

## Three new species of *Ophiorrhiza* (Rubiaceae-Ophiorrhizeae) from Thailand

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**ABSTRACT.** Three new species of *Ophiorrhiza* L., *O. larseniorum*, *O. pseudofasciculata*, and *O. longifloriformis* from Thailand are described and illustrated.

*Ophiorrhiza* L. (Rubiaceae, Ophiorrhizeae) is a predominantly herbaceous genus distributed from E India to the W Pacific and from S China to N Australia. Altogether more than 400 species have been described, though many of them probably superfluously. However systematic knowledge of this genus is still inadequate, recent regional revisions are available only for marginal parts of its area: the Pacific (Darwin, 1976), China (Lo, 1990), and the Indian subcontinent (Deb & Mondal, 1997, publ. 2001). About 30 species have been recorded from Thailand and adjacent areas of Peninsular Malaysia (King & Gamble, 1903; Ridley, 1923; Craib, 1932). Most of them were described in the first half of the 20<sup>th</sup> century and some are known only from type collections. Revision of herbarium collections of the genus *Ophiorrhiza* for the coming treatment for Flora of Thailand revealed a number of specimens that could not be assigned to any of the species described so far. They neither fit the existing descriptions nor conform with the type specimens of these species and hence are described below as new.

***Ophiorrhiza larseniorum* Schanzer, sp. nov.** Herba perennis, 70–170 mm alta. Folia supra dense pilis villosis, appressis, 0.5–1.5 mm longis vestita, subtus dense vel sparse villosa pilis 0.4–0.8 mm longis. Pedunculus sparse villosus vel glaber. Bracteeae bracteolaeque lineares vel anguste lanceolatae, 2–3 mm longae, margine pilosae. Ovaria hispida. Alabastra 8–10 mm longa, apice corniculata. Corolla infundibuliformis, basi cylindracea, extra pilosa pilis 0.1–0.4 mm longis. Plantae heterostylae, fortasse heterodistylae. Flores macrostyli tubis ca. 8 mm longis, intus dense piloso-anulatis. Antherae infra tubi medium inclusae. Stylus supra antheris anuloque piloso inclusus, ca. 5 mm longus, rami stigmati rotundati. Flores brevistyli tubis ca. 8.5 mm longis, intus sparse piloso-anulatis. Antherae tubi medio inclusae. Stylus infra antheris anuloque piloso inclusus, ca. 3–3.5 mm longus, rami stigmati lanceolati. Typus: Thailand, Surat Thani, *K. Larsen et al.* 40905 (holotypus AAU!). Fig. 1.

*Perennial* herbs; stems ascending to erect, 70–170 mm long, unbranched, or with few branches, loosely to densely hairy throughout or only on 2 opposite sides with hairs flexuose, rusty, 0.4–1 mm long. *Leaves* equal or slightly unequal, ovate to elliptic, 70–90 mm long, 30–50 mm wide, acuminate, broadly cuneate to rounded or nearly subcordate at

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base, pale green to whitish underneath when dry, lateral nerves in 7–10 pairs, densely hairy with hairs straight to villous, appressed, white to purplish, 0.5–1.5 mm long above, and densely to loosely hairy with hairs villous, mostly appressed, white to purplish, 0.4–0.8 mm long below. *Petioles* 5–30 mm long. *Stipules* somewhat hairy, narrowly triangular, often cleaved at apex, 1.5–2.5 mm long, 0.5–1 mm wide. *Peduncle* 20–30 mm long at anthesis, 40–50 mm long at fruit, glabrous or loosely hairy on 1 or 2 opposite sides. *Peduncle hairs* villous, spreading, 0.5–0.8 mm long, white to purplish. *Inflorescence* terminal, thyrsoid, with contracted main axis, composed of ca. 15–30 flowers; inflorescence branches helicoid or scorpioid cymes, very compact in flower and fruit, to 9–10 mm long, densely to loosely hairy on 1 or 2 opposite sides with hairs 0.5–0.8 mm long. *Bracts and bracteoles* linear to narrowly lanceolate, 2–3 mm long, hairy on surface and margins. *Pedicels* 1–1.5 mm long. *Ovary* densely hispid. *Calyx* lobes lanceolate, longer than wide, 0.8–1 mm long. *Flower buds* 8–10 mm long, with horny triangular appendages at the top. *Corolla* infundibuliform with cylindrical basal part of the tube, white to pink, with white or pink to purple lobes, exterior hairy on both tube and lobes with hairs 0.1–0.4 mm long; lobes upright, ca. 3 mm long, glabrous from inside; dry corolla with extremely thin and tender walls, indicating thick and succulent in a live plant. Heterostylous, probably distylous. *Longistylous flowers* with ca. 8 mm long tube; with a dense ring of hairs inside and scattered hairs or scales above and below the hair ring, ring hairs appressed upwards, 0.2–0.4 mm long. *Stamens* attached just above the tube base, well below the hair ring; filaments ca. 1 mm long, in lower part adnate to the tube wall, with free part of 0.3 mm only; anthers ca. 1.5 mm long, situated below the tube middle, and below the hair ring. *Style* situated above anthers and the hair ring, glabrous, ca. 5 mm long, stigma ca. 1 mm long, with roundish lobes. *Brevistylous flowers* with ca. 8.5 mm long tube; with a loose ring of hairs inside, and scattered hairs or scales above the hair ring, ring hairs perpendicular to walls, ca. 0.1 mm long. *Stamens* attached just above the tube base, well below the hair ring, filament ca. 4.5 mm long, in lower part adnate to the tube wall, with free part ca. 3.3 mm; anthers ca. 1.5 mm long, situated at the tube middle, above the hair ring. *Style* situated below anthers, glabrous, ca. 3–3.5 mm long, stigma ca. 1.5 mm long, with lanceolate lobes. *Capsules* laterally flattened, cordate, with slightly concave upper margin, 2–2.5 mm long, 6.5–7 mm wide, densely clustered and overlapping in the inflorescence.

