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The genus *Periploca* L. A monograph

INTRODUCTION

Periploca is a genus of the *Periplocaceae* family. Its name is derived from one of its characteristic features, i. e. the ability to twine. It comes from Greek „peri' meaning around, and "plecein" — to twine. To the genus *Periploca* belong twining shrubs which partly lose this character, and are limited to the Old World in their occurrence: from Cape Verde Islands and Canary Islands to North China, and from the Balkan Peninsula to Malawi in East Africa.

No monograph dealing with this genus has been written yet; only E. Boissier in his Flora Orientalis (vol 4 + Suppl.) has given the description of 5 species of *Periploca*, while the others have been discussed in regional floras only. The different interpretations of the morphological features have resulted in no fewer than 94 specific names of *Periploca*, 73 of which, however, are only synonyms of species belonging to other genera of *Periplocaceae*, *Asclepiadaceae*, and even *Apocynaceae* families. In some cases the proper classification of the names could not be established. Of the 21 names, which can be classed among the *Periploca*, ten have been found to be synonyms only; two other taxa have been reduced to subspecies. As a result of my own studies I have described two new species, and thus the genus *Periploca* amounts to eleven at present.

The performance of this task has been facilitated thanks to the help of the Polish Academy of Sciences and the scholarship from Wanda Roehr's Foundation (New York), and thus I could carry on my studies in the libraries and herbaria of the Royal Botanic Gardens at Kew and in Edinburgh, as well as in the British Museum (Natural History) in London. I had the opportunity, to study too, the herbarium collections in Cambridge, Paris, Geneve, Florence, Vienna and Sofia. Besides I revised the herbaria (over 2200 sheets) made kindly available to me by the directors and curators of a number of Institutions whom, hereby, I wish to express my sincere thanks. In 1962 I met one species of *Periploca* — *P. graeca* — in its natural localities in Bulgaria.

The specimens cited in this work come from the following Herbaria (abbreviations acc. to the Index Herbariorum, ed. 4. 1959).

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B — Botanisches Museum, Berlin-Dahlem, West Berlin
BC — Instituto Botanico, Barcelona, Spain
BG — Universitates Botaniske Museum, Bergen, Norway
BM — British Museum (Natural History), London, Great Britain
BP — Museum of Natural History, Budapest, Hungary
BPU — Institute of Systematic Botany and Plant Geography, University, Budapest, Hungary
BR — Jardin Botanique de l'Etat, Bruxelles, Belgium
C — Botanical Museum and Herbarium, Copenhagen, Denmark
CAL — Indian Botanic Garden, Calcutta, India
CGE — Botany School, University of Cambridge, Great Britain
E — Royal Botanic Garden, Edinburgh, Scotland
F — Herbarium Universitati Florentinae, Instituto Botanico, Firenze, Italy
G — Conservatoire et Jardin botanique, Geneve, Switzerland
GB — Goteborgs Botaniska Tradgard, Goteborg, Sweden
HUJ — Department of Botany, Hebrew University, Jerusalem, Israel
JE — Institut für Spezielle Botanik, Jena, East Germany
K — Royal Botanic Gardens, Kew, Great Britain
KOR — Institute of Dendrology, Kórnik, Poland
KRA — Herbarium Instituti Botanici Academiae Scientiarum Polonae, Kraków, Poland
LE — Botanical Institute of Academy of Sciences of the USSR, Leningrad, USSR
LINN — The Linnean Society, London, Great Britain
O — Botanisk Museum, Oslo, Norway
P — Muséum National d'Histoire Naturelle, Paris, France
POZ — Institute of Systematic Botany and Plant Geography, University, Poznań, Poland
PR — Botanical Department of the National Museum, Praha, Czechoslovakia
PRC — Institutum botanicum Universitatis Carolinae, Praha, Czechoslovakia
RAW — Gordon College, Rawalapindi, Pakistan
S — Naturhistoriska Riksmuseum, Stockholm, Sweden
SO — Botanical Institute, University, Sofia, Bulgaria
SOM — Botanical Institute of the Bulgarian Academy of Sciences, Sofia, Bulgaria
W — Naturhistorisches Museum, Wien, Austria
WA — Institute of Systematic Botany and Plant Geography, University, Warszawa, Poland
WU — Botanisches Institut der Universität. Wien, Austria
ZA — Botanical Institute and Garden, University, Zagreb, Yugoslavia.

When working at this monograph I was helped by many people. I am greatly indebted to. I owe a special gratitude to Mr .R. D. Meikle, Dr. A. A. Bullock, Mr. N. Y. Sandwith for their kindness and helpfulness during my stay at Kew, to Miss D. Hillcoat from the British Museum (Natural History), London, who enabled me to study the herbarium collections of Vesey-Fitzgerald and G. Popov, not yet published; to Mrs. A. G. Borisova, Botanical Institute in Leningrad and to Dr. T. R. Dudley, Arnold Arboretum, Jamaica Plain, Mass. for their help in completing data about the fossil species of *Periploca;* to Dr. R. Wilczek, Brussels, for his assistance in establishing the localities of *P. linearifolia* in Congo. My thanks are due to Prof. Dr. G. Moggi, Firenze, for the photograph of *P. graeca* from the Herbarium Cesalpino, to Mr. Carl-Axel Jansson, Göteborg, for the photograph of *P. graeca* from the herbaria of Linnaeus and Burser, to Mr. J. Keenan, Edinburgh, for the photographs of types from G. Forrest's collections, and to my collegue K. Jakusz, Kórnik, for the photographs of herbaria and illustrations.

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This monograph has been translated by Mrs. W. Gąsiorowska, teacher of English at Poznań University.

The Latin diagnoses have been kindly prepared by N. Zabinkova and M. Kirpicznikov, Botanical Institute, Leningrad.

HISTORICAL CONSIDERATION

The genus *Periploca* was established by Linnaeus in 1753 (Species Plantarum), though the name itself — *Periploca* — derives from the middle of the 16th c. For the first time it was used by Luca Ghini, professor of botany at Pisa University, in a letter to Mathioli. According to Ghini the name *Periploca* includes two species of plants: *Periploca greaca* L. and *Cionura erecta* (L.) Griseb. (details in the discussion on *P. graeca*).

The generic name *Periploca* was applied by A. F. Braun, in 1919, in the entomology (Ent. News 30 : 261) on *Lepidoptera (Glechioidea)*, occurring in the southern states of the U. S. A.; this genus numbers 12 species.

1753. Linnaeus described 4 species of *Periploca* of which only one *P. graeca* is classed among this genus, while the others, *P. indica*, *P. africana* and *P. te uifolia* belong to quite different genera. According to Linnaeus *P. graeca* comes from Syria.

Some scores of years later Poiret in the Encyclopedie Methodique, Botanique (182—192., 1804) mentions already 15 species of *Periploca* (only 3 properly), while De Candolle (Prodromus 8 : 497—500) in 1844 gives the names of as many as 33 species (only 7 properly).

1789. W. Aiton gave a short diagnosis of a new species he called *P. laevigata.* This species was offered to the Kew Gardens by Francis Masson, it was brought from the Canary Islands in 1779.

So far as I know there is no herbarium specimem by Aiton which could be taken as type of *P. laevigata*

1791. J. J. H. de Labillardière described *P. angustifolia* from Syria, and published its accurate drawing (leafed twig with flowers and fruits, and separate flower parts). *P. angustifolia* was, later on, mostly taken for a species identical with *P. laevigata* thus causing a lot of confusion in the taxonomy of the genus *Periploca.*

Till the end of the 18th c., as we can see, only 3 species of the genus *Periploca* were known, two of which *P. graeca* and *P. laevigata* were grown as ornamental shrubs.

1833. The fourth species was separated by A. Bunge who based on herbarium material collected in North China, it is *P. sepium.* Is seems to have been known already earlier, because Poiret (l. c.) in his description of *P. graeca* mentioned that it grew in Syria, on Greek islands and in Siberia. As the two mentioned species are much alike, and the word Siberia was often used very

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vaguely, it may be supposed that Poiret thought of *P. sepium* described about 30 years later.

1834. Wight described from India, from the outer range of the Himalayas, a new species of a twining shrub, he classed among the genus *Streptocaulon*, as *S. calophyllum*. After thorough studies H. Falconer numbered it among the genus *Periploca* in 1842, and he used the same specific name (*P. calophylla*).

1840. The first species of *Periploca* from eastern Africa (*P. linearifolia*) was identified by R. Quartin-Dillon and A. Richard. It derived from Ethiopia, district of Aduwa, that is from a region lying near the northern limit of the area. This east African shrub, so common as it is, has been very rarely mentioned in literature. According to R. Schlechter it is very characteristic and easily distinguishable (Notizbl. Bot. Gart. Berlin, 9 : 24. 1927).

1842. H. Falconer mentioned that in Kashmir a pseudo-aphyllous twining shrub was met, and he placed it among the *Periploca*, and named *P. hydaspidis*. It belongs to the least known species of this genus down to this day.

1844. From the near region of West Pakistan J. Decaisne published a further, already the eighth, species — *P. aphylla*. It is very striking that this species, too, just as *P. graeca*, *P. angustifolia* and *P. linearifolia* was found in a marginal locality. It is a plant of very wide distribution from India far to the west, to Egypt.

1876. The next species of *Periploca* comes from Somalia. It was, at first, referred to the genus *Leptadenia* as *L. visciformis* by W. Vatke. To the genus *Periploca* it was transferred by K. Schumann, but not till 1905. *Periploca visciformis* is one of the most discussed species within the genus what is shown by the great number of synonyms not met in other species. In addition to Vatke B. Balfour described it in 1893 giving another name. Balfour established a distinct genus *Socotora* for it, with one species *S. aphylla*, stating that it is endemic of the Socotra island.

1879. By reference to herbarium specimens of B. Balansa, from southern Turkey which were named at first *P. laevigata*, and of Th. Kotschy named *P. greaca*, E. Boissier in his Flora Orientalis gives the diagnosis of a new species — *P. gracilis*. As a result of analysis of a rather rich herbarium material I have come to the conclusion that *P. gracilis* should be separated into a new genus I have called *Cyprinia* (cf. Feddes Repertorium, 72 : 127, 1966). It is a monotypic genus differing from *Periploca* mainly in having parted corona lobes and sessile translators. Its only species *C. gracilis* (Boiss.) Browicz occurs in southern Turkey and on Cyprus.

P. visciformis was thus the last species of the genus *Periploca* described in the 19th c. In this way nine species were known till the end of that century. In the 20th c. the number has been enlarged only by 2 further species.

1913. R. Schlechter referring to herbarium specimens of G. Forrest from southern China separated a species, closely allied to *P. calophylla*, a species he named *P. forrestii* in honour of the famous explorer.

1929. E. Blatter and C. McCann (The Flora of the Indus Delta, 18) mentioned a new species of *Periploca*, but gave no name to it nor added any diagnosis. According to them it occurs in Gholam on limestone hills.

1934. Y. Tsiang revising Asiatic *Apocynales* and basing on Forrest's material from southern China described another species under the name of

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P. floribunda. Just as *P. forrestii* it is much alike to *P. calophylla*. In consequence of an analysis of a large number of herbarium sheets of these three species (over 260) from the whole area I concluded that the rank of species given to the two last taxa was much too high and it would be better to reduce it to subspecies.

1938. A. F. G. Kerr in 1921, found in central Thailand (Doi Chiengdao) at the altitude of about 1600 m a.s.l. a twining under-shrub, he classed among the *Periploca* as *P. purpurea*. At present this plant is only known from several herbarium specimens (BM. K.) and only in the flowering stage. Though its leaves are so very similar to *P. calophylla* subsp. *forrestii*, especially to its extreme narrow-leaved forms, so that it is difficult to distinguish the two species from each other vegetatively, the flower structure shows clearly that its enumeration among the genus *Periploca* was too rash. The variations are very clearly seen in the corollal and coronal lobes. The corolla lobes in *P. purpurea* are deep purple, narrowly lanceolate, acuminate at the apex, thin and translucent with a clearly visible nervation. The corona lobes are filiform and puberulous, but very short — 4—5 times shorter than the corolla lobes. These features are so characteristic that, without doubt, *P. purpurea* should be transferred, but it may well be that we have to do with a quite new genus though related to *Periploca*. As we see „*P. purpurea*" needs further studies and if its fruits will be found one day then its proper classification will be better justified.

In this publication I describe 2 further new species of *Periploca* separated on account of herbarium specimens I found in collections of the Royal Botanic Gardens, Kew. Both have been described under the common name *P. laevigata* Ait. One of these species comes from Somalia and is represented by 2 herbarium sheets (with the same number) — named by me *P. somaliense*. The other species has been worked out on much richer material (over ten sheets), collected both in flowers and in fruits — named by me *P. chevalieri*. And so at present the genus *Periploca* amounts to 11 species, 5 subspecies and 6 varieties; I have not separated lower taxa.

K. Schumann in 1895, was the first, and only scientist who tried to divide the genus *Periploca* into sections. He worked out the family *Asclepiadaceae* for "Die Natürlichen Pflanzenfamilien" by Engler and Prantl. He divided the genus into 2 sections taking into account the vegetative characters in his division; size of leaves and the shrub habit. Schumann classed among the former section, *Euperiploca* (twining, more rarely erect shrubs with large leaves): *P. graeca*, *P. sepium*, *P. laevigata*, *P. linearifolia*, *P. calophylla*, with two other species, belonging to other genera now: *P. Preussii* K. Sch. (= *Parquetina nigrescens* Afz.) Bullock) and *P. gracilis* Boiss. (= *Cyprinia gracilis* (Boiss.) Browicz). The other section *Campelepis* (erect shrub with short, squamate leaves) is composed of the following species: *P. hydaspidis*, *P. aphylla* and *P. visciformis*. This division, however, does not represent the proper relations between the species or their evolution. It attaches too much importance to the habit form (twining and erect shrubs) and the size of leaves, and disregards such basic characters as the flower structure. Species, which, according to Schumann, behave as erect shrubs, may have twining shoots in young growths just as twining species, may, when older growths, have the appearance of erect shrubs (e. g. *P. laevigata*, *P. angustifolia*).

The division into sections applied in this monograph is based mainly on characters of generative organs. Like Schumann I have divided the genus *Peri-*

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ploca into two sections: *Periploca* and *Immaculata* — but this division proved to be insufficient for the *Periploca* section. The species of this section show group relation, and therefore a further division of the section into series has been necessary. I have distinguished 3 such series: *Connatae*, *Laevigatae* and *Aphyllae*. In this division the features of vegetative organs play a more important part than in the division into sections.

Apart from taxonomic investigations the species of genus *Periploca*, mainly *P. graeca*, have been more or less subject to examination in other branches of botany.

The following works were given to the morphologic structure of flowers and fruits and the specific structure of translators: J. C. Kölreuter — Nova Acta Acad. Sci. Imp. Petrop. 10:407—413, 1797; P. Grélot — Annales Sci. Nat. Bot., ser. 8., 5 : 22—23, 1897; K. Demeter — Flora, 115, 2—3: 130—176, 1922; M. Scarano — Nuovo Giorn. Bot. Ital., n. s. 39: 54—69, 1932; F. W. Safwt — Annals Missour. Bot. Gard. 49, 1—2: 95—119, 1962. The work that is specially valuable is K. Demeter's publication. He was interested in the problem of the ontogeny of translators, while the role of translators in the pollination process had been explained by F. Delpino (Sugli apparecchi delle fecondazione nelle piane autocarpe, 1867).

The morphology of seedlings of *P. graeca* was a matter of considerable interest to I. T. Vassilczenko (Flora et Syst. Plant Vasc. 9: 317, 1950 and Wschody dierewiew i kustarnikow 267—268, 1960), and that of pollen to H. Mohl (Annales Sci. Nat. Bot., ser. 2., 3 :221, 1835) and R. P. Woodehouse (Pollen Grains, 1935).

Not less numerous, compared with the morphologic ones, are the works on the anatomy of *Periploca* concerned mainly with the anatomic structure of shoots, rootstocks and milky canals. A historical review of this sort of publications since 1863 was prepared by T. Guelfi-Bacci (Nuovo Giorn. Bot. Ital., n. s. 39: 36—53, 1932). Of the embriologic papers the one that deserves mentioning is P. Pardi's (Nuovo Giorn. Bot. Ital., n. s. 40:141—166, 1933).

Cytologic studies have dealt only with two species: *P. graeca* and *P. sepium*. W. M. Bowden (Amer. Jour. Bot. 27: 357, 1940) stated that *P. graeca* has $2n = 22$ chromosomes while P. Pardi (Nuovo Giorn. Bot. Ital., n. s. 40: 576, 1934) and F. Lopane (Caryologia 4, 1: 44—46, 1951—52) gave a somewhat higher number, namely $2n = 24$. K. Sax and L. Husted (Amer. Jour. Bot. 23, 9: 608, 1936) defined the number of chromosomes $2n = 22$ in *P. sepium*.

A separate group is formed by the publications on chemical compounds obtained from *Periploca*. They are applied in pharmacology. The glucoside Periplocin ($C_{30}H_{48}O_{12}$) and its derivatives used in heart diseases are extracted from the bark of *P. graeca*. The result of such works, with a list of literature to this effect, were gathered by J. Renz in 1953 (Rev. inter. de bot. appl. et d'agric. tropic., 33 no. 363—364: 52—55) Some other publications not mentioned by Renz are: A. Levi (Atti Soc. Nat. e Mat. Modena 6, 10: 81—90, 1931) and S. Abramovicz (Farmakologia i Toksykologia 1: 52—58, 1941).

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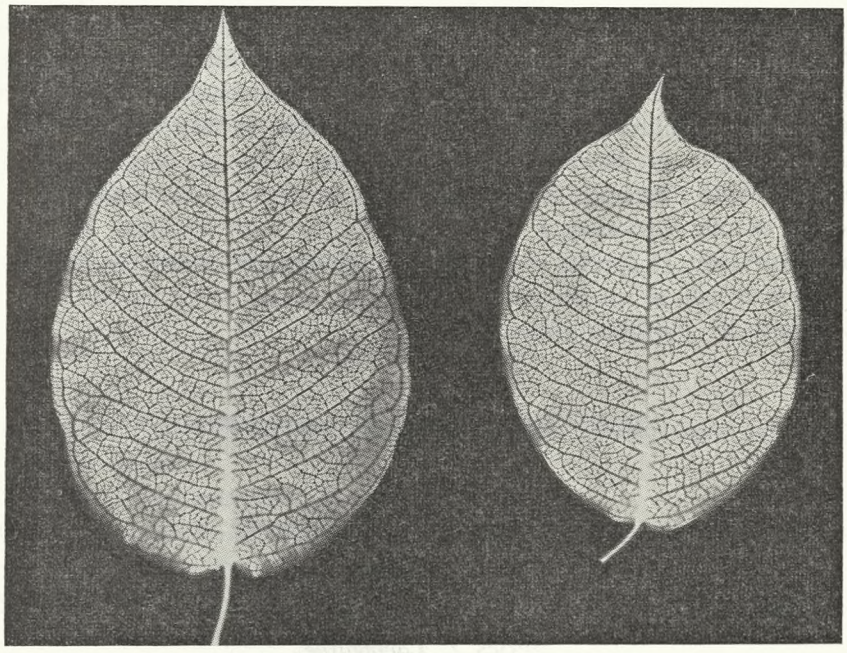
The problems of geographical distribution and the evolution of the whole genus *Periploca* have been dealt with rather sporadically. As a lot of species belonging to other genera have been erroneously included to the *Periploca* the results obtained are of no great avail (J. M. MacFarlane, The evolution and distribution of flowering plants, vol. 1. *Apocynaceae: Asclepiadaceae*, 1933; R. Good, An Atlas of the *Asclepiadaceae*, New Phytologist, 51: 198—209, 1952).

SYSTEMATIC TREATMENT

Periploca Linnaeus Sp. Pl. 211 (1753)

Syn: *Aploca* Necker Elem. Bot. 1:255 (1790); *Ehretiana* Collinson in Linn. Correspon. 1:32 (1821); *Campelepis* Falconer, Trans. Linn. Soc. Bot. 19:101 (1845); *Socotora* Balfour f., Proc. Roy. Soc. Edinb. 12:77 (1883).

Shrubs with white milky juice, twining, with thin and slender shoots, or erect and then only the youngest shoots show the power to twine. Leaves opposite, deciduous or persistent, entire, petiolated or sessile, with lateral nerves closing



Phot. K. Jakusz

Fig. 1. Leaves of *Periploca graeca* — nervation characteristic of the genus *Periploca*

characteristically at the margin of the blade (if visible); sometimes plants quite leafless or with only minute, reduced leaves falling off early. Stipules absent. Inflorescences terminal or lateral (opposite) in the form of cymes, simple or

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branched several times, erect or somewhat pendulous. Bracts and bractlets minute, membranous. Flowers 5—30 mm in diameter, hermaphrodite, actinomorphic, coloured and fragrant, pedicellate. Calyx tube very short, with 5 basal glandules within. Calyx teeth ovate or broadly ovate, obtuse or somewhat acute. Corolla sympetalous, 5-lobed. Corolla lobes spread or exceptionally turned toward calyx base, almost linear the margins being convolute, light coloured at the margin, middle part dark, violet-purplish, violet, or violet-brown, often provided with a white elliptic spot, formed of very minute, dense hairs, glabrous, or more or less bearded along the margins and at the top, apex retuse; sometimes the lobe - dissections weakly marked. The middle, colourful part of corolla lobes usually somewhat swollen excreting a viscid substance, in some species developed into a distinct large gland-patch. The corona consists of 5 brightly coloured lobes alternating with the corolla lobes. The middle part of the corona lobe filiform, more or less tapering, tomentose or glabrous (when strongly magnified minute dispersed hairs visible), somewhat shorter than corolla lobes, arcuate, at the top bent toward the inside of the flower. Stamens 5, free, on very short flattened filaments, bearded at the back. Pollen-masses granular, solitary or united in tetrads. Translators 5, fixed to stigma consist of a funnel-shaped upper part lined with a foamy secretion and turning into the stalk and basal adhesive disc. Ovary of 2 separate carpels. Disc absent. Styles 2, very short, free up to stigma. Stigmatic head broad, pentagonal. Ovules numerous in each carpels. Fruit composed of 2 dry follicles arranged horizontally or at acute angle, free or somewhat connate at apex. Follicles elongate, cylindrical, more or less evenly thick along the whole length, or distinctly swollen at base, dehiscing lengthwise on the adaxial side, with numerous seeds. Seeds black or dark brown, smooth, flattened with a tuft of long hairs at apex.

Distribution: 11 species occurring in south Europe, north, east and partly west Africa as well as in Asia (from Asia Minor to north-east China).

Type species: *Periploca graeca* Linnaeus

CONSPECTUS OF SUBDIVISIONS AND SPECIES

Periploca

Section 1. *Periploca*

Series 1. *Connatae*

1. *P. graeca*, 2. *P. sepium*

Series 2. *Laevigatae*

1. *P. laevigata*, 2. *P. chevalieri*, 3. *P. angustifolia*, 4. *P. somaliense*

Series 3. *Aphyllae*

1. *P. aphylla*, 2. *P. visciformis*

Section 2. *Immaculata*

1. *P. calophylla*, 2. *P. hydaspidis*, 3. *P. linearifolia*

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KEY TO THE SPECIES

1. Corolla lobes above with a white spot in the centre ..... (Sect. *Periploca*) 2
   Corolla lobes without spot .....(Sect. *Immaculata*) 9
2. Plants leafed. Leaves well shaped 3
   Plants leafless or with very small leaves falling off early ..... (Ser. *Aphyllae*) 8
3. Follicles arranged at acute angle, connate at apex ..... (Ser. *Connatae*) 4
   Follicles arranged horizontally or arranged at obtuse angle, not connate ..... (Ser. *Laevigatae*) 5
4. Corolla lobes spread without gland-patch ..... 1. *P. graeca*
   Corolla lobes revolute, with a more or less distinct gland-patch .... 2. *P. sepium*
5. Leaves up to 7 cm long 6
   Leaves up to 33 mm long at most, usually 20—30 mm 7
6. Ratio of width to length of leaf 2,5—5 .....3. *P. laevigata*
   Ratio of width to length of leaf 6—11 .....4. *P. chevalieri*
7. Leaves on biennal shoots, or older, fascicled ..... 5. *P. angustifolia*
   Leaves always singly arranged ..... 6. *P. somaliense*
8. Corolla lobes bearded above, without gland-patch ..... 7. *P. aphylla*
   Corolla lobes glabrous, with gland-patch ..... 8. *P. visciformis*
9. Plants leafed 10
   Plants leafless ..... 11. *P. hydaspidis*
10. Fo licles arranged at acute angle ..... 10. *P. calophylla*
    Follicles arranged horizontally ..... 9. *P. linearifolia*

SECTION 1. *PERIPLOCA*

Flores magni (10)15—25(30) *mm in diam. Corollae laciniae supra macula basali alba elliptica ornatae.*

Species 8. Typus sectionis: *P. graeca*

Flowers large (10)15—25(30) mm in diameter. Corolla lobes at base above with an elliptic white spot in the centre.

Type species: *P. graeca*

Series 1. *Connatae* Browicz, ser. nova

Frutices volubiles. Folia decidua. Corollae laciniae pilosae. Folliculi cylindrici, arcuati, apice connati.

Species 2. Typus seriei: *P. graeca.*

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Shrubs twining, with leaves falling off in winter. Flowers with pubescent corolla lobes. Follicles cylindrical, arcuate, connatae at apex.

Type species: *P. graeca*

1. *Periploca graeca* Linnaeus

Sp. Pl. 211 (1753); Jacquin, Miscell. Austriaca 1 : 11 (1778); Aiton, Hort. Kew. ed. 1., 300 (1789); Savi, Fl. Pisana 1 :261 (1798); Poiret in Lamarck Encycl. Meth. 5 :187 (1804); Marschall, Biberstein, Fl. taur.-cauc., 1 :176 (1808); Sibthorp, Fl. Greac., 3 :44 (1819); Dumont d'Urville, Mém. Soc. Linn. Paris 1 :283 (1822); Pieri, Fl. Corcirensis 20 (1824); Gussone, Pl. rariores 109 (1826); Tenore, Sylloge Fl. Neapol. 122 (1830); Bertoloni, Fl. Ital. 3 :6 (1837); Grisebach, Spicil. Fl. Rumel. 2 :67 (1844); Ledebour, Fl. Ross. 3 :44 (1847—49); Visiani, Fl. Dalm. 3 : 1 (1850); Buhse, Aufzaehl. 147 (1860); Caruel, Prodr. Fl. Toscana 447 (1860); Tchihatcheff, Asie Mineure 2 :68 (1860); Schlosser, Farkaš-Vukotinovič, Fl. Croatica 614 (1869); Boissier, Fl. Or. 4 :49 (1879); Kanitz, Pl. Romaniae 77 (1879—81); Tristram, Surv. W. Palest. 356 (1884); Caruel in Parlatore Fl. Ital. 6 :714 (1886); Piccicoli, Pl. Legn. Ital. 220 (1890); Velenovsky, Fl. Bulgar. 379 (1891); Alboff, Acta Hort. Petrop. 13, 8 :117 (1893:;) Post, Fl. Syr. Palest. Sinai 524 (1896); Baldacci, Bul. Herb. Boissier 4 :643 (1896); Schmalhausen, Fl. sredn. już. Rossi 2 :208 (1897); Brandza, Fl. Dobrogei 268 (1898); Grecescu, Consp. fl. Roman. 395 (1898); Baroni, Suppl. Gen. Prodr. Fl. Toscana 4 :384 (1901); Halacsy, Consp. Fl. Graec. 2 :290 (1902); Freyn, Bul. Herb. Boiss. 2 sér., 2, 11 :897 (1902); Kusnezow, Bush, Fomin, Fl. cauc. crit. 4 :333 (1905); Bornmüller, Bul. Herb. Boiss. 2 sér., 7, 2 :777 (1907); Halacsy, Suppl. Fl. Graec. 72 (1908); Maire, Petitmengin, Étud. Pl. Vasc. Grèce 4 : 150 (1908); Vandas, Reliq. Forman. 392 (1909); Handel-Mazzetti, Ann. Naturhist. Mus. Wien 27 :425 (1913); Stojanov, Jahrb. Univ. Sofia 8—9 :32 (1914); Davidov, Spis. Byłgarsk. Akad. Nauk 12 :101 (1915); Davidov, Trav. Soc. Bulg. Sci. Nat. 8 :53 (1915); Hayek, Denkschr. K. Akad. Wiss. Wien 94 :189 (1917); Urumov, Spis. Byłgarsk. Akad. Nauk 28 :66 (1923); Turrill, Kew Bull. 353 (1924); Fiori, Nuov. Fl. Anal. Ital. 2 :246 (1926); Nábelek, Iter Turc.-Pers. 3 :11 (1926); Zirnich, Nuov. Giorn. Bot. Ital., n. ser. 34 :538 (1927); Markgraf, Feddes Repert. (Beih.) 45 :203 (1927); Rehder, Man. Cult. Trees, Shrubs 771 (1927); Markgraf, Notizbl. Bot. Gart. Berlin 10 :368 (1928); Stojanov, Zeitschr. Bulg. Akad. Wiss. 37 :146 (1928); Cavera, Nuow. Giorn. Bot Ital. n.s., 34,5:1331(1928); Krause, Feddes Repert. (Beih). 26:332 (1929); Turrill, Pl. Life Balk. Pen. 383 (1929); Bouloumoy, Fl. Liban 225 (1930); Hayek, Pr. Fl. Pen. Balc. 2 :430 (1930); Markgraf, Denkschr. Akad. Wiss. Wien, Math.-Nat. Kl. B. 102 :349 (1931); Hermann, Bul. Soc. Bot. Bulg. 5 :138 (1932); Bornmüller, Feddes Repert. 30 :341 (1932); Post, Dinsmore, Fl. Syr. Palest. Sinai 2 :190 (1933); Rechinger, Beih. Bot. Centralbl. 54 B:649 (1935); Hermann, Feddes Repert. (Beih.) 87 :14 and 69 (1936); Rechinger, Feddes Repert. (Beih.) 98 :47 (1938); Ade, Rechinger, Feddes Repert. (Beih.) 100 :134 (1938); Bornmüller, Beih. Bot. Centralbl. 61 B :79 (1942); Rechinger, Fl. Aegaea 559 (1943); Kasapligil, Kuzey Anadolu Botanik Gezileri 157 (1947); Parsa, Fl. Iran 4 :57 (1949); Zohary, Fl. Iraq 116 (1950); Birand, Prelim. list spec. coll. Turkey 191 (1952); Pobiedimova, Fl. USSR 18 :665 (1952); Mitrushi, Druret dhe Shkurret 402 (1955); Prilipko, Fl. Azerbajdsh. 7 :109 (1957); Wisjulina, Fl. Ukrain. 8 :270 (1957); Amico, Webbia 14 :23 (1958—59); Rechinger, Ark. Bot. 5 :325 (1960); Kolakovsky, Fl. Veget. Colchida 154 (1961); Topa, Fl. Rep. Romine 8 :489 (1961); Hejazi, Sabeti, Bul. no. 26 Univ. Teheran, College Agric. 42 (1961); Wagenitz, Willdenowia 3, 2 :266 (1962); Zamjatin, Trees, Shrubs USSR 6 :27 (1962), Montelucci, Webbia 19 :171 (1964); Browicz, Feddes Repert. 72,2—3:124 (1966).

Syn: *Periploca maculata* Moench, Meth. 46 (1794).

Periploca laeta Salisbury, Prodr. 148 (1796).

Periploca graeca L. var. *angustifolia* Uechtritz et Sintenis in Kanitz, Pl. Romaniae 77 (1879—81);

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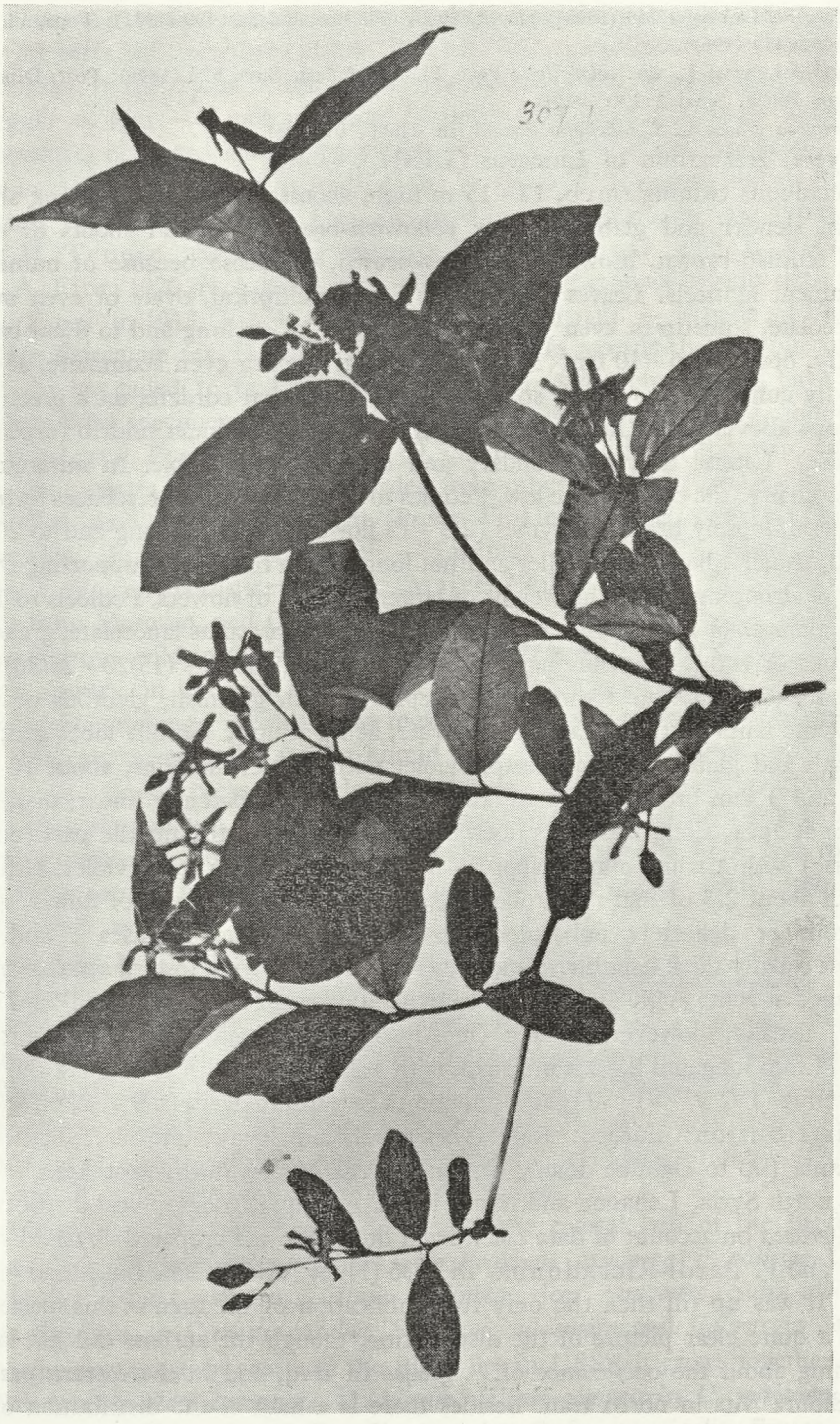

Phot. IDC microfiche edition of Herb. Linnaeus

Fig. 2. Type of *Periploca graeca*

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Brandza, Fl. Dobrogei 268 (1898); Hayek, Prodr. Fl. Pen. Balc. 2:430 (1931); Topa, Fl. Rep. Romine 8:489 (1961).

Periploca graeca L. var. *oblongifolia* Post, Fl. Syr. Palest. Sinai 524 (1896); Post, Dinsmore Fl. Syr. Palest. Sinai 2:190 (1933).

Periploca graeca L. f. *salicifolia* Savelli (in sched., Firenze).

Type: Herbarium of Linnaeus (LINN.).

Deciduous twining shrub, 12—15 m high, shoots to 30 m long. Young shoots green, slender and glabrous, later yellowish-brown. Biennial shoots or older ones reddish-brown, brownish and grey-brown, verrucose because of numerous prominent lenticels. Leaves elliptical or broadly-elliptical, ovate or even ovate--lanceolate, sometimes even almost roundish, to 13 cm long and to 8 cm broad, mostly, however, 6—10 cm×3—5 cm, acute at apex or even acuminate, at base broadly cuneate or rounded, sometimes also somewhat cordate, dark green and lustrous above, below lighter green with distinctly prominent midrib (especially at base). Lateral nerves (secondary and tertiary) well visible. In autumn the leaves change the colour to yellow. Petioles to 1,5 cm long. Inflorescences terminal or lateral, loosely branched cymes (2)3—15 flowers, to 15 cm long and to 20 cm broad, usually, however, smaller and not longer than the leaves supporting them, erect or drooping under the weight of larger number of flowers. Pedicels to 1 cm long, glabrate or with single, white hairs. Bracts and bractlets lanceolate, greenish, glabrous or with some white hairs, to 3—4 mm long. Flowers (15)20—25(30) mm in diameter. Calyx to 3 mm long, deeply incised, greenish, glabrous or with few white hairs on tube. Calyx teeth ovate, acute at apex. Corolla lobes greenish beneath and glabrous, above purple-violet with lighter margins, about 10 mm long and 3 mm broad, owing to convolute margins apparently linear, distinctly retuse at apex, along margins pubescent, hairs white, in the middle part (nearer to base) with a white elliptic spot 2—3 mm long. Corona lobes violet, filiform, length about 2/3 of that of corolla lobes reclining toward centre of flower, quite glabrous or delicately puberulent (greatly magnified). Follicles cylindrical, almost equally thick lengthwise and only scarcely narrowing toward apex, arcuate, arranged at acute angle and slightly connate at apex, to 15 cm long and 5—7 mm thick, usually, however, smaller (mostly 6—9 cm long). Seeds dark-brown, 10—14 mm long and 2—3 mm broad, with a 2,5 cm long tuft of hairs at the top. Flowering (IV) V—VI (VII) and sometimes in autumn again (fig. 1, 2, 6, 7*e*—*g*),

Distribution: Europe: Italy (very rarely), Balcan peninsula, south-west Romania (up to Danube delta), Caucasus, Asia Minor, north-west Iran, north Iraq, north Syria, Lebanon and north Israel. A map of geographical distribution of *P. graeca* on account of data taken from literature was prepared by E. Francini and P. Pardi-Riccadonna in 1936 (Nuov. Giorn. Bot. Ital., n. s. 43,1 : 181). It was up till then the only full publication of the area of this species. It gives a quite clear picture of the distribution, though the authors did not know anything about the occurrence of *P. graeca* in Iraq, and in the eastern part of the Elburz Mts in north Iran. Besides there is a map of the distribution of *P. graeca* in Bulgaria worked out by B. Stefanov (Fitogeografski elementi na Bylgarija, 194, 1943).

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The area of *P. graeca* is continuous and only in Italy there are isolated localities. They are recorded from three places. The best known localities are concentrated in Tuscany, in the region of the inundation ground of the Arno mouth, between Viareggio — Pisa — Livorno. These localities have been frequently indicated in literature, discussed and supported by numerous herbarium specimens. The other localities are situated in south Italy: in Calabria (Rosarno) and in Apulia (Otranto — Lago d'Alimini). They are cited, among others, by: G. Gussone 1826, M. Tenore 1830, A. Bertoloni 1837, T. Caruel 1886, L. Piccioli 1890, A. Fiori 1926, A. Amico 1958—59 (l. c.) They are more broadly dealt with by A. Fiori in 1913 (Fiori, Béguinot, Pampanini — Schede ad Floram Italicam Exiccatam ser. II., fasc. IX., no. 1913). He records that in spite of his efforts he has failed to find *P. graeca* in Otranto. Although I myself have seen no herbarium specimens from Calabria and Apulia, I have placed, following Francini and Pardi-Riccadonna (l. c.), both localities in the map (fig. 3).

Periploca graeca has been also recorded from other countries, growing in semi-wild state. And so M. Willkomm (Prodr. Fl. Hisp. 2 : 667, 1870) and D. M. Colmeiro (Enum. Pl. Pen. Hisp. — Lusitan. 4 : 46, 1888) report it from Spain, J. Braun-Blanquet and R. Maire (Bul. Soc. Bot. France 68 : 216, 1921) from Morocco, and O. D. Wisjulina (l. c.) from Crimea. In Yugoslavia where it grows wild in the south, it occurs also as a run wild shrub in the north of the country, in Croatia (Schlosser, Farkaš-Vukotinovič, l. c.).

Generally speaking *P. graeca* grows mostly in river and stream valleys, especially near their estuaries to the sea, in humid deciduous forests and at their edges, sometimes even on rocks in insolated places as well as in xerothermic communities pseudomacchia), always, however, near water basins. As a rule it grows in status situated low from the sea level, up to 400—500 m a. s. l., in Asia Minor, however, it occurs in mountains up to 1000—1200 m, and in north Iraq even up to 1800 m.

According to Francini and Pardi-Riccadonna (l. c.) *P. greaca* occurs in Tuscany mostly in plant communities of mezzophyllic-hygrophyllic type, beside such species as: *Ulmus campestris*, *Alnus glutinosa*, *Fraxinus excelsior*, *Quercus robur*, *Populus alba*, *Ligustrum vulgare*, *Prunus spinosa*, *Cornus sanguinea*, *Crataegus monogyna*, *C. oxyacantha*, *Rubus fruticosus*, *Clematis vitalba*, *Hedera helix*, *Smilax aspera* var. *mauretanica*, and others. In addition to this it is also known from xerotermic communities composed of *Quercus ilex*, *Phillyrea angustifolia*, *Spartium junceum* and *Daphne gnidium*.

In Bulgaria it is more frequently met in the coastal belt of the Black Sea in humid decideous forest associated with *Fraxinus oxycarpa*, *F. pallisae*, *Carpinus betulus*, *Ulmus campestris*, *Alnus glutinosa*, *Acer campestre*, *Salix alba* and other climbers, as *Clematis vitalba*, *Solanum dulcamara* and *Calystegia sepium*.

On the northwestern coasts of the Black Sea in USSR it grows together with: *Smilax excelsa*, *Acer campestre*, *A. laetum*, *Ulmus campestris*, *U. montana*, *Fraxinus excelsior*, *Tilia platyphyllos*, *T. caucasica*, *Sorbus torminalis*, *Prunus avium* (G. Radde in Engler, Drude, Veget. der Erde 3 : 169, 1899). According

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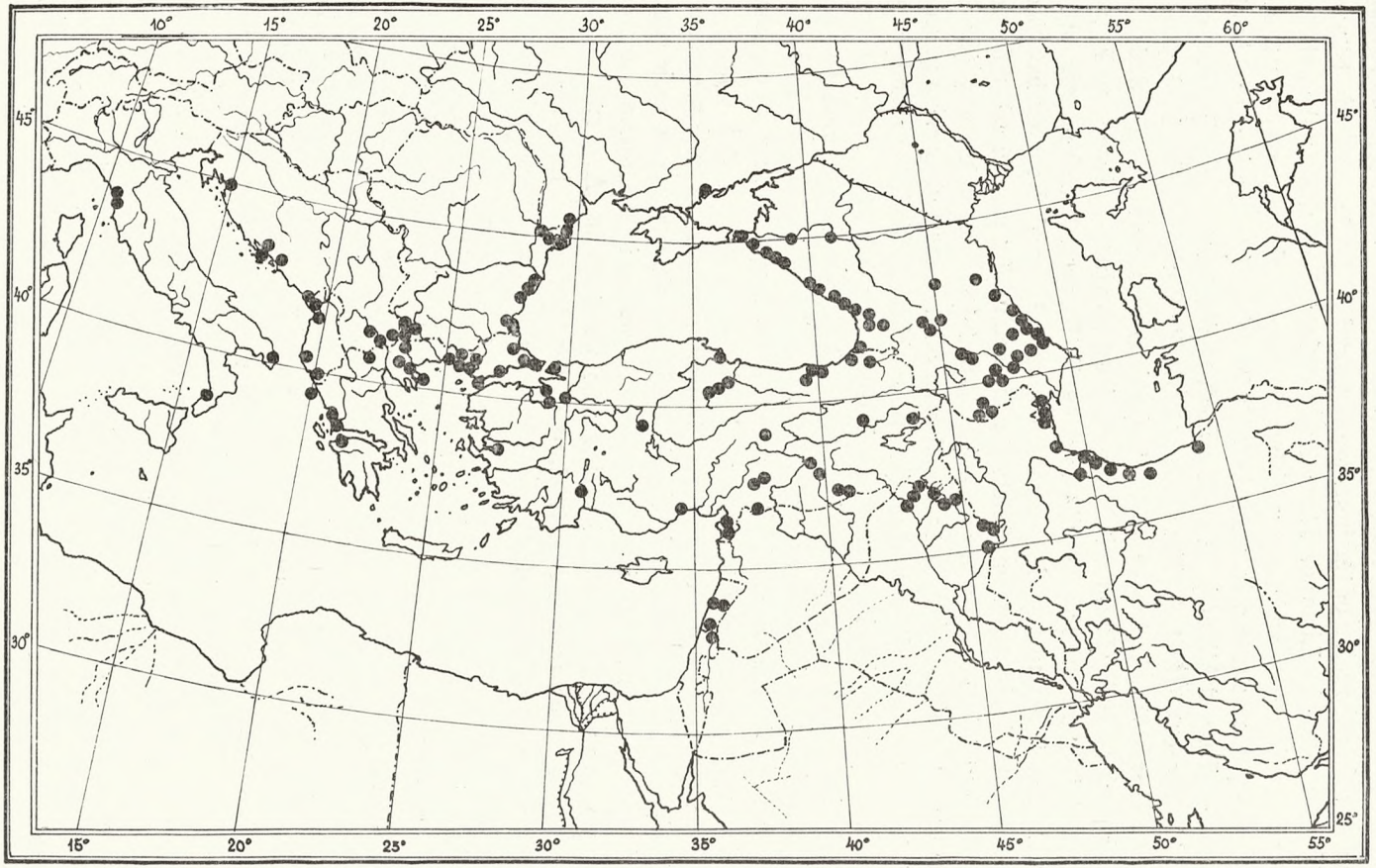

Fig. 3. Distribution of *Periploca graeca*

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to R. Hajazi and H. Sabeti (l. c.) in north Iran, in the Elburz Mts. *P. graeca* is associated with: *Parrotietum*, *Parrotio-Carpinetum*, *Buxetum*, *Quercetum* and *Alno-Populetum*.

1a. *Periploca graeca* L. var. *graeca*

Browicz, Feddes Repert., 72, 2—3:126 (1966).

Leaves and petioles glabrous.

Distribution: The whole region of the area.

Specimens examined.

