Burseraceae in Kuala Keniam and Surrounding Area at Taman Negara Pahang, Peninsular Malaysia

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Abstract. A preliminary survey on Burseraceae diversity was conducted in Kuala Keniam and surrounding area at Taman Negara Pahang, Peninsular Malaysia. The data from recent scientific expedition in early September 2020 were compiled with the previous collections lodged in the Herbarium of Universiti Kebangsaan Malaysia (UKMB), Herbarium of Forest Research Institute Malaysia (KEP), Herbarium of University of Malaya (KLU) and Herbarium of Singapore Botanic Gardens (SING). A total of 19 taxa of Burseraceae from five genera were listed in this area. Santiria and Dacryodes represented the highest species with six (6) taxa each followed by Canarium with five (5) species. The common species that we have counted around Kuala Keniam are Canarium littorale and Dacryodes rostrata. From the flora survey, we counted Canarium littorale, C. pilosum, D. costata, D. rostrata, D. rugosa, Santiria griffithii, S. laevigata and Triomma malaccensis. Meanwhile, in the plot study, we counted Canarium littorale, C. pilosum, Dacryodes rostrata, D. rugosa, Santiria laevigata, S. tomentosa and Scutianthe brunnea.

1. Introduction

Burseraceae is widely found in the tropics and subtropics, with about 18-19 genera and more than 700 species recorded [1] [2]. The largest genus is Commiphora with c. 185-190 species [3] followed by Protium (with c. 160-180 species) [2]. In Peninsular Malaysia, six genera and 38 species are recorded [4]. Meanwhile in Pahang, a total of 28 species from five genera are recorded [5] not including a rare species of Dacryodes multijuga from Tekam Forest Reserve [6]. As there is no report of Burseraceae in any particular forest in Pahang as well as Taman Negara at Kuala Keniam, the aim of this paper is to
present the preliminary results of Burseraceae composition of Taman Negara at Kuala Keniam and its surrounding area.

2. Materials and Methods
During the scientific expedition to Taman Negara at Kuala Keniam in early September 2020, voucher specimens of Burseraceae were collected. Floristic notes on the abundance and habit of every species were recorded. Additional data were obtained from ecological plots and the previous collections lodged in the Herbarium of Universiti Kebangsaan Malaysia (UKMB), Herbarium of Forest Research Institute Malaysia (KEP), Herbarium of University of Malaya (KLU) and Herbarium of Singapore Botanic Gardens (SING). Leaf samples were collected for identification purpose. Fresh specimens of leaves were pressed between newspapers and then preserved in 70% alcohol. The specimens were kept in tied plastic bags to form an air-tight condition. In the laboratory, the specimens were transferred to dry newspapers. The pressed specimens were then oven-dried at 60 °C for seven to ten days depending on the type, thickness of the leaf and also the presence of fruits or flowers. The method for pressing the specimens was based on [7]. Identification was carried out with the keys of [4] and [8]. The list of species names, brief descriptions and ecological distribution are also included in this paper based on Turner [5].

3. Results and Discussion
A total of 19 taxa from five (5) genera of Burseraceae has been recorded in Kuala Keniam and surrounding area of Taman Negara Pahang. Santiria and Dacryodes has recorded the highest species with six (6) taxa each, followed by Canarium with five (5) species. The total number of species in this study is similar to other studies in Peninsular Malaysia. For instance, a study by Ahmad Fitri et al. [9] have listed 20 species in five (5) genera in the lowland forest of Universiti Kebangsaan Malaysia Permanent Forest Reserve, Selangor. However, in a study in lowland and hill dipterocarp forest at Gunung Tebu Forest Reserve, Terengganu, Ahmad Fitri et al. [10] only listed 11 taxa from three (3) genera of Burseraceae. The similar result was also reported by Ahmad Fitri et al. [11] in lowland dipterocarp forest in Ulu Sat Forest, Kelantan with 11 species from three (3) genera.

