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# I. STUDIES IN THE BORAGINACEAE,—II.

## 1. A Synopsis of the American native and immigrant Borages of the Subfamily Boraginoideae.

The following summary of the American *Boraginoideae* is the result, first, of a critical examination and study of the generic lines within the subfamily, and, second, of a careful study of the bibliography of the group and a serious attempt to identify as many as possible of the poorly understood or unidentified species. The data accumulated have been fashioned into a synopsis containing new keys to both genera and species, and such precise information as to specific distribution as available specimens and reliable records will permit. For the territory south of Mexico the occurrence of introduced species has been given by countries, but to the north the occurrence has been given by states. An attempt has been made to distinguish between reports based upon published records, and those founded upon specimens personally examined, all records of the latter sort being indicated by the exclamation sign. No attempt has been made to treat the genus *Cryptantha* which is being reserved for a subsequent paper. Such genera as *Amsinckia* or *Plagiobothrys* which have had recent revision are not treated in detail; instead, merely the reference to the latest published review has been cited.

The study of the South American members of the subfamily has been practicable only through the courtesy of Dr. W. R. Maxon and Dr. N. L. Britton who have loaned for my study, in conjunction with the material in the Gray Herbarium (G), that from South America contained in the United States National Herbarium (US) and the New York Botanical Garden (NY). Invaluable for my study of *Pectocarya* was the Southern Californian material of that genus contained in the Baker Herbarium of Pomona College (P) and loaned me by Dr. P. A. Munz.

### Key to Genera.

Attachment of nutlet surrounded by a tumid annular rim, rather strongly convex or plug-like, leaving a pit upon the flat or low-convex gynobase. *Anchuseae.*

Stamens appendaged dorsally, closely crowded about the style; corolla rotate, suggesting that of a *Solanum* ..... 1. *Borago.*

Stamens unappendaged, included within the decidedly tubular corolla.

Corolla lacking faucal appendages or these represented by villous spots ..... 2. *Nonea.*

Corolla with definite faucal appendages formed by the intrusion of tissue.

Corolla broadly tubular; throat conspicuously developed and campanulate-dilated; lobes short, erect or with tips recurved; faucal appendages lanceolate, acute, margins denticulate ..... 3. *Symphytum*.
Corolla funnel- or salver-form; throat ill-defined, abruptly expanding or absent; lobes usually elongate, spreading or divergent; faucal appendages deltoid or oblong, obtusish, usually hairy.
Corolla-tube distinctly bent near middle, limb subirregular and oblique ..... 4. *Lycopsis*.
Corolla-tube straight, limb perfectly regular, not oblique ..... 5. *Anchusa*.
Attachment of nutlet without an annular rim, flat or somewhat concave, not leaving a pit on the gynobase.
Stigmas geminate or style bifid. *Lithospermeae*.
Corolla more or less irregular, oblique; stamens unequal ..... 6. *Echium*.
Corolla regular or only very obscurely irregular, stamens equal.
Calyx cylindrical, merely toothed; teeth short, triangular, not half length of tube, usually connivent over fruit; one nutlet normally developed this persistent and falling enclosed in calyx; pubescence in part of uncinate hairs.
Inflorescence naked, very dense ..... 7. *Moritzia*.
Inflorescence leafy-bracted, open ..... 8. *Thaumatocaryon*.
Calyx cut to near base; lobes linear or lanceolate, much longer than tube; four nutlets normally developed; these falling separately and not enclosed in the calyx, which is persistent; pubescence of straight hairs.
Corolla very large, 2.5–8 cm. long, lobes acute; stamens very long, reaching at least to corolla-sinuses and frequently much beyond ..... 9. *Macromeria*.
Corolla of small or medium size, less than 2.5 mm. long; stamens very short, included and not approaching corolla-sinuses.
Filaments ligulate; anthers densely hirsute dorsally; corolla-lobes short, rounded, erect ..... 10. *Lasiarrhenum*.
Filaments filiform; anthers glabrous.
Corolla-lobes acute or acuminate, erect; style long-exserted, protruded as the buds open; anthers sagittate ..... 11. *Onosmodium*.
Corolla-lobes rounded or obtuse, ascending or spreading or recurved; style included or short-exserted, never protruded until flower is fully opened; anthers oblong.
Nutlets attached to a flat gynobase by a large broad centered basal attachment, usually smooth and shiny but occasionally tuberculate-roughened; leaves alternate ..... 12. *Lithospermum*.
Nutlets attached suprabasally and obliquely to a pyramidal gynobase or attached to a flat gynobase by a small strongly eccentric substipitate basal prolongation of the ventral keel, always tuberculate- or rugose-roughened, dull; lower leaves usually opposite ..... 13. *Antiphytum*.