Italy: Livorno, ad oriente della cittá, 24.5.1911 c. fl., Fiori (BC. F.); Ex maritimis Hetruriae, in sylva Pisana, 9.10.1861 c. fl. et fr., Ball (E. K.); ex paludosis Hetruriae prope Viareggio, 30.6.1866, Ball (E); lungo delto a Viareggio, 1839 c. fl., Erbario Lucchese (BM); Viareggio, in sylvis, 8. 1889 c. fr., Martelli (B.GB.PRC.W.); Lungo il litorale a Viareggio, 7.1886 c.fr., Mori (BPU.WAR); Bocca d'Arno, super arbores et frutices scandens, 5—8.1882 c.fl. et fr., Sommier (B.BC.BP.F.G.JE.O.P.PR.S.W.WU.); Pisa, a Castangolo, 28.5.1891 c.fl., Fantozzi (F).); Pineta di Bocca d'Arno, 14.9.1896 c.fr., Sommier (F.); Bocca d'Arno 1.10.1871 c.fr., Sommier (F); Pineta di Migliarino (Salviati) 15.9.1896 c.fr., Sommier (F); Pineta Sud de Viareggio 8.1881 c.fr., Martelli (F); Viareggio nella pineta orientale, 1878 c.fl., Bottini (F); Pineta del lago di Massaciuccoli 1920 c.fr., Pampanini (F.); Nei boschi a Migliarino presso Pisa, 15.9.1896 c.fr., Biondi (F.); Nei boschi rampicante, Tombolo presso Paduletta 8.1986, Biondi (F.); Pineta di Megliarino 9.9.1903, Fiori (F.); Livorno ad Autignano 5.1910 c.fl., Patterini (F.); Pineta Selvatica San Rossore 3.5.1951, Chiarugi, Corti (F.); Bosco tra Km 1 et 2 del viale del Gombo (Pineto) a N. e S. San Rossore 3.5.1951, Chiarugi, Corti (F.); Paduletta di Livorno 15.5.1872 c.fr., Maraucci (F.); Marinia di Pisa; prati umidi alla Bocca dell Arno 15.8.1915, Savelli (F.); Pisa, nelle siepi lungo la perrovia di Livorno, 25.8.1914, Savelli (F.); Nella selva di Tombolo, presso Marina di Pisa 21.7.1948, Corradi, Contardo (F.); Cave di Maiaro, spontanea, 1947 c.fl. et fr., Corradi, Contardo (F.); Lago di Massaciuccoli 14.5.1951, Corradi, Contardo (F.); Presso il puesolli di Massaciuccoli 4.7.1952, Corradi (F.); Prov. di Pisa, in paludosis silvae Tombolo dictae, inter Pisas et Ligurum (Livorno), alt. 2—4 m, solo humoso-sedimentario 9.6. c.fl. et 8.1912 c.fr., Passerini 1913 (BM.BP.F.K.LE.); Pisis, in sepibus, presso Palazetto 6.1892 c.fl. (BPU.F.); In dumetibus sylvae pisanae 5.1847 c.fl., Savi (C.F.P.PR.); Lieux humides de la foret de Pise, ou il grimpe sur les arbres 6.1856 c.fl., et fr., Savi 2108 (BM.CGE.E.G.JE.LE.P.W.); Aunaies dans les lieux marécageaux du Bois de Pise près delle Cascine 6.1857 c.fl. et fr., Savi 524 (B.BM. BP.C.CGE.G.GB.JE.K.LE.P.PRC.S.W.); Pisa, c.fl., et fr., Herb. Van Heurck (K.); Prov. di Pisa, 1913, Fiori (WU.); Umbria — Lago Trasimeno, Tra Passignano e M. del Lago 1955 c.fr., Palombini (F.); Liguria — Varazze (introdutta) 16.5.1928 c.fl., Gavioli 14058 (F.); Sulle rupi che sovrastano il porto di Savona. Probabilimentte inselvatichita, 1900, N. Mezzana (F.); Torre del Lago nella Pineta (Etruria) 1884 c.fl., Martelli (W).; nei cespugli lungo l'arigene sinistro del Cavol presso Ca'Bianca, Chioggia (Veneto), Chiamenti (F.).

Yugoslavia: Makedonija, Vardar, alluvium 230 m, 10.1962 c.fr., Forestry Fac. Zagreb (KOR.); Macedonia, prope Demir-Kapija, 7.1959 c.fr., Z Stecki (KOR.); In campsis ad rivulum prope opp. Strumica (Macedonia) 23.5.1926 c.fl., Košanin ,Černjavski (S.); Veles, 5.1918 c.fl., Burg 470 (JE.); In aquosis prope Narentam Fluv., 5.1829 c.fl., Herb. Hooker (BP.CGE.E.K.PR.PRC.W.); Narenta, c.fr., Herb. Botteri (W.); Dalmatia c.fl., Ball (E.); Dalmatien c.fl., Herb. Schott (BP.); In Dalmatium c.fl,? (ZA.); Spalato, Hecken 7.1901 c.fl., Engelhardt (PR.); Lesina c.fl., Botteri (W.); Fl. croatica: In littorali maritimis ad Segniam, c.fl., Vukotinovič (W.); in vall. Narent, Metković, Dalmacia 15.7.1929, Paczoski (POZ.).

Albania: Umgebung von Shkodra, Hecken an Pistala-Bach (südostl. v. Shkodra) 26.7.1916 c.fr., E. Janchen (WU.); Umgebung von Shkodra: Hecken an Wassergräben in der Niederung

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von Dorf Brdica 31.8.1916, E. Janchen (WU.); Umgebung von Shkodra. Hecken am Pistala-Bach, zwischen Kuči und Gajtani (Südostl. v. Shkodra) 18.6.1916, E. Janchen (WU.); Auf felsigen Boden an Bardanjolt bei Scutari 27.4.1914 c.fl., Dörfler 52 (WU.); Distr. Sarandë (Santi Quaranta): near Cukë, in alluvial swamps on N. side of Lake Butrinto, sea level 2.6.1933 c.fl., Alston, Sandwith 1322 (BM.K.S.); ad Poro et Skala Vojussa distr. Musakija-Barat, in silvis 10. 1894 c.fr., Baldacci 182 (BM.F.K.LE.P.PR.WU.).

Romania: Donaudelta, Wald von Kara-Orman, 20.6.1874 c.fl., 1.8.1874 c.fr., Gebr. Sintenis 865 (LE.S.); Delta Dunarei: Hermacul-Mare, 7.1929 c.fr., Georgescu (K.); Delta fluminis Danubii: Sulina—Cardon—Rosetti—Letea—Periprava—Valcov 17.7.1931, Domin, Krajina 2995a, b (PRC.); Mahmudia (Dobrudscha) Weidenwald am St. Georges Canal, gegenüber Ivanča, 16.6. 1874 c.fl., 1.8.1874 c.fr., Gebr. Sintenis (BP.); Dobrogea, distr. Tulcea. In silvis arenosis ad pagum Letea in Delta Danubii, alt. ca. 4—5 m s.m., 18.7.1923 c.fr., Borza, Nyárády, v. Tiesenhausen 584a (BP.C.E.K.KRA.P.PR.O.S.SO.W.WAR.WU.).

Bulgaria: Dobrogea, distr. Caliacra. In dumetosis promontorii saxosi „Capul Caliacra" ad oras Ponti Euxini 15.6.1925 c.fl., Borza, Nyárády 584c (BP.C.E.G.K.KRA.O.P.PR.S.SO.W. WAR.WU.); Dobrogea, distr. Caliacra. Ad margines silvae prope pagum Ecrene ad oras Ponti Euxini, copiose, alt. ca. 0—5 m s.m., solo arenoso 6.6.1924 c.fl., Pantu, Solacolu 548b (BP.C.E. G.KRA.O.P.PR.S.SO.WU.); Dobrogea: Balcic—Ecrene 12.7.1931 c.fr., Domin, Krajina 2410, 2429a, b, c (PRC.); Dobrogea: distr. Caliacra. In litoribus Ponti Euxini inter pagos Ecrene et Balcic, alt. ca. 50—100 m, 16.6.1936 c.fl., Nyárády (BP.); Dobrogea: distr. Caliacra, ad pagos „Cap Caliacra" 7.1933 c.fl.,? (SO.); Dobrogea: Kanskoh et Batova 12.7.1931 c.fr., Skottsberg (GB.); „Baltata" in val. flum Batova 2.7.1952 c.fl., Stojanov, Kitanov, Velčev (SOM.); Dobruja, in Fraxinus forest near the mouth of Batova 16.6.1962 c.fl., Browicz (KOR.); Zlote Piaski 14.6. 1962 c.fl., Browicz (KOR.): Varna: Kamčyk 8.1886 c.fr., Herb. Bornmüller (WU.); Varna. In Gebüschen a.d. Steilküste 7.1957, Düll (B.); In dumosis ad Longosa, distr. Varna 10.6.1925 c.fl., Drenovsky, Urumov (SOM.) Varna distr., 1923, B. Gilliat-Smith 292 (K.); Coast N. of Varna 9.6.1924 c.fl., Gilliat-Smith 677 (K.); Varna distr. 27.9.1924, Gilliat-Smith 967 (K.); Varna, ad pontum in fruticosis 3.6.1907 c.fl., C. K. Schneider 340 (K.); Warna 6.1898 c.fl., Stříbrný (SO.); Ad Varnam 1927 c.fl., Urumov 602 (BP.); Ad Varnam 7.1896 c.fl., Velenovský (PRC.); Longos--Forest near the mouth of Kamczija river 15.6.1962 c.fl., Browicz (KOR.); In pseudomacchia ad Pontum prope ostium rivi Kamčia 9.8.1910 c.fr., Davidov (SOM.); Near Kamčia river 8.1923, Jordanov (K.SO.); Kamčia river 15.9.1924 c.fr., Jordanov (SO.); In silvis ad ripas flum. Struma prope vic. Pripečene, distr. Petrič 20.5.1958 c.fl., Bondev (S.); Macedonia, in val. flum. Struma, inter Simitli et Sandanski 19.9.1958, Browicz (KOR.), Struma River, inter Krupnik et Mečkul, 1.8.1949, Kitanov (SOM.); Au borde de la rivier Struma, près de village Pripetchene 5.5.1958 c.fl., Konjucharov, Kouzmanov (K.); Struma, prope pag. Svoboda 22.5.1954 c.fl., I. Kolev (SO.); ad radicem mt. Belassica — in paludosis ad Kodža Orman, sub pagum Elešnica, distr. Petrič 25.—27.5.1950 c.fl., Stojanov, Achtarov (SO.SOM.); In fruticetis, in val. fl. Strumica 9.1915 c.fr., Stojanov 6733 (SO.); prope pag. Bansko 8.5.1916 c.fl., Stojanov (SO.); In nemorosis ad rivum Struma prope vicum Topolnica, distr. Petrič 20.9.1931 c.fl., Stojanov 2057 (K.SO.); M. Strandža — ad ripas humidis rivi Velika prope urb. Achtopol 7.6.1954 c.fl., Achtarov, Stojanov (SOM.); Ropotamo river, near the mouth 9.1958 c.fr., Browicz (KOR.); In Kresnaschlucht bei Kriva Livada 5.1936 c.juv. fr., Stojanov (SO.); In fruticetis, ad ripas lac. Mugres, prope Burgas 12.8. 1930, Paczoski (POZ.).

Greece: South Macedonia, above Gumendge 9.1918 c.fr., M. Wilson 298 (BM.F.); South Macedonia, Stavros 5.1918 c.fl., Capt. Watreston (BM.); Mesta river, near the mouth 7.11.1942 c.fr., N. Vychodzewskij (SOM.); Ad p. Camköi non procul urbem Soflu 26.7.1914 c.fr., Urumov (SOM.); Ad Dede-Agač 1914 c.fr., Urumov (BP.); Greek Macedonia, ravine between Iurica and Kopriva, south of Struma Plain 29.5.1917 c.fl., Turrill 347 (BM.K.); Thrace, nr. Moussafacli 200′, 13.5.1936 c.fl., Tedd (K.); Thrace: Bekkeuy 8.7.1933 c. juv. fr., Tedd (K.); Porto Logos 6.1919, Stefanov (SO.); Patras c.fl., Sibthrop (W.); Macedonia: distr. Edessa (Vodena). Inter oppidum Edessa et pagum Agra (Vladovo) 28.6.—3.7.1932 c.fr., Rechinger 3250 (BP.); Auf dem Berge Athos 8.1893 c.fl., Pichler (K.); Greichland c.fl. et fr., Hochenacker (PRC.); ad sepes

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Aetoliae pr. Aetolikon 19.5.1878 c.fl., Heldreich (BP.F.P.); Central Greek Macedonia: Struma Plain and northern slopes of the Krusa Balkan 4—5.1918 c.fl., G. W. Harris 162 (K.); In rivularibus Thraciae occidentalis, Badoma ad urben Dede-Agač 16.5.1914 c.fl., Davidov (SOM.); In vinetis Thraciae occidentalis ad urbem Gjumjuldzina 13.5.1914 c.fl., Davidov (SOM.); Makri 7.1915, Adamovič (SO.); In humidis Acarnani c.fl., Heldreich (P.); Macedonia, prope Vodena 24.5.1905 c.fl., Adamovič 671 (WU.); Cara-tach pag. Gramaticova prope Vodena 200 m, 4.1909 c.fl., Dimoniae (E.GB.PR.PRC.W.WU.); Corcyrae c.fl., Mazzoni (F.).

USSR. Moldavia, Valcov 50′, full sun, sand 2.9.1934 c.fr., E. Anderson 75 (K.); Prov. Krasnodar: Anapa in vale Sukko 7.1938 c.fr., Czerniakowska-Reinecke (LE.); Reg. Tuapse, ad viam Tuapse-Soczi, 1930 c.fr.,?, 289 (LE.); Reg. Novorossiysk, in mont. Markotch 1.7. 1923 c.fr., Pojarkova (LE.); Prope Novorossiysk, 28.5.1911 c.fl. et fr. Palibin, Worobiew 594 (LE.); Gelendzhik 18.7.1911 c.fl., Palibin, Worobiew 618 (LE.); Reg. Novorossiysk, in angustiis fl. Aderby, prope Gelendzhik 16.5.1907 c.fl., Litvinov (LE.); Prope Novorossiysk 23.7.1890 c.fr., Lipsky (LE.); Novorossiysk, in declivibus jugo-occ. montis Markotch 27.6.1938 c.fl., Krovoda 271 (LE.); Szirokaja balka, 1937 c.fr., Kravcova 157 (LE.), Gagri, ad ripam fl. Bzipi 23.5.1940 c.fl.,? (LE.); Prope Gagri 7.6.1927 c.fl., Sacharov 1628 a(LE.); Prov. Batumi, distr. Batumi, Zielonyj mys, 12.6.1916 c.fl., Krylov, Steinberg (LE.); Prov. Batum, inter pagos Sarp et Makrial, ad viam silvestram 600—800′, 1902 c.fl., Alexeenko, Woronow 14010 (LE.); Prope Soczi 15.6. 1923 c.fl., W. Steup (LE.); Sochi 11.4.1932 c.fl., Panjutin 1628b (LE.); Prope Sochi 28.6.1895 c.fl., Lipsky (LE.); Prope Sochi, 17.5.1895 c.fl., Lipsky (LE.); Sukhumi, in Ulmus fruticet. 8—9 1916 c.fr.,? (WAR.); Sukhumi 28.5.1919 c.fl.,? (WAR.); Colchis, ad flumen Phasim (Rion), inter Kutais et Namakhvani 23.7.1890 c.fr., Sommier, Levier 920 (F.LE.); Ruines de Kouthais 4.1853 c.fl., Sredinskij 6 (LE.); Kutais 400′, c.fl., Herb. Sredinskij (LE.); Trouvé aupres d'un jardin, sur le bords de Werah (petite river), Tiflis 10.4.1854 c.fr., Pomorzoff 148 (LE.); Prope Tiflis 20.5.1871 c.fl., Owerin (LE.); In arboribus scandent, prope Gandscha-čai 22.6.1844, Kolenati 1239 (LE.); In declivibus prope fluvium Gandscha, districtus Airum 1.6.1844 c.fl., Kolenati 1239 (LE.); Georga: prov. Tiflis, steppa Karajazy, inter pagos Michajlovka et fl. Kura, 21.5.1929 c.fl., Kolakovsky (LE.); Tiflis c.fl., v. Hoeff (LE.); Tiflis, 1894 c.fl., O. A. et B. A. Fedtschenko (LE.); Abchazia: Nowyj Afon 22.6.1891 c.fr., Lipsky (LE.); Abchazja, Gudauta c.fr., Alboff (LE.); Abchazja: loc. Skurcza prope ostium fl. Kodor, in fruticetis littoralibus 12.6. 1904 c.fl., Woronow (F.LE.); Abchazia, ad. fl. Kur, 1843 c.fl., Wittmann (LE.); Abchasia, in sylvis prope Suchumi et Olginskoje 1.9.1897 c.fr., Busch (LE.); Abchasia: Non procul ab urbe Suchum-Kale, inter frutices ad monasterium N. Athonense 8.5. 1906 c.fl., Brodzilowski (LE.); Kachetia, Lagodechi 7.1898 c.fl. et fr., A. Fomin (LE.); Iberia c.fl. et fr., Wilhelms (LE.); Tiflis, in collibus prope hortium botanicum 8.7.1890, Sommier, Levier (F.); Iberia, 1922 c.fl., Fischer (G.LE.W.); Ex Grusinia, c.fl., Herb. Ledebour 665 (K.LE.); Iberia c.fl., Herb. Lindley (CGE.); Mingrelia c.fl., C. A. Meyer (P.); Armenia: distr. Migri, pag. Migri. In vinetis ad ripas fl. Migri-tschai 3.6.1934 c.fl., I. Karjagin (LE.); Prov. Zangezur, pr. pag. Sichauz et Bassut-cai 5.8.1929 c.fr., Schelkovnikov, Kara-Murza (LE.); Zangezur: Kafan reg. Schikahoh 11.5.1960 c.fl., M. Grigorian (LE.); Gub. Elisabethpol, distr. Nucha, inter pagos Pirally et Sultan-Nucha, in paludosis 30.8.1899, Alexeenko (LE.); Azerbajdzhan, distr. Geok-tshaj, prope p. Kormarjan 29.7.1932, Tshilikina (LE.); Azerbajdzhan, prope Baku, steppa Shirvan, inter p. Tafu et op. Agdash 12.5.1930 c.fl., M. Sachokia (LE.); In insula Sari ,maris Caspii 24.5.1880 c.fl., Radde 557 (LE.); Azerbajdzhan, prov. Gandzha, distr. Agdam, steppa Karabach, inter oppidum Bardy et pagum Avad 1.8.1927 c.fr., Prilipko (LE.); Azerbajdzhan, distr. Baku, Lenkoran prope pagum Alexeewka 26.7.1930 c.fr., Prilipko (LE.); Azerbajdzshan, prope .Baku, distr. Lenkoran, inter p. Alexeewka et m. Kizil-Halasy, 6.8.1928 c.fr., Prilipko (LE.); Azerbajdzhan, prov. Gandzha, distr. Agdam, steppa Karabach, p. Chan-Kervend- p. Kizil-gadzhilu — p. Dzhinly, 27.6.1928 c.fr., Prilipko (LE.); Azerbajdzhan, prov. Gandzha, distr. Agdam, steppa Mil, prope p. Karadonly 26.5.1928 c.fl., Prilipko (LE.); Azerbajdzhan, prov. Gandzha, distr. Agdam, steppa Karabach, prope oppidum Bardy, in silva 5.8.1927 c.fr. Prilipko (LE.); Azerbajdzhan, distr. Zangelan, pr. Bartaz, in valle fl. Araxis 23.7.1932, Karjagin (LE.); Azerbajdzhan, distr. Samuch, ad pedem borealem jugi Ejlar-oughi, in silva ad ripam fl. Jora 11.5.1941 c.fl., Grossheim (BM.); Azerbaj-

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dzhan, distr. Agdasch, inter Agdasch et Chaldan, ad ripam canalis 10.5.1940 c.fl., Grossheim (LE.); In sylvis et dumetis prope Lenkoran 28.5.1830 c.fl. et fr., teste N. Kouznezow (LE.); Talish, reg. Lenkoran, prope pag. Szagla-Kodscha 14.8.1936,? (LE.); Talish, prope pag. Maruschli 28.5.1894 c.fl., A. L. (LE.); Reg. Lenkoran, prope pag. Alexeewka, ad ripam fl. Kamyschowka 100 m, 28.6.1952 c.fl., Vasiljev, Vasiljeva (LE.); Lenkoran, non procul pag. N. Mjuaby (?), 11.6. 1931 c.fl., Skipczinsky (LE.); Gub. Baku, distr. Kuba, prope Michailowka (Nizovaja). Ad ostium fluvia, inter frutices 50', 27.6.1899 c.fr., Alexeenko 885 (LE.); Gub. Baku, distr. Kuba. Ad st. viae ferr. Chamczaz. In humidis ad margines arborum 1.5.1902, Alexeenko 18367 (LE.); Gub. Baku, Lenkoran. Ad ostium fl. Lenkoran-czai 28.7.1897, Alexeenko (LE.); Lenkoran 1.6.1880 c.fl., Radde 447 (LE.); Gub. Baku, Talysch. Inter Havzavuja et Hirdoni. In planitite ad fl. Havza 0—100', 12.8.1897, Alexeenko (LE.); Gub. Baku, distr. Geokczai. Inter Kalynczach et Dshuljan Infer., in fruticetis humidosis 1900', 1.8.1899 c.fr., Alexeenko (LE.); Gub. Baku, inter pagos Ozbishan et Bibiani. In silvis 1400—2300', 10.8.1897, Alexeenko (LE.); Distr. Baku, Talysch. In umbrosis jugi Bobbila (Bebolabad) supra pag. Tengivan (Tangovon) 800—2000', 2.8.1897, Alexeenko (LE.); Reg. Lenkoran, prope pag. Majely 1.8.1931, E. Matveeva 828 (LE.); Lenkoran: pag. Podgornoje 22.6.1931, E. Matveeva 72 (LE.); Lenkoran: Kustbi, Maruszli 13.8.1914 c.fr., N. Pastuchov (LE.); Prope Lenkoran, c.fr., Medviediev 157 (LE.); Talysch, distr. Lenkoran: SW Duzba-Kala „Awrora" 25.7.1936, Karmoszkin (LE.); ad ripas Lenkoran-czai, prope Lenkoran 12.7.1928 c.fr., Ivanova (LE.); Lenkoran 1873 c.fl., A. Becker 352 (LE.); Dagestan: Michacz-Kala, in fruticetis 4.9.1929 c.fr., E. Vasilkova 76 (LE.); Prov. Dagestan, distr. Kaitag-Tabassaran 20'. Pr. st. Kajakent, in fruticetis 17.7. 1900 c.fr., Alexeenko 4345, 4359, 4418 (LE.); Distr. Kuba, Czer-Labinskaja 11.7.1925, E. Schiffers, L. Sokolova 905 (LE.); Distr. Kuban, Jekaterinodar 7.6.1890 c.fl., Lipsky (LE.); Distr. Kuban, Armavir 19.6.1890 c.fl. et fr., Lipsky (LE.); Baku, distr. Kuba, prope Ivanovka, 7.1900 c.fr., Grigoriev (LE.); In arboretis circa Terek c.fl., teste Kusnezow (LE.); Gefunden von Agronom Baumann auf der Steppe am Liman des Molotschna Flusses (LE.); Karabach 10.8.1895 c.fr., A. L. (LE.); Imeretia 5.5.1830 c.fl. et fr., Szovits (G.E.F.K.LE.P.S.W.WU.); Lazistania rossica, prope p. Gonich (?), 27.8.1910 c.fr., Woronow 2222 (LE.); in virgulitis ad rivulus, Samcheti, Kazachi, Karabagh 19.5.1829 c.fl., 18.10.1929 c.fr., Szovits 186 (LE.); Prope pag. Alexeevka 6.8.1931 c.fr. Shipczinsky 1027 (LE.); Prov. Jelizavetpol, distr. Areš. In dumosis circa Geok-tapa (Areš St. Tr.) 17.5.1911 c.fl., Schelkovnikov, Woronow 233 (LE.); Dzhubga 1913 c.fr., Lavrova (LE.); distr. Tersk:Kizlar 1.6.1890 c.fl., Lipsky (LE.); Dschuba c.fr., Bayern (LE.); ad ripas fluviosum circa Katarinenfeld c.fl., Frick (LE.); Caucase 1871 c.fl., L. Pierre (P.); Caucas, 1829—30 c.fl. et fr., C. A. Meyer (LE.); Caucas c.fl., Massalsky (E.); Caucas, 10.9.1917, V. Kociejovski (WAR.); Caucas c.fl., Hussin-Puschin (S.); Caucas 6.1856 c.fl. et fr., Herba. J. Gray (K.); Caucasus 10.1823 c.fl. et fr., Goldbach (LE.); Caucasus c.fl., Herb. Bentham (K.); Caucasus c.fr., Bayern (E.);.

Turkey: Gallipoli: Boghali 8.7.1923 c.fr., Ingoldby 411 (K.); Gallipoli: Angadere 16.10, 1923 c.fr., Ingoldby 417 (K.); Gallipoli Peninsula c.fl., Major W... (K.); Ad Bulair 1912 c.fl.. Urumov (SOM.); Tekir-Dagh: Kumbala 1913 c.fl., Stojanov 6733 (SOM.); Prov. Istanbul: Belgrade forest near Gumusdere, by the river 20.10.1960 c.fr., Yaltirik (E.); Prov. Istanbul: Belgrade forest, near Buyuk Belgrad Bendi, 26.5.1961 c.fl., Yaltirik (E.); Ost-Thrazien: Umgebung des Tschifl.-Tschillingos (südl. Midia): Longos-Wald im unteren Tschillingos-dere 1.7.1927, J. Mattfeld 3311 (LE.); Falaise près de Kemer-Bournou 6.6.1866 c.fl., B. Balansa (E.F.G.JE. K.P.W.); Constantinopole c.fr., ? (P.); Sweet-Water of Asia — Bosphorus 4.10.1867, Ball (E.); Dardanelles, 5.1856 c.fl., and 12.1858 c.fr., ? (E.); Bithyn. inter frutices pr. Heida-pascha ad Brussam 6.1874 c.fl., Pichler 48 (BP.F.G.JE.K.W.); Olympus Bithynic., 5.1869 c.fl., ? (JE.); Bei Biledschik 5.5.1914 c.fl., Dingler (W.); Bithynia: ad Bilecik, in declivitatibus vallis fluvii Kara-su, in vinetis derelictis prope stationem 3—400 m, 17—24.5.1929 c.fl., J. et F. Bornmüller 13456 (BM.BP.E.G.K.LE.P.PR.S.W.); pr. Smyrne 1833 c.fl., Montbret (F.P.W.); Amasia: in dumosis secus fluvium Yesil-Ormak 360 m, 14.5.1889 c.fl. et fr., J. Bornmüller 354 (BM.JE. K.LE.SOM.W.WU.); Amasya, ufer des Yesil-Irmak, oberhalb der Stadt 480 m, 26.7.1931 c.fr., Görz 858 (BM.G.LE.); Amassia: Galatia, c.fl., Manissadjian 973 (JE.K.LE.P.PR.); Akdagh pr. Amassia, c.fr., Manissadjian 967 (JE.K.LE.P.S.SOM.); Prope Angora, in montibus calcareis

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Elma-daghi, 1834 c.fl. et fr., Wiedemann (LE.); Prope urbem Trapezuntum ad proximum rivulum trans flumen Pixit Su in fruticetis, substr. vulcanico, ca. 30 m, 8.7.1907, Handel-Mazzetti 306 (W.WU.); Lazistan, ad viam inter Gumische et Trapezuntum, in angustis fl. Dereshi-dere, ? (LE.); Araklie 50′, 24.6.1933 c.fl., Balls 404 (E.K.SOM.); Anatolia: Araklie 1.9.1917, Schischkin (LE.); In regione Pontica 25.8.1889, Kousnezoff (LE.P.); Erzeroum, 1867 c.fl., Herb. Hooker (K.); Reg. Artvin: Ardanuch 30.5.1914 c.fl., Turkiewicz 604 (LE.); Prov. Antalya, distr. Gebiz (Pisidie), Bozburn dag nr. Penargazu 550—600 m, 23.7.1949 c.fr., Davis 15489 (E.K.); Gorge du Guzel--Déré, à 3 lieues au NO de Mersina 7.5.1885 c.fl., B. Balansa 718 (BM.PB.C.E.F.G.JE.K.P.W.); Marshy shores of Lake of Antioch 18.5.1933 c.fl., Meinertzhagen (BM.).; Marash 5. 1886 c.fl., Herb. Post (BM.); In dumetis fl. Dschihan, inter Marash et Albistan 3000′, 31.7.1865 c.fr., Haussknecht (BM.JE.K.LE.P.W.); Env. of Killis 2000—2500′, 25.5.—3.6.1911 c.fl., Manoog Haradjian 4468 (G.W.); Kharput: Schuschnat 8.6.1889 c.fl., Sintenis 688 (P.W.WU.); Kurdistania: Distr. Diarbekir, ad fontes in declivibus angustiarum, inter Arghana Maden et Kesin, substr. siliceo 1100—1200 m, 31.8.1910 c.fl., Handel-Mazzetti 2635 (W.WU.); Prov. Mardin: Mardin-Diyarbakir, 24 km from Mardin, limestone, 1000 m, 27.5.1957 c.fl., Davis, Hedge 28821 (E.K.); Prov. Maras. Along the road Oraras-Halalya, ± 140 km SW of Malatya, along rivulet, ca. 700 m, 25.5.1959 c.fl., E. Hennipman 1401 (K.); in valle Auina prope Merdina, ad torrentes in arboribus scandens, 14.6.1841 c.fl., Kotschy 285 (K.W.); Mardin: Khanaki, ad rivulum 29.5. 1888, Sintenis 855 (E.); Dere Bagtsche 300 m, 25.5.1933 c.fl., W. Wall (S.); Amanus: ad pag. Dere Bagtsche infra pag. Beylan, solo schistoso-gneissaceo, in fruticetis ad rivulum ca. 320 m, 25.5.1933 c.fl., Samuelsson 5347 (S.); Armenia turcica: Egin: Kemergoep, in fruticetis 30.5.1890 c.fl., Sintenis 2546 (PR.S.); Lazsitan: Hope 6.8.1917, Schischkin (LE.); Ala-Dagh, 1835 c.fl., Wiedemann (LE.); Asia Min., 1837 c.fl., Aucher-Eloy 1506 (F.G.P.); Asia Minor, 1858 c.fl., Tchihatcheff 471 (P.); Kurdistan: in dumetis pr. Saldmanrek (?) 7.1867 c.fr., Haussknecht (LE.W.).

Iran: Gilan, 1839 c.fr. ? (LE.); Mazanderan: Haraz valley, between Aliabad and Siah Bisheh, climbing in shrubbery of Ficus and Rubus sp., c. 700 m, 24.7.1959, Wendelbo 1477 (BG.); Prov. Asterabad: Bender Ges. in dumetis ad rivulos 12.12.1900 c.fr., Sintenis 1403 (LE.); Prov. Gilan: near Lahijan, sea-level, swampy plain 15.5. 1955 c.fl., H. F. Mooney 6606 (K.); Prov. Gilan, Rescht 24.5.1893 c.fl., Lipsky (LE.); Lahijan, 1937 c.fl., Miss. N. Lindsay 883 (BM.K.); Prov. Mazanderan: Ramsar 1200 m, c.fl., Gauba, Esfandiari (W.); Ghilan c.fr., Chodzko (LE.); Gilan, bei Rescht u. Rudbar 14.5.1848 c.fl., Herb. Buhse 970 (LE.); Sylv. Ghilanae c.fr., Aucher-Eloy 4923 (BM.F.K.P.); Prov. Ghilan: In angustis inter Rolischin (?) et Pul-i-ombu 24.7.1902 c.fr., Alexeenko 405 (LE.); Prov. Mazanderan: Distr. Kudjur: Inter Kindj et Dasht-e-Nasir 800 m, 9—11.8.1948, K. H. et F. Rechinger 6559 (G.W.).

Iraq: Zawita c.fl., V. C. Robertson 56 (K.); In the flood plain of the Diyala nera Pewaz 5.1958 c.fl., M. C. D. Poore 627 (K.); 36°36′ N, 44°44′ E, 1934 c.fr., W. A. Macfadeyn (BM.); Mossul, 1841, Kotschy 285 (S.); Shaqlawa 900 m, 1.6.1948 c.fl., Gillett 11581 (K.); Qara Dagh 1200 m, 23.4.1947 c.fl., Gillett 7919 (K.); Shaqlawa 900 m, frequent, 8.5.1947 c.fl., Gillett 8034 (K.); Qara-Dagh, Wadi Jaafaran 1070 m, near water, 4.9.1933, Eig, Feinbrun (HUJ.); Env. of Sulaimani, Surchinar Bakaraji farm, irrigated and innudated places 17.9.1933 c.fr., Eig, Feinbrun (HUJ.); Village Sulaf near Amadia, ca. 1000 m, near water 23.9.1933 c.fr., Eig, Feinbrun (HUJ.); Kurdistania: in montis Kuh-Sefin reg. infer. infra pagum Schaklava (ditionis Erbil) 1000 m, 28.5.1893 c.fl., J. Bornmüller 1542 (E.F.G.JE.LE.P.PR.W.WU.); Zerma on Turkish border 1000 m, among Platanus by river 12.8.1947 c. juv. fr., Gillett 9803 (K.); Sarsang 3500′, frequent, 16.7.1955 c.fr., Wheeler Haines 523 (E.K.); Hazi-Omran 1800 m, 3.6.1948 c.fl., Chapman 11921 (K.).

Syria: Bord de la derivation qui conturne le poste de Kefar Haouar (35 km S.O. de Damas) alt. vers 1200 m, 13.9.1927 c.fr., A. Berton 463 (P.); ad Aïn Abou dibs 16.5.1879 c.fl., E. Peyron (G.).

Lebanon: Litany Valley, 1863—64, B. T. Lowne (BM.CGE.K.); Nahr-el-Kelb near Beyruth 13.5.1932 c.fl., Ararf Haptrmi (S.); Beirut 18.5.1824 c.fl., G. Ch. Ehrenberg (S.); Nahr-el-Kelb, ad radices rupium calcar., 2.4.1932 c.fl., G. Samuelsson 1120 (S.); Berg Nahr-el-Kelb 21.4.1932

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c.fl., Wall (S.); Nahr-el-Kelb 26.10.1924 c.fr., Eig (HUJ.); Near Pachas Garden, Beirut, 5.1880 c.fl., Herb. Post 1145 (BM.K.).

Israel: Hula Plain, Hatsbani banks, South East of Mayan Baruch, alluvial soil 24.5.1963 c.fl., M. Zohary, U. Plitmann 524547 (HUJ.); Dan Valley, Hazbani bridge, env. of Maayan Baruch, field border near river bank 26.4.1963 c.fl., U. Plitmann 21/1 (HUJ.); Adonis, c.fl., W. A. Hayne (K.).

Discussion:

The earliest information of *P. graeca* comes from the middle of the sixteenth century. Luca Ghini, professor of botany and founder of the botanical garden in Pisa, in his letter 1551 accompanying his parcel of plants to Mathioli mentions that, in 1547, he received from Syria follicles of two twining plants one of which was defined as *Periploca repens*, and the other as *Periploca non repens* (G. B. De Toni, I Placiti di Luca Ghini, Mem. del R. Inst. Veneto di Sci. Lettr. Arti 28 no. 8, 1903). The former of these species is just nothing else than *P. graeca*, the other *Cionura erecta* (L.) Griseb.

Fig. 4. Oldest illustration of *Periploca graeca* (P. A. Matthioli — Commentarii in Libros Sex Pedacii Dioscoridis, 1565)

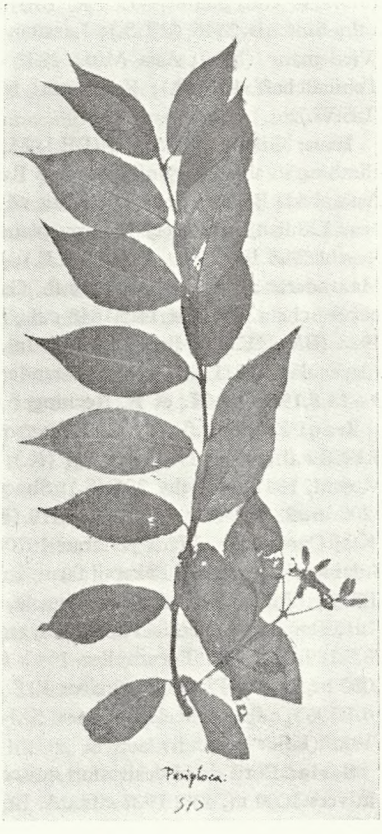

Fig. 5. Oldest herbarium specimen with flowers of *Periploca graeca* — Caesalpini herbarium, ca. 1563

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Plants obtained from the first seeds Ghini identified with „*Apocynum*" already mentioned by Dioscorides. That Ghini's *Periploca repens* is identical with *P. graeca* is seen in the first illustration of this plant printed in 1565, in the Latin edition of Mathioli's work "Commentarii in Libros Sex Pedacii Dioscoridis", p. 1102. This excellent illustration represents the whole plant in a leafed state, with characteristically incurved follicles, connate at the apex. The shoots of "*Apocynum repens*" are elongated and twisted, thus showing well its twining growth (fig. 4).

Two years later than Ghini's seeds of the same two species came to Italy by another way. This is mentioned by L. Anguillara founder of the botanical garden in Padua, on page 274 of his work „Semplici" (1561). In the chapter on "*Apocino*" he writes : "... in 1549 I got two plants from Greece, both climbing up shrubs by means of long shoots and bearing follicles... I have been told that these plants are named *Periplocada* what means twining plants".

The three names cited above: *Apocynum*, *Periploca repens* and *Periplocada* have not been the only ones to indicate *P. graeca* in the following centuries. A list of these names up to Linnaeus has been given below, and it is worth stressing that the name cited by Linnaeus was used much earlier by Lobelius who had applied it, however, to *Cionura erecta.*

Lobelius	(1576) —	*Periploca serpens, angustiore folio,*
Dodoneus	(1583) —	*Periploca altera,*
Clusius	(1601) —	*Apocynum secundum angustifolium,*
Bauhin	(1623) —	*Apocynum folio oblongo,*
Gerard	(1633) —	*Periploca repens angustifolia,*
Parkinson	(1640) —	*Apocynum angustifolia sive repens*
Bauhin	(1651) —	*Apocynum sive Periploca scandens, folio oblongo flore purpurascente,*
Tournefort	(1719) —	*Periploca foliis oblongis,*
Linnaeus	(1737) —	*Periploca foliis lanceolato-ovatis.*
Linnaeus	(1753) —	*Periploca graeca*

As Ghini's letter shows *P. graeca* came to Italy for cultivation in 1547, but was discovered in wild state only in 1789 by Savi (Flora Pisana), who writes as follows: "It occurs in Selva Pisana twining round elms, oaks and other trees". Appreciating this finding and basing on the oldest data from literature E. Chiovenda (Nuov. Giorn. Bot. Ital. n. s. 45: XXVI—XXXV, 1938) states that *P. graeca* is not a species native to Tuscany, but it ran wild here in an ideal way as an escape from cultivation (most probably from the botanical garden in Pisa). E. Francini expressed a different view (Nuov. Giorn. Bot. Ital. n. s., 45: XXXV-XL; 45: 391—399, 1938) who beside historical data from literature ground her arguments on the oldest herbarium Cibo/Petrollini, kept in the Biblioteca Angelica in Rome.

Number 941 and no 183 of the third volume of this herbarium shows a branchlet of *Lonicera caprifolium* as well as two leaves of *Periploca graeca* named "*Periclymenum lactescens*". This name, according to Francini, must have been

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given before Ghini got the seeds from Syria, because both Cibo and Petrollini, Ghini's students would have known and applied the name mentioned in Ghini's letter — "*Periploca repens*" or "*Apocynum*". We may therefore presume that *P. graeca* grew wild in Tuscany already before 1547. Francini adds another argument to those, i. e. the finding of fossil remains of *P. graeca* (leaf impressions)

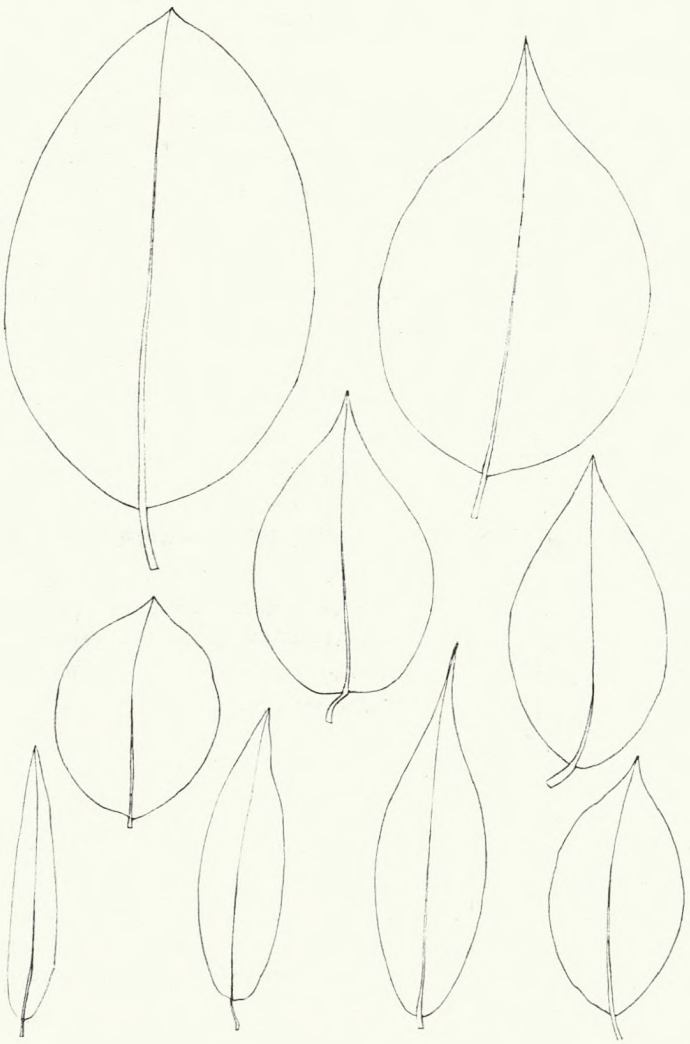

Fig. 6. Variability of leaves of *Periploca graeca* (less. 2×)

in Italy, in Tuscany. They date to the Older Quaternary. Drawing conclussions from the discussion between E. Chiovenda and E. Francini I am inclined to take *P. graeca* for a native species, and not run -wild in Italy.

The oldest herbarium specimen of *P. graeca* with presserved flowers is found in the Caesalpini herbarium, number 517. (fig. 5). This herbarium is kept

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in the Instituto Botanico in Florence, and as Saint-Lager (Histoire de Herbiers, 1885) assumes, it was put together about 1563. In the herbarium of Aldrovandi, which is older than the Caesalpini, *P. graeca* is not found, though in the index to the first volume of this herbarium No. 553 the name "*Periploca*" is mentioned.

Saint-Lager (l. c.) reports, too, that in volume IV of Rauwolf's herbarium collected in the years 1573—1575 during his journey in the Near East, No. 68 shows "*Apocynum repens*" (= *P. graeca*) gathered in the Lebanon Mts. As I have been informed by the Curator of the herbarium in Leiden, Dr. S. J. van Ooststroom the specimen has been lost. As *P. graeca* is also missing in the herbarium of G. Bauhin, the author of "Pinax", the next specimen of *P. graeca* in turn is in Burser's herbarium kept in Uppsala (H. O. Juel, Symb. Bot. Uppsal. 2, 1: 113, 1936). It is also a flowering branchlet placed in volume 17 of the herbarium, number 51. It was gathered in Basel, as a cultivated specimen. Where Linnaeus' herbarium specimen (type) comes from is not known, because Linnaeus in his "Species Plantarum" alludes to Syria only, as the country of *P. graeca* (most probably after Mathioli).

Periploca graeca is a species showing great variability in the size and shape of leaves. The leaves are mostly broadly-ovate or broadly-elliptic, but leaves almost round or lanceolate or even linear-lanceolate can be met, too. They are met either on one and the same shrub, or on different shrubs. The occurrence of specimens of extremely narrow-lanceolate leaves has caused the distinction of such varieties in *P. graeca* as: var. *angustifolia* Uecht. et Sint. and var. *oblongifolia* Post. I think they can't be treated as distinct taxa, because, as I myself observed in natural localities of *P. graeca* in Bulgaria, these are usually shrubs damaged or growing weak or even very young ones, which have the lanceolate shape of leaves, so characteristic in annual seedlings. These narrow leafy forms are known from different places, as for instance, from the Danube delta in Romania, from Bulgarian Dobruja, from Yugoslavian Macedonia, from Albania, from the district of Pisa in Italy, from Lebanon and Caucasus (vicinity of Tbilisi).

1b. *Periploca graeca* L. var. *vestita* Rohlena

Sitz.-Ber. Böhm. Ges. Wiss. 1:84 (1911); Hayek, Pr. Fl. Pen. Balc. 2:430 (1930); Browicz, Feddes. Repert., 72, 2—3:127 (1966).

Syn: *P. graeca* L. f. *vestita* Rohlena, Preslia 20—21:321 (1942).

Type: Yugoslavia: In fruticetis lacus Skadarsko jezero, 8. 1906, J. Rohlena (PR. PRC.).

Leaves below, petioles and young shoots pubescent.

Distribution: Described from Yugoslavia, yet Rohlena reports that Baldacci has found it also in Albania. It occurs, too, in Turkey, Anatolia, but the Turkish specimens differ from Rohlena's type specimen in having glabrous shoots.

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Specimens examined:

Turkey: In Anatolia, 1834 c.fl., Wiedemann (LE.); Prov. Samsun: Balik Gol nr. Bafra, in Fraxinus-Carpinus Forest on alluvial plain, 6.9.1954 c.fr., Davis, Polunin 24997 (E.K.).

