

## FINAL REPORT OF FLORA

**TREE SPECIES IDENTIFICATION ALONG EDUCATION TRAIL IN CONSERVATION AREA ADJACENT TO JELALONG 5 ESTATE, GLENEALY PLANTATIONS SDN BHD**

For

**GLENEALY PLANTATIONS SDN BHD**  
(Sustainability Division)

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# **TREE SPECIES IDENTIFICATION ALONG EDUCATION TRAIL IN CONSERVATION AREA ADJACENT TO JELALONG 5 ESTATE, GLENEALY PLANTATIONS SDN BHD**

## **EXECUTIVE SUMMARY**

Tropical rain forest which is very rich in diversity of flora and fauna is a treasure and a gift that needs to be protected as best as possible by every generation in Malaysia. Responsibility in managing and preserving the health of the country's rich biodiversity forests and ecosystems has become an important agenda for the future, in line with the Sustainable Development Goals (SDG) of the United Nations 2030 (Wennersten & Qie, 2018). Therefore, every company that carries out activities related to forestry and agriculture needs to maintain at least 50% of its total land area under forest cover remains true, as currently 55.3% of the country's land area remains under forest cover (Sadono et al., 2020). Efforts are needed to ensure healthy forest services that are active carbon absorbers are in line with the country's green growth initiative. The 12<sup>th</sup> Malaysia Plan (2021-2025) which has been outlined as mainstreaming of Sustainable Development Goal 15 of the United Nations in relation to forest management practices. Understanding related to forest health so that plant diversity can be conserved as best as possible among forest users, a study is proposed to be carried out along education trail in forest conservation area adjacent to Jelalong 5 Estate, Glenealy Plantations Sdn Bhd. The results on Education Trail study, with the length of more than five kilometers, show that 172 trees have been recorded which have been identified from 33 families, 59 genera and 101 species. All seven groups based on The International Union for Conservation of Nature's (IUCN) Red List of Threatened Species of which there are five (5) species categorized as Critically Endangered (CR) found around this trail. The findings of this study can help to assess the health of the forest through the amount of richness of tree species and their stands found along the developed study trail. In conclusion, a high diversity of tree species can be an important indicator in making healthier forest management decisions especially for the protected plants species.

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## **BACKGROUND AND RATIONALE**

The richness and diversity of flora and fauna species that are still living well in the forest ecology following their natural order will play an important role in the well-being of life in the surrounding area (Weismayer et al., 2017). Policies in development to involve forest disturbances that occur based on accelerating economic development in each development area need to be evaluated holistically and statically. Therefore, balanced development planning to the natural structure of the forest will provide many benefits provided to the policy of biodiversity conservation are public goods that are not traded in the market. The maintenance of the existence of natural life in the economic development area will be a gem of attraction to the outside community and even to the forest creatures who want it to be a habitat for their lives.

In order to change the negative perception of the community to the development of large-scale plantations such as palm oil in the state of Sarawak, Syarikat Samling Berhad has taken the right steps in ensuring the concept of their plantation development to maintain the wealth of the forest for the flora and fauna that are still rich to live peacefully in its ecology. With this ongoing noble effort in assessing the level of richness and uniqueness of forests and the environment can help guide the design of these policies by eliciting public preferences for different biodiversity attributes (Fatemeh Bakhtiari et al., 2014, Christie et al., 2006), so this can be considered in determining investment and policy decisions (Stenger et al., 2009). Cooperation in ensuring the country's economic development agenda that does not set aside the importance of the environment needs collaboration with local university researchers to assess the level of wealth of forest islands left to natural conservation.

Therefore, the measures proposed in assessing the health of the forest that play a role in the social aspect of the ecologically effective forest need to be scrutinized in depth. This includes consideration of where - in the landscape conditions forest development will have a high impact on biodiversity change for the remaining forest patches that are now increasingly valuable. Therefore, there is a need for ecological research of forest patches to evaluate the integrated economy where the factors that determine biodiversity patterns in these patches are identified together with the preferences of local people to increase biodiversity and management measures that lead to a better

conservation status for the future in order to determine the strategy and planning of its use in the future.

### **Objectives:**

- 1) Assess forest health and plant diversity within the forest conservation areas.

### **Study Area and Methodology**

The development of a palm oil plantation by Syarikat Samling SDN BHD under the name of Glenealy Plantations Sdn Bhd is located upstream of the Jelalong River with seven operating camps. The distance of the project area from UPMKB is around 200 kilometers with a time of approximately 3 to 4 hours driving four-wheel drive. The study was conducted at a forest conservation area with the size of 128.83 hectares adjacent to Jelalong 5 Estate area with the collaboration of Universiti Putra Malaysia Bintulu Sarawak Campus (UPMKB). The length of the education trail is more than five kilometer. The remaining of the forest conservation area is located about three kilometers from Jelalong 5 Estate Office (Refer Figure 1). This forest area is an over-logged forest area that has not been disturbed for more than ten years.

The remain forest patches in many oil palm plantations plays an important role in maintaining the diversity of plant species to continue to exist in the future. In order to assess the richness of the buffer forest zone, trails (monitoring for 10m x 10m left and right) and plots (20m x 20m) of the study was developed according to the suitability of the forest area and tree stand identified. The Global Positioning System/GPS (GARMIN Ltd.) is used to determine plot coordinates (latitude and longitude) in the field and the Epicollect5 application will be used to record tree information that is sampled for the study. All trees >10 cm in diameter were marked with yellow plastic labels, measured and identified. The following data will be recorded from all trails and subplots: (1) botanical and local names of trees, (2) number of trees, and (3) diameter at breast height (dbh in cm) and tree height in meters. Identification of specimens that have not yet been identified in the field will be made at the herbarium of UPM Bintulu Sarawak Campus and the Sarawak Forestry Department.



**Figure 1.** Transect lines of the tree inventory in forest conservation area near Jelalong 5 Estate, Glenealy Plantations Sdn Bhd.

Stand data were analyzed for species composition, calculated based on the percentage of individual species relative to the total number of species recorded. The basal area (BA) of the tree was calculated using the formula (Hush et al., 2002):

$$\begin{aligned}
 BA &= \frac{\pi dbh^2}{4 (10,000)} \\
 &= 0.00007854 \text{ (dbh}^2 \text{ in a Ha)}
 \end{aligned}$$

