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Ryticaryum kaorahai (Icacinaceae s.str.), a new species from Halmahera, and the first new species in the genus for over one hundred years

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ABSTRACT: A new species of *Ryticaryum*, *Ryticaryum kaorahai* Utteridge & Arifiani, collected from Weda Bay, Halmahera, is described as new to science here. This species is unique in the relatively large oblong-elliptic leaves with unequal bases, and the large fruits to 4.5 cm long. It is the first arborescent member of the Icacinaceae s.str., to be described from Malesia in over a century.

KEY WORDS: Icacinales, Indonesia, Malesia, Maluku, Moluccas, *Ryticaryum macrocarpum*, *Ryticaryum purpurascens*, Wallacea.

INTRODUCTION

Icacinaceae is a pantropical family of trees, shrubs, and lianas consisting of 24 genera and around 155 species (POWO, 2025). Before molecular techniques, the family included unrelated groups placed together on account, *inter alia*, of the alternate, exstipulate leaves, and the small flowers with two pendulous ovules. The genera are now classified in several families: Icacinaceae s.str., Stemonuraceae, Cardiopteridaceae, and Metteniusaceae (see Utteridge and Schori, 2011; Byng *et al.*, 2014; Potgieter *et al.*, 2016; Stull *et al.*, 2020). In Asia, using the previous 'traditional' classification of the family, an overview was provided by Sleumer (1969) with Flora accounts for Malesia (Sleumer, 1971), Thailand (Sleumer, 1970) and China (Peng and Howard, 2008). New collections from Malesia in the last 50+ years since the publication of the Flora Malesiana account, have led to several new taxa across the group, especially in the Stemonuraceae (Schori and Utteridge, 2010; Utteridge, 2001, 2011; Utteridge and Schori, 2009), but new species of Icacinaceae s.str. have been very limited. Although there have been minor changes, such as *Polyporandra* Becc. moving to *Iodes* Blume (Byng *et al.*, 2014), and the new record of *Phytocrene oblonga* Wall. in Singapore (Lindsay *et al.*, 2022; Utteridge and Turner, 2024), only one new species—*Sleumeria auriculata* Utteridge, Nagam. & Teo, a Bornean rainforest liana—has been described in the family since the Flora Malesiana account (Utteridge *et al.*, 2005). *Platea malayana* Utteridge from Peninsular Malaysia, initially classified under Icacinaceae (Utteridge, 2010), has now been reassigned to Metteniusaceae.

Within Icacinaceae s.str., the small genus *Ryticaryum* Becc. consists of approximately 12 accepted species distributed from Malesia to the Solomon Islands and northern Australia. The genus is characterized by being dioecious trees, having leaves with conspicuous venation (often distinctly raised on one or both surfaces), secondary nerves ± markedly looping before the margin, and flowers in axillary spikes. The drupaceous fruit, typical of the Icacinaceae, is laterally compressed with a sharp crest running around the edges, a thin red to orange exocarp, and a woody endocarp with a coarsely reticulate (to alveolate or lacunose) surface. The laterally compressed fruits have led to members of the genus being confused with other taxa exhibiting similar traits, particularly resembling enlarged *Antidesma* L. fruits when dry (for example, *Antidesma megalocarpum* S.Moore is a synonym of *R. longifolium* K.Schum. & Lauterb.). Note that the genus was initially described as *Ryticaryum* Becc. by Beccari (1877), with the orthographic variant *'Rhyticaryum'* appearing a year later (Beccari, 1878). The spelling *Ryticaryum* is currently preferred and is used by sources such as World Flora Online (WFO, 2025) and Plants of the World Online (POWO, 2025); this is the spelling used here.

Except for two species, *Ryticaryum oleraceum* Becc. and *R. longifolium* K.Schum. & Lauterb., all members of the genus are confined to New Guinea (Utteridge and Schori, 2011). While *Ryticaryum longifolium* extends eastward to the Solomon Islands and northern Australia, *R. oleraceum* is found in New Guinea as well as several islands to the west in Wallacea, including Tanimbar Island, Morotai, Halmahera, and Ceram.

Halmahera is the largest island in the Maluku archipelago and renowned for its abundant nickel reserves. Hence, Halmahera is rich in ultramafic soils, approximately covering 8000 km^2 (van der Ent *et al.*, 2013). Ultramafic soil has poor nutrition because of its mineral deposit contents that are toxic to plants. However, the low quality of the soil causes higher plant diversity and endemism (Lopez *et al.*, 2019a,b). The Weda Bay area is the site of nickel mining complex and located in Central Halmahera. A series of botanical collections has been made in the vicinity, with new taxa being described from the area including a new genus of Euphorbiaceae, *Weda* Welzen (van Welzen *et al*., 2021), a new pitcher plant—*Nepenthes weda* Cheek (Cheek, 2015), a new breadfruit species—*Artocarpus bergii* E.M.Gardner, Arifiani & Zerega (Gardner *et al*., 2021), and three new *Pandanus* species (Callmander *et al*., 2015).

