BOTANICAL ASSESSMENT OF TIMIMBANG-BOTITIAN FOREST RESERVE

INTODUCTION

The Timimbang-Botitian Forest Reserve comprises of 3 forest reserves, namely Timimbang FR (A), Timimbang FR (B) and Botitian FR, covering 13,610 ha and located in the northeastern part of Sabah (see Fig. 1). The Timimbang-Botitian FMU was gazetted as forest reserves in 1984 (SFD 2013). The management of all these reserves comes directly under the jurisdiction of the Beluran Forestry District of the Sabah Forestry Department. Botitian was a commercial production forest before it was reclassified as a Class I Protection Forest Reserve. Timimbang is in the process to be gazetted as a Class I Protection Forest Reserve.

STUDY SITE

Location

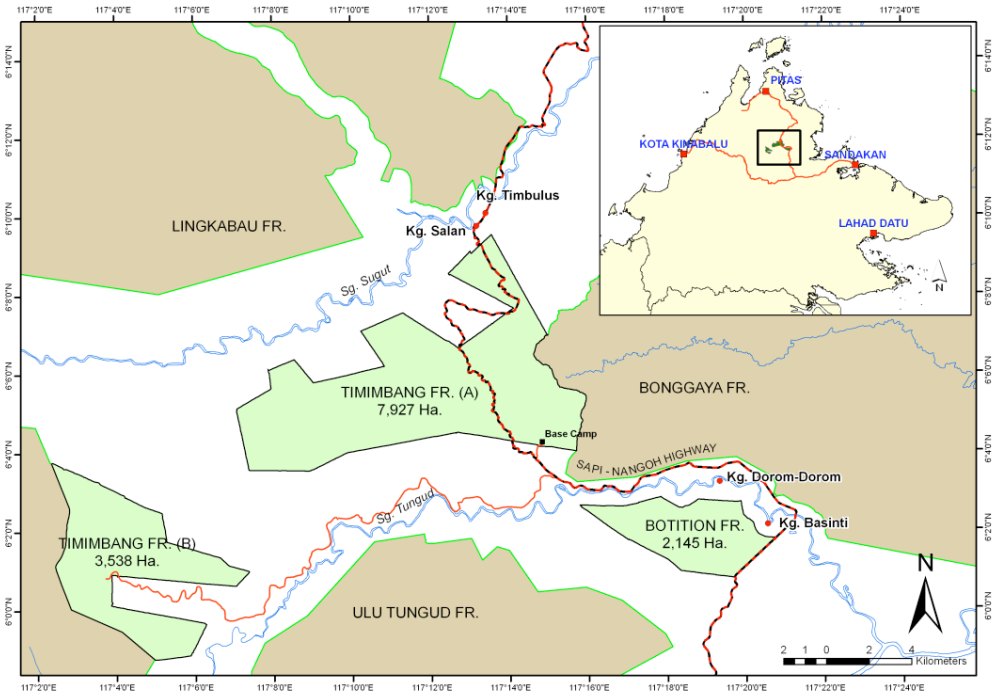

Figure 1. Location of Timimbang-Botitian FR in Sabah.

The Timimbang-Botitian F.R. is located within the Beluran Forestry District. Timimbang FR (A) and Botitian FR are readily accessible from the Sapi-Nangoh Highway. Timimbang FR (B), however, has to be accessed through private oil palm estates belonging to Malsa Corporation and Tungud Plantations, where the road is unpaved. Telupid is the nearest rural town where key government administrative offices are located. These reserves are generally surrounded by private oil palm estates, the largest being that owned by Malsa Corporation and Tungud Plantations.

Soils

Botitian −The Dalit soil association covers about 50 % of Botitian, with the Crocker and Lokan Associations covering the remaining 41 % and 9 % of the area respectively. Both soil associations are derived from mudstone and sandstone parent materials, where orthic acrisols are the dominant soils.

Timimbang FR (A) & (B) **–** The soil of Timimbang A is entirely made up of the Crocker Association, whereas Timimbang B is a combination of Crocker (65 %) and Lokan (35 %).

Topography

The topography of Timimbang-Botitian is generally heterogeneous. High hills and steep slopes feature prominently in all three fragments, particularly in Timimbang FR (A) and (B). The lowest point in the area is about 30 m above sea level, while the highest point is about 750 m, located in Compartment 25 in Timimbang FR (B).

Vegetation

The vegetation of the Timimbang-Botitian FMU is largely logged-over lowland mixed dipterocarp forest. Botitian generally supports better quality forests, especially in the western part owing to its status as a Class I Forest Reserve.

