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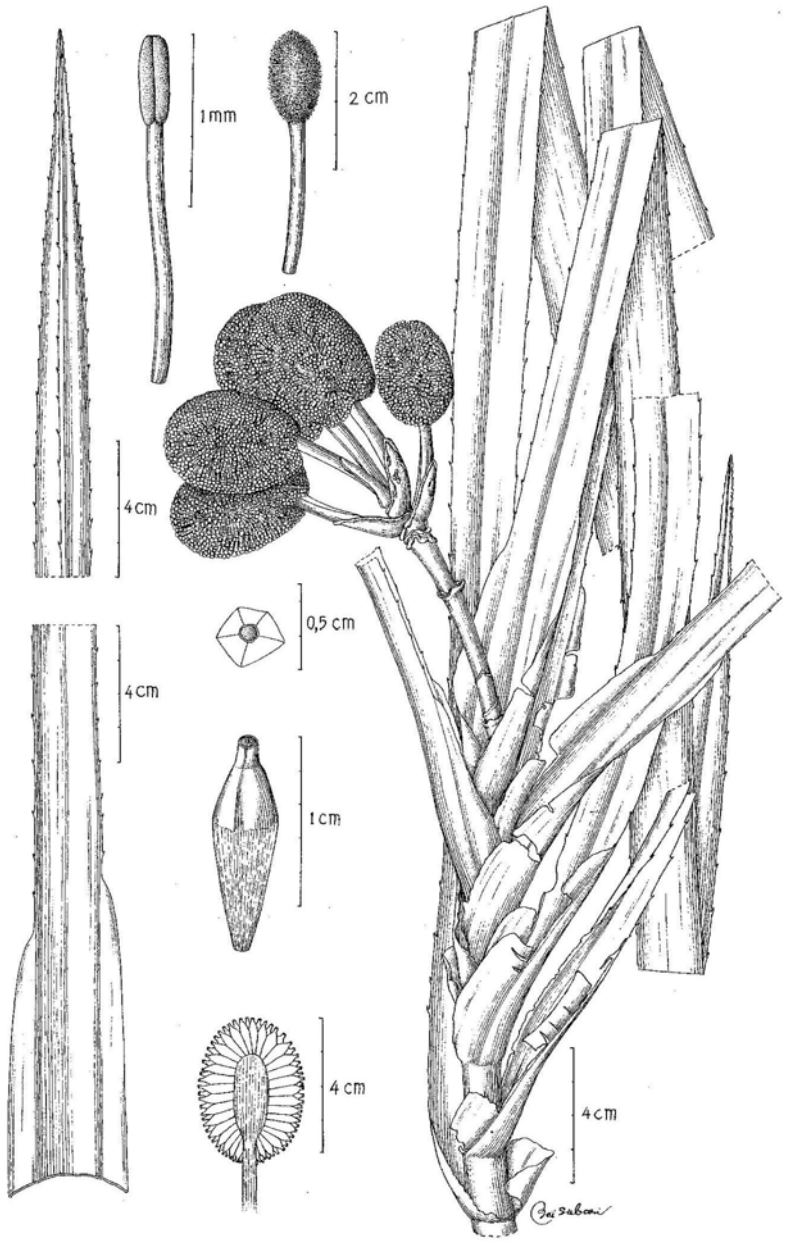

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PANDANACEAE OF SUMBAWA, WEST NUSA TENGGARA, INDONESIA

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ABSTRACT
KEIM, A. P. & RAHAYU, M. 2010. *Pandanaceae* of Sumbawa, West Nusa Tenggara, Indonesia. *Reinwardtia* 13(2): 151–158. —Two species of *Freycinetia* and two species of *Pandanus* are recorded from the Batulanteh vicinity in West Sumbawa. One species is a new species described here for the first time and named *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu.

Keywords: *Freycinetia*, Lesser Sunda Islands, Nusa Tenggara, *Pandanaceae*, *Pandanus*, Sumbawa.

