

New distribution data of the green mantella, *Mantella viridis*, from northern Madagascar (Anura: Mantellidae)

Vincenzo Mercurio^{1,2}, Franco Andreone^{3*}

Abstract. Mantellas are colourful small frogs endemic from Madagascar. Although data on their distribution are being accumulated, for some species only little information is available, fact influencing their conservation management. Therefore, we conducted a field work in the Antsiranana region aimed to unveil the distribution of *Mantella viridis*. Of the 42 visited sites, 32 (76%) were confirmed with the presence of the species and ten other sites (31%) with the presence of *M. ebonaui* or a different form intermediate in colouration between *M. viridis* and *M. ebonaui*. *M. viridis* was found in different primary and secondary habitats. This adaptability allows the colonization degraded habitats as well as human perturbed areas. Thus, seen both the new emerged geographic scenario, and the ecological plasticity the conservation status of this species needs to be re-evaluated.

Key words. Conservation status, ecology, IUCN, re-evaluation.

Introduction

Mantellas are colourful and attractive small frogs endemic from Madagascar (Jovanovic et al., 2006; Glaw and Vences, 2007). The genus contains 16 species, with five species currently classified in the Red List of IUCN (Andreone and Luiselli 2003; Andreone et al. 2005; IUCN 2006) as critically endangered (CR; *M. aurantiaca*, *M. cowani*, *M. expectata*, *M. milotympanum*, and *M. viridis*), and two species classified as endangered (E; *M. bernhardi* and *M. crocea*). Since they are interested by a considerable trade they are all included in the CITES Appendix II (Rabemananjara et al., 2008).

Major threats pending on the *Mantella* species are represented by the ongoing habitat destruction and the exploitation for the international pet-trade (Andreone et al., 2006). Although data on their distribution are being accumulated, for some species only little information is available. This is the case of the green mantella, *Mantella viridis*, until very recently known only from

south of the Antsiranana town (terra typica), and from Montagne des Français (Vences, Glaw and Böhme, 1999; Glaw and Vences, 2007). With the exception of Montagne d'Ambre National Park and Montagne des Français the Antsiranana region is severely affected by deforestation with a consequent loss of original habitats (D'Cruze et al., 2007).

The new emerged geographic scenario together with further information available on distribution, colouration, and genetics (Jovanovic et al. 2006; Metcalf et al., 2007; Rabemananjara et al., 2007) provide new tools for the interpretation of the threats affecting this species and for a better evaluation of its conservation status.

Material and Methods

We conducted field work in the Antsiranana: the survey lasted from 5 to 24 January 2005, with two persons active on the field. During the day frogs were searched in all the suitable habitats or by the location of calling males. Geographic coordinates were taken using a GPS device. The distribution map has been created through the software DIVA-GIS version 5.2.0.2. Used toponyms follow the indications by local people, and must be therefore intended as unofficial names. Some representative individuals were collected by hand and euthanised by immersion in chlorobutanol solution, fixed in 4% formalin or in 90° ethanol, and stored in 70% ethanol solution. Voucher specimens are currently housed in the Museo Regionale di Scienze Naturali di Torino (MRSN), and Parc Zoologique et Botanique de Tsimbazaza (PBZT).

1 Department of Ecology and Evolution, Goethe-Universität, Biologie-Campus, Siesmayerstr. 70, 60323 Frankfurt am Main, Germany

2 Forschungsinstitut und Naturmuseum Senckenberg, Sektion Herpetologie, Senckenberganlage 25, 60325, Frankfurt am Main, Germany; e-mail: vmercurio@senckenberg.de

3* Museo Regionale di Scienze Naturali, Sezione di Zoologia, Via Giolitti 36, I-10123, Torino, Italy; e-mail: f.andreone@libero.it

*corresponding author

Results

Several formerly unknown populations were found (Table 1; Fig. 1). Of the 42 visited sites, 32 (76%) were confirmed with the presence of the species and ten other sites (31%) with the presence of *M. ebenau* or a different form intermediate in colouration between *M. viridis* and *M. ebenau*. Of special interest is the presence of one population inside the third parcel of the Montagne d'Ambre N.P. (Andranobaribe), so far the only population known inside a protected area.

