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Taxonomic revision of the genus *Lilium* L. in India and adjoining region

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&

D. B. DEB

RÉSUMÉ

DASGUPTA, S. & D. B. DEB (1984). Révision taxonomique du genre *Lilium* L. en Inde et dans les régions voisines. *Candollea* 39: 487-506. En anglais, résumé français.

Cette révision taxonomique du genre *Lilium* L. (Liliacées) en Inde et dans les régions voisines fournit les descriptions de 11 espèces et de 3 variétés avec leurs illustrations, synonymie, citation, typification, distribution, phénologie et leur écologie. Une clé des sections, espèces et variétés y est jointe. Les spécimens étudiés sont cités.

ABSTRACT

DASGUPTA, S. & D. B. DEB (1984). Taxonomic revision of the genus *Lilium* L. in India and adjoining region. *Candollea* 39: 487-506. In English, French abstract.

This taxonomic revision of the genus *Lilium* L. (Liliaceae) in India and adjoining regions describes 11 species and 3 varieties with illustrations, synonymy, citations, typification, distribution, phenology and ecology. A key to the sections, species and varieties is worked out. Studied exsiccata are cited.

Introduction

The genus *Lilium* was originally proposed by TOURNEFORT in Inst. Raj Herb 369. 1700 and included by LINNAEUS (1737) and validated in his Sp. Pl. (1753) and Gen. Pl. (1754). The genus *Lirium* of Roy kept distinct in Systema Naturae (LINNAEUS, 1735) was merged with it in the above publication, extending its circumscription. LINNAEUS (1753, 1754) placed *Lilium* L. in between *Allium* L. and *Fritillaria* L., and described 7 species in Sp. Pl. 1753. *L. candidum* has been selected by HITCHCOCK & GREEN (1929) as the type species. SCHULTES (1829) placed *Lilium* in — between *Fritillaria* L. and *Funkia* Spreng. and included 35 species in it described by various authors by that time. In course of addition of new species from time to time *Lilium* became a heterogeneous group. Efforts were also going on to make it homogeneous by separation of species and creation of new genera from its constituents. As such the genera *Ambilirion* Rafin., *Cardiocrinum* Lindl., *Notholirion* Boiss., *Nomocharis* Franch. etc., were proposed. Taxonomic status of most of them are still controversial. ENDLICHER (1836), BAKER (1874) and WILSON (1925) considered them as infrageneric groups under *Lilium*. Generic status of *Notholirion* and *Cardiocrinum* was recognised by BOISSIER (1882) and LINDLEY (1845) respectively. LINDLEY (l.c.) was followed by MAKINO (1913), BUXBAUM (1937) and STEARN (1948) in recognising *Cardiocrinum*, whereas BOISSIER (l.c.) was followed by COTTON (1934) and STAPF (1934) in recognising *Notholirion*. *Ambilirion*, however, was never recognised by any worker and was treated as a synonym of *Fritillaria*. *Nomocharis* proposed by FRANCHET (1898) and emended by EVANS (1925) is a genus containing species which previously were placed either in *Lilium* or in *Fritillaria*. *Notholirion* is a genus of good standing and differs from *Lilium* in tunicated bulb, presence of radical leaves, tripartite stigma and wingless seed. Though flowers of *Cardiocrinum* are similar to those of *L. wallichianum*, *L. nepalense*, etc., the bulbs formed by existing leaf bases,

long petioled cordate leaves with reticulate venation definitely distinguish it from others as a distinct genus. *Nomocharis* sect. *Lophophora* and sect. *Ecristata* do not possess typical stamens of *Nomocharis*. Some species of *Lilium*, like *L. mackliniae*, *L. arboricola* and *L. sherriffiae* are, also allied to *Nomocharis* in some respect. Strictly speaking, there is overlapping of characters and scarcely a clear cut combination of characters is available to distinguish this genus from *Lilium*. There are some *Nomocharoid* characters which appear to have initiated in *Lilium*, and passed over in different combinations and proportion to different species of *Nomocharis*. Attachment of anthers with the filament below the middle is a constant character in the genus.

Lilium has been dealt here according to the delimitation proposed by HUTCHINSON (1973). Present revision is based on study of specimens extant in CAL, BSIS, MH, BSD, DD, LWG, and some issued on loan from K, BM, E, L.

Lilium [Tournef. in Inst. Rei. Herb. 369. 1700] L., Sp. Pl. 302. 1753 & Gen. Pl. 143. 1754; Reichenb., Consp. Reg. Veg. 65. 1828; Schultes f., Syst. Veg. 7: 399. 1829; Endl., Gen. Pl. 141. 1836, excl. *Cardiocrinum* and *Ambilirion*; Kunth, Enum. Pl. 4: 256. 1843, excl. *Cardiocrinum*; Baker in Journ. Linn. Soc. 14: 225. 1874, excl. subgen. *Cardiocrinum*; Elwes, Monogr. Lilium 48. 1880; Boiss., Fl. Or. 5: 172. 1882; Benth. in Benth. & Hook. f., Gen. Pl. 3: 816. 1883; Engl. in Engl. & Prantl, Nat. Pflanzenfam. Teil. 2. Abtl. 5: 60. 1888, excl. *Cardiocrinum* and *Notholirion*; Hook. f., Fl. Brit. Ind. 6: 349. 1892, excl. *L. giganteum* Wall., *L. thomsonianum* Royle & *L. roseum* Wall.; Wilson, Lilies E. Asia 17. 1925, excl. subgen. *Cardiocrinum*, *Notholirion* and *Lophophorum*; Komarov, Fl. U.S.S.R. 4: 282. 1935, excl. *Cardiocrinum*; Woodcock & Stearn, Lilies World 113. 1950; Hutchinson, Fam. Fl. Pl. 732. 1973. *Martagon* [Rupp. Fl. Jen. ed. Hall 148. 1745] Salisb., Gen. Pl. Fragm. 56. 1866.

Type: *L. candidum* L. (Linn. 421.1 LINN).

Herbs bulbous with cauline leaves and terminal inflorescence; bulbs 3-6 × 2-6 cm, subglobose, ovoid or cupular, composed of loose imbricate scales; scales deltoid or ovate-lanceolate, thick, fleshy, often with membranous margin; daughter bulbs arise at the axils of scales. *Stem* erect, 15 cm-2 m, terete, glabrous, rarely puberulous, striated, underground portion often bearing roots above the bulbs at several nodes. *Leaves* many, in irregular spiral or opposite, often verticillate at the top, sessile, linear or lanceolate, parallel-veined. *Inflorescence* racemose, few flowered or the flower may be solitary or geminate. *Flowers* ascending, horizontal, or nodding, 4.5-24 cm long, infundibuliform or cupular or campanulate, actinomorphic; pedicel 1-8 cm long; bracts indistinct from cauline leaves, large, solitary or two or few in whorl. *Perianth* segments in 2 whorls, free or overlapping, erect or spreading or revolute, 4.5-24 × 1.5-4 cm, elliptic-lanceolate or oblanceolate, acute or obtuse, often beaked, outer narrower with converging veins, inner broader with diverging veins. *Nectaries* at the base of the perianth, prominent, linear or slightly broader below, grooved, glabrous or lined by papillae. *Stamens* shorter than perianth, included or excluded; filaments filiform or subulate, adnate to the base of the perianth, sometimes irregularly bent at the tip on maturity; anthers oblong or linear, mid-dorsifixed latrorse in dehiscence. *Pistil* as long as stamens or slightly longer; ovary sessile or substipitate, trilobular, linear or obovate, truncate, longitudinally 6-lobed, by the longitudinal groove on each lobe, each lobe finely winged; placentation axile; ovules numerous, biseriata in each locule; style filiform or linear, longer than the ovary; stigma trilobed. *Capsules* stipitate, ascending, 2.5-7 × 1.7-6 cm, broadly oblong or obovate-oblong, truncate, trilobular, trilobed, trivalved, abruptly contracted at the base, dehiscing from the top; each lobe retuse above, dorsally finely winged, transversely striated; stipe stout; pericarp crustaceous, outer deep brown, dull, inner stout, shining; dehiscing margin longitudinally fibrillar. *Seeds* numerous, superposed in 2 series in each locule, 5-10 × 2-9 mm, orbicular, compressed, winged; wing narrow or broad, membranous.

Distribution. — About 80 species distributed in N. temperate region (AIRY SHAW, 1973). Eleven species and 3 extra typical varieties in India and adjoining region mostly confined to Himalayas, at an altitude of 1000-4000 m (Fig. 1).

Chromosome number. — Chromosome numbers of Indian species of *Lilium* were studied by various workers and were reported as $2n = 24$ in all the cases.

