

A REVISION OF THE BORAGINACEAE OF WEST PAKISTAN AND KASHMIR *

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24. *Lindelofia* Lehm. Hamburg. Gart.-Blumenzeit. 6: 351. 1850.

TYPE SPECIES: *L. longiflora* (Benth.) Baill.

Perennial pubescent herb. Basal leaves usually petiolate, cauline leaves alternate, ovate to linear-lanceolate. Inflorescence ebracteate. Calyx usually divided to the base, slightly enlarged and spreading in fruit. Corolla blue, purple or dark purple, cylindrical or cylindrical-campanulate to infundibuliform, lobes usually spreading; faucal appendages usually large, rarely small, trapeziform to oblong, developed at the level of the filaments, or above, on the corolla throat. Stamens 5, anthers large, linear to oblong, usually three times as long as broad, often sagittate; filaments short. Ovary 4-lobed; style long, slender, stigma small. Nutlets depressed-ovoid to depressed-globose, dorsally deeply concave to plane, appendiculate at the margins, appendages subulate and glochidiate at apex, dilated and confluent at base, ventrally attached to a short gynobase.

Species about 12, distributed in northern Iran, Afghanistan, West Pakistan, Kashmir, northwest India, and adjoining areas of URSS and China.

KEY TO THE SPECIES

- a. Corolla tube much shorter than the limb, limb divided for $1/3$ to $1/2$ its length; filaments shorter than the anthers, inserted a little to much below the bases of the faucal appendages. 1. *L. anchusoides*.
- a. Corolla tube equalling to much longer than the limb, limb divided nearly to the base; filaments \pm equalling the anthers, inserted adjacent to the bases of faucal appendages.
 - b. Corolla lobes oblong, faucal appendages very short, much shorter than the anthers. 2. *L. stylosa*.
 - b. Corolla lobes ovate, faucal appendages large, equalling or longer than the anthers. 3. *L. longiflora*.

- 1. *L. anchusoides* (Lindl.) Lehm. Hamburg. Gart.-Blumenzeit. 6: 352. 1850; Linnaea 24: 216. 1851; Riedl in Rechinger, Fl. Iranica 48: 138. 1967.

Cynoglossum anchusoides Lindl. Bot. Reg. 28: t. 14. 1842; A. DC. in DC. Prodr. 10: 151. 1846.

C. emodi Schouw. Ind. Sem. Hafn. Coll. 4. 1846.

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C. macrostylum Bunge, Lehm. Reliq. Bot. 412. 1847; Mém. Acad. St. Pétersb. Sav. Étr. 7: 412. 1851; Boiss. Fl. Orient. 4: 266. 1875.

Paracaryum heliocarpum Kerner, Ber. Naturw.-Med. Innsbruck 1: [suppl.] 105. 1870; C. B. Clarke in Hook. f. Fl. Brit. India 4: 161. 1883; Boiss. Fl. Orient. suppl. 354. 1883; Hook. in Curtis's Bot. Mag. 113: t. 7520. 1897.

Adelocaryum anchusoides (Lindl.) Brand, Repert. Sp. Nov. 13: 548. 1915; Pflanzenr. IV. 252(Heft 78): 77. 1921.

Lindelofia cynoglossoides Brand, Pflanzenr. IV. 252(Heft 78): 88. 1921.

Lindelofia aspera Rech. f. Ann. Naturh. Mus. Wien 58: 48. 1951.

L. macrostyla (Bunge) M. Pop. Fl. URSS. 19: 627. 1953.

TYPE: Cultivated from the seeds obtained from Kashmir and Tibet, Herb. East India Company without citation of collector's name, *s.n.* (κ).

ICON.: Lindl. l. c. t. 14. 1842, under *Cynoglossum anchusoides*; M. Pop. l. c. t. 35. fig. 1. 1953, under *Lindelofia macrostyla*; Hook. in Curtis's Bot. Mag. 123: t. 7520. 1897, under *Paracaryum heliocarpum*.

Perennial, erect or rarely decumbent herb, to 100 cm. tall. Stems fistulose, striate, solitary or few with ligneous bases, simple or branched above, covered sparsely or densely with long, soft, usually retrorsely subappressed to appressed trichomes, nontuberculate at base, or sometimes with spreading trichomes arising from tuberculate bases. Basal leaves petiolate, petioles to 18 cm. long, lamina lanceolate, entire, acute, gradually narrowed towards the base, to 25 cm. long, 7 cm. broad, upper surface covered sparsely with soft, long, \pm retrorsely subappressed trichomes, lower surface sparsely to densely pubescent in the young leaves, rarely the old leaves covered with stiff trichomes arising from tuberculate bases; cauline leaves short petiolate, lanceolate, to 13 cm. long, 2 cm. broad; upper cauline leaves sessile, lanceolate to linear-lanceolate, to 8 cm. long, 1 cm. broad. Inflorescence terminal and axillary, long pedunculate, geminate or ternate, few flowered. Pedicel erect, to 4(-5) mm. long, in flower, horizontally recurved or slightly reflexed, densely pubescent and 10(-20) mm. long in fruit. Calyx divided nearly to the base, lobes oblong to oblong-ovate, obtuse, densely and uniformly pubescent, 2.5-5 mm. long, to 1 mm. broad in flower, enlarged to 6(-7) mm. long, 1.5(-2) mm. broad in fruit. Corolla pink, blue or purple, campanulate, to 10 mm. long, tube equalling or longer than the calyx, limbs about 1.5 times longer than the tube, divided $1/3$ to $1/2$ its length, lobes suborbicular; faucal appendages usually puberulous with a prominent medial line, to 2 mm. long, 1 mm. broad at the base, slightly tapering towards the trilobed apex, margins usually ciliate. Anthers to 2 mm. long, 0.5 mm. broad, sagittate; filaments fleshy, shorter than the anthers, inserted at the middle or below the bases of the faucal appendages on the corolla tube. Style \pm 9 mm. long, filiform; stigma capitate. Nutlets orbicular to ovate, 4-5(-6) mm. long, 3-4 mm. broad, dorsal surface, usually appendiculate along the medial line and the margins, dorsal appendages generally shorter than the marginal ones, marginal appendages puberulous, triangular, to 2 mm. long, confluent at base and forming a broad marginal wing, usual-

ly more or less inflexed on the dorsal surface; appendages on the lateral and latero-ventral surfaces slightly shorter than the marginal ones.

DISTRIBUTION: Afghanistan, West Pakistan, Kashmir, northwest India, Pamir Alaj, Tien Shan.

West Pakistan: CHITRAL STATE: Brumboret, 2000 m., on Hindukush south, *Bowes Lyon 644* (BM); Ziarat, Lowarai Pass, 2100 m., *Stainton 2552* (BM, E). GILGIT AGENCY: Rama Valley, s.-w. of Astor, 3000 m., *Lankester & Pearson 1453* (BM); Naltar lake, 3500–4000 m., 21 July, 1954, *R. R. Stewart s.n.* (MICH); Gurez Valley, Badwan, 2500 m., *R. R. Stewart 19617* (GH); Chillam Chowki, 3100 m., *Siddiqui, Nasir & Zaffar 4229* (BM); Chhacher pass, 3500 m., *Webster & Nasir 6392* (GH); Astor valley, 2300–2700 m., 23 July, 1892, *Duthie s.n.* (BM); Gilgit, *Toppin 1005* (K); Gubbar, south of Hindukush, 3000 m., *Giles 745* (K); South of Hindukush, *Giles s.n.* (E); South of Astor, 2500 m., *Giles s.n.* (K); Kunslwan (south of Gurez), 2500 m., 21 July, 1876, *C. B. Clarke 29366a, 39388* (K), *29366b* (BM); Kero Lugma Glacier, left bank, 3500 m., *Russell 1319* (BM, GH). HAZARA DIST.: Kaghan Valley: Burawai-Basal road, *Siddiqui 24161* (BM); Naran, 2700 m., *Kazmi 573b* (PES), *Jafri & Ali 3416* (E); between Naran and Saiful Maluk, ca. 2800 m., *Kazmi 802b* (PES). KURRAM AGENCY: Kurram Valley, Hariab, *Aitchison 576* (GH); between Kurram and Kaiwas, *Aitchison 579* (BM). SWAT STATE: Batani, above Ushu, 3000 m., *R. R. Stewart & Rehman 25321* (BM); Kalam, 2200 m., *Rechinger 19424* (W); Utror, 2500 m., *Rechinger 19554* (W); Kulali, 1800 m., *R. R. Stewart 24518* (RAW); without locality, July 1961, *N. A. Malik s.n.* (PES). Reported from: Chitral, Ziarat, *Harriss 16378, 16380* (DD); Gujar, 2550 m., *Harriss s.n.* (DD); Chitral, *Younghusband s.n.*; Barum Gol, Zapotili, 3600 m., *Wendelbo s.n.* (BG).

Kashmir: KISHANGANGA VALLEY: Prope Goroi, 2500 m., *Drummond 15007* (K); near Chorwan, 2700 m., *R. R. Stewart 22625* (GH); Keran, 1200 m., in pond, *R. R. Stewart 17638* (GH); Kishtwar: Machel, sapphire mines, 2600 m., *Ludlow & Sherriff 9126* (BM, GH). LADAKH: Zoji La, 3000 m., *Ludlow & Sherriff 814* (BM); Zoji La Pass, 3300 m., *R. R. Stewart 21249* (GH); Shemsha Karbu, 2850 m., *Ludlow & Sherriff 816* (BM); Dras, 3200 m., *Ludlow & Sherriff 8315* (BM); Dras, 3150 m., *Ludlow & Sherriff 8337* (GH); Dras to Dandal, Sept. 1880, *Young s.n.* (BM); Matayan to Dras, 3000 m., *R. R. Stewart 7444* (K), near Kharbu, 2900 m., *R. R. Stewart 21100* (GH); SIND VALLEY: Sonamarg, 2600 m., *R. R. Stewart 9715* (GH); vicinity of Sonamarg, along Sind River, 50 road-miles east-northeast of Srinagar, 2600 m., *Dickason 90* (MICH); ZANSKAR: Seni, Phe, 3500 m., *Koelz 5808* (GH, MICH); Seni, Hamling, 3500 m., *Koelz 5807* (GH, MICH); Char, Ichor, 4000 m., *Koelz 5681* (GH, MICH); Kangi La to Rangdum, 3500 m., *Koelz 2874* (GH); Oma valley, 3700 m., *Osmaston 193* (K); Mitzahoi, 3300 m., *Rich 1145* (K). Miscellaneous: Himal. bor. occ., regio temp., 8–10000 ped., Herb. Ind. Or. Hook. f. & Thomson, *Thomson s.n.* (BM, GH). Reported from: Sind Valley, *Duthie 11526*.

The trichomes covering the stems and leaves, and the size of calyx and corolla are very variable in *Lindelofia anchusoides*. The trichomes in most cases are long, soft, and appressed in variable densities and give the plant a pale green to greenish appearance. In a few specimens (*Stewart 17638, 21100*; *Young* from Dras to Dandal) the leaves bear shorter, stiff trichomes, arising from large tuberculate bases. This character some-

times is correlated with smaller flowers and shorter pedicels and sometimes not. On examination of more material the plants with stiff, tuberculate trichomes and short pedicels may prove to be a variation worth recognition.

From the other two species of our area, *Lindelofia longiflora* and *L. stylosa*, *L. anchusoides* differs in having a much longer corolla limb compared to the length of the tube, and filaments shorter than the anthers, which are obviously inserted below the bases of faucal appendages.

2. *L. stylosa* (Kar. & Kir.) Brand, Pflanzenr. IV. 252(Heft 78): 85. 1921; M. Pop. in Fl. URSS 19: 633. 1953; Riedl in Rechinger, Fl. Iranica 48: 141. 1967.

Cynoglossum stylosum Kar. & Kir. Bull. Soc. Nat. Moscou 15: 409. 1842.

Solenanthus nigricans Schrenk ex Fisch. & C. A. Mey. Enum. Pl. Nov. 2: 29. 1842; DC. Prodr. 10: 165. 1846; Ledeb. Fl. Rossica 3: 171. 1847.

Lindelofia benthamii Hook. f. Fl. Brit. India 4: 159. 1883.

TYPE: In pratensibus subalpinus Alatau ad fl. Sarchan, *Karelin & Kirilow s.n.* (LE-holotype, US-isotype).

ICON.: M. Pop. l. c. t. 36. fig. 1. 1953.

