

STUDIES IN THE BORAGINACEAE, XXI
SINO-INDIAN SPECIES OF ONOSMA

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19. *Onosma Waddellii* Duthie, Kew Bull. 1912: 41 (1912). — Type from Lhasa, Tibet, ca. 3650 m. alt., *Waddell*.

Plant with one to several slender stems arising from a slender dye-stained root, annual or biennial or sometimes perennial; stems erect to decumbent, 1–3 dm. long, 1–3 mm. thick towards the base, simple or more commonly bearing slender ascending floriferous branchlets (1–8 cm. long) at least above middle, at times with pedunculate cymes in many of the leaf-axils, sparsely hispid (hairs ca. 1 mm. long, stiff, spreading, from thickened base) and abundantly strigulose (hairs 0.1–0.2 mm. long, mostly closely appressed, mainly retrorse); leaves numerous, veinless, green above, strigulose and with scattered appressed coarse hairs with evident pallid bases, lower surface paler, abundantly strigulose; basal leaves usually not persistent at flowering time, narrowly oblanceolate, about 4–6 cm. long; middle stem leaves lanceolate, 2–5 cm. long, 4–7 mm. broad; cymes usually numerous, terminating stems and branches and frequently pedunculate in the upper axils, not forked, at anthesis 1–1.5 cm. broad, at maturity becoming racemose, 4–7 cm. long; peduncles slender, sparsely leafy, 3–5 cm. long; calyx 5–7 mm. long, weakly accrescent at maturity, lobes lanceolate, 0.5–1 mm. broad, short hispid; pedicels 1–3(–5) mm. long; corolla blue, 10–15 mm. long, with a short tube ca. 2 mm. thick then expanding into a campanulate throat 5–8 mm. broad, outside inconspicuously strigulose or hispidulous on and directly below the lobes, elsewhere usually obscurely puberulent, inside glabrous except for the usually villose nectary; lobes triangular, 2.5 mm. broad, 1–1.5 mm. long, margin revolute; throat outside moderately inflexed below the corolla-sinus; anthers 4–7 mm. long, coherent at base and sides to form a tube, partially to nearly completely exserted, affixed 1.5 mm. above base, base carried 2–5 mm. below level of corolla-sinus, sterile tips 0.5–1 mm. long; filaments 5–7 mm. long, arising 3–4 mm. above corolla-base, decurrent base 2.5–3 mm. long, becoming swollen when moistened, frequently minutely papillate; nectary very narrow, 0.1 mm. high, lobulate, more or less villulose; style glabrous, 10–16 mm. long; nutlets 2.5 mm. long, somewhat lustrous, sparsely tuberculate and obscurely rugulose.

TIBET: Lhasa, 12000 ft., Sept. 1904, *Waddell* (Ed, G, ISOTYPES); Lhasa, 12000 ft., open sandy banks, fl. clear bright blue, *Ludlow & Sherriff* 9738 (G); near Drepung Monastery, Lhasa, 12000 ft., gravelly soil, fl. bright sky-blue, *Ludlow & Sherriff* 9000 (G); Singma Khangchung, 11500 ft., *F. S. Chapman* 190 (Ed); Lilung, Tsangpo Valley, long. 93°54', 10000 ft., open grassy meadow, fl. very bright blue, *Ludlow, Sherriff & Taylor* 5702

(G); Tumnyen, long. $94^{\circ}38'$, common down Tsangpo Valley in sandy gravelly or dry places, fl. deep blue, 9500 ft., *Ludlow, Sherriff & Taylor 5469* (G); Gyala, Tsangpo Valley, long. $94^{\circ}56'$, 9300 ft., *Ludlow, Sherriff & Taylor 7547* (G); Gyala, gorge of Tsangpo, 9000 ft., rocky open situations by river, very sandy soil, fl. sky blue, *Ward 5965* (Ed, K); without locality, 1884, *King's collector 363* (DD).

19A. *Onosma Waddellii* var. *brachylinum*, var. nov.

A varietate genuina differt filamentis conspicue brevioribus 2–3 mm. longis.

TIBET: Kharta Valley, stony ground, 11500 ft., fl. deep blue, July 3, 1922, *E. F. Norton 312* (TYPE, Kew); Arun Valley, stony ground, 11000 ft., fl. pink, July 3, 1922, *E. F. Norton 305* (K); Orpa near Kharta Shika, 11000 ft., July 7, 1923, *L. R. Wager* (K); north of Mt. Everest, 12–16000 ft., Aug. 1921, *A. F. R. Wallaston 229, 231, and 232* (K).

Onosma Waddellii is a well-marked species. In general appearance it most suggests *O. multiramosum*, *O. adenopus* and *O. Farrerii*, and probably has some relations with them. Compared with the latter *O. Waddellii* differs in its ample corolla with coarser lobes and less strongly pleated throat. The corolla also has a thinner texture and its outer surface has a distinctive very minute puberulence. The folded corolla in the mature flower-bud is noticeably stouter and less attenuate apically than in the species mentioned.

The variety *brachylinum* comes from the northern base of Mt. Everest and accordingly from a part of Tibet to the southwest of that in which typical *O. Waddellii* is known. It differs from the typical variety not only in its very short filaments (2–3 mm., not 5–7 mm. long), but also in a number of less precise details. Noteworthy are its more spreading, frequently rather tawny, rather than pallid hairs, its proportionately broader leaves, and its slightly coarser cymes. These combine to make the variety *brachylinum*, as compared with var. *typicum*, appear slightly coarser, darker in color, and perceptibly less smooth and tidy in general appearance. Examination under the microscope reveals differences in the indument on the exterior surface of the corolla. The corolla of var. *brachylinum* is more abundantly and evidently puberulent, but less hispidulous than in *typicum*. The two also show differences in the degree to which the anthers may protrude from the corolla. The anthers are wholly included or have only their tips exerted in var. *brachylinum*. In var. *typicum* the anthers are exerted usually for at least half their length.

20. *Onosma Farrerii*, sp. nov.

Planta cinerea fruticulosa radice et basi caulis ignota, fortasse perennis et laxe ramosa; ramis hornotinis gracilibus foliosis simplicibus vel apicem versus ramulis paucis brevibus floriferis donatis, 2–3 dm. longis basim versus ca. 2 mm. crassis, hispida (pilis rigidis robustulis adscendentibus vix abundantibus 0.5–1.3 mm. longis basi discoidea orientibus) et strigulosis (pilulis 0.1–0.2 mm. longis retrorsis); foliis 1.5–3 cm. longis 2–4 mm. latis oblanceolatis enervatis scabris, in facie superiore hispidis (pilis adscendentibus rigidis 0.5–1 mm. longis basi discoidea orientibus) et

abundante strigulosis; in facie inferiore abundanter strigulosis; cymis 1–2 cm. latis, maturitate ad 4 cm. longis; calyce subanthesi ca. 6 mm. longo, lobis 0.5–1 mm. latis, pedicello ad 6 mm. longo; corolla in alabastro rostrato-attenuata apicem versus obscure curvata; corolla sub anthesi 11–11.5 mm. longa coerulea, a basi 2–2.5 mm. crassa primo laeviter deinde (ca. 2.5 mm. supra basim) validioriter ampliata, sinus versus 3–5 mm. crassa, sub sinus supra medium plicata, extus antrorse strigulosis et minutissime puberulenta, intus (nectario excepto) glaberrima; antheris 8 mm. longis basaliter lateraliterque cohaerentibus tubum formantibus, 1–1.5 mm. supra basim affixis, apicibus sterilibus ca. 1 mm. longis, basibus 1–2 mm. infra sinus corollae positus; filamentis 7 mm. longis a basi 0.3–0.5 mm. lata sursum gradatim attenuatis, 3 mm. supra basim corollae orientibus, transverse arcuateque affixis, haud decurrentibus; nectario angustissimo lobulato villuloso ca. 0.1 mm. alto; stylo glabro 13–15 mm. longo; nuculis ignotis.

CHINA (southern Kansu): betw. Kiai Chow and Wen Hsien, very abundant on dry bank, Apr. 26, 1914, *R. Farrer* 3 (TYPE, Gray Herb.).

This species comes from southernmost Kansu and there, at about lat. 33°, sets the northern limit for the genus in China. It appears to be related to *O. sinicum*, which ranges south of it, but is quickly separated by having the inner surface of the corolla and the filaments glabrous. Farrer, Jour. R. Hort. Soc. 42: 87 (1916) gives the following field notes concerning the type collection: "It fills all the torrid banks, in the torrid region of the Blackwater and the Nan Ho, with low clumped masses of narrow gray foliage, from which, in April, unfurl croziers of long pale-blue bugles, very pretty, but not large enough, and with the unfortunate notion of attempting a copy, at all points, of the supreme and inimitable *Lithospermum graminifolium*."

21. **Onosma Thomsoni** Clarke, Fl. Brit. India 4: 178 (1883).—Type from Banahal, southern Kashmir, 6000 ft., *Thomson* ("Onosma no. 3").

Plant perennial, producing numerous somewhat fruticose stems from a small loosely branched persisting fruticose caudex; stems of the year leafy, erect or ascending, 1.5–5 dm. long, 2–3 mm. thick towards base, simple or producing more or less elongate ascending leafy branches, abundantly villose or villose-hispid (hairs spreading 1–3 mm. long, white, slender); leaves numerous firm, veinless, frequently with strongly revolute margins, upper surface green, sparsely hispid (hairs pungent, stiff, usually ascending, arising from large white disks) and scantily strigulose (hairs 0.1–0.2 mm. long), lower surface white, minutely villulose or strigulose (hairs 0.1–0.2 mm. long) and also abundantly villose (hairs 1–2 mm. long); leaves towards base of stem oblanceolate, as much as 5–10 cm. long and 5–10 mm. broad, acute; middle cauline leaves usually narrowly lanceolate, 2–5 cm. long, 2–9 mm. broad; cymes 1.5–3 cm. broad at anthesis, at maturity loosely racemose and 4–9 cm. long, frequently forked, terminating

the main stems and branches and occasionally arising on peduncles 2–3 cm. long from the uppermost leaf-axils; calyx 8–11 mm. long, lobes lanceolate, densely villose or villose-hispid, pedicels 1–3 mm. long at anthesis, becoming 3–10 mm. long at maturity; corolla 10.5–12 mm. long, narrow, from a short tube 2–2.5 mm. thick expanding into an elongate throat 3–4.5 mm. thick, outside abundantly but minutely strigulose with mostly retrorse hairs, inside glabrous except for the nectaries, throat narrowly and tightly infolded below each corolla-sinus, lobes triangular 1.5 mm. broad, 1 mm. long, tip loosely recurved; anthers 7–8.5 mm. long, united into a tube, long exserted, affixed 1.5–2.2 mm. above base, sterile tips 1–2 mm. long, base carried 1.5–3 mm. below level of corolla-sinus; filaments 6–7 mm. long, arising 3–3.5(–4) mm. above corolla base, subulate, broadened near the base, attached transversely and arcuately, not at all decurrent; nectary very narrow, lobulate, ca. 0.1 mm. high, villulose; style 12–17 mm. long, glabrous; nutlets 2.5–3.5 mm. long, lustrous, obscurely rugulose or nearly smooth.

