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Wurfbainia rubrofasciata (Zingiberaceae), a new species from Palawan, Philippines

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Abstract. A ginger species collected in Palawan, Philippines was initially thought to be *Wurfbainia palawanensis* but differs by the dark brown fertile bracts and red spinose fruits. This species is also morphologically similar to the continental Asian *Wurfbainia microcarpa* but can be distinguished from this by the entire ligule, petiolate lamina, congested rachis, and presence of red stripes at the base of the labellum. Therefore, we here describe *Wurfbainia rubrofasciata* providing colour plates, data on phenology, distribution, habitat, and a provisional conservation assessment. A key to five species of *Wurfbainia* in the Philippines is provided and we discuss the likely closest relatives of *Wurfbainia palawanensis*.

Keywords: *Amomum* s.l., endemic, endangered, taxonomy, *Wurfbainia*.

INTRODUCTION

In 2018, the ginger genus *Wurfbainia* Giseke was reinstated by De Boer et al. as a monophyletic genus within the polyphyletic *Amomum* Roxb. sensu lato. The spoon-shaped labellum, the trilobed anther crest in which the side lobes usually pointing upwards and the mid lobe positioned behind the stigma distinguishes *Wurfbainia* from its closely related genera, especially from its sister, *Meistera* Giseke. *Wurfbainia* is distributed with 26 species in North East India, Bangladesh, China, and South East Asia with a centre of diversity in Thailand that harbours 18 species (Kaewsri and Sangvirotnjanapat 2022).

The taxonomic revision by De Boer et al. (2018) divided the Philippine species hitherto placed in *Amomum* into three genera namely *Amomum* (1 species), *Meistera* (3 species), and *Wurfbainia* (4 species). Two species, *Amomum luzonensis* Elmer and *A. warburgii* (K.Schum.) K.Schum., however, were listed as *incertae sedis* since both have very limited protologues and their respective type is either lost or destroyed. Thus, there is not sufficient evidence to conclude their generic placement.

The four species of *Wurfbainia* in the Philippines are all endemic (Pelser et al. 2011 onwards). Ridley (1905) described *Amomum elegans* Ridl. and *A. trilobum* Ridl. Turner (2001), however, made a new name, *A. hedyosmum* I.M.Turner, for *A. trilobum* since the name was already used for a different species in Vietnam. Furthermore, Elmer (1915) described *A. mindanaense* Elmer and *A. palawanense*, both named after the island where they were discovered. The combinations of *A. elegans*, *A. hedyosmum*, *A. mindanaense*, and *A. palawanense* in *Wurfbainia* was based entirely on morphology since none of them had been included in a molecular-based phylogeny.

The present paper focuses on a species of *Wurfbainia* in Palawan which was at first misidentified as *W. palawanensis* (Elmer) Škorničk. & A.D.Poulsen (Figure 1). The resulting new species is described in detail and illustrated below and an updated key to all species of the genus in the Philippines is provided.

MATERIAL AND METHODS

On the website of Co's Digital Flora of the Philippines (CDFP), a photograph of a *Wurfbainia* taxon in Palawan was identified by M.A.K. Naive as *W. palawanensis* (see http://www.phytoimages.siu.edu/imgs/pelserpb/r/Zingiberaceae_Wurfbainia_palawanensis_122428.html). In 2018, this taxon was collected during fieldwork in Palawan.

Herbarium specimens, including types and specimens relevant to *Wurfbainia* deposited in several herbaria (BM, BO, E, FI, FEUH, G, GH, K, L, NY, PNH, U, US, USTH, and Z), protologues, and published morphological descriptions of relevant species were examined. Specimens that were examined using only digital images are indicated with an apostrophe (*). Geospatial Conservation Assessment Tool (GeoCAT) (Bachman et al. 2011: <http://geocat.kew.org/>) was used to calculate the area of occupancy (AOO) and was used to assess the conservation status of the new species using the International Union for Conservation of Nature (IUCN) criteria (IUCN Standards and Petitions Committee 2019). The distribution map presented was generated using SimpleMappr (Shorthouse 2010).

