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***RAFFLESIA BANAHAWENSIS* (RAFFLESiaceae), A NEW SPECIES FROM LUZON, PHILIPPINES**

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ABSTRACT

Rafflesia banahawensis Madulid, Villariba-Tolentino, & Agoo, a new species from Mt. Banahaw, Quezon province on Luzon Island is described. Its size is comparable to other Philippine species namely *R. manillana* Teschemacher, *R. baletei* Barcelona & Cajano, and *R. lobata* Galang & Madulid. The network of very thin, elongated, and interconnected warts on the diaphragm is similar to *R. baletei* but it differs in the shape and density of the warts in the perigone lobe (i.e., more elongate and more numerous), in having windows on the inner side of the diaphragm and the structure and arrangement of processes on the disk.

Key words: endemic plant, Mt. Banahaw, parasitic plant, Philippines, *Rafflesia*

INTRODUCTION

Rafflesia banahawensis, sp. nov. is the eighth member of the genus to be described in the Philippines. It is the third species recorded to occur on Luzon Island, following *R. manillana* (Mt. Makiling) and *R. baletei* (Mt. Isarog).

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A species from Mt. Makiling, Laguna was identified and recorded as *Rafflesia manillana* by Brown (1912), Merrill (1923), Pancho (1983), Meijer (1997), Madulid (2000), Nais (2001), and Fernando and Ong (2005). The same species was also cited to occur on Mt. Banahaw by Fernando and Ong (2005). Another species, *Rafflesia philippensis* Blco. described based on a collection from Majayjay, Laguna, was later reduced to a synonym of *R. manillana* by other authors, e.g. Merrill (1923). Mt. Banahaw and Mt. Makiling, both straddling the Laguna-Quezon provincial boundary in southern Luzon, are regarded as twin mountains as they are just about 35 km from each other and share the same geological, climatic, and biological features. The discovery of *R. banahawensis* provides additional information towards the understanding of the distribution, speciation and ecology of the genus *Rafflesia* in the Philippines.

The open flower of this new species was first seen and photographed in 2003 by members of the *Tanggol Kalikasan*, a local environmental conservation group. The photograph was later brought to the attention of one of the authors (CVT) who formed a team composed of professors and students of the Manuel S. Enverga University Foundation (MSEUF) to further document the species outside the perimeter fence of the restricted zone on Mt. Banahaw National Park. Research on the distribution and ecology of the species was pursued by the team in coordination with the Department of Environment and Natural Resources Region IV, the Kinabuhayan Municipal Environmental and Natural Resources Office (MENRO) and the *barangay* or village chief.

Mt. Banahaw National Park (14° 03.239N 121° 29.214E) is located south of the Laguna-Quezon provincial boundary line, between Laguna de Bay to the north and Tayabas Bay to the south. The mountain rises to about 2,100 m.a.s.l. It has been closed to the general public since 2003 to allow the forest within to recover from the adverse effects of human activities in the area. It is regarded as a sacred mountain where people flock during the Lenten season and perform folk religious activities. It is also a favorite camping and trekking site for mountaineers.

TAXONOMIC TREATMENT

***Rafflesia banahawensis* Madulid, Villariba-Tolentino & Ago, sp. nov.** Figs. 1-2.

Rafflesiae baletaei diaphragmatis clauso similis, diaphragmate infra fenestris, processis applanatis serratis plusminusve circulo dispositis externe deflexis, numerosis minoribus ubique disco differt. – *Typus*: MSEUF 101 (PNH, Holotype). Philippines, Luzon, Quezon province, Kinabuhayan, Mt. Banahaw.