Stigmas solitary and simple, capitate or disk-shaped, occasionally emarginate.
Nutlets attached near the apical end, divaricate or distinctly divergent, anterior face forming a right angle or a very broad acute angle with the floral axis. *Cynoglosseae.*
Dorsal surface of nutlets rather uniformly covered with glochidiate filiform or subulate appendages, rarely margined and then merely by a wrinkle in the pericarp.
Nutlets lenticular, very depressed; cauline leaves on slender petioles at least half as long as the deeply cordate blades; plants weak and trailing.....14. *Mimophytum.*
Nutlets turgid, usually compressed-ovoid; cauline leaves sessile or on very short winged petioles which are very much shorter than the linear to oblanceolate blades; plants erect.....15. *Cynoglossum.*
Dorsal surface of nutlets naked or occasionally covered with uncinate appendages, with a callous or chartaceous margin that is entire or serrate or with uncinately tipped subulate teeth or appendages.
Fruiting pedicels nodding or reflexed, coarse, stiff, shorter than nutlets; corolla minute, tubular or salverform; nutlets flat or convex and somewhat ovate or elongate, with the toothed or undulate margins usually armed with uncinate hairs.....16. *Pectocarya.*
Fruiting pedicels various, usually flexuous, much longer than nutlets; corolla conspicuous, subrotate or rotate-tubular; nutlets with cupulate margins which lack uncinate hairs or teeth.....17. *Omphalodes.*
Nutlets attached near base or middle, more or less erect and parallel, anterior face paralleling floral axis or forming a very narrow acute angle with it.
Fruiting calyces extraordinarily irregular, three lobes nearly distinct, the other more united, enclosing the fruit and becoming cornute with 7–9 long glochidiate processes; ovules 2. *Harpagonelleae*.....18. *Harpagonella.*
Fruiting calyces regular or practically so, not armed with cornute glochidiate processes; ovules usually 4. *Eritrichieae.*
Corolla-lobes convolute in the bud; herbs with usually ebracteate racemes and smooth narrowly and basally attached nutlets.....19. *Myosotis.*
Corolla-lobes imbricate in the bud.
Nutlets 2, each commonly 2-celled; anthers sagittate with the auricles usually appendaged; rather rank herbs with broad deeply cordate sessile leaves.....20. *Cerinthe.*
Nutlets usually 4, these normally 1-celled; anthers not sagittate nor appendaged; leaves not cordate.
Fruiting calyx strongly accrescent, very veiny, irregularly toothed and lobed, plicate.....21. *Asperugo.*
Fruiting calyx moderately accrescent if at all, not conspicuously veiny nor irregularly toothed or lobed, never plicate.
Cotyledons 2-lobed; corollas unappendaged, orange or yellow.....22. *Amsinckia.*