Perennial herb, to 60 cm. tall. Stems single to many, striate, simple or branched above, sparsely covered with usually spreading, or sometimes in young plants, retrorsely subappressed trichomes, hardly tuberculate at their bases; old stems sometimes quite glabrous below. Basal leaves lanceolate, entire, acute, narrowed towards the bases into long petioles, including petioles to 35 cm. long, 6 cm. broad; covered on both surfaces with white, subappressed trichomes, to 0.5 mm. long, arising from tuberculate bases; lower cauline leaves subsessile to short petiolate, to 20 cm. long, 1.5 cm. broad; upper cauline leaves few, sessile, linear. Inflorescence terminal, short in flower, to 15 cm. long and paniculately branched in fruit. Pedicels to 7 mm. long in flower, to 22 mm. long and arched out in fruit. Calyx divided to the base, lobes linear-lanceolate, acute, densely covered with subappressed, white trichomes, 6–8 mm. long, 1 mm. broad, slightly enlarged in fruit. Corolla dark purple, tubular to tubular-campanulate, 11–13 mm. long, tube ca. twice as long as the limb, limb divided to 3/5 its length, lobes narrow-oblong to oblong, obtuse to roundish, suberect, 3–5 mm. long, ca. 1.5 mm. broad; faucal appendages, to 1 mm. long and broad, semilunar. Anthers exerted from the corolla tube, 3–3.5 mm. long, 0.5 mm. broad, apiculate, sagittate; filaments fleshy, 1.5 mm. long, inserted on the corolla tube adjacent to the bases of faucal appendages. Style filiform, 13–15 mm. long; stigma capitate. Nutlets 4, broad ovate, to 7 mm. long, 6 mm. broad, dorsal surface glabrous or tuberculate, short appendiculate at the margins and all around, appendages not exceeding 0.7 mm. in length, apices glochidiolate, sometimes marginal appendages confluent at their bases forming a very narrow marginal wing.

DISTRIBUTION: Pamir Alaj, Tien Shan, Dsungaro-Tarbagatai, Tibet, Alatau, Afghanistan, West Pakistan, Kashmir, northwest India.

West Pakistan: CHITRAL STATE: Upper Yarkhun valley, 4000–4500 m., *Schmid* 2284 (MICH). GILGIT AGENCY: Baltistan, upper end of Hushe valley, Ghondakoro glacier basin at the foot of Mesherbrum, 3500–4000 m., *Webster & Nasir* 6077, 6102 (GH).

Kashmir: LADAKH: Shelshel river, 4300 m., *Strachey & Winterbottom* 2 (GH); Hunnupatta, 3500 m., *Osmaston* 49 (K); Tsaka La, 4500 m., in dry ravine, *Koelz* 2369 (GH); Bod Kharbu, Treaty Road, 3300 m., *Ludlow & Sherriif* 8368 (GH); Zaskar: Kangi La to Rangdum, 3500 m., *Koelz* 2874 (GH); Sulle to Padum, *Schlagintweit* 6708 (GH); top of the Pentse La Pass (pass between Zaskar and Dras), *Schlagintweit* 7476 (GH).

Brand [Pflanzenr. IV. 252(Heft 78): 87. 1921] considering *Lindelofia benthamii* Hook. f. (l. c.) identical to *L. angustifolia* (Schrenk) Brand, l. c. IV. 252(Heft 78): 87. 1921, cited a number of specimens from our area. In fact *L. benthamii* is a synonym of *L. stylosa* and agrees in all its details with the latter. *L. stylosa*, is distinguished from *L. angustifolia* by having distinct faucal appendages in the corolla throat, whereas such appendages are totally absent in *L. angustifolia*. I did not see any specimen of *L. angustifolia* from West Pakistan, Kashmir or northwest India and its occurrence in these areas appears to be quite doubtful. The specimen (*Schlagintweit* 6708) cited by Brand belongs to *L. stylosa*.

Lindelofia stylosa is closely related to *L. longiflora* from which it is distinguished by having narrower corolla lobes and very short faucal appendages.

3. *L. longiflora* (Benth.) Baill. Hist. Pl. 10: 379. 1890; Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 103. t. 42, fig. A–C. 1893; Brand, Pflanzenr. IV. 252(Heft 78): 85. 1921.

Cynoglossum longiflorum Benth. in Royle Illustr. Bot. Himal. Mount. 305. 1839; Lindl. Bot. Reg. 26: t. 50. 1840.

Omphalodes longiflora A. DC. in DC. Prodr. 10: 158. 1846.

Paracaryum longiflorum Boiss. Diagn. Pl. Orient. 11: 132. 1849.

Lindelofia spectabilis Lehm. in Hamb. Gart.-Blumenzeit. 6: 352. 1850; Linnaea 24: 216. 1851; C. B. Clarke in Hook. f. Fl. Brit. India 4: 159. 1883.

TYPE: Cashmere, *Royle s.n.* (K?).

ICON.: Lindl. Bot. Reg. 26: t. 50. 1840.

Perennial herb, to 60 cm. tall. Stems usually solitary, sometimes few, simple, covered sparsely to densely with white, crisped, spreading to subappressed trichomes, to 1.5 mm. long, some from tuberculate bases others not. Basal leaves lanceolate, entire, acute, attenuate towards the base into petioles, usually shorter, sometimes equal or rarely longer than the lamina, including petioles to 18 cm. long, 8 cm. broad, sparsely to densely covered on both surfaces with subappressed to erect trichomes, more or less like those on the stem; cauline leaves very variable, lower cauline leaves ses-

sile, oblong-lanceolate to ovate, acute, at the bases slightly dilated, more or less rounded or subcordate; upper cauline leaves semiamplexicaul, shorter and narrower than the lower ones. Inflorescence terminal or subterminal, short in flower, later elongated to 15 cm. Pedicel erect, to 5 mm. long in flower, pubescent, elongated up to 12 mm., horizontal to sub-reflexed in fruit. Calyx divided to the base or connate for its lower $1/4$, 7 mm. long in flower, lobes oblong to ovate, obtuse to subacute, ca. 3.5 mm. broad, variously hairy, to 10 mm. long, lobes 5.5 mm. broad in fruit. Corolla bright to deep blue to purple, campanulate-infundibuliform, tube to 13 mm. long, limbs to 6 mm. long, divided nearly to the base, lobes ovate, spreading; faucal appendages to 4 mm. long, 2 mm. broad, sometimes slightly tapering toward the more or less emarginate apex, margins ciliate. Anthers ca. 2 mm. long, 0.5 mm. broad, more or less rounded at both ends; filament ca. 2 mm. long, fleshy, inserted adjacent to the bases of the faucal appendages on the corolla tube. Nutlets ovate, excluding appendages to 4 mm. long, 2.5 mm. broad, margins appendiculate, appendages to 2 mm. long, glochidiate at apex, dilated at base, free or confluent forming a narrow marginal wing, spreading, rarely inflexed on the concave dorsal surface, which has a more or less prominent medial ridge, bearing few to many vertical appendages similar to the marginal ones. Style to 15 mm. long, filiform; stigma capitate.

DISTRIBUTION OF SPECIES: West Pakistan, Kashmir, northwest India.

KEY TO THE VARIETIES

- a. Upper cauline leaves broad-lanceolate to ovate; calyx lobes with prominent midrib, bearing long crisped trichomes usually only on the midrib and margins. 3b. var. *levingii*.
- a. Upper cauline leaves lanceolate; calyx lobes with inconspicuous midrib, bearing short trichomes usually all over the surface and margins.
 - b. Calyx lobes subacute to acute at apex, lobes uniformly pubescent on the dorsal surface. 3c. var. *falconeri*.
 - b. Calyx lobes obtuse to roundish at apex, densely pubescent on the margins with short trichomes, and uniformly pubescent on the dorsal surface. 3a. var. *longiflora*.

3a. Var. *longiflora*.

Leaves on the upper surface sparsely covered with subpatent, long trichomes, arising from tuberculate bases, densely covered on the lower surface with subappressed, crisped, soft trichomes, not tuberculate at their bases, to 0.3 mm. long. Calyx usually divided for $3/4$ of its length or sometimes to the base, lobes to 7 mm. long, 3.5 mm. broad in flower, enlarged to 10 mm. long, 5.5 mm. broad in fruit, with inconspicuous midrib, covered densely over the dorsal surface with long, white trichomes, usually longer on the middle and towards the base, margins very densely pubescent with trichomes to 0.2 mm. long, ventral surface more or less pubescent, usually on the upper parts and margins. Corolla dark blue, in-

fundibuliform, tube to 13 mm. long, limb to 7 mm. long; faucal appendages comparatively narrower and shorter than in var. *levingii*.

West Pakistan: CHITRAL STATE: Brumboret, M. A. Siddiqui & A. Rehman 26853 (BM). GILGIT AGENCY: Kamri Pass, 3000–3500 m., Duthie 12581 (BM); Baltistan, 2700 m., Hunter-Weston 10251 (MICH). HAZARA DIST.: Kaghan Valley, Saiful Maluk, Shaukat Ali 129 (BM).

Kashmir: Tragbal, 19 July 1876, C. B. Clarke 29226 (K), 3200 m., Sept. 1913, Evershed s.n. (BM), Duthie 13524 (K); Rajdhangan Pass, R. R. & I. D. Stewart 18005 (GH), 3000–3500 m., R. R. Stewart 19517 (GH), 3000 m., R. R. Stewart 19307 (GH); Sonamarg, 3300 m., R. R. Stewart 6560 (K), 9801A (GH); Sind Valley, 3000 m., Stainton 5026 (BM); vicinity of Sonamarg, on the Sind river, 50 road-miles east-northeast of Srinagar, 4000 m., Dickason 91 (MICH); Gangangir, Sind Valley, 3200 m., Ludlow & Sherriff 7971 (BM, GH), 7979 (GH); Gumber valley in Sind Valley, 3300 m., Ludlow & Sherriff 7636 (GH); Sekiwas, Yamkar Pass, 3500 m., R. R. Stewart 12552 (GH); Mengandob, 3300 m., Polunin 56/724 (BM); Butin Pandsab, Wangat Valley, 3300 m., Pinfold 269 (BM); Dras Valley, Zoji La, 2 June 1870, Henderson 324 (K); Gangabal Lakes, 3000 m., R. R. & I. D. Stewart 4552 (MICH); Zaiwan, 3000 m., Polunin 56/603 (BM); near Karagbal, 2700 m., R. R. Stewart 22559 (GH); Allyabad, Pir Panjal, Inayat 25720 (K); Surgun, 3200–4000 m., Schmid 549 (BM); Budnambal, 4000 m., Fuller 226 (K); Mantar Valley, near Desu, 3000 m., Ludlow 95 (BM). Miscellaneous: Kashmir, Price 72A (K), Coventry 577 (K).

The typical variety is very variable in the form of its leaves. Generally the basal leaves have long petioles; the cauline leaves are oblong-lanceolate, acute, usually narrowed at both ends and truncate, roundish or subamplexicaul at base. The lower surfaces are densely covered with short trichomes to sometimes slightly pubescent. All the trichomes lack tuberculate bases. These characters are well correlated with the ovate, obtuse calyx lobes densely ciliate at the margins. The corolla tube is narrower than that of var. *levingii*. Corollas in almost all the collections are deep blue rather than purple.

3b. Var. *levingii* (C. B. Clarke) Brand, Pflanzenr. IV. 252(Heft 78): 85. 1921.

Lindelofia spectabilis var. *levingii* C. B. Clarke in Hook. f. Fl. Brit. India 4: 159. 1883.

L. platycalyx Riedl in Køie & Rechinger, Biol. Skr. 13(4): 202. 1963, in Rechinger, Fl. Iranica 48: 140. 1967, *syn. nov.*

TYPE: Kashmir: Pir Pingul, alt. 11500 ft., *Levinge* s.n. (K).

ICON.: Riedl, l. c. fig. 153. 1963, under *Lindelofia platycalyx*.

Leaves sparsely covered on both surfaces with trichomes arising from tuberculate bases; calyx shape more or less like that of the typical variety; calyx lobes with prominent midrib, covered sparsely or densely, usually on the midrib and margins, with crisped trichomes, to 0.5 mm. long, internally usually glabrous. Corolla mostly purple to sometimes dark

blue, campanulate-infundibuliform, tube to 10 mm. long, limbs 5–6 mm. long, divided nearly to the base; faucal appendages to 4 mm. long and 2 mm. broad.

West Pakistan: GILGIT AGENCY: Upper Astor Valley, Kalapani to Shankargarh, 3300 m., *R. R. Stewart 22745a* (GH). HAZARA DIST.: Ithal (Shadal), 16 Aug. 1899, *Inayat s.n.* (w-type of *L. platycalyx* Riedl); Kaghan Valley, between Balakot and Babusar Pass, *Abel 134* (BM); between Shogran and Sari Rest House, 2500 m., *Kazmi 2158* (PES); northeast of Saiful Maluk Sar, 3570 m., *Schmid 331* (BM, E); Saiful Maluk, *Shaukat Ali 129* (BM, mixed with var. *longiflora*).