Known only from northwestern India; ranging in the front ranges of the Himalayas from Garhwal (long. $78^{\circ}30'$) to Hazara (long. $73^{\circ}30'$), from 3000 to 7000 ft. alt.

INDIA: Kalansa, Jaunsar, 5000 ft., May 1896, *J. S. Gamble 25771* (DD); rocks in Tons Valley, Jaunsar, above Thudiyar, 3000–4000 ft., May 4, 1895, *Duthie 15569* (DD); Chakrata Hills, Bodyar-Simla road, 7500 ft., fl. white, May 29, 1936, *C. E. Parkinson 7020* (DD); Bassahir, *J. R. Drummond 26013* (Ed); Tons Valley, Tehri-Garhwal, rocks, 3000–4000 ft., May 12, 1897, and May 22, 1900, *Duthie 19804* and *23934* (DD); Karole, Tons valley, 3000 ft., May 1895, *J. S. Gamble 25420* (DD); Kagan Valley, Hazara, 7000 ft., May 13, 1896, *Inayat 19479* (DD); Jabori, Saran range, Hazara, Aug. 1896, *Inayat* (DD); Kawai, Hazara, May 19, 1897, — no. *22013* (DD); Dhanni to Tithwal, lower Kishenganga Valley, Kashmir, ca. 3000 ft., *R. R. Stewart 17371* (G); ["Bahahal, Kashmir"], 5000–7000 ft., *T. Thomson 3* (G, ISOTYPE).

I can suggest no very close relative for this very well marked species. In the transverse arcuate attachment of its filaments it resembles *O. Farrerii*, but is no more closely related to that species than to *O. hypoleucum*, the Indian species so long confused with it.

22. *Onosma bracteatum* Wallich in Roxburgh, *Fl. Indica*, ed. Carey, 2: 13 (1824); DC. *Prodr.* 10: 66 (1846); Wallich, *Numerical List* 26, sub no. 936 (1829); Clarke, *Fl. Brit. India* 4: 178 (1883). — Type from "Shree-nugur" [Srinagar, Kumaon], *Kamroop*.

Onosma macrocephala D. Don, *Prodr. Fl. Nepal.* 99 (1825) and *Gen. Syst.* 4: 316 (1838). — A renaming of *O. bracteatum* Wall.

Perennial with several simple stems arising from a coarse persisting cluster of basal leaves; herbage coarsely villose-hispid and also minutely villulose, coarse hairs moderately stiff 1.5–4 mm. long, mostly arising from thickened bases, frequently somewhat tawny, short hairs straight, spreading or retrorse, 0.2–0.6 mm. long; stems 3–5 dm. tall, becoming 4–6 mm. thick,

leafy; leaves usually with some evident veins, the upper surface green, hispid, and scantily villulose, the coarse hairs with conspicuous pallid bases, the lower surface with a pallid villulose indument, scantily hispid; basal leaves persisting at anthesis, 12–30 cm. long (including the winged petiole 3–4 mm. wide and 6–8 cm. long), blade 15–35 mm. wide, gradually narrowed towards both ends, apex acute; middle cauline leaves lanceolate, 6–8 cm. long, 1–2.7 cm. wide, base rounded and broadly sessile, apex acute; inflorescence a pallid abundantly villose coarse terminal glomerate cluster, 4–10 cm. broad at anthesis and very dense, eventually 10–20 cm. broad, becoming less dense and revealing the crowded densely flowered forked individual cymes of which it is composed; bracts lanceolate, their acuminate tips slender and very prolonged; calyx abundantly and conspicuously white villose (hairs 1–5 mm. long), at anthesis 15–18 mm. long and borne on a pedicel 3–5 mm. long, at maturity about 20 mm. long and supported by a pedicel 8–12 mm. long; calyx-lobes linear, very slender, white villose; corolla (blue, fide Duthie) 13–17.5 mm. long, equaling the calyx-lobes or much surpassed by them, 6–7 mm. thick below the sinus, 3 mm. thick at base, outside villose above the middle, inside glabrous except on the nectary; corolla-lobes triangular, 2–3 mm. broad, 1–1.5 mm. long, weakly revolute, apex not sharply acute; anthers 6–7 mm. long, coherent at base only, attached 1.5–2 mm. above base, carried 6–7 mm. below the level of the corolla-sinus, sterile tip weakly developed, 0.5–0.8 mm. long, filaments 2–2.5 mm. long, attached 5.5–6.5 mm. above corolla-base, decurrent base swollen, fusiform, 3.5–4 mm. long, marked by fusiform depressions on the outside of corolla; nectary evident, a weakly lobed collar, densely villose on inner side; style 9–13 mm. long, glabrous; nutlets gray, angulate, coarsely rugose and tuberculate, 4–4.5 mm. long.

Himalaya of Garhwal and Kumaon (long. 79°–81° E.); reported from Kashmir.

INDIA: Chalck, Byans, 11–12000 ft., July 23, 1886, *Duthie 5824A* (DD); Palang Gadh., Byans, 11–12000 ft., July 21, 1886, *Duthie 5824* (DD); Duktin, Darma Valley, Kumaon, Sept. 7, 1900, *Inayat 24757* (DD, K); Nipchang Valley, Darma, 14–15000 ft., Aug. 31, 1881, *Duthie 3193* (DD); Ralam Valley, Kumaon, Aug. 18, 1900, *Inayat 24755* (DD); Shafa udyar, Ralam Valley, Aug. 19, 1900, *Inayat 24756* (DD, UC); Ralam, 11000 ft., *Strachey & Winterbottom* (G); near Kauri Pass, Brit. Garhwal, 12–13000 ft., Sept. 8, 1886, *Duthie 4230* (DD); Jumnotri, Tehri-Garhwal, 1877, *Native Collector* (DD).

NEPAL: Nampa Gadh, 11–12000 ft., July 26, 1886, *Duthie 5824 bis* (DD).

A very distinct species and one lacking any obviously close relatives. Among its notable features are its broad, frequently somewhat triple-veined bicolored leaves, its very attenuate bracts, and its very slender villose linear calyx-lobes which equal or much surpass the corolla. The type of the species has not been seen. The original description, however, leaves no doubt as to its identity. It was originally given as collected at "Shree-nugur by Kamroop." Wallich also spelled the locality "Srinuggur."

Don in describing *O. macrocephala* from a duplicate of the same collection cited the collection-locality as "Sirinagur." All these location-names appear to refer to Srinagur in Kumaon, a locality about fifty miles easterly from Dehra Dun. The specimens probably came from the high mountains lying to the north or northeast of the locality.

23. *Onosma Hookeri* Clarke, Fl. Brit. India 4: 178 (1883). — Type from Sikkim, *Hooker*.

Perennial; indument hispid or hispid-villose and also minutely hispidulous or villulose, coarse hairs 2–5 mm. long, minute hairs less than 0.3 mm. long; stems several 1–4.5 mm. long, arising from a cluster of persisting leaves, unbranched, hispid or hispid-villose (hairs tending to be somewhat tawny), minute hairs usually scanty; leaves firm, thickish, margins revolute, midrib very prominent, upper surface usually with very scanty minute hairs, loosely appressed hispid or hispid-villose, the hairs usually with thickened bases, the lower surface usually pallid with a felt-like indument composed of very abundant minute hairs, coarse hairs usually very scattered and most abundant along the midrib, only rarely becoming abundant and clothing the surface; basal leaves oblanceolate, 5–15 (or rarely 20) cm. long, 5–15 mm. broad, usually acute; middle cauline leaves lanceolate or lance-linear, 3–12 cm. long, 3–15 mm. broad, base obtuse or rounded, apex acute; cymes usually terminal and solitary, rarely accompanied by a second smaller one produced from the uppermost leaf-axil, simple or forked, at anthesis 3–6 cm. broad, in fruit elongating but remaining densely flowered and becoming at most only 8 cm. long; bracts narrowly lanceolate or subulate, not conspicuous, appressed; calyx 12–22 mm. long, lobes subulate, hispid or hispid-villose or both, pallid or slightly tawny; pedicels 2–10 mm. long; corolla 16–28 (usually 19–26) mm. long, blue to purple or red, usually evidently bluish when dry, 5–12 mm. thick below the level of the sinus, 2–3 mm. thick at the very base, outside evidently appressed villose or villulose; anthers coherent at the very base, 5.5–8 mm. long, affixed 2 mm. above base, base held 5–9 mm. below the level of the sinus, sterile tip short ca. 0.5 mm. long; filaments linear, 3.5–6 mm. long, arising 9–19 mm. above base of corolla and hence slightly above the middle of the corolla, base conspicuously decurrent forming an elevated ridge 7–15 mm. long; nectary villose on the inner surface; style 22–30 mm. long, glabrous; nutlets ca. 3 mm. long, more or less rugose.

Known from Sikkim and Bhutan and adjoining Tibet.

SIKKIM: without locality, *Hooker no. 2* (G, ISOTYPE); Llonok, 15000 ft., Aug. 4, 1909, *Smith & Cave 2110* (DD).

BHUTAN: Philey La, Tibet border, long. 89°30', 14000 ft., *R. E. Cooper 3464* (Ed); Lingshi Timpu, long. 89°30', 13000 ft., *R. E. Cooper 1596*, 1823, and 1745 (Ed).