Cotyledons unlobed; corollas almost always appendaged, white or blue or very rarely even yellowish.
Shrub 9–18 dm. high; nutlets broadly attached anteriorly for nearly their whole length, margin lacerate, dorsum with glochidiate appendages.....23. *Selkirkia.*
Herbaceous or rarely suffrutescent plants, less than 9 dm. high.
Nutlets with a definite medial ventral groove formed by the non-fusion of the pericarpial walls.....24. *Cryptantha.*
25. *Oreocarya.*
Nutlets with the pericarpial walls fused at least above the middle and commonly forming a medial ventral keel.
Dorsum of nutlets not encircled by an up-turned rim or flange, almost always without glochidiate appendages.
Corolla white, throat very short and shallow, tube exceeded by or rarely just exceeding calyx; nutlets usually with a medial dorsal keel; style usually shorter than nutlets.....26. *Plagiobothrys.*
Corolla blue, throat cylindrical or funnelform, tube usually much surpassing calyx; nutlets usually lacking a medial dorsal keel; style usually greatly exceeding nutlets..27. *Mertensia.*
Dorsum of nutlets encircled by an up-turned rim or flange which is usually toothed or lacerate, commonly with uncinate hairs or glochidiate appendages.
Gynobase flat; nutlets definitely tetrahedral, attached basally (at apex of inverted tetrahedron) or through a suprabasal substipitate prolongation.....28. *Trigonotis.*
Gynobase pyramidal or subulate; nutlets not at all tetrahedral, attached ventrally.
Nutlets equalling the subulate gynobase, attached for nearly their whole length along the ventral keel, lacking a definite areola; style usually surpassing nutlets; bracteate annuals.....29. *Lappula.*
Nutlets twice surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola; style exceeded by nutlets; usually ebracteate; perennials or biennials.

Fruiting calyces erect or ascending; low densely caespitose silky-pubescent plants with small firm leaves.....30. *Eritrichium.*
Fruiting calyces reflexed; rank tufted glabrous or sparsely pubescent plants with broad herbaceous leaves.....31. *Hackelia.*

1. **Borago** [Tourn.] L. Sp. Pl. 137 (1753); Gen. Pl. 67 (1754).

**Borago officinalis** L. Sp. Pl. 137 (1753).—Native of the Mediterranean region. Introduced in N. S., Me.!, N. H.!, Mass.!, Conn., N. Y., Penn., D. C., Va., Ont., Tenn., Ill.!, O., Mich., Wis., N. D., Ore., B. C., Vera Cruz!, Jalisco, Nicaragua, Ecuador, Bolivia!, Chile, Uruguay, Argentina.

2. **Nonea** Medik. Phil. Bot. i. 31 (1789).

KEY TO SPECIES.

Nutlets apparently attached on side, longer than tall, with the strongly defined coarse annular basal rim papillose-dentate on margin.....1. *N. vesicaria*
Nutlets apparently attached at or near the base, evidently taller than broad, with the annular basal portion weakly developed and not papillose-dentate.
Nutlets brown, nearly vertical, only slightly oblique, subterete, very obscurely rugose, greatest breadth ca. ⅔ height; plant commonly branched only near base; corolla usually yellow.....2. *N. lutea.*
Nutlets plumbeous, strictly ascending, strongly oblique, compressed, conspicuously rugose, greatest breadth nearly equalling height; plant branched above; corolla rose-colored at least upon opening.....3. *N. rosea.*

1. **Nonea vesicaria** (L.) Reichenb. Fl. Germ. Excur. i. 338 (1831). *Lycopsis vesicaria* L. Sp. Pl. 138 (1753). *Echioides nigricans* Desf. Fl. Atl. i. 163 (1798–1800). *N. nigricans* DC. Fl. Fr. iii. 626 (1805).—Native of the western Mediterranean region. Reported, Mem. N. Y. Bot. Gard. v. 525 (1915), as adventive in the vicinity of New York.

2. **N. lutea** (Desr.) DC. Fl. Fr. iii. 626 (1805); Bornmüller, Bull. Herb. Boiss. ser. 2, vii. 780 (1907). *Lycopsis lutea* Desr. in Lam. Dict. iii. 657 (1791). *L. ciliata* Willd. Sp. Pl. i. 780 (1797). *N. ciliata* DC. l. c. *L. setosa* Lehm. Asperif. ii. 269 (1818). *N. setosa* R. & S. Syst. iv. 754 (1819).—Native of southeastern Europe and adjacent Asia. Occasionally introduced in impure seed. Known from Penn.!, Ky.!, and N. Y.!

