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FICUS STRICTA (MIQ.) MIQ.: A NEW RECORD IN SINGAPORE

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ABSTRACT. — *Ficus stricta* (Miq.) Miq. (Moraceae) is a fig previously unrecorded in Singapore, and was listed as an exotic by Chong et al. (2010). However, since it was only recently collected in 2004, and with Singapore lying within the general geographic range of the species, we are of the opinion that the species is native but previously uncollected and overlooked because of its rarity. it is only known from Changi and Pulau Ubin, and we would like to propose it as nationally critically endangered. Oriental pied hornbills were observed to feed on its ripe syconia, and we believe that it is an important food resource of this and other bird species. Therefore, we suggest that existing reproductive individuals should be conserved and more plants should be planted in parks and gardens to support animal biodiversity.

KEY WORDS. — *Ficus stricta*, Moraceae, Singapore

INTRODUCTION

The genus *Ficus* (figs) consists of more than 700 species worldwide, with more than 360 of the species native to Malesia (Berg & Corner, 2005). *Ficus stricta* (Miq.) Miq. belongs to the subgenus *Urostigma*, section *Urostigma*, and subsection *Conosycea*. It ranges from South China, Myanmar (Andaman Islands), Indochina, the Philippines (Luzon, probably cultivated), the Malay Peninsula, Sumatra, and Java, inhabiting forests up to 2000 m above sea-level (Berg & Corner, 2005). Based on the description by Berg & Corner (2005), it is a tree up to 40 m tall, developing through a hemiepiphytic stage. The slender 2–3-mm thick branches bear leaves in two rows with elliptic, oblong to ovate glabrous leaf blades that are 8–14 cm by 3.6–6 cm (Fig. 1a,b) and petioles 0.9–1.8 cm long. The midrib is slightly impressed with a pair of waxy glands at the base (Fig. 1c). There are 10–14 pairs of lateral veins, with the basal pair 1/10–1/6 up the length of the leaf blade. The stipules are up to 3 cm long (Fig. 1d). The syconia with persistent basal bracts are found paired or solitary in leaf axils (Fig. 1e,f). They are 1.5–3 cm across when fresh and ripen yellow though orange to dark red.

PAST AND PRESENT RECORDS

Even though the range of the species includes the Malay Peninsula, it was not collected in Singapore until S. K. Ganesan deposited two specimens from Changi in the Herbarium, Singapore Botanic Gardens (SING) in 2004 (Table 1). The dearth of specimens for this species was unexpected as mature trees were previously noted by Ali bin Ibrahim (AI) of the National Parks Board (NParks) to be found on Pulau [= Island] Ubin as well as in Changi in 2002. As it is not a cultivated species in Singapore, it is very likely that it was originally found in Singapore but overlooked and uncollected because of its rarity, and its numbers may have further reduced owing to the deforestation of Singapore in historical times (Corlett, 1991).

Berg & Corner (2005) also noted that the species is poorly represented in herbarium collections and we interpret this as evidence of its general rarity. Another piece of evidence suggesting that the species has been found in Singapore much earlier on is John Turnbull Thomson's depiction of a tree in 1850 (see Fig. 3a), which could be the same individual as

Table 1. Previous Singapore collections of *Ficus stricta* (Miq.) Miq. deposited in the Herbarium, Singapore Botanic Gardens (SING).

S/No.	Accession No.	Collector	Collector's No.	Date	Locality
1.	—	S. K. Ganesan	SKG69	23 Apr.2004	Hendon Road, Changi
2.	—	S. K. Ganesan	SKG74	23 Apr.2004	Cranwell Road, Changi

the one found at Celestial Resort, on Pulau Ubin (Ali bin Ibrahim, 2002). This would make the above-mentioned tree more than 160 years old, which makes it a very fitting recipient of the heritage tree title under the Heritage Tree Scheme of NParks.

To our knowledge, there are seven sizable reproductive individuals in Changi. Two of these trees, located at Aloha Changi Chalets along Netheravon Road, are listed as Heritage Trees. We further noted two trees at Sealand Road, and one tree each at Cranwell Road (near the junction with Loyang Avenue), along Loyang Avenue in the Changi Air Base (opposite Halton Road), and at Old Pier Road (Fig. 2). On Pulau Ubin, it is represented by another eight sizable individuals. Three of them, including the Heritage Tree mentioned above, are found at the Celestial Resort (Fig. 3). One tree is found behind the Ubin Volunteer Hub, two are found along Jalan Noordin, near the National Police Cadet Corp (NPCC) Camp Resilience campsite, and one each at Kampong Sungei Tiga Chinese Cemetery and in Kampong Melayu (Fig. 4). In light of the species being represented in Singapore by fewer than 20 sizable individuals, we would like to propose that it should be considered as nationally critically endangered. We have also nominated to NParks a number of trees for consideration as heritage trees.