ABSTRAK
KEIM, A. P. & RAHAYU, M. 2010. *Pandanaceae* dari Sumbawa, Nusa Tenggara Barat, Indonesia. *Reinwardtia* 13(2): 151–158. — Dua jenis *Freycinetia* dan dua jenis *Pandanus* terekam di kawasan Batulanteh, Sumbawa Barat. Satu di antaranya adalah jenis baru dan dipertelakan pertama kali dalam tulisan ini serta diberi nama *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu.

Kata kunci: *Freycinetia*, Lesser Sunda Islands, Nusa Tenggara, *Pandanaceae*, *Pandanus*, Sumbawa.

INTRODUCTION

Sumbawa is an island within the string of islands stretched eastward from Bali to Timor known as the Lesser Sunda Islands. Unlike the neighbouring Java, the pandan flora in any of these islands remains largely unknown. The nature of the pandans in the Lesser Sunda Islands is illustrated by inadequate information. Prior to this current study, there have been only two records ever published; Martelli (1910) and Markgraf (1929). Martelli (1910) proposed a new species from Timor, *F. timorensis*, whereas Markgraf (1929) proposed *F. lombokensis* from Lombok. Both species are endemics and so far are known only from the types. Other information to be mentioned is brief accounts (supported by two black and white photos) by Rensch (1930) on *Freycinetia* and *Pandanus* (*P. odoratissimus*) from Flores. The information of *F. urvilleana* of Decaisne (1853) has been discarded. This species was previously regarded by Solms (1878; see also Warburg, 1900) as collected from the area of Vavao in Timor. However, Vavao is actually a district in the Guadalcanal Island in the Solomon Archipelago, one of islands in Oceania that was visited by Hombron and Jacquinot during their 1837-1840 collecting trips (*see* Decaisne, 1853). Neither Hombron nor Jacquinot was known to visit Timor during that period. Despite extensive explorations and collections made by Kostermans and his colleagues from Herbarium Bogoriense (BO) in Sumbawa (*see* Kostermans, 1963), the pandan flora of Sumbawa is still in doubt. This current study is aimed to provide an up to date information on the pandan flora of Sumbawa. The exploration was proceeded in the Batulanteh area in the western side of the island.

RESULTS AND DISCUSSIONS

Two species of *Freycinetia* and two species of *Pandanus* are recorded from the Batulanteh vicinity in West Sumbawa, in which one species described here is a new species and named *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu.

1. FREYCINETIA INSIGNIS Blume — Fig. 1.

Freycinetia insignis Blume (1835) 158, t. 42. — Type: Java, West Java, Bogor (then Buitenzorg), Gede Mountain, *Blume s.n.* (Lectotype:L).

Robust climber, climbing 20–30 m high. *Stem* robust, 7.5–8 cm circumference, green to yellowish green, glabrous; internodes 2 cm. *Leaf* lanceolate-

elongate, 70–100 cm long, 3–4 cm wide, integer margin, minute spines only on terminal and basal parts of leaf; adaxial surface green, glabrous, adaxial ventral pleats absent; abaxial surface green, glabrous, main venation obvious; leaf sheath pale yellowish green; auricle tapered, brown, rather rounded on apex, apex with minute spines. *Infructescence* terminal, binate (2) or ternate (3), 32–33 cm long; peduncle ca. 15 cm long, green, glabrous, hanging; pedicel green, scabrous, 4.5–5 cm long, hard-stiff. *Cephalium* ellipse to elongated ellipsoidal, green, 12–14 cm long, 3.5–4 cm wide; stigma 2, brown.

Distribution. Java and the Lesser Sunda Islands.

