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. ebenaui* or a different form intermediate in colouration between *M. viridis* and *M. ebenaui*. *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

*corresponding author

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 clorobutanol 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).

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

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. ebenaui* or a different form intermediate in colouration between *M. viridis* and *M. ebenaui*. 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; Anketrabe); (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.

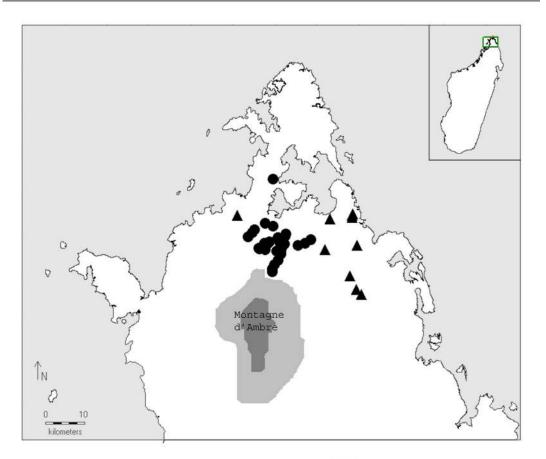


Figure 1. Distribution map of *Mantella viridis* (dots) and *M. ebenaui* or a different form intermediate between *M. viridis* and *M. ebenaui* (triangle).

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. ebenaui*.

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°22'20" 49°17'37" 123 4 Ambovomamy Andajampona 12°13'40" 49°12'15" 37 5 Analamandro Antongombato 12°22'57" 49°13'22" 200 6 Analamanga 1 Antongombato 12°22'56" 49°13'39" 82 9 Analamanga 3 Antongombato 12°22'51" 49°13'39" 82 9 Analamanga 4 Antongombato 12°22'10" 49°13'31" 156 10 Andohonymangoko* Ivovona 12°23'11" 49°12'51" 165 11 Andranobaribe P.N. Montagne. d'Ambre 12°23'14" 49°12'51" 18 12 Anketrabe Antongombato 12°2'10" 49°12'51" 18 13 Anketrabe Antongombato 12°2'10" 49°12'51"		Toponymy	Regions	S	E	Alt. (m)
2 Ambodimanga 1 Ambodimanga 12°22'20" 49°17'37" 123 3 Ambodimanga 2 Ambodimanga 12°22'2'7" 49°12'15" 37 4 Ambovomamy Andoajampona 12°13'40" 49°12'15" 37 5 Analamandro Antongombato 12°23'51" 49°13'20" 200 6 Analamanga 1 Antongombato 12°23'51" 49°13'30" 82 9 Analamanga 3 Antongombato 12°23'14" 49°13'13" 156 10 Andohonymangoko* Ivovona 12°12'3'50" 49°10'21" 165 11 Andranobaribe P.N. Montagne. d'Ambre 12°23'35" 49°10'21" 165 11 Andranomangitra* M. des Français 12°23'13" 49°12'57" 168 12 Anketrabe Antongombato 12°22'13" 49°12'57" 164 13 Ankitsakalaninaombi* Ankitsakalaninaombi 12°23'13" 49°12'257" 64 14 Ankiabe Antongombato 12°23'13" 49°12'257" 64 14 Ankiaba Antongombato <td>1</td> <td>Ambinay</td> <td>Antongombato</td> <td>12°21'54"</td> <td>49°08'43"</td> <td>134</td>	1	Ambinay	Antongombato	12°21'54"	49°08'43"	134
3 Ambodimanga 2 Ambodimanga 12°22'47" 49°16'47" 130 4 Ambovomamy Andoajampona 12°13'40" 49°13'22" 200 6 Analamandro Antongombato 12°23'51" 49°13'22" 200 6 Analamanga 1 Antongombato 12°23'51" 49°13'42" 86 8 Analamanga 2 Antongombato 12°22'56" 49°13'42" 86 9 Analamanga 4 Antongombato 12°22'3'1" 49°10'21" 156 10 Andohonymangoko* Ivovona 12°18'50" 49°10'21" 165 11 Andranomangitra* M. des Français 12°23'35" 49°10'21" 165 12 Anketrabe Antongombato 12°24'22" 49°13'19" 98 13 Anketrabe Antongombato 12°23'35" 49°12'57" 168 14 Ankitakalaninaombi 12°30'07" 49°12'57" 64 15 Ankitsakalaninaombi 12°30'07" 49°12'24" 90						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						
5AnalamandroAntongombato $12^{\circ}23^{\circ}51^{\circ\prime}$ $49^{\circ}13^{\circ}22^{\circ}$ 200 6Analamanga 1Antongombato $12^{\circ}22^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}30^{\circ}$ 114 7Analamanga 2Antongombato $12^{\circ}22^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}42^{\circ}$ 86 8Analamanga 3Antongombato $12^{\circ}22^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}42^{\circ}$ 86 9Analamanga 4Antongombato $12^{\circ}22^{\circ}47^{\circ}$ $49^{\circ}13^{\circ}13^{\circ}$ 82 9Analamanga 4Antongombato $12^{\circ}22^{\circ}47^{\circ}$ $49^{\circ}10^{\circ}17^{\circ}$ 35 10Andohonymangoko*Ivovona $12^{\circ}18^{\circ}50^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 165 11Andranomangitra*M. des Français $12^{\circ}22^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 168 12AnketrabeAntongombato $12^{\circ}22^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 168 13Anketrabe 2Antongombato $12^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 