

STATUS AND DISTRIBUTION IN SINGAPORE OF *FICUS CRASSIRAMEA* (MIQ.) MIQ. (MORACEAE)

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ABSTRACT. — In Singapore, *Ficus crassiramea* (Miq.) Miq. (Moraceae), commonly known as the collared fig, is a nationally critically endangered species that can now only be found in the wild on Pulau Tekong and Pulau Ubin. It has been observed to do well in cultivation and is known to support a wide range of frugivorous bird species. We therefore propose that *Ficus crassiramea* should be propagated and planted more extensively around Singapore Island, where it can be grown in coastal parks and other sites to enhance the native biodiversity.

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

INTRODUCTION

Ficus crassiramea, the collared fig, and previously identified as *Ficus procera* (Corner, 1988), is a hemiepiphytic tree up to 30 m tall (Berg & Corner, 2005). Its 5–18 mm thick twigs have minute hairs concentrated at the stipular scars. The spirally arranged, stalked leaves have leathery leaf blades that are long, narrow, 8–38 cm long by 3–16 cm wide, with rounded ends (Fig. 1). Each leaf blade has 6–12 pairs of lateral veins, with the basal pair departing 0.2–1.0 cm above the base of the midrib towards the blade margins. The petiole is 2–8 cm long and 2–5 mm wide (Fig. 2). The stipules are usually 2–5 cm long. The axillary syconia are usually paired or single on the twig with three, yellow, circular basal bracts, mostly 5–20 mm long (Fig. 3) and which cover 1/6 to 2/3 of each syconium. The round syconia are 8–35 mm across (Fig. 4). When ripe, the syconia are yellow to dark red with ostioles 2–10 mm across (Fig. 4).



Fig. 1. Spirally arranged leaves of *Ficus crassiramea*. (Photograph by: Ng Xin Yi).



Fig. 2. Upper and under sides of the leaf and a whole syconium. Scale bar = 2 cm. (Photograph by: Ng Xin Yi).



Fig. 3. Paired and single syconia with distinct ostioles. Scale bar = 1 cm. (Photograph by: Ang Wee Foong).



Fig. 4. Two halves of a syconium showing the cut surfaces. Scale bar = 0.5 cm. (Photograph by: Ng Xin Yi).

Ficus crassiramea ranges from Myanmar and Thailand to the Solomon Islands and in Malesia it is found in Sumatra, the Malay Peninsula, Java, Borneo, the Philippines, Celebes, Moluccas and New Guinea (Fig. 5) (Berg & Corner, 2005). It can be found in forests up to 1,500 m altitude and grows frequently in coastal and riverine areas.

The ripe syconia of *Ficus crassiramea* are consumed by various bird species such as the orange-bellied flowerpecker (*Dicaeum trigonostigma*), blue winged leafbird (*Chloropsis cochinchinensis*) (Shanahan et al., 2001), jambu fruit dove (*Ptilinopus jambu*), thick-billed green-pigeon (*Treron curvirostra*), lesser green leafbird (*Chloropsis cyanopogon*), greater green leafbird (*Chloropsis sonnerati*), fairy bluebird (*Irena puella*), yellow-vented flowerpecker (*Dicaeum chrysorrheum*), buff-vented bulbul (*Iole olivacea*), hill myna (*Gracula religiosa*), emerald dove (*Chalcophaps indica*) and red-eyed bulbul (*Pycnonotus brunneus*) (Lambert, 1989) as well as the blue crowned hanging parrot (*Loriculus galgulus*), a fig specialist (and probable seed predator) and uncommon resident in Singapore (Wells, 1999).

