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Two New Species of Mouse Lemurs (Cheirogaleidae: *Microcebus*) from Eastern Madagascar

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Abstract The number of newly discovered Malagasy vertebrate taxa has multiplied in recent years, emphasizing the importance of complete taxon sampling for phylogenetics, biogeography, functional ecology, and conservation biology, especially in such a biodiversity hotspot. In particular, the diversity of extant lemurs is much higher than previously thought, and we have yet to comprehend fully the full extent of lemuriform biodiversity. A recent genetic analysis of mtDNA and nDNA sequence data in Malagasy mouse lemurs revealed the existence of several novel mtDNA clades based on new field sampling. These geographically defined and previously unrecognized mtDNA clades corresponded precisely to patterns of population structure revealed in the analysis of the nDNA data, thus confirming their evolutionary divergence from other mouse lemur clades. Two of these independently evolving lineages correspond to specimens that were collected by us in the Marolambo and Manantantely/Ivorona regions. Here

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we summarize the genetic evidence and report on the morphometric and external characteristics of these animals, formally describing them as new species. This report thus brings the number of currently recognized and described mouse lemur species to 20. The forests in which these mouse lemurs were discovered have been heavily degraded in the past decade, prompting the classification of one of the new species as Endangered by the IUCN, even before its formal description. As with several other newly described lemur species, immediate field studies and appropriate conservation actions are therefore urgent.

Keywords Biodiversity · Taxonomy · Madagascar · *Microcebus* · Mouse lemurs

Introduction

Madagascar is one of the global biodiversity hotspots owing to its exceptionally high levels of endemism and biodiversity (Myers *et al*. 2000). The diversity and phylogeographic history of Madagascar's vertebrate fauna, in particular, continues to attract the interest of a wide range of different taxonomic specialists and evolutionary biologists. For example, when, how, and from where the ancestors of the different groups of extant Malagasy vertebrates colonized the island has been subject to intensive discussion in recent years (Ali and Huber 2010; Kappeler 2000; Poux *et al*. 2005; Samonds *et al*. 2012; Stankiewicz *et al*. 2006; Yoder and Nowak 2006; Yoder *et al*. 2003). Likewise, the microendemic distribution of many extant species across the island has recently generated several hypotheses about speciation patterns and processes underlying the adaptive radiations of various vertebrate lineages (Pearson and Raxworthy 2009; Vences *et al*. 2009; Wilmé *et al*. 2006). Finally, as field research effort has increased and new genetic methods have been applied and combined with other types of data, the number of newly discovered vertebrate taxa has also multiplied in recent years (Nagy *et al*. 2012; Ramasindrazana *et al*. 2011; Solano *et al*. 2011; Vieites *et al*. 2009), emphasizing the importance of complete taxon sampling for phylogenetics, biogeography, functional ecology, and conservation biology, especially in such a biodiversity hotspot.

The endemic primates of Madagascar (Lemuriformes) have played a central role in all of the aforementioned research programs. Importantly, the full diversity of these enigmatic mammals has still not been fully described, as new populations and species continue to be discovered (Louis *et al*. 2008; Radespiel *et al*. 2012). In fact, the number of recognized lemur species has more than tripled in the past decade. These taxonomic revisions, especially of small nocturnal taxa, have been driven by a combination of new discoveries in the field and genetic investigations in the laboratory (Mittermeier *et al*. 1994 vs. Mittermeier *et al*. 2011). A critical evaluation of the available genetic data indicates that confirmation of the species status of several taxa will require reanalysis based on larger samples (Markolf *et al*. 2011; see also Groeneveld *et al*. 2009; Tattersall 2007), and, ideally, access to proper museum specimens. Regardless of which species concept is employed, a consensus view of genetic, morphological, geographic, and ecological data yields a clear signal, however: The diversity of extant lemurs is much higher than previously thought and we have yet to comprehend the full extent of lemuriform biodiversity.