The common species that we have counted in Kuala Keniam are Canarium littorale and Dacryodes rostrata. From the flora survey, we counted Canarium littorale, C. pilosum, D. costata, D. rostrata, D. rugosa, Santiria griffithii, S. laevigata and Triomma malaccensis. Meanwhile, in the plot study, we counted Canarium littorale, C. pilosum, Dacryodes rostrata, D. rugosa, Santiria laevigata, S. tomentosa and Scutinanthe brunnea. The complete checklist for Burseraceae species that are found in Taman Negara at Kuala Keniam and its surrounding area is given below. Pictures of some selected species of Burseraceae are shown in Figures 1-5.

The checklist of all species of Burseraceae found in Kuala Keniam and its surrounding area at Taman Negara Pahang are as follows:

3.1. Canarium caudatum King
Small tree (herbarium specimen).
Specimen examined: Ulu Sg. Sat, Whitmore, FRI 15239, 11 July 1970, (SING).
Note: This species is not recorded in Kuala Keniam.
Distribution: This species is widespread in lowland forest of Peninsular Malaysia.

3.2. Canarium littorale Blume
Saplings (observed, voucher and herbarium specimens) and trees (observed, voucher and herbarium specimens).
Specimens examined: Tembeling, Henderson, SFN 21895, 15 July 1929, (SING); Sg. Teku, Kiah, SFN 31770, 23 July 1936, (SING); Sg. Riul, Everett, FRI 14444, 12 July 1970, (KEP); Ulu Sg. Sat, M. Shah & M. Noor, MS1878, 13 July 1970, (SING); Ulu Sepia, Whitmore, FRI15360, 19 July 1970, (KEP); Bukit Tersik, Soepadmo, 849, 31 August 1970, (KLU); Kuala Tahan, M. Shah & M. Noor, MS 2176,
17 August 1972, (SING); Trail to Bukit Tersik, Y.C. Chan, FRI 21793, 19 April 1975, (KEP); Trail to Bukit Tersik, Razali, 186 R, 19 April 1975, (UKMB); Lata Berkoh, K.C. Ang, FRI 234283, 30 April 1975, (KEP); Kuala Tahan, Soepadmo, 47, 157, 13 May 1975, (KLU); Kuala Tahan, Pannell, 1042, 1055, 5 March 1978, (KLU); Kuala Keniam, K.M. Wong & Khairuddin, FRI 32647, 20 August 1982, (KEP); Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 6 September 2020, 7 September 2020.
Note: Common in Kuala Keniam.
Distribution: This species is the commonest found in the lowland forests throughout Peninsular Malaysia.

3.3. *Canarium megalanthum* Merrill
Trees (herbarium specimens).
Specimens examined: Tembeling. Henderson, SFN 21916, 15 July 1929, (SING); Lata Berkoh, Rahim, AR 186, 30 April 1975, (UKMB).
Note: This species is not recorded in Kuala Keniam.
Distribution: This species is found in lowland forest in Kedah, Pahang, Negeri Sembilan and Johor.

3.4. *Canarium patentinervium* Miquel
Small to medium tree (herbarium specimens).
Specimens examined: Bukit Belar, M. Shah, MS 1634, 7 March 1968, (SING); Ulu Sg. Sepia, M. Shah & M. Noor, MS 1895, 16 July 1970, (SING); between Kuala Teku and Wray’s Camp, Soepadmo, 878, 1 September 1970, (KLU); Jeram Belau, Whitmore, FRI 20152, 11 June 1971, (KEP); Lata Berkoh, K.C. Ang, FRI 23424, 30 April 1975, (KEP); Kuala Tahan, Soepadmo, 158, 13 May 1975, (KLU).
Note: This species is not recorded in Kuala Keniam.
Distribution: This species is found in lowland and hill forest understory in Kedah, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

3.5. *Canarium pilosum* Benn
Saplings (observed and voucher specimen) and trees (voucher and herbarium specimens).
Specimen examined: Kuala Teku, Holttum, SFN 20088, 24 August 1928, (SING); Kuala Sg. Teku, F.G. Saw, 41015, 19 July 1936, (KEP); Gua Peningat, H.S. Loh, FRI 17208, 14 July 1970, (KEP); Ulu Sg. Sepia, M. Shah & M. Noor, MS 1962, 17 July 1970, (SING), Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 6 September 2020.
Note: Saplings are uncommon in Kuala Keniam.
Distribution: This species is widespread in Peninsular Malaysia in both the lowland and hill forests.