Immature bud 6.5-7 cm diam; bracts or scales 3.5 – 5.5 x 4.5 – 6.5 cm. *Mature bud* 13 – 16 cm diam; bracts or scales 7.5 – 8.5 x 7 – 8 cm. *Open flower* 29.5 – 32 cm diam, 14 cm high; scales 7 – 9 x 5 – 7 cm. *Perigone lobes* 9 – 10 x 9 – 10.5 cm, reddish; warts white, oval, elongated horizontally, some coalesced, 8 – 12 along the median part of the lobes; margins with white lining. *Diaphragm* 3.5 – 4.0 cm broad, 12.5 – 13 cm across, upper surface same color as lobes; warts a network of interconnected thin, raised, white structures; inner margin with distinct white lining; opening 5.5 – 6 cm diam; windows present in the undersurface, in 2 rows, as elongated, flattened, raised structures, extending to 2/3 of the surface. *Perigone tube* 7 cm high, 11 – 12 cm at widest part. *Ramenta* on lower part of perigone tube sparse, to 5 mm, simple; on middle part dense, to 5 mm, filiform; on upper part dense, to 4 mm, filiform. *Annulus* 5 mm thick. *Column* 0.75 – 1 cm high. *Disk* 6.5 – 7 cm diam; rim raised, 0.75 – 1 cm high, pointing outward, shallowly crenulate. *Processes* reddish; larger ones 13 – 15, flattened and jagged at the apices and margins, inclined or projecting outwards, arranged in a ring, some radially from the center, 3 – 5 clustered in the center, also somewhat forming a ring; smaller ones tuberculate, numerous, scattered throughout, though sparsely at the center. *Male flowers* with 14 – 17 anthers; each anther 3 – 4 x 4 – 5 mm. *Female flowers* not seen.

Locality and distribution: Along trail to waterfall, Kinabuhayan, Mt. Banahaw, Quezon province, Luzon Island, Philippines

Habitat and ecology: Lowland evergreen forest, in damp area. Starts to bloom in January.

Host plant: *Tetrastigma piscicarpum* (Miq.) Planch., MSEUF 102 - (Fig. 3).

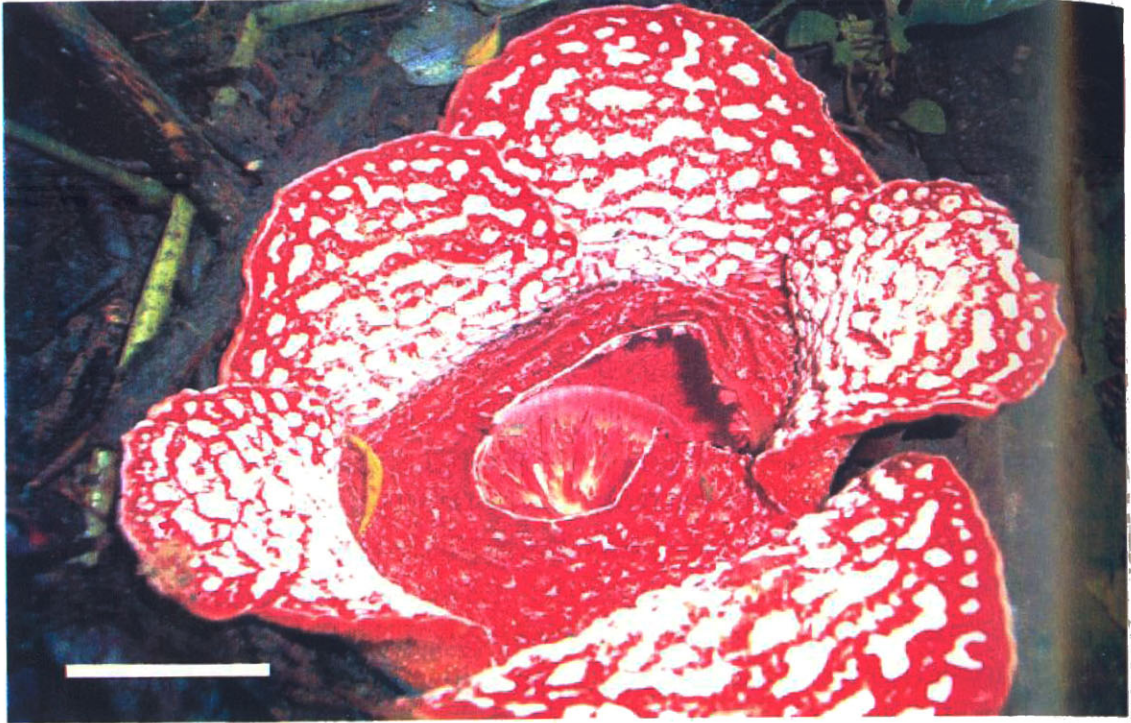


Figure 1. Open flower with diaphragm cut to show diagnostic characters such as windows on the underside of the diaphragm and wart pattern. (MSEUF 101, Holotype) scale bar: 5 cm.

