

***Pinalia floribunda* (Lindl.) Kuntze (Orchidaceae):
Rediscovery and conservation of a species thought extinct in Singapore**

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Abstract. Until recently, the last local herbarium collection for *Pinalia floribunda*, a Singapore native species, was made 125 years ago in 1892. In November 2012, a small clump of this orchid was found among the debris of a fallen tree in Bukit Timah Nature Reserve. It was collected and grown in the Singapore Botanic Gardens and its identity confirmed when it flowered in February 2013. Since then, this species has been sighted growing epiphytically on several trees in Nee Soon Swamp Forest. In 2016, a large clump about 90 cm in diameter was sighted growing on a tall tree (*Pentace triptera*), some 20 m above ground, deep within this swamp forest. A portion of this was collected for propagation and future reintroduction. This species is thus documented as a rediscovery and considered as nationally Critically Endangered owing to its rarity here.

Key words. Orchidaceae, *Pinalia floribunda*, *Eria*, Nee Soon Swamp Forest, rediscovery, conservation

INTRODUCTION

This paper documents the rediscovery and conservation of *Pinalia floribunda* (Fig. 1) in Singapore. John Lindley established the genus *Pinalia* (Lindley, 1826) but subsequently in 1830 decided to reduce it to a section of *Eria* (Lindley, 1830), a genus he established in 1825 (Lindley, 1825). He later described the species *Eria floribunda* in the Edwards's Botanical Register (Lindley, 1843). Kuntze restored *Pinalia* to generic status in 1891 and transferred the species *Eria floribunda* into *Pinalia* (Kuntze, 1891). However, his treatment was not widely used and the name *Eria floribunda* continued to be generally accepted. The genus *Eria* sensu lato was confirmed to be polyphyletic as evidenced in molecular analyses of Ng (2002), and as a result, *Pinalia* was restored to generic status in the subtribe Eriinae in *Genera Orchidacearum* (Pridgeon et al., 2005).

DESCRIPTION

Pinalia floribunda is an epiphytic orchid, forming a clump, usually small to about 90 cm across, with many closely clustered, erect, stem-like, yellowish-green pseudobulbs. These are covered by thin reddish-brown, translucent sheaths with distinct venation that turn pale translucent and tattered with age. Each pseudobulb is about 40–50 cm long and about 1 cm across, slightly flattened when young, maturing cylindrical and fleshy with about 10 nodes along its length. Leaves are sessile, 4–6, narrow elliptic to elliptic, crowded at the apex of the pseudobulb, bright pale green and soft, mid-green above and slightly paler below, maturing coriaceous, 4.6–25 cm long and 1.5–3.1 cm wide. Inflorescences are axillary, 5–14.2 cm long, arising within a sheath near the nodes on the upper part of the pseudobulb (leaving a pit on the pseudobulb when shed), with about 2–7 inflorescences per pseudobulb with several at the same developmental stage, racemose, with about 36–50 flowers per inflorescence, and the flowers lax to dense. The inflorescences develop from the leafy zone or the upper part of the pseudobulb below the insertion of the leaves, and are almost horizontal and arching slightly downwards to being pendent. The peduncle is up to 1 cm long and subtended by pale brown bracts. The bracteole of each flower is ovate and brown. Each flower is about 5 mm long and 7 mm across and covered with sparse maroon hairs outside. The pedicel is about 4 mm long. Sepals are white, and the petals white but sometimes tinged pinkish at the margins. The lip is white but suffused pink near the side lobes, and the column is maroon at its apex and whitish to pinkish below, and at the foot. The flowers are very faintly scented.

PAST AND PRESENT RECORDS

Distribution. *Pinalia floribunda* is distributed from Myanmar to Vietnam in the north, to Thailand, Peninsular Malaysia, the Riau Islands, and Singapore in the south, from the Philippines, Sabah, and Sarawak in the east to Sumatra and the Mentawai Islands in the west and is found in the lowlands, from mangrove to freshwater swamp forests, and lowland dipterocarp forest to hill forest, and up to montane forest at more than 2,000 m at Gunung Tahan (Ridley, 1908; Seidenfaden & Smitinand, 1959; Holttum, 1964; Wood & Cribb, 1994; Comber, 2001; Cootes, 2011).

