

## Extended Distribution of Some *Astragalus* L. (Fabaceae) in India

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### Abstract

Four species of *Astragalus* L. viz.: *A. donianus* DC. from Arunachal Pradesh, *A. lessetioides* Benth. ex Bunge from Uttaranchal, *A. leucocephalus* Grah. ex Benth. from Sikkim and *A. orotrephe* W. W. Smith from Jammu & Kashmir are reported as new records. *A. donianus* DC. was earlier known from Uttaranchal and Sikkim, *A. lessetioides* Benth. ex Bunge from Sikkim, *A. leucocephalus* Grah. ex Benth. from North West Himalaya (Jammu & Kashmir to Uttaranchal). *A. orotrephe* W. W. Smith, earlier known from Tibet, constitutes a new record for India. Detailed descriptions of these species are provided.

**Keywords:** Four *Astragalus* species, New records, Extended distributions, India

### Introduction

*Astragalus* L. with about 3000 species (including the genus *Astracantha*) is designated as the largest genus in Angiosperms in the world (Zarri & Podlech, 1997). In a recent revisionary study of the genus conducted by the author (unpublished), about 90 species have been identified from India, chiefly from the Himalayas. While investigating the genus in India, the author observed some new distributional data of four species of *Astragalus* L., which are summarised here.

*A. donianus* DC. is a commonly growing species in Sikkim. Ali (1961) recorded it for the first time from Uttaranchal (North West Himalaya) outside Sikkim based on the specimen *J. F. Duthie 5482*. My study shows that the species has also extended its distribution to Arunachal Pradesh from where only two species of *Astragalus* were reported so far (Chaudhary & Khan, 2003). *A. lessetioides* Benth. ex Bunge, earlier known as a North East Himalayan element extended from China to Nepal, is recorded now from North West Himalaya (Uttaranchal). *Astragalus leucocephalus* Grah. ex Benth. was previously recorded from Jammu & Kashmir to Uttaranchal in North West Himalaya but it is reported here for the first time from North East Himalaya (Sikkim). *Astragalus orotrephe* W. W. Smith

was first described from East Himalaya (Tibet?) based on a single collection (Smith, 1913). After the type specimens, no other collections have been made from any part of East Himalaya as this species has not been recorded so far from Nepal (Press *et al.*, 2000) and Bhutan (Grierson & Long, 1987). In the present study this species is reported for the first time for India from Jammu & Kashmir (Ladakh) in the North West Himalaya based on a very old collection.

Detailed descriptions of these species are provided along with data on phenology, distribution, ecology and specimens examined.

***Astragalus donianus*** DC., Prod. 2: 283. 1825; Baker in Hook. f., Fl. Brit. India 2: 119. 1876; Chatter in Hara *et al.*, Enum. Fl. Pl. Nepal 2: 106. 1979; Grierson & Long, Fl. Bhutan 1(3): 719. 1987; Sanjappa, Legum. India 87. 1992; Press *et al.*, Anno. Checkl. Fl. Pl. Nepal 166. 2000. *Astragalus pycnorhizus* Wall. ex Benth. in Royle, Illust. Bot. Himal. 199. 1835; Baker in Hook. f., Fl. Brit. India 2: 119. 1876; Ali in Biologia 7: 10. 1961. *A. macrorhizus* D. Don, Fl. Nepal. 245. 1825, non Cav.

*Perennial prostrate herbs*, with thick woody rootstock or fibrous roots, profusely caespitose, several stems arising from the base, 10-40 cm long. *Stem* reddish, slender, glabrous to thinly pubescent with minute,