2. *Periploca sepium* Bunge

Enum. Pl. Chin. Bor. 43 (1833); Decaisne in DC. Prodr. 8:498 (1844); Maximowicz, Mém. Sav. Étr. Pétersb. 9:474 (1859) (Ind. Pl. Pekin.); Hance, Jour. Bot. 13:134 (1875); Maximowicz, Mél. Biol. 9:774 (1877); Maximowicz, Bul. Acad. Sci. St. Petersb. 23.:352 (1877); Moellendorf, Zeitschr. d. Gesel. f. Erdkunde, Berlin 16 no. 76 (1881); Franchet, Pl. David. 1:207 (1884); Hemsley, Jour. Linn. Soc. Bot. London 26:101 (1889); Schumann in Engler, Prantl. Natürl. Pflanzenfam. 4, 2:216 (1895); Schlechter in Diels, Bot. Jahrb. Engler 29:541 (1900); Komarov, Fl. Mansch. (Acta Hort. Petrop. 22), 3:282 (1903); Gilg, Loesner, Bot. Jahrb. Engler 34:59 (1904); Pavolini, Nuov. Giorn. Bot. Ital. 15:428 (1908); Jack, Mitt. Deutsch. Dendr. Ges. 287 (1909); Pampanini, Piante Vasc. Hu-peh 149 (1911); Schneider, I11. Handb. Laubholzk. 2:853 (1912); Yabe, Ic. Fl. Manchur. 1:1 pl. 9 (1914); Schneider in Sargent Pl. Wils. 3:343 (1917); Loesner, Beih. Bot. Centr. 37, 2:169 (1918); Yabe, Prelim. Rep. Fl. Tsing-Tau Reg. 93 (1918); Limpricht, Feddes Repert. (Beih.) 12:470 (1922); Chung, Mem. Sc. Soc. China 1:221 (1924); Rehder, Man. Cult. Trees, Shrubs 771 (1924); Liu, Enum. Pl. Chichli Prov. 146 (1927—28); Komarov, Klobukova-Alisova, Key Pl. Far. East. Reg. USSR 2:870 fig. 871 (1932); Tsiang Sunyantsenia 2,2:178 (1934); Tsiang, Sunyantsenia 3,2—3:161 (1936); Rehder in Bailey Stand Cycl. Hortic. 3:2553 (1939); Kitagawa, Lineamenta Fl. Manshur. 364 (1939); Bean, Trees,

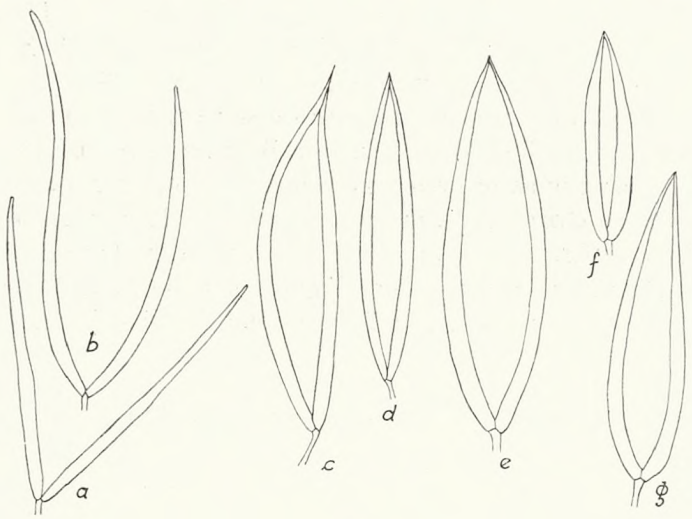

Fig. 7. Shape and arrangement of follicles: *a—b P. calophylla*, *c—d P. sepium*, *e—g P. graeca* (less. 3×)

Shrubs 7 ed., 2:402 (1951); Pobiedimova, Fl. USSR 18:666 (1952); Lim, Lim, Jour. Biol. Inst. Dep. Bot. Univ. Seoul 2,1:127 (1954); Liou Tchen-ngo, I11. Fl. Ligneous Pl. N.-E. China 483 pl. 155 fig. 386 (1958); Krüssmann, Handb. Laubholzk. 2:177 (1961); Zamjatin, Trees, Shrubs USSR 6:27 (1962).

Type: China: Ad sepes, vias et in montosis Pekinum, 1831 c. fl. Bunge (K. LE. P.).

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Twining shrub to 3—4 m high (according to Krüssmann l. c. even to 10 m.). Young shoots green, quite glabrous, older ones greyish-brown, or grey with numerous prominent lenticels. Leaves deciduous, ovate-elongate, ovate-elliptic, ovate-lanceolate or even lanceolate, 4—12 cm long and 1—4 cm broad, widest part in the middle or a little below, stretched into a long, narrow apex, acute or obtuse at apex, cuneate at the base, glabrous on both sides, dark green above, lustrous or nearly opaque, lighter green beneath, margins slightly undulate. The net of lateral nerves clearly visible. Petioles glabrous, 5—15 mm long. In-

Phot. R. B. G. Kew

Fig. 8. *Periploca sepium* — type (Royal Botanic Gardens, Kew)

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florescences lateral or terminal, 3—5 flowered (sometimes 1—2) shorter than, or equal to, the leaves supporting them. The inflorescence axis to 6 cm long (usually about 3 cm), quite glabrous just like peduncles, bracts and bractlets, as well as calyx. Bracts and bractlets membranous, 1—1.5 mm long, ovate-lanceolate, brownish, easily falling off. Peduncles 1—1.5 cm long. Flowers 15—20 mm in diameter. Calyx greenish, 3—3.5 mm long, deeply dissected. Calyx teeth ovate, margin sparsely ciliate, obtuse at the apex. Corolla lobes to 8 mm long and 3(4) mm wide, lower surface greenish, upper surface dark-violet-brown, lighter limbate, white pubescent on margin and in apical part, bent down toward calyx base, in middle part with a distinct, prominent, elliptic gland-patch, to 5 mm in length, at base with a narrowly elliptic, white spot, to 3 mm long. Filiform corona lobes somewhat shorter than corolla lobes, delicately puberulent (greatly magnified). Follicles almost equally thick length-

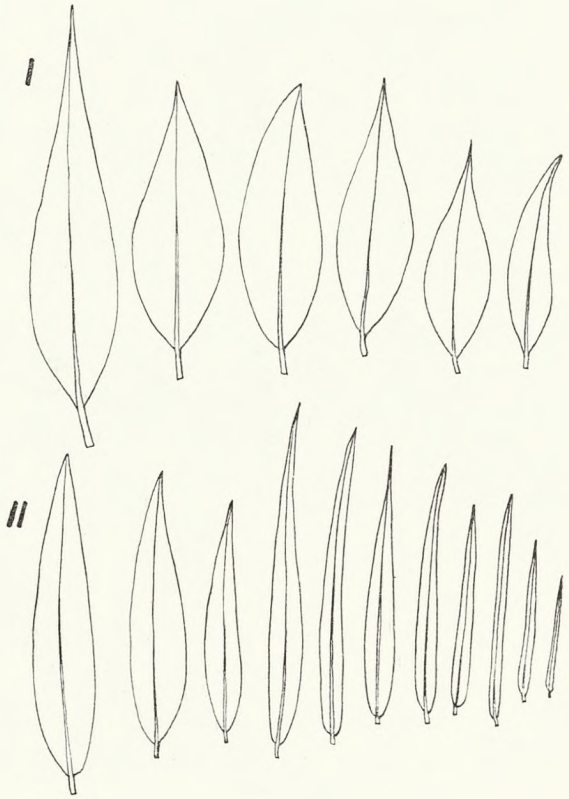

Fig. 9. Variability of leaves: I. *P. sepium*, II. *P. linearifolia* (less. 2×)

wise, placed at acute angle arcuate, connate at apex, 9—13 (17) cm long, and about 5 mm thick. Seeds dark brown or almost black 6—8 mm long and about 1—1.5 mm broad, with coma to 3 cm long. Flowering IV—VI, sometimes even to VIII (fig. 7*c-d*, 8,9-I).

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Distribution: North and east China (Mandshuria, Hopeh, Shansi, Shensi, Kansu, Inner Mongolia, Shantung, Honan, Szehwan, Hupeh, Kiangsu) and North Korea. It grows in forests, in scrubs, on mountain slopes, and in river- and stream valleys, on sandy, often arid and sterile substratum, also on rocky slopes, in mountains up to 2100 m a. s. l. In China the flowers of *P. sepium* are much eaten (Franchet, l. c.). In the USSR, in the Far East, it is merely a species cultivated in gardens and parks and called „Korean liana" (fig. 10-2).

In 1905 *P. sepium* was introduced for the first time to cultivation in the Arnold Arboretum by J. G. Jack (l. c.), who had gathered its seeds in China in Nankau north of Peking. The shrubs grown from these seeds flowered in June 1908. A species very rare in cultivation.

Specimens examined:

China: Ad fl. Sungari, pag. Shi Shienza, 4.6.1900 c.fl., Wislouch 133 (LE.); Prov. Ljaonin, distr. Tschan'u, st. Tschangutaj, 10.4.1952 c.fr., Tuh Péi-Yun, Li Shu-hsin, Liu Ying-hsin 5442 (LE.); Prov. Ljaonin, Tschenchjatun 4.6.1950 c.fl., Chang Yui-Ciang, Tuh-Pei-yun 44 (LE.); Prov. Ljaonin, distr. Tschan'u, st. Tschangutaj, 14.6.1953 c.fl., Wang Chang, Li Shu-hsin, Liou

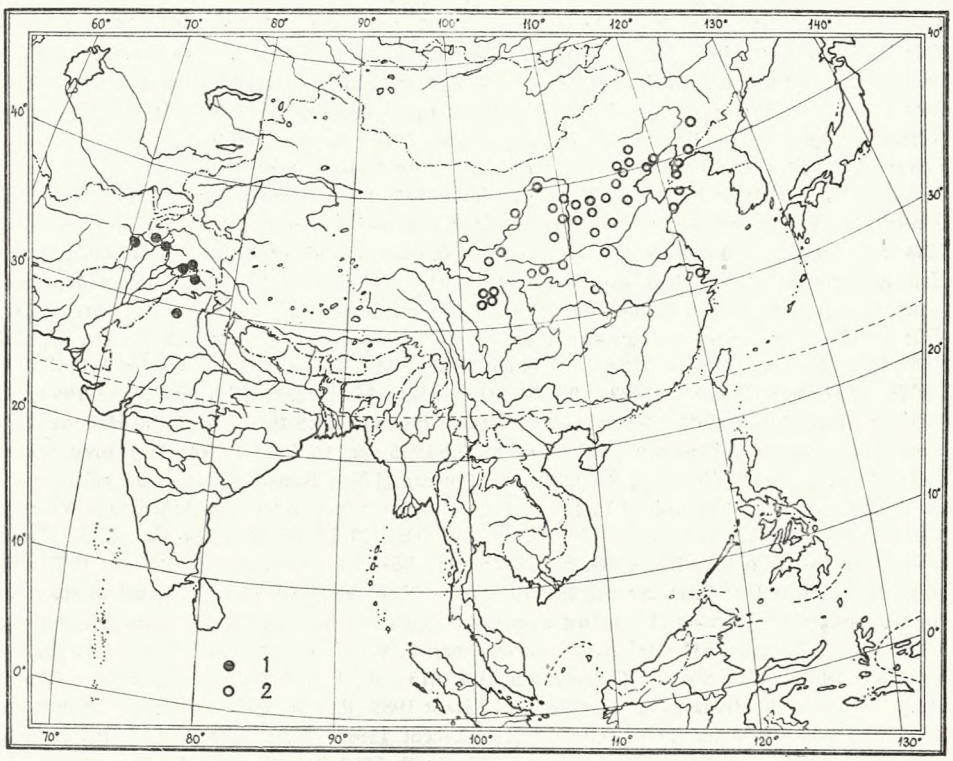

Fig. 10. Distribution of *P. hydaspidis* (1) and *P. sepium* (2)

Ying-hsin, Tuh Pei-Yun 2357 (LE.); Prov. Ljaonin, distr. Bensi, ad vicum Ljanshanguan, mont. Moshjanlin 24.5.1950 c.fl., Chang Yui-Ciang, Chao Ta-chang, Tuh Pei-yun 778 (LE.); Prov. Ljaonin, pag. Daljan 1951 c.fr., Wang Chang, Liou Ying-hsin, Tuh Pei-yun 837 (LE.); Penins. Liaodun, st. In-czen-tzy 12.7.1902 c.fr., Litvinov 1326 (LE.); Prope Pekin., mnot. Pohuashan,

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c.fl., Bazilewskij (LE.); prope Peking 8.1878, Zaholotnai (LE.); Peking 1843 c.fl., Kirilov (LE).; Peking 24.4.1908 c.fl., Vassiliev (LE.); Pekin 1843 c.fl., Herb. Fischer (LE.); Peking: Chej-fan gatan 1955 c.fl., Herb. Bot. Inst. Acad. Sinicae 113, 230, 1319 (S.); Peking 1955 c.fl., Herb. Inst. Bot. Acad. Sinicae 182 (S.); In collibus ditionis Pekinensis 5.1867 c. fl., 8.1867 c. fr., Williams 14681 (BM.); Peking 1858 c.fl., Tatarinov (K.LE.S.W.); China Borealis c.fl., Brteschneider 14681 (K.); Liao-wu-tai-shan (Fl. Pekinensis), 6.1879 c.fl., Möllendorfer (K.LE.); Western Hills, Peking 30.6.1930 c.fr., T. N. Liou 155 (W.); Peking, Hei-lung tan, on the hill slopes, local 23.5. 1880 c.fl., W. Hancock 37 (K.); Mountain west of Peking 1881 c.fl., Bretschneider (BM.); Pékin, dans les haies, bord des ruisseaux 6.1888 c.fl., Bodinier (E.); c.fr., Bodinier 5 (E.); Peking, 1882 c.fl., Carles (BM.); Shanhaikwan 1913 c.fl., Vassiliev (LE.); Shanhaikwan 1915 c.fl., Vassiliev (LE.); Ho-pei: Nai-kiu 27.5.1951 c.fl., H. Y. Liu 00243 (KRA.); Hopei: Nai-chiu-hsien 14.5. 1951 c.fl., H. Y. Liu 164 (SOM.); Chili: Ch'o-k'ou-tien (50 km SW Peking) 14.5.1927 c.fl., B. Bohlin 141 (S.); Pohuashan (Chili) 6.1877 c.fl., Bretschneider (BM.LE.); Tche-Ly, montagnes 8.1915 c.fl., Chanet 769 (K.); Chili Province, Peitai Ho, 12.6.1913 c.fl., M. S. Clemens 6336 (E.); W. Tomb, Chihli, Tai Ling 15.5.1927 c.fl., J. C. Liu 415 (K.); Tche-Ly: Montagne de Men T'eou Keou 5.1912 c.fl., H. Serre 703 (G.K.); Port Arthur, c.fl., Agnes Mölke (C.); Dairen, Manshuria 1910 c.fl. et juv. fr., B. Stuart (BM.); Mongolia orientale: Gihol 6.1864 c.fl., David (P.W.); Mongolia orientale, environs San-yu 7.1863 c.fr., David 1840 (P.); Mongolia occidentalis, mont Alaschan orient., 1872 c.fl., Przewalski (E.K.LE.); Mongolia: Ordos. In collibus arenae mobilis a lacu Narin-gol, 11.9.1884 c.fr., G. N. Potanin (LE.); Mongolia occidentalis, mont. Alaschan austr. 20.7.1880 ? (LE.); Alaschan, 4500′ 25.9.1901, W. Dadygin (LE.); Schensi, Tsinling-schan centr. inter Mei et Liupa, in silvis secus fluvios 5.1934 c.fl., G. Fenzel 537 (W.); Presso Fu-kio, Shen-si 5.1894 c.fl., Giraldi 1774 (F.); Colline du Fu-kio, Shen-si 5.1894 c.fl., Giraldi 30 (F.); Pou-o-li, Shensi 7.1894 c.fl., Zampini in Giraldi 1768 (F.); China interior, Schensi septentr., c.fr., Giraldi (K.P.); Tai-pei-shan, 1910 c.fr., Purdom 912 (E.K.); N-Schensi: Yenan, nich selten 12.5.1938 c.fl., Zettmar (LE.W.); In Kia-po, Schensi septentr. 4.6.1897 c.fl., Giraldi 2276 (F.K.); In Kia-po 5.1900 c.fl., Giraldi 7130 (F.); Lun-fan-huo, Shen-si, 1895 c.fl., Giraldi 29 (F.); Kan-y-san prope Huo-kia-Zaez, Shen-si septentr. 1897 c.fr., Giraldi 2278, 2281 (F.); prov. Shensi septentr. in basalti monti Nga-san, 7.1899 c.fr., Giraldi 2277 (F.); Monte Hau-san, presso Gniu-ju, Shen-si septentr 29.8.1895 c.fr., Giraldi 2279 (F.); Schen-si septentr., monte Sciu-ian-san, lungo il fiu- Kan-y-huo, a sud del Lao-y-san 19.5.1899 c.fl., Giraldi 2275 (F.); Streffa valle Fon-y-huo, presso il Lao-y-san, Schansi septentr. 28.7.1898 c.fr., Giraldi, 2280 (F.); Mt. Lao-y-san 1897 c.fl., Fr. Hugh (BM.); Mt. Kia-san; Hu-scen-scien 8.1897 c.fl., Fr. Hugh (BM.); Chefoo, 7.1883 c.fl., W. Perry (K.); First Park, Tsing-tao, 13.6.1930 c.fl. C. Y. Chiao 2504 (C.E.G.K.S.SO.); Kansu: Wenhsien 910 m, 15.6.1930 c.fr., K. S. Hao 420 (S); Kansu: inter Kanku et Dungwei 1500—2000 m, 5.6.1935 c.fl., G. Fenzel 1990 (W.); prov. Kansu occidentalis, ad vicum Wu-ping 9.7.1885 c.fl., Potanin (LE.); Kansu occident., in valle Poi-ho 21.7.1885 c.fl. et juv.fr., Potanin (LE.); Kansu occident., in trajectu inter vicos Mörping et Wu-ping 3.7.1885, Potanin (LE.); Kansu occident., ad fl. Peishui 21.5.1885 c.fl., Potanin (LE.); Kansu borealis, in val. Ia-ba-can 24.7.1908, S. S. Czetyrkin 569 (LE.); Kansu: Sifti, 5—6.6.1957 c.fl., N. E. Kabanov (LE.); Prov. Szansi 28.7.1957 c.fr., N. E. Kabanov (LE.); Chansi merid., environs montagn. de Ta ming 11.6.1916 c.fl., et juv. fr., Licent 2034 (BM.K.P.); Chansi: Hai-kia-wa, 6.7.1916 c.fr., Licent 1334 (BM.K.P.); Chansi merid., vers Yu kiang hien 15.5.1916 c.fl., Licent 1881 (BM.P.W.); Shansi, Taihangshan 21.6.1915 c.fl., Licent 1221 (BM.K.P.W.); Chansi merid., environs de Hiang ming 3.6.1916 c.fl., Licent 1988 (P.); Schansi; Tsiliyii (?) ad montem Ho-schan 1600—2100 m, 29.6.—5.8.1935 c.fl., Licent 11811 (W.); Prov. Shansi: Tai-yuan-fu in fruticetis apricis ca. 800 m, 29.5.1924 c.fl., H. Smith 5562 (S.); Shansi: Tai Yuan Fu, 6—8. 1902 c.fl., E. Nystrom (S.); Shansi: Shou-Yang-Hsien 22.5.1919 c.fl., J. G. Andersson 623a (S.); Shansi: distr. Tajyuan, prope oppidum 24.5.1957 c.fl., M. P. Pietrov (LE.); Shansi: distr. Tajyuan, 25 km SO ab oppidum, prope Lun-uan, 23.5.1957 c.fl., Pietrov (LE.); Shansi: distr. Tajyuan, 20 km SW ab oppid., in declivit. mont. Si Schan 7.9.1957 c.fl., Pietrov (LE.); Im Kreise Ten feng, Honan, 675 m., 7.1907 c.fr., A. K. Schindler 134 (W.); Honan c.fl., Hers 473 (K.); Honan: Hweihsien, frontière Shansi 19.6.1919 c.fl., Hers 711 (P.); Presso Siang-yang, 200 m.,

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28.4.1909 c.fl., C. Silvestri (F.); Western Szechuan, Mao-chou, arid rocky places, 1300—1900 m, 24.5. and 10.1908 c.fl., et fr., E. H. Wilson 2251 (BM.E.K.); Szetschwan, Li-fang-ting 30.3. 1914 c.fl., Limpricht 1365 (WU.); Prov. Sze-chu'an, reg. bor. S. Wen-ch'uan-hsien 1200 m., 27.6.1922 c.fl. et fr., H. Smith 2322 (S.); Szechuan: Wenchuan, at roadside 25.7. 1928 c. fr., W. P. Fang 1500 (E.K.P.); Prov. Szechuan, inter vic. Ku-err-kou et Err-dou-cziao 14.8.1893 c.fr., Potanin (LE.); Prov. Szechuan, inter vic. Czuti et Ku-err-kou 13.8.1893 c.fr., Potanin (LE.); Prov. Szechuan, inter Czagolo et Li Fan Fu 17.8.1893 c.fl., Potanin (LE.); Shanghai, 4.1887 c.fl., Carles (K.); China, c.fl., Herb. Lindley (CGE.); North China 1881 c.fl., Perry (K.); c.fl., Oliver 141 (E.); from cult., Arnold Arboretum 9.8.1921, ? 5410 (K.).

USSR (in cult.): Nikolsk-Ussuryjsk, 1918 c.fl. et fr., Kiss Arpad (BP.); Nikolsk-Ussuryjsk, M. Fritz (LE.); Nikolsk-Usuryjsk, 2. 6.1914 c.fl., T. P. Gordiej (LE.); Nikolsk-Usuryjsk 12.7. 1915 c.fl., ? (LE.); Khabarovsk, 7.1934, determ. Komarov (LE.).

Discussion: Species closely allied to *P. graeca*, distinguished from it mainly by revolute corolla lobes, presence of gland-patch, weaker growth, poorer and shorter inflorescences and narrower leaves. The occurrence of the gland-patch has not been mentioned hitherto in descriptions of *P. sepium*, only Y. Tsiang (1934, l. c.) writes that flowers have"a thickened elongated callous in the center near the base of the petals". It is a feature very characteristic, known besides in the genus *Periploca* in the *P. visciformis* only. It is easy to distinguish *P. sepium* from another Chinese species of *Periploca*, *P. calophylla* as it has flowers almost twice as large, white spots on corolla lobes and follicles connate at apex. It has been, however, erroneously taken for the former species. And so A. Rehder and E. H. Wilson (Jour. Arn. Arb. 9, 2—3: 112, 1928) discussing J. F. Rock's collections from China defined his herbarium specimens number 12080 from south Kansu and number 12036 from west Szechwan as *P. sepium*. The specimens have, however, small flowers, hardly 6—7 mm in diameter, and leaves lustrous on both sides, with numerous lateral nerves running parallel, and there is no doubt it should belong to *P. calophylla*.

The *P. sepium* is charactarised by rather small variability seen only in the size and shape of leaves. It appears, judging by the data from herbarium labels, that this variability is conditoned on the character of localities. Specimens deriving from dry regions (e. g. specimens Przewalski from the Alaschan Mts.) have elongate, but very narrow leaves, 6—10 mm at most. The flowers of these specimens, too, are somewhat smaller be'ow 15 mm in diameter. Herbarium specimens from cultivation (number 5410, Arnold Arboretum) are characterized by their large, broad and remarkably elongated leaves, hardly ever met in specimens collected from natural localities (except the specimens of Potanin from Kansu and Szehwan).

Series 2. *Laevigatae* Browicz, ser. nova

Frutices erecti ramis juvenilibus partim volubilibus. Folia hieme persistentia, nervis lateralibus subinconspicuis vel inconspicuis. Corollae laciniae glabrae. Folliculi recti, horizontales, rarius sub angulo obtuso inclinati, basi incrassati, valde fibrosi. Species 4. Typus seriei: *P. laevigata*

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Shrubs erect, young shoots show the ability to twine. Leaves persistent, with faintly visible, or invisible lateral nerves. Corolla lobes glabrous. Fruits straight, arranged horizontally, rarely at obtuse angle, distinctly thick at the base, strongly fibrous.

Type species: *P. laevigata.*

3. *Periploca laevigata* Aiton

Hort. Kew. ed. 1 : 301 (1789); Poiret in Lamarck Encycl. Meth. 5 : 188 (1804) p. p.; Persoon. Synops. Pl. 1 : 272 (1805); Buch, Abhandl. K. Akad. Wiss. Berlin 364 (1816—17); Schultes, Syst. Veget. 6 : 127 (1820); Decaisne in Webb, Barker, Berthelot, Hist. Nat. Iles Canaries 3,1 : 15 (1836); London, Arb. et Fr. Brit. 3 : 1258 (1838); Decaisne in DC. Prodr. 8 : 498 (1844) p. p.; Lowe, Florul. Salvagicae Tent. 16 (1869); Bolle, Bot. Jahrb. Engler 14 : 247 (1891); Pitard, Proust, Iles Canaries 269 (1908); Knoche, Kanar. Inseln 1 : 248 (1923); Rechinger, Denkschr. Akad. Wiss. Wien, Math. Nat. Kl. 105,2 : 131 (1943); Cordoba, Medina, Estudio Veget. Fl. Forrest Canar. Occident. 404 (1951); Lems, Sarracenia 5 : 15 (1960).

Syn: *Periploca punicefolia* Cavanilles, Icon. Descr. 3 : 9 tabl. 217 (1794); 5 : 69 tabl. 500 bis no. 239 (1799).

Periploca oleaefolia Salisbury, Prodr. 148 (1796).

Periploca Secamone Lamarck ex Decaisne in DC. Prodr. 8 : 498 (1844).

Type: Cult. in H. Kevensis, misit Fr. Masson ex Ins. Canariis, 1779.

Erect shrub to about 1.5—2 m high, partly twining. Young shoots glabrous, green at first, but becoming cinnamon-brown later; older shoots grey-brown or grey. Leaves leatherlike, persistent, densely arranged along the shoot, detached from it at acute or right angles, variable in shape, mostly elliptic, but also obovate and almost lanceolate with numerous intermediate forms, broadest in the middle or somewhat above, (2)2.5 — 5(6) cm long and 5—15 mm broad (exceptionally broader), bright-green above, somewhat lighter-coloured below, glabrous on both sides, with rather clearly visible lateral nerves, especially on the undersurface of the lamina, acute or rounded, mucronulate at apex, cuneate and gradually passing into the petiole which is, therefore, sometimes rather hard to distinguish. Petiole rather thick, 2—7 mm long. Inflorescences mostly terminal, but lateral, too, 2—7 cm long, composed of 3—15 flowers (terminal ones richer), as long as, or somewhat longer than, the leaves supporting them, erect. Inflorescence axis thick, green, peduncles as well, bracts and bractlets and calyx puberulent. Bracts and bractlets membranous, ovate or ovate-lanceolate, brownish, 1—1.5 mm long. Peduncles thick, stiff, 2—4 mm long. Calyx 2.5—3 mm long. Calyx teeth broadly-ovate, obtuse at apex, margins membranous and translucent. Flowers 10—15 mm in diameter. Corolla lobes more or less linear, to 7 mm long, and 2—2.5 mm broad, at apex obtuse and retuse, undersurface greenish-yellow, above violet or violet-brown, especially in the inside part, becoming lighter-coloured toward margins, glabrous on both sides, with a white, elliptic spot in the centre, 1—1.5 mm long. The filiform parts of corona lobes violet, delicately puberulent (only strongly magnified) to 3/4 of the length of corolla lobes more or less. Follicles arranged horizontally or at strongly ob-

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Phot. K. Jakusz

Fig. 11. *Periploca laevigata* (Naturhistoriska Riksmuseum, Stockholm)

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tuse angle 7—12 cm long (usually 7—10) and to 12 mm thick, clearly thicker in the basal part and gradually narrowing toward the apex that is usually bent upwards, when ripe often with several distinct, prominent, elongated ribs. Seeds black, flattened, 7—8 mm long and to 2.8 mm broad. Coma to 4 cm long. Flowers and bears fruit all the year round. (fig. 11, 12-I, 13 *a—b*).

Distribution: Species confined to Canary Islands (save Lanzarote) and to Salvages Islands. It occurs more often on Tenerife and and werstern islands than eastern ones, from the sea coast up to 300—500 m a. s. l. According to K. Knoche (l. c.) in Gran Canaria it even reaches about 850 m a. s. l. It grows

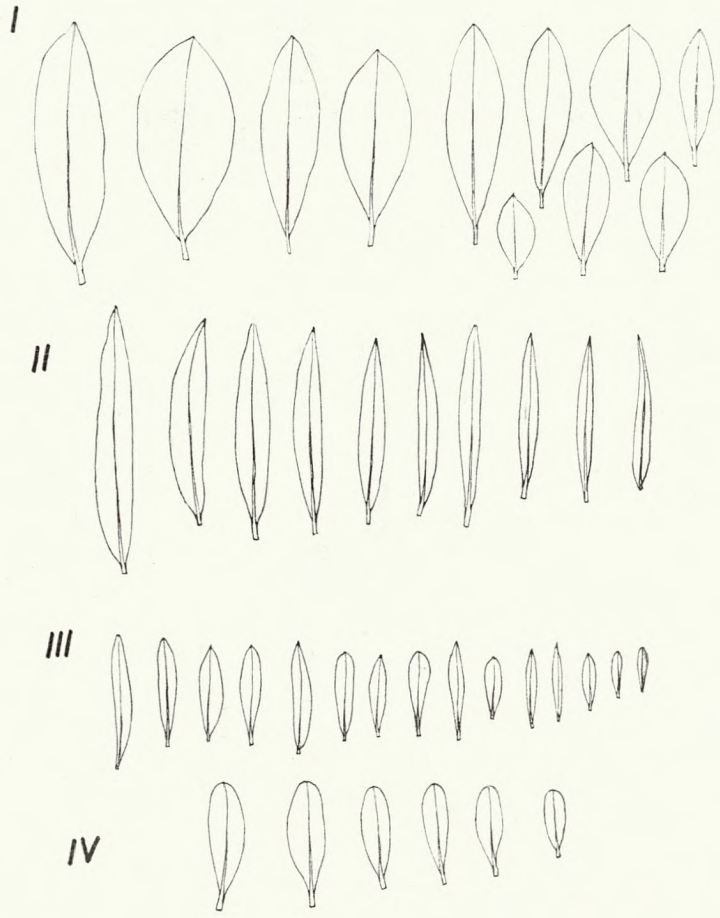

Fig. 12. Variability of leaves of species from *Laevigatae* series: I. *P. laevigata*, II. *P. chevalieri*, III. *P. angustifolia*, IV. *P. somaliense* (less. 2×)

on seaside sands, gravels and dry rocky slopes, much insolated especially together with *Euphorbia canariensis*, on which it twines its young shoots. Cordoba and Medina (l. c.) record it from Las Palmas on the height of 50—150 m a. s. l. from xerophytic formations composed of *Euphorbia canariensis*, *E. balsamifera*, *Ceropegia dichotoma*, *Sempervivum goochiae*, *Kleinia neriifolia*, *Rumex lunaria*,

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Forskohlea angustifolia, *Ricinus communis*, *Rhamnus crenulata*, *Teucrium heterophyllum*, *Lavandula abrotanoides*, *Micromeria* sp., *Ajuga iva*, *Echium acileatum*, *Artemisia canariensis*, *Aloe vera* and *Asparagus umbellatus*. Knoche (l. c.) mentions it also on Gran Canaria in forests of *Pinus canariensis* (fig. 14—1).

Specimens examined:

Tenerife: 16.1.1921 c.fl., Borgesen 148 (C.); Santa Cruz 14.2.1921 c.fr., Borgesen 445 (C.); Orotava, cult. 15.1.1921, Borgesen 135b (C.); Pino de Oro, 1956 c.fl. et fr., C. Bolle (K.W.); Ste Croix, c.fl. et fr., Boivin 297 (F.K.); Taganana, in rupib. marit. 60 m, 14.6.1900 c.fr., J. Bornmüller 961 (G.P.W.); Santa Cruz, in rupestribus 100 m, 27.5.1901 c.fl., J. Bornmüller 2642 (G.JE.LE.P.PR.PRC.W.); in saxosis apricis regionis inferiores 1.1845 c.fl. et fr., Bourgeau 19 (CGE.E.G.K.P.W.); in glareosis Bufadero 11.4.1855 c.fr., Bourgeau 1422 (BM.C.F.G.K.P.W.); 1867 c.fl. et fr., Herb. Broufsonet (LE.); in scopulis reg. calid. inferioris Sta Cruz 17.1.—20.8. 1855 c.fr., Herb. Bunge (P.); P-to Orotava, in aridis saxosis 9.1903 c.fl. et fr., O. Burchard 71 (O.PRC.); Laguna, 11.1897 c.fl., A. Cook 1068 (GB.); Pinar del Castro. On the skirt of Pinetum canariense 3.10.1924, H. Czeczott 378 (K.); Santa Cruz 26.12.1926 c.fl., J. M. Dalziel 8004 (K.); Buena Vista 450 m, 13.7.1957 c.fr., Y. Eliasson (GB.); c.fl., Escholtzer (LE.); c.fl. et fr., Dr. Finaly (K.); c.fl., Herb. Fischer (LE.); Puerto de la Cruz, near the sea 1.1923 c.fl., H. Gilbert-Carter (CGE.); 8.1879 c.fl. et fr., W. Hildebrand (W.); 1867 c.fl., Herb. Hooker. (K.); 1.1898 c.fl., Dr. Innsis? (K.); Sta Cruz, SO Seite. Lava 1905 c.fl., Kraskovitz (GB.); 1905/06 c.fl. et fr., Kraskovitz (W.); An felsen, Puerto Orotava 17.5.1895 c.fl. et fr., Kuegler (JE.); Granadilla 1888 c.fr., O. Kuntze (K.); Hedge near Orotava 27.2.1837 c.fl., Herb. Lemann (CGE.); Guimar 24.6.1954 c.fr., B. Lindquist (GB.); P. Orotava, nr. Realejo 3.1858 c.fr., Herb. Lowe 30 (BM.K.); Puerto Orotava 25.5.1895 c.fl., R. P. M. (BM.); Trés abondant, Puero de la Orotava, c.fl. et fr., Perez (P.); Sta Cruz, in vulcanicis cultis 3.1855 c.fl. et fr., Perraudière (C.); Bufadero, 1.1855 c.fr.

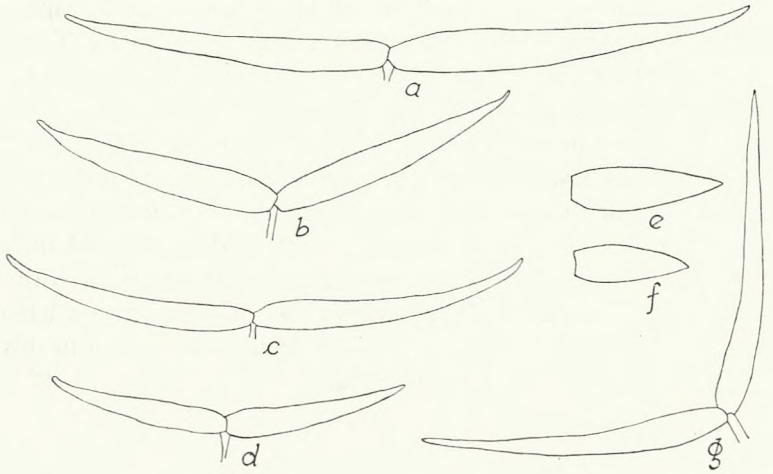

Fig. 13. Shape and arrangement of follicles in species from *Laevigatae* series: *a—b P. laevigata* *c—d P. angustifolia*, *e—f P. somaliense* (hulls), *g P. chevalieri* (less. 2,5×)

Perraudière (P.); Bco de Bufadero, ad sepes marit., 27.1.1906 c.fl., Pitard 1775 (P.); c.fr., Herb. Poiret (P.); below Sevd de los Vinos, 6.6.1890 c.fr., A. Prior (K.); c.fl. et fr., Riedle (P.); c.fl. et fr., Herb. Roem (BM.); c.fr., Schwarz (GB.); c.fl. et fr., Ch. Smith (BM.); La Matura 8.1905 c.fl. et fr., C. Sobrado (BC.); Lava stream, Orotava 25.5.1913 c.fl. et fr., Sprague, Hutchinson 102 (K.); Sta Cruz 15.8.1902, M. Vahl (C.); Valle seco 19.8.1902 c.fr., M. Vahl (C.); c.fl. et fr., Herb. de Ventenat (G.); S. Cruz, c.fl., Wawra, Maly (W.); in vicin. pag. Santa Ursula, Punta de

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Barranco Honda 8.3.1933 c.fl. et fr., E. Asplund 154 (G.K.S.); Zumta, St. Ursula, abundant 18.2.1930 c.fl., A. H. Maud (BM.); St. Ursula, Zumta 16.3.1929 c.fl. et fr., A.H. Maud (BM.); Hotel Iaero, rocks 3.3.1930 c.fl., A. H. Maud (BM.); Sta Cruz, c.fl., E. Weiss 108 (BP.); Santa Cruz 3.1933 c.fl. et fr., A. W. Trethewy 1 (K.); S. Ursula, 1928 c.fl., Trethewy (BM.); St. Ursula 3.1933 c.fl., Trethewy 118 (K.); Nivaria: Teno — in glareosis siccis juxta mare abundanter 7.3.1948 c.fl. et fr., E. R. Sventenius (GB.); Hedges between Matanjas and Laguna 8.1.1838, Herb. Ward (BM.); In regione inferiore, c.fl. et fr., Barker-Webb (G.P.); Environs de Ste. Croix 12.1848 c.fl. et fr., Herb. Webb. (F.); 1850 c.fl., Herb. Webb. (F.); „Prisco de Oro", on rocks 400′, 11.1903 c.fl. et fr., ? 51 (K.); In regione inferiore Canaria 7.1845 c.fl. et fr., Webb (E.F.K.P.); Canarica, 1843 c.fr., Webb (P.); Canariense c.fl. et fr., Herb. Richard (P.).

Gran Canaria: Valley behind Agaete, growing with Euphorbia canariensis 7.5.1890 c.fr., Murray (K.); S. Nicolas, c.fr., F. Simony (W.); Telde 6.1888 c.fl. et fr., O. Kuntze (K.); Barranco el Dragonal, Tafira 16.5.1897 c.fr., O. Gelert (C.BG.); c.fl., Despréaux (CGE.G.); Tafira 5.1897 c.fr., A. C. Cook 510 (GB.PRC.); Tafira, 5.1897 c.fr., A. C. Cook 547 (GB.); prope Tafira in aridis 4—500 m, 20.5.1900 c.fr., J. Bornmüller 960 (G.JE.LE.P.PR.PRC.W.); stony desert between Juan Grande and Maspalomas 8.5.1894 c.fr., R. P. Murray (BM.); Malapsis near Arynaga 8.5. 1894 c.fl. et fr., R. P. Murray (BM.).

Hierro: Los Llanillos 3.1906 c.fr., C.J. Pitard 614 (BP.G.); El Pozo de Sabinosa, in aridis maritimis 2.4.1905 c.fr., C. J. Pitard 252 (BP.G.P.); El Golfo, below Frontera ca. 100′, 7.8.1957 c.fr., O. J. Gillie 2603 (E.); El Golfo, pr. Los Llanillos 2—300 m, 16.5.1901 c. fr., J. Bornmüller 2643 (LE.).

Gomera: zwischen Alajero u. S. Sebastian in Barranco de la Guancha, ? (LE.); Barrances W. of San Sebastian 27.5.1957 c.fr., K. Larsen 8 (C).

Palma: Barranco del Carmen 31.5.1913, Sprague, Hutchinson (K.) ? .

Salvages Islands: Selvagem Grande 1865, R. T. Lowe (BM.K.).

Discussion: Species very variable in regard to leaf size and shape. According to Aiton's diagnosis (l. c.) they are elongate-lanceolate. This type of leaves, however, appears to be rather rare and is probably found mainly on long young shoots of strong growth. The most frequent type of leaf is more or less elliptic, where the ratio of width to length ranges from 2.5—4.5.

It is commonly supposed that the area of *P. laevigata* is much larger and runs from Cape Verde Islands and across north Africa, stretches to Syria and that it also occurs in south-east Spain and on several islets of the Mediterranean. This view is based mainly on the identification of *P. laevigata* with another species — *P. angustifolia* Labill. The separateness of these species has recently been discussed by K. H. Rechinger (l. c.). A detailed discussion in this matter is given in the description of *P. angustifolia.*

4. *Periploca chevalieri* Browicz, spec. nova

Frutex erectus, ad 1.5 m altus, ramis tantum juvenilibus volubilibus. Ramuli annotini glabri vel tenuissime pubescentes (sub lente valida!), serius rubescenti--brunnei, rami perennes griseo-brunnei vel grisei. Folia persistentia, e totam longitudinem aequilata, vel lanceolata, medio latissima, apice acuminata vel etiam cuspidata, basi angustata, decurrentia, petiolo obsoleto, (3) 3.5—6(7) cm longa, 3—8(10) mm lata, glabra, utrinque concoloria, juvenilia tantum nervis lateralibus vix conspicuis (subtus praecipue) percursa, dense congesta, sub angulo acuto sursum

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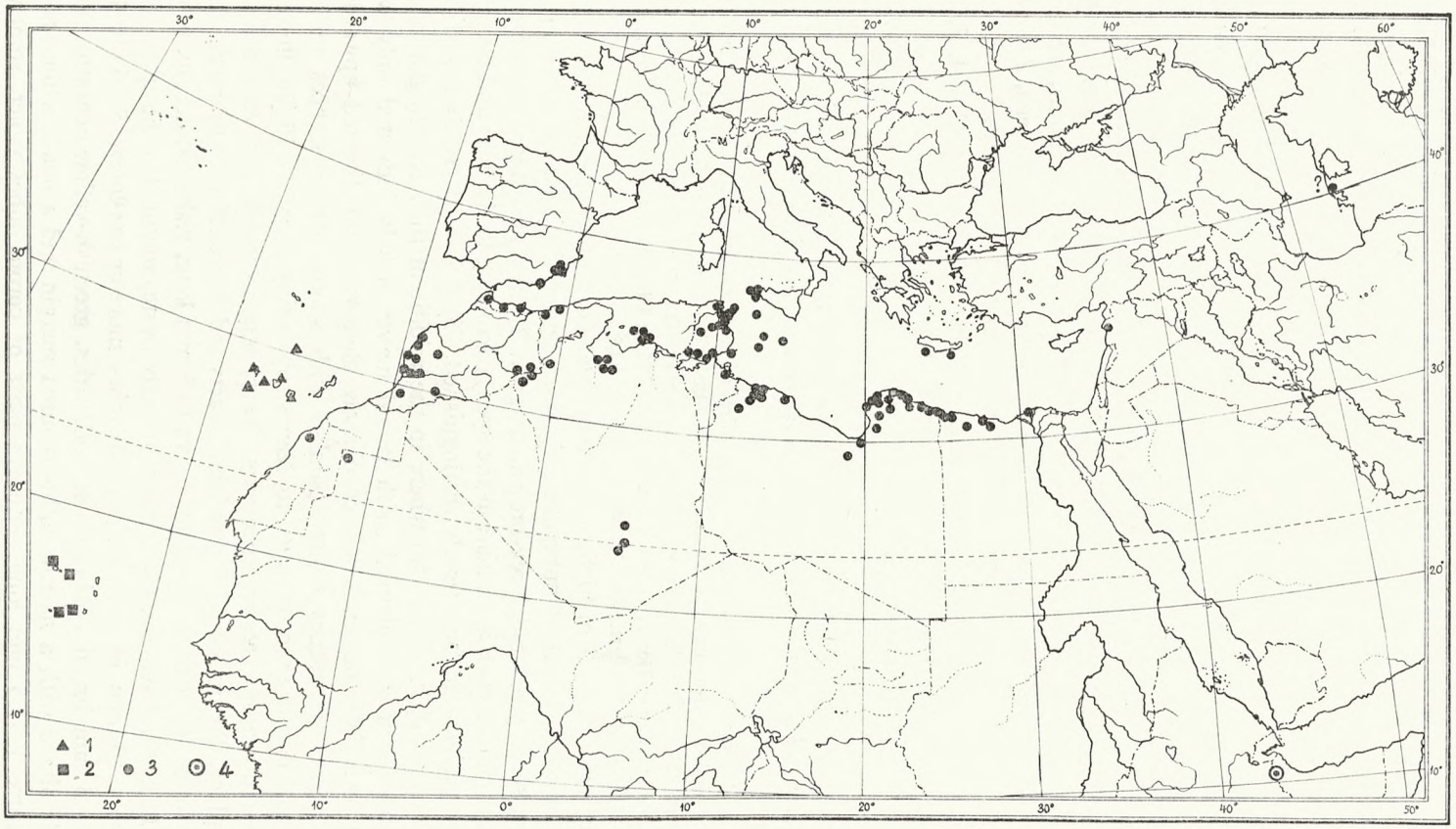

Fig. 14. Distribution of species of series *Laevigatae*: 1. *P. laevigata*, 2. *P. chevalieri*, 3. *P. angustifolia*, 4. *P. somaliense*

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directa, interdum cauli subaccumbentia. Inflorescentiae terminales vel laterales, foliis fulcrantibus berviores vel aequilongae, 3—15 (20) - florae, axi principali (rhachide) ac pedunculis fructiferis crassis, tenuissime pubescentibus. Pedunculi fructiferi ad 5 mm longi. Bracteae et bracteolae membranaceae, ovatae, 1 mm longae, tenuissime pubescentes. Calyx ad 3 mm longus, glaber, profunde, fere ad basin dissectus. Dentes calyci late ovati, apice rotundati. Flores ca 15 mm in diam. Corollae laciniae plus minusve aequilatae, angustae, 5—6 mm longae, 2—3 mm latae, utrinque glabrae subtus viridulo-flavae, supra violaceo-purpureae margine angusto pallidiore, macula alba 1—1.5 mm longa praeditae. Coronae laciniae filiformis, violaceae, laciniis corollae subbreviores, glabrae vel tenuiter pubescentes (sub lente valida). Folliculi 9—13.5 cm longi (teste Chevalier 12—15 cm longi) in parte inferiore prope basin latissimi (10 mm lati) ad apicem sensim angustati, sub angulo obtuso sed non horizontaliter inter se dispositi. Semina nigra, 6 mm longa, 2 mm lata, comata, coma ad 3.5 cm longa. Floret et fructiferat per totum annum.

Typus: Insulae Capitis Viridis: Fogo — Chã das Caldeiras 23—24. 7. 1934 c. fl., A. Chevalier 44879 (Holo .K. + iso. C. P.).

Distributio: *Species insularum Capitis Viridis endemica, inter 300— et 1800 m s. m.*

Affinitas: *Species Periplocae laevigatae affinis, a qua tamen follis concoloribus aequilatis vel lanceolatis, 6—11-plo longioribus quam latis, minime variabilibus differt.*

Syn.: *Periploca laevigata* auct. non Aiton,: Poiret in Lamarck Encycl. Meth. 5 : 188 (1804) p. p.; Webb, Spicilegia Gorgonea (in Hooker, Niger Flora) 150 (1849); Schmidt, Beiträge Fl. Cap Verd. Ins, 214 (1852); Coutinho, Arq. Univ. Lisboa 1 : 302 (1914); Béguinot, Annali Mus. Civ. Storia Nat. Giacomo Doria, Genova, ser. 3, 8 : 41 (1917); Chevalier, Revue Bot. Appl. et Agr. Trop. 15 : 923 (1935); Petterson, Comment. Biolog. 22,9 : 52 (1960).

Erect shrub to 1.5 m high, only young shoots twining. Annual shoots glabrous, or very delicately puberulent (great magnification), later reddish-brown. Shoots, some years old, grey-brown, or grey. Leaves persistent, linear or lanceolate, acute or even acuminate at the apex, narrowing to the base and decurrent so that petiole can be scarcely distinguished, (3) 3.5—6(7) cm long and 3—8 (10) mm broad, broadest somewhere in the middle of their length, glabrous on both sides and one-coloured, with lateral nerves weakly indicated only when young, especially on undersurface, densely glomerate and directed upwards at acute angle, sometimes almost parallel with shoots. Inflorescences terminal or lateral, shorter than, or equal to, leaves supporting them, 3—15 (20) flowered, directed upwards. Inflorescence axis like peduncles, thick and very delicately puberulent. Peduncles to 5 mm long. Bracts and bractlets membranous, ovate, 1 mm long, delicately puberulent. Calyx to 3 mm long, glabrous, deeply, to very near the base, dissected. Calyx teeth broadly ovate, rounded at the apex. Flowers about 15 mm in diameter. Corolla lobes more or less linear, 5—6 mm long and 2—3 mm broad, glabrous on both sides, greenish-yellow beneath, violet-purple above with a narrow light-coloured margin and a small, white spot in the centre 1—1.5 mm long. Filiform parts of corona lobes violet, somewhat shorter than corolla lobes, glabrous or delicately puberulent (great magnification).

