

Extended distribution of two frogs from Madagascar: *Mantella crocea* and *Mantella manery* (Anura: Mantellidae)

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Abstract. The genus *Mantella* is composed of 16 species of frogs endemic to Madagascar. More than half of the genus is considered threatened with extinction according to the IUCN. The geographical distribution of several species is still poorly understood and this hinders conservation efforts. I confirm several new localities for two species of *Mantella* and report geographic coordinates that significantly extend their known distribution. *Mantella crocea* was confirmed at Zahamena National Park, which broadens its distribution to the north. *Mantella crocea* was also confirmed in forest bordering the north of Torotorofotsy marsh. Frogs that phenotypically appear to be *M. manery* were found near Daraina in northeast Madagascar. Here, they occur alongside *M. ebenau*, with some individuals intermediate in coloration between the two species, suggesting possible hybridization.

Keywords. Amphibia, Mantellidae, distribution, Zahamena, Daraina, Madagascar, *Mantella ebenau*, *Mantella crocea*, *Mantella manery*.

The Madagascar-endemic genus *Mantella* is composed of 16 species of small frogs, many of which display vibrant aposematic coloration (Daly et al., 1996). They are well-known for their attractive colors, and many species are heavily collected for the pet trade (Andreone et al., 2006; Rabemananjara et al., 2008). Although they are among the most familiar Malagasy amphibians, the distribution of many species remains unclear, and this may delay conservation efforts (Vences et al., 1999; Bora et al., 2008). Subsistence agriculture, timber extraction, charcoal production, and livestock grazing threaten their habitat (Andreone et al., 2005). In order to take appropriate conservation measures, the distribution of mantella frogs must be more fully understood. Several species, such as *M. manery*, have until recently only been known from a single site. Others, like *M. crocea*, have been reported from protected areas outside their known distribution, but without geographic coordinates for confirmation. Precise geographical data for the distribution of *Mantella* species is needed to determine their conservation priority and potentially expand or create new protected areas to included populations of threatened frogs found in forest fragments or other habitat under high pressure from human populations.



Figure 1. *Mantella crocea* at Bakozetra site.

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Figure 2. *Mantella crocea* in Zahamena National Park.

Field work was conducted from January 11th-14th and February 3rd-12th 2009. Local guides and community members helped locate mantella populations after examining photographs of target species. Frogs were actively searched for during the day, starting soon after sunrise and ending late afternoon. A GPS unit was used to record geographic coordinates and elevation. Site names were given by guides or members of the local community. Voucher photographs were taken with an Olympus E-510 digital SLR camera.

A population of *M. crocea* was confirmed directly north of Torotorofotsy marsh at 18°46.186S, 48°25.605E and 860 m on February 13th, 2009. This location is likely the same as that provided by Zimmerman and Hetz (1992) and Behra et al. (1995), though these accounts do not provide geographic coordinates. Bora et al. (2008) offer estimated coordinates for this locality and name it Bakozetra, but note that *M. crocea* had not been confirmed here in recent surveys. Five individuals were located in the afternoon, all displaying a typical tan-brown dorsal coloration and black face mask (Fig. 1). The forest was partially flooded at the time of survey. This population was first identified by guides

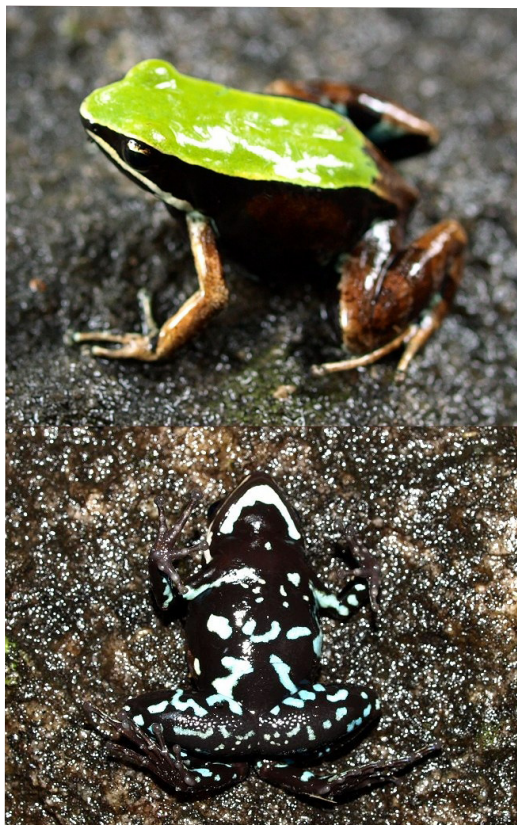


Figure 3. *Mantella manery* from near Ankazafa.

of the NGO Association Mitsinjo, which manages the area with local community members. The forest here borders the north of Torotorofotsy marsh and is protected under the RAMSAR Convention on Wetlands.

