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THE VASCULAR PLANT FLORA OF ADMIRALTY FOREST, SINGAPORE

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ABSTRACT. — A checklist of vascular plant species was compiled for Admiralty Forest, a secondary forest located at the junction of Woodlands Avenue 4 and Woodlands Avenue 9 on Singapore Island. In 2011, we sampled 10 plots of 20 × 20 m each within Admiralty Forest—five in the northern half and five in the southern half of the forest patch, which have different land use histories. Within each plot, we recorded all vascular plant species and measured the diameter at breast height (DBH) of all woody stems with a DBH ≥5 cm to estimate species dominance. The resultant species list was supplemented with information from other surveys conducted in 2012. We recorded 122 species from 56 families. Eighty-six of the recorded species are native, 32 are exotic, and four are cryptogenic. Among the measured woody stems, *Hevea brasiliensis* was the species found to occur most frequently on average. The high native species richness of Admiralty Forest and the presence of iconic, large native trees support the conservation of Admiralty Forest in the face of proposed development.

KEY WORDS. — checklist, conservation, flora, Admiralty Road West, secondary forest

INTRODUCTION

Admiralty Forest (01°26′54″N, 103°47′17″E) is a secondary forest that has regenerated on land that was once used for cultivation. It is located in the north of Singapore Island, at the junction of Woodlands Avenue 4 and Woodlands Avenue 9, and it is bound by Admiralty Road West to the north, and Admiralty Park and Republic Polytechnic to the west (Figs. 1, 4A). Based on Google Earth® satellite images, the total area of Admiralty Forest is estimated to be 38.2 ha.

Fig. 1. Admiralty Forest with respect to nearby landmarks (Google, 2012). The red outline shows the extent of the forest at 19 Feb.2012 (date that the satellite image was acquired). The locations of surveyed vegetation plots are represented by yellow dots—plots in the southern half (abandoned rubber plantations) are labelled A1–A5 while plots in the northern half (cleared land and sundry cultivation) are labelled B1–B5.

The construction of the northernmost train station of the Thomson Mass Rapid Transit Train Line, expected to be completed in 2019 (The Straits Times, 2012; URA, 2013), is likely to impact the north-western region of the forest. According to recently released plans for the new Woodlands North Coast district (Fig. 2), the rest of the forest will be cleared for commercial developments within the next 10–15 years (The Straits Times, 2013; URA, 2013).

Admiralty Forest was part of a rubber plantation from the 1920s to the 1950s (Surveyor-General, Federated Malay States and Straits Settlements, 1924; Survey Production Centre, South East Asia, 1945; Surveyor-General, Malaya, 1953). By 1969, the northern half of the vegetation was cleared, while the southern half remained rubber plantations (Chief Surveyor, Singapore, 1969). In the 1980s, the vegetation in the northern half of Admiralty Forest was classified as sundry tree cultivation and minor cultivation, while the southern half remained rubber tree-dominated (Singapore Mapping Unit, 1982, 1987). From the 1990s onwards, the vegetation of Admiralty Forest was characterised as sundry tree cultivation, and the area was also for a brief period, a military protected area (Singapore Mapping Unit, 1992, 2000).

Despite the fact that secondary forests are disturbed and sometimes degraded forests, they can be refuges and resource pools for local biodiversity (Turner & Corlett, 1996; McShea et al., 2009; Edwards et al., 2010). Previous studies have shown that secondary forests in urban Singapore can support populations of wildlife such as birds, butterflies, and frogs (Koh & Sodhi, 2004; Castelletta et al., 2005; Bickford et al., 2010; K. Y. Chong, S. Teo, and H. T. W. Tan, unpublished data).

Fig. 2. The Singapore Urban Redevelopment Authority's plans for the new Woodlands North Coast district of Woodlands Regional Centre (URA, 2013). The approximate current extent of Admiralty Forest is outlined in yellow.

This paper aims to provide an accessible working checklist of the vascular plant species of Admiralty Forest, which may be useful for assessing the conservation value of the forest.