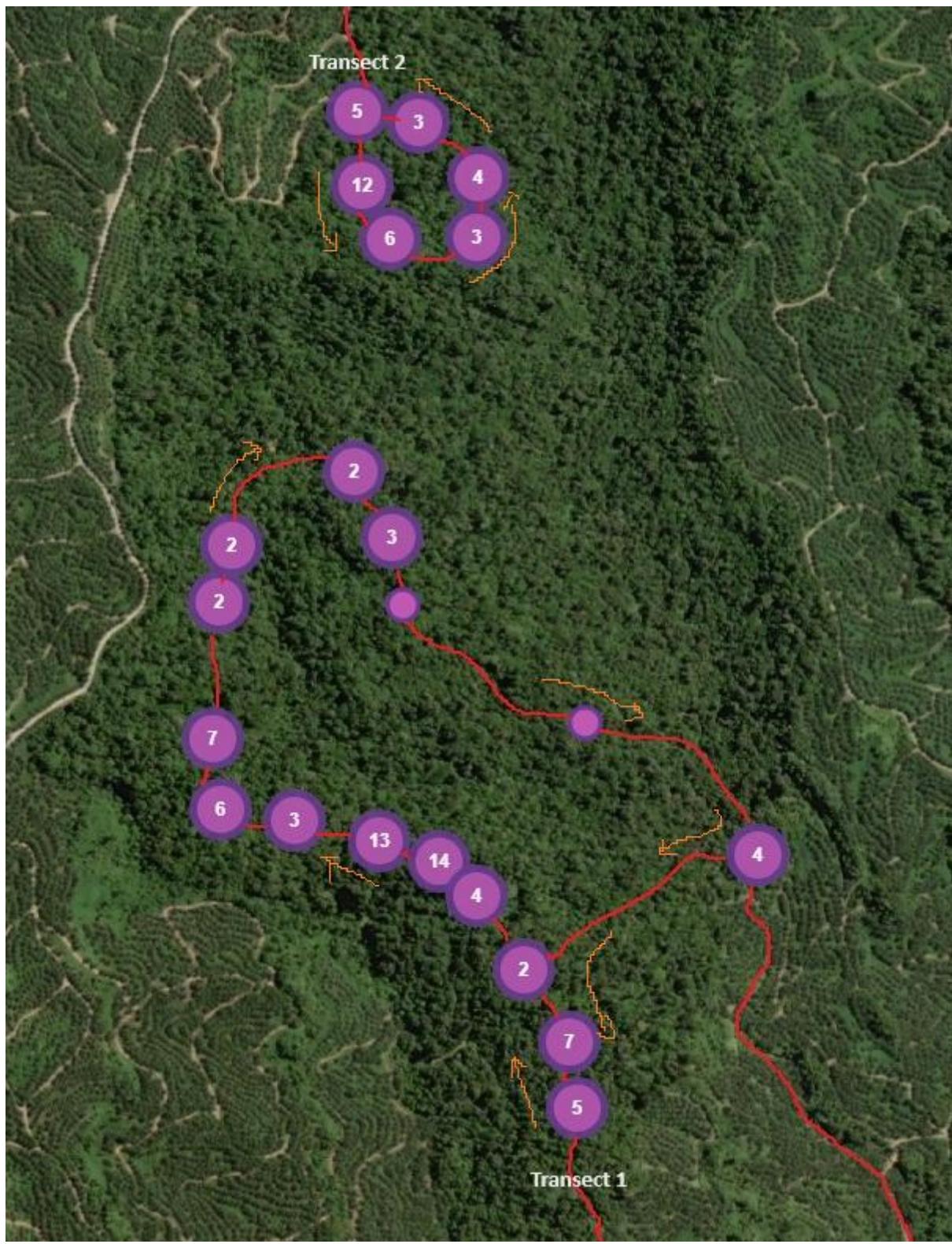
Later, from all the identified plants and trees species in the plot, the conservation status of the trees species will be identify based on online database of official organization website such as official website of IUCN Red List of Threatened Species that provide service to identify if which plants and trees have crucial conservation ranging from

Least Concern (LC) until the final classification of Extinct (EX). The classification using the IUCN Red List of Threatened Species are classified based on the global level of the plants and tree conservation status (IUCN, 2023).

## **RESULT AND DISCUSSION**

The development of educational trail in forest conservation area adjacent to palm oil plantation area adjacent to Jelalong 5 Estate is an excellent initiative in ensuring that sustainable development is given priority. There are two trails that have been identified and developed which are labeled as Transect 1 with a length of approximately 4 kilometers and Transect 2 with a length of approximately one kilometer (Figure 2). In each trail as many as six plots have been used as plant assessment locations, especially trees with a size of more than 10 cm in diameter at breast height are selected to be used as samples in the assessment of tree diversity. However, trees found in large sizes and interesting to introduce to visitors are also recorded in the assessment of this study. A total of 172 individual trees were recorded in this study representing 33 families, 59 genera and 102 species (Refer to Table 1). The total basal area of the 172 trees recorded in this study is 21.04511076 m<sup>2</sup>.

Based on the record of the number of species found along this trail, it shows that this forest conservation area still has a very high number of species, and observation in the forest environment also has the potential to be a forest rich in high-value tree species, which is very good. This is because this forest is still dominated by species from the dipterocarp group and some species of high value such as Belian. This forest also still records the number of trees that wild animals choose as their food source including their leaves and fruits. The selection of the trail route is seen as appropriate because it partly passes through the ridge of a long hill, followed by a gentle slope and a flat creek bank. The location of the trail selection allows visitors to recognize plants that like to live in different ecological areas according to soil type and soil moisture.



**Figure 2.** Transect lines with the circle number of the tree samples inventory in forest conservation area adjacent to Jelalong 5 Estate, Glenealy Plantations Sdn. Bhd.

**Table 1.** Tree Family, Genera, Species, BA and IUCN Status of Trees Recorded in Education Trail of forest conservation area adjacent to Jelalong 5 Estate.

No.	Family Name	No. of Stem	No.	Genus Name	No. of Stem	No.	Species Name	Vernacular Name	No. of Stem	BA (m <sup>2</sup> )	IUCN Status	Remark
1	Actinidiaceae	1	1	<i>Saurauia</i>	1	1	<i>Saurauia glabra</i>	Singkrang/Mata Ikan	1	0.0107527	LC	Fruit Edible
2	Anacardiaceae	2	2	<i>Campnosperma</i>	1	2	<i>Campnosperma auriculatum</i>	Terentang Daun Besar	1	0.1809792	LC	
			3	<i>Pentaspadon</i>	1	3	<i>Pentaspadon motleyi</i>	Plajau / Pelong Licin	1	0.3632152	DD	
3	Anisophylleaceae	1	4	<i>Anisophyllea</i>	1	4	<i>Anisophyllea disticha</i>	Delek	1	0.0013856	LC	Herb
4	Annonaceae	3	5	<i>Goniothalamus</i>	3	5	<i>Goniothalamus macrophyllus</i>	Selukai	1	0.0052817	NE	Herb
						6	<i>Goniothalamus ridleyi</i>	Hujan panas	2	0.0049093	NE	Herb
5	Apocynaceae	1	6	<i>Dyera</i>	1	7	<i>Dyera costulata</i>	Jelutong	1	0.1885986	LC	
6	Burseraceae	5	7	<i>Canarium</i>	1	8	<i>Canarium pilosum</i>	Keramoh	1	0.0186289	LC	Fruit Edible
			8	<i>Dacryodes</i>	3	9	<i>Dacryodes costata</i>	Kemayau	2	0.1564441	LC	Fruit Edible
						10	<i>Dacryodes laceagata</i>	Kedondong	1	0.0978804	LC	
			9	<i>Santiria</i>	1	11	<i>Santiria laevigata</i>	Kedondong Daun Licin	1	0.1158267	LC	Fruit Edible
7	Calophyllaceae	1	10	<i>Calophyllum</i>	1	12	<i>Calophyllum lanigerum</i>	Bintangor bukit	1	0.0401202	NE	Herb
8	Cannabaceae	1	11	<i>Gironniera</i>	1	13	<i>Gironniera parvifolia</i>	Hampas tebu	1	0.1412140	NE	
9	Clusiaceae	1	12	<i>Garcinia</i>	1	14	<i>Garcinia parvifolia</i>	Kandis	1	0.0349712	NE	
10	Combretaceae	2	13	<i>Terminalia</i>	2	15	<i>Terminalia calamansai</i>	Jelawai Mentalun	1	0.0401202	LC	
						16	<i>Terminalia subspathulata</i>	Jelawai/Talisai	1	0.1326874	NE	
11	Connaraceae	1	14	<i>Ellipanthus</i>	1	17	<i>Ellipanthus tomentosus</i>	Kebin	1	0.0723920	DD	Herb
12	Dipterocarpaceae	90	15	<i>Anthoshorea</i>	2	18	<i>Anthoshorea lamellata</i>	Meranti Lapis	1	0.0716407	CR	
						19	<i>Anthoshorea ochrocea</i>	Raruk	1	0.0444939	VU	Fruit Edible
			16	<i>Dipterocarpus</i>	7	20	<i>Dipterocarpus fagineus</i>	Keruing Pipit	3	0.3877896	CR	
						21	<i>Dipterocarpus palembanicus</i>	Keruing Ternek	1	0.0326894	VU	
						22	<i>Dipterocarpus sarawakensis</i>	Keruing	1	0.1604808	EN	
						23	<i>Dipterocarpus stellatus</i>	Keruing Daun Nipis	2	0.2159379	VU	
			17	<i>Dryobalanops</i>		24	<i>Dryobalanops aromatica</i>	Porau/Kapur Bukit	1	0.5675238	VU	