The mouse lemurs, i.e., the genus *Microcebus,* exhibits one of the highest species numbers among extant lemurs, and indeed, among all primates. Mouse lemurs represent a radiation of small (<100 g), nocturnal cheirogaleids that are found in all major forest habitats across Madagascar. In the early 1990s, only two species of mouse lemurs were thought to exist (Schmid and Kappeler 1994), but increased sampling effort has led to the current recognition of 18 species (Radespiel *et al*. 2012; Weisrock *et al*. 2010). Although mouse lemurs vary little in size or ecology, a recent analysis of variation in nuclear (n) DNA confirmed the taxonomic status and validity of most species, even though many of them were originally described based only on mitochondrial (mt) DNA variation (Markolf *et al*. 2011). In particular, a recent comprehensive genetic analysis revealed a high correspondence between clades in the mtDNA gene tree and nuclear genotypic clusters based on Bayesian STRUCTURE analyses (Weisrock *et al*. 2010). This study unequivocally identified the mouse lemurs from a newly sampled site in central eastern Madagascar (Marolambo) as a genetically distinct lineage, and there was no evidence for gene flow with adjacent *Microcebus lehilahytsara*, *M. simmonsi,* and *M. rufus* populations (Fig. 1). Similarly, a population of mouse lemurs in southeastern Madagascar (from forests at Manantantely and Ivorona) was found to be genetically distinct from adjacent *Microcebus murinus* and *M. griseorufus* populations (see also Hapke *et al*. 2013). Although it has been demonstrated that limited gene flow exists between certain sympatric species (Hapke *et al*. 2011), such patterns of hybridization are entirely consistent with the maintenance of "good" species (Mallet 2008), which, in the case of mouse lemurs, have existed for 7–10 million years (Yang and Yoder 2003).

One reason why the true diversity of eastern mouse lemurs has not been recognized earlier may also lie in the fact that these small, nocturnal animals are phenotypically rather similar (Fig. 2; see also Yoder *et al*. 2005 for western mouse lemurs). As in many other invertebrate and vertebrate taxa that harbor numerous cryptic species, morphological change might not correlate with species boundaries or might not be useful in discriminating species, either because they are differentiated by nonvisual mating signals and/or subject to selection that promotes morphological stasis (Bickford *et al*. 2007). Thus, demonstration of statistically significant phenotypic variation may be informative for many questions, but is not necessarily required for recognizing species boundaries (Fujita and Leaché 2011; Padial *et al*. 2010). We therefore here illustrate minor interspecific variation in internal and external morphometric measurements (see Cuozzo *et al*. 2013; Heckman *et al*. 2006 for levels of intraspecific variation), between small samples of these two eastern mouse lemurs and other *Microcebus* spp. from the east coast below and formally describe them as new species.

Methods

During a field trip in December 2003, one of us (R. M. Rasoloarison) captured three mouse lemurs (two females, one male) with baited Sherman traps at the Forêt de Marohita located within the Marolambo forest in Toamasina province in eastern Madagascar (Fig. 1). Lemurs were collected with the permit of the Malagasy Ministry for Water, Forest and the Environment (no. 167 MINENVEF/SG/DGEF/DPB/SCBLF, 29/08/2003).

