

THE STATUS AND DISTRIBUTION IN SINGAPORE OF *POMATOCALPA DIFFUSUM* BREDA

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INTRODUCTION

This paper documents the distribution and status of *Pomatocalpa diffusum* Breda (Fig. 1) in Singapore. *Pomatocalpa* is a rather small, mainly epiphytic, vandaceous orchid genus, previously thought to comprise of around 35–40 species (Comber, 1990; Seidenfaden & Wood, 1992), but has recently been revised and determined to comprise of only 13 species and six subspecies (Watthana, 2007).

The genus is rather widely distributed and can be found from India to Malesia, eastwards through New Guinea, the Cape York Peninsula of Australia, and Fiji, northwards to northeastern Himalaya, and Taiwan (Comber, 1990; Seidenfaden & Wood, 1992; Watthana, 2007). The highest number of congeners are found in Thailand (six species) and Peninsular Malaysia-Singapore (six species), followed by Borneo (five species), and Sumatra (five species), while China, Taiwan, Bangladesh, the lesser Sunda Islands, Vanuatu, and Fiji only have one species each, indicating that the centre of diversity of *Pomatocalpa* lies within the boundaries of Thailand, and Peninsular Malaysia-Singapore (Watthana, 2007).

Pomatocalpa is derived from the Greek *pomataos* meaning flask or cup and *calpe* meaning pitcher, which refers to the flask- or cup-shaped labellum (lip). The genus was established by Jacob Gijsbertus Samuël van Breda in 1829, who first described a single species (*Pomatocalpa spicatum*) based on a specimen collected by Kuhl, and van Hassel from Java (Breda, 1829; Watthana, 2007). However, the holotype designated by Breda at Leiden was lost, thus leading Pearce and Cribb (2002) to designate the illustration rendered by Breda (Breda, 1829: pl. 15) as the lectotype. The second species *Pomatocalpa diffusum* was described by Breda (1830) in *Genera et Species Orchidearum, Fascicle IV*, which was for many years thought to have existed as a single copy and thus was not accepted as being effectively published until van Steenis-Kruseman & Veldkamp (1991) discovered a second copy of the book and reinstated the taxon.

The genus was initially disregarded and overlooked (Seidenfaden, 1988) until Smith (1912) reinstated the genus, finding however that many taxa were wrongly allocated to other genera, such as *Cleisostoma*, and *Saccolabium* amongst many others. Smith later supplied a preliminary list of 29 taxa, which he admitted, was crude owing to insufficient descriptions. On top of this, the genus *Pomatocalpa* was for many years erroneously placed in the subtribe *Sarcanthinae* Benth., as first noted by Rasmussen (1985), because the subtribe was based on an illegitimate name, *Sarcanthus* Lindl. Seidenfaden (1988) later proposed that *Pomatocalpa* be placed in the subtribe *Aeridinae* Pfitzer, which has since been universally accepted (Watthana, 2007).

Pomatocalpa species are typically monopodial, with the stem apex growing continuously and producing distichously alternating leaves while the base of the stem gradually dies away. The inflorescences are axillary and the aerial roots penetrate the leaf sheaths (Watthana, 2007). Congeners can be broadly classified into two main groups. The first group consists of small- to medium-sized, fan-shaped plants with 2–11 leaves and short internodes, while the second group consists mainly of large, rambling plants with more than 10 leaves and long internodes. In the second group, the roots are produced all along the length of the stem, to secure the plant firmly to its substrate. *Pomatocalpa diffusum* is belongs to the second group.

Pomatocalpa species are generally found in evergreen rain forest, but have also been reported in other tropical habitats such as mangrove forest, scrub, rocky sea shores, as well as isolated trees in open sites, and cultivated areas. Most species are lowland plants up to an altitude of 750 m with only a few species being recorded above 1,000 m. The flowers are probably bee-pollinated, as van der Pijl and Dodson (1966), and Jones (1981) have observed bees (*Trigona* sp.) with dark pollinaria of *Pomatocalpa macphersonii* attached to their heads. Congeners also seem to have a phorophyte preference for *Myristica* and *Syzygium* species (Mursidawati et al., 1999) and were observed to generally grow on the lower main tree trunk instead of the high branches of the crown which is preferred by other genera (Watthana, 2007).