Kashmir: Pir Panjal, 3300 m., *Levinge, s.n.* (κ-type); Pir Panjal Pass, 3200 m., *Ludlow 31* (BM); Banihal Pass, Pir Panjal Range, 2575 m., *R. R. Stewart 12203, 14709* (GH); Gulmarg, 2750 m., *Duthie 13045* (BM), 3000 m., *R. R. Stewart 10395* (GH), 2700 m., *Tamin 158* (BM); Gulmarg, Nagini, 2700 m., *R. R. Stewart 14843a* (GH); Killanmarg, above Gulmarg, 3000 m., *R. R. Stewart 10420A, 8665* (GH); Pahlgam, *R. R. & I. D. Stewart 5904* (MICH); vicinity of Kolahoi mountains and glacier, about 50 miles north of Islamabad, via Pahlgam and Arau, *Dickason 94* (MICH); Tuleon, above Pahlgam, 3200 m., *R. R. Stewart 21844a* (GH); Tuleon Way, east of Pahlgam, on east Lidder river, 27 road-miles north of Islamabad, 2700 m., *Dickason 93* (MICH); Shisha Nag, 3500 m., *Coventry 645* (κ); Lidderwat, 3000 m., *Coventry 577* (κ); Sina-than Pass, 3500 m., *Ludlow & Sheriff 9291* (BM, GH); Ningle Nullah, *Pinfold 217* (BM). Miscellaneous: Kashmir: *R. R. Stewart 12957* (BM), 2700 m., 1957, *Mrs. Prescott-Decie s.n.* (BM).

The variety *levingii* of *Lindelofia longiflora* is very variable in the size and form of leaves, but generally the cauline leaves are much broader and shorter compared to those of the other two varieties. The leaves are always sparsely pubescent on both surfaces. These characters are correlated with the pubescence of the calyx lobes, which are covered only on the midrib and the margins with long, crisped white trichomes. The corolla in this variety is comparatively broader and more or less campanulate in form, bearing longer faucal appendages compared to the corolla in the other two varieties.

Lindelofia platycalyx agrees in all its details to *L. longiflora*.

3c. Var. *falconeri* (C. B. Clarke) Brand, Pflanzenr. IV. 252 (Heft 78): 85. 1921.

Lindelofia spectabilis Lehm. var. *falconeri* C. B. Clarke in Hook. f. Fl. Brit. India 4: 159. 1883.

TYPE: KASHMIR: *Falconer s.n.* (κ-Herb. Late East India Co., holotype, GH-isotype).

Leaves very similar to those of var. *longiflora*; calyx obviously divided to the base, lobes oblong-lanceolate, acute to subacute, to 6 mm. long, 1.5 mm. broad in flower, enlarged to 10 mm. long and 3 mm. broad in fruit; corolla as that of var. *longiflora*.

West Pakistan: GILGIT AGENCY: Burzil Pass, north slope, 3300 m., *R. R.*

Stewart 22004 (GH), south slope, *R. R. Stewart* 19126 (GH); Kamri Pass, 4000 m., *Giles* 700 (K); Mir Panzil Pass, ascent to the Deosai, 3300 m., *R. R. Stewart* 19985 (GH). Miscellaneous: Gilgit-Chitral, *Leichtlin* s.n. (K, received in herb. on July 1889).

Kashmir: Koragbal, north slope, Rajdhiangan Pass, ca. 2750 m., *R. R. Stewart* 22586c (GH); Sonamarg, 3000 m., *R. R. Stewart* 9858A (GH); vicinity of Sonamarg, on Sind river, 50 road-miles east-northeast of Srinagar, 3500 m., *Dickason* 92 (MICH); above Gulmarg, 3000 m., *R. R. Stewart* 10329 (GH); Koslorkut, 8 miles n.w. of Vishensar, 3300 m., *Polunin* 56/701 (BM). Miscellaneous: Kashmir, *Falconer* s.n. (K, GH, types).

Lindelofia longiflora var. *falconeri* can very easily be distinguished from the other two varieties of the species by its lanceolate, acute to subacute calyx lobes. In the type specimen the upper cauline leaves are narrower than in any of the other specimens cited. In the other collections the cauline leaves are usually oblong-lanceolate and broader than those in the type specimen.

25. *Cynoglossum* L. Sp. Pl. 134. 1753; Gen. Pl. ed. 5. 65. 1754.

TYPE SPECIES: *C. officinale* L. (Lectotype).

Usually perennial or biennial, rarely annual herbs. Calyx usually divided to the base, slightly enlarged in fruit. Corolla cylindrical to campanulate-infundibuliform; limbs divided to the middle or to the base, lobes usually ovate; faucal appendages usually subquadrate, rarely oblong to semilunar. Stamens included; anthers usually ovoid to oblong-ovoid, at maximum three times as long as broad, usually shorter; filaments usually inserted at the middle or rarely above the middle of the corolla tube. Style fleshy or filiform of different lengths, stigma capitate. Nutlets 4, forming a much depressed pyramid, ovoid to globose, appendiculate at the margins or all around, appendages glochidiate at apex, free at the base to sometimes dilated and confluent forming narrow or broad marginal wings, attached to the gynobase by ventral scars, usually developed on the upper half of the ventral side.

Species about 60, distributed all over the world, except in arctic regions.

KEY TO THE SPECIES

- a. Nutlets 2–3 mm. long.
 - b. Styles filiform, long, cylindrical; nutlets roundish to ovate, usually dorsally concave, rarely convex, variously appendiculate, appendages of equal or various lengths, marginal ones usually confluent at their bases and forming narrow to broad wings. 3. *C. wallichii*.
 - b. Styles fleshy, thick, short, \pm 4-angled; nutlets roundish, dorsally convex, uniformly appendiculate, appendages \pm of equal length, usually not confluent at their bases.
 - c. Leaves uniformly covered dorsally with trichomes, to 0.2 mm. long, not arising from tuberculate bases. 2. *C. zeylanicum*.

- c. Leaves covered dorsally with trichomes of unequal lengths, usually longer than 0.2 mm., obviously arising from tuberculate bases. 1. *C. lanceolatum*.
- a. Nutlets 3.5–5 mm. long.
 - d. Basal leaves petiolate, lamina ovate, abruptly narrowed at the base, truncate or rarely subcordate. 4. *C. stewartii*.
 - d. Basal leaves petiolate, lamina oblong, gradually attenuate at the base towards the petioles.
 - e. Cauline leaves oblong, obtuse to subacute, gradually narrowed towards the bases. 5. *C. nervosum*.
 - e. Cauline leaves ovate, acute to acuminate, roundish at base. 6. *C. microglochin*.

1. *C. lanceolatum* Forssk. Fl. Aegypt.-Arab. 41. 1775; DC. Prodr. 10: 149. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 156. 1883; Brand, Pflanzenr. IV. 252(Heft 78): 137. 1921, excl. vars.; Riedl in Rechinger, Fl. Iranica 48: 145. 1967.

C. micranthum Desf. Tab. Ecole Bot. ed. 1. 220. 1804.

C. hirsutum Jacq. Hort. Schönbr. 4: tab. 489. 1804.

C. canescens Willd. Enum. 180. 1809.

C. racemosum Roxb. Hort. Beng. 13. 1814; Fl. Indica, ed. Carey, 2: 6. 1824.

C. platyphyllum Klotzsch in Peter, Reise Mozambique Bot. 254. 1862.

C. abyssinicum Hochst. & Vatke ex Engler, Abh. Preuss. Acad. Wiss. 1891. 2: 353. 1892.

C. johnstoni Baker, Kew Bull. 1894: 29. 1894.

TYPE: Hadie, *Forsskål s.n.* (c).

ICON.: Brand, l. c. fig. 18, A–G. 1921.

Erect biennial or perennial herb, 60–150 cm. tall. Stems woody at base, branched, branches long, spreading; densely covered with stout, white trichomes arising from tuberculate bases up to 2 mm. long, trichomes on the upper part of the stem comparatively shorter and \pm subappressed. Basal leaves petiolate (petioles to 8 cm. long), lanceolate, entire, acute, attenuate at the base, including the petioles to 30 cm. long and 4 cm. broad, nerves on the upper surface inconspicuous, raised and prominent below, upper surface covered uniformly with thin, subappressed trichomes, intermixed in different densities with longer, thicker trichomes to 1 mm. long, arising from large tuberculate bases, sometimes surrounded with tiny white tubercles, lower surface covered more densely, especially on the nerves, with similar trichomes; cauline leaves sessile to short petiolate, to 12 cm. long and 2 cm. broad; upper cauline leaves sessile, much reduced in size. Inflorescence axillary or terminal, bifurcate to dichotomously branched, branches spreading, ebracteate, short, scorpioid in flower, elongated to 25 cm. when in fruit. Pedicels to 0.1 mm. long in flower, to 2 mm. long and usually reflexed in fruit. Calyx divided to the base, lobes ovate, obtuse, densely hairy externally, glabrous within, \pm 1 mm. long, enlarged and spreading in fruit, to 2 mm. and 1 mm. broad. Corolla light blue, 2–3 mm. long, limbs divided to the

base, lobes ovate; faucal appendages broader than long. Stamens included, anthers ovate, minute, filaments short. Nutlets 4, ovate, 1–2 mm. long, \pm equally broad, dorsally convex, appendiculate all around, appendages of equal length, vertical, not confluent at base, apex glochidiate. Style short, fleshy, 0.5–0.7(–1) mm. long in fruit.

DISTRIBUTION: Africa excluding the northwestern parts, Arabia, Pakistan, Kashmir, India, Nepal, Burma, Thailand, Philippines, Formosa, Riu Kiu, and China.

West Pakistan: DIR STATE: Dir village, 1500 m., *Salim* 105 (K). HAZARA DIST.: Tribal area, Nilishang, ca. 1200 m., *Burt* 1426 (E); Kaghan valley, between Balakot and Babusar Pass, *Abel* 13 (BM); Siran Valley, Jabori, *Burt* & *Arshad Ali* 778 (E). KURRAM AGENCY: Kurram Valley, *Afandi* 671a (PES). RAWALPINDI DIST.: Khangah to Sangla Hills, *R. R. Stewart* 1457 (K); near Rawalpindi, 600 m., *R. R. Stewart* 16521a, 13787 (GH); Rawalpindi, 500 m., *R. R. Stewart* 12958 (K, GH, RAW). SWAT STATE: Near Bahrain, *R. R. Stewart* 25406 (BM); near Madian, ca. 1500 m., *Rodin* 5551 (US), *Kazmi s.n.* (PES). Miscellaneous: Bank of Chenab, Oct. 1846, *Thomson s.n.* (K); Western Himalaya, May 1832, *Gerard s.n.* (BM).

Kashmir: Bandipur, 1500 m., *R. R. Stewart* 22521 (GH); Ganderbal, *R. R. Stewart* 7497 (K); Gund, 2000 m., *Rich* 278 (K); Chokoti to Uri, Aug. 1880, *Young s.n.* (BM). Miscellaneous: Himal. bor. occ. 3–7000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (GH, MICH).

2. *C. zeylanicum* (Vahl) Thunb. ex Lehm. Neue Schriften Naturf. Ges. Halle 3(2): 20. 1817; Asperif. 116. 1818; Brand, Pflanzenr. IV. 252(Heft 78): 134. 1921, excl. var. *lanceolatum* C. B. Clarke; Riedl in Rechinger, Fl. Iranica 48: 145. 1967.

Anchusa zeylanica Vahl ex Hornem. Enum. Hafn. 3. 1807, Hort. Hafn. 1: 176. 1813, *nomen nudum*.

Echinospermum zeylanicum Lehm. Asperif. 116. 1818; A. DC. in DC. Prodr. 10: 142. 1846.

Rochelia zeylanica Roem. & Schult. Syst. 4: 108, 780. 1819.

Cynoglossum furcatum Wall. Cat. No. 919. 1828, *nomen nudum*; ex Roxb. Fl. Indica, ed. Carey, 2: 6. 1824; DC. Prodr. 10: 149. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 155. 1883.

Cynoglossum coeruleum Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 100. 1825.

C. micranthum Desf. var. *decurrens* Trimen, Handb. Fl. Ceylon 3: 203. 1895.

TYPE: not indicated.

ICON.: Wight, Icon. Pl. Indiae Orient. 4: t. 1395. 1850, under *C. furcatum*.

