

A new species of *Gastrodia* (Orchidaceae) from Hainan Island, China and its conservation status

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A new species, *Gastrodia longitubularis* Q.-W. Meng, X.-Q. Song & Y.-B. Luo from Hainan Island, southern China is described and illustrated. This is the first species of *Gastrodia* recorded from Hainan Island. Diagnostic characters, description, detailed illustration and taxonomic comments are given. This species is closely related to *G. gracilis*, which is characterized by tuberous rhizome with flesh roots, lax inflorescence and nearly united perianth tube. *Gastrodia longitubularis* distinctly differs from *G. gracilis* by having slender, glabrous, long perianth tube, horizontal or slightly downward bending flowers. The habitat was investigated in detail and its conservation status was assessed as a critically endangered EN (B2a, C2a) according to the IUCN threatened category criteria based on data from five years' observations.

The genus *Gastrodia* R. Br. (Orchidaceae) contains saprophytic orchids distributed in warm areas of Madagascar, tropical Asia, Oceania, Japan and China (Jones 1991, Seifenfaden 1992, Leou 2000). It is a small genus of 16–31 species, characterized by a fleshy tuber or coralloid underground stem, absence of leaves, union of sepals and petals and two mealy pollinia without caudicles (Dressler 1993, Seifenfaden and Wood 1995, Leou 2000, Chung and Hsu 2006). Despite clear diagnostics and readily recognized characters, most *Gastrodia* species are unknown to botanists.

During a botanical orchid expedition to Hainan Island, southern China, an unknown species of *Gastrodia* was collected from the tropical mountain rain forest. In general appearance, this species is similar to *G. gracilis* Blume distributed in Taiwan and Japan, but the morphological anatomy of floral organs and a careful field observation on its habitat have revealed that it is easily distinguished from *G. gracilis* by having a slender, glabrous, long perianth tube, horizontal or slightly downward bending flowers, and thus represents an undescribed species.

Material and methods

Living plants of the *Gastrodia longitubularis* were collected in the field, and its habitat and population size was investigated during the years 2002 to 2006. Herbarium specimens of *G. gracilis*, *G. menghaiensis*, *G. tuberculata* and *G. wuyishanensis* deposited in PE were investigated for comparison.

The conservation status of *G. longitubularis* was assessed according to the World Conservation Union (IUCN) red list category criteria (IUCN 2001).

Gastrodia longitubularis Q.-W. Meng, X.-Q. Song & Y.-B. Luo sp. nov. (Fig. 1)

Herba saprophytica erecta; rhizoma tubulosum, radicibus carnosis; caulis erectus, gracilis, sparsim nodosus, vaginatus. Inflorescentia laxa, 2–6-flora. Flores tubulares glabri, horizontales vel plus minusve reflexi, 1.6–1.8 cm longi, 6–8 mm in diametro; sepala petalaeque in tubum longum connata. Columna stricta, stigma basi rotundatum. Forma et habitu Gastrodiae gracili affinis, sed perianthii tubo glabro longiore, floribus horizontalibus vel plus minusve reflexis differt.

Type: China, Hainan: Ledong County, 19°00'N, 109°06'E, alt. 876–913 m, 14 May 2006, Q.-W. Meng & X.-Q. Song 2006051402 (PE holotype, PE isotypes).

Saprophytic terrestrial herb. Rhizome tuberous, horizontal, cylindrical or digitate, 4–7 cm long, 3–6 mm thick, usually with 3–5 roots emerging from the neck. Stem erect and slender, 10–24 cm tall, 1–2 mm thick, distantly noded and sheathed. Inflorescence a raceme, laxly 2–6-flowered, 1–3.5 cm long; bracts minute, erect, lanceolate-ovate, deep brown, apex acuminate, 6 × 3 mm. Flowers tubular, gray-brownish, 1.6–1.8 cm long, 6–8 mm in diameter, horizontally spreading or slightly bending downwards pedicel and