The genus *Ryticaryum*, primarily distributed in Malesian and Papuasian regions, was revised by Sleumer (1969: 249) in a preparatory paper for Flora Malesiana, where 12 species were recognized. All species, including taxa described in other genera but later transferred to *Ryticaryum*, were described between 1877 and 1923. Therefore, the description of *R. kaorahai* Utteridge & Arifiani here marks the first new species within the genus, as well the first arborescent member of the Icacinaceae s.str., to be described from Malesia in over a century.

MATERIALS AND METHODS

Identification of the new species was undertaken with the use of relevant literature, particularly Sleumer (1969, 1971). Specimens of the genus from Malesia, including types of similar taxa, were studied at BO, K, and SING, and specimen images were consulted from Global Plants JSTOR (http://plants.jstor.org/ - coverage includes A, B, BM, BR, BRI, P etc.), GBIF (*Ryticaryum*: https://www.gbif.org/species/7314357; *Rhyticaryum*: https://www.gbif.org/species/7314373), and the BioPortal of Naturalis Biodiversity Center (http://bioportal.naturalis.nl/ - coverage includes L, U and WAG). All measurements were taken from dried specimens. Terminology and format of the description follow Systematics Association Committee (1962), Hickey (1979) and Sleumer (1971). The preliminary conservation status is proposed in accordance with the IUCN Red List Criteria (IUCN, 2012).

DISCUSSION

Ryticaryum kaorahai Utteridge & Arifiani, ***sp. nov.***

Fig. 1

Type: INDONESIA, North Maluku Province, Halmahera, East Halmahera Regency, Weda Bay, Kao Rahai, 693 m, 00°41′54″N, 128°01′02″E, 26 Feb 2013 (fruiting), *Bahar Fabanyo, Tjut Jul Fatisa Bangun, Samsul Lasut & Ahmad Yani 59* (holotype: BO! [BO-1933900]; isotype: MO-image! [MO-4014867]).

***Diagnosis*:** Recognised in the genus *Ryticaryum* by the following combination of characters: the oblong-elliptic leaves, coriaceous and drying greenish to yellowish, with unequal base, relatively large (15–21 by 8–12.5 cm), the practically glabrous, large ripe drupes 4.1–4.5 cm long, 3.2–3.5 cm wide, by 1.8–2 cm deep when dry (recorded as 5.5 cm long and 4.5 cm wide when fresh).

Small ***tree*** c. 3 m, c. 2 cm dbh. ***Branchlets*** slender, to 5 mm in diameter, glabrous, with scattered groups of pustular lenticels. ***Leaves*** oblong-elliptic, apex rounded, with the very apex subacute tip, base rounded to subcordate, unequal, lamina coriaceous, greenish to yellowish when dry, glabrous, somewhat shining on the lower face, 15–21.5 by 8–12.5 cm, nerves 7–9 pairs, brochidodromous, straight-ascending at an angle of c. 60° from the midrib, secondary branches looping and joining adjacent secondary, usually tertiary arches, only slightly raised above, distinctly raised beneath, intersecondary veins present (sometimes appearing as composite intersecondary veins), tertiary venation random reticulate to slightly orthogonal reticulate, coarse to the naked eye, raised on both faces; petiole 1.2–1.9 cm long, finely striate-tubercled on the upper surface. ***Inflorescences (at fruit)*** axillary, spicate, glabrous, 5.5–8 cm long, c. 4 mm in diameter. ***Flowers*** not known. ***Drupe*** ovoid-ellipsoid, much compressed laterally, without strong lateral crests, (1.3–)4.1–4.5 cm long, (0.9–)3.2–3.5 cm wide, by 1.8–2 cm deep when dry, said to measure 5.5 cm long and 4.5 cm wide when fresh, seemingly glabrous but very sparsely hairy with a few well-spaced tightly appressed simple hairs to 0.5 mm long; drupe appearing irregularly and coarsely reticulate due to the endocarp surface pattern.

Field notes: ‘Small tree 3 m tall, 2 cm dbh. Young fruits green, ripe fruits orange with pubescence black, long 5.5 cm, width 4.5 cm. Growing on slope.’ Note, under the stereomicroscope, the fruit surface is covered with numerous tiny, black patches (perhaps fungi?), but there are no black hairs.

Distribution: Only known at the type locality in Weda Bay area, Halmahera. Whilst Weda is the capital of Central Halmahera Regency (Kabupaten Halmahera Tengah), from the latitude and longitude on the label data, this specimen was collected from the south-eastern edges of East Halmahera Regency (Kabupaten Halmahera Timur).