3. **N. rosea** (Marschall) Link, Enum. i. 167 (1821). *Anchusa rosea* Marschall, Fl. Taur.-Cauc. i. 125 (1808).—Native of southeastern Europe. Collected in a waste place at Bangor, Me., in 1902 by O. W. Knight.

ed. 12, 146 (1767). *C. amplexicaule* Michx. Fl. Bor. Am. i. 132 (1803). *C. lucidum* Stokes, Bot. Mat. Med. i. 277 (1812).—Southern Connecticut southward to northern Florida, west to Louisiana and Missouri.

13. **C. boreale** Fernald, Rhodora vii. 250 (1905).—New Brunswick and adjacent Quebec, southward to northern Connecticut, westward through New York and southern Ontario to northern Michigan; reappearing in southern British Columbia. All the vegetative characters of this species can be matched, after a short search, among indubitable material of *C. virginianum*. It usually differs, however, in its more slender habit, less stiff pubescence, more elongate slender pedicels, and smaller floral parts; and seems to be always distinct in its smaller nutlets and northern range. Brand, Pflanzenr. iv. Fam. 252, i. 131 (1921), reduces the species outright to *C. virginianum*, but surely it is deserving of varietal rank at the very least.

16. **Pectocarya** DC. in Meisner, Genera i. 279; ii. 188 (1840).

*Ktenospermum* Lehm. Del. Sem. Hort. Hamburg 17 (1837), nom. nud. *Gruvelia* A. DC. Prodr. x. 119 (1846).

KEY TO SPECIES AND VARIETIES.

Nutlet-margins lacerate or undulate or uncinate-bristly, usually ascending or erect. § *Eupectocarya.*
- Back of nutlets armed with coarse subulate appendages similar to those forming the margin ..... 1. *P. anomala.*
- Back of nutlets without coarse subulate appendages; margin well defined.
  - Plant erect, ascendingly branched above; body of nutlets obovate; calyx-lobes surpassing the nutlets..... 2. *P. lateriflora.*
  - Plant prostrate or decumbent, much branched from the base; body of nutlets usually linear or oblong, rarely somewhat obovate; calyx-lobes equaled or surpassed by nutlets.
    - Nutlets with margins pectinately lacerate or dentate to near base and in addition usually uncinate-bristly about apex ..... 3. *P. gracilis.*
    - Fruit similar throughout plant, not dimorphic.
      - Body of nutlets definitely linear.
        - Nutlet-margin very narrow and inconspicuous..var. *genuina.*
        - Nutlet-margin broad and very conspicuous....var. *platycarpa.*
      - Body of nutlets obovate or oblong-obovate.....var. *boliviana.*
    - Fruit dimorphic, with normal divaricate nutlets borne on branches and peculiar reflexed persistent ones borne about base of plant.....var. *dimorpha.*

Nutlets with margins entire or undulate along sides, armed only at apex where densely uncinate-bristly. 4. *P. penicillata.*

Nutlets similar, all margined; fruit not dimorphic, similar in all parts of plant.....var. *genuina.*

Nutlets dissimilar, fruit on the branches consisting of two evidently margined and two unmargined nutlets, fruit borne at base of plant with consimilar unmargined strongly reflexed nutlets . . . var. *heterocarpa*.

Nutlet-margin entire, lacking uncinate-hairs or lacinae or teeth.

§ *Gruvelia*.

Nutlets equally divergent, marginless, obviously angular and rhomboid in outline; calyx-lobes strigose with appressed uncinate hairs towards the tip; plant very slender, branched mainly near base, sparsely strigose. . . . . 5. *P. pusilla*.

Nutlets divergent in pairs, some usually wing-margined, obscurely angular, obovate or rhomboid-obovate in outline; calyx-lobes strigose and sparsely spreading hirsute; plant stiffish, becoming freely branched, very strigose. . . . 6. *P. setosa*.

Fruit with nutlets all wing-margined. . . . . var. *holoptera*.

Fruit with some of nutlets lacking a wing-margin.

Nutlets all marginless. . . . . var. *aptera*.

Nutlets margined and unmargined in the same fruit. . . . . var. *genuina*.