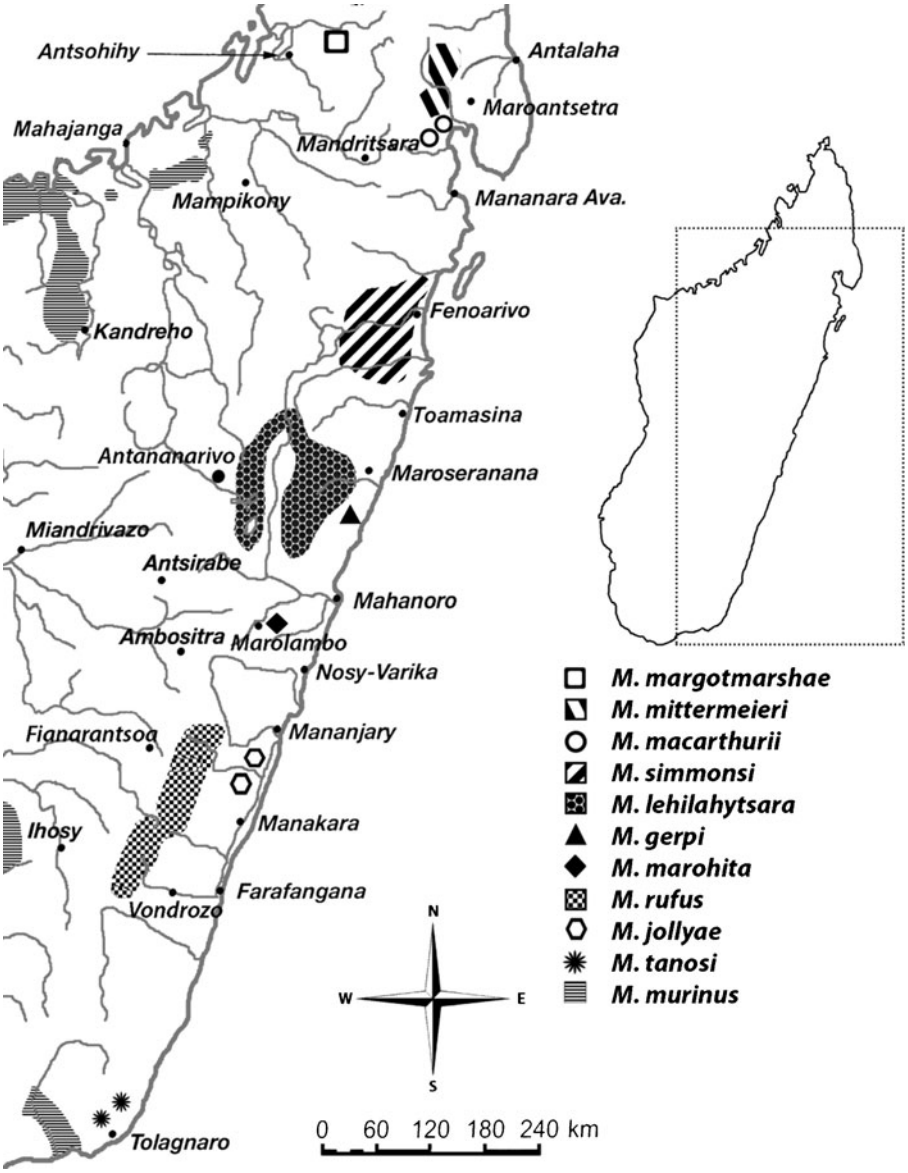

Fig. 1 Map of eastern Madagascar summarizing currently available information on the geographic distribution of eastern mouse lemurs. (Modified from Mittermeier *et al*. 2011).

During another field trip in April 2007, R. M. Rasoloarison captured six mouse lemurs at the Forêt de Manantantely and four individuals at the Forêt d'Ivorona, both located in the Anosy region in southeastern Madagascar (Fig. 1), and he took tissue samples from all of them for DNA sequence analyses. Two females and one male from Manantantely and one male from Ivorona were prepared as museum specimens with permit no. 254 MINENVEF/SG/DGEF/DPB/SCBLF/RECH 31/10/2006. This research received clearance from, and complied with the protocols approved by the Département de

Fig. 2 Phenotypic variation among eastern mouse lemurs (*Microcebus* spp). Adult museum specimens of, from left to right, *M. mittermeieri*, *M. simmonsi*, *M. lehilahytsara* and *M. rufus* are depicted together with an individual from Marohita and Manantantely. All specimens were collected by R. M. Rasoloarison and are housed at the collection of the Département de Biologie Animale, Université d'Antananarivo. Photographs of *M. gerpi* can be found in Radespiel *et al*. (2012). No holotype has been deposited yet. No photos of *M. jollyae* (holotype still alive in November 2012 at Parc Botanique et Zoologique Tsimbazaza, Antananarivo; see Louis *et al*. 2006) have been published yet.

Biologie Animale (DBA) and the CAFF/CORE, i.e., the functional equivalents of institutional animal care committees in Madagascar. Therefore, all research reported in this article adhered to the legal requirements of the country in which the work took place.

We prepared these mouse lemurs as standard museum skins with associated skulls and postcranial skeletons and recorded standard field morphometric data as well as several standard cranial measurements (see Rasoloarison *et al*. 2000 for definitions). Specifically, we recorded body mass as well as the length of the total body, tail, head–body, hind foot, and ear. We also recorded data on nine craniodental variables, including greatest skull length, skull height, and canine length. We described pelage color in natural light, using a color chart to identify color numbers (Smithe 1975). Small tissue samples were preserved in 90 % ethanol and used for later DNA extraction. All specimens have been deposited for future reference in the collection of the DBA of the University of Antananarivo.

Two mitochondrial and four nuclear loci were previously sequenced from tissue samples as described in Weisrock *et al*. (2010) and analyzed together with sequences of 279 (mtDNA) and 209 (nDNA) other mouse lemurs from 78 sites distributed across Madagascar (see Table I and Fig. 1 in Weisrock *et al*. 2010). For each gene locus, we performed a Bayesian phylogenetic analysis, and a Bayesian STRUCTURE analysis provided information on nuclear clustering. The mtDNA haplotypes of the three individuals from Marolambo constitute a novel clade that is highly diverged from other geographically defined mtDNA clades within the mouse lemur phylogeny. Similarly, Marolambo haplotypes sampled from the nuclear *eno* gene also formed a