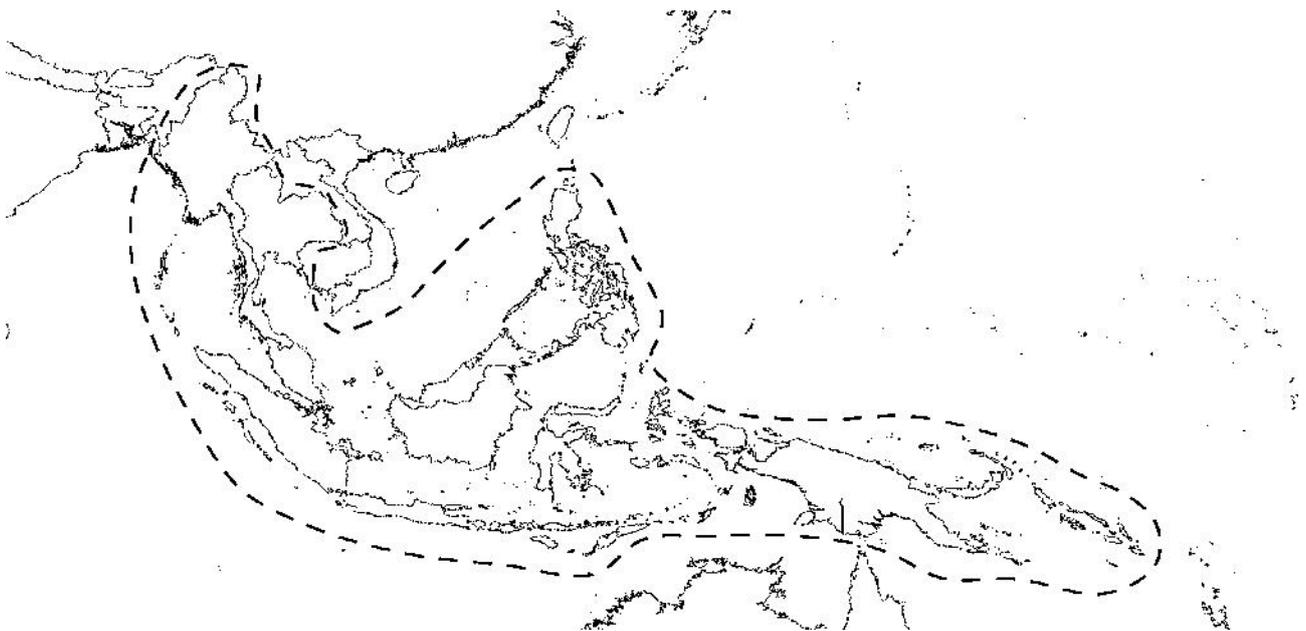


Fig. 5. Distribution of *Ficus crassiramea*. (Map by: Alex T. K. Yee).

Animal interactions. — *Ficus* species are highly dependent upon fig wasps for pollination of their flowers (Wiebes, 1979). Fig wasp species associated with *Ficus crassiramea* include *Waterstoniella fiorii* Grandi, *Waterstoniella acobsoni* (Grandi), *Waterstoniella cuspidis* Wiebes and *Waterstoniella solomonensis* Wiebes in different parts of its range (Wiebes, 1994). Like most other pollinators of monoecious *Ficus* species, *Waterstoniella* species fly above the canopy where air currents are likely to carry them long distances (Jeevanandam & Corlett, 2013). This means that the Singapore plants are probably linked by pollination with other populations well beyond Singapore, rather than depending on local wasp production. Monoecious *Ficus* species also support many species of non-pollinating wasps, some of which appear to be species specific. NXY and RCJL have observed syconium production in two individuals in Singapore within six months of each other. *Ficus crassiramea* was recorded to fruit at regular intervals of 5–7 months and within 6 weeks for individuals in Kuala Lompat, Peninsular Malaysia. The ripe syconia were also observed in the same study to persist on the plant for 14–30 days (Lambert & Marshall, 1991). *Ficus crassiramea* was observed to shed its leaves throughout the year in Tasik Chini, Peninsular Malaysia (Muhammad Azmil & Wan Juliana, 2013).

In addition, the Oriental pied hornbill (*Anthracoceros albirostris*), a fig specialist and rare resident, was observed feeding on the syconia (Fig. 6.) of the *Ficus crassiramea* individual near the Pulau Ubin Jetty on 5 and 6 Feb. 2013 (NXY and RCJL, pers. obs).

Propagation methods and its significance. — In Singapore, 69% of the native *Ficus* species are either nationally critically endangered or nationally extinct (Jeevanandam & Corlett, 2013). *Ficus crassiramea* is a nationally critically



Fig. 6. Oriental pied hornbill (*Anthracoceros albirostris*) feeding on the ripe syconia in Pulau Ubin. (Photograph by: Fung Tze Kwan).