Suitable habitats for the species are represented by light bushed savannahs used as pasture; small parcels of secondary forests; and mango and *Eucalyptus* plantations crossed by irrigation ditches. *Mantella viridis* is present and sometimes abundant in areas with moist soil and thick leaf litter, especially near small water bodies where males are calling from elevated positions, under leaf or other hiding places.

Some preferred primary and secondary microhabitats

have been detected: (1) dead arms of torrents with very moist soil (e.g., Antomboko, Vinay); (2) small light vegetated valleys with permanent dropping water or formation of pools after rain, stones and dead wood branches as hiding place (e.g., Antsahampano, Ambovomamy, Tegnantsahampano); (3) temporary pools with edge vegetation, dead wood branches and stones as hiding places (e.g., Parchuite, Lamerouge); (4) mango plantations with abundant leaf litter and humid soil (e.g., Analamanga; Ambodimanga; Anketrahe); (5) secondary forest with temporary stream, abundant leaf litter and humid soil (e.g., Andranobaribe); (6) draining channels along roads with tight vegetation, leaf litter and wood branches as hiding places (e.g., Maleza).

Discussion

Mantella viridis was found in different habitat conditions, thus showing a wide ecological plasticity.

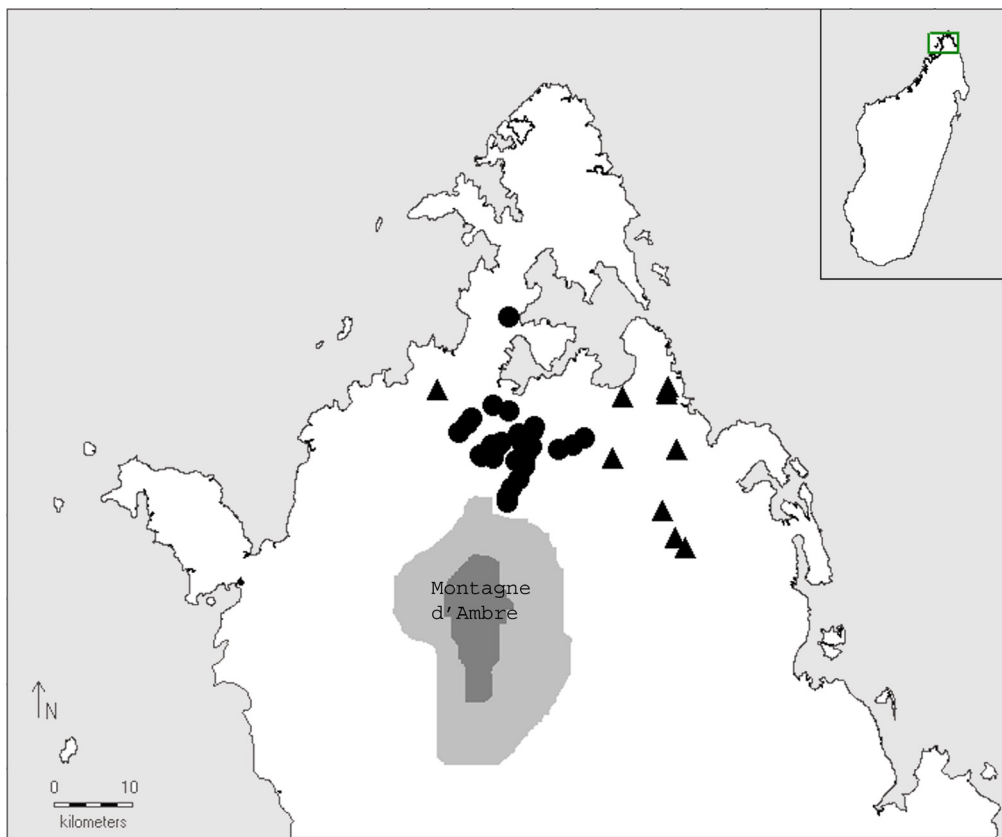


Figure 1. Distribution map of *Mantella viridis* (dots) and *M. ebenau* or a different form intermediate between *M. viridis* and *M. ebenau* (triangle).

