Species richness and IUCN status of commercial timber in Kedah Forest, Leuser ecosystem

E Harnelly1, Martunis2, Hawati3 and Iqbar1

1Biology Department, Faculty of Mathematics and Natural Sciences, Syiah Kuala University, Jl. Tgk. Syech Abdul Rauf No. 3, Banda Aceh 23111, Indonesia.
2Agricultural Product Technology Department, University of Syiah Kuala, Banda Aceh 23111, Indonesia
3Forestry Department, PSDKU Gayo Lues, University of Syiah Kuala, Indonesia

E-mail: iqbar@unsyiah.ac.id

Abstract. The Kedah Forest in Sumatra is one of the forests allocated for tourism and research purposes for the local or foreign communities. The Kedah Forest contains a wealth of biological natural resources, flora and fauna, including wood species with a high economic value (commercial). However, data on the diversity of commercial timber plant species in the area have not been recorded and documented, both in terms of tree species and their conservation status. This research aimed to identify commercial timber plant species and determine the population and conservation status of these species in the Kedah Forest. This study was carried out between October and December 2019. We assessed the species richness and the IUCN status of commercial timber species and assessed its conservation status in accordance with IUCN criteria. The result showed that Kedah Forest has 16 species of commercial timber plants from 11 families, of which six species of commercial timber plants have not been registered as commercial timber according to the Decree of the Minister of Forestry Number: 163 / Kpts-II / 2003 dated 26 May 2003. Four species of wood plants commercial forest in Kedah are listed on the IUCN Red List under the Near Threatened, Low Risk, and Data Less categories.

1. Introduction

Indonesia is regarded as an agricultural country rich in wood-producing plants, which are widely used for various purposes, such as large industries, small industries, and households. Although the forestry sector in Indonesia has experienced a paradigm shift from wood production to non-timber forest products, there is no doubt that the wood demand in the role of wood remains important considering that wood is multi-functional and has many advantages compared to other materials. That is why wood is one of the main needs of humans. All woods are composed of cellulose, lignin, hemicelluloses, and minor amounts (usually less than 10%) of extraneous materials contained in a cellular structure. Variations in the characteristics and proportions of these components and differences in the cellular structure make woods. Since the qualities of wood are typically similar for each species, selecting wood solely on species is sometimes adequate [1]. However, to use wood to its best advantage and most effectively in engineering applications, specific characteristics or physical properties must be considered.

Commercial timber is wood traded for building materials, household purposes, and other types [2]. The classification and determination of trade timber species in Indonesia have been carried out several
times in 1995, through the Decree of the Minister of Forestry (Menhut) number 311/Kpts-IV/1995, and revised through the Decree of the Minister of Forestry in 1997. Furthermore, the classification of commercial species is based on the Decree of the Minister of Forestry No. 163/Kpts/2003 concerning the grouping of wood species as the basis for imposing forestry fees which can be further divided into several groups, namely, Meranti type group (commercial one group), mixed species group (commercial two groups: mixed species wood), ebony wood species group (decorative one group) and decorative wood species group (decorative two groups) [3].

Conservation status is the classification of the level of threat to living things, both flora and fauna. The purpose of having conservation status is to protect and preserve living species. Individual governments or agencies can declare species conservation status. The International Union for the Conservation of Nature and Natural Resources (IUCN) is dedicated to preserving nature and natural resources. The IUCN is made up of governments from various countries as well as civil society organizations, and the organization publishes the IUCN Red List of Threatened Species, which is a list of the rare status of a species. The IUCN Red List's conservation status category was originally published in 1984 and is still the most significant reference for biodiversity conservation status. Every 5-10 years, the list is reviewed and assessed. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), established in 1973 and amended in 1979, contributes to wild flora and fauna conservation by requiring government permits for international trade in threatened species and wildlife products [4].

In-Law No. 5 of 1990 concerning Conservation of Biological Natural Resources and Ecosystems, the Indonesian government declared the status of animal and plant protection in Indonesia. According to article 20 paragraph 1, there are two conservation statuses for plants and animals in this regulation: protected and unprotected. According to Article 20, paragraph 2, protected plants and animals are on the endangered list or have small populations. A list of the most recent protected animals and plants can be found in Government Regulation No. 7 of 1990 for the Preservation of Plant and Animal Species. According to the rule, there are 249 animal and plant species that must be preserved [4]. In addition, the Minister of Environment and Forestry's Regulation No. P 20 Amendment to P. 106 of 2018 adds or renews the list of protected species, stating that there are 904 species of animals and plants that must be preserved.