No.	Family Name	No. of Stem	No.	Genus Name	No. of Stem	No.	Species Name	Vernacular Name	No. of Stem	BA (m <sup>2</sup> )	IUCN Status	Remark
						25	<i>Dryobalanops beccarii</i>	Porau / Kapur Bukit	2	0.2127511	LC	
						26	<i>Dryobalanops lanceolata</i>	Kapur Paji/Kapur hitam	4	0.6490194	LC	
			18	<i>Hopea</i>	2	27	<i>Hopea bracteata</i>	Merawan Ungu / Luis Padi	2	0.0255288	CR	
			19	<i>Parashorea</i>	1	28	<i>Parashorea macrophylla</i>	Peran / Bilat	1	0.1392228	NT	
			20	<i>Richetia</i>	4	29	<i>Richetia gibbosa</i>	Lun Gajah	3	0.6142241	CR	
						30	<i>Richetia multiflora</i>	Lun Jantan	1	0.0401202	LC	
			21	<i>Rubroshorea</i>	58	31	<i>Rubroshorea acuminata</i>	Meranti Rambai Daun	2	0.0941092	LC	
						32	<i>Rubroshorea amplexicaulis</i>	Engkabang Pinang Licin	1	0.0716407	NT	
						33	<i>Rubroshorea argentifolia</i>	Benato	9	1.3631378	LC	Fruit Edible
						34	<i>Rubroshorea dasypylla</i>	Meranti Batu	5	0.5027758	EN	
						35	<i>Rubroshorea fallax</i>	Engkabang Layar	2	0.0996517	LC	
						36	<i>Rubroshorea leprosula</i>	Meranti Tembaga	1	0.2256710	NT	
						37	<i>Rubroshorea macroptera</i>	Meranti Melantai	5	0.7833674	LC	
						38	<i>Rubroshorea meciostopterix</i>	Kawang Burong	5	0.4654472	VU	
						39	<i>Rubroshorea ovata</i>	Meranti Pitis	1	0.0408334	EN	
						40	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	18	2.1952549	LC	
						41	<i>Rubroshorea parvistipulata</i>	Engkabang Pinang	1	0.2011163	LC	
						42	<i>Rubroshorea pauciflora</i>	Meranti nemesu	4	0.2878528	EN	
						43	<i>Rubroshorea pinanga</i>	Engkabang Langgai Bukit	2	0.1599506	LC	
						44	<i>Rubroshorea pubistyla</i>	Meranting Bulu Merah	1	0.0629099	LC	
						45	<i>Rubroshorea slootenii</i>	Meranting Kepong	1	0.0615832	VU	
			22	<i>Shorea</i>	8	46	<i>Shorea atrinervosa</i>	Selangan batu hitam	1	0.1333339	VU	
						47	<i>Shorea crassa</i>	Selangan batu Daun tebal	1	0.0366486	LC	
						48	<i>Shorea falciferoidea</i>	Lun Barun	1	0.1520728	VU	
						49	<i>Shorea foxworthyi</i>	Selangan Batu Bukit	1	0.1146233	VU	
						50	<i>Shorea glauca</i>	Balau laut	1	0.1590638	EN	

No.	Family Name	No. of Stem	No.	Genus Name	No. of Stem	No.	Species Name	Vernacular Name	No. of Stem	BA (m <sup>2</sup> )	IUCN Status	Remark
						51	<i>Shorea materialis</i>	Selangan Batu Pasir	1	0.1418809	CR	
						52	<i>Shorea maxwelliana</i>	Selangan batu hitam	1	0.3380289	EN	
						53	<i>Shorea scaberrima</i>	Lun kuning	1	0.0397659	NT	
			23	<i>Vatica</i>	1	54	<i>Vatica nitens</i>	Resak	1	0.0260147	NT	
13	Ebenaceae	3	24	<i>Diospyros</i>	3	55	<i>Diospyros foxworthyi</i>	Kayu malam	1	0.0243316	LC	
						56	<i>Diospyros pilosanthera</i>	Kayu malam	1	0.0323697	NE	
						57	<i>Diospyros siamang</i>	Kayu Malam	1	0.0091621	NE	Fruit Edible
14	Eleocarpaceae	2	25	<i>Elaeocarpus</i>	2	58	<i>Elaeocarpus masterii</i>	Sep / Mendong	2	0.0774472	NE	Fruit Edible
15	Euphorbiaceae	1	26	<i>Elateriospermum</i>	1	59	<i>Elateriospermum tapos</i>	Kelampai	1	0.0794329	NE	Fruit Edible
16	Fabaceae	6	27	<i>Dialium</i>	1	60	<i>Dialium indum</i>	Keranji	1	0.0176738	LC	Fruit Edible
			28	<i>Koompassia</i>	2	61	<i>Koompassia malaccensis</i>	Pa / Menggeris	2	0.1533053	LC	
			29	<i>Parkia</i>	1	62	<i>Parkia speciosa</i>	Petai	1	0.0725928	LC	Fruit Edible
			30	<i>Saraca</i>	1	63	<i>Saraca indica</i>	Bua alak	1	0.2507512	LC	
			31	<i>Sindora</i>	1	64	<i>Sindora leiocarpa</i>	Sepetir	1	0.0855410	LC	
17	Fagaceae	6	32	<i>Lithocarpus</i>	6	65	<i>Lithocarpus elegans</i>	Mempening/Empili	2	0.3957616	NE	Fruit Edible
						66	<i>Lithocarpus ewyckii</i>	Mempening/Empili	4	0.5124013	NE	Fruit Edible
18	Hypericaceae	1	33	<i>Cratoxylum</i>	1	67	<i>Cratoxylum arborescens</i>	Geronggang	1	0.1604808	LC	
19	Lamiaceae	1	34	<i>Teijsmanniodendron</i>	1	68	<i>Teijsmanniodendron pteropodum</i>	Kepapa/Buak-Buak	1	0.1046482	LC	
20	Lauraceae	8	35	<i>Beilschmiedia</i>	1	69	<i>Beilschmiedia kunstleri</i>	Medang	1	0.9196037	NE	
			36	<i>Eusidroxylon</i>	7	70	<i>Eusidroxylon zwageri</i>	Belian	7	2.2434053	VU	
21	Malvaceae	4	37	<i>Microcos</i>	1	71	<i>Microcos antidesmifolia</i>	Seng Ntung	1	0.0120778	NE	Fruit Edible
			38	<i>Scaphium</i>	2	72	<i>Scaphium longiflorum</i>	Kembang semangkuk	1	0.0441207	VU	
						73	<i>Scaphium macropodium</i>	Kembang Semangkuk jantung	1	0.1590638	LC	
			39	<i>Sterculia</i>	1	74	<i>Sterculia cordata</i>	Kelumpang	1	0.3349443	NE	
22	Meliaceae	1	40	<i>Sandoricum</i>	1	75	<i>Sandoricum koetjape</i>	Apok	1	0.0191159	LC	Fruit Edible
23	Moraceae	7	41	<i>Artocarpus</i>	4	76	<i>Artocarpus anisophylus</i>	Denging/Tawak	1	0.1698447	VU	

