

The rediscovery of *Hetaeria oblongifolia* Blume (Orchidaceae) in Singapore

Paul K. F. Leong, Hock K. Lua & Tim W. Yam*

National Parks Board, 1 Cluny Road, Singapore 259569, Republic of Singapore; Email: yam_tim_wing@nparks.gov.sg
(*corresponding author)

Abstract. There are two species of *Hetaeria* Blume in Singapore, both of which were presumed extinct in Singapore in the last Singapore Red Data Book. One is *Hetaeria obliqua* Blume, which was rediscovered recently from the Nee Soon freshwater swamp forest. The other, *Hetaeria oblongifolia* Blume (traditionally known in this region by its synonym, *Hetaeria nitida* Ridl.), has now been rediscovered in Tengah Forest. Prior to this present rediscovery, *Hetaeria oblongifolia* was last collected from Bukit Timah Nature Reserve by H. N. Ridley, way back in 1897.

Key words. Orchidaceae, *Hetaeria oblongifolia*, Singapore, rediscovery, Tengah Forest, conservation

Recommended citation. Leong PKF, Lua HK & Yam TW (2021) The rediscovery of *Hetaeria oblongifolia* Blume (Orchidaceae) in Singapore. Nature in Singapore, 14: e2021019. DOI: 10.26107/NIS-2021-0019

INTRODUCTION

The genus *Hetaeria* Blume consists of 27 species of small terrestrial orchids of up to about 60 cm in height, that belong in the subfamily Orchidoideae, tribe Cranichideae and subtribe Goodyerinae (Chase et al., 2015; POWO, 2019). The genus is distributed in the tropical and subtropical regions of the Old World from West Africa to Tanzania, the western Indian Ocean, Asia and the Western Pacific Islands (POWO, 2019). Eleven species occur in Malesia. It is closely related to *Zeuxine*. However, the flowers of *Zeuxine* are wholly or partially resupinate as compared to *Hetaeria*, where they are not, i.e., the lip of a *Hetaeria* flower faces upwards (Pedersen et al., 2011). Typically, the lip of the flower exhibits several small appendages inside its saccate base. The lip also narrows towards its apex.

There are two species of *Hetaeria* in Singapore, both of which were presumed Nationally Extinct as indicated in the Singapore Red Data Book (Tan et al., 2008). *Hetaeria obliqua* Blume was rediscovered in Nee Soon freshwater swamp forest and its rediscovery was published in Malesian Orchid Journal (Leong & Yam, 2013). In 2020, an environmental baseline study was carried out by a consultancy in the Tengah area, when a botanist in the team came across a patch of herbs that superficially resembled ornamental *Dracaena* species. On closer examination, several inflorescences in bloom revealed that these plants were actually a population of ground orchids. Specimens were collected and sent to the herbarium of the Singapore Botanic Gardens (SING), where its identity was established to be *Hetaeria oblongifolia* Blume.

Key to *Hetaeria* species of Singapore

1. Inflorescence, outer surface of bracts and sepals pubescent with glandular hairs; flower about 4–5 mm long with filiform papillae inside the base of lip; pedicel-with-ovary held close to the inflorescence rachis*Hetaeria oblongifolia*
2. Inflorescence, outer surface of bracts and sepals pubescent but hairs not glandular; flower about 6–7 mm long with dentate scales inside the base of lip; pedicel-with-ovary held at an acute angle with the inflorescence rachis*Hetaeria obliqua*

Hetaeria oblongifolia Blume

Description. *Hetaeria oblongifolia* is a small terrestrial orchid about 14–20 cm tall (Fig. 1). The rhizome is decumbent, elongating, terete, fleshy and brownish-green with thick and wooly-pubescent roots about 3–5 cm long arising from its nodes. The rhizome sometimes branches, is about 8–20 cm long and 4–5 mm in diameter, with internodes about 2–2.5 cm long, and eventually ascends into an erect stem. The stem is a continuation of the rhizome such that in the event that a part of the plant higher up is excised, new roots can be seen sprouting from lower nodes of the erect stem and new shoots can form, branching off from a node higher up (Fig. 2). The stem is dark green, about 4–5 mm in diameter with internodes 1.7–4.5 cm long. The internodes appear longer near the base and decrease towards the apex with 7–8 leaves, each arising from a node on the stem. The leaves are spirally arranged and held at about 30 degrees from the stem, with the adaxial lamina facing slightly inwards towards the stem. Leaves are thinly fleshy, slightly glossy, mid to dark green above and paler and indistinctly tri-nerved below, and asymmetrically elliptic to oblong with acuminate apices.



