chaudh.
c) var. *linearisepala* Chaudh.
d) subsp. *tobolkana* Chaudh.
106. *P. albanica* Chaudh.
a) subsp. *albanica*
b) subsp. *graeca* Chaudh.
107. *P. carica* Chaudh.
a) var. *carica*
b) var. *stipulata* Chaudh.
108. *P. azerbaijanica* Chaudh.
109. *P. cephalotes* Chaudh. (M.Bieb) Besser
a) subsp. *cephalotes;* var. *cephalotes*
b) var. *simonkaiana* Borhidi
c) var. *soói* Borhidi
d) var. *minutiflora* Chaudh.
e) var. *recurvans* Chaudh.
f) subsp. *bulgaria* Chaudh.
g) subsp. *thracica* Chaudh.
110. *P. bornmülleri* Chaudh.
111. *P. maroccana* Chaudh.
112. *P. mesopotamica* Chaudh.
a) subsp. *mesopotamica*
b) subsp. *syriaca* Chaudh.
113. *P. boissieri* Rouy
114. *P. caespitosa* Stapf
115. *P. somaliensis* Baker
116. *P. kurdica* Boiss.

a) subsp. and var. *kurdica;* subvar. *kurdica*
b) subvar. *fragilis* Chaudh.
c) subvar. *laxa* Chaudh.
d) subvar. *viridescens* Chaudh.
e) var. *imbricata* Chaudh.
f) var. *haussknechtii* Chaudh.
g) subsp. *montis-munzur* Chaudh.

117. *P. splendens* Steven
a) var. *splendens*
b) var. *erivanensis* Chaudh.

118. *P. bungei* Boiss.

119. *P. sinaica* Fresen.
a) var. *sinaica*
b) var. *flavescens* Boiss.

120. *P. palaestina* Eig

121. *P. macrosepala* Boiss.
a) var. *macrosepala*
b) var. *insularum* (Gandoger) Greuter
c) var. *cretica* Chaudh.

122. *P. jordanica* Chaudh.
a) var. *jordanica*
b) var. *latifolia* Chaudh.

123. *P. chabloziana* Beauverd

124. *P. capitata* (L.) Lam.
a) subsp. *capitata;* var. *capitata*
b) var. *libyca* Borzi et Mattai
c) var. *tarhunensis* (Pamp.) Chaudh.
d) var. *longistyla* Emberger et Maire
e) var. *scabrida* Chaudh.
f) subsp. *atlantica* (Ball) Chaudh.

125. *P. haggariensis* Diels
a) subsp. and var. *haggariensis*
b) var. *latifolia* Chaudh.
c) subsp. *sahariensis* Chaudh.

126. *P. chlorothyrsa* Murbeck
a) subsp. *chlorothyrsa;* var. *chlorothyrsa*
bi) var. *querioides* (Ball) Batt.; subvar. *querioides*
bii) subvar. *dichotoma* Batt.
c) var. *bracteosa* Batt.
d) var. *coarctata* Chaudh.
e) var. *erythraea* (Fiori) Chaudh.
f) subsp. *canariensis* Chaudh.

127. *Herniaria glabra* L.
a) var. *glabra*
b) var. *glaberrina* Fenzl
c) var. *setulosa* Beck
d) var. *magniflora* Chaudh.
e) *glabra* x *hirsuta*

128. *H. ciliolata* Melderis
a) subsp. *ciliolata*
b) subsp. *subciliata* (Bab.) Chaudh.
c) subsp. *robusta* Chaudh.

129. *H. microcarpa* Presl

130. *H. bornmülleri* Chaudh.

131. *H. alpina* Chaix
a) var. *alpina;* subvar. *alpina*
b) subvar. *puberula* Chaudh.
c) var. *sempronia* Williams
d) var. *foliosa* Chaudh.

132. *H. olympica* Gay

133. *H. caucasica* Rupr.

134. *H. argaea* Boiss.

135. *H. parnassica* Heldr. et Sartori
a) subsp. *parnassica*
b) subsp. *cretica* Chaudh. var. *cretica*
c) var. *hirtella* Chaudh.

136. *H. micrantha* Jackson & Turrill

137. *H. permixta* Gussone

138. *H. abyssinica* Chaudh.

139. *H. hisuta* L.
a) subsp. *hirsuta;* var. *hirsuta;* forma *hirsuta*
b) forma *pauciflora* Rohlena
c) var. *subglabrifolia* Zapal.
d) var. *antalyaca* Chaudh.
e) subsp. *aprutia* Chaudh.