MATERIAL AND METHODS

In 2011, we surveyed 10 vegetation plots of 20 × 20 m each within Admiralty Forest. The forest patch was divided into two according to differing land use history and five plots, spaced at least 60 m apart from one another and located at least 40 m from the forest edge, were sampled within each section. The location of each plot was randomly derived using the fTools v. 0.6.1 plugin for the Quantum GIS software v. 1.6.0 (Quantum GIS Development Team, 2010). Within each plot, we recorded all species of vascular plants. Where species could not be identified in the field, specimens were collected for their identities to be further determined in the laboratory or in the Singapore Botanic Gardens Herbarium (SING). To estimate species dominance, stem diameter at breast height (DBH; measured at 1.3 m above the ground) was recorded for all woody stems with a DBH ≥5 cm. Palms (Arecaceae) were not measured owing to the difficulty in measuring the true stems for some species. The species with their DBH measured were ranked by the mean number of stems per plot.

In addition to the vegetation plots, we conducted some opportunistic exploration of the forest in 2012 and recorded the presence of species that were found then.

A checklist of all vascular plant species recorded from Admiralty Forest was compiled. The nomenclature and national status category of each species mostly follow and update those of Chong et al. (2009).

A species accumulation curve was constructed from the 10 sampled plots to determine how the number of recorded vascular plant species increased with sampling effort. The 'specaccum' function implemented in the vegan v. 2.0-2 package of the statistical software R v. 2.14.1 (R Development Core Team, 2011) was used. The approximate total number of species in the species pool, i.e., including unseen or undetected species, was calculated using the 'specpool' function in the vegan v. 2.0-2 package (R Development Core Team, 2011). In addition, the species with their DBH measured were ranked by the mean number of stems per plot.

RESULTS AND DISCUSSION

A total of 122 vascular plant species from 56 families were recorded. The species and their national conservation status categories are presented in Appendix 1. Based on Chong et al. (2009), 86 of the recorded species are native, 32 are exotic, and four are cryptogenic (equivalent to the "Weed of Uncertain Origin" category in Chong et al., [2009]). Of the native species, one was deemed to be nationally extinct in Chong et al. (2009), seven are nationally critically endangered, five are nationally endangered, and 11 are nationally vulnerable (Table 1). The species presumed to be nationally extinct is *Syzygium myrtifolium*, which has probably persisted from cultivation from non-Singaporean

Table 1. Summary of the national status categories of the vascular plants of Admiralty Forest.

Nativeness	National Status Category	No. of Species	Percentage of All Species	Percentage of All Native Species
Exotic	Naturalised	18	14.75	—
	Casual	8	6.56	—
	Cultivated only	6	4.92	—
	Total	**32**	**26.23**	—
Cryptogenic	Cryptogenic	4	3.28	—
	Total	**4**	**3.28**	
Native	Presumed nationally extinct (persistence from cultivation)	1	0.82	1.16
	Critically endangered (persistence from cultivation)	1	0.82	1.16
	Critically endangered	6	4.92	6.98
	Endangered	5	4.10	5.81
	Vulnerable	11	9.02	12.80
	Common	61	50.00	70.93
	Not Assessed	1	0.82	1.16
	Total	**86**	**70.49**	—

provenance. Of the seven critically endangered species, two are likely to have persisted from cultivated rather than local provenance. They are: *Calophyllum inophyllum* and *Nephelium lappaceum*. The other five critically endangered species are: *Macaranga hullettii*, *Gymnacranthera forbesii*, *Piper flavimarginatum*, *Centotheca lappacea*, and *Psychotria sarmentosa*.

When the number of species recorded from the surveyed plots was plotted against sampling effort, it was found that the species accumulation curve did not plateau (Fig. 3). This suggests that further sampling effort is required for a better approximation of the true number of species in Admiralty Forest. The estimates of the total number of species in the species pool of Admiralty Forest are presented in Table 2, and range from 125–200 species (Table 2). Based on the most conservative estimate (Chao), only 54% of the total number of species was sampled.

