



## NOTE

## Four new additions and a taxonomic amendment to the orchid flora of Hong Kong

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**ABSTRACT:** Four new additions to the orchid flora of Hong Kong are reported: *Calanthe* × *dominyi*, *Chrysoglossum assamicum*, *Gastrodia clausa* and *Liparis sootenzanensis*. Full descriptions, analytical plates and notes on nomenclatural history, affiliations, occurrence, ecology and global conservation status are provided. Type status for *Calanthe* × *dominyi* is validated. In addition, the taxonomy of *Vanilla shenzhenica* is reviewed, leading to the recognition of distinct morphological characters that warrant its separation from *V. somae*, with which some authors have considered it synonymous.

**KEY WORDS:** Conservation assessment, Indo-Burma Biodiversity Hotspot, insular East Asia, new record, Orchidaceae.

### INTRODUCTION

Despite its limited land area of just 1106 km<sup>2</sup> and long history of botanical exploration that dates back to 1816 (Xing *et al.*, 1999), knowledge of Hong Kong's flora remains incomplete. More than 40 new records and new species - including ferns, myco-heterotrophic herbs, shrubs, lianas and canopy trees - have been added to the official list of 2175 native plants (Hong Kong Herbarium, 2012) in the last eight years alone (Gale *et al.*, 2013; Hu *et al.*, 2014; Kumar *et al.*, 2014; Tong *et al.*, 2014; Mar and Saunders, 2015; Zhu *et al.*, 2018; Kumar and Gale, 2020; Liu *et al.*, in press; Wang and Jiang, 2020). In addition to furnishing increasingly comprehensive information on the flora itself, these discoveries help place the territory's ecology and conservation priorities in a regional context (Nichol *et al.*, 2017). Thus, Hong Kong's vegetation is now viewed as part of a transitional evergreen forest belt that spans South China and northern Indochina, a region coincident with a significant portion of the Indo-Burma Biodiversity Hotspot (Tordoff *et al.*, 2012), reflecting its marginal tropical location, rugged topography and monsoon-driven climate (Dudgeon and Corlett, 2004). Fragmented and modified by millennia of degradation, Hong Kong's forests have undergone considerable recovery over the last 70 years, due to a combination of natural regeneration, afforestation and protection (Abbas *et al.*, 2016; 2019). Even so, many of the newly documented taxa occur as small, isolated populations, with scant evidence of expansion.

The Orchidaceae are among Hong Kong's largest

and most diverse families of flowering plants (Hong Kong Herbarium and South China Botanical Garden, 2011), with 131 native species representing all five orchid subfamilies (Barretto *et al.*, 2011; Gale *et al.*, 2013; 2014; Hu *et al.*, 2014; Kumar *et al.*, 2014; Kumar and Gale, 2020). The majority of these species exhibit a distinct Indo-Burmese biogeography (Gale *et al.*, 2014), consistent with the regional affiliation of Hong Kong's flora as a whole. Here we report a further four native orchids newly discovered during the course of field surveys over the last five years: *Calanthe* × *dominyi*, *Chrysoglossum assamicum*, *Gastrodia clausa* and *Liparis sootenzanensis*. Whilst *C. assamicum* and *L. sootenzanensis* reinforce the territory's strong phytogeographic connection with the Indo-Burma region, *C. × dominyi* and *G. clausa* are species of insular East Asia that are recorded in continental Asia for the first time. All four are confined to just one or two isolated populations in Hong Kong, underscoring their precarious local status. Descriptions based solely on the novel Hong Kong material are presented, together with notes on nomenclatural history, affiliations, occurrence, ecology and global conservation status following IUCN guidelines (IUCN Standards and Petitions Committee, 2019); extent of occurrence (EOO) and area of occupancy (AOO, using 2 × 2 km grid cells) were calculated using GeoCAT (Bachman *et al.*, 2011). In addition, we report the findings of a taxonomic reappraisal of *Vanilla shenzhenica*, another native Hong Kong orchid, revealing clear morphological characters to distinguish it from the Taiwanese *V. somae*, under which it has been synonymised.



## TAXONOMIC TREATMENT

### NEW RECORDS

1. *Calanthe* × *dominyi* Lindl., Gard. Chron. 1858: 4 (1858). **Type:** Icon, *del.* W.H. Fitch in Curtis's Botanical Magazine 84: t.5042 (1858) (neotype, designated here).

Robust, tufted terrestrial herb up to 90 cm tall. Pseudobulbs tightly clustered along stout rhizome, conical, 2–4 cm tall, several noded, enclosed in overlapping leaf bases, each bearing 2–7 leaves. Leaves basal, clustered, elliptic, 24–47 cm long, 5–12 cm wide, acute, plicate, papery, dark green to greyish-green, glabrous above, sparsely puberulent to pubescent below, tapering into a grooved petiole-like stalk up to 9 cm long at base. Inflorescences 1 or 2 per plant, emerging laterally from nodes on pseudobulb, erect, sometimes sinuous, cylindrical, 45–85 cm long, light green, finely pubescent, bearing 3–5 scattered sheathing sterile bracts, with a crowded raceme of 28–40 flowers at apex; floral bracts prominent, persistent, ovate, 2–3 cm long, 1–1.5 cm wide, acuminate, light green. Flowers opening widely, ca. 4 cm across, finely puberulent outside, white flushed mauve, with a prominent orange and red callus on the labellum; pedicel and ovary spreading, slender, 3.5–4 cm long, white flushed green; dorsal sepal ovate, 16–18 mm long, 7–8 mm wide, apex acute; lateral sepals elliptic-obovate, oblique, 18–20 mm long, 5.5–7.5 mm wide, apex acuminate-apiculate; petals obovate, 16–18 mm long, 7–8 mm wide, apex rounded-apiculate; labellum obovate-flabellate, 3-lobed, 17–19 mm long, 16–20 mm wide, with an ascending spur 3–3.5 cm long at base; side lobes placed a short way above the base, oblong, slightly oblique, 6–8 mm long, ca. 2.5 mm wide, apex rounded; mid-lobe deeply divided into 2 diverging, flabellate-truncate lobules, each 7–8 mm long and 6–8 mm wide; disc bearing a callus of 3 tubercular ridges in between the side lobes; column stout, 5–6 mm long, thickened at apex; anther ovoid; pollinia 8 in 2 groups of 4, clavate, attached to single obovoid viscidium; stigma concave. Capsule ellipsoid, 3–4 cm long. (Fig. 1).

