



Discovery through citizen science: *Cryptocoryne paglaterasiana* (Araceae), a new endangered species from Tampilisan, Zamboanga del Norte, Western Mindanao

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ABSTRACT: *Cryptocoryne paglaterasiana*, a new endemic species discovered by two citizen scientists in Zamboanga del Norte, Western Mindanao, Philippines is herein described and illustrated. A detailed description, colour plates, phenology, distribution, provisional conservation status and a list of *Cryptocoryne* species in the Philippines are presented below. With this discovery, the Philippines now holds a total number of seven *Cryptocoryne* species and except for one they are endemic, rare and threatened.

KEY WORDS: Aquatic plant, aroid, *Cryptocoryne joshanii*, Philippine biodiversity, Plant taxonomy, Zamboanga peninsula flora.

INTRODUCTION

Citizen science is the process of involving the general public in scientific research in order to advance our scientific knowledge. It has become a useful tool for democratizing science and advancing the objective of equitable and universal access to scientific data and knowledge. In the Philippines, several new species have been described through the discovery by citizen science (Boyce *et al.*, 2015; Ang *et al.*, 2020a; Hettterscheid *et al.*, 2020) and sometimes they are involved in species description and publication (Naive *et al.*, 2017; Naive and Martyr, 2018; Ang *et al.*, 2020a, b).

In July 2022, two citizen scientists contacted the first author to help them in the identification of their recent *Cryptocoryne* Fisch. ex Wydler observation in the streams of Tampilisan, province of Zamboanga del Norte. He then visited the locality specimen sampling for further investigation on its identity, take in situ photographs and identify any possible threats for an IUCN conservation assessment. Upon careful examination of its vegetative and reproductive morphology as well as comparison to any relevant literature and digitized herbarium specimens for the genus *Cryptocoryne* in the Philippines and neighbouring countries, it became apparent that the collected specimen does not match any other known *Cryptocoryne* species. Thus, we herein describe it as *C. paglaterasiana*, a species new to science and the seventh representative of the genus *Cryptocoryne* for the Philippine archipelago (Table 1). A detailed description, photographs to aid identification, distribution, phenology, ecology, proposed conservation status and comparison to its allied species are provided below.

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

1. *Cryptocoryne aponogetifolia* Merr.
Endemic, Luzon (Sorgozon and Albay Provinces), Negros, Panay
2. *Cryptocoryne ciliata* (Roxb.) Schott var. *latifolia* Rataj
Thailand (Bangkok), Cambodia (Koh Kong), Malaysia (Peninsular, Sarawak and Sabah), Indonesia (Bintan, Anambas, Moluccas (Morotai, Ambon)) and the Philippines (Palawan)
3. *Cryptocoryne coronata* Bastm. & Wijng.
Endemic, Mindanao (?)
4. *Cryptocoryne joshanii* Naive & R.J.T.Villanueva
Endemic, Basilan
5. *Cryptocoryne paglaterasiana* Naive & N.Jacobsen sp. nov.
Endemic, Mindanao
6. *Cryptocoryne pygmaea* Merr.
Endemic, Mindanao
7. *Cryptocoryne usteriana* Engl.
Endemic, Guimaras

MATERIALS AND METHODS

The measurements and descriptions were based on fresh collected materials. Multiple photographs were taken and the coloured plates were prepared and edited in Affinity Photo software. Inflorescences were preserved in 70% ethanol and were subjected to stereomicroscopy. Relevant specimens and literature of *Cryptocoryne* species from the Philippines and neighbouring countries were examined in different herbaria and 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>. An assessment of conservation status was carried out following IUCN (2022), based on our current knowledge and using their terminology on categories, criteria and subcriteria.



TAXONOMIC TREATMENT

Cryptocoryne paglaterasiana Naive & N.Jacobsen, *sp. nov.* **Figs. 1–3**

Type: PHILIPPINES. Western Mindanao, Zamboanga del Norte, Tampilisan, elev. 150 m, 31 July 2022, MAK Naive 131 (holotype PNH, isotype HNUL).

Diagnosis: Spathe somewhat resembling *Cryptocoryne joshanii* Naive & J.R.T.Villanueva but is only 4–7 cm long ($\frac{1}{4}$ – $\frac{1}{2}$ length of *C. joshanii*); stigmas creamy white, ascending to erect (*C. joshanii* has purplish red, forwardly bent stigmas); leaves with a blackish to reddish brown purple lamina (*C. joshanii* has a (silvery) green lamina with irregular line markings). The plant size also significantly differs as this new species is much smaller than *C. joshanii*.