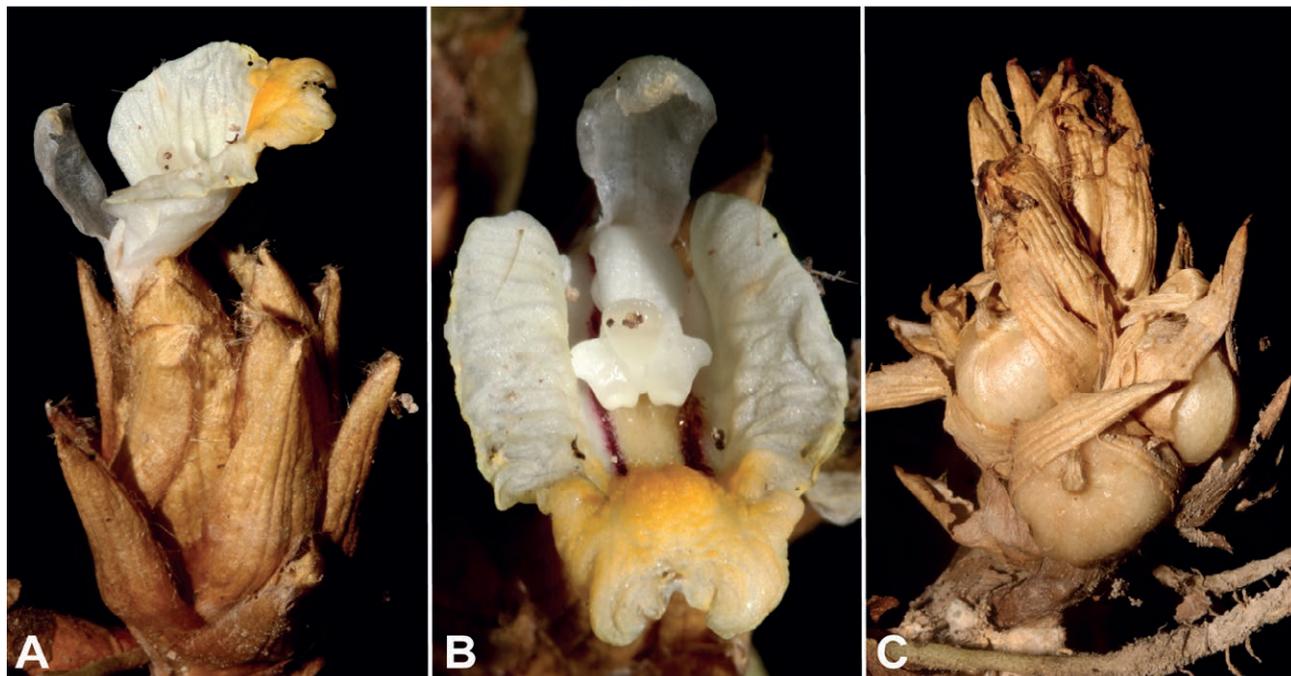


Figure 1. *Wurfbainia palawanensis*: A Inflorescence B Flower C Infructescence. Based from R.V.A. Docot et al. 299 (Photographs by R.V.A. Docot).

TAXONOMIC TREATMENT

Considering the proximity of the type locality of *Wurfbainia palawanensis* it is not surprising that one might jump to the conclusion that photographs taken of this genus in this area of Palawan are of this species (Figure 2). An examination of our recent material, however, demonstrated that it clearly did not match *W. palawanensis* nor any other known species of Philippine *Wurfbainia*. Of these, *W. elegans* (Ridl.) Škorničk. & A.D.Poulsen shares some characters but the continental Asian, *W. microcarpa* (C.F.Liang & D.Fang) Škorničk. & A.D.Poulsen, is most similar (Table 1). The material is at the same time distinguished from all this and a novel species is therefore described below.

***Wurfbainia rubrofasciata* Docot & Domingo, sp. nov.** (Figure 3).

Type: Philippines, Palawan Puerto Princesa City, Barangay Irawan, 1 July 2018, C.B.M. Domingo & R.V.A. Docot PL18-006 (holotype PNH; isotypes FEUH + spirit, L, PPC, USTH).

Diagnosis

Wurfbainia rubrofasciata is morphologically similar to *W. microcarpa* (C.F.Liang & D.Fang) Škorničk. & A.D.Poulsen in having white flowers with a clawed and saccate labellum but differs in the entire ligule (vs emarginate to bilobed), 7–11 mm long petiole (vs < 2 mm); 2–4 flowers open at a time (vs 1–2); congested rachis (vs elongated); white calyx tube and corolla lobes (vs white to red), presence of 10–12 red stripes at the base of the labellum (vs minute red dots) and ovate and petaloid lateral lobes of the anther crest (vs oblong and fleshy).

