

OBSERVATIONS OF POLLINATION IN THE PIGEON ORCHID, *DENDROBIUM CRUMENATUM* SWARTZ (ORCHIDACEAE) IN SINGAPORE

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ABSTRACT. — As the flowers of the pigeon orchid, *Dendrobium crumenatum*, bloom for just one day, this presents only a narrow window of opportunity for pollination to be carried out. We report observations of bees (*Apis cerana*) performing this important duty on the morning of its full blossom, and subsequently estimate the relative success of pollination by the floral visitors.

KEY WORDS. — pigeon orchid, *Dendrobium crumenatum*, pollination, *Apis cerana*

INTRODUCTION

The pigeon orchid, *Dendrobium crumenatum* Swartz is a widespread species within South and Southeast Asia, having been recorded from India, Sri Lanka, Andaman Islands, Myanmar, Indo-China, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi, Philippines, and Taiwan (NIER, 2005). It is an epiphytic orchid that is able to survive from coastal areas to forests, from suburban to urban habitats. In Singapore, this species frequently adorn the branches of mature trees growing along roadsides, in gardens, parks, and forest edges. In residential areas, they are always a welcome sight, especially during their flowering period (Fig. 1).



Fig. 1. Epiphytic pigeon orchids (*Dendrobium crumenatum*) growing on a tree in a residential area along Dover Road, photographed on 28 Oct.2011, one day after its full bloom. (Photograph by: Tzi Ming Leong).

Invariably, one becomes conscious of the blooms when the air is thick with their distinctive fragrance. Their flowering is synchronous and lasts for only a day. Despite their flowers being short-lived, they are indeed a sight to behold when one is able to capture this fleeting full bloom. The flower is entirely pearly white, except for a tinge of light sulphur yellow in the middle of its lip (Fig. 2). The reason why it is called a 'pigeon' orchid becomes clear when the flower is viewed from below. From this perspective, the tapering mentum resembles the bird's diminutive head, the dorsal sepal resembles the bird's tail, while the lateral sepals and lateral petals may give the impression of fluttering wings when the pigeon/dove is in flight (Fig. 3).



Fig. 2. Characteristic white flower of the pigeon orchid (ca. 3 cm across), photographed along Dover Road on 3 Apr.2012. (Photograph by: Tzi Ming Leong).



Fig. 3. View of flower (as in Fig. 2) from the underside to appreciate its resemblance to a white pigeon, or dove in flight. (Photograph by: Tzi Ming Leong).

There was a time in the late 1970s when these orchids were systematically removed from tree branches, in the mistaken belief that they damage the host trees. Staghorn ferns, *Platycerium coronarium*, and other epiphytic ferns were removed as well. Fortunately, this was reversed in the early 1990s when these orchids and ferns became fashionable again, and for a time, these newly acquired epiphytes were actually attached back to the trees (Wee, 2007).

Historically, this orchid has caught the attention of a number of early botanists (e.g., Burkill, 1917; Seifrizz, 1923; Holttum, 1954). At the Singapore Botanic Gardens, Burkill (1917) conscientiously recorded the flowering events of pigeon orchids over four years (1913–1916), and made attempts to compare these with the localised rainfall data collected over the same period. At the Botanic Gardens in Buitenzorg (now known as Bogor) in Java, Indonesia, similar comparisons and speculations on flowering triggers were made by Seifrizz (1923). One of the best line drawings of this orchid was illustrated by Leong Hong Tim, and appears in Holttum (1954: 123, Fig. 24). The illustration accompanied chapter 10, *'The Story of the Pigeon Orchid'* (Holttum, 1954), where the stimulus to flower and pollination by bees were also mentioned and discussed. Since then, we have acquired a clearer picture of the environmental circumstances that precede a gregarious flowering event. There is general consensus that a combination of low temperature induction (abrupt drop of 5°C) and hydration of dormant flower buds brought about by a heavy rain would lead to simultaneous flowering nine days later (Hew & Yong, 2004; Yam et al., 2010).

Apart from the curiosity aroused over its flowering physiology, the beauty of this elegant orchid has also inspired the realisation of Singapore's first embroidered appliqué stamp, which was issued on 6 May 2009 (Singapore Post, 2009). The collector's sheet featured a S\$5 stamp as the centrepiece, with three delicately embroidered flowers (Fig. 4).