Table I Descriptive statistics of external measurements of adult specimens of *Microcebus* spp. from eastern Madagascar

	M. mittermeieiri (Marojejy)	*M. simmonsi* (Tampolo & S^{te} Marie)	*M. lehilahytsara* (Ambohitantely)	*M. rufus* (Andrambovato)	*M. marohita* (Marolambo)	*M. tanosi* (Manantantely & Ivorona)
Total length (mm)	263.2±12.28	279.0±10.21	223.0±6.00	231.6±8.44	280.5±7.78	264.8±11.84
	(256.0–285.0; *N*=5)	(263.0–295.0; *N*=12)	(228.0–240.0; *N*=4)	(220.0–241.0; *N*=5)	(275.0–286.0; *N*=2)	(254.0–275.0; *N*=4)
Tail length (mm)	145.0±9.33	139.8±6.52	119.7±7.41	119.4±3.29	139.0±8.49	138.8±16.52
	(137.0–160.0; *N*=5)	(128.0–148.0; *N*=12)	(112.0–129.0; *N*=4)	(115.0–124.0; *N*=5)	(133.0 – 145.0; *N*=2)	(115.0–150.0; *N*=4)
Head–body length (mm)	118.6±4.16	131.8±6.27	111.5±3.00	108.6±7.47	135.3±4.16	126.5±9.95
	(115.0–125.0; *N*=5)	(123.0–141.0; *N*=12)	(110.0–116.0; *N*=4)	(100.0–118.0; *N*=5)	(132.0–140.0; *N*=3)	(116.0–140.0; *N*=4)
Hind foot length (mm)	33.2±0.84	34.2±1.03	30.0±0.57	31.6±0.54	34.7±0.58	32.0±1.41
	(32.0–34.0; *N*=5)	(33.0–36.0; *N*=12)	(30.0–31.0; *N*=4)	(31.0–32.0; *N*=5)	(34.0–35.0; *N*=3)	(30.0–33.0; *N*=4)
Ear length (mm)	18.4±0.55	19.2±0.83	19.8±1.70	19.0±0.22	18.7±0.58	19.5±0.58
	(18.0–19.0; *N*=5)	(18.0–20.0; *N*=12)	(18.0–22.0; *N*=4)	(19.0–19.5; *N*=5)	(18.0–19.0; *N*=3)	(19.0–20.0; *N*=4)
Body mass (g)	56.4±3.85	60.6±6.50	39.3±7.18	37.9±4.28	78.0±12.77	51.5±5.69
	(50.0–60.0; *N*=5)	(51.0–74.0; *N*=12)	(35.0–50.0; *N*=4)	(33.0–44.5; *N*=5)	(64.0–89.0; *N*=3)	(48.0–60.0; *N*=4)

Variables are defined in Rasoloarison *et al.* (2000)

novel and divergent clade distinct from other *eno* haplotypes. These novel and divergent clades mapped to a distinct nuclear STRUCTURE cluster with an individual membership coefficient of 1.0. The 10 samples of lemurs collected at Manantantely and Ivorona yielded sequences that clustered together, forming another novel clade in the mtDNA gene tree and a novel clade in the nuclear *fga* gene tree. These novel and divergent clades mapped to a distinct nuclear STRUCTURE cluster with an average individual membership coefficient of 0.93.

Members of the Manantantely/Ivorona lineage occur in the same area as *Microcebus murinus* and *M. griseorufus* (Weisrock *et al*. 2010, Fig. 4; Hapke *et al*. 2013), but show no evidence of gene flow, despite the fact that these three populations are separated by ≤10 km. Larger sample size and additional locality sampling would be useful in clarifying the geographic distribution of genetic variation of these lineages as well. Further, the Marolambo population is relatively proximal to the recently described *Microcebus gerpi* (Radespiel *et al*. 2012) and it would be useful to evaluate their genetic distinctiveness. Currently, only mtDNA is available for *Microcebus gerpi*, preventing a full comparison to mouse lemur lineages identified in Weisrock *et al*. (2010). Further, the phylogenetic placement of these two species is also unlikely to be resolved with such limited data (Weisrock *et al*. 2012), contrary to the phylogenetic results presented in Springer *et al*. (2012). Nonetheless, within the framework of the metapopulation lineage concept of species (de Queiroz 1998), the available results clearly identified the mouse lemurs from Marolambo and those from Manantantely/Ivorona, respectively, as independently evolved lineages

Because holotypes are not available for all species from eastern Madagascar (Louis *et al*. 2006; Radespiel *et al*. 2012), because the types of measurements taken vary among authors, and because a comparison always entails the risk of errors due to interindividual variation among researchers taking measurements, we present only data collected by R. M. Rasoloarison on specimens collected by him (see also Yoder *et al*. 2000). Small sample sizes preclude analytical statistical analyses, but some patterns are nonetheless clearly discernible for the two species described herein.