white, flat, adpressed hairs; stipules 2 x 1-1.5 mm, free or slightly adnate to petiole on back, almost encircling the stem, connate on the opposite side of the petiole at lower portion of the plant, membranous, ovate or ovate-lanceolate, acute to subacuminate at apex, irregularly dentate along margins with glandular structure. *Leaves* 16-35 mm long, imparipinnately compound; petioles 0-5 mm long; rachis pubescent with white, adpressed, flat hairs; leaflets 11-16, 3-6 x 1.5-3.5 mm, alternate to opposite, oblong, oblong-obovate or oblong-elliptic, emarginate at apex, cuneate or subobtusate at base, glabrous above, pubescent with white, flat, adpressed to half spreading hairs below. *Inflorescence* axillary, peduncled, raceme 1-2-flowered; peduncles 17-50 mm long, equal to or longer than subtending leaf, pubescent with minute, adpressed hairs in upper portion, hairs white or mixed white and brown; bracts 1.5-2 x 1.5 mm, membranous, persistent, encircling the pedicel, broadly ovate, acute to subacuminate at apex, glabrous, dentate along margins with some glandular structures; bracteoles present at the tip of pedicel, 1-1.5 mm long, ovate-lanceolate, in other details similar to bracts. *Flowers* c. 15-18 mm long, deep brownish purple, blackish brown or dark maroon; pedicels c. 1.5 mm long, densely pubescent with flat, brown or black, adpressed hairs; *calyx* 5-7 mm long, tinged light brown, persistent, campanulate, pubescent with brown, flat, adpressed hairs outside, tube 2.5-4 mm long, lobes 2.5-3 x 1 mm, equal to tube, ovate-lanceolate with long acuminate tip, densely hairy inside with black or rarely white hairs, glands present along margins; standard petals 15-18 x 11-13 mm, backwardly reflexed, suborbicular, emarginate at apex, claw c. 3 mm long; wing petals c. 14 mm long, shorter than standard petals, lamina c. 9 x 4 mm, oblong-ovate, obtuse at apex with a slight notch near the apex on ventral margin, upper auricle c. 1.5 x 1.5 mm, claw c. 5 mm long; keel petals c. 14 mm long, slightly longer than or sometimes more or less equal to wing petals, lamina c. 9 x 5 mm, narrowly obovate, incurved towards and obtuse at apex, upper auricle c. 2 x 2 mm, claw c. 5 mm long; stamens monadelphous, closed, split on dorsal side after anthesis, staminal sheath c. 10 mm long, obtuse at apex, filaments free c. 1.5-2.5 mm long, alternately shorter and longer; ovary c. 9 mm long, stipitate, stipe c. 3 mm long, minutely pubescent with white hairs; style c. 4 mm long, bearded at and near the apex on the inner side; stigma penicillate. *Pods* 9-18 x 4-9 mm (excluding stipe and beak), partially tinged light brown, oblong, narrowed at apex into a long beak (beak 7-8 mm long), turgid with intruded dorsal suture, unilocular, shortly stipitate, pubescent with very minute, brown or brownish black, adpressed hairs;

stipe c. 1 mm long; seeds c. 1.5 x 1 mm, reniform, suborbicular, black, turgid, smooth, glabrous.

*Flowering & Fruiting*: July-September.

*Habitat*: Abundant (in Sikkim) in open grassy hill slopes, along agriculture field, on rocky flat lands, river sides in sandy and hard gravelly soil.

*Altitude*: 2700-4600 m.

*Distribution*: India (Uttaranchal, Sikkim, Arunachal Pradesh), Nepal, Bhutan, China.

*Specimens Examined*: INDIA, **Arunachal Pradesh** : Pukdua – Gambesi, 9000 – 14000 ft., 31. 05. 1958, R. S. Rao 17202 (CAL). **Sikkim**: Zemu valley, 11800 ft., 11.07. 09, Smith & Cave 1207 (CAL); Chola Range, Barfonchar, 11000 ft., 26. 9. 92, G. A. Gammie 1301 (CAL); Cheongtong, 5000 ft., 28. 07. 1892, G. A. Gammie 301 (CAL); Samdong, 1901, Prain 221 (CAL); Llonak, 13,000 ft., 30. 07. 1909, Smith & Cave 2774 (CAL); Lachen, 8000 ft., Sept. – Oct. 1909, Ribu & Rhomoo 3049 (CAL, LWG); Between Lachen and Thangu, Kelep, 3800 m, 12. 8. 2004, L. B. Chaudhary 225064 (LWG); Thangu, 4000m, 12.8.2004, L. B. Chaudhary 225067 (LWG); Between Lachung and Yumthang, 15 km away Yumthang, 3300 m, 15.8.2004, L. B. Chaudhary 225080 (LWG); North of Lachung between Phumi-Yackae, 3310 m, 14.7.1996, G. P. Sinha & D. G. Long 17839 (SIKKIM); 2 km away from Yumthang, near Garampani, 3800m, 15.8.2004, L. B. Chaudhary 225084 (LWG); Yumthang, 13000 ft., 23.10.1924, Rhomoo Lepchha 2276 (LWG); Upwards Thangu along Lasha Chhu, 3400 ft., 22.7.1988, D. C. S. Raju & S. Singh 8890 (SIKKIM). **Uttaranchal**: Kumaon, Bhalek in Kali Valley, Byans, 11 – 12000 ft., 23. 07. 86, J. F. Duthie 5482 (CAL).

