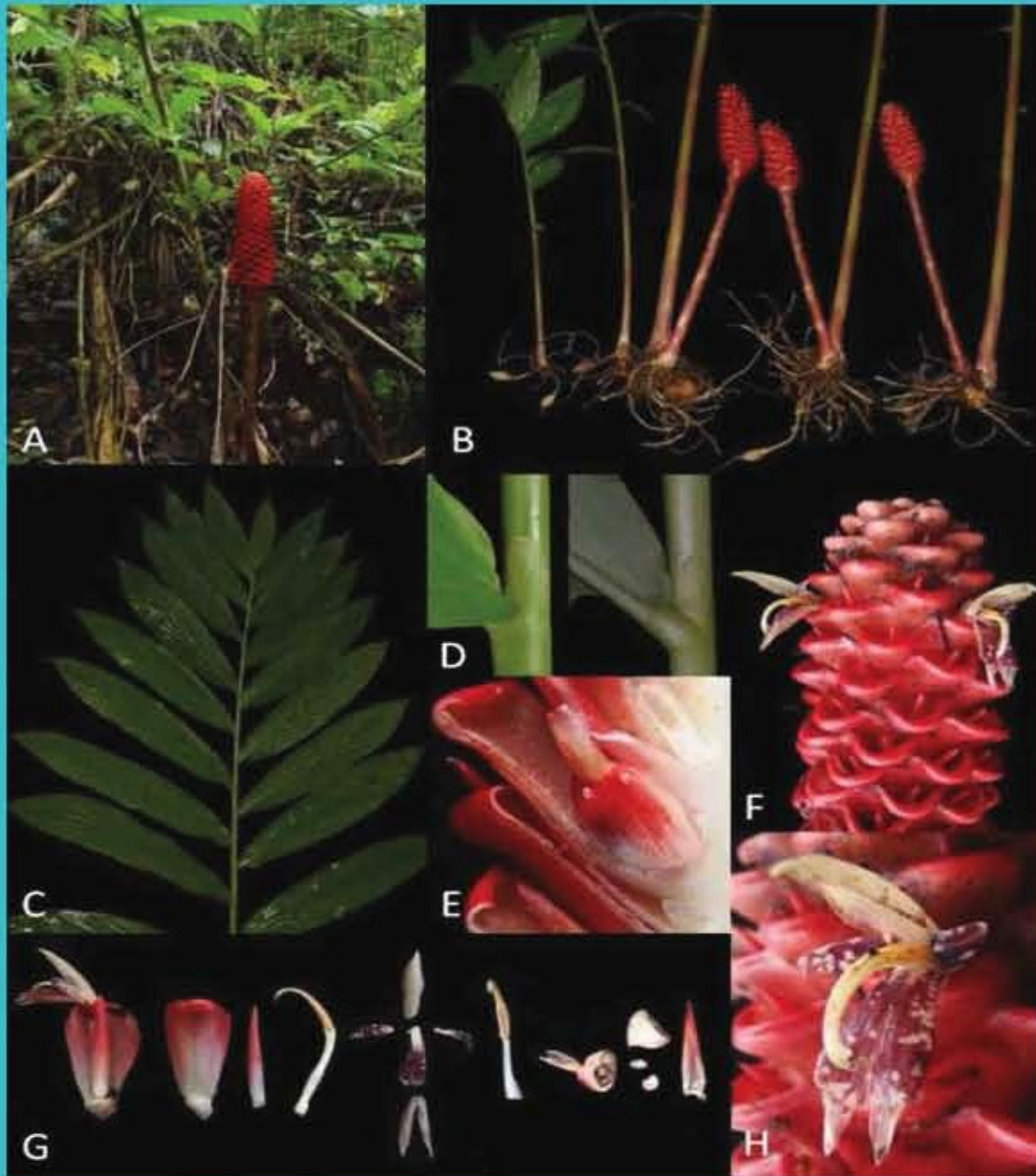




REINWARDTIA

A JOURNAL ON TAXONOMIC BOTANY, PLANT SOCIOLOGY AND ECOLOGY

ISSN 0034 - 365 X | E-ISSN 2337 - 8824



2015 14 (2)

REINWARDTIA

A JOURNAL ON TAXONOMIC BOTANY,
PLANT SOCIOLOGY AND ECOLOGY

Vol. 14(2): 249-324, December 23, 2015

Chief Editor

Kartini Kramadibrata (Mycologist, Herbarium Bogoriense, Indonesia)

Editors

Dedy Darnaedi (Taxonomist, Herbarium Bogoriense, Indonesia)

TukirinPartomihardjo (Ecologist, Herbarium Bogoriense, Indonesia)

Joeni Setijo Rahajoe (Ecologist, Herbarium Bogoriense, Indonesia)

Marlina Ardiyani (Taxonomist, Herbarium Bogoriense, Indonesia)

Topik Hidayat (Taxonomist, Indonesia University of Education, Indonesia)

Eizi Suzuki (Ecologist, Kagoshima University, Japan)

Jun Wen (Taxonomist, Smithsonian Natural History Museum, USA)

Managing Editor

Himmah Rustiami (Taxonomist, Herbarium Bogoriense, Indonesia)

Lulut Dwi Sulistyaningsih (Taxonomist, Herbarium Bogoriense, Indonesia)

Secretary

Endang Tri Utami

Layout

Medi Sutiayatno

Illustrators

Subari

Wahyudi Santoso

Anne Kusumawaty

Correspondence on editorial matters and subscriptions for Reinwardtia should be addressed to:

HERBARIUM BOGORIENSE, BOTANY DIVISION,

RESEARCH CENTER FOR BIOLOGY-INDONESIAN INSTITUTE OF SCIENCES

CIBINONG SCIENCE CENTER, JLN. RAYA JAKARTA - BOGOR KM 46,

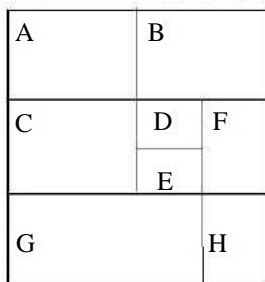
CIBINONG 16911, P.O. Box 25 CIBINONG

INDONESIA

PHONE (+62) 21 8765066; Fax (+62) 21 8765062

E-MAIL: reinwardtia@mail.lipi.go.id

<http://e-journal.biologi.lipi.go.id/index.php/reinwardtia>



Cover images: *Zingiber engganoensis* Ardiyani. A. Habit B. Leafy shoot and the inflorescence showing rhizomes, roots and root-tuber C. Leaves D. Ligule and swollen petiole E. Dissection of inflorescence showing fruit F. Spike and flowers G. Dissection of flowers and fruits showing bract, bracteole, two lateral staminodes, two petal lobes, labellum, and the four appendages of the anther H. Flower. Source of materials: E190 (BO). Photo credits: B, C, D by Arief Supriatna. A, E, F, G, H by Marlina Ardiyani.

The Editors would like to thank all reviewers of volume 14(2):

Abdul Latiff Mohamad, Faculty of Science & Technology, Universiti Kebangsaan Malaysia, Malaysia
Abdulrokhman Kartonegoro - Herbarium Bogoriense, Bogor, Indonesia
Agus Susatya - University of Bengkulu, Bengkulu, Indonesia
Axel D. Poulsen - Royal Botanic Garden Edinburgh, Edinburgh, Scotland, UK
Campbell O. Webb - Arnold Arboretum, University of Harvard, USA
Edwino Fernando - Dept. of Forest Biological Sciences, University of the Philippines, Los Baños, Philippines
Fabian Brambach - Dept. of Ecology & Ecosystem Research, Georg August University, Gottingen, Germany
John Mood - Lyon Arboretum, University of Hawaii, USA
Kuswata Kartawinata - Integrative Research Center, The Field Museum, Chicago, USA
Mark Newman - Royal Botanic Garden Edinburgh, Edinburgh, Scotland, UK
Martin Dancak - Faculty of Science, Palacky University, Czech Republic
Mien A. Rifai - Akademi Ilmu Pengetahuan Indonesia (AIPI)
Ridha Mahyuni - Herbarium Bogoriense, Bogor, Indonesia

NOTES ON *RAFFLESIA* (RAFFLESiaceae) IN SUMATRA WITH A NEW RECORD *RAFFLESIA GADUTENSIS* MEIJER

Received April 09, 2015; accepted September 23, 2015

RIDHA MAHYUNI

Herbarium Bogoriense, Botany Division, Research Center for Biology-LIPI, Cibinong Science Center, Jln. Raya Jakarta-Bogor Km. 46, Cibinong 16911, Bogor, Indonesia. E-mail: ridhamahyuni@gmail.com

YAYAN WAHYU C. KUSUMA & WIHERMANTO

Center for Plant Conservation – Botanic Gardens, LIPI. Jln. Ir. H. Juanda No. 13 Bogor, 16122, Indonesia.

J. F. VELDKAMP

Naturalis Biodiversity Center, section Botany, P.O. Box 9517, 2300 RA Leiden, The Netherlands. E-mail: jef.veldkamp@naturalis.nl

ABSTRACT

MAHYUNI, R., KUSUMA, Y. W. C., WIHERMANTO & VELDKAMP, J. F. 2015. Notes on *Rafflesia* (Rafflesiaceae) in Sumatra with a new record *Rafflesia gadutensis* Meijer. *Reinwardtia* 14(2): 317 – 322. — Pulau Mursala is a small island west of the Sibolga, Tapanuli Tengah District, North Sumatra, Indonesia. The occurrence of the genus *Rafflesia* (Rafflesiaceae) there has never been reported before. However, during a visit in April 2013 three populations are located close together with more than twenty buds and some rotting blooming flowers, *Tetrastigma* sp. was detected. Field observations could be made and material was collected for comparison with that in the Herbarium Bogoriense (BO). It was concluded that they are *R. gadutensis* Meijer, which is known from Padang, Ulu Gadut. Notes on its morphology are given. The distribution of species is discussed.

Keywords: Mursala, *Rafflesia*, *R. gadutensis*, *Rafflesiaceae*, Sumatra.

ABSTRAK

MAHYUNI, R., KUSUMA, Y. W. C., WIHERMANTO & VELDKAMP, J. F. 2015. Catatan *Rafflesia* (Rafflesiaceae) Sumatera dengan rekaman baru *Rafflesia gadutensis* Meijer. *Reinwardtia* 14(2): 317 – 322. — Pulau Mursala adalah pulau kecil yang berada di bagian barat Sibolga, Tapanuli Tengah, Sumatera Utara. Sebelumnya tidak pernah dilaporkan keberadaan marga *Rafflesia* (Rafflesiaceae) di lokasi ini. Namun, selama kunjungan pada April 2013, ditemukan tiga populasi *Rafflesia* dengan jarak saling berdekatan dengan lebih dari 20 kuncup bunga dan bunga mekar yang hampir membusuk dengan inang *Tetrastigma* sp. Pengamatan lapangan dilakukan dan spesimen dikoleksi serta dibandingkan dengan koleksi yang ada di Herbarium Bogoriense (BO). Disimpulkan bahwa itu adalah *R. gadutensis* Meijer, yang dikenal dari Ulu Gadut, Padang. Catatan mengenai morfologi disajikan. Persebaran jenis didiskusikan.