**Phenology.** Flowering in July and August in Hong Kong.

**Habitat.** Growing in deep shade on moist slopes in evergreen hill and montane forest at 400–800 m elevation.

**Global distribution.** SE China (Hong Kong S.A.R.), SW Japan (Kagoshima Prefecture, Okinawa Prefecture) and Taiwan (Chiayi County, Hualien County, Pingtung County, Taipei City, Taitung County).

**Specimens examined.** CHINA, Hong Kong S.A.R., Lantau Island, Sunset Peak, 9 August 2015, *S.W. Gale SG1359* (KFBG). JAPAN, Kagoshima Prefecture, Tokunoshima Island, Isen-cho, 29 December 1987, *Harui s.n.* (TNS8504288) (TNS); Kagoshima Prefecture, Yakushima Island, Yaku-cho, 27 July 1991, *Kanda & Hanei s.n.* (TNS8504290) (TNS); Okinawa Prefecture, Okinawa Island, Kunigami-son, 17 June 1993, *Harui s.n.* (TNS8504286) (TNS); Okinawa Prefecture, Okinawa Island, Kunigami-son, 24 July 1951, *Amano 6634* (TNS264857) (TNS); Okinawa Prefecture, Okinawa Island, Motobu-cho, 30 May 1993, *Harui s.n.* (TNS8504292) (TNS);

Okinawa Prefecture, Iriomote Island, Taketomi-cho, 12 September 1982, *Kanda & Hanei s.n.* (TNS8504291) (TNS). TAIWAN, Hualien County, Taroko to Tatung, 800 m elevation, 31 May 2014, *P.-F. Lu 26710* (TAIF449350) (TAIF).

**Notes.** *Calanthe* × *dominyi* is a hybrid formed between *C. masuca* and *C. triplicata*. It was first produced artificially in 1854 by John Dominy, foreman at Messrs Veitch & Son's nursery in the U.K., and is the earliest documented example of a successfully flowered manmade orchid hybrid (Lindley 1858; Clayton and Cribb 2013). Although Lindley (1858) did not cite a specimen, “names of nothotaxa at the rank of species or below must conform with the provisions of the *Code*”, including nomination of a type (Turland *et al.*, 2018, Article H.10). The illustration that appeared in *Curtis's Botanical Magazine* the same year (Hooker, 1858) was of a plant from Veitch's nursery and is accompanied by a description in Latin and text that directly cites Lindley's article, and therefore seems a fitting neotype (Turland *et al.*, 2018, Article 9.8; Fig. 2). *Calanthe* × *dominyi* has since been found occurring naturally throughout Taiwan (Su, 2000) and is also known from several sites in southwest Japan (T. Yukawa pers. comm.). This is the first record of the entity in continental Asia.

Both *C. masuca* and *C. triplicata* occur at scattered locations in Hong Kong (Barretto *et al.*, 2011; Gale *et al.* 2014), and the hybrid has now been confirmed at two sites, one at high elevation on Lantau Island, in the vicinity of which both parental species grow, and the other at mid-elevation in the central New Territories, in the vicinity of which neither has been recorded. Sterile plants at the first site resemble *C. masuca*, with shorter, glossy green leaves that are pubescent beneath, whereas those at the second site more closely resemble *C. triplicata*, with longer, greyish-green leaves that are only sparsely puberulent beneath. Both have an inflorescence that bears prominent, persistent floral bracts, much like *C. triplicata*. The flowers, however, are unmistakably intermediate, being smaller than those of *C. masuca* but larger than those of *C. triplicata*, ranging in colour from white flushed mauve to pale violet, but never the bold pink or pure white of either parent. The labellum lobules are both broadly flabellate, like those of *C. masuca*, and widely divergent, like those of *C. triplicata*. Further, the callus at the base of the labellum is a combination of the red and orange colouration typical of either parent.

In Hong Kong, *C. triplicata* typically flowers from late June to late July, whereas *C. masuca* flowers from August to September, but it is conceivable that in some years the respective flowering periods overlap. Capsules have been seen on the hybrid, suggesting that it is pollinated here. It remains an open question whether the hybrid arose spontaneously in Hong Kong, and if so, on how many occasions, or if hybrid seed dispersed into the territory from elsewhere.

**Conservation status.** The IUCN Red List guidelines (IUCN Standards and Petitions Committee, 2019) do not



**Fig. 1.** *Calanthe x dominyi*. **A.** Plant in habitat. **B.** Close-up of flower. **C.** Flower (side view). **D.** Dorsal sepal. **E.** Petal. **F.** Lateral sepal. **G.** Labellum. **H.** Column (dorsal view). **I.** Column (side view). **J.** Column (ventral view). **K.** Anther cap with pollinarium. **L.** Pollinarium.



**Fig. 2.** Walter Hood Fitch's plate of *Calanthe x dominyi*, drawn from plants of known parentage and raised in the nursery of Messrs Veitch & Son, is selected here as neotype for the name. Reproduced from *Curtis's Botanical Magazine* Vol. 84 (1858) t. 5042.

provide for the assessment of hybrid taxa. The two parental species are very widespread in tropical Asia, and Hong Kong lies well within the native range of both. Indeed, given the occurrence and abundance of both *Calanthe masuca* and *C. triplicata*, it is surprising that the hybrid is not more widely reported.