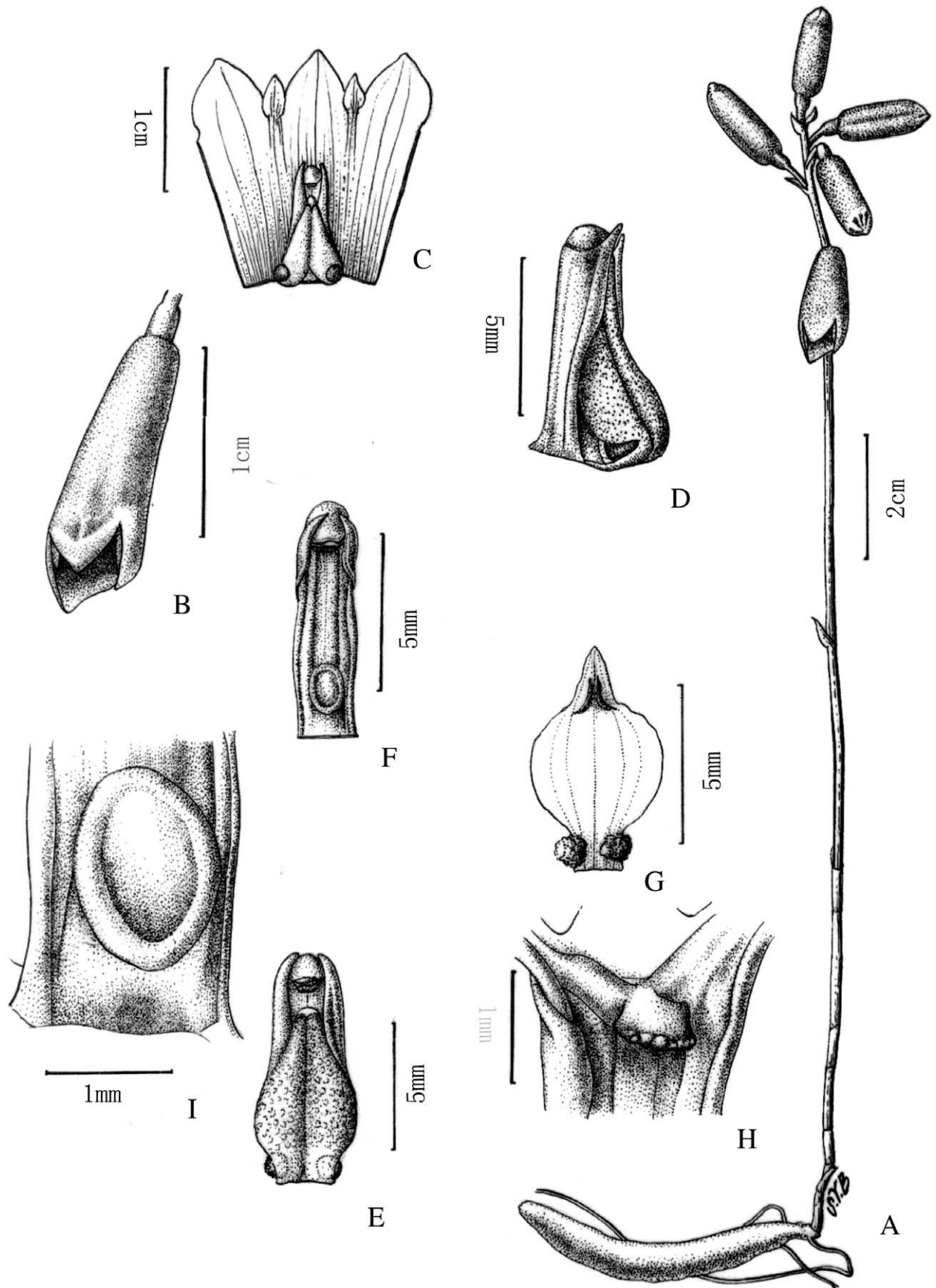


Fig. 1. *Gastrodia longitubularis* Q.-W. Meng, X.-Q. Song & Y.-B. Luo. (A) habit, (B) flower, view from above, (C) perianth tube, dissected and extended, (D) column and labellum, side view, (E) column and labellum, front view, (F) column, front view, (G) labellum, (H) rostellum, (I) stigma.

Table 1. Morphological comparison of *Gastrodia longitubularis* and related species.

Character	<i>G. longitubularis</i>	<i>G. gracilis</i>	<i>G. menghaiensis</i>	<i>G. wuyihshanensis</i>
Rhizome	tuberous	tuberous, pilose	tuberous	tuberous, slightly noded
Rhizome size (cm)	4–7 × 0.3–0.6	2–10 × 0.3–1.5	1–2.5 × 0.5–1	1.5–2 × 0.6–0.8
Roots	3–5 long, slender roots from neck of tuber	several roots from neck of tuber	adventitiously from tuber	several fleshy roots
Flower position	horizontal or slightly bending	nodding	sub-erect	slightly nodding
Flower color	gray–brownish	dull brownish	white	brownish
Perianth tube	glabrous, slender, margin entire	glabrous, ventricose, margin undulate	glabrous, slender, margin undulate	glabrous
Perianth tube size (cm)	1–1.5 × 0.6–0.8	0.8–1.0 × 0.5–0.7	0.8–1.2 × 0.5	0.6–0.9 × 0.4–0.6
Labellum	red or orange–red; ovate or cordate	red or orange–red; ovate–triangular	upper part broadly ovoid, lower part to base linear	white, rhombic–ovate
Stigma	near base of column	near middle of column	not seen	not seen
Pedicel and ovary	non-elongated in fruit	greatly elongated in fruit	elongated in fruit	not seen