168 14AnkiabeAntongombato $12^{\circ}22^{\circ}01^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 164 15Ankitsakalaninaombi*Antongombato $12^{\circ}22^{\circ}01^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}27^{\circ}$ 15AntistakalaninaombiAntongombato $12^{\circ}22^{\circ}33^{\circ}$ $49^{\circ}12^{\circ}45^{\circ}$ 190 16Antongombato $12^{\circ}23^{\circ}37^{\circ}$ $49^{\circ}12^{\circ}45^{\circ}$ $91^{\circ}24^{\circ}51^{\circ}$ $91^{\circ}24^{\circ}51^{\circ}$ 16Antongombato $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}12^{\circ}28^{$		-	-			
6Analamanga 1Antongombato $12^{\circ}22^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}30^{\circ}$ 114 7Analamanga 2Antongombato $12^{\circ}22^{\circ}56^{\circ}$ $49^{\circ}13^{\circ}42^{\circ}$ 86 8Analamanga 3Antongombato $12^{\circ}22^{\circ}56^{\circ}$ $49^{\circ}13^{\circ}13^{\circ}$ 82 9Analamanga 4Antongombato $12^{\circ}22^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}13^{\circ}13^{\circ}$ 156 10Andohonymangoko*Ivovona $12^{\circ}18^{\circ}50^{\circ}$ $49^{\circ}07^{\circ}10^{\circ}$ 35 18AndranobaribeP.N. Montagne. d'Ambre $12^{\circ}23^{\circ}37^{\circ}$ $49^{\circ}19^{\circ}10^{\circ}1^{\circ}$ 156 11Andranomangitra*M. des Français $12^{\circ}22^{\circ}31^{\circ}1^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 168 14AnktrabeAntongombato $12^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}22^{\circ}07^{\circ}$ $49^{\circ}22^{\circ}23^{\circ}19^{\circ}$ 16Anosiravo*M. des Français $12^{\circ}23^{\circ}07^{\circ}$ $49^{\circ}12^{\circ}27^{\circ}3^{\circ}190$ 17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}22^{\circ}23^{\circ}190$ 19Antomboko 1Antongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}22^{\circ}23^{\circ}190$ 19Antomboko 2Antongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}22^{\circ}23^{\circ}12^{\circ}28^{\circ}22^{\circ}23^{\circ}12^{\circ}28^{\circ}22^{\circ}23^{\circ}12^{\circ}28^{\circ}24^{\circ}190^{\circ}12^{\circ}28^{\circ}24^{\circ}14^{\circ}190$ 19Antomboko 4Antongombato $12^{\circ}22^{\circ}25^{\circ}3^{\circ}49^{\circ}12^{\circ}26^{\circ}25^{\circ}3^{\circ}49^{\circ}12^{\circ}27^{\circ}98^{\circ}23^{\circ}12^{\circ}28^{\circ}23^{\circ}12^{\circ}28^{\circ}23^$						
7Analamanga 2Antongombato $12^{\circ}22^{\circ}56^{\circ}$ $49^{\circ}13^{\circ}42^{\circ}$ 86 8Analamanga 3Antongombato $12^{\circ}22^{\circ}10^{\circ}$ $49^{\circ}13^{\circ}39^{\circ}$ 82 9Analamanga 4Antongombato $12^{\circ}22^{\circ}47^{\circ}$ $49^{\circ}13^{\circ}13^{\circ}$ 156 10Andohonymangoko*Ivovona $12^{\circ}22^{\circ}35^{\circ}$ $49^{\circ}0^{\circ}10^{\circ}$ 35 18AndranobaribeP.N. Montagne, d'Ambre $12^{\circ}22^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 165 11Andranomangitra*M. des Français $12^{\circ}22^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 168 12AnketrabeAntongombato $12^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 13Ankitakalaninaombi*Antongombato $12^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 14AnkiabeAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}21^{\circ}51^{\circ}$ 89 16Anosiravo*M. des Français $12^{\circ}19^{\circ}20^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}37^{\circ}$ 90 17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}24^{\circ}$ 190 19Antomboko 1Antongombato $12^{\circ}23^{\circ}33^{\circ}$ $49^{\circ}13^{\circ}24^{\circ}$ 94 21Antomboko 2Antongombato $12^{\circ}23^{\circ}33^{\circ}$ $49^{\circ}13^{\circ}24^{\circ}$ 94 22Antomboko 3Ambatomenavava $12^{\circ}25^{\circ}53^{\circ}$ $49^{\circ}12^{\circ}26^{\circ}$ 231 23Antomboko 4Antongombato $12^{\circ}22^{\circ}53^{\circ}$ $49^{\circ}12^{\circ}12^{\circ}$ 94 <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td>			-			