OBSERVATIONS

Despite the fact that this orchid is widely distributed and generally abundant throughout Singapore, actual observations, reports, or photographs of pollination activity appears to be scarce. On the morning of 23 Jul.2012, pigeon orchids had begun to bloom in a residential garden along Sian Tuan Avenue. Before 0800 hours, a small group of bees (*Apis cerana*) had arrived, with quick and multiple visits to most of the opened flowers (Fig. 5). Although the bees flew

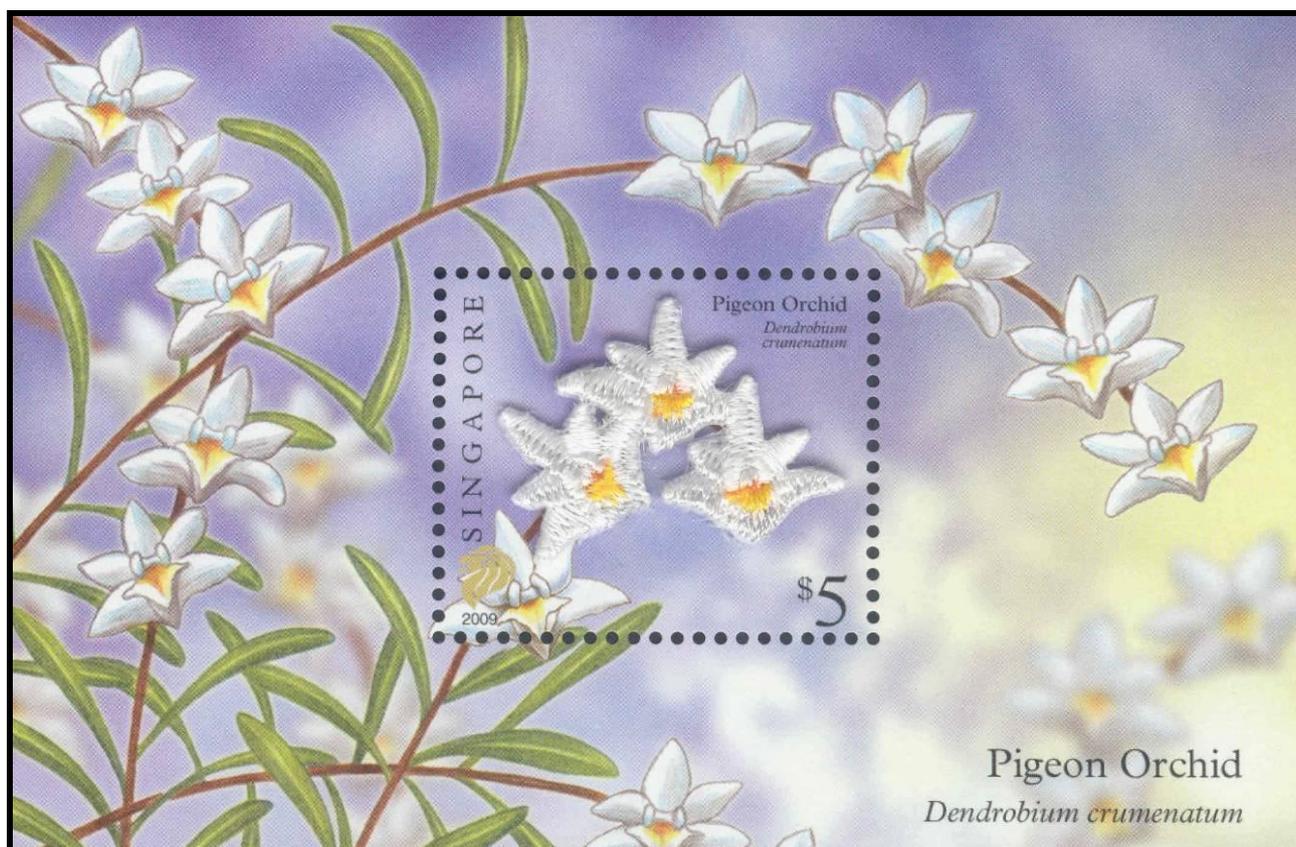


Fig. 4. The collector's sheet featuring Singapore's first embroidered stamp, issued on 6 May 2009. Image courtesy of the Singapore Philatelic Museum and reproduced here with permission.



Fig. 5. Lateral view of a bee, *Apis cerana*, visiting a pigeon orchid flower along Sian Tuan Avenue on the morning of 23 Jul.2012 at 0758 hours. (Photograph by: Yeow Chin Wee).

rapidly from one flower to another, with brief stops at each flower, attempts to photograph this activity allowed us to capture an image of a bee with pollinium successfully attached to its thorax (Fig. 6). Five days later, the number of developing fruits was counted (37 out of a total of 47 flowers), and it was found to have a rather high success rate of pollination (78.7%). The young, green fruits were 10×4 mm and still had the wilted flowers attached to their apices (Fig. 7).