ovary about 8–10 mm long; sepals connate, forming a tube, glabrous outside, margin entire, apex trilobed, free lobes slightly curved inwards, about 2–3 mm long, tubular part 1–1.5 cm long; petals attached to sepal tube, elliptical, ovate or sub-rotundate, 3–3.5 × 2.2–2.5 mm; lip adnate to column foot, red or orange–red towards apex, unlobed, ovate or cordate, 6 × 4–5 mm, margin minutely undulate or entire, apex longly cuspidate, base with a long claw, 2 subglobose calli occurring on claw, adaxial surface of lip longitudinally 3–5-grooved, a pair of longitudinal lamellae near apex, lamellae about 1 mm tall, parallel towards apex, longitudinally deeply grooved at the middle part of abaxial surface; column straight, longer than lip, 6–7 mm long excluding column foot, laterally winged towards apex, the prominent above column acute triangular, about 0.8–1.2 mm; column foot distinct; anther cap scutellate, pollina 2 ovoid; stigma distinct, near base of column, rounded, about 1 mm in diameter; rostellum revolute, pedate, apex papillate, about 0.5 mm tall. Fruit capsule, obvoid, 1.2–1.5 cm, pedicel and ovary not elongated in fruit. Flowers in April to June, fruiting during May to July.

Habitat and ecology

Gastrodia longitubularis grew in a thick litter-fall layer with rich organic matter under the tropical mountain rain forest, which is composed of trees of *Aquilaria sinensis* (Lour.) Gilg, *Cryptocarya maclurei* Merr., *Cryptocarya metcalifiana* Allen, *Garcinia oblongifolia* Champ., *Helicia formosana* Hemsl., *Lasianthus chinensis* Benth., *Magnolia paenetaula* Dandy, *Microcos paniculata* L., *Peristrophe montana* Nees, *Pterospermum heterophyllum* Hance, *Reevesia longipetiolata* Merr. & Chun, *Taxotrophis ilicifolius* Vidal, *Xanthophyllum hainanense* Hu, and shrub of *Daemonorops jankinsianus* Mart., *Ixora hainanensis* Merr., *Lasianthus cyanocarpus* Jack, *Psychotria rubra* (Lour.) Poir. Under the heavy shade of woodlands, *Gastrodia longitubularis* usually becomes a unique species. It usually grows as a small cluster of 3–5 individuals and occurs at altitudes from 876–913 m.

Range

A local endemic species; *Gastrodia longitubularis* is currently only found in Ledong County, Hainan Island, southern

China. It is the first species of *Gastrodia* recorded in this region.

Conservation status

We saw photos of this species in 2002, and then searched for it in the field. Up to now, only one locality with about 100 plant individuals of *Gastrodia longitubularis* has been found to occur in an area of 1 km². According to IUCN red list categories (IUCN 2001) criteria, this species is categorized as a critically endangered EN (B2a, C2a). Fortunately, this locality is in a remote place in the Bawang Ling Natural Reserve.

Taxonomic discussion

Gastrodia longitubularis is referable to *Gastrodia* because of its tuberous rhizome, absence of leaves, nearly complete union of sepals and petals, and two mealy pollinia without caudicles. In general appearance, *Gastrodia longitubularis* is most similar to *G. gracilis*, which is characterized by having tuberous rhizome with roots, lax inflorescence and nearly united perianth tube. However, *G. menghaiensis* Z.-H. Tsi and *G. wuyihshanensis* D.-M. Li & C.-D. Liu may also be its allies.

Gastrodia longitubularis differs from *G. gracilis* by having a slender, glabrous, long perianth tube, horizontal or slightly downwards bending flowers and stigma close to the base of the column. It is distinguished from *G. menghaiensis*, a species with white flowers, by having gray–brownish flowers. The newly described species is different from *G. wuyihshanensis* (Li and Liu 2007) in having a long perianth tube, gray–brownish flowers and ovate or cordate labellum. In the latter species, the perianth tube is shorter, the flowers are white and the labellum is rhombic–ovate. For a detailed comparison of morphological characters between *G. longitubularis* and its related species, see Table 1.

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