Biennial erect herb, to 85 cm. tall. Stems brownish, fleshy, simple or branched, covered densely with thick yellow to brownish, antrorsely appressed to subappressed trichomes. Basal leaves petiolate, lamina oblong to elliptic, obtuse to subacute, 15–20 (–30) cm. long, 35–85 mm. broad, narrowed towards the base into petioles to 12 cm. long, nerves prominent below, covered uniformly on both surfaces with nonpungent

trichomes to 0.2 mm. long, not arising from conspicuous tuberculate bases; cauline leaves short petiolate, upper cauline leaves sessile, oblong-lanceolate, gradually reduced in size upwards. Inflorescence terminal or subterminal, short in flower, ebracteate and elongated in fruit. Pedicel shorter than the calyx in fruit. Calyx divided for $3/4$ of its length, lobes ovate, 3–4 mm. long, obtuse to roundish at apex, covered with trichomes like those on the leaves. Corolla blue, infundibuliform, 5 mm. long, limbs 8–9 mm. in diameter, divided nearly to the base; faucal appendages blue, subquadrate, larger than the anthers. Style fleshy, much shorter than the calyx. Nutlets 4, ovoid, 3–4 mm. long, uniformly appendiculate all around, emarginate, appendages glochidiate at apex, free at base, dorsal surface convex.

DISTRIBUTION: Afghanistan, Pakistan, India, Ceylon, Philippines, Japan, China.

West Pakistan: Reported from Swat: inter Madyan et Kalam, 1700 m., *Rechinger 19377* (w).

I did not see a specimen of this species from Afghanistan or West Pakistan; its distribution in these areas needs thorough investigation.

3. *C. wallichii* G. Don, Gen. Syst. 4: 354. 1838; A. DC. in DC. Prodr. 10: 150. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 157. 1883.

C. stellatum Wall. Cat. No. 924. 1828, *nomen nudum*.

C. canescens Wall. Cat. No. 918. 1828, *nomen nudum*.

C. calycinum Wall. Cat. No. 923. 1828, *nomen nudum*, non C. A. Meyer.

C. vesiculosum Wall. Cat. No. 920. 1828, *nomen nudum*.

C. edgeworthii A. DC. in DC. Prodr. 10: 150. 1846.

C. denticulatum A. DC. in DC. Prodr. 10: 150. 1846.

C. micranthum Hook. f. & Thoms. ex C. B. Clarke in Hook. f. Fl. Brit. India 4: 157. 1885.

TYPE: Native of Nepaul, in Gosainsthan, *Wallich 923* (κ).

Erect biennial herb, to 75(–100) cm. tall. Stems solitary to many, striate, usually branched above, branches long, divaricate; stem and branches in the lower parts covered densely with spreading, white trichomes to 3 mm. long, arising from tuberculate bases, in the upper part with shorter, sometimes subappressed ones. Basal leaves petiolate, including petioles, to 17 cm. long and 32 mm. broad, lamina usually shorter, sometimes equalling or longer than the petiole, lanceolate to obovate, obtuse to acutish, gradually narrowed at base, nerves on the upper surface sunken, on the lower surface raised and prominent, both surfaces densely covered with long, spreading, white trichomes, usually arising from large, prominent tuberculate bases, trichomes on the margins of petioles are sometimes even longer; lower cauline leaves acute, usually longer and broader than the basal ones and with much shorter petioles; middle and upper cauline leaves subsessile to sessile, gradually reduced

in size upwards. Inflorescence terminal or axillary, usually geminate, branches divaricate, ebracteate, short scorpioid, bearing closely set flowers, much elongated after flowering, with fruits to 20 mm. apart. Pedicels none to very short in flower, hairy, reflexed to 3 mm. long in fruit. Calyx divided to the base, lobes oblong, erect, ca. 2 mm. long and 0.5 mm. broad, slightly enlarged in fruit, spreading, densely pubescent to sometimes ciliate at the margins, rarely with the trichomes arising from minute tubercles. Corolla pale to deep blue, campanulate, 3.5–4 mm. long, tube \pm equalling the calyx, limbs equalling the tube, divided nearly to the base, lobes rounded; faucal appendages subquadrate, slightly emarginate, puberulent. Anthers ovate, 0.8 mm. long, 0.4 mm. broad; filament short, inserted nearly at the middle of the corolla tube. Nutlets ovate, apex roundish to acute, excluding the appendages, 2–2.5 mm. long, 1.5–2 mm. broad, dorsally concave, bearing few to many vertical glochidiate appendages, margins appendiculate with the appendages more or less confluent at their bases and usually forming a marginal wing, appendages on the ventral side like those on the margins, not confluent at bases and usually smaller.

DISTRIBUTION: Afghanistan, Pakistan, Kashmir, Pamir Alaj, India.

3a. Var. *wallichii*.

Dorsal surface of the nutlets broad-ovate, sunken, sparsely to densely covered with vertical appendages, dorsal longitudinal keel not conspicuous, apex roundish, marginal appendages many, long, dilated and confluent at base forming broad elevated wings.

West Pakistan: CHITRAL STATE: Brir, 1200 m., *Siddiqui & Rahman* 26851 (BM). GILGIT AGENCY: Naltar Valley, 2000 m., *Duthie* 12437 (BM); BALTISTAN: Skardu to Shigar, 2000 m., *R. R. Stewart* 20480 (GH); Skardu, 1900 m., *R. R. Stewart* 20469 (GH); right side of the Shayok via Kiris to Neru on the right side of Indus, *Schlagintweit* 5827 (GH); south of Satpara Lake, ca. 4.5 miles south of Skardu, 2000 m., *Webster & Nasir* 5841 (GH); Skardu, 1800 m., *Webster & Nasir* 5449 (GH); upper end of Hushe Valley, Ghondakoro Glacier basin at the foot of the Masherbrum, 2500 m., *Webster & Nasir* 6045 (GH); Rattu, Kamri Nala, Astor, 8 July 1901, *Duthie s.n.* (K); Rupal to Gorikot, 1700 m., *R. R. & I. D. Stewart* 18911 (GH); Shinger, 1900 m., *R. R. Stewart* 20543 (GH); Pranu, 2500 m., *Koelz* 9701 (GH); Skardu, 2500 m., *Schlagintweit* 840 (US); Ashkoley, 3000 m., *Clarke* 30408 (K); Gilgit, *Toppin* 1038 (K); KAKORAM: Kero Lugma Glacier, 3000–3500 m., *Russell* 1337 (BM); Kushuchun Lugma Valley, 3000–3500 m., *Russell* 1776 (BM). HAZARA DIST.: Kaghan Valley, Saiful Maluk, ca. 3000 m., *Kazmi* 799A (PES), *Shaukat Ali* 133 (BM); Balakot, 1000 m., *Jafri & Ali* 3267 (E); Shogran to Sari Rest House, ca. 2500 m., *Kazmi* 686B (PES); Sarul, *Inayat* 22034 (K); Shinu, *Inayat* 22035 (K); Tribal territory, Ganja Kandoo to Hill Durra Nullah, 3000 m., *Burt & Kazmi* 1259 (E). KURRAM AGENCY: Kurram Valley, Parachinar, *Barbour s.n.* (BM), *Afandi* 671 (PES). RAWALPINDI DIST.: Rawalpindi, 1960, *McVean s.n.* (E); MURREE HILLS: near Rosenheim, 2000 m., *Rodin* 5360 (US). QUETTA DIST.: Ziarat, *Lace* 3401 (E). SWAT STATE: Sho Nala, *Rahman* 26 (BM).

Kashmir: Gulmarg, 2700 m., Sept. 1922, *Barbour s.n.* (BM), 3500 m., Aug. 1922, *Barbour s.n.* (BM); Purig, Tangola, *Koelz 6075* (US); Parkachen, *Koelz 5977* (MICH, GH, US); Pahlgam, Lidder Valley, 2000 m., *R. R. Stewart 21623* (GH); Pahlgam, 2100 m., *R. R. Stewart 21628, 21762* (GH); Islamabad, 17 Nov. 1896, *H. H. Johnston 2* (E); Kootihar Valley, 3 Dec. 1896, *H. H. Johnston s.n.* (E); Banks of Jhelum below Islamabad, ca. 2000 m., *Duthie 13059* (K); Kajei-utholi, Padar, upper Chenab, 2000 m., *R. R. Stewart 2925* (K), 2919 (K, US); Upper Chenab Valley, *Ellis in Gamble 189* (K); Goochi, 2000 m., *Fuller 172* (K); Kuihama Range, Nagmarg, 3000 m., *Fuller 72b* (K); Rambar, Jammu-Kashmir Road, ca. 1000 m., *R. R. Stewart 12964* (GH); Gurez across the Ulli plain and two small passes to Bandipur, northwest of Srinagar, *Schlagintweit 12082* (GH); Baramula, along both sides of Jhelum Valley down to Mera, 1800–2000 m., *Schlagintweit 12469* (GH); environ of Srinagar, within a circle of 8 miles, *Schlagintweit 4503* (US), 4237 (GH); Sonamarg, 2500–3000 m., *R. R. Stewart 6280* (K); Sonamarg to Kulan, Sept. 1880, *Young s.n.* (BM); Sund to Gagangar, Sept. 1880, *Young s.n.* (BM); Zanskar, Tetha, Tankse, 4000 m., *Koelz 5592* (US); Padri Pass to Bhadrar, *Schlagintweit 3067* (US); Wingle Nullah, *Pinfold 195* (BM); Banihal village, Kashmir-Jammu Road, 1800 m., *R. R. Stewart 12555* (GH); Agharwat, 3000–3500 m., *Timins 257* (BM); Aliabad, 3200 m., *Clarke 28725* (BM); Ladak: Hernes, 3700 m., *Koelz 2539* (GH, US); Hemis, *Koelz 6393* (MICH, US); Mulbekh, Robila, *Koelz 6157* (GH, MICH, US); Mitsahoi, 3000 m., *R. R. Stewart 12553* (GH); Dah, right side of Indus Valley, *Schlagintweit 1212* (GH); Marsho, *Koelz 6393a* (GH); Dras, 3000 m., 31 Aug. 1922, *R. R. Stewart s.n.* (K); Chitta Pani Valley, Poosiana, *Levinge in Clarke 27124* (BM). Miscellaneous: Himal. bor. occ., regio temp., 8000–10,000 ped., *Herb. Ind. Or. Hook. f. & Thoms., Thomson s.n.* (BM, GH-as *Cynoglossum* No. 6), 6–9000 ped., *Thomson s.n.* (BM, K, US-as *Cynoglossum denticulatum*).

2595 3b. Var. *glochidiatum* (Wall. ex Benth.) Kazmi, comb. nov.

Cynoglossum glochidiatum Wall. ex Benth. in Royle, Illustr. Bot. Himal. Mount. 1: 306. 1839.

TYPE: *Nepaulia, Wallich 922* (K).

ICON.: Lindl. in Bot. Reg. t. 15. 1841.

Dorsal surface of the nutlets ovate, less sunken, covered usually with few vertical appendages along the more or less prominent longitudinal keel, apex obtuse to acutish, marginal appendages at their bases not at all, to slightly dilated, sometimes confluent, forming a narrow marginal wing.

West Pakistan: GILGIT AGENCY: Baltistan, Chalpani Nala, 3000–3500 m., *Duthie 13816* (K); Chutrun, 2000 m., *Ludlow 262* (BM). HAZARA DIST.: Kaghan Valley, Silan, 12 July 1899, *Inayat s.n.* (K); between Balakot and Babusar Pass, *Abel 128* (BM).

Kashmir: Vicinity of Sonamarg, on the Sind river, 50 road-miles east-north-east of Srinagar, 2000 m., *Dickason 107* (MICH, US), 2200 m., *Dickason 106* (MICH); Purig, Tangola, *Koelz 6075* (MICH, US); vicinity of Pahlgam, on east Lidder River, 27 road-miles north of Islamabad, *Dickason 111* (MICH); Pahlgam to Lake Tuliori, 2300 m., *R. R. Stewart 21848* (US).

4. *C. microglochin* Benth. in Royle, Illustr. Bot. Himal. Mount. 1: 305. 1839; A. DC. in DC. Prodr. 10: 151. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 158. 1883; Brand, Pflanzenr. IV. 252 (Heft 78): 133. 1921.

TYPE: Kashmir, *Royle s.n.* (K?).