Thailand.— PENINSULAR: Surat Thani [Khao Sok, evergreen gallery forest, 98° 40' E 08° 55' N, altitude 100–200 m, flowers pink, 25 Oct.1990, *K. Larsen et al.* 40905 (holotype AAU! *the brevistylous form*); Khao Sok, evergreen gallery forest, 98° 40' E 08° 55' N, altitude 100–200 m, flowers pink, 25 Oct.1990, *K. Larsen et al.* 40904 (AAU! *the longistylous form*)].

Distribution.— Endemic to Thailand. Fig. 2.

Ecology.— Evergreen gallery forest, at 100–200 m alt.

Etymology.— The species is named in honour of Prof. Kai and Supree Saksuwan Larsen, distinguished researchers on the flora of Thailand.

Notes.— The relations of this species are unclear. In the wide infundibular corollas and pubescent leaf it approaches the Indian *O. thomsonii* Hook.f. and *O. lurida* Hook.f. from E Himalaya; in bracts, leaf pubescence, and overall habit it also resembles *O. villosa* Roxb., *O. pedunculata* Schanzer, occurring in NW and W Thailand, and *O. kunstleri* King,

known from two localities at the Thai-Malaysian border., *O. lawrenceana* King et Prain (from northern Myanmar) and *O. thomsonii* (E Himalayan) are similar to this species in possessing an unusual pattern of hairiness, when an altogether rather long and densely hairy plant has almost glabrous peduncles and inflorescence branches.

***Ophiorrhiza pseudofasciculata* Schanzer, sp. nov.** Herba perennis, 250–350 mm alta. Folia supra sparse pilosa pilis appressis, albis, 0.5–1 mm longis, subtus dense vel sparse villosa pilis 0.2–0.3 mm longis. Bracteeae bracteolaeque lineares vel anguste lanceolatae, 5–12 mm longae, pilosae. Ovaria dense hispida. Corolla cylindracea vel anguste infundibuliformis, 8–13 mm longa, extra pilosa pilis 0.1–0.3 mm longis. Plantae heterostylae, fortasse heterodistylae. Flores macrostyli intus dense piloso-anulatis. Stamina supra basi corollae affixa. Antherae infra tubi medium inclusae. Stylus supra antheris anuloque piloso inclusus, apice pilosus, ca. 6–10 mm longus, rami stigmatis rotundati vel elliptici. Flores brevistyli intus sparse piloso-anulatis. Stamina in parte media corollae affixa. Antherae supra tubi medium inclusae vel subexserta. Stylus infra antheris anuloque piloso inclusus, glaber, ca. 4–7 mm longus, rami stigmatis lanceolati. Typus: Thailand, Nan, *J. F. Maxwell* 98-805. (holotypus BKF!; isotypus CMU). Fig. 3.

