Newly Recorded *Endiandra* R. Br. (Lauraceae) from Waigeo Island, Raja Ampat, Papua, Indonesia

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Abstract

Endiandra trees are not frequently encountered in the forest in Indonesia. Recent exploration in Waigeo Island resulted in the collection of three species of *Endiandra*. All three species were collected for the first time from Waigeo Island. The three species are restricted in distribution to eastern part of Indonesia (Papua Province) and Papua New Guinea. Key to the species and species description are provided.

Introduction

Waigeo Island is part of the Raja Ampat Islands, an archipelago that is situated at the northern extremity of Indonesia's easternmost Papua province. Waigeo Island is the largest island in the archipelago, 130 km long and 48 km wide and positioned at the northernmost of Raja Ampat Islands. Raja Ampat is very rich in both terrestrial and oceanic biodiversity including plant, coral reefs and fish (Anonymous 2006).

Endiandra is one of the genera in the family Lauraceae, a dominant plant family in tropical forests and occurs from lowland up to montane forests. Main distribution area of Lauraceae species is in the tropical forests of South East Asia and America (Heywood, 1993).

Endiandra was first described by R. Brown (1810) based on the type species, *Endiandra glauca*, from Australia. The genus consists of approximately 100 species distributed from South China, Taiwan, Malesia, and Australia up to Fiji (Rohwer, 1993). In Malesia, New Guinea is the main distribution centre of *Endiandra* with several endemic species. A floristic survey to Waigeo Island was carried out to study the occurrence of *Endiandra* on the island and to make additional collection for the Herbarium Bogoriense.

Materials and Method

Herbarium specimens studied for this research were collected from Waigeo Island. Additional specimens of *Endiandra* available at the Herbarium Bogoriense were also examined. Main localities explored on Waigeo Island are forests in the area of Teluk Mayalibit District and riverine forest along the Werabiyai River.

We collected vegetative, floral and fruiting parts of each plant species and took their pictures. Information, such as locality, plant habit, uses, color and scent of specimens, were noted to help make the species identification easier. Identification was done mainly by consulting references and comparing the recently collected herbarium with the herbarium available at the Herbarium Bogoriense. The descriptions for each species were constructed based on observed morphological characters of the collected specimens.

Results and Notes

The forests at the Waigeo Island are mostly of moist lowland type. The areas of Warsamdim and Werabiyai on the island vary from slightly hilly to steep slope. Easily accessible forests were disturbed, especially by logging activities in the past. However, good vegetation can still be found on hills and slopes.

Endiandra species are less known because they are not easily found in the forests in general, neither in Waigeo forests. The more common genera of Lauraceae in the area are *Actinodaphne*, *Cryptocarya* and *Litsea*, of which young trees are easily spotted inside the forests. However, it is very fortunate that in the recent floristic exploration in Waigeo Island, we encountered three species of *Endiandra*.

Three species of *Endiandra*, i.e., *Endiandra beccariana*, *E. grandifolia* and *E. papuana*, were collected from the island.

Endiandra R. Br. (Lauraceae)

Taxonomically, the genus *Endiandra* is characterized by having alternate, spiral and pinnately-veined leaves, inflorescences paniculate-determinate with ultimate flowers not strictly opposite. Flowers trimerous, bisexual, stamens 3, each with 2 thecae, glands present or absent. In some species glands are united forming a disc surrounding the stamens and pistil. Fruits are without cupule, free on receptacle.

The genus *Endiandra* is known for its wood. *E. palmerstonii* produces high quality wood commonly used for good furniture and for building construction.

Identification key to species of *Endiandra* in Waigeo Island

1. Lamina broadly elliptic, lateral veins 11-15 pairs, glands reniform, not united around stamens ……..…. 2. ***E. grandifolia***
1.Lamina elliptic, lateral veins 7-10 pairs, glands united forming disc-like appendages.....……. ……...……2

2. Leaf surfaces and panicles sparsely pubescent ……. 1. ***E. beccariana***
2. Leaf surfaces and panicles densely pubescent ……..…… 3. ***E. papuana***

Species description

1. ***Endiandra beccariana*** Kosterm., Reinwardtia 7: 5 (1969) 474. –**Type**: Morotai Isl., District Tobelo, N. Totodoku, 14 May 1949, *Kostermans & Tangkilisan 146* (A, BO). **Plate 1.**