Kedah is the name of a hamlet in Gayo Lues Regency's Penosan Sepakat Village, Blangjerango District, which is one of the entrances to the Leuser Forest of Gunung Leuser National Park (TNGL). Gunung Leuser National Park is a tropical rain forest that has the world's most diverse plant species and the world's most complicated ecosystem [5]. The Gunung Leuser National Park (TNGL) forest is located close to the Kedah Forest, a protected forest that spans 590 hectares and is a popular tourism destination for foreign and local visitors [6].

In 1987, Kedah Forest was used as the National Park Resort's office, facilitating forest management, such as maintaining, protecting, and monitoring. The Rainforest Lodge Kedah is now a tourist attraction as well as a location for education and research. When the conflict between the Government of Aceh and separatists in Aceh occurred in 2002, the Lodge in Kedah Forest was burned by unknown people. In 2007 a German climber contributed to developing the Kedah Forest, which is located at an altitude of 1300 m above sea level, and made this place a favorite place for climbers because it is the initial departure point to the summit of Leuser Forest [7]. Since the Kedah Forest is one of the entrances to the Leuser Forest, there is a concern that biodiversity in the Kedah Forest will be disturbed. Therefore, the conservation of the commercial timber in the Kedah Forest needs to assess the species richness and the IUCN status of commercial timber at Kedah forest.

2. Methods
The diversity of commercial timber species was studied at three different elevations, namely 1300 masl, 1400 masl, and 1500 masl. Samples of commercial timber plants from trees, poles, saplings, and seedlings were gathered from each growth strata. A sampling at each of these elevations was carried out
on a 100 m long transect line by placing four nesting plots distanced 5 m from the line. Three transect lines were established at each elevation. The sampling plot was scaled according to the growth strata.

A. Trees strata (20 m x 20 m)
B. Poles strata (10 m x 10 m)
C. Sapling strata (5mx5m)
D. Seedling strata (2 m x 2 m)

3. Results and discussion
16 species out of 45 species from 11 tribes of wooded plants with a good economic value (table 1) found in the Keudah Forest. The timber species Litsea sp. is the most abundant with 52 individuals, followed by Garcinia bancana, locally known as Kayu Kandis (figure 1). Litsea species is an indigenous widely grown species in the secondary forests and wetlands in Indonesia. These genera can also be found in peat swamp forests, particularly in Kalimantan and Sumatra. Garcinia bancana, also known by the trade name kandis wood, is a strong class I-II wood that can be used for building materials, poles, interior fixtures, furniture, and fences. Semi-permanent buildings, piles, span beams, supports, rafters, floors, bridges, vehicle frames, tool handles, battens, pegs, rulers, lathes, chess pieces, pallets, and other paper pulping materials. This wood can also be made into high-quality charcoal [8].

![Figure 1](image1.jpg)

**Figure 1.** The two most dominant timber plants in Kedah Forest. A. *Litsea grandis*, B *Garcinia bancana*.

A group of plants commonly found in the tropics is the Medang-Medangan family (Lauraceae). Lauraceae has approximately 45 genera in Southeast Asia and South America, including more than 2000 species. Lauraceae is also one of the most used and most important economic groups [9].
The Kedah Forest is the starting point for hiking trails into the Leuser Forest, and as a popular ecotourism destination, all these activities may unintentionally affect commercial timber plants. Furthermore, local people frequently go in and out of the area to earn a living, such as picking rattan and catching birds. They would open small access roads to enter the forest, posing a threat to small commercial timber species such as saplings and seedlings as they may step on or remove small woody plants along the roads. Therefore, to protect plants from the threat of extinction, it is necessary to know the conservation status of commercial woody plant species in the Kedah forest. The conservation status refers to the conservation status according to PERMENHUT RI No. P.106/MENLHK/SETJEN/KUM.1/12/2018 and IUCN (International Union for Conservation of Nature and Natural Resources), and CITES conservation status of commercial timber plant species (table 2).