*Perennial herbs*, stems erect, 250–350 mm long, mostly unbranched; loosely to densely hairy or tomentose throughout or on 1 or 2 opposite sides with hairs more or less appressed, flexuose, white or rusty, 0.3–0.6 mm long. Leaves equal or unequal, ovate to elliptic to broadly lanceolate, 65–160 mm long, 30–70 mm wide, acuminate, cuneate to broadly cuneate at base, darkish to olive-greenish to pale greenish underneath when dry, lateral nerves in 10–12 pairs; scattered hairy with hairs straight or curved, appressed, 0.5–1 mm long, white above, and dense to scattered hairy with hairs curved, mostly appressed, 0.2–0.3 mm long, white below. *Petioles* 4–25 mm long. *Stipules* persistent or caducous, somewhat hairy, narrowly triangular to narrowly subulate, often cleaved at apex, sometimes minute, deltoid or reduced to several glands, 2–9 mm long, 0.5–1.5 mm wide. *Peduncle* 10–40 mm long at anthesis, 20–40 mm long in fruit, densely to loosely hairy throughout or on 1 or 2 opposite sides with hairs spreading or appressed, villous, 0.4–0.5 mm long, white or rusty. *Inflorescence* terminal, thyrsoid, with contracted main axis, composed of ca. 20–45 flowers; inflorescence branches helicoid or scorpioid cymes, very compact in flower and fruit, to 12 mm long, densely hairy throughout or on 1 or 2 opposite sides with hairs 0.3–0.4 mm long. *Bracts and bracteoles* linear to narrowly lanceolate, 5–12 mm long, hairy on surface and margins. *Pedicels* 1–1.5 mm long. *Ovary* densely hispid. *Calyx* lobes lanceolate, longer than wide, ca. 1 mm long. *Flower buds* 8–13 mm long, rounded or slightly angular at the top. *Corolla* cylindrical to narrowly infundibular, white, in upper part of the tube often pink to purple, especially in buds, exterior hairy on both tube and lobes with hairs 0.1–0.3 mm long; lobes upright to recurved, 1.5–2 mm long, scaly from inside. *Heterostylous*, probably distylous. *Longistylous flowers* with 8–12 mm long tube; with a dense ring of hairs inside, and with or without scattered hairs or scales above the hair ring, ring hairs appressed upwards, 0.3–0.6 mm long. Stamens attached above the tube base, well below the hair ring; filaments free, 0.3–0.5 mm long; anthers 2–2.5 mm long, situated below the hair ring, below the tube middle. Style 6–10 mm long, hairy in upper part, situated above anthers; stigma 1–1.5 mm long with roundish to elliptic lobes. *Brevistylous flowers* with 7–13 mm long tube; with a loose ring of hairs inside, ring hairs

perpendicular to walls or appressed upwards, 0.2–0.3 mm long. Stamens attached at the tube middle, at the lower edge of the hair ring or inside it; filaments 6–11 mm long, adnate to the corolla tube wall in the lower part, with free part 3–4 mm long; anthers 2–2.5 mm long, situated above tube middle or half exserted. Style 4–7 mm long, situated below anthers, glabrous; stigma 1.5–2 mm long with lanceolate lobes. *Capsules* laterally flattened, cordate, with straight or slightly concave upper margin, ca. 2.5 mm long; 5–6 mm wide, densely clustered and overlapping in infructescence.

Thailand.— NORTHERN: Chiang Mai [Doi Chiang Dao, Mae Na Lao drainage, 2 Jul. 1953, *Garrett* 1410 (L!, K!); Doi Pui, 6 Oct. 1973, *Bornkud* 37 (BK!); Doi Pui, surroundings of the top, 16 Jun. 1968, *van Beusekom & Phengkklai* 1279 (BKF!, AAU!, L!); Doi Pha Hom Pok, 7 Nov. 1998, *Suksathan* 1423 (QBG!); Huai Maeni, 4 Jun. 1994, *BGO staff* 770 (792) (QBG!); Doi Suthep, Phuphing Palace/village area, 29 Jun. 1988, *Maxwell* 88-819 (BKF!, AAU!); Chiang Rai [along Nam Mae Kok about 15 km west of Chiang Rai, 23 Sept. 1967, *Iwatsuki et al.* 10872 (BKF!); below the summit of Doi Pha Hom Pok, NW of Phan, 13 Sept. 1967 *Iwatsuki et al.* 9669 (BKF!, L!); Doi Tung, 26 Sept. 1967, *Iwatsuki et al.* 11165 (BKF!, L!); Doi Thung, en route from Ban Huai Khrai to Wat Doi Tung, 24 Sept. 1967, *Iwatsuki et al.* 10977 (BKF!, L!); Payao interior of Ban Lang Lat, along the upper course of Nam Mae Lao, 25 Dec. 1965, *Iwatsuki & Fukuoka* 3482 (BKF!); Nan [distr. Ban Luang, Ban Bi Subdistrict, Doi Pha Chang Wildlife Sanctuary, southern tip, Huai Fai Station, along Huai Fai stream, altitude 450 m, shaded places in soil, near the stream; mixed, primary, evergreen + deciduous, seasonal, hardwood forest with bamboo, shale bedrock, 4 Aug. 1998, *Maxwell* 98-805 (holotype - BKF!, isotype - CMU); Doi Phu Kha National Park, 25 May 2000, *Srisanga* 1402 (QBG!); Doi Phukha National Park, Pua distr., 25 km on Bo Kluea rd., 16 Sept. 1999, *Puff* 990916-1/1 (QBG!, WU)]; Lampang [distr. Mueang Bahn (Pan), Chae Son National park, Mae Chae (Yae) Yao Village, at the falls, 23 Aug. 1996, *Maxwell* 96-1120 (BKF!, CMU)]; Lampang/Payao [distr. Wang Nua/Mueang; Doi Luang National Park, 2 Jul. 1998, *Maxwell* 98-714 (BKF!, CMU)]; Loei [Phu Luang, 29 Jun. 1954, *Smitinand* 1747 (BKF!, L!); Mae Suai, 20 Jul. 1967, *Bunchuai & Nimanong* 1410 (BKF!)].