Fig. 1. *Pomatocalpa diffusum* growing midway on the main trunk and low branches of a *Cratoxylum formosum* tree just outside the SAF Nee Soon Range I. Scale bar = 10 cm. (Photograph by: Alvin Francis Lok Siew Loon).

PAST AND PRESENT RECORDS

Pomatocalpa diffusum was previously known by synonyms such as *Cleisostoma cumingii* Rchb. f., *Cleisostoma latifolium* Lindl., *Pomatocalpa latifolium* (Lindl.) J. J. Sm., *Saccolabium hortense* Ridl., *Saccolabium latifolium* (Lindl.) Schltr., and *Sarcanthus cumingii* (Rchb. f.) J. J. Sm. (Watthana, 2007). *Pomatocalpa diffusum* plants are mainly rambling although compact plants are encountered from time to time (Figs. 1, 2). Their stems have been known to reach 5 m long, with a stem diameter of 1–1.3 cm and internodes of up to 4.6 cm long. The leaves are scattered evenly along the stem, with tubular leaf sheaths tightly embracing the stem for their entire length. The leaf blade is 15–23 cm × 1.7–2.3 cm, narrowly oblong to linear. The inflorescences are 7–30 cm long, paniculate with up to five branches and bearing as many as 200 flowers (Fig. 2). Each branch is 2.4–5.8 cm long, bearing 15–50 flowers, with basal branches sometimes producing second-order branches. The peduncle is 4–23 cm long with brownish-purple spots. The terminal rachis is 2–6.4 cm long, and the side branch rachides 0.2–4.3 cm long and usually ridged. The non-resupinate flowers are dirty-yellow with reddish-brown borders on the sepals and petals and are about 1.2 cm in diameter (Fig. 3). The dorsal sepal is 3.0–4.2 × 0.9–1.6 mm, obovate-oblong, obtuse and three-veined. The laterals are 2.3–3.8 × 1.2–1.8 mm, obovate to obovate-oblong, slightly oblique, acute to obtuse and three-veined. The petals are 2.1–3.9 × 0.7–1.5 mm, obovate-oblong and sometimes falcate, obtuse and three-veined. The labellum is complex with the mid-lobe producing a less than 90° abaxial angle to the spur, which is broadly-ovate, acute sometimes obtuse and strongly recurved. The labellum's side lobes are obliquely triangular, subacute to acute. The spur is 2.4–3.5 mm long and 1.3–1.7 mm in diameter, bucket-shaped, dorsoventrally compressed, and slightly inflated.

Pomatocalpa diffusum is quite widely distributed, ranging from Thailand, Peninsular Malaysia, Singapore, Borneo, Sumatra, Java, Bali, Sulawesi (Watthana, 2007), and possibly the Philippines (Comber, 2001). This species usually grows as an epiphyte on tree trunks and low branches in shaded as well as open areas in lowland tropical rain forest, mangrove forest, dipterocarp forest, beach forest and solitary trees in villages up to an altitude of 300 m (Watthana,



Fig. 2. Cultivated *Pomatocalpa diffusum* specimen flowering. Scale bar = 5 cm. (Photograph by: Alvin Francis Lok Siew Loon).



Fig. 3. Close-up of *Pomatocalpa diffusum* flowers showing non-resupination. Scale bar = 0.5 cm. (Photograph by: Alvin Francis Lok Siew Loon).

Table 1. *Pomatocalpa diffusum* Breda specimen details in the Herbarium, Singapore Botanic Gardens (SING).

S/No.	Bar Code No.	Collector	Collector's No.	Date Collected	Locality
1.	0041040	J. S. Goodenough	s.n.	28 Aug.1889	Jurong



Fig. 4. *Pomatocalpa diffusum* growing with other orchidaceous epiphytes and *Platycerium coronarium* on the trunk and branches of a *Cratoxylum formosum* tree. (Photograph by: Alvin Francis Lok Siew Loon).



Fig. 5. The critically endangered *Bulbophyllum sessile* growing on the same tree as *Pomatocalpa diffusum*. Scale bar = 1 cm. (Photograph by: Alvin Francis Lok Siew Loon).