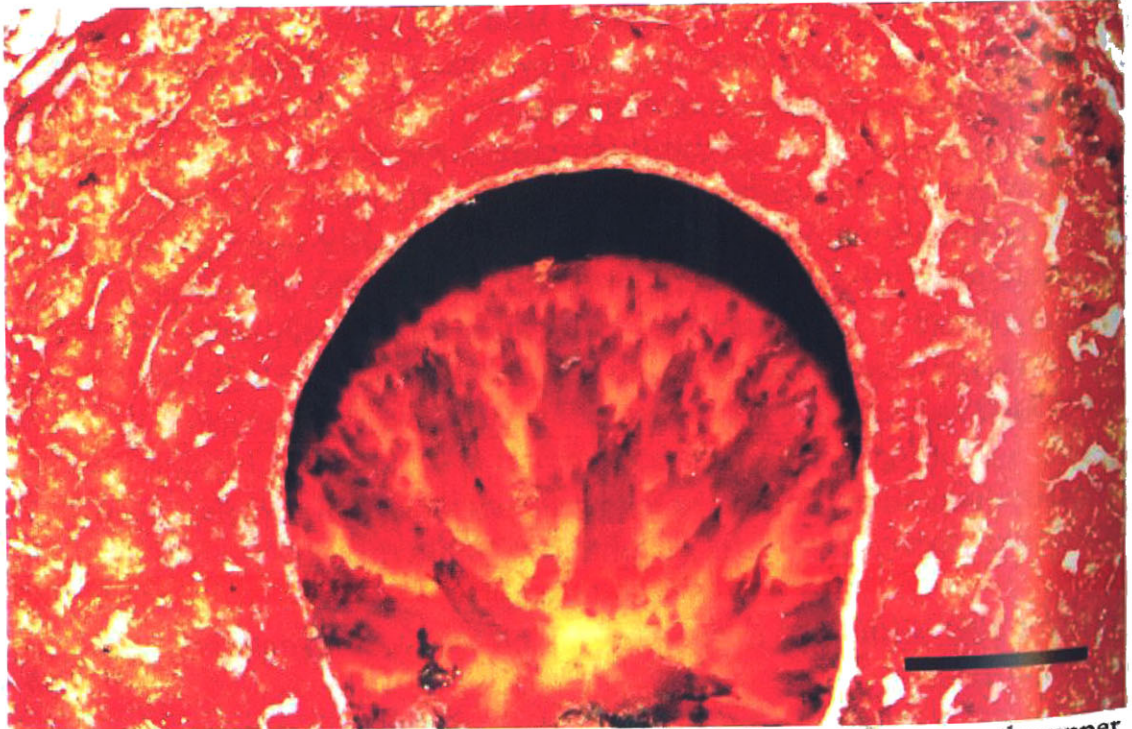


Figure 2. Close up of flower of showing reticulate raised structures on the upper surface of diaphragm and processes flattened laterally with irregular margins and scattered throughout the disk. (MSEUF 101, Holotype) scale bar: 2 cm.



Figure 3. Leafy shoot of host plant, *Tetrastigma piscicarpum*. (scale bar: 5 cm)

Proposed IUCN conservation category and criteria: Critically Endangered [CR A4acd; B1ab (ii, iii, v); D ver. 3.1 (2001)]; the species is so far known to occur as a small single population on Mt. Banahaw which is a protected area; the exact location, however, is along the trail and accessible to human disturbance.

Notes: Similar to *R. baletai* in size and in having closed diaphragm but differs in the shape and density of the warts on the perigone lobes (i.e., oval or elongate and more numerous), in the presence of windows on the underside of the diaphragm; and in the structure and form of the processes on the disk (i.e., flattened and jagged at the apices, and deflexed outwards, and with numerous smaller processes dispersed throughout the disk).