2. *Chrysoglossum assamicum* Hook.f., *Fl. Brit. India* 5: 784 (1890); *Collabium assamicum* (Hook.f.) Seidenf., *Opera Bot.* 72: 24 (1983 publ. 1984); *Collabiopsis assamica* (Hook.f.) S.S.Ying, *Coloured Illustr. Orchid. Fl. Taiwan* 2: 456 (1990). **Type:** India, Assam, *Griffith 1233/1322* (K – holotype, W – isotype).

*Chrysoglossum sinense* Mansf., *Repert. Spec. Nov. Regni Veg.* 27: 295 (1930). **Type:** China, Guangxi Province, Pingnan County, Yao Shan, April 1929, *S.S. Sin 8090* (B – holotype $\dagger$ , PE – isotype).

Terrestrial herb up to 90 cm tall. Rhizome creeping, cylindrical, 3–12 mm in diameter, dark olive-green,

irregularly many-noded, each internode 2–11 mm long and producing 1 wiry root up to 9 cm long, each node bearing the remnants of a caducous papery sheath. Pseudobulbs placed at 2–5 cm intervals along the rhizome, cylindrical to narrowly conical, dark olive-green, either vegetative (leaf-bearing) or generative (inflorescence-bearing); vegetative pseudobulbs 2.5–5 cm long, 0.5–1.3 cm in diameter, enclosed in fibrous sheath; generative pseudobulbs 1–3 cm long, 0.4–0.8 cm in diameter. Leaf solitary, elliptic-lanceolate, 14–35 cm long, 4–10 cm wide, papery, plicate, prominently veined, base cuneate, apex acuminate-acute, dark green, borne on a slender petiole-like stalk 3–9.5 cm long. Inflorescence erect, 40–90 cm long, terete, dark purplish-brown flushed green, bearing 2 or 3 scattered sterile bracts, laxly 10–24-flowered, arching slightly or curved downwards at apex; floral bracts narrowly triangular, 12–16 mm long, apex acuminate. Flowers patent, opening widely; pedicel and ovary curved, 15–18 mm long, 2–3 mm in diameter, light green; sepals and petals pale yellowish-green flushed white at base with purple flecks and blotches; dorsal sepal linear-oblong, curving forwards, 14–17 mm long, 2.5–3.2 mm wide, apex acute-acuminate; lateral sepals linear-oblong, falcate, 17–19 mm long, 2.3–2.8 mm wide, slightly expanded and attached to column-foot at base, lower margin somewhat in-rolled, deflexed towards apex, apex acute; petals oblong, falcate, 16–19 mm long, 4.5–5 mm wide, arching over the column, slightly reflexed towards apex, apex obtuse; labellum broadly oblong-ovate, 12–14.2 mm long, 7.5–10 mm wide, 3-lobed, attached to column-foot and with a spur at base, strongly deflexed at the middle, white with purple blotches on side lobes and mid-lobe; hypochile 4.5–5.5 mm long, slightly saccate at base, lateral margins raised and distinctly twice-pleated; side lobes raised, broadly ovate, 3.8–4 mm long, 3.8–4.5 mm wide, apex rounded; mid-lobe broadly elliptic-ovate, 3.4–4.5 mm long, 5.8–7.8 mm wide when flattened, lateral margins and most of the apical margin in-rolled; disc bearing 3 tall, slightly fleshy keels, the median one straight and terminating slightly above the base of the side lobes, the lateral ones straight at base then diverging and curved at apex, terminating just below the middle of the mid-lobe; spur projecting backwards, slightly curved in horizontal plane, 5–6 mm long, not tapering, apex rounded; column elongate, 7–9 mm long, curving forwards, slightly expanded at base, ventrally with a pair of parallel keels in lower half and a pair of prominent hooked wings slightly above the middle, white flushed orange-yellow at base and yellow at apex; wings 1–1.5 mm long, spotted purple at apex; column-foot 2–2.5 mm long, with a slit-like opening to the spur at middle and a pair of globular, orange-yellow calli below; anther broadly helmet-shaped, 1–1.2 mm long; pollinia 2, obovoid; rostellum broad, raised; stigma semi-circular, with a pair of narrowly conical teeth on basal margin. (Fig. 3).

**Phenology.** In Hong Kong, plants produce generative pseudobulbs in February, with the inflorescence bearing



**Fig. 3.** *Chrysoglossum assamicum*. **A.** Plant in habitat. **B.** Rhizome. **C.** Flower (front view). **D.** Flower (side view). **E.** Flower (view from above). **F.** Flower (view from below). **G.** Petals and sepals. **H.** Column (ventral view). **I.** Labellum, column and ovary (side view). **J.** Labellum (view from top). **K.** Labellum (side view). **L.** Anther cap and pollinarium.



flowers from mid-March through April. Vegetative pseudobulbs develop shortly after the flowering period, from late April to June or July, with each leaf persisting for at least two years.

**Habitat.** In Hong Kong, *C. assamicum* grows in organic soils and leaf litter among rocks on moist stream banks in evergreen hill forest at an elevation of 300–500 m.

**Global distribution.** S & W China (Guangxi Province, Hong Kong S.A.R., Tibet), NE India (Assam) and N & C Vietnam (Kon Tum Province, Lao Cai Province, Quang Binh Province, Vinh Phuc Province).