The species for which we measured basal area are presented in Appendix 2, and are ordered by the mean number of stems measured per plot, except for species for which only a single individual was measured. The species found to occur most frequently was the Pará rubber, *Hevea brasiliensis*, which averaged 12.6 stems per plot and made up 2.3% of the basal area measured in a plot on average. The most dominant species by basal area was found to be albizia, *Falcataria moluccana*, which made up 18.1% of the basal area of a plot on average and averaged 2.5 stems per plot. One exotic species of ecological concern that should be highlighted is *Cecropia pachystachya*. This species is potentially invasive in Singapore. It has been shown to have naturalised and spread widely around Singapore, and it has been hypothesized that it outcompetes native *Macaranga* species (Lok et al., 2010; Raphael, 2012). *Cecropia pachystachya* averaged 1.3 stems per plot and occupied 1.0% of a plot on average, with a DBH range of 6.5–20.1 cm.

While exotic species such as rubber and albizia are a substantial component of the sub-canopy and canopy layers of this forest, the majority of the species that we measured are native species typical of young secondary forests in Singapore (e.g., *Rhodamnia cinerea*, *Adinandra dumosa*, *Timonius wallichianus*) (Boo, 1996; Shono et al., 2006). During our opportunistic exploration of the forest, we also encountered very large, mature individuals of native species such as pulai, *Alstonia angustiloba* (Fig. 4b) and tembusu, *Fagraea fragrans* (Fig. 4c). The high representation of native species in the tree community and in the understory (70% of all recorded species are native, and include characteristic young secondary forest genera such as *Calophyllum*, *Macaranga*, and *Syzygium*) shows that the native plant species community is diverse and well established in Admiralty Forest despite the cultivation legacy of the area.

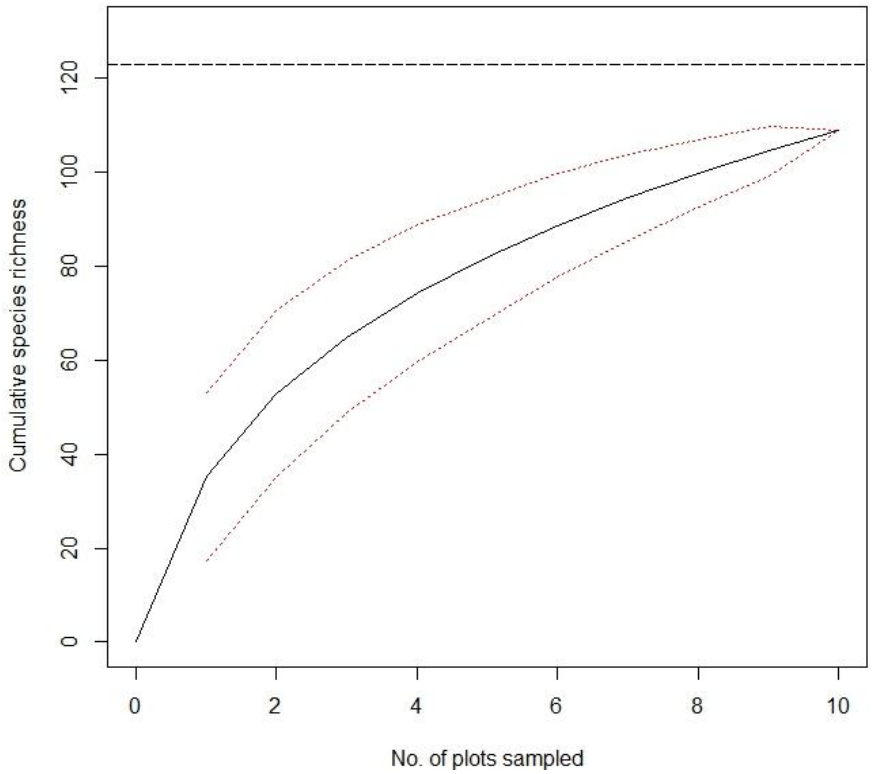

Fig. 3. Species accumulation curve showing the cumulative increase in the number of species recorded from the 10 sampled plots. The dotted lines represent 95% confidence intervals of the curve. The horizontal dashed line represents the total number of species recorded from Admiralty Forest (122 species).