METHODS

Sampling and plant identification

Prior to field survey, various maps, including soil map, forest stratum (Figure 2) and natural vegetation map were obtained for field survey planning. From the maps, areas of interest were identified and located. The field surveys were conducted from 17th to 22nd of February, 2014 for the HoB programme.

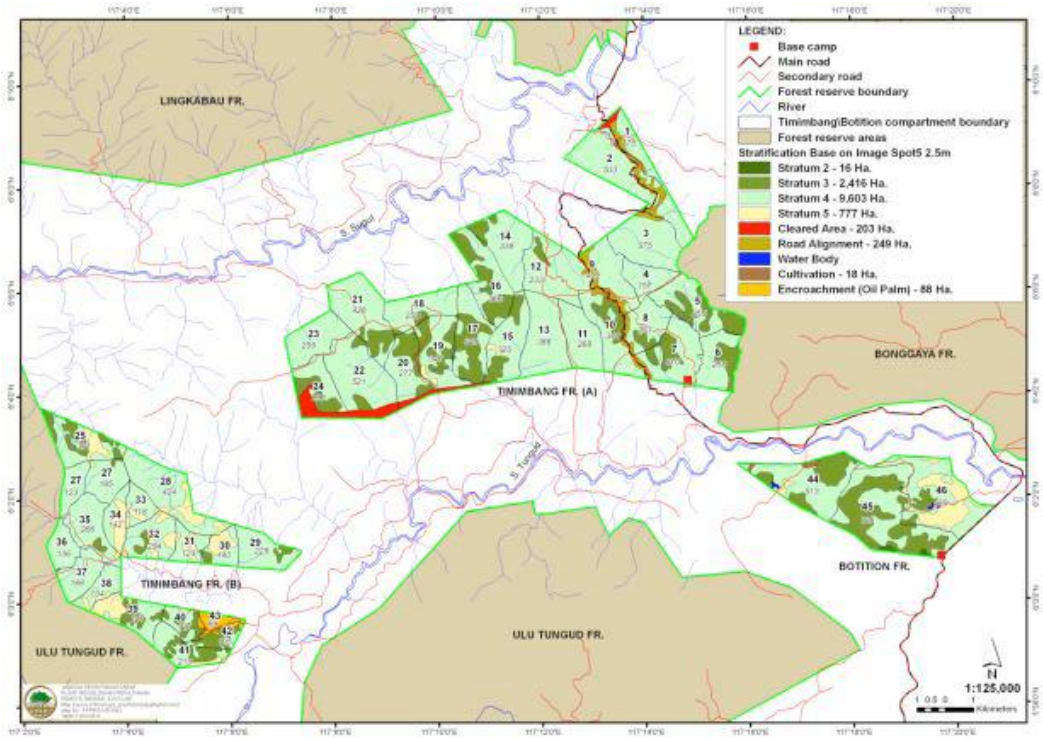

Figure 2. Forest stratum of Timimbang-Botitian FR.

All plant species and trees ≥10 cm diameter at breast height (dbh) were recorded from 11 of c. 0.1 ha circle plots which were established on pristine and disturbed old growth forest (see table 1). Plant specimens with reproductive parts (for herbarium specimen) and sterile plant specimens (voucher specimens) of all vascular plant species in the plot were collected and deposited at the Sandakan Herbarium (SAN). General herbarium collections and dipterocarp survey were also randomly conducted within the forest reserves. Collecting and preserving plant specimens follow Bridson *et al*., 1992. The common plant species were identified directly to species level in the field by means of their distinctive field characteristics. For those that could not be readily identified, voucher specimens were collected and brought back to SAN. These specimens were oven-dried 45–55° C for several days before determining their identities. All specimens were sorted according to morphospecies and attempted for identification to species level by cross-referencing with the existing specimens in the herbarium and related flora references (e.g., Soepadmo *et al*., 1995, 1996, 2000, 2002, 2004, 2007, 2011). Plant classification of the Angiosperm group is based on Stevens, P.F. (2001 onwards). These flora data were compiled with existing data derived from plant database, e.g. Botanical Research and Herbarium Management System (BRAHMS) collected within the reserves.

Relevant literature materials were also consulted to determine the conservation status of the plants listed.