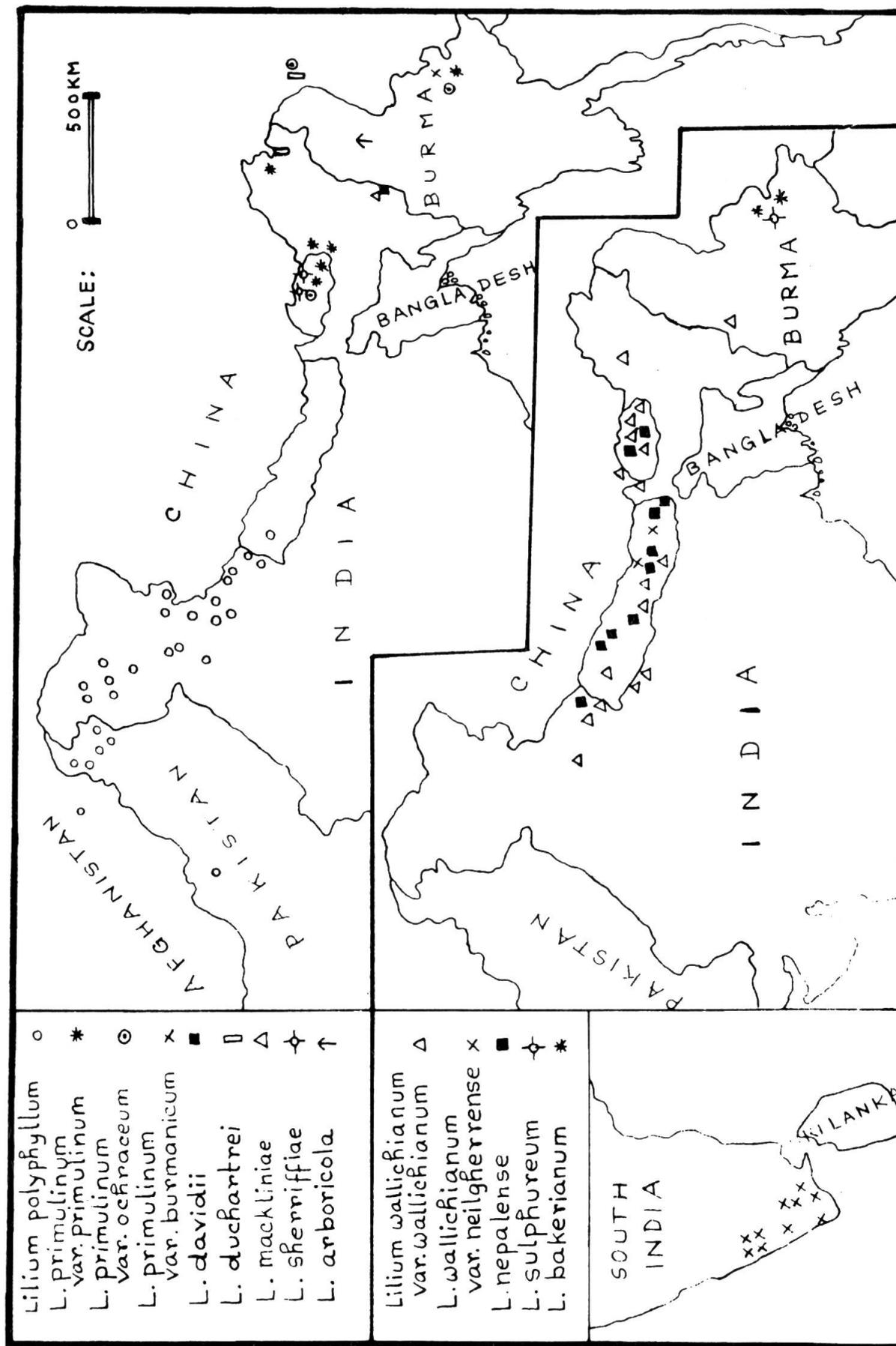


Fig. 1. — Map showing distribution of the genus *Lilium* L. in India and adjoining region.

Chromosome numbers were studied in *L. wallichianum* Schultes f. by HALL (1934), SEN (1973), MALLA & al. (1981), in *L. wallichianum* Schultes f. var. *neilgherrense* (Wt.) Hara by ABRAHAM (1939) and SEN (1973), in *L. duchartrei* Franch. and *L. sulphureum* Baker by STEWART (1947), in *L. polyphyllum* D. Don by MEHRA & SACHDEV (1971) and by MEHRA & PANDITA (1978), in *L. nepalense* D. Don by SEN (1973), MALLA & al. (1974).

Infrageneric classification of the genus *Lilium*

Infrageneric classification of *Lilium* was first proposed by REICHENBACH (1828) by dividing the genus into two subgenera *Eulirion* and *Martagon*. SCHULTES (1829) treated them into 4 sections on the basis of the shape of the flower and perianth. ENDLICHER (1836) recognised 5 subgenera — 1. *Ambilirion*, 2. *Pseudolirion*, 3. *Martagon*, 4. *Eulirion* and 5. *Cardiocrinum* on perianth and nectary characters. KUNTH (1843) followed ENDLICHER (l.c.) but transferred the group *Ambilirion* to the genus *Fritillaria*. LINDLEY (1845) elevated *Cardiocrinum* to a genus. BAKER (1871) considered 2 subgenera — 1. *Lilium* and 2. *Notholirion*, and divided the subgenus *Lilium* into 5 sections: *Cardiocrinum*, *Eulirion*, *Archelirion*, *Isolirion*, *Martagon*. Later BAKER (1874) transferred *Notholirion* as a subgenus under *Fritillaria* and elevated the remaining sections into subgeneric rank. Characters on which divisions were proposed are shape of the flower, perianth segments, leaves and position of stamens and pistil. *Pseudolirion* Endl. and a portion of *Eulirion* Endl. were placed in new group *Isolirion* Baker. *Archelirion* Baker was an assorted group, consisting of species which were later placed in other genera. *Notholirion* was elevated to the rank of a genus by BOISSIER (1882). FRANCHET (1892) divided the genus into 2 sections: 1. *Cardiocrinum* and 2. *Eulirion* having assemblage of some species in *Eulirion* which were later placed in different genera like *Notholirion* and *Nomocharis*. WILSON (1925) with a profound field knowledge on Liliaceae divided the genus into 4 subgenera: 1. *Eulirion*, 2. *Cardiocrinum*, 3. *Notholirion*, 4. *Lophophorum* and subdivided the subgenus *Eulirion* into 4 sections: 1. *Leucolirion*, 2. *Archelirion*, 3. *Pseudolirion*, 4. *Martagon*. He considered different aspects like bulbs, flowers, leaves, stamens, pistil and seeds in dividing the genus. He was followed by KRAUSE (1930) and KOMAROV (1935) except recognition of *Nomocharis* as genus by the former.

Cardiocrinum Lindl., *Notholirion* Boiss., *Nomocharis* Franch. (including *Lophophorum* Wilson) as distinct genera, were considered by various workers including Woodcock & Stearn who divided the *Lilium* proper following Baker into 4 sections.

In the present study Indian *Lilium* sensu stricto (HUTCHINSON, 1973) is divided into 3 sections: 1. *Lilium*, 2. *Martagon* and 3. *Archelirion*.

Key to the sections and species of the genus *Lilium*

1. Flowers big (10-24 cm long), infundibuliform or campanulate Sect. **Lilium**
- 1a. Flowers small (4-10 cm long), open campanulate or cupular 5
2. Flowers yellow inside. Perianth segments form a narrow tube below 3
- 2a. Flowers uniformly or spotted with purple-red or brown inside. Perianth segments form a broad tube below 4
3. Leaf axils not bulbiferous. Outer and inner perianth segments of same breadth
 1. **L. wallichianum**
- 3a. Leaf axils bulbiferous. Inner perianth segments broader than outer 2. **L. sulphureum**
4. Stamens and pistil longer than 1/2 the length of the perianth. Leaves 5-7-veined
 3. **L. nepalense**
- 4a. Stamens and pistil shorter than 1/2 the length of the perianth. Leaves 3-veined
 4. **L. bakerianum**

5. Perianth segments oblanceolate or lanceolate, or ovate-lanceolate, loose, revolute. Nectaries linear Sect. **Martagon** 6
- 5a. Perianth segments oblong or elliptic or oblong-lanceolate, overlapping, erect or spreading. Nectaries broader below Sect. **Archelirion** 9
6. Nectaries glabrous 7
- 6a. Nectaries lined by papillae or appendages 8
7. Flowers with brown spots near the margin. Perianth segments much revolute
5. L. polyphyllum
- 7a. Flowers with maroon colour at the base. Perianth segments slightly revolute
6. L. primulinum
8. Nectaries lined by papillae. Flowers white with purple spots **7. L. duchartrei**
- 8a. Nectaries lined by appendages. Flowers orange with black spots **8. L. davidii**
9. Leaves small (up to 15 × 1.2 cm). Ovary less than 1/2 the length of the style 10
- 9a. Leaves larger (up to 25 × 4.5 cm). Ovary more than 1/2 the length of the style
11. L. arboricola
10. Flowers white or purple outside and carmine at base **9. L. mackliniae**
- 10a. Flowers brown tessellated with golden yellow **10. L. sherriffiae**

