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Short Communication: Rediscovery of the Zamboanga peninsula endemic *Boesenbergia longipetiolata* (Ridl.) Merr. (Zingiberaceae) after a lapse of over a century, including an amended description and an updated distribution

JANNAH E. YONGCO[1,♥], OLIVE A. AMPARADO[1], MARK ARCEBAL K. NAIVE[2,3,♥♥]

[1]Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-Iligan Institution of Technology. Andres Bonifacio Ave, Iligan City, 9200 Lanao del Norte, Philippines. ♥email: jannah.yongco@g.msuiit.edu.ph
[2]Center for Integrative Conservation, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences. Mengla, Yunnan 666303, China
[3]University of Chinese Academy of Sciences. No.1 Yanqihu East Rd, Huairou District, Beijing, PR China, 101408, China. Tel.: +86-10-68597521, ♥♥email: arciinaive19@gmail.com

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Abstract. *Yongco JE, Amparado OA, Naive MAK. 2023. Short Communication: Rediscovery of the Zamboanga peninsula endemic* Boesenbergia longipetiolata *(Ridl.) Merr. (Zingiberaceae) after over a century, including an amended description and an updated distribution. Biodiversitas 24: 6305-6309.* Zamboanga Peninsula is one of the important sites for biodiversity studies in the Philippines. Despite that, there have been limited attempts for field explorations focusing on the floral diversity and plant inventories in the region, resulting in the scarcity of floristic data and has left many of its plant species, including their status, unknown. Included is *Boesenbergia longipetiolata*, a poorly known plant species belonging to the Zingiberaceae family, endemic to the Zamboanga Peninsula, Western Mindanao, Philippines and considered a long-lost species as its existence had not been reported since it was first collected in 1909. A meticulous examination of a specimen collected from a recent botanical exploration conducted in Mount Timolan Protected Landscape of Zamboanga Peninsula in July 2022 revealed the rediscovery of *B. longipetiolata* after a lapse of over a century. This species is unique among all other Philippine endemic Boesenbergia species by having a very long petiole and is closely similar to the Malay Peninsula endemic *B. longipes* but differs significantly by having lower stature, narrowly ovate to lanceolate lamina, a longer calyx and a slender corolla tube. In this study, an amended taxonomic description, including information on its geographical distribution and habitat, and a proposed conservation status are provided.

Keywords: Endangered, endemic, ginger, Philippine biodiversity, Zamboanga Peninsula

INTRODUCTION

Botanical explorations focused on collecting gingers have updated our knowledge of the Zingiberaceae of the Philippines (Naive 2017; Naive and Alejandro 2018; Docot et al. 2020). However, the lack of recent floristic studies and limited available literature focusing on the ginger flora of the Philippines still impede our understanding of this family and has left many of its species, including their status, unknown as some of these species are of ecological and conservation importance.

The genus *Boesenbergia* Kuntze, placed in the subtribe Zingibereae, tribe Zingiberoideae (Kress et al. 2002), is a genus of relatively small, herbaceous plants found mostly in the forest understory, distributed from southwest India, eastward to the Philippines and southward to the Wallace Line (Mood et al. 2014). While the genus is no stranger to botanical literature, the full extent of its richness remains far from comprehensively explored. Currently, the genus contains approximately 99 species, with the center of diversity in Thailand and Borneo (Lam et al. 2022). Although most species are found in forests, some have adjusted to inhabit unusual environments, such as limestone formations close to the ocean and sandstone mountain tops at elevations of over 1000 m (Mood et al. 2014). Therefore, Boesenbergia species have evolved their vegetative parts into various forms to adapt to specific environments. While individual species within this group may exhibit some variations, some general characteristics are often associated with *Boesenbergia* plants, e.g., underground finger-like rhizomes and typically lance-shaped leaves usually attached to long petioles. Members of the genus can also be recognized by their basipetalous flowering pattern, in which the first flower opens near the inflorescence apex and each subsequent flower closer to the base (Mood et al. 2014). *Boesenbergia* is considered a genus that has received limited attention in botanical research compared to other genera in the ginger family. While certain species within the *Boesenbergia* genus, such as *Boesenbergia rotunda*, have been more extensively studied for their medicinal uses (Kanjanasirirat et al. 2020, Wang et al. 2022), one reason why *Boesenbergia* could be considered poorly studied is because of its taxonomic complexity. Despite these challenges and the scarcity of research on *Boesenbergia*, interest in the genus has been growing in recent years (Mood et al. 2014; Aishwarya et al. 2015; Mood et al. 2019). As botanical exploration, research efforts, and taxonomic revisions expand, our knowledge of