Kata Kunci: Mursala, *Rafflesia*, *R. gadutensis*, *Rafflesiaceae*, Sumatera.

INTRODUCTION

The island of Sumatra, Indonesia, is the home of more than 10 of more than 30 recognized species of *Rafflesia* R. Br. ex Gray (Rafflesiaceae) and three of them are incompletely species (Meijer, 1997, Barcelona *et al.*, 2011; Pelser *et al.*, 2013). It could be called the “Island of *Rafflesia*”, not in the least because what is generally considered the first species known to western science, *R. arnoldi* R. Br., was discovered there by Joseph Arnold (1782–1818), Sir Thomas Stamford Raffles (1781–1826), Lady Olivia Mariamne Raffles (1771–1814), and Mr. Palsgrave (? Presgrave, fide Winkler, 1927: 89), Resident of Manna, on May 20, 1818, on Pulau Lebar in the Passumah Ulu Manna, south of Bengkulu, just before Arnold’s death in July. It was of course long known to the local people who called it Krubut, Ambun-ambun, or Peliman sikuddi, the Devil’s siri-box.

Actually, the first species of *Rafflesia* probably was seen by Louis Auguste Deschamps

(1765–1842), a French naturalists, probably in August 1797, in Nusa Kambangan island, just off the southern coast of Java, of which he described and collected herbarium specimens. It was locally known as *Bunga patma*. Unfortunately, due to the Napoleonic War between France and Great Britain, his manuscripts were captured in 1802 by the British and are now in BM, while his specimens seem to have been lost. His writings have remained unpublished until today, although this spectacular finding and descriptions circulated in the early 19th century. His drawing of *R. patma* Blume was reproduced by Van Steenis *et al.* (1954).

Arnold’s male flower was sent to Sir Joseph Banks (1743–1820) in the UK, who referred it to Robert Brown (1773–1858). The latter delivered a speech at the Linnean Society on June 30, 1820, in which he named the genus *Rafflesia* and its only species *R. arnoldi*, thus honouring both its discoverers. However, names merely mentioned in lectures never were validly published under the various Nomenclatural Codes (McNeill, *et al.*,

2012: Art. 29.1: “Publication ... is not effected by communication of new names at a public meeting”). He effectively published the names in 1821a.

Apparently, minutes had been made and these were published by Samuel Frederick Gray (1766–1828). In the first publication (1820a) of August no name was mentioned, and the plant was said to have come from Java, in the second one (1820b) of September the name *Rafflesia* and a description were given based on Sumatra specimen materials. The latter publication may have been the source of notes in Dutch (Anonymous, Nov 1820; J.C. Kraus?) and in German by Kraus (28 Nov 1820). Hereby the correct author citation of *Rafflesia* is R. Br. ex Gray, and not R. Br. (Mabberley, 1999: 343).

Brown, himself, distributed a preprint in April 1821 while the publication in the Journal usually cited was between 23 May and 21 June 1821. Here two species are described, one from Sumatra (*R. arnoldi*) and one from Java (*R. horsfieldii*). As the genus had already been described on the Sumatra species, *R. arnoldi* is the type, not the lectotype. The correct orthography of the epithet is “*arnoldi*”, as was used by Brown, not “*arnoldii*” as is usually found. Arnold may be considered as a personal name with a well-established Latinised form under Rec. 60C.2. Saint Arnouldus of Soissons (ca. 1040–1087) is the patron of hop-pickers and Belgian brewers, honoured for saving many people from the 11th century until today, as beer made from boiled water is safer than ordinary water then and now.

The American Thomas Horsfield (1773–1859) also found a *Rafflesiaceae* in Java: the enigmatic *R. horsfieldii* R. Br. (1821a: 25; 1821b: 225) of which the provenance is unknown, type is lost, a drawing mislaid, whereby its identity is uncertain. Backer & Bakhuizen f. (1964) have suggested that this might be *Rhizanthus zippelii* (Blume) Spach, but Meijer & Veldkamp (1988: 329–330) said that “It obviously is a true *Rafflesia*”. The meticulous Brown surely would have noted the great differences between *Rafflesia* and a *Rhizanthus*, even when in bud. Interestingly, its name is not mentioned at all by Meijer (1997) and Nais (2001). Mabberley (1999: 348) thought it was *Rafflesia patma*, but did not rule out that it might be *Rhizanthus zippelii*. This seems unlikely, as the flower is much too small for both, and it might be a species now extinct. William Jack (1795–1822) collected additional material, among which a female flower, that was sent to Brown who used both for a lecture in 1834, of which he distributed a preprint in 1844.