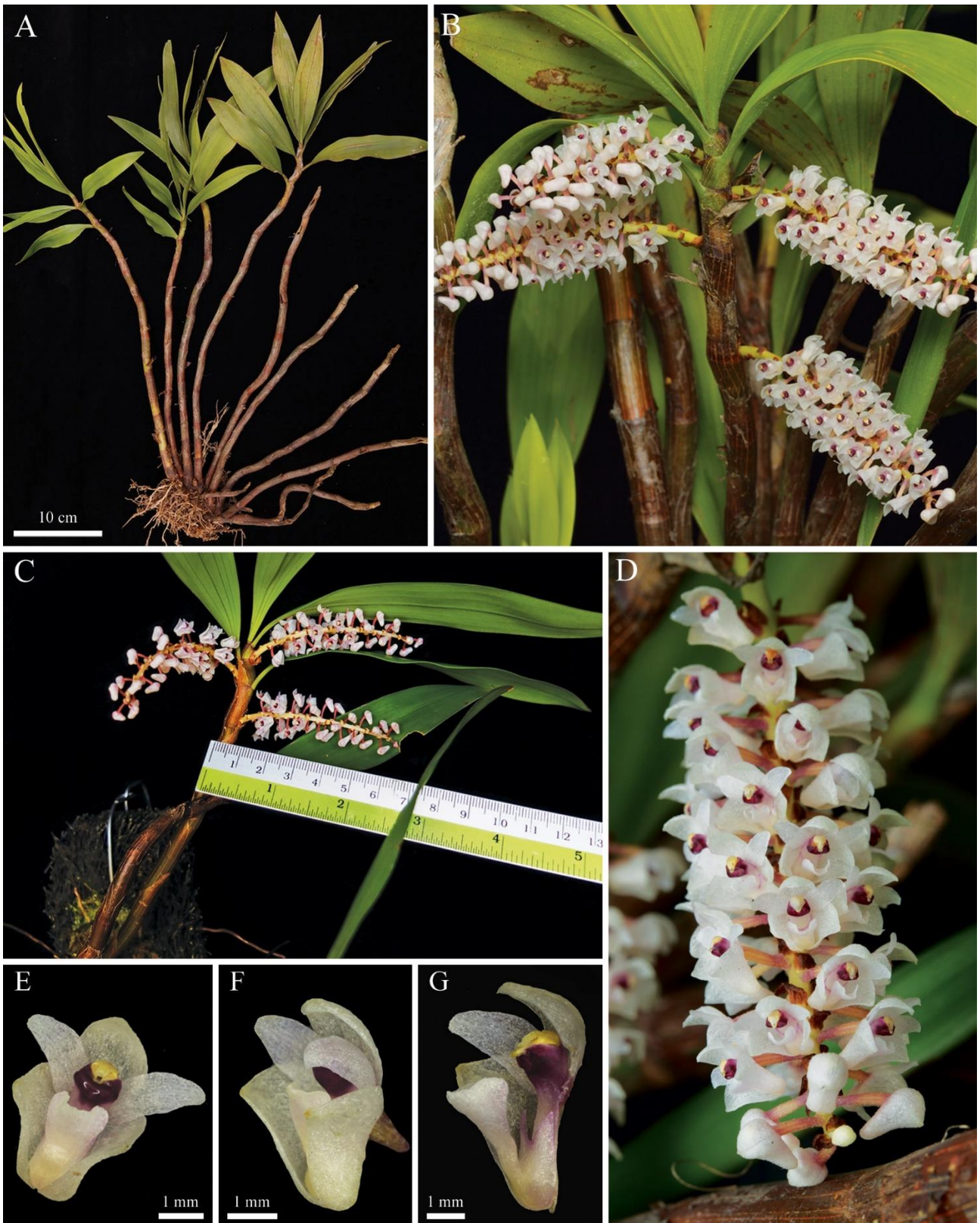


Fig. 1. A, cutting from the orchid clump; B, inflorescences of one pseudobulb; C, inflorescence with ruler; D, inflorescence close up; E, front view of the flower; F, side view of the flower; G, side view of the flower with a petal removed to show the lip attachment to the column with the column foot. (Photographs by: Felicia E. L. Tay [E–G], Paul K. F. Leong [A & C], and Tim W. Yam [B & D]).