Table 2. Approximate true number of species calculated based on data from the 10 sampled plots, using four commonly used species richness estimators.

Estimator	Chao	Jackknife 1	Jackknife 2	Bootstrap
Predicted number of species	200.05	148.50	176.68	125.40
Proportion of the observed number of species out of the total predicted number of species	0.54	0.73	0.61	0.86

Fig. 4. Some characteristic aspects of Admiralty Forest. A, Admiralty Forest as seen from Woodlands Drive 91, with Republic Polytechnic shown on the left; B, a large *Alstonia angustiloba* tree; C, a large *Fagraea fragrans* tree. (Photographs by: Louise Neo).

CONCLUSIONS

The development plan for Woodlands North Coast district includes a "Green Boulevard" within and around the proposed commercial hub. Admiralty Forest has conservation value because 70% of the flora is native, of which 28% is nationally threatened. We recommend that parts of it be retained as part of the "Green Boulevard". This would include the areas where nationally critically endangered species can be found. Within these areas, minimal restoration can be conducted to remove some of the more aggressive exotic species, such as *Cecropia pachystachya*. We also suggest that the large native trees of the forest be conserved and incorporated into the "Green Boulevard" for their iconic value. The retention of some parts of the spontaneously occurring natural vegetation of Admiralty Forest can contribute towards the lush green environment that is proposed for the Woodlands North Coast developments, while also preserving the heritage and identity of the Woodlands region of Singapore.

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APPENDIX 1

Checklist of the vascular plant flora of Admiralty Forest. Nomenclature and conservation status categories follow those of Chong et al. (2009) with some modifications based on our observations. "Weed of Uncertain Origin" of Chong et al. (2009) is cryptogenic in this list. Species are grouped by family and arranged in alphabetical order.

S/No.	Species	Nativeness	National Status
	ACANTHACEAE		
1.	*Asystasia gangetica* (L.) T.Anderson subsp. *micrantha* (Nees) Ensermu	Exotic	Naturalised
	ADIANTACEAE		
2.	*Adiantum latifolium* Lam.	Exotic	Naturalised
	ANACARDIACEAE		
3.	*Mangifera indica* L.	Exotic	Casual
	ARACEAE		
4.	*Alocasia longiloba* Miq.	Native	Common
5.	*Colocasia esculenta* (L.) Schott	Exotic	Casual
6.	*Epipremnum aureum* (Linden ex André) Bunting	Exotic	Casual
7.	*Syngonium podophyllum* Schott	Exotic	Naturalised
	ARALIACEAE		
8.	*Arthrophyllum diversifolium* Blume	Native	Common
	ARECACEAE		
9.	*Caryota mitis* Lour.	Native	Common
10.	*Dypsis lutescens* (H.Wendl.) Beentje & J.Dransf.	Exotic	Cultivated only
11.	*Elaeis guineensis* Jacq.	Exotic	Cultivated only
12.	*Ptychosperma macarthurii* (H.Wendl. ex anon.) H.Wendl. ex Hook.f.	Exotic	Naturalised
	APOCYNACEAE		
13.	*Allamanda cathartica* L.	Exotic	Casual
14.	*Alstonia angustiloba* Miq.	Native	Common
	AQUIFOLIACEAE		
15.	*Ilex cymosa* Blume	Native	Common
	ASPARAGACEAE		
16.	*Dracaena surculosa* Lindl.	Exotic	Cultivated only
	ASPLENIACEAE		
17.	*Asplenium nidus* L.	Native	Common
	ASTERACEAE		
18.	*Mikania micrantha* Kunth	Exotic	Naturalised
	BIGNONIACEAE		
19.	*Spathodea campanulata* P.Beauv.	Exotic	Naturalised
	BLECHNACEAE		
20.	*Stenochlaena palustris* (Burm.f.) Bedd.	Native	Common
	CALOPHYLLACEAE		
21.	*Calophyllum ferrugineum* Ridl.	Native	Common
22.	*Calophyllum inophyllum* L.	Native	Critically endangered
	CHRYSOBALANACEAE		
23.	*Maranthes corymbosa* Blume	Native	Endangered