Fig. 1. *Ficus stricta* (Miq.) Miq.: a, leafy shoots; b, close-up of back of leaf; c, close up of petiole showing glands; d, close up of stipule; e, figging shoot; and f, close up of ripe syconia. Scale bars = 1 cm. (Photographs by: Yeo Chow Khoon).

Fig. 2. *Ficus stricta* individuals found on Singapore Island: a, Loyang Avenue (about 10 m tall); b, Cranwell Road (about 12 m tall); c, d, Sealand Road (about 12 m and 10 m tall respectively); e, two heritage trees at Netharavon Road Aloha Changi chalet compound; and f, Old Pier Road (about 15 m tall). (Photographs by: Ng Wen Qing [a] and Yeo Chow Khoon [b–f]).

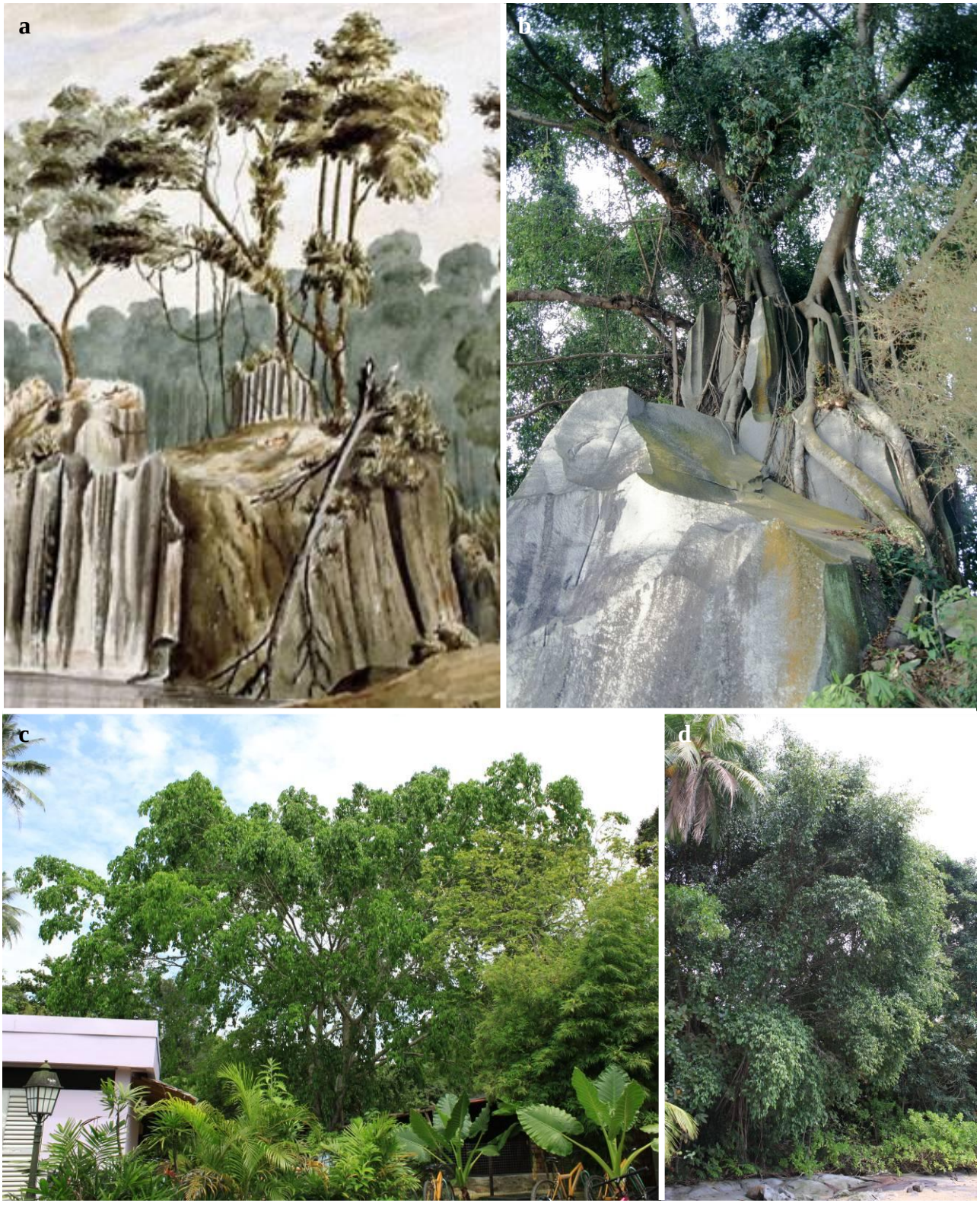

Fig. 3. a, Tree on an outcrop at Pulau Ubin depicted by John Turnbull Thomson in 1850, entitled "Grooved stones at Pulo Ubin near Singapore" (shown in part); b, tree which bears a striking resemblance to the *Ficus stricta* individual designated as a Heritage Tree at Celestial Resort. The complete image of the painting, whose use is subjected to conditions stated by the University of Otago Library, can be obtained at the following url: http://digital.otago.ac.nz/images/hocken/full/a12165.jpg. Two younger and smaller individuals about 10 m tall: c, at the entrance to the resort; and d, on the rocky shore just east of the Heritage Tree. (Photographs by: Ali Ibrahim [b] and Yeo Chow Khoon [c–d]).