TIBET: Koo-ma-py-a, Chumbi, fl. bluish red, July 29, 1884, *King's Collector 617* (DD); Rudarg, Chumbi and Phari, fl. dark red, July 1879, *Dunghoo* (DD); You-so near Chumbi, fl. purple, root used as dye, June 29, 1882, *Dunghoo* (DD); Cho-leh-lay near Chumbi, fl. reddish blue,

July 3, 1878, *Dungboo* (DD); Linji La, 17000 ft., July 5, 1939, *Gould* 2295 (DD); Tuna to Dochen, 14000 ft., Aug. 7, 1936, *F. S. Chapman* 716 (DD).

23A. *Onosma Hookeri* var. *intermedium*, nom. nov.

Onosma Hookeri subsp. *Wardii* Stapf, Bot. Mag. **155**: t. 9254 (1931).—

Type from Lake Pasum, Tsangpo Valley, eastern Tibet, *Ward*. Not *O. Hookeri* var. *Wardii* W. W. Smith (1916).

Corolla 24–28 mm. long, anthers 8–9 mm. long; filament 4–6 mm. long, borne at middle of corolla 12–14 mm. above its base; cymes becoming more loose at maturity, its bracts not secund but rather divaricate or reflexed.

Known only from eastern Tibet.

TIBET: Pasum Lake, long. 94°, rocky slope, 10–11000 ft., fl. violet, *Ward* 6115 (Ed); Nyarlu, Gyamda Chu, long. 94°09', 9800 ft., corolla purplish blue, pink at base, grass in open pine forest, *Ludlow, Sherrieff & Taylor* 6814 (G); Longong, long. 93°47', grass-covered cliff-ledges, corolla rich dark blue, turns bluish pink later on; style crimson above middle, white below, *Ludlow, Sherrieff & Taylor* 5510 (G).

23B. *Onosma Hookeri* var. *longiflorum* Duthie ex Stapf, Bot. Mag. **155**: sub tab. 9254 (1931).

Onosma longiflorum Duthie, Kew Bull. **1912**: 40 (1912).—Type material from Gyantze, *Walton* 57 & 1561; Lhasa, ca. 3650 m., *Waddell*.

Corolla very elongate, 31–33 mm. long, bearing its filaments well above the middle; anthers 7–9 mm. long; filaments 4–7 mm. long, borne 18–20 mm. above base of corolla.

TIBET: Lhasa, open rocky slopes, 12000 ft., fl. reddish purple, *Ludlow & Sherrieff* 9572 (G); Hills north of Lhasa, 13500 ft., among boulders, fl. iridescent pinkish purple, *Ludlow & Sherrieff* 8687 (G); Nyenchengtang La, 4 days northwest of Lhasa, 13–14000 ft., cliff ledges, fl. dark red to dark blue, *Ludlow & Sherrieff* 9649 (G); Gyantze Hills, dry ground, July 13, 1907, *H. M. Stewart* (Ed).

A readily recognized species which has three geographic variants differing in length of corolla and in the position on the corolla at which the filaments arise.

24. *Onosma dichroanthum* Boiss. Diag. ser. 1, 11: 107 (1849).—
“Hab. in Iberia prope *Baku* (Meyer!) Persia boreali in monte *Demawend* prope *Ask*, Kotsch. no. 383.”

Onosma setosum var. *dichroanthum* Boiss. Fl. Orient. **4**: 181 (1879); Lipsky, Acta Hort. Petrop. **26**: 499 (1910).

Plant biennial or a very short-lived perennial, conspicuously bristly and also very minutely hispidulous; coarse hairs abundant, grayish, spreading, 2–4 mm. long and (particularly on the upper leaf-surface) arising from a bulbous base; minute hairs abundant, commonly 0.1–0.2 mm. long; stems usually several, erect or ascending, branching above the middle, 3–7 mm. thick towards the base; basal leaves usually dried up at anthesis, clustered, 10–20 cm. long, 4–15 mm. broad, linear or linear-oblongate; middle

cauline leaves linear to oblance-linear, 4–15 mm. broad; bracts (especially the lowermost) distinctly lanceolate; cymes 5–6 cm. in diameter at anthesis, frequently forked, at maturity becoming a unilateral raceme 10–15 cm. long, borne terminal on the main stem and usually also on leafy branchlets produced from a few to many of the upper leaf axils; calyx 15–25 mm. long at anthesis, at maturity becoming 25–30 mm. long, pedicel at first about 5 mm. long, later becoming 10–15 mm. long, calyx-lobes linear or lance-linear; corolla yellow, 25–33 mm. long, base 2.5–3 mm. thick, gradually expanding upwards and becoming 10 mm. thick just below the level of the sinus, except for a tuft of hairs near the tip of the lobes, glabrous or practically so, lobes deltoid 2.5–4.5 mm. broad, recurving; anthers 9–12 mm. long, coherent at the base, attached 2.5–4 mm. above base, sterile tip 1–1.5 mm. long, base carried 8–12 mm. below level of corolla-sinus; connective swollen, muriculate; filaments linear, 3.5–4.5 mm. long, arising 17–20 mm. above corolla-base, usually evidently decurrent for about 10 mm.; nectary glabrous, collar-like or somewhat lobed, 0.3–0.8 mm. high; style glabrous, 25–33 mm. long; nutlets 4–5 mm. long, lustrous, pale, smooth or somewhat roughened.

INDIA: Waziristan, *A. M. Harriah* (DD); Chitral District, 1896, *H. Hamilton* (DD); Chitral District, 1894, *F. E. Younghusband* (DD); Chitral, 4900 ft., June 2, 1895, *Harriss* (DD); Guirat to Chitral, 4700 ft., May 31, 1895, *Harriss* (DD); Broz, 8500 ft., fl. yellow shaded to orange brown in age, June 6, 1895, *Harriss* (DD); Drosh, Chitral, 4500 ft., 1908, *Toppin* 110 (K); Shinnak, Kurrum Valley, Apr. 1879, *Aitchison* 28 (G, DD); Kurrum Valley, Para Chenar, Apr. 14, 1894, *Harriah* (DD); Kurrum Valley, June 3, 1879, *Harriah* (DD); Kaghusi, Gilgit Exped., 5500 ft., June 30, 1881, *Dr. Giles* 375 (DD); Shinkiyari, Hazara, June 3, 1899, *Inayat* (DD).

AFGHANISTAN: Badghis, fl. yellow turning bright orange, May 23, 1885, *Aitchison* 550 (DD, G).

BALUCHISTAN: Ziarat, 7000 ft., plant erect 1.5 ft. tall, fl. yellow, *H. Santapau* 6449 (G); Kawas Pangi, 6000 ft., Apr. 30, 1893, *A. V. Munro* (DD).

U. S. S. R.: Ashkhabad district, *W. A. Dubiansky* in 1916 (G) and *Litwinow* 1736 (G); Ashkhabad, in glareosis montium supra pagum Neph-ton, 1900, *Sintenis* 212 (Missouri); Marghelan, Ferghana Dist., *Dessiatoff* 489 (G); Turka, Atren Valley, Tashkent Dist., *Barodin* 42 (G); Pishpek Dist., *Tsinserling & Sviachintzev* 164 (G); Apsheron Peninsula (east of Baku) near Shuvelyany, marine sand, 1930, *Kariahin* (G).

Among all our species this is the only one which ranges far beyond our borders. Its nomenclature and its delimitation must be considered tentative until its representatives west and northwest of our area are given detailed study. The type of *O. dichroanthum* Boiss. and, also, of the apparently synonymous *O. caspicum* Gruner, Bull. Sov. Nat. Moscou 40¹: 441, t. 9a (1867), came from the vicinity of Baku in Transcaucasia. I have seen only one collection from that general locality. It agrees reasonably well with the original descriptions of the species mentioned and furthermore is so similar to plants of our area that I am content to

treat them as conspecific under the name *O. dichroanthum*. This plant from the Apsheron Peninsula differs from the more easterly material in only one notable detail. Its anthers are free. They are not basally coherent as is universally the case among all other specimens of the species I have dissected.

Boissier, and also Lipsky, treated *O. dichroanthum* as a variety of *O. setosum* Ledeb. The latter was based on collections from near Astrakan and has its closest relations in middle and southern Europe among the immediate relatives of true *O. echioides* L., and particularly with *O. Visianii* Clem. of Roumania. It differs from our plant in having more elongate filaments borne at the middle of the shorter and stouter corolla. Furthermore, like *O. Visianii*, but unlike *O. dichroanthum*, the base of the calyx becomes slightly indurate as well as somewhat glabrescent at maturity.

25. *Onosma pyramidale* Hooker, Bot. Mag. 14: t. 6987 (1888).—

Type grown at Kew from seeds sent by Duthie in 1885 and almost certainly gathered by him in the Kali Valley, Kumaon, in 1884.

Plant probably biennial; stems several, 2–6 dm. long, erect or ascending, 2–5 mm. thick towards the base, bearing floriferous branchlets (up to 10 cm. long) from the upper axils, younger parts hispid (hairs slender, spreading, cinereous, 1–2.5 mm. long); leaves numerous, usually drying dark, veinless, upper surface appressed hispid (hairs 1–2 mm. long), dotted with pallid hair-bases, lower surface paler and less hairy; basal leaves oblanceolate, 1–2 dm. long, usually drying up before anthesis; middle cauline leaves lanceolate, acute, 5–8 cm. long, 8–15 (–22) mm. broad; cymes relatively loose at anthesis, 2–3 mm. broad, simple or forked, terminal on the main stems and on the leafy branchlets from upper axils, at maturity becoming racemose, loose, up to 10 cm. long; bracts lanceolate, attenuate; calyx 8–11 mm. long, lobes lance-linear, 0.7–1.7 mm. broad, acute, hispid and hispidulous; pedicels very slender, 5–20 mm. long, spreading, hispid; corolla red (“bright scarlet fading to lilac”), 11–13 mm. long, barrel-shaped, broadest near the middle, 6–8 mm. thick, base 2 mm. broad, mouth 4–6 mm. broad; lobes 1.8–2 mm. broad, ca. 1 mm. long, recurved; corolla outside very minutely hairy (hairs both antrorse and retrorse), inside with a hairy nectary and villose on the filament-bases but otherwise glabrous; anthers 4–4.5 mm. long, joined at base only, base carried 4–4.5 mm. below level of corolla-sinus, affixed 0.5–0.7 mm. above base, sterile tip ca. 0.5 mm. long; filaments 5–6 mm. long, mostly subulate and glabrous but just above base thickened, geniculate and densely villose, arising 1.7–2.5 mm. above corolla-base, not distinctly decurrent; nectary very narrow, somewhat toothed, hairy; style 10–12 mm. long, glabrous, not exerted; nutlets 1.5–2 mm. long, dark colored, lustrous, obscurely rugose.

