

New distribution record of *Rhombophryne coudreaui* (Angel, 1938) from a low-elevation tropical forest fragment on the east coast of Madagascar

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For decades, the genus *Rhombophryne* Boettger, 1880, also known as Diamond Frogs, was considered monotypic. Molecular assessments that started in 2005 (Andreone et al., 2005; Wollenberg et al., 2008) resulted in the reassignment of numerous *Plethodontohyla* species to this genus (Frost et al., 2006), which now consists of 27 currently described nominal species (Frost, 2026; Scherz et al., 2026) organised into six species groups (Belluardo et al., 2022; Scherz et al., 2026), all of which are endemic to the humid forests of Madagascar. In addition, there are some additional candidate species which will be analysed once newly collected material will become available (Scherz et al., 2026). Species belonging to this genus are characterised by microendemic distributions and are often known from only a single locality (Belluardo et al., 2022; Scherz et al., 2022, 2026).

Rhombophryne coudreaui (Angel, 1938) belongs to the *R. testudo* species group, comprising moderately to highly specialised burrowing frogs (Belluardo et al., 2022; Scherz et al., 2022, 2026). This species measures

approximately 28 mm in snout-vent length (SVL), exhibiting a light brown dorsal colour and granular skin (Glaw and Vences, 2007; Scherz et al., 2026). The ecology and biology of this species are poorly known, although it seems to be a species that lives in the forest leaf litter. Clutches or tadpoles of *R. coudreaui* are unknown, but it has been hypothesised that the species lay eggs in liquefied jelly in soil cavities (Scherz et al., 2022, 2026). It is currently classified as Near Threatened following the criteria of the IUCN Red List. However, this assessment is based on an inferred distribution that includes the type locality of *R. coudreaui* (the Réserve Intégrale de Betampona), the Ambolokopatrika, Maroantsetra and the Parc National de Marojejy (IUCN SSC Amphibian Specialist Group, 2016), but specimens from these latter three localities belong to the recently described *Rhombophryne maraorao* Scherz et al., 2026; as such *R. coudreaui* is reliably known only from Betampona (where it has been found at Sahambendrana, Maintimbato, Sahaindrana and Sahabefoza; Rosa et al., 2012; Piccoli et al., 2025), and Ampasina (Scherz et al., 2026) (Fig. 1).

As part of our surveys of the herpetofauna of the forest fragments of the Toamasina district, we conducted four expeditions to the Analabe Forest (Fig. 1), between 2024 and 2025. The Analabe forest fragment (150–240 m elevation) is an unprotected fragment of low-elevation forest, and it is a typical example of the remaining fragments scattered along the east coast of Madagascar. It covers an area of approximately 17 hectares and is characterised by a low-altitude tropical climate. It is surrounded by secondary forests dominated by Traveller's Palm (*Ravenala* spp.), rice fields, and arboriculture areas (Licata et al., 2022). Inventories carried out in this forest have so far revealed the presence of 27 amphibian species (X.P., unpublished data), despite its small size and the threats it faces.

During our visits to this site, we performed opportunistic

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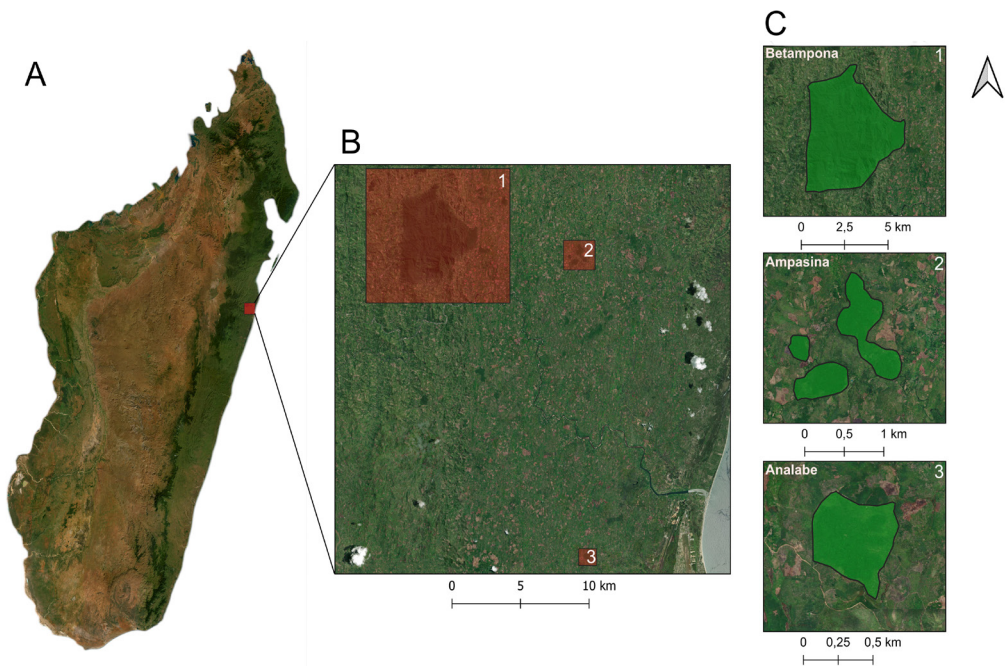


