

## ***Rafflesia banaoana* (Rafflesiaceae): Another new species from Luzon, Philippines**

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*Rafflesia banaoana* Malabrigo, a new species from Kalinga Province, Northern Luzon, Philippines is described. It is the tenth endemic *Rafflesia* species thus far described from the Philippines, and the sixth reported from Luzon Island. Its size is comparable to other Philippine species, namely: *Rafflesia mira* Fernando & Ong and *R. speciosa* Barcelona & Fernando. Perigone color and wart ornamentations closely resemble *R. balettei* Barcelona & Cajano but the species differs in size and in the number, structure and arrangement of processes on the disk.

**Key words:** *Rafflesia banaoana* Malabrigo *sp. nov.*, Rafflesiaceae, endemic plant, Balbalasang-Balbalan National Park, Banao Tribe, Balbalan Municipality, Kalinga Province, Northern Luzon, Philippines

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## INTRODUCTION

*Rafflesia* R.Br. (Rafflesiaceae) is one of the three genera of the Tribe Rafflesieae of the subfamily Rafflesioideae. Members of Rafflesieae are only known to occur in Indomalaysia while the other tribes of the subfamily (Cytineae and Apondatheae) occur in America, Africa, the Mediterranean region and Southwest Australia (Meijer 1997). *Rafflesia*, including the two other genera of the tribe (*Rhizanthus* Dumort. and *Sapria* Griff.) are obligate parasite of the liana genus *Tetrastigma* Planch. (Vitaceae). The plants are completely dependent on their host plants for their water and nutrients because they do not have leaves, chlorophyll, stems, and roots (Barcelona *et al.* 2009).

*Rafflesia* is exclusively found in the forests of Southeast Asia, particularly in Thailand, Peninsular Malaysia, Sumatra, Java, Borneo and the Philippines. The Philippines has the highest species richness of the known members of the genus known to date. Out of the 27 recognized and described species of *Rafflesia*, 10 are recorded as endemic to the Philippines.

*Rafflesia banaoana* sp. nov. is the tenth member of the genus to be described from the Philippines (all endemic) and the sixth species reported to occur in the island of Luzon following *R. manillana* Teschem. (Mt. Makiling, Laguna), *R. baletei* Barcelona & Cajano (Mt. Isarog and Mt. Asug, Camarines Sur), *R. philippensis* Blanco (Mt. Banahaw, Quezon and Laguna), *R. leonardi* Barcelona & Pelsner (Cagayan) and *R. aurantia* Barcelona, Co & Balete (Siera Madre Mountain Range, Quirino). For more than a century, since the historical collection of *R. manillana*, the very first species of *Rafflesia* in the Philippines (Merrill 1923), no single population of *Rafflesia* was recorded in Northern Luzon. Only just very recently, Northern Luzon has been recognized as a local center of *Rafflesia* diversity in the country. For the past three years, three new species of *Rafflesia* were discovered and described from the region; *R. leonardi* in 2008, *R. aurantia* in 2009 and most recently *R. banaoana* Malabrigo sp. nov.

## Description of New Species

### *Rafflesia banaoana* Malabrigo sp. nov.

Figures 1-3

Flores 40-50 cm diametro. Lobi perigonii orbicularis, ad circa 12-15 cm longi, 15-20 cm lati. Diaphragma circa 18-22 cm diametro. Flores masculi antheris 18-22. *Rafflesia speciosa* Barcelona & Fernando (species Panayense et Negrosense) et *Rafflesia mira* Fernando & Ong (species mindanaoense) magnitudine floris similis. *Rafflesia baletei* Barcelona & Cajano (species Luzonense) similis in hospitibus radicibus stirpibusque crescens, perigonii colore, sed processis applanatis serratis plusminusve circulo dispositis externe deflexis, numerosis minoribus ubique disco differt.

**Typus:** PHILIPPINES, Luzon Island, Kalinga Province, Balbalan Municipality, Barangay Balbalasang, Sitio Cafcafulao, Balbalasang-Balbalan National Park (BBNP), slightly disturbed upper montane rainforest, alt. 1361m asl, 04 May 2009, Malabrigo 605 (Holotype, LBC).