No.	Family Name	No. of Stem	No.	Genus Name	No. of Stem	No.	Species Name	Vernacular Name	No. of Stem	BA (m <sup>2</sup> )	IUCN Status	Remark
			42	<i>Ficus</i>	2	77	<i>Artocarpus dadah</i>	Talun / dadak	1	0.1018008	NE	Fruit Edible
						78	<i>Artocarpus elasticus</i>	Talun	1	0.2472133	NE	
						79	<i>Artocarpus odoratissimus</i>	Lumuk	1	0.0834798	NE	Fruit Edible
						80	<i>Ficus geocharis</i>	Abung Bulu	1	0.0036322	NE	Fruit Edible
			43	<i>Sloetia</i>	1	81	<i>Ficus variegata var. chlorocarpa</i>	Nyawai Bala	1	0.2156794	LC	Fruit Edible
						82	<i>Sloetia elongata</i>	Tempinis	1	0.0120778	LC	
24	Myristicaceae	1	44	<i>Knema</i>	1	83	<i>Knema intermedia</i>	Penarahan	1	0.0120778	NT	
25	Myrtaceae	6	45	<i>Syzygium</i>	4	84	<i>Syzygium havilandii</i>	Ubah	2	0.1615804	DD	
						85	<i>Syzygium lineatum</i>	Kelat	1	0.3536643	NE	
						86	<i>Syzygium polyanthum</i>	Daun Salam	1	0.0764643	NE	Herb
			46	<i>Tristaniopsis</i>	2	87	<i>Tristaniopsis whiteana</i>	Selunsur	2	0.2253348	NE	
26	Olacaceae	2	47	<i>Ochanostychis</i>	1	88	<i>Ochanostychis amentacea</i>	Petaling	1	0.1134262	DD	
			48	<i>Scorodocarpus</i>	1	89	<i>Scorodocarpus borneensis</i>	Kulim/Bawang Hutan/Jaui	1	0.0683581	LC	Herb
27	Phyllanthaceae	2	49	<i>Baccaurea</i>	1	90	<i>Baccaurea brevipes</i>	Tampoi Burong	1	0.0018098	LC	Fruit Edible
			50	<i>Glochidion</i>	1	91	<i>Glochidion superbum</i>	Tebangau	1	0.0124706	NE	
28	Polygalaceae	2	51	<i>Xanthophyllum</i>	2	92	<i>Xanthophyllum amoenum</i>	Nyalin/Langir	2	0.0355737	NE	Fruit Edible
29	Rubiaceae	2	52	<i>Neonauclea</i>	1	93	<i>Neonauclea gigantea</i>	Tebalut	1	0.1029351	NE	
			53	<i>Prismatomeris</i>	1	94	<i>Prismatomeris glabra</i>	Tongkat Aji Samad	1	0.0052817	NE	Herb
30	Sapindaceae	2	54	<i>Lepisanthes</i>	1	95	<i>Lepisanthes alata</i>	Kelebunyau	1	0.0098533	DD	
			55	<i>Pometia</i>	1	96	<i>Pometia pinnata</i>	Kasai	1	0.1412140	LC	Fruit Edible
31	Sapotaceae	1	56	<i>Palaquium</i>	1	97	<i>Palaquium ottolanderi</i>	Nyatoh	1	0.1182523	NT	
32	Thymelaeaceae	4	57	<i>Aquilaria</i>	2	98	<i>Aquilaria microcarpa</i>	Garuk lan	2	0.0485533	EN	Herb
			58	<i>Gonystylus</i>	2	99	<i>Gonystylus macrophyllus</i>	Ramin	1	0.0052817	LC	
						100	<i>Gonystylus velutinus</i>	Ramin	1	0.3589546	LC	
33	Verbenaceae	1	59	<i>Callicarpa</i>	1	101	<i>Callicarpa pentandra</i>	Selangkak Duk	1	0.0186289	LC	Herb
Family: 33		172	Genera:59		172				Species:101	172	21.04511076	

*Notes:*

*CR: Critically Endangered*

*EN: Endangered*

*VU: Vulnerable*

*NT: Near Threatened*

*LC: Least concern*

*DD: Data Deficient*

*NE: Not Evaluated*

Table 2 shows that Dipterocarpaceae is a very important tree in the forest conservation area with the largest total basal area (BA) which is 10.91276 m<sup>2</sup> contributed by 90 trees followed by Lauraceae with eight trees with a BA value of 3.16009 m<sup>2</sup>.

**Table 2.** Top 10 family recorded the highest Basal Area Recorded in Education Trail of forest conservation area adjacent to Jelalong 5 Estate..

No.	Family Name	No. of Stem	BA (m <sup>2</sup> )
1	Dipterocarpaceae	90	10.91276
2	Lauraceae	8	3.16009
3	Fagaceae	6	0.908163
4	Moraceae	7	0.83222
5	Myrtaceae	6	0.817043
6	Fabaceae	6	0.579864
7	Malvaceae	4	0.550207
8	Anacardiaceae	2	0.544194
9	Thymelaeaceae	4	0.41279
10	Burseraceae	5	0.388788

Table 3 shows *Rubroshorea* which is a very important genus with a total of 58 trees in the forest conservation area with the largest amount of BA which is 6.582291 m<sup>2</sup> followed by *Eusidroxylon* with seven trees with a BA value of 2.243405 m<sup>2</sup>.