Perennial herb, erect, 35–90 cm. tall. Stems simple or branched, densely covered with white trichomes. Basal leaves petiolate, lanceolate to oblong-lanceolate, on both surfaces densely covered with soft white trichomes, attenuated at both ends, 6–20 cm. long including petioles, 12–30 mm. broad; cauline leaves sessile ovate to elliptic, acuminate, round towards the base, to 6 cm. long, 30 mm. broad, nerves sunken above, raised below, upper surface densely covered with thin, antrorsely subappressed to appressed, white trichomes 0.5–1 mm. long, arising from prominent white tuberculate bases, lower surfaces densely albido-tomentose; upper cauline leaves smaller in size. Inflorescence terminal or axillary, ebracteate, short in flower, later elongated to 15 cm., simple or geminate, branches arched out, bearing closely set flowers and to 10 mm. distant fruits. Pedicels none to 0.7 mm. long, reflexed. Calyx divided to 4/5 of its length, lobes ovate-elliptic, obtuse, erect, 3.5–4.5 mm. long, 1.5–2 mm. broad in flower, externally covered with antrorsely subappressed, unequal white trichomes, densely tomentose internally at the margins; spreading in fruit, sometimes slightly incurved at the margins, enlarged to 5.5–6.5 mm. long and 3–3.5 mm. broad. Corolla pale blue to light purple, campanulate, tube more or less equalling the limbs, ca. 3.5 mm. long, lobes ovate, spreading, 3.5 mm. long, ca. 2.5 mm. broad; faucal appendages emarginate, puberulous, ca. 1 mm. long, 0.7 mm. broad. Anthers ovate, 1.2–1.4 mm. long, 0.5 mm. broad; filaments short, inserted ca. 3 mm. above the corolla base. Nutlets ovate, puberulous to minutely and densely pubescent, 4.5–5.5 mm. long, 3–3.5 mm. broad, margins appendiculate, appendages 0.5–0.7 mm. long, distant, glochidiate at apex, dilated at base, usually confluent, forming a narrow, thick, marginal wing, dorsal middle area concave, sometimes with quite conspicuous longitudinal keel, with few scattered vertical glochidiate appendages, appendages on the lateral and ventral sides smaller than those of the margins. Style 3.5–5 mm. long; stigma capitate.

DISTRIBUTION: West Pakistan, Kashmir, northwest India.

West Pakistan: HAZARA DIST.: KAGHAN VALLEY: between Balakot and Babusar Pass, *Abel 135* (BM).

Kashmir: Pooniana (?), 3000 m., *Clarke 28819* (BM).

Very little material belonging to *Cynoglossum microglochin* is available in herbaria. The type collection by Royle from Kashmir is also not traceable. Bentham (*l. c.*), C. B. Clarke (*l. c.*) and Brand (*l. c.*) describe the basal leaves as attenuated towards the base, and differentiate this species from the closely allied *C. nervosum* by its fewer cauline leaves,

ovate to elliptic, and acute, densely pubescent above, pubescent below, whereas *C. nervosum* has oblong to elliptic cauline leaves, sparsely hirsute on both surfaces. From the specimens of both the species available to me, the differentiating characters seem to be quite stable. The two specimens cited above are immature and lack fruits, but they agree in the form of leaves, their indumentum, and in the floral parts with a very good and complete specimen collected from Dalhousie by C. B. Clarke (23 Sept. 1874, *Clarke 2298* at Kew) and determined by him, which agrees in all its details with Bentham's original description.

5. *C. nervosum* Benth. ex C. B. Clarke in Hook. f. Fl. Brit. India 4: 158. 1883; Hook. Bot. Mag. 123: *t. 1713*. 1897; Brand, Pflanzenr. IV. 252(Heft 78): 142. 1921; Riedl in Rechinger, Fl. Iranica 48: 146. 1967.

Omphalodes nervosa Edgeworth ex C. B. Clarke in Hook. f. Fl. Brit. India 4: 158. 1883, *nomen nudum*.

TYPE: WESTERN HIMALAYA: Kulu, Jalauri Pass, *Edgeworth s.n.* (K).

ICON.: Hook. l. c. *t. 1713*. 1897.

Perennial erect herb, to 90 cm. tall. Stems solitary or few, branched above the base; stem and branches covered with crisped white, spreading trichomes, to 1.5 mm. long, arising from tuberculate bases on the lower part; with shorter, subappressed trichomes on the upper part. Basal leaves petiolate, petioles to 4 cm. long, lamina ovate to oblong-ovate, entire, rounded at apex, attenuated towards the base, to 4 cm. long and 1.5 cm. broad, covered on both surfaces with soft, white, crisped, spreading trichomes, usually arising from minute tuberculate bases; lower cauline leaves petiolate, petioles to 10 cm. long, lamina lanceolate, acute, gradually narrowed at base, to 12 cm. long and 2 cm. broad, indumentum like that of the basal leaves; middle and upper cauline leaves sessile, narrow to broadly lanceolate, to 7 cm. long, gradually reduced in size upwards. Inflorescence terminal or axillary, bifurcate, branches 2–3 cm. long, scorpioid in flower, later elongated to 10 cm., bearing 10–20 mm. distant fruits. Pedicels to 1 mm. long, in flower, sometimes elongated to 3 mm. and reflexed in fruit. Calyx divided to the base, lobes oblong-ovate, obtuse, sparsely to densely covered with long, soft, spreading trichomes, dorsally sometimes ciliate at the margins, more or less glabrous within, up to 3.5 mm. long and 1 mm. broad in flower. Spreading and enlarged to 4.5(–5) mm. long, 1.5 mm. broad in fruit. Corolla blue, infundibuliform, tube equalling or longer than the calyx, limbs 7–8 mm. in diameter, divided for 4/5 of its length, lobes transversely ovate, ca. 3 mm. long, 4 mm. broad, patent; faucal appendages emarginate, ciliate at the margins, puberulous above, 1 mm. long and broad. Anthers oblong-ovate, 1–1.5 mm. long; filaments 0.3 mm. long, inserted adjacent to the bases of the faucal appendages. Style to 3.5 mm. long, filiform, stigma capitate. Nutlets ovate, to 4.5 mm. long, 3 mm. broad, appendages

glochidiate, marginal ones dilated at their bases, confluent, forming a narrow or broad marginal wing, dorsal appendages few to many.

DISTRIBUTION: Afghanistan, West Pakistan, Kashmir, northwest India.

5a. Var. *nervosum*.

Petioles of the lower cauline leaves 3–4 cm. long; leaves covered on both surfaces with trichomes usually arising from prominent tuberculate bases; calyx lobes to 6 mm. long in fruit; fruiting pedicels usually shorter than the calyx; corolla 9–11 mm. in diameter.

Kashmir: above Tragbal, 3500 m., *Osmaston* 13 (κ); Hunan Nullah, Chamba Pangi, ca. 3000 m., *R. R. Stewart* 2827 (κ); Chamba, Aug. 1880, *Ellis* 187, 405B (κ). Reported from: Gorai, *Meebold* 4183; Margan Pass, *Meebold* 4182.

5b. Var. *petiolatum* (Hook.) Kazmi, comb. nov.

Anchusa petiolata Hook. Bot. Mag. 67: t. 3858. 1841.

Cynoglossum petiolatum (Hook.) A. DC. in DC. Prodr. 10: 149. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 158. 1883; Brand, Pflanzenr. IV. 252 (Heft 78): 141. 1921.

TYPE: e Nepalia in hort. bot. Glascovium introduc.

ICON.: Hook. l. c. t. 3856. 1841.

Petioles of the lower cauline leaves 5–8 cm. long; leaves covered on both surfaces with soft trichomes usually not arising from prominent tuberculate bases; calyx lobes to 8 mm. long in fruit, fruiting pedicel usually longer than the calyx; corolla 16–18 mm. in diameter.

Kashmir: Bhujaz, foot of Umasi La, Zanskar Frontier, 3300 m., *Ludlow & Sherriff* 9197 (BM). Reported from: alpine western Himalaya, Zanskar, near Umasi Pass, *Thomson s.n.* (κ).

6. *C. stewartii* Kazmi, sp. nov.

TYPE: KASHMIR: Pahlgam to Lake Sorus, 10,000–11,000 ft., flowers dark blue purple, basal leaves large, 8 Aug. 1945, *R. R. Stewart* 21584 (GH-holotype).

Herba perennis, erecta, ad 150 cm. alta. Caules brunneoli, striati, singulares vel numerosi, ad basim plerumque lignei (interdum lignei supra), simplices vel ramosi, rami longi, divaricati; caules ramique infra plerumque sparse pilosi, raro glabri, nitidi, supra plus minusve dense trichomatibus patentibus vel subappressis vestiti, trichomata ad 1 mm. longa. Folia basalia petiolata, petioli ad 18 cm. longi, lamina ovata vel ovato-lanceolata, integra, acuminata, ad basim plerumque truncata, interdum abrupte attenuata vel raro subcordata, manifeste nervata, ad 26 cm. longa, 12 cm. lata, supra uniformiter sparseque trichomatibus albis, tenuibus, patentibus vestita, trichomata ad 0.5 mm. longa, ad basim magni-tu-

berculata, infra trichomatibus densioribus, patentibus vel appressis, etuberculatis; foliis caulina petiolata, petioli ad 6 cm. longi, plerumque breviores, lamina ovato-lanceolata, acuminata, gradatim attenuata ad basim; folia caulina superiora sessilia vel subsessilia, in magnitudine sursum gradatim reducta. Inflorescentia terminalis vel axillaris, plerumque geminata, interdum dichotome ramosa, brevis, scorpioidea, in juventute flores approximati, deinde ad 15 cm. longa et fructibus distantibus ad 15 mm. Pedicelli ad anthesin perbreves; in fructu calycem aequantes, vel breviores vel interdum longiores. Calyx paene $4/5$ divisus, lobi oblongo-ovati, obtusi, 3.5–4.5 mm. longi, 1.5–2 mm. lati ad anthesin, extus trichomatibus mollibus albis antrorse appressis vestiti, trichomata ad 0.5 mm. longa, intus densiore vestiti, trichomata breviora; lobi ad margines albido-tomentosi, in fructu ad 5 mm. longi et 3 mm. lati, patentes. Corolla purpureo-caerulea, infundibuliformi-campanulata vel rotata, tubus calycem aequans, 4–5 mm. longus, limbus ad basim divisus, lobi late ovati, patentes, 3–4 mm. longi, 3.5–4.5 mm. lati; appendices fauciales trapeziformes, subemarginatae, puberulae. Antherae ovatae, 1.6 mm. longae, 0.7 mm. latae; filamenta perbrevia, supra basim ca. 3.5 mm. inserta. Nuculae late ovatae, ca. 4 mm. longae, 2.5 mm. latae, plus minusve acutae, bases rotundatae, margines appendiculatae, appendices ad 1.5 mm. longae, 0.5 mm. latae ad basim, apex glochidiatus, bases liberae vel subconfluentes cum ala angusta marginale, dorsum planum, glabrae vel interdum puberulae, longitudinaliter subcarinatae, 1–3 appendicibus verticalibus, appendices laterales et ventrales erectae, glochidiatae. Stylus 2.5 mm. longus, filiformis, stigma capitatum.

DISTRIBUTION: West Pakistan, Kashmir, northwest India.

West Pakistan: HAZARA DIST.: KAGHAN VALLEY: Kund Bangala, 2500 m., *Kazmi 2572* (PES); Bala Bhurj, 3000 m., *Inayat 19520* (K); Kamalban, 17 June 1899, *Inayat s.n.* (K), *Kazmi 2528a*, *2532a* (PES); Silan, 12 July 1899, *Inayat s.n.* (K). RAWALPINDI DIST.: Murree Hills, along the pipeline from Murree north to Nathia gali, 2500–3000 m., *Dickason 109* (MICH). SWAT STATE: Bishigram, 3000 m., *R. R. Stewart & Rahman 24957* (BM); Bahrain, 2500 m., *Kazmi 2510* (PES); above Utror, 2500–3000 m., *R. R. Stewart & Rahman 25228* (BM).

Kashmir: Vicinity of Pahlgam, on east Lidder River, 27 road-miles north of Islamabad, *Dickason 108* (MICH); Pahlgam to Lake Sorus, 3000–3500 m., *R. R. Stewart 21584* (GH-type); Pahlgam, *R. R. Stewart 8319*, *21723a* (GH), 2500 m., *R. R. Stewart 21504* (GH, K); Ferozpur Nullah near Gulmarg, 3000 m., *R. R. Stewart 12963* (GH); Sonamarg, *R. R. Stewart 6354*, *7198 1/2* (K), 3000 m., *R. R. Stewart 12960* (GH); Chinari, *Kazmi 241* (PES); Gulbarg, 2700 m., *R. R. Stewart 12961* (GH); Jhelum Valley, Tilpatra forests, near Rampur, *Ludlow & Sherriff 7714* (GH); SIND VALLEY: Gangangir, hill face, *Ludlow & Sherriff 7970* (BM); Gund, 2000 m., *Ludlow & Sherriff 7695* (BM); Kishanganga Valley, Sharda, *R. R. & I. D. Stewart 17769* (MICH). Miscellaneous: Himal. bor. occ., 6000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (BM).

The specimens cited above are mostly named as *C. nervosum* or *C. microglochis* in herbaria, but they are very different from both these

species and deserve specific recognition based on the following distinguishing characters.