Description

Terrestrial herb in loose clump. Rhizome 1–2 cm wide, axis yellowish-green, scales 10–16 mm long, dark brown, glabrous, stilt roots absent. Leafy shoots 1–2 m long, arching at various degrees, with ca. 30 leaves per shoot, 6–7 cm apart, base 20–34 mm wide, white; sheath reticulate, mid-green, pubescent including the margin; ligule ovate, 2–4 × 3–4 mm, brownish-green, sericeous, apex rounded to obtuse; petiole 7–11 mm long, mid-green, pubescent; lamina narrowly ovate, 29–35 × 5–7 cm, mid-green and glabrous above, light green and pubescent beneath, veins slightly plicate, base obtuse, apex acuminate, margin entire and pubescent. Flowering shoot 4–7 cm long, arising near base of the leafy shoot or from rhizome; peduncle nodding at vari-

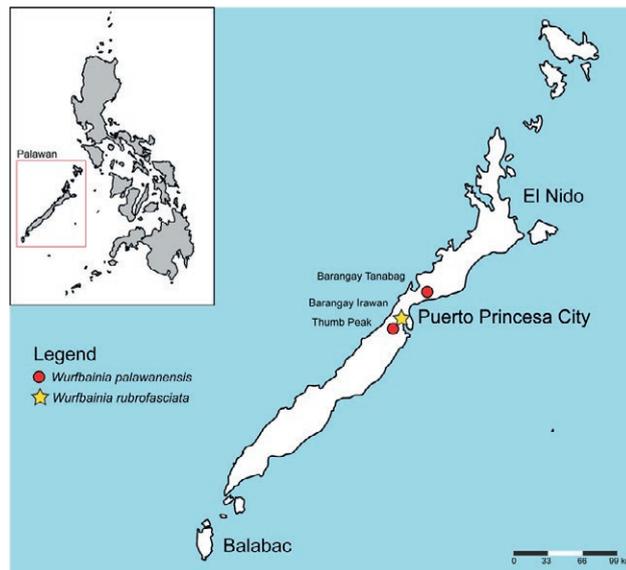


Figure 2. Distribution map of *Wurfbainia palawanensis* and *W. rubrofasciata* sp. nov.

ous degrees, pubescent, 4–7 cm long at flowering state, elongates up to 9 cm long at fruiting state; peduncular bract tubular, 5–7 mm long, dark brown, glabrous; spike bouquet-like, with 4–8 flowers, 2–4 open at a time, 3–4 cm long; rachis congested even at fruiting state; fertile bracts each subtending one flower only, ovate, 13–21 × 8–11 mm, dark brown, glabrous, apex mucronate; bracteole spathaceous, 9–16 mm long, dark brown, sparsely pubescent, apex acute; pedicel ca. 2 mm long, pubescent, elongates up to 4 mm at fruiting state; flowers 3–4 cm long; calyx spathaceous, 17–22 mm long, semi-transparent white, pubescent, apex 2–3-dentate; corolla tube 18–23 cm long, white, glabrous outside, ciliate inside; corolla lobes narrowly ovate, white, margin transparent, glabrous, apex cucullate; dorsal corolla lobe 10–14 × 4–5 mm; lateral corolla lobes 8–13 × 3–4 mm; labellum saccate, trilobed, glabrous, basal part with 10–12 red stripes adaxially, lateral lobes white, central lobe yellow with minute red dots, emarginate; lateral staminodes oblong or tooth-like, ca. 3 mm long, red and white; stamens 8–12 mm long; filament flattened, 5–7 × 1–2 mm, white, glabrous; anther 4–6 × 3–4 mm, connective white and glabrous; anther crest trilobed, the lobes ovate, lateral lobes 3–4 mm long, central lobe 2–3 mm long and sometimes emarginate, white, glabrous; thecae 4–6 × 1–2 mm, white, margin facing each theca ciliate; style 27–35 mm long, white, glabrous; stigma ca. 2 mm wide, white, glabrous; epigynous glands linear, 3–4 mm long, yellow, glabrous; ovary subglobose, 3–5 × 2–3 mm, light brown, pubescent. Infructescence 5–10 cm long, with