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Follicles 9—13.5 cm long (acc. to Chevalier l. c. — 12—15 cm), thickest in the lower part near the base (ab. 10 mm), gradually narrowing towards the apex, arranged at obtuse angle, but not horizontally. Seeds black, 6 mm long and 2 mm broad, with coma to 3.5 cm long. Flowers and bears fruit presumably all the year round (fig. 12-II, 13-g, 15).

Distribution: Species endemic to Cape Verde Islands recorded from the following islands there: Sto. Antao, S. Nicolau, S. Tiago and Fogo. According to A. Chevalier (l. c.) it grows on dry, stony slopes, especially in mountains

Phot. R. B. G. Kew

Fig. 15. *Periploca chevalieri* — holotype (Royal Botanic Gardens, Kew)

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ranging from 800—1800 m a. s. l., here and there it also grows in lower places 300—400 m a. s. l. Chevalier regards it, as one of the most characteristic species of the primitive flora of the archipelags. It was formerly much more widespread and occurred even in places lying much lower, but was completely destroyed as it was commonly used for tanning goats' hides. According to J. A. Schmidt (l. c.) *P. chevalieri* forms vast and impassable thickets on the Sto Antao island, similar in their appearance to the thickets of Cistus in south Europe (fig. 14-2).

Specimens examined:

Fogo: at the Gorate up Monte Muco (?) 24.3.1864 c.fl., R. T. Lowe (LE.); Cha das Caldeiras 23—24.7.1934 c.fl. et fr., Chevalier 44988, 44851 (P. — topotypus); Chupadeiro 23.7.1934 c.fl., 25—26.7.1934 c.fl. et juv.fr., Chevalier 44890 (P.); env. de S. Filipe 500 m, 18.7.1934, Chevalier 44812 (P.); Cap-Vert, Herbier rapporté du Portugal en 1808 par. M. G. Saint-Hillaire (P.).

S. Tiago: montagnes près Trinidad 30.8.1934, Chevalier 44732 (P.).

Sto Antao: Cava, 1300—1400 m, 26—27.9.1934 c.fl. et fr., Chevalier 45580 (P.); Bordeiros 9.1934, Chevalier 45597 (P.).

S. Nicolau: 1851 c.fl., Bolle (K.S.); Thome pires (?) 23.2.1864 c. fl.et juv. fr., R. T. Lowe (BM.K.P.); Ribina Brava 7.1857, Herb. Webbianum (P).

Discussion: This species has been hitherto described as *P. laevigata* Ait. and identified with the plants occurring on the Canary Islands. There is no doubt it is closely allied to *P. laevigata*, but it is clearly distinct from it. The differences, just like in other species from the series *Laevigatae*, are mainly indicated in the leaf shape and size, whilst no such differences have been found in the flowers.

Unlike *P. laevigata P. chevalieri* is chiefly characterized by leaves of a equal type (rather invariable). Thought the accessible herbarium material is rather poor (scarcely 21 sheets) it enables to draw proper conclusions. As a result of length- and width-measurements of leaves we can conclude that *P. chevalieri* has leaves clearly elongate, while their width is small (mostly 3—6 mm). The ratio, therefore, between width and length is more than 80 per cent ranging from 6 to 11, tending to increase, whilst in *P. laevigata* it ranges mainly from 2.5—5 (over 77 percent). Furthermore the leaves of *P. chevalieri* are unicoloured, with faintly visible petiole, always lanceolate or linear, never elliptic or obovate, with invisible lateral nervation (save in the beginning of developing). It is rather doubtful whether *P. chevalieri* may be treated as a separate species instead of as a subspecies of *P. laevigata*. The following arguments support its being a separate species: a) the considerable isolation of the Canary Islands and Cape Verde Islands, and b) lack of variability of leaves in *P. chevalieri*. Against this is the great variability of leaves in *P. laevigata* on the Canary Islands, where transitional forms are known which are near to the kind of leaves of *P. chevalieri*, i. e. possessing elongated and narrow leaves. Among such transitional forms may be classed: A. Carter Cook No. 510, 1068 (GB.); T. A. Sprague and J. Hutchinson (s. n. K.); Herb. Webbianum (s. n. F. LE.); R. P. Murray (s. n. BM.); F. Borgesen No. 135b (C.); Lindquist (s. n. GB.).

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As in many herbarium specimens it has been found that the variability of leaves of *P. laevigata* is indicated on the same shrubs, the differences being so great, that the branchlets seem to belong to different shrubs, it may be assumed that the specimens mentioned above do not represent leaves of the whole plant, but only of some part it. It may well be, too, that this variability is connected with the form of growth of shoots: fast growing and long annual shoots, and thickened, slowly growing short shoots. Somewhow or other, the variability of leaves of *P. laevigata* should be examined in field in many shrubs and then a proper answer could be given whether the specimens in the Canary Islands are also *P. chevalieri*, or its transitional forms.

If we consider other parts we can find some differences in fruits, too, which in *P. chevalieri* are not arranged horizontally but at obtuse angle. The paucity of the herbarium material with ripe fruits does not allow to state whether this feature is constant or accidental.

5. *Periploca angustifolia* Labillardière

Ic. Pl. Syr. Dec. 2:13 t. 7 (1791); Defsontains, Fl. Atlant. 1:209 (1798); Persoon, Synops Plant. 1:272 (1805); Schultes, Syst. Veg. 6:127 (1820); Gussone, Fl. Sicul. Prodr. 1:287 (1827); Bertoloni, Fl. Ital. 3:7 (1837); Boissier, Voy. bot. Espagne 2:410 (1839); Tornabene. Fl. Sicul. 378 (1887); Battandier, Bul. Soc. Bot. France 36:223 (1889); Ross, Bul. Herb. Boiss. 7:287 (1899); Chevalier, Bul. Herb. Boiss., 2 sér., 3:676 (1903); Rechinger, Denkschr. Akad. Wiss. Wien. Mathm.-Nat. Kl. 105,2:131 (1943); Täckholm, Stud. Fl. Egypt 180 (1956).

Syn.: *Periploca laevigata* auct. et collect. non Aiton: Vahl, Symb. Bot. 3:45 (1794); Willkomm in Willkomm, Lange Prodr. Fl. Hisp. 2:667 (1870); Ball, Jour. Linn. Soc. Bot. 16:565 (1878); Boissier, Fl. Orient. 4:50 (1879); Caruel in Parlatore, Caruel Fl. Ital. 6:716 (1886); Colmeiro, Enumer. Pl. Pen. Hisp.-Lusit. 4:46 (1888); Battandier, Trabut, Fl. Alger. 4:584 (1890); Piccicoli, Piante Legn .Ital. 220 (1890); Schweinfurth, Ascherson, Bul. Herb. Boiss. 1:658 (1893); Bonnet, Barratte, Catal. Pl. Vasc. Tunis 284 (1896); Post, Fl. Syr. Palest. Sinai 524 (1896); Fiori in Fiori, Paoletti, Béguinot, Fl. Analit. Ital. 2,3:345 (1902); Fiori, Paoletti, Icon. Fl. Ital. 2:323 t. 2739 (1899—1904); Jiménez, Munuera, Mem. R. Soc. Espan. Hist. Nat. 2,2:98 (1903); Hochreutiner, Le Sud-oranais (1904); Lojacono-Pojero, Fl. Sicula 2,2:54 (1907); Durand, Barratte, Fl. Libycae Prodr. 162 (1910); Muschler, Stud. Fl. Egypt 2:743 (1912); Béguinot, Vaccari, Annali Bot. 12:113 (1913); Pampanini, Pl. Tripolit. 190 (1914); Trotter, Fl. Econom. Libia 258 (1915); Pampanini, Nuov. Giorn. Bot. Ital. n. s., 24:149 (1917); Pampanini, Zanoni, Nuov. Giorn. Bot. Ital. n. s., 26:215 (1919); Braun-Blanquet. Bul, Soc. Bot. France 68:216 (1921); Pampanini, Nuov. Giorn. Bot. Ital. n. s., 31:223 (1924); Fiori, Nuov. Fl. Analit. Ital. 2:247 (1926); Borg, Descr. Fl. Maltese Isl. 447 (1927); Bouloumoy, Fl. Liban, Syrie 225 (1930); Pampanini, Prodr. Fl. Cirenaica 305 (1930); Maire, Mém. Soc. Hist. Nat. Afr. Nord no. 3:170 (1933); Sennen, Mauricio, Catal. Fl. Rif. Orient. 77 (1933); Jahandiez, Maire, Catal. Pl. Maroc. 3:580 (1934); Caballero, Trab. Mus. Nac. Cien. Nat. y Jard. Bot. Madrid, ser. bot. no. 30:7 (1935); Guinea, Veget. Lenosa Sahara Esp. 69 (1945); Guinea, Anales Jard. Bot. Madrid 8:410 (1948); Sauvage, Vindt, Fl. Maroc. 1:124 (1952); Rigual, Esteve, Anales Inst. Bot. J. Cavanill., 11:437—476 (1953); Chueca, Anales Inst. Bot. J. Cavanill., 12:265 (1954); Guinet, Sauvage, Trav. Inst. Scien. Chérif., sér. general no. 2:118 (1954); Quézel, Monogr. région. Inst. Recher. Sahar., Univ. Alger no. 2:37 (1954); Montasir, Hassib, Ill. Man. Fl. Egypt 1:350 (1956); Leredde, Etud. ecol. phytogeogr. Tassili N'Ajjer 384 (1957); Ozenda, Fl. Sahara Septr. et Centr.

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370 fig. 131 (1958); Négre, Petite, Fl. Reg. Arid. Maroc Occid. 2:135 pl. 87 f. 547a—c (1962): Martino, Lav. Instit. Bot. e Guard. Colon. Palermo 19:177 (1963).

Periploca audiacea Raeusch, Nom. ed. 3:72 (1797).
Periploca rigida Viviani, Fl. libycae specimen 14 t. 6. f. 3—4 (1824).
Periploca fasciculata Viviani ex Cosson, Bul. Soc. Bot. France 12:278 (1865).
Periploca laevigata Ait. f. *angustifolia* Ross, Bul. Soc. Bot. Ital. no. 3—4:41 (1906).
Periploca laevigata Ait. var. *angustifolia* Fiori, Nuov. Fl. Anal. Ital. 2:247 (1926); Baroni, Guida Bot. Ital. 366 (1955).

Type: ad Latakieh Syriae maritimae c. fl.et fr., Labillardière (F. — probably holotypus + BM. G. K.).

Erect shrub, 1.5—2.5 m high, twining only by means of tops of youngest, strongly elongated shoots. Young shoots glabrous, light green, later yellow--brown, and older ones grey-brown or dark grey. Brachyblasts numerous in form of nodose swells. Leaves leatherlike, persistent, linear, lanceolate or elongate-lanceolate, 15—30 (35) mm long and 2—6 (8) mm broad (usually 3—4 mm), at apex acute or obtuse and then mostly mucronulate, decurrent, often somewhat convolute on margins, glabrous on both sides and one coloured, sessile (esp. on brachyblasts), on very short petiole (1—2 mm, esp. on shoots of strong growth), turned upwards and on long shoots almost parallel to shoot. Midrib well marked, lateral nerves invisible or only faintly visible on developing leaves. Leaves on brachyblasts fasciculate, 3—5 or more. Inflorescences 3—9 flowered, sometimes on stronger shoots up to 15 flowers; sometimes solitary or in twos. Inflorescences usually shorter than, or equal to, leaves supporting them, terminal or lateral. Inflorescence axis erect or slightly drooping, glabrous the same as peduncles, calyx, bracts and bractlets, or delicately puberulent at most (greatly magnified). Peduncles 3—6 mm long. Bracts and bractlets ovate-lanceolate, membranous, 1—1.5 mm long. Flowers 10—15 mm in diameter. Calyx 2—3 mm long. Calyx teeths broadly-ovate, or even half-round, rounded at apex, margins membranous and translucent. Corolla lobes linear, to 6 mm long, and 2—3 mm broad, greenish-yellow beneath, violet-purple above, edges lighter coloured, with a small white spot in the centre 1—1.5 mm long, glabrous on both sides, irregularly retuse at apex. Filiform parts of corona lobes violet, clearly minutely puberulent, somewhat shorter than corolla lobes, twisted. Follicles arranged horizontally to each other (4) 5—9 cm long (usually 5—7 cm) and 7—10 mm thick, more strongly thickened near the base, gradually narrowing to apex, mostly somewhat bent upwards. Seed black, flattened, up to 8 mm long and 2.5 mm broad, with coma to 3 cm long. Flowers and bears fruit all the year round (fig. 12-III, 13 *c-d*, 16).

Distribution: Norh Africa: Spanish Sahara, north-west Mauritanie, Ifni, Morocco, Algeria, Tunisia, Libya, and Egypt, chiefly in the seaside regions but here and there also far inland (Hoggar, Tassili N'Ajjer, Tefedest). Furthest to the south *P. angustifolia* reaches somewhat south of the Equator: in Algeria and in Spanish Sahara (cf. map of Guinea's work. 1945 l. c.). In Europe it is only known from a few localities in south-east Spain (province of Almeria

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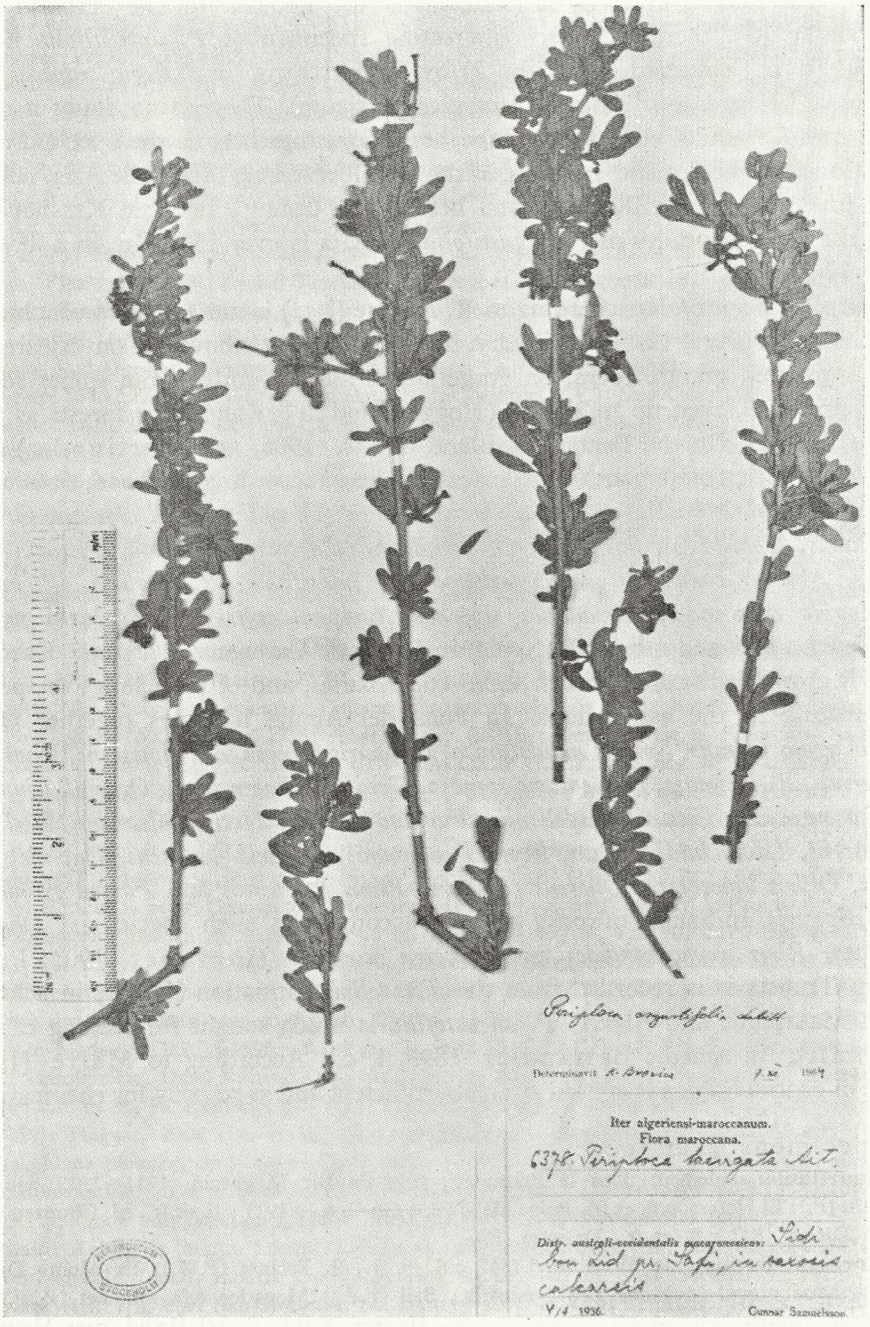

Phot. K. Jakusz

Fig. 16. *Periploca angustifolia* (Naturhistoriska Riksmuseum, Stockholm)

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and Murcia), in south Italy (islets near Sicily)*, on Malta and on islets near Crete. One locality from Syria (Latakia) is also known. In the herbarium in Stockholm (S). there is a very interesting specimen of *P. angustifolia* dated 7.1901 (c. fr.) collected (would-be ?) by P. Sintenis in :"*Regio transcaspica, Krasnovodsk, in saxosis*" (Iter transcaspico-persicum). There is no doubt it must be a mistake made when putting the herbarium together, as the species is not mentioned in the floristic literature of the USSR referring to Middle Asia, neither is it given in the USSR Flora, and besides the distance between Krasnovodsk and the nearest locality of *P. angustifolia* in Syria is over 1500 Km in a beeline (fig. 14-3).

Periploca angustifolia according to R. Négre (l. c.) is not a species edaphically specialised, occurs, however, in dry, insolated places, above all on calcareous, sandstone and granite rocks, on gorge slopes and in wadis, from somes scores of metres a.s.l. even up to 2100 m (Hoggar), and in dry and clear forests as well as in thickets. On the Pantalleria island (Ross, 1906, and Martino l.c.) it is a characteristic component of the macchia where, according to Ross, it is associated with such species as: *Cistus monspeliensis, C. villosus* var. *creticus, C. salviaefolius, Genista aspalathoides, G. candicans, Calycotome villosa, Pistacia lentiscus, Myrtus communis, Erica arborea, E. multiflora, Rosmarinus officinalis, Euphorbia dendroides, Lavandula stoechas, Juniperus phoenicea, Arbutus unedo, Daphne gnidium* and others. In Spain, in Sierra de Cartagena (Rigual, Esteve, l. c) it grows in the area of *Tetraclinis quadrivalvis*, and often belongs to species dominating in the associations. In Pena del Aguila it grows together with: *Chamaerops humilis, Smilax mauritanica, Capparis spinosa* var. *canescens, Rhamnus alaternus, R. lycioides, Calycotome spinosa, Genista sphaerocarpa, Coronilla juncea, Catha europaea, Cistus monspeliensis, Fumana spachii, Nerium oleander, Witlania frutescens, Lavandula dentata, Myrtus communis, Pistacia lentiscus, Daphne gnidium, Osyris lanceolata, Quercus coccifera, Pinus halepensis* and *Punica granatum* var. *silvestris*. In Sahara in rocky gorges it accompanies such species as: *Daemia cordata, Rhus oxyacanthoides* and *Deverra scoparia* (Chevalier 1903, l. c.). From Tunisia it is recorded from the *Tetraclinis* formation (Gibbs, in sched.).

In Mauritanie and Algeria *P. angustofilia* is much sought for feeding camels (Schmitt, in sched.; Battandier 1899, l. c.). According to Maire (1903, l. c.) in central Sahara it is used as an abortifacient and as remedy for rheumatism.

Specimens examined:

Mauritanie: seulement dans le Zemmour, près de Bir Mogherin, 1911—1912 c.juv.fr., Schmitt (P.); El Hafera, c.fl. et fr., Puigaudeau (P.); Guelb 6.13.1911 c.fl. et fr., M. Chudeau (P.); prope Djema 1847 c.fl. et fr., Delestre (P.).

Morocco: Environs de Mogador 5.1867 c.fl. et fr., B. Balansa (P.W.); Ex Monte Djebel Hadid, haud procul Mogador 6.1871 c.juv.fr., Ball (F.P.); Mogador c.fr., Buchet (P.); Near Mogador, Aïn-el-Hadjar 4—5. 1871 c.fl. et fr., Hooker (K.P.); Djebel Hadid, near Mogador, 4—5. 1871 c.fl., Hooker (K.); Marrakech, colline calcaire du Gueliz 450 m, 18.4.1923 c.fl. et fr.,

* Caruel (1. c.) and Fiori (1902. 1. c.) record *P. angustifolia* from Sicily itself (Palermo Trapani), but it is no confirmed.

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Jahandiez 164 (C.G.); Agadir, dunes 28.4.1923 c.fl., Jahandiez 201b (BM.O.); Oued Ysem to Agadir 500′, 4—5. 1924 c.fl. et fr. Lynes 45 (BM.); Foret sablonneuse d'Argania près Agadir 5.4.1936 c.fr., Paulsen (C.); Mogador 3.1889 c.fl., Payton 63 (K.); Pentes rocheuses du Djebel Grouz (Aïne Yalou) 4.1913 c.fl. et fr., Pitard 3583 (K.P.); Distr. australi occidentalis marocanesicus: Sidi bou Zid pr. Safi, in saxosis calcareis 4.4.1936 c.fl., G. Samuelsson 6378 (S.); Safi 4.4. 1936 c.fl., Skottsberg (GB.); Mogador-Agadir, Tingeret 5.4.1936 c.fl. et fr., Skottsberg (GB.); Agadir, 11.1935, Trethwey 91 (K.); Agadir, Taroudant Road 2.1934 c.fr., Trethwey 92,95 (K.); Mogador 2.1931 c.fl., Trethwey 110 (K.); Mogador 2.1931 c.fl., Trethwey 117, 117A (K.); Safi 4.4.1936 c.fr., Wall (S.); Foret d'Augan, entre Mogodor et Safi, 1896 c.fl., ? (P.); Hadid, Urica 6.1872 c.fl. et fr. Rein, v. Fritsch 242 (K.); Montagnes de Siggrat et Ghiliz, jusque vers Ighirmillul a l'Est du district de Tazeroualt 1876, Cosson (P.); Djebel Maïz, in rupestribus ,4.1913 c.fl. et fr., Pitard 3854 (.P); Djebel Tizelmi et montagnes de Tazeroualt 1876 c.fr., Cosson (P.); Tignig in monte Djebel Taghalu, in alt. ca. 100 m, 26.4.1928, Andreánszky (BPU.); Sud-Ouest Maroc, Oudjan 1875 c.fr., Cosson (P.); Toumalili et partie septentrionale du district d'Ida Ouchemlal, Sud-Ouest du Maroc, 1876 c.fl., Cosson (K.LE.P.); Tahoust et Ait Zelten, pays montagneux 1876 c.fr., Cosson (P.); Tamelat, 1876, Cosson (LE.P.); Sud-Ouest: Zaouia Tamrat, rochers sur l'Oued Tidsi, 24.4.1936 c.fl. et fr., J. Gattefossé (G.GB.K.P.PR.S.); In atlante c.fl., Desfontains 656 (E.G.).

Spanish Morocco: Cabo Tres Forcas, escarpments 2—6.1930 c.fl. et fr., H. Mauricio 7638 (BC.BM.F.G.W.); Melilla, kabila de los Santos 7.10.1932 c.fl. et fr., H. Mauricio 8578 (BC. BM.G.W.); Hab. in rupibus calc., Xauen dict. (Bocoia) ad 300 m alt., 20.10.1928 c.fl., 28.1. 1929 c.fr., Font Quer 353 (BM.F.G.S.); Hab. in rupestribus calcareis juxta Marsa Saguira (Littore rhiphaeo) 20 m. alt., 15.5.1927 c.fl. et fr., Font Quer 487 (BC.BM.G.); Pozo Aridal 28.3. 1946 c.fl., et fr., M. Agacino 366 (K.).

Algeria: In montibus Atakor-n-Ahggar, in rupibus graniticus secus Amnem Ilaman 2000—2100 m, 13.3.1928 c.fl., Maire 792 (G.); Brousailles du littoral, Nemours 3.1913 c.fl. et fr., d'Aileizette (P.); Sahara algeriensis: Colomb-Béchar, in alveolis siccis torrentium montis Dj. Béchar, alt. 900—1000 m, 22.4.1928, Andreánszky (BPU.); Environs de la Fontaine-Chaude, près Biskra, 20.2.1853 c.fl., B. Balansa 1039 (BM.C.E.F.G.K.P.W.); Biskra: in montibus, ad Djebel-Maouïa, col. de Sfa 30.4.1896 c.fl. et fr., Chevalier 67 (C.F.G.GB.JE.P.PRC.WU.); Laghouat, ad rupes „Mount de Chiens", 4.1889 c.fl., Chevalier 67a (F.); Biskra, in decliv. collinum 6.1902 c.fr., Chevalier (B.GB.); Biskra, c.fl. et fr., Herb. Cosson (P.); Dans le Mzab 12.5.1858 c.fl., Cosson (P.); In rupestribus prope Biskra 29.5. 1853c.fr., Cosson (O.P.); Oueds with rock--bare and Hammada betw. Ghardaïa a. Guerrara 4.1914 c.fl., E. Hartert (BM.); Province d/Oran: oasis de Abograr Foukani, rochers arides au N. de l'oasis, 950 m, 4.6.1901 c.fr., Hochretutiner 642 (G.); Col. de Sfa, env. de Biskra 1852 c.fl., Jamain (P.); In rupetribus calcareis Djebel Milogh, ad occidentem urbis Laghouat 2.6.1858 c.fl., L. Kralik 70 (C.F.G.K.P.W.); In montibus Tefedest, in ruepstr. graniticis secus omnem Agelil, 1200 m, 11.5.1928 c.fl., R. Maire 793 (P.); Ad littora maris, Aïn-Madagh, Oran 5.1896 c.fl. et fr., Munby 71 (BM.C.K.LE.P.); Bou-Saada, sud de la prov. Constantine, 1869, Rebaud (P.); Sud Oranis: Ben Zireg, ravin de l'oued el Kherouna 14.4.1906 c.fl. et fr., H. Romieux 873 (G.); Coteaux, rochers à Biskra 3.1856 c.fr., Ch. Schmitt 374 (K.P.); Hoggar, 1928 c.fl. et fr., Mission Saharienne Augieras-Draper 64, 83, 131 (P.); Mdoukal, hauts plateaux de la prov. Constantine 5.1862, Letourneux (P.); Bou Saada, sud de la prov. Constantine 1865 c.fl., Cosson (P.); El Outain (?), prov. de Constantine 30.3.1858 c.juv.fr., Cosson (P.); Gour bun Messaum, Haza Zderi 4.3.1890, J. Dybowski 100 (P.).

Tunisia: Kebili, in monte Djebel Tebaga ca. 150 m, 5.6.1928 c.fl., Andreánszky (BPU.); Kebili: in alveolis (oued) montis Djebel-Tebaga, alt ca. 100 m, solo calcareo 5.3.1928 c.fl., Andreánszky (BP.); Djebel Bou-Kournin, bei Hammam lif, 13.4.1913 c.juv.fr., Hayek (GB.BP.); Bou Kournin ca. 200 m, 12.4.1913 c.fl. et fr., Ginzberger (WU.); Bou Kournin 27.4.1900 c.fl., A. Cuénod (G.); Pentes du Bou Kournine 22.3.1900 c.fl., Cuénod (G.); Bois montagneux: Dj. bou Koruéin, A. Chabert (F.); Tebourba 6.5.1883 c.fl. et fr., Cosson (LE.P.); Brousailles près du Hammam El-Ichkeul 15.6.1888 c.fr., Cosson (P.); Nebeul, presque ile du Cap Bon 13.5. 1883 c.fl. et fr., Cosson (P.); Nord d'Hammam-Sousa 4.6.1883 c.fr., Cosson (P.); Hammam-el-Lif

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8.5.1883 c.fr., Cosson (P.); Aïn Cherichira, Ouest de Kairouan 20.6.1883 c.fl. et fr., Cosson (P.); Kerkenna 21.6.1884, Doumet-Adanson, Bonnet (P.); Hammam-Lif, Pentes du Djebel Bou Kornine 6.1891 c.fl. et fr., A. Félix (BC.); Habitat in Cap B. Spei, c.fl., Fischer (LE.); Hammam--Lif: Djebel Bou Korneïn, dry northern slopes ca. 200 m, Tetraclinis formation, 2.1920 c.fl., Gibbs 6900 (BM.); Hammam el-Lif 27.4.1897 c.fr., Grimburg (GB.); Djebel Tadjera 6.5.1884 c.fl. et juv.fr., Letourneux (P.); Djerf Oum-el-Azir 24.4.1884 c.fl., Letourneux (P.); Zarzis 11—17. 5.1884 c.fl., Letourneux (P.); Chebika 4.5.1887 c.fl. et fr., Letourneux (P.); Djebel Ichheul 27.6. 1887 c.fr., Letourneux (F.P.); In convallibus Djebel Oebaga (Dj. Cezza) prope El Hamma 26.5. 1884 c.fl.et fr., Letourneux (P.); Sidi-Aich, sur le versant nord de la montagne 19.5.1884 c.fl., Robert (P.); Dj. Bou-Koureïn 21.6.1896 c.fl. et fr., Murbeck (BM.F.); Dj. Aziza 4.5.1896 c.fl., et fr., Murbeck (O.S.); Hammam-el Lif, in collibus aridis 1.1907 c.fl., Pitard 191 (BP.G.); Gafsa, in petrosis 4.1908 c.fr. Pitard (E.); Djebel Gafsa, in rupestribus 4.1908 c.fr. Pitard 435 (BP.G.); Gafsa: Djebel Younes, ad sepes 3.1909 c.fr. Pitard 3069 (G.); Oued Marguelil 1881 c.fl., Reboud (P.); Hills, near Tunis 4.1930 c.fr., C. W. Thase 4773 (K.); Bir Oum-Ali, dans le Dj. Cherte Oriental 5.5.1886 c.fr. Thomas (P.); Zaghouan 700, 28.3.1925 c.fl.E. Wall (S.); Oued Eddej 24.4.1884 c.fl. et fr., Doument-Adanson, Bonnet (P.); Djebel Hattig 17.5.1884 c.fr., Doumet--Adanson, Bonnet (P.); Djebel Berd, 29.5.1884 c.fl., Doumet-Adanson, Bonnet (P.); In rupestribus Djebel Keroua prope Gabes 4.5.1854 c.fr., L. Kralik 269 (BM.E.F.G.K.P.W.); Djebel Kebirita, Mission des Chotts, 3.1879 c.fl., M. Roudaire (P.).

Libya: Tripolit. septentr. Ad margines alveolorum dic. „uadi" plantiei Gefara, prope pag. Giose 25.2.1928 c.fl., Andreánszky (BPU.); Cirenaica: Marmarica: Tobruk 1918, F. Cassiniere (F.); dans la Djafara, près de Tripoli 18.10.1860, H. Duveyrier (P.); Wadi Soffajene, near Mizda, small stony wadis 6.1951 c.fl., K. M. Guichard 4 (BM.); Cirenaica Sirtica: Fra l'Oasi di Marada e l'Uadi Faregh a 16 km sud dell'Uadi Faregh 13.3.1932 c.fl., R. Krueger (F.); Cirenaica: Benghasi: Forte Lohesci 19.2.1922 c.fl., A. Maugini (F.); Cyrenaica. On flat terrace near font of Tocra. Red limestone soil-bare ground with rocks 800′, 20.9.1956 c.fl., C. H. Gimingham 18 (K.); Derna: Uadi Derna 10.4.1926 c.fl., G. Palma (F.); Tarhuna: Abiar Milgah sul Ras Neb 28.2. 1913 c.fl., Pampanini 461 (F.); Tarhuna: Abiar Milgah sul Ras Has 2.3.1913, Pampanini 625 (F.); Tarhuna: Ras Ghenai 25.3.1913, Pampanini 1506 (F.); Tarhuna: Abiar Milgah sul Ras Ter 19.3. 1913 c.fl., Pampanini 1132 (F.); Tarhuna: Ras Bu Tauil 21.3.1913 c.fl., Pampanini 1139 (F.); Tarhuna: Uadi Msaaba 22.3.1913 c.fr., Pampanini 1437 (F.); Tarhuna: Uadi Sart 3.4.1913, Pampanini 2127 (F.); Tarhuna: Kasr Daun 7.4.1913 c.fl., Pampanini 2267 (F.); Tarhuna: Uadi Ksea, Ras Argobinani 8.4.1913 c.fl., Pampanini 2455 (F.); Mesellata: Msid di Mesellata 9.4.1913, Pampanini 2550 (F.); Mesellata: colline a N-W di Cussabat 12.4.1913 c.fl., Pampanini 2947 (F.); Mesellata: Uadi Gherrim 15.4.1913 c.fr., Pampanini 3248 (F.); Mesellata: Da Gherrim a Sindara 15.4.1913 c.fr., Pampanini 3404 (F.); Garian: Ras Tecut 26.4.1913 c.fl., Pampanini 3676 (F.); Garian: Bu Gheilan 24.4.1913 c.fl., Pampanini 4519 (F.); Garian: Ras Bu Gamus 27.4.1913, Pampanini 4520 (F.); Msus 20.3.1933 c.fl., Pampanini 6151 (F.); Uadi-es Sahal fra Tobruk e Bardia 23.3.1933 c.fl., Pampanini 6152 (F.); Tobruk 23.3.1933 c.fl., Pampanini 6153 (F.); Fra Bir Acheim e el-Mechili Trigh Enver Bei Bir Bu Usceica 25.3.1933 c.fl., Pampanini 6154 (F.); Bir Acheim: Bir Belamed 26.3.1933 c.fl. et fr., Pampanini 6165 (F.); Tocra — U. Bakur 6.4. 1933 c.fr., Pampanini 6157 (F.); Um er-Rzem a sud est di Barce, 8.4.1933 c.fl., Pampanini 6158 (F.G.K.); Apollonia-Rgua 11.4.1933 c.fr., Pampanini 5159 (F.); Fra Tocra e Tolmeta 23.4.1933 c.fl. et fr., Pampanini 6160 (F.); Uadi Faregh Maaten Giofer 8.4.1934 c.fr., Pampanini, Pichi-Sermolli 6161 (F.); Saunnu a nord-est di Agedabia 10.4.1934 c.fl., Pampanini, Pichi-Sermolli 6162 (F.); Fra Benghasi e Tocra: Driana 15.4.1934, Pampanini, Pichi-Sermolli 6163 (F.); Chersa (Derna) 16.4.1934 c.fl. et fr., Pampanini, Pichi-Sermolli 6164 (F.); Derna: U. el-Naga 16.4.1934 c.fl. et fr., Pampanini, Pichi-Sermolli 6165 (F.); Um-er-Rzem e sud est di Barce, U. esc. Suenia 18.4.1934 c.fl., Pampanini, Pichi-Sermolli 6166 (F.); el-Mechili 18.4.1934 c.fl. et fr., Pampanini, Pichi-Sermolli 6167 (F.); Apollonia: U. Scechaba 1.5.1934 c.fl., Pampanini, Pichi-Sermolli 6168 (F.); U. Giargiarummah: Brates 8.5.1934 c.fl. et fr., Pampanini, Pichi-Sermolli 6169 (F.); Messa: Negret Said 8.5.1934 c.fr., Pampanini, Pichi-Sermolli 6170 (F.); Bomba 12.5.1934 c.fr., Pampanini, Pichi-Sermolli 7171 (F.); Derna: U. Derna 12.5.1934, Pampanini,

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Pichi-Sermolli 6172 (F.); Barce Road — Bottom Tocra Pass 500′, 23.10.1957 c.fl., Barry C. Park 92 (K.); Tocra Pass (Forest Protected Area) 1000′, 17.5.1958 c.fr., Barry C. Park 472 (K.); Regione di Derna: Feteiah 12.1934, Rompietti 50 (F.); limestone rocks above Apollonia ca. 300 m, 4.4.1939 c.fl. et fr., Sandwith 2371 (K.); Mirsa Badia, 10.3.1890 c.fl., Schweinfurth 87 (K.LE); Derna: in montosis non raro, 12.4.1887 c.fl., P. Taubert 321 (E.JE.P.); Derna, in saxosis aridis secundum uadi Derna prope ostium uadi Dernina 14.1.1913 c.fl. et fr., Vaccari 143 (F.); Bengasi 20.5.1917 c.fr., V. Zanoni 177 (F.); Bengasi: Om.-Sciachneno 8.7.1916, V. Zanoni 629 (F.K.).

Egypt: Fuka: uadi Khreymisa 28.12.1930 c.fl., E. Gauba 282 (W.); W. desert, Libyan Plateau, between Marsa Matruh and Qattara Depression 2.6.1962, B. Boczancev (LE.); W. desert, mediterranean seaside, between Fuka and Ras-el-Chekma 5.4.1962, B. Boczancev (LE.); W. desert, mediterranean seaside, Es-Sallum, 7.4.1962 c.fr., B. Boczancev (LE.); Sallum 6.1961 c.fl., K. H. Batanouny 3 (K.); sandy stone soil close to the sea, Wady El Ramla N. to Sallum, 13.4.1932 c.fr., Shabetai 54 (K.); Mariut, 4.1887 c.fr., Ascherson (O.).

Syria: Herb. Poiret (P.); Syria, Herb. Maire (P.).

Spain: In rupibus promontosis Chandemi, Cabo de Gata 19.12.1891, J.Lange (C.O.); Cabo de Gata 5.1889 c.fl. et fr., Herb. De Coincy (P.); Carthagena 24.4.1869 (JE.); Pentes méridionales de la Atalaya à Cartagena 22.4.1852, E. Bourgeau 1624a (E.F.G.P.); Sierra de Orihuela, au Barranco de Soils, près Murcia 25.6.1854 c.fl., E. Bourgeau 2325 (CGE.F.G.K.P.); Cercanias de la Ciudad, Cartagena 5—6.1902 c.fr., Ibanez, Jimenez, Pau (B.BC.BPU.F.G.W.); Murciae: Carthagène, Barranco del Porillo 5.1908 c.fr., Jimenez, Ibanez 696 (BC.E.JE.W.); Cartagena, c.fl., C. Pau (G.); Cartagena, prov. Murcia (Algameca Chica) on rocky limestone hill by the sea in full exposure 10.1961, Sandwith (K. — pl.viv.).

Italy: Levanzo 4.1890 c. fr., H. Ross (JE.); In rupibus calcareis meridionalibus insulae Favignana et Levanzo, Herb. Schrader (LE.); Favignana, in collibus 4.1889 c.fr., H. Ross (F.WU.); In rupestribus siccis insulae Favignana 4.5.1855 c.fr., Huet du Pavillon (CGE.F.G.K.O.P.W.); Favignana c.fr., Grenier (P.); Favignana 1860 c.fl. et fr., Citarda (JE.); Insula Linosa (olim Aethusa), in dumetis 1,3.1906 c.fl., 4.3.1906 c.fl. et fr., 26.3.1906 c.fl. et fr., Sommier (F.); In collibus aridis, ex insula Linosa 22—23.4.1873 c.fr., Sommier (F.); In insula Aethusa (Linosa) 4.1873 c.fl. et fr., A. Ricci (F.); Isola di Linosa, colli aridi 20.4.1873 c.fr., Herb. Florent. (F.K.WU.); in rupibus calcareis calidioribus, Insl. Pantelleria 5.1882 c.fl. et fr., Lojacono 516 (CGE.E.F. P.WU.); In rupibus calcareis Pantelleria c.fl. et juv.fr., Citarda (CGE.E.F.JE.K.P.S.); only from Egadi, Lampedosa, Linosa, Pantelleria 24.5.1960 c.fl. et fr., Miss. S. A. Davies (K.); In rupestribus martimis insulae Pantelleria 1855 c.fl. et fr., E. et A. Huet du Pavillon (CGE.F.G.P.W.); In rupibus insuale Pantelleria c.fl. et fr., Philippi (W.); Pantelleria, in rupibus, 4.1890 c.fl. et fr., H. Ross 45 (B.BC.BG.BPU.E.F.G.GB.JE.K.O.P.PR.PRC.S.W.WU.): Pantelleria, in fruticetis 4.1890 c.fr., H. Ross (F.); Insula Pantelleria, regione dei Sesi 31.3.1906 c.fl. et fr., Sommier (F.); Insula Pantelleria, alle balate 16.3.1906 c.fl., Sommier (F.); In rupibus calcareis, Lampedusa c.fl., Todaro (BP.F.W.); Insula Lampedusa, in „Isoletto dei Conigli", 8—10.3.1906 c.fr., Sommier (F.); Prope Portum. In saxosis aridis, Lampedusa 20.4.1873 c.fl. et fr., Sommier (F.); Insula Lampedusa. In insula vulgata 13.3.1906 c.fl., Sommier (F.); Cape Ponente. In rupibus calcereis (Lampedusa) 28.4.1873 c.fr., Sommier (F.);Ins. Lampedusa, ca. Imbriacola 14.4.1884 c.fl., Solla (BP.); Lampedusa c.fl. et fr., Nyman (S.); In dumetis et ad sepes Ins. Lampedusa c.fl. et fr., Herb. Martelli (F.GB.); Lampedosa 1867 c.fl. et fr., Herb. Hooker (K.); Insula Lampedusa 1830 c.fr., Gussone (C.G.K.P.); Ins. Lampedusa 14.4.1874 c.fl. et fr., Herb. Bubela (PRC.); Lampedusa, Contrada Fascerri 8.9.1873 c.fl., Herb. Florent. (F.); La Hydrunti c.fr., Tenore (P.); Sicilia 4.1903 c.fr., A. Prior (K.); Siciliae, Herb. Zeyheri (LE.).

Greece: Crete: Distr. Spahkia: Insula Gavdos. In arenosis collibus ad promontorium Tsuno 6.6.1942 c.fr., Rechinger 13647 (E.G.K.S.); Hierapetra: Insel Gaidaronisi, auf verwitterten Sandstein zwischen Juniperus phoenicea, Rechinger 13120 (n. v.).

Malta: Migiarro, Gozo (not in Delicata). Also found by Gulia at Ia Cenc. Gozo, and by Duthie at Ured-el-Gharel, 22.5.1872 c.fl., C. A. Wright (K.); Malte c.fl. et fr., Fontenay (P.).

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Discussion: *Periploca angustifolia* is one of the species of the genus *Periploca* described earliest, only 2 years after *P. laevigata*. It is worthy of notice that Labillardière recorded it from Syria, i. e. from the margin of the area, where it has been hitherto known merely from this and only locality. Yet Labillardière already knew that it grew also on the Lampedusa island in Italy and in the Atlas Mts. Although in the first years after its discovery *P. angustifolia* was distinguished from *P. laevigata* from the Canary Islands, later, to the present time, with few exceptions, it has been identified with this species. It may be that the opinion of Willkomm, Boissier, and Caruel (l.c.) was decisive here. Not earlier than 1890 H. Ross (l.c.) revised this view and taking into account the shape and size of leaves, and their arrangement on the shoot, stated that *P. laevigata* and *P. angustifolia* were undoubtedly two separate species. This view, however, was not accepted and even Ross himself, some years later, recognized *P. angustifolia* for a form of *P. laevigata* (Ross 1906, l.c.).

The next analysis was carried out by K. H. Rechinger (l.c.) in 1943, because *P. angustifolia* was discovered on small islets situated at the south coasts of Crete. Comparing the herbarium specimens from the Canary Islands, Algeria and Italy, he distinguished several features that help to separate these two species. According to Rechinger they are as follows: leaf colour (above and beneath), the length of the petiole, leaf shape and length of fruit. The differentiation by means of flowers has not given any positive results.

The features chosen by Rechinger are essential, especially those of leaves and, in a lesser degree, of fruits. In order to examine these features I made myself acquainted with the large herbarium material consisting of about 400 sheets of *P. angustifolia* from the whole of its area, about 150 sheets of *P. laevigata* from the Canary Islands, as well as 21 sheets of *P. chevalieri* from Cape Verde Islands. I measured the length and breadth of leaves of such specimens as are in quite a good state, taking 10 leaves of each sheet. As it was difficult to define, in many cases, the limit between the leaf lamina and petiole, the length was measured from the petiole base up to the lamina apex. The breadth of the leaf was measured in its broadest part. In this way 1430 leaves of *P. angustifolia* were measured, 1140 of *P. laevigata* and 170 of *P. chevalieri*. The unequal number of measurements influences, of course, the interpretation of results obtained, yet, in spite of this, they give an idea of the differentiation of the discussed species. The measurements were carried out with the precision to 0.5 mm. The results obtained were put together in tables 1 and 2, where the number of leaves with a length in 5 mm intervals and width in 1 mm intervals is given.

Table 1 shows that the length of leaves of *P. angustifolia* ranges only from 10—45 mm, shifting clearly to lesser values, while that of *P. laevigata* 10—70, usually upwards to greater values. Very similar are the results of measurements of breadth in table 2. We can see that leaves of *P. angustifolia* are distinctly smaller and narrower than those of *P. laevigata*. The results will be much more accurate if given in the form of a histogram illustrating the per cent share of

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Table 1

Species	Number of leaves	Length of leaves in mm												
		10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	60–65	65–70	70→
P. laevigata	1140	1	18	87	171	222	210	188	126	76	28	12	1	—
P. chevalieri	170	—	—	—	2	7	27	33	39	29	13	14	3	3
P. angustifolia	1430	26	392	586	267	126	31	2	—	—	—	—	—	—

Table 2

Species	Number of leaves	Width of leaves in mm																				
		1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21→
P. laevigata	1140	—	16	21	31	77	106	164	130	117	115	87	81	48	34	33	20	18	15	6	7	4
P. chevalieri	170	—	4	34	41	26	17	17	11	9	8	3	—	—	—	—	—	—	—	—	—	—
P. angustifolia	1430	10	290	612	302	135	51	17	7	3	2	1	—	—	—	—	—	—	—	—	—	

Table 3

Species	Number of follicles	Length of follicles in cm																	
		4	4,5	5	5,5	6	6,5	7	7,5	8	8,5	9	9,5	10	10,5	11	11,5	12	12,5	13→
P. leavigata	120	—	—	1	2	4	4	5	10	17	10	23	10	9	5	8	5	5	1	1
P. chevalieri	6	—	—	—	—	—	—	—	—	—	—	1	2	—	—	2	—	—	—	1
P. angustifolia	165	6	4	12	16	32	16	32	14	11	6	9	1	1	2	2	—	1	—	—

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the ratio of breadth to length (fig. 17). In *P. angustifolia* 80, 29 per cent of leaves show the ratio of breadth to length within 4—6.5, while in *P. laevigata* 77, 31 per cent have the ratio 2.5—4.5. If we still consider the fact that the petioles of *P. laevigata* are longer and may be better distinguished than those of *P. angustifolia* then this ratio, measuring more accurately, would turn towards lesser values in *P. laevigata.*

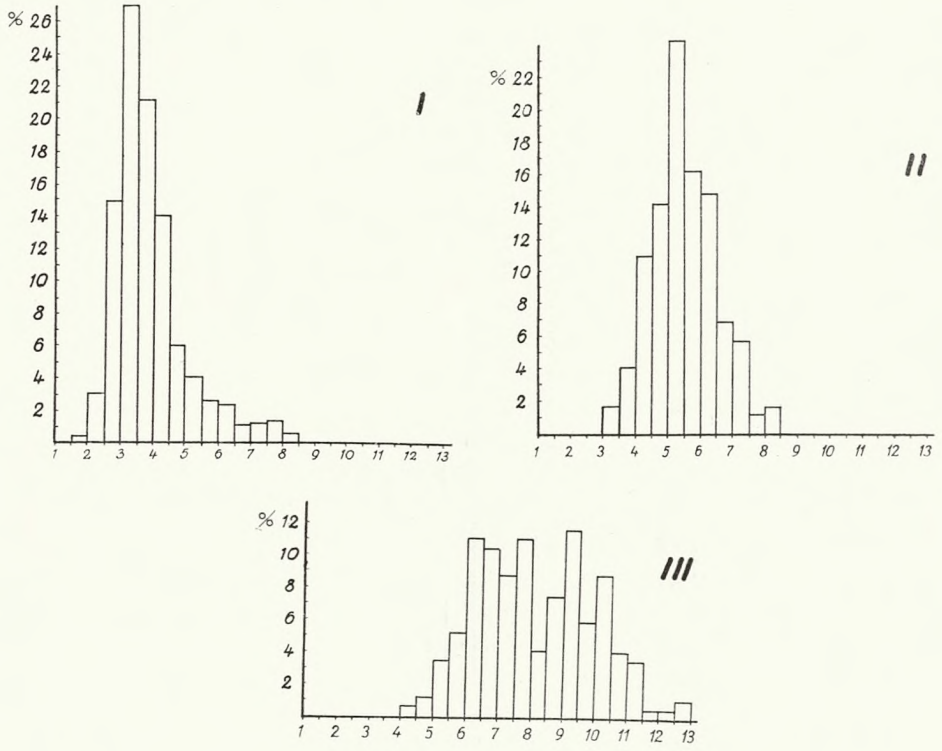

Fig. 17. Histogram illustrating variation in the ratio of leaf blade width to length in the herbarium material available of the species: I. *P. laevigata*, II. *P. angustifolia*, III. *P. chevalieri*

The length of follicles was measured to the nearest 0.5 cm. The number of measured follicles was of course much smaller than that of leaves. The results of measurements are given in table 3. They are less suggestive, show, however, that thougth the differences in sizes of follicles in the separate species are considerable *P. laevigata* has much longer follicles than *P. angustifolia.*

The best way to distinguish *P. angustifolia* from *P. laevigata*, beside the leaf sizes given above, are fasciculate leaves on brachyblasts; this feature is not found in any other species of the *Laevigatae* series. As to the flowers, just like Rechinger, I was unable to state any essentially distinct feature in their structure.