140. *H. lusitanica* Chaudh.
a) subsp. *lusitanica;* var. *lusitanica;* subvar. *lusitanica*
b) subvar. *fernandesii* Chaudh.
c) var. *latifolia* Chaudh.
d) var. *gaditana* Chaudh.
e) subsp. *berlengiana* Chaudh.
f) subsp. *segurána* Chaudh.

141. *H. algarvica* Chaudh.

142. *H. acrochaeta* (Bornm.) Chaudh.

143. *H. cinerea* DC.
a) subsp. and var. *cinerea;* subvar. *cinerea*
b) subvar. *laxa* Chaudh.
c) var. *virescens* (Salzmann) Ball
d) subsp. *euphratica* Chaudh.

144. *H. erckertii* Hermann
  a) subsp. *erckertii;* var. *erckertii*
  b) var. *dewetii* Herm.
  c) var. *dinteri* Chaudh.
  d) subsp. *pulvinata* Chaudh.
145. *H. schlechteri* Herm.
146. *H. saxatilis* Brummitt
147. *H. rhiphaea* Font Quer
148. *H. regnieri* Braun-Blanquet et Maire
149. *H. maritima* Link
150. *H. scabrida* Boiss.
  a) subsp. *scabrida;* var. *scabrida*
  b) var. *glabrescens* Boiss.
  c) var. *unomunoana* (Sennen) Chaudh.
  d) subsp. *guardarramica* Chaudh.; var. *guadarramica*
  e) var. *alemtejica* Chaudh.
151. *H. cyrenaica* Herm.
  a) var. *cyrenaica*
  b) var. *subglabra* Chaudh.
152. *H. oranensis* Chaudh.
  a) var. *oranensis*
  b) var. *subglabrifolia* Chaudh.
153. *H. boissieri* Gay
  a) subsp. *boissieri*
  b) subsp. *maroccana* (Font Quer) Chaudh.
154. *H. baetica* Boiss. et Reuter
155. *H. pisidica* Brummitt
156. *H. incana* Lam.
  a) var. *incana*
  b) var. *villosa* Chaudh.
  c) var. *angustifolia* Fenzl
157. *H. cachemiriana* Gay
  a) var. *cachemiriana*
  b) var. *hispida* Chaudh.
158. H. *latifolia* Lapeyr.
159. *H. capensis* Bartling
160. *H. pearsonii* Chaudh.
161. *H. grimmii* Herm.
162. *H. maskatensis* Bornmüller
163. *H. polygama* Gay
164. *H. nigrimontium* Herm.
  a) var. *nigrimontium*
  b) var. *purnar-daghii* Chaudh.
165. *H. degenii* (Herm.) Chaudh.
166. *H. canariensis* Chaudh.
167. *H. pujosii* Sauv. et Vindt
168. *H. frutosica* L.
  a) var. *frutosica*
  b) var. *erecta* Willk.
  c) var. *longifolia* Chaudh.
169. *H. ericifolia* Townsend
170. *H. fontanesii* Gay
  a) subsp. and var. *fontanesii;* subvar. *fontanesii*
  b) subvar. *glabrescens* (Pampanini) Chaudh.
  c) subvar. *pulvinata* Chaudh.
  d) var. *gracilis* Maire
  e) var. *pubescens* Battandier
  f) subsp. *almeriana* Brummitt & Heywood
171. *H. mauritanica* Murb.
  a) forma *mauritanica*
  b) forma *subrosea* Chaudh.
172. *H. hemistemon* Gay
  a) var. *hemistemon*
  b) var. *parviflora* Chaudh.
  c) var. *albostipulata* Chaudh.
173. *H. arabica* Handel-Mazz.
174. *Philippiella patagonica* Spegaz.

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The author was born on February 15, 1932, at Gujarkhan, West Pakistan. Studied at Islamia High School, Gujarkhan and graduated from Gordon College, Rawalpindi in 1951. Took the degree of Master of Science (M.Sc.) in Botany, with Systematic Botany and Plant Morphology as the special subjects, from the Panjab University, Lahore, in 1953. Worked as Lecturer in General Botany from 1955 till 1963, and taught the undergraduates at Kohat, Dera Ismail Khan, Bannu and Peshawar in NW-West Pakistan.

Engaged in the study of the *Centrospermae* of West Pakistan since 1955. Contributed an account of the genus *Paronychia* for P. H. Davis' Flora of Turkey, and that of the subtribe *Paronychiinae* for Prof. K. H. Rechinger's Flora Iranica. Future plans uncertain.