***Astragalus lessertioides*** Benth. ex Bunge in Mem. Acad. Sci. St.-Pet. ser. 7, 11: 24. 1868 & 12: 28. 1869; Baker in Hook. f., Fl. Brit. India 2: 124. 1876; Grierson & Long in Grierson Long, Fl. Bhutan 1 (3): 718. 1987; Sanjappa, Legum. India 90. 1992; Press *et al.*, Annot. Checkl. Fl. Pl. Nepal 166. 2000.

*Erect or decumbent herbs*, 6-35 cm long. *Stem* 2-18 cm long, tinged red, unbranched or once or twice branched, terminated into peduncled inflorescence, glabrous or thinly pilose with white, spreading hairs; stipules 5-15 x 2-6 mm, tinged red, foliaceous, free, oblong-lanceolate or narrowly ovate, obtuse at tip, surface glabrous, margins ciliate, hairs long, mixed white and black or only white, spreading. *Leaves* 2.5-8 cm long, imparipinnately compound; petioles 1.0-2.5 cm long; rachis and petiole deeply channelled above, glabrous; leaflets 9-13, 6-14 (-25) x 3-8 (-10) mm, opposite, obovate, ovate, elliptic or oblong, obtuse or cuneate at base, obtuse or rounded at apex, glabrous above, unevenly thinly pilose with white

hairs along margins, extra margins and midrib below. *Inflorescence* axillary, peduncled and capitate raceme; peduncles 7-10 cm (up to 18 cm in frutescence) long, tinged red, longer than subtending leaf, glabrous in lower portion, pilose with blackish-brown, adpressed hairs in upper portion; racemes *c.* 7-20 flowered, close; bracts 3-7 × 0.5-1 mm, persistent, longer than pedicels, linear or linear-lanceolate, densely pilose with long, forwardly oriented, mixed brown and white or black hairs outside and along margins. *Flowers c.* 10-11 mm long, deep yellow, noded at maturity; pedicels less than *c.* 2 mm long, densely pubescent with blackish-brown, forwardly oriented hairs; calyx 4-5 mm (8-9 mm in fruits in *Duthie 984*) long, campanulate, persistent, tube 2.5-3 mm long, glabrous, lobes *c.* 1.5 mm long, half of the tube pubescent with blackish-brown hairs on both sides (more densely hairy inside); standard petals *c.* 11 × 7.5 mm, obovate, emarginate at apex, claw not distinct; wing petals equal to standard, lamina *c.* 4 × 1.5 mm, oblong, obtuse at apex, upper auricle minute, claw *c.* 7 mm long; keel petals almost equal to standard, lamina *c.* 4 × 2 mm, oblong, slightly curved above, subacute at apex, upper auricle minutely dentate along margin, claw *c.* 7 mm long; vexillary filament *c.* 10 mm long; staminal sheath *c.* 10 mm long, obtuse at apex, filaments free *c.* 1 mm long, alternately longer and shorter; ovary stipitate, densely hairy with mixed white and black or only brownish hairs, stipe *c.* 3 mm long. *Pods* 12-15 (- 20) × 4-6 mm, lanceolate, narrowed at both ends, turgid, stipitate, unilocular, densely pilose with blackish-brown, forwardly oriented hairs, 3-4 seeded, stipe 2.5-3 mm long, (6 mm in *Duthie 984*) equal to or slightly longer than calyx tube.

*Flowering & Fruiting:* July-October.

*Habitat:* On grassy slopes or flat lands in open moist soil.

*Altitude:* 3000-5000 m.

*Distribution:* India (Sikkim, Uttaranchal), Nepal, Bhutan, China.