the *Boesenbergia* will likely improve, shedding light on its taxonomy.

In the Philippines, there are five recorded endemic species of *Boesenbergia* (Pelser et al. 2011 onwards) (Table 1). The most recently described species was *Boesenbergia igorota* Tad-o & Napal discovered in Cordillera region, the first and only reported *Boesenbergia* in mainland Luzon (Tad-o et al. 2022). The other two *Boesenbergia* species were recorded in Palawan Province, *Boesenbergia eburnea* Docot and *Boesenbergia leonardocoi* Funak. & Docot (Docot et al. 2020). The remaining two *Boesenbergia* species discovered in Mindanao are *B. macropoda* Merr. from Jolo, Sulu and *Boesenbergia longipetiolata* (Ridl.) Merr. from Zamboanga Sibugay, both are collected and described about a century ago.

Zamboanga Peninsula is one of the important sites for diversity studies in the Philippines. This region encompasses a range of protected areas, including natural parks, landscapes, seascapes, and wildlife sanctuaries, each characterized by its exceptional and diverse biological richness (Biodiversity Management Bureau 2015). Mount Timolan Protected Landscape (MTPL) is one of the protected areas in the region which features diverse habitats, including but not limited to forests, grasslands, and freshwater ecosystems and is considered the last frontier of Zamboanga del Sur in terms of biodiversity richness (Cudal et al. 2021). However, there have been limited attempts for field explorations focusing on the floral diversity and plant inventories in the region, resulting in the scarcity of floristic data and a lack of information about the status of many plant species.

Recent botanical explorations conducted in MTPL in July 2022 have led to the discovery of the species identified as a member of the genus *Boesenbergia*. After meticulously examining its morphology, thoroughly reviewing relevant literature, and comparing the type specimens of the genus *Boesenbergia* from the Philippines and neighboring countries, the specimen collected from MTPL matched with the poorly known *Boesenbergia longipetiolata.* The species was first described by Ridley in 1909 as *Gastrochilus longipetiolata* Ridl. based on the collection H.N. Whitford & J. Hutchinson 9110 from Zamboanga Sibugay, Mindanao. Before this report, *B. longipetiolata* had never been reported since its initial collection. A glaring scarcity of data compounded this prolonged absence from the botanical record due to the limited available literature about this plant species. On this basis, the current collection of *B. longipetiolata* is a rediscovery of the species from the Philippines after a lapse of over a century. Thus, the study prompted us to provide a detailed description based on our recently collected material, a photograph to aid identification, updated distribution information and provisional conservation status assessment.

MATERIALS AND METHODS

The measurements and descriptions were based on fresh, collected materials unless otherwise indicated. Multiple photographs were taken using Canon EOS 800D and the colored plates were prepared and edited in Affinity Photo software. Flowers were preserved in 70% ethanol and were subjected to stereomicroscopy. The general plant descriptive terminology follows Beentje (2016). Herbarium citations follow the Index Herbariorum (Thiers 2021). Relevant specimens and literature of *Boesenbergia* species from the Philippines and neighboring countries were examined in different herbaria through high-resolution images from Global Plants on JSTOR accessed at https://plants.jstor.org/ and Global Biodiversity Information Facility (GBIF) accessed from https://www.gbif.org. Based on our current knowledge and their terminology on categories, criteria, and subcriteria, conservation status was evaluated following the IUCN Red List categories (IUCN 2022) (Table 1). The extent of occurrence (EOO) and area of occupancy (AOO) were estimated using GeoCAT (Bachman et al. 2011).