Jack in 1820 published a paper with many new taxa, e.g. of *Dryobalanops* C.F. Gaertn., *Sagum* Rumph. ex Gaertn., *Nepenthes* L., *Stagmaria* Jack, and also the combination *R. titan*. This was based

on his own observations and not on the specimens collected by Arnold *et al.*, which are now in the BM. The combination is therefore not superfluous for *R. arnoldi* as Mabberley has stated (1999: 347). In a letter to home dated April 10th, 1820 (see Hooker, 1835: 135), Jack wrote “I lately sent to England a short account of some of my most interesting plants including the Sumatran gigantic flower to Mr. Marsden”. [William Marsden (1754–1836), author of “An account of the natural history of Sumatra” (1783–1811)]. Burkill (1916: 27) and Merrill (1952: 203) noted that a copy must have been present among the papers that Jack’s mother had kept. In another letter of 1 May 1821 to Wallich in Calcutta he noted “You must observe that though called an appendix to the Malayan Miscellanies it had been kept back till we hear what is done at home about the great flower”.

If it is brought forward in England, then this is to be suppressed and not published; if not, then this may be used in the event of the French getting hold of it, as a proof of priority of publication. So you understand that it is at present ‘inedita’, dost thou comprehend”. Apparently he wanted to have his bread buttered on both sides! If the species has been published in England, then his publication is to be “suppressed” destroyed, but if the French (Deschamps!) would dare to take priority, he then triumphantly could hold up his copy and claim that he was first. This is of course legally impossible, and even then not really decent and proper.

Clearly there was a copy of this paper with this letter which must have been printed earlier and this letter of 10 April 1820 may be regarded as the moment of effective distribution. It is tempting to think that he sent one even earlier to Marsden as well, but finding out is far beyond the scope of this paper. Wallich’s copy is in the library of the Calcutta Botanical Garden. Another one was donated on 14 July 1821 by Major General Thomas Hardwicke (1755–1835) to the library of the Asiatic Society of Bengal (Merrill, 1952: 203). Jack sent a letter to Robert Brown on 23 May 1821 with a copy of his paper (Mabberley, 1999: 343). This fulfils the requirement of Art. 29.1 of the Code (McNeill *et al.*, 2012) that printed matter was distributed. Another copy of the Appendix was reviewed by Anonymous in an Edinburgh journal (1822a, on April 12) in which Brown’s paper is noted, but the name *Rafflesia* is attributed to Jack, and only *R. titan* is mentioned. This copy should be looked for in either Aberdeen or Edinburgh libraries. Most of the stock was lost in a fire for which reason it was reprinted by e.g. Hooker (1835), Griffith (1843), Trench & Trübner (1887), and the Boerhaave Press (1977, but without the appendices). Hooker (1835: 259) cited *R. titan* with *R. arnoldi* in its synonymy.

Bastin (1973) in vain has tried to pinpoint any 1820 publication date for the giant flower to

prevent the ultimate priority of *R. titan* Jack. In conclusion it is clear that *R. titan* was published probably before 10 April 1820, and certainly before April 1821 and thus has priority over *R. arnoldi* (Apr 1821). Obviously the latter combination needs conservation. The next species to be described for Sumatra was *R. hasseltii* Suringar (1879, 1884), found between the Liki and Lampatan Andjang rivers, West Sumatra, around the end of December of 1877 by A. L. van Hasselt, Veth & Snelleman (<http://www.nationaal-herbarium.nl/FMCollectors/H/HasseltALvan.htm>).

Koorders (1918) described *R. atjehensis* from Lokop, Aceh. Meijer (1997) regarded this as a variety of *R. arnoldi*. Susatya (2011) recognized that it is a distinct species based on ramenta structure. Ramenta of *R. atjehensis* are tuberculate and those of *R. arnoldi* are filiform. This species is known only from Lokop, Aceh.

In 1984, Meijer published five new species of *Rafflesia* two of them are from Sumatra: *R. gadutensis* and *R. micropylora*. The first occurs in West Sumatra, the second in Aceh, in the Gunung Leuser National Park. Until 2006 no new species of *Rafflesia* from Sumatra were described. *Rafflesia patma* Blume has been reported for Lampung (Meijer, 1997), but due to the absence of material, Susatya *et al.* (2005) believed that it probably refers to *R. bengkuluensis* Susatya, Arianto & Mat-Salleh from Southern Bengkulu because of the similarity in distribution.

In 2010 two species of *Rafflesia* were described for North Sumatra, *i.e.* *R. lawangensis* (Mat-Salleh *et al.*, Wiriadinata & Sari) from Bukit Lawang, Gunung Leuser National Park. JFV saw three localities there in September 2010. *Rafflesia meijeri* occurs in the Taman Wisata Alam Sicike-cike, District of Samosir. It is very similar to *R. rochussenii* Teijsm. & Binn. Meijer (1997) recognized that distribution of *R. rochussenii* in west Java, north Sumatra and further south in Tapanuli and it probably still occurred in Berastagi in 1980 and this site was logged and destroyed in 1981.

***Rafflesia gadutensis* Meijer**

Based on ramenta shape, *R. gadutensis* may be included in the *R. hasseltii* complex together with *R. azlanii* Latiff & M. Wong, *R. cantleyi* Solms, and *R. hasseltii*. Latiff & Wong (2003) compared the last three species, and found that they were distinguished by size, perigone lobes, warts, pattern of perigone lobes, size and diameter of the diaphragm, circular dots, ramenta, number of processes, position of the windows, and the number of anthers.