Results and Discussion

Some descriptive statistics on standard external (Table I) and cranial (Table II) measurements are presented for the mouse lemurs from Marolambo and Manantantely/Ivorona, as well as for other mouse lemur species from adjacent regions along the Malagasy east coast to depict patterns of morphometric variation. The mouse lemurs from Marohita are relatively large; the mean body mass of the two females is 85 g. The single male is lighter (64 g), but his head–body length and skull length are very similar to those of the females, suggesting that this is a young adult individual, which is confirmed by incomplete epiphyseal fusion. They differ phenotypically from other mouse lemurs in displaying a strikingly rufous dorsal pelage color and in having relatively short ears and long hind feet. The mouse lemurs from Manantantely and Ivorona, in contrast, are intermediate in all external and craniodental characters, but, compared to the other five eastern species for which we have corresponding data, this species has a relatively long head–body length and relatively long ears for its body mass. The skull is relatively high and it has a short nasal bone for its length. Also, its canines are longer than those of other described species.

Table II Descriptive statistics of cranial measurements of adult specimens of *Microcebus* spp. from eastern Madagascar

	M. mittermeieiri (Marojejy)	*M. simmonsi* (Tampolo & S^{te} Marie)	*M. lehilahytsara* (Ambohitantely)	*M. rufus* (Andrambovato)	*M. marohita* (Marolambo)	*M. tanosi* (Manantantely & Ivorona)
Greatest skull length (mm)	33.9±0.19	34.9±0.64	31.2±0.60	31.7±0.63	34.5±0.79	33.6±0.55
	(33.7–34.2; *N*=5)	(33.9–36.0; *N*=12)	(30.4–31.7; *N*=4)	(31.0–32.4; *N*=5)	(33.9–35.4; *N*=3)	(33.1–34.4; *N*=4)
Skull height (mm)	15.6±0.27	15.2±0.40	14.8±0.51	15.5±0.36	15.3±0.11	15.6±0.75
	(15.2–15.9; *N*=5)	(14.4–15.7; *N*=12)	(14.3–15.5; *N*=4)	(14.9–15.9; *N*=5)	(15.2–15.4; *N*=3)	(14.5–16.3; *N*=4)
Palate length (mm)	14.4±0.24	15.4±0.33	13.2±0.18	13.0±0.25	15.1±0.49	14.5±0.31
	(14.1–14.7; *N*=5)	(14.6–15.8; *N*=12)	(12.9–13.3; *N*=4)	(12.7–13.3; *N*=5)	(14.8–15.7; *N*=3)	(14.2–14.9; *N*=4)
Condylobasal length (mm)	27.0±0.34	28.1±0.80	24.4±0.40	25.2±0.60	27.9±0.95	27.2±0.66
	(26.5–27.4; *N*=5)	(26.8–29.6; *N*=12)	(23.8–24.7; *N*=4)	(24.3–25.8; *N*=5)	(27.2–29.0; *N*=3)	(26.3–27.9; *N*=4)
Zygomatic breadth (mm)	21.6±0.66	22.0±0.75	18.9±0.45	19.5±0.62	21.8±1.10	20.7±0.15
	(20.6–22.4; *N*=5)	(21.0–23.0; *N*=12)	(18.4–19.5; *N*=4)	(18.5–20.2; *N*=5)	(20.5–22.5; *N*=3)	(20.5–20.8; *N*=4)
Nasal length (mm)	10.1±0.92	10.7±0.52	9.0±0.50	9.5±0.66	10.9±0.83	10.3±0.45
	(8.5–10.7; *N*=5)	(9.7–11.4; *N*=12)	(8.3–9.5; *N*=4)	(9.5–10.1; *N*=5)	(10.0–11.6; *N*=3)	(9.9–10.9; *N*=4)
Occipital length (mm)	4.0±0.36	3.8±0.43	3.5±0.27	4.0±0.36	3.8±0.35	3.7±0.24
	(3.7–4.5; *N*=5)	(3.1–4.9; *N*=12)	(3.3–3.9; *N*=4)	(3.5–4.5; *N*=5)	(3.4–4.0; *N*=3)	(3.4–3.9; *N*=4)
Canine length (mm)	2.4±0.13	2.3±0.21	1.9±0.05	2.1±0.19	2.4±0.21	2.3±0.08
	(2.3–2.6; *N*=5)	(2.0 – 2.7; *N*=12)	(1.9–2.0; *N*=4)	(1.9–2.4; *N*=5)	(2.2–2.6; *N*=3)	(2.2–2.4; *N*=4)
1st Molar length (mm)	2.0±0.08	2.2±0.08	1.9±0.05	1.9±0.11	2.1±0.15	1.9±0.06
	(1.9–2.1; *N*=5)	(2.0–2.3; *N*=12)	(1.8- 1.9; *N*=4)	(1.8–2.1; *N*=5)	(2.0–2.3; *N*=3)	(1.8- 1.9; *N*=4)