8 Analamanga 3 Antongombato 12°23'01" 49°13'13" 156 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°12'57" 168 12 Anketrabe Antongombato 12°23'13" 49°12'57" 168 14 Ankitabe Antongombato 12°20'0" 49°12'57" 164 15 Ankitsakalaninaombi* Ankitsakalaninaombi 12°19'20" 49°20'23" 190 16 Anosiravo* M. des Français 12°19'20" 49°13'37" 90 20 Antomboko 1 Antongombato 12°23'57" 49°13'27" 84 21 Antomboko 3 Ambatomenavava 12°23'35" 49°13'27" 94 23 Antomboko 4 Antongombato 12°23'35" </td <td></td> <td>e</td> <td></td> <td>12°22'56"</td> <td></td> <td></td>		e		12°22'56"		
9Analamanga 4Antongombato $12^{\circ}22^{\circ}47^{\circ\prime}$ $49^{\circ}13^{\circ}13^{\circ\prime}$ 156 10Andohonymangoko*Ivovona $12^{\circ}18^{\circ}50^{\circ}$ $49^{\circ}07^{\circ}10^{\circ}$ 35 18AndranobaribeP.N. Montagne. d'Ambre $12^{\circ}23^{\circ}35^{\circ\prime}$ $49^{\circ}01^{\circ}21^{\circ}$ 165 11Andranomangitra*M. des Français $12^{\circ}22^{\circ}22^{\circ}42^{\circ}2^{\circ}49^{\circ}13^{\circ}19^{\circ}98$ $12^{\circ}24^{\circ}22^{\circ}49^{\circ}13^{\circ}19^{\circ}98$ 13AnketrabeAntongombato $12^{\circ}22^{\circ}13^{\circ}^{\circ}49^{\circ}12^{\circ}57^{\circ}$ 64 14AnkitabeAntongombato $12^{\circ}22^{\circ}07^{\circ}49^{\circ}12^{\circ}57^{\circ}$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}23^{\circ}07^{\circ}49^{\circ}12^{\circ}27^{\circ}$ 64 16Anosiravo*M. des Français $12^{\circ}19^{\circ}20^{\circ}7^{\circ}49^{\circ}12^{\circ}46^{\circ}$ 190 17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}7^{\circ}49^{\circ}12^{\circ}24^{\circ}6^{\circ}$ 91 19Antomboko 1Antongombato $12^{\circ}23^{\circ}57^{\circ}7^{\circ}49^{\circ}12^{\circ}28^{\circ}$ 222 20Antomboko 2Antongombato $12^{\circ}23^{\circ}57^{\circ}7^{\circ}49^{\circ}12^{\circ}28^{\circ}$ 222 21Antomboko 3Ambatomenavava $12^{\circ}25^{\circ}53^{\circ}7^{\circ}49^{\circ}12^{\circ}28^{\circ}$ 222 22Antongombato $12^{\circ}23^{\circ}37^{\circ}49^{\circ}13^{\circ}27^{\circ}98$ $23^{\circ}49^{\circ}13^{\circ}27^{\circ}98$ 23Antongombato $12^{\circ}22^{\circ}25^{\circ}7^{\circ}49^{\circ}11^{\circ}17^{\circ}8324^{\circ}Antashampano12^{\circ}21^{\circ}59^{\circ}49^{\circ}11^{\circ}17^{\circ}8324Antsahampano 1Antsahampano12^{\circ}21^{\circ}25^{\circ}49^{\circ}11^{\circ}17^{\circ}9823^{\circ}49^{\circ}149^$	8	•			49°13'39"	82
10Andohonymangoko*Ivovona $12^{\circ}18^{\circ}50^{\circ}$ $49^{\circ}07^{\circ}10^{\circ}$ 35 18AndranobaribeP.N. Montagne. d'Ambre $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 165 11Andranomangitra*M. des Français $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 168 12AnketrabeAntongombato $12^{\circ}25^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 168 13Anketrabe 2Antongombato $12^{\circ}22^{\circ}13^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}23^{\circ}07^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}23^{\circ}07^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 16Anosiravo*M. des Français $12^{\circ}23^{\circ}07^{\circ}$ $49^{\circ}12^{\circ}24^{\circ}$ 190 17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}24^{\circ}$ 190 18Antomboko 1Antongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}13^{\circ}24^{\circ}$ 94 21Antomboko 2Antongombato $12^{\circ}25^{\circ}53^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}$ 222 22Antomboko 4Antongombato $12^{\circ}26^{\circ}25^{\circ}$ $49^{\circ}12^{\circ}07^{\circ}$ 98 23Antsahampano 1Antsahampano $12^{\circ}20^{\circ}25^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 24Antsakaomaro*Ivovona $12^{\circ}18^{\circ}41^{\circ}$ $49^{\circ}23^{\circ}39^{\circ}$ $12^{\circ}23^{\circ}49^{\circ}12^{\circ}12^{\circ}$ 25Antsakabampano 1Antsahampano $12^{\circ}22^{\circ}54^{\circ}$ $49^{\circ}110$	9	•		12°22'47"	49°13'13"	156
