



Corrective paper concerning three new species of the genus *Lepilemur* Geoffroy, 1851 (Mammalia)

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Abstract

In 2006, we described three new species of sportive lemurs (Primates, genus *Lepilemur* Geoffroy, 1851) in an online journal. However, as the descriptions have been published online only and before 2012, the nomina are nomenclaturally unavailable. Herewith, we formally correct our original descriptions.

Key words

LEPILEMURIDAE; *STREPSIRRHINI*; sportive lemur; Madagascar.

Introduction

In 2006, we published the descriptions, diagnoses and nomina (scientific names) of three new species of mammals (Andriaholinirina *et al.* 2006). Unfortunately, these new nomina are nomenclaturally unavailable because they were published only online before 1st January 2012, and all online publications are unavailable before that date according to Article 8.5.1 of the 2012 Amendment of the *Code* (Anonymous 2012).

We therefore publish here a formal correction to our original work. The present paper, published in a periodically printed journal and distributed simultaneously to all subscribers, with later online access after paper distribution, is available under the traditional rules of zoological nomenclature for species descriptions.

We refer to the original work (Andriaholinirina *et al.* 2006) for the details of the phylogenetic, biological, etc., information concerning the new taxa. We structured the descriptions of the species according to Dubois (2010). The following information is provided here just in order to make their nomina nomenclaturally available:

Description of new species

Lepilemur aeeclis sp. nov.

Onomatophore (nomen-bearer)

Holotype: skull (UM 2003-Lem-100, for measurements see Appendix 1) stored at the University of Mahajanga, Madagascar. The individual was found dead at the type locality.

Hair and DNA samples from an additional five different individuals (paratypes) are stored at the Université Louis Pasteur, Strasbourg, France and the Gene Bank of Primates (GBP), German Primate Center, Germany (ID numbers of 5 paratypes GBP 1028–1032). Measurements of individuals are given in Appendix 2. See Fig. 6 in Andriaholinirina *et al.* (2006: 7) for photographs of *L. aeeclis*.

Type locality

Antafia (approx. 16°03.057'S, 45°54.522'E), north-east side of the Mahavavy du Sud River, Fokotany Ambatomahavavy, Firaisana Antongomena-Bevary, Fivondronona Mitsinjo, Province Mahajanga, Madagascar.

Description

Pelage coloration is considerably variable in the expression of the colours, possibly as a function of the age of individuals. Depending on light conditions (daylight or flashlight at night) the impression of colours may change. However, some constant characters are present, though variably expressed. The face is essentially grey and the ears are protruding and rounded. Sometimes there is the impression of a “facemask”, in that there may be a darker diffuse, patch of hair in the middle of the forehead. Above the eyes darker coloured but diffuse stripes may run upwards to join in the

middle of the head. These confluent stripes continue as one darker and distinct stripe along the back. The stripe is especially well expressed until it reaches the middle of the back, and then continues less prominently to the tail. On the back, the animals are essentially grey and reddish grey. The middle part of the back, especially, may show considerable reddish colouration that extends onto both shoulders and the upper and lower arms. The thigh and lower limb in general are less reddish than the upper part of the body. The ventral pelage is light to darker grey. The tail is variably coloured between grey with some red influence to deep rusty red with negligible grey influence.

Diagnosis

Differs, with the exception of *L. randrianasoloi* sp. nov. and *L. ruficaudatus* Grandidier, 1867, from all other sportive lemurs in karyotype (2N = 20; see Appendix 3; for figures of the karyotypes, see Andriaholinirina *et al.* 2006). In the complete mitochondrial cytochrome *b* gene, *L. aeeclis* differs from its closest relative, *L. randrianasoloi* in 59 diagnostic characters (positions 12, 20, 33, 52, 54, 67, 90, 133, 174, 189, 228, 246, 265, 274, 282, 285, 288, 306, 315, 323, 336, 369, 378, 417, 475, 495, 498, 522, 543, 546, 553, 555, 558, 577, 579, 582, 612, 621, 643, 648, 672, 712, 732, 813, 816, 834, 852, 886, 894, 895, 909, 912, 966, 1041, 1046, 1058, 1098, 1110 and 1114 of the gene). Its body size is slightly larger than *L. randrianasoloi*, but is similar to that of *L. ruficaudatus* (see Appendix 2). Head measurements (length and width) are more similar to *L. ruficaudatus* than to *L. randrianasoloi*. However, hind foot length is more similar to *L. randrianasoloi* than to *L. ruficaudatus*, which has the shortest hind foot (for statistical evidence see footnote of Appendix 2).

Distribution

The taxon occurs between the Betsiboka and Mahavavy du Sud rivers. The southern extension of the taxon across the Mahavavy du Sud River is unknown, and needs further research.