Indian Himalayas just west of Nepal border.

INDIA: Kali Valley, Byans, 9–10000 ft., rocks, fl. crimson, July 17, 1886, *Duthie 5827* (DD); Kali Valley, 8–9000 ft., fl. crimson, Sept. 16, 1884, *Duthie 3194* (DD, Ed); Budhi, Kali Valley, Sept. 14, 1900, *Inayat 24752* (DD, UC); Malpagarh, Kali Valley, Sept. 15, 1900, *Inayat 24753*

(DD); between Shirkha and Sosa, 9-10000 ft., fl. crimson, Sept. 19, 1884, *Duthie 3194* (DD); Sosa, Kali Valley, Sept. 17, 1900, *Inayat 24754* (DD); Palang Gadh, Byans, 9-10000 ft., July 19, 1886, *Duthie 5827* (DD); betw. Lamari and Budhi, Byans, fl. carmine, July 18, 1886, *J. R. Reid* (Ed).

This remarkable species is known only from Kumaon in the Himalayan valleys just west of the Nepal boundary. In the account of his explorations in 1884, Duthie, *Gard. Chron. n. s.* 25: 456 (1886), mentions its discovery on Sept. 16 and notes it as an "*Onosma* sp., a handsome Boraginaceous plant with bright crimson flowers . . . , common on the rocks above Lamari." Its red barrel-shaped corollas quickly distinguish it from all other congeners. It has no close relatives. The corolla gradually swells from the base, becoming broadest near the middle and then gradually contracts towards the mouth. It has no inflexures below the sinus, nor does it have any puffed-out ribs nor any recesses on the outer surface in the vicinity of the filament-attachments. Although the barrel-shaped corolla suggests those of *O. bicolor* and its relatives, the resemblance is superficial. Furthermore, the filaments of *O. pyramidale*, geniculate and densely villose at the base, and also its divided calyx, are so different from those of *O. bicolor* and relatives that direct relation between our plant and the latter seems highly improbable.

26. *Onosma mertensioides*, sp. nov.

Planta 15-35 cm. alta; indumento adpresso haud denso; pilis adscendentibus 0.8-1.3 mm. longis gracilibus; caulibus basim versus ca. 3 mm. crassis erectis vel arcuate adscendentibus sub inflorescentiam non ramosis sparse foliatis pilis e basibus bulbosis orientibus obsitis; foliis costatis sed enervatis firmis, supra pilis e basi bulbosa orientibus donatis, subtus pallidioribus pilis gracilioribus donatis; foliis basalibus 5-8 mm. longis 7-10 mm. latis oblanceolatis; foliis caulinis medionalis oblongo-lanceolatis 5 cm. longis 8-10 mm. latis; cymis simplicibus 1-2 apice caulis approximatis, maturitate racemosis 10-12 mm. longis; bracteis lanceolatis basi abrupte rotundis; calyce sub anthesi 5-10 mm. longo, lobis linearibus 0.5-1 mm. latis; calyce maturitate 10-13 mm. longo, lobis lanceolatis 1-1.5 mm. latis hispidulis; pedicellis ad anthesi 3-5 mm. longis mox 10-14 mm. longis; corolla (in sicco caerulescenti) 16-17 mm. longa calyce duplo longiore a basi 2.5-3 mm. crassa sursum gradatim ampliata apicem versus 7-9 mm. crassa extus dense antrorseque pubescenti intus sub lobos sparse inconspicueque strigulosa; lobis corollae 3-3.5 mm. longis 1.5-2 mm. latis recurvis; antheris 7-7.5 mm. longis basi cohaerentibus 1.5-2 mm. supra basim affixis, basibus 6.5-8 mm. sub sinus corollae positus, apicibus sterilibus ca. 1 mm. longis; filamentis subulatis 4-5 mm. longis 5-6 mm. supra basim corollae affixis, basibus decurrentibus 3 mm. longis crassiusculis parte inferiore tumidis; nectario angustissimo ad 0.2 mm. alto lobulato villosulo; stylo glabro ca. 19 mm. longo; nuculis ignotis.

CHINA (Sikang): between Baurong and Tachienlu, via Hadjaha, May-June, 1929, *Herbert Stevens 483* (TYPE, Gray Herb.).

A very well marked species for which I can suggest no very close relatives.

27. *Onosma limitaneum*, sp. nov.

Planta hispidissima; pilis majoribus conspicuis abundantibus 2–4 mm. longis saepe e basibus bulbosis orientibus; pilis minoribus erectis ad 0.1 mm. longis inconspicuis; caulibus solitariis vel pluribus e radice palari 3–7 mm. crasso purpureo-tincto ut videtur perenni erumpentibus erectis vel adscendentibus simplicibus vel supra medium ramulis fertilibus gestis basim versus 2–5 mm. crassis; foliis firmis crassiusculis enervatis facie superiore pilis rigidis e basi bulbosa erumpentibus dense armatis; foliis basalibus oblanceolatis 2–6 cm. longis 5–10 mm. latis sub anthesi plus minusve persistentibus; foliis caulinis oblongis vel lanceolatis; cymis ad anthesin densis 2–2.5 mm. crassis mox 4–7 mm. longis densifloris, bracteis lanceolatis acutis inconspicuis; calyce sub anthesi 8–10 mm. longo 1–2 mm. longe pedicellato, maturitate 10–12 mm. longo 3–5 mm. longe pedicellato, lobis linearibus extus hispidis intus conspicue abundanterque villosis; corolla (8–)10–12 mm. longa angusta subcylindracea, basi 2 mm. crassa, apicem versus 3–5 mm. crassa, extus supra medium vel solum lobis puberulenta, lobis deltoideis 1.5 mm. latis recurvatis; antheris 4–5 mm. longis basi cohaerentibus saepe 1.5 (1.3–2) mm. supra basim affixis, basibus 4–5 mm. sub sinus corollae positis, apicibus sterilibus 0.5–0.9 mm. longis; filamentis (2–)2.5 mm. longis, (3.5–)4 mm. supra basim corollae affixis, basi 0.3–0.8 mm. latis transverse arcuateque affixis sursum gradatim attenuatis deorsum vix decurrentibus; nectario 0.1–0.5 mm. alto sparse villuloso vel subglabro; stylo 9–12 mm. longo glabro; nuculis 3–4 mm. longis laevibus nitidis.

BALUCHISTAN: Sin Kachh, May 12, 1897,—no. 20600 (DD); Kharwande, June 7, 1897,—no. 20600B (DD); Gastoi, May 28, 1897,—no. 20600A (DD); Mina Bazaar, alt. 4800 ft., May 11, 1896,—no. 18928 (DD); Fort Sandemann, 4600 ft., May 16, 1896,—no. 18927 (TYPE, Dehra Dun); Gival, 5–6000 ft., May 6, 1893, *A. V. Monro* (DD); Gival, 6000 ft., Apr. 27, 1888, *J. H. Lace* 3794 (DD).

INDIA (Northwest Frontier): Waziristan, *native collector* 15804A (DD); Shinnak to Kuram, Kurram Valley, Apr. 1879, *Aitchison* (DD).

27A. *Onosma limitaneum* var. *parviflorum*, var. nov.

A varietate genuina differt floribus minoribus; corolla 7–9 mm. longa extus puberulenta basi 1.5–2 mm. crassa sinus versus 2–3 mm. crassa, lobis triangularibus 0.8–1.2 mm. longis; antheris 2.5–3 mm. longis 0.5–0.7 supra basim affixis; filamentis 1.5–2 mm. longis 3 mm. supra basim corollae affixis; stylo 5.5–6.5 mm. longis.

AFGHANISTAN: without locality, *Griffith* 5949 (TYPE, Gray Herb.; ISOTYPE, DD).

PERSIA: without locality [? Ispahan], *Derderian* (G).

27B. *Onosma limitaneum* var. *majus*, var. nov.

A varietate genuina differt floribus robustioribus; corolla 15–17 mm. longa extus (costa lorum sparse hispidulosa excepta) glabra, basi 2–2.5 mm. crassa, sinus versus 5–6 mm. crassa, lobis triangularibus 1.5 mm.

longis; antheris 5.5–6.5 mm. longis, 1.5–2 mm. supra basim affixis; filamentis 3.5–4 mm. longis, 6–8 mm. supra basim corollae affixis.

AFGHANISTAN: without locality, *Griffith 5946* (TYPE, Gray Herb.).

BALUCHISTAN: without locality, *Stocks 997* (DD).

Closely related to *O. stenosphon* Boiss. and formerly confused with it. Readily separated from Boissier's species by having the filaments borne not at the middle of the corolla but rather distinctly below it. *Onosma stenosphon* was based on plants from north-central Persia. Its type collection has corollas 14.5–15 mm. long which are minutely hispidulous outside. The anthers are 5 mm. long and attached 1.7 mm. above the base. The filaments are 1.7–2 mm. long and arise 7–7.5 mm. above the corolla-base. As compared with those of *O. limitaneum* the filaments of *O. stenosphon* are not only attached higher in the corolla but are also proportionately only half as long. The base of the anther is held about opposite the filament-attachment, not opposite the middle of the filament as in *O. limitaneum*.

28. *Onosma cingulatum* W. W. Smith, Notes R. Bot. Gard. Edinburgh 9: 112 (1916).—Type from plateau near Chaotung, northeastern Yunnan, *Maire 296*.