Tree up to 32 m, 40 cm dbh. Bark greyish brown, lenticellate. Young **twigs** dense erect pubescent, rusty colored. Terminal buds densely pubescent, rusty colored, 8 mm long and 3 mm wide. **Leaves** spiral, stiffly chartaceous, elliptic; 8.5-19 × 6-11 cm; apex acuminate, base cuneate or slightly rounded; both surfaces finely reticulate; upper surfaces shiny, midrib flat, lateral veins slightly impressed; lower surfaces slightly shiny, sparsely pilose or glabrescent, midrib raised; lateral veins 7-10 pairs, prominent below, arcuate towards margin; petiole terete, densely pubescent to glabrescent, flat, 12-23 × 10-20 mm. **Inflorescences** paniculate, axillary, 4-11 cm long, pubescent. Pedicel slender, *ca* 3 mm long. **Flowers** yellow, *ca* 6 mm in diameter; tepals fleshy, spreading, narrowly elliptic, slightly acuminate, 2.5-3 mm long; glands united in a form of a disc, *ca* 0.75 mm thick, brownish yellow; anthers widely triangular, emerge from gland-like disc; locules large; ovary ellipsoid, glabrous; style 0.5 mm long, stigma unconspicous. **Fruit** ellipsoid, *ca* 1-2 cm long, green, free on the receptacle.

Recently collected specimens: INDONESIA. **Papua Province**: Kabupaten Raja Ampat, Waigeo Isl., District Teluk Mayalibit, Desa Warsamdim, 120 m, 8 Jun 2007, *D. Arifiani & Obaja 596* (BO); *ibid*., ± 50 m, 13 Jun 2007, *D. Arifiani & Obaja 652* (BO).

Additional specimens examined: INDONESIA. **Sorong**, Kadamah, 14 Aug 1948, *Main 592* (BO); Manokwari, Warnapi 15 km N. of Ransiki, 10 m, 25 Sep 1948, *Kostermans 448* (BO); Manokwari, Warnapi, 20 m, 30 Sep 1948, *Kostermans 491* (BO); Morotai Isl., along Sambiki R. (S.E. Morotai), 30 m, 22 May 1949, *Kostermans 854* (BO); Morotai Isl., along Sambiki R., 100 m, 22 May 1949, *Kostermans 890* (BO); Morotai Isl., 23 May 1951, *Kostermans 934* (BO); N. slopes of upper Aifat Valley, between Senopi and Aifatfekaan, W. of Kebar Valley, 10 Dec 1961, *Moll BW 12908* (BO).

Note: *Endiandra beccariana* was first described by Kostermans in 1969 based on specimens from Morotai Island, Manokwari, Sorong, and Ramoi. In our exploration, we spotted the species in two locations on Waigeo Island.

This species is similar to the *E. papuana* Lauterbach, which both can only be differentiated by checking the amount of indument on the lower leaf surface and the inflorescences. Kostermans (1969) noted that the panicles of *E. beccariana* are glabrous and I would not agree with his statement given the fact that the panicles bear sparsely erect indument.

The specimens of *E. beccariana* collected from this floristic survey were a new record of the species occurrence on Waigeo Island. Known previously from Morotai Island and Northwest part of West Papua, its occurrence in Waigeo Island indicates a possible connection by seed dispersal from Morotai Island to Papua and/or vice versa (Fig. 2).

2. ***Endiandra grandifolia*** Teschn., Engl. Bot. Jahrb. 58 (1923) 417. –**Type**: Papua New Guinea, 10 May 1909, *Schlechter 17691* (K).

Tree up to 25 m high, 45 cm dbh. **Twigs** hairy. **Leaves** simple, coriaceous; broadly elliptic; 14-32 × 10-17 cm apex acute to rounded; base obtuse; both surfaces finely reticulate, upper surfaces shiny, midrib slightly raised, lateral veins slightly impressed, with indument; lower surfaces densely tomentose; midrib raised below; lateral veins 11-15 pairs, prominent below, arcuate towards margin; petiole 1.5 cm long, stiff, tomentose. **Inflorescences** paniculate, compact, up to 9 cm long, axillary, densely tomentose, reddish brown, many flowers. Tepals slightly unequal; elliptic; apex obtuse; tomentose. Stamens elliptic, tip rounded, pubescent; glands reniform, stalked, pilose; staminodia cordate, pilose, stalked. Ovary ovoid, glabrous. **Fruit** unknown.

Recently collected specimens: INDONESIA. **Papua Province**: Kabupaten Raja Ampat, Waigeo Isl., District Teluk Mayalibit, Desa Warsamdim, low alt., Jun 2007, *Mirmanto & Ruskandi 09305* (BO).