**Table 3.** Top 10 genus recorded the highest Basal Area Recorded in Education Trail of forest conservation area adjacent to Jelalong 5 Estate..

No.	Genus Name	No. of Stem	BA (m <sup>2</sup> )
1	<i>Rubroshorea</i>	58	6.582291
2	<i>Eusidroxylon</i>	7	2.243405
3	<i>Dryobalanops</i>	7	1.429294
4	<i>Shorea</i>	8	1.148425
5	<i>Beilschmiedia</i>	1	0.919604
6	<i>Lithocarpus</i>	6	0.908163
7	<i>Dipterocarpus</i>	7	0.796898
8	<i>Richetia</i>	4	0.654344
9	<i>Artocarpus</i>	4	0.602339
10	<i>Syzygium</i>	4	0.591709

Table 4 shows *Eusidroxylon zwageri* with seven trees contributed the greatest BA value of 2.243405 m<sup>2</sup>. The second highest BA was contributed by *Rubroshorea parvifolia* with the amount of BA was 2.195255 m<sup>2</sup>.

**Table 4.** Top 10 species recorded the highest Basal Area Recorded in Education Trail of forest conservation area adjacent to Jelalong 5 Estate..

No.	Species Name	No. of Stem	BA (m <sup>2</sup> )
1	<i>Eusidroxylon zwageri</i>	7	2.243405
2	<i>Rubroshorea parvifolia</i>	18	2.195255
3	<i>Rubroshorea argentifolia</i>	9	1.363138
4	<i>Beilschmiedia kunsleri</i>	1	0.919604
5	<i>Rubroshorea macroptera</i>	5	0.783367
6	<i>Dryobalanops lanceolata</i>	4	0.649019
7	<i>Richetia gibbosa</i>	3	0.614224
8	<i>Dryobalanops aromatica</i>	1	0.567524
9	<i>Lithocarpus ewyckii</i>	4	0.512401
10	<i>Rubroshorea dasypylla</i>	5	0.502776

Table 5 shows the biggest individual trees recorded in forest conservation area was *Beilschmiedia kunsleri* with the DBH of 108.2 cm. This tree also contributed the largest amount of BA with 0.919604 m<sup>2</sup> followed by *Dryobalanops aromatica* with the DBH 85 cm and BA value of 0.567524 m<sup>2</sup>.

**Table 5.** Top 10 individual trees recorded the highest Basal Area Recorded in Education Trail of forest conservation area adjacent to Jelalong 5 Estate..

No.	Species Name	DBH	BA (m <sup>2</sup> )
1	<i>Beilschmiedia kunsleri</i>	108.2	0.919604
2	<i>Dryobalanops aromatica</i>	85	0.567524
3	<i>Eusidroxylon zwageri</i>	80.5	0.509024
4	<i>Eusidroxylon zwageri</i>	80.2	0.505237
5	<i>Eusidroxylon zwageri</i>	75.8	0.45132
6	<i>Rubroshorea macroptera</i>	72.1	0.408335
7	<i>Pentaspadon motleyi</i>	68	0.363215
8	<i>Gonystylus velutinus</i>	67.6	0.358955
9	<i>Rubroshorea argentifolia</i>	67.2	0.354719
10	<i>Syzygium lineatum</i>	67.1	0.353664

Based on the assessment of vegetation status according to The International Union for Conservation of Nature's (IUCN) Red List of Threatened Species developed in 1964, it shows that the tree species were classify in seven categories that can be found here. Table 6 shows the most tree species was the Least Concern (LC) plant species with 39 species. However, species that need to be given more attention because of their status in the Critically Endangered (CR) category are found in this trail area as many as five species, Endangered species as many as eight species and the Vulnerable category as many as 12 species. Based on the basal area value of this species, it shows that trees in the LC category have the largest amount of BA with a value of 8.57816201 m<sup>2</sup> followed by VU with a value of 4.245076121 m<sup>2</sup> and the LE category with a value of 4.090107594 m<sup>2</sup>.

**Table 6.** Detailed of tree species, genera and family of trees found in of forest conservation area adjacent to Jelalong 5 Estate..

No.	IUCN Status	No. of Species	Sum of BA (m <sup>2</sup> )
1	LC	39	8.57816201
2	VU	12	4.245076121
3	NE	26	4.090107594
4	EN	7	1.537588746
5	CR	5	1.24106399
6	NT	7	0.6326452
7	DD	5	0.7204671
<b>Grand Total</b>		<b>101</b>	<b>21.04511076</b>

Notes:

CR: Critically Endangered

EN: Endangered

VU: Vulnerable

NT: Near Threatened

LC: Least concern

DD: Data Deficient

NE: Not Evaluated

Based on the transect line that has been developed, it shows that transect 1 (Table 7) has a number of trees of 124 trees recorded while transect 2 (Table 8) records only 48 trees.

**Table 7.** Detailed of tree species, genera and family of trees found in Transect Line 1 in forest conservation area adjacent to Jelalong 5 Estate..

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
1	<i>Saurauia glabra</i>	Singkrang/Mata Ikan	Actinidiaceae	11.7	LC	Fruit Edible
2	<i>Ficus geocharis</i>	Abung Bulu	Moraceae	6.8	NE	Fruit Edible
3	<i>Shorea atrinervosa</i>	Selangan batu hitam	Dipterocarpaceae	41.2	VU	
4	<i>Artocarpus odoratissimus</i>	Lumuk	Moraceae	32.6	NE	Fruit Edible
5	<i>Callicarpa pentandra</i>	Selangkak Duk	Verbenaceae	15.4	LC	Herb
6	<i>Goniothalamus ridleyi</i>	Hujan panas	Annonaceae	6.5	NE	Herb
7	<i>Shorea materialis</i>	Selangan Batu Pasir	Dipterocarpaceae	42.5	CR	
8	<i>Rubroshorea meciostopterix</i>	Kawang Burong	Dipterocarpaceae	12.1	VU	
9	<i>Rubroshorea meciostopterix</i>	Kawang Burong	Dipterocarpaceae	37.2	VU	
10	<i>Parkia speciosa</i>	Petai	Fabaceae	30.4	LC	Fruit Edible
11	<i>Aquilaria microcarpa</i>	Garuk lan	Thymelaeaceae	3.6	EN	Herb
12	<i>Rubroshorea macroptera</i>	Meranti Melantai	Dipterocarpaceae	17	LC	
13	<i>Dyera costulata</i>	Jelutong	Apocynaceae	49	LC	
14	<i>Goniothalamus ridleyi</i>	Hujan panas	Annonaceae	4.5	NE	Herb
15	<i>Anisophyllea disticha</i>	Delek	Anisophylleaceae	4.2	LC	Herb
16	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	49	LC	
17	<i>Aquilaria microcarpa</i>	Garuk lan	Thymelaeaceae	24.6	EN	
18	<i>Dacryodes laveagata</i>	Kedondong	Burseraceae	35.3	LC	
19	<i>Rubroshorea macroptera</i>	Meranti Melantai	Dipterocarpaceae	42	LC	Fruit Edible
20	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	49	LC	
21	<i>Elaeocarpus masterii</i>	Sep / Mendong	Eleaocarpaceae	31.4	NE	Fruit Edible
22	<i>Dacryodes costata</i>	Kemayau	Burseraceae	26.1	LC	Fruit Edible
23	<i>Canarium pilosum</i>	Keramoh	Burseraceae	15.4	LC	Fruit Edible
24	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	38.9	LC	Fruit Edible
25	<i>Dialium indum</i>	Keranji	Fabaceae	15	LC	Fruit Edible
26	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	20.7	LC	
27	<i>Sindora leiocarpa</i>	Sepetir	Fabaceae	33	LC	
28	<i>Calophyllum lanigerum</i>	Bintangor bukit	Calophyllaceae	22.6	NE	Herb
29	<i>Glochidion superbum</i>	Tebangau	Phyllanthaceae	12.6	NE	
30	<i>Baccaurea brevipes</i>	Tampoi Burong	Phyllanthaceae	4.8	LC	Fruit Edible
31	<i>Syzygium havilandii</i>	Ubah	Myrtaceae	21	DD	
32	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	27.2	LC	
33	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	29.9	LC	
34	<i>Lithocarpus ewyckii</i>	Mempening/Empili	Fagaceae	38.3	NE	Fruit Edible