Lilium L. sect. **Lilium**

Lilium L. subgen. *Eulirion* Reichenb., Consp. Reg. Veg. 65. 1828; Endl., Gen. Pl. 141. 1836; Kunth, Enum. Pl. 4: 264. 1843; Baker in Journ. Linn. Soc. 14: 228. 1874. *Lilium* L. sect. *Eulirion* Baker in Gard. Chron. 104. 1871; Boiss., Fl. Or. 5: 172. 1882; Engl. in Engl. & Prantl, Nat. Pflanzenfam. Teil 2, Abt. 5: 60. 1888, excl. *Notholirion* and *Martagon*. *Lilium* L. sect. *Eulirium* Franch. in Journ. Bot. Paris 6: 307. 1892, pro parte minore. *Lilium* L. sect. *Liriotypes* Ascherson & Graebner, Synop. Fl. 3: 171. 1905; emend. Stearn, Lily Year Book 4: 140. 1935. *Lilium* L. sect. *Leucolirion* Wilson, Lilies E. Asia 17. 1925; Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 13a: 330. 1930; Komarov, Fl. U.S.S.R. 4: 284. 1935 (*Lec-tiliron* erroneously?); Woodcock & Stearn, Lilies World 114. 1930.

Type: *L. candidum* L.

Flowers solitary or few in racemes, ascending or horizontal, infundibuliform. *Perianth* segments spatulate, 1/2-2/3 below overlapping, to a tube-like structure and spreading above. *Stamens* converging, long.

Distribution. — Four species and one extratypical variety are distributed in the Himalayan ranges from U.P. and Nepal extending to Burma and China.

- 1. *Lilium wallichianum*** Schultes f., Syst. Veg. Pl. 7(2): 1689. 1830; Kunth, Enum. Pl. 4. 267. 1843; Hook. in Curtis's Bot. Mag. 77: t. 4561. 1851; Baker in Journ. Linn. Soc. 14: 227. 1874; Elwes, Monogr. Lilies t. 4. 1878; Baker in Gard. Chron. Ser. 2, 14: 80. 1880; Hook. f., Fl. Brit. Ind. 6: 349. 1892; Wilson, Lilies E. Asia 20. 1925; Woodcock & Stearn, Lilies World 361. 1950. *L. japonicum* sensu D. Don, Prodr. Fl. Nepal 52. 1824, non Thunb. 1784. *L. longiflorum* Wall., Tent. Fl. Nepal 40: t. 29. 1826, non Thunb. 1784 (**Type:** Nepal, Wall. Cat. 5076A K-W Photo! L!; Kumaon, *Blinksworth* s.n. Wall. Cat. 5076B K-W Photo! CAL — duplicate!).

Herbs up to 2 m long. *Bulbs* up to a depth of 30 cm below soil, 3-5 × 3-6 cm, subglobose; scales 3-4 × 1.5 cm, cream-coloured. *Leaves* many, spiral, 5-20 × 0.3-2 cm, linear or lanceolate, larger and denser in the middle of the stem; adaxial surface deeper coloured than abaxial surface; veins 5; margin revolute. *Flowers* 1 or 2, creamy white, 15-23 cm long, infundibuliform, 1/2 the length from the base tube-like, gradually spreading to 14-16 cm wide mouth; pedicel short; bracts

few, leafy. *Perianth* segments 2-5 cm broad, spatulate, erect, mid-vein prominent, 2 mm broad. *Nectaries* linear, glabrous. *Filaments* 10-17 cm long, filiform; anthers 1.5-3 × 0.2-0.25 cm, linear-oblong. *Pistil* as long as stamens; ovary sessile, 3-5 × 0.2-0.4 cm, linear-oblong; style 11-15 cm long, filiform; stigma 0.8-1 cm broad, trilobed.

Note. — Bulb is smaller with respect to the plant. Adventitious roots arising from the underground stem provide mechanical support and absorb food from the soil, when the bulb has been exhausted.

Key to varieties of *L. wallichianum*

1. Margin of bulb scales scarious. Leaves linear (14-20 × 0.3-0.8 cm) **1a. var. wallichianum**
- 1a. Margin of bulb scales not scarious. Leaves shorter and broader, lanceolate or linear-lanceolate (5-14 × 0.8-2 cm)..... **1b. var. neilgherrense**

1a. *L. wallichianum* Schultes f. var. wallichianum (Fig. 2)

Bulb scales scarious at the margin. *Leaves* 14-20 × 0.3-0.8 cm linear. *Flowers* fragrant, tube green, perianth white. *Filaments* green, 12-14 cm; anthers yellow, 2.5-3 cm × 2.0-2.5 mm; pollen golden yellow. *Ovary* 4-5 × 0.2-0.4 cm, linear, slightly broader above, truncate; style and stigma green. *Capsule* 10 cm long, oblong, suddenly tapering below, surface marked with 6 prominently raised ribs, alternating with less prominent veins. *Flowering and fruiting*: May-September.

Distribution. — Himalayan region in U.P., Sikkim, Nepal, Bhutan to N. Burma on sandy grassy hill at 1350-3000 m in altitude (Fig. 1).

Uses. — Bulbs are eaten as vegetable by the local people.

Herbarium specimens examined

India. Uttar Pradesh-Kumaon, *Moreboh*, Wall. Cat. No. 5076A (CAL); *B. Blinksworth* s.n., Wall. Cat. No. 5076B (CAL); Banks of Surjoo, *Strachey & Winterbottom 2* (CAL, K); below Dwali, *Strachey & Winterbottom 1* (CAL); Jeolikote, *N. Gill* (LWG); Dehra Dun (cultivated), *M. B. Raizada 172* (DD); Almora, *Narayana 30* (DD); Nainital (cultivated), *S. K. Jain 13087* (LWG). Arunachal, *R. S. Rao 1480* (CAL). Sikkim — Singhik, *Leslee* (CAL). **Bhutan.** Wangdi Potrang, *Ludlow & Sherriff 3355* (BM); Trongse Bridge, *Ludlow, Sherriff & Hicks 17047* (BM); Tongas Dzong — Manzde Ghu, *Ludlow, Sherriff & Hicks 19559* (BM); Wangchu Phrodang, *S. Bowes Lyon 5017* (BM); Khoma Chu, *Ludlow, Sherriff & Hicks 20896* (E); E. Bhutan — Jiri Chu, *Ludlow, Sherriff & Taylor 6756* (E). **Nepal.** Seopore, *Wall. Cat. No. 5076 & 5076A* (L); Bagmati zone, *D. H. Nicholson 2545* (BM); Barpate village, *Capt. Lall. Dhweij 265* (BM, E); Jhakoo, *Capt. Lall. Dhweij 255* (BM); Lumsum, *Stainton, Sykes & Williams 4060* (BM, CAL) and *9155* (BM); Setalpati, *Polunin, Sykes & Williams 1231* (BM); Sonagara, *Sisram* (DD). **Pakistan.** Khutu Lake, *Purr* (DD). **Burma.** Kindat, *Kingdon Ward 22555* (BM).

- 1b. *L. wallichianum* Schultes f. var. neilgherrense** (Wight) Hara in Bull. Univ. Mus. Tokyo 8: 132. 1973. Basionym: *L. neilgherrense* Wight, Icon 6: 20. t. 2031-2032. 1853 (**Type:** Nilgiri, *Wight* s.n. CAL! K! L!); Duchart., Obs. Gen. Lis. 71. 1870; Baker in Journ. Linn. Soc. 14: 230. 1874 and in Curtis Bot. Mag. 103: t. 6332. 1877; Elwes, Monogr. Lilium t. 6. 1880; Hook. f., Fl. Brit. Ind. 6: 350. 1892; Fyson, Fl. Nilgiri & Pulney Hill tops 1: 416. 1915; Wilson, Lilies E. Asia 19. 1925; Woodcock & Stearn, Lilies World 287. t. 83. 1950. *L. tubiflorum* Wight, Icon. 6: 20. t. 2033-2034. 1853 (**Type:** Nilgiri, *Wight* s.n. CAL! L! K!). *L. wallichianum* Wight, Icon. 6: 2035. 1853, auct non Schultes f. 1830. *L. neilgherrensicum* Hort., Veitch Lemaire Ill. Hort. 10: 353. 1865. *L. metzii* Steud. ex Duch. in Journ. Soc. Hort. Par. ser. 2, 4: 556. 1870 (**Type:** Nilgiri, 1851, *Hohenacker 954* L! BM!). *L. longiflorum* Thunb. subsp. *neilgherrense* (Wight) Baker in Gard. Chron. 479. 1871.