Distribution.— Endemic to N & NE Thailand; Fig. 2.

Ecology.— Shady places along streams and waterfalls in primary evergreen forests altitude 500–2,000 m, often on granite bedrock.

Etymology.— The specific name is based on the close resemblance between this species and the NE Indian *O. fasciculata*.

Notes.— This species is undoubtedly very close to *O. fasciculata*, a species known from NE India, Nepal and Bhutan (cf. map, Fig. 2, based on the specimens cited below). *O. pseudofasciculata* can be distinguished from *O. fasciculata* by much longer (0.4–1.2 mm) hairs on stems, inflorescence branches, and leaves, the underside of the leaf being hairy not only along nerves but throughout its surface; longer (to 12 mm long) and usually narrower inflorescence bracts; corolla tubes with well developed ring of hairs 0.3–0.6 mm long; and much longer filaments (to 3–4 mm long) in brevistylous flowers. It could be regarded as a geographical race of the latter, however, due to the constancy of the mentioned differences I think it is better to recognize it as a separate species. The species is widely distributed in N and NE Thailand.

Specimens of *O. fasciculata* G. Don examined for comparison with *O. pseudofasciculata*:

Bhutan.— 5 km N of Deothang, 22 Jun. 1979, *Grierson & Long* 2161 (K!).

India.— Bailadila, Bastar State, 8 Oct. 1940, *Mooney* 1491 (K!); Orissa, Koraput distr., Bhalupodar, Pottangi, 13 Jul. 1950, *Mooney* 3886, K; Orissa, Goyal-khaj Ghati, near Gunpu, S. Kalahandi, 16 Jul. 1949, *Mooney* 3501 (L!, K!); Orissa, in Bonai State, near Toda, 24 Nov. 1940, *Mooney* 1618 (K!); East Himalaya Herb., *Griffith* 2855 (K!); Assam, Khasia hills distr., King's coll. (K!); Mohargari, Kumaon, *Starchey & Winterbottom* (K!); Kafkote, Almorah, 29 Jul. 1900, *Duthie* (K!); Khasia, 11 Jan. 1850, *anonymous* (K!); Khasia, 8 Oct. 1850, *Hook. & Thomson* (K!, L!); Khasia, 11 Jul. 1850 *Hooker & Thomson* 1622 (K!, L!); Morong hills, 18 Jun. 1810, *anonymous* 6230B (K: Herb. Wall.!); Near Parewa, Kotah range, Garhwal Don, 14 Jun. 1902, *Duthie* 25908 (K!); Neterhat, *Haines* 4673 (K!); Rungbee, Darjeeling, 11 Aug. 1869, *Clarke* 8566 (K!); Rungbee, Darjeeling, 2 Aug. 1870, *Clarke* 12282B (K!); North Cachar Hills, Surma valley branch Indian tea association, *anonymous* 34 (K!); Darjeeling, 11 Aug. 1875, *Clarke* 26936C (K!); Drajeeling, Dalighas, from Chonkoley, 21 Aug. 1923, *Cowan* (K!); Gurhwal, *Falconer* 517 (K!); Garhwal, Ukhimath, 17 Aug. 1968, *Rau* 38770 (L!); Bamunfrohi, 26 Jul. 1876, *Gamble* 866A (K!); Bamunfrohi, Terai, E. Himalaya, Sikkim, 26 Jul. 1876, *Gamble* 866B (K!); Bengal (Sikkim), Kalunhung, *Gamble* 10479 (K!); Mongpo, Sikkim 5 Oct. 1884, *Clarke* 36207B (K!); Sikkim, *anonymous* (K!); Sikkim Mts., 6-7000 ft., *Hooker* (K!, L!); Sikkim, Jeven, *Hooker* (K!, L!).