S/No.	Species	Nativeness	National Status
	CYATHEACEAE		
24.	*Cyathea latebrosa* (Wall.) Copel.	Native	Vulnerable
25.	*Cyathea squamulata* (Blume) Copel.	Native	Endangered
	CYPERACEAE		
26.	*Scleria ciliaris* Nees	Native	Common
	DAVALLIACEAE		
27.	*Davallia denticulata* (Burm.) Mett.	Native	Common
28.	*Davallia fejeensis* Hook.	Exotic	Cultivated only
	DILLENIACEAE		
29.	*Dillenia suffruticosa* (Griff. ex Hook.f. & Thomson) Martelli	Native	Common
30.	*Tetracera indica* (Christm. & Panz.) Merr.	Native	Common
	DIOSCOREACEAE		
31.	*Dioscorea laurifolia* Wall. ex Hook.f.	Native	Common
32.	*Dioscorea orbiculata* var. *tenuifolia* (Ridl.) Thapyai	Native	Not Assessed
33.	*Dioscorea pyrifolia* Kunth	Native	Common
	ELAEOCARPACEAE		
34.	*Elaeocarpus ferrugineus* (Jack) Steud.	Native	Common
35.	*Elaeocarpus mastersii* King	Native	Common
36.	*Elaeocarpus petiolatus* (Jack) Wall	Native	Common
	EUPHORBIACEAE		
37.	*Claoxylon indicum* (Reinw. ex Blume) Hassk.	Native	Common
38.	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	Exotic	Naturalised
39.	*Macaranga bancana* (Miq.) Mull.Arg.	Native	Common
40.	*Macaranga conifera* (Zoll.) Mull.Arg.	Native	Common
41.	*Macaranga gigantea* (Rchb.f. & Zoll.) Mull.Arg.	Native	Common
42.	*Macaranga griffithiana* Müll.Arg.	Native	Vulnerable
43.	*Macaranga heynei* I.M.Johnst.	Native	Common
44.	*Macaranga hullettii* King ex Hook.f.	Native	Critically endangered
45.	*Macaranga hypoleuca* (Rchb.f. & Zoll.) Mull.Arg.	Native	Common
46.	*Mallotus paniculatus* (Lam.) Mull.Arg.	Native	Common
	FABACEAE		
47.	*Acacia auriculiformis* A.Cunn. ex Benth.	Exotic	Naturalised
48.	*Adenanthera pavonina* L.	Exotic	Naturalised
49.	*Andira inermis* (W.Wright) Kunth ex DC.	Exotic	Casual
50.	*Centrosema pubescens* Benth.	Exotic	Naturalised
51.	*Derris amoena* Benth. var. *maingayana* (Baker) Prain	Native	Vulnerable
52.	*Falcataria moluccana* (Miq.) Barneby & J.W.Grimes	Exotic	Naturalised
53.	*Pterocarpus indicus* Willd.	Exotic	Casual
54.	*Pueraria phaseoloides* (Roxb.) Benth.	Exotic	Naturalised
	FLAGELLARIACEAE		
55.	*Flagellaria indica* L.	Native	Common
	GENTIANACEAE		
56.	*Fagraea fragrans* Roxb.	Native	Common
	GLEICHENIACEAE		
57.	*Dicranopteris linearis* (Burm.f.) Underw.	Native	Common
	LAMIACEAE		
58.	*Clerodendrum laevifolium* Blume	Native	Common
59.	*Vitex pinnata* L.	Native	Common