Figure. 1. *Rafflesia banaoana* Malabrigo *sp. nov.* A. General morphology of a fully-bloom flower. B. Close-up of flower showing the very few processes concentrated on the central disc and the very fine, reddish brown ramenta distributed all over the under surface of the diaphragm. (Photo by P.L. Malabrigo, 04 May 2009)

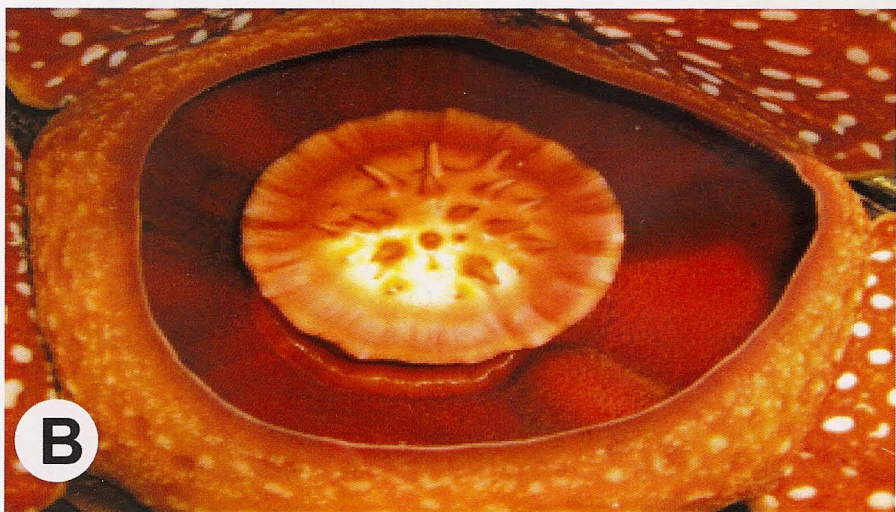
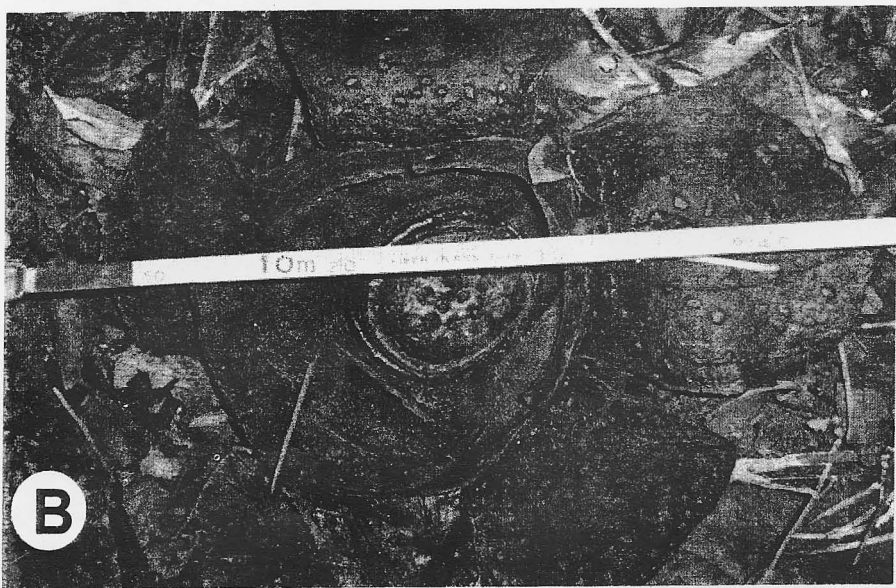




Figure. 2. *Rafflesia banoana* Malabrigo *sp. nov.* A. A mature flower bud. B. A flower in later phase of senescence. (Photo by P.L. Malabrigo, 04 May 2009)