Nepal.— Napalia, 1821, *H. B.* 6228A & B (K: Herb. Wall.! & general Herb.!); Nepal, 1821, *Wallich* (K!).

***Ophiorrhiza longifloriformis*** Schanzer, **sp. nov.** Herba perennis, 300–400 mm alta, caulibus glabris. Folia glabra margine brevissime pilosula. Pedunculus 45 mm longus, sparse pilosus. Bractee bracteolaeque lineares vel anguste lanceolatae, 3–12 mm longae, glabrae. Ovaria brevissime pubescentia vel glabra. Corolla cylindracea vel anguste infundibuliformis, extra glabra, 14–15 mm longa. Flores homostyli, tubis intus sparse piloso-anulatis. Stamina ad corollae faucis affixa. Antherae 2 mm longae, subexsertae. Stylus inter antheris anuloque piloso inclusus vel exsertus, glaber, ca. 16 mm longus, rami stigmati elliptici. Typus: Thailand, Trat, *Murata, Fukuoka & Phengklai* 17402 (holotypus BKF!; isotypus KYO). Fig. 4.

*Perennial herb*, stems erect, 300–400 mm long, unbranched, glabrous. *Leaves* equal, elliptic to broadly lanceolate, 200–230 mm long, 60–70 mm wide, acuminate, with cuneate base, olive-green underneath when dry, with 14–16 pairs of lateral nerves, glabrous on both sides except for few short hairs along margins. *Petioles* 10–30 mm long. *Stipules* caducous, glabrous, narrowly triangular, ca. 4 mm long, 1–1.5 mm wide. *Peduncle* 45 mm long at anthesis, loosely hairy with hairs spreading to appressed, straight rusty, ca. 0.1 mm long. *Inflorescence* terminal, thyrsoid, with contracted main axis, composed of ca. 50 flowers; inflorescence branches helicoid or scorpioid cymes, elongate during anthesis, to 20 mm long, densely to loosely hairy on 1 or 2 opposite sides with hairs 0.05–0.1 mm long. *Bracts and bracteoles* linear to narrowly lanceolate, 3–12 mm long, glabrous. *Pedicels* 0.5–2.5 mm long. *Ovary* pubescent as on the pedicel to minutely scaly to glabrous. *Calyx* lobes 0.5 mm long, deltoid, length (sub)equal to width. *Flower buds* 16–17 mm, apically rounded to slightly angular, or with small conical appendages at the tip. *Flowers* homostylous. *Corolla*

white (?), cylindrical to narrowly infundibular, exterior glabrous. Corolla lobes ca. 2–2.5 mm long, scaly inside; tube 14–15 mm long, interior hairy, with loose ring of hairs and scattered hairs or minute scales above the hair ring, ring hairs perpendicular to walls, 0.5–0.6 mm long. Stamens attached at tube throat; filaments (free part) 0.6–0.7 mm long; anthers ca. 2 mm long, half exserted. Style ca. 16 mm long, situated at the level of the anthers, or exserted, glabrous; stigma 1–1.5 mm long, with elliptic lobes. *Capsules* immature, laterally flattened, rhomboid in outline, with convex upper margin.

Thailand.— SOUTH-EASTERN: Trat [Ko Chang, in evergreen forest, near sea level, 2 Aug. 1973, *Murata, Fukuoka & Phengkklai* 17402 (holotype BKF!, isotype KYO)].

Distribution.— Endemic to S.E. Thailand. Fig. 2.

Ecology.— Evergreen forest.

Etymology.— The specific name is based on the long corollas, characteristic of this species, and its resemblance to *O. longiflora* Blume from Java.

Notes.— The species is known from the type specimen only. Its relations are not clear. Superficially it most closely resembles *O. nutans* Ridl. from Sumatra from which it differs in erect inflorescences and unwinged corollas. In large corollas it resembles also *O. ixora* Ridl. from W Sumatra and *O. longiflora* Blume from Java, as well as *O. umbricola* W.W. Sm. and *O. ripicola* Craib from Upper Myanmar and NW Thailand, differing from them in narrower bracts, and completely glabrous vegetative parts. This entire species group possesses very large pollen grains (ca. 0.05 mm diam.) which may be indicative of their possibly polyploid nature. It must also be noted that the specimen bears no open flowers. Even half-fallen corollas are still closed, which may indicate cleisto- or at least autogamy.