18AndranobaribeP.N. Montagne. d'Ambre $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 165 11Andranomangitra*M. des Français $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}10^{\circ}21^{\circ}$ 190 12AnketrabeAntongombato $12^{\circ}24^{\circ}22^{\circ}$ $49^{\circ}13^{\circ}19^{\circ}$ 98 13Anketrabe 2Antongombato $12^{\circ}24^{\circ}22^{\circ}$ $49^{\circ}12^{\circ}57^{\circ}$ 64 14AnkitasAntongombato $12^{\circ}22^{\circ}10^{\circ}$ $49^{\circ}24^{\circ}51^{\circ}$ 89 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}30^{\circ}07^{\circ}$ $49^{\circ}24^{\circ}51^{\circ}$ 89 16Anosiravo*M. des Français $12^{\circ}19^{\circ}20^{\circ}$ $49^{\circ}21^{\circ}23^{\circ}$ 190 17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}46^{\circ}$ 190 19Antomboko 1Antongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}$ 222 20Antomboko 1Antongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}$ 222 21Antomboko 3Ambatomenavava $12^{\circ}26^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}06^{\circ}$ 231 23AntongombatobeAntongombato $12^{\circ}21^{\circ}57^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 24Antsahampano 1Antsahampano $12^{\circ}21^{\circ}57^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 25Antsakaamaro*Ivovona $12^{\circ}21^{\circ}57^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 26Antsakaamaro*Ivovona $12^{\circ}21^{\circ}57^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 <tr< tr="">2</tr<>	10	•	-	12°18'50"	49°07'10"	35
11Andranomangitra* AnketrabeM. des Français Antongombato $12^{\circ}23'41''$ $49^{\circ}19'40''$ 190 12AnketrabeAntongombato $12^{\circ}24'22''$ $49^{\circ}13'19''$ 98 13Anketrabe 2Antongombato $12^{\circ}22'13''$ $49^{\circ}12'57''$ 168 14AnkiabeAntongombato $12^{\circ}22'00''$ $49^{\circ}12'57''$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}20'07''$ $49^{\circ}21'57''$ 89 16Anosiravo*M. des Français $12^{\circ}19'20''$ $49^{\circ}20'23'''$ 190 17AntamotamoAntongombato $12^{\circ}23'57''$ $49^{\circ}12'46'''$ 190 19Antomboko 1Antongombato $12^{\circ}23'57''$ $49^{\circ}12'28''''''''''''''''''''''''''''''''''$	18		P.N. Montagne. d'Ambre	12°23'35"	49°10'21"	165
13Anketrabe 2Antongombato $12^{\circ}25'13''$ $49^{\circ}12'57''$ 168 14AnkiabeAntongombato $12^{\circ}22'00''$ $49^{\circ}12'57''$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}30'07''$ $49^{\circ}24'51''$ 89 16Anosiravo*M. des Français $12^{\circ}20''$ $49^{\circ}22''51''$ $49^{\circ}22''51''$ 17AntamotamoAntongombato $12^{\circ}23'57''$ $49^{\circ}12'24''$ 190 19Antomboko 1Antongombato $12^{\circ}23'57''$ $49^{\circ}13'24''$ 94 20Antomboko 2Antongombato $12^{\circ}25'53''$ $49^{\circ}12'28''$ 222 21Antomboko 3Ambatomenavava $12^{\circ}25'53''$ $49^{\circ}12'28''$ 222 22Antomboko 4Antongombato $12^{\circ}26'25''$ $49^{\circ}12'28'''$ 231 23AntongombatobeAntongombato $12^{\circ}22'3'03''''''''''''''''''''''''''''''''$	11	Andranomangitra*	-	12°23'41"	49°19'40"	190
14AnkiabeAntongombato $12^{\circ}22'00"$ $49^{\circ}12'57"$ 64 15Ankitsakalaninaombi*Ankitsakalaninaombi $12^{\circ}30'07"$ $49^{\circ}24'51"$ 89 16Anosiravo*M. des Français $12^{\circ}19'20"$ $49^{\circ}20'23"$ 190 17AntamotamoAntongombato $12^{\circ}23'57"$ $49^{\circ}12'46"$ 190 19Antomboko 1Antongombato $12^{\circ}23'57"$ $49^{\circ}12'46"$ 190 20Antomboko 2Antongombato $12^{\circ}23'35"$ $49^{\circ}12'28"$ 222 21Antomboko 3Ambatomenavava $12^{\circ}25'53"$ $49^{\circ}12'26"$ 231 23AntongombatobeAntongombato $12^{\circ}23'03"$ $49^{\circ}13'27"$ 98 25Antsahampano 1Antsahampano $12^{\circ}21'25"$ $49^{\circ}11'27"$ 83 24Antsahampano 2Antsahampano $12^{\circ}20'25"$ $49^{\circ}11'07"$ 83 24Antsakoamaro*Ivovona $12^{\circ}21'25"$ $49^{\circ}11'07"$ 83 25Antsiasia 1Antongombato $12^{\circ}22'50"$ $49^{\circ}11'07"$ 83 24Antsakoamaro*Ivovona $12^{\circ}21'25"$ $49^{\circ}11'07"$ 83 25Antsiasia 1Antongombato $12^{\circ}23'04"$ $49^{\circ}11'07"$ 215 26Antsiasia 1Antongombato $12^{\circ}23'04"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}23'04"$ $49^{\circ}21'16"$ 215 30Daraina*Daraina $12^{\circ}29'21''47"$ $49^{\circ}2$	12		3	12°24'22"	49°13'19"	98
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°23'35" 49°13'37" 90 20 Antomboko 2 Antongombato 12°23'35" 49°12'26" 222 21 Antomboko 3 Ambatomenavava 12°25'53" 49°12'06" 231 23 Antongombatobe Antongombato 12°23'03" 49°13'27" 98 25 Antsahampano 1 Antongombato 12°26'25" 49°12'06" 231 24 Antsahampano 2 Antsahampano 12°19'59" 49°11'07" 83 24 Antsakoamaro* Ivovona 12°23'04" 49°11'07" 215 25 Antsiasia 1 Antongombato 12°23'04" 49°11'04" 210 29 Bekamankuri* M. des Français	13	Anketrabe 2	-	12°25'13"	49°12'57"	168