Variables are defined in Rasoloarison *et al.* (2000)

Within our small samples we did not detect striking individual variation in coat coloration in either species. The formal description of the two new species is as follows:

Systematics
Family Cheirogaleidae Gray 1873
Genus *Microcebus* É. Geoffrroy 1828
Microcebus marohita sp. nov. (Fig. 3)
Marohita mouse lemur

Holotype RMR 136; adult female, skin, skull, skeleton, and preserved tissues. Collected December 2, 2003 by R. M. Rasoloarison.

Standard measurement (in mm except for mass) recorded in the original field catalog and on the skin tag of the type include: total length: 286; head–body length: 140; tail length: 145; hind foot length: 35; ear length: 19; and body mass: 89 g. Selected cranial measurements (all in mm) are: greatest skull length: 35.4; skull height: 15.2; palate length: 15.7; zygomatic breadth: 22.5; nasal length: 11.6; occipital length: 4.0; canine length: 2.2; and molar length: 2.3. The skin, the skull, and associated skeleton are in a good shape. The mammae were large and the vagina was perforated.

Type locality Madagascar: Province de Toamasina, Région Antsinanana, District de Marolambo, Forêt de Marohita; 20°03′S, 48°10′E, *ca*. 695 m above sea level (Fig. 1).

Hypodigm Madagascar; Province de Toamasina, District de Marolambo, Forêt de Marohita; 20°03′S, 48°10′E, *ca*. 695 m above sea level (RMR 131; RMR 138)

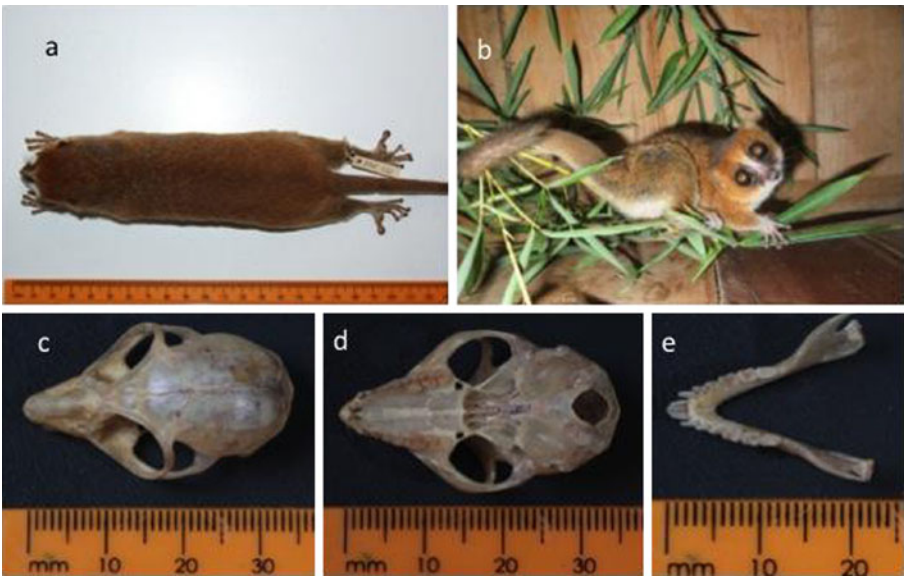

Fig. 3 (**a**) Holotype of *Microcebus marohita.* (**b**) Photograph of an adult female *M. marohita.* (**c**–**e**) Skull and mandible of the holotype of *M. marohita*.

Diagnosis A distinctly large mouse lemur characterized by its body length (total length, 275–286 mm), long tuft tail (133–145 mm), notably long hind feet (34–35 mm), short ears (18–19 mm), and considerable body mass (up to 89 g). The dorsal pelage is rufous with a poorly defined mid-dorsal stripe. The underside is a grayish-beige with dark gray underfur.