3.6. *Dacryodes costata* (Benn.) H.J. Lam
Saplings (observed and voucher specimen) and trees (voucher and herbarium specimens).
Specimen examined: Kuala Tahan, Broadwalk route: Bukit Teresek, M.Y. Chew et al., TN 137, 3 October 2013, (KEP); Kuala Keniam, Jeram Belau, T.C. Whitmore, FRI 20151, 1 June 1971, (KEP); Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 6 September 2020.
Note: Saplings are uncommon in Kuala Keniam.
Distribution: This species is found in lowland and hill forest in Kedah, Terengganu, Pulau Pinang, Perak, Pahang, Selangor, Negeri Sembilan and Johor.

3.7. *Dacryodes incurvata* (Engl.) H.J. Lam
Tree (herbarium specimen).
Specimen examined: Tahan Woods, Whitmore, FRI 4757, 20 February 1968, (KEP).
Note: This species is not recorded in Kuala Keniam.
Distribution: This species is commonly found in lowland and hill forest including swamps; Kelantan, Terengganu, Perak, Pahang, Selangor and Johor.
3.8. **Dacryodes incurvata** (Engl.) H.J. Lam
Small trees (herbarium specimen).
Specimens examined: Ulu Sg. Sat, M. Shah & M. Noor, MS 1834, 11 July 1970, (SING).
Note: This species is not recorded in Kuala Keniam.
Distribution: This endemic species is common in the lowland and hill forests throughout Peninsular Malaysia.

3.9. **Dacryodes laxa** (Benn.) H.J. Lam
Tree (herbarium specimens).
Specimen examined: Sungai Tahan, Ridley, 2451, 1891, (SING); Sg. Riul, Everett, FRI 14446, 12 July 1970, (KEP).
Note: This species is not recorded in Kuala Keniam.
Distribution: This species is widespread in lowland and hill forest in Peninsular Malaysia.

3.10. **Dacryodes rostrata** (Blume) H.J. Lam
Saplings (observed and voucher specimen) and trees (observed, voucher and herbarium specimens).
Specimen examined: Sg. Kenyam, Whitmore, FRI 8509, 3 March 1968, (KEP); Sg. Belau, Whitmore, FRI 8617, 7 March 1968, (KEP); Bukit Belau, M. Shah, MS 1634, 7 March 1968, (SING), Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Sapling and trees are common in Kuala Keniam.
Distribution: This species is found in lowland and hill forests; recorded in all states in Peninsular Malaysia.

3.11. **Dacryodes rugosa** (Blume) H.J. Lam
Sapling (observed and voucher specimen).
Specimen examined: Sungai Tahan, Ridley, s.n., 24 July 1891, (SING); Tembeling, Henderson, SFN 24547, 28 May 1931, (SING); Jeram Belau, Whitmore, FRI 20151, 30 June 1971, (KEP), Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 6 September 2020.
Note: This species is uncommon in Kuala Keniam.
Distribution: The species is common in lowland forest in Peninsular Malaysia; Kedah, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

3.12. **Santiria apiculata** Benn. var. **rubra** (Ridl.) Kalkman
Saplings (observed) and tree (herbarium specimen).
Specimen examined: Permatang Terusuk, Whitmore, FRI 4720, 16 February 1968, (KEP); Tahan Woods, Whitmore, FRI 4812, 22 February 1968, (KEP); Ulu Sat, Whitmore, FRI 15238, 11 July 1970, (KEP); Lata Berkoh, Latiff, 389, 24 March 1983, (UKMB).
Note: This species is uncommon in Kuala Keniam.
Distribution: This widespread variety is distributed in the lowland and hill forests of Peninsular Malaysia.