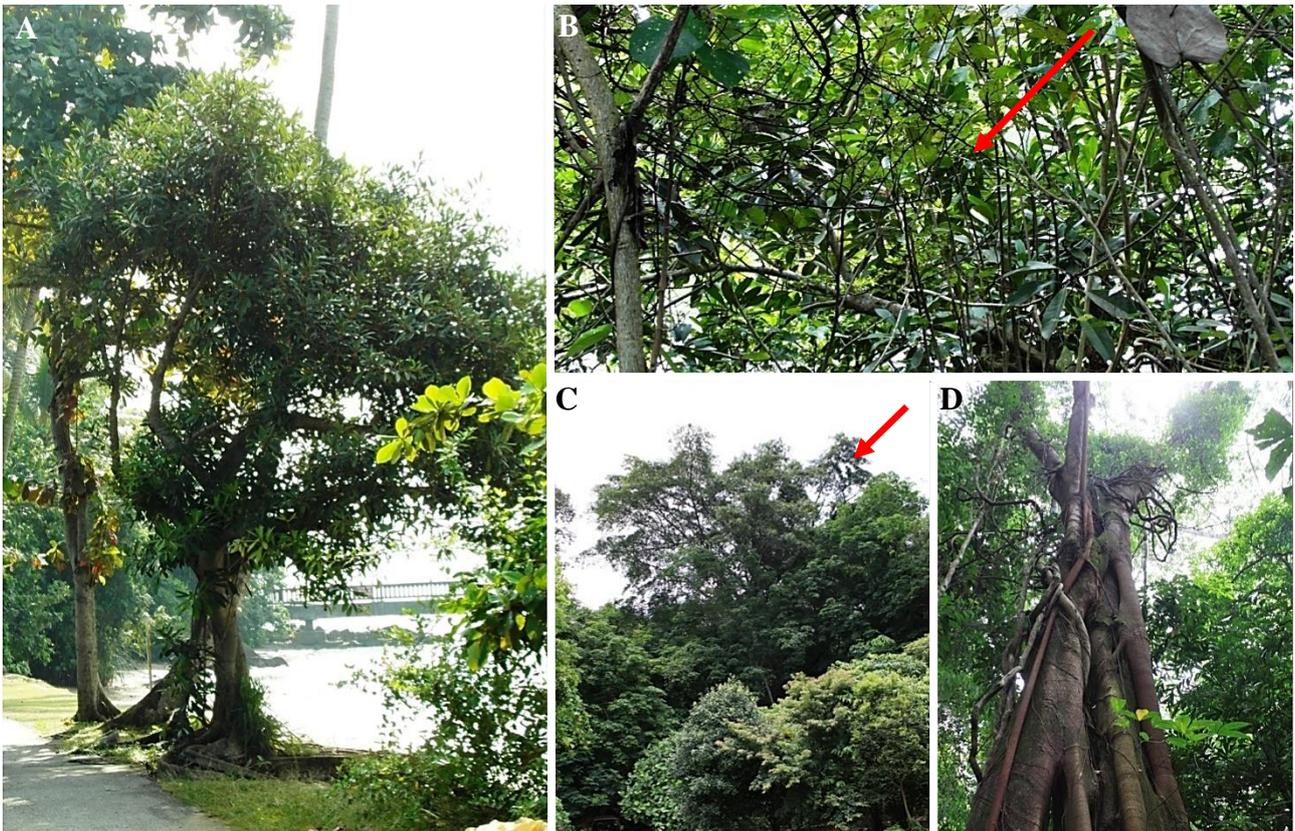


Fig. 7. Three individuals of *Ficus crassiramea* in Pulau Ubin. A, the individual near to the information kiosk where the Oriental pied hornbill has been observed feeding on its syconia; B, the sprawling individual near to National Parks Board Sensory Trail; C & D, the mature individual in Ketam Mountain Bike Park. (Photographs by: Reuben C. J. Lim [A, B] and Yeo Chow Khoo [C, D]).

endangered species (Tan et al., 2008; Chong et al., 2009) that can only be found on Pulau Tekong and Pulau Ubin, so more effort should be put into propagating this rare plant.