RESULTS AND DISCUSSIONS

Taxonomic treatment

Boesenbergia longipetiolata (Ridl.) Merr., Enum. Philipp. Fl. Pl. 1: 243 (1924); *Gastrochilus longipetiolata* Ridl., Philipp. J. Sci., C 4: 166 (1909). (Figures 1A-B).

Type

The Philippines. Mindanao, District of Zamboanga, Port Banga, *H.N. Whitford & J. Hutchinson For. Bur. 9110* (could not be located).

Table 1. *Boesenbergia* species present in the Philippine archipelago

Name of species	Distribution	Conservation Status
Boesenbergia igorota	Luzon, Benguet	Critically Endangered (Tad-o et al. 2022)
Boesenbergia eburnea	Palawan	Critically Endangered (Docot et al. 2020)
Boesenbergia leonardocoi	Palawan	Endangered (Docot et al. 2020)
Boesenbergia macropoda	Mindanao, Jolo Sulu Archipelago	Not yet evaluated
Boesenbergia longipetiolata	Zamboanga City, Zamboanga Sibugay	Endangered (This study)

Amended description

Deciduous terrestrial herb, 20-40 cm tall. *Rhizome* subterranean, 3-5 mm in diameter, brownish white outside, greenish-white inside, faintly aromatic. *Pseudostem* 2.5-5.0 cm long, glabrous, brownish to yellowish white. *Leaves* 5-7, ligulate, petiolate; *ligule* deeply bilobed, lobes ligulate, glabrous, membranous, reddish green; *petiole* 10-19 cm long, 0.5-0.7 cm in diameter, fleshy, canaliculate, glabrous, green suffused with red; *lamina* narrowly ovate to lanceolate, 14-22 cm long × 4.0-6.5 cm wide, coriaceous, glabrous, green above, pubescent, pale green beneath, margin entire, apex acute. *Inflorescence* terminal, located between leaf sheaths, flowering basipetally; *peduncle* 1.0-1.8 cm long, fleshy, glabrous, creamy white; *bract* boat-shaped, 1-4 cm x 0.8-2.2 cm, striate, glabrous on both sides, margin membranous, entire, apex acute, long acuminate when young; bracteole ensiform, 1-2 × 0.5-0.8 cm wide, striate, glabrous on both sides, margin membranous, entire, apex acute; calyx tubular for half its length, 10-12 mm long, glabrous, translucent white, apex bidentate; corolla tube tubular, terete, 4.0-4.2 cm long, glabrous, white; dorsal corolla lobe narrowly ovate, 17-20 mm long × 5-6 mm wide, glabrous, cucullate, white to creamy white, slightly translucent, margin entire, involute, apex acute; lateral corolla lobes narrowly lanceolate to linear, 2.0-2.2 cm long × 0.25-0.35 cm wide, glabrous, white to creamy white, slightly translucent, margin entire, apex acute; labellum obovate, held flat, petaloid, 2.0-2.3 cm long × 1.8-2.0 cm wide, glabrous, white to creamy white with a yellow throat, margin repand, apex emarginate; lateral staminodes obovate, petaloid, 1.9-2.1 cm long × 1.0-1.2 cm wide, glabrous, white to creamy white, slightly translucent, margin entire, apex obtuse; filament 4-5 mm long × 1.8-2.0 mm wide, white; anther 4-5 mm long × 1.8-2.0 mm wide; anther crest 1.5-2.0 mm long, white, apex retuse; style 4.5-4.7 cm long, glabrous, white; stigma orbicular, white; epigynous glands two, linear, 2-4 mm long, glabrous, creamy white; ovary irregularly cylindrical, 3-5 mm long, trilocular, placentation axile, glabrous, white. *Fruit* not observed.