Plant 7–15 dm. tall, very bristly with abundant stiff tawny hairs 1–3 mm. long, also abundantly though inconspicuously villulose; stems erect, simple below, 4–10 mm. thick, above the middle producing numerous floriferous branches 1–2 dm. long; basal leaves and lower cauline leaves unknown; middle cauline leaves lanceolate, 4–8 cm. long, 1–2 cm. broad, occasionally showing a few obscure veins, base sessile and rounded to acute, apex acute; cymes produced abundantly, paniculately displayed, at anthesis 2–3 cm. broad, at maturity lengthening and loose becoming racemose and 4–6 cm. long; calyx 7–9 mm. long at anthesis, 12–15 mm. long in fruit, lobes narrow; pedicels very slender, 5–15 mm. long; bracts lanceolate; corolla pink, 9.5–10.5 mm. long, gradually expanding from the base upwards, 5.5–8 mm. broad, appressed hairy outside, inside glabrous except for the villose nectary; anthers 4–4.5 mm. long, coherent at the base, affixed 1 mm. above base, base carried 5–6 mm. below the level of the corollasinus, sterile apex ca. 0.7 mm. long; filaments 2–2.5 mm. long, subulate, arising 2–2.5 mm. above corolla-base, with thickened decurrent base ca. 1 mm. long; nectary very narrow, somewhat lobed, 0.5 mm. high or less, villose; style glabrous, 7–9 mm. long, not exserted; nutlets 2.5 mm. long, lustrous, dusky, obscurely punctate and verrucose.

Known only from northeastern Yunnan.

YUNNAN: "pâtures des plateaux à Tcha-ho," 2800 m. alt., 1914, *Maire 296* (TYPE, Ed); without locality, plant 19 dm. tall, *Maire 892* (Ed, G).

The basal structures of this very well marked species are unknown. Very likely, however, the plant is a biennial with a single stiff erect stem producing numerous floriferous branchlets above its middle.

29. *Onosma Tsiangii*, sp. nov.

Planta ut videtur erecta biennis saltem 1 mm. alta; caule medium versus 6–7 mm. crasso cinereo ramulos floriferos graciles adscendentes 7–12 cm. longos proferente pilis erectis sparsis 1–1.5 mm. longis basi bulbosa erumpentibus et pilulis abundantibus retrorse-adscendentibus praedito; foliis caulinis medionalibus lanceolatis 5–9 mm. longis 15–20 mm. latis firmis cinereis basi late sessilibus rotundis, apice acutis, facie superiore pilis abundantibus adpressis 1–2 mm. longis e basi pallida discoidea erumpentibus et pilulis 0.1–0.2 mm. longis sparsissimis donatis, facie inferiore subvelutinis pilulis 0.1–0.2 mm. longis erectis abundantissimis et pilis robustioribus sparsis obsitis evidenter nervatis; cymis eis ejusdem ramuli solum cognitis 1–3 cm. latis simplicibus vel furcatis; bracteis 3–6 mm. longis lanceolatis inconspicuis; calyce 9 mm. longo, lobis ca. 1 mm. latis lanceo-subulatis; pedicello gracili 7–11 mm. longo; corolla purpurea (in sicco brunnescenti) 11 mm. longa a basi 2 mm. crassa sursum gradatim ampliata apicem versus 7 mm. crassa, extus supra medium dense antrorseque pallido-strigulosa; antheris 5.5 mm. longis, basi cohaerentibus ca. 1.5 mm. supra basim affixis, basibus 4–5 mm. infra sinus corollae positis, apicibus sterilibus ca. 0.5 mm. longis; filamentis 4 mm. longis a basi 0.5 mm. latis sursum attenuatis ca. 3.5 mm. supra basim corollae affixis, basibus decurrentibus ca. 1 mm. longis tumidis pilulis adpressis sparse donatis; nectario 0.5–1 mm. alto intus dense villosus; stylo 11–12 mm. longo infra medium pilulis adpressis sparsis donatis; nuculis ignotis.

CHINA (Yunnan): Tai-hwa-shan, Kunming, along shady trail, 2000–2300 m. alt., fl. deep purple, July 20, 1933, *Y. Tsiang 11201* (TYPE, Gray Herb.).

Of this well-marked species I have seen only a section of the midstem which bears middle cauline leaves and numerous leafy axillary branchlets terminated in cymes. The plant probably has a habit similar to that of *O. cingulatum*.

30. *Onosma verruculosum*, sp. nov.

Planta gracilis; radice et base caulis ignotis; caulibus ut videtur ca. 5 dm. longis gracilibus 2–3 mm. crassis supra medium ramulis adscendentibus 10–15 cm. longis donatis, indumento sparso donatis, hispidis et hispidulis; pilis majoribus sparsis rigidulis patentibus 2–3 mm. longis e basi bulbosa orientibus; pilulis abundantioribus rigidulis contortis vel retrorse adpressis 0.1–0.4 mm. longis; foliis adpresse hispidis et antrorse minuteque strigulosis (pilis majoribus rigidis 1–2 mm. longis e basi discoidea orientibus; pilulis valde adpressis ca. 1 mm. longis), facie superiore viridis, facie inferiore obscure venosis pallidioribus; foliis inferioribus oblanceolatis ad 8 cm. longis; foliis superioribus lanceolatis 5–7 cm. longis 7–9 mm. latis apice acutis basi acutis obtusisve; cymis sub anthesi 1.5–2 cm. latis simplicibus vel furcatis, maturitate elongatis secundis racemosis ca. 6 cm. longis; calyce 6–7 mm. longo, tubo cupuliformi, lobis cuneatis 3.5–4 mm. longis basi 1.5–2 mm. latis acutis costatis hispidis;

pedicello 2–8 mm. longo; corolla coerulea 14–15 mm. longa utroque contracta basi 1.5 mm. crassa, apice 2–3 mm. crassa, parte medionali $\frac{2}{3}$ subcylindracea sursum leviter ampliata ad 10 mm. supra basim 5–7.5 mm. crassa, extus sparse minuteque retrorse-strigulosa supra medium sub lente evidenter verruculosa, a fundis sinuum usque ad medium tubi 5-sulcata, infra medium costis 5 inflatis et areolis 5 planis ellipticis 4 mm. longis (apice haud invaginati) ornata; lobis minutis recurvis ca. 1 mm. latis; antheris 4.5 mm. longis basi cohaerentibus ca. 1 mm. supra basim affixis inclusis, basibus ca. 4.5 mm. sub sinus corollae positus, apicibus sterilibus 0.7 mm. longis; filamentis 4.5–5 mm. longis subulatis 4–4.5 mm. supra basim corollae affixis basi 1–2 mm. latis, duobus symmetricis medianervatis transverse arcuateque affixis, ceteris asymmetricis (nerviis excentricis donatis), duobus oblique et uno verticaliter affixis et plus minusve decurrentibus, omnibus villulosis; nectario 1–1.3 mm. alto sparse villuloso; stylo ca. 15 mm. longo glabro; nuculis 2.5 mm. longis brunneis tuberculatis et minute abundanterque papillatis.

NEPAL: Tatey, 9000 ft., fl. blue, 1930, *Lall Dhawog 161* (TYPE, Edinburgh).

A well-marked species having general relations not only with *O. bicolor* but also with *O. lycopsioides* and its allies. From *O. bicolor* and related species of the middle Himalayas it is distinguished by its relatively large corollas. The narrow, less firm leaves, smaller calyx, and the proportionately more elongate, more protrudent, verruculose corollas of thinner texture all distinguish *O. verruculosum* from *O. lycopsioides* and its close relatives. The type of our species lacks the basal parts of the plant. If we may judge from its slender stems, the root is probably a weak one, perhaps similar to that of *O. bicolor*.

31. **Onosma Borii** Fischer, Kew Bull. 1940: 38 (1940). — Type from Laruri, Naga Hills, Assam, *Bor 39*.

Root probably perennial; stems probably several (basal half unknown), at least 3 dm. long, pale, ca. 2.5 mm. thick, bearing not only scattered rigid spreading hairs 1–2 mm. long arising from bulbous bases, but also smaller appressed or incurving hairs 0.1–0.5 mm. long; basal leaves not seen; upper cauline leaves lanceolate, 4–5.5 cm. long, 8–12 mm. broad, broadest at or below the middle, obscurely veined, apex acute, base abruptly contracted, obtuse and sessile, surface scabridulous, with short appressed hairs, 0.6–1.2 mm. long, from discoid bases, and also strigulose with hairs about 0.1 mm. long, lower surface paler, abundantly and minutely strigulose and also scantily strigose with hairs 0.5–1 mm. long, bearing some coarse spreading hairs on the prominent midrib and revolute leaf-margins; cymes terminal on stems and on branchlets from the uppermost axils, simple or forked, at anthesis ca. 2 cm. diameter, in age racemose and as much as 5 cm. long; calyx 8–10 mm. long, hispid, tube cupulate, calyx-lobes cuneate or narrowly triangular, apex somewhat attenuate, 5–6(–7) mm. long, 2–3 mm. broad at base; pedicels 2–10 mm. long; corolla blue changing

to pink at mouth, barrel-shaped, 14–15 mm. long, broadest (8 mm.) about 1 cm. above base, mouth 3–4 mm. diameter, outside very minutely and retrorsely strigulose, inside with scanty hairs about base of filaments, sulcate below the sinus, below middle with puffed-out ribs protruding between the calyx-lobes and also with alternating elliptic depressions 5 mm. long (depressions with very small invagination at upper end); anthers 5–5.5 mm. long, coherent at base, affixed 1 mm. above base, not exerted, sterile tips 1.5 mm. long denticulate; filaments 3–4 mm. long, strap-shaped with expanding base, with evident mid-vein, arising ca. 5 mm. above corolla base; two filaments with symmetric base, medial vein and transverse arcuate attachment, the other with oblique or vertical attachment, and asymmetric more or less decurrent base and excentric vein; nectary a glabrous collar about 1 mm. tall; style glabrous to 16 mm. long; nutlets 2.5 mm. long, dark, dull, plump, irregularly tuberculate and also abundantly and minutely papillate.

INDIA: Laruri and Shiloi Jopi, Naga hills, Assam, 4000–8000 ft., basal rosette of leaves lying procumbent, fl. blue changing to pink at mouth, Nov. 17, 1935, *N. L. Bor* 39 (K, TYPE).

Closely related to *O. lycopsioides*, from which it differs chiefly in the nature of its indument. It is a plant with smaller leaves and pale stems. Unlike its relative it is not evidently bristly. Because of the short appressed hairs on stems and leaves it is relatively smooth in appearance. The differences between the species are not impressive and possibly may not prove to be of specific value.

32. *Onosma lycopsioides* Fischer, Kew Bull. 1940: 39 (1940). — Type from Japvo, Naga Hills, Assam, *Bor* 6501.