Habitat. Humid sub montane to montane forests at 1,000 to 1,700 m altitude. *Freycinetia insignis* is a mountainous species that commonly found at altitude higher than 1000 m. In Java this species is

Fig. 1. *Freycinetia insignis* Blume. a. Habit; b. Infructescence consists of three ellipsoidal cephalia (ternate). The same picture is also partially showing the long and hanging peduncle; c. Tapered bright orange auricle. Photos: A.P. Keim & M. Rahayu.

recorded from mountainous areas in western side of the island such as Burangrang, Gede, Pulasari, Salak, and Tangkuban Prahu (*see* Blume 1835). In Bali this species is abundant at Bedugul forest and adjacent areas at 1,300 m altitude. In Lombok this species is found abundantly at Passuk forest in East Lombok at about 1,450 to 1,650 m altitude. In Sumbawa, *F. insignis* is conspicuously found in hill slopes at about 1,500 to 1,700 m altitude, never lower than that.

Vernacular name. Sampian (Bali, Bedugul dialect), Klipan (Sumbawa).

Uses. The mature cephalium is said to be eaten by birds.

Notes. Local people mentioned that the "flower" is white tinted with red or deep red. Obviously what they do mean by "flower" is actually the bract. Unfortunately, the bracts were not available by the time the collection (*A.P. Keim 1265*) was made. Until the specimen with bracts is collected this taxon is identified here as belonging to *F. insignis* based on the information on the colour of bract. The unmistakably white tinted with deep red to reddish-purple colour bract is a distinctive field character for *F. insignis*. Furthermore, there is no single distinctive morphological character that can be used to separate this taxon from *F. insignis*.

Specimen examined. INDONESIA, Lesser Sunda Islands, Bali, Bedugul, Mt. Batukau, 1961, *A. Kostermans et al. 83* (BO!); South of Tabanan, Mt. Batukaru, 20 July 1964, *N. Wirawan 484* (BO!); Bukit Tapui, above Bedugul, 18 June 1976, *W. Meijer 10499* (BO!); Lake Bratan, near Bedugul, 20 June 1976, *W. Meijer 10529* (BO!); East Bali, Tabanan, WNW Bedugul, Mt. Lesung, 22 July 1994, *Mc Donald & Ismail 4818* (BO!); Nusa Tenggara Barat, Lombok, Sembalun, Pussuk, 02 June 1909, *J. Elbert 1704* (BO!); 04 June 1909, *J. Elbert 1738* (BO!); Seban, 24 June 1964, *Sun Hong Fan Herbarium 9408* (BO!); Sumbawa, West Sumbawa, Batulanteh, Pusu, 07 May 1961, *A. Kostermans 18714* (BO!), *18718A* (BO!); 02 Nov. 1961, *A. Kostermans 19148* (BO!); Batudulang, Katintih, 15 Aug. 2009, *A.P. Keim 1265* (BO!); Nusa Tenggara Timur, Flores, West Flores, Manau near Ruteng, 24 April 1965, *A. Kostermans & N. Wirawan 584* (BO!).

2. Freycinetia sumbawaensis A.P. Keim & M. Rahayu, *spec. nov.* — Fig. 2–4.

Gracilis scandens usque ad 20 m altum, ca 1 cm diametro, viridi; infructescentia terminale, binata vel ternata; stigma simper 1, nigrum. — Typus: INDONESIA, Lesser Sunda Islands, Nusa Tenggara Barat, Sumbawa, West Sumbawa, Batulanteh, Batudulang, Brang Tampu, *A.P. Keim 1270* (BO!– Holotype), 16 Aug. 2009.

Slender climbing pandan, climbing up to 20 m high. *Stem* slender, *ca*. 1 cm diameter, green. *Leaf* ellipse or oblong-ellipsoidal, *ca.* 10 cm long, *ca*. 1.5 cm wide, acuminate apex, with minute spines; adaxial surface green, glabrous, shiny; abaxial surface light green, glabrous; auricle tapered, glabrous. *Infructescence* terminal, binate (2) or ternate (3), *ca.* 4.5 cm long; peduncle very short, less than 1 cm long; pedicel green, glabrous, 1.5–2 cm long. *Cephalium* green, said to be red when ripe, globose to rather elongated globose close to ellipse, *ca.* 2.5 cm long, *ca*. 1.5 cm wide; stigma 1, black.