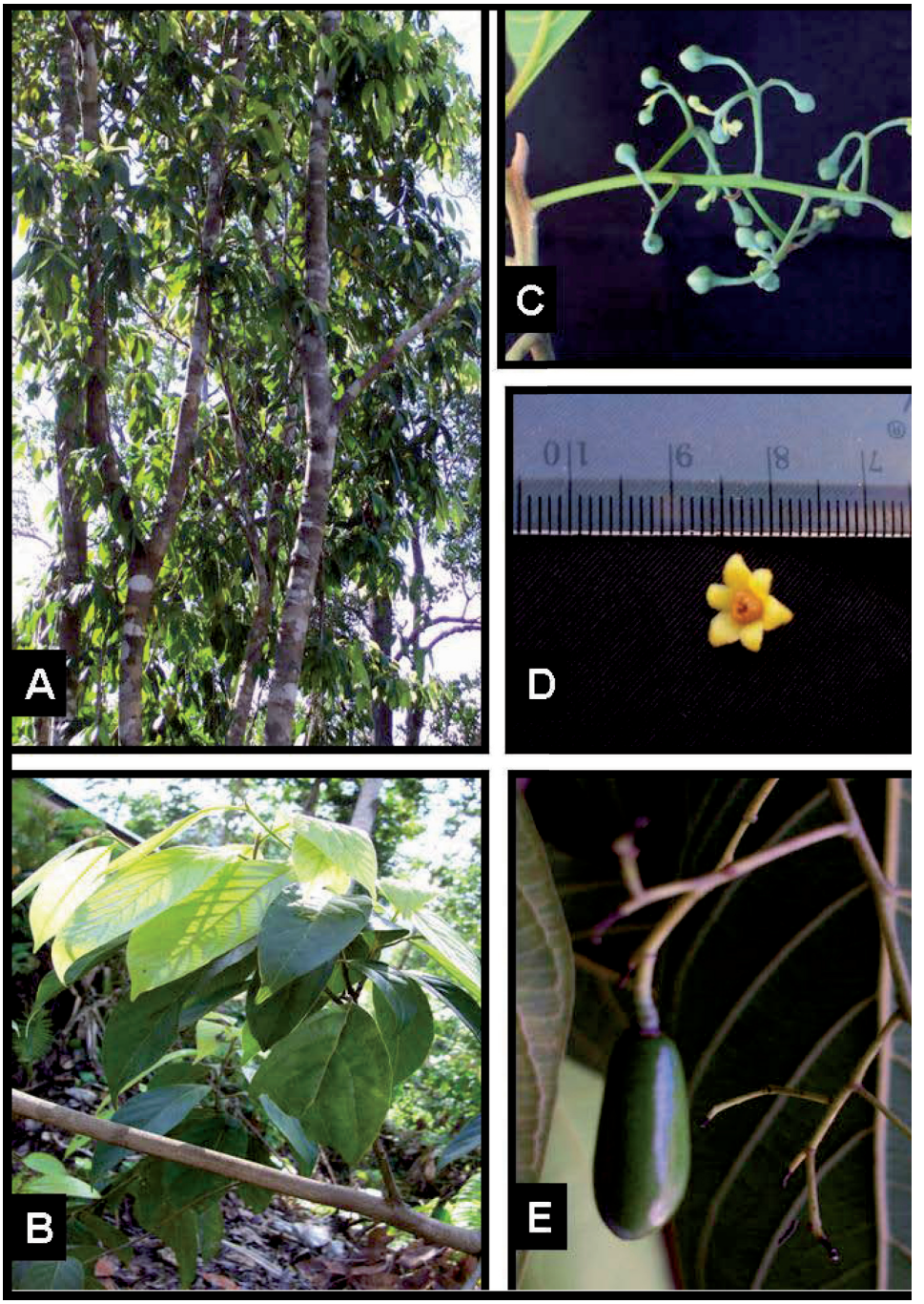

Plate 1. *Endiandra beccariana*: A. Tree habit (D. Arifiani & Obaja 652); B. Leaf arrangement; C. Flower buds; D. Mature flower, glands united forming disc-like appendages with stamens exposed from the middle; E. Young fruit. (Photos C-E: A. Hidayat).

Additional specimens examined: PAPUA NEW GUINEA. Madang District, Terr. of New Guinea, near the Gogol River by Mawan village (*ca* 25 km inland), 60 m, 22 Jun 1955, *Hoogland 4919* (BO); Morobe District, Lae Subdistrict, Oomsis Logging area N.G.I., 180 m, *Millar NGF 12036* (BO); Morobe District, Menyamya Subdistrict, between Aseki & Menyamya, Spreader Divide, 21 Nov 1970, *Streimann & Kairo NGF 42451* (BO).

Note: *E. grandifolia* may be differentiated from both *E. beccariana* and *E. papuana* by observing the shape or fusion of the glands. Some species of *Endiandra*, including *E. grandifolia*, bear three pairs of glands at the bases of each stamen. However, these glands sometimes may unite to each other because of the limited space inside the flower and forming a disc-like appendage surrounding the stamens. This is the case with both *E. beccariana* and *E. papuana*.

This survey yielded the first collection of *Endiandra grandifolia* from western part of New Guinea. Previously, the species was only collected from Madang and Morobe districts of Papua New Guinea. Occurrence of *E. grandifolia* in Waigeo Island extend its distribution toward northwestern part of New Guinea (Fig. 2).