**Specimens examined.** CHINA. Guangxi Province, Pingnan County, Yao Shan, Lungon, 450 m elevation, April 1929, S.S. *Sin 8090* (PE00271397) (PE); Guangxi Province, Pingnan County, Yao Shan, Luoxiang, 25 April 1936, Z. *Huang 39101* (PE00271398) (PE); Hong Kong S.A.R., New Territories, Tai Po Kau, 300–500 m elevation, 15 April 2020, S.W. *Gale SG1640* (KFBG); Tibet, Motuo, 1600 m elevation, 25 January 1983, B.S. *Li & S.Z. Cheng 2702* (PE01376923) (PE). INDIA. Assam, *Griffith 1233/1322* (K000387859) (K). VIETNAM. Kon Tum Province, Kon Plong District, Hieu Municipality, 1057–1220 m elevation, 2 March 2000, D.K. *Harper & N.T. Hiep 4678* (LE01059085) (LE); Lao Cai Province, Van Ban District, Khanh Yen Ha Municipality, 680–880 m elevation, 14 March 2002, L. *Averyanov, P.K. Loc & D.T. Doan HAL2321* (LE01059091) (LE); Quang Binh Province, Bo Trach District, Hung Trach Municipality, 600–700 m elevation, 30 January 2005, L. *Averyanov, P.K. Loc, P.V. The, A. Averyanova, N.T. Vinh, N.Q. Vinh & N.T. Binh HAL6268* (LE01059095) (LE); Vinh Phuc Province, Tam Dao, 26 January 1988, *LX-VN s.n.* (LE01059088) (LE).

**Notes.** Housed at Kew, William Griffith's type specimen of *Chrysoglossum assamicum* bears two collector's numbers, 1322 and 1233, one possibly being a typographic error of the other, as well as an East India Company Herbarium number (5287); van der Burgh and de Vogel (1997) state that a flower from the type is kept at Vienna, but this could not be traced. Seidenfaden (1983) placed *C. sinense* in the synonymy of *C. assamicum* (as *Collabium assamicum*), a position since universally followed (van der Burgh and de Vogel, 1997; Govaerts *et al.*, 2020), but gave the number of Shuzhi Xin's type collection from Yao Shan as 8091, an apparent error later repeated by van der Burgh and de Vogel (1997). As the protologue testifies (Mansfield, 1930), the holotype was deposited in Berlin ("Herb. Berol.") and is therefore presumed to have been destroyed. An isotype is held in the Institute of Botany herbarium in Beijing. A Tibetan collection also housed in PE (B.S. *Li & S.Z. Cheng 2702*) lacks flowers but bears two capsules with the elongate spur and slightly arched column that persist at the apex of both indicating the plant is referable to this taxon, as concluded by Chen and Wood (2009).

The discovery of *C. assamicum* in Hong Kong is not altogether surprising, given its occurrence in Pingnan County in eastern Guangxi Province in mainland China, as well as at a handful of sites in northern and central Vietnam. It does appear to be a rare species, however, of which few collections have been made: no other locations are known in between these at the eastern margin of its range and those at the type locality in

northeast India plus the one Tibetan record to the west. Contrary to the information provided by Govaerts *et al.* (2020), it has not yet been reported in Thailand (Pedersen, 2014), although its occurrence there and in other parts of the Indo-Burma region seems likely.

By comparison, *C. ornatum* is a far more widespread and apparently abundant species, having been collected throughout South, East and Southeast Asia and the Pacific (van der Burgh and de Vogel, 1997; Chen and Wood, 2009; Pedersen 2014; Govaerts *et al.*, 2020). Although *C. assamicum* closely resembles *C. ornatum* in habit and gross morphology, the two are readily distinguished by details of their flowers: in *C. ornatum*, the lip has relatively narrow, oblong side lobes and the mid-lobe is almost as long as it is wide, whereas in *C. assamicum*, the side lobes of the lip are broadly ovate and the mid-lobe is almost twice as wide as it is long. In addition, the median keel on the lip of *C. ornatum* terminates well beyond the midpoint of the sidelobes and the lateral keels are almost parallel, whereas in *C. assamicum* the median keel terminates just above the base of the side lobes and the lateral keels diverge. Also, the column of *C. ornatum* is usually strongly bent forwards whilst that of *C. assamicum* arches only slightly. Finally, whereas the spur of *C. ornatum* is no more than 2.5 mm long and barely protrudes beyond the base of the lateral sepals, that of *C. assamicum* is 5–6 mm long and extends well clear of the lateral sepals.

Bonnet *et al.* (2009) described a regular sympodial growth pattern in *C. ornatum* in which a plant that has reached flowering size produces a generative (inflorescence-bearing) pseudobulb and then a vegetative (leaf-bearing) pseudobulb in succession in a single growth cycle (i.e. each year). Our observations of *C. assamicum* in Hong Kong indicate a similar modular pattern of emergence, with the vegetative module being produced from the base of the preceding generative module in fertile plants, but with generative pseudobulbs being produced far less regularly. Plants observed in this study had a series of between 2–5 vegetative modules present along the rhizome before the next inflorescence-bearing pseudobulb emerged, suggesting that they do not flower every year.

**Conservation status.** We confirmed the occurrence of *C. assamicum* at just eight localities, with only six of these sightings being made in the last 50 years. These six more recent sightings generate an EOO of 1,027,037 km<sup>2</sup> and an AOO of 24 km<sup>2</sup>. Thus, although the species has a relatively wide distribution, it appears to be quite uncommon, or at least rarely recorded, throughout. Whilst the field notes on sheet HAL2321 at LE claim the plant to be "rare", those on sheet HAL6268 describe it as "locally common"; the single Hong Kong subpopulation comprises approximately 30 plants. No other information on plant numbers is available, and so it is not possible to estimate total population size. Moreover, data are lacking on the continued occurrence of the species at the more



historic localities, and so it is difficult to infer population trend or establish the existence of a particular threat, if any. Given the absence of sightings across a large part of the Indo-Burma region where it is likely to occur, as well as the species' gross morphological similarity to the much more common *C. ornatum* (at least when not in flower), we refrain from undertaking a full conservation assessment on account of insufficient data that could, at least in part, be due to both under-recording and misidentification. For now, we consider it DD.