Figure 1. Geographic location and extent of the three forests in eastern Madagascar where *Rhombophryne coudreaui* is known to occur. (A) Map of Madagascar indicating the regional location of the forests (red box) along the east coast; (B) Regional view highlighting the relative position of the three forests; (C) Detailed view of each forest site showing site boundaries and surface area: 1) Betampona (2665 ha), 2) Ampasina (74.1 ha), and 3) Analabe (17 ha). Satellite imagery was obtained from ESRI World Imagery via QuickMapServices in QGIS.

searches during both day and night, using headlamps and torches, exploring all available microhabitats along trails and by visiting small streams and temporary ponds present in the area. During our visits we observed four individuals of *R. coudreaui* (Fig. 2; Table 1). The first individual was observed in July 2024, during the day, while the three other individuals were found in January 2025, during the night. All individuals were found in the moist leaf litter. Tissue samples of all individuals (XP_0049, XP_0386, XP_0391 and XP_0423) were collected to infer the extent of the genetic differentiation of this population from the *R. coudreaui* population

from the type locality. Current identification is based on morphology, and more specifically on the following set of externally visible characters: small body size (XP_0391: SVL = 22.2 mm; XP_0423: SVL = 21.8 mm), head much wider than long, small eyes, short hindlimbs, large inner metatarsal tubercle, indistinct outer metatarsal tubercle, second finger shorter or equal in length to fourth, third toe distinctly longer than fifth, dorsal skin rugose with converging longitudinal rows of tubercles, presence of few, small chin barbels, absence of pronounced superciliary spines, and absence of inguinal ocelli. Morphologically, this species differs

Table 1. Collection and locality data for the four individuals of *Rhombophryne coudreaui* recorded at Analabe forest, eastern Madagascar. XP, field number of Xavier Porcel.

Tissue code	GPS coordinates (°S, °E)	Elevation (m)	Date	Time (h)	Habitat
XP_0049	-18.1053, 49.3236	75	07/07/2024	09:18	Leaf litter
XP_0386	-18.1071, 49.3246	38	15/01/2025	18:48	Leaf litter
XP_0391	-18.1071, 49.3246	38	15/01/2025	19:04	Leaf litter
XP_0423	-18.1071, 49.3246	38	15/01/2025	18:48	Leaf litter