Plant perennial from a strong root; stems several, erect, 3–5 dm. tall, simple or with ascending floriferous branchlets 1–1.5 cm. long, 3.5–5 mm. thick towards base, villose-hispid with the slender spreading hairs 1.5–3 mm. long; leaves obscurely to evidently veined, villose-hispid (larger hairs not very abundant, 1.5–3 mm. long, arising from discoid or bulbous bases; minute hairs 0.1–0.2 mm. long, appressed, scanty or none), upper surface darkened in drying, lower surface becoming grayish; basal leaves oblanceolate, 10–18 cm. long, 8–15 mm. broad above the middle, apex acute; middle and upper leaves lanceolate to ovate-lanceolate, 5–10 cm. long, 1–3.5 cm. broad, base obtuse, apex acute; cymes terminal, frequently forked, 2–3 cm. broad at anthesis, in age becoming loosely racemose and 4–6 cm. long; calyx 7–9 mm. long, tube broadly cupulate, lobes narrowly triangular, 4–5 mm. long, 1.5–3 mm. broad at base, hispid; pedicels 1–10 mm. long; corolla blue to purplish blue, 16–18 mm. long, barrel-shaped, broadest ca. 10 mm. above base where 7–9 mm. thick, mouth 3–4 mm. diameter, inner surface somewhat hairy on and near attachment of stamens, outer surface minutely and retrorsely pubescent, sulcate below the sinus, below the middle with puffed-out ribs alternating with large plane elliptic areas (areas not invaginate at upper end); corolla-lobes

minute, recurved; anthers 5.5–6 mm. long, coherent at base, affixed 1 mm. above base, sterile tip denticulate 1 mm. long, not exerted from corolla; filaments 4–5.5 mm. long, subulate with a broadened base, affixed 5–6 mm. above corolla-base; two filaments symmetric, with medial nerve, transversely and arcuately attached, the other three filaments with asymmetric base excentric nerve and oblique or vertical attachment and base more or less decurrent; nectary a collar ca. 1 mm. high, somewhat villose towards base on inner surface; style 17–19 mm. long, glabrous; nutlets ovoid, 2.5–3 mm. long, dull coarsely tuberculate as well as abundantly and minutely papillate.

INDIA: Japvo, Naga Hills, Assam, 9900 ft., fl. bluish purple, Sept. 27, 1935, *N. L. Bor 6507* (Kew, TYPE).

CHINA (western Yunnan): Shweli-Salwin divide, lat. 25°40', open stony alpine pasture, 11000 ft., 12–20 in. tall, fl. purplish rose, July 1924, *Forrest 24663* (G, Ed); Shweli-Salwin divide, lat. 25°30', open stony pasture on margin of thicket, 10000 ft., 12–18 in. tall, fl. bright blue, Aug. 1918, *Forrest 17568* (Ed).

The type of *O. lycopsioides* is a specimen showing the upper two thirds of a plant in the early fruiting state. The single corolla associated with it was dissected by the author of the species and can be examined only in its opened dried state. As far as can be determined from comparisons, the type seems essentially similar to collections made by Forrest near the China-Burma frontier about 500 km. to the eastward of the type locality of the species. The differences detected fall within the range of variation to be expected within a species of this genus. They can be worthy of nomenclatorial recognition only if they prove to be geographically correlated. The type collection has slightly broader upper cauline leaves than the collections from China and the coarser hairs have discoid rather than bulbous bases. Its stamens have longer (5–6 rather than 4–5 mm. long) filaments which are also abundantly rather than sparingly hairy at the base.

The species is obviously related to *O. microstoma* of southwestern China and, especially so, to *O. Borii* of Assam. The Chinese species is distinguished by its smaller leaves, abruptly rounded at the base, and also by its much denser indument. *Onosma Borii* also has smaller leaves, but these dry pale rather than dark as in *O. lycopsioides* and *O. microstoma*, and, since their hairs are short and very appressed, they are smoother and very much more tidy in appearance. *Onosma lycopsioides* and its close relatives evidently belong to the same immediate circle of relationships as *O. emodi*, and agree with that species not only in their distinctive calyx but also in many details of their elaborately organized corollas. Their corollas similarly have a small mouth and above their middle, because of narrow inflexed plaits, are also sulcate below each sinus. Below the middle their puffed-out ribs, protruding between the calyx-lobes, and the elliptic depressions, hidden behind the calyx-lobes, are similar also though much less well developed. In *O. emodi*, however, there is a saccate invagination at the upper end of the depressions on the corolla. This invagination

inside the corolla forms a protuberance from which the stamens arise. Such invaginations are lacking in *O. lycopsioides* and its close relatives. In these species the stamens arise directly from the corolla-wall. Surprisingly, the five filaments in each corolla differ among themselves in form and attachment. Two have an arcuate attachment oriented transversely and have a medial nerve and a symmetric non-decurrent base. Two others are obliquely affixed and have an excentric nerve and an asymmetric decurrent base. The fifth stamen is vertically affixed and has an excentric vein and a more prolonged asymmetric decurrent base. Though the corolla itself is regular, its stamens, in their differing types of base and attachment, show a trend towards bilateral symmetry. This condition has been observed in *O. verruculosum*, *O. Borii*, *O. lycopsioides*, *O. microstoma*, and *O. egregium*. It may also be present in *O. bicolor*.

33. *Onosma microstoma*, sp. nov.

Planta perennis e radice valida palari ad 1 cm. crassa oriens; caulibus pluribus 3–6 dm. longis simplicibus ca. 3 mm. crassis villosio-hispidis, pilis gracilibus patentibus 3–4 mm. longis abundante donatis; foliis basalibus et caulinis inferioribus tempore florendi emarcidis, medionalis et superioribus lanceolatis in sicco fuscis 4–6 cm. longis 10–13 mm. latis medium versus vel infra medium latioribus, apice acutis, basi abrupte rotundis sessilibus, facie superiore abundante adpresseque villosio-hispidis (pilis 2–3 mm. longis), facie inferiore griseis villosio-hispidis et strigulosis bases pallidas pilorum deficientibus; cymis terminalibus densis sub anthesi 3 cm. latis; calyce 7–10 mm. longo, tubo cupuliformi 2–3 mm. profundo, lobis anguste triangularibus apice plus minusve attenuatis 5–6 mm. longis basi 1–3 mm. latis villosio-hispidis; pedicello 2–10 mm. longo; corolla purpureo-coerulea 16 mm. longa oblongo-obovoidea utroque contracta a basi 1.5–2 mm. crassa sursum gradatim ampliata ca. 10 mm. supra basim crassissima (8–9 mm. lata) deinde abrupte contracta apice ore 2.5–4.5 mm. diametro donata, intus basim filamentorum versus sparse villosula extus dense retrorseque pubescenti, a fundis sinuum usque ad medium tubi 5-sulcata, infra medium tubi costis 5 inflatis et areolis 5 planis ellipticis ca. 4 mm. longis (apice haud invaginati) ornata; antheris 5.5 mm. longis inclusis basi cohaerentibus 1 mm. supra basim affixis, apicibus sterilibus ad 1 mm. longis denticulatis, basibus ca. 6 mm. infra sinus corollae positis; filamentis 5–6 mm. longis subulatis a basi lata villulosa sursum gradatim attenuatis, 6–6.5 mm. supra basim corollae affixis, duobus symmetricis medionervatis transverse arcuateque affixis, ceteris asymmetricis nerviis excentricis donatis plus minusve decurrentibus duobus oblique et uno verticaliter affixis; nectario 1–1.5 mm. alto intus villosio; stylo 18 mm. longo glabro; nuculis ignotis.

CHINA: Chenkang, Snow Range, Hsiaoshushan, southwestern Yunnan, open rock slopes, 3000 m. alt., common perennial 1–2 ft. tall, fl. purplish blue, Aug. 5, 1938, T. T. Yü 17227 (TYPE, Gray Herb.).

A close relative of *O. lycopsioides*, distinguished by its very much more

abundant villose-hispid indument and its smaller stem-leaves abruptly rounded at the base.

34. *Onosma dumetorum*, sp. nov.

Planta cinerea 3–6 dm. alta; caulibus ad 7 dm. longis basim versus 4–5 mm. crassis hispidis (pilis gracilibus patentibus 2–3 mm. longis e basi bulbosa orientibus) basim versus ramosis, ramulis adscendentibus ad 3 dm. longis; foliis (radicalibus ignotis tempore florendi nullis) caulinis numerosis, facie superiore viridibus adpresse hispidis (pilis 1–2 mm. longis e basi discoidea pallida orientibus) et minute strigulosis, in facie inferiore pallidis adpresse hispidis et abundantissime strigulosis; foliis inferioribus plus minusve oblanceolatis 6–10 cm. longis 1.5–2 cm. latis apice acutis supra medium latioribus deinde deorsum basim versus gradatim attenuatis, foliis medialis et superioribus lanceolatis utroque acutis 4–8 cm. longis 1–2 cm. latis medium versus latioribus; cymis terminalibus furcatis sub anthesi ca. 2 cm. latis; calyce 5–7 mm. longo, tubo cupuliformi 1–2 mm. profundo, lobis anguste triangularibus 4–5 mm. longis basi 1.5–2 mm. latis extus villosio-hispidis, intus pilis albis adpressis dense vestitis; pedicello 2–10 mm. longo; corolla lutea 12 mm. longa utroque contracta medium versus crassissima (4–5 mm. crassa) basi 2 mm. crassa, ore 3–4 mm. diametro, extus minute retrorseque strigulosa, a fundis sinuum usque ad medium tubi 5-sulcata, infra medium tubi costis 5 inflatis et areolis 5 planis ellipticis apice haud invaginatibus ornata, intus basim versus filamentorum villulosa; lobis obtusiusculis 1–1.5 mm. longis latisque; antheris 4 mm. longis basi cohaerentibus inclusis, 1 mm. supra basim affixis, apicibus sterilibus ca. 1 mm. longis, basibus ca. 5 mm. infra sinus corollae positis; filamentis 5 mm. longis subulatis 2–3 mm. supra basim corollae affixis, duobus symmetricis medionervatis transverse arcuateque affixis, ceteris asymmetricis nervio excentrico donatis duobus oblique et uno verticaliter affixis et plus minusve decurrentibus; nectario 1 mm. alto villosio; stylo 10–12 mm. longo glabro; nuculis tuberculatis et minute papillatis opacis.