S/No.	Species	Nativeness	National Status
	LAURACEAE		
60.	*Cinnamomum iners* Reinw.	Native	Common
61.	*Lindera lucida* (Blume) Boerl.	Native	Vulnerable
62.	*Litsea elliptica* Blume	Native	Common
63.	*Litsea firma* Hook.f.	Native	Vulnerable
	MALVACEAE		
64.	*Durio zibethinus* L.	Exotic	Casual
	MELASTOMATACEAE		
65.	*Clidemia hirta* (L.) D.Don	Exotic	Naturalised
66.	*Melastoma malabathricum* L.	Native	Common
	MELIACEAE		
67.	*Dysoxylum cauliflorum* Hiern	Native	Vulnerable
	MENISPERMACEAE		
68.	*Fibraurea tinctoria* Lour.	Native	Common
	MORACEAE		
69.	*Artocarpus integer* (Thunb.) Merr.	Exotic	Casual
70.	*Ficus aurata* Miq. var. *aurata*	Native	Vulnerable
71.	*Ficus benjamina* L.	Cryptogenic	Cryptogenic
72.	*Ficus fistulosa* Reinw. ex Blume	Native	Common
73.	*Ficus grossularioides* Burm.f. var. *grossularioides*	Native	Common
74.	*Ficus heteropleura* Blume	Native	Common
75.	*Ficus microcarpa* L.f.	Native	Common
76.	*Ficus punctata* Lam.	Exotic	Cultivated only
	MYRICACEAE		
77.	*Myrica esculenta* Buch.-Ham.	Native	Common
	MYRISTICACEAE		
78.	*Gymnacranthera forbesii* (King) Warb.	Native	Critically endangered
	MYRSINACEAE		
79.	*Ardisia elliptica* Thunb.	Native	Endangered
	MYRTACEAE		
80.	*Rhodamnia cinerea* Jack	Native	Common
81.	*Syzygium borneense* (Miq.) Miq.	Native	Common
82.	*Syzygium grande* (Wight) Walp.	Native	Common
83.	*Syzygium lineatum* (DC.) Merr. & L.M.Perry	Native	Common
84.	*Syzygium myrtifolium* Walp.	Native	Presumed nationally extinct (persistence from cultivation)
85.	*Syzygium polyanthum* (Wight) Walp.	Native	Vulnerable
86.	*Syzygium zeylanicum* (L.) DC.	Native	Common
	OLEANDRACEAE		
87.	*Nephrolepis auriculata* (L.) Trimen	Cryptogenic	Cryptogenic
	ORCHIDACEAE		
88.	*Bromheadia finlaysoniana* (Lindl.) Miq.	Native	Common
	PASSIFLORACEAE		
89.	*Passiflora laurifolia* L.	Exotic	Naturalised
90.	*Passiflora suberosa* L.	Exotic	Naturalised

S/No.	Species	Nativeness	National Status
	PENTAPHYLACACEAE		
91.	*Adinandra dumosa* Jack	Native	Common
	PHYLLANTHACEAE		
92.	*Bridelia tomentosa* Blume	Native	Common
93.	*Breynia coronata* Hook.f.	Native	Endangered
	PIPERACEAE		
94.	*Piper caninum* Blume	Native	Common
95.	*Piper flavimarginatum* C.DC.	Native	Critically endangered
96.	*Piper porphyrophyllum* (Lindl.) N.E.Br.	Native	Endangered
97.	*Piper sarmentosum* Roxb.	Native	Common
	POACEAE		
98.	*Centotheca lappacea* (L.) Desv.	Native	Critically endangered
99.	*Imperata cylindrica* (L.) P.Beauv.	Cryptogenic	Cryptogenic
100.	*Ischaemum ciliare* Retz.	Cryptogenic	Cryptogenic
101.	*Ottochloa nodosa* (Kunth) Dandy	Native	Common
102.	*Pennisetum polystachion* (L.) Schult.	Exotic	Naturalised
	POLYPODIACEAE		
103.	*Goniophlebium percussum* (Cav.) Wagner & Grether	Native	Vulnerable
104.	*Pyrrosia longifolia* (Burm.) Morton	Native	Common
105.	*Pyrrosia piloselloides* (L.) M.G.Price	Native	Common
	PTERIDACEAE		
106.	*Taenitis blechnoides* (Willd.) Sw.	Native	Common
	RHIZOPHORACEAE		
107.	*Gynotroches axillaris* Blume	Native	Common
	RUBIACEAE		
108.	*Gynochthodes sublanceolata* Miq.	Native	Common
109.	*Oxyceros longiflorus* (Lam.) T.Yamazaki	Native	Vulnerable
110.	*Psychotria sarmentosa* Blume	Native	Critically endangered
111.	*Timonius wallichianus* (Korth.) Valeton	Native	Common
	SAPINDACEAE		
112.	*Dimocarpus longan* Lour.	Exotic	Cultivated only
113.	*Nephelium lappaceum* L.	Native	Critically endangered (persistence from cultivation)
	SAPOTACEAE		
114.	*Planchonella obovata* (R.Br.) Pierre	Native	Vulnerable
	SCHIZAEACEAE		
115.	*Lygodium flexuosum* (L.) Sw.	Native	Common
116.	*Lygodium microphyllum* (Cav.) R.Br.	Native	Common
	THELYPTERIDACEAE		
117.	*Christella subpubescens* (Blume) Holttum	Native	Common
118.	*Pronephrium triphyllum* (Sw.) Holttum	Native	Common
	URTICACEAE		
119.	*Cecropia pachystachya* Trécul	Exotic	Naturalised
	VERBENACEAE		
120.	*Lantana camara* L.	Exotic	Naturalised