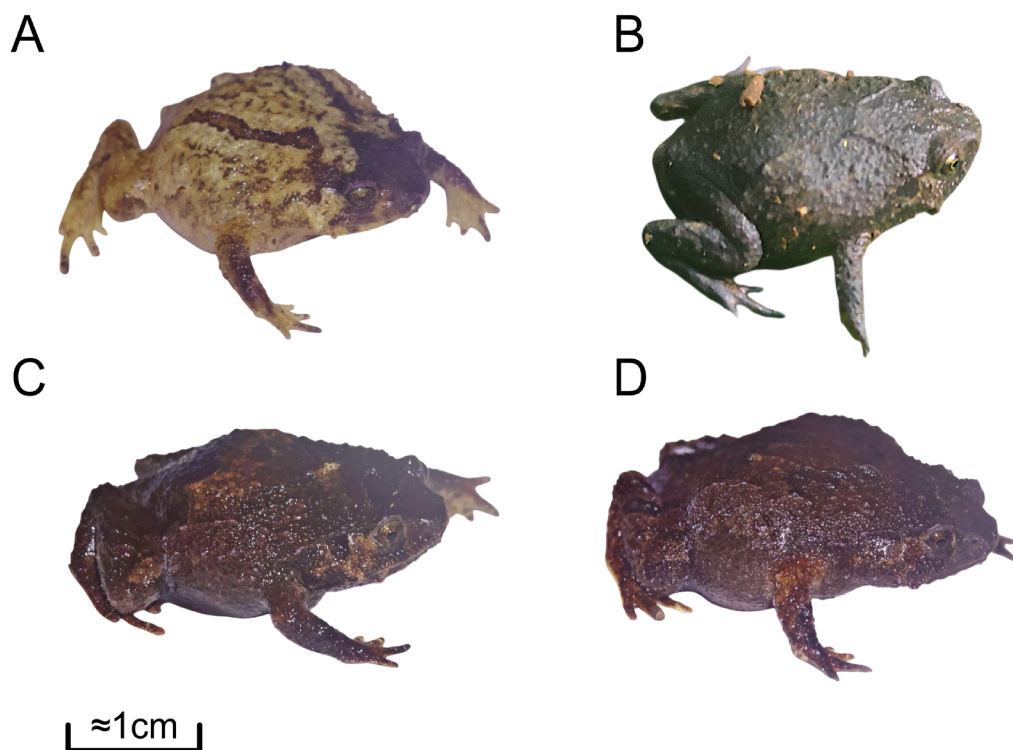


Figure 2. The four sampled individuals of *Rhombophryne coudreaui* found at Analabe forest, eastern Madagascar, showing variation in dorsal colouration and patterns. Individual corresponding to (A) tissue sample XP_0423; (B) tissue sample XP_0049; (C) tissue sample XP_0391; (D) tissue sample XP_0386). Photos by Xavier Porcel.

from its closest relative, *R. maraorao*, by possessing fewer and almost indistinguishable barbels on the lower lips (versus presence of pronounced pointed barbels), larger relative eye size, expressed as horizontal eye diameter (ED) over head length (HL) (XP_0391: ED = 2.6, HL = 7.8, ED/HL = 0.33, XP_0423: ED = 2.1, HL = 7.5, ED/HL = 0.28; versus ED/HL = 0.25–0.27 in *R. maraorao*) and in relative finger length, with the second finger shorter or equal in length than the fourth, versus the second finger slightly longer than the fourth in *R. maraorao* (Scherz et al., 2026).

Despite two previous visits conducted at Analabe by members of our team (2018 and 2019), this species was not yet previously detected, but this undetection is likely due to its fossorial lifestyle and inconspicuous colouration. Other leaf-litter species were discovered only after numerous expeditions into Madagascar's forests, such as *Rhombophryne* sp. Ca15 or *Stumpffia davidattenboroughi* at Betampona Strict Nature Reserve (Piccoli et al., 2025) or *Wakea madinika* in the Ankarana Special Reserve (Carné et al., 2025).

Species inventories that target the leaf litter offer the best opportunity to locate new populations of *R. coudreaui* and extending these efforts represents the best chance for obtaining a more comprehensive understanding of its distribution across the low-elevation forests of central-eastern Madagascar. This will be crucial to refine its conservation status under the IUCN criteria.

The limited distribution of *R. coudreaui* (Fig. 1) places it directly in the path of environmental pressures. Madagascar has suffered from significant deforestation for decades (Vieilledent et al., 2018), mainly due to the practice of slash-and-burn agriculture (locally known as *tavy*) and the exploitation of forest resources (Suzzi-Simmons, 2023). This has resulted in an increasingly fragmented forest cover, with 46% of the remaining forest located within 100 m of the forest edge (Vieilledent et al., 2018). Several studies have shown that, despite their small size, these fragments can harbour a significant amphibian diversity (e.g., Penny et al., 2017; Hyde Roberts et al., 2025) and are crucial to

sustaining regional biodiversity (Riemann et al., 2015; Ndriantsoa et al., 2017).

Beyond the necessary inventory effort to fully reveal Malagasy biodiversity, protecting these small forest fragments is an urgent priority. The Analabe forest is highly susceptible to edge effects, which can alter abiotic conditions and affect amphibian species up to 1 km into the interior (Laurance et al., 2011; Hardwick et al., 2015; Schneider-Maunoury et al., 2016; Tuff et al., 2016). For *R. coudreaui*, a leaf-litter specialist, the reduction in soil and litter moisture at the edge of forests (Riutta et al., 2012) could critically compromise survival and larval development, particularly if it is confirmed that the species reproduces using liquefied jelly nests within cavities (Mitchell, 2002; Scherz et al., 2022). Implementing reforestation with endemic trees along the fragment edges is essential to create a buffer zone, mitigating both edge effects and climate change impacts (Ndriantsoa et al., 2017; Huang et al., 2022).

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