Fig. 2. — *Lilium wallichianum* Schultes f.
a, flowering twig; b, bulb.

Leaves 5-14 × 0.8-2 cm, lanceolate, or linear-lanceolate. Flowers creamy white. Filaments 10-17 cm, anthers 1.5-3 × 0.2-0.25 cm. Ovary sessile, 30-40 × 2-4 mm, linear. Flowering: June-December.

Distribution. — S. India in Nilgiri, Pulney, Annamalai and Tinneveli hills and also in Nepal (Fig. 1) at 200-1700 m in altitude.

Herbarium specimens examined

India. Tamil Nadu: Nilgiri, Thomson s.n. (K, CAL, L); R. F. Hohenacker 954 (L, BM); Gamble 12492 (K); R. H. Beddome 7785, 7787 & 7789 (BM); King s.n. (CAL); Fischer 1311 & 2916 (CAL); Gardner s.n. (CAL) and Cleghorn (E); Nadvattam, K. Subramanyam 10541 (MH); Palni, Bourne 62 (CAL); Ramnad, Vajravelu 39336 (MH); Madura, K. C. Jacob 17522 (MH); Peninsular India, Wight 2814 (E, L, CAL, K). Kerala: Travancore, Narayanaswami 113 (CAL). W. Bengal: Cultivated in IBG, Howrah (CAL). **Nepal.** Upper Buri Gandaki, Stainton 3898 (BM); Ankhu Khola, Stainton 3863 (BM).

2. **L. sulphureum** Baker ex Hook. f., Fl. Brit. Ind. 6: 351. July 1892 (**Type:** Burma, Shan State, 1889, Hugh Low s.n., cultivated, K); Baker in Curtis's Bot. Mag. 118: t. 7257. Oct. 1892; Woodcock & Stearn, Lilies World 285. 1950. *L. wallichianum* var. *superbum* Baker in Gard. Chron. ser. 3, 10: 480. Oct. 1891 (**Type:** Burma, Shan State, 1889, Hugh Low s.n., cultivated, K). *L. myriophyllum* Franch., in Journ. Bot. Paris 6: 313. Sept. 1892 (**Type:** China, N.W. Yunnan, Delavay s.n., A); Wilson, Lilies E. Asia 33. 1923; Grove & Cotton, Suppl. 83. 5.

21. 1939; Cotton in Lily Year Book, London 8: 30. t. 12. 1939. *L. brownii* var. *leucanthum* Hook. f. in Curtis's Bot. Mag. 126: t. 7722. 1900 (**Type:** China, S.W. Yunnan, 1897, Henry s.n., flowered at Kew, K) excluding syn., non Baker. *L. myriophyllum* var. *superbum* (Baker) Wilson, Lilies E. Asia 34. 1925.

Herb 50 cm-3.5 m long. *Bulbs* $\pm 7.5 \times 10$ cm, more or less globose, red purple. *Leaves* dense, 5-9 \times 0.5-1.5 cm, linear-lanceolate, dark-green, glabrous, upper ones with large brown bulbils in their axils. *Flowers* 1-many, 18-24 cm long, infundibuliform, half the length tube-like, erect, fragrant, varying in colour, deep yellow at the throat, creamy white towards the tips and pink outside or yellow throat, upper part white and greenish outside or yellow without pink outside; outer perianth segments 15-24 \times 0.3-0.4 cm, spreading; lanceolate, peculiarly acute, inner perianth segments as long as the outer but broader, 18-24 \times 0.4-0.5 cm, oblanceolate, spreading, obtuse at the tip. *Filaments* 14-17 cm long, filiform; more than half the length of perianth; anthers purplish yellow, 1.5-2.5 \times 0.3-0.5 cm, linear-oblong; pollen orange brown. *Ovary* 4.5-5 \times 0.3-0.4 cm, linear-oblong; style 13-18 cm long, filiform, much longer than stamens; stigma trilobed, 5-7 mm broad. *Flowering:* May-July.

Distribution. — Burma to China (Fig. 1), in well drained loam, enriched with leaf mould at an altitude of 1200 m.

Note. — Description of bulbs and bulbils are taken from Woodcock and Stearn (l.c.) as those were not available for study.

Herbarium specimens examined

Burma. Shan hills: Cultivated in Calcutta Botanic Garden (CAL); flowered in Mongpoo, Gammie (CAL); *A. H. Hilderbrand* (CAL); *G. Forrest 27096* (K).

3. *L. nepalense* D. Don in Mem. Wern. Soc. 3: 412. 1821 (**Type:** E. Nepal, 1818, *Gardner* s.n. Paratype BM! E. Nepal, 1819, *Gardner* s.n. Paratype BM!) and Prodr. Fl. Nepal 52. 1824; Wall. Pl. Asiat. Rar. 3: 67. t. 291. 1832; Kunth, Enum. Pl. 4: 267. 1843; Duchart, Obs. Gen. Lis. 64. 1870; Baker in Journ. Linn. Soc. 14: 231. 1874; Elwes, Monogr. Lilies t. 5. f. A. 1880; Baker in Gard. Chron. ser. 2, 14: 80. t. 19. 1880 and in Curtis's Bot. Mag. 115: t. 7043. 1889; Collett & Hemsley in Journ. Linn. Soc. 28: 138. 1890; Hook. f., Fl. Brit. Ind. 6: 350. 1892; Bamber, Fl. Punjab 442. 1916; Wilson, Lilies E. Asia 8. 1925; Constable in Journ. Roy. Hort. Soc. Lond. 73: t. 142. 1949; Woodcock & Stearn, Lilies World 288. t. 84. 1950; Kitamura in Kihara Fauna & Fl. Nepal Himal. 1: 93. 1953; Hara, Fl. E. Himal. 408. 1966 (Fig. 3).

Herbs up to 1 m long. *Bulbs* 3.5-4 \times ± 4 cm, subglobose, scales 3.5-4 \times 0.8-1.5 cm, ovate-lanceolate. *Leaves* alternate or irregularly spiral, fewer and smaller in the lower part of the scape, denser, larger in the upper, 2.5-9 \times 1.2-3 cm, lanceolate or oblong-lanceolate or elliptic, deeply acute at the apex, sessile, narrowed at the base; veins 5-7. *Flowers* 1-3 in raceme, large, 14-16 cm long, very fragrant, infundibuliform, narrowed below forming a tube-like structure, greenish white, yellowish green or cream outside, red, purplish red or brown inside except base and tips; pedicel 1-8 cm; bracts leafy, 3-7, verticillate. *Perianth* segments 14-16 \times ± 3.5 cm, elliptic, lanceolate or oblanceolate, acute, spreading at the tip. *Nectaries* linear, glabrous. *Filaments* 8.5-9 cm long, filiform, greenish yellow or yellowish white; anthers brown, $\pm 12 \times 2$ mm, linear-oblong; pollen orange. *Pistil* as long as or longer than stamens. *Ovary* sessile, 2-3 cm \times 2-3 mm, narrowly obovate; style 7-8 cm \times 2 mm, filiform, green, often recurved, stigma 3-4 mm broad, green. *Cap-sules* erect, 5 \times 2 cm, oblong. *Flowering:* June-July. *Fruiting:* July-August.

Distribution. — C. Himalaya in Nepal and Bhutan; in grass land beside streams or rivers or on rocky slopes in open or in partial shade of the trees, like *Betula*, *Abies*, etc., at an altitude of 2700-3700 m.

Local name. — 'Bhangoo' (Nepal).