Fig. 1. *Hetaeria oblongifolia* plants showing aerial shoots, rhizomes and roots. (Photograph by: Leong P. K. F.).



Fig. 2. A new shoot of *Hetaeria oblongifolia* sprouting from a node on a stem that has been damaged. (Photograph by: Yam T. W.).



Fig. 3. In situ *Hetaeria oblongifolia* plant with inflorescence. (Photograph by: Yam T. W.).



Fig. 4. Inflorescence of *Hetaeria oblongifolia*. (Photograph by: Yam T. W.).



Fig. 5. Glandular hairs on inflorescence, outer surface of bracts and sepals of *Hetaeria oblongifolia*. (Photograph by: Leong P. K. F.).

They measure $6.5\text{--}8 \times 3\text{--}3.5$ cm and have amplexicaul petioles that are about 1.5–2 cm long, dark green and translucent pale brownish at their sheathing bases. The inflorescence is terminal, racemose, pubescent with glandular hairs, and about 5–22 cm long (Figs. 3–5). There are two forms of sterile bracts, both with glandular pubescent hairs: there are 2–3 lanceolate, translucent, pale, reddish-brown, sheathing bracts near the base that are about 24×3 mm in size with acuminate apices; and several smaller sterile bracts higher up the inflorescence, about 12×2 mm in size with linear-attenuate apices. The rachis is elongating, about 30 mm long or longer, and with 15 to more than 20 spirally arranged flowers, 4–8 of which are open at a time, opening from the base upwards. The floral bracts are glandular hairy, awl-shaped, reddish-brown with darker striations, about 5–7 mm long, and with linear-attenuate apices. Flowers are non-resupinate, not opening widely, about 5×4 mm in size, and the ovary and pedicel are about 5 mm long and covered with glandular hairs (Figs. 6, 7). Sepals and petals are free; sepals rufous and covered with glandular hairs on the outside, whitish and glabrous within; dorsal sepal ovate, acute, slightly reflexed at the apex, about 4×2 mm; lateral sepals gibbous at base, ovate, acute, about 4×2.5 mm; petals obliquely spatulate, margin irregularly sinuate, translucent white, glabrous, 4.5×1.5 mm (at the widest); lip is without a spur and does not protrude below the bases of the lateral sepals when the flower is viewed from the side, translucent white, sac-like at the base, with about 5 filiform knob-like papillae in each half, spread along the 4 longitudinal veins; main part of hypochile yellow and narrowing from its sac-like base towards the epichile, with the side edges rolled-in; epichile is constricted, rudimentary, white with acuminate apex. The column is without a foot, adnate to the base of the lip and forms a lid over the lip base. Both the column and the lip are not twisted. The column has 2 prominent rostellum arms and 2 shorter, strongly sigmoid wings below it (Fig. 8). The ovary is glandular pubescent and about 5–7 mm long (Fig. 9).