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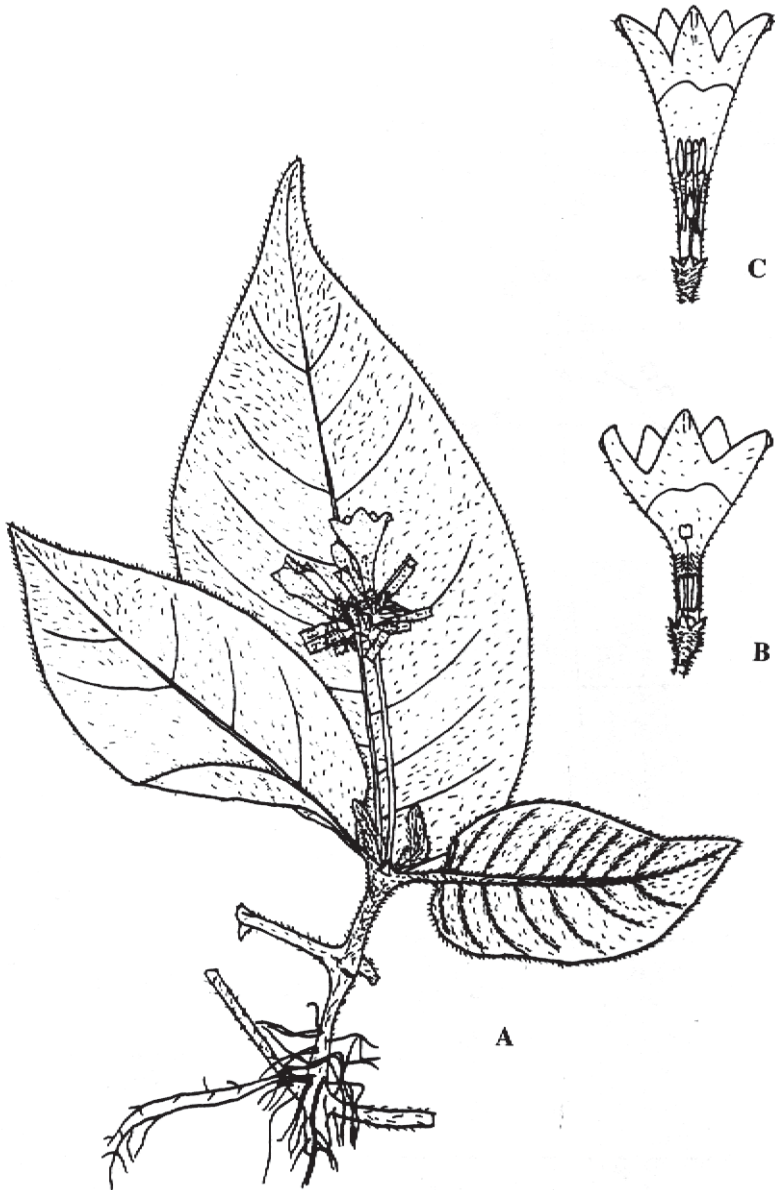


Figure 1. *Ophiorrhiza larseniorum* Schanzer: A. habit; B. longistylous flower; C. brevistylous flower. Scale bar 1 cm.