Distribution and habitat

Endemic to the Zamboanga Peninsula, Western Mindanao, Philippines. So far, it has only been found in Port Banga of Zamboanga City, Malangas of Zamboanga Sibugay, and Mt. Timolan Protected Landscape of Zamboanga del Sur (Figure 2). *Boesenbergia longipetiolata* was found growing along the trail with deeply shaded locality and damp, moist clayish soil at 730 m above sea level. It grew with other flowering plants such as *Globba campsophylla*, *Begonia affinis*, *B. oblongata*, etc.

Phenology

Observed flowering in July, August, October, and November.

Etymology

The specific epithet pertains to the long petiole of this beautiful and unique Boesenbergia species.

Vernacular name

According to Merrill (1924), the species was locally known by the Subanen tribe as ‘Bubùnad’.

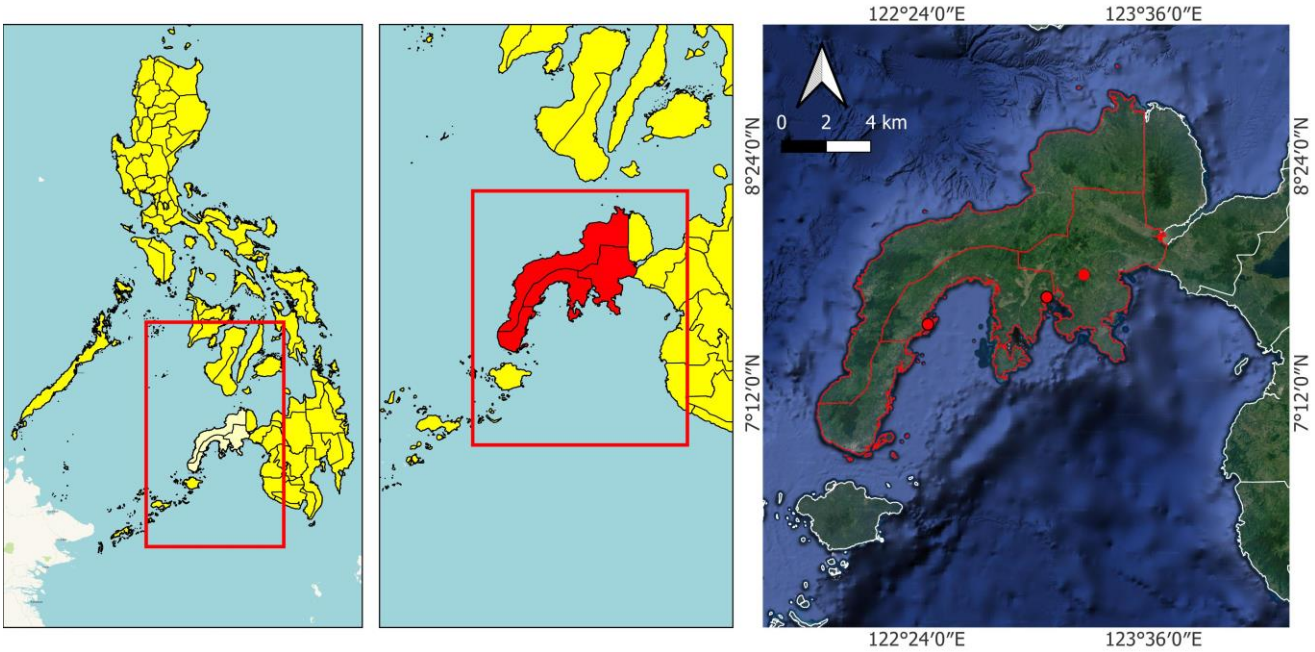

Figure 2. Map showing the distribution of the species in Mindanao Island, Philippines. Map created by KRF Mazo

Figure 1. *Boesenbergia longipetiolata* A. Habit B. Detail of flower. Scale bars: A: 10 cm; B: 1 cm. Photos by: MAK Naïve

Proposed conservation status

Three localities are known for this species, including the type locality giving an Extent of Occurrence (EOO) of 132.631 km^2 and the approximate Area of Occupancy (AOO) of 12 km^2. Although we found it within the protected area, the species is quite rare, with only a small population in a limited area. Following the Red List criteria of the IUCN Standards and Petitions Subcommittee (2022), the species would fall into the IUCN category of 'Endangered' [EN B1ab(iii)].