Table 1: Location of plots or collection sites in Timimbang-Botitian FRs

No.	Location name	Forest Formation	Altitude (m)	Northing	Easting
1	Timimbang FR	Disturbed upland mdf	441	6° 5' 07.2"	117° 9' 38.6"
2	Timimbang FR	Disturbed upland mdf	446	6° 5' 04.3"	117° 9' 44.6"
3	Timimbang FR	Disturbed lowland mdf	65	6° 4' 15.4"	117° 14' 43.4"
4	Timimbang FR	Disturbed lowland mdf	128	6° 4' 36.4"	117° 14' 30.3"
5	Timimbang FR	Disturbed lowland mdf	143	6° 04' 40.3"	117° 14' 32.5"
6	Timimbang FR	Disturbed lowland mdf	84	5° 59' 32.4"	117° 06' 09.4"
7	Timimbang FR	Disturbed lowland mdf	91	5° 59' 31.4"	117° 06' 07.8"
8	Timimbang FR	Disturbed lowland mdf	93	5° 59' 29.5"	117° 06' 00.8"
9	Botitian FR	Pristine lowland mdf	93	6° 00' 50.2"	117° 19' 31.7"
10	Botitian FR	Pristine lowland mdf	117	6° 01' 05.5"	117° 19' 24.1"
11	Botitian FR	Disturbed lowland mdf		6° 01' 45.4"	117° 20' 41.4"

RESULT AND DISCUSSION

Plant Diversity

From the collections (herbarium and voucher specimens), records from past surveys and additional data retrieved from BRAHMS database, a total of 1180 taxa have been recorded from the reserves. These represented by 2 lycophytes families, 11 ferns, 1 Gymnosperm, 15 Angiosperms (Monocotyledon) and 88 Angiosperm (Dicotyledon) (Table 2).

Table 2. Number plant taxa by plant groups from Timimbang-Botitian FR, Sabah, Malaysia.

Plant group	No. of families	No. of taxa
Lycopyhtes	2	5
Ferns	11	26
Gymnosperm	1	5
Angiosperm:		
Monocotyledon	15	126
Dicotyledon	88	1020
Total	**117**	**1182**

The ten most specious families are Dipterocarpaceae(100), Fabaceae (62),Rubiaceae (58), Orchidaceae (52), Euphorbiaceae (50), Lauraceae(42), Malvaceae(42), Moraceae(29), Meliaceae(27) and Myrtaceae (27) (Figure 3).

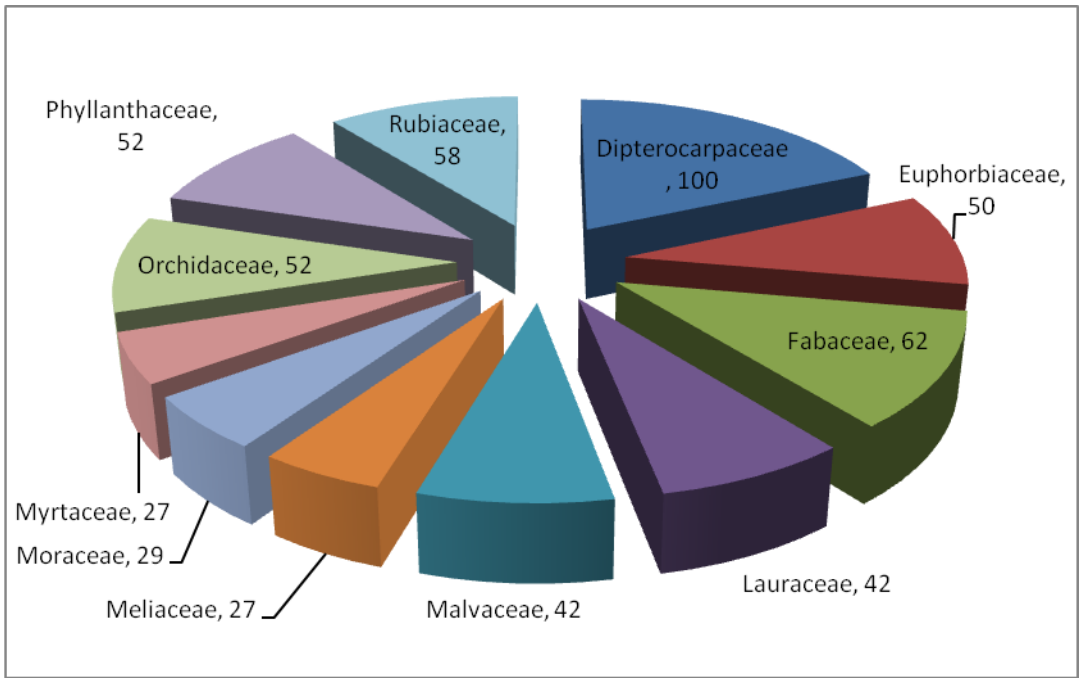

Figure 3. The ten most specious families in Timimbang-Botitian FR

Plant Conservation

Endemism

Endemism is the ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat type; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere. The extreme opposite of endemism is cosmopolitan distribution. Endemics can easily become endangered or extinct if their restricted habitat changes, particularly but not only due to human actions, including the introduction of new organisms.