3. *Gastrodia clausa* T.C.Hsu, S.W.Chung & C.M.Kuo, *Taiwania* 57: 271 (2012); *Demorthis clausa* (T.C.Hsu, S.W.Chung & C.M.Kuo) M.A.Clem. & D.L.Jones, *Austral. Orchid Rev.* 84: 38 (2019). **Type:** Taiwan, New Taipei City, Sanchih District, Peisinchuang, ca. 400 m elevation, 24 March 2008, *T.C.Hsu 1299* (TAI – holotype, TAIF – isotype).

Miniature leafless, holomycotrophic herb up to ca. 4 cm tall in flower, elongating to ca. 37 cm tall in fruit. Rhizome not seen. Peduncle erect, 8–12 mm long, 2–4-noded, dark brown flushed pinkish-brown, scabrous, with a small sheathing scale-like bract at each node; rachis erect, 2–7 mm long, dark brown, bearing 1–3 flowers; floral bracts ovate, 5–7 mm long, 4–6 mm wide, apex sub-acute, dark brown. Flowers erect, tubular, cleistogamous; pedicel and ovary erect, 7–12 mm long, slightly grooved, dark brown flushed pinkish-brown at base; pedicel elongating to ca. 35 cm in fruit; sepals, petals and labellum connate for ca. 2/3 of their length and forming a perianth tube; perianth tube not opening or sometimes with a very small aperture at apex, 8–13 mm long, 4.5–6 mm in diameter, slightly flared above the middle, dark brown, outer surface verrucose, obscurely lobed at apex; apical lobes of sepals triangular-ovate, 3–4.5 mm long, slightly concave and converging to a point; apical lobes of petals ovate, slightly oblique, 3–3.5 mm long, apex rounded, light brown; labellum petaloid, fused to the perianth tube like the petals, the free portion orbicular-ovate, 3–3.5 mm long, 2.5–3 mm wide, lateral margins slightly erose, apex rounded, light brown; column clavate, straight, 5–6.5 mm long, pale yellowish-white, ventrally with a prominent appendage and a pair of broad, low, rounded, bright orange wings that terminate in projecting acute stelidia; appendage attached to the reduced column-foot at base, held parallel to the column, ovate-rhombic, ca. 5 mm long, apex bifid, bright orange; anther globular, ca. 1.2 mm in diameter, containing 2 mealy pollinia; rostellum reduced; stigma placed midway along the column on ventral surface, broadly ovate. Capsule erect, fusiform, up to ca. 2.5 cm long, dark brown with pinkish-brown suture lines. (Fig. 4).

**Phenology.** In Hong Kong, plants emerge in late January and flower from late February to mid-March. The pedicel elongates in April and capsules dehisce in early May.

**Habitat.** In Hong Kong, *G. clausa* grows in leaf litter in the understorey of mossy evergreen hill forest at an elevation of 600–700 m.

**Global distribution.** SE China (Hong Kong S.A.R.), SW Japan (Okinawa Prefecture) and Taiwan (Ilan County, Pingtung County, Taipei City, Taitung County, Taoyuan County).

**Specimens examined.** CHINA. Hong Kong S.A.R., Lantau Island, 600–700 m elevation, 1 March 2020, *S.W. Gale SG1627* (KFBG). TAIWAN. Taipei County, Palaka Road, 200–350 m elevation, 14 March 2007, *S.-W. Chung 10207* (TAIF375863) (TAIF); Taipei County, Hunglushan, 180 m elevation, 28 February 2009, *W.-M. Lin s.n.* (TAI270633) (TAI); Taipei County, Chungchengshan, 450 m elevation, 5 April 2009, *W.-M. Lin s.n.* (TAI271859) (TAI); Taipei City, Neikou, 100–200 m elevation, 11 March 2012, *T.C. Hsu 5483* (TAIF391833) (TAIF); Pingtung County, Shouka, 300 m elevation, 21 February 2010, *S.-S. Lin s.n.* (TAI274625) (TAI); Pingtung County, Shouka, 400–500 m elevation, 17 February 2011, *S.-S. Lin s.n.* (TAI278557) (TAI); Taitung County, Tienchih Trail, 100–200 m elevation, 22 March 2014, *S.-K. Yu 9* (TAIF446431) (TAIF).

**Notes.** *Gastrodia clausa* is an inconspicuous holomycotrophic herb that was described in 2012 based on plants found in northern Taiwan (Hsu *et al.* 2012). Populations were also known in Pingtung County in the south of the island at the time (Hsu *et al.*, 2012) and the species was subsequently found on Okinawa Island in southwest Japan (Suetsugu *et al.*, 2013). This is the first time it has been reported from continental Asia.

The Hong Kong plants closely match those described in the protologue, with the unopening perianth tube, peloric lip and prominent column appendage being diagnostic. As suggested by the combination of these characters plus the absence of a functional rostellum and the mealy pollinia, the species is self-pollinating and cleistogamous (Hsu *et al.*, 2012; Suetsugu *et al.*, 2013). Corroborating the earlier reports, plants observed in the present study underwent fructification, with the pedicel elongating markedly and capsules dehiscing in early May, even though the perianth tube had remained closed throughout the flowering period.