3. ***Endiandra* papuana** Lauterbach, Nova Guinea, Bot. 8: 2 (1912) 819. – **Type**: Papua New Guinea, 6 Dec 1907, *Branderhorst 263* (BO, K).

Tree up to 30 m. **Twigs** densely pilose, rusty colored. Terminal buds densely pubescent, smooth, rusty colored. **Leaves** spiral, elliptic, stiffly chartaceous, 10-19 × 7-10 cm, apex acute, base obtuse to acute; both surfaces densely reticulate; upper surface shiny, midrib flat, lateral veins slightly impressed; lower surface slightly shiny, densely pilose, midrib raised; lateral veins 7-8 pairs, raised, arcuate towards margin; petiole terete, densely pubescent, 1.5-2.0 × 0.20-0.25 cm. **Inflorescences** paniculate, densely pubescent, up to 18 cm long, axillary. Tepals spreading; glands large, united to form a disc-like appendage. **Fruits** spherical to ellipsoid, 1-1.5 cm long, free on the receptacles.

Recently collected specimens: INDONESIA. **Papua Province:** Kabupaten Raja Ampat, Waigeo Isl., along Werabiyai River, Jun 2007, *Mirmanto & Ruskandi 09304* (BO).

Additional specimens examined: WEST NEW GUINEA, Albatros Bivouac, 7 May 1926, *Docters van Leeuwen 9016* (BO). PAPUA NEW GUINEA, Morobe District, Wareo, 450 m, 5 Feb 1936, *Clemens 1782* (BO); Northern

Division, Terr. of Papua, between Mambare and Arumu Rivers, South of Botue village (near Kokoda), 350 m, 21 Sep 1953, *Hoogland 3955* (BO); Oomsis Logging area, NW of Lae, Morobe District, T.N.G, 90m, 5 Mar 1959, *White NGF 10487*, Near Garagos, Lae, Bulolo Road, Morobe District, 450 m, 3 May 1962, *Havel & Kairo NGF 11197* (BO); Titapuba, Morobe District; 10 Jan 1966, *Streimann & Kairo NGF 26160* (BO). Tributary of Busu River, above Sankwep R., Lae Subdistrict, Morobe District, 13 Apr 1972, *Wommersley NGF 43919* (BO).

Note: *E. papuana* is more commonly encountered in the forests of Papua New Guinea, around Morobe District than in Indonesian part of New Guinea. Specimen of *E. papuana* collected from Waigeo Island is a good addition to the Herbarium Bogoriense collection (see Fig. 3).

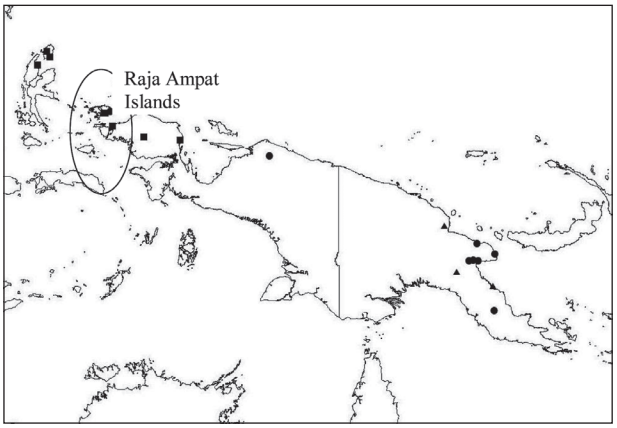

Figure 2. Distribution of *Endiandra beccariana* (■), *E. grandifolia* (▲) and *E. papuana* (●).

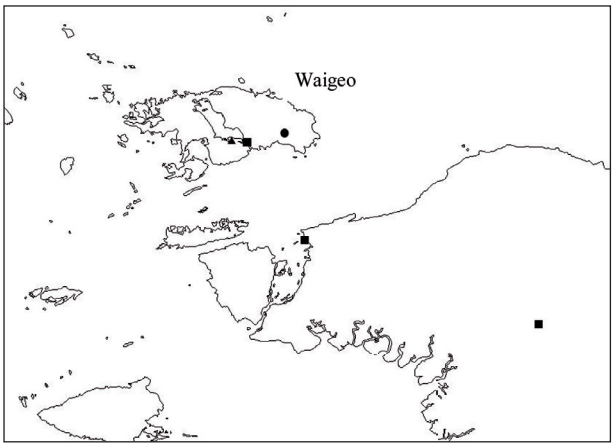

Figure 3. Occurrence of newly recorded species of Endiandra in Waigeo Island: *Endiandra beccariana* (■), *E. grandifolia* (▲) and *E. papuana* (●)

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