Habitat and Ecology: Only known from disturbed primary forest at 693 m asl. From the latitude and longitude, the collection locality is on ultrabasic rocks or ultramafic soils (see Monk *et al*., 1997: 37, Fig. 2.8; Van der Ent *et al*., 2013).

Phenology: Collected with mature fruit in February.

Etymology: The epithet refers to the Kao Rahai area in East Halmahera, currently the only known locality of this species. Kao Rahai means the best or most beautiful in Tobelo dialect.

Proposed IUCN conservation status: Mineral extraction has grown significantly in Indonesia, driven by increasing demand for nickel and other elements essential to the transition toward green energy infrastructure. Over 95% of the nation's nickel is sourced from Wallacea, predominantly Sulawesi and Halmahera (Struebig *et al*., 2022). Currently, there is a lack of population data for plant species from Halmahera, highlighting the urgent need for further observations and collections across all plant groups in this region. *Ryticaryum kaorahai* is

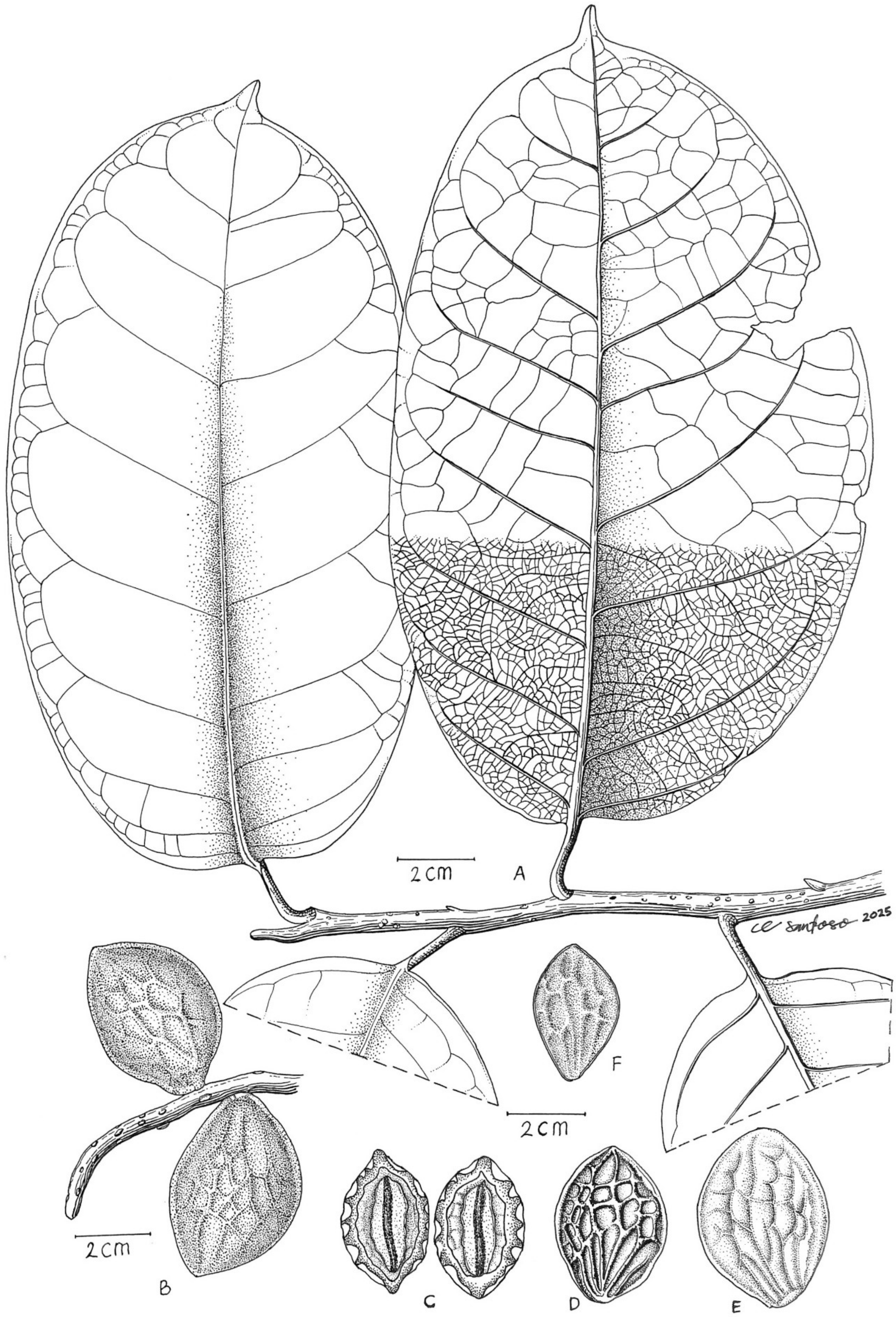

Fig. 1. ***Ryticaryum kaorahai*** Utteridge & Arifiani, sp. nov. **A**. Habit. **B**. Detail of infructescence. **C**. Cross section of drupe. **D**. Drupe with flesh removed showing endocarp surface. **E**. Mature intact fruit. **F**. Immature intact fruit. Drawn by Wahyudi Santoso.