16Anosiravo*M. des Français12°19'20"49°20'23"19017AntamotamoAntongombato12°23'57"49°12'46"19019Antomboko 1Antongombato12°23'17"49°13'37"9020Antomboko 2Antongombato12°23'35"49°13'24"9421Antomboko 3Ambatomenavava12°25'53"49°12'28"22222Antomboko 4Antongombato12°26'25"49°12'06"23123AntongombatobeAntongombato12°23'03"49°12'06"23124Antsahampano 1Antsahampano12°19'59"49°12'12"526Antsahampano 2Antsahampano12°20'25"49°12'07"8324Antsahampano 2Antsahampano12°20'25"49°11'07"8325Antsakampano 2Antsahampano12°20'25"49°11'09"22526Antsakamaro*Ivovona12°23'45"49°11'09"22527Antsiasia 1Antongombato12°23'04"49°24'14"5029Bekamankuri*M. des Français12°29'21"49°24'04"9031FrancomFrancom12°26'54"49°12'08"28133Ivovona*M. des Français12°19'12"49°23'32"1132Ivovona*M. des Français12°14'7"49°13'58"4733Ivovona*M. des Français12°14'7"49°13'58"4734LamerougeAntongombato12°21'47"49°1	14	Ankiabe		12°22'00"	49°12'57"	64
17AntamotamoAntongombato $12^{\circ}23^{\circ}57^{\circ}$ $49^{\circ}12^{\circ}46^{\circ}$ 190 19Antomboko 1Antongombato $12^{\circ}23^{\circ}17^{\circ}$ $49^{\circ}13^{\circ}37^{\circ}$ 90 20Antomboko 2Antongombato $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}13^{\circ}24^{\circ}$ 94 21Antomboko 3Ambatomenavava $12^{\circ}25^{\circ}53^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}$ 222 22Antongombato $12^{\circ}26^{\circ}25^{\circ}$ $49^{\circ}12^{\circ}06^{\circ}$ 231 23AntongombatobeAntongombato $12^{\circ}23^{\circ}03^{\circ}$ $49^{\circ}13^{\circ}27^{\circ}$ 25Antsahampano 1Antsahampano $12^{\circ}20^{\circ}25^{\circ}^{\circ}$ $49^{\circ}12^{\circ}12^{\circ}^{\circ}$ 24Antsahampano 2Antsahampano $12^{\circ}20^{\circ}25^{\circ}^{\circ}$ $49^{\circ}12^{\circ}12^{\circ}^{\circ}$ 25Antsakoamaro*Ivovona $12^{\circ}18^{\circ}41^{\circ}^{\circ}$ $49^{\circ}23^{\circ}39^{\circ}^{\circ}$ 26Antsiasia 1Antongombato $12^{\circ}22^{\circ}50^{\circ}^{\circ}$ $49^{\circ}11^{\circ}09^{\circ}^{\circ}$ 27Antsiasia 2Antongombato $12^{\circ}22^{\circ}50^{\circ}^{\circ}$ $49^{\circ}11^{\circ}09^{\circ}^{\circ}$ 28Antsiasia 2Antongombato $12^{\circ}22^{\circ}0^{\circ}^{\circ}^{\circ}^{\circ}$ $49^{\circ}11^{\circ}09^{\circ}^{\circ}^{\circ}$ 29Bekamankuri*M. des Français $12^{\circ}23^{\circ}44^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}$	15	Ankitsakalaninaombi*		12°30'07"	49°24'51"	89
19Antomboko 1Antongombato $12^{\circ}23^{\circ}17^{\circ}$ $49^{\circ}13^{\circ}37^{\circ}$ 90 20Antomboko 2Antongombato $12^{\circ}23^{\circ}35^{\circ}$ $49^{\circ}13^{\circ}24^{\circ}$ 94 21Antomboko 3Ambatomenavava $12^{\circ}25^{\circ}53^{\circ}$ $49^{\circ}12^{\circ}28^{\circ}$ 222 22Antomboko 4Antongombato $12^{\circ}26^{\circ}25^{\circ}$ $49^{\circ}12^{\circ}26^{\circ}$ 231 23AntongombatobeAntongombato $12^{\circ}23^{\circ}03^{\circ}$ $49^{\circ}13^{\circ}27^{\circ}$ 98 25Antsahampano 1Antsahampano $12^{\circ}20^{\circ}25^{\circ}^{\circ}$ $49^{\circ}11^{\circ}07^{\circ}$ 83 24Antsahampano 2Antsahampano $12^{\circ}20^{\circ}25^{\circ}^{\circ}$ $49^{\circ}12^{\circ}12^{\circ}^{\circ}$ 5 26Antsakoamaro*Ivovona $12^{\circ}18^{\circ}41^{\circ}^{\circ}$ $49^{\circ}23^{\circ}39^{\circ}^{\circ}$ 12 27Antsiasia 1Antongombato $12^{\circ}22^{\circ}50^{\circ}^{\circ}$ $49^{\circ}11^{\circ}09^{\circ}^{\circ}$ 225 28Antsiasia 2Antongombato $12^{\circ}22^{\circ}50^{\circ}^{\circ}$ $49^{\circ}11^{\circ}09^{\circ}^{\circ}$ 225 29Bekamankuri*M. des Français $12^{\circ}23^{\circ}04^{\circ}^{\circ}^{\circ}$ $49^{\circ}24^{\circ}14^{\circ}^{\circ}^{\circ}$ 30Daraina*Daraina $12^{\circ}29^{\circ}21^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}$	16	Anosiravo*	M. des Français	12°19'20"	49°20'23"	190