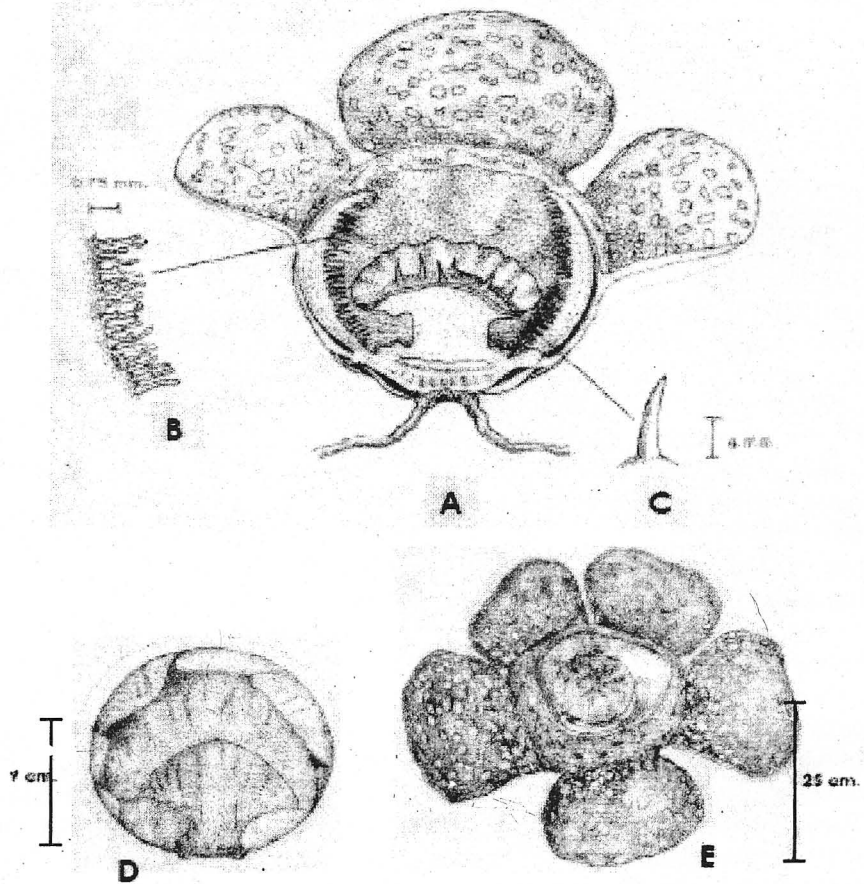


Figure 3. *Rafflesia banaoana* Malabrigo *sp. nov.* A. Longitudinally dissected male flower showing very few processes and very fine ramenta. B. Magnified variably-sized and branched ramenta. C. Magnified process pointing outward towards the rim. D. Mature bud showing the variably-sized cupules.

Mature flower buds 16-18 cm in diameter; cupule of mature flowers *c.* 2.5 cm high, 8.0 cm wide, bud scales to 13 cm long. Mature flower 40-50 cm diameter, 15-18 cm high when expanded. Perigone lobes widely separated, orbicular, 12-15 cm x 15-20 cm, *c.* 8mm thick at base, reddish-orange in color becoming darker with age; upper surface warty, warts teeth-like white spots regularly scattered, irregular in shape, whitish on a reddish-orange background in new bloom; under surface generally smooth, darker orange in color; margin entire to sinuate. Diaphragm 18-22 cm, to 6 mm thick, lighter orange than the perigone lobe, upper surface devoid of the white warts present on the perigone lobes, instead numerous irregular blots present all over, appearing reddish on light orange background in bloom, the rim entire, reddish; orifice 14-16 cm diameter. Disk 8-9 cm diameter, *c.* 5 mm thick, dome-shaped centrally, yellow-orange becoming reddish-orange at the periphery; rims 3-4 layers, 5-10 mm raised apart, entire becoming crenulate with age, yellowish-orange in new bloom; column 2-2.5 cm above the base of the perianth tube or 5 cm from cupule base to the tip of the disk; well-developed processes 14-16, concentrated on the central disk, pointing outward towards the rim, 8-12 mm long, *c.* 5 mm wide at base, yellowish-orange proximally, reddish-orange distally. Ramenta very fine and dense distributed all over the under surface of the diaphragm, reddish-brown, *c.* 1.5 mm long. Male flowers with 18-22 anthers, each anther *c.* 3.5 x 5 mm, Female flowers not known.