Description The dense soft and long cover hairs of the dorsum are bicolored to tricolored: Verona Brown (223 C) and Tawny Olive (223 D). The poorly defined mid-dorsal stripe, which commences behind the shoulders and terminates at the base of the tail, varies in coloration from Raw Umber (123) to Mars Brown (223 A). The underfur of the dorsum surfaces of the body is Blackish Neutral Gray (82) and the underfur of the ventral surface of the body is Dark Neutral Gray (83). The midventral fur is whitish-beige and the flanks are bicolored from Light Neutral Gray (85) to Pale Neutral Gray (86). Crown and ears are Raw Sienna (136).

This mouse lemur has a dull white and Pale Pinkish Buff (121 D) patch between the eyes. The tail has short fur to distal tip; the proximal 75 % has a bicolored dorsal surface of Verona Brown (223 C) and Sayal Brown (223 C), and the ventral portion is Cinnamon (123 A) to Clay Color (123 B). A sharp line on the lower flanks forms the division between the contrasting ventral and dorsal surfaces. The darker tail tip has a monocolored dorsal surface of Row Umber (123). The upper surfaces of forefeet and hind feet are covered with short whitish-gray fur.

Etymology The name *marohita* refers to the local name of the forest in which the holotype was captured. In Malagasy it means “many views.”

Systematics
Family Cheirogaleidae Gray 1873
Genus *Microcebus* É. Geoffrroy 1828
Microcebus tanosi sp. nov. (Fig. 4)
Anosy mouse lemur

Holotype RMR 209 adult female, skin, skull, skeleton, and preserved tissues, collected April 1, 2007 by R. M. Rasoloarison.

Standard measurements (in mm except for mass) recorded in the original field catalog and on the skin tag of the type include: total length: 275; head–body length: 125; tail length: 150; hind foot: 33; ear length: 20; and body mass: 49 g. Selected cranial measurements (in mm) are: greatest skull length: 34.4; skull height: 16.3; palate length: 14.9; Zygomatic breadth: 20.6; Nasal length: 10.2; Occipital length: 3.5; Canine length: 2.3; Molar length: 1.8. The skin, the skull and associated skeleton are in a good condition.

Type locality Madagascar; Province de Toliara, Région d’Anosy, District de Taolagnaro, Forêt de Manantantely; 24°98′S, 46°92′E.

Diagnosis A relatively large mouse lemur (total length, 255–275 mm; tail length, 115–150 mm) with a dark brownish dorsal pelage, a reddish head, a dark dorsal stripe largely visible along the midportion of the mid-dorsal area, and a mixture of dull beige and dark gray underside.

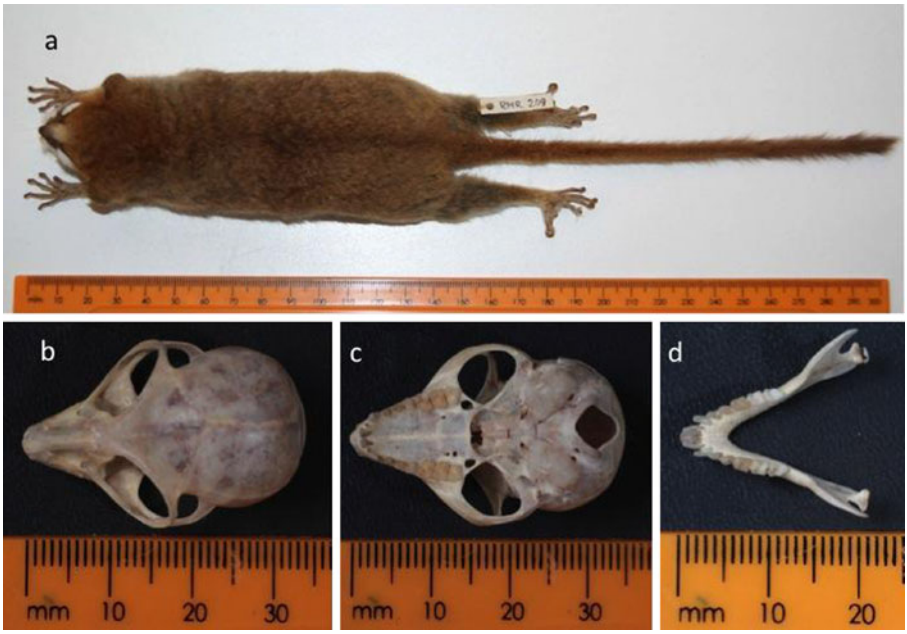

Fig. 4 (**a**) Holotype of *Microcebus tanosi*, bottom). (**b**–**d**) Skull and mandible of the holotype of *M. tanosi.* Photographs of living individuals are not available.