CHINA: Shunning, Wumulung, southwestern Yunnan, 2450 m. alt., common herb 1–2 ft. tall, at margin of thicket, fl. yellow, July 9, 1938, T. T. Yü 16629 (TYPE, Gray Herb.).

A very well marked species perhaps most closely related to *O. lycopsioides*, from which it is quickly distinguished by its small, proportionately more elongate corollas, yellow rather than blue or bluish purple in color.

35. *Onosma emodi* Wall. in Roxb. Fl. Indica, ed. Carey, 2: 11 (1824); G. Don, Gen. Syst. 4: 316 (1838); Clarke, Fl. Brit. India 4: 179 (1883).—Type from "Gosain-Than in Nepal," probably *Wallich* 937.

Maharanga emodi (Wall.) DC. Prodr. 10: 71 (1846).

Onosma vestitum Wall. Numerical List, p. 26, sub no. 937 (1829), nomen; G. Don, Gen. Syst. 4: 317 (1838).—Type from Gosain-Than, Nepal, *Wallich* 937.

Plant perennial from a strong taproot; stems usually several, leafy, decumbent or ascending, 2–5 dm. long, 4–5 mm. thick towards base, simple or producing loose floriferous branches above the middle, usually hirsute especially above middle; leaves on upper surface hispid and minutely strigulose, the hair-bases not conspicuous, on lower surface paler, hairs similar to those on upper surface but usually more scanty, cauline leaves acute, lanceolate or oblanceolate, elongate, mostly broadest at or above middle, 5–15 cm. long, 7–20 mm. broad, frequently with some veins; basal leaves oblanceolate, petiolate; cymes terminal, usually forked, grouped to form a rounded terminal cluster usually 4–5 cm. broad at anthesis; calyx 6–10 mm. long, with short broad tube, lobes triangular or lance-triangular, acute, 3–6 mm. long, 2–3 mm. broad at base; pedicels slender, 3–10 mm. long; corolla 9–13 mm. long, from a short tubular base 2–2.5 mm. thick and ca. 2 mm. long abruptly expanding and becoming 7–10 mm. thick slightly below middle and then gradually contracting (to a point in the bud) to a mouth no more than 5 mm. in diameter, outside hispidulous or villulose (hairs 0.2–0.5 mm. long, not very abundant, tending to be retrorse), above the middle longitudinally plaited and hence more or less grooved below each lobe-sinus (plaits inflexed, by tightness of fold controlling apparent diameter of corolla-mouth and apparent breadth of lobes, also the degree to which corolla as a whole contracts in diameter above middle); below middle of corolla outside each plait replaced by a large sharply defined elliptic depression (hidden by calyx-lobe) with a deep pocket at upper end (this pocket inside corolla forms the shoulder of one of the 5 stamen-bearing protuberances); because of the inflexure and depression below each lobe-sinus the intervening sectors of the corolla (those below the lobes) appear puffed out to form coarse convex longitudinal ribs especially prominent on the lower middle quarter of the corolla where they help give the latter its maximum diameter; swollen ribs just below their most prominent portion ended by an abrupt contraction, their most prominent part bulging out between the calyx-lobes with their abruptly contracted lower end, chin-like, resting on the bottom of the adjacent calyx-sinus; corolla-lobes small, recurved, 1.5–2 mm. broad and 1–1.5 mm. long; corolla inside below the middle bearing 5 thickish somewhat wedged-shaped protuberances which project into the corolla-cavity 1–2 mm. or more, converge about the style, and bear the filaments on their upper inner extremity; protuberances somewhat hairy, containing a pocket-like invagination originating on the outside of the corolla, base 2–3 mm. long, narrowing and only 1–2 mm. long on the vertical distal margin, uppermost edge nearly horizontal; anthers 4–5.5 (usually 4.5) mm. long, coherent at base only, included, affixed about 1 mm. above base, sterile apex 0.5–1 mm. long serrulate; filaments 1–2 (usually 1.5) mm. long, glabrous, borne 3.5–6 (usually 4–5) mm. above corolla-base on the shoulder of a protuberance, flat, subulate-linear with evident midnerve, usually bent into a sigmoid curve, below attachment decurrent to form a pair of narrow wings (1–2 mm. long and 0.1–0.5 mm. high) along the

crest of the protuberance; nectary a conspicuous collar, 1–1.5 mm. high, usually somewhat hairy; style glabrous, 10–12 mm. long; nutlets 2–3 mm. long, dull, coarsely tuberculate and also very abundantly and minutely papillate.

Eastern Himalayas, Garhwal to western Bhutan, long. 80° to 90° .

GARHWAL: Tungnath, 12000 ft., *Strachey & Winterbottom* (G); near Kuari Pass, 11–12000 ft., fl. pink, Sept. 10, 1885, *Duthie 4231* (DD).

NEPAL: Gossain Than, *Wallich 937* (Ed, ISOTYPE *O. vestitum*); Tak Tor, 12–13000 ft., fl. orange, 1930, *Lall Dhwoj 49* (Ed); without locality, 1927, *Clive Wigram 30* (Ed); without locality, *Lall Dhwoj 119* and *130* (Ed).

SIKKIM: Chola Range to Gnatong, 12000 ft., Sept. 30, 1892, *G. A. Gammie 1326* (DD); Gnatung, Aug. 1891, *Cummins* (DD); Kyang lashe, 9000 ft., July 22, 1945, *Bor's collector 727* (DD); Sandokphoo, Aug. 1887, *King's collector* (DD); Too-koo-la, July 14, 1877, *G. King 4313* (DD); Pa-tang-la, Sept. 1, 1882, fl. pink, *King's collector* (DD); Ko-pish, Aug. 25, 1878, fl. red, *Dungboo* (DD); Phallut, 11000 ft., 1913, *Ribu & Rhamoo 6331* (Ed); Megu, 14000 ft., fl. yellow, July 7, 1913, *R. Lepcha 818* (Ed); Gongri, 13000 ft., Oct. 1938, *B. N. Ghose* (G).

BHUTAN: La-ree, fl. reddish blue, June 30, 1884, *Dungboo 350* (DD); Tang Chen, Ritang, 12500 ft., on cliff-ledges and steep open slopes among stones, fl. blue-violet to purplish blue, lobes bright red or reddish black, calyx almost black, June 9, 1937, *Ludlow & Sherriff 3234* (G).

The corolla of *O. emodi* is the most elaborate in the genus. It is obese in form and has puffed-out longitudinal ribs which below the middle alternate with sunken areas. Below the middle inside it has five prominent intrusions from which the stamens arise. The result is a corolla very different from the form prevailing in the genus. All its peculiarities, however, both individually and collectively, are simply extreme manifestations of tendencies more or less developed by related species. A study of these latter reveals a very complete series of forms transitional between the extreme corolla of *O. emodi* and the much less complex one conventional in the genus. The genus *Maharanga*, based on the complex floral structures of *O. emodi*, *O. Wallichianum*, and *O. bicolor*, accordingly is untenable.

Only an artist working from fresh flowers can properly portray the corolla of *O. emodi*. Words are very inadequate for the purpose. The description given above, the most complete yet attempted, needs to be verified and augmented by someone with fresh flowers available. Some of my corrections of previous descriptions need noting. The suprabasal collar-like nectary of *O. emodi* differs from that of other species only in being especially well developed. Wallich and DeCandolle, however, were much impressed by it. The former described it as the base of the corolla bent inward and embracing the ovary. DeCandolle, though identifying it as only a coroniform appendage, failed to recognize it as the structure present on the corollas of most *Onosma* species and accordingly as one not particularly significant. One of the most unusual features of the corolla of *O. emodi* is the well-developed wedge-shaped protuberances from which

the stamens arise. These project into the corolla-cavity, nearly filling it, just below its middle. They are saccate invaginations (opening on the outside of the corolla) given greater prominence by the decurrent filament-base that provides each with knife-like crests. Wallich mentions them as "five villous protuberances." DeCandolle completely ignores them. Bentham & Hooker, *Gen. Pl.* 2: 864 (1876), describes them succinctly as follows: "staminibus plicis seu gibbis intrusis extus foveolatis affixis." Another feature of the corolla is the manner in which its puffed-out longitudinal ribs abruptly terminate directly opposite the base of the calyx-sinus. This abruptly contracted base forms a chin which rests in the angle between the adjacent calyx-lobes. Above the base the ribs are very prominent, bulging out and noticeably protrudent between the lobes of the calyx. This remarkable condition is referred to in earlier descriptions only by DeCandolle and by him only indirectly as "costis 5 obtusis basi saccatis."

The closest relative of *O. emodi* is *O. Wallichianum*, a species with a more slender growth-habit, less persistent root, and slightly smaller but otherwise similar corolla. Other species obviously belonging to the same circle of relationship are *O. verruculosum*, *O. Borii*, *O. lycopsioides*, *O. microstoma*, *O. dumetorum*, *O. bicolor*, and *O. egregium*. These all have a similar calyx and an apically constricted corolla which bears puffed-out ribs and depressed areas below the middle. They differ from *O. Emodi* and *O. Wallichianum* in lacking well-developed invaginated protuberances within the corolla as well as in the more elongate corolla-form and less exaggerated ribs and depressions. Their close relationship with *O. emodi*, however, is beyond doubt.

The plant which Wallich described as *O. emodi* is different from that which he subsequently catalogued under that name (sub no. 940) in his Numerical List. The plant described as *O. emodi* is that which was catalogued (sub no. 937) as "*Onosma vestitum*." The plant (no. 940) incorrectly identified as *O. emodi* was subsequently given the name *O. Wallichianum*, by DeCandolle.

36. ***Onosma Wallichianum*** (DC.) Benth. ex Clarke, *Fl. Brit. India* 4: 179 (1883).

Maharanga Wallichiana DC. *Prodr.* 10: 71 (1846).—Type from Nepal, Wallich [no. 940 from Gossain Than].

Onosma emodi sensu Wall. Numerical List 27, sub no. 940 (1829), not Wall. (1824).