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°26'25" 49°12'06" 231 23 Antongombatobe Antongombato 12°26'25" 49°12'06" 231 24 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°218'41" 49°23'39" 12 27 Antsiasia 1 Antongombato 12°22'50" 49°11'09" 225 28 Antsiasia 2 Antongombato 12°22'3'04" 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°18'52"	17	Antamotamo	Antongombato	12°23'57"	49°12'46"	190
20Antomboko 2Antongombato $12^{\circ}23'35''$ $49^{\circ}13'24''$ 94 21Antomboko 3Ambatomenavava $12^{\circ}25'53''$ $49^{\circ}12'28''$ 222 22Antomboko 4Antongombato $12^{\circ}26'25'''$ $49^{\circ}12'06''$ 231 23AntongombatobeAntongombato $12^{\circ}26'25'''$ $49^{\circ}12'06''$ 231 23AntongombatobeAntongombato $12^{\circ}27''''$ 98 25Antsahampano 1Antsahampano $12^{\circ}19'59''''''''''''''''''''''''''''''''''$	19	Antomboko 1	Antongombato	12°23'17"	49°13'37"	90
22Antomboko 4Antongombato $12^{\circ}26'25"$ $49^{\circ}12'06"$ 231 23AntongombatobeAntongombato $12^{\circ}23'03"$ $49^{\circ}13'27"$ 98 25Antsahampano 1Antsahampano $12^{\circ}19'59"$ $49^{\circ}11'07"$ 83 24Antsahampano 2Antsahampano $12^{\circ}20'25"$ $49^{\circ}12'12"$ 5 26Antsakoamaro*Ivovona $12^{\circ}23'45"$ $49^{\circ}11'09"$ 225 27Antsiasia 1Antongombato $12^{\circ}23'45"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}23'04"$ $49^{\circ}24'14"$ 50 30Daraina*Daraina $12^{\circ}29'21"$ $49^{\circ}24'14"$ 50 31FrancomFrancom $12^{\circ}26'54"$ $49^{\circ}24'04"$ 90 31FrancomFrancom $12^{\circ}21'47"$ $49^{\circ}23'32"$ 11 32Ivovona*M. des Français $12^{\circ}19'12"$ $49^{\circ}23'32"$ 11 33Ivovona*M. des Français $12^{\circ}19'12"$ $49^{\circ}23'32"$ 13 34LamerougeAntongombato $12^{\circ}21'47"$ $49^{\circ}13'58"$ 47 35MahatsijoAmbodimanga $12^{\circ}27'29"$ $49^{\circ}23'10"$ 65 38MenagisyAndranotsymaty $12^{\circ}23'33"$ $49^{\circ}11'46"$ 117 40TegnantsahampanoAntongombato $12^{\circ}22'50"$ $49^{\circ}11'46"$ 117 41TsimanankaratraAndranotsimaty $12^{\circ}20'54"$ $49^{\circ}09'36"$ 114 <td>20</td> <td>Antomboko 2</td> <td></td> <td>12°23'35"</td> <td>49°13'24"</td> <td>94</td>	20	Antomboko 2		12°23'35"	49°13'24"	94
23AntongombatobeAntongombato $12^{\circ}23'03''$ $49^{\circ}13'27''$ 98 25Antsahampano 1Antsahampano $12^{\circ}19'59''$ $49^{\circ}11'07''$ 83 24Antsahampano 2Antsahampano $12^{\circ}20'25''$ $49^{\circ}12'12''$ 5 26Antsakoamaro*Ivovona $12^{\circ}23'45'''$ $49^{\circ}11'09''$ 225 27Antsiasia 1Antongombato $12^{\circ}22'50'''$ $49^{\circ}11'09'''$ 210 29Bekamankuri*M. des Français $12^{\circ}23'04''''$ $49^{\circ}24'14'''''$ 50 30Daraina*Daraina $12^{\circ}29'21''''''''''''''''''''''''''''''''''$	21	Antomboko 3	Ambatomenavava	12°25'53"	49°12'28"	222
25Antsahampano $12^{\circ}19'59''$ $49^{\circ}11'07''$ 83 24Antsahampano $12^{\circ}20'25''$ $49^{\circ}12'12''$ 5 26Antsakoamaro*Ivovona $12^{\circ}18'41''$ $49^{\circ}23'39''$ 12 27Antsiasia 1Antongombato $12^{\circ}23'45''$ $49^{\circ}11'09''$ 225 28Antsiasia 2Antongombato $12^{\circ}22'50''$ $49^{\circ}11'04''$ 210 29Bekamankuri*M. des Français $12^{\circ}22'50''$ $49^{\circ}11'04''$ 210 29Bekamankuri*M. des Français $12^{\circ}22'304''$ $49^{\circ}24'14''$ 50 30Daraina*Daraina $12^{\circ}29'21''$ $49^{\circ}24'04''$ 90 31FrancomFrancom $12^{\circ}26'54''$ $49^{\circ}12'08''$ 281 33Ivovona*M. des Français $12^{\circ}19'12''$ $49^{\circ}23'33''$ 11 32Ivovona*M. des Français $12^{\circ}19'12''$ $49^{\circ}23'32''$ 13 34LamerougeAntongombato $12^{\circ}21'47''$ $49^{\circ}13'58''$ 47 35MahatsijoAmbodimanga $12^{\circ}21'31'''$ $49^{\circ}14'06'''$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29'''''$ $49^{\circ}14'06'''''''''''''''''''''''''''''''''''$	22	Antomboko 4	Antongombato	12°26'25"	49°12'06"	231