1. **Pectocarya anomala**, sp. nov., erecta 7–15 cm. alta dichotoma strigosa supra laxe ramosa; foliis linearibus 1–3 cm. longis 0.8–1 mm. latis sparse hispidis inferioribus oppositis; pedicellis recurvatis quam bracteae foliaque multo brevioribus; sepalis lanceolatis quam nuculae paullo longioribus; nuculis obovato-oblongis ca. 0.7–0.8 mm. latis 1.5–1.7 mm. longis granulatis, dorso et marginibus cum appendicibus valdis uncinatis subulatis subteretibus uncinato-pubescentibus ca. 1–1.2 mm. longis munitis, marginibus inconspicuis.—PERU: sandy pampa on the southern slope of Chachani Mountain near Arequipa, 2400 m. alt., *Mr. & Mrs. F. E. Hinkley 41* (TYPE, Gray Herb.).—Although in habit clearly a *Pectocarya* this species is quite anomalous in the genus in having the back of the nutlet, not unarmed and margined, but studded with coarse uncinate subulate uncinately pubescent appendages which are quite indistinguishable from those of the proper margin. The plant is erect-growing with a few loosely ascending branches from above the middle. In this habit it differs from *P. gracilis* and *P. penicillata*, and agrees with *P. lateriflora*. It is, however, a lower, less stiff, and less strictly branched plant than the latter. According to its collectors the plant is locally known as "estrella gateadora."

2. **P. lateriflora** (Lam.) DC. Prodr. x. 120 (1846). *Cynoglossum lateriflorum* Lam. Encycl. ii. 239 (1786); Planch. t. 92, fig. 2 (1791). *Mattia lateriflorum* Don, Gen. Syst. iv. 310 (1838). *C. pilosum* R. & S. Fl. Peruv. ii. 6, t. 111b (1799). *M. pilosa* Don, l. c. *Rindera pilosa* R. & S. in DC. l. c. (?) *Ktenospermum linifolium* Lehm. Linnaea xii. Lit. 84 (1838); nom. nud.—Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), has taken *P. lateriflora* as including the two following

species, but as here taken it is in a much more limited sense and restricted to the Peruvian plants originally described. The species is known only from the western strip of Peru, and is well characterized by its erect habit of growth.

3. **P. gracilis** (R. & P.), comb. nov. *Myosotis gracilis* R. & P. Fl. Peruv. ii. 5 (1799). *Echinospermum gracile* Lehm. Asperif. i. 129 (1818). *Rochelia gracilis* R. & S. Syst. iv. 111 (1819). *Cynoglossum lineare* R. & P. l. c. 6. *P. linearis* DC. Prodr. x. 120 (1846). *P. chilensis* DC. l. c. (?) *P. chilensis*, var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857).

3a. **P. gracilis**, var. **genuina**.—This is the common species of *Pectocarya* in Chile and Argentina. It is uncommon in North America, apparently restricted there to Southern California and to the islands off that coast. The following cited collections represent all the material of true *P. gracilis* which I have seen from North America.—San Diego, *Brandegee 1636* (G, P); Granite, San Diego County, *Spencer 115* (G); Palm Springs, *Margaret Ferguson 41* (Wellesley College Herb.); Butte west of Lakeview, 1920, *Johnston* (P); Temescal Canyon, *Munz & Harwood 3387* (G); foothills of San Bernardino Mts., 1896, *Cummings* (G); Claremont, *Munz 2005* (P), *Baker 4135* (P); Surprise Canyon, Panamint Mts., *Coville & Funston 721* (G); Santa Cruz Island, 1887, *Ford* (G); Catalina Island, *Grant 913* (G); Clemente Island, *Munz 6690* (G, P); Guadalupe Island, *Palmer 69a* (G), *Anthony 237* (G).