*Specimens Examined:* **Uttaranchal:** Tehri Garhwal, Chinpul, opposite Banderpunch, 12000-13000 ft., *J. F. Duthie 984* (CAL: photo LWG, BM: photo LWG); Kumaon, Furkia, Pindari moraine, 3500-5000 m, 23. 10. 1957, *T. A. Rao 4426* (BSD). **Sikkim:** North Sikkim, Thangu, Giagaon, 4600 m, 13. 8. 2004, *L. B. Chaudhary 225072* (LWG); Llonak, 13000 ft., 26.7.1909, *Smith & Cave 1773* (CAL: photo LWG); *Smith & Cave 1173* (LBG); Llonak, Naka Chu, 16000 ft., 3.8.1909, *Smith & Cave 1896* (CAL). Lachung, Samdong, 16500 ft., 17.8.1892, *G. A. Gammie 852* (CAL); Tebli, 15000 ft., 9 September-October, *Lepcha collector 2722* (CAL: photo LWG,

LBG); Zemu valley, 12000 ft., 12.7.1909, *Smith & Cave 1224* (CAL, LBG);

***Astragalus leucocephalus*** Grah. (in Wall., Cat. 5923. 1831-32, *nom. nud.*) ex Benth. in Royle, *Illust. Bot. Himal.* 198, t. 32, f. 2. 1835; Boiss., *Fl. Or.* 2: 241. 1872; Baker in Hook.f., *Fl. Brit. India* 2: 128. 1876; Ali in *Biologia* 7: 25. 1961 & in Nasir & Ali, *Fl. W. Pakistan* 100: 147, f. 19 B-G. 1977; Sanjappa, *Legum. India* 90. 1992.

*Perennial herbs*, usually with woody rootstock, decumbent, rarely erect, densely caespitose. *Stem* minute to 20 cm long, generally unbranched, densely tomentose, hairs white, unequal, almost adpressed; stipules 7-12 × 2-2.5 mm, longer than internodes, persistent, foliaceous, opposite to petiole, connate up to the middle, triangular-ovate, acuminate at apex, densely hairy outside, glabrous inside. *Leaves* 5-11 cm long, imparipinnate; petioles 1.5-2 cm long, densely tomentose; rachis 3.5-8 cm long, grooved above, densely tomentose, hairs white, mixed adpressed and spreading; leaflets 21-35, 5-9 × 1.8-5 mm, close, opposite, subopposite or alternate, subsessile, linear, oblong, elliptic, ovate, narrowly ovate or obovate, cuneate or obtuse at base, obtuse, subacute, acute or sometimes retuse with a minute gland at apex, densely hairy on both sides, hairs white, spreading on upper surface, adpressed on lower surface. *Inflorescence* axillary, peduncled, capitate raceme; peduncles 1.8-12.5 cm long, densely tomentose, hairs white, mixed adpressed and spreading; racemes 7-20 × 10-15 mm, many flowered, very compact, oblong, oblong-ovate or almost globose; bracts 4-5 × 1.5-2 mm, lanceolate with acuminate tip, densely hairy; bracteoles 2, situated at the base of calyx, *c.* 1 mm long, linear, densely hairy. *Flowers* pinkish-white or yellowish, 7-8 mm long, subsessile; calyx 7-7.5 mm long, campanulate, persistent, densely pilose to shaggy outside, glabrous inside, tube 3 mm long, lobes 4-4.5 mm long, subequal, linear-triangular; standard petals 7-8 × 3 mm, slightly exerted from calyx, narrowly obovate with broad basal portion, emarginate at apex; wing petals *c.* 6.5 mm long, lamina *c.* 3.5 × 1 mm, oblong-obovate with minutely dentate apex, claw *c.* 3 mm long; keel petals 4.5-5 mm long, lamina 2-2.5 × 1.5 mm, curved towards apex, claw *c.* 2.5 mm long; vexillary filament *c.* 4 mm long; staminal sheath *c.* 4 mm long, filaments free *c.* 1.5 mm long; ovary 3.5 × 2 mm, sessile, elliptic-ovate, densely white sericeous, *c.* 9-ovuled; style *c.* 2 mm long, curved from base, glabrous; stigma capitate, glabrous. *Pods* 4-5 × 2 mm, sessile, ellipsoid or oblong, turgid, included into the calyx, densely pilose, unilocular, *c.* 6-seeded; seeds 1.5-1.7 × 1 mm, brown, reniform, turgid, smooth, glabrous.

*Flowering & Fruiting:* May-October.

*Habitat:* Growing on grassy mountainous slopes.