Specimens examined: MSEUF 101 (Holotype, deposited in PNH), MSEUF 103

Table 1. Comparison of *R. banahawensis* and *R. balettei*.

	<i>R. banahawensis</i>	<i>R. balettei</i> (Barcelona et al., 2006)
Mature bud size	13-16 cm diam	7.5-9 cm diam
Bract size	7-9 x 5-8 cm	4-7 x 3.5-6.5 cm
Open flower size	29.5-32 cm diam; 14 cm high	9-22 cm diam; 13-13.5 cm high
Perigone lobes	9-10 x 9-10.5 cm; reddish	5-7.5 x 5-8 cm; dark-, reddish- or rusty brown
Warts on perigone lobes	white, oval or elongated horizontally, somewhat coalesced, 8-12 along median part	whitish, irregular in shape
Margins of perigone lobes	with white lining	same color as the surface of the perigone lobes
Diaphragm dimensions	3.5-4.0 cm broad; 12.5-13 cm across; opening 5.5-6 cm diam.	7.5-12 cm diam.; opening 3-3.5 cm diam.
Diaphragm color	same color as perigone lobes; inner margin with distinct white lining	paler than perigone lobes; inner margin reddish brown, darker than the rest of the diaphragm
Warts on diaphragm	a network of interconnected elongated, raised white structures	reticulate ornamentations that are whitish and sharp-edged forming irregularly shaped but commonly pentagonal areoles
Windows	present, in 2 rows	absent
Ramenta	on lower part of perigone tube sparse, to 5 mm, simple; on middle part dense, to 5 mm, filiform; on upper part dense, to 4 mm, filiform	dense, nearly evenly distributed all over inner surface of diaphragm and perigone tube; variably branched, to 2 mm long
Column	0.75-1 cm high	to 2 cm high
Disk	6.5-7 cm diam; rim raised	5-5.5 cm diam; rim raised
Processes	larger ones 13-15, arranged in a ring, some radially from the center, flattened and jagged at the apices and margins, projecting outwards, reddish; 3-5 processes in central cluster, forming a ring; smaller ones tuberculate, numerous; scattered throughout.	19-26, arranged in 2 concentric rings, laterally compressed, variably branched, pointing outwards toward the rim, reddish orange basally, darker apically
Anthers	14 -17	11-14

DISCUSSION

Rafflesia banahawensis is a small-sized species thus belonging to the group composed of *R. manillana*, *R. lobata* and *R. baletei* whose open flowers measure 20 cm more or less. It is similar to *R. manillana* and *R. lobata* in having windows on the inner surface of the diaphragm. It is, however, similar to *R. baletei* in having a closed diaphragm and the surface having a meshwork of white, thin, elongated and continuous warts, instead of the white, irregularly oblong warts on the upper surface of the diaphragm in *R. manillana* and *R. lobata*. The warts on the perigone lobes of *R. banahawensis* are oval or elongate horizontally and more dense than in *R. baletei*. The windows of *R. banahawensis* are arranged in two rows or rings and formed as thin, elongated, and raised structures. The processes on the disk are more or less flattened, jagged on the apices and margins, deflexed outward and somewhat irregularly arranged in a ring. Smaller tuberculate processes are spread throughout the disk and also interspersed between the larger processes. The ramenta are numerous, varied in form and length and cover the entire inner surface of the perigone tube and undersurface of diaphragm, before the area occupied by windows. A more detailed comparison between *R. baletei* and the proposed new species is presented in Table 1.

The discovery of *R. banahawensis* came at a critical time when the Protected Area and Management Board (PAMB) of Mt. Banahaw National Park implemented a management decision temporarily closing public access to the park to allow for the recovery of the forests. The presence of a critically endangered and scientifically important species such as *R. banahawensis* further justifies strict protection and conservation of the area. It also lends support for the inclusion of Mt. Banahaw as an Important Plant Area for the Philippines.

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