Rafflesia gadutensis has pale maroon red perigone lobes and a pale red diaphragm. The ramenta are crateriform and swollen. It can be

distinguished from *R. arnoldi* and *R. hasseltii* by the ornamentation on the perigone lobes, the size of the flowers, the form of the ramenta, and the number of anthers. *Rafflesia hasseltii* has larger warts on the perigone lobes compared to other species and was known to Suringar as “cendawan matahari” (= sun mushroom). *Rafflesia gadutensis* also has larger warts than *R. arnoldi* and sometimes one wart and another overlap near the base of the perigone lobes.

Discovery of *Rafflesia gadutensis* in Mursala Island

Rafflesia gadutensis previously had been misidentified as *R. arnoldi* *e.g.* by Olah (1960; 2n = 12) and Hotta *et al.* (1984). The latter ones for specimens found in the Gajah Buih plot in Ulu Gadut. In 1984 Meijer (1984) regarded it as distinct and named it after the location where it had been collected. Recently it has been reported for a number of localities in West Sumatra (Meijer, 1997). Schäfer (1940) reported about 20 places within a range of a *ca.* 2 hours walk around Lebong Tandai, North Bengkulu. Meijer (1997: 24) equated his photographs with *R. gadutensis*. A specimen from Kejora, Batang Toru District, South Tapanuli, *Sih Kahono 2003* (BO), originally identified as *R. arnoldi*, after inspection turned out to be *R. gadutensis* as well. The species has also been recorded for Sibolga, Central Tapanuli District, by Jeremy Holden (part time Fauna & Flora International staffer) whose photograph can be found on the internet (<http://www.parasitic-plants.siu.edu/Rafflesiaceae/Raff.gad.page.html>).

Mursala is a small island located west off the Sibolga coast, Tapanuli Tengah District, North Sumatra, at *ca.* 1° 37'60" N, 98° 31'60" E. It can be reached by a two-hour boat from Sibolga. The entire island mainly is covered by lowland primary forest dominated by Dipterocarpaceae, Myrtaceae, Euphorbiaceae, Anacardiaceae, *etc.* *Sarcotheca diversifolia* Miq. (Oxalidaceae) has been found here by Teijsmann in February 1856, a curious disjunction, as otherwise the species is widespread in Borneo.

It has been visited by botanists before, *e.g.* by Jack in March 1820, and more recently by Centre for Plant Conservation-Botanic Garden in April 2013. An infected *Tetrastigma* *sp.* was found on the slope of a mountain in Kuala Hantu. There are three populations located close together. The distance between first populations and the second population of approximately 10 meters. Meanwhile, the distance to the third population about 150 m. Approximately more than twenty small flower buds ranging from 2 to 7.8 cm in diameter were present. The temperature was 28.1°–29.3° C and the surrounding vegetation was composed of *Cyrtandra picta* Blume (Gesneriaceae), *Dacryodes*

rostrata (Blume) H. J. Lam (Burseraceae), *Dipterocarpus* sp. and *Hopea* sp. (Dipterocarpaceae), *Ficus* sp. (Moraceae), *Homalomena* sp. (Araceae), *Laportea* sp. (Urticaceae), and *Syzygium* sp. (Myrtaceae).

After close inspection of a partly opened flower and some rotten flowers, we conclude that it agreed with *R. gadutensis*, but that it was smaller (± 29 cm) in size than the description *R. gadutensis* by Meijer (1997), flowers 40–46 cm and there were fewer processes. They are arranged in two rings, 14 or 15. (But see description below and Fig. 1, Map 1). Usually, the number of processes is over 15, and they are arranged in three rings. The transition to the next is not clear: that is the number of ridges around the column of the male and female flowers. This has been reported for a few species, e.g. *R. gadutensis*, *R. hasseltii*, *R. patma*, and *R. rochusenii*. The ridges of the male flower are wider than in the female one. Meijer (1984) observed that the female flowers have about 80 ridges around the column, but the flowers from Mursala have ca. 67.

R. gadutensis in Mursala

Mature female flower bud, up to 14 cm in diameter. *Perigone lobes* 15–16.2 cm long, 12–12.2 cm

wide. *Opening in diaphragma* 5.6–5.8 cm in diameter. *Diaphragma* 8.4–8.6 cm in diameter. Lower face of diaphragma with 5 concentric rings of white blots, the two rings with a flat 0.2–2.2 cm wide. *Disc* 8 cm in diameter, rim disc 2.2 cm high, with soft hairs. *Processes* arranged in two rings, of 14 or 15 in the outer, 4 or 5 in the central rings (but see above and Fig. 1B), 2.2–2.4 cm long, simple cone-shaped, and flat, with the same colour as the disc, apex with hairs. *Ramenta* toadstool-shaped or with many branches, swollen at apex 0.3–1 cm long. Column with about 67 ridges, protruding for about 1 by 4 mm. *Annulus* between exterior and interior 0.9 cm. *Male flower* unknown. (Collection numbers YY 437, YY 442 in BO - spirit).

ACKNOWLEDGEMENTS

The authors are grateful to the Dinas Kehutanan dan Kelautan Sibolga for permitting us to conduct the fieldwork. High appreciation goes to Selin Siahaan, Rahmat, Eddy, Nduru and other people in Mursala island who accompanied us during the field work. This research was supported by DIPA 2013 Centre for Plant Conservation-Botanic Garden. The manuscript was critically reviewed by Dr. Agus Susatya, Forestry Department, Agriculture Faculty, University of Bengkulu (UNIB).