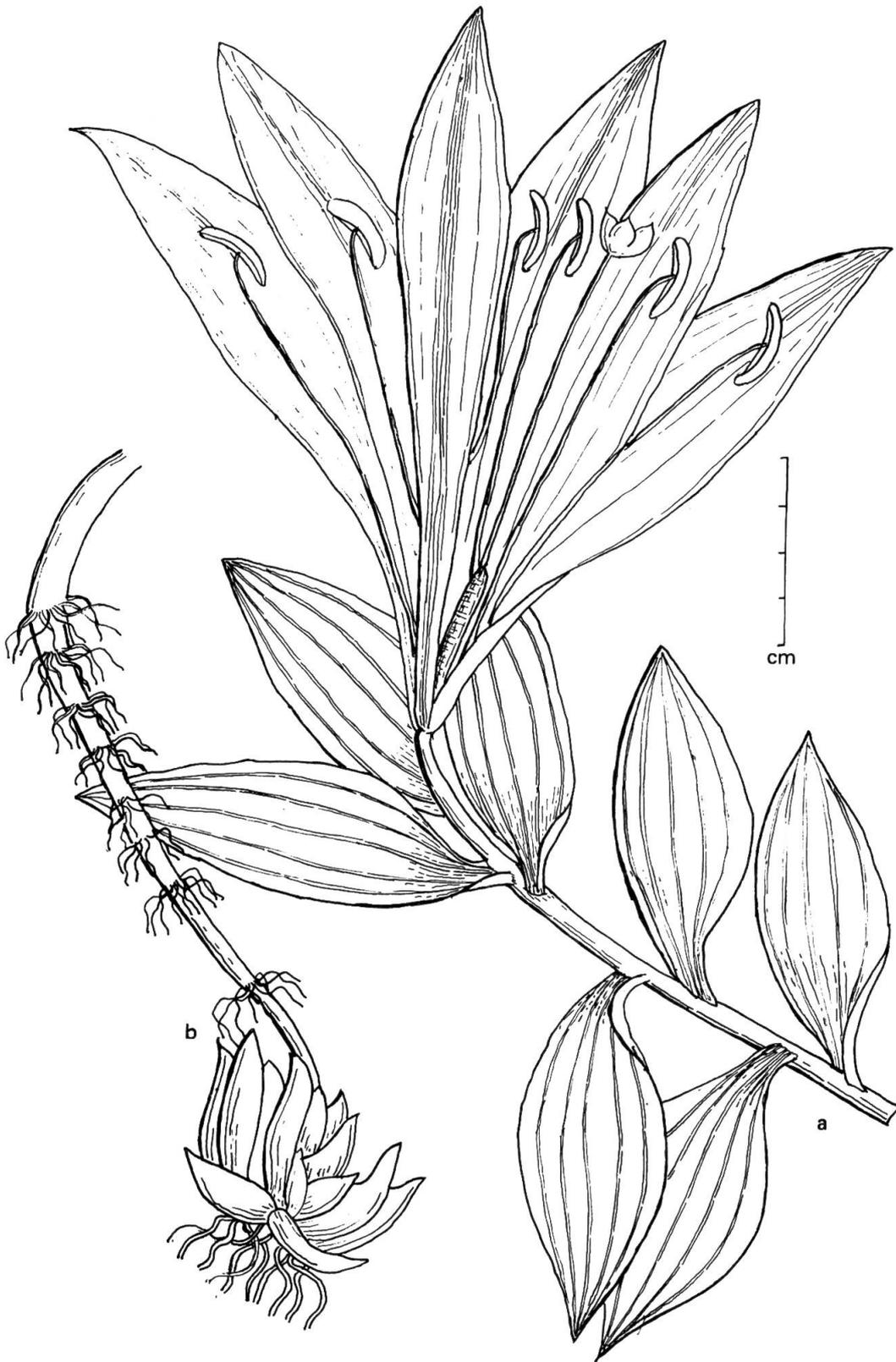


Fig. 3. — *Lilium nepalense* D. Don
a, twig showing different parts of a flower; b, bulb.

Herbarium specimens examined

India. Uttar Pradesh: Kumaon, *Thakur Rupchand 819* (L) and Almora, *F. Charton Thomas 20853* (DD). **Nepal.** *E. Gardner* s.n. (BM); *Wall. Cat. No. 5078A* (CAL, BM); Rambrong, *Stainton, Sykes & William 5946* (CAL); Bheri valley, *Polunin, Sykes & Williams 2429* (CAL, BM, E); Shatey, *Capt. Lall Dhvaj 01* (CAL); Kathmandu, *Mrs. D. Proud* (CAL); Suligad, *T. B. Shrestha 31* (BM); Arun Tamur valley, *G. Shnilz 200* (BM); Pinjore Danda, *L. H. J. Williams 1126*; Marigaon, *Polunin, Sykes & Williams 144* (CAL); North of Jumla, *Polunin, Sykes & Williams 4392* (CAL, BM); Kali-Gandaki, *Stainton, Sykes & Williams 1507* (CAL) and *1535* (BM); Dhorpatan, *Stainton, Sykes & Williams 3465* (CAL); between Set and Jumbosi, *A. D. Schilling 931* (K); Langtang, *Polunin 579 & 689* (BM); Maikot, *Stainton, Sykes & Williams 3272* (E). **Bhutan.** *Chendebi, Ludlow & Sherriff 3339* (BM) and *Ludlow, Sherriff & Hicks 17081* (BM); Ri Tang, *B. J. Gould 743* (K).

4. L. bakerianum Collett & Hemsley in Journ. Linn. Soc. 28: 138. t. 22. 1890 (**Type:** Upper Burma, Shan hills, June 1888, *Collett 834*, K Photo!); Hook. f., Fl. Brit. Ind. 6: 350. 1892; Baker in Gard. Chron. Ser. 3, 30: 62. f. 17. 1901 and in Journ. Roy. Hort. Soc. Lond. 26: 336. 1902; Wright in Journ. Linn. Soc. 36: 128. 1903; W. W. Smith in Trans. Bot. Soc. Edin. 28: 155. 1922; Wilson, Lilies E. Asia 42. 1925.

4a. L. bakerianum Collett & Hemsley var. **bakerianum** Stearn in Gard. Chron. ser. 3, 124: 4. 1948; Constable in Journ. Roy. Hort. Soc. Lond. 74: t. 141. 1949; Woodcock & Stearn, Lilies World 150. 1950; Sealy in Kew Bull. 5: 266. 1950. *L. lowii* Baker in Curtis's Bot. Mag. 118: t. 7232. 1892 (**Type:** Upper Burma, *W. Boxall* s.n., flowered in the garden of M/s. Hugh Low & Co. in 1891, K) and in Gard. Chron. ser. 3, 120: t. 29 1893.

Herbs 30-90 cm long. *Bulbs* $\pm 4 \times 5$ cm, broadly ovoid or globose; scales ovate-lanceolate or lanceolate. *Leaves* scattered, $6-10 \times 0.5-1.5$ cm, lanceolate, prominently 3-veined, glabrous or puberulous on the margin and veins. *Flowers* nodding, 1-7 in raceme, 10-11 cm long, more than 6 cm across, campanulate, fragrant, at first greenish becoming white, reddish brown spotted within; pedicel up to 15 cm long, stout; bracts whorled, leafy, 2-few. *Perianth* segments $10-11 \times 1.5-3$ cm, lanceolate, spreading below the apex, midvein prominent; nectaries linear, glabrous. *Stamens* and pistil shorter than 1/2 the length of perianth segments; filaments ± 3.5 cm long; anthers brownish $\pm 2 \times 0.4$ cm, linear-oblong; pollen orange. *Ovary* $\pm 2.5 \times 0.5$ cm, linear-oblong; style ± 3.5 cm long. *Capsules* $3-4 \times \pm 2$ cm, narrowly obovoid-oblong. *Seeds* numerous, 2 rowed in each locule, $\pm 1 \times 0.7$ triangular-rotund, compressed; wing 2 mm broad. *Flowering:* May-June. *Fruiting:* December.

Distribution. — Burma to China in steep slopes in loam or yellow clay or limestone, among shrubs and grasses at an altitude of 1200-2500 m (Fig. 1).

Note. — SEALY in Kew Bull. (1950) recognised 5 varieties of which the typical one only extends to Burma, the other four remaining confined to China.

Vernacular name. — 'Paihwa' (Burmese).

Herbarium specimens examined

Burma. Shan State, *Mac Gregor 683* (CAL), *A. H. Hildebrand* s.n. (CAL) and *W. A. Robertson 339* (K); Kang Fang, *Kingdon Ward 95* (BM); Taungi, *F. G. Dickson 9413* (CAL).

Lilium L. sect. **Martagon** (Reichenb.) Baker in Gard. Chron. 104. 1871; Boiss., Fl. Or. 5: 122. 1882; Wilson, Lilies E. Asia 61. 1925; Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 15a: 331. 1930; Komarov, Fl. U.S.S.R. 4: 288. 1935; Woodcock & Stearn, Lilies World 119. 1950. *Lilium* L. subgen. *Martagon* Reichenb., Consp. Reg. Veg. 65: 1828; Endl., Gen. Pl. 141. 1836; Kunth, Enum. Pl. 4: 257. 1843; Baker in Journ. Linn. Soc. 14: 240. 1874. Gen. *Martagon* [Rupp. Fl. Jen. ed. Hall, 148. 1745] Salisb. Gen. Pl. Fragm. 56. 1866. *Lilium* L. subgen. *Eulirion* Reichenb. emend. Wilson, Lilies E. Asia 1925, pro sect. *Martagon*.

Type: *L. martagon* L.

Flowers in raceme (4-9 cm long), drooping when matured, open campanulate. *Perianth* segments lanceolate or oblanceolate, loose, revolute. *Nectaries* linear. *Stamens* long, diverging.

Distribution. — Four species and 2 extratypical varieties are distributed along Himalayas in India extending to Afghanistan in the West and Burma and China in the North East and East.