Cynoglossum stewartii is a tall perennial, taller than either of the species cited above; its basal leaves are very large, petiolate with petioles to 18 cm. long; lamina ovate to ovate lanceolate, truncate at base, abruptly narrowed or rarely subcordate, to 20 cm. long and 12 cm. broad. In the other two species petioles and lamina of the basal leaves never exceed 10 cm. and 12 cm. in length, respectively. In shape the lamina are ovate to oblong-ovate and always gradually narrowed towards the base. The middle and upper cauline leaves in *C. stewartii* are distinctly petiolate, with petioles sometimes to 6 cm. long, and the uppermost leaves subsessile to rarely sessile, these are gradually narrowed towards the petioles at base. In *C. nervosum* and *C. microglochin* the middle cauline leaves are sessile to subsessile and the upper ones distinctly sessile. In *C. nervosum* the upper cauline leaves are more or less narrowed, but in *C. microglochin* these are obviously rounded at base. The trichomes on both surfaces of the leaves of *C. stewartii* do not exceed 0.5 mm. in length, whereas in both the other species they are 0.5–1 mm. long. In form of the calyx and corolla, *C. stewartii* closely resembles *C. microglochin*, excepting for some minor details given in the descriptions.

SPECIES NOT SEEN

648 *C. schlagintweitii* (Brand) Kazmi, comb. nov.

Adelocaryum Schlagintweitii Brand, Repert. Sp. Nov. 13: 548. 1915; Pflanzenr. IV. 252 (Heft 78): 78. 1921.

TYPE: TIBET: PROVINZ DRAS: Kargil, zwischen Suru und Tstringmat, *Schlagintweit* 7211 (Breslau).

Perennial subshrubby herb, covered all over with short trichomes arising from tuberculate bases. Basal leaves petiolate, oblong to lanceolate, (including the petioles) 5–6 cm. long, 5–8 mm. broad, obtuse, attenuate towards the base; lower cauline leaves short petiolate, the upper sessile, much reduced. Inflorescence long, lax, many flowered. Calyx lobes oblong, obtuse, pilose. Corolla campanulate, 3 mm. long, lobes broadly ovate, tube short; faucal appendages broader than long, semilunar. Stamens inserted on the lower part of the corolla tube, filaments short. Style nearly half the length of the calyx. Nutlets (usually two abortive) ovoid, 4 mm. long, appendiculate at the margins, appendages glochidiate at apex, dorsally carinate, the ventral scar very small.

DISTRIBUTION: Kashmir, southwest Tibet.

Kashmir: Kargil, between Suru and Tstringmat, *Schlagintweit* 7211 (Breslau).

C. flexuosum (Brand) Kazmi, comb. nov.

Adelocaryum flexuosum Brand, Repert. Sp. Nov. 14: 145. 1915; Pflanzenr. IV. 252 (Heft 78): 78. 1921.

TYPE: KASHMIR: Gurez (nortlich von Srinagar, der Haupt Stadt von Kaschmir), 3 und 4. 10. 1856, *Schlagintweit* 7612 (Breslau).

Annual (?) herb, stems delicate, flexuous, to 30 cm. or longer, covered with spreading trichomes. Basal leaves not seen; cauline leaves short petiolate, the upper sessile, oblong to lanceolate, 3–4 cm. long, 10–16 mm. broad, attenuate at both ends. Inflorescence terminal, lax, many flowered. Pedicels of the lower fruits longer than the calyx. Calyx lobes oblong-elliptic, obtuse, to 3 mm. long. Corolla cylindric-campanulate 4.5 mm. long, tube equalling the limb; faucal appendages subquadrate, apex emarginate. Stamens inserted at the middle of the corolla tube, anthers reaching the bases of faucal appendages, filaments short. Style equal or subequal to the calyx. Nutlets 3 mm. long, dorsally appendiculate, appendages glochidiate at apex.

DISTRIBUTION: West Pakistan.

West Pakistan: GILGIT AGENCY: Gurez, *Schlagintweit*, 7612 (Breslau).

Since I did not see the types of the two species cited above, the descriptions given here are according to Brand (l. c.). From the descriptions the taxa appear to belong to the genus *Cynoglossum*, and the species to be closely related to *C. wallichii*. On examination of the original material the species may, however, prove to be the same as or varieties of *C. wallichii* or *C. lanceolatum*.

26. *Actinocarya* Benth. in Benth. et Hook. f. Gen. Pl. 2: 846. 1876.

TYPE SPECIES: *A. tibetica* Benth.

Slender procumbent or diffuse annual herbs, sparsely strigose or nearly glabrous. Leaves alternate. Flowers minute, solitary on axillary pedicels. Calyx divided to the base, 5-lobed, hardly enlarged in fruit. Corolla campanulate, lobes broad-ovate, slightly shorter than the tube, obtuse, spreading, imbricate in bud; faucal appendages 5, very small, transversely linear. Stamens 5, inserted in the lower part of the corolla tube, anthers included, small, ovate, obtuse; filaments short. Ovary deeply 4-lobed; style short, stigma small. Nutlets 4, obovoid-oblong, appendiculate, appendages glochidiate at apex, free or dilated at base, confluent, forming marginal wings or a coniform dorsal crest, attached apically or subapically to a plane gynobase, turgid at the margins.

Species 2, distributed in Kashmir, southwest Tibet and northwest India.

KEY TO THE SPECIES

- a. Leaves glabrous on the upper surface, with few short trichomes below; sepals bearing scattered short trichomes externally; fruits densely covered with minute, frequently uncinat trichomes and scattered appendages. 1. *A. tibetica*.
- a. Leaves with long trichomes on both surfaces and at the margins; sepals bear-

ing few scattered trichomes externally, ciliate at the margins; fruits glabrous, appendiculate, appendages forming a dorsal crest. 2. *A. acaulis*.

1. *A. tibetica* Benth. in Benth. & Hook. f. Gen. Pl. 2: 846. 1876; C. B. Clarke in Hook. f. Fl. Brit. India 4: 154. 1883; Gürke in Nat. Pflanzenfam. IV. 3a: 101. 1893; Brand, Pflanzenr. IV. 252(Heft 78): 162. 1921.

TYPE: WEST TIBET: Nubra, alt. 13,000 ft., near Karsar village, *Thomson s.n.* (K-holotype, GH-isotype).

ICON.: Hooker, Icon. 23: t. 2256. 1893.

Annual, decumbent or erect herb, to 15 cm. tall. Stem solitary or many, slender, weak, unbranched, usually glabrous in the lower parts, with few scattered, spreading, minute, trichomes above. Basal leaves few, obovate-spathulate, entire, sometimes slightly revolute at margins, apex round, narrowed towards the base into long petioles, (including petioles) to 25 mm. long, 1.5–5 mm. broad, glabrous on both surfaces, or the lower surface bearing few scattered, retrorsely subappressed minute trichomes arising from tuberculate bases; cauline leaves usually with shorter petioles. Flowers axillary throughout the length of the plant. Pedicels short, in flower erect in the axils of the lower leaves, up to 25 mm. long in fruit, slender, with antrorsely suberect minute trichomes, gradually reduced in size upwards. Calyx divided to the base, lobes lanceolate to broad-lanceolate, obtuse to subacute, externally sparsely pilose, ca. 1.5 mm. long, 0.5 mm. broad in flower; erect, not at all to slightly enlarged in fruit. Corolla light blue, campanulate, tube usually shorter than the calyx, ca. 1 mm. long, limb equalling or slightly longer than the tube, divided nearly to the base, lobes broad-ovate, ca. 1 mm. long and broad, spreading; faucal appendages very small. Stamens 5, anthers small, ovate, obtuse, included, filaments short. Ovary 4-lobed, style short, stigma small, capitate. Nutlets 4, grayish, obovoid-oblong, divaricate, ca. 2 mm. long, bearing numerous minute, frequently uncinat trichomes as well as numerous appendages, appendages glochidiate at apex, 1–1.5 mm. long, scattered, not forming a dorsal crest.

DISTRIBUTION: West Tibet, Kashmir, northwest India (?).

Kashmir: Nubra near Karsar village, *Thomson s.n.* (K, GH); Ladakh: Nunu, 4500 m., *Koelz 2358* (GH); Henu, 3300 m., *Koelz 2558* (GH). Reported from: Kambajong, *Prain s.n.* (in Herb. Bornmüller); without locality, *King's collector*, 1882 (DD).

2. *A. acaulis* (W. W. Smith) I. M. Johnston, Jour. Arnold Arb. 21: 53. 1940.

Eritrichium acaule W. W. Smith, Rec. Bot. Surv. India 4: 225. 1911.

TYPE: Naku La, Llonakh, Sikkim, top of Pass, 17,500 ft., 3 Aug. 1909, *Smith & Cave 2811* (CAL-holotype, GH-, K-isotypes).

Annual prostrate compact herb, sometimes branched near the base; branches many, very short, fleshy, covered with many scattered, spreading trichomes to 0.5 mm. long, arising from tuberculate bases. Leaves obovate-spathulate, entire, rarely slightly revolute at the margins, apex round, narrowed at base into long, usually winged petioles \pm dilated below, (including petioles) to 20 mm. long and 4 mm. broad, bearing on both surfaces and margins crisped, spreading trichomes, to 0.7 mm. long arising from tuberculate bases; cauline leaves, if any, shorter. Flowers solitary in the axils of leaves or sometimes few axillary and congested on the top of the short branches. Pedicels short in flower, to 10 mm. long, fleshy, in fruit bearing many spreading trichomes. Calyx divided nearly to the base, ca. 1.5 mm. long in flower, lobes erect, ovate to oblong, obtuse to subacute at apex, bearing few scattered trichomes dorsally, with ciliate margins, enlarged to 2 mm. long and \pm 1 mm. broad in fruit. Corolla blue, campanulate, tube usually equalling the calyx, limbs shorter than the tube, divided to the base, lobes rotundate, spreading; faucal appendages very small. Stamens 5, included, anthers ovate, small, filaments short. Nutlets 4, ovoid-oblong, glabrous, appendiculate, appendages to 1 mm. long, glochidiate at apex, dilated at base, confluent and forming a dorsal crown.

DISTRIBUTION: Kashmir, northwest India, Sikkim.

Kashmir: LADAKH: Rupshu, Kiangchu, Lachulung, 4500 m., *Koelz* 6650 (GH). Reported from: Rupshu, Purga, *Koelz* 2184; Nanu, *Koelz* 2358.

Both species of *Actinocarya*, widely distributed in the Himalayas, are very similar in gross habit. *A. tibetica* is apparently glabrous though the leaves are pustulate and strigose beneath. The dimorphic fruits bear numerous minute, frequently uncinatate trichomes. In *A. acaulis* the stem and the leaves bear relatively coarse, elongate, loosely appressed hairs. The fruit is nearly glabrous and the secondary glochidiate appendages are fewer, tending to be crowded just outside the coarse dorsal margin of the nutlet.

The fruits of *A. tibetica* are dimorphic. Those borne along the stems are long pedicellate and composed of apically attached nutlets bearing a small crown on the back towards the base. Outside this small crown are numerous scattered glochidiate appendages. The fruits produced about the base of the plant have short stout pedicels and more compressed nutlets. The dorsal crown is incomplete on these, or entirely absent. Numerous scattered glochidiate appendages, are however, always present.

27. *Lithospermum* L. Sp. Pl. 132. 1753; Gen. Pl. ed. 5. 64. 1754.

Buglossoides Moench, Meth. 418. 1794; I. M. Johnston, Jour. Arnold Arb. 38: 38. 1954.

TYPE SPECIES: *L. officinale* L. (Lectotype species).

Annual or perennial, erect or decumbent, hispid or rough herbs. Leaves

alternate. Flowers white, blue or yellow, axillary and solitary or in terminal bracteate racemes. Calyx divided to or nearly to the base, usually enlarged in fruit. Corolla infundibuliform to hypocrateriform, either longitudinally plicate or gibbous at throat, lobes imbricate in bud, later suberect to spreading. Stamens 5, included; anthers oblong, obtuse or apiculate; pollen encircled with a single row of 6 to 9 pores. Ovary deeply 4-lobed; style usually filiform, stigma bifid. Nutlets 4, erect, ovoid, stony, smooth, rough or tuberculate, attached by a basal scar to the nearly flat gynobase.

A polymorphous genus of 50 to 60 species, distributed mainly in America. About 10 species are known in Africa and about 10 in Europe and Asia, including three species from West Pakistan and Kashmir.

KEY TO THE SPECIES

- a. Nutlets shining, white, smooth. 3. *L. officinale*.
- a. Nutlets rough, grayish, tuberculate.
 - b. Plants weak, usually little branched; nutlets weakly attached by a narrow areola to the gynobase. 1. *L. arvensis*.
 - b. Plants robust, usually much branched; nutlets firmly attached by a broad areola to the gynobase. 2. *L. tenuiflorum*.