*Altitude:* 1200-5500 m.

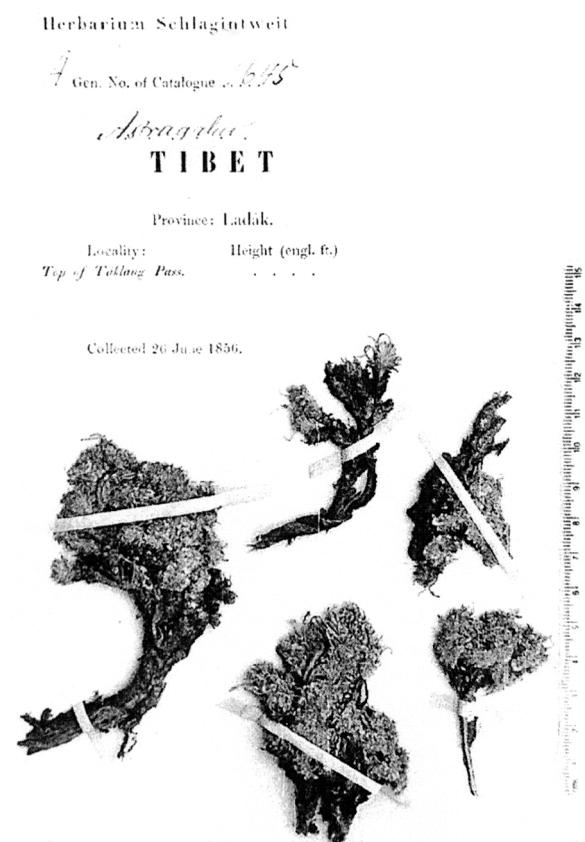
*Distribution:* India (Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Sikkim). Afghanistan, Pakistan, Nepal.

*Specimens Examined:* **Sikkim:** Llonak, 14800 ft., 5. 8. 1909, *Smith & Cave* 2142 (LBG); Chanra Gumpa, on dry hill sides, 14000 ft., 5. 10. 1923, *Ribu Rhomoo* 7639 (LBG). **Jammu & Kashmir:** Panchori, 8.6.86, *S. Kumar* 81457 (BSD); Shankaracharya hill, 2300 m, 25.7.56, *T. A. Rao* 792 (BSD); Tangmarg to Baramula, near Pattan, 30.6.1957, *Kaul & Party* 23539 (LWG); Andanwar, 13.5.1962, *A. Khan* 96309 (LWG); Srinagar, 6000 ft, 25.7.1958, *G.D. Thapliyal* 26293 (DD); Ladakh, Mulbekh (N to NW hills), 3310 m, *B. M. Wadhwa* 58873 (BSD); Ladakh, Chushul, 5500 m, 24. 8. 1975, *M. V. Viswanathan* 55012 (BSD); Kashmir, 1864, *Falconer* 421 (CAL); Kashmir; July, 1956, *T. A. Rao* 792 (CAL). **Himachal Pradesh:** From Panjian to Aut rest house, 21.5.1959, *J. G. Srivastava et al.* 58562, 58584, 59425, 59416 (LWG); Chamba, Bharmour, 23.7.1963, *C.L. Malhotra & V.J. Nair* 28326 (BSD); Sarahan, 2400 m, 26.5.1962, *N.C. Nair* 21903 (BSD); Kulu, Manikaran, 3 Kms. from Manikaran towards Phulga, 17.9.2001, 1600 m, *L. B. Chaudhary* 220700 (LWG); Chamba, Gothan ridge, 7,000 ft., 27. 04.1898, *J. H. Lace* 1693 (CAL); Cherat, Aug., 1897, *H. Collett s.n.* (CAL). **Uttaranchal:** Garhwal himalaya: Chamoli, Suraithola, *P. K. Hajra* 87381 (BSD); Pauri Gharhwal, Chopra Pauri, 22.10.1975, *H. B. Naithani* 526 (DD); Mussoorie, Dhobighat, 1500 m, 9.8.1967, *U. C. Bhattacharyya* 37278 (BSD); Mussoorie, 2000 m, 23.01.1977, *B. S. Aswal.* 6266 (CDRI); Mussoorie, Jhari Pani, 28.4.1932, *Kirat Ram s.n.* (DD); between Mussoorie and Kempty fall, near Himalaya Adventurous Centre, 6000 ft., 15.8.2001, *L. B. Chaudhary* 220627 (LWG); Dehra Dun, Tons valley, 1200 m, 2.10.1995. *T. S. Rana* 108252 (LWG); Chakrata, Kanasar, 9000 ft., 14.8.2001, *L. B. Chaudhary* 220625 (LWG); Deoban, above spider colony, 8000 ft., 13.8.2001, *L. B. Chaudhary* 220620 (LWG); Jaunsar, 7000 ft., May 1891, *J. S. Gamble* 22834 (DD). Kumaon himalaya: Nainital/ Ayalpata, 21-2500 m, 8.10.1957, *T. A. Rao* 4902 (BSD); Nainital, 7500 ft., 27.5.1967, *P. Pradhan* 7 (BSD, CAL); Ranikhet, 27.3.1968, *K. M. Balapure* 72740, 72750 (LWG); Jaunsar, 8,500 ft., April, 1892, *J. S. Gamble* 23474 (CAL); Tehri-Garhwal, 5 – 6, 000 ft., April, 1891, *J. F. Duthie s.n.* (CAL).