Table 1. Comparison of some key characters of the large fruited ***Ryticaryum*** species (***R. kaorahai***, ***R. macrocarpum*** and ***R. purpurascens***).

Characters	*Ryticaryum kaorahai*	*R. macrocarpum*	*R. purpurascens*
Distribution	Halmahera	New Guinea mainland	New Guinea mainland
Leaf shape	Oblong-elliptic	Elliptic-oblong, or elliptic	Elliptic to elliptic-obovate
Leaf length	17.5–21 cm	(12–)15–20 cm	15.5–25 cm
Leaf width	10–12.5 cm	4–7(–9) cm	5–9.5 cm
Leaf base	Rounded to subcordate	Attenuate	Attenuate
Lamina texture	Coriaceous	Chartaceous	Chartaceous
Leaf drying color	Greenish to yellowish	Brownish	Purplish
Reticulation	Coarse	Fine	Fine
Petiole length	1.2–1.9 cm	1–1.5 cm	1.5–2 cm
Fruit length	4.1–4.5 cm	3.5–4.3 cm	3.75 cm

currently known from one locality, and available evidence indicates a continued decline in suitable habitat, as detailed in testimony from the Kao people (Blesteran, 2022, 2023; CRI, 2024). The Kao Rahai forest has now been cleared for ore extraction, suggesting that the original population from which the type specimen was obtained has likely been extirpated. The ecology of the species is still to be determined, for example, whether it is confined to forest on nickel-rich soils, thereby limiting its distribution, or if it possesses greater ecological adaptability and could be found more widely across eastern Halmahera. Should its habitat specificity be confirmed, extinction may have already occurred. The species is recorded from a single site with an estimated extent of occurrence (EOO) less than 100 km² and area of occupancy (AOO) less than 10 km², rendering classification as CR B1ab(i,ii,v) or B2ab(i,ii,v) most appropriate at present (IUCN, 2012; 2024). Exhaustive surveys are necessary to determine if the species should be assessed as Extinct; however, designation as Critically Endangered (Possibly Extinct)—CR(PE) could be warranted since, if extinct in the wild, the species is neither cultivated nor represented in *ex situ* collections and would therefore be considered extinct (IUCN, 2024).

Notes: The leaf morphology together with the fruit size and shape, as outlined in the diagnostic statement, are unique in *Ryticaryum*, and the species will not be confused with any other species in the genus. In the revision to *Ryticaryum* by Sleumer (1969), *R. kaorahai* does not key out to any definitive result but the lack of hairs, leaf drying color and fruit size would key to the species *R. macrocarpum* Becc. The latter species is restricted to mainland New Guinea and has a similar, but slightly smaller, sized drupe 3.5–4.3 cm long by 2.5–3 cm wide by c. 1.5 cm deep (fide Sleumer 1969, 1971; *R. kaorahai* drupe to 4.1–4.5 cm by 3.2–3.5 cm by 1.8–2 cm when dry at maturity; recorded as 5.5 cm long when fresh), and also differs in the chartaceous leaves to 4–7(–9) cm wide with attenuate leaf bases (*R. kaorahai*: leaves coriaceous to 8–12.5 cm wide, with unequal rounded to subcordate base) and has laxly strigose branchlets and inflorescence rachis (*R. kaorahai*: branchlets and inflorescence rachis glabrous).

In *Ryticaryum*, the only other species with relatively large fruits that could be confused with the new species is *R. purpurascens* G.Schellenb. from the Sepik area of Papua New Guinea. Although initially described from staminate material, several collections have now been made with fruit (e.g., *Henty & Barlow NGF 42979*, Utteridge, pers. obs.). This species differs from *R. kaorahai* in the elliptic to elliptic-obovate leaves to 25 cm long, the chartaceous lamina becoming purple on drying, and the fruits to 3.75 cm long. The large fruited species of *Ryticaryum* are compared in Table 1.

Currently, *Ryticaryum kaorahai* is the only species of *Ryticaryum* known from Halmahera (with no records available in herbaria or online sources). However, *R. oleraceum* Becc. is the only other species in the genus to extend west from New Guinea into Wallacea, and also dries greenish-yellowish. *Ryticaryum kaorahai* is unlikely to be confused with *R. oleraceum*, however, as the latter species has much smaller fruits to only 2.6 cm long and 1.5 cm wide, and if sterile, has chartaceous leaves to only 10 cm wide and with 12–14 pairs of secondary veins, compared to the coriaceous, wider leaves with up to 9 pairs of secondary veins found in the new species.

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