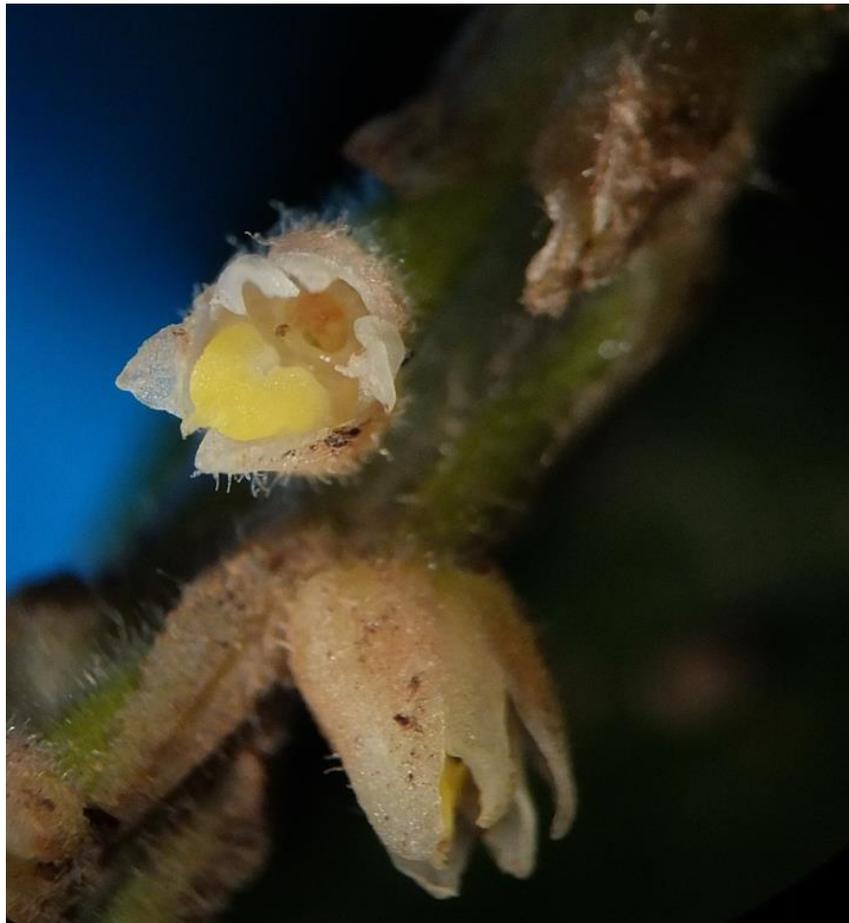


Fig. 6. *Hetaeria oblongifolia* flower. (Photograph by: Leong P. K. F.).



Fig. 7. Close-up of *Hetaeria oblongifolia* flower. (Photograph by: Leong P. K. F.).

