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RESEARCH ARTICLE

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A new species of *Freycinetia* Gaudich. (*Pandanaceae*; *Freycinetoidea*) with lateral infructescence and rostrate cephalia from the Arfak Mountains, Papua, Indonesia

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Key words

Arfak
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Abstract A new species of *Freycinetia* Gaudich. (*Pandanaceae*; *Freycinetoidea*) with a lateral infructescence and rostrate berries each with 4–8 stigmatic remains, rarely 4, fairly common 8, mostly 5–6. The possession of rostrate berries places this new species in the section *Devrieseella*. The existence of *F. wiharjae* extends the distribution of the section further east to mainland New Guinea, while it was previously only known from Sulawesi and the Philippines.

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INTRODUCTION

Freycinetia Gaudich. is one of the five extant genera of *Pandanaceae* (the others are *Benstonea* Callm. & Buerki, *Martellidendron* (Pic.Serm.) Callm. & Chassot, *Pandanus* Parkinson, and *Sararanga* Hemsl.) and it consists of approximately 300 species (Stone 1982, 1983a). The genus is unique in the *Pandanaceae* (a large palm-like monocotyledonous dioecious family with three or four lanceolate-elongate leaves terminally arranged and confined to the Old World tropics with approximately 1 000 species; Stone 1982), as it is the only genus that possesses the climbing habit with three exceptions, the non-climbing *F. arborea* Gaudich. (Stone 1983b), *F. dewildeorum* Pasaribu (Pasaribu 2010a, b), and *F. kwerbaensis* A.P.Keim (Keim 2012).

Furthermore, *Freycinetia* also has auricles, which are small ear-like projections on the basal margin of the leaf sheath. In *Freycinetia* the auricles are longer and much more distinct than in the other genera within the family (the auricles in the other genera easily disintegrate); so much that the auricles are used as one of the distinctive morphological characters for the infra-generic classification of the genus (Stone 1968).

The genus has its main diversity in New Guinea, where 164 species occur prior to this current study, of which 35 species were recorded from Indonesian New Guinea only (Sinaga et al. 2010, Sinaga 2011, Keim et al. 2022a). All species are classified in 11 out of the 17 infra-generic subdivisions (sections) proposed by Stone (1968). The Bird's Head (then Vogelkop) Peninsula in the north-western corner of mainland New Guinea is the area where the Arfak Mountains are located. Prior to this study, 16 species of the genus were recognised from this area (Solms & Graffen 1883, Martelli 1910, Rendle 1917, Kanehira 1941, Sinaga 2010, Keim et al. 2022a).

Nevertheless, none of the species mentioned above possesses the distinctive morphological character of rostrate berries, present in the newly discovered species that is described here. The character is typical for section *Devrieseella* B.C.Stone, which originally comprised three species; *F. devriesei* Solms, *F. rostrata* Merr., and *F. megacarpa* Merr. (Stone 1968). *Freycinetia rostrata* was later put into the synonymy of *F. devriesei*, which consequently reduced the number of member species of the section to two species (Stone 1969). Prior to this study section *Devrieseella* was unknown for New Guinea. The section was known only from Sulawesi, the Philippines, and the Moluccas (Keim et al. 2022b). The result of this study shows a new taxon from the Arfak Mountains, Papua, Indonesia, which is unique within the section *Devrieseella* for the possession of a lateral infructescence and stigmatic numbers of often more than six, which have not been seen before in the section. Therefore, the taxon is proposed here as a new species namely *Freycinetia wiharjae* A.P.Keim, Witono and W.Sujarwo. As the consequence of this discovery, the presence of the section *Devrieseela* in New Guinea is now confirmed.

KEY TO THE SPECIES OF FREYCINETIA SECTION DEVRIESEELLA

1. Infructescence terminal; number of stigmatic remains 5–6, never more than 6 2
1. Infructescence lateral, number of stigmatic remains 4–8 . . . . . *F. wiharjae*

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Fig. 1 *Freycinetia wiharjae* A.P.Keim, Witono & W.Sujarwo, holotype, showing the lateral infructescence and rostrate cephalia. — Photo: A.P. Keim, 2023.