Summing up the above arguments it can be stated with certainty that *P.angustifolia* and *P. laevigata* are two separate species, differing not only on their morphological characters but also in the geographical distribution (a great

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isolation). There is no doubt that they are closely allied species where no intermediate forms have been found. An exception may be those specimens of *P. angustifolia* that, owing to their exuberant growth, have leaves much longer than usual, on much elongated and strong annual shoots (only on such); these leaves in their shape and size resemble the smaller leaves of *P. laevigata*.

Another species closely allied to *P. angustifolia* is *P. chevalieri*. Just as in the previous case the best feature distinguishing both species is the lack of fasciculate leaves in *P. chevalieri*, and differences in leaf sizes (tables 1 and 2). Though the breadth of leaves is similar in both species their length differs considerably. The leaves of *P. chevalieri* are most often 4—5 cm long while in *P. angustifolia* only 2 leaves of such length were found, 1430 being measured. The paucity of fruits of *P. chevalieri* I had at my disposal did not allow to draw any conclusions. The resemblance between *P. angustifolia* and *P. chevalieri* beside the narrowness of leaves, is seen in their being one coloured, and in their nervation (invisible lateral nerves).

6. *Periploca somaliense* Browicz, spec. nova

Frutex erectus, probabiliter partem volubilis, ramis juvenilibus glaberrimis, viridiusculis, vetustioribus brunneis, serius griseo-brunneis. Folia persistentia, 18—33 mm longa (20—30 mm praecipue), 3.5—10 mm lata (5—7 mm praecipue), anguste obovata, vel anguste elliptica, apice rotundata et obtusa, rarius breviter aristata, basi decurrentia, supra atro-viridia, subtus cyano-viridia vel coerulea, utrinque glabra, nervo medio bene distincto, nervis lateralibus inconspicuis, petiolo crasso, glabro, 1—2 mm longo. Inflorescentia 3—5 -flora, brevis, foliis fulcrantibus brevior, axi principali ac pedunculis fructiferis viridibus. Calyx ad 2.5 cm longus, glaber, dentibus late ovatis, apice obtusatis. Flores ignoti. Folliculi 4—5 cm longi, basi ca. 10—12 mm lati. Semina ignota. Floret Novembri-Decembri?

Typus: Somalia: Dabalaidshe Mt. Libah Heleh range, 10°20′ N., 43° E., 5800′ (1740 m), at the mountain top (limestone) with scattered *Juniperus procera*, 5.12.1932 c. fr., J. B. Gillett 4712 (K.).

Distributio: *Species partis orientalis Somali endemica.*

Affinitas: *P. angustifoliae et P. laevigatae affinis est, sed a priore foliis in ramis vetustioribus solitariis nec fasciculatis, a posteriore autem foliis minoribus et folliculis brevioribus differt.*

Syn.: *Periploca laevigata* sensu Bullock non Ait., Kew Bul. no. 4:586 (1954) p. p.

Erect shrub, probably partly twining. Young shoots quite glabrous, greenish, older ones brown becoming grey-brown or grey. Leaves persistent, 18—33 mm long (mostly 20—30 mm), and 3.5—10 mm broad (mainly 5—7 mm), narrowly obovate, or narrowly elliptic, rounded at apex and obtuse, more seldom short mucronulate, decurrent, dark green above, livid-green or cerulean below, glabrous on both sides, with well marked midrib, lateral nerves invisible. Petiole glabrous, thick, 1—2 mm long. Inflorescences 3—5 flowered (judging from the preserved peduncles), short, shorter than leaves supporting them. Inflorescence

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axis and peduncles green. Calyx to 2.5 mm long, glabrous. Calyx teeth broadly-ovate, obtuse. Flowers unknown. Follicles 4—5 cm long and about 10—12 mm thick at base. Seeds unknown. Flowers XI—XII (?) (fig. 12-IV, 13 *e-f*).

Distribution East Somalia, on the border with Ethiopia, in mountains at the altitude of 1740 m, together with *Juniperus procera* (fig. 14-4).

Discussion: Species known hitherto only from two herbarium sheets having the same number. They have been termed *P. laevigata* by A. A. Bullock (l.c.). Bullock defined other specimens collected in Somalia, found in the Kew Herbarium in the same way, namely: Las Anod, 7.2.1942, E. F. Peck 122; Las Anod 18.5.1945, Glover, Gilliland 1009; and two further specimens he did not publish: 12 miles south of Garoe 10.9.1959, C. F. Hemming 1578; 4 miles south of Garoe 14. 6. 1958 C. F. Hemming 1372. Specimen no. 1578 served G. Cufodontis (Bul. Jard. Bot. Etat Bruxelles 30, suppl. 694, 1960) to place *P. laevigata* in his "Enumeratio Plantarum Aethiopiae". It is sure that all these specimens belong to one species, but differ considerably from Gillett's specimens and cannot be identified with them. They are, above all, characterized by a totally different type of leaves, which are linear, almost to 5 cm long, their average breadth being 3—5 mm, sessile and strongly rugose. Their young shoots are clearly puberulent, and follicles cylindric, thin, arranged at right or obtuse angle. It is certainly not *P. laevigata*, but a species belonging to quite another genus (which?). This is also confirmed by the flower structure, though scarce, and poorly developed, the corona segments being invisible.

Follicles only may witness that Gillett's specimens belong to the genus *Periploca* and to the series *Laevigatae*, as flowers are missing; they are identical with, though smaller than, the follicles of *P. laevigata* and *P. angustifolia* in their morphological appearance. Just as in the former species they are strongly swollen in the basal part, characteristically elongate-fibriform, with single ribs near the place of dehiscence. There are, however, only four empty hulls, seeds absent. By their length they are nearer to *P. angustifolia* as they are scarcely to 5 cm long. As to leaves they resemble the leaves of *P. laevigata* by their solitary arrangement on the shoot (not fasciculate) two coloured, with thick petioles, while they remind us of the leaves of *P. angustifolia* in their size and shape as well as in their lateral nerves being invisible.

Gillett noted on the herbarium label that flowers are yellowish, they are, however, not preserved in the herbarium, and we can only judge from the peduncles of the structure of inflorescence. The appearance of the inflorescence axis and peduncles reminds of the relations met in others of the *Laevigatae* series, but the colour of flowers is surprising; it refers perhaps only to the undersurface of the corolla lobes, and then it would be no surprise at all. We don't know, however, whether there are any white spots on the upper part of the lobes. These spots are so characteristic for the section *Periploca*. Further collections can help to make it clear. It seems, however, that the classification of this new species of *Periploca* is justified.

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Series 3. *Aphyllae* Browicz, ser. nova

Frutices erecti, aphylli vel in ramulis juvenilibus tenuibus interdum volubilis foliis minutis cito deciduis praediti. Folliciuli horizontaliter dispositi.

Species 2. Typus seriei: *P. aphylla.*

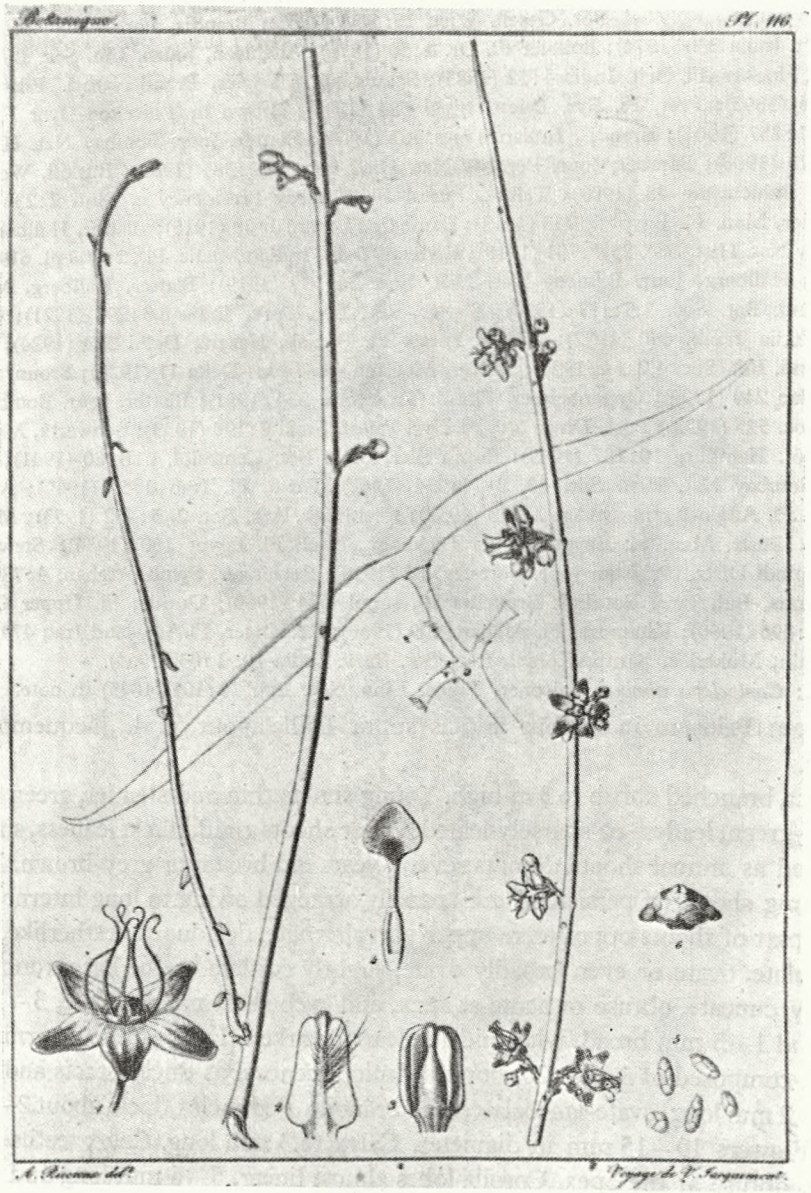

Fig. 18. Oldest illustration of *Periploca aphylla* (Jacquemont, Voy. Bot. 1844)

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Erect, leafless shrubs, or with only minute, early deciduous leaves on youngest, thin, sometimes twining shoots. Follicles arranged horizontally.

Type species: *P. aphylla.*

7. *Periploca aphylla* Decaisne

Jacquemont, Voy. Bot. 109 t. 116 (1844); Decaisne in DC. Prodr. 8:499 (1844); Schweinfurth, Verh. K. K. Zool.-Bot. Gesell. Wien 15: 553 (1865); Brandis, Forest Fl. North.-West. a. Centr. India 330 (1874); Boissier Fl. Or. 4:50 (1879); Aitchison, Journ. Lin. Soc. Bot. 18:79 (1880); Hooker ,Fl. Brit. India 4:12 (1883); Schumann in Engler, Prantl Natürl. Pflanzenfam. 4,2:216 (1895); Post, Fl. Syr. Palest. Sinai 524 (1896); Brown in Thiselton-Dyer Fl. Trop. Afr. 4,1:257 (1904); Brandis, Indian Trees 467 (1906); Blatter, Jour. Bombay Nat. Hist. Soc. 18,4:775 (1908); Bamber, Jour. Bombay Nat. Hist. Soc. 19,2:385 (1909); Burkill, Work. List Fl. Pl. Baluchistan 48 (1909); Talbot, Forest Fl. Bombay Presidency a. Sind 2:238 (1911); Muschler, Man. Fl. Egypt 2:743 (1912); Bamber, Fl. Punjab 60 (1916); Blatter, Hallberg, Jour. Bombay Nat. Hist. Soc. 25,4:731 (1918); Kirtikar, Basu, Indian Medic. Pl., 2:808 pl. 619 (1918); Blatter, Hallberg, Jour. Bombay Nat. Hist. Soc. 26:539 (1919); Blatter, Hallberg, McCann, Jour. Ind. Bot. Soc. 1,5:177 (1920); Blatter, Rec. Bot. Surv. India 8,3:294 (1921); Gamble, Man. India Timb. 490 (1922); Parker, Forest Fl. Punjab, Hazara, Delhi 343 (1924); Sabins, Jour: Ind. Bot. Soc. 4,2:64 (1924); Blatter, McCann, Fl. Indus Delta 17 (1929); Broun, Massey, Fl. Sudan 249 (1929); Oppenheimer, Florul. Transjord. 234 (1931); Blatter, Jour. Bombay Nat. Hist. Soc. 525 (1933); Post, Dinsmore, Fl. Syr. Palest. Sinai 2:190 (1933); Schwartz, Mitt. Inst. Allg. Bot. Hamburg 10:187 (1939); Bornmüller, Beih. Bot. Centralbl. 61B:80 (1941); Sabins, Jour. Bombay Nat. Hist. Soc. 42, 3—4:534 (1942); Parsa, Fl. Iran 4:57 (1949); Andrews, Flower. Pl. Anglo-Egypt. Sudan 2:413 (1952); Rechinger, Ark. Bot. 2, 5:402 (1953); Montasir, Hassib, Illustr. Man. Fl. Egypt 1:350; Täckholm, Stud. Fl. Egypt 180 (1956); Stewart, Fl. Rawalapindi Distr. (Pakistan Jour. Forestry) 82 (1958); Rechinger, Symb. Afghan. 4:78 (1958); Cufodontis, Bul. Jard. Bot Etat Bruxelles 30, suppl. 684 (1960); Duthie, Fl. Upper Gangetic Plain 1:496 (1960); Kitamura, Fl. Afghan. 309 (1960); Rechinger, Fl. Lowland Iraq 479 (1964); Puri, Jain, Mukerjee, Sarup, Kotual, Rec. Bot. Surv. India 19, 1:83 (1964).

Syn.: *Campelepis viminea* Falconer, Trans. Linn. Soc. Bot. 19:101 (1845) in note.

Type: Pakistan in collibus apricis supra Djillalapour, c. fl., Jacquemont 113 (K.P.).

Erect, branched shrub to 3 m high. Young shoots thin and slender, green or yellowish-green, leafless or sparsely leafed. Older shoots rigid, thick, leafless, similarly coloured as annual shoots. Shoots several years old brown or grey-brown. Leaves on young shoots (if persistent) are sparsely arranged owing to long internodes, in lower part of shoots opposite, in upper part alternate, deciduous, leatherlike, ovate-lanceolate, ovate or even broadly ovate, slightly cordate at the base, rounded or broadly cuneate, obtuse or acute at apex, and even short mucronulate, 3—12 mm long and 1—5 mm broad, with midrib clearly marked. Inflorescences terminal or lateral, composed of 3—15 (20) flowers. Inflorescence axis thick. Bracts and bractlets 1—2 mm long, ovate-lanceolate, membranous. Peduncles thick, about 2—3 mm long. Flowers 10—15 mm in diameter. Calyx to 3 mm long. Calyx teeths broad-ovate, obtuse at the apex. Corolla lobes almost linear, 5—6 mm long and 2.5—3 mm broad, usually convolute, retuse, undersurface glabrous, upper surface more or less, from the middle to apex, densely white bearded along the margin. Lobe

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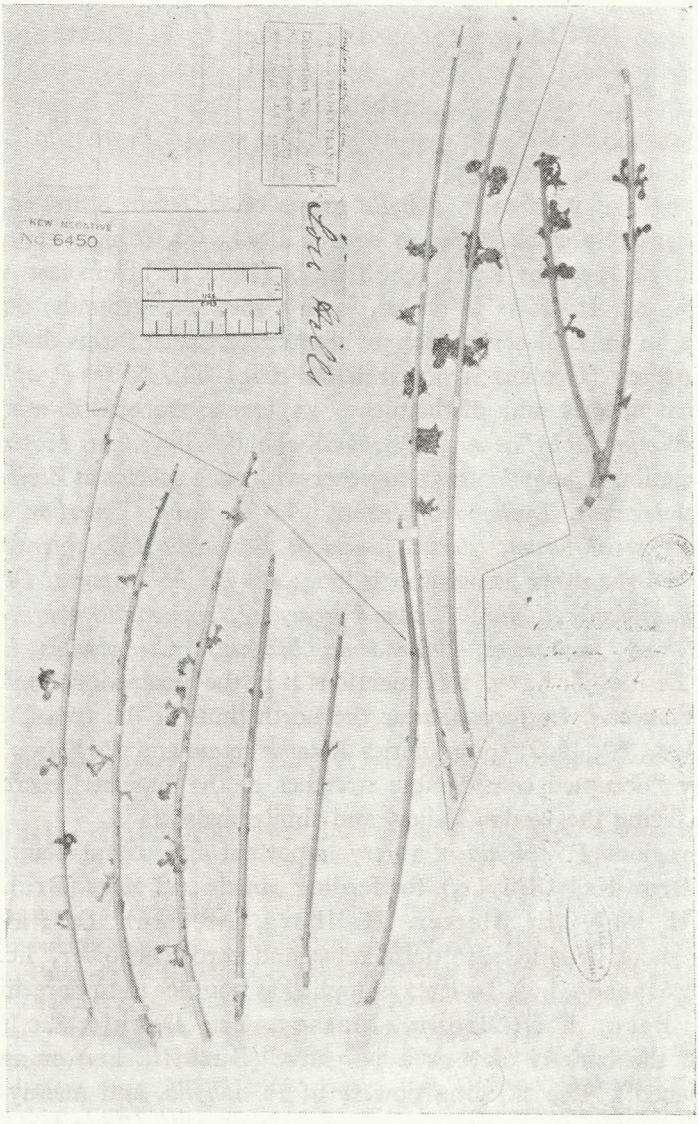
margin lighter yellowish-brown, middle part dark purple or violet, with characteristic elliptic white spot, 2—3 mm long. Sometimes in the basal part of corolla lobe there is a slight swelling resembling somewhat the gland-patch. Filiform parts of corona lobes glabrous, violet, almost as long as corolla lobes, bent. Follicles (5) 6—9 (12) cm long and 5—6 mm thick, gradually narrowing toward the apex which is always acute and somewhat convolute, straight or slightly bent, green or greenishgrey, arranged at 180° angle, and sometimes even at a larger one. Seeds black, to 8 mm long and to 2.5 mm broad, flattened, with a coma to 2.5 cm long. Flowers and bears fruit all over the year (fig. 18, 19).



Phot. R. B. G. Kew

Fig. 19. *Periploca aphylla* — type (Royal Botanic Gardens, Kew)

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Distribution: Species of a wide area, from the west coast of the Red Sea, over the Sinai Peninsula, Arabia, south Iran to West Pakistan and east Afghanistan and even to West India. It is also known in south-east Iraq and in Jordan. J. Hutchinson and E. A. Bruce (Bul. Misc. Inf. Kew no. 2: 144, 1941) record it from the Somalia mountains, too, but the herbarium specimen (Gillett 4698) should be numbered among the next species — *P. visciformis*. According to R. Muschler (l.c.) P. *aphylla* grows in north Egypt in Mandara and Abukir, yet I have not seen any herbarium sheets from those localities. (fig. 22-2).

As we can see from literature *P. aphylla* is a species quite often met in West Pakistan, mainly in Baluchistan, Sind (near Karachi, too), as well as in Punjab. It also occurs in West India, mentioned from there by R. Blatter and F. Hallberg (1919, l.c.) and Puri, Jain, Mikerjee, Sarup, Kotual (l.c.) from the west Rajputana desert, the herbarium specimens are, however, unknown to me. Therefore the accurate east limit of the area of *P. aphylla* could not be exactly indicated in the map.

On the whole of its area *P. aphylla* grows on different altitudes, from lowlands, lying scarcely some scores of metres a. s.l., up to high mountains. The highest locality is given by K. H. Rechinger (1958, l.c.) from east Afghanistan, ca. 2600 m a. s.l. It grows in desert, in dry, insolated grounds, on rocky and sandy slopes, in some places in such an abundance that it forms distinct associations. M. Zohary (Geobot. Struct. Iran. 64—65, 1963), classes *P. aphylla* among Nubo-Sindian species and distinguishes its two characteristic associations in Iran: *Periplocetum aphyllae* and *Periploca aphylla-Amygdalus scoparia*. In the former association *P. aphylla* grows together with such species as *Ziziphus nummularia* var. *glabrescens*, *Lycium barbarum*?, *Acacia flava*, *Teucrium oliverianum*, *Helianthemum sessiliflorum*, *Aerva javanica*, *Gaillonia calycoptera*, *Haloxylon salicornium*. To the other association belong: *Amygdalus scoparia*, *Dodonaea viscosa*, *Astragalus fasciculifolius*, *Lycium barbarum*?, *Amygdalus eburnea*, *Zizyphus nummularia* var. *glabrescens*, *Ochradenus baccatus*, *Convolvulus leiocalycinus*, and others. Besides Zohary, too, mentions it in the association *Euphorbia larica* — *Gaillonia aucheri*. In Jordan, near the north limit of the area (M. Zohary, Pl. Life Palest., 69, 1962) communities *Retama retam* and *Perliploca aphylla* are known, they "occupied considerable stretches of the Judean Desert, the rocky escarpment facing the Jordan Valley, and similar habitats".

In some regions *P. aphylla* is a very important and useful plant. It is used f.i. as fuel (Brandis, 1874, l.c.), for feeding camels and goats (Brandis, 1874, l.c.; Burkill 1909, l.c.; Blatter, Hallberg, McCann l.c.); as there are fibres in its shoots it is used to make ropes and cords (Hooker, l.c.; Duthie, l.c.; Broun, Massey, l.c.). Its latex is applied as poultice in tumors and swellings (Kirtikar, Basu, l. c.; Broun, Massey, l.c.; Duthie, l.c.), while the decoction of the bark is used as a purgative (Burkill, l.c.) or against fever (Jain, in sched.). The smelling flowers of *P. aphylla*, and mainly the flower buds are commonly eaten, raw or boiled, as vegetable (Brandis, 1874, l.c.; Hooker. l.c.; Burkill, l.c.; Broun, Massey, l.c.; Duthie, l.c.).

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7a. *Periploca aphylla* Decainse ssp. *aphylla*

Inflorescentiae in ramulis lateralibus brevissimis (ad 2 cm) aphyllis vel basi foliis 1—2 jugis parvis cito deciduis praeditis dispositae, densae et compactae, floribus subsessilibus. Calyx, pedunculi fructiferi brevissimi, inflorescentiae axis principalis, folia, rami juveniles vel etiam vetustiores necnon folliculi plus minusve pubescentes vel partim glabri.

Distributio: *Aream speciei totam fere occupat, sed in parte eius orientali praecipue obvenit.*

Inflorescences set on very short (to 2 cm) lateral shoots, leafless or supported at the base by 1—2 pairs of small leaves, falling off early. Peduncles very short, so that flowers seem sessile, and inflorescences dense, compact. Calyx, peduncles, inflorescence axis, leaves, young and even older shoots, as well as follicles more or less pubescent, or partly glabrous (fig. 20-I, 21 e-h).

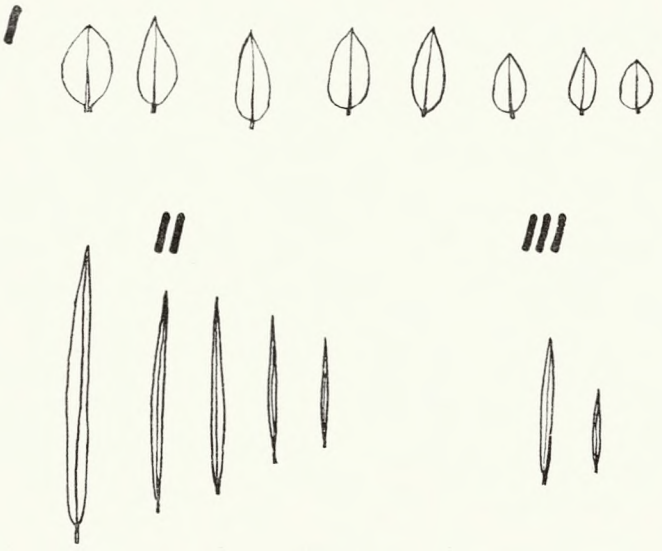

Fig. 20. Variability of leaves: I. *P. aphylla*, II. *P. hydaspidis*, III. *P. visciformis* (natural magnitude)

Distribution: Almost all over the region of the species area, mainly in its eastern part.

Specimens examined:

Egypt: In desertis Sinaiticis, 1837 c.fl. et fr., Aucher 1502 (BM.F.G.K.LE.P.); Upper Egypt, 1847 c.juv.fr., Parlatore (K.); Sinai, c.fl. et fr., A. Kaiser 309 (S.); Central Sinai, Wadi Feiran 4.5.1939, M. Drar 234 (S.); Central Sinai, Gebel Musa 7.7.1939 c.fl., M. Drar 581 (S.); Jebel Hamer Seleini, between rocks, 17.3.1945 c.fl., Kovt (HUJ.).

Aden Protectorate: At Haja on the northern Jol near Zamuk, at 4000′. In a sandy wadi bed in mixed thorn scrub 28.2.1952 c.fl., Popov, Illin, Gilliland 4233 (.BM.K).

Saudi Arabia: Taif, 5500′, Coll. Simonds 16 (K.); Southern Arabia, 1906 c.juv.fr., Pilgrim (K.); Central Arabia, 1865 c.fl. et fr., L. Pelly (K.); Nejd: Jebel Shammar, rocky mountain sides 11.5.1944 c.fr., D. Vesey-Fitzgerald 1376 (BM.); Wady Dhila, 4000′, Wady bed only, but

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seen locally in wady on eastern slopes at about 5000′ 22.2.1945 c.fl., D. Vesey-Fitzgerald 14464 (BM.); Taif, 6000′, 3.5.1947 c.fl., D. Vesey-Fitzgerald 17032/S.(BM.).

Oman: Jabal Hafit 25.4.1948 c.fl. et juv.fr., W. Thesinger (BM.); Wady Ylyyly, bed of wady 25.1.1944 c.fl., D. Vesey-Fitzgerald (BM.); In wady Dhula, on stony barren hillsides 15.11.1925, J. Fernandez 66 (K.); On the way to Lislat 20.11.1925 c.fr., J. Fernandez 448 (K.); Oman c.fr., A. S. G. Jayakar 136 (BM.); Near Boi 3.2.1947 c.fl., W. Thesiger (BM.); Dhufar, Jebel Samhan, desert zone along top of southern precipices, occasional 11.10.1948 c.fr., D. Vesey-Fitzgerald 12564 (BM.); foothills of Jabal Akhdhar 3.5.1957 c.fl. et fr., G. Popov 52 /75 (BM.).

Jordan: W. Coast of Dead Sea, Ain el Ghuweir 7.3.1928 c.fl. et fr., Miss. R. Gabrielith 10852 (HUJ.); North of Wadi-Farah, alt. 760 m, 12.3.1935 c.fl. et fr., J. E. Dinsmore 9221 (E.S.); Jeb. Hamuram 25.4.1886 c.fl., Herb. Post (BM.); Tall-Fadda, near sea, 390 m, 20.6.1910 c.fr., F. S. Meyers, J. Dinsmore 5221 (E.); Wady-Daresch 17.3.1928 c.fr., R. Q. (K.).

Iraq: Koma Sank, near Mandali c. 130 m, 2.5.1957 c.fr., Ali al-Rawi 20589 (K.); Jabal al-Muwaila (E. of J. Hamrin) c. 100 m, 28.3.1957 c.fr., Guest, Rawi, Rechinger 17617 (K.); Mandali, Persian foothills. Just over border, but also seen within Irak 2.2.1956 c.fl. et fr., R. Wheeler-Haines 539 (E.K.); Tursaq 4.5.1958 c.fr., R. Wheeler-Haines 539 (K.); Buskaya, 190 m, gravelly hillside 4.4.1958 c.fl. et juv.fr., Ali al-Rawi, Sh. Haddad 25562 (K.).

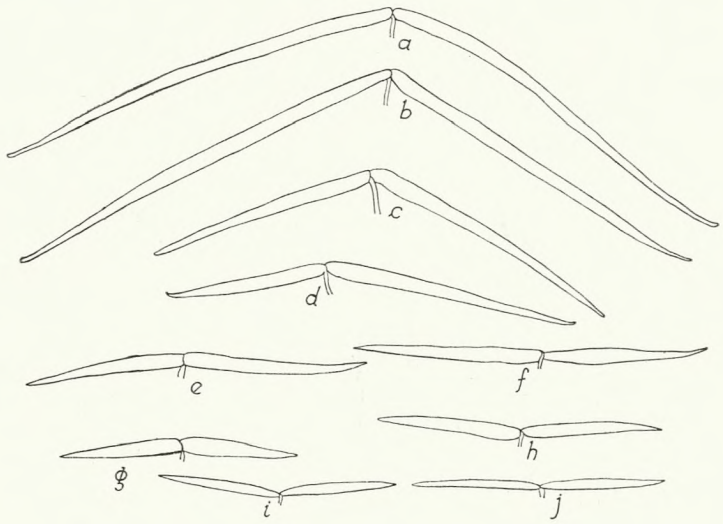

Fig. 21. Shape and arrangement of follicles: *a—d P. linearifolia*, *e—h P. aphylla*, *i—j P. visciformis* (less. 3×)

Iran: Desert ad finum Persicum c.fl. et juv.fr., Aucher-Eloy 4931 (BM.F.G.K.LE.P.W.); Golfe persicen: Insula Sheshma 29.4.1949 c.fr., Behbudi 572 E (W.); Persia: insulae Hormus 5.2.1893 c.fl., J. Bornmüller 516 (PR.); Buschir: supra Daleki, 200—300 m, 14.12.1892 c.fl., J. Bornmüller 3891 (BM.BP.JE.K.LE.P.W.WU.); Henqam, Persian Gulf 17.3.1921 c.juv.fr., Cheesman (BM.); Persian Gulf, 8.1876 c.fr., E. A. Floyer (K.); Distr. Khuzistan, c. 16 km SW of Masjed-i-Sulaiman (ca. 185 km. NE a. N. of Abadan) c. 200 m. Top of steep soil bank, by roads to Ahwaz 27.6.1958 c.fr., E. R. Guest, R. Bakhtiar 25425 (K.); Kaserun 4.1868 c.fl., C. Haussknecht (BM.K.W.); Madenu, Kirman. Dry desert gulch 25.12.1939 c. fl., W. Koelz 14234 (W.); 60 km of Dizful, 500 m, 14.4.1937 c.fl. et fr., M. Køie 290 (BM.); Prope pagum Dalechi inter Abuschir et Schiras 3.1842 c.fl., Th. Kotschy 209 (BM.G.K.LE.P.W.); Persian Gulf, ? Island, 5.1879, W. W. Perry (K.); Hier und da in der Khonarsteppe, zw. Borasdschun und Daleki 24.4.1885 c.fl. et fr., O. Stapf 276, 277 (K.) and 343 (W.); Khuzestan: near the big Dezdam under construction, ca. 32°30′ N, 48°30′ E, c. 400 m, 28.3.1959 c.fl., P. Wendelbo 54 (BG.); Distr.

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Khuzestan, Des Dam site, NE of An-dimeshk 26.9.1960 c.fl. et juv.fr., H. E. Wright, A. M. Bent 426—301 (K.); Tang-i-Darlan, east of Lar. In gulleys above the river, ca. 550 m, 1.3.1959 c.fl., ? 3615 (K.); Prov. Balučistan: Inter Khash (Vasht), (Kwash) et Iranshahr (Bampur). Montes Karevandar, ca. 1500—1600 m, 16—17.4.1948 c.juv.fr., K. H. et F. Rechinger 4027 (BM.G. K.W.); Inter Seytun et Bebehan 6.1868 c.fr., Haussknecht (JE.); Bandar Abbas to Bam 22.4. 1907 c.fr., W. E. James (K.); pr. Sarbaz 20.11.1900 c.fl., G. Gadd 79 (LE.); Arabistan 24.11. 1904 c.fl., G. Gadd 398 (LE.); Arabistan: 194 km ESE Nasiri pr. pagum Degbische (?) 9.3. 1930—31 c.fl., A. A. Predteczenskij 275 (LE.); Isin: Laristan 500′, in desert 18.11.1939 c.fr., W. Koelz (W.); Luristan: Puskl-i-Kulu, Halat-e-Nuchran (?) c.fl., Behbudi 188 (W.).

Afghanistan: Near Kandahar, Pirzada 900 m, 19.5.1948 c.fr., M. Køie 2056 (C.E.W.); Sarobi-Darnuta, steinige Abhänge, 12.5.1951 c.fl. et fr., Volk 1922 (W.); Giri, 8000′, dry slope, 20.5.1937 c.fl., W. Koelz 11521 (E.W.); Cabul to Tamraad (?), 1879—1880, J. W. Johnston (E.); Kabulschlucht bei Surobi, 1050 m, 16.6.1950 c.fr., A. Gilli 3057 (W.); Schutthalde am Fuss einer Felswand südöstlich von Surobi in der Kabulschlucht 1050 m, 28.5.1951 c.fr., A. Gilli 3056 (W.); NO-Hang eines Berges der Siah Koh-Kette am rechten Kabulufer in der Nähe von Menraul bei Kaghaie-Laghman, Schlucht 790 m, 17.3.1950 c.fr., A. Gilli 3055 (W.); Nuristan: zwischen Ort Waigel und Nischai 12.8.1951 c.fr., H. F. Neubauer 742 (W.); Nuristan: zwischen Nischai und Ningalam 14.8.1951 c.fr., Neubauer 793 (W.); Prov. of Nuristan, Junction of Rangul and Killam, 6000′, 29.8.1956 c.fr., W. Thesiger 1548 (BM.); Afghanistan c.fl. et fr., Griffith 3751 (BM.C.K.LE.P.W.); Afghanistan (Kurumi Valley ?) 29.4.1886 c.fl. and 10.1885 c.fr., Coll. Lace (K.).

West Pakistan: Kafiristan, 23.10.1924 c.fr., D. Bukinicz (Exp. N. Vavilov) (LE.); Waziristan: Barwand, 4000′, 26.4.1895 c.fl., Duthie 15715 (K.); Pind D. Khan Range, 1886 c.fr., Herb. G. Watt (E.); Hydebarad: Kotri-Tam Shoro Road (?), dry rocky ground 17.2.1960 c.fl., A. Talis 139 (BM.); Sinde, c.fl., Stocks 589 (CGE.K.P.W.); Punjab, Salt Range, Jhelum Distr., 1500′, 6.1.1917 c.fl., R. R. Stewart 806 (K.); Punjab, Rawalapindi, top of hill, Topi Park 22.1.1918 c.fl., Sprague 40 (K.); Tirach c.fr., Duthie 65 (K.); Distr. Shahpur 13.4.1904 c.fl., J. R. Drummond 20417 (E.K.); Sakesar (mt. Salinis) distr. Shahpur, in petrosis ad 4500′, 5.4.1902 c.fl. et fr., Drummond 13808 (CAL.K.); Rawalapindi: Lori Hills 20.3.1871 c.fl., Aitchison 467 (K.); Salt Range 1870 c.fl. et fr., Aitchison 14 (K.); Dhok Pathan, Attock, 23.3.1957 c.fl., Stewart, Nasir 27885 (RAW.); Chitral, Drosh 4500′, on stony slopes 20.4.1958 c.fl., Stainton 2251 (BM.E.); Chitral: Mirkhani 3500′, 25.6.1953 c.fr., Seddiani 27119 (BM.RAW.W.); Sind: Tatta Desert Range c.fl. et fr., Ritchie (E.); Swat: Mingora 3000′, 12.4.1954 c.fl., S. Ali 26105 (BM.W.); Balakot, Kagan valley. Hazara, 30.6.1925 c.fr., Abdul Hafiz (G.); Loralai, stony hills, 27.6.1957 c.fr., Jefri, Akbar 2280 (E.); Nuskhi, Kharan 3000′, common, 10.4.1953 c.fl., Crookshank 30 (K.); Waiu Iangi Forest, nr. Harnai 3300′, 14.12.1887 c.fr. and 22.4.1889 c.fl. et fr., Lace 3614, 3512 (E.); Abbottabad c.fl. et fr., Drummond 21967 (K.); Northern Baluchistan, very common in the desert country amongst rocks, 6.10.1884 c.fr., Aitchison 47 (K.); Baluchistan 10.6.1952 c.fr., Crookshank 236 (K.); Chitral: Laram 6000′, 12.9.1895 c.fr., Gatacre 17327 (CAL.); Chitral: Kala Drash 4500′, 29.5.1895 c.fr., Harris 16368 (CAL.); Baluchistan: near Duk 10.6.1952 c.fr., R. Holland 236 (K.); Baluchistan: Nai Ubbo (?), 20.5.1897 c.fl., Harsukh 20590 (CAL.K.); Baluchistan: Kharwande (?) 7.6.1897 c.fr., Harsukh 20590b (K.); Herb, Falconer, c.fr. (K.); Herb. Wight, c.fl., 509 (K.); Near Mardan, dry rocky hills 5000′, 14.8.1952 c.fr., R. J. Rodin 5510 (K.).

India: Kutch: Nakhatrana 11.4.1960 c.fr., S. K. Jain 61964 (E.); North-West Province, India, 7.1907 c.fl. et fr., H. Deane (K.); W. Himalaya 4000′, 19.5.1896 c.fl. et fr., Duthie 18916 (LE.); W. Himalaya 5500′, 5.1890 c.fl., Duthie (K.); N. W. India, c.fl. et fr., J. L. Stewart (E.).

Discussion: A species very variable in pubescence. Mostly all parts of the plant are pubescent, i. e. calyx, pedicels, bracts as well as bractlets, rachis, shoots one or two years old, and fruits, not only when young, but when quite ripe. We can, however, meet specimens with only some pubescent parts, while others are quite glabrous. And so only pedicels, calyx and rachis may be pubescent,

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or pedicels, calyx and young shoots may be so, or again pubescence is seen on young fruits while it disappears on old ones. Almost quite glabrous specimens are also known. J. E. Stocks drew attention to it on the herbarium label of a specimen collected in Sinde, No 589 he recorded: "*P. aphylla var. caulis, cymis, calycobusque glaberrimus*" and he added that this specimen differs from the typical specimen of Jacquemont, Kotschy from Iran, of Griffith from Afghanistan, as well as of Aucher-Eloy, and that there are transitional forms between pubescent and glabrous specimens. It may well be, as K. H. Rechinger (1964, l.c.) suggests that the plants are "velvety canescent while young, then glabrous". It appears to be a not very common phenomenon, as I know herbarium specimens where I found pubescence not only on some year old shoots, but also on quite ripe, dehiscent follicles.

The attempt to range the material at our disposal according to the degree of pubescence is rather useless as, there is a large number of transitional forms. The state of herbarium specimens is rather poor and the dispersion of these forms all over the area does not allow to treat them as valuable taxa.

7b. *Periploca aphylla* Decaisne ssp. *laxiflora* (Bornm.) Browicz, comb. nov.

Syn.: *Periploca aphylla* Decne. var. *laxiflora* Bornm., in sched.; Drar, Enum. Pl. Collect. at Gebel Elba 10 (1936); Täckholm, Stud. Fl. Egypt 180 (1956).

Periploca aphylla Decne. var. *laxifera* (Bornm.) spahlm., Montasir, Hassib, Ill. Man. Fl. Egypt 1:350 (1956).

Type: Oman — in rupestribus ad Maskat 26.1.1893 c.fl., J. Bornmüller 511 (W.).

Inflorescences loose, 3—9-flowered, set on top of elongated, 10 cm long or even longer, thin, lateral shoots, with distant alternate leaves. Calyx, pedicels, rachis, shoots, leaves and follicles quite glabrous, or at most somewhat puberulent at first.

Distribution: Only in the west and south-west part of the area, mainly in Jordan, Egypt, Sudan, more rarely on the Arabian peninsula (Oman) and in Iran.

Specimens examined:

Egypt: Gebel Elba, 1—2.1932 c.fl., M. Drar 389 (S.); Wadi Kewan near Mersa Halaib, 1—2.1933 c.fl., M. Drar 39 (S.); Gebel Elba, Wadi Haikwal, 1—2.1933 c.fl., M. Drar 209 (S.); Gebel Elba 23—27.1.1929 c.fl., Täckholm (S.); J. Elba 22.2.1933 c.fl., Cooke 145 (K,.); Gebel Elba, Wady Kansisrob 15.1.1933 c.fl., Mrs. Palmer (K.); Gebel Elba, Wady Kansisrob 24.1.1933 c.fl., Shabetai F. 1828 bis (K.).

Sudan: Ssoturba Gebirges an der Nubischen Küste, 22° n. B., Gebel Schellal, 23.4.1864 c.fr., Schweinfurth 238 (BM.BP.K.P.); Ssoturba Gebirges, Gebel Schellal 6.3.1865 c.fl. et fr., Schweinfurth 340 (BM.BP.P.W.); Nubia: about 21° lat. Sea-coast to between 3000—4000′, 1896, c.fl. et juv fr., J. Th. Bent (K.).

Jordan: Judean Desert, between W. Darafa and Ras Fashkha, 26.3.1926 c.fl., M. Zohary 10850 (HUJ.); Lower Jordan Valley, W. Farah 6.4.1927 c.fl., A. Eig 10848, 10849 (HUJ.); Lower Jordan Valley, outlet of W. Farah, hammada, soil among flat rockes 19.6.1936 c.fr., A. Eig, M. Zohary, N. Feinbrun 10849 (HUJ.); Env. of Dead Sea 3.4.1943 c.fl., Tuvia Kush-nir 01018

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(HUJ.); Vallis fluvii Jordan (Cisjordaniae) 10 km ad sept. vers. a Jiftlik, in rupibus calcareis ca. 250 m, 10.4.1933 c.fl., G. Samuelsson 3159 (S.); Jiftlik, 200 m, 10.4.1933 c.fl., et fr. E. Wall (S.).

Iran: Makran 11.12.1930 c.fl., S. A. Predteczenskij 233 (LE.); Baluchistan: Tangué Sarhe 24.3.1949 c.fl., Scharef 577 E (W.).

Discussion: The first to draw attention to this subspecies was E. Boissier (l.c.), who wrote in his remarks to *P. aphylla*: "Planta sub eodem nomine e montium Ssoturba Nubiae littoralis a. cl. Schweinfurth distributa specifice differt glabratiae, cymis laxifloris...". It was separated only in 1893 by J. Bornmüller under the variety name "*laxiflora*" (herbarium label), but it was never

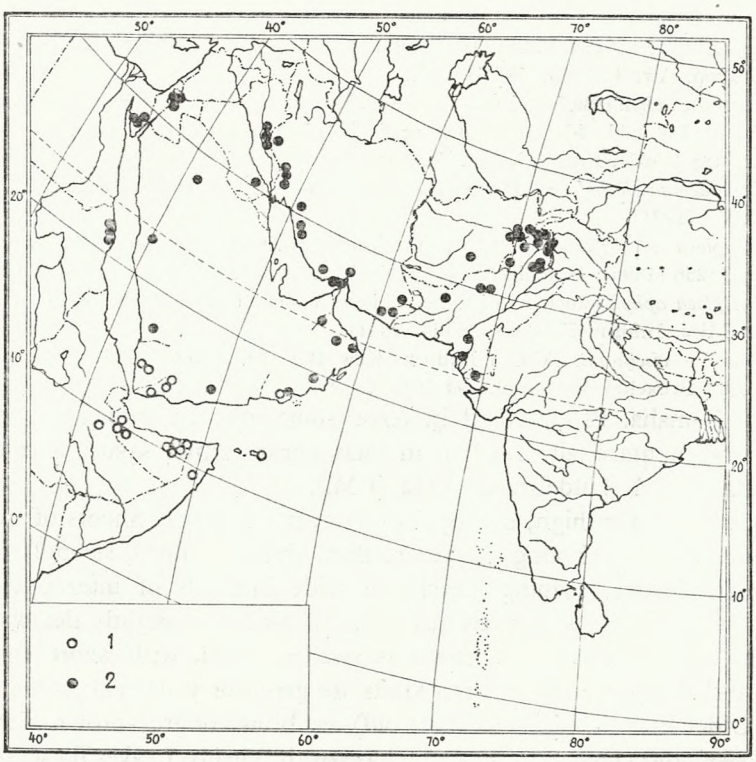

Fig. 22. Distribution of species of series *Aphyllae*: 1. *P. visciformis*, 2. *P. aphylla*

described by him. In 1941 Bornmüller (l.c.) mentions, true enough, a herbarium specimen thus defined in the "Iter Persico-turcicum", but there is no mention of the name "*laxiflora*" as if Bornmüller doubted its value. For the first time Bornmüller's variety was published by M. Drar in 1936 (l.c.); he gave the name to specimens of *P. aphylla* from south Sinai, as well as from Gebel Elba in Egypt, without, however, the Latin diagnosis.

As there is a considerable variability in the pubescence of *P. aphylla* ssp. *aphylla*, a right definition of ssp. *laxiflora* can be only achieved when inflorescence is taken into account. So it may well be that some of the herbarium specimens

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classed among the typical subspecies have been defined in a wrong way. Of other features that could be helpful in separating these two subspecies thickness and length of follicles should be considered. As specimens of the ssp. *laxiflora*, though few in number, show the follicles in this subspecies are longer and thinner than in the ssp. *aphylla*. But whether this is really so, only richer herbaria could supply an answer.