Table 1. Localities list with presence of *Mantella viridis* in the surroundings of Antongombato and Montagne des Français; * sites with specimens of intermediate colouration between *M. viridis* e *M. ebenauui*.

	Toponymy	Regions	S	E	Alt. (m)
1	Ambinay	Antongombato	12°21'54"	49°08'43"	134
2	Ambodimanga 1	Ambodimanga	12°22'20"	49°17'37"	123
3	Ambodimanga 2	Ambodimanga	12°22'47"	49°16'47"	130
4	Ambovomamy	Andoajampona	12°13'40"	49°12'15"	37
5	Analamandro	Antongombato	12°23'51"	49°13'22"	200
6	Analamanga 1	Antongombato	12°22'57"	49°13'50"	114
7	Analamanga 2	Antongombato	12°22'56"	49°13'42"	86
8	Analamanga 3	Antongombato	12°23'01"	49°13'39"	82
9	Analamanga 4	Antongombato	12°22'47"	49°13'13"	156
10	Andohonymangoko*	Ivovona	12°18'50"	49°07'10"	35
18	Andranobaribe	P.N. Montagne. d'Ambre	12°23'35"	49°10'21"	165
11	Andranomangitra*	M. des Français	12°23'41"	49°19'40"	190
12	Anketrabe	Antongombato	12°24'22"	49°13'19"	98
13	Anketrabe 2	Antongombato	12°25'13"	49°12'57"	168
14	Ankiabe	Antongombato	12°22'00"	49°12'57"	64
15	Ankitsakalaninaombi*	Ankitsakalaninaombi	12°30'07"	49°24'51"	89
16	Anosiravo*	M. des Français	12°19'20"	49°20'23"	190
17	Antamotamo	Antongombato	12°23'57"	49°12'46"	190
19	Antomboko 1	Antongombato	12°23'17"	49°13'37"	90
20	Antomboko 2	Antongombato	12°23'35"	49°13'24"	94
21	Antomboko 3	Ambatomenavava	12°25'53"	49°12'28"	222
22	Antomboko 4	Antongombato	12°26'25"	49°12'06"	231
23	Antongombatobe	Antongombato	12°23'03"	49°13'27"	98
25	Antsahampano 1	Antsahampano	12°19'59"	49°11'07"	83
24	Antsahampano 2	Antsahampano	12°20'25"	49°12'12"	5
26	Antsakoamaro*	Ivovona	12°18'41"	49°23'39"	12
27	Antsiasia 1	Antongombato	12°23'45"	49°11'09"	225
28	Antsiasia 2	Antongombato	12°22'50"	49°11'04"	210
29	Bekamankuri*	M. des Français	12°23'04"	49°24'14"	50
30	Daraina*	Daraina	12°29'21"	49°24'04"	90
31	Francom	Francom	12°26'54"	49°12'08"	281
33	Ivovona*	M. des Français	12°19'12"	49°23'33"	11
32	Ivovona*	M. des Français	12°18'52"	49°23'32"	13
34	Lamerouge	Antongombato	12°21'47"	49°13'58"	47
35	Mahatsijo	Ambodimanga	12°23'09"	49°15'48"	271
36	Maleza	Antongombato	12°21'31"	49°14'06"	49
37	Mangatokona*	Mahavavona	12°27'29"	49°23'10"	65
38	Menagisy	Andranotsymaty	12°23'33"	49°10'12"	171
39	Parchuite	Antongombato	12°22'39"	49°11'46"	117
40	Tegnantsahampano	Antongombato	12°22'50"	49°11'34"	142
41	Tsimanankaratra	Andranotsimaty	12°20'54"	49°09'36"	114
42	Vinay	Andranotsimaty	12°21'14"	49°09'16"	78



Figure 2. *Mantella viridis* from Antongombato with green colouration.

This adaptability allows the colonization of secondary and degraded habitats as well as human perturbed areas. Examples of this are the populations found within the Antongombato region (inside the homonymous village) and the populations of Malema and Lamerouge, which live within the draining channels along the road. In such a context the elective habitat is represented by mango plantations with irrigation ditches where large populations of *M. viridis* have been found. We assume

that the presence of a thick and humid leaf litter together with the availability of flies attracted by the rotted fruits play an important role in determining the high population density.