S/No.	Species	Nativeness	National Status
	VITACEAE		
121.	*Leea indica* (Burm.f.) Merr.	Native	Common
	VITTARIACEAE		
122.	*Vittaria elongata* Sw.	Native	Common

APPENDIX 2

Mean percentage basal area per plot of sub-canopy and canopy species sampled from Admiralty Forest. Species are arranged in descending order of the mean number of stems per plot, except for species with only one individual found out of all the plots which are arranged in decreasing order of stem size.

S/No.	Species	Mean Percentage Basal Area per Plot ± Standard Error of the Mean	Mean No. Of Stems per Plot ± Standard Error of the Mean
1.	*Hevea brasiliensis*	2.27 ± 0.31	12.60 ± 5.48
2.	*Acacia auriculiformis*	1.58 ± 0.23	5.70 ± 4.36
3.	*Dillenia suffruticosa*	0.40 ± 0.05	3.10 ± 1.54
4.	*Falcataria moluccana*	18.09 ± 4.46	2.50 ± 1.42
5.	*Adinandra dumosa*	1.05 ± 0.15	1.50 ± 1.02
6.	*Cecropia pachystachya*	1.02 ± 0.26	1.30 ± 1.01
7.	*Macaranga gigantea*	4.17 ± 1.67	0.90 ± 0.69
8.	*Cinnamomum iners*	0.77 ± 0.34	0.90 ± 0.59
9.	*Rhodamnia cinerea*	0.92 ± 0.26	0.80 ± 0.70
10.	*Fagraea fragrans*	2.05 ± 0.81	0.80 ± 0.51
11.	*Lindera lucida*	0.72 ± 0.18	0.80 ± 0.36
12.	*Spathodea campanulata*	4.92 ± 2.71	0.60 ± 0.43
13.	*Nephelium lappaceum*	0.61 ± 0.27	0.60 ± 0.34
14.	*Syzygium polyanthum*	2.43 ± 1.50	0.30 ± 0.30
15.	*Timonius wallichianus*	0.59 ± 0.22	0.30 ± 0.30
16.	*Syzygium lineatum*	0.52 ± 0.23	0.30 ± 0.15
17.	*Ficus fistulosa*	0.49 ± 0.13	0.20 ± 0.20
18.	*Litsea elliptica*	0.13 ± 0.01	0.20 ± 0.20
19.	*Syzygium grande*	0.42 ± 0.14	0.20 ± 0.20
20.	*Arthrophyllum diversifolium*	0.45 ± 0.03	0.20 ± 0.13
21.	*Elaeocarpus petiolatus*	0.41 ± 0.07	0.20 ± 0.13
22.	*Vitex pinnata*	5.33	0.10 ± 0.10
23.	*Gynotroches axillaris*	1.67	0.10 ± 0.10
24.	*Pterocarpus indicus*	0.74	0.10 ± 0.10
25.	*Macaranga hypoleuca*	0.44	0.10 ± 0.10
26.	*Ficus aurata*	0.37	0.10 ± 0.10
27.	*Mallotus paniculatus*	0.28	0.10 ± 0.10