8. *Periploca visciformis* (Vatke) Schumann

In Engler, Prantl, Natürl. Pflanzenfam. 4, 2:216 (1895); Schwartz, Mitt. Inst. Allg. Bot. Hamburg 10:187 (1939).

Syn.: *Leptadenia visciformis* Vatke, Oesterr. Bot. Zeitschr. 26, 5:146 (1876); Brown in Thiselton-Dyer, Fl. Trop. Afr. 4, 1:433 (1903).

Socotora aphylla Balf. f., Proc. Roy. Soc. Edinb. 12:77 (1883):;Balfour f., Trans. Roy. Soc. Edinb. 31:159 tabl. 46 (1888); Balfour f., in H. O. Forbes, Nat. Hist. of Sokotra and Abd-el-Kuri 485 (1903); Engler, Veget. der Erde 9, 1:207 f. 179 (1910).

Leptadenia ephedriformis Desflers, Voyage au Yemen 166 (1899); Blatter, Rc. Bot. Surv. India 8, 3:300 (1921).

Periploca ephedriformis (Desfl.) Schweinfurth ex Desflers, Asclep. Arab. in Mem. Inst. Egyptien 3, 3:256 (1896); Hutchinson, Bruce, Bul. Misc. Inform. Kew no. 2:144 (1941).

Periploca aphylla auct. non Decne, Chiovenda, Fl. Somala 1:217 (1929); Hutchinson, Bruce, Bul. Misc. Inform. Kew no. 2:144 (1941).

Socotora visciformis (Vatke) Bullock, Kew Bul. 10, 2:266 (1955); Cufodontis, Bul. Jard. Bot. Etat Bruxelles 30, Suppl. 794 (1960).

Type: Somalia. Prope Meid in terra somalensi, in montium Ahl dictorum regione montana alt. 1200 m in locis apricis rimas saxorum calcarearum 4.1875 c.fr., J. M. Hildebrandt 1432 (BM.).

Shrub erect to 3 m high, usually, however, much lower. Shoots of two kinds: young and ripe ones. Young shoots are thin, almost filiform, strongly elongated (to 30 cm), slender, twining weakly, at wide intervals of internodes, mostly furnished with minute leaves, turned upwards and only slightly detached from the shoot. The other kind of shoots is swollen, rigid, with short internodes, often fascicled, quite leafless. Both kinds are green or yellowish green, slightly striated. Older branches (several years old), are brown or grey-brown with a thickkened (corky) and cracked bark, at the base of the shrub. Leaves on young shoots are linear, to 1,5 cm long and to 1.5 mm broad, acute at apex, sessile or with a very short petiole (1.5 mm), hard to distinguish from the blade, rather thick, with a clearly marked midrib beneath. Such leaves, it appears, fall off early, therefore they are missing on a number of thin shoots. Flowers solitary or 2—3, exceptionally 4—5, mainly terminal not so often lateral. Rachis considerably shortened, so that it looks as if all flowers were solitary, though near to one another. The flower 10—15 mm across. Pedicels 1—3 mm long. Bracts and bractlets membraneous, broadly ovate, obtuse, to 1 mm long, translucent on margin, glabrous. Calyx to 2 mm long, glabrous or with single hairs. Calyx teeth obtuse, rounded at apex. Corolla lobes glabrous on both surfaces, elongate-ovate, 5—6 mm long and about 2 mm broad, retuse at apex, or almost rounded,

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clearly two-coloured: marginal part is lighter, yellow or yellowish-green, the inner part darker, violet-brown or violet-red, distinctly swollen, standing out in the form of a gland-patch, about 3 mm long, copiously excreting a viscid substance. In the middle part of this patch there is an elongated, elliptic, white spot 1—1.5 mm long. Filiform parts of corona glabrous, 3—4 mm long. Follicles (3) 4—6(8) cm long and 3—4 (5) mm thick, almost evenly so throughout their whole length, narrowing slightly twoards the base and apex, delicately lengthwise striated, diverging at an angle 120°—180°. Seeds 3—3.5 mm long and 0.8—1 mm broad, black with a coma 1—1.5 cm long. Flowers and fruits all the year round (fig. 20-III, 21 *i-j*, 23, 24).

Distribution: South-west part of Arabian peninsula (Oman-Dhufar, Aden, Yemen), Socotra, Somalia and north-east Ethiopia. Occurs on rocky slopes, mainly calcareous, on sandy coasts of wadis, in exsposed insolated places, on edges of *Acacia* woods or in thickets of *Juniperus procera* from some ten meters a. s. l. up to 2300 m in mountains (fig. 22-1).

According to Edgell (insched.) the shrub contains some tanin components. A. A. Bullock (l.c.) notes after Gillett, that in some districts of Somalia *P. visciformis* is an important plant used for feeding camels.

8a. *Periploca visciformis* (Vatke) Schumann var. *visciformis*

Rami, juveniles praecipue, et folliculi pubescentes.
Distributio: *tantum ib montibus Somali.*
Shoots, especially the youngest ones, as well as follicles, pubescent.
Distribution: Only in Somalia Mountains.

Specimens examined:

Somalia: Denan, Al Hills, 10°55′ N, 48°55′ E, 3750′ (Common at Sugli, but not in flowers. Fairly common at Shimba Beris), c.fl., C. N. Collenette 331 (K.); Libah Helle mt., 500′, 3.12.1932, J. B. Gillett 4698 (F.); Gan Libah, Golis Range, 9.7.1945, Glover, Gilliland 1145 (BM.K.); Hill at Dunkasia, 5800′, on rocks, 22 miles NW of Borama, 4.10.1954 c.fl., Bally 9985 (G.K.); Surud, E. side Road from Eringavo to Mait, 30.7.1957 c.fl. et fr., Newbould 739 (K.); Golis Range, 5750′—6000′, 12.1909 c.fl. et fr., Drake—Brockmann 540, 556 (K.).

Discussion: *Periploca visciformis* has been classed among three different genera since its discovery. For the first time it was decsribed by Vatke (l.c.), as a species of the genus *Leptadenia*. He was not very sure, however, of his definition (flowers absent), and he placed a question mark at the generic name. He was the first to draw attention to the similarity of his species to *Periploca*. Desflers (l.c.), too, included it to the genus *Leptadenia*, but he gave it another name "*ephedriformis*". Independent of the two authors B. Balfour formed a new monotypic genus *Socotora* to this plant, on the grounds of material from Socotra, and classed it among the *Apocynaceae* family, tribus *Echitioideae*. As A. A. Bullock (l.c.) has recently shown this classification was due to a wrong interpretation of the complex flower structure. Bullock is, however, of the same opinion as Balfour as to the genus *Socotora* being independent and dif-

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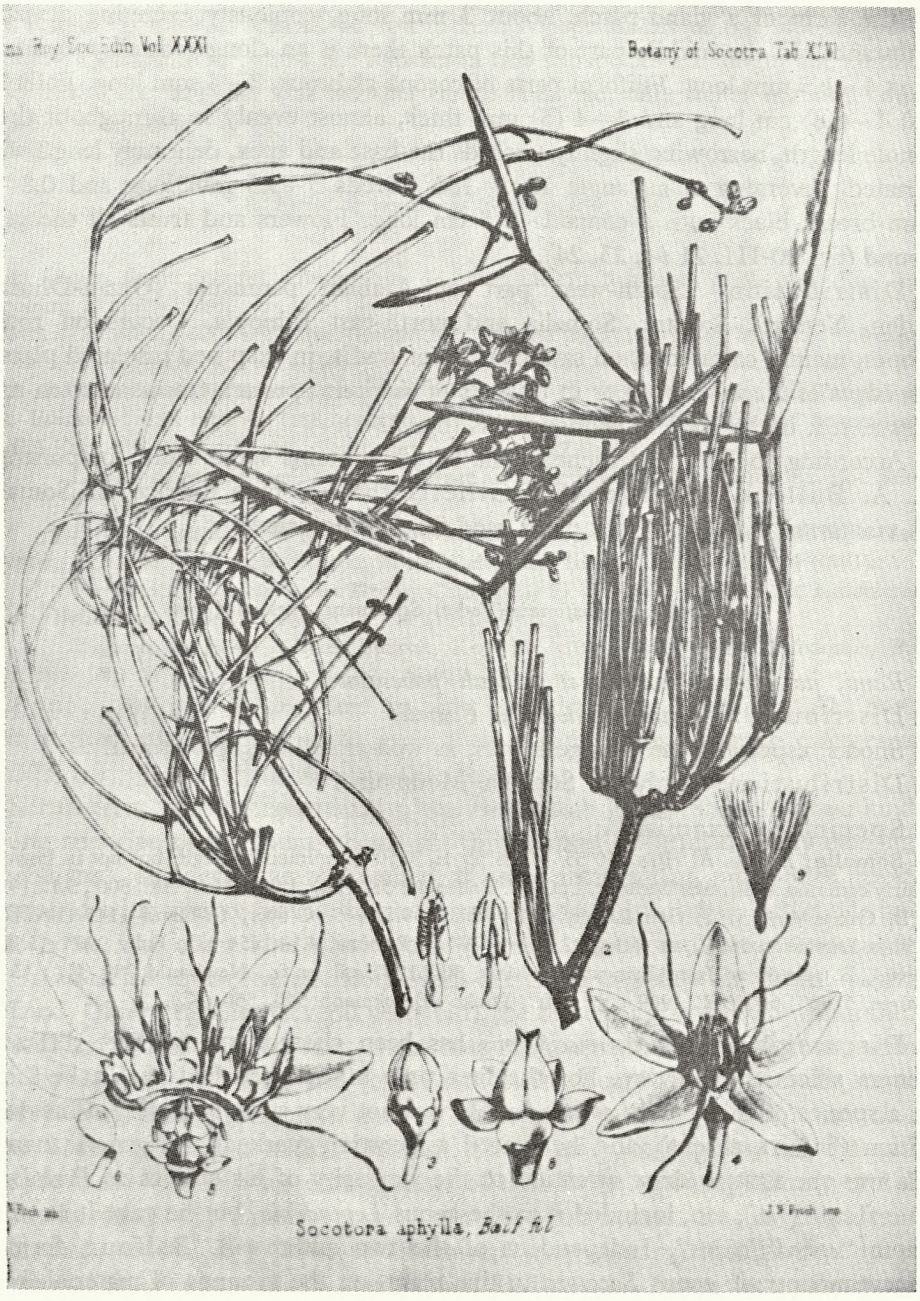

Fig. 23. Oldest illustration of *Periploca visciformis* (as *Socotora aphylla* — Balfour, Trans. Roy. Soc. Edinb. 1888)

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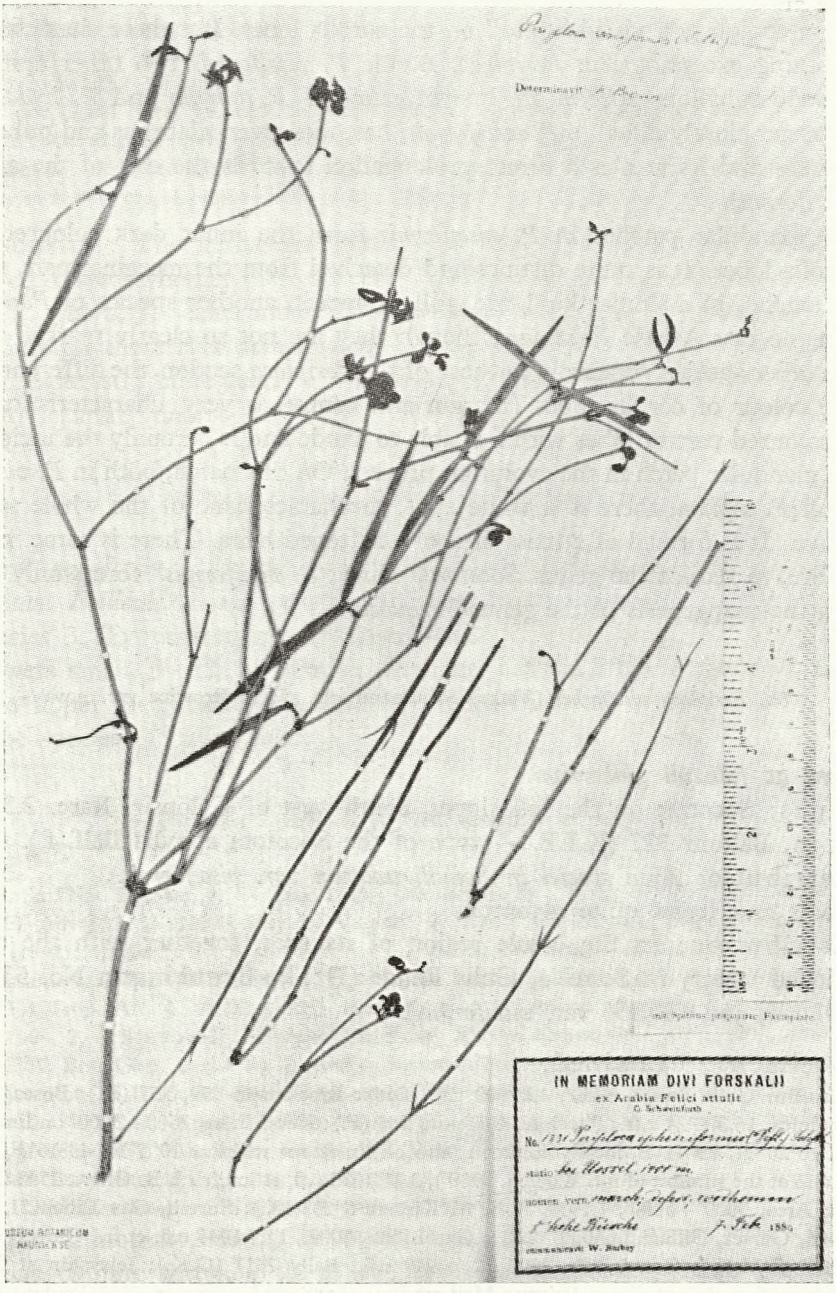

Phot. K. Jakusz

Fig. 24. *Periploca visciformis* — on thin, one-year-old shoots minute, narrow early deciduous leaves are visible (Botanical Museum, Copenhagen)

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fering, according to him, from the genus *Periploca* in its habit, "it is a completely aphyllous switchplant", and in the presence of "large red gland patches exuding copiously a viscid liquid" on the corolla lobes. But these characteristics are nothing exceptional in *Periploca*. Beside *P. visciformis* two other aphyllous or pseudo-aphyllous species are known, namely: *P. aphylla* and *P. hydaspidis*. The former closely allied to *P. visciformis*, has, moreover, glabrous and pubescent specimens and its area is a direct prolongation towards the east of the area of *P. visciformis*.

The glandular patches in *P. visciformis* form the inner dark coloured part of corolla lobes. It is quite distinct and detached from the marginal part. Glandular patches of a similar kind are still known in another species of *Periploca*, viz. in the east Asiatic *P. sepium*, though they are not so clearly marked there. In the other species, especially in those of the *Periploca* section, the differentiation of the colour of corolla lobes (margin and centre) is very characteristic. The dark coloured part of lobes within is able to exude and is certainly the incipience of the glandular patch in the evolution process. On this patch, both in *P. visciformis* and *P. sepium*, there is a white spot, so characteristic of the whole section *Periploca*. It is formed of a mass of short, flattened hairs. There is some reason therefore, to reduce the genus *Socotora*, while "*S. visciformis*" forms only a last link in the xerogenesis of the genus *Periploca*.

8b. *Periploca visciformis* (Vatke) Schumann var. *glabra* Browicz var. nova

Rami ac folliculi glaberrimi.

Typus: Socotra: on the hill slopes, south-west of Galonsir. Rare. 2.3.1880 c.fl.et fr., Balfour 327 (K.LE. — type of the Socotora aphylla Balf. f.).

Distributio: *Area speciei in Somali unacum var. visciformis.*

Shoots and fruits quite glabrous.

Distribution: In the whole region of its area, together with the above mentioned variety in Somalia, Golis Range (Drake-Brockmann No. 539,557 var. *glabra*, and 540,556 var. *visciformis*).

Specimens examined:

Somalia: Golis Range, 5750′, 12.1909 c.fl., Drake-Brockmann 539, 557 (K.); Boscagalia di Bur Budulca, 16.3.1924 c.fr., Puccioni, Stefanini 288 (F.); Kabri Bahr, 2500—3000′ on limestone slopes, 10°20′ N, 43°44′ E, locally common (also on limestone rocks at 10°5′ N, 43°16′ E, at ca. 4300′, also at the summit of mt. Wooleh, 5900′), 3.11.1932 c.fl. et juv.fr., J. B. Gillett 4548 (F.K.); Erigavo Area, 5000′—6000′, 1.1939, A. S. McKinnon S/237 (K.); Surudi, Gan Libah 21.1.1945 c.fl. et fr., Glover, Gilliland 660 (BM.K.); Gan Libah, 5000′, 11.7.1945 c.fl. et fr., Glover, Gailliland 1209 (BM.K.); Gan Libah, 4000′, 2.6.1949 c.fl., Bally 7311 (G.K.); Jelayshin at foot of final cliff on Surud 5 mls W. of Erigavo-Mait road, ca. 7000′, 29.5.1958 c.fr., S.B. Boaler 65 (K.); Mijjarten, 18 miles from El Gal on Durbo Rd., 27.9.1959, C. F. Hemming 1776 (K.); Mijjarten: Dabaga Pass, S. of Durbo, stony plateau and hills slopes, 6.11.1959 c.fr., C. F. Hemming 1804 (K.); Abassa headwaters, above 6000′, on top of limestone hills, 18.8.1953, M. White 188 (K.); Brit. East Africa: Ghadhela, 250′, limestone hills, 29.1.1953 c.fl., G. Popov 90 (BM.); British East Afr.: Ros Kattanahan, 100′, 18.2.1953, G. Popov 130 (BM.).

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Ethiopia: Yuka, Harar, on limestone slopes, 5600′, 9°27′ N, 41°40′ E, 10.3.1933 c.fl., J. B. Gillett 5456 (F.K.P.S.).

Aden Protectorate: on the hills at Aden, 1910, R. C. Edgell (K.); Wadi between Minwakh and Zamakh, sandy wadi bank, 1.6.1955, Hemming 536 (K.); Hadhramaut, West Road, Mile 40, amongst rocks, 25.6.1950 c.fl., K. M. Guichard 316 (BM.).

Yemen: Gebel Bura, 3.1.1889, G. Schweinfurth 310 (K.LE.); Bei Uossil, 1400 m, 7.2.1889 c.fl. et fr., G. Schweinfurth 1231 (BM.C.G.K.LE.WU.).

Oman: Dhufar, Jabal Quara, 27.10.1943 c.fl., Vesey-Fitzgerald 12740/2 (BM.); Dhufar, Wady Gizelot, rock cervices, 1.11.1943 c.fl. et fr., Vesey-Fitzgerald 12810/7 (BM.).

Discusion: The herbarium material is rather poor and more material is required to state whether there are any transitional forms between var. *visciformis* and var. *glabra*. It seems much more accurate, therefore, to maintain the rank of variety for these taxa than to treat them as subspecies. No other feature, but the characteristic pubescence of shoots and fruits, could be found that would help to separate them.

SECTION 2. *IMMACULATA* BROWICZ, SECT NOV.

Flores parvi, 5—12(14) mm in diam. Corollae laciniae supra macula alba destitutae. Folliculi teretes, per totam longitudinem aequicrassi.

Species 3. Typus sectionis: *P. linearifolia.*

Flowers small, 5—12 (14) mm in diameter. Corolla lobes without white spot on the upper face. Follicles cylindric, evenly thick all over.

Type species: *P. linearifolia.*

9. *Periploca linearifolia* R. Quartin-Dillon et A. Richard

Ann. Sci. Nat. Bot. ser. 2., 14:263 (1840); Decaisne in DC. Prodr. 8:498 (1844); A. Richard Tent. Fl. Abyss. 2:33 (1851); Engler, Abhandl. K. Akad. Wiss. Berlin, Phys.-Math. Cl., Abh 2:341 (1892); Engler, Pflwelt Ost-Afr. C:321 (1895); Schumann in Engler, Prantl, Natürl' Pflanzenfam. 4, 2:216 (1895); Engler, Bot. Jahrb. Engler 28:454 (1900); Brown in Thiselton--Dyer Fl. Trop. Afr. 4, 1:257 (1904); Schlechter in Mildbread Deutsche Zentr.-Afr.-Exped. 1907—1908, 2, 6:542 (1913); Battiscombe, Trees, Shrubs Kenya Col. 102 (1926); Schlechter, Notizbl. K. Bot. Gart. Berlin 9:24 (1927); Broun, Massey, Fl. Sudan 249 (1929); Chiovenda, Lav. Inst. Bot. R. Univ. Modena, Mem. 6:81 (1935); Hutchinson, Bruce, Bul. Misc. Inform. Kew no. 2:144 (1941); Andrews, Flow. Pl. Anglo-Egypt. Sudan 2:413 (1952); Täckholm, Stud. Fl. Egypt 180 (1956); Montasir, Hassib, III. Man. Fl. Egypt 1:350 (1956); Cufodontis, Bul. Jard. Bot. Etat, Bruxelles 30, Suppl. 694 (1960).

Syn.: *Periploca linearis* Hochstetter, Flora 24, 1,Intelligentblatt 2:25 (1841).

Type: Ethiopia: Adowa, 17.9.1939 c.fl., Quartin-Dillon et Petit (K.P.).

Strong twining shrub, to 20 m long, even longer. Young shoots green, thin, terete, slender and completely glabrous. Older shoots olive-brown or olive--grey, finally grey-brown. Leaves linear or lanceolate, acuminate, cuneate or slightly rounded at the base, to 9 cm long and to 10 (15) mm broad, mostly 5—6 cm long and 3—5 mm broad, dark green above, somewhat lighter beneath, glabrous on both sides, persistent. Midrib hollowed above, prominent below.

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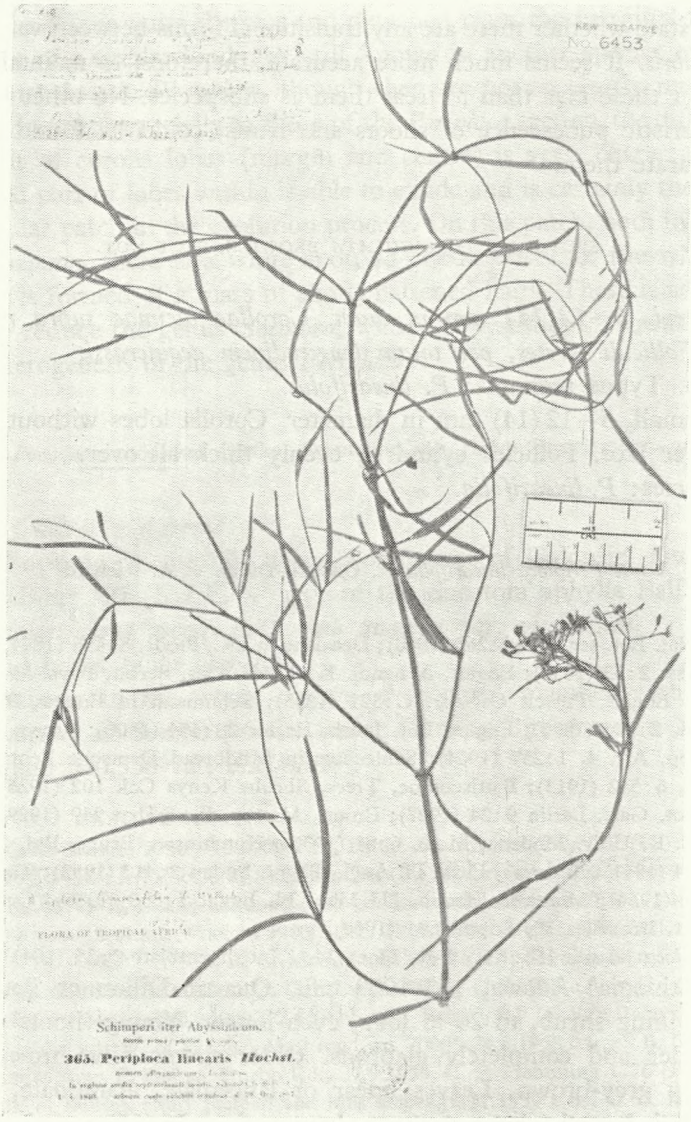
Lateral nerves visible on under side of lamina, yet only in young and broad leaves. Petioles thin, 2—5 mm long, glabrous. Inflorescences composed of manifold cymes, rarely simple, distinctly longer than leaves supporting them, spreading, pendulous, often having some scores of flowers (over 50 even). Rachis, pedicels, bracts, and bractlets, as well as calyx, quite glabrous. In composite inflorescences at the base of branched rachides there are minute leaves 1—2 cm long and 1—2 mm broad, which, most likely, fall off early. Bracts and bractlets membraneous, ovate, obtuse at apex, 0.5 — 1 mm long. Pedicels thin,



Phot. R. B. G. Kew

Fig. 25. *Periploca linearifolia* (Royal Botanic Gardens, Kew)

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to 5 mm long. Flowers 6—9 mm across. Calyx very small, to 1.5 mm long. Calyx teeth broadly ovate, rounded at apex. Corolla lobes more or less linear or narrowly ovate, 3—4 mm long and 1—1.5 mm broad, in full bloom convolute on margins, undersurface glabrous, greenish-yellow or creamy, on the upper surface purple or violet within, on margins white bearded and lighter coloured, at apex irregularly retuse or amlost rounded. Filiform parts of corona lobes puberulent, somewhat shorter than corolla lobes, twisted. Follicles straight, cylindric, evenly thick throughout their length, 6—12 (16) cm long and 4—5 mm thick, arranged horizontally, often turned toward the pedicel (at an angle

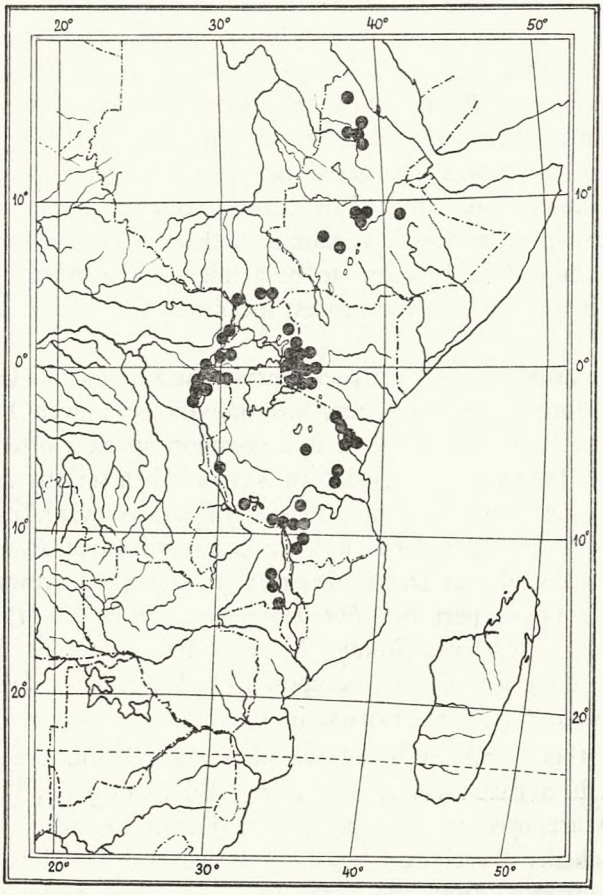

Fig. 26. Distribution of *Periploca linearifolia*

over 180°). Seeds black, flattened, 7—8 mm long and to 1.5 mm broad, with a coma to 3 cm long. Flowers and fruits all the year round (fig. 9—II, 21 *a—d*, 25).

Distribution: East Africa, from Ethiopia and south Sudan through Kenya, Uganda, Congo (Léopoldville) and Tanzania to central Malawi, between 980——2900 m a.s.l., most often between 1800—2300 m. *P. linearifolia* is also re-

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corded from southeast Egypt, from Gebel Elba (borderland with Sudan). For the first time recorded by M. Drar (Bull. Tech. Sci. Surv. Min. Agr. Egypt no. 149:9,1937) who wrote: "A small shrub with leafless whip-like drooping branches". The description does not agree with *P. linearifolia* and refers rather to *P. aphylla* known from these mountains. Drar's herbarium specimen from Gebel Elba (No 302, Herb. Stockholm), too, collected 1.2.1932 in its vegetative state (shoots and few leaves) clearly shows that it is not *P. linearifolia*. The shoots of this specimen are thick, cream-yellow, and their youngest parts and petiols are pubescent. Even Drar himself was not sure of his definition and he added "most probably" in brackets on the herbarium label beside the name *P. linearifolia*. From every indication it is a representative of the genus *Leptadenia* (fig. 26).

Nevertheless in 1956 both V. Täckholm (l c.) and A. M. Montasir and M. Hassib (l.c.) record *P. linearifolia* from Gebel Elba in their floras of Egypt, but giving a different morphologic description: climber with slender shoots, linear leaves, minute flowers gathered in loose spreading cymes and corolla lobes densely ciliated. This kind of description agrees, in fact, with *P. linearifolia*. In the herbarium material, I examined, there has been no specimen that would confirm these data. It seems to be a mistake the more that Gebel Elba is situated much further than the nearest localities of *P. linearifolia* in Ethiopia and Sudan.

P. linearifolia usually occurs on rocky substratum or on old lava, in low and clear savannah forests, in evergreen, sclerophyllic and even bamboo forests, mainly, however, on forest edges. It is a common species, often met on colonising grassland (Jackson, in sched.). In Kenya it is a serious danger to young plantations choking them by dense masses of shoots (Gardner, in sched.). J. B. Gillett (in sched.) records it from communities of *Podocarpus* forests. In Tanganyica according to D. M. Napper (in sched.) it grows in forests dominated in their upper part by: *Entadophragma*, *Euphorbia*, *Polyscais*, and in the lower one by: *Dombeya*, *Croton*, *Toddalia* and numerous lianas, while in Kenya it grows along forest edges composed of *Acacia lahai*, *Dombeya mastersii* and *Olea hochstetteri* (Geesteranus, in sched.).

The uses of this shrub at home are numerous. A mixture prepared from its milky juice is a galactogogue for cows (Battiscombe, l.c.). Young but ligneous shoots are used in Tanganyica and Kenya to make cords and ropes (Harley, in sched.; Battiscombe, l.c.), because their white phloem fibres can be easily separated from the bark. In Congo they make fishing nets out of such silky fibres (Germain, in. sched.).

9a. *Periploca linearifolia* Q. Dillon et A. Rich. var. *linearifolia*

Folia magna, ad 9 cm longa, ad 10/15 mm lata
Distributio: *Area speciei.*
Leaves large, to 9 cm long and 10 (15) mm broad.
Distribution: In the whole region of its area.

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Specimens examined:

Ethiopia: Scholada, c.fl., Quartin-Dillon et Petit (P.); Adowa et environs, 15—30.9.1841 c.fl., A. Petit 235 (P.); Abyssinia, c.fl., A. Richard (G.P.); ex Tigré v. Begemder, Amogai, 6000—8000′, 19.9. and 3.12.1862 c.fl. et fr., Schimper 226 (BM.E.K.WU.); In regione media septentrionali montes Scholada, 28.10.1837 c.fl., Schimper 365 (BM.BP.CGE.F.G.K.LE.P.W.WU.); Agrinia, Ambasea, 6000—7000′′, 8.10.1858 c.fl. et fr., Schimper 987 (CGE.K.LE.P.); Prope Intschatkab, 7. 1838 c.fr., Schimper 1332 (BM.CGE.F.G.K.LE.P.W.); In monte Scholada prope Axum, 6500—8000′, 7.10.1842 c.fl., Schimper 1857 (BM.F.G.JE.K.LE.P.S.W.); Shoa: Chakka Mountains, 5.1842, Roth 417 (K.); Bosco di Gaggi (Sletta), 2400 m., 5.4.1937 c.fl., G. Giordanus 358 (F.); Da Addis Abeba ad Sletta, 1937 c.fl., Senni 883 (F.); Mt. Damota, naer Soddu, 8—10000′, 11.1948, H. Scott 86 (K.); Timma, 12.8.1958 c.fl., I. E. Siegenthaler 49 (K.); Geldid, Podocarpus forest, 7600′, 6.3.1933 c.fl., J. B. Gillett 5391 (F.K.P.S.); Over bushes along Omonadda road, 48 km NE of Jimma, Kaffa Province, 1800 m, 21.1.1962 c.fl., F. G. Meyer 8071 (K.); Eritrea-Scimenzana, Altipiano di Gheleba, 2480 m, 22.9.1902 c.fl., A. Pappi 854 (F.G.); Eritrea — Scimenzana: Guna Guna m., 2200 m, 21.9.1902, A. Pappi 683 (F.); Choa, c.fl., Rochet d'Hericourt (P.); Presso Stola (?), 14.9.1937, A. Vatova 630 (F.); Zembien, veget., Solazzo (F.); Abyssinia c.fl., Drake-Brockmann 249 (K.).

Sudan: Mt. Baghanj: Imatong Mts., 6000—7000′, 13.6.1939 c.fl., T. W. Andrews 1884 (BM.K.); Gilo, Imatong Mountains, 1900 m, 3.6.1953 c.fl., J. K. Jackson (K); Kipia ,8700′, Imatong Mts., 28.7.1939 c.fl., J. G. Myers 11686 (K.); ?., 3000′, 4.1943 c.fl., Purseglove 1415 (K.).

Uganda: Kuwa, Kigezi 6000′, among old lava, 12.1938 c.fl., Chandler 2626 (K.); Kigezi Distr., 3 miles from Mushogiri along the path to Nakalembe, 6800′, 9.1.1933 c.fl., C. G. Rogers 313 (BM.K.); Kachwekano Tam, Kigezi, hill-side thicket, 6600′, 2.1950 c.fl., J. W. Purseglove 3234 (K.); Mpala, Kigezi, 5500′, savannah, 7.1939 c.fr., Purseglove 902 (K.); Kigezi, Kabale--Kisoro Road, 22.12.1957 c.fl., Napper 667 (K).; Nyakasura (?) Toro, 5500′, volcanic hillside in depression 4.5.1937 c.fl., Kafamba, Mbatia 6 (K.); Napak, Karamoja, 7300′, 6.1950 c.fl., W. J. Eggling 5927 (BM.K.); Bwamba Pass track, E. Ruwenzori, 6500′, 7.1940 c.fl., W. J. Eggling 4013 (K.); Behungi, Kigezi, 8000′, Forest zone, 22.12.1933 c.fl., A. S. Thomas 1163 (BM.K.).

Kenya: Mt. Margaret Estate, Kedong 6400′, 6.1940 c.fl., Bally 980 (K.); Kedong, Mt. Margaret Estate, 6400′, 7.1945 c.fl., A. Starzeński (KRA.); Kiambu Distr. Cathagi, in thicket over bush, 20.7.1952 c.fl., Krivka 225 (K.); Kiambu Distr., 20.7.1952, c.fl., A. Starzeński (KRA.); Rift Valley Escarpment, 5.1946 c.fl., A. Starzeński (KRA.); Lemuru, 7000′, 24.6.1918 c.fl., J. Dl. 640 (K.); Lemuru, 6000′, 6.7.1950 c.fl., Lugard (K.); Kitale, T. Nzoia, 6200′, 14.6.1955, Symes 88 (K.); SE Mt. Kenya: Native Reserve near Chugoria Mission, 6500′, 8.8.1949 c.fl., F. White 1106 (BM.); Kinango Escarpment, 6.1946, A. Starzeński (KRA.); North Kinango Escarpment, road near Naivasha (?), 1.7.1962 c.fl., T. A. Williams (K.); from Eldama, 4—5.3. 1898, A. Whyte (K.); NE Mt. Elgon, but has been on plains of Trans Nzoia, 7600′, 6.1949 c.fl. Tweedie 735 (K.); Kikuyu 7000′, 1931 c.fl., Dr. v. Sonaver (?) 1161 (K.); near Nanyuki 28.8. 1929 c.fl., A. B. Rendle 624 (BM.); Nandi, ab. 6000′, 3.1.1911 c.fl., H. Powell 4 (K.); Kiyabe Forest, 5.1962 c.fl., Qssent 684 (K.); Rift Valley Escarpment, near Kijabe, 6000′, 17.1.1960 c.fl., Polhill 178 (K.); Nairobi, 12.1909, ? (K.:); Plateau Kikuyu, 2000 m, 18.7.1911 c.fl., Mission Gronier-Le Petit (P.); Masailand, Narok Distr., Ndunyangerro aera, near Njura Settlement about 7 miles from Olulunga, ca. 7000′, 6.6.1961 c.fl., Glover, Gwynne, Samuel 1627 (K.); Nyanza Province, Londiani Distr., Tinderet Forest Reserve, Camp. 4, 2000 m, 29.6.1949 c.fl., R. A. Maas Geesteranus 5332 (G.K.S.); Nyanza Province, Londiani Distr., Tinderet Forest, Camp 1., 2260 m, 14.6.1949 c.fl., R. A. Maas Geesteranus 4921 (G.K.S.); Uplands, in rather drier part near eastern edge of Rift Valley Escarpment, 6.1934 c.fl., H. M. Gardner 3218 (K.); Nieri, pr. Forest station in fruticetis, 1.1.1922 c.fl., Rob. E. and Th. C. E. Fries 636 (BR.K.S.); Nieri, in silva, 21.12.1921 c.fl., Rob. E. and Th. C.E. Fries 213 (K.); Kikuyu, 8000′, 4.1930 c.fl., E. E.D. (K.); Kisumu, 29.11.1916, P. Davoli 24 (F.); Garita River, 6350′, 1.1940 c.fl., H. Copley B. 574 (K.); Mara River, 6200′, 1. 1940, H. Copley B. 612 (K.); Marakwet, 7800′, c.fl., Mrs.? 250 (K.); Nyeri Hill, 6000—6500′, 14.10.1907 c.fl., Battiscombe 79 (K.); Sotik, 6000′, common climber on forest edges, 13.6.1950 c.fl., Bally 7839 (K.); Sotik, Kibajet Estate, 6000′, 12.9.1949 c.fl.,

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Bally 7473 (K.); Endabarra, Mau forest, 31.12.1946, Bally 4996 (K.); Ngong Hills, 7300′, 9.7. 1939 c.fl., Bally 76 (BM.); D. O. Afrika, Bumbuli, 1250 m, 12.1902 c.fl., Meinkop 72 (LE.); Lemuru, 7000′, 24.6.1918 c.fl., J. D. Snowden 640 (BM.).

Congo (Léopoldville): Kamatembe, terr. Masisi, 29.4.1934 c.fl., G. de Witte 1577 (BR.P.);. Kibati, terr. Rutshuru, 17.1.1934 c.fl., G. de Witte 1298 (BR.P.); Nioka, terr Maghani, 11.1951 c.fl., Sperry et Taton 38 (BR.); Tshinka, province du Kivu, 3.1933 c.fl., Scaetta 1495 (BR.); Prov. Kivu, Territ. Lubero, Luofu, 1710 m, 31.8.1959 c.juv.fr., A. Léonard 5289 (BR.K.); Entre Kiugi (?) et Busogo, terr. Masisi, 11.1937 c.fl., J. Lebrun 8653 (BR.); Etre Sake et Lulenga (Kivu), 1980 m, 2.1932 c.fl., J. Lebrun 5037 (BR.K.); Montagnes au SW du Lac Edoudard, Cirque de Ganjo, 2000 m, 5—6.1929 c.fl., H. Humbert 8313 (P.); Plaines de laves entre les lacs Kivu et Edouard, 4—5.1929 c.fl., H. Humbert 7863 (BR.K.P.); Tshizimwhe, terr. Kabare, 19.11. 1940 c.fl., Hendrickx 1390 (BR.K.); Mulungu, terr. Kabare, 12.1940 c.fl., Hendrickx 1540 (BR.K.); Plaine de laves „Nyagisenyi" entre Kinamaharagi et le Nyaseke, 10.3.1945 c.fl. et fr., R. Germain 3664 (BR.); Volcan Rumoka, à ca. 1 km. du cratère, 1600 m, 6.1.1945 c.fl., R. Germain 3237 (BR.K.); Mont Adjo, terr. Djugu, 2400 m, 15.6.1957 c.fl., D. Froment 162 (BR.K.); Prov. Orientale, Terr. Djugu, Lekwa, Savanne au bordure de foret, 15.6.1959 c.fl., A. Devillé 487 (BR.K.); Tongo, terr. Rutshuru, plaine de lave, 25.9.1914 c.fl., Berquaert 5866 (BR.).

Tanzania: Südwestl. Tanganyika-Territorium: Matengo-Hochland. WSW von Songea. Buschgehölze oberhalb Ugano, 16—1700 m, 12.2.1936 c.fl., H. Zerny 424 (W.); Near the Forest Reserve Kwezinga, Lushoto District, 8.7.1950 c.fl., G.R. Williams 47 (K.); Fl. d. Kilimandscharo Marangu 1450 m, 5.1893 c.fl., G. Volkens 269 (BM.BR.E.JE.K.LE.WU.); Station Kyimbila, 1350 m, 9.1.1911 c.fl., A. Stolz 575 (BP.C.G.JE.K.O.PRC.S.W.); Station Kyimbila, 1350 m, 1913 c.fl., A. Stolz 2185 (BP.C.G.JE.PRC.S.W.); Distr. Lushoto, Lushoto Township, 24.6.1961 c.fl., S. R. Semsei 3235 (K.); Kilimandscharo: SO Seite, 1800 m, Gürtenwald (untere Grenze) Buschwald., 9.1.1934 c.fl., H. J. Schlieben 4506 (BM.BR.G.P.S.); Distr. Morogoro: Uluguru--Gebirge, W. Seite, 140 m, Savannenhügel, 16.2.1933 c.fl., H. J. Schlieben 3460 (BM.BR.G.K.P.); Stromgebiet des oberen Ruhudje, Landschaft Lupembe, nördlich des Flusses, 3.1931 c.fl., H. J. Schlieben 404 (BM.BR.G.K.P.S.); Ufipa District: Sumbawanga, Mbesi Forest, 2400 m, 13.3.1957 c.fl., H. M. Richards 8682 (K.); Ngwazi Lake, Mufindi, Southern Highlands Prov., 5500′, 7.1959 c.fl., J. Proctor 1267 (K.); Mbizi Forest, Ufipa District, ca. 7000—8000′. A mountain range on edge of the Rukwa Rift Escarpment, 21—26.11.1958, Napper 1088 (K.); At Nyandiduma Forest Reserve, Morogoro District, Eastern Province, 3.1955 c.fl., C. D. Mgara 17 (K.); Songea District, Matengo Hills, about 9,5 km N. of Miyau, 1.3.1956 c.fl., E. Milne-Redhead, P. Taylor 8777 (K.S.); Njombe, allover the place inside and outside edge of forest, 2.1.1932 c.fl., H. Lynes 92 (K.); Maramba, nr. Usambara 5500′, 28.1.1932 c.fl., (?) 213 (K.); Usambar: Hekoma 3.1893 c.fl., C. Holst 2573 (K.); Mpanda District: Kungwe-Mahali Peninsula, N. W. slope of Musenabantu, 5800′, 13.8.1959, R. M. Harley 9317 (K.); Lushoto District, Mkuzi, 4 miles NE of Lushoto, West Usambaras, 1600 m, 20.4.1933 c.fl., R. B.Drummond, J. H. Hemsley 2149 (F.K.S.); Lushoto Distr., common throughout the areas of the West Usambaras, Mkuzi, 5500′, 30.1.1962, P. J. Greenway 10476 (K.); Rungwe Distr., Undalis, common, 6500′, 25.2.1933 c.fl., R. M. Davies 850 (K.); Kondoa Distr., Kinyassi Mts. top, 7000′, 2.1.1928 c.fl., B. D. Burtt 1863 (K.); Kinyassi, 2.1.1928 c.fl., B. D. Burtt 991 (K.); Upper Kuona river, 6500′, 5.1938 c.fl., Marlunes (?) 457 (BM).

Malawi: Centr. Prov: Dedza Mt., 1830 m, 20.3.1955 c.fl., Exell, Mendonça, Wild 1072 (BM.); Distr. Dedza, among the numerous hills in Chongoni Forest, 10.1.1961, J. D. Chapman 1152 (K.); From the edge of a relic rain forest patch on Lwanjati Hill, Champila. Also seen Misulu, and other places in Vipya, 27.1.1956 c.fl., Chapman 275 (BM.); Chintembwe Mission, nr. Nichisi 1370 m, 22.2.1959 c.fl., Robson, Steele 1714 (BM.K.).

Discussion: A very characteristic species and easy to distinguish. The herbarium specimens, I have seen, represent a very level material of terminal parts of shoots with inflorescences. We can't take for certain the sizes of leaves given

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in the description of the species to be right. It may be that they refer only to the youngest shoots, while older ones from lower parts of the shrub may have different leaves, e.g. broader ones.

Judging by the annotations on herbarium labels the collectors disagree as to the sizes and lignification of shoots of this species. They write it is a herbaceous twiner, climber half ligneous, or climbing or scrambling shrub growing high above the crowns of trees, forming dense festoons of flowers and leaves. All this denotes that *P. linearifolia* is really a ligneous liane. That it may be so is made clear by (a few) thick and clearly ligneous parts of shoots found in the herbaria. Among the specimens at Kew there is one whose ligneous shoots are as thick as a finger of a grown-up person (R. M. Harley No 9317 from Tanganyika).

Such differences of opinion are also met when recording the colour of flowers; according to some collectors they are white, while others describe them as creamy, greenish or yellowish; only a few mention that the inner part of corolla lobes is purple or red. This opinion is probably caused by a rough observation of flowers, whose corolla lobes are really yellowish or creamy on the lower surface, while the white pubescence on the upper surface covers their whole surface many a time.

9b. *Periploca linearifolia* Q. Dillon et A. Rich. var. *gracilis* Browicz, var. nov.

Folia minora ac angustiora, vix 1.5—3 cm longa, 1—1.5 mm lata.
Typus: Sudan: Lado Yei River, 23.10.1919, F. Sillitoe 260 (K.).
Distributio: *tantum in parte Sudani australi.*
Leaves smaller and narrower, scarcely 1.5—3 cm long and 1—1.5 mm broad.
Distribution: Only in south Sudan as far, near the north limit of the area.

10. *Periploca calophylla* (Wight) Falconer

Proc. Linn. Soc. London 1:115 (1842); Falconer, Annals and Mag. Nat. Hist. 8:449 (1842); Decaisne in DC. Prodr. 8:498 (1844); Falconer, Trans. Linn. Soc. Bot. 19:56 (1845); Griffith, Notul. Pl. Asiat. 4:72 pl. 386A f. 8 (1854); Brandis, Forest Fl. N-W. and C. India 330 (1874); Hooker f., Fl. Brit. Ind. 4:12 (1883); Hemsley, Jour. Linn. Soc. London 26:101 (1889); Schumann in Engler, Prantl, Natürl. Pflanzenfam. 4, 2:216 (1895); Schlechter in Diels, Bot. Jahrb. Engler 29:541 (1900); Brandis, Indian Trees 467 (1906); Léveillé, Fl. Kouy-Tchéou 43 (1914); Léveillé, Catal. Pl. Yun-Nan 14 (1915); Schneider in Sargent, Pl. Wilson. 3:343 (1917); Chung, Mem. Scienc. Soc. China 1:221 (1924); Parker, Forest Fl. Punjab 343 (1924); Osmaston, Forest Fl. Kumaon 358 (1927); Cowan, Cowan, Trees N. Bengali 91 (1929); Tsiang, Sunyantsenia 2, 2:179 (1934); Handel-Mazzetti, Symb. Sinicae 7,4:992 (1936); Tsiang, Sunyantsenia 3,2—3:161 (1936); Kanjilal, Kanjilal, Fl. Assam 3:280 (1939); Tsiang, Sunyantsenia 4,1—2:98 (1939); Biswas, Indian Forest Rec. (bot.) 3,1:35 (1941); Tsiang in Fang, Icon. Pl. Omeiensium 2 no. 2 pl. 193 (1946); Duthie, Fl. Upper Gangetic Plain 1:497 (1960); Hundley, Chit Koko, Trees, Shrubs, Herbs and Princip. Climbers Burma 168 (1961).