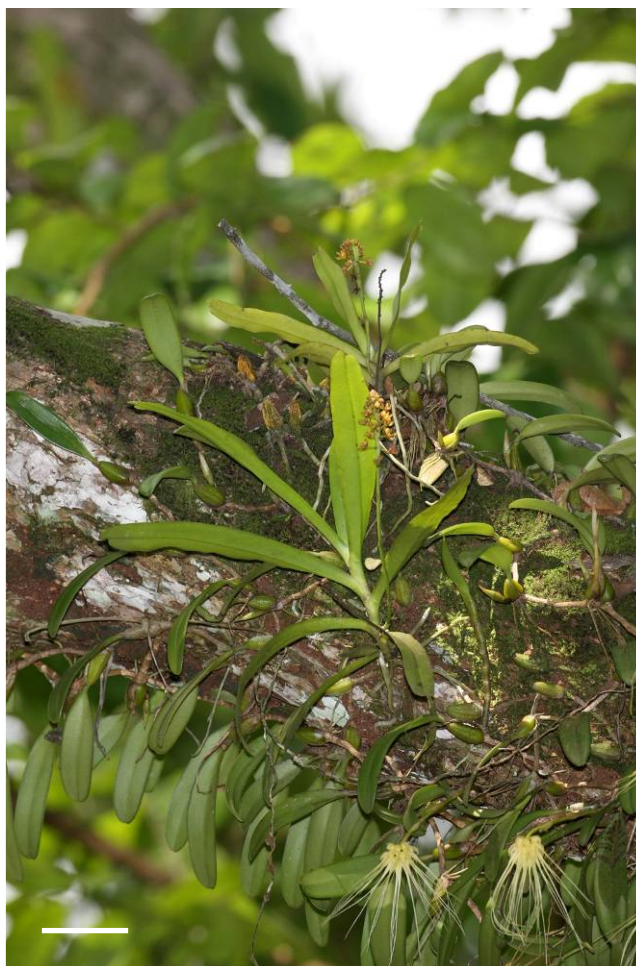


Fig. 6. *Pomatocalpa diffusum* growing and flowering *in-situ* with *Bulbophyllum vaginatum*. Scale bar = 5 cm. (Photograph by: Alvin Francis Lok Siew Loon).

2007), but also as a lithophyte on granitic bed rock (Comber, 2001; Watthana, 2007), or terrestrially in grassland and scrub (Comber, 2001). Other phorophytes include cultivated *Lagerstroemia*, *Garcinia* and *Tamarindus* species trees (Watthana, 2007).

In Singapore this species is nationally critically endangered (Tan et. al., 2008; Chong et. al., 2009) and was last collected on 28 Aug.1889 at Jurong (Table 1). Today, this species is only found in the Nee Soon Swamp Forest where sterile specimens were first observed in Feb.2010 growing on a *Cratoxylum formosum* tree outside the SAF Nee Soon Range I (Fig. 4), with other native orchid species including the nationally critically endangered *Bulbophyllum sessile* (Fig. 5), nationally endangered *Bulbophyllum vaginatum* (Fig. 6), and *Polystachya concreta* which was previously thought to be nationally extinct. In mid-Apr.2010, specimens collected from the host phorophytes in Feb.2010 started developing inflorescences and flowered in cultivation in May 2010 (Fig. 2), which also coincided with the flowering of wild specimens on the host phorophyte *in-situ* (Figs. 1, 6). This may have indicated that the flowering of the plants in cultivation were natural and not caused by stress.

Interestingly, only a single *Cratoxylum formosum* phorophyte seemed to be festooned with a wealth of epiphytes, while surrounding trees were devoid of epiphytic orchids and ferns, indicating the distinct preference for certain phorophytes, especially for the orchids. Possible explanations could include physical factors such as the highly scaly and fissured bark of *Cratoxylum formosum* which probably helps retain water in an increasingly desiccating Singapore environment and also provide a better foothold for orchid roots to penetrate. Other biotic reasons for phorophyte preference might also include symbiotic relationships with *Crematogaster* ant species which are found under the bark of the entire tree as well as around the root systems of the orchids and within the shield fronds of the *Platyserium coronarium* growing on the same tree. *Crematogaster* ant infestation may help play a part in plant herbivory protection as well as from mechanical damage from *Macaca fascicularis* (long-tailed macaques), which are usually found foraging on all other surrounding trees, but hardly ever on this specific *Cratoxylum formosum* individual. The last possible reason is that the fissured bark of this *Cratoxylum formosum* may be extensively infected with orchid mycorrhizae and combined with the moisture-retaining characteristics of the bark; create a more ideal habitat for orchid seed germination.

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