Figure 3. *Wurfbainia rubrofasciata* Docot & Domingo (A) Habit. (B) Ligule. (C) Inflorescence and infructescence. (D) Inflorescence showing different angle of the flowers. (E) Infructescence. (F) Floral dissection. (G) Stamen at different views. (notice the white arrow pointing a lateral staminode). Based from C.B.M. Domingo & R.V.A. Docot PL18-006 (type). Abbreviations: br: bracteole; ca: calyx tube; dc: dorsal corolla lobe; fb: fertile bract; fl: flower; inf: inflorescence; la: labellum; lc: lateral corolla lobes; ov: ovary with epigynous glands on the top. Scale bars = 1 cm. (Photographs by R.V.A. Docot).

3–4 fruits; fruits globose, 8–11 × 7–10 mm, dark red, sparsely pubescent, spinose; seed irregular to subglobose, ca. 2 mm long, black, aril white.

Etymology

The specific epithet refers to the red stripes at the base of the labellum.

Distribution and habitat

Wurfbainia rubrofasciata is endemic to Palawan, Philippines, where it inhabits semi-shaded areas of secondary forest near and along streams.

Phenology

Flowering and fruiting from March to August.

Provisional IUCN conservation assessment

Based on the IUCN red list categories and criteria (IUCN Standards and Petitions Committee, 2019), *Wurfbainia rubrofasciata* is assessed as Endangered (EN B2ab(iii), D). The area of occupancy (AOO) is estimated to be less than 10 km² (total AOO is c. 4 km²) as the species is only known from the type locality. *Wurfbainia rubrofasciata* is abundant within Barangay Irawan with more than 200 individuals observed. There are reports that the new species is likely present in Northern Palawan (e.g., El Nido) but specimens are needed in order to support this.

Notes

In the Philippines, *Wurfbainia elegans* resemble the new species by having dark brown fertile bracts and red spinose fruits. *Wurfbainia rubrofasciata*, however, can be easily distinguished by the presence of red stripes at the base of the labellum (vs minute red spots) and ovate and petaloid side lobes of the anther crest (vs linear and fleshy).

Based on overall morphology (Table 1), the most similar species is *Wurfbainia microcarpa* of continental Asia. Although both *W. microcarpa* and *W. rubrofasciata* can reach 2 m long, *W. rubrofasciata* can be readily distinguished in its vegetative state by the sericeous and entire ligule (vs tomentose and emarginate to bilobed), 7–11 mm long petiole (vs sessile), and obtuse lamina base (vs attenuate). In the floral morphology, both has white spikes. In *Wurfbainia rubrofasciata*, the rachis of the spike is congested while it is elongated in *W. microcarpa*. During anthesis, there are 2–4 flowers open at a time in *W. rubrofasciata* whereas in *W. microcarpa*, 1–2 flowers are open. In terms of flower colour, the calyx and corolla of *W. macrocarpa* vary from white, light pink to red. In *W. rubrofasciata*, however, it is white only. The most observable difference between the two species is the labellum colour and pattern in which there are 10–12 red stripes at the base in *W. rubrofasciata* while only minute red dots are present in *W. microcarpa*. There are no reported local name or use of the new species.

Table 1. Morphological comparison between *Wurfbainia rubrofasciata*, *W. microcarpa*, *W. elegans*, and *W. palawanensis*

Morphological characters	<i>Wurfbainia rubrofasciata</i>	<i>Wurfbainia microcarpa</i>	<i>Wurfbainia elegans</i>	<i>Wurfbainia palawanensis</i>
Ligule indumentum and apex	sericeous, entire	tomentose, emarginate to bilobed	pubescent, entire	glabrous, bilobed
Petiole length	7–11 mm	1–2 mm (sessile)	4–8 mm	5–9 mm
Lamina base	obtuse	attenuate	obtuse	attenuate
Lamina apex	acuminate	caudate	acuminate	attenuate
Flower anthesis	2–4 open at a time	1–2 open at a time	1–2 open at a time	1–2 open at a time
Rachis	congested	elongated	congested	congested
Bracteole apex	1-dentate	2-dentate	1-dentate	2-dentate
Calyx color	white only	white, light pink or red	reddish at the base, becoming white towards the apex	white only
Corolla lobes color	white only	white or red	white only	white only
Labellum color and pattern	white with 10–12 red stripes at the base of the labellum	white with minute red dots at the base of the labellum	white with yellow and minute red dots at the middle	white with yellow band and two parallel purplish-red lines at the middle
Filament color	white only	white or red	white only	white only
Lateral lobes of the anther crest	ovate, 3–4 mm long, petaloid	oblong, 2–3 mm long, fleshy	linear, 4–5 mm long, fleshy	linear, 1–2 mm long, fleshy
Fruit	red, spinose	red, spinose	red, spinose	light brown, smooth