Table 1. Previous Singapore collections of *Pinalia floribunda* (Lindl.) Kuntz deposited in the Herbarium, Singapore Botanic Gardens (SING).

S/No.	Bar Code No.	Collector	Collector's No.	Date Collected	Locality
1.	SING 0010751	H.N. Ridley	s.n.	26 February 1889	Kranji
2.	SING 0010753	H.N. Ridley	1634	9 January 1890	Sungei Buloh
3.	SING 0010752	H.N. Ridley	8928	1892	Seletar
4.	SING 0010749	J.S. Goodenough	s.n.	13 January 1892	Chan Chu Kang Forest Reserve
5.	SING 0010750	J.S. Goodenough	s.n.	18 September 1892	Sungei Murai
6.	SING 0205850	N.N.H. Faizu	SING 2012-518	November 2012	Bukit Timah Nature Reserve
7.	In process	C. Lee et. al.	SING 2016-135	26 February 2016	Nee Soon Freshwater Swamp Forest

Records of the Singapore Botanic Gardens' Herbarium (SING) showed that the species was collected five times in Singapore in the 19th century (Table 1). The first was from Kranji by H. N. Ridley in 1889. The second was collected from Sungei Buloh by H. N. Ridley in 1890. It was collected three times in 1892 by H.N. Ridley (Seletar) and J. S. Goodenough (Chan Chu Kang and Sungei Murai). Since then, it was thought to be presumed nationally extinct as it has not been encountered again by 2008, when the 2nd Edition of the Singapore Red Data Book (Tan et al., 2008) was published.

A small clump of *Pinalia floribunda* was found growing epiphytically on a fallen tree in Fern Valley, Bukit Timah Nature Reserve in November 2012. It was collected and brought to the Singapore Botanic Gardens for cultivation and its identity was confirmed when it flowered in February 2013. It was lodged as herbarium specimen, N. N. H. Faizu SING 2012-518.

During a field survey on 26 February 2016 at the Nee Soon Swamp Forest, we encountered this orchid species again. Several plants were seen on smaller trees within the swamp forest perched on branch forks of trees in bright but filtered light. A large clump was found growing on a 30-m tall tree, *Pentace triptera* (Malvaceae) (Figs. 2–4), incidentally, the same species of tree that fell in the Fern Valley, where the orchid was first rediscovered.

The Nee Soon Swamp Forest is a freshwater swamp forest area of around 80 ha, consisting of a mixture of old secondary and primary forests, with the Nee Soon Stream running through it. The area where the species was found is about 10 m above sea level and generally flat with thick leaf litter, but surface water was visible within gaps in the root mat. Most of the trees within the area had trunk girths of around 30–60 cm, and an average height of around 30 m. The tree canopy coverage was around 50%, offering bright light to filter in. There were epiphytes such as ferns and another orchid species, *Cymbidium finlaysonianum*, as well as *Freycinetia* and *Korthalsia* climbers that are typical of the primary freshwater swamp forest flora.

CONSERVATION

The specimen collected is now growing in Singapore Botanic Gardens' orchid nursery. The plant has been divided into cuttings consisting of five to six pseudobulbs each. The cuttings were planted in a growing medium consisting of charcoal



Fig. 2. A large clump of *Pinalia floribunda* was found growing on a 30-m tall *Pentace triptera* (Malvaceae) tree. (Photograph by: Clayton Lee).



Fig. 3. Crown of the tree in the Nee Soon Swamp Forest where *Pinalia floribunda* was rediscovered. (Photograph by: Paul K.F. Leong).