Syn.: *Streptocaulon calophyllum* Wight, Contrib. Bot. India 65 (1834); Ill. Ind. Bot. 2:230 t. 182 f. 1. (1850).

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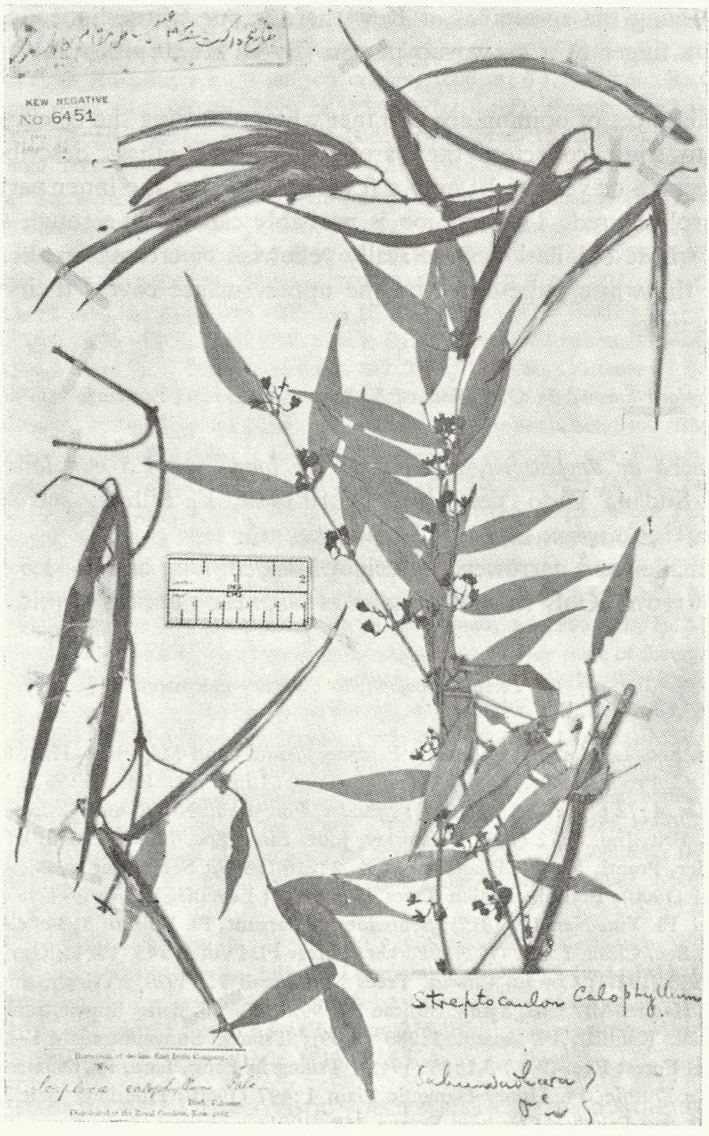
Type: India. Hab. passim in vallibus exterioribus montium Himalensium (as *Streptocaulon calophyllum* Wight.) c.fl. et fr., Herb. Falconer (K — holotypus? + C.Le.P.S.W. isotypus).

Shrub climbing to 10 (20?) m high. Young shoots thin, slender, light green, completely glabrous; older ones brown-reddish or brown, lustrous, with numerous minute lenticels, delicately scaling. Leaves subcoriaceous and persistent, lustrous and glabrous on both sides, dark green above, somewhat lighter below, (3) 4—9 (11) cm long and (4) 6—20 (25) mm broad, elliptic, elongate-elliptic,



Phot. R. B. G. Kew

Fig. 27. *Periploca calophylla* ssp. *calophylla* — type (Royal Botanic Gardens, Kew)

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ovate-lanceolate or lanceolate, broadest halfway down their length or slightly below, more or less acuminate, acute at base, somewhat convolute on margin. Midrib on upper side of lamina hollowed, on underside markedly prominent; lateral nerves numerous, subparallel, well visible. Petioles 1—3 mm long, glabrous. Inflorescences lateral, more rarely terminal, mostly shorter than leaves supporting them, solitary or 2—3 times branched cymes, with some or over ten flowers (exceptionally more flowers). Rachis, pedicels, bracts and bractlets as well as calyx quite glabrous. Pedicels filiform, 2—3 mm long. Bracts and bractlets membranous, ovate-lanceolate, 1—1.5 mm long. Calyx 2—2.5 mm long. Calyx teeth ovate. Flowers 8—14 mm across. Corolla lobes glabrous, greenish-yellow (?) beneath, dark purple above, lighter on margin, glabrate or more or less white pubescent along margins, 3—5 (6) mm long and 2—2.5 mm broad, ovate, rounded or incised at apex. Filiform corona lobes about 2 mm long, white pubescent or tomentose. Follicles arranged at acute angle (ca. 40—50°), 8—15 (20) cm long and about 5 mm thick, evenly thick throughout their length, straight or only slightly arcuate. Seeds black, to 18 mm long and to 3 mm broad with a coma to 4 cm long. Flowers and fruits all the year round (fig. 7-*a*—*b*).

Distribution: *P. calophylla* has a very elongated area west-east, beginning in Kashmir, through northern India, Nepal, Sikkim, Buthan to north Burma, south-west China (Tibet, Yunnan, Szechwan, Hupeh, Kansu, Kweichow, Kwangsi) and north Vietnam. It is met mainly in mountains to 3100 m a.s.l. (from 300 m), mostly, however, between 1000—2500 m. It grows in exposed places on rocks, among thickets and in forests, chiefly along river banks and streams. According to F. Kingdon-Ward (in sched.) "ascending to the tops of trees and hanging down in long festoons". The size of shrubs is not well known yet. In literature and on herbarium labels it is often noted that it is a weak shrub, scarcely 1—3 m high, but G. Forrest gives its height 10—30′, i.e. 3—9 m. Still larger sizes are given by W. P. Fang (in sched. No. 799), up to 20 m. It may be that the separate subspecies differ from one another in the power of growing, the height of shrubs may also depend on the place of occurrence — probably in the south of the area *P. calophylla* grows more abundantly (fig. 30).

10a. *Periploca calophylla* (Wight) Falconer ssp. *calophylla*

Leaves mostly elongate-elliptic or ovate-lanceolate, broadest in the half of their length, more rarely somewhat lower, 7—25 mm broad, mostly, however, 9—19 mm. The ratio of breadth to length ranges between 3—5.5. Inflorescences short, simple, more rarely branched, cymes. Corolla lobes more or less pubescent, sometimes glabrate. Corona lobes pubescent. (Ryc. 27, 31-I).

Distribution: Almost the whole area, mainly, however, in the west and north, exceptionally in the south.

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Specimens examined:

India: Mussooree, north slopes of range, 4500′, 31.8.1944 c.fr., R. R. Stewart 21341 (K.RAW.); Punjab: Kalel, Chamba, 5000′, 21.6.1917 ,R. R. Stewart 2333 (K.); N. W. India c.fl., Royle (K.LE.); Khela 4.1881, F. B. J. (E.); Rudar Nath, Garhwal, 26.10.1938 c.fr., Kerah Ram 9000, (E.); Indes Orientales, c.fl., Jacquemont 419 (P.); Darjeeling, 5000′, 10.1876 c.fr., Herb. Gamble 719A (K.); Kumaon, below Naini Tal, 4500′, c.fl., Strachey, Winterbottom (BM.K.P.); Kumaon, Amparau, 3500′, 2.8.1913 c.fr., N. Gill 643 (CAL.); Assam c.fl., Dr. King (E.F.G.K.LE.P.W.WU.); Assam, below Chatan, 5500′, 9.9.1914 c.fr., U. Kanjilal 4441 (CAL.); East Bengal, c.fl., Herb. Griffith 3750 (C.K.LE.P.S.W.); Khasya Hills, c.fl., Simon 51 (K.LE.); Hab. Mont Khasia, alt. 4—6000′, 1850 c.fl. et fr., Hooker, Thomson (BM.C.CGE.E.F.G.K.LE.O.P.S.W.); Assam: Forest Flora of Siwalik and Jausnar Division, Selaqui, 14.4· c.fl., 3.11.1922 c.fr., Shiv Das Mengi 84 (P.); North-West Himalaya, c.fl., McKinnon (CAL.); Above Bheemtall (?) 3—5000′, c.fl., Major Madden 414 (E.K.); Himalaya, Massuri c.fl., Hügel (W.); Himalaya, alt. 3—4000′ c.fr.,? (K.); Delei valley, 2000′, 28° 5′ N, 96° 30′ E, 21.3.1928 c.fl., Kingdon-Ward 7985 (K.).

Nepal: Nepal c.fl., Wight (K.); Nepal c.fl. et fr., Wallisch 8252 (BM.CGE.E.F.G.K.LE.P.); Nepal, 1821 c.fl., Wallisch (G.K.); Kabre, Kali Gandahi Valley 6500′, 31.5.1954 c.fr., Stainton, Sykes, Williams 5483 (BM.E.).

Sikkim: Sikkim, Regio temp. 6000′, c.fl. et fr., Hooker, Thomson (BM.C.CGE.F.K.P.S.W.); Sikkim, 3000′, 10.6.1874 c.fr., G. King 841 (K.).

Bhutan: Br. Bhutan, near Kalimpong 4500′, 3.1875 c.fl., Herb. Gamble 3229B (K.).

China: Southern Kansu: beyond Pikou on bank of Wen hsien ho, 4. 1925 c.fl., Rock 12080 (LE.P.W.); Szechuan: Lo shan Hsien, 1000 m, 22.8.1931 c.fr., Wang 23565 (P.); Western Szechuan, along Fu Kiang, on rocky cliffs and grassy banks, 4.1925 c.fl., Rock 12036 (E.K.S.); Su-tchuen oriental, district de Tchen-Kéou-tin, c.fl. et fr., R. P. Farges 1025 (P.); Szechuan: Omei-shan, 13.7.1930 c.fr., Fang 7460 (K.); Mount Omei, Szechuan, 4000′, 1887 c.fr., E. Faber (K.); Szechuan, Pao-hsing-hsien 1800 m, 24.8.1936 c.fr., K. L. Chu 3646 (E.); Szechuan, Kuan--hsien 28.2.1927 c.fr., S. S. Chien 5841 (E.); Szechuan, Kuan-hsien, 10.4.1937 c.fl., S. S. Chien 5723 (E.); Szechuan, Nanch'uan: Huang ts'ao ping, 28.7.1891 c.fr., C. Bock, A. v. Rosthorn 108 (O.); Kweichow: Pin-fa, 5.4.1904 c.fl., Cavalerie 1745 (E.K.W.); Mt. Omei 11.1904 c.fr., E. H. Wilson 4094 (K.); Western China, 4—5000′, 8.1903 c.fl. et fr., E. H. Wilson 4097 (K.); Western Hupeh, North and south of Ichang, thickets, common, alt. 3—600 m, 5.7.1907 c.fl. et fr., E. H. Wilson 1942 (BM.E.K.); Hupeh c.fr., E. H. Wilson 565 (E.K.W.); Hupeh, S. Wu-shan, 4.1901 c.fl., E. H. Wilson (K.); Hupeh, Ichang and immediate neighbourhood, 5.1887 c.fl., 10.1887 c.fr., Henry, 3419, 3419c (BM.E.K.LE.P.); Ichang, Prov. Hupeh, c.fr., Henry 4119 (BM.E.P.); Prov. Hupeh, c.fr., Henry 7711A (K.); Yünnan, Beyendjing, in rupibus prope Djin-schuidji, 23.3.1919 c.fl., Ten 43 (C.WU.); Yunnan, Muli, Guhtzun, 3100 m, upon thickets, common, 4.12.1937 c.fr., T.T. Yü 14823 (E.); Yun-nan, environs de Lou han, 16.3.1906 c.fl., F. Doucloux 3442 (P.); Tybet, Dirang Dz., 5250′, A common climber in thickets and forest 23.5. 1934 c.fr., Kingdon-Ward 11504 (BM.); Tschili, Peking, 1925 c.fl., S. S. Chien 135 — cult. (W.).

10b. *Periploca calophylla* (Wight) Falconer ssp. forrestii (Schlechter) Browicz, comb. nov.

Syn.: Periploca forrestii Schlechter, Notes Roy. Bot. Gard. Edin. 8:15 (1913); Diels, Notes Roy. Bot. Gard. Edin. (Pl. Chinen. Forrestianae) 7 (1912) nomen; Léveillé, Catal. Pl. Yun-Nan 14 (1915); Tsiang, Sunyantsenia 2,2:180 (1934); Handel-Mazzetti, Symb. Sin. 7,4:992 (1936); Tsiang, Sunyantsenia 3,2—3:161 (1936); Tsiang, Sunyantsenia 4,1—2:98 (1939).

Type: China: Thickets on hills west of Yunnanfu. Elevation 8000′, 7.1903 c.fl., G. Forrest 572 (E. holo. + P. iso.).

Leaves ovate-lanceolate or lanceolate, broadest in the lower half of their length, with a strongly elongated, narrow and sharp apex, 4—14 mm broad,

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usually 5—12 mm. Ratio of breadth to length 5.5—8.5. Cymes simple or branched. Corolla lobes glabrous or slightly pubescent. Corona lobes puberulent or pubescent (fig. 28, 31-III).

Distribution: Western and southern part of area, rarely in the north.

Specimens examined:

India: South-eastern Tibet, Mönyul Province: Pangchen-Shakti; Nyam Jang Chu, 7000′, 27° 38′ N, 91° 46′ E, 3.11.1938 c.fl. et fr., Ludlow, Sheriff, Taylor 7047 (BM.); Mönyul Province: Shakti; Nyam Jang Chu 6000′, 14.11.1938 c.fl., Ludlow, Sheriff, Taylor (BM.E.); Khasya, 1844 c.fl., Lehmann 161 (K.); Khasya c.fl., et fr., Griffith 161 (CGE.W.); Khasya, Mumbree, 9.11. 1825 c.fl. et fr., Griffith 936 (K.) Mairung, 4500′, Khasia, 31.10. 1871 c.fl., C. B. Clarke 1663g (BM.F.LE.); North-Western Himalayas, Waterfalls below Simla, 4500′, 2.3.1890 c.fl., G. Watt 10029 (E.); N. W. India, J. L. Stewart (E.); Siwalik and Jausnar Divisions: Kalsi, 4.4.1922 c.fl., 20.10.1922 c.fr., Harnam Singh 100 (G.); Chamba State, Mamul to Dalhousie 4—5000′, 12.4.1887 c.fl., J. H. Lace 1524 (E.); Jausnar N.—W. Provinces, in hot-ravines generally below 4000′, 5.1890, Keshava Nand 150 (E.); Chamba, between Rakh and Chitrari, 4—6000′, 9.9.1896, Gammie 18558 A(K.); Malbot (?), 4500′, 2.1895 Gamble, 25320 (K.); Punjab: Kulu--Lahaul, near Chamni 27.6.1888, Drummond 22926 (K.); in saxosis ad clives apricis c. 2000′, versus Snidhára in regio Chamba, 8.1880, Drummond 819 (K.); Poonch, Azad Kashmir, Sirar near Hajira (?), 13.12.1952, Rashid, Nasir, Stewart (RAW.).

Nepal: Kabre, N. of Dana 5000′, 25.5.1954 c.fr., Stainton, Sykes, Williams 651 (BM.G.); Nr. Bhartha, Tila Valley 5500′, 21.4.1952 c.fl.. Polunin. Sykes, Williams 1935 (BM.E.).

Burma: Distr. Mandalay, hab. Maymyo plateau, 3600′, 8.1913, A. E. English 31 (K.); North Burma: Sumpra Bum 4000′. In jungle, c.fl., Kingdon-Ward 20571 (BM.).

China: Yunnan: Chengkang, Snow Range, 2500′, upon thicket, common, 22.7.1938 c.fr., T. T. Yü 16890 (E.); Yunnan: Shunning, Hila, 1700 m, upon thicket, common, 21.6.1938 c.fr., T. T. Yü 16382 (E.); Yunnan: circa Pe Yen Tsin, San-y-tsen, in occidente Pintchoan, 18.4 1917 c.fl., Ten 366 (E.); Yunnan: lecta ex Thoan in Tsin (Yunpe) 28.3.1920 c.fl., Ten 226 (E.); Yunnan, circa Pe yen Tsin, silvis Pa-Song Pin 26.3.1916 c.fl., Ten 100 (E.); Yünnan, Beyendjing 26.3.1916, Ten 68 (WU.); Yunnan: ad ripas lacu. Can-chu, 1700 m, 25.7.1957, N. Stojanov (SOM.); Yunnan: vicinity of Yun-nan-sen, c.fl. E. E. Maire 1136 (BM.E.) and 211 (E.); Yunnan: Mouy-kou, 500 m, 1912 c.fl., E. E. Maire 204 (E.); Yunnan, brousse de collines à Mouy-Kou, 900 m, 1913 c.fl., E. E. Maire 412 (BM.E.LE.); Long-Ka, 6.1904 c.fr., J. Cavalerie 2077 (E.); Pin-fa, 25.6.1905 c.fr., J. Cavalerie 1985 (E.); Yunnan, Lichiang Range, Sung Kuei, grows on the middle part of the mountain, 1933 c.fr., McLaren 299 (BM.E.); Yunnan, Lichiang Range, Tali. Grows in the middle part of San Yang Mt., 1933 c.fl., McLaren 81 (BM.E.K.); Yunnan, Mengzi 5000′, Henry 9130 (E.LE.); Yünnan, In monte Hsi-schan prope urbem Yünnanfu, in regione callide temperate, rupibus ad templa, substr. calcareo, 2250 m, 1.3.1914 c.fl., Handel--Mazzetti 358 (F.P.W.WU.); Yunnan, Tali Range, 9.9.1929 c. fr., Forrest 28182 (E.); Yunnan, on scrub on dry hillsides in the Mekong Valley near Tu-wo, 99° 25′ E, 26° 19′ N, 8000′, 4.1924 c.fl., Forrest 25469 (BM.E.K.); Yunnan. On scrub in the thickets by streams on the hills north of Yungpeh 26° 40′ N, 100° 45′ E, 8000′, 3.1922 c.fl., Forrest 21138 (E.K.P.W.); Yunnan: In thickets by stream in the Wei-Hsi Valley, 7—8000′, 27° 18′ N, 99° 12′ E, 10.1921 c. fr., Forrest 20790 (E.K.P.); Yunnan: On rocks in open situation, on hills around Tengyueh 25° N, 6—7000′, 12.1912 c.fl., Forrest 9384 (E.K.S.); Yunnan: Yu-nan-sen. Buissons dans les vallons du Tchong chan 17.3.1904 c.fl., Ducloux 174 (E.); Yunnan: Environs de Yun-nan-sen, 29.1.1897 c.fl., Ducloux 43 (E.); Szechuan: Nanchuan Hsien, grassy field, 5000—6000′, 16.5.1928, Fang 799 (E.K.P.); Szechuan: Kuan-hsien, under forest, 7.4.1938 c.fl., Fang 12102 (BM.W.); Szechuan: Kuan-hsien, in forests 8.4.1938, Fang 12135 (W.); S. Kweichow: Loh-chu, in dense mixed woods, 20.10.1930, Y. Tsiang 7430 (W.); Province du Kouy-Tcheou, district de Tsin-gay, vallée de Kia-la-tchong 21.12.1897 c.fl. et fr., E. Bodinier 2022 (E.).

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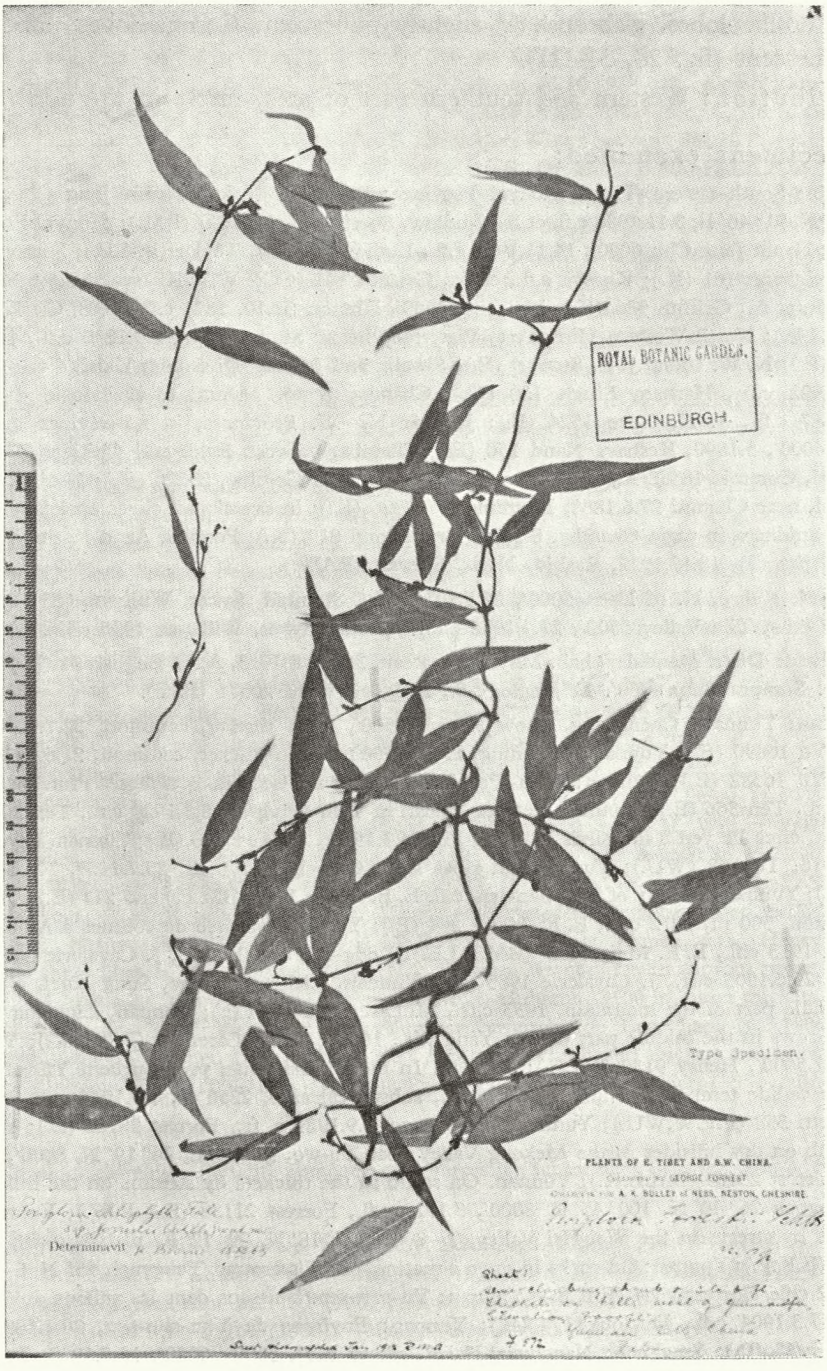

Phot. R. B. G. Edinburgh

Fig. 28. *Periploca calophylla* ssp. *forrestii* — type (Royal Botanic Garden, Edinburgh)

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10c. *Periploca calophylla* (Wight) Falconer ssp. *floribunda* (Tsiang) Browicz, comb. nov.

Syn.: *Periploca floribunda* Tsiang, Sunyantsenia 2,2:180 pl. 33 (1934).

Type: China: Scandent shrub of 20—30 ft., forming matted masses on scrub in open situations by streams on the hills north of Tengyueh 6000′, 10.1924 c.fl., G. Forrest 25318 (BM.E.K.S.).

Leaves broadest in half of their length, elliptic or even broadly elliptic, 7—25 mm broad, mostly 12—19 mm. Ratio of breadth to length 2.5—4.5. Cymes

Phot. R. B. G. Kew

Fig. 29. *Periploca calophylla* ssp. *floribunda* — type (Royal Botanic Gardens, Kew)

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many flowered, branched several times. Flowers small, 8—10 mm in diameter. Corolla lobes always distinctly pubescent. Corona lobes with a dense, slightly squarrose pubescence (fig. 29, 31-II).

Distribution: South-east part of area: China (Yunnan), Burma and Vietnam.

Specimens examined:

Burma: Maymyo Plateau, alt. 3500′, near Wetwun Water 3000′, 30.1.1914 c.fl., A. E. English 26 (E.); Maymyo 3500′, 2.1914 c.fl., A. E. English (E.); near Kang-fang 1800 m, hanging over cliffs in evergreen forests, 11.12.1938 c.fl., Kingdon-Ward 98 (BM.).

Vietnam: Route de Chapa à la Garderie de Lo Zui Ho, vers 1600 m, 9.1929 c.fl., M. Pételot (P.); Environs de Chapa, vers 1300 m, 8.1931 c.fr., M. Pételot (P.); Environs de Sa-Pa, 1650 m, savanna, 28.10.1963 c.fl. et fr., T. Przybylski 170 (KOR.); Environs de Sa-Pa, 31.10.1963, T. Przybylski 246 (KOR.); Environs de Sa-Pa, avec Hydrangea sp., 12.11.1963 c.fl., T. Przybylski 376 (KOR.).

China: On scrub and trees. Hills to the north of Tengyueh 7000′, 5.1912 c.fr., Forrest 7713 (E.K.); Yunnan. On scrub in open situations in the Minkwong valley 4000′, 11.1912 c.fl., Forrest 9213 (E.K.); On rocks in open situations on hills arround Tengyueh 6—7000′, 12.1912 c.fr., Forrest 9440 (E.K.); Yunnan; 8.1917 c.fl., Forrest 16048 (E.K.); Yunnan: Shweli-Salween

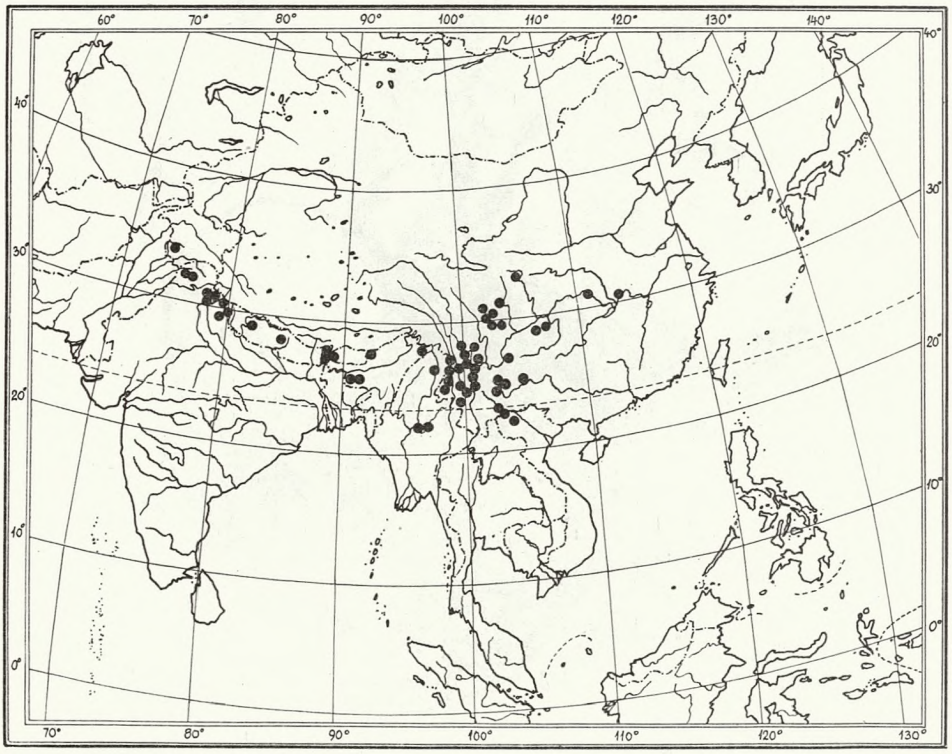

Fig. 30. Distribution of *Periploca calophylla*

divide, lat. 25° 40′ N, alt. 6000—7000′, on rocks and amongst scrub, 10.1919 c.fl., Forrest 18557 (BM.E.K.W.); On scrub and rock, on dry slopes on the Shweli-Salween divide 8000′, 6.1924 c.fr., Forrest 24430 (BM.E.); On scrub by streams and in thickets on the Shweli-Salween divide 7000—8000′, 24° 45′ N, 98° 58′ E, 9.1924 c.fl., Forrest 25245 (E.K.); Prov. Yünnan bor. occid.

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In regione calide temperate ad austro-orient. pagi Dschungdien („Chungtien"), dumetis circa vicas Meidsping et Losiwan copiose, substr. schistaceo 2000—2500 m, 21.4.1915 c.fr., Handel-Mazzetti 5646 (E.W.WU.); Yunnan, Mengzi forest, 5500′, c.fl., A. Henry 11311 (E.K.LE.); Mengzi, 5000′, c.fr. Henry 10311 A (E.); Yunnan, between the Chungtien river and the Yangtze, northwest of the Likiang Snow Range, 7.1923 c.fr., Rock 9792 (E.); Yunnan: Mienning, Taheching 2300 m, common, upon thicket 30.9.1938, T. T. Yü 17803 (E.); Yunnan, Kiukiang Valley (Taron), Muchietu 1600 m, upon woody, casual, 9.11.1938 c.fl., T. T. Yü 21011 (E.); Taron gorge 6000′, 27.10.1922 c.fl. et fr., Kingdon-Ward (E.); Salwin Valley, Sekai 1600 m, upon woods, casual 21.9.1938 c.fr., T. T. Yü 23058 (E.); Yunnan, Salwin Valley, Sekai, bank of river, upon forest 1700 m, 16.11.1938 c.fl., T. T. Yü 22990 (E.).

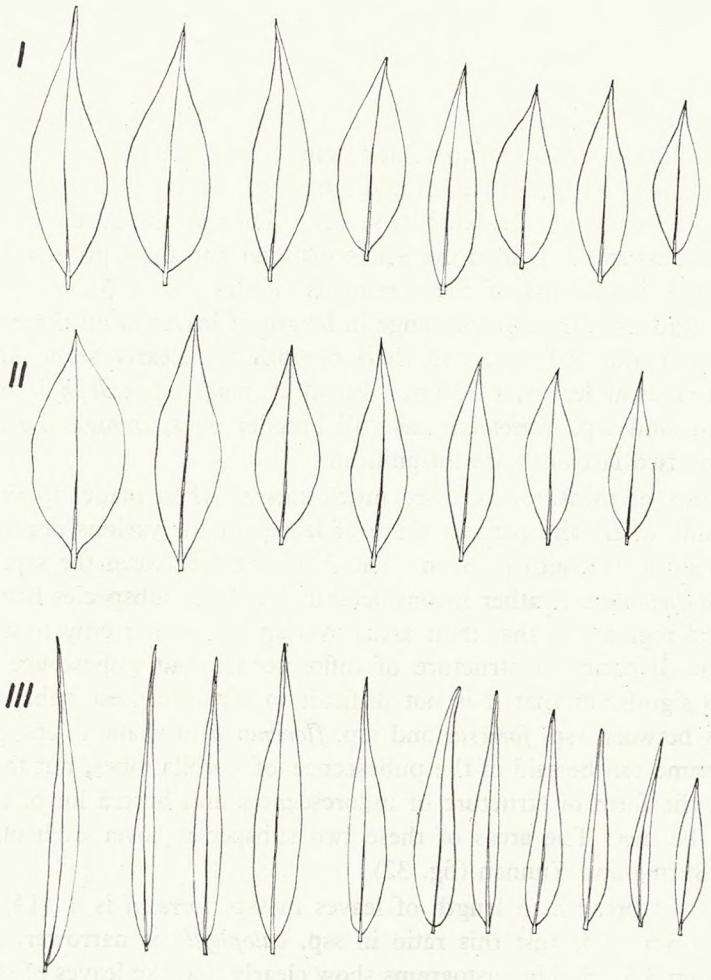

Fig. 31. Variability of leaves of *P. calophylla*: I. ssp. *calophylla*, II. ssp. *floribunda*, III. ssp. *forrestii* (less. 3×)

Discussion: *Periploca calophylla* is an exceptionally variable species. The variability is met in a number of characters, but most of all in the shape and size of leaves, in the size of flowers, degree of pubescence of corolla and corona

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lobes, as well as in the structure of inflorescences (simple and branched cymes). Therefore some species closely allied to *P. calophylla* have been distinguished: *P. forrestii* and *P. floribunda*. Provided with a rich herbarium material (over 260 sheets), and especially with material from China, and analysing it thoroughly on account of the characters cited above, I have come to the conclusion that these two taxa must be abandoned and that there is between them and *P. calophylla* a number of transitional forms whose classification is very difficult. Some of the examined features show that the given specimen belongs to the one species, while others it being near to the other. A great many of such transitional forms can be found in south China, in Yunnan, where the areas of the three taxa cross. In connetion with this I thought it right to reduce *P. forrestii* and *P. floribunda* to subspecific rank.

In the analysis of herbarium material I paid special attention to the shape of leaves, and in order to find to what extent it can be helpful in separating any subspecies I measured the breadth and length of leaves, 10 leaves of each well preserved specimen and calculated these sizes. Then on the grounds of the other morphologic features I divided the whole material into three groups (subspecies) and tabulated the results of measurements (tables 4 and 5).

It was found that, though the range in length of leaves of all three subspecies is considerable the differences in their breadth are clearly seen. And so ssp. *forrestii* has narrow leaves, 7—10 mm broad at most, ssp. *calophylla* most often 11—15 mm, and ssp. *floribunda* has still broader ones, though the differences between the two last ones are insignificant.

The results of measurements are much clearer when made up in the form of histograms where the percent share of leaves in the various degrees of ratio of their breadth to length is given. The differences between the ssp. *calophylla* and ssp. *floribunda* are rather inconsiderable, but both subspecies have different geographical regions, so that their areas overlap each other only to a very little extent. The disparity in structure of inflorescence and pubescence of corona lobes is so significant that it is not difficult to separate these subspecies. The differences between ssp. *forrestii* and ssp. *floribunda* in shape of leaves are very clear, the same can be said of the pubescence of corolla lobes, but they become blurred in the form of structure of inflorescences and here a lot of transitional forms can be met. The areas of these two subspecies cover each other in the region of Burma and Yunnan (fig. 32).

The ratio of breadth to length of leaves in ssp. *forrestii* is 4—14, the maximum being 5.5—8.5. Just this ratio in ssp. *calophylla* is narrower, 2—8, with the maximum 3.5—5. The histograms show clearly that the leaves of ssp. *forrestii* compared with those of ssp. *calophylla* tend to be slender (long and narrow). The partly likeness of histograms will be better understood when we remember the fact that the areas of these subspecies overlap.

R. Schlechter (l.c.) who described *P. forrestii* as an independent species drew attention to two of its characters: glabrous corolla lobes and small size of flowers. Both characters are greatly variable and, despite what Schlechter

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Table 4

P. calophylla	Number of leaves	Length of leaves in mm														
		30—35	35—40	40—45	45—50	50—55	55—60	60—65	65—70	70—75	75—80	80—85	85—90	90—95	95—100	100→
ssp. *floribunda*	350	—	2	29	49	63	63	59	55	25	16	6	—	—	—	—
ssp. *calophylla*	660	1	19	52	93	118	111	105	85	56	16	4	—	—	—	—
ssp. *forrestii*	600	1	2	29	79	135	78	85	59	41	27	34	12	11	6	1

Table 5

P. calophylla	Number of leaves	Width of leaves in mm																								
		4—5	5—6	6—7	7—8	8—9	9—10	10—11	11—12	12—13	13—14	14—15	15—16	16—17	17—18	18—19	19—20	20—21	21—22	22—23	23—24	24—25	25→
ssp. *floribunda*	350	—	—	—	5	4	13	15	19	35	43	45	41	34	14	28	18	12	9	10	2	2	2
ssp. *calophylla*	660	—	—	—	7	20	56	47	71	74	67	84	57	55	38	34	19	12	7	2	3	4	3
ssp. *forrestii*	600	17	36	68	115	111	94	69	61	25	4	—	—	—	—	—	—	—	—	—	—	—	—

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writes, flowers with glabrous corolla lobes are mostly large. Handel-Mazzetti (l.c.) gave attention to it; he assumed that *P. forrestii* as species must be abandoned. Another important character, neglected by Schlechter, is the size of leaves which as said above may be very helpful in distinguishing subspecies. All that is obscure in Schlechter's diagnosis of *P. forrestii* seems to be due

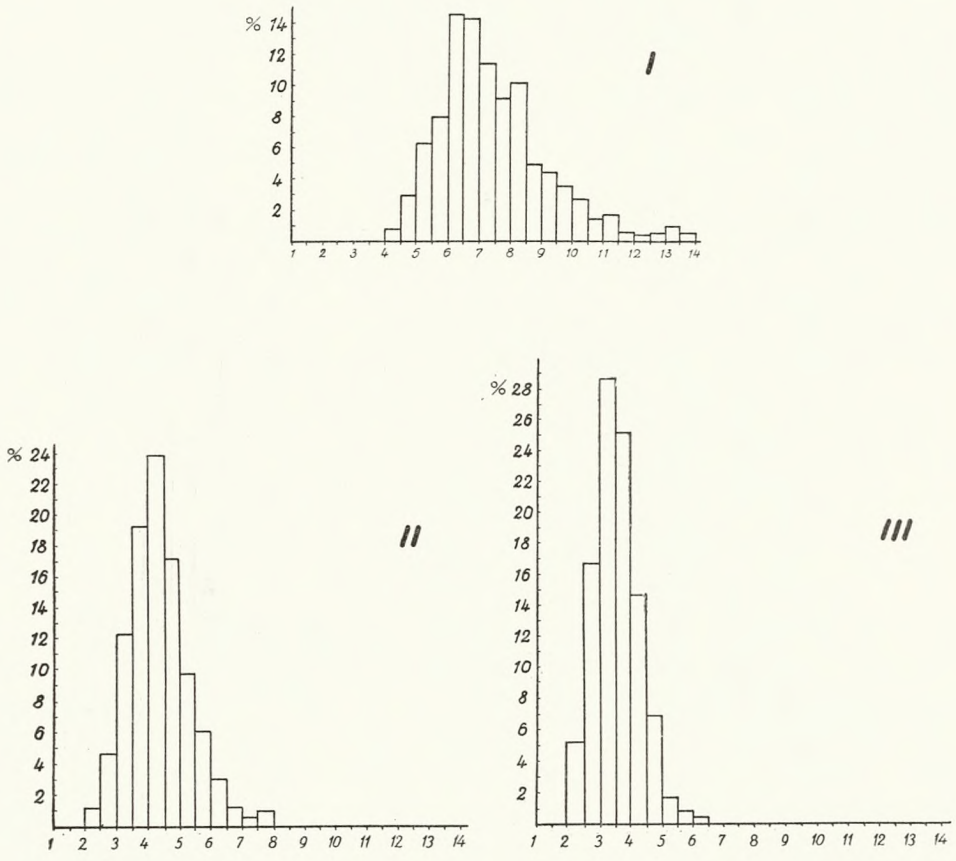

Fig. 32. Histogram illustrating variation in the ratio of leaf blade width to length in the herbarium material available of *P. calophylla*: I. ssp. *forrestii*, II. ssp. *calophylla*, III. ssp. *floribunda*

to a very poor (one specimen only) herbarium material, that served him to describe the species. By an odd set of circumstances the material, especially as far as the size of leaves is considered, represents the form of subspecies *forrestii* that is on the line of ssp. *calophylla*. Whether these two subspecies should be separated can be settled by very exact observations in the field only, on living specimens. They should refer to the variability of leaves within an individual, and this cannot be done on herbarium material showing merely a part of the examined plant.

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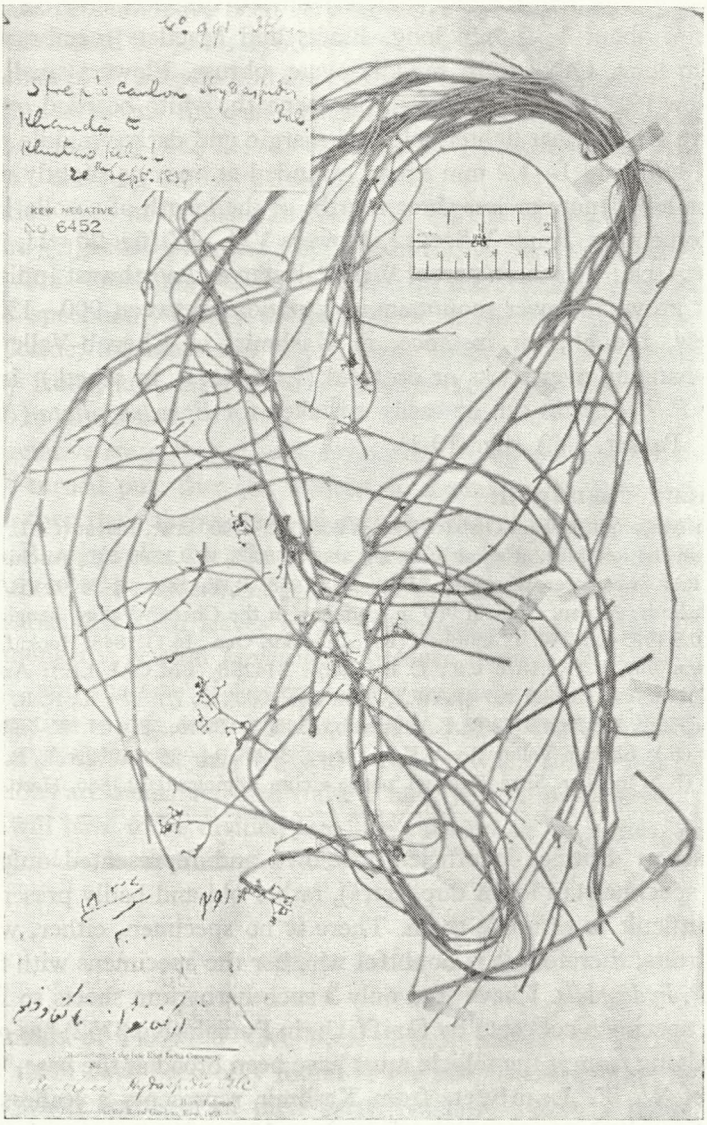
11. *Periploca hydaspidis* Falconer

Proc. Linn. Soc. 1:115 (1842); Falconer, Annals and Mag. Nat. Hist. 8:449 (1842); Decaisne in DC. Prodr. 8:498 (1844); Falconer, Trans. Linn. Soc. Bot. 19:56 (1845); Aitschison, Jour. Linn. Soc. Bot. 19:176 (1882); Hooker f., Fl. Brit. India 4:12 (1883); Boissier, Fl. Or. Suppl. 344 (1888); Schumann in Engler, Prantl Natürl. Pflanzenfam. 4,2:216 (1895); Brandis, Indian Trees 467 (1906); Bamber, Pl. Punjab 643 (1916); Parker, Forest Fl. Punjab, Hazara, Delhi 342 (1924); Kitamura, Fl. Afgh. 309 (1960).

Type: Secus ripas extra Kashmeer prope "Kutao Kelah", 20. 9. 1837 c.fl., Falconer 991 (K. Holotypus? — C. P. Isotypus).



Phot. R. B. G. Kew

Fig. 33. *Periploca hydaspidis* — type (Royal Botanic Gardens, Kew)

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Climbing or supporting shrub. Young shoots glabrous, green, thin, erect or twining, often fascicled. Older shoots greenish-grey, or grey-brown with a corky bark, minutely cracked. Leaves early deciduous, so that shrubs appear to be leafless, rarely persistent a longer time. The leaves are linear, to 4 cm long and 1—3 mm broad, acuminate, decurrent, glabrous on both sides, with a prominent midrib below. Petioles 1—2 mm long. Leafless shoots are slightly thickened in nodes. Inflorescences erect, 2—3 mm long, simple or branched cymes, with several, or over ten, flowers, arranged at the top of shoots, or lateral, numerous. The leaves falling, off such annual shoots with inflorescences seem to be one big paniculate inflorescence. Rachis, pedicels, bracts, bractlets and calyx glabrous. Pedicels thin, about 1—2 mm long. Bracts and bractlets membranous, ovate, about 1 mm long. Calyx teeth broadly-ovate, obtuse. Flowers small, 5—6 mm across, yellow (?). Corolla lobes glabrous beneath, white bearded on the upper surface, with a somewhat lighter coloured margin and darker middle part, ovate, 2—2.5 mm long and 1—1.2 mm broad, rounded at apex or slightly retuse. Filiform corona lobes more or less three fourths of the length of corolla lobes, white squarrose tomentose. Fruits?. Seeds?. Flowers VII—IX (fig. 20—II, 33).

Distribution: Northern part of West Pakistan and northwest India (Kashmir, Punjab). It grows in lower mountainous situations between 900—1300 m a.s.l., rather rarely, though, for instance, in Kashmir, in Chenab-Valley it occurs commonly hanging over rocks or on trees (Lambert, in sched.). In the vegetative state *P. hydaspidis* can be easily mistaken for *Ephedra ciliata* (Aitchison; Boissier; Parker, l.c.) (fig. 10-1).

Specimens examined:

Pakistan: Malkandi, Kagan, District Hazara 6000′, 2.9.1900 c.fr., Inayat (CAL.); At Jelamai, near Shinak, in the low hills, at an altitude not above 3800′, 18.9.1880 c.fl., Aitchison 550 (BM. C.E.F.K.LE.P.); Swat, near Wanglaur 3500′, 14.8.1958, R. R. Stewart 28002 (RAW.).

India: Kashmir: Marsu, Chineni 960 m, common in the Chenab-Valley, hanging over rocks or on trees, 10.5.1925 c.fr., W. T. Lambert (K.); Ind. Bor. Occ., 16.11.1848, Hook. f. et Thomson (K.); Kishtwar 4000′, 19.9.1876 c.fl., C. B. Clarke 31428B (BM.CAL.LE.); Azad Kashmir: Keran (?) 7.9.1958 c.fl., Mohd 137 (RAW.); Kishtwar 4000′, 26.7.1917 c.fl., R. R. Stewart 3053 (K.); Punjab, Herb. Griffith 3752 (E.K.); Punjab, 1863, L. Pierre (P.); N. W. India, 1871 c.fl., J. L. Stewart (E.); Shelum Valley Road, Kashmir ca. 3000′, 14—19.9.1920 c.fl., R. R. and I. D. Stewart 6083 (K.); in distr. Sirsa (Hissar), prope vicum Ramngari, 12.1886, Herb. J. R. Drummond (K.).

Discussion: Species insufficiently known and represented only by a few herbarium specimens (a lot of duplicates), rather old and badly preserved, therefore it is difficult to estimate them. There is no specimen, either, with flowers as well as fruits, therefore it is doubtful whether the specimens with fruits really belong to *P. hydaspidis*. I have seen only 3 such herbarium sheets so far.