5. *L. polyphyllum* D. Don in Royle, *Illustr. Bot Himal.* 388. 1840 (**Type:** Kunawar, Taranda, Royle s.n. LIV!); Kunth, *Enum. Pl.* 4: 677. 1843; Baker in *Journ. Linn. Soc.* 14: 246. 1874; Elwes, *Monogr. Lilies* t. 48. 1877; Boiss., *Fl. Or.* 3: 176. 1882; Hook. f., *Fl. Brit. Ind.* 6: 351. 1892; Collett, *Fl. Simlens.* 527. 1902; Coventry, *Willd Fl. Kashmir* 1: 95. t. 47. 1923; Wilson, *Lilies E. Asia* 66. 1925; Blatter, *Beaut. Fl. Kashmir* 2: 179. t. 60. f. 2. 1928; Woodcock & Stearn, *Lilies World* 312. 1950. *L. polyphyllum* var. *uniflorum* Boiss., *Fl. Or.* 5: 176. 1882 (Fig. 4).

Herbs ± 2 m × 1 cm. *Bulbs* ± 5 × 3-4.5 cm, ovoid; scales 4-5 × ± 1 cm, lanceolate. *Leaves* many, in irregular spiral, 5-15 × 0.2-2.5 cm, linear, linear-lanceolate or lanceolate, sessile, long attenuated at base, acute or acuminate at apex; midrib prominent. *Flowers* 1, 2 or many in raceme, 5-9 cm long, open campanulate; cream-yellow with purple or brown spots near the margin; pedicel 2-12 cm × 1.5-3 mm, stout; bracts leafy, paired, unequal, sometimes 3 or 4, 2-8 × 0.4-2 cm, linear-lanceolate or broadly lanceolate, sessile, acute or acuminate. *Perianth* segments 5-9 × 0.4-1.5 cm, oblanceolate, loose, much revolute; veins subparallel. *Nectaries* linear, glabrous. *Stamens* exerted; filaments 3-3.5 cm × 1 mm, linear, irregularly bent at the subapex with maturity; anthers 7-13 × 1-2 mm, narrowly oblong, umbonate at tip. *Pistil* as long as stamens or longer, exerted; ovary substipitate, 5-15 × 2-2.5 mm, style 2.5-6 cm × 1 mm, filiform, much longer than the ovary; stigma 2 mm broad. *Capsules* 2.5-6 × 1.5-4 cm, obovoid or obovoid-oblong, retuse or emerginate, dehiscing from the top; stipe 3-3.5 × 2-3 mm, stout. *Seeds* 6-8 × 5-5.5 mm, deep brown. *Flowering:* June-August. *Fruiting:* August-September.

Distribution. — Western Himalayan region in Uttar Pradesh, Himachal Pradesh, Punjab and Kashmir in India, extending to Afghanistan, rare in Nepal. Temperate to alpine regions at an altitude of 2000-4500 m.

Herbarium specimens examined

India. Himachal Pradesh, Rakcham-Baspa valley, Ludlow & Sherriff 7430 (E, BM); Simla, Lady Dalhousie s.n. ex Wight (CAL); Drummond s.n., Kew No. 20921 (K); Johnson 188 (CAL); Mohindar Nath s.n. (CAL); Gamble 45729 (CAL); J. R. Drummond 733 (DD); Paternatla, Brandis 1487 (CAL, DD); Harang, Brandis s.n. (CAL); Taranda, Stoliczka s.n. (CAL); Pangee, Stoliczka s.n. (CAL); Brandis s.n. (CAL); Douie 107 (CAL); Chamba, Harsukh s.n. (CAL, DD); J. G. Srivastava 61243 (LWG); Kulu valley, S. K. Jain & R. C. Bharadwaj 113280 (DD). Uttar Pradesh, Kumaon, Joan M. Legge 31 (K); Strachey & Winterbottom 3 (CAL, BM) and 4 (CAL); Gill 841 (CAL); Inayat 15027 (DD); Garhwal, A. E. Osmaston 952 (DD); M. A. Rau 1570 & 10343 (BSD); Duthie 506 (CAL); B. D. Naithani 37508 (BSD); Bashahr, J. H. Lace 310 (E, CAL); N. C. Nair 30623 (BSD); Kangarh, Edgeworth 101 (CAL). Kashmir: Sonemarg, R. R. Stewart 6448 (K); Pindaball, A. Meebold 4118 (CAL); Kunslwan, Clarke 29355, 29461 (CAL) and 29383 (BM); Liddar valley, Duthie 13086 (CAL); Srinagar, Clarke 29121 (CAL); Gulmarg, Aitchison s.n. (CAL); Upper Chenab valley, R. Ellis 1479, 1604 (CAL); B. H. Baden Powel 316 (CAL); R. Ellis 337 (K); Gurais valley, Inayat 25766 (DD); Drummond 14305 (K); Jhelum valley, Ludlow & Sherriff 7725 (BM); Kulan, Ludlow & Sherriff 7668 (BM); N.W. Himalayas, T. Thomson (BM, CAL). **Pakistan.** Hazara, Inayat 20231, 20232, 20233 (CAL); Swat-Bishigram, Stewart & Rahman 24996 (BM); Chitral, Major S. M. Toppin 763 (K); W. Gatan 17578 (DD); Sir H. A. Deane s.n. (CAL); Jaunser, Roger s.n. (DD); W. R. Fischer s.n. (DD); Gamble 23521 (K). **China.** Tachienlu, Pratt 103 & 688 (CAL).

6. *L. primulinum* Baker in Curtis's Bot. Mag. 118: t. 7227. 1892 (**Type:** Upper Burma, Shan State, Boni, W. Boxall s.n., flowering in 1891 in the Garden of M/s. Hugh Low & Co.); Hook. f., *Fl. Brit. Ind.* 6: 331. 1892. *L. ochraceum* sensu Wilson, *Lilies E. Asia* 61. 1925.

Herbs subterranean up to 30 cm and 30 cm to 1.5 m terrestrial, green or purplish or shining brown. *Bulbs* 3-7 × 2-9 cm, ovoid; cream-coloured turning to purple on exposure; scales



Fig. 4. — *Lilium polyphyllum* D. Don
 a, flowering twig; b, bulb; c, perianth segment; d, capsule; e, seed.
Lilium davidii Duchartre
 f, leaves; g, flowering twig; h, nectaries with processes.

lanceolate-ovate. *Leaves* scattered, denser and larger at the middle of the serial stem, and smaller and sparse at the two ends, 2-9 × 0.8-2.2 cm, lanceolate to elliptic, subsessile, long acute; midrib with 1-3 veins on either side. *Flowers* solitary or few in raceme, horizontal or nodding, 4-10 cm long, open campanulate, fragrant, glossy, cream to different shades of maroon below; bracts 2-3, leafy. *Perianth* segments 4-10 × 1.2-3 cm, lanceolate or oblanceolate, loose, revolute, with prominent sinus in the middle. *Nectaries* glabrous. *Filaments* 3.5-7 cm long, linear; anthers 0.8-1 × 0.2 cm, linear-oblong. *Pistil* 4-9 cm long; ovary oblong; style curved, broader above. *Capsules* stipitate, erect, obovoid.

Key to the varieties of *L. primulinum*

1. Flowers large (7-10 cm long) 2
- 1a. Flowers small (4-6 cm long) **6c. var. ochraceum**
2. Flowers uniformly glossy cream colour. Leaves 2-9 × 0.8-2.2 cm **6a. var. primulinum**
- 2a. Flowers greenish yellow with purple blotch. Leaves 5-12 × 1-1.5 cm
6b. var. burmanicum

6a. *L. primulinum* Baker var. *primulinum* Stearn & Hylander in Gard. Chron. 124: 13. 1948; Woodcock & Stearn, Lilies World 324. 1950. *L. neilgherrense* Collett & Hemsley in Journ. Linn. Soc. 28: 138. 1890, non Wight (**Type:** Burma, Shan State, *W. Boxall*, cultivated in the Garden of M/s. Hugh Low & Co.). *L. nepalense* var. *primulinum* (Baker) W. W. Smith in Trans. Proc. Bot. Soc. Edinb. 28: 136. 1922. *L. ochraceum* var. *primulinum* (Baker) Wilson, Lilies E. Asia 63. 1925. *L. nepalense* var. *concolor* Cotton in Kew Bull. 1937: 193. 1937 (**Type:** Bhutan, 1930, *Bailey & Sherriff*, E); Grove & Cotton, Suppl. Elwes Monogr. Liliium 60 and 65, November 1937; Kingdon Ward in Gard. Chron. 119: 229. f. 231. 1946. *L. assamicum* Kingdon Ward in Gard. Chron. ser. 3, 104: 422. 1938 (**Type:** Arunachal — Balipara, Monyul, *Kingdon Ward 13999*, BM!) (Fig. 5).