Specimen examined

The Philippines. Western Mindanao, Zamboanga del Sur, Tigbao, Mt. Timolan Protected Landscape, along the trail, 730 m, 26 July 2022, MAK Naive 129 (HNUL); Zamboanga Sibugay, Malangas, Oct. to Nov. 1919, M. Ramos and G. Edano 36798 (P02203069-image seen! US00331444-image seen!).

Notes

Boesenbergia longipetiolata is unique among other *Boesenbergia* species from the Philippines in having longer petiole, as the epithet indicates. According to Ridley (1909), this species resembles *B. longipes* (King & Prain ex Ridl.) Schltr. in Indochina but has not indicated those characters that would delineate the two species. Based on our investigation and the broadened description provided by Holttum (1950), *B. longipetiolata* differs from *B. longipes* by having lower stature (20-40 cm vs. 60 cm) and narrowly ovate to lanceolate lamina about 14-22 x 4.0-6.5 cm (vs. 30 x 10 cm, widest above the middle), with acute apex (vs. broadly pointed). Sirirugsa (1992) made a revision of the genus resulting to additional floral characters being described indicating that inflorescence are both terminal and enclosed between leaf-sheaths but slightly differs in peduncle 1.0-1.8 cm long (vs 2-3 cm long); a longer calyx with 10-12 mm long, tubular for half its length, apex bidentate (vs 5-7 mm long; lobes short and broad, apex truncate); a slender corolla tube 4.0-4.2 cm long (vs 2.4 cm long) with dorsal corolla lobe narrowly ovate, 17-20 mm long x 5-6 mm wide, glabrous, cucullate, white to creamy white, slightly translucent, margin entire, involute, apex acute (vs 1-5 cm. long and 7 mm. wide, elliptic, acute, laterals a little narrower, all white); labellum white to creamy white with a yellow throat, obovate, flat, apex emarginate and margin repand (vs whitish with red blotches at the middle, obovate, saccate, apex reflexed and crinkled); staminodes white to creamy white, slightly translucent, obovate, and apex obtuse (vs whitish, obovate, apex 2-lobed); slightly different stamen: filament 4-5 mm long, white (vs 3 mm long, brownish), anther 4-5 mm long (vs 6 mm long), anther crest apex retuse (vs rounded); stigma orbicular (vs inconspicuously lobed, not ciliate).

The rediscovery of *B. longipetiolata* after a lapse of over a century presents a significant opportunity for botanical researchers, providing a more accurate and up-to-date classification and description of the species, contributing to our understanding of its place within the genus *Boesenbergia* and the broader family Zingiberaceae. The rediscovery not only emphasizes the need to undertake more floristic surveys in Zamboanga Peninsula and nearby regions but also underscores the idea that other plant species may be waiting to be discovered or that have remained undocumented for an extended period. Additionally, it fills up the gap about the deficient data of this long-lost species, which has implications for conservation efforts, as species with limited data may be at greater risk of being overlooked, facing threats to their

survival. Extensive fieldwork in less-explored forested areas of the region and other parts of the Philippines is much needed to confirm the diversity of the genus in the country and the possibility of recollecting the other Mindanao endemic species *B. macropoda*. Furthermore, these efforts may lead to the discovery of more highly localized species. By continuing floristic surveys, the Philippines can significantly improve our knowledge of the Zingiberaceae family and better protect the valuable ginger species found within its borders. These efforts not only contribute to scientific knowledge but also help safeguard the country's rich biodiversity.

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