24Antsahampano 2Antsahampano $12^{\circ}20'25"$ $49^{\circ}12'12"$ 526Antsakoamaro*Ivovona $12^{\circ}18'41"$ $49^{\circ}23'39"$ 12 27Antsiasia 1Antongombato $12^{\circ}23'45"$ $49^{\circ}11'09"$ 225 28Antsiasia 2Antongombato $12^{\circ}22'50"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}23'45"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}22'50"$ $49^{\circ}11'04"$ 210 30Daraina*Daraina $12^{\circ}29'21"$ $49^{\circ}24'14"$ 50 31FrancomFrancom $12^{\circ}26'54"$ $49^{\circ}12'08"$ 281 33Ivovona*M. des Français $12^{\circ}19'12"$ $49^{\circ}23'33"$ 11 32Ivovona*M. des Français $12^{\circ}18'52"$ $49^{\circ}23'32"$ 13 34LamerougeAntongombato $12^{\circ}21'47"$ $49^{\circ}13'58"$ 47 35MahatsijoAmbodimanga $12^{\circ}27'29"$ $49^{\circ}13'6"$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29"$ $49^{\circ}23'10"$ 65 38MenagisyAndranotsymaty $12^{\circ}22'39"$ $49^{\circ}11'46"$ 117 40TegnantsahampanoAntongombato $12^{\circ}22'50"$ $49^{\circ}11'46"$ 117 41TsimanankaratraAndranotsimaty $12^{\circ}20'54"$ $49^{\circ}09'36"$ 114	23	Antongombatobe	Antongombato	12°23'03"	49°13'27"	98
26Antsakoamaro*Ivovona $12^{\circ}18'41"$ $49^{\circ}23'39"$ 12 27Antsiasia 1Antongombato $12^{\circ}23'45"$ $49^{\circ}11'09"$ 225 28Antsiasia 2Antongombato $12^{\circ}22'50"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}23'45"$ $49^{\circ}24'14"$ 50 30Daraina*Daraina $12^{\circ}29'21"$ $49^{\circ}24'04"$ 90 31FrancomFrancom $12^{\circ}26'54"$ $49^{\circ}12'08"$ 281 33Ivovona*M. des Français $12^{\circ}19'12"$ $49^{\circ}23'33"$ 11 32Ivovona*M. des Français $12^{\circ}18'52"$ $49^{\circ}23'32"$ 13 34LamerougeAntongombato $12^{\circ}21'47"$ $49^{\circ}13'58"$ 47 35MahatsijoAmbodimanga $12^{\circ}27'29"$ $49^{\circ}14'06"$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29"$ $49^{\circ}14'06"$ 49 38MenagisyAndranotsymaty $12^{\circ}23'33"$ $49^{\circ}11'46"$ 117 40TegnantsahampanoAntongombato $12^{\circ}22'50"$ $49^{\circ}11'34"$ 142 41TsimanankaratraAndranotsimaty $12^{\circ}20'54"$ $49^{\circ}09'36"$ 114	25	Antsahampano 1	Antsahampano	12°19'59"	49°11'07"	83
27Antsiasia 1Antongombato $12^{\circ}23'45"$ $49^{\circ}11'09"$ 225 28Antsiasia 2Antongombato $12^{\circ}22'50"$ $49^{\circ}11'04"$ 210 29Bekamankuri*M. des Français $12^{\circ}22'50"$ $49^{\circ}24'14"$ 50 30Daraina*Daraina $12^{\circ}29'21"$ $49^{\circ}24'04"$ 90 31FrancomFrancom $12^{\circ}26'54"$ $49^{\circ}12'08"$ 281 33Ivovona*M. des Français $12^{\circ}19'12"$ $49^{\circ}23'33"$ 11 32Ivovona*M. des Français $12^{\circ}18'52"$ $49^{\circ}23'32"$ 13 34LamerougeAntongombato $12^{\circ}21'47"$ $49^{\circ}13'58"$ 47 35MahatsijoAmbodimanga $12^{\circ}23'09"$ $49^{\circ}15'48"$ 271 36MalezaAntongombato $12^{\circ}21'31"$ $49^{\circ}14'06"$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29"$ $49^{\circ}23'10"$ 65 38MenagisyAndranotsymaty $12^{\circ}22'39"$ $49^{\circ}11'46"$ 117 40TegnantsahampanoAntongombato $12^{\circ}22'50"$ $49^{\circ}11'34"$ 142 41TsimanankaratraAndranotsimaty $12^{\circ}20'54"$ $49^{\circ}09'36"$ 114	24	Antsahampano 2	Antsahampano	12°20'25''	49°12'12"	5
28Antsiasia 2Antongombato $12^{\circ}22'50^{\circ}$ $49^{\circ}11'04^{\circ}$ 210 29Bekamankuri*M. des Français $12^{\circ}23'04^{\circ}$ $49^{\circ}24'14^{\circ}$ 50 30Daraina*Daraina $12^{\circ}29'21^{\circ}$ $49^{\circ}24'04^{\circ}$ 90 31FrancomFrancom $12^{\circ}26'54^{\circ}$ $49^{\circ}12'08^{\circ}$ 281 33Ivovona*M. des Français $12^{\circ}19'12^{\circ}$ $49^{\circ}23'33^{\circ}$ 11 32Ivovona*M. des Français $12^{\circ}18'52^{\circ}$ $49^{\circ}23'32^{\circ}$ 13 34LamerougeAntongombato $12^{\circ}21'47^{\circ}$ $49^{\circ}13'58^{\circ}$ 47 35MahatsijoAmbodimanga $12^{\circ}21'31^{\circ}$ $49^{\circ}15'48^{\circ}$ 271 36MalezaAntongombato $12^{\circ}21'31^{\circ}$ $49^{\circ}14'06^{\circ}$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29^{\circ}$ $49^{\circ}23'10^{\circ}$ 65 38MenagisyAndranotsymaty $12^{\circ}22'39^{\circ}$ $49^{\circ}11'46^{\circ}$ 117 40TegnantsahampanoAntongombato $12^{\circ}22'50^{\circ}$ $49^{\circ}11'34^{\circ}$ 142° 41TsimanankaratraAndranotsimaty $12^{\circ}20'54^{\circ}$ $49^{\circ}09'36^{\circ}$ 114°	26	Antsakoamaro*	Ivovona	12°18'41"	49°23'39"	12