Etymology. The epithet means from Sumbawa, which refers to the island where the type was collected.

Distribution. Endemic.

Habitat. Lower tropical rainforest to montane forest. The species is commonly found along streams or riverbanks at 400 to 950 m altitudes or in hill slopes at 1,500 to 1,700 m altitudes.

Vernacular names. Klipan, melung (Sumbawa).

Uses. As strings. Mature cephalium is said to be eaten by birds.

Notes. In general appearance *F. sumbawaensis* very much resembles *F. scandens* except for the number of stigma (Table 1). *Freycinetia sumbawaensis* always has berry consistently with 1 stigma, while *F. scandens* always has 2 to 4 stigmas, usually 2, but never less than 2. *Freycinetia* species with a fairly globose cephalium with number of stigma 1 is extremely rare. There are only two species known with that character; *F. forbesii*, and *F. oblanceolata*. However, these species have 1 to 2 stigmas (Table 1).

Freycinetia forbessii are commonly found with one stigma, rarely two (*see* Ridley, 1886). Indeed, apart from differences in number of cephalia per infructescence and cephalium dimension the two species are very similar. Ridley (1886) suggested that *F. forbesii* and *F. scandens* as closely ally. The result of this current study is in accordance with Ridley and adding *F. sumbawaensis* into the alliance.

Stone (1967) mentioned that *F. angustissima* possesses berries with numbers of stigma 1 to 3. Observations made on specimens in BO indicate that *F. angustissima* possesses berries with numbers of stigma 2 to 3. The protologue itself (*see* Ridley, 1886) did not mention about the number of stigma.

Fig. 2. Habit of *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu (marked with arrow). Photo: A.P. Keim & M. Rahayu.

Table 1 Morphological comparison on leaf and cephalium dimensions, number of cephalia per infructescence, and number of stigma between *F. angustissima, F. forbesii*, *F. oblanceolata, F. scandens,* and *F. sumbawaensis*.

Species	Leaf dimension	Number of cephalia per infructescence	Cephalium dimension	Number of stigma
Freycinetia angustissima	5–6 by 0.6 cm	1 to 2	1.26–1.3 by 1.26–1.3 cm	2 or 3 (current study), but 1 or 2 according to Stone (1967)
F. forbesii	10–15 by 1.9–2 cm	3 to 4	1.9–2 by 1.9–2 cm	1 or 2, rarely 2
F. oblanceolata	15–21 by 3–4 cm	3 to 4	2.5 by 2 cm	1 or 2
F. scandens	8–10 by 1–2.7 cm	1 to 4	3–6 by 2.5–3 cm	2 to 4, usually 2, rarely 4
F. sumbawaensis	10 by 1.5 cm	2 to 3	2.5 by 1.5 cm	Always 1

Ridley described that the infructescence consists of 1 to 2 cephalia (he noted: "capitula feminea singula vel bina") and it is allied to *F. angustifolia*. *Freycinetia angustifolia* is known to possess numbers of stigma 3 to 4.

Prior to the collection made in this current study, a specimen was collected by Mrs. Rensch (*Frau Rensch 907*), who accompanied her husband in the 1924-1925 German exploration to the Lesser Sunda Islands. Although Mrs. Rensch clearly mentioned that the cephalium (she noted as fruit) was kept in spirits, but the spirit collection was not found in BO.

A taxon mentioned as *F. meijeri* by Stone (1967) was regarded as having berries with numbers of stigma 1. Apparently the name has never been validly published, and became a *nomen nudum*. Evidently, Stone (1970) did publish the taxon but as a variety of *F. robinsonii* Merr., that called *F. robinsonii* Merr. var. *meijeri* B.C. Stone. In contrast to his previous opinion when mentioning *F. meijeri*, *F. robinsonii* var. *meijeri* is described as possessing berries with number of stigmas 2 to 3.