Map 1. Mursala Island, Sibolga.

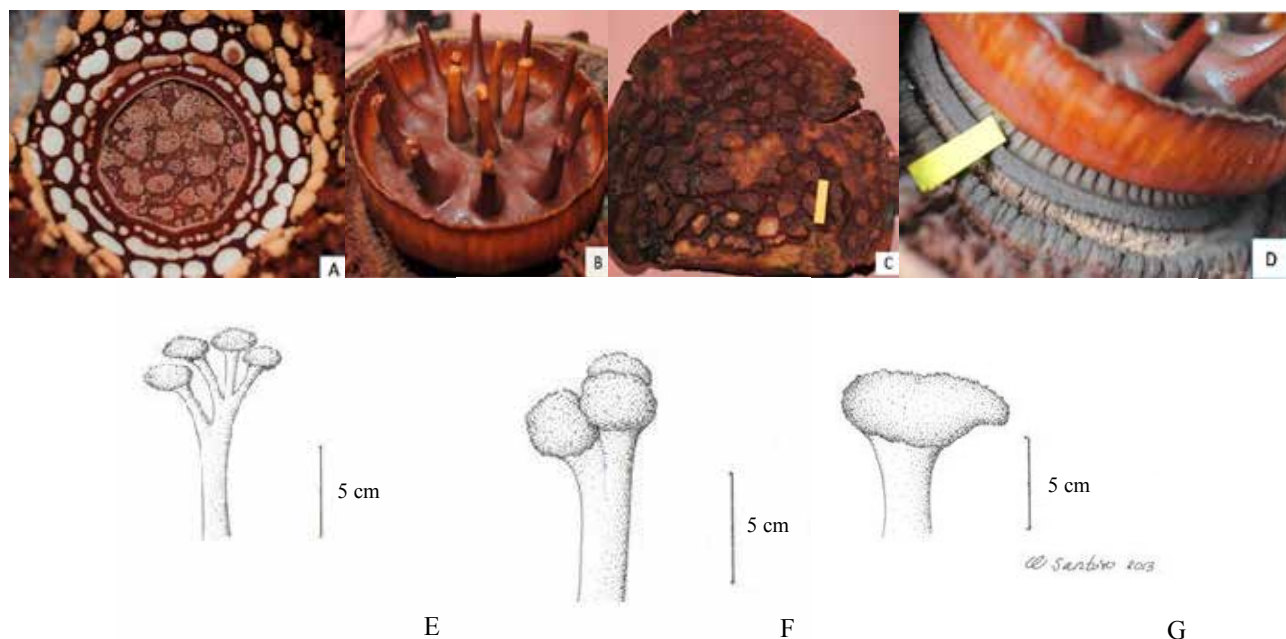


Fig. 1. *Rafflesia gadutensis* Meijer in Mursala. A. Windows, B. Prosesess, C. Perigone lobes, D. Annulus, E. Ramenta-Upper, F. Ramenta-Middle, G. Ramenta-lower. Photo: R. Mahyuni & Y. Kusuma.

REFERENCES

- ANONYMOUS (J. C. KRAUS). 1820 (10 Nov). Natuurkundige bijzonderheden. Een nieuwe ontdekte bloem van buitengewone grootte. *Alg. Konst.-Lett.-Bode* 1820, 2, 46: 318–319.
- ANONYMOUS. 1822a (12 Apr.). 53. *Rafflesia titan*. *Edinburgh Philosophical Journal* 6: 398.
- ANONYMOUS (J. C. KRAUS?). 1822b (5 Jul.). Natuurkundige Bijzonderheden. Nader bericht wegens de *Rafflesia arnoldi*, de grootste tot hier bekende bloem. *Algemene Konst en Letterbode* 1822. 27: 8–10.
- BACKER, C. A. & BAKHUIZEN VAN DEN BRINK, F. R. C. 1964 (“1963”). *Flora of Java* 1: 166. Noordhoff, Groningen.
- BARCELONA, J. F., FERNANDO, E. S., NICKRENT, D. L., BALETE, D. S., & PELSER, P. B. 2011. An amended description of *Rafflesia leonardi* and a revised key to Philippines *Rafflesia* (Rafflesiaceae). *Phytotaxa* 24: 11–18.
- BASTIN, J. 1973. Dr. Joseph Arnold and the discovery of *Rafflesia arnoldi* in West Sumatra in 1818. *J. Soc. Bibliogr. Nat. Hist.* 6: 305–372.
- BOERHAAVE PRESS. 1977. *Descriptions of Malayan plants*: facs. Edition of Jack, *Mal. Misc.* (1820–1822). Leiden.
- BROWN, R. 1821a. An account of a new genus of plants, named *Rafflesia*. *Trans. Linn. Soc. London* 13: 1–34. Taylor, London.
- BROWN, R. 1821b (May–Jun). An account of a new genus of plants, named *Rafflesia*. *Trans. Linn. Soc. London* 13: 201–234, t. 15–22.
- BROWN, R. 1844a (Sep). On the female flower and fruit of *Rafflesia arnoldi* and on *Hydnora africana*: 1–27. Taylor, London. *Trans. Linn. Soc.* 19: 221–247 (Nov 1844).
- BROWN, R. 1844b (Nov). On the female flower and fruit of *Rafflesia arnoldi* and on *Hydnora africana*. *Trans. Linn. Soc.* 19: 221–247.
- BURKILL, I. H. 1916. William Jack’s letters to Nathaniel Wallich. *J. Straits Branch Roy. Asiat. Soc.* 73: 226–231.
- JACK, W. 1820. Descriptions of Malayan plants, Appendix: 1–26, Sumatran Mission Press, Bencoolen.
- GRAY, S. F. 1820a (Aug). Physical science during the year 1819. IV. Botany. *Ann. Philos. Mag. Chem.* 16: 129.
- GRAY, S. F. 1820b (Sep). Proceedings of philosophical societies. *Ann. Philos. Mag. Chem.* 16: 225–226.
- GRIFITH, W. 1843. Descriptions of Malayan plants by William Jack arranged according to their natural families, etc. *Calcutta J. Nat. Hist.* 4: 215–218. Copy in L fide Merrill 1952: 205. Reprinted 1843 separately paged iii, 230 pp, no plates, but without the Appendix.
- HOOKER, W. J. 1835. Description of Malayan plants by William Jack with a brief memoir of the author and extracts from his correspondence. *Compan. Bot. Mag.* 1: 121–272. (259–264, t. XIV, XV).
- HOTTA, M. 1989. Miscellanea. In Hotta, M. (Ed.), Diversity and plant-animal interaction in equatorial rain forest: report of 1987–1988 Sumatra Research. Kagoshima University, Kagoshima.
- HOTTA, M. TAMIN, R & ITO, M. 1984. Flora of G. Gadut area. In Hotta, M. (Ed.), Forest ecology and flora of G. Gadut; report of 1980–1984. Sumatra Nature Study (Botany). Kyoto.
- JACK, W. 1820. Descriptions of Malayan plants. Malayan Miscellanies 1, Appendix: 1–26.
- KOODERS, S.H. 1918. Botanisch overzicht der Rafflesiaceae van Nederlandsch-Indië. Batavia: G. Kolff and Company.
- KRAUS, J. C. 1820 (28 Nov). Botanische Notizen. 1. *Rafflesia*, eine neue Pflanzengattung. *Flora* 3: 699–700.
- LATIFF, A. & WONG, M. 2003. A new species of *Rafflesia*. *Folia Malaysiana* 4: 135–146.