Description: Amphibious, perennial herb, up to 7 cm tall. *Rhizome* terete, 4–8 mm in diameter, fleshy, glabrous, brownish white outside, creamy white inside, stolon long, slender. *Cataphylls* narrowly triangular, falcate, 2–3 cm long by 0.5–0.9 cm wide, chartaceous, striate, basal 1/3 creamy white, the rest of the length brownish white, margin entire, cucullate, apex long acuminate. *Leaves* 11–19 cm long, fully spreading, up to 10 leaves per individual; *petiole* 7–12 cm long (longest in deeply submerged specimens), flattened, glabrous, canaliculate, brown to pale brown; *lamina* ovate to oblong, 5–8 cm long by 2–4 cm wide, glabrous on both sides, adaxially (blackish) brown to reddish brown, abaxially brick red, margin entire, base cordate, apex acute. *Peduncle* flattened, 8–16 mm long, fleshy slightly sulcate, glabrous, purplish cream. *Spathe* 4–7 cm long; *kettle* narrowly urceolate, 9–14 mm long, 4–5 mm in diameter, fleshy, glabrous, creamy white; *tube* tubular, 12–19 mm long, 3–4 mm in diameter, fleshy, glabrous, creamy white suffuse with dark maroon at the apex; *limb* narrowly triangular, erect to forward pointing, 1.5–3 cm long, twisted surface and margin with conspicuous, large, irregular protuberances, dark maroon, margin recurved in older specimens, apex long acuminate; *collar* vaguely indicated, throat yellow. *Spadix* 1.8–2.5 cm long. *Female flowers* 5–7; *ovary* 2.0–2.5 mm long, 1.5–3.5 in diameter, creamy white to yellowish white, minutely papillose; *stigmas* 1.5–2.0 mm long, creamy white, ascending to erect, concave, narrowly obtuse; *olfactory bodies* golden yellow; naked *axis* 6.5–8.0 mm long, glabrous, crystal white to purplish white. *Male flowers* ca. 30, pale yellow, irregularly rounded, smooth, congested; sterile *appendix* creamy white to yellowish white. Young *syncarp* broadly ovoid, ca. 5 mm long, ca. 4 mm in diameter, greenish brown, verrucose, apex apiculate; *seeds* ellipsoid, 2.5–3.0 mm long, ca. 1 mm in diameter, curved, brownish, embryo cone-shaped, with a simple, undifferentiated plumule.

Distribution: Endemic to the Zamboanga Peninsula. The species has so far only been found in the province of Zamboanga del Norte, Western Mindanao, Philippines.

Ecology: The species was found growing attached to cracks in the rock or in the sandy soil and in sympatry with *Cryptocoryne pygmaea* Merr. in a stream with clear, slow running water and in a deeply shaded to brightly lit with lots of decaying leaves at 140–150 m a.s.l. The populations were submerged or partly submerged with the leaves exposed.

Phenology: Plants of the new species was observed flowering in March, July and August.

Eponymy: The specific epithet '*paglaterasiana*' was coined after the names of two citizen scientists wherein '*pagla*' was derived from Mr. Ariel Paglalulan and '*teras*' from Mr. Edilberto Ponteras, who discovered the species and brought it to the attention of the first author.

Cultivation: The first results in cultivation revealed that it is an easy grown plant in sandy soil added with some leaf litter.

Proposed conservation status: Following the IUCN Standards and Petitions Committee (2022), we propose *Cryptocoryne paglaterasiana* to be treated as 'ENDANGERED' (EN). At present, the species is only known in the streams of Municipalities of Tampilisan and Liloy with less than 100 mature individuals found. It was found growing near human settlements where anthropogenic activities are rampant (e.g., quarrying, poaching, slash and burn, and agriculture) endangering the existence of this highly endemic species.

Taxonomic notes: Based on overall morphology, the spathe of *Cryptocoryne paglaterasiana* resembles *C. joshanii* but is much smaller. However, the new species differs significantly in having ovate, purple leaves (vs. lanceolate, silvery green with darker green irregular markings leaves in *C. joshanii*), urceolate kettle (vs. tubular to narrowly ovoid kettle in *C. joshanii*), narrowly triangular limb (vs. erect, ovate limb in *C. joshanii*), creamy white, narrowly obtuse stigmas (vs. purplish red, acicular stigmas in *C. joshanii*), and congested male flowers (vs. lax male flowers in *C. joshanii*). The new species grows in sympatry with *C. pygmaea*, however, it can easily be recognized in having purplish leaves (vs. green leaves in *C. pygmaea*), collar only vaguely indicated (vs. presence of collar in *C. pygmaea*), forward pointing, dark maroon limb (vs. horizontally twisted, purple limb in *C. pygmaea*) and congested male flowers (vs. lax male flowers in *C. pygmaea*).

In the checklist presented in Table 1, we excluded *Cryptocoryne auriculata* Engl. which was included in the list of Co's Digital Flora of the Philippines (Pelser *et al.* 2017). The suggested occurrence of *C. auriculata* in the Philippines was based on two wrongly annotated collections, viz, Merrill 9272 (K, US), from Palawan, Tatay (a new yet undescribed species), and Ramos & Edano 37040 (BM, K, L, P, US), Mindanao, Zamboanga District, Malangas (a yet unidentified specimen due to insufficient herbarium material). *C. auriculata* has a very short spathe with an upright black purple limb and only occurs in Borneo (see Bastmeijer, 2018).