Stem cuttings collected from Pulau Ubin had a rooting success rate of 47 out of 100 collected (unpublished research data from A. F. S. L. Lok and W. F. Ang). Cuttings of at least three nodes were placed in running water for at least a day to leach out the latex before planting in moist sand, and then took approximately one month to start rooting. Once rooted, individuals can be planted in a mixture of potting mix, perlite, and vermiculite.

PAST AND PRESENT RECORDS

Ficus crassiramea was first collected in Singapore in the late 19th century by H. N. Ridley and R. W. Hullett (Table 1). More recent collections have been in Pulau Tekong and Pulau Ubin between 1997–2008, and once from Pulau Seraya in 1949. Presently, there are four individuals on Pulau Ubin—one grows near the Pulau Ubin Ferry Terminal jetty, another near the National Parks Board Sensory Trail and the remaining two, in the Ketam Mountain Bike Park. The first is a small tree 4 m tall (Fig. 7A), the second is a sprawling shrub (Fig. 7B), the third is a large tree about 25 m tall (Fig. 7C) and the fourth is a smaller tree close by. There are three individuals in Pulau Tekong near the coast (R. Teo, pers. obs.), and three individuals around the edge of the Pulau Tekong Reservoir (A.F.S.L. Lok, pers. obs.). One individual is designated by the National Parks Board as a [Heritage Tree](#) and it grows on Pulau Ubin, along the Ketam Bike Trail, near the Pipit Hut (Reference No. HT 2013-205; 1°24'44.9"N 103°56'37.3"E).

DISCUSSION

The loss of much coastal forest because of land reclamation and land-use change in Singapore may have resulted in *Ficus crassiramea* being no longer being found on Singapore Island. There could be more individuals in Pulau Tekong and Pulau Ubin but more extensive surveys need to be done to record the exact number present there.

Ficus crassiramea, with its relatively successful propagation rate, has potential to be a good ornamental or landscape plant, which could be planted in coastal parks as well as at forest fringes. In addition, it can survive relatively well in

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

S/No.	Bar Code No.	Collector(s)	Collector's No.	Date	Locality
1.	0013968	R. W. Hullett	529	Apr.1886	Singapore
2.	0013965	H. N. Ridley	s.n.	1892	Changi
3.	0013966	H. N. Ridley	3396	1892	Fort Canning
4.	0013967	J. Sinclair	38585	1 May 1949	Pulau Seraya
5.	0008056	J. Lai	167	7 Jan.1997	Pulau Ubin
6.	0042887	A. T. Gwee	161	7 Jan.2003	Pulau Ubin
7.	0046148	A. T. Gwee	331	13 Aug.2003	Pulau Ubin
8.	0109188	A. T. Gwee	2008-247	17 Jun.2008	Pulau Tekong

cultivation as seen from cultivated individuals in the Singapore Botanic Gardens and National University of Singapore. The NUS individual was found to be producing figs recently (Figs. 8). Other than its ornamental potential, its roots, bark and leaves have been also used traditionally to treat snake bites by pounding them into a paste (Slik, 2009).

Syconium production attracts frugivorous birds such as the Oriental pied hornbill, which is an uncommon resident in Singapore. Syconia are an important food resource for the hornbills owing to their calcium content which is essential for the egg-laying period in female birds (Wee et al., 2008). Most of the other bird species that were recorded to feed on *Ficus crassiramea* are also uncommon residents which are either *Ficus* species generalists, whereby figs make up a large percentage of their diet (Wee et al., 2008). Therefore planting more *Ficus crassiramea* individuals and other native *Ficus* species could lead to the enhancement of the native bird biodiversity in urban parks and gardens.

CONCLUSIONS

As *Ficus crassiramea* is restricted to the offshore islands with only a few known individuals, and its localised and patchy distribution makes it very vulnerable to local extinction. More extensive surveys should be conducted on these islands where more individuals could be discovered and propagated for greater genetic diversity. It has sporadic syconium-producing episodes which have been documented to feed a substantial number of frugivorous bird species and is potentially an important food resource for many birds if planted more abundantly. *Ficus crassiramea* has a beautiful form consisting of a single trunk with a few pillar roots and attractive leaves and orange syconia, and the ability to withstand roadside conditions. The relative ease of propagation means many individuals can be produced in little time. These points make it ideal for cultivation in several urban sites such as parks, streetscapes, and housing estates for both conservation and ecological benefits.