1. *L. arvensis* L. Sp. Pl. 132. 1753; Ledeb. Fl. Rossica 3: 129. 1847; Boiss. Fl. Orient. 4: 216. 1875; C. B. Clarke in Hook. f. Fl. Brit. India 4: 174. 1883; M. Pop. Fl. URSS 19: 165. 1953; Riedl in Rechinger, Fl. Iranica 48: 151. 1967.

Margarospermum arvense Decne. in Jacquem. Voy. Inde Bot. 122. 1844.

TYPE: "Habitat in Europae agris et arvis," Herb. No. 181.4 (LINN).

ICON.: Hegi, Illustr. Fl. Mitt. Eur. 5(3): fig. 3112, a-c. 1927.

Annual, erect herb to 50 cm. tall. Stems slender, usually solitary, rarely few, little branched, covered with antrorsely appressed, white trichomes with tuberculate bases. Basal leaves few, ovate, entire, roundish, gradually or abruptly narrowed into long petioles, (including petioles) to 20 mm. long and 5 mm. broad, covered on both surfaces with minute subappressed trichomes arising from tuberculate bases; lower cauline leaves similar to the basal ones; middle cauline leaves oblong, oblong-ovate or lanceolate, subsessile or with very short petioles; upper cauline leaves, subsessile to sessile, lanceolate, obtuse to subacute. Inflorescence of terminal racemes, short in flower, elongated in fruit, bracteate, bracts leaf-like. Pedicels lacking in flowers, stout, pubescent, to 3 mm. long in fruit. Calyx divided nearly to the base, lobes linear, acute, to 6 mm. long and 0.5 mm. broad, densely covered with spreading, stiff white trichomes with tuberculate bases, enlarged to 8 mm. long and 1.5 mm. broad, connate at the base and forming a cup to hold the nutlets in fruit. Corolla white to light blue, tubular-infundibuliform, externally minutely strigose, corolla tube longitudinally pli-

cate from the top of the anthers to the throat, glandular or minutely hairy, 4–5 mm. long, lobes ovate, spreading, to 1 mm. long. Anthers oblong, apiculate, roundish at the base, to 1 mm. long; filaments very short, inserted 1–1.5 mm. above the corolla base. Nutlets 4, gray, pink, or light brown, ovate, usually abruptly narrowed in the upper half, tuberculate all over the surface, 3 mm. long, 2 mm. broad; areola basal, small.

DISTRIBUTION: Europe to Japan.

West Pakistan: CHITRAL STATE: Oihor Gol, 3000 m., *Bowes Lyon* 841 (BM); Brumboret Gol, N. of Drosh, *Stainton* 2226 (BM). HAZARA DIST.: Abbottabad, 1300 m., *R. R. Stewart* 13690A (GH, US). KHYBER AGENCY: Khyber Pass, 1100 m., *H. H. Johnston* 143 (E); Forsapper, Khyber Pass, 1700 m., *H. H. Johnston* 61 (E). QUETTA DIST.: Environ de Quetta, *Schmid* 1572 (G). RAWALPINDI DIST.: Dharmyal near Rawalpindi, 500 m., *R. R. Stewart* 19389A (GH); Topi Park, Rawalpindi, *Pinfold* 10 (BM); Murree Hills, Ghora Gali, 1700 m., field weed, *R. R. Stewart* 12951 (GH).

Kashmir: Srinagar, 1700 m., *R. R. Stewart* 12952 (GH); near Srinagar, *R. R. Stewart* 63 (BM). Miscellaneous: Himal. bor. occ., *Herb. Ind. Or. Hook. f. & Thoms., Thomson s.n.* (GH).

2. *L. tenuiflorum* L. f. *Suppl.* 130. 1781; *DC. Prodr.* 10: 75. 1846; *Boiss. Fl. Orient.* 4: 217. 1875; C. B. Clarke in *Hook. f. Fl. Brit. India* 4: 175. 1883; *M. Pop. Fl. URSS* 19: 164. 1953; *Riedl in Rechinger, Fl. Iranica* 48: 150. 1967.

Myosotis tenuiflora Viviani, *Fl. Libycae*, 9. 1824.

TYPE: "Habitat in Aegypto," *Latourette*, *Herb. No.* 181.13 (LINN).

ICON.: *Jacq. Icon. Pl. Rar.* 2: t. 313. 1793; Viviani, l. c. t. 1. fig. 2. 1824.

Very similar to *Lithospermum arvensis* except that the plants are robust; stems decumbent, many, usually branched, to 30 cm. long; leaves larger, cauline leaves usually sessile with a broad base; corolla 5–6 mm. long; areola of the nutlets broad and firmly attached to the gynobase.

DISTRIBUTION: North Africa and southeastern Europe to Central Asia, Afghanistan, West Pakistan, Kashmir, northwest India.

West Pakistan: CHITRAL STATE: Chitral village, 1500 m., *Stainton* 2156 (BM). DIR STATE: Dir, *Salim* 1 (K). HAZARA DIST.: Abbottabad, 1300 m., *R. R. Stewart* 13691 (GH). KALAT DIST.: Surab to Kalat, ca. 20 km. from Surab, 1800 m., *Lamond* 671 (E), *Rechinger* 28327 (G, W). KHYBER AGENCY: Jamrud, 7.3.1898, *Duthie* (K). PESHAWAR DIST.: Islamia College, ca. 350 m., *Kazmi* 2528 (PES); between Peshawar and Tarnab Farm, ca. 350 m., *Kazmi* 2481 (PES); Pabbhi-Nowshehra, *Kazmi* 2470 (PES); Peshawar, ca. 350 m., *Kazmi* 21b (PES), *Vicary s.n.* (K). QUETTA DIST.: Near Sanjawi, road from Harnai, 1500 m., *Lamond* 1318 (E); Quetta, *Duthie* 8680 (BM). RAWALPINDI DIST.: Rawalpindi, *Aitchison* 1079 (K), *R. R. Stewart* 1509 (K), *Kazmi s.n.* (PES). SWAT STATE: without locality, *Jafri s.n.* (E).

Kashmir: Kotli, ca. 900 m., *R. R. Stewart* 27385 (GH); near Srinagar, *Duthie*

10841 (K); Tangmarg, 2200 m., *R. R. Stewart* 12953 (GH). Miscellaneous: Himal. bor. occ., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (BM, GH), dated 4. 4. 1848 (K).

3. *L. officinale* L. Sp. Pl. 132. 1753; Ledeb. Fl. Rossica 3: 130. 1847; Boiss. Fl. Orient. 4: 218. 1875; C. B. Clarke in Hook. f. Fl. Brit. India 4: 175. 1875; M. Pop. Fl. URSS 19: 162. 1953; Riedl in Rechinger, Fl. Iranica 48: 149. 1967.

Margarospermum officinale (L.) Decne. in Jacquem. Voy. Inde Bot. 122. 1844. [This reference given in Index Kewensis, but the combination was not properly made by Decaisne.]

TYPE: "Habitat in Europae ruderatis," Herb. No. 181.1 (LINN).

ICON.: Reichenb. Icon. Fl. Germ. 18: t. 112. I, 1-4. 1858; Hegi, Fl. Mitt.-Eur. 5(3): fig. 3115, a-f and 3116. 1927.

Erect perennial herb, to 100 cm. tall. Stems solitary or many, branched, branches to 20 cm. long; stem and branches covered with subappressed to patent trichomes, to 1.5 mm. long, arising from minute or large tuberculate bases. Leaves lanceolate, entire, sometimes slightly revolute, acute, to 8 cm. long, 20 mm. broad, covered with thin or thick, antrorsely subappressed trichomes with tuberculate bases, to 1 mm. long. Inflorescence bracteate, bracts leaflike. Pedicels very short in flower, erect, pubescent, elongate, to 4(-5) mm. long in fruit. Calyx divided to the base, lobes narrowly lanceolate, 3-4 mm. long in flower, not much enlarged, pubescent, trichomes spreading in fruit. Corolla yellowish, greenish or sometimes nearly white, hypocrateriform, 4-6 mm. long, corolla tube usually equaling, sometimes slightly longer or shorter than the calyx, 2.5-3.5(-4) mm. long, limb 4 mm. in diameter, lobes spreading, 1-1.5 mm. long, corolla throat with 5 trapeziform, intruded, distinctly invaginated appendages, densely velvety at apex, glanduliferous (especially on the sides). Filaments inserted at the middle of the corolla tube. Style 1-2 mm. long; stigmas 2, small. Nutlets ovate, white, smooth, shining, 3-4 mm. long.

DISTRIBUTION OF SPECIES: From Europe to central Asia.

The plants from Afghanistan, West Pakistan, and Kashmir are different from the specimens of *Lithospermum officinale* collected from the other areas of its distribution in having longer, stouter, and spreading trichomes on the stems. They are distinguished here as a variety.

Var. *stewartii* Kazmi, var. nov.

TYPE: KASHMIR: Banehal Pass, 9000 ft., July 1-4, 1931, *R. R. Stewart* 12182 (GH-holotype).

A varietate *officinali* differt caulibus hispidulis, pilis gracilibus, rectis, divaricatis donatis.

DISTRIBUTION OF VARIETY: Afghanistan, West Pakistan, and Kashmir.

West Pakistan: KURRAM AGENCY: Kurram Valley, *Aitchison* 338 (GH).

Kashmir: Banehal Pass, *R. R. Stewart* 12182 (GH-type); Sind Valley, Gandarbal, 1800 m., *Ludlow & Sherriff* 7621 (BM); Tilal Valley to Chorwan, ca. 3000 m., *R. R. & I. D. Stewart* 18599 (GH); vicinity of Sonamarg, on the Sind River, 50 road-miles east-northeast of Srinagar, *Dickason* 89 (MICH); Srinagar, *C. B. Clarke* 29100A (BM). Miscellaneous: Kashmir, *Kohli* 1 (K); Himal. bor. occ., 6000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (BM, GH).

The new variety closely resembles *Lithospermum erythrorhizon* Sieb. & Zucc. (Abh. Bayer. Akad. Wiss. 4(3): 149. 1846) from eastern Asia in having spreading trichomes on the stem. In characters of the calyx and corolla, however, the plants of var. *stewartii* agree with typical *Lithospermum officinale*. In *L. erythrorhizon*, unlike the condition in *L. officinale*, the corolla limb is spreading and formed of rounded, equally long and broad corolla lobes, in diameter it is commonly equal to the total length (5–9 mm.) of the corolla. The fruiting calyx is usually 5–10 mm. long and several times longer than the nutlets.

28. *Arnebia* Forssk. Fl. Aegypt.-Arab. 62. 1775.

TYPE SPECIES: *Arnebia tetragyna* Forssk.

Annual to perennial, erect to decumbent hispid herbs. Stems single to many, branched or unbranched, arising from a tap root. Inflorescence usually terminal, simple or forked, of scorpioid cymes, bracteate. Calyx divided nearly to the base, lobes accrescent, usually shorter than the corolla tube. Corolla regular or nearly so, yellow, cream, blue, or purple, sometimes with conspicuously spotted limb, salverform or rarely tubular, lobes strongly imbricate in bud, usually spreading or widely ascending, entire to sometimes lacerate, throat usually glabrous within, faucal appendages lacking. Anthers oblong to narrowly oblong, included to slightly exserted; filaments usually much shorter than the anthers, inserted at or below the throat of the corolla tube, at the same or different levels. Flowers heterostylic. Style slender, simple or simply forked or bifid, included to slightly exserted; stigmas 2–4, capitate, oblong or flabellate, simple or slightly bilobed. Usually one to four nutlets developing, these conic-ovoid, pyramidal or lance-ovoid, usually broadest at base, rough, tuberculate, verrucose, rugose or rugulose, surface usually dull; venter usually angulate, keeled, attachment basal, large, horizontal or suboblique. Gynobase flat or broadly pyramidal, attachment surface separated by lineal grooves, plane or somewhat concave.

Species 20 to 22, distributed from North Africa to Central Asia and the Himalayas.

KEY TO THE SPECIES

- a. Plants distinctly perennial; corolla tube without annulus at base.
- b. Leaves with midrib only; inflorescence globose or broader than long.