**Table 1.** The commercial woody plant species from Keudah Forest.

| No. | Scientific name           | Family         | Number of Individuals | Commercial Group                  |
|-----|---------------------------|----------------|-----------------------|-----------------------------------|
| 1   | *Aglaia argentea* Blume   | Meliaceae      | 11                    | -                                 |
| 2   | *Pterospermum javanicum* Jungh | Sterculiaceae | 6                     | Mixed wood species group (commercial II) |
| 3   | *Artocarpus gomezianus*   | Moraceae       | 16                    | Mixed wood species group (commercial II) |
| 4   | *Eugenia sp.*             | Myrtaceae      | 4                     | Mixed wood species group (commercial II) |
| 5   | *Garcinia bancana*        | Clusiaceae     | 44                    | Mixed wood species group (commercial II) |
| 6   | *Payena lucida*           | Sapotaceae     | 6                     | Mixed wood species group (commercial II) |
| 7   | *Artocarpus elasticus*    | Moraceae       | 1                     | Mixed wood species group (commercial II) |
| 8   | *Mangifera sp.*           | Anacardiaceae  | 2                     | Mixed wood species group (commercial II) |
| 9   | *Magnolia montana*        | Magnoliaceae   | 26                    | -                                 |
| 10  | *Actinodaphne glabra*     | Lauraceae      | 15                    | -                                 |
| 11  | *Actinodaphne nitida*     | Lauraceae      | 14                    | -                                 |
| 12  | *Actinodaphne angustifolia* | Lauraceae     | 52                    | Mixed wood species group (commercial II) |
| 13  | *Litsea grandis*          | Lauraceae      | 2                     | Mixed wood species group (commercial II) |
| 14  | *Litsea sp.*              | Lauraceae      | 2                     | Mixed wood species group (commercial II) |
| 15  | *Toona sp.*               | Meliaceae      | 3                     | Mixed wood species group (commercial II) |
| 16  | *Bischoffia javanika*     | Phyllanthaceae | 6                     | Mixed wood species group (commercial II) |
Tabel 2. The conservation status of commercial timber species in the Kedah Forest.

| No | Scientific Name              | Family          | Conservation Status | INA Gov  | IUCN       | CITES     |
|----|------------------------------|-----------------|---------------------|----------|------------|-----------|
| 1  | *Aglaia argentea* Blume      | Meliaceae       | Not Protected       | Least Concern | Not Listed |
| 2  | *Pterospermum javanicum* Jungh | Sterculiaceae   | Not Protected       | Not Protected | Not Listed |
| 3  | *Artocarpus gomezianus*      | Moraceae        | Not Protected       | Not Protected | Not Listed |
| 4  | *Eugenia* sp.                | Myrtaceae       | Not Protected       | Endangered | Not Listed |
| 5  | *Garcinia bancana*           | Clusiaceae      | Not Protected       | Least Concern | Not Listed |
| 6  | *Payena lucida*              | Sapotaceae      | Not Protected       | Near Threatened | Not Listed |
| 7  | *Artocarpus elasticus*       | Moraceae        | Not Protected       | Least Concern | Not Listed |
| 8  | *Mangifera* sp.              | Anacardiaceae   | Not Protected       | Not Protected | Not Listed |
| 9  | *Magnolia montana*           | Magnoliaceae    | Not Protected       | Data Deficient | Not Listed |
| 10 | *Actinodaphne glabra*        | Lauraceae       | Not Protected       | Least Concern | Not Listed |
| 11 | *Actinodaphne nitida*        | Lauraceae       | Not Protected       | Least Concern | Not Listed |
| 12 | *Actinodaphne angustifolia*  | Lauraceae       | Not Protected       | Not Protected | Not Listed |
| 13 | *Litsea grandis*             | Lauraceae       | Not Protected       | Not Protected | Not Listed |
| 14 | *Litsea* sp.                 | Lauraceae       | Not Protected       | Least Concern | Not Listed |
| 15 | *Toona* sp.                  | Meliaceae       | Not Protected       | The population is low, but the species now is planting a lot | Not Listed |
| 16 | *Bischoffia javanika*        | Phyllanthaceae  | Not Protected       | Not Protected | Not Listed |

Sources: IUCN (2015), CITES (2017), and PP. No. 106 of 2018. Note: NT (Near Threatened) DD (Data Deficient) LR (Lower Risk)

The conservation status of commercial wood plants in the Kedah Forest was examined based on IUCN and CITES lists (table 2) and the Republic of Indonesia government regulation number 106 of 2018 addressing plant and animal species preservation. Based on the IUCN red list of commercial timber plant conservation status, there were three plants in the Low Risk (LC) category, namely Balik Angin (*Aglaia argentea* Blume), Pertik Wood (*Artocarpus elasticus*), and Medang Kapur (*Actinodaphne glabra*), that have been evaluated but do not fall into any category. The commercial timber plant that is included in the endangered (EN) category is Medang Rangku (*Eugenia* sp.), being at risk of extinction in the wild in the near future [10].

The IUCN red list conservation status of commercial timber plants classified as Near Threatened (NT) is mayang wood (*Payena lucida*), which means that the plants in this category are under threat or on the endangered list but are not threatened. There is also an IUCN red list that includes plant species
classified as lacking data (DD). Medang Cempa/Jempa (*Magnolia montana*) is a lesser-known species concerning its distribution and population abundance [10].

4. Conclusion

There were 16 out of 45 species from 11 tribes of wooded plants with the commercial value found in the Kedah Forest. Based on the IUCN red list of commercial timber plant conservation status, there were three plants in the Low Risk (LC) category, namely Balik Angin (*Aglaia argentea* Blume), Pertik Wood (*Antrocarpus elasticus*), and Medang Kapur (*Actinodaphne glabra*).

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