The first specimen collected by Griffith in Punjab (No 3752) has one crashed hull and judging from it the follicle must have been broad at the base. The second specimen of W. T. Lambert from Kashmir represents a leafless, thin and curled shoot with thin follicles (3—4 mm), to 13 cm long arranged at an obtuse angle. Lambert defined this specimen as *P. hydaspidis*, while on the label

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added to the sheet there is Parker's annotation: "P. sp. (*P. aphylla* Decne.?)". That this is not *P. aphylla* is seen from the arrangement of follicles on a thin shoot and not, as in the case of *P. aphylla*, on a thick ligneous pedicel and on a thick shoot. The follicles in *P. aphylla*, too, are placed at a different angle (horizontally). Finally the third specimen comes from a herbarium in Calcutta, gathered in Pakistan, distr. Hazara and named *P. aphylla*. On its leafless, thin and twisted shoots there is only one fruit, or rather two thin hulls 7 cm long, arranged horizontally. The character of shoots would rather state its being *P. hydaspidis* and not *P. aphylla*.

Descriptions of fruits have been very scarce in literature, and they even differ one from other. And so J. D. Hooker (l.c.) writes that they are "broader or less woody than in *P. aphylla* (old only seen)". It can be supposed that Hooker in his description means the same specimen of Griffith I have cited above. C. J. Bamber in 1916 (l.c.) defines the fruits of *P. hydaspidis* as follows "cylindric, smooth" and the seeds "flattened, ovoid, winged with a tuft of hairs"; this description does not explain anything. In 1925 R. N. Parker (l.c.) records that fruits are "3 inches long, less woody than in *P. aphylla* and on more slender peduncles". This description is much nearer to the appearance of follicles from Lambert's specimen. Which description or herbarium specimen is proper is hard to decide, the more that the original diagnosis of Falconer does not mention any fruits, and the typical specimens have only flowers. This matter is still open to discussion.

In the vegetative state *P. hydaspidis* resembles *P. visciformis*, mainly its young shoots. If it turned out, that the follicles in Lambret's specimen belong to *P. hydaspidis* then their shape, size and even the way of arrangement would bring it nearest to *P. calophylla*. Its affinity with *P. linearifolia* is seen on the similarity of leaves to those of *P. linearifolia* arranged at the base of branched inflorescences. It is remarkable that such leaves in *P. linearifolia* fall off easily. *P. hydaspidis* is classed among the section *Immaculata* because there is no white spot on the corolla lobes, and the size of flowers is very small (the smallest of the genus). It is an exception in this section being leafless, just as the *Aphyllae* series is so in the section *Periploca*. It may be that in future, when richer and fuller herbarium collections are available, then those I have had at my disposal, the section *Immaculata* will have to be divided into two subsections or series, just to show that *P. hydaspidis* is distinct.

FOSSIL DATA

Fossil remains of *Periploca* have been already known for about 100 years, but most of them have been only found in the last 10 years. They are only impressions of whole leaves or of their parts. No impressions of fruits or flowers have been met. They belong to 5 species, which can be divided into 2 groups. The first group consists of leaf impressions of *P. melonii* and *P. cretacea*, their

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classification among the genus *Periploca* is, however, more than doubtful. The other group comprises 3 species: *P. angustifolia*, *P. graeca fossilis* and *P. kryshtofovichii*. The impressions of their leaves are well preserved and it seems they have been properly classified. They come from 3 regions widely separated: 1. central Italy, 2. Caucasus, 3. Kazakhstan. In the two former regions *P. graeca* has hitherto occurred, in the later the species of *Periploca* are not only absent, but their nearest localities are a long way off. These three species represent very important material to explain the history of the whole genus.

GROUP 1

1. *Periploca cretacea* Hollick

The Cretaceous Flora of Southern New York and New England, Monogr. U. S. Geol. Surv. 50:105 t. 40 f. 16 (1906).

Localities: Gay Head, Marthas Vineyard, USA.

Age: Cretaceous.

Judging from the drawing of a leaf impression of *P. cretacea* enclosed to Hollick's publication, its inclusion to the genus *Periploca* is a misunderstanding. The nervation of the leaf in the impression is badly preserved so that it is impossible to find whether the lateral nerves close at the margin of the blade. The author himself giving attention to the uniqueness of this kind of leaf in his fossil collections showed its similarity with species deriving from the Tertiary of Europe described by Heer and belonging to the *Asclepiadaceae* and *Apocynaceae* families (*Apocynophyllum oeningense* Heer and *Acerates veterana* Heer).

2. *Periploca melonii* Massalongo.

Massolongo G. et Scarabelli G., Studii sulla flora fossile e geologia stratigrafica del Senigalliese, Imola, 288 t. 14 f. 3 (1859).

Localities: Senigallia (between Ancona et Rimini), Italy.

Age: Pliocene.

According to Massolongo the species greatly resembles *P. graeca*, but W. S. Kornilowa (cf. below) has some doubts to "*P. melonii*" belonging to the genus *Periploca* at all. Her opinion is wholly acceptable because, just as in the former species though the lateral nervation is preserved better, the closing of nerves near the blade margin is missing and it is so characteristic to the genus *Periploca*.

GROUP 2

3. *Periploca angustifolia* Kutuzkina.

The Sarmatian Flora of Armavir, Acta Inst. Bot. Leningrad, ser. 8 (Paleobotanica) 5:222 t. 15 f. 2,5, 15; t. 17 f. 18, 19 (1964).

Localities: Armavir, USSR.

Age: Upper Miocene.

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The species was described on account of two leaf impressions, one of which representing almost a whole leaf (without top), and the other only the bottom part. This leaf is linear-lanceolate, 71 mm long and 11 mm wide, with a well marked nervation, closing at the blade margin as can be seen from the author's drawing (t. 17.f.19). Paying attention to the nervation of this leaf Kutuzkina compares it with the nervation of *P. graeca*, but leaves of such a shape are unknown in the latter species. As to the shape of the leaf it resembles the leaves of the east African species — *P. linearifolia*.

The name "*angustifolia*" proposed by Kutuzkina is, I am afraid, wrong, as it suggests its being allied to *P. angustifolia* Labill., growing nowadays, with which the fossil species has nothing in common.

4. *Periploca graeca* L. *fossilis*

a. Gaudin C. T. et Strozzi C., Contributions à la Flore fossile italienne, Quatrième Mémoire. Travertines Toscanes, Nouv. Mém. Soc. Helvetique 28, t. 3 f. 12 (1860).

Localities: Perolla (Tuscany), Italy.

Age: Pleistocene.

b. Tongiorgi E., Ricerche sulla vegetazione del' Etruria Maritima, V., Documenti per la storia della vegetazione della Toscana e del Lazio, Nuov. Giorn. Bot. Ital, n. s., 43:807 t. 13 f. 3, (1936).

Localities: Bagni delle Galleraie, Cascine (Tuscany), Italy.

Age: Pleistocene.

c. Kolakovsky A., The Pliocen Flora of Suchumi, Trudy Suchumsk. Bot. Sada 7:96 t. 2 f. 9 (1952); Kolakovsky A., Pliocenowa flora Kodora, 124 t. 47 f. 8-10 (1964).

Localities: Suchumi (Georgia), USSR.

Age: Pliocene.

d. Takhtadzhian A., Bot. Jour. USSR 41:655 t. 3 f. 1—5 (1956); Takhtadzhian A., Periplocaceae Schlechter in Osnovy Paleobotaniki 596 t. 36 f. 4—5 (1963).

Localities: Agarak (Armeniya), USSR.

Age: Tertiary — Middle/Lower Pliocene.

e. Kolakovsky A., Trudy Tbilisk. Bot. Inst. 17:275 (1955) Kolakovsky A., Trudy Suchumsk. Bot. Sada 10:251 t. 6 f. 3 (1957).

Localities: Meore-Atara (Abkhazskaya ASSR), USSR.

Age: Tertiary — Pliocene.

The drawings and photographs of fossil impressions of leaves given in the publications cited above belong beyond doubt to *P. graeca*. Takhtadzhian had the richest fossil material at his disposal and he wrote in his publication (1956, l.c.) that: "just as it is in contemporary specimens of *P. graeca*, the fossil material shows a very great variability in the leaf shape, from almost rounded to lanceolate".

5. *Periploca kryshtofovichii* Kornilova

Niżniemiocenowaja flora Kuszuka, Alam-Ata, 80 t. 8 f. 6—12; t. 13 f. 3—4; t. 18 f.1,10 (1960).

Localities: Kuschuk at the river Ulu-Zhilanczik (Kazakhstan), USSR.

Age: Tertiary — Lower Miocene.

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Kornilova states that the species described by her is very closely related to three contemporary species: *P. graeca*, *P. sepium* and *P. calophylla*. She assumes that in the Oligocene-Miocene or even erlier there was a species of *Periploca* in Kazakhstan that united characters of the species mentioned above and was widely distributed. Later in the Neogene the species died out in Kazakhstan, while in the western and eastern parts of its area new species were differentiated and have came down to our times. The hypotesis is very interesting.

The fossil material represented by her on separate tables is clearly differentiated into 2 groups. To the first one belong leaves drawn in table 8 — they are, lanceolate, 6—7 cm long and 18—24 mm broad; they resemble most leaves of *P. sepium*. The other group are leaves of table 13. Judging from preserved fragments they are large, at least 10 cm long and 5—6 cm broad (in the diagnosis of *P. kryshtofovichii* such sizes have not been given) which, as the author herself marks (p. 83) show a resemblance to the fossil leaves of *P. graeca fossilis* from Agarak in Armeniya (Takhtadzhian, 1956).

It seems to me that *P. kryshtofovichii* consists of two species one of which (table 13) is most probably identical with *P. graeca*. Though the latter species is very variable and lanceolate leaves may be also met in it, the nervation type shows a certain difference of leaves from table 8. Nevertheless, whatever the interpretation of *P. kryshtofovichii* would be (one or two species) it is the oldest representative, hitherto known, of the genus *Periploca*, a witness of the ancient connection of area of the species from the series *Connatae*: *P. graeca* and *P. sepium*.

GEOGRAPHICAL DISTRIBUTION, EVOLUTION AND MIGRATION

The area of the genus *Periploca* is connected with Holarctis and Paleotropis (smaller part) and is limited to the Old World only. It forms a rather narrow belt between 45° and 15° N. The separate species are characterized by their areas elongated in parallel direction, the only exception being *P. linearifolia* the area of which is typically meridional: from northern Ethiopia, along the mountain chains of east Africa, to Malawi, more or less from 17° N to 15° S. It is thus the only species of the genus *Periploca* occurring south of the Equator (fig. 34).

A salient feature of the area of the genus *Periploca* is its continuity (slightly interrupted in north-east Egypt) while, at the same time, the areas of separate species hardly ever overlap. There is no locality, not that I know of, where two taxa would occur side by side. Nevertheless, there are three regions, where, to a very small extent, the areas of some species overlapped; they are: 1. west China (Szechwan) where the terminal parts of the area of *P. calophylla* laps over that of *P. sepium*, 2. north Pakistan and India (Kashmir), including the areas of *P. hydaspidis P. calophylla* and *P. aphylla*, and 3. north Ethiopia, north Somalia and southwest part of the Arabian peninsula where *P. linearifolia*, P. *visciformis*, *P. aphylla* and *P. somaliense* meet.

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Vast areas, some of the largest in the whole *Periplocaceae* family, have: *P. aphylla* — from east Egypt to west India; *P. calophylla* — from east Kashmir to central China; *P. graeca* — from Italy to north Iran and Iraq; *P. sepium* — from west China to Korea and P. *linearifolia*. The other species have small, compact areas, limited to merely a few localities, and in the case of *P. somaliense* even to only

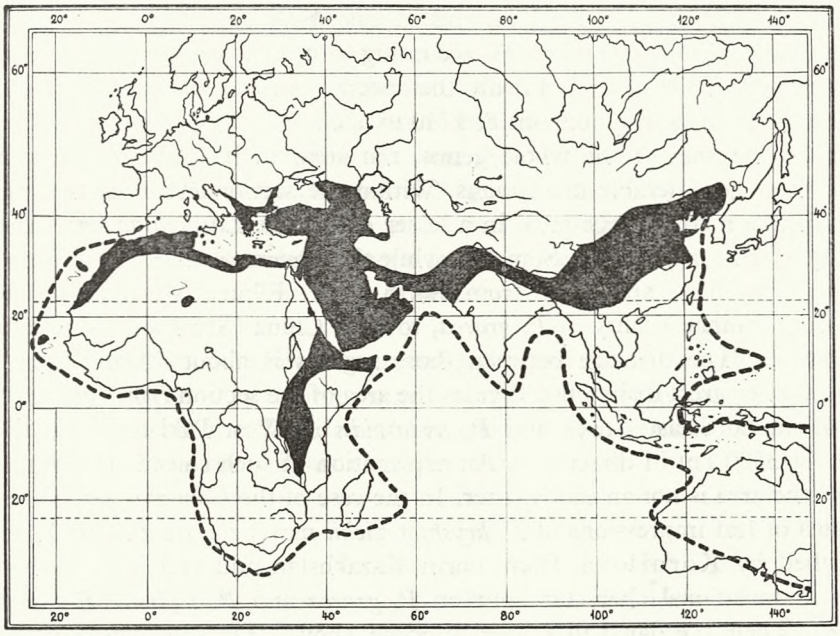

Fig. 34. Distribution of the *Periplocaceae* family acc. to R. Good (broken black outline) and of the genus *Periploca* (orig.-black shading)

one. With the exception of *P. hydaspidis*, *P. calophylla*, *P. linearifolia*, and partly *P. sepium*, too, that occur in the interior of the continent, other species tend to spread mainly along seacoasts (forming broader or narrower belts), or are limited to isolated islands (*P. laevigata*, *P. chevalieri*). Only 4 species have localities both on the continent and on islets: *P. angustifolia* — islets near Sicily and Crete, Malta; *P. visciformis* — the Socotra island; *P. graeca* — Aegean islands; *P. aphylla* — islands situated between south Iran and Oman (Strait of Hormuz).

Area continuity is met in nearly all species of *Periploca*, and only two have an area slightly disrupted; they are *P. angustifolia* with isolated localities in south Algeria (Hoggar), in southeast Spain, Syria and on islets of the Mediterranean; *P. graeca* with isolated localities in Italy.

In vertical distribution the differences between the separate species are relatively small. Most species grow from the very seacoasts, or, at least, from some scores of meters a.s.l. to over 2000 m a.s.l., the further from the seacoast the locality the higher they grow. And so *P. laevigata* grows from 0—850 m a.s.l., *P. graeca* from 0-1800 m, *P. angustifolia* over 2100 m, *P. visciformis* to 2300 m

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and *P. aphylla* (in Afghanistan), to 2600 m. *P. chevalieri* is found on Cape Verde isles from 300—1800 m a.s.l., however, as Chevalier (l.c.) states, it must have previously grown lower, from the coast itself. The lower limit of occurrence of *P. sepium* is not known, in the mountains this species reaches 2100 m a.s.l. Inland species: *P. linearifolia* and *P. calophylla* attain the highest altitudes. Their lower limit runs 900—1000 m high, more or less, while the upper one in *P. linearifolia* reaches 2900 m, and *P. calophylla* even to 3100 m a.s.l. The third inland species, *P. hydaspidis*, according to present very scarce data, grows between 300—1300 m a.s.l. Finally the species *P. somaliense*, known only from one locality, grows in mountains at 1740 m a.s.l.

Unlike the area of the whole genus, the areas of its different sections and series show considerable disruptions. Within the section *Periploca* the *Aphyllae* series shows a continuous area, in a lesser extent the *Laevigatae* series (isolated locality of *P. somaliense* in Somalia), while the *Connatae* series presents an enormous disjunction, spreading from north Iran (Elburz Mts.), where we can find the terminal locality of *P. graeca*, to west China (Szechwan) where *P. sepium* occurs. The distance between those regions is about 4.500 km in direct line. Another great disjunction divides the area of the section *Immaculata*: *P. linearifolia* in northeast Africa and *P. hydaspidis* in West Pakistan — a distance of about 3500 km in direct line. An explanation of such considerable interruptions of the area is not an easy matter. In the case of the *Connatae* series the fossil remains of leaf impressions of *P. kryshtofovichii* may be a great help. They were described by Kornilova from north Kazakhstan and according to her they show a transitional character between *P. graeca* and *P. sepium (P. calophylla*, too ?). Their age dated to Lower Miocene shows that somewhere at the turn of Oligocene and Miocene the area of the *Connatae* series must have been continuous. There are no fossil data in the case of the *Immaculata* section.

Ecologically, though only a few species are present, the genus *Periploca* is strikingly differentiated and may be divided into four groups:

1. Hygro-mesophyllic species, occurring in river valleys in damp places, often humid, in forests, more rarely in exposed places. *P. graeca* and *P. calophylla* may be numbered in this group. *P. graeca* which in optimal conditions grows up to 30 m is only a weak shrub, hardly some metres high when in insolated and dry localities. In such places it is liable to perish gradually, and so, for instance, in Armenia, in the region of Megri, where many fossil remains of *P. graeca* come from, from the Pliocene, and serve as evidence of abundant occurrence, only a few specimens of this climber are known nowadays (Takhtadzhian, Bot. Jour. USSR 41: 655, 1956). *P. calophylla* is never so high as *P. graeca* (up to 20 m). Both species have characteristically large leaves, persistent in *P. calophylla*, but deciduous in *P. greaca.*

2. Mesophyllic species, as *P. sepium* and *P. linearifolia.* They grow most often in exposed places, on forest edges and in thickets, not necessarily near water basins and have relatively large leaves, but smaller ones than in the previous group.

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3. Mesoxerophytes, to which three species of the *Laevigatae* series belong: *P. laevigata*, *P. chevalieri* and *P. somaliense*. They are characterized by their weak growth (to 3 m high), persistent leaves, rather small and leather-like, with a weakly marked lateral nervation, and partly decreasing ability to twine.

4. Typical xerophytes: *P. angustifolia*, *P. hydaspidis*, *P. aphylla* and *P. viscifformis*. The first species has persistent leaves but they are short, narrow, thick, fascicled on nodose brachyblasts while the other species are aphyllous, or have strongly reduced and early deciduous leaves, while the role of assimilation organs is performed by green shoots. These species grow in the driest regions of the area of the genus *Periploca*, even in desert ones.

Most species of *Periploca* flower all over the year; except the species of the *Connatae* series whose representatives *(P. graeca* and *P. sepium)* flower from April to June (July), sometimes so again during autumn. These species have the most northern areas and deciduous leaves in winter. The phenologic data for two species: *P. somaliense* and *P. hydaspidis* are insufficient to generalize them.

The data listed above allow to examine the evolution of the genus *Periploca*, to define the direction of morphologic changes. The evolution of the genus, as it seems, went in the direction of growth of xeromorphism. Now here we have some data how the various characters have changed:

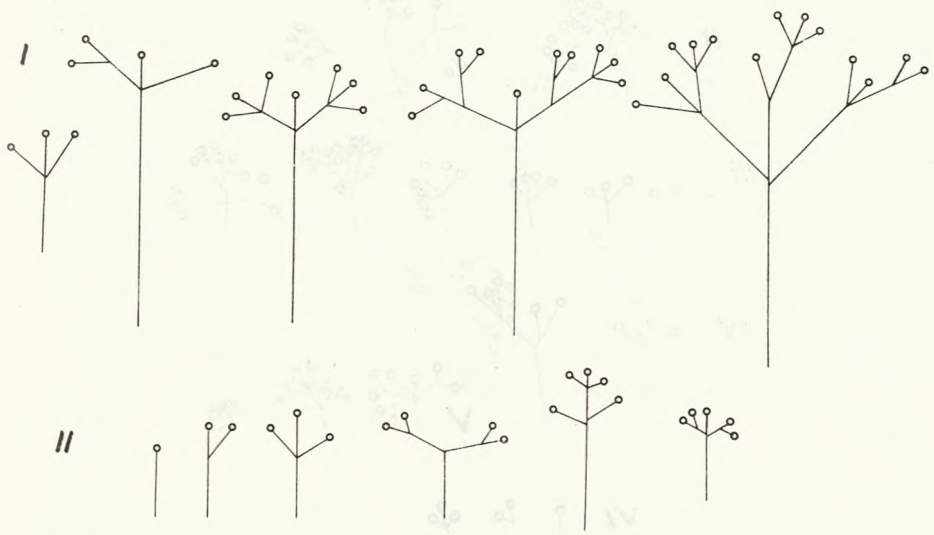

Fig. 35. Diagram of structure of inflorescences in *Periploca graeca* (I) and *P. sepium* (II) (less. 2×)

1. Reduction of height and form of shrubs: from luxuriant, high, twining lianes *(P. linearifolia*, *P. calophylla*, *P. graeca)* to low, erect shrubs, hardly able to twine and then only the youngest shoots. An extreme example may be *P. visciformis* with thin, filiform young shoots.

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2. Reduction of size of leaves with a simultaneous loss reduction of visibility of lateral nerves. The last link of this sort of changes is the complete leaflessness in *P. aphylla* and *P. visciformis*. That these shrubs have their origin in leafed ancestors may be testified by the presence of minute, reduced and mostly early deciduous leaves, growing on thin one-year-old shoots. An intermediate link may be *P. angustifolia*, where internodes being shortened, the leaves are arranged in fascicles on brachyblasts. Species with largest leaves are: *P. graeca*, *P. sepium*, *P. calophylla* and *P. linearifolia*; the two first, however, have lost the power to keep their leaves through winter.

3. Increase of pubescence of elements. Beside species completely glabrous (except corolla and corona lobes) there are species strongly pubescent, as *P. aphylla* ssp. *aphylla* and mainly *P. visciformis* var. *visciformis*.

4. Reduction of inflorescences and number of flowers, as well as of length or rachis and pedicels. *P. linearifolia* has the most branched inflorescences, elongated and broad (spread). Much elongated inflorescences, though not so

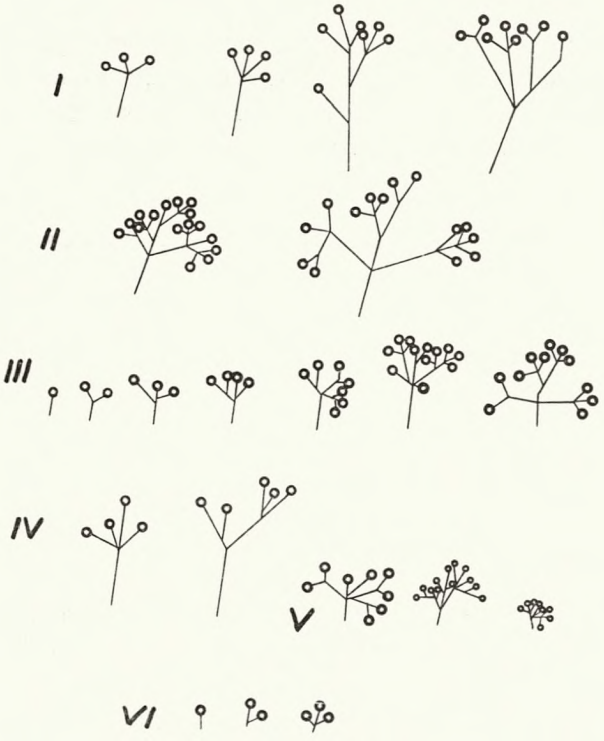

Fig. 36. Diagram of structure of inflorescences in: I. *P. laevigata*, II. *P. chevalieri*, III. *P. angustifolia*, IV. *P. aphylla* ssp. *laxiflora*, V. *P. aphylla* ssp. *aphylla*, VI. *P. visciformis* (less. 2×)

rich ones, has also *P. graeca*, and maniflowered ones though not so long — *P. calophylla* ssp. *floribunda*. As it is known inflorescences in the genus *Periploca* are composed of simple cymes. Such a simple cyme composed of 3 flowers is met in mesoxerophytic and xerophytic species, especially in *P. visciformis*.

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In this species an extreme reduction of inflorescence — to one flower, can be met. A strongly reduced rachis but not number of flowers has *P. aphylla* ssp. *aphylla*, while in the ssp. *laxiflora* the rachis is elongated and the inflorescence spreading. This subspecies is completely or almost completely glabrous. Everything goes to show that it may be taken for a kind of relict which has kept a rather large number of mesomorphic characters in desert conditions (fig. 35, 36, 37).

5. Formation of gland-patch. The inner part of corolla lobes on the upper surface clearly darker-coloured and distinct from the marginal part may exude a viscid substance (probably fragrant), which attracts insects (to the flower). This part, too, has changed in the evolution process into a distinct, prominent gland-patch with xerogenesis of some species. It is known in 2 species: *P. sepium* and *P. visciformis* (much better developed).

Whether the white spot on the corolla lobes is a primary or a secondary feature is difficult to answer. It may be only noted that this spot is missing in the section *Immaculata*, the two representatives of which, *P. calophylla* and *P. linearifolia*, belong, most likely, to the most primitive species of the genus *Periploca*.

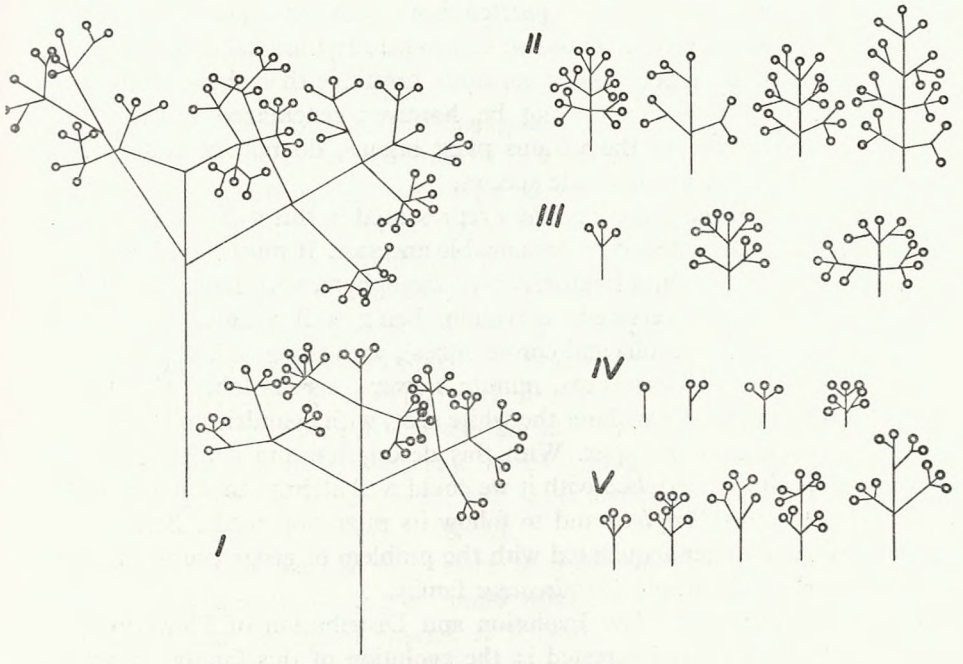

Fig. 37. Diagram of structure of inflorescences in: I. *P. linearifolia*, II. *P. calophylla* ssp. *floribunda*, III. *P. calophylla* ssp. *forrestii*, IV. *P. calophylla* ssp. *calophylla*, V. *P. hydaspidis* (less. 2×)

6. Changes in the way of arrangement and in thickness of follicles. Follicles in *Periploca* are of two types. The first type are thin, cylindric follicles, more or less evenly thick throughout their length, characteristic of the section *Immaculata* (are they so for *P. hydaspidis* ?) and *Connatae* series from the section

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Periploca. The other type is represented by the follicles of *Laevigatae* series — they are distinctly swollen in the basal part, narrowing towards the apex. The follicles of the *Aphyllae* series are an intermediate type. As the first type is met in species that are strong twiners, with large spreading inflorescences, i.e. in hygro- and mesophyllic species, it seems to be right to take cylindric fruits for primary and swollen at the base for secondary ones.

It is much more difficult to interpret the way of arrangement of follicles, which can be placed horizontally, or at an obtuse, or even at an acute angle. In the last case they may be free *(P. calophylla)* or united at the apex (*P. graeca*, *P. sepium*). Follicles arranged horizontally are typical of the *Laevigatae* and *Aphyllae* series from section *Periploca*, though they may also occur in the section *Immaculata*, in P. *linearifolia*. Which of these arrangements is primary is rather difficult to judge, because, for instance, in the group of strong twiners *P. graeca*, *P. calophylla* and *P. linearifolia* belong to, (viz. in species having primary types of cylindric follicles) they may be united *(P. graeca)*; free, but arranged at acute angle *(P. calophylla)*; and finally free, but horizontal, and even at an angle greater than 180° *(P. linearifolia)*. We must, however, remember, that in the flower of *Periploca* two carpels separated from each other are partly united by means of very short styles. Thus we can conclude that follicles united at the apex or arranged at an acute angle are more primitive than those arranged horizontally. This conclusion must not be, however, generalized because evolution changes occurring in the various plant organs, do not, of course, happen in the same direction in the whole species.

The evolution of the genus *Periploca* represented in this way allows to describe the morphologic character of its presumable ancestor. It must have been a vigorous high climbing shrub, a hygrophyte or mesophyte, with large, probably persistent, leaves, richly nervated, nervation being well visible, quite glabrous (except, perhaps the corolla and corona lobes), with elongated, strongly branched and spreading inflorescences, minute flowers, corolla lobes without gland--patches and, supposedly without the white spot, with cylindric and thin follicles, presumably united at the apex. With this description and comparing the contemporary species of *Periploca* with it we could well attempt to define the original centre of the genus *Periploca* and to follow its migration roads. Before such an analysis we have to get acquainted with the problem of geographical distribution and evolution of the whole *Periplocaceae* family.

J. M. MacFarlane (The Evolution and Distribution of Flowering Plants, 1 : 97—101, 1933) was interested in the evolution of this family, as subfamily *Periplocoideae* of the *Asclepiadaceae* family. According to him the *Periplocaceae* family has 8 genera and about 20 species in West Tropical Africa, 10 genera and about 35 species in the Middle and East Tropical, Africa, 6 or 7 genera and about 20 species in South Africa, 5 genera and 9 species in Mascarene, 6 genera and 9 species in East India, 8 genera and 15 species in Indo-China, and only one genus with 2—3 species in Malaya, and with one in North-East-Australia. MacFarlane thinks that these statistic data point distinctly to the origin of the

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family from Tropical Africa "with gradual advance of the evolving genera and species mainly along the great Gondwana inter-continental line through Madagascar, next along the Lemuria bridge to Ceylon and East India, then to Indo-China, Malaya and Australia". An exception to this is only the genus *Periploca*, whose origin is the same, but its migration road led through Ethiopia and Egypt to Arabia, Syria, Iran, Baluchistan and Punjab.

According to R. Good (An Atlas of the Asclepiadaceae, New Phytologist 51: 199—201, 1952) the *Periplocaceae* family is composed of some forty genera. According to J. Hutchinson (Fam. Flower. Pl. sec. ed. 1959) the number comes to fifty; at present while some further new genera have been recorded by A. A. Bullock and the genus *Cyprinia* has been excluded from the genus *Periploca*, their number will grow to some fifty. As Good notes there are only two genera in the *Periplocaceae* family, having their representatives both in Africa and in Asia — they are *Periploca* and *Cryptolepis*. The latter has also one species in Madagascar. The areas of these two genera overlap but *Periploca* stretches further to the north, and its northern limit of the area is, at the same time, the northern limit of the area of the whole family. The genus *Cryptolepis* is, according to Good, often taken for the least specialized genus among *Periplocaceae*, and probably resembles the ancestral type of the family most. There are about 20 species in it, most of which belong to Africa. The genera most closely allied to *Cryptolepis* occur in Africa and on Madagascar, too.

Good notices that, with the exception of 12 species of the *Periplocaceae* family, characterized by wide areas, the others have narrow ones or are endemic species. About 50% of such "small" species grow in Tropical Africa, about 15% in south Africa, about 12 % on Madagascar, and only 20% in Asia.

As both MacFarlane's and Good's works clearly show, most genera and species of the *Periplocaceae* family belong to Africa and Madagascar, and this, to a high degree, speaks for the African origin of the whole family. Statistic data are not quite accurate because there are no critical works on the whole family yet, and the criteria to distinguish genera are not yet made uniform. The *Periplocaceae* family is strikingly monotypic in its genera, remarkably endemic in species and their area is rather small, and so it should be explained whether they are neoendemites or old relict species.

MacFarlane (l.c.) placing the centre of origin of *Periploca* in west and central tropical Africa, thinks that it comes from the ancestor type *Cryptolepis--Tacazzea*, and that its initial species is *P. nigrescens* (at present *Parquetina nigrescens* (Afz.) A.A. Bullock). MacFarlane traces *P. linearifolia* and *P. graeca* on the other hand from "*P. nigrescens*", a species with similarly large leaves and purple flowers. According to MacFarlane there were two migration roads of *Periploca*. The former led through Sinai, Iran, Baluchistan and Afghanistan to west India, and then to Punjab and Khasya, and it was the migration road of *P. aphylla*, *P. hydaspidis* and *P. calophylla*. *P. graeca* migrated on the other road, beginning also in Africa. This species came through Syria to Asia Minor, Greece and Iran. *P. gracilis* and *P. laevigata* segregated off from P.

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graeca. As MacFarlane thinks *P. laevigata* wandering along north Africa reached the Canary Islands and south Spain "...at the time when the regions were probably all connected".

We can't wholly agree with this kind of argumentation, as MacFarlane does not consider the essential affinity relations between the various species and series, he erroneously includes "*P. nigrescens*" among the genus *Periploca* and does not take into account the possibility of migration of species from the *Laevigatae* series out of the interior of Africa. And that this may be so is evidenced by the localities of *P. angustifolia* from the high mountains of south Algeria (Hoggar) and by the presence of a new species *P. somaliense* in north-east Africa. MacFarlane did not dispose of data about fossil species of *Periploca*, either.

Summing up the cited facts the following conclusions can be drawn:

1. As fossil remains of *P. kryshtofovichii* show, the genus *Periploca* had its origin a long time ago, probably already in the Oligocene, while the differences between the species appeared in the Lower Miocene.

2. The ancestral type of *Periploca* was a vigorous, high liana, with large leaves, abundant and loose inflorescences and cylindric follicles.

3. Species most like to the ancestral type are: *P. linearifolia* — leaves persistent, rather large, richly branched inflorescences, small flowers, cylindric follicles, but arranged horizontally; *P. calophylla* — leaves persistent, large, flowers small, while inflorescences branched several times in ssp. *floribunda*, fruits cylindric, arranged at an acute angle but not united; *P. graeca* — leaves largest in the genus, deciduous, flowers large, fruits cylindric and apices united; *P. sepium* — like *P. graeca*, but growing weaker, with smaller leaves and poorer inflorescences. P. *linearifolia* and *P. calophylla* are subtropical species, while *P. graeca* and *P. sepium* are species of the temperate zone.

4. Most species of the *Periplocaceae* come from Africa, mainly from Tropical Africa, and here we should look for the ancestral land of this family.

5. The knowledge of the *Periplocaceae* family is too scanty, and the excluded genera are sometimes critical (e.g. the genus *Socotora*).

So everything shows that the discussion of the history and migration of the genus *Periploca* must still be rather general.

The genus *Periploca* was most probably formed in Africa in its north-east part. The ancestral type of *Periploca* came nearest in its characters to the contemporaneous species of the *Immaculata* series. The great disjunction (Africa-India) must not be explained by a land-bridge leading through Madagascar. The migration certainly went through Arabia and Iran. That this section had a much larger area in the past can be evidenced by the monotypic genus *Cyprinia* from Cypre and south Turkey. In this genus, just as in the *Immaculata* section, the flowers are small and corolla lobes thin with no white spot in the centre. The area of *Immaculata* section continuous initially, became disrupted owing to the climate getting arid. Then the differentiation of species in their present appearance occurred *(P. linearifolia* and *P. calophylla)*, and so did the formation of a separate genus *(Cyprinia)*. At the extreme east part of the area, as the cli-

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mate got more and more arid, a leafless (but climbing) species was separated, *P. hydaspidis*, clearly connected in its area with that of *P. calophylla*.

As the fossil remains show, the differentiation of representatives belonging to the *Periploca* section is very ancient (Lower Miocene) and probably occurred almost, or even, at the same time with the formation of the *Immaculata* section, the first formed being the ancestor of the *Connatae* series. The area of this series was divided into two parts, west and east, and the species owing to isolation, are still found, but in the temperate zone, keeping a lot of ancestral characters (large leaves, cylindric and united follicles), but losing the ability to keep leaves in winter.

The ancestors of the *Periploca* section migrated to the east probably in the same way as the ancestors of *Immaculata* section, but more along the northern limit. A trace of this migration are such species as adapted themselves to extremely dry new conditions found in south-west Asia and on the Arabian peninsula. Such species are *P. aphylla* and *P. visciformis* of *Aphyllae* series. The former, in the ssp. *laxiflora*, limited to the west part of the area of this species, shows quite a close affinity with *P. linearifolia*: longer and narrower follicles, glabrous shoots and other parts of the plant, more frequent presence of minute leaves, and spreading and elongated inflorescence.

The youngest, it seems, is the *Laevigatae* series, whose latest remains of its occurrence in east Africa, is *P. somaliense*. The *Laevigatae* series is most closely allied to the *Aphyllae* series, especially having follicles swollen at the base, arranged horizontally. Both series trace probably their origin to north-east Africa, where such species as *P. somaliense (Laevigatae* series*)* and *P. aphylla*, as well as *P. visciformis* (*Aphyllae* series) occur nowadays. The migration of both series went in opposite directions: *Aphyllae* to the east, *Laevigatae* to the west. The migration of *Laevigatae* had taken place before the Sahara became arid, an evidence of this, as already cited, is the locality of *P. angustifolia* in south Algeria. Then as a result of the Sahara getting dry, the migrants broke off from the mother centre, where only *P. somaliense* remained, and the latter shows a considerable affinity with *P. laevigata* isolated on the Canary Islands. The most xerophytic species of the *Laevigatae* series, *P. angustifolia*, has undergone a lot of changes: leaves smaller and thicker, internodes shortened considerably, so that brachyblasts have been formed with fascicled leaves. In the process of time the area of *P. angustifolia* became much smaller and was limited almost exclusively to seacoast regions of the Mediterranean and the Atlantic, and only on its southern foreland there are still solitary localities in the mountains.

NAMES TO BE EXCLUDED FROM *PERIPLOCA*

Periploca africana L. (Sp. Pl. 211, 1753) = *Vincetoxicum pilosum* Nichols.
Afzelii G. Don. (Gen. Syst. 4:163, 1838) = *Parquetina nigrescens* (Afz.) Bullock
albicans Poir. (Encycl. 5:191 (1804) = ?
alboflavescens Dennst. (in Schluess Hort. Malab. 35) = *Parsonsia sp.*

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americana Rafin. (Autikon. Bot. 183,1840) = ?
apiculata (Oliv.) Roberty (Bul. Inst. Franc. Afr. Noire 15:1429, 1953) = *Tacazzea apiculata* Oliv.
arborea Dennst. (in Schluess Hort. Malab. 35) = ?
astacus Léveillé (Fl. Kouy-Tcheou 43, 1914—15) = *Trachelospermum axillare* Hook. f.
Batesii Wernham (Jour. Bot. 54:228, 1916) = *Cynanchum polyanthum* K. Schum.
bifida D. Dietr. (Syn. Pl. 2:883, 1840) = *Phyllanthera bifida* Blume
calophylla (Baill.) Roberty non Falc. (Bul. Inst. Franc. Afr. Noire 15:1429, 1953) = = *Parquetina nigrescens* (Afz.) Bullock
calumpitensis Llanos (Fragm. Pl. Filipin. 62, 1851) = *Streptocaulon baumii* Decne.
capensis Roxb. ex Arn. (Edinb. New Phil. Jour. 17:261, 1834) = *Glossostephanus linearis* E. Mey.
capsularis Forst. f. (Florul. Insul. Austral. Prodr. 20, 1786) = *Parsonsia capsularis* R. Br.
chinensis Decne. (in Dc. Prodr. 8:499, 1844) = *Calotropis gigantea* (L.) Dryand
chinensis Spreng. (Syst. 1:836, 1825) = *Cryptolepis sinensis* (Lour.) Merr.
ciliata Leschen. ex Kostel (Allgem. Med.-Pharm. Fl. 3:1082, 1834) nomen = ?
cochinchinensis Lour. (Fl. Cochinch. 167, 1790) = *Calotropis gigantea* Dryand
cordata Dennst. (in Schluess, Hort. Malab. 14) = *Cosmostigma racemosa* Wight
cordata Poir. (Encycl. 5:191, 1804) = *Hemidesmus indicus* R. Br.
divaricata Spreng. (Syst. 1:836, 1825) = *Strophanthus divergens* R. Grah.
dubia Burm. f. (Fl. Ind. 70, 1768) = *Cryptolepis buchanani* Roem. et Schult.
emetica Retz. (Obs. Bot. 2:14, 1781) = *Secamone emetica* R. Br. ex Roem. et Schult.
esculenta L. f. (Suppl. 163, 1781) = *Oxystelma esculentum* (L. f.) R. Br.
Forsteri Decne. (in DC. Prodr. 8:499, 1844) = *Parsonsia rosea* Raoul
fruticosa Mill. (Gard. Dict. ed. 8 n. 3, 1768) = ?
gabonica (Baill.) A. Cheval. (Rev. Bot. Appl. et Agr. Trop. 31:251, 1951) = *Parquetina nigrescens* (Afz.) Bullock
P. gracilis Boiss. (Fl. Or. 4:50, 1879) = *Cyprinia gracilis* (Boiss.) Browicz
hastata Decne. (in DC. Prodr. 8:499, 1844) = *Microloma sagittatum* R. Br.
heterophylla A. Cunn. ex Decne. (in DC. Prodr. 8:499, 1844) = *Parsonsia albiflora* Raoul
Humboldtiana Schult. (Syst. Veg. 6:129, 1820) = *Astephanus cubensis* H. B. et K.
indica L. (Sp. Pl. 211, 1753) = *Hemidesmus indicus* R. Br.
khasiana Benth. et Hook. f. (Fl. Brit. Ind. 4:4, 1885) = *Stelmacrypton khasianum* Baill.
latifolia K. Schum. (in Engler Pflanzenw. Ost-Afr. C:321, 1895) = *Mondia whiteii* (Hook. f.) Skeels
malabarica Burm. ex Decne. (in DC. Prodr. 8:499, 1844) = *Hemidesmus indicus* R. Br.
mauritiana Poir. (Encycl. 5:188, 1804) = *Tylophora laevigata* Decne.
montana Rottl. ex Wight (Contrib. Bot. India 45, 1834) = *Gymnema montanum* Hook. f.
mucronata Humb. et Bonpl. ex Schult. (Syst. Veg. 6:129, 1820) = *Metastelma mucronatum* Decne.
multiflora Burm. f. (Prodr. Fl. Cap. 7, 1768) nomen = ?
nigrescens Afzel. (Stirp. Guin. Medic. Sp. Nov. 1:2, 1818) = *Parquetina nigrescens* (Afz.) Bullock
nigricans Schltr. (Westafr. Kautschuk-Exp. 308, 1900) = err. orth. = *Parquetina nigrescens* (Afz.) Bullock.
oblongata Humb. et Bonpl. ex Schult. (Syst. Veg. 6:129, 1820) = *Metastelma suberosum* Griseb.
ovata Poir. ex Decne. (in DC. Prodr. 8:508, 1844, in. syn.) = *Pleurostelma cernuum* (Decne.) Bullock
ovata Sessé et Moc. (Fl. Mexic. ed. 2, 71, 1894) = ?
pallida Salisb. (Prodr. 148, 1796) = *Vincetoxicum pilosum* Nichols.

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Palvalli Dennst. (in Schluess Hort. Malab. 35) = ?
parviflora Poir. (Encycl. 5:192, 1804) = ?
parviflora Sessé et Moc. (Fl. Mexic. ed. 2, 71, 1894) = ?
parviflora Willd. ex Schult. (Syst. Veg. 6:129, 1820) = *Astephanus cubensis* H. B. et K.
Petersiana Vatke (Oesterr. Bot. Zeitschr. 26:147, 1876) = *Dregea macrantha* Klotzch
Preussii K. Schum. (Engler Bot. Jahrb. 17:117, 1893) = *Parquetina nigrescens* (Afz.) Bullock
pubescens Humb. et Bonpl. ex Schult. (Syst. Veg. 6:129, 1820) = ?
purpurea Kerr (Bul. Misc. Inform. Kew no. 10:448, 1938) = ? (probably new genus)
pyrotechnica Spreng. ex Decne. (Ann. Sci. Nat. sér. 2., 2:258, 1834) = *Leptadenia spartum* Wight
repens Sessé et Moc. (Pl. N. Hisp. ed. 1., 42, 1887—90) = ?
reticulata Roth. (Nov. Pl. Sp. 175, 1821) = *Cynanchum callialata* Buch. Ham. ex Wight
scandens Aubl. (Hist. Pl. Guian. Franc. 2, 1775, Table des noms 23 ad vol. 1:273) = = *Gonolobus scandens* (Aubl.) Urb.
Secamone L. (Mant. Pl. 2:216, 1771) = *Oxystelma esculentum* (L. f.) R. Br.
Secamone Thunb. (Prodr. Fl. Cap. 47, 1794) = *Secamone thunbergii* E. Mey.
sinensis Steud. (Nomencl. Bot. ed. 2., 1:552, 1821) = *Cryptolepis sinensis* (Lour.) Merr.
sylvestris Retz. (Obs. Bot. 2:15, 1781) = *Gymnema sylvestre* (Retz.) Schult.
tenuifolia Humb. et Bonpl. ex Schult. (Syst. Veg. 6:129, 1820) = *Gymnema subvolubile* Decne.
tenuifolia L. (Sp. Pl. 212, 1753) = *Microloma tenuifolia* K. Schum.
tunicata Herb. Madr. ex Wight (Contrib. Bot. India 56, 1834) = *Cynanchum callialata* Buch. Ham. ex Wight
tunicata Retz. (Obs. Bot. 2:15, 1781) = *Cynanchum pauciflorum* R. Br.
umbellata Aubl. (Hist. Pl. Guian. Franc. 2, 1775, Table des noms 23 ad vol. 1:273) = = *Forsteronia corymbosa* (Jacq.) G.T.W. Mey.
venosa Hochst. in Herb. Schimp. ex Decne. (in DC. Prodr. 8:493, 1844, in. syn.) = = *Tacazzea venosa* Decne.
virgata Poir. (Encycl. 5:192, 1804) = *Orthosia (Vincetoxicum) virgata* Fourn.
viridiflora Kostel. (Allg. Med.-Pharm. Fl. 3:1082, 1834) = *Cryptolepis buchanani* Roem. et Schult.
viridiflora Sessé et Moc. (Fl. Mexic. ed. 2., 71, 1894) = ?
vomitoria Leschen. ex Kostel. (Allg. Med-Pharm. Fl. 3:1082, 1834) nomen = ?
Wildemanii A. Chev. (Etud. Fl. Afr. Centr. Franc. 1:197, 1913; Sudania 1:188 no. 10879, 1911, nomen) = *Parquetina nigrescens* (Afz.) Bullock
zeylandica salicifolia Burm. ex Decne. (in DC. Prodr. 8:500, 1844) = *Hemidesmus indicus* R. Br. var.?

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