Of the 1182 taxa that been recorded, 233 taxa are endemic to Borneo (indicated in bold in Appendix II and Appendix III), including 33 taxa that are endemic to Sabah (indicated in underlined bold in Appendix II and Appendix III). None of the species that has been recorded is endemic to the reserve.

The IUCN Red List

The IUCN Red List Categories and Criteria were designed for global taxon assessments. There are 17 plant species that listed as Vulnerable (VU), 12 Endangered (EN) and 34 Critically Endangered (CR) from the reserves (Appendix IV).

Wildlife Conservation Enactment 1997 and Sabah Forest Enactment 1968

Sabah Wildlife Conservation Enactment 1997 (SWD, 1997), under part VI (Protection of Plants) listed plants that may not be harvested without a license. There are 3 taxa, namely *Tetrastigma diepenhorstii, T dubium* and *T. lanceolarium* that fall under Schedule 1, part II, Totally Protected Plant Species (marked with ** in Appendix II). There are 62 plant taxa, which are 52 taxa of orchids, 7 taxa of gingers, 2 species of pitcher plants and *Arenga undulatifolia* that fall under Schedule 2, part II, Protected Plant Species (marked with * in Appendix II).

Under Sabah Forest Rules 1969, the director of forest may for reasons of silviculture or for any other reason prohibit or restrict the cutting or removal of plant species within FR. There are 72 plant taxa in Timimbang-Botitian that fall under the prohibited species by the director of Forest (marked with *** in appendix II and Appendix V).

RECOMMENDATIONS

Since the forests in Botitian have already been legally gazetted as Protection Forest (class I), although Timimbang is yet to be gazette as such, the essential step is to formulate a forest management plan for the reserve. Forest management plan is essential as a guideline to manage any forested area or forest reserve, such as Timimbang-Botitian in order to maintain the integrity of the reserves, including protection or conservation of plant species of high conservation value. Plant species of high conservation value may include species that are, e.g. endemic to a locality, threatened and also important as food source for wildlife. This high conservation value plants or plant conservation targets must be identified and monitored, including conducting population studies. The data can be used to further determine appropriate steps to ensure their survival. For feasibility and practicality wise, two plant species, the critically endangered and Sabah endemic dipterocarp, the Melapi bunga, *Shorea symingtonii* and the Kapur gumpait, *Dryobalanops keithii* were here selected as plant species conservation targets.

Eventhough *Shorea symingtoniii* is an unpopular timber compared to the other dipterocarp species, the tree is still harvested for timber due to the dwindling resources. This species is also endemic to Sabah and is confined to the eastern parts of Sabah, occurring in Ranau, Beluran, Kinabatangan, Sandakan, Lahad Datu, Semporna and Tawau districts. The conservation status of the species is Critically Endangered (A1cd) in IUCN Red List (2011).

For Kapur gumpait (*Dryobalanops keithii*) apart from the threat of high demand for timber this species is very important for the wildlife, especially the hornbill. Hornbill is normally known to nest in large arboreal natural tree cavity of the Kapur tree, including Kapur gumpait. Five species of hornbills were reported from the reserves (Hutan, 2008). Felling of this giant tree without proper management will destroy the habitat of hornbills. This species is listed as endangered (A1cd+2cd) in the IUCN Red List (2011).

Protection of forest reserve, including from forest fire and illegal encroachment or felling must also be emphasized in the forest management plan.

CONCLUSION

A total of 1182 taxa have been recorded. Of the 1182 taxa that been recorded, 233 taxa are endemic to Borneo (indicated in bold in Appendix II), including 33 taxa that are endemic to Sabah (indicated in underlined bold in Appendix II). None of the species that

has been recorded is endemic to the reserve. There are 17 plant species that listed as Vulnerable (VU), 12 Endangered (EN) and 34 Critically Endangered (CR) from the reserves. There are 62 plant taxa, which are 52 taxa of orchids, 7 taxa of gingers, 2 species of pitcher plants and *Arenga undulatifolia* that fall under Schedule 2, part II, Protected Plant Species. There are 3 taxa, namely *Tetrastigma diepenhorstii, T. dubium* and *T. lanceolarium* that fall under Schedule 1, part II, Totally Protected Plant Species and 118 plant taxa that fall under Schedule 2, part II, Protected Plant Species.

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