A



B



Fig. 8. Cultivated *Ficus crassiramea* trees in: A, National University of Singapore Kent Ridge Campus (Kent Ridge Crescent) and; B, Singapore Botanic Gardens. (Photographs by: Reuben C. J. Lim [A] and Ang Wee Foong [B]).

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LITERATURE CITED

- Berg, C. C. & E. J. H. Corner, 2005. *Ficus*—Moraceae. *Flora Malesiana*, Series I, **17**: 1–730.
- Chong, K. Y., H. T. W. Tan & R. T. Corlett, 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 Nov.2009. http://lkcnhm.nus.edu.sg/nus/pdf/PUBLICATION/LKCNH%20Museum%20Books/LKCNHM%20Books/flora_of_singapore_tc.pdf. (Accessed 31 Aug.2013).
- Corner, E. J. H., 1988. *Wayside Trees of Malaya. Volume 2. 3rd Edition*. Malayan Nature Society, Kuala Lumpur. ix pp., Pp. 477–861, figs. 146–260, pls. 139–236.
- Jeevanandam, N. & R. T. Corlett, 2013. Fig wasp dispersal in urban Singapore. *Raffles Bulletin of Zoology*, **61**: 343–347.
- Lambert, F. R., 1989. Fig-eating by birds in a Malaysian lowland forest. *Journal of Tropical Ecology*, **5**: 401–412.
- Lambert, F. R. & A. G. Marshall, 1991. Keystone characteristics of bird-dispersed *Ficus* in a Malaysian lowland rain forest. *Journal of Ecology*, **79**: 793–809.
- Muhammad Azmil, A. R. & W. J. Wan Juliana, 2013. Phenological patterns of selected *Ficus* species in Tasik Chini, Malaysia. *Malaysian Applied Biology Journal*, **42**: 89–92.
- Shanahan, M., S. So, S. G. Compton & R. Corlett, 2001. Fig-eating by vertebrate frugivores: A global review. *Biological Reviews*, **76**: 529–572.
- Slik, F., 2009. *Ficus crassiramea*, Moraceae. *Plants of Southeast Asia*. http://www.asianplant.net/Moraceae/Ficus_crassiramea.htm. Last updated 25 Feb.2013. (Accessed 31 Aug.2013).
- Tan, H. T. W., K.-x. Tan, Ali bin Ibrahim, P. T. Chew, K. S. Chua, H. Duistermaat, S. K. Ganesan, M. W. K. Goh, A. T. Gwee, R. Kiew, S. M. L. Lee, P. Leong, J. Lim, A. F. S. L. Lok, A. H. B. Loo, S. K. Y. Lum, T. Morgany, Saifuddin Suran, S. Sim, Haji Samsuri bin Haji Ahmad, Y. C. Wee, K. F. Yap, C. K. Yeo & J. W. H. Yong, 2008. Checklists of Threatened Species—Seed Plants. In: Davison, G. W. H., P. K. L. Ng & H. C. Ho (eds.), *The Singapore Red Data Book. 2nd Edition*. The Nature Society (Singapore), Singapore. Pp. 213–244.
- Wee, Y. C., K. C. Tsang, M. Chan, Y. M. Chan & A. Ng, 2008. Oriental pied hornbill: Two recent failed nesting attempts on mainland Singapore. *BirdingASIA*, **9**: 72–77.
- Wells, D. R., 1999. *The Birds of the Thai-Malay Peninsula. Volume 1. Non-Passerines*. Academic Press, London. 648 pp.
- Wiebes, J. T., 1979. Co-evolution of figs and their insect pollinators. *Annual Review of Ecology and Systematics*, **10**: 1–12.
- Wiebes, J. T., 1994. *The Indo-Australian Agaoninae (Pollinators of Figs)*. Koninklijke Nederlandse Akademie van Wetenschappen Verhandelingen Afdeling Natuurkunde, Tweede Reeks, Deel 92. North-Holland, Amsterdam. 208 pp.