29Bekamankuri*M. des Français $12^{\circ}23'04''$ $49^{\circ}24'14''$ 50 30Daraina*Daraina $12^{\circ}29'21''$ $49^{\circ}24'04''$ 90 31FrancomFrancom $12^{\circ}26'54''$ $49^{\circ}12'08''$ 281 33Ivovona*M. des Français $12^{\circ}19'12''$ $49^{\circ}23'33''$ 11 32Ivovona*M. des Français $12^{\circ}18'52''$ $49^{\circ}23'32''$ 13 34LamerougeAntongombato $12^{\circ}21'47''$ $49^{\circ}13'58''$ 47 35MahatsijoAmbodimanga $12^{\circ}23'09''$ $49^{\circ}15'48'''$ 271 36MalezaAntongombato $12^{\circ}21'31'''$ $49^{\circ}14'06'''$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29'''$ $49^{\circ}23'10'''$ 65 38MenagisyAndranotsymaty $12^{\circ}22'33''''$ $49^{\circ}11'46''''''''''''''''''''''''''''''''''$	27	Antsiasia 1	Antongombato	12°23'45"	49°11'09"	225
30Daraina*Daraina $12^{\circ}29'21''$ $49^{\circ}24'04''$ 90 31FrancomFrancom $12^{\circ}26'54''$ $49^{\circ}12'08''$ 281 33Ivovona*M. des Français $12^{\circ}19'12''$ $49^{\circ}23'33''$ 11 32Ivovona*M. des Français $12^{\circ}18'52''$ $49^{\circ}23'32''$ 13 34LamerougeAntongombato $12^{\circ}21'47''$ $49^{\circ}13'58''$ 47 35MahatsijoAmbodimanga $12^{\circ}23'09''$ $49^{\circ}15'48''$ 271 36MalezaAntongombato $12^{\circ}21'31''$ $49^{\circ}14'06''$ 49 37Mangatokona*Mahavavona $12^{\circ}27'29''$ $49^{\circ}23'10''$ 65 38MenagisyAndranotsymaty $12^{\circ}23'33'''$ $49^{\circ}10'12''''$ 171 39ParchuiteAntongombato $12^{\circ}22'50'''$ $49^{\circ}11'34'''''$ $142''''''''''''''''''''''''''''''''''''$	28	Antsiasia 2	Antongombato	12°22'50"	49°11'04"	210
31FrancomFrancom12°26'54"49°12'08"28133Ivovona*M. des Français12°19'12"49°23'33"1132Ivovona*M. des Français12°18'52"49°23'32"1334LamerougeAntongombato12°21'47"49°13'58"4735MahatsijoAmbodimanga12°23'09"49°15'48"27136MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°23'33"49°10'12"17139ParchuiteAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	29	Bekamankuri*	M. des Français	12°23'04"	49°24'14"	50
33Ivovona*M. des Français12°19'12"49°23'33"1132Ivovona*M. des Français12°18'52"49°23'32"1334LamerougeAntongombato12°21'47"49°13'58"4735MahatsijoAmbodimanga12°23'09"49°15'48"27136MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°22'39"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	30	Daraina*	Daraina	12°29'21"		90
32Ivovona*M. des Français12°18'52"49°23'32"1334LamerougeAntongombato12°21'47"49°13'58"4735MahatsijoAmbodimanga12°23'09"49°15'48"27136MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°22'33"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	31	Francom	Francom	12°26'54"	49°12'08"	281
34LamerougeAntongombato12°21'47"49°13'58"4735MahatsijoAmbodimanga12°23'09"49°15'48"27136MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°22'33"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	33	Ivovona*	M. des Français	12°19'12"	49°23'33"	11
35MahatsijoAmbodimanga12°23'09"49°15'48"27136MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°23'33"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114		Ivovona*	M. des Français		49°23'32"	13
36MalezaAntongombato12°21'31"49°14'06"4937Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°23'33"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	34		Antongombato	12°21'47"		47
37Mangatokona*Mahavavona12°27'29"49°23'10"6538MenagisyAndranotsymaty12°23'33"49°10'12"17139ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114	35	Mahatsijo	Ambodimanga	12°23'09"	49°15'48"	271
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						
39ParchuiteAntongombato12°22'39"49°11'46"11740TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114						
40TegnantsahampanoAntongombato12°22'50"49°11'34"14241TsimanankaratraAndranotsimaty12°20'54"49°09'36"114		6 2				
41 Tsimanankaratra Andranotsimaty 12°20'54" 49°09'36" 114		Parchuite	Antongombato	12°22'39"	49°11'46"	117
		Tegnantsahampano	6			142
42 Vinay Andranotsimaty 12°21'14" 40°00'16" 78		Tsimanankaratra				
42 Villay Andrahotsiniaty 12 21 14 49 09 10 78	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



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

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.

Distribution of Mantella viridis



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.
- Metcalf, 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. 17 (1-2): 3-72.