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
35	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	35.7	LC	
36	<i>Pometia pinnata</i>	Kasai	Sapindaceae	42.4	LC	Fruit Edible
37	<i>Xanthophyllum amoenum</i>	Nyalin/Langir	Polygalaceae	16.2	NE	Fruit Edible
38	<i>Sandoricum koetjape</i>	Apok	Meliaceae	15.6	LC	Fruit Edible
39	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	47.1	LC	
40	<i>Hopea bracteata</i>	Merawan / Luis Padi	Dipterocarpaceae	17.2	CR	
41	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	26.4	LC	
42	<i>Shorea pinanga</i>	Keregong / Engkabang Langgai Bukit	Dipterocarpaceae	20.5	LC	
43	<i>Rubroshorea acuminata</i>	Meranti Rambai Daun	Dipterocarpaceae	19.2	LC	
44	<i>Shorea falciferoidea</i>	Lun Barun / Selangan Batu Daun Nipis	Dipterocarpaceae	44	VU	
45	<i>Dacryodes costata</i>	Kemayau	Burseraceae	36.2	LC	Fruit Edible
46	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	44.6	LC	
47	<i>Rubroshorea acuminata</i>	Meranti Rambai Daun	Dipterocarpaceae	28.8	LC	
48	<i>Richetia gibbosa</i>	Lun Gajah	Dipterocarpaceae	62	CR	
49	<i>Rubroshorea amplexicaulis</i>	Engkabang Pinang Licin	Dipterocarpaceae	30.2	NT	
50	<i>Scaphium macropodum</i>	Kembang Semangkuk jantung	Malvaceae	45	LC	
51	<i>Richetia gibbosa</i>	Lun Gajah	Dipterocarpaceae	42.8	CR	
52	<i>Koompassia malaccensis</i>	Pa / Menggeris	Fabaceae	28.8	LC	
53	<i>Dryobalanops lanceolata</i>	Kapur Paji/Kapur hitam	Dipterocarpaceae	47.1	LC	
54	<i>Dipterocarpus fagineus</i>	Keruing Pipit	Dipterocarpaceae	46	CR	
55	<i>Syzygium havilandii</i>	Ubah	Myrtaceae	40.2	LC	
56	<i>Dipterocarpus palembanicus</i>	Keruing Ternek	Dipterocarpaceae	20.4	VU	
57	<i>Lithocarpus elegans</i>	Mempening/Empili	Fagaceae	44.5	NE	
58	<i>Ochanostyphis amentacea</i>	Petaling	Olacaceae	38	DD	
59	<i>Dryobalanops aromatica</i>	Porau/Kapur Bukit	Dipterocarpaceae	85	VU	
60	<i>Rubroshorea macroptera</i>	Meranti Melantai	Dipterocarpaceae	32	LC	
61	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	40.3	LC	
62	<i>Knema intermedia</i>	Penarahan	Myristicaceae	12.4	NT	
63	<i>Gonostylus velutinus</i>	Ramin	Thymelaeaceae	67.6	LC	
64	<i>Teijsmanniodendron pteropodum</i>	Kepapa/Buak-Buak	Lamiaceae	36.5	LC	
65	<i>Anthosherea lamellata</i>	Meranti Lapis	Dipterocarpaceae	30.2	CR	
66	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	42.2	LC	
67	<i>Lepisanthes alata</i>	Kelebunyau	Sapindaceae	11.2	DD	Fruit Edible
68	<i>Rubroshorea parvistipulata</i>	Engkabang Pinang	Dipterocarpaceae	50.6	LC	
69	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	48.3	LC	
70	<i>Tristaniopsis whiteana</i>	Selunsur	Myrtaceae	42.8	NE	
71	<i>Dipterocarpus fagineus</i>	Keruing Pipit	Dipterocarpaceae	38.2	CR	
72	<i>Ellianthus tomentosus</i>	Kebin	Connaraceae	9.6	DD	Herb
73	<i>Diospyros siamang</i>	Kayu Malam	Ebenaceae	10.8	NE	Fruit Edible