In our survey we considered as *M. viridis* only the individuals with dorsal and lateral green-yellowish colouration and did not check yet whether other colour morphs should be included in the same species. Although Jovonavic et al. (2006) already pointed out that similar individuals for body size and shape, but differing for the overall colouration (being reddish instead than green) are present elsewhere in North Madagascar, such as the Ankarana Massif. Recently, a finding of *M. viridis* has been reported for the island of Nosy Hara (Metcalf et al., 2007), but its identity needs to be confirmed.

Seen the actual wide distribution of *M. viridis* in the considered area, and some populations appear to be locally abundant, the status of this species needs to be re-evaluated. This should be done within the framework of the Global Amphibian Assessment (Andreone et al., 2005), in order to draw new and updated conservation strategies.



Figure 3. Individual from Montagne des Français with colour traits intermediate between *Mantella viridis* and *M. eburnei*.



Figure 4. Typical mango plantation, habitat of *M. viridis*.

Acknowledgements

The study has been done in collaboration with the Parc Botanique et Zoologique de Tsimbazaza (Antananarivo) and Université d'Antananarivo. We thank J.E. Randrianirina for his assistance to obtain the necessary research permits. The fieldwork was financially supported by DAPTF, Air Madagascar, Acquario di Genova, Nando Peretti Foundation, and Gondwana Conservation and Research.

References

- Andreone, F., Cadle, J.E., Cox, N., Glaw, F., Nussbaum, R.A., Raxworthy, C.J., Stuart, S.N., Vallan, D., Vences, M. (2005): Species review of amphibian extinction risks in Madagascar: Conclusions from the Global Amphibian Assessment. *Conservation Biology*. **19** (6): 1790-1802.
- Andreone, F., Mercurio, V., Mattioli, F., Razafindrabe, T. J. (2005): Good news for three critically endangered and traded frogs from Madagascar. *Froglog*. **72**: 2-3.
- D'Cruze, N., Sabel, J., Green, K., Dawson, J., Gardner, C., Robinson, J., Starkie, G., Vences, M., Glaw, F. (2007): The first comprehensive survey of amphibians and reptiles at Montagne des Français. *Madagascar. Herpetological Conservation and Biology*. **2**: 87-99.
- Glaw, F., Vences, M. (2007): A fieldguide to the amphibians and reptile of Madagascar. Third edition. Vences und Glaw Verlags, Cologne.
- Jovanovic, O., Rabemananjara, F., Ramilijaona, O., Andreone, F., Glaw, F., Vences, M. (2006): Frogs of Madagascar Genus *Mantella*. Pocket Identification Guide. Conservation International. Tropical Pocket Guide Series, Washington.
- Metcalfe, C.J.E., Hampson, K., Gray, A., Andrianirina, R. (2007): Herpetofaunal assemblages on seven offshore islands of northwestern Madagascar. *Tropical Zoology*. **20**(2): 151-161.
- Rabemananjara, F.C.E., Crottini, A., Chiari, Y., Andreone, F., Glaw, F., Duguet, R., Bora, P., Ravoahangimalala Ramilijaona, O., Vences, M. (2007): Molecular systematics of Malagasy poison frogs in the *Mantella betsileo* and *M. laevigata* species groups. *Zootaxa*. 1501: 31-44.
- Rabemananjara, F.C.E., Raminosoa, N.R., Ramilijaona, O.R., Andreone, F., Bora, P., Carpenter, A.I., Glaw, F., Razafindrabe, T., Vallan, D., Vieites, D.R., Vences, M. (2008): Malagasy poison frogs in the pet trade: a survey of levels of exploitation of species in the genus *Mantella*. - In: Andreone F. (ed), *A Conservation Strategy for the Amphibians of Madagascar*. Monografie, 45. Museo Regionale di Scienze Naturali, Torino, *in press*.
- Vences, M., Glaw, F., Böhme, W. (1999): A review of the genus *Mantella* (Anura, Ranidae, Mantellinae): taxonomy, distribution and conservation of Malagasy poison frogs. *Alytes*. **7** (1-2): 3-72.