**Etymology.** The species is named after the very hospitable and environment-friendly people in Kalinga, the Banao Tribe, whose traditional forest management practice is exemplary. The people of Banao have kept a good forest status of Kalinga for having the least reduction of old-growth forests among the provinces of Cordillera Administrative Region. The most recent forest survey showed that old-growth forests cover more than 85% of the total BBNP area. Further, the locality where the population was discovered is part of the Banao watershed inside the BBNP.

**Distribution and habitat.** PHILIPPINES, Luzon Island, Kalinga Province, Banao watershed, Balbalasang-Balbalan National Park (BBNP), Balbalan Municipality, Barangay Balbalasang, Sitio Cafcafulao, N 0295223, E 1938659, slightly disturbed upper montane rainforest, at 1361m asl, the highest elevation recorded thus far for any *Rafflesia* population in the Philippines, on steep slope, about 10 m away from the embankment of Mapangal Creek. Endemic.

**Ecology.** Host plant: *Tetrastigma loheri* Gagnep (Vitaceae); Voucher specimen, *Alcantara* 326 (LBC). All individuals of *R. banaoana* observed in the type locality were found parasitic on underground roots and stems of the host plant, but never blooming on the aerial portion of the liana. Flower blooms probably start from the later part of February to May. Several flowers were already at a later phase of senescence when population was found on May 04, 2009.

**Morphological affinities.** *Rafflesia banaoana* is comparable in size (medium-sized) with *R. mira* and *R. speciosa* but other morphological characteristics are similar with those of the small-sized *Rafflesia*. The reddish-orange perigone resembles *R. baletei*, *R. manillana*, *R. lobata* and *R. leonardi*. It is further similar to *R. manillana* and *R. leonardii* by its widely separated perigone lobes, which is not the case for the two other medium-sized *Rafflesia*. It most closely resembles *R. baletei* in the shape and

## A new species of *Rafflesia*

density of the perigone warts and in the color and morphology of the rammenta. *Rafflesia banaoana* differs from all other *Rafflesia* species in the Philippines in the number and structure of the processes that are very few (14-16), concentrated in the center of the disc but irregularly scattered.

**Conservation.** The species is so far known to occur as a small single population in Balbalasang-Balbalan National Park. Though, BBNP is a declared protected area, the exact location, however, is along the trail going to Mapangal river or creek, thus very accessible to human disturbance. The discovery of *R. banaoana* supports previous studies revealing high yet poorly understood biological diversity in this part of the Cordillera (Barcelona 2003, Diesmos *et al.* 2002). It further implies that BBNP and perhaps other adjacent forests in CAR such as that of Malibcong in Abra still support a large portion of the country's threatened, endemic, and unknown flora. It therefore strengthens the proposal of the Banao people to proclaim BBNP a Natural Biotic Area under the National Integrated Protected Area System.

## ACKNOWLEDGMENTS

The author dedicates this new species to the beautiful people of the Banao community in Balbalasang-Balbalan National Park. The Resources, Environment and Economic Center for Studies Inc. (REECS) who initiated the Rapid Site Assessment Project provided financial support from the Foundation for Philippine Environment (FPE). Willis B. Cabbuttot and Sheldon A. Malaga first brought to the author's attention the presence of this unique species in their locality. The Concerned Citizens of Abra for Good Government (CCAGG), the local NGO partner. Mr. Renante M. Meera and Mr. Ariston P. Alcantara served as research assistants, being at the front line of the fieldwork for the whole duration of the study. Mozart B. Gupaal and Eriberto Busacay provided invaluable field assistance in completing the work on time. The illustration of *R. banaoana* appearing as Figure 3 was drawn by Mr. Rafael D. Tandang of the UPLB Museum of Natural History, College, Laguna.

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The publication of this Special Issue of ASIA LIFE SCIENCES is made possible through a generous financial grant from the University of the Philippines Los Baños Foundation, Inc. (UPLBFI) to the Museum of Natural History, University of the Philippines Los Baños.

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## **ASIA LIFE SCIENCES**

The Asian International Journal of Life Sciences

ISSN 0117-3375

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*Asia Life Sciences* has an Impact Factor of **0.259**