- c. Plants gray or silvery, stem arising from the center of the basal leaf-cluster, less than 15 cm. tall, leaves less than 5 mm. broad, herbage not glanduliferous. 4. *A. inconspicua*.
- c. Plants green or somewhat tawny, stem lateral to the basal leaf-cluster, usually 40 cm. tall, leaves usually 5–10 mm. broad, herbage usually glanduliferous. 3. *A. euchroma*.
- b. Leaves usually with 3–5 longitudinal ribs; inflorescence thyrsoid, evidently much longer than broad.
 - d. Thyrses continuous, with numerous exerted bracts; calyx lobes very slender and flexible. 1. *A. benthamii*.
 - d. Thyrses interrupted, only the lowermost bracts protruding; calyx lobes slender, stiff. 2. *A. speciosa*.
- a. Plants annual to perennial; corolla tube with distinct annulus at base.
 - e. Plants flowering in the first year, but becoming perennial. . . 7. *A. guttata*.
 - e. Plants always annual.
 - f. Style bifid at apex to once again somewhat bifid; stigma deeply bilobed.
 - g. Corolla 20–35 mm. long, limb 10–15 mm. in diameter, lobes spreading, bearing distinct large dark purple patches; nutlets to 2 mm. long. 11. *A. grandiflora*.
 - g. Corolla 12–18 mm. long, limb less than 10 mm. in diameter, lobes ascending, erect or slightly recurved, large purple patches lacking; nutlets 2–3.5 mm. long.
 - h. Corolla lobes ascending; calyx 4–5 mm. long in flower, 10–15 mm. long, hardened, connate and with very prominent midribs in fruit; nutlets 2–2.5 mm. long. . . . 10. *A. decumbens*.
 - h. Corolla lobes erect to slightly recurved; calyx 8–12 mm. long in flower; 18–20 mm. long, hardened, connate and without prominent midrib; nutlets 3–3.5 mm. long. . . 13. *A. simulatrix*.
 - f. Style once bifid at apex and stigma entire, or style undivided and stigma bilobed.
 - i. Corolla brown to dark purple, hardly exceeding the calyx. 12. *A. waziristanica*.
 - i. Corolla yellowish white, yellow or orange, sometimes with dark purple spots, never brown to dark purple, usually exceeding the calyx.
 - j. Corolla lobes at the margins undulate, crenate to fimbriate. 8. *A. fimbriopetala*.
 - j. Corolla lobes always entire.
 - k. Calyx lobes obtuse, 6–10 mm. long, 1–1.5(–2) mm. broad at base, in flower hardened with prominent midrib and marginal veins, elongated to 22 mm., dilated at base to 3–5 mm. in fruit. 9. *A. linearifolium*.
 - k. Calyx lobes acute, 7–9 mm. long, 0.5–1.5 mm. broad at the base, in flower not hardened, with midrib not very prominent and veins invisible, elongated to 15 mm., hardly dilated at the base (to 2 mm.) in fruit.
 - l. Plants densely covered with stout trichomes; corolla yellow, 10–15 mm. long, villulose in a band ca. 1 mm. broad inside, limb 4–8 mm. broad; calyx lobes slightly unequal, to 7 mm. long, 1.5 mm. broad in flower, not much enlarged in fruit. 5. *A. hispidissima*.

1. Plants loosely covered with slender trichomes; corolla yellow to orange, 20–23(–30) mm. long, glabrous inside, limb 10–15(–20) mm. broad, with 5 dark purple spots; calyx lobes equal, to 9 mm. long and 0.5 mm. broad in flower, enlarged in fruit to 15 mm. long and 1.5 mm. broad. 6. *A. griffithii*.

1. *A. benthamii* (Wall. ex G. Don) I. M. Johnston, Jour. Arnold Arb. 35: 56. 1954.

Echium benthamii Wall. Cat. No. 931. 1829, *nomen nudum*; G. Don, Gen. Syst. 4: 333. 1838.

Macrotomia benthamii (Wall.) A. DC. in DC. Prodr. 10: 27. 1846; C. B. Clarke in Hook. f. Fl. Brit. India 4: 177. 1883.

Leptanthe macrostachya Klotzsch in Reise Prinz Waldem. Bot. 95. t. 63. 1862.

Lithospermum benthamii (Wall. ex G. Don) I. M. Johnston, Jour. Arnold Arb. 33: 333. 1952.

TYPE: India: Budrinath, *Wallich 931* (κ-holotype, A-isotype).

ICON.: Hook. Bot. Mag. 114: t. 7003. 1888; Coventry, Wild Flowers of Kashmir 1: t. 37. 1923; Blatter, Beautiful Flowers of Kashmir 2: t. 45. 1929.

Erect perennial herb with thick roots rich in purple dye, sometimes to 3 cm. in diameter. Stem solitary, fistulous, unbranched, arising from the center of the basal leaf-cluster, to 90 cm. long, densely covered with white, spreading trichomes tuberculate at base, to 3 mm. long. Basal leaves many, lanceolate, entire, acute, attenuated at both ends, with 3–5 prominent, longitudinally parallel ribs, to 30 cm. long and 3.5 cm. broad, covered on both surfaces with silvery, thin, spreading to subappressed trichomes, to 2 mm. long, arising from tuberculate bases; middle and upper cauline leaves gradually reduced in size upwards. Inflorescence a dense cylindrical thyrse, to 35 cm. long, 5–7 cm. thick at maturity; bracts linear-lanceolate, acuminate, densely hairy, exceeding the calyx, to 5 cm. long, 1.5–2.5 mm. broad. Calyx divided to the base, lobes linear-lanceolate, slender, acuminate, flexible, densely pubescent, 13–25 mm. long in flower, 25–35 mm. long in fruit. Corolla pink or purple to maroon, usually shorter than the calyx, 20–25 mm. long, tube gradually expanding after 10–12 mm. to form a 4–5 mm. long, 5–7 mm. wide throat lacking glands or appendages, lobes ovate, 2.5–3.5 mm. long, 2–3 mm. broad. Anthers borne at the middle of corolla tube, sometimes partially exerted at its summit, 2–2.5 mm. long. Style reaching the middle of the corolla tube or to the summit, entire or very inconspicuously forked at apex; stigmas 2, broader than long, more or less separate. Nutlets broadest near the middle, narrowed towards the basal attachment, 3–4 mm. long, irregularly rugose and somewhat tuberculate, surface dull from abundant very minute papillae, ventral keel continuous over the beaked apex, attachment scar frequently with two distinct dorsal traces.

DISTRIBUTION: West Pakistan, Kashmir, north and northwestern India to Nepal.

West Pakistan: GILGIT AGENCY: Deosai Plains, *Osmaston* 86 (K); HAZARA DIST.: Kaghan valley, Makra Hill, beyond Shogran, 3500 m., *Kazmi* 634 (PES); Paya, between Shogran and Makra, 3000 m., *Kazmi* 2571 (PES); Naran, on the top of Ganji Pahari, ca. 3000 m., *Kazmi* 2266b (PES); Saiful Maluk, 3000 m., *Shaukat Ali* 128 (BM, RAW), *Kazmi* 2278b (PES); Batakundi, valley towards the east of the Rest House, ca. 3000 m., *Kazmi* 2571 (PES); Siran Valley, north of Shahid Pani Rest House, on the slopes of Musa ka Musalah, 3000 m., *Kazmi* 839b (PES); on the eastern slope of Musa ka Musalah, near the top, 3500 m., *Kazmi* 459a (PES); Nathiagali Hills, Miran Jani, near the top, 3500 m., *Kazmi* 326b (PES). SWAT STATE: Swat Kohistan, ca. 3000 m., *Kazmi* s.n. (PES). Reported from Kagan, Makra, *Inayat* 21999 (?).

Kashmir: Above Gulmarg, ca. 3000 m., *Duthie* 11323 (BM, E); Pangtran to Thanin, 1884, *Young* s.n. (BM); Near Sinthan Pass, head of Bringhi Valley, *Ludlow & Sherriff* 8183 (BM); Sind Valley, Zaiwan, 3000–4000 m., *Ludlow & Sherriff* 2661 (GH); Masjid Gali, ca. 4000 m., *R. R. & I. D. Stewart* 18429 (GH); Aliabad, ca. 3000 m., *C. B. Clarke* 28909 (BM); Kalohoi Valley Pass, 4000 m., *Pollunin* 56/539 (BM, E). Miscellaneous: in Herb. late East India Co., *Falconer* s.n. (GH); Himal, bor. occ., 10,000–12,000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson* s.n. (GH); Kashmir, 3200 m., *Mrs. Prescott-Decie* (1915) s.n. (BM); Kashmir, ca. 3100 m., *R. R. Stewart* 21805 (GH).

2. *A. speciosa* Aitch. & Hemsl. Jour. Linn. Soc. Bot. 18: 81. 1881 and 19: 179. 1882; Riedl in Rechinger, Fl. Iranica 48: 168. 1967.

Lithospermum speciosum (Aitch. & Hemsl.) I. M. Johnston, Jour. Arnold Arb. 34: 13. 1953.

Macrotomia speciosa (Aitch. & Hemsl.) Kitamura, Fl. Afghanistan 322. 1960.

TYPE: PAKISTAN: Hills behind Kaiwas, Kurram Valley, 9000–12,000 ft., open grassy spots, 3 July 1879, *Aitchison* 720 (K-holotype).

ICON.: Aitch. & Hemsl. l. c. 19: t. 24. 1882.

Erect perennial herb. Stems simple, arising from the center of the basal leaf-cluster, to 60 cm. long, 8 mm. thick at the base, covered with stout, white trichomes retrorsely appressed on the lower part of the stem, spreading on the upper part, 2–4 mm. long. Basal leaves narrowed above the broad, sheathing, dye-stained base, broadest above the middle, and then gradually narrowed to an acute apex, 10–15(–25) cm. long (*vide* Aitch. & Hemsl.), 7–10 mm. broad; lower cauline leaves similar to the basal ones, with three strong, longitudinal ribs, covered on both surfaces with slender stiff, spreading to ascending, sometimes retrorse trichomes, 1–2(–3) mm. long, those on the upper surface arising from minute tuberculate bases; middle cauline leaves lanceolate, 5–14 cm. long, 5–8 mm. broad near the base; upper cauline leaves gradually reduced upwards. Inflorescence an elongate interrupted cylindrical thyrse, 15–25 cm. long, 5–7 cm. thick, composed of small terminal cymes borne in the leaf axils along the upper half of the stem; cymes densely flowered, at first glomerate and 3–5 cm.

broad, but in age tending to elongate and become obviously scorpioid; bracts shorter than the calyces, subtending leaves surpassing only the lower cymes. Calyx hispid, 17–18 mm. long in flower, elongated to 21 mm. in fruit; lobes equalling to slightly surpassing the corolla lobes, ca. 15 mm. long, 1.5–2 mm. broad near the base. Flowers heterostylous (the type is a short-styled form). Corolla purple, elongate, externally strigose, especially on the lobes, bearing few, if any, stipitate glands, glabrous within, basal nectary lacking, 16–17 mm. long (20–24 mm. *vide* Aitch. & Hemsl.), tube 13 mm. long, 1.2 mm. thick at the middle, gradually widened above and becoming 3 mm. thick at the summit; throat short and broad, limb about 7 mm. in diameter, lobes ascending, apex rounded, 2 mm. long, 2.5 mm. broad. Anthers attached at the summit of the corolla tube and partly exerted into the throat, 2 mm. long. Style reaching to the middle of the corolla tube, obscurely forked at apex, 5 mm. long, lobes ca. 0.3 mm. long; stigmas 2, compressed, broader than long. Nutlets gray to brown, erect, 4–5 mm. long, obliquely attached by the broad base to a low pyramidal gynobase, with a very prominent narrow ventral keel, apex, truncate and sometimes toothed, back 2–3 mm. broad below the middle, then narrowed to the laterally compressed apex, usually with prominent longitudinal ridges paralleling the dorsal keel, surface minutely tuberculate and irregularly verrucose.

DISTRIBUTION: West Pakistan, Afghanistan (*vide* Kitamura, 1960).

West Pakistan: KURRAM AGENCY: Kurram Valley, hills behind Kaiwas, 2700–3600 m., *Aitchison* 720 (K-type).

Arnebia speciosa is known from West Pakistan only from the type collection. The only other specimen collected by Kitamura is from Paghman in east Afghanistan, which is preserved in the herbarium of Kyoto University.

Arnebia speciosa is closely related to *A. benthamii* and *A. nobilis*. *Arnebia speciosa* is more like *A. benthamii* in the form of its nutlets but differs, however, in having stiffer and spreading trichomes on the stem and leaves. The calyx lobes are broader, stiffer, and the thyrse is not continuous but distinctly interrupted, with fewer shorter bracts in comparison to *A. benthamii*. *Arnebia nobilis* Rech. f. (Ann. Naturh. Mus. Wien 58: 58. 1951), a species described from east Afghanistan [TYPE: Gazni, Djerratu, *Neubaur* 836 (w)] which has its distribution in the areas of Afghanistan adjacent to the western frontier of West Pakistan, can be expected in West Pakistan. *A. speciosa* is distinguished from *A. nobilis* by having different nutlets, corolla externally strigose and hispid, and rather distinctly strigose basal leaves.

[To be continued]



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