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
74	<i>Santiria laevigata</i>	Kedondong Daun Licin	Burseraceae	38.4	LC	Fruit Edible
75	<i>Rubroshorea pinanga</i>	Keregong/Engkabang Langgai Bukit	Dipterocarpaceae	40.2	LC	
76	<i>Rubroshorea meciostopterix</i>	Kawang Burong	Dipterocarpaceae	36.2	VU	
77	<i>Rubroshorea fallax</i> * <i>Shorea fallax</i>	Engkabang Layar	Dipterocarpaceae	30	LC	
78	<i>Rubroshorea pauciflora</i>	Meranti nemesu	Dipterocarpaceae	42.5	EN	
79	<i>Gironniera parvifolia</i>	Hampas tebu	Cannabaceae	42.4	NE	
80	<i>Microcos antidesmifolia</i>	Seng Ntung	Malvaceae	12.4	NE	Fruit Edible
81	<i>Lithocarpus elegans</i>	Mempening	Fagaceae	55.3	LC	Fruit Edible
82	<i>Rubroshorea leprosula</i>	Meranti Tembaga	Dipterocarpaceae	53.6	NT	
83	<i>Artocarpus anisophylus</i>	Denging/Tawak	Moraceae	46.5	VU	
84	<i>Shorea foxworthyi</i>	Selangan Batu Bukit	Dipterocarpaceae	38.2	VU	
85	<i>Rubroshorea dasypylla</i>	Meranti Batu	Dipterocarpaceae	35.3	EN	
86	<i>Rubroshorea dasypylla</i>	Meranti Batu	Dipterocarpaceae	28.8	EN	
87	<i>Rubroshorea dasypylla</i>	Meranti Batu	Dipterocarpaceae	33.1	EN	
88	<i>Dipterocarpus fugineus</i>	Keruing Pipit	Dipterocarpaceae	36.9	CR	
89	<i>Artocarpus dadah</i>	Talun / dadak	Moraceae	36	NE	Fruit Edible
90	<i>Shorea maxwelliana</i>	Selangan batu hitam	Dipterocarpaceae	65.6	EN	
91	<i>Artocarpus elasticus</i>	Talun	Moraceae	56.1	NE	
92	<i>Anthoshorea ochrocea</i>	Raruk	Dipterocarpaceae	23.8	VU	Fruit Edible
93	<i>Dryobalanops lanceolata</i>	Kapur Paji/Kapur hitam	Dipterocarpaceae	54.8	LC	
94	<i>Beilschmiedia kunsleri</i>	Medang	Lauraceae	108.2	NE	
95	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	63	VU	
96	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	80.5	VU	
97	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	13.5	VU	
98	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	52	VU	
99	<i>Dipterocarpus stellatus</i>	Keruing Daun Nipis	Dipterocarpaceae	45.3	VU	
100	<i>Ficus variegata</i> var. <i>chlorocarpa</i>	Nyawai Bala	Moraceae	52.4	LC	Fruit Edible
101	<i>Goniothalamus macrophyllus</i>	Selukai	Annonaceae	8.2	NE	Herb
102	<i>Parashorea macrophylla</i>	Peran / Bilat	Dipterocarpaceae	42.1	NT	Fruit Edible
103	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	67.2	LC	
104	<i>Camnosperma auriculatum</i>	Terentang Daun Besar	Anacardiaceae	48	LC	
105	<i>Rubroshorea macroptera</i>	Meranti Melantai	Dipterocarpaceae	72.1	LC	
106	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	80.2	VU	
107	<i>Sterculia cordata</i>	Kelumpang	Malvaceae	65.3	NE	
108	<i>Syzygium polyanthum</i>	Daun Salam	Myrtaceae	31.2	NE	Herb
109	<i>Rubroshorea dasypylla</i>	Meranti Batu	Dipterocarpaceae	54.1	EN	
110	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	35.5	LC	
111	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	25	LC	
112	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	35.2	LC	

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
113	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	38.6	LC	
114	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	36.5	LC	
115	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	44.5	LC	
116	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	28	LC	
117	<i>Rubroshorea pubistyla</i>	Meranting Bulu Merah	Dipterocarpaceae	28.3	LC	
118	<i>Rubroshorea slootenii</i>	Meranting Kepong	Dipterocarpaceae	28	VU	
119	<i>Hopea bracteata</i>	Merawan Ungu / Luis Padi	Dipterocarpaceae	5.4	LC	
120	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	75.8	VU	
121	<i>Pentaspadon motteyi</i>	Plajau / Pelong Licin	Anacardiaceae	68	DD	Fruit Edible
122	<i>Saraca indica</i>	Bua alak	Fabaceae	56.5	LC	
123	<i>Terminalia calamansai</i>	Jelawai Mentalun	Combretaceae	22.6	LC	
124	<i>Prismatomeris glabra</i>	Tongkat Aji Samad	Rubiaceae	8.2	NE	Herb

**Table 8.** Detailed of tree species, genera and family of trees found in Transect Line 2 in forest conservation area adjacent to Jelalong 5 Estate..

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
1	<i>Rubroshorea dasyphylla</i>	Meranti Batu	Dipterocarpaceae	17.4	EN	
2	<i>Dipterocarpus stellatus</i>	Keruing Daun Nipis	Dipterocarpaceae	26.4	VU	
3	<i>Dryobalanops lanceolata</i>	Kapur Paji/Kapur hitam	Dipterocarpaceae	40.8	LC	
4	<i>Rubroshorea pauciflora</i>	Meranti nemesu	Dipterocarpaceae	33.9	EN	
5	<i>Rubroshorea pauciflora</i>	Meranti nemesu	Dipterocarpaceae	22.4	EN	
6	<i>Rubroshorea ovata</i>	Meranti Pitis	Dipterocarpaceae	22.8	EN	
7	<i>Rubroshorea meciostopterix</i>	Kawang Burong	Dipterocarpaceae	36.8	VU	
8	<i>Rubroshorea meciostopterix</i>	Kawang Burong	Dipterocarpaceae	41.6	VU	
9	<i>Elateriospermum tapos</i>	Kelampai	Euphorbiaceae	31.8	NE	Fruit Edible
10	<i>Diospyros pilosanthera</i>	Kayu malam	Ebenaceae	20.3	NE	
11	<i>Diospyros foxworthyi</i>	Kayu malam	Ebenaceae	17.6	LC	
12	<i>Shorea scaberrima</i>	Lun kuning	Dipterocarpaceae	22.5	NT	
13	<i>Dryobalanops beccarii</i>	Porau / Kapur Bukit	Dipterocarpaceae	36.8	LC	
14	<i>Rubroshorea argentifolia</i>	Benato	Dipterocarpaceae	45.2	LC	
15	<i>Vatica nitens</i>	Resak	Dipterocarpaceae	16.2	NT	
16	<i>Garcinia parvifolia</i>	Kandis	Clusiaceae	21.1	NE	Fruit Edible
17	<i>Shorea crassa</i>	Selangan batu Daun tebal	Dipterocarpaceae	21.6	LC	
18	<i>Lithocarpus ewyckii</i>	Mempening/Empili	Fagaceae	45.6	LC	Fruit Edible
19	<i>Koompassia malaccensis</i>	Pa / Menggeris	Fabaceae	33.5	LC	
20	<i>Shorea glauca</i>	Balau laut	Dipterocarpaceae	45	EN	
21	<i>Richetia gibbosa</i>	Lun Gajah	Dipterocarpaceae	46.3	CR	
22	<i>Tristaniopsis whiteana</i>	Selunsur	Myrtaceae	32.2	NE	