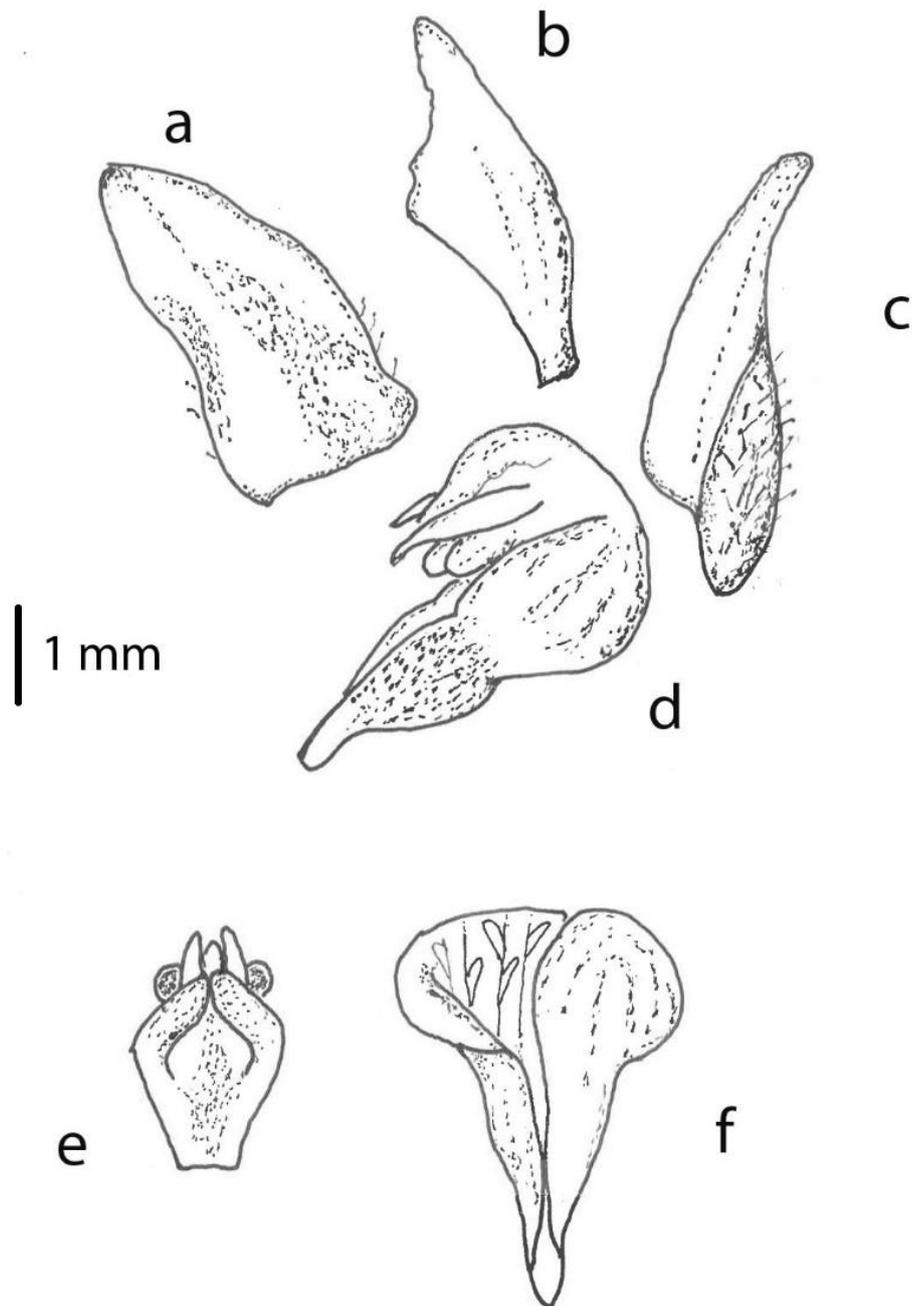


Fig. 8. A dissected flower of *Hetaeria oblongifolia*. a, lateral sepal; b, petal; c, dorsal sepal; d, side view of the column and lip showing the column's rostellum arms and the wings below it; e, front view of the column comparing the length of the rostellum arms and the sigmoid wings; f, lip with one side-edge unrolled to show the filiform appendages (on each half) located at the inner base of the epichile. (Drawing by: Leong P. K. F.).



Fig. 9. Seed capsules of *Hetaeria oblongifolia* developing along the whole inflorescence, an indication of self-pollination. (Photograph by: Yam T. W.).

Table 1. Herbarium collections of *Hetaeria oblongifolia* Blume as deposited in The Singapore Herbarium (SING), Singapore Botanic Gardens.

S/No.	Bar code no.	Collector	Collector no.	Date collected	Locality
1.	SING 0010820	Ridley H. N.	s.n.	1896	Chan Chu Kang
2.	SING 0010821	Ridley H. N.	s.n.	1896	Chan Chu Kang
3.	SING 0010822	Ridley H. N.	s.n.	1897	Bukit Timah Nature Reserve
4.	SING 0295015	Boo C. M.	SING 2020-595	17 June 2020	Tengah Forest

Distribution. *Hetaeria oblongifolia* is widespread: it can be found from South Asia and South East Asia (including much of Malesia), northwards to Taiwan and the Ogasawara Archipelago (Japan), and southwards to Queensland (Australia) and the Pacific islands (O’Byrne, 2011; POWO, 2019).

In Singapore, only three collections were made prior to the present collection (Table 1), all of them by H. N. Ridley, the first Director of the Singapore Botanic Gardens. The last collection was 123 years ago, indicating that this is a Critically Endangered species (Tan et al., 2008; Chong et al., 2009).

Habitat. In Papua New Guinea, *Hetaeria oblongifolia* grows from sea level to an altitude of about 800 m on the floor of the rainforest and in moist, shady thickets in savannah regions (O’Byrne, 1994). Observations of the forested locality in Tengah indicate that it thrives in full shade (Fig. 10). The single localised population is unevenly distributed within an approximately 100 × 200 m area along the northeast-facing slope of a forested ridge. The habitat is a secondary forest largely dominated by native pioneer trees, with a canopy height varying between 15 and 30 m. The tallest trees consist of scattered *Cyrtophyllum fragrans* (Roxb.) DC. and *Litsea elliptica* Blume trees, while the lower main canopy comprises *Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg., which are regenerated trees of past cultivation, as well as common native secondary forest trees such as *Macaranga gigantea* (Rchb.f. & Zoll.) Müll. Arg., *Polyscias diversifolia* (Blume) Lowry & G. M. Plunkett, *Litsea firma* (Blume) Hook.f., *Cinnamomum iners* (Reinw. ex Nees & T. Nees), *Ficus fistulosa* Reinw. ex Blume and *Ficus variegata* Blume. Parts of the habitat are dominated by stands of *Dillenia suffruticosa* (Griff.) Martelli trees, with stems of the *Smilax setosa* Miq. vine creeping along the forest floor and clambering through the understorey, and its leaves covering parts of the forest canopy. The forest understorey is sparse, with scattered young seedlings and saplings of trees as well as the occasional herbs, including *Hetaeria oblongifolia* of varying sizes.