***Astragalus orotrephe*** W. W. Smith in Trans. Bot. Soc. Edinburgh 26: 178. 1913. **Fig. 1.**

*Perennial herbs* with rhizomatous rootstocks, dwarf upto c. 5 cm above the ground, very densely caespitose. *Stem* numerous, very short, densely covered with leaves, compact in hemispherical form;

stipules 4-5 x 1.2 mm, membranous, ovate with acuminate tip, adnate and connate up to the middle on the back of petiole, densely pilose with white, long, adpressed hairs outside, glabrous inside. *Leaves* c. 9 mm long, imparipinnate; petioles c. 4 mm long; rachis c. 4 mm long, densely sericeous with white, half spreading hairs; leaflets 15 (radical leaves trifoliate in Type specimen), 1.5-3 mm long, close, sessile, ovate or obovate-elliptic, densely sericeous with white, long hairs on both sides; bract c. 2 mm long, ovate with



**Figure 1.** *Astragalus orotrephe* W. W. Smith (s. coll. 1645)

acuminate tip, pilose with white, long hairs outside. *Flowers* solitary on very short peduncle, c. 5 mm long; calyx c. 4 mm long, densely hairy outside with white, long, adpressed hairs, tube c. 2.5 mm long, lobes slightly shorter than tube, linear-lanceolate, densely hairy with mixed black and white hairs on both sides; petals subequal, standard petals c. 5 x 2.5 mm; wing lamina c. 2 x 0.5 mm; keel lamina c. 2 x 1.5 mm; vexillary filament c. 4 mm long; staminal sheath c. 3 mm long, filaments free c. 2 mm long; ovary c. 2 mm long, sessile, densely white hairy; style c. 2.5 mm long. *Pods* ovoid, densely hairy with white, long hairs,

unilocular; seeds not seen.

*Flowering & Fruiting* : June - July

*Distribution*: India (Jammu & Kashmir-Ladakh), Tibet (?)

*Note*: The dwarf nature and compactly caespitose cushion forming habit make this species peculiar. The exact place of collection of this species is not mentioned on the Type specimens. On Holotype, Sikkim has been stricken off and replaced by East Himalaya with a question mark. Smith (1913) mentioned that this species was not recorded from Sikkim and probably was collected from the Tibetan plateau beyond or along the boundaries of Sikkim. After the Type collection, no other collections of this species have been made from the East Himalaya or from any other regions (Ali, 1977; Grierson & Long, 1987; Sanjappa, 1992; Press *et al.*, 2000; Kumar & Sane, 2003). However, while studying the specimens of BM on loan, it was found that this species had already been collected from Tibet and Ladakh-Taklang pass (now in Jammu & Kashmir, India) long back in 1856, but remained unidentified and unrecorded. During my recent visit to Leh and Ladakh, this species could not be observed at Tanglang La (5328 m). Further collections are very much required to assess its conservation status.

*Specimens Examined*: **Jammu & Kashmir**: Ladakh, Top of Taklang pass, 26. 6. 1856, *s. coll.* 1645 (BM: photo LWG). **East Himalaya** (?), July 1902, *Political Officer, Sikkim* (CAL-Holotype).

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