M. crocea was also confirmed in Zahamena National Park, at 17°32.114S, 48°42.725E and 1086 m. Two individuals were located over a three day period in February, 2009 along the main tourist trail in the northwest corner of the park. Both were predominantly green in coloration with a black mask (Fig. 2), appearing very similar to *M. crocea* at Ambohitantely Forest Reserve. Bora et al. (2008) report *M. crocea* at Zahamena National Park from surveys conducted in 1994 and from a description by a Peace Corps worker in 2008, but these reports lacked geographic coordinates for confirmation or a description of frogs at this location.

Frogs that phenotypically appear to be *M. manery* were found at 13°12.340S, 49°36.589E and 498 m elevation on January 14th, 2009 (Fig. 3). This is near the village Ankazafa, which is several kilometers west of the town of Daraina. A large number of males were observed calling near the base of boulders in gallery forest following a rainstorm in the afternoon (Fig. 4). The



Figure 4. Habitat of *Mantella ebenaui* and *Mantella manery* near Ankazafa.

surrounding area was mostly grassland and agricultural fields. *M. ebenaui* also occurred in the forest along the stream, where they seemed as abundant as *M. manery* (Fig. 5). Two frogs with a yellow dorsum intermediate in coloration between the green of *M. manery* and the brownish-red of *M. ebenaui* were also observed (Fig. 6). These may represent hybrids, but future genetic work will need to be done on all mantellas in this area to determine their taxonomic status. The first reports of these frogs were provided by Toshihiko Shun Theo Nagano to Miguel Vences in 2006 at 13°15.347S, 49°36.513 and 292m elevation (M. Vences, personal communication), which is several kilometers south of the site I report. In addition to the large number of *M. manery* observed near Daraina, a single juvenile was found at their type locality near Camp 1 in Marojejy National Park. It displayed a pattern identical to that of adults (Fig. 7). Three days of actively searching the area for additional specimens did not yield any.

The verification of *M. crocea* near Bakozetra and at Zahamena National Park confirms this IUCN Red-listed Endangered frog in two protected areas. Previously, this species was known with certainty only from one protected area (Ambohitantely Forest Reserve, Antananarivo Province), with the other six confirmed *M. crocea* sites occurring over 100 km east of here, in unprotected forest around Moramanga. Bakozetra is in this same area, but because of its proximity to Torotorofotsy



Figure 5. *Mantella ebenaui* (left) and *Mantella manery* (right) on a boulder near Ankazafa.



Figure 6. An individual showing coloration intermediate between *Mantella ebenaui* and *Mantella manery* near Ankazafa.



Figure 7. Juvenile *Mantella manery* from Marojejy National Park.

marsh, the forest here is included as part of a RAMSAR site and protected under international law. Zahamena National Park is over 90 kilometers north of all other known *M. crocea* populations. Future surveys should be conducted in the unprotected forests between these two newly confirmed *M. crocea* localities because there are undoubtedly other sites in the eastern rainforest belt where this species occurs that have yet to be documented.

Until now, *M. manery* was known only from its type locality near Camp 1 of Marojejy National Park, where just three individuals had been found. Recently, frogs that appear to be *M. manery* have also been identified in the Analabe Forest along the Ramena River, which is northwest of Marojejy National Park (Raxworthy et al., 2008). The site near Ankazafa described in this article is more than 80 kilometers north of either of these localities, and significantly extends the known distribution of *M. manery*. Additionally, while this species seems to occur at low densities at its type locality, near Ankazafa it was abundant during the survey. Perhaps most interesting about the site near Ankazafa was the presence of *M. ebenaui*, and the two specimens

intermediate in coloration between this species and *M. manery*. Phylogenetic studies should be conducted on this population of frogs to sort out their systematics. Unfortunately, this small forest fragment where *M. manery*, *M. ebenau*, and putative hybrids were found is unprotected and in an area that appears to be used heavily for zebu grazing and agriculture.

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