Closest relatives of Wurfainia palawanensis

Elmer (1915) described *Amomum palawanense* using a set of specimens collected in Mount Pulgar (= now known as Thumb Peak), Palawan and noted that *Amomum loheri* K.Schum. (now placed in *Meistera*) as the most related species. So far, *W. palawanensis* is restricted in Palawan (Figure 2). Examination of the type, protologue, and relevant materials revealed that *W. palawanensis* is instead, due to the light brown fertile bracts and light brown smooth fruits (Figure 1C), more closely related to *W. mindanaensis* (Elmer) Škorničk. & M.F.Newman of the Philippines and *W. compacta* (Sol. ex Maton) Škorničk. & A.D.Poulsen in Indonesia. Future molecular-based phylogenetic work will be able to test this prediction.

Specimens examined

***Wurfainia elegans*.** Philippines. Luzon, Bataan, Mount Mariveles, Lamao River, May 1905, T.E. Borden 3033 (K, US*); Orani, Barangay Tala, Mount Natib, 12 June 2019, R.V.A Docot et al. 274 (FEUH); Ilocos Norte, Pagudpod, Barangay Balaoi, Kalbario-Patapat Natural Park, 18° 34.012'N, 120° 53.789'E, 360 m. a.s.l., 14 June 2022, R.V.A. Docot et al. 321 (FEUH); 18°33.831'N, 120°53.574'E, 385 m. a.s.l., 14 June 2022, R.V.A. Docot et al. 324 (FEUH).

***Wurfainia microcarpa*.** Laos. Oudomxia, Ban Nam Peng, 21°01'05 N, 101°39'32 E, 810 m.a.s.l., 22 June 1999, M.F. Newman 870 (E); Vientiane, Feuang, Bane Ne Xeng, 18°48'27"N, 102°6'31"E, 264 m.a.s.l., 1, May 2008, V. Lamxay et al. VL1214 (E + spirit).

***Wurfainia mindanaensis*.** Philippines. Mindanao, Davao del Sur, Todaya, Mount Apo, June 1909, A.D.E. Elmer 10822 (BO, C, FI, G, GH, HBG, K, L, U, Z); Surigao del Norte, Tubod, Barangay Sapa, 9°31'43.1"N 125°43'52.4"E, 11 July 2019, C.B.M. Domingo et al. SDN19-001 (FEUH + spirit, L, PNH, USTH).

***Wurfainia palawanensis*.** Philippines. Palawan, Puerto Princesa City, Mount Pulgar, March 1911, A.D.E. Elmer 12795 (BM, BO, FI, G, GH, K, L, U, US*, Z); Beside trail to first camp to San Rafael to Cleopatras Needle, 09°48'N, 118°56'E, 100 m.a.s.l., 15 January 1998, Q. Cronk et al., 25351 (E + spirit); Barangay Tanabag, 10 March 2020, R.V.A Docot et al. 299 (FEUH + spirit, PNH, PPC, USTH).

Key to the Philippine *Wurfainia* species

1a. Fertile bract light brown, persistent; fruit smooth, light brown.....2

- 1b. Fertile bract dark brown, non-persistent; fruit spinose, red.3
- 2a. Margin of sheet and ligule with brown hairs; flowering shoot elongates with age; lateral lobes of anther crest ovate and petaloid *W. mindanaensis*
- 2b. Margin of sheet and ligule glabrous; flowering shoot does not elongate with age; lateral lobes of anther horn-like and fleshy *W. palawanensis*
- 3a. Base of the labellum with red stripes; lateral lobes of the anther crest ovate and petaloid *W. rubrofasciata*
- 3b. Base of the labellum with minute red spots; lateral lobes of the anther crest linear and fleshy4
- 4a. Lamina narrowly ovate to linear, velvety beneath *W. elegans*
- 4b. Lamina narrowly ovate only, glabrous beneath *W. hedyosma*

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