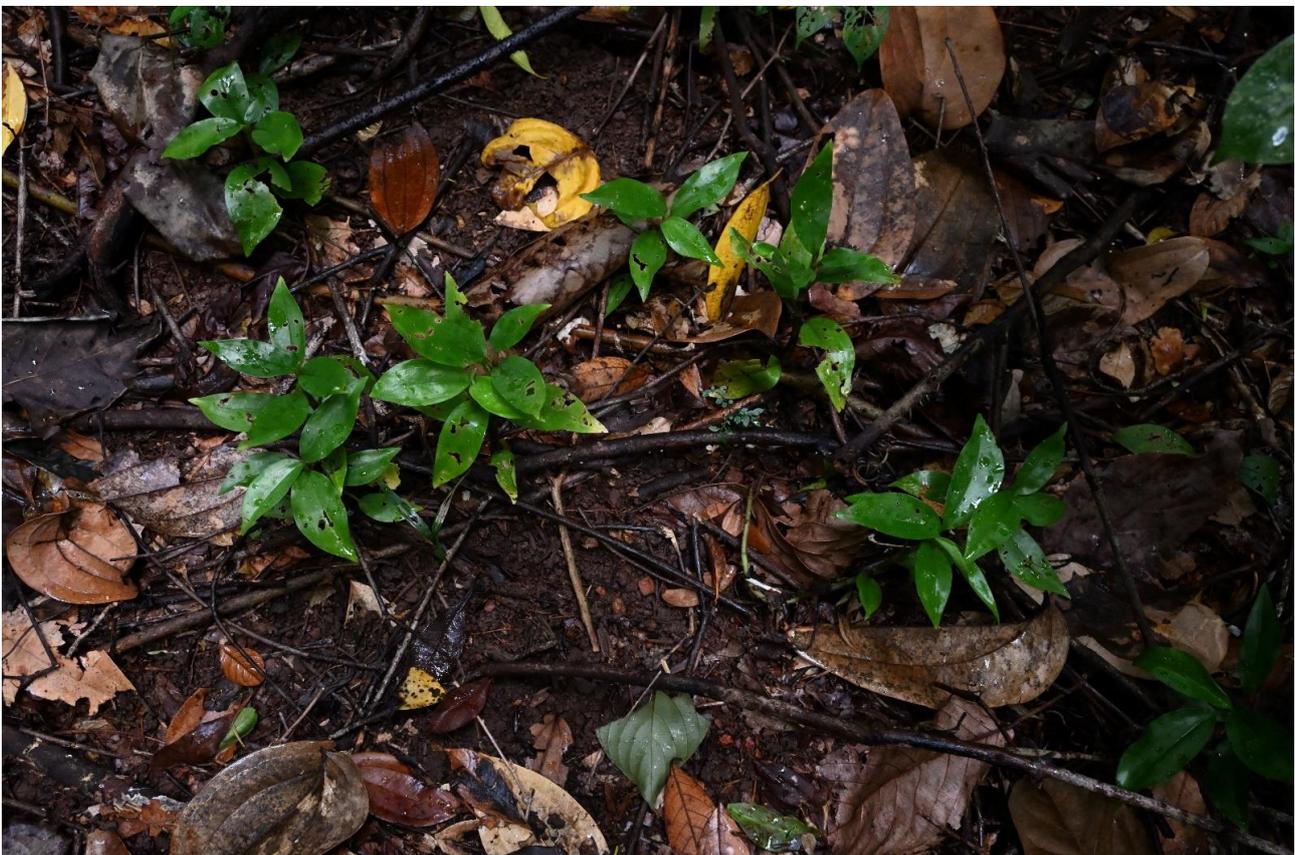


Fig. 10. Habitat of *Hetaeria oblongifolia* in Tengah forest. (Photograph by: Yam T. W.).

The soil composition of the forest in Tengah consists of clayey subsoil with several centimetres of topsoil above it. This is covered by a layer of decomposing leaf litter about 5 cm thick, with most leaves belonging to *Smilax setosa*, *Dillenia suffruticosa* as well as several trees mentioned above. Immediately below and just above the topsoil is a mat of roots from several plants that permeates through the organic humus. It is within this aerated region that the creeping rhizomes of *Hetaeria oblongifolia* are rooting.