2. Leaf lanceolate-elongate, c. 16 by 2 cm. — Sulawesi and Moluccas (Halmahera Island) . . . . . *F. devriesei*
2. Leaf ellipsoidal, 14–17 by 3.5–4 cm. — Philippines . . . . . *F. megacarpa*

TAXONOMIC TREATMENT

Freycinetia wiharjae A.P.Keim, Witono & W.Sujarwo — Fig. 1

Etymology. The epithet is to honour Wiharja, a technician from the then Indonesian Institute of Sciences (LIPI), who faithfully accompanied one of the authors when both were serving for three years (2009 to 2011) in the then Wamena Biological Garden, Wamena, Papua.

Medium-sized climbing pandan with a lateral infructescence and rostrate berries, each with 4–8 stigmatic remains, rarely 4, fairly common 8, mostly 5–6. — Type: *W.A. Mustaqim 1424* (holo BO!), Indonesia, West Papua, Arfak Regency, Angga Gida District, on the road from Lake Anggi Gida, S1°21'59.3" E133°57'18.7".

Medium sized climbing pandan; climbing up to 5 m high. *Stem* glabrous, greyish green, 0.7–0.9 cm diam. *Leaf* lanceolate-elongate, 28–30 by 0.5–0.6 cm, apex acute, surfaces glabrous, green, minute spines on apical and basal parts of the leaf; auricle tapered, glabrous. *Infructescence* lateral, distance between 2 infructescences c. 5 cm; each 8–12 cm long, ternate or quaternate (with 3 or 4 cephalia); peduncular bract c. 2.5 by

Table 1 Morphological differences between *Freycinetia devriesei*, *F. megacarpa*, and *F. wiharjae.*

Species	Leaf shape	Leaf dimension	Position of infructescence	Number of stigmatic remains
Freycinetia devriesei	Lanceolate-elongate	c. 16 by 2 cm	Terminal	5–6
F. megacarpa	Ellipsoidal	14–17 by 3.5–4 cm	Terminal	6
F. wiharjae	Lanceolate-elongate	28–30 by 0.5–0.6 cm	Lateral	4–8

1 cm; peduncle 1.5–5.5 cm long; pedicel 2.5–3 cm long, conspicuously scabrous. *Cephalia* elongate-lanceolate to fairly globose, 3–4.5 by 2–2.5 cm. *Berry* rostrate, 0.5–0.7 cm long; stigmatic remains 4–8, rarely 4, fairly common 8, mostly 5–6.

Distribution — Endemic to the Bird's Head Peninsula (Arfak Mountains) in the extreme north-western corner of mainland New Guinea.

Habitat & Ecology — Lower Mountain forest at about 1975 m altitude and found growing on a mossy trunk.

Conservation Status — Likely, Critically Endangered (CR) as *F. wiharjae* is so far only known from the type, but recorded as Data Deficient (DD) as no other data are available.

Notes — In this current study, *F. wiharjae* is recognized as one of the three species that classified as the member of the section *Devrieseella*, the other are *F. devriesei* and *F. megacarpa*. *Freycinetia wiharjae* differs from the other two species in four morphological characters (Table 1). Prior to this present study, no member of the section *Devrieseella* was known to possess the two distinctive morphological characters of lateral infructescence and number of stigmatic remains 4–8. These two characters do circumscribe *F. wiharjae* as a new species. The existence of *F. wiharjae* extends the distribution of section *Devrieseella* further east in Malesian to mainland New Guinea. It was previously known only from Sulawesi, the Philippines, and Halmahera Island in the Moluccas (Keim et al. 2022b). This distribution supports a possible strong biogeographical link between Sulawesi and the Philippines with east Malesia, which is apparently stronger than with west Malesia as was proposed by Lam (1945a, b). Further study is essential. This current study is in accordance with the identification of a taxon identified by Stone and collected in South Sulawesi (*E.F. de Vogel* 6084; L!), which has an affinity with *F. megacarpa*; which also suggests phytogeographical bonds between Sulawesi and the Philippines, from which *F. megacarpa* was only previously known (Merrill 1908). This current study shows a higher similarity between the new taxon and *F. devriesei* because of the conspicuously elongated lanceolate leaves.

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