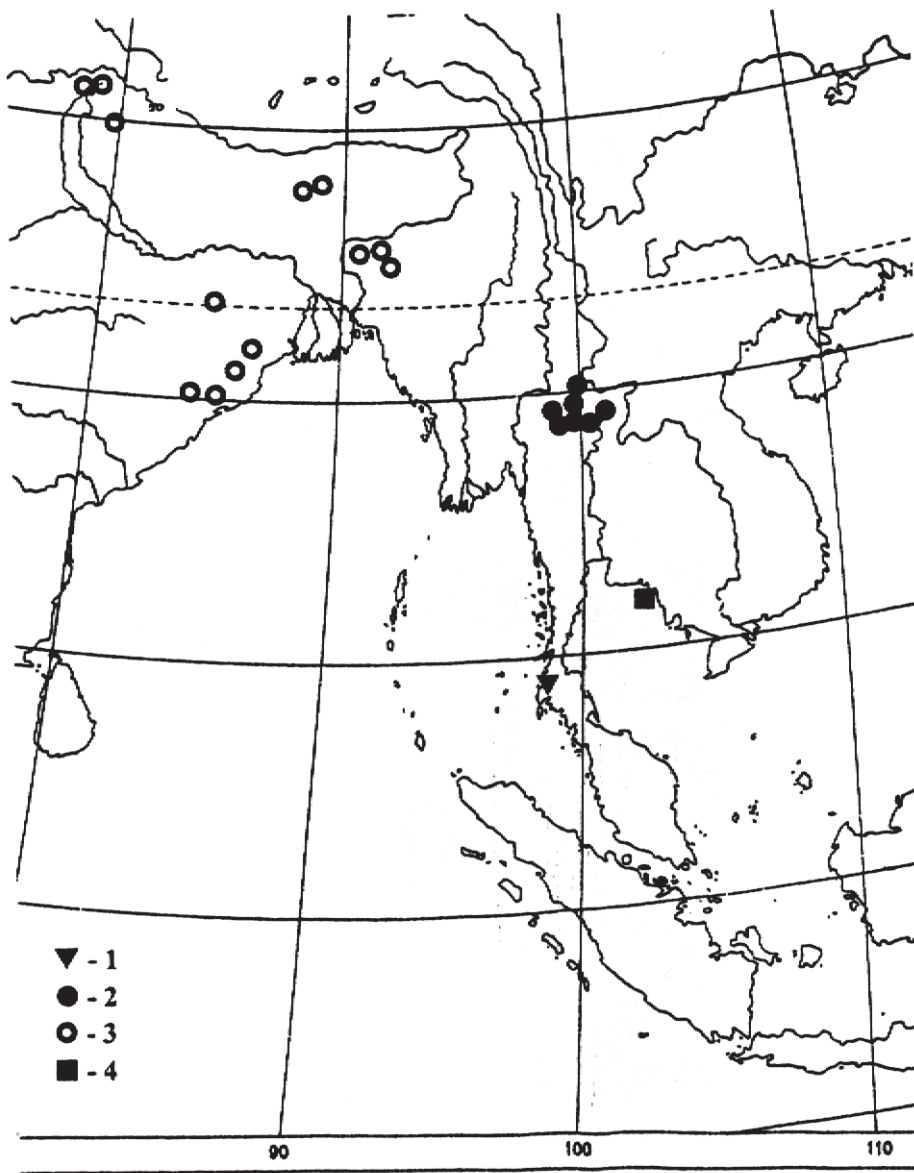


Figure 2. Distribution of: 1. *O. larseniorum*; 2. *O. pseudofasciculata*; 3. *O. fasciculata*; 4. *O. longifloriformis*.