3b. **P. gracilis**, var. **platycarpa** Munz & Johnston, var. nov., ascendens saepe robustior; margine nuculae grosse dentato ca. 1 mm. lato valde conspicuo.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Wickenburg, *W. W. Jones 88* (G); Tucson, *Greene 1109* (G); mesas near Camp Lowell, April 16, 1881, *Pringle* in part (TYPE, Gray Herb.); without locality, 1884, *Pringle* (G). UTAH: valley of Virgin near St. George, *Parry 167* (G). CALIFORNIA: Agua Caliente, *Parish Bros. 122* (G); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Providence Mts., *Munz & Harwood 3532* (P), *3535* in part (P); east of Daggett, *Munz & Harwood 3673* (P).—This well marked variety seems to replace the var. *genuina* in the deserts of California, Arizona, and Utah. With only North American material at hand the plant seems so extreme and positive as to merit specific rank. However, the South American material of the var. *genuina* frequently has rather broadly margined nutlets that show an approach to the condition characteristic of the var. *platycarpa*, and it hence seems best to treat the latter merely as a variety of the same species.

3c. **P. gracilis,** var. **boliviana,** var. nov., ramosa prostrata; nuculis obovatis vel oblongo-obovatis.—BOLIVIA: Chignana, 3700 m. alt., *Asplund 3897* (TYPE, U. S. Nat. Herb.); Challapata, 3900 m. alt., *Asplund 5895* (US); Teneral Campero, 4200 m. alt., *Asplund 5894* (US); Atocha, 3700 m. alt., *Asplund 5896* (US).—This appears to be the northern phase of *P. gracilis* in South America. The cited suite of specimens is uniform in the crucial characters of the variety, the obovate body of the nutlet, but as to margining varies from conspicuously pectinate-dentate to almost naked.

3d. **P. gracilis,** var. **dimorpha,** var. nov., ramosa prostrata; fructis dimorphis, superioribus nuculas divaricatas compressas normales gerentibus, infimis nuculas reflexas crassas persistentes gerentibus; nuculis oblongis.—CHILE: Vallemar, *Rose 19331* (US); Desert of Atacama, *Morong 1282* (TYPE, Gray Herb.; ISOTYPE, N. Y. Bot. Gard.).—This plant of northern Chile is evidently not typical of the var. *genuina* and because of its conspicuously dimorphic nutlets appears to deserve special varietal recognition. The normal nutlets have a very broad, erect, merely toothed margin.

4. **P. penicillata** (H. & A.) A. DC. Prodr. x. 120 (1846). *Cynoglossum penicillatum* H. & A. Bot. Beech. 371 (1840). *P. linearis,* var. *penicillata* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895). *P. miser* Nels. Bot. Gaz. xxxvii. 278 (1904).—In its two forms this is the most common and widely distributed of the North American Pectocaryas. Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), takes up *Cynoglossum Nuttallii* Spreng., Syst. i. 566 (1825), as the earliest name of the present species. Sprengel's name, however, is based upon *C. pilosum* of Nuttall, Gen. i. 114 (1818), which is, as Gray, Synop. Fl. N. Am. ii. pt. 1, 190 (1878), has indicated, a species of *Lappula.*

4a. **P. penicillata,** var. **genuina.**—Ranging from British Columbia, Idaho and southwestern Wyoming southward to northern Nevada and Lower California. In Arizona, southern Nevada, and the deserts of California it is replaced by the following variety.

4b. **P. penicillata,** var. **heterocarpa,** var. nov., deserticola; nuculis heteromorphis, duabus marginatis, duabus emarginatis gracilioribus paullo reflexis.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Camp Grant, *Palmer 182* (G); near Camp Lowell, 1881, *Pringle* in part (G); without locality, 1876, *Palmer* (G). NEVADA: Moapa, *Goodding 2200* (G); St. Thomas, *Tidestrom 8642* (G). CALIFORNIA: Ft. Yuma, *Major Thomas* (G); (?) Colorado River, 1854, *Bigelow;* Coahuilla Valley, 1901, *Hall* (G); Surprise Canyon, Panamint Mts., *Coville & Funston 721* in part (G); Providence Mts., *Munz & Harwood*