- MABBERLEY, D. J. 1999. Robert Brown on *Rafflesia*. *Blumea* 44: 343–350.
- MARSDEN, W. 1783–1811. The history of Sumatra (ed. 1–3). Marsden, London. Ed. 1.
- MAT-SALLEH, K., MAHYUNI, R., SUSATYA, A. & VELDKAMP, J. F. 2010. *Rafflesia lawangensis* (Rafflesiaceae) A new species from Bukit Lawang, Gunung Leuser National Park. *Reinwardtia* 13 (2): 159–166.
- MCNEILL, J., BARRIE, F. R., BUCK, W. R., DEMOULIN, V., GREUTER, W., HAWKSWORTH, D. L., HERENDEEN, P. S., KNAPP, S., MARHOLD, K., PRADO, J., PRUD'HOMME VAN REINE, W. F., SMITH, G. F., WIERSEMA, J. H. & TURLAND, N. J. 2012. International code of nomenclature for algae, fungi, and plants (Melbourne Code). *Regnum Veg.* 154: xxx, 1–208.
- MEIJER, W. 1984. New species of *Rafflesia* (Rafflesiaceae). *Blumea* 30: 211.
- MEIJER, W. 1997. Rafflesiaceae. *Flora Malesiana* I, 13: 1–42.
- MEIJER, W. & VELDKAMP, J.F. 1988. A revision of *Rhizanthus* (Rafflesiaceae). *Blumea*: 31: 329–342
- MERRILL, E. D. 1952. William Jack's genera of Malaysian plants. *J. Arnold Arbor.* 23: 242.
- NAIS, J. 2001. *Rafflesia* of the world: xvi, 243 pp. Sabah Parks, Kota Kinabalu.
- OLAH, L. V. 1960. Cytological and morphological investigations in *Rafflesia arnoldii* R. Brown. *Bull. Torrey Bot. Club* 87: 406–416.
- PELSER, P. B., NICKRENT, D. L., CALLADO, J. R. C. & BARCELONA, J. F. 2013. Mt. Banahaw reveals: The resurrection and neotypification of the name *Rafflesia lagascae* (Rafflesiaceae) and clues to dispersal of *Rafflesia* seeds. *Phytotaxa* (131):35–40.
- SCHÄFER, H. 1940. Nieuwe *Rafflesia* vindplaatsen in Benkoelen. *Trop. Natuur* 29: 21–23.
- STAFLEU, F. A. & R. S. COWAN. 1979. Taxonomic literature, ed. 2, 2: *Regnum Veg.* 98: 395–396.
- SURINGAR, W. F. R. (post “25 Oct 1879”). *Rafflesia hasseltii*. *Acta Soc. Reg. Sci. Neerl.* = *Verslagen & Mededeelingen van de Koninklijke Akademie van Wetenschappen (Afd. Natuurkunde)* 14, *Verslag* 25 Oct. 1879 (in Dutch).
- SURINGAR, W. F. R. 1884. Fam. Cytinaceae tribus Rafflesiaceae in A. L. van Hasselt & J. G. Boerlage, Bijdragen tot de kennis der flora van Midden-Sumatra, in P. J. Veth (Ed.), *Midden-Sumatra, Reizen en onderzoekingen der Sumatra-Expeditie, 1877-79. Part 4 (Natural History), 2nd part, Flora:* 26–30.
- SUSATYA, A. 2011. *Rafflesia Pesona Bunga Terbesar di Dunia*. Direktorat Kawasan Konservasi dan Bina Hutan Lindung. Departemen Kehutanan. Jakarta.
- SUSATYA, A., ARIANTO, W., & MAT-SALLEH, K. 2005. *Rafflesia bengkuluensis* (Rafflesiaceae), a new species from south Sumatra, Indonesia. *Folia Malaysiana*. 6 (3&4): 139–152.
- SUSATYA, A., WAHYUDI, A., SOFYAN, A., ASHARI, A & DUNNER, A. 2002. *Kajian Distribusi dan Ekologi jenis-jenis Rafflesia di Taman Nasional Kerinci Seblat Provinsi Bengkulu*. Departemen Kehutanan dan Yayasan KEHATI. Jakarta.
- TRENCH, K.P. & TRÜBNER, N. 1887. Miscellaneous papers relating to Indo-China. Trübner's oriental series. Reprinted for the *Straits Branch of the Royal Asiatic Society. Ser. 2, 2:* 1–313.
- VAN STEENIS, C. G. G. J., VAN STEENIS-KRUSEMAN, M. J. & BACKER, C. A. 1954. Louis Auguste Deschamps, a prominent but ill-fated early explorer of the flora of Java. 1793-1798. *Bull. Brit. Mus. Nat. Hist.* I, 2: 61.
- WIRIADINATA, H. & SARI, R. 2010. A new species of *Rafflesia* (Rafflesiaceae) from North Sumatra. *Reinwardtia* 13 (2): 95–100.
- WINKLER, H. 1927. Über eine *Rafflesia* aus Zentral Borneo. *Planta* 4: 1–97.