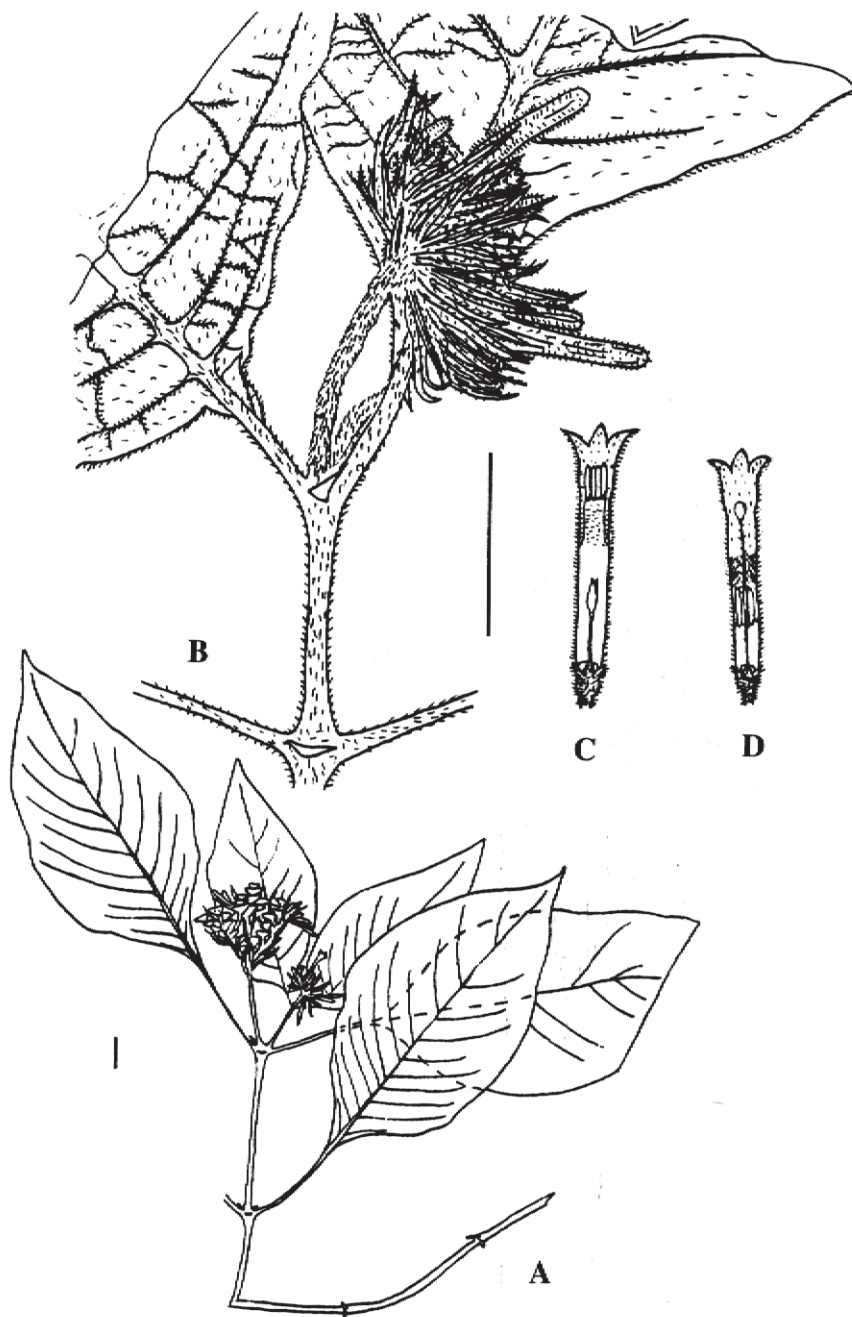


Figure 3. *Ophiorrhiza pseudofasciculata* Schanzer: A. habit; B. inflorescence; C. brevistylous flower; D. longistylous flower. Scale bar 1 cm.

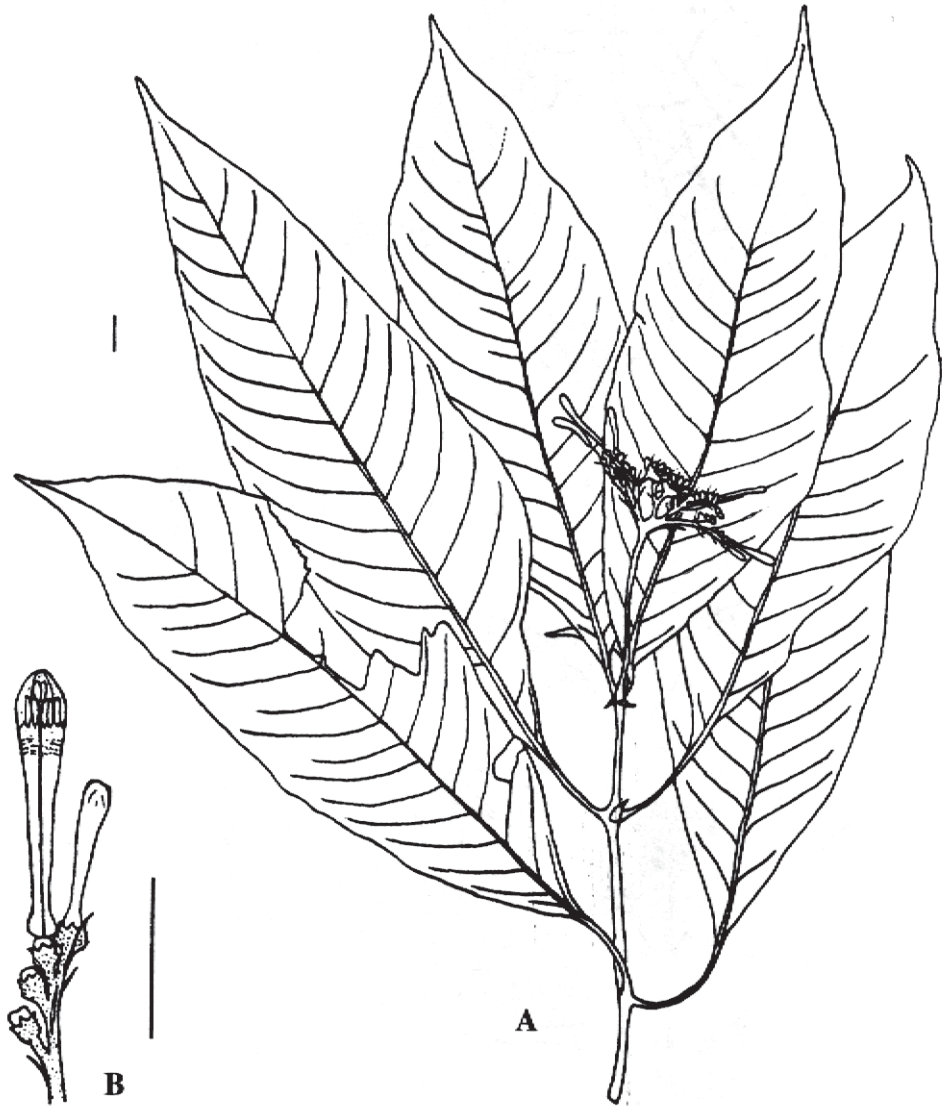


Figure 4. *Ophiorrhiza longifloriformis* Schanzer: A. habit; B. inflorescence branch with flower buds. Scale bar 1 cm.