Herbs 30-120 cm. *Leaves* broadly lanceolate or elliptic, midrib prominent, 3 veined on either side. *Flowers* 8-10 × 7-8 cm, open campanulate, uniformly glossy cream coloured with faint purplish tinge at the base outside. *Perianth* segments 8-10 × 2-3 cm, lanceolate, papillose at the tip, inner surface with 5 ridges and furrows, veins many with prominent midrib. *Filaments* 6.5-7.0 × 0.1 cm, linear; anthers brown, ± 10 × 2 mm, linear. *Pistil* longer than stamens; ovary ± 1.5 × 0.2-0.3 cm, style 6-8 × 0.2 cm, curved at the top; stigma 3 mm broad. *Flowering:* July-September.

Distribution. — India (Arunachal), Bhutan to Burma in well-drained soil on sharp slopes or steep bank of rivers at 2400-2700 m altitude (Fig. 1).

Herbarium specimens examined

India. Arunachal — Balipara, *F. Kingdon Ward 13999* (BM). **Bhutan.** Tobrang, Trashigangsi Chu, *Ludlow, Sherriff & Hicks 20843* (BM); Samtigong Augduphorana, *R. E. Cooper 2352* (E); Diwangiri, *Ludlow & Sherriff 553* (BM).

6b. *L. primulinum* Baker var. *burmanicum* (W. W. Smith) Stearn, Gard. Chron. 124: 13. (July) 1948; Woodcock & Stearn, Lilies World 323. 1950. *L. nepalense* sensu Baker in Bot. Mag. 115: t. 7043. 1889. *L. nepalense* D. Don. var. *burmanicum* W. W. Smith in Trans. Bot. Soc. Edinb. 28: 135. 1922. *L. ochraceum* sensu Wilson, Lilies E. Asia 61. 1925. *L. ochraceum* Franch. var. *burmanicum* (W. W. Smith) Cotton in Kew Bull. 1937: 192. 1937; Grove & Cotton, Suppl. Elwes Monogr. Liliium 71. t. 19. 1937; Woodcock & Stearn, Lilies World 323. 1950.

Herbs 120-180 cm long. *Bulbs* fairly large up to 7 × 9 cm. *Leaves* 5-12 × 1-1.5 cm, lanceolate or linear lanceolate, 3 nerved. *Flowers* 2-7, fragrant, pendulous, up to 8 cm long; pedicel 10-14 cm long; bracts 3, leafy, broadly lanceolate. *Perianth segments* greenish yellow conspicuously pur-

ple blotched in the throat and margin. *Filaments* \pm 6 cm long, linear, purple; anthers dark purple, pollen rusty brown. *Capsule* \pm 3.5 \times 2 cm, obovoid, truncate. *Flowering*: July-December. *Fruiting*: October-December.

Distribution. — Burma in Shan State extending from Yunnan in China.

Herbarium specimens examined

China. E. Yunnan, Shweli-Salwin divide, *G. Forrest* 24802 (K) and 25296 (K).

6c. *L. primulinum* Baker var. *ochraceum* (Franch.) Stearn in Gard. Chron. 124: 13. July 1948; Woodcock & Stearn, Lilies World 323. 1950. *L. ochraceum* Franch. in Journ. Bot. Paris 6: 319. 1892 (**Type**: China, N.W. Yunnan, 20.8.87, *Delavay* s.n. P); Grove in Gard. Chron. 70: 62. f. 25. July 1921; Groove & Cotton, Suppl. Elwes Monogr. Liliium 71. 1937. *L. nepalense* Leveille in Fedde Repert. 6: 265. 1909. *L. bodineiri* Leveille ex W. W. Smith in Trans. Proc. Bot. Soc. Edinb. 28: 134. 1922, pro syn.

Herbs 90-165 cm terrestrial. *Leaves* subsessile, 5-6 \times 1.5-2 cm, oblong-lanceolate, or elliptic, 1 or 3-veined. *Flowers* 1-13, fragrant, 4-6.5 cm long. *Perianth* 4-6.5 \times 1.2-1.5 cm, lanceolate, olive-yellow, vein and edge deeply maroon, distinct from the base, revolute from the middle. *Filaments* olive, 3.5-4.0 cm long, linear, diverging; anthers dark-purple, 0.8-1 \times 0.2 cm, linear-oblong, pollen rusty brown. *Pistil* 4 cm long; ovary oblong, style broader above; stigma 4 mm broad. *Capsules* stipitate, 11-13 cm long, on stout pedicel, obovoid or quadrate. *Flowering*: March-July. *Fruiting*: May-December.

Distribution. — Bhutan to Upper Burma and China (Fig. 1).

Herbarium specimens examined

Bhutan. Samtigong, *N. E. Cooper* 2352 (E). **Burma**. S. Shan State, *Capt. R. W. Mac Gregor* 1040 (CAL); Maymyo, *C. Bogg* s.n. (K); Kang Rang, *Kingdon Ward* 90 (BM). **W. China**. Yunnan, *G. Forest* 2869 (CAL).

7. *L. duchartrei* Franch. in Nouv. Archiv. Mus. Paris ser. 2, 10: 90 1887 (**Type**: China, Mupin, June 1869, *David* s.n. P); Franch. in Journ. Bot. Paris 6: 316. 1892; C. H. Wright in Curtis's, Bot. Mag. 132. t. 8072. 1906; Wilson, Lilies E. Asia 64. 1925; Grove & Cotton, Suppl. Elwes Monogr. Liliium 33. t. 12. 1936; Constable in Journ. Roy. Hort. Soc. Lond. 74: t. 140. 1949; Woodcock & Stearn, Lilies World 212. 1950. *L. forrestii* W. W. Smith in Notes Roy. Bot. Gard. 8: 192. 1914 (**Type**: China, *Forrest* 6244, E). *L. farreri* Turrill in Gard. Chron. ser. 3, 66: 76. 1919 (**Type**: China, Kansu, 1914, *Farrer* 183, K) (Fig. 5).

Herbs 20-35 cm long, often puberulous. *Bulbs* \pm 4 \times 4 cm, ovoid, white; scales ovate. *Leaves* few, spiral or opposite, sessile, 2-6 \times 0.3-0.8 cm, linear-lanceolate, acute, often puberulous, at the margin; smaller and fewer above, close in the middle. *Flowers* solitary or few in raceme, small, open campanulate, horizontal or nodding, strongly fragrant, white with purple spots, colour deepening with age; pedicel 5-9 \times 0.2 cm; bract 1, leaf-like. *Perianth* segments \pm 5 \times 1 cm, oblanceolate, fleshy, loose, above 2/3 portion revolute, twice or thrice, margin membranous. *Nectaries* \pm 15 mm long, margin papillose. *Filaments* 2.5-4 \times 0.1 cm or less, filiform; anthers 8-10 \times 1-2 mm, linear or oblong. *Pistil* longer than stamens, exserted; ovary 8-10 \times 2.5-3 mm, oblong; style \pm 3 cm long, linear; stigma 3 mm broad. *Capsules* stipitate, horizontal, 2-3.5 \times 3-3.5 cm, obovoid, with prominent central axis. *Flowering*: April-July. *Fruiting*: May-July.

Distribution. — Arunachal to China; in open pasture or in pine forest, in glades, thickets and at alpine meadows at an altitude of 1350-3450 m (Wilson l.c.).

Note. — Bulb character and ecology have been taken from Woodcock & Stearn (l.c.) and Wilson (l.c.).

Herbarium specimens examined

India. Arunachal, Lohit valley, *F. Kingdon Ward* 19471 & 19550 (BM) and 19578 (ASSAM). **China**. Yunnan, *Forrest* 16730 (CAL); Kansu Orientale, *Potania* s.n. (CAL).



Fig. 5. — *Lilium primulinum* Baker
a, plant with bulb, leaves and flower showing different parts.
Lilium duchartrei Baker
b, flowering twig.

8. *L. davidii* Duchartre in Elwes Monogr. t. 24. 1877 (**Type:** China, Mupin, *Armand David* s.n., P); W. W. Smith in Trans. Bot. Soc. Edinb. 28: 141. t. 7. 1922; Wilson, Lilies E. Asia 81. t. 13. 1925; Grove & Cotton, Suppl. Elwes, Monogr. Liliaceae 91. t. 22. 1939; Woodcock & Stearn, Lilies World 206. 1950. *L. cavaleriei* Levelle & Vaniot in Mem. Pontif. Accad. Roma. Nuovi Lincei 24: 44. 1905. *L. sutchuense* Wilson in Fl. Sylv. 2: 330. 1905. *L. thayerae* Wilson in Kew Bull. 1913: 266 (Fig. 4).