*3435* in part (P); near Daggett, *Munz & Harwood 3673* in part (P); north of Randsburg, 1922, *Pierce* (P); Corn Springs, Chuckawalla Valley, 1922, *Munz & Keck 4870* (TYPE, Pomona College Herb.); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Paloverde Valley, 1905, *Wilder* (P); Palm Springs, *Spencer 115* (P). The following collections appear intermediate between var. *genuina* and var. *heterocarpa*. Hemet, *Baker 4139* (P); near Cabazon, *Munz, Street & Williams 2387* (P); Santa Susana Mts., *Brewer 210* (G); Oil City, *Heller 7586* (G).—The nutlets of this variety are dissimilar, two of each fruit usually being unmargined, thicker, and somewhat reflexed. The fruit borne about the base of the plant is different from that borne well out on the branches and perhaps is produced by cleistogamous flowers. The nutlets of this fruit are usually consimilar, all are strongly reflexed, very thickened, and broadly and permanently affixed to the gynobase. Similar fruit is found in the Chilian *P. gracilis*, var. *dimorpha*.

5. **P. pusilla** (A. DC.) Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia pusilla* A. DC. Prodr. x. 119 (1846); Gay, Fl. Chile iv. 482, t. 52, fig. 3 (1849). *P. pusilla*, var. *flagillaris* Brand, Pflanzenr. iv. Fam. 252, i. 96 (1921).—West of the high mountains from southern Washington to middle (Fresno County) California; also in Chile where very rare. Brand, l. c., considers the North American plant varietally distinct from the South American, arguing that it has more slender, elongate stems. Though the northern material may frequently attain greater slenderness and height than the southern, the two are certainly indistinguishable at times.

6. **P. setosa** Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia setosa* Rydb. Bull. Torr. Bot. Cl. xl. 479 (1913).—This species is confined to western North America and breaks up into three geographic varieties as follows:—

6a. **P. setosa**, var. **genuina.**—Washington and Idaho in the arid interior, southward into Utah and Arizona, and along the Sierras to the Mohave and northern Colorado Deserts. This is the common and typical phase of the species having two of the four nutlets winged, and two wingless with the latter pair partially hidden by the former.

6b. **P. setosa**, var. **aptera**, var. nov., australis; nuculis vix alatis vel omnino apteris.—CALIFORNIA: Warners Hot Spring, *Eastwood 2620* (G); dry canyon floor near Campo, 1903, *Abrams 3571* (TYPE, Gray Herb.).—The nutlets of this variety are quite similar to those of *P. pusilla*. The specimens referred here come from the western

side of the Colorado Desert and represent the only material of the species seen from the area.

6c. **P. setosa**, var. **holoptera**, var. nov., mohavensis; nuculis omnibus late aequaliterque alatis.—CALIFORNIA: White Mts. east of Laws, *Heller 8187* (G); Granite Wells, Mohave Desert, 1922, *Johnston 6489* (TYPE, Pomona College Herb.); near Mohave, 1920, *Johnston* (P); Mt. Pinos, *Hall 6423* (P).—This form, characterized by having all its nutlets broadly and equally winged, occurs along the northwest edge of the Mohave Desert.

## 17. **Omphalodes** Moench, Meth. 419 (1794).

### KEY TO SPECIES.

Cauline leaves sessile, oblong-linear or lanceolate; corolla white; introduced plants.....1. *O. linifolia.*
Cauline leaves long-petiolate, blades more or less cordate; corolla blue or bluish; indigenous plants, mainly Mexican.
  Flowers in naked racemes with only the lowermost if any bracteate; annual.....2. *O. aliena.*
  Flowers all axillary; short-lived perennials.
    Corolla large, 10–14 mm. broad; leaves herbaceous, lower ones 25–35 mm. broad.....3. *O. acuminata.*
    Corolla small, 5–7 mm. broad; leaves firm, largest lower ones only 10–15 mm. broad.
      Leaves with evident veining, sharply acute or acuminate, rather sparsely strigose; pedicels shorter or but little exceeding the bracts.....4. *O. cardiophylla.*
      Leaves with obscured veining, broadly acute, velutinous with a dense short pubescence; pedicels twice exceeding the subtending leaves.....5. *O. mexicana.*

1. **Omphalodes linifolia** (L.) Moench, Meth. 419 (1794). *Cynoglossum linifolium* L. Sp. Pl. 134 (1753).—Native of southwestern Europe. Reported by Hooker, Fl. Bor. Am. ii. 86 (1838), from Labrador. Collected in 1919 on street parking in Salem, Oregon, by J. C. Nelson.