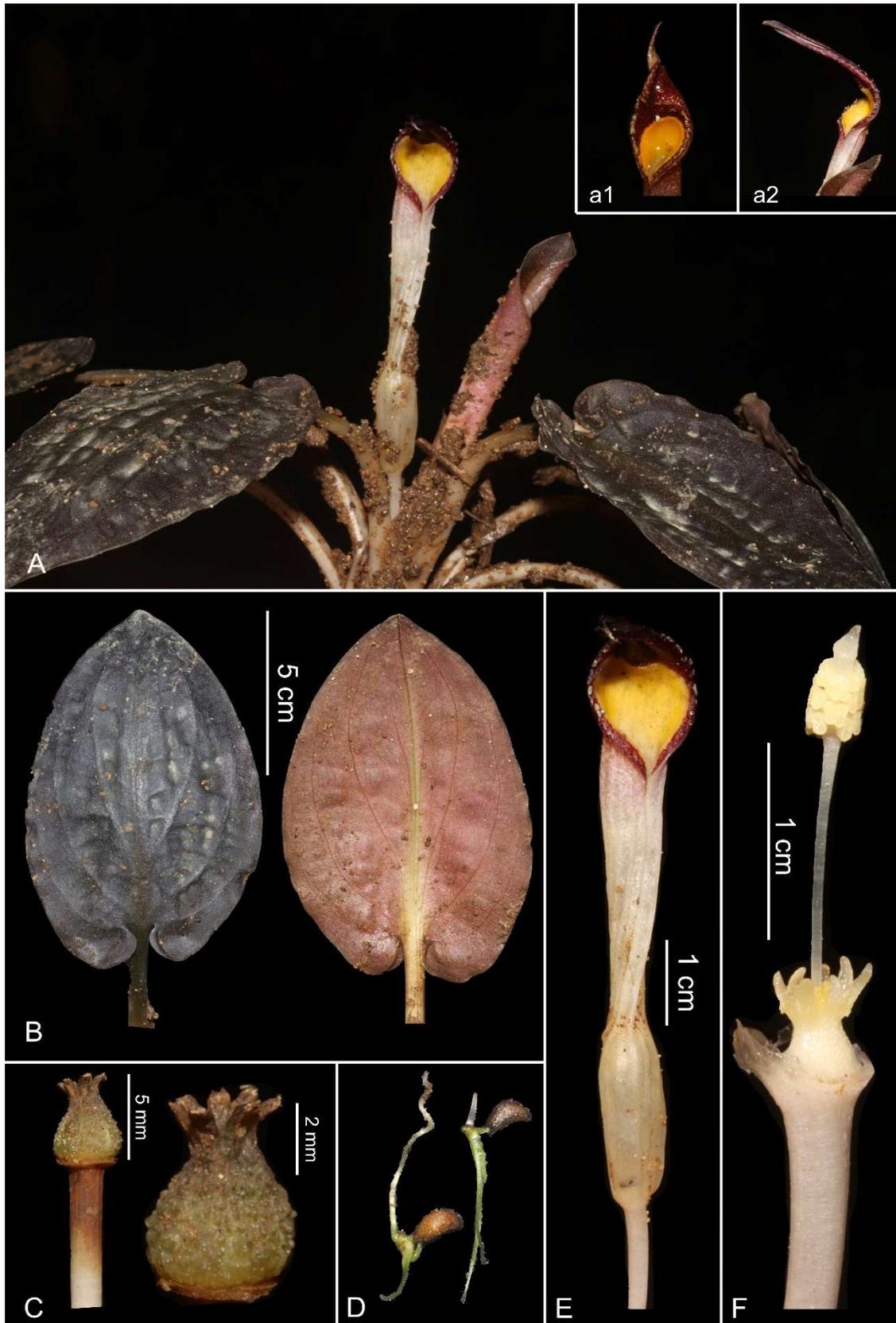


Fig. 1. *Cryptocoryne paglaterasiana* Naive & N.Jacobsen, sp. nov. **A.** Habit, a1: front view of limb, a2: profile view of limb **B.** Detail of leaves (left: adaxial leaf, right: abaxial leaf) **C.** Detail of young syncarp **D.** Seedlings **E.** Spathe **F.** Spadix. Photos by: MAK Naive.



Fig. 2. Habitat pictures of *Cryptocoryne paglaterasiana* **A.** Detail of habitat **B.** Plants in deeper water with long leaves. **C.** Plants fastened in cracks in the bedrock. **D.** Emergent plant fastened in the rock. Photos by MAK Naive.



Fig. 3. Submerged flower of *Cryptocoryne paglaterasiana* **A.** Unopened spathes **B.** Spadix. Photos by MAK Naive.

The discovery of this new species highlights the importance of citizen science and the need for their engagement in exploring and conserving our Philippine biodiversity. In addition, this discovery signifies the urgent need to extensively explore the flora of Philippine archipelago most especially in the Zamboanga Peninsula as there are still more species awaiting discovery and description (e.g., Mazo *et al.*, 2021, 2022a, b; Mazo and Rubite, 2022; Mazo, 2022) and given the increasing pace of forest destruction and habitat loss. Given the precarious state of this new species, propagation and *ex situ* conservation should be done to create enough stock for conservation work and for the possibility of re-introducing this species in its natural habitat.

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