Reinwardtia

Published by Herbarium Bogoriense, Botany Division, Research Center for Biology,
Indonesian Institute of Sciences

Address: Jln. Raya Jakarta-Bogor Km. 46 Cibinong 16911, P.O. Box 25 Cibinong

Telp. (+ 62) 21 8765066; Fax (+62) 21 8765062

E-mail: reinwardtia@mail.lipi.go.id

***REINWARDTIA* Author Agreement Form**

Title of article :

Name of Author(s) :

I/We hereby declare that:

- My/Our manuscript was based on my/our original work.
- It was not published or submitted to other journal for publication.
- I/we agree to publish my/our manuscript and the copyright of this article is owned by Reinwardtia.
- We have obtained written permission from copyright owners for any excerpts from copyrighted works that are included and have credited the sources in our article.

Author signature (s)

Date

Name

IBRAHIM DJAMALUDDIN, POPPY INDRAYANI, YASUHIRO MITANI, SHUICHIRO TAGANE & TETSUKAZU YAHARA. GIS web server for biodiversity information system	249
TAN AI LEE, NURNIDA MOHD KAMAL, TAN HOOI POAY & IZLAMIRA ROSLAN. Notes on morphological characteristics of <i>Erycoma</i> spp. and its status in Peninsular Malaysia	259
ANDREW POWLING, AURORA PHILLIPS, ROSIE PRITCHETT, SIMON T. SEGAR, REBECCA WHEELER, ANI MARDI-ASTUTI. The vegetation of Lambusango forest, Buton, Indonesia	265
RUTH KIEW. <i>Chionoxthus</i> (Oleaceae) in Sulawesi, Indonesia, including three new species	287
KHOON MENG WONG, SYLVAIN G. RAZAFIMANDIMBISON. A new combination and a new name in <i>Gynochthodes</i> (Rubiaceae)	297
J. F. VELDKAMP, LULUT DWI SULISTYANINGSIH. Nomenclature and typification of <i>Musa salaccensis</i> Zoll. ex Kurz. (Musaceae)	299
J. F. VELDKAMP & WITA WARDANI. <i>Asplenium tenerum</i> var. <i>pallidum</i> is the correct name for <i>A. thaxbergii</i> var. <i>belangeri</i> (Aspleniaceae)	303
MARLINA ARDIYANI. A new species of <i>Zingiber</i> (Zingiberaceae) from Enggano island, Indonesia	307
WISNU H. ARDI & MARLINA ARDIYANI. Two new species of <i>Alpinia</i> from Sulawesi, Indonesia	311
RIDHA MAHYUNI, YAYAN WAHYU C. KUSUMA, WIHERMANTO & J. F. VELDKAMP. Notes on <i>Rafflesia</i> (Rafflesiaceae) in Sumatra with a new record <i>Rafflesia gabatensis</i> Meijer	317
W. J. J. O. DE WILDE, B. E. E. DUYFJES & RUGAYAH. <i>Gymnopetalum pectinatum</i> (W.J. De Wilde & Duyfjes) Rugayah: rank of species for <i>Gymnopetalum scabrum</i> var. <i>pectinatum</i> (Cucurbitaceae)	323

Reinwardtia is a LIPI accredited Journal (517/AU2/P2MI-LIPI/04/2013)

<http://e-journal.biologi.lipi.go.id/index.php/reinwardtia>

Herbarium Bogoriense
 Botany Division
 Research Center for Biology – Indonesian Institute of Sciences
 Cibinong Science Center
 Jln. Raya Jakarta – Bogor, Km 46
 Cibinong 16911, P.O. Box 25 Cibinong
 Indonesia