Specimen examined. INDONESIA, Lesser Sunda Islands, Nusa Tenggara Barat, Sumbawa, West Sumbawa, Batulanteh, Batudulang, Brang Suwir, 13 Aug. 2009, *A.P. Keim 1246* (BO!); *A.P. Keim 1247* (BO!); Brang Tampu, 16 Aug. 2009, *A.P. Keim 1270* (BO!, holotype); East Sumbawa, Wawo, 2-3 June 1924, *Frau Rensch 907* (BO!).

3. PANDANUS FAVIGER Backer — Fig. 5.

Pandanus faviger Backer (1925) 44. — Type: Java, East Java, Residency of Pasuruan, Lamongan, Febr. 1921, *A.R. van Loemadjang s.n.*. (BO!- Holotype).

Solitary robust tree pandan, *ca*. 30 m tall. *Proproots* present, obvious, 5–10 m tall, greyish creamy brown with sharp nodules. *Stem* greyish creamy brown, 60–62 cm circumference, robust, hard,

Fig. 3. *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu showing the infructescence with 2 fairly globose cephalia (binate; × 1.6), in which each berry is consistently with 1 dark brown to black stigma. Brown bracts still persist. Photo: A.P. Keim & M. Rahayu.

Fig. 4. *Freycinetia sumbawaensis* A.P. Keim & M. Rahayu infructescence with 3 cephalia (ternate; × 1.4) but the bracts have already fallen (caducous bracts). Photo: A.P. Keim & M. Rahayu.

branched on top. *Leaf* lanceolate-elongate, 240–250 cm long, 5.5–6 cm wide, acuminate apex, margin with minute-sharp spines; adaxial surface green, glabrous, adaxial ventral pleats absent; abaxial surface light green, glaucous white, recurved spines absent; leaf sheath short, *ca.* 5 cm long, white. *Infructescence* terminal, hanging, consists of 7–8 cephalia; 1 infructescence 100–101 cm long; peduncle *ca*. 50 cm long, green, glabrous; rachis 50–51 cm long. *Cephalium* elongated-ellipsoidal, sausage-like, trigonal, dull orange when mature, 17–24 cm long, 13–16 cm circumference. Drupes compactly arranged, *ca.* 1 cm long; stigma short, oblique on the ventral side of pileus, flat, slightly bifurcate.

Distribution. Java and Lesser Sunda Islands. Backer (1925) mentioned that this species occur only in Java and Bali. In Java, *P. faviger* is only so far found in Lamongan (*see also* Stone 1972) and stored as the type. In other words, new collection has never been made.

Habitat. Humid montane forests at altitude 1,000 to 1,800 m. In Sumbawa this species is abundantly found at altitude 1,700 to 1,800 m.

Vernacular name. Panan layun (Sumbawa).
USES. The hanging prop-roots are boiled and drink as an aphrodisiac and also believed can increase the size of male sexual organ.

Notes. People at Batudulang named this species "Panan layun", which means forest pandan. Apparently, they have never used or harvested the leaves. *Pandanus faviger* in Sumbawa is always found at altitude above 1,000 m dominating the humid montane forest of Batulanteh and adjacent areas. This finding is in accordance with Kostermans (1963).