Hypodigm Madagascar; Province de Toliara, Région d'Anosy, District de Taolagnaro, Forêt de Manantantely; 24°98′S, 46°92′E (RMR 210; RMR 211); Province de Toliara, Région d'Anosy, District de Taolagnaro, Forêt d'Ivorona 24°83′S, 46°95′E (RMR 202).

Distribution Currently known only from the holotype locality in the Manantantely and Ivorona forests.

Description The dense and long cover hairs of the dorsum are bicolored: Mikado Brown (121 C) and Brussels Brown (121 B). The back stripe, which varies in coloration from Prout's Brown (121 A) to Burnt Umber (22), is diffused and is largely visible along the midportion of the mid-dorsal area to the base of the tail. The ventrum has a soft grayish-beige fur along the central and upper portions of the belly and bicolored dull beige and Pale Neutral Gray (86) flanks. The underfur of the dorsum surface is Dusky Brown (19) and the underfur of the ventrum surface is Vandyke Brown (221). Crown and ears are Antique Brown (37). The head has a uniform pale white patch above the nose and between the eyes. The tail, with dense and short hair in individuals from Manantantely forest, has a Mars Brown (223 A) dorsal surface and Sayal Brown ventral surface; and those from Ivorona forest, with a relatively dense and long fur, particularly toward the terminus, have a Verona Brown (223 B) dorsal surface and a Tawny Olive (223 D) ventral surface. The upper surfaces of forefeet and hind feet are Clay Color (123 B). Vibrissae are generally dark.

Etymology The name *tanosi* is derived from Malagasy and means "from the Anosy Region."

Distribution, Biology, and Conservation Status

Marohita mouse lemurs are currently known only from the holotype locality in the Forêt de Marohita (found within an extensive area known as Forêt de Marolambo). The wider geographical distribution currently remains unknown, but north of the Mangoro river two other mouse lemur species have been described in recent years: *Microcebus lehilahytsara* (highland; Kappeler *et al*. 2005) and *M. gerpi* (lowland; Radespiel *et al*. 2012). *Microcebus jollyae* and *M. rufus* are the currently described species known to occur south of Marolambo (Mittermeier *et al*. 2011).

No field studies have yet been undertaken on these new mouse lemur species and all aspects of their natural history, social system, and life history remain unstudied. However, the large body mass of *Microcebus marohita* is remarkable. Radespiel *et al*. (2012) have recently summarized all available body mass data for mouse lemurs (their Table 3). The single male *Microcebus marohita*, which we judge to be a subadult, is as heavy as *M. gerpi* males, which until the new species described here, were the largest known mouse lemur males. The female *Microcebus marohita* are *ca*. 20 % heavier than the heaviest females known so far (*M. simmonsi* and *M. gerpi* with *ca*. 70 g each). The holotype RMR 136 was pregnant with three small embryos, but RMR 138 was not pregnant, allowing us to gain an unbiased assessment of standard body size.

Microcebus tanosi are known only from the two sites that we sampled. *Microcebus murinus* and *M. griseorufus* are also known to occur in this highly heterogeneous area of southeastern Madagascar (Hapke *et al*. 2013), but the extent of their sympatric co-occurrence remains undetermined. Population structure and habitat preferences of the latter two species have been studied in great detail in nearby forests (Gligor *et al*. 2009; Rakotondranary *et al*. 2011), where they were found to partly hybridize (Hapke *et al*. 2011).

As revealed by a recent visit (in 2012), the forest of Marohita is highly degraded and has been substantially damaged since the initial collecting trip from 2003. Thus, despite its species' name, this mouse lemur is threatened by ongoing habitat destruction, and "many views" of its members are unlikely. Accordingly, this species was classified as Endangered during the IUCN/SSC red-listing workshop held in Antananarivo in July 2012. *Microcebus tanosi* has not been classified yet, but it is likely to obtain a similar rank. The forest at Manantantely was already heavily degraded at the time of our field survey, whereas the forest at Ivorona was only slightly degraded, but the current state of these forests and the mouse lemur populations therein is not known. Field studies and additional regional surveys are therefore urgently needed to determine at least the geographic range and population status of these newly described species so that appropriate conservation measures can be implemented.

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