Fig. 4. Clayton Lee collecting the rediscovered *Pinalia floribunda* from the *Pentace triptera* tree. (Photograph by: Tim W. Yam).

and coconut husk in 6-inch plastic pots. All the cuttings are growing well, with new shoots emerging. Four inflorescences began to appear in late June and flowered on 21 July 2016.

Since only one specimen was collected and there were no seed capsules on the plant, we can only propagate the plant by division. We would like to expedite the propagation so that reintroduction of this species back to our forests can be carried out in a few years' time.

Besides conservation, the species is also a very attractive plant for horticulture (Hawkes, 1965). A well-grown mature plant is rather compact in size and produces numerous sprays of attractive, slightly scented flowers. In the 2016 Singapore Orchid Show, a beautiful *Pinalia floribunda* won the trophy for the best species and the Reserve Champion of the show!

ACKNOWLEDGEMENTS

We would like to thank the staff from the Conservation Division, National Parks Board, especially William Ng, Ngon Soon Kong, Toh Yuet Hsin, Derek Liew, and Hassan Ibrahim for their support during the field surveys and the staff of the Orchid Nursery, Singapore Botanic Gardens, Whang Lay Keng, Mark Choo and Kee Kai Ying for growing the species. Also, we would like to thank the Singapore Botanic Gardens' Herbarium and Library for access to the herbarium specimens and reference books, respectively, and in particular to Ho Boon Chuan and Hubert Kurzweil for their assistance in deciphering the old literature as well as Aung Thame for collecting the inflorescences when the Bukit Timah Nature Reserve plant flowered during the Chinese New Year holiday period.

LITERATURE CITED

- Comber JB (2001) Orchids of Sumatra. Natural History Publications (Borneo) in association with The Royal Botanic Gardens, Kew, 1,026 pp.
- Cootes J (2011) Philippines Native Orchid Species. Katha Publishing, Quezon City, 288 pp.
- Hawkes AD (1965) Encyclopedia of Cultivated Orchids. Faber & Faber, 602 pp.
- Holtum RE (1964) A Revised Flora of Malaya. Volume I, Orchids of Malaya, 3rd Edition. Government Printing Office, Singapore, 759 pp.
- Kuntze O (1891) Revisio generum plantarum, 2: 375–1011.
- Lindley J (1825) The botanical register, 11: 868–955, 88 colour pls.
- Lindley J (1826) Orchidearum Sceletos. Typis Ricardi Taylor, London, England, 27 pp.
- Lindley J (1830) The Genera and Species of Orchidaceous Plants. Ridgways, London, 544 pp.
- Lindley J (1843) Edwards's Botanical Register, 29: 1–66, 65 colour pls.
- Ng YP (2002) Molecular Systematics and Evolution of *Eria* (Orchidaceae). Unpublished PhD Thesis, Birkbeck College, University of London, London, 111 pp.
- Pridgeon AM, Cribb PJ, Chase MW & Rasmussen FN (2005) Genera Orchidacearum Vol. 4 Epidendroideae (Part One). Oxford University Press, Oxford, UK, 672 pp.
- Ridley HN (1908) Materials for a Flora of the Malayan Peninsula, Part I. Printed at the Methodist Publishing House, Singapore, 233 pp.
- Seidenfaden G & Smitinand T (1959) The Orchids of Thailand: A Preliminary List. Parts I and II. Siam Society, Bangkok, 186 pp.
- Tan HTW, Tan K-x, Ali bin Ibrahim, Chew PT, Chua KS, Duistermaat H, Ganesan SK, Goh MWK, Gwee AT, Kiew R, Lee SML, Leong P, Lim J, Lok AFSL, Loo AHB, Lum SKY, Morgany T, Saifuddin bin Suran, Sim S, Haji Samsuri bin Haji Ahmad, 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. The Nature Society (Singapore), Singapore. Pp. 213–244.
- Wood JJ & Cribb PJ (1994) A Checklist of the Orchids of Borneo. Royal Botanic Gardens, Kew, UK, 409 pp.