Specimen examined. INDONESIA, Java, East Java, Pasuruan, Mt. Lamongan, Febr. 1921, *A.R. van Loemadjang s.n.* (BO!, holotype); BALI, Bedugul, Lake Bratan, 11 Apr. 1936, *C.G.G.J. van Steenis 8129* (BO!); 08° 15' S 115° 10' E, 20 June 1976, *W. Meijer 10536* (BO!); Lesser Sunda Islands, Nusa Tenggara Barat, Lombok, 17 June 1936, *C.N.A. de Voogd 2674a* (BO!); Sumbawa, West Sumbawa, Batulanteh, 27 Apr. 1961, *A. Kostermans 18538* (BO!); Batulanteh to Brang Bosang, 2004, *D. Girmansyah & H. Wiriadinata s.n.* (BO!); Saléléng, on road from Punik to Pusu, 15 Aug. 2009, *A.P. Keim 1266* (BO!); Sampar Tolak, on road from Punik to Pusu, 16 Aug. 2009, *A.P. Keim 1267* (BO!).

4. PANDANUS ODORATISSIMUS L. f.

Pandanus odoratissimus L. f. (1781) 424 — Type: *Thunberg s.n.* "Zeylan" (U), SRI LANKA, around Colombo, 1777-1778.

Pandanus tectorius Soland. ex Parks. (1773, printed but not published & widely distributed) — Type: *Solander s.n.* Tahiti "Z" (L), TAHITI, 1769-1760.

Robust, clustered shrubby pandan, *ca.* 5 m high. *Prop-roots* present, short, less than 1 m tall. *Stem* short with sharp nodules, less than 1 m tall, pale creamy brown, unbranched. *Leaf* lanceolate elongate, odorous, *ca.* 300 cm long, *ca.* 5 cm wide, acuminate apex, integer margin; adaxial surface green, glabrous, shiny, adaxial ventral pleats absent; abaxial surface light green, glaucous white, main nerve apparent, recurved spines absent; leaf sheath white, *ca.* 50 cm long. Neither *inflorescence* nor *infructescence* present.

Distribution. Old world tropics from Africa to Pacific, except New Zealand. Cultivated throughout the world.