No.	Family Name	Species Name	Vernacular Name	DBH (cm)	IUCN Status	Remark
23	<i>Eleoocarpus beccarii</i>	Mendong	Eleoocarpaceae	37.4	NE	Fruit Edible
24	<i>Xanthophyllum amoenum</i>	Nyalin/Langir	Polygalaceae	13.8	NE	Fruit Edible
25	<i>Rubroshorea macroptera</i>	Meranti Melantai	Dipterocarpaceae	41.2	LC	
26	<i>Rubroshorea pauciflora</i>	Meranti nemesu	Dipterocarpaceae	14.4	EN	
27	<i>Richetia multiflora</i>	Lun Jantan	Dipterocarpaceae	22.6	LC	
28	<i>Rubroshorea fallax</i> * <i>Shorea fallax</i>	Engkabang Layar	Dipterocarpaceae	19.2	LC	
29	<i>Dryobalanops beccarii</i>	Porau / Kapur Bukit	Dipterocarpaceae	36.8	LC	
30	<i>Cratoxylum arborescens</i>	Geronggang	Hypericaceae	45.2	LC	
31	<i>Gonostylus macrophyllus</i>	Ramin	Thymelaeaceae	8.2	LC	
32	<i>Neonauclea gigantea</i>	Tebalut	Rubiaceae	36.2	NE	
33	<i>Sloetia elongata</i>	Tempinis	Moraceae	11.6	LC	
34	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	54.7	LC	
35	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	26.8	LC	
36	<i>Lithocarpus ewyckii</i>	Mempening/Empili	Fagaceae	24.8	LC	Fruit Edible
37	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	38.6	LC	
38	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	56.8	LC	
39	<i>Scorodocarpus borneensis</i>	Kulim/Bawang Hutan/Jaui	Olacaceae	29.5	LC	Herb
40	<i>Palaquium ottolanderi</i>	Nyatoh	Sapotaceae	38.8	NT	
41	<i>Syzygium lineatum</i>	Kelat	Myrtaceae	67.1	NE	
42	<i>Lithocarpus ewyckii</i>	Mempening/Empili	Fagaceae	48.6	NE	Fruit Edible
43	<i>Dryobalanops lanceolata</i>	Kapur Paji/Kapur hitam	Dipterocarpaceae	37.1	LC	
44	<i>Rubroshorea parvifolia</i>	Meranti Sarang punai	Dipterocarpaceae	36.2	LC	
45	<i>Eusidroxylon zwageri</i>	Belian	Lauraceae	55.2	VU	
46	<i>Terminalia subspathulata</i>	Jelawai/Talisai	Combretaceae	41.1	NE	
47	<i>Dipterocarpus sarawakensis</i>	Keruing	Dipterocarpaceae	45.2	EN	
48	<i>Scaphium longiflorum</i>	Kembang semangkuk	Malvaceae	23.7	VU	

## CONCLUSION

The development of an educational trail for the local forest user community is a facility to enable educational communication related to plants to be shared periodically. The pure purpose of this trail is to complete the knowledge about the diversity of plant species and natural ecological selection as well as applying the care of tree species that provide shade to forest life, it is very important to understand. The existence of many tree species that have been listed as a red list in The International Union for Conservation of Nature's Red List of Threatened Species shows that the forest conservation area adjacent to Jelalong 5 Estate needs to be well preserved to help sustainable development in the coming period. Documentation of tree species that are important to the environment and the development of the country's timber industry, especially to the provision of planting material for forest trees in the future. In

conclusion, efforts to record plant data around the development of palm oil plantations is a responsibility to recognize the wealth of forest tree species so that protected species can be well preserved for the future.

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## APPENDIX



Picture 1. Example of Dipterocarps a. *Rubroshorea argentifolia*, b. *Rubroshorea meciptopterix*, c. *Shorea atrinervosa* and d. *Dryobalanops beccarii*.



Picture 2. Example of non-dipterocarps a. *Sandoricum koetjape*, b. *Melanochyla caesia*, c. *Santiria laevigata*, d. *Sarcostheca griffithii*,  
e. *Myrmeconauclea strigosa* and f. *Dyera costulata*



a



b



c

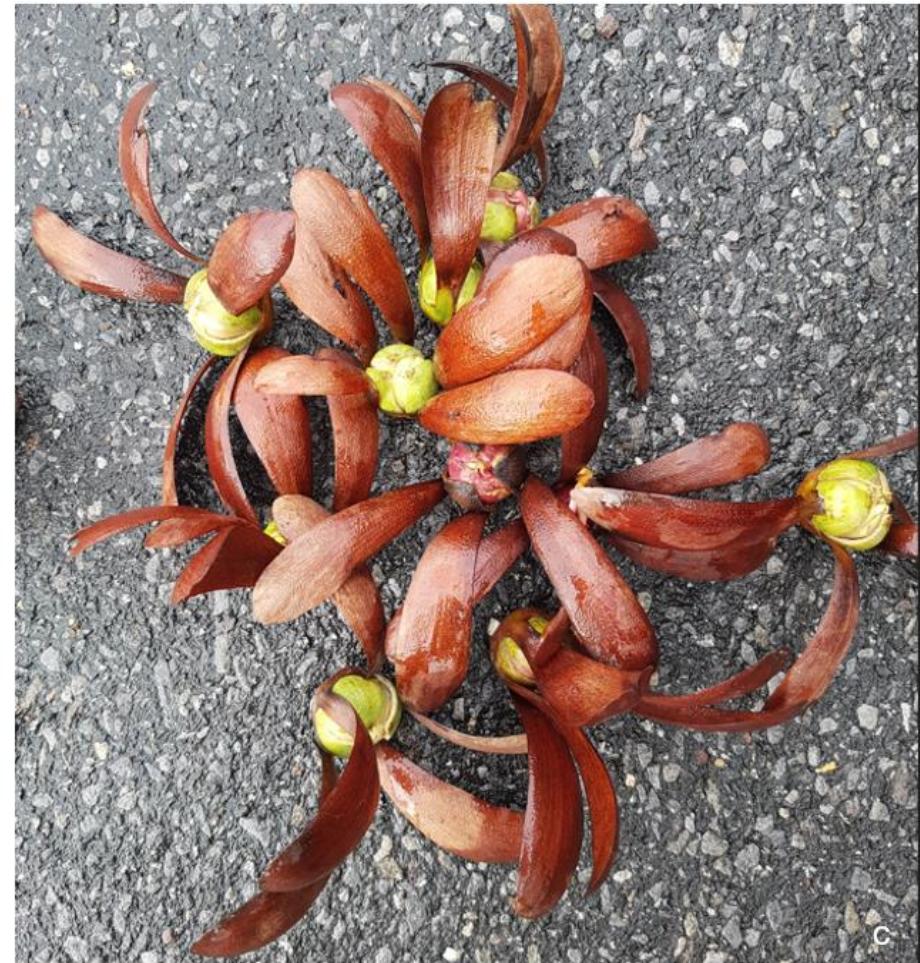
Picture 3. Samples of tree crown a. *Saraca indica*, b. *Rubroshorea dasyphylla* and c. *Barringtonia macrocarpa*



Picture 4. Stem of a. *Xylopia ferruginea*, b. *Dryobalanops aromatica*, c. *Koompassia malaccensis* and d. *Tristaniopsis whiteana*.



Picture 5. Stem of a. *Dryobalanops lanceolata*, b. *Rubroshorea parvifolia* and c. *Eusidroxylon zwageri*.



Picture 6. Example of a. *Parashorea macrophylla* fruits, b. *Eusidroxylon zwageri* leaf and c. *Dryobalanops lanceolata* fruits.



Picture 7. Trees example of food source a. *Ficus grossularioides*, b. *Ficus variegata* var. *chlorocarpa*, c. *Ficus geocharis* and d. *Artocarpus odoratissimus*.



a



b



c



d

Picture 8. Examples of palm a. *Calamus leptospadix*, b. *Salacca zalacca* c. *Licuala longipes* and d. *Salacca affinis*.



Picture 9. Ground cover examples a. *Cyanoneuron pubescens*, b. *Pandanus pygmaeus* and c. *Piper borneense*.



Picture 10. Sedimentation rock at Sungai Saging suitable for picnic area.