Propagation and conservation. Most orchids are cross-pollinated and typically have a low fruit set. However, some orchids are characterised by spontaneous self-pollination (autogamy), resulting in high fruit set under natural conditions (Tremblay et al., 2005). We observed seed capsules forming along the whole inflorescence, which is an indication of self-pollination. Some seed capsules were collected by us for germination trials for ex situ conservation purposes. Upon dissection, many of the seed capsules other than the young ones contained seeds. Since this is the only population in Singapore, it could be a highly inbred population and the seeds not viable. Seeds have been sown on germination media designed specifically for terrestrial orchids, and so far, the seeds have not germinated.

Some of the plants have been collected and planted in the Singapore Botanic Gardens orchid nursery (Fig. 11). The planting material was prepared by mixing soil and leaf litter collected from the site with about 20% sphagnum moss. The plants were placed and secured on the soil mix, and another thin layer of mixed soil was placed on top. The plants are kept in an area with high humidity, with mosses growing on the walls of the surrounding areas. A 50% shade cloth netting was hung above the plants to provide shade.

The species can also be propagated by rhizome cuttings. In its natural habitat, it was observed that new shoots sprout from nodes, especially on plants that had been damaged—for example, when the apical part of the plant had been removed. Some of the damaged rhizomes collected from the field were placed on the growing medium, and indeed, new shoots emerged from the node. This seems to be an effective way of vegetative propagation for the species.



Fig. 11. *Hetaeria oblongifolia* plants collected for cultivation are kept in an area with high humidity, with mosses growing on the walls of the surrounding areas. (Photograph by: Yam T. W.).

ACKNOWLEDGEMENTS

We would like to thank Boo Chih Min for collecting and vouchering a specimen of this species in the SING Herbarium; David Middleton for encouraging us to write the article and Hubert Kurzweil for critically reading the article and commenting on the text.

LITERATURE CITED

- Chase MW, Cameron KM, Freudenstein JV, Pridgeon AM, Salazar G, van Den Berg C & Schuiteman A (2015) An updated classification of Orchidaceae. *Botanical Journal of the Linnean Society*, 177: 151–174.
- Chong KY, Tan HTW & Corlett RT (2009) A Checklist of the Total Vascular Plant Flora of Singapore: Native, Naturalised and Cultivated Species. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore, 273 pp. Uploaded 12 November 2009. https://lcnhm.nus.edu.sg/app/uploads/2017/04/flora_of_singapore_tc.pdf (Accessed 11 November 2020).
- Leong PKF & Yam TW (2013) The rediscovery of *Hetaeria obliqua* in Singapore. *Malesian Orchid Journal*, 12: 23–28.
- O’Byrne P (1994) *Lowland Orchids of Papua New Guinea*. SNP Publishers, Singapore, 584 pp.
- O’Byrne P (2011) *A to Z of South East Asian Orchid Species. Volume 2*. Orchid Society of South East Asia, Singapore, 195 pp.
- Pedersen HÆ, Kurzweil H, Suddee S & Cribb PJ (2011) *Orchidaceae 1 (Cyripedioideae, Orchidoideae, Vanilloideae)*. *Flora of Thailand*, 12: 166–167.
- POWO (2019) *Plants of the World Online*. Facilitated by the Royal Botanic Gardens, Kew. <http://www.plantsoftheworldonline.org/> (Accessed 11 November 2020).
- Tan HTW, Tan KX, Ali I, Chew PT, Chua KS, Duistermaat H, Ganesan SK, Goh MWK, Gwee AT, Kiew R, Lee SML, Leong PKF, Lim J, Lok AFSL, Loo AHB, Lum SKY, Morgany T, Saifuddin S, Sim S, Samsuri A, Wee YC, Yap KF, Yeo CK & Yong JWH (2008) Checklists of threatened species—Seed plants. In: Davison GWH, Ng PKL & Ho HC (eds.) *The Singapore Red Data Book: Threatened Plants & Animals of Singapore*. 2nd Edition. Nature Society (Singapore), Singapore, pp. 213–244.
- Tremblay RL, Ackerman JD, Zimmerman JK & Calvo RN (2005) Variation in sexual reproduction in orchids and its evolutionary consequences: A spasmodic journey to diversification. *Biological Journal of the Linnean Society*, 84: 1–54.