**Conservation status.** In addition to the Taiwanese specimens cited above, TAI and TAIF hold over 30 verified records of *Gastrodia clausa* collected across the island within the last 15 years. Together with the single Japanese record from Nago City in Okinawa (*M. Nakama s.n.* [KYO]; Suetsugu *et al.* 2013) plus the site in Hong Kong newly reported here, we estimate an EOO of 219,913 km<sup>2</sup> and an AOO of 100 km<sup>2</sup>. Although several of the populations are geographically clustered (particularly in the vicinity of Taipei City and in Pingtung County, Taiwan), the species has been discovered at new localities with increasing frequency, potentially reflecting a capacity for regional dispersal and population growth. Indeed, as a fully autogamous species, *G. clausa* is able to reproduce and recruit independently of pollinators, and is therefore not considered severely fragmented. There is no evidence of continuing decline or extreme fluctuation and, with the



Fig. 4. *Gastrodia clausa*. A. Plant in habitat. B. Plant in fruit. C. Flower (side view). D. Section of perianth tube. E. Labellum. F. Column (dorsal view). G. Column (side view).





addition of the Hong Kong population, it is quite plausible that the species' range will expand further into continental Asia. Around 20 emergent plants were found at the site in Hong Kong, but some subpopulations contain dozens of individuals (Suetsugu *et al.*, 2013), suggesting that the global population could amount to 1000 mature individuals or more. No direct threats have been noted, although the species' evergreen forest habitat may be subject to disturbance at some localities. Overall, *G. clausa* does not meet sufficient sub-criteria for it to be considered threatened and it is here tentatively assessed as NT (D1) on the grounds of small population size.

4. *Liparis sootenzanensis* Fukuy. Rep. (Annual) Taihoku Bot. Gard. 3: 84 (1933); *Liparis macrantha* var. *sootenzanensis* (Fukuy.) S.S.Ying, Coloured Ill. Indig. Orchids Taiwan 1(2): 224 (1977); *Liparis nigra* var. *sootenzanensis* (Fukuy.) T.S.Liu & H.J.Su, Fl. Taiwan 5: 1047 (1978); *Diteilis sootenzanensis* (Fukuy.) M.A.Clem. & D.L.Jones, Orchadian 15: 41 (2005). **Type:** Taiwan, Shinchiku, minami-sooten-zan, May 1933, *N. Fukuyama 4104* (KPM – holotype).

*Liparis tixieri* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 33: 434 (1961). **Type:** Vietnam, Dalat, 1959, *Tixier 17/59 f. 352* (P – holotype). *Liparis piriformis* Szlach., Fragm. Florist. Geobot. 38: 456 (1993). **Type:** Vietnam, Dalat, 1955, *Freie Paul s.n., sub-Segaldi 223* (P – holotype). *Liparis nigra* var. *flava* Aver., Bot. Zhurn. (Moscow & Leningrad) 84(10): 128 (1999); *Liparis flava* (Aver.) Aver., Updated Checklist Orchids Vietnam: 79 (2003). **Type:** Vietnam, Lam Dong Province, Lac Doung District, Da Chay, 26 April 1997, *Averyanov, Hiep & Binh VH 4426* (LE – holotype).

Leafy terrestrial herb 20–60 cm tall. Stems 2–5, borne in tight clusters on short rhizome, upright, cylindrical, pseudobulbous, 10–25 cm long, 2–2.5 cm in diameter, 3- or 4-noded, enclosed in papery sheaths when young and bearing 3–5 leaves clustered at the apex, the older ones leafless. Leaves elliptic, oblique, 12–26 cm long, 6–14 cm wide, apex acute, plicate, prominently 7- or 9-veined, apple green, margins somewhat undulate, sheathing the stem at base; sheathing base 4–9 cm long, 2–3 cm wide. Inflorescence terminal, erect, arising from stem apex between leaf bases, 17–35 cm long, 5–8 mm in diameter, ridged, apple green, with 1 small deltoid sterile bract towards base, bearing 11–42 laxly to subdensely arranged flowers from below the middle to the apex; floral bracts ovate-triangular, 6–7.5 mm long, 4–6 mm wide, apex acute-acuminate, apple green. Flowers 15–23 mm across, green flushed orange-yellow, becoming orange with age; pedicel and ovary patent, arching upwards at the apex, 19–26 mm long, ridged, apple green; sepals linear-oblong, 14–17 mm long, 3–4 mm wide, apex obtuse, margins rolled backwards; dorsal sepal arching forwards over column; lateral sepals spreading backwards and curving upwards slightly; petals spreading backwards and slightly curved, linear, 12–15 mm long, ca. 1 mm wide, apex acute; labellum strongly decurved above the base and rolling backwards

at middle, flabellate-obovate, 12–15 mm long, 8–11 mm wide, lateral margins cuneate and entire below widest point, apical margins serrulate, slightly notched at apex, distinctly longitudinally grooved at centre, bearing 2 bulbous calli near base which give rise to 2 diverging ridges that extend to below the middle; column clavate, arching forwards, 6–7.5 mm long, stem ca. 1 mm in diameter, expanding to ca. 1.8 across the anther, ventrally winged, with a pair of small triangular steldia below the apex; anther broad, flattened; pollinia waxy, 4 in 2 pairs, orange; rostellum prominent; stigma concave. Capsule ellipsoid-obovoid, 2–3 cm long. (Fig. 5).

**Phenology.** A new leafy shoot arises close to the base of the previous year's pseudobulb in early to mid-March, and the inflorescence emerges from within the bases of the expanding leaves from late March to mid-April. Flowering occurs from late April to mid-May.

**Habitat.** In Hong Kong, growing in shallow soils and leaf detritus among mossy boulders and in rocky crevices under evergreen hill forest at 400–600 m elevation.

**Global distribution.** S China (Guizhou Province, Hong Kong S.A.R.), SW Japan (Kagoshima Prefecture), Laos (Houaphan Province), Taiwan (Chiayi County, Kaohsiung County, Pingtung County, Taipei City, Taoyuan County, Yunlin County), Thailand (Phitsanulok Province) and Vietnam (Dak Lak Province, Ha Giang Province, Lao Cai Province).