Plant with a slender annual or at most biennial root; stems slender, 3–4.5 dm. long, 1–2 mm. thick towards base, simple or with short floriferous branchlets from the upper leaf-axils, sparsely short-hispid (hairs ca. 1 mm. long) and also sparingly appressed villulose-hispidulose (hairs 0.1–0.3 mm. long); leaves green above, paler beneath, obscurely triplinerved, bearing sparse slender appressed bristles 1–1.5 mm. long and also minute appressed hairs 0.1–0.3 mm. long; hairs arranged singly or numbers of very minute hairs borne on the thickened base of the bristles and stellately

arranged, especially so on the lower leaf-face; cauline leaves 3–5 cm. long, 6–10 mm. broad, oblanceolate, apex broadly acute; basal leaves not seen; cymes small, terminal, 1.5–2.5 cm. broad; calyx at anthesis 3.5–4 mm. long, lobes cuneate to broadly cuneate, 2.5–3 mm. long, acute, 1–1.5 mm. broad at base, densely appressed villose on inner face, outside sparsely hispid and minutely strigulose; pedicels 1–5 mm. long; corolla in form and organization similar to that of *O. emodi*, differing only in size; corolla 8 mm. long, 6.5–7 mm. thick, obese, with lower end of puffed-out ribs forming gibbose projections protruding between the calyx-lobes; anthers 3.5 mm. long; filaments 0.8–1 mm. long, arising from a protuberance 3.5 mm. above the base of the corolla; nectary a collar 0.6–1 mm. high.

NEPAL: Gossain Than, *Wallich 940* (Ed, ISOTYPE).

This species has the growth habit of *O. bicolor* and *O. egregium* and the floral organization of *O. emodi*. The corolla, though perceptibly smaller, and perhaps also of more delicate texture, is otherwise a replica of that of *O. emodi*. It is broader and more obese than that of *O. bicolor* and *O. egregium* and its puffed-out ribs are more protrudent and the protuberances inside are conspicuously rather than inconspicuously developed. In vegetative characters *O. Wallichianum* most resembles *O. egregium*. The foliage in these two is thinner than in *O. bicolor*, and furthermore, their sparser indument consists in part of more or less well developed stellate hair-clusters. In *O. bicolor* the hairs all occur singly. In *O. egregium* numerous straight minute hairs arise on and diverge stellately from the mineralized disk at the base of certain of the bristles on the leaf-surface. The same condition occurs in *O. Wallichianum* but is less well developed, the stellately arranged hairs being not only smaller but also more slender and even contorted rather than straight. Furthermore, the number of minute hairs on the mineralized disk is frequently reduced to few or even one.

37. *Onosma bicolor* Wall. Numerical List 26, sub no. 939 (1829), nomen; G. Don, Gen. Syst. 4: 317 (1838); Clarke, Fl. Brit. India 4: 179 (1883). — Type from Gossain Than, Nepal, *Wallich 939*.

Maharanga bicolor (Wall.) DC. Prodr. 10: 71 (1846).

Plant with one to several stems from a firm slender (1–3 mm. thick) annual or possibly biennial root; stems 15–40 cm. long, usually 1–3 mm. thick, apparently decumbent or sprawling, simple or with a few leafy floriferous branchlets above the middle, usually bristly (hairs 1–3 mm. long) and also minutely and retrorsely strigulose; leaves frequently more or less evidently triple-nerved, with slender appressed hairs 2–3 mm. long, those on upper surface usually with pallid bases, minute hairs strigulose; lower cauline leaves oblanceolate, apex obtuse, from above middle gradually narrowed towards the attachment, 2–6 cm. long, 5–12 mm. broad; upper cauline leaves lanceolate or elliptic, usually 1.5–5 cm. long, acute; cymes 2–3 mm. broad, terminal, usually forked, at anthesis glomerate, at maturity loosely racemose; calyx 5–7 mm. long, lobes cuneate to narrowly

triangular, 2.5–4.5 mm. long, 1.5–2 mm. broad at base, inner surface with abundant appressed straight white hairs, outer surface bristly; pedicel slender, 3–7 mm. long; corolla 9–12 mm. long, barrel-shaped, twice as long as broad, broadest near middle (4–6 mm.), base 1.5 mm. thick, below the middle with narrow but evident ribs protruding slightly between the calyx-lobes, outer surface with short appressed hairs, inner surface hairy on stamen-bases and on tube below; corolla-lobes recurving, triangular, 0.7–1 mm. broad, 0.5–0.8 mm. long; anthers 3–4 mm. long, coherent at base, included, affixed 0.6–0.8 mm. above base, sterile tip 1 mm. long denticulate; filament 1.7–2.5 mm. long, cuneate, the broad base arising from an inconspicuous invaginated protuberance 3–4.5 mm. above corolla-base; nectary a collar, 0.9–1.1 mm. high, inner surface hairy; style 7–10 mm. long, glabrous; nutlets erect 1.5 mm. long, brown, dull, tuberculate and also minutely and very abundantly papillate, base truncate.

BHUTAN: Paro, 7750 ft., July 11, 1938, *B. J. Gould* 981 (K).

TIBET: Pun-ka-bee-see-mo, Chumbi, fl. white, July 24, 1884, *King's Collector* 173 (DD); Yatung, lat. 27°51', long. 88°35', *H. E. Hobson* (K).

SIKKIM: without locality [? Lachen], 9–10000 ft., *Hooker* (G).

NEPAL: Gossain Than, *Wallich* 939 (K, ISOTYPE); without locality, *Dr. J. Scully* (Ed, DD).

A species closely related to *O. egregium* and *O. Wallichianum*, differing from both in having firmer leaves that are more abundantly clad with non-clustered hairs. Its barrel-shaped corolla further distinguishes it from *O. Wallichianum*. All three species have a similar weak annual or at most biennial root, conspicuously different from the coarse strong perennial root of *O. emodi*. DeCandolle has suggested, as regards the type of *O. Wallichianum*, that this root-condition may be that of a juvenile plant or at least one growing in unfavorably wet or shaded conditions. Two of the collections of *O. bicolor* examined (Nepal, *Scully*; Chumbi, *King's col.* 173) show well-developed plants with roots. The roots are slender as I have described them. As far as can be compared the other collections of *O. bicolor* cited are so similar to those with roots that I feel certain that their underground parts were also similar. I find it hard to believe them only ecological forms of *O. emodi*.

38. *Onosma egregium*, sp. nov.

Planta e radice palari gracillima oriens ut videtur annua vel biennis; caulibus plus minusve simplicibus 2–3.5 dm. longis basim versus 1.5–3 mm. crassis hispidis (pilis simplicibus gracilibus pallidis 1.5–3 mm. longis) et retrorse strigulosis (pilulis 0.1–0.5 mm. longis); foliis caulinis oblanceolatis non rare venosis 4–8 cm. longis 8–18 mm. latis supra medium latioribus, apice acutis, basi acutis sessilibusque vel 1–3 mm. longe petiolatis acutisque, facie superiore viridibus indumento sparsissime donatis adpresse hispidis et minutissime hispidulis, pilis majoribus 1–2 mm. longis e centro disci pallido erumpentibus plerumque basi pilulos 0.1–0.4 mm. longos pluros radiate dispositos disco pallido marginem versus erumpentes cir-

cumdatis, pilulis 0.1–0.4 mm. longis dispersis vel stellato-aggregatis, facie inferiore foliorum indumento ei faciei superioris simili vel pilulis stellato dispositis nullis vel raris praeditis; cymis terminalibus 1.5–2.5 cm. latis; calyce 6–7 mm. longo, tubo cupuliformi, lobis cuneatis 4–5 mm. longis basi 1–1.5 mm. latis; corolla eis *O. bicoloris* simili 8–10 mm. longa utroque contracta basi 1.5–2 mm. crassa medium versus vel infra medium crassissima (4–5 mm. crassa), ore 1–3 mm. diametro, extus sparsissime retrorseque strigulosa, infra fundos sinuum sulcata, infra medium costis inflatis et areolis planis ellipticis (apice plus minusve invaginat) ornata; lobis triangularibus reflexis 1 mm. latis 0.8 mm. longis; antheris 4–4.5 mm. longis, inclusis, basi cohaerentibus, ca. 1 mm. supra basim affixis, apicibus sterilibus serrulatis ad 0.5 mm. longis; filamentis angustissime cuneatis 1–1.5 mm. longis medionervatis e gibbis intrusis 3 mm. supra basim corollae orientibus basim versus sparse villulosis; nectario 1 mm. alto intus villulosis; stylo 7–8 mm. longo glabro; nuculis ignotis.

INDIA (Kumaon): Palang garb, Byans, ca. 10000 ft., July 19, 1880, *J. R. Reid* (TYPE, Edinburg); Palang Gadh, Byans, 10000 ft., July 19, 1886, *Duthie 5826* (DD).

Most closely related to *O. bicolor* with which it agrees in flower and general habit. It differs in having the more scanty indument on its thinner leaves composed in part of stellate hair-clusters. Such hair-clusters occur in only one other species in our area, in the related *O. Wallichianum*, where they are less well developed. To the naked eye the leaves of these species appear to have an indument in no way distinctive, but under ten to twenty diameters of magnification their clustered hairs are readily apparent. The development of such clustered hairs in these allies of *O. emodi* is of some interest since the presence or absence of such trichome-groups are criteria upon which the primary divisions of the genus traditionally have been made. It is certain that the many diverse species with stellately arranged hairs which occur beyond our limits, in the Middle East and westward into southern Europe, are not closely related to our Himalayan plants. To associate them with the extralimital species because of trichomes would do violence with natural relationships. The traditional primary divisions of the genus, based solely on trichomes, may be convenient, but their naturalness is questionable.

UNPLACED SPECIES

ONOSMA AFGHANICUM Bornmüller, Bot. Jahrb. 66: 234 (1934). — Type from Afghanistan, "Kabul, auf dem Berge Babur, 1800 m.," July 15, 1929, *Constantin Manger*.

Not recognized from the description. The few details given concerning the flower are as follows, — corolla, flava, calyce vix quatra longiore, 20–21 mm. longa, glabra, lobis breviter triangularibus reflexis; antheris apice breviter exsertis; filamentis brevissimis; stylo 24 mm. longo.



Johnston, I. M. 1951. "Studies in the Boraginaceae, XXI. Sino-Indian species of *Onosma* [concl.]." *Journal of the Arnold Arboretum* 32(4), 344–368.

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