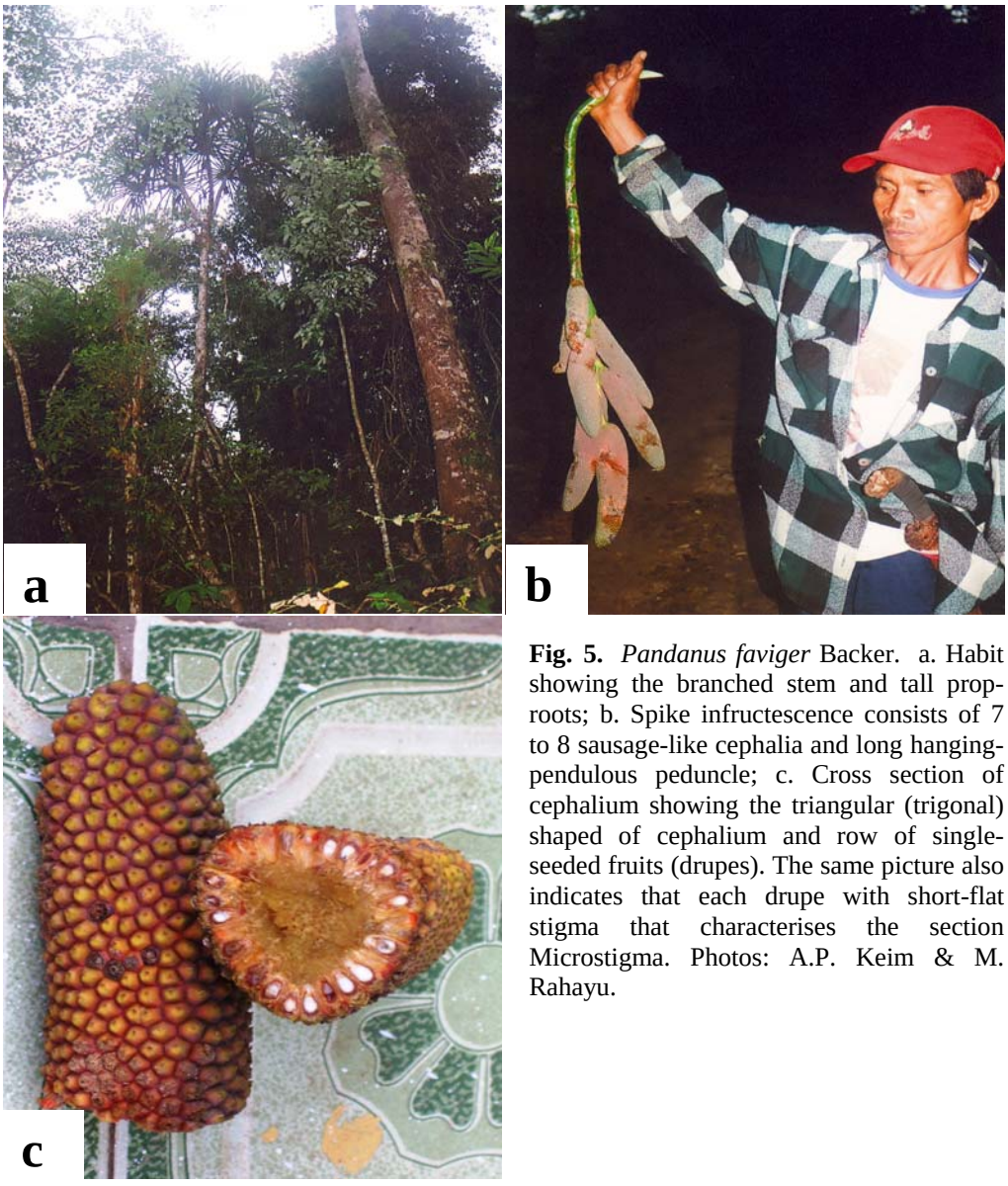

Fig. 5. *Pandanus faviger* Backer. a. Habit showing the branched stem and tall prop-roots; b. Spike infructescence consists of 7 to 8 sausage-like cephalia and long hanging-pendulous peduncle; c. Cross section of cephalium showing the triangular (trigonal) shaped of cephalium and row of single-seeded fruits (drupes). The same picture also indicates that each drupe with short-flat stigma that characterises the section Microstigma. Photos: A.P. Keim & M. Rahayu.

Habitat. Beach, mangrove, from seaside up to 500 m altitude.

Vernacular name. Pandan, pandan mayit (Sumbawa).

Uses. The leaf is very aromatic (odorous) and used by the local people at Batudulang and adjacent areas in funeral procession. Leaf is also used for mats.

Notes. Only one cluster of about five individuals is found in Batudulang village. Batudulang is located at around 400 m altitude, thus still within the range of altitude tolerated by *P. odoratissimus*. The species could not be found anywhere else in Batudulang and adjacent areas. Local people mention that the plants are cultivated and have not yet been seen in fruiting. Nevertheless, inflorescences were once observed and the inflorescences are said to be odorous and the bracts are white; thus match the field description for *P. odoratissimus*.

Prior to this current study, there has been no collection of *P. odoratissimus* from Sumbawa, thus a new record. In fact, previously Herbarium Bogoriense possesses only three specimens of *P. odoratissimus* (labelled as *P. tectorius*) from the entire Lesser Sunda Islands. These findings are regarded here as quite surprising concerning the fact that *P. odoratissimus* is undoubtedly the most wide-spread species in the genus *Pandanus*.

Specimen examined. INDONESIA, Lesser Sunda Islands, West Nusa Tenggara, Sumbawa, Batudulang, 16 Aug. 2006, *A.P. Keim & M. Rahayu "Sumbawa 1"* Ethnobotanical sample (BO!); Bali, Karangasem, Tumbu, 07 Nov. 1976, *E.A. Widjaja 118* (BO!). EAST TIMOR, Timor, Dili, *O. del Castro 100* (BO!); Los Palos, Los Palos-Fuiloro, 21 Dec. 1953, *C.G.G.J. van Steenis 18220* (BO!, L).

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