Fig. 4. a, A young *Ficus stricta* individual about 8 m tall, just behind the Ubin Volunteer Hub on a live sea almond (*Terminalia catappa*) host tree (blue arrow). b, The largest tree on Pulau Ubin second to the Heritage Tree, with girth of just over 6 m measured at 1 m. The dying host tree (blue arrow), durian (*Durio zibethinus*), is still visible between the encircling roots. It is so huge that it was not possible to take a good habit photograph given the limited space. Two sizable individuals along Jalan Noordin, at over 25 m tall: c, with girth of over 3.5 m measured at 1 m (Joseph Lai of NParks posing for scale) and d, over 4.5 m tall (Ali Ibrahim and Joseph Lai of NParks examining the fruiting tree). e, The shortest of the trees on Pulau Ubin found at the Chinese Cemetery at Kampong Sungei Tiga. At just 8 m tall, it has just started to strangle a neighbouring ipoh tree (*Antiaris toxicaria*; indicated by the blue arrow). The *Ficus stricta* individuals are indicated by red arrows. (Photographs by: Yeo Chow Khoon).

IMPORTANCE OF PROTECTING THE SPECIES

Ficus is considered to be a keystone taxon in Southeast Asia and the Neotropics for its aseasonal year-round fruit production that supports a wide range of vertebrate frugivores (Leighton & Leighton, 1983; Terborgh, 1986; Lambert & Marshall, 1991). In the course of our field observations we also noted that mature individuals of the species attracted frugivorous birds, such as Asian koel (*Eudynamys scolopaceus* (Linn.); Fig. 5), and insectivores such as swifts (family Apodidae; Fig. 6). It also appears to be a food resource of the Oriental pied hornbill (*Anthracoceros albirostris* (Shaw & Nodder); Fig. 7), and the aseasonal fruiting of the genus may constitute a staple for this and other hornbill species. Wee et al. (2008) have suggested that syconia are a favourite food of the Oriental pied hornbill and may be an important source of calcium during its breeding season. Thus, we would like to affirm the importance of *Ficus* in supporting

diverse bird species at various trophic levels, and suggest that a proper food-web study is needed to verify the anecdotal evidence we have to date.

While vertebrate frugivores may depend on *Ficus* syconia as a stable, though not necessarily the sole, food resource, there are probably even more diverse invertebrate communities dependent on *Ficus*, notably the chalcid wasps (Chalcidoidea: Hymenoptera), consisting of both species-specific pollinators and less species-specific parasites (Weibes, 1979; Boucek, 1993), which owing to the close symbioses cospeciate to various extents with the host *Ficus* species (Jackson, 2004). These invertebrate communities, while less visible and studied, should not be overlooked as a major beneficiary of efforts to conserve *Ficus* species.

We believe that existing mature individuals of the species should be protected and more individuals could be propagated to support animal biodiversity and as a plant of ornamental value. Supplying the growing material should be easy as it can be easily propagated by air-layering and stem cuttings in both sand and aerated water (CKY, pers. obs.). Furthermore, in the context of critical population size of *Ficus* (Bronstein et al., 1990), our "population" is probably not self-sufficient in supporting the pollinator-fig mutualism, which requires unbroken compatible overlapping reproductive phases. Thus, in conserving the few local reproductive individuals of the species we are conserving a small part of a geographically extensive breeding population. This places our local conservation effort in a regional perspective and highlights how protecting our biological heritage often has to be a coordinated effort that crosses national borders.

Fig. 5. Asian koel, *Eudynamys scolopaceus* (Linn.), feeding on the ripe figs of *Ficus stricta* along Loyang Avenue. (Photograph by: Ng Xin Yi).

Fig. 6. Swifts were sighted circling *Ficus stricta* with ripe and ripening syconia along Loyang Avenue. It is hypothesized that the Phase D syconia releasing pollinator wasps could be attracting these insectivorous birds. (Photograph by: Ng Xin Yi).

Fig. 7. An Oriental pied hornbill, *Anthracoceros albirostris* (Shaw & Nodder), feeding on the ripe figs of *Ficus stricta* along Loyang Avenue. (Photograph by: Ng Xin Yi).

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