2. **O. aliena** Gray in Hemsl. Biol. Centr. Amer. Bot. ii. 377 (1882).—TEXAS: common, rocky hillsides, Sanderson, *H. C. Hanson 381.* NUEVO LEON: limestone hills near Monterey, 600 m. alt., *Pringle 10205, 10206;* Monterey, 1880, *Palmer 893* (TYPE).

3. **O. acuminata** Robins. Proc. Am. Acad. xxvi. 170 (1891).—NUEVO LEON: Sierra Madre near Monterey, *Pringle 2220* (TYPE); limestone ledges of Sierra Madre above Monterey, *Pringle 10162.*

4. **O. cardiophylla** Gray in Hemsley, Biol. Centr. Amer. Bot. ii. 377 (1882).—PUEBLA: Boca del Monte on shaded mountain slopes, *Purpus 2498.* COAHUILA: mountains near Saltillo, *Palmer 894* (TYPE).

5. **O. mexicana** Wats. Proc. Am. Acad. xxv. 158 (1890).—Nuevo Leon: fissures of dry lime rock, Sierra Madre near Monterey, *Pringle 1878* (type).

18. **Harpagonella** Gray, Proc. Am. Acad. xi. 88 (1876).

**Harpagonella Palmeri** Gray, Proc. Am. Acad. xi. 88 (1876); Baill. Bull. Mens. Soc. Linn. Paris no. 102, 812 (1889); Hist. Pl. x. 351, fig. 266–8 (1890); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 130, fig. 53 (1891).—An anomalous monotype known only from Pima and Cochise counties in southern Arizona, extreme southwestern California in western San Diego and southwestern Riverside counties, extreme northwestern Lower California, and on the Guadelupe and Santa Catalina Islands.

19. **Myosotis** [Dill.] L. Sp. Pl. 131 (1753); Gen. Pl. 63 (1754).

Key to Species.

Inflorescence leafy-bracted nearly throughout; corolla-tube at least a third longer than calyx; prostrate antarctic perennials.
Corolla white, limb ca. 4 mm. broad; pedicels equalling calyx and becoming 1–2 mm. long; nutlets ca. 1.8 mm. long, 1.2 mm. broad; plant sparsely short-hairy.....1. *M. albiflora.*
Corolla blue, limb ca. 2.5 mm. broad; calyx subsessile; nutlets ca. 1.3 mm. long, 0.8 mm. broad; plant long-hairy throughout.....2. *M. antarctica.*
Inflorescence naked or rarely with the lowermost flowers bracteate; corolla-tube little if at all exceeding calyx; mostly erect annuals.
Hairs on calyx few, short, straight, closely appressed, eglandular; aquatic or marsh plants.
Style commonly much exceeding the nutlets and about equalling calyx-tube; corolla large, 6–9 mm. broad; calyx-lobes commonly shorter than tube; inflorescence usually completely bractless; stems rather coarse, angled, usually ascending, stoloniferous at base..3. *M. scorpioides.*
Style clearly exceeded by nutlets and shorter than calyx-tube; corolla rather small, 3–6 mm. broad; calyx-lobes about equalling the tube; main branches of inflorescence bracted at base; stems slender, terete, branched at base, not stoloniferous.....4. *M. laxa.*
Hairs on at least basal portion of calyx uncinate or gland-tipped; plants of well drained soil.
Plants conspicuously densely retrorse-hirsute below, rather coarse and loosely decumbent; leaves broadly oblanceolate, contracted to a narrow well developed petiole..5. *M. azorica.*
Plants not conspicuously retrorse-hirsute, rather slender, mainly erect; leaves oblong or lanceolate, lacking well developed petioles.
Plants densely tufted; stems with loose papery sheaths at base; native alpine perennials.....6. *M. alpestris.*