Herbs up to 120 cm high, scabrid. *Bulbs* up to 4 cm diameter, globose; scales ovate lanceolate. *Leaves* many in irregular spiral, up to 10 × 0.4 cm, linear, diminishing above, single vein, margin inrolled. *Flowers* up to 20 in raceme, open campanulate, orange colour, nodding, on horizontal pedicel; pedicel 4-10 cm long; bracts leafy. *Perianth segments* 6-8 × 1-1.5 cm, ovate-lanceolate, loose, revolute above, small black spots on the inner sides, tips tubercled. *Nectaries* linear, fringed with appendages tips of which are hairy; several other short appendages scattered at the base of the perianth segments. *Filaments* 4-4.5 cm long, linear, pale orange; anthers ± 7 × 2 mm, linear-oblong, dorsifixed; pollen orange red and scarlet. *Pistil* as long as stamens or longer, exserted; ovary ± 12 × 2 mm, linear oblong; style 4.5-5 cm long, linear; stigma ± 3 mm broad. *Flowering:* May-August.

Distribution. — India in Manipur extending from Szechwan, and Yunnan in China at an altitude of 1525-2895 m.

Herbarium specimens examined

China. Yunnan, *Joseph F. Rock 23049* (K); Chinese collector for *H. D. McLaren* (K); *O. Schoch 289* (K).

- Lilium** L. sect. *Archelirion* Baker in Gard. Chron. 1871: 104. 1871, pro parte, excluding *L. oxypetalum* (= *Nomocharis*); Wilson, Lilies E. Asia. 45. 1925; Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 15a: 331. 1930; Woodcock & Stearn, Lilies World 119. 1950. *Lilium* L. subgen. *Archelirion* Baker in Journ. Linn. Soc. 14: 233. 1874.

Type: *L. auratum* Lind.

Flowers 1-few in raceme, small (4-5 cm long), cupular or open campanulate. *Perianth segments* oblong, elliptic or oblong-lanceolate, overlapping at the base, erect or spreading. *Nectaries* short, slightly broader below. *Stamens* short, not converging. *Pistil* as long as stamens.

Distribution. — Three species in Manipur, Bhutan and Burma.

9. *L. mackliniae* Sealy in Journ. Roy. Hort. Soc. Lond. 74: 349. t. 116-118. 1949 (**Type:** North Manipur, Sirhoi hills, January 1946, *Kingdon Ward 16008* (fruit). Paratype K! *Ibid.*, 5.5.1948, *Kingdon Ward 17604* (flower). Paratype BM! *Ibid.*, *Kingdon Ward 17606* (flower). Paratype BM!) and in Kew Bull. 5: 280. 1950; F. Kingdon-Ward, Pl. Hunter in Manipur 122. 1952; Deb in Bull. Bot. Surv. India 3(2): 120. 1961 (1963) (Fig. 6).

Herbs small, 10-15 cm subterranean, up to 100 cm terrestrial, green or reddish brown, hirsute, leafy from little above the base. *Bulbs* ± 4.5 × 4 cm, broadly ovoid, pale-yellow; scales pale-yellow, outer 2-3 cm wide. *Stem* up to 100 cm long. *Leaves* many (40-100), irregular spiral, ascending above and spreading below, topmost verticillate, 2.5-7.5 × 0.4-0.7 cm, linear, or lower up to 15 × 1.2 cm, linear-elliptic, more or less acute, villous at the base, midrib distinct on lower surface. *Flowers* solitary or few in raceme, nodding, 4.5-6 × 5.5 cm, cupular or open campanulate; pedicel ascending or spreading, green or reddish brown, 2.5-5 cm long, often stout; bracts 3-6 in solitary flower and 2 per flower in the inflorescence, leafy, 3-5 × 0.6-1 cm, lanceolate. *Perianth segments* 4.5-6 × 1.5-2.5 cm, oblong-lanceolate, white or purple outside and carmine at the base, erect or spreading at the tip, overlapping at the base. *Nectaries* 4-7 mm long, broader at the base, in both the perianth whorls. *Stamens* included, half the length of perianth, or slightly longer, erect; filaments white, ± 2 cm long, subulate or linear; anthers 6-7 × 2 mm, oblong, brick red, turning to brown. *Pistil* green included, slightly longer than stamens; ovary sessile, 7-8 × 2-3 mm, oblong; style 2.5 cm long, more than double the length of ovary, linear, broader above; stigma 3-4 mm broad. *Capsules* 2.5-2.8 × 1.7-1.8 cm, broadly obovoid, truncate at the apex, suddenly contracted



Fig. 6. — *Lilium mackliniae* Sealy
a, flowering twig; *b*, flower showing different parts; *c*, capsule.
Lilium sherriffiae Stearn
d, plant; *e*, outerperianth; *f*, innerperianth; *g*, stamen; *h*, pistil.

at the base; pale-yellow or light brown, pericarp papery. Seeds 8-10 × 6.5-9 mm, deltoid-rotund, compressed, dull greyish brown with a wide membranous wing. *Flowering*: April-May. *Fruiting*: July-January.

Distribution. — Endemic in Sirhoi hills, Manipur at altitude 2285-2600 m (Fig. 1).

Note. — Allied to *Nomocharis* on one hand and *Lilium* on the other. Long filaments, long style, mid-dorsifixed anthers, non-bilobed nectaries are in favour of its inclusion in *Lilium*.

Herbarium specimens examined

India. Manipur, Sirhoi hills, *Kingdon Ward 17255 & 17604* (BM).

10. *L. sherriffiae* Stearn in Journ. Roy. Hort. Soc. Lond. 75: 190. f. 108. 1950 (**Type**: Eastern Bhutan, Lao. 31.5.1949, *Ludlow, Sherriff & Hicks 20658*. Holotype BM! Eastern Bhutan, Dhurchu Bumthangchu, 22.7.1949, *Ludlow, Sherriff & Hicks 19490*. Paratype BM!) (Fig. 6).

Herbs 35-90 cm long. *Bulbs* 2-5 × 1.5-3 cm, narrowly ovoid; white or light brown; scales few, narrowly ovate. *Leaves* few, in irregular spiral, ascending, 6-15 × 0.5-1 cm, linear or linear-lanceolate, upper long acuminate, lower acute; midvein prominent. *Flowers* 1 or 2, terminal, horizontal, brown; corolla open campanulate; tessellated with golden yellow; pedicel 2-7 cm long; bracts leaf-like. *Perianth* segments spreading, overlapping at the base, 5.5-6 cm long, oblong or elliptic. *Nectaries* short, broader at the base; outer 1.8-2 cm broad, inner 2.3-2.5 cm broad. *Filaments* ± 1.8 × 0.1 cm, slender, glabrous, pale; anthers ± 1.2 × 0.1 cm, narrowly linear; pollen orange coloured. *Ovary* sessile, ± 1 × 0.25 cm, cylindrical; style ± 2.8 cm long, more than double the length of ovary, linear, gradually broader above; stigma 3 mm broad. *Flowering*: May-July.

Distribution. — Bhutan, on sandy steep river bank or grassy hillside at an altitude of 2700-3600 m, associated with species of *Fritillaria*, *Polygonatum*, *Cotoneaster* and *Salix*.

Common name. — 'Abecas' (Bhutanese).

Herbarium specimens examined

Only the type specimens have been examined.

11. *L. arboricola* Stearn in Gard. Chron. Ser. 3, 136: 127. 1934 (**Type**: N. Burma, N. Triangle, 23.8.1953, *Kingdon Ward 21212*, BM!) (Fig. 7).

Herbs epiphytic, 70-120 cm long, erect, slender. *Bulbs* ± 3 × 5 cm, somewhat flattened above and below, yellowish white; scales thick, 2.5 × 3 cm, broader than long, cuneate at base, lower part abruptly narrowed into a triangle, upper part rose-tinged. *Leaves* few, scattered, descending, up to 25 × 4.5 cm, lanceolate, increasing in size from the base to the middle, then again decreasing upwards, acuminate, glabrous, 3-5 nerved; bulbils at the axils of upper leaves, small. *Flowers* 1-3, in raceme, small, nodding, fragrant, green, cupular; pedicel about 17 cm long, glabrous; bracts leafy, 12 cm long. *Perianth* segments spreading, overlapping at the base, ± 5 × 0.8-1.1 cm, elliptic, acute, narrowed at base; outer narrowly elliptic. *Nectaries* short, broader below, sulcate, glabrous. *Filaments* erect, ± 2.2 cm long, smaller than perianth, subulate, glabrous; anthers ± 1 cm long, linear-oblong; pollen orange. *Ovary* cylindrical, 1.8 × 0.3 cm, sessile; style 2.5 cm long; stigma small, slightly spreading. *Capsule* 4-4.5 × 2 cm, oblong. *Flowering*: August.

Distribution. — Burma at 1370 m in altitude.

Herbarium specimens examined

Type specimen only has been examined.



Fig. 7. — *Lilium arboricola* Stearn
a, leafy twig; b, flower.

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