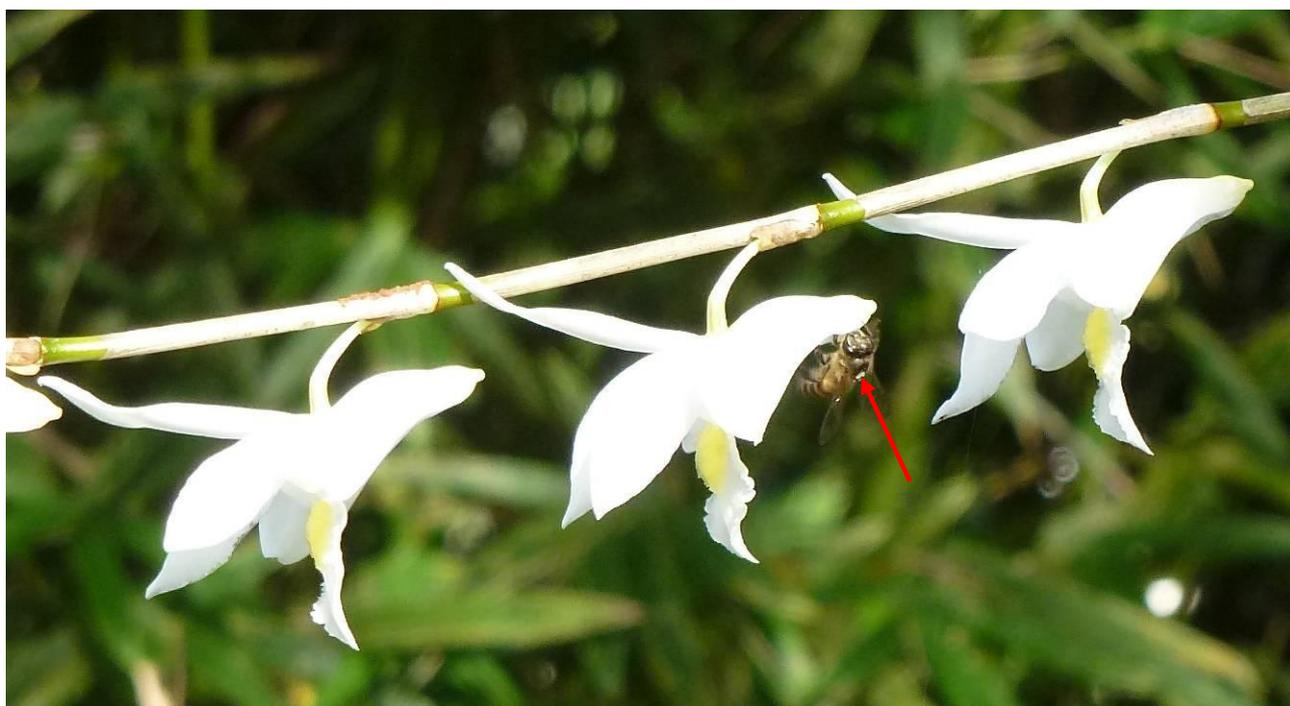


Fig. 6. Frontal view of a bee, *Apis cerana*, just about to leave a pigeon orchid flower. The pollinium (arrowed) attached to the dorsum of its thorax is just visible. Photographed at 0805 hours on the morning of 23 Jul.2012 along Sian Tuan Avenue. (Photograph by: Yeow Chin Wee).



Fig. 7. Examples of young, developing fruits (10 × 4 mm) of the pigeon orchid (as in Figs. 5, 6), measured and photographed on 28 Jul.2012. (Photograph by: Yeow Chin Wee).

In the account of this orchid species by Holttum (1954), he mentioned that the “delightful fragrance...and the white colour of the flowers attract bees, which come soon after dawn and visit the flowers to suck their nectar”. The assumption by Holttum that nectar reward was provided by the orchid remains to be proven or even disproved. It is apparent that many species of *Dendrobium* are lacking in nectar, and may employ pollination strategies of deception and mimicry to achieve this (Kjellsson et al., 1985). Specific examples of nectarless species from Asia and Australia include *Dendrobium infundibulum* (Thailand; Kjellsson et al., 1985), *Dendrobium monophyllum* (Australia; Bartareau, 1995), *Dendrobium sinense* (China; Brodmann et al., 2009), and *Dendrobium speciosum* (Australia; Slater & Calder, 1988).

In a recent paper by Arditti et al. (2012: 422, Fig. 9E), a photograph of a bee at a pigeon orchid flower, with a pollinium on its thorax, was featured. This was photographed by Greg Alikas (American Orchid Society). Hopefully, our observations will serve as a reminder of the crucial role that bees play in the ecosystem and help to prevent the excessive or inconsiderate use of pesticides/insecticides in and near ecologically-sensitive landscapes. The continued survival and reproduction of beautiful orchids, and countless other flower species, is highly dependent on the health of the humble bees.

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