3.13. **Santiria conferta** Benn
Sapling (observed) and tree (herbarium specimen).
Specimen examined: Lata Berkoh, Rahim, 187 AR, 30 April 1975, (UKMB).
Note: This species is uncommon in Kuala Keniam.
Distribution: This species is common throughout Peninsular Malaysia in lowland forest and also found in the mountain.

3.14. **Santiria griffithii** (Hook.f.) Engl.
Sapling (observed and voucher specimen) and trees (herbarium specimen).
Specimen examined: Between Kuala Teku and Wray’s Camp, Soepadmo, 875, 1 September 1970, (KLU); Kuala Tahan, Whitmore, FRI 20138, 10 June 1971, (KEP); Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Uncommon in Kuala Keniam.
Distribution: This species is common throughout Peninsular Malaysia in lowland forest.

3.15. Santiria laevigata Blume
Seedlings (voucher and herbarium specimens) and trees (observed, voucher and herbarium specimens).
Specimen examined: Bukit Terom, Razali, 227 R, 28.4.1975, (UKMB), Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Uncommon in Kuala Keniam.
Distribution: This species is very common in Peninsular Malaysia from the lowland to montane forests, recorded in all states except for Perlis and Langkawi Islands.

3.16. Santiria oblongifolia Blume
Trees (herbarium specimen).
Specimen examined: Tahan Woods, Whitmore, FRI 4810, 20 February 1968, (KEP); Bukit Terom, Whitmore, FRI 8547, 5 March 1968, (KEP); Sg. Tahan, M. Shah, MS 1389, 22 November 1968, (SING); s.loc. Everett, FRI 14377, 9 July 1970, (KEP); Ulu Sepia, Whitmore, FRI 15320, 17 July 1970, (KEP); Lata Berkoh, K.C. Ang, FRI 23389, 28 April 1975, (KEP); Gunung Terom, Y.C. Chan, FRI 23826, 28 April 1975, (KEP); Lata Berkoh, K.C. Ang, FRI 23425, 30 April 1975, (KEP).
Note: Not recorded in Kuala Keniam.
Distribution: This species is recorded in Kedah southwards.

Figure 2. Herbarium specimen from Taman Negara Pahang. A. Santiria apiculata var. rubra. B. S. griffithii.

3.17. Santiria tomentosa Blume
Seedling and sapling (observed, voucher and herbarium specimens), tree (herbarium specimens).
Specimen examined: Tahan Woods, Whitmore, FRI 4832, 22 February 1968, (KEP); Bukit Keliyu, Whitmore, FRI 4927, 2 March 1968, (KEP); Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Uncommon in Kuala Keniam.
Distribution: This species is common in the lowland forests, recorded in all states except for Perlis.

3.18. Scutinanthe brunnea Thwaites
Saplings (observed and voucher specimen), tree (observed).
Specimen examined: Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Uncommon in Kuala Keniam.
Distribution: This species is found in lowland and hill forest of Kedah, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

3.19. *Triomma malaccensis* Hook.f.
Sapling (observed and voucher specimen).
Specimen examined: Kuala Keniam, Ahmad Fitri et al., AFZ s.n., 7 September 2020.
Note: Uncommon in Kuala Keniam.
Note: This species is common throughout Peninsular Malaysia.

![Herbarium specimen from Taman Negara Pahang. A. *Santiria oblongifolia*. B. *S. tomentosa*.](image)

**Figure 3.** Herbarium specimen from Taman Negara Pahang. A. *Santiria oblongifolia*. B. *S. tomentosa*.

4. **Conclusion**
From this study, forested area in Kuala Keniam and surrounding area at Taman Negara Pahang harboured many species of Burseraceae. A total of 19 taxa from five (5) genera of Burseraceae were recorded. All taxa were commonly found in other lowland and hill forests in Peninsular Malaysia.

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