**Specimens examined.** CHINA. Hong Kong S.A.R., Hong Kong Island, Mt. Victoria, 400–500 m elevation, 15 May 2015, *S.W. Gale SG1351* (KFBG). LAOS. Houaphan Province, Hem District, Khon Ngua Village, 15 April 2015, *N.T. Hiep, L. Averyanov, N.S. Khang et al. LA-VN1499* (HNL, LE). TAIWAN. Chiayi County, Tefuyeh, 1000–1100 m elevation, 3 June 2004, *S.-W. Chung 7155* (TAIF211700) (TAIF); Kaohsiung County, Paoshan-Tengchih, 26 October 1934, *N. Fukuyama s.n.* (TAIG00543) (TAI); Pingtung County, Santiman, 1300–1500 m elevation, 30 April 1988, *B.-J. Wang 13728* (TAIF166668) (TAIF); Pingtung County, Shouchia, 30 April 1977, *J. L. Tseng 9687* (TAIF178810) (TAIF); Pingtung County, Kueitsuchia, 8 April 1934, *S. Sasaki 40014* (TAI115426) (TAI); Taipei County, Tunghouhsi, 700 m elevation, 17 February 1937, *N. Fukuyama s.n.* (TAIG00541) (TAI); Taoyuan County, Takaishan, Peichatienshan, May 1933, *N. Fukuyama s.n.* (TAIG00542) (TAI); Taoyuan County, minami-sooten-zan, May 1933, *N. Fukuyama 4104* (NA0105558) (KPM); Taoyuan County, Chatienshan, May 1933, *N. Fukuyama s.n.* (TAIT00066) (TAI); Yunlin County, 30 April 1977, *J.L. Tseng 9687* (TAIF178806) (TAIF). THAILAND. Phitsanulok Province, Phu Hin Rong Kla National Park, 27 May 2011, *Tetsana et al. 328* (BKF). VIETNAM. Ha Giang Province, Quan Ba District, Tung Vai, Thang Village, 1200–1400 m elevation, 22 April 2018, *L. Averyanov et al. VR697* (LE01054192) (LE); Ha Giang Province, Quan Ba District, Tung Vai, Thang Village, 1200–1450 m elevation, 23 April 2018, *L. Averyanov et al. VR774* (LE01054206) (LE); Lao Cai Province, Bat Xat District, Bat Xat Nature Reserve, 1820 m elevation, 4 June 2019, *M.S. Nuraliev & N.A. Vislobokov 2633* (LE01058728) (LE); Dak Lak Province, Lak District, Bong Krang, Chu Yang Sin National Park, 1240 m elevation, 25 May 2019, *M.S. Nuraliev, N.A. Vislobokov & S.V. Yudina 2607* (LE01058729) (LE); Lao Cai Province, Bat Xat District, Bat Xat Nature Reserve, 1820 m elevation, 4 June 2019, *M.S. Nuraliev 2633* (LE01059472) (LE); Ha Giang Province, Quan Ba District, Ta Van Commune, Can Ho Village, 1100–1250 m elevation, 9 September 2019, *L. Averyanov, H.S. Nguyen & T. Maisak VR1458* (LE01061070) (LE).

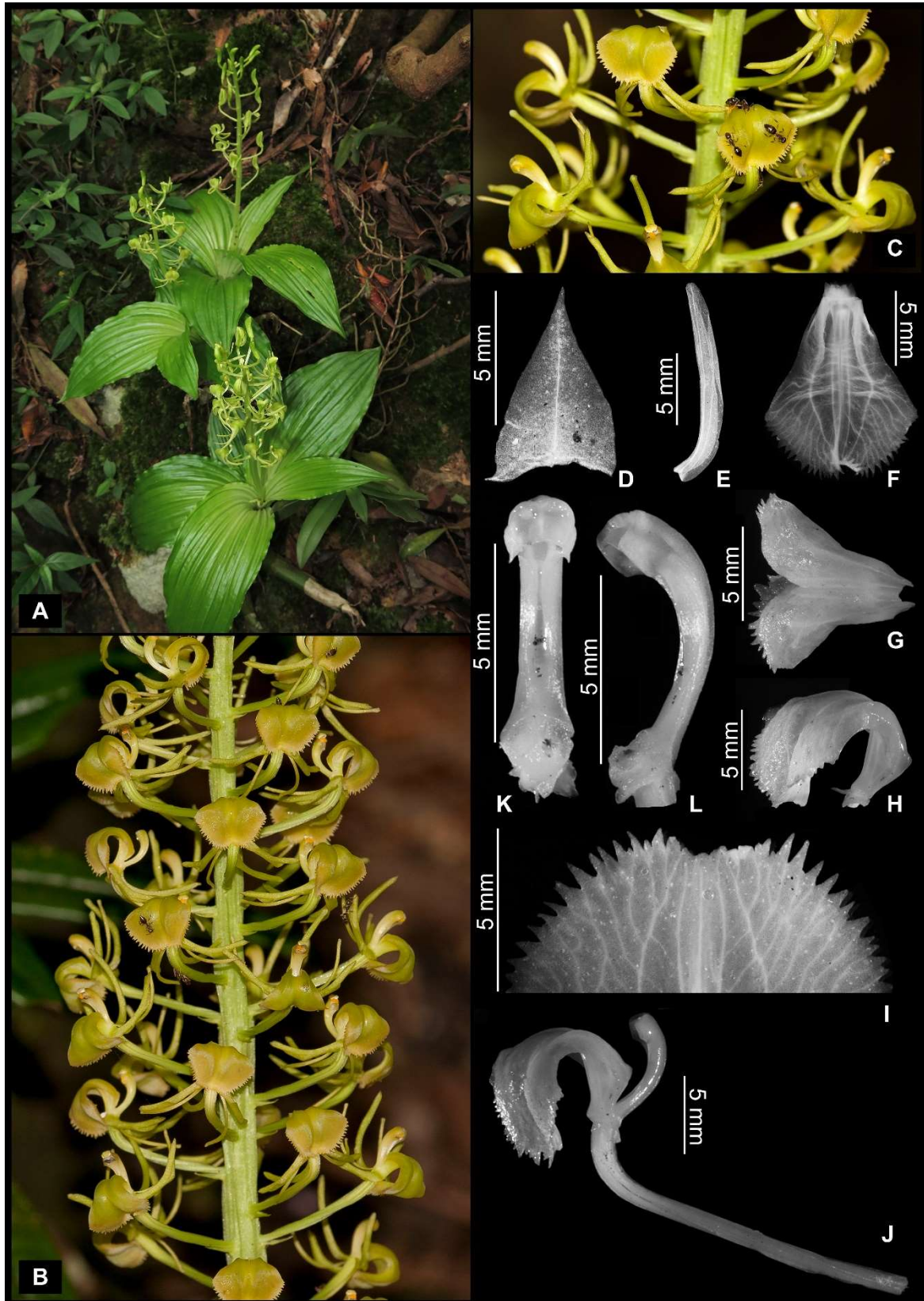


Fig. 5. *Liparis sootenzanensis*. A. Plants in habitat. B. Close-up of inflorescence. C. Close-up of flowers. D. Floral bract. E. Petal. F. Labellum (flattened, view from above). G. Labellum (view from above). H. Labellum (side view). I. Apex of labellum. J. Labellum, column and ovary. K. Column (ventral view). L. Column (side view).



**Notes.** *Liparis sootenzanensis* is a conspicuous species with tall, perennial stems, attractive plicate leaves, large flowers and a distinctive serrulate lip, but it was reported from mainland China (Wei *et al.* 2010), Thailand (Tetsana *et al.* 2013) and Laos (Averyanov *et al.* 2016) only relatively recently. Two subpopulations have now been confirmed in Hong Kong, one on Hong Kong Island comprising 40 or so plants and one in the central New Territories comprising fewer than ten. Fruit-set has been observed at both sites, indicating that plants are pollinated here.

**Conservation status.** We verified sightings at a total of 22 sites in China, Japan, Laos, Taiwan, Thailand and Vietnam, together generating an EOO of 2,281,428 km<sup>2</sup> and an AOO of 88 km<sup>2</sup>. Field notes on several herbarium specimens document that the species is not common where it has been found (e.g. *L. Averyanov et al. VR697*, *L. Averyanov et al. VR1458*, *L. Averyanov et al. VR774*), suggesting generally small subpopulations. Taking the size of the two Hong Kong subpopulations as a guide, we estimate an average subpopulation size of 25 plants. Thus, across all known 22 sites, a global population of 550 individuals is estimated. Despite its rather patchy occurrence, however, the sightings record does not indicate that *Liparis sootenzanensis* is subject to continuing decline; rather, its known range has increased over the last decade. Furthermore, the presence of capsules on several herbarium sheets suggests that the species is pollinated and sets fruit freely across much of its range. There is therefore no reason to suspect that its subpopulations are severely fragmented. Although further effort is clearly needed to more accurately establish population size and trend, it is possible to tentatively assess *L. sootenzanensis* as LC under Criterion B (geographic range) and Criterion C (small population size and decline), but as VU (D1) under Criterion D (very small or restricted population). Adopting the precautionary principle, the latter prevails.

#### REINSTATEMENT OF NAME

1. *Vanilla shenzhenica* Z.J.Liu & S.C.Chen, Acta Phytotax. Sin. 45: 301 (2007). **Type:** China, Guangdong Province, Shenzhen, Longgang, Meishajian, ca. 300 m elevation, 22 February 2005, *Z.J. Liu 3025* (NOCC – holotype).

**Notes.** When describing *Vanilla shenzhenica* based on plants found in Shenzhen City, Liu *et al.* (2007) critically compared their material with *V. somae* Hayata from Taiwan (Hayata 1916). Their new species was deemed to differ from the latter in possessing only weakly opening flowers that are borne on 4-flowered inflorescences, with the purple-red lip being fused to the column for three-quarters of its length and bearing a patch of retrorse hairs above the middle. Despite these apparently diagnostic features, the name was reduced to the synonymy of *V. somae* by Soto Arenas and Cribb (2010), a stance since adopted also by Averyanov (2011), Souvannakhoumane *et al.* (2018) and Govaerts *et al.* (2020).

*Vanilla shenzhenica* also occurs in Hong Kong (Barretto *et al.* 2011), at a site less than 25 km from the type locality, and cuttings have been established in cultivation at Kadoorie Farm and Botanic Garden. Recent flowering of these cultivated plants provided an opportunity to re-evaluate the species' taxonomic status. We corroborate the diagnostic features given by Liu *et al.* (2007), and note also substantial differences in the outline and dimensions of the sepals and petals, which are obovate-spathulate, at least 1.7 cm wide and imbricate for most of their length in the case of *V. shenzhenica*, but narrowly oblanceolate, up to 1 cm in width and consequently widely separated at full anthesis in the case of *V. somae* (Fig. 6). The lip is indeed dark purplish-red, not rose-pink flushed green at the apex as in *V. somae*, and whereas the apical margin of the lip is distinctly undulate in *V. shenzhenica*, it is more-or-less flat in the latter. Finally, whereas the apex of the lip (above the patch of retrorse hairs) bears three or more irregular rows of upright conical appendages in *V. shenzhenica*, it bears just two or three regular rows of flexuous, clavate appendages in *V. somae*. We therefore contend that *V. shenzhenica* is clearly distinct from *V. somae*, with a rather limited range in Guangdong Province (Liu *et al.* 2007; Chen and Rao 2009) and Hong Kong S.A.R., and hereby reinstate the name.

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**Fig. 6.** *Vanilla shenzhenica*. **A.** Flower. **B.** Close-up of labellum. **C.** Close-up of labellum appendages. **D.** Flower (side view). **E.** Labellum, column and ovary (side view). **F.** Sepals and petal. **G–I:** *Vanilla somae*. **G.** Flower. **H.** Close-up of labellum. **I.** Close-up of labellum appendages.



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