Etymology of new nomen

Lepilemur aeeclis is named in honour of the Association Européenne pour l'Étude et la Conservation des Lémuriens (A.E.E.C.L.), which has supported our fieldwork for 12 years.

***Lepilemur randrianasoloi* sp. nov.**

Onomatophore (nomen-bearer)

Holotype: tissue and DNA from one individual stored at the Gene Bank of Primates, German Primate Center, Germany (GBP 941). See Fig. 7 in Andriaholinirina *et al.* (2006: 8) for photographs of *L. randrianasoloi*.

Type locality

Andramasay (approx. 44°29'E, 19°28'S), Province Toliary, Madagascar.

Description

Measurements of five males and four females from the type locality Andramasay are listed in Appendix 2.

Diagnosis

Differs, with the exception of *L. aeeclis* and *L. ruficaudatus*, from all other sportive lemurs in karyotype (2 N = 20; see Appendix 3; for figures of the karyotypes, see Andriaholinirina *et al.* 2006). In the complete mitochondrial cytochrome *b* gene, *L. randrianasoloi* differs from its closest relative, *L. aeeclis*, in 59 diagnostic characters (positions 12, 20, 33, 52, 54, 67, 90, 133, 174, 189, 228, 246, 265, 274, 282, 285, 288, 306, 315, 323, 336, 369, 378, 417, 475, 495, 498, 522, 543, 546, 553, 555, 558, 577, 579, 582, 612, 621, 643, 648, 672, 712, 732, 813, 816, 834, 852, 886, 894, 895, 909, 912, 966, 1041, 1046, 1058, 1098, 1110 and 1114 of the gene). The species is slightly smaller than *L. aeeclis* and *L. ruficaudatus* (see Appendix 2). It differs from these species by having a narrower but slightly longer head. These differences in head size are most pronounced in males. Hind feet are of similar length to *L. aeeclis*, but longer than in *L. ruficaudatus*. Tail length is similar in all three species (for statistical evidence see footnote of Appendix 2).

Distribution

Currently, *L. randrianasoloi* is known only from the type locality and Bemaraha. The Tsiribihina River is most likely the southern limit of the species' range. Further fieldwork is necessary to determine the northern limit. A possible northern barrier could be one of the major rivers Manambaho or the Mahavavy du Sud.

Etymology of new nomen

Lepilemur randrianasoloi is named in honour of our late colleague, Georges Randrianasolo, who worked from 1970 to 1977 to sample the sportive lemurs necessary for the first taxonomic revision based on cytogenetic studies, and who walked for two weeks to obtain data and samples from *L. ruficaudatus* at Antsalova.

Lepilemur sahamalaza* sp. nov.**Onomatophore (nomen-bearing)***

Syntypes: tissue and DNA samples from four individuals from type locality, stored at the Université Louis Pasteur, Strasbourg, France (Ldo158s, Ldo153s, Ldo40, Lepi205Ak99).

Additional specimens in the hypodigm: six animals from Ankarafa (47°45'E, 14°22'S), 25 km southeast of the type locality, from which morphometric measurements have been taken. See Fig. 8 in Andriaholinirina *et al.* (2006: 9) for photographs of *L. sahamalaza*.

Type locality

Sahamalaza Peninsula (approx. 47°58'E, 14°16'S), Province Mahajanga, Madagascar.

Description

Pelage coloration is variable, possibly also depending on age of individuals. Depending on light conditions (daylight or flashlight at night) the impression of colours may change. However, some constant characters are present, though variably expressed. The face is essentially grey. The forehead and the hairline around the ears are red-brown with sometimes darker diffuse patches. A dark diffuse line runs from the middle of the upper skull down the spine, ending in the middle or at the lower part of the back, but is never present on the tail. The dorsal pelage, including shoulders and the upper and lower arms, is predominantly red-brown, whereas the thigh and lower limbs in general are less reddish than the upper part of the body. The ventral pelage is generally grey to creamy. The coloration of the tail is red-brown to deep brown. Measurements of two males and of four females from Ankarafa are listed in Appendix 4.

Diagnosis

Differs, with the exception of *L. dorsalis* Gray, 1871, *L. tymerlachsonorum* Louis *et al.*, 2006 and *L. leucopus* (Forsyth Major, 1894), from all other sportive lemurs in diploid chromosome number ($2N = 26$; see Appendix 3; for figures of the karyotypes, see Andriaholinirina *et al.* 2006). The karyotypes of *L. leucopus* and *L. sahamalaza* differ in six chromosomal rearrangements, whereas none exists between the latter and *L. dorsalis* and *L. tymerlachsonorum*. In the complete mitochondrial cytochrome *b* gene, *L. sahamalaza* differs from its closest relative, *L. mittermeieri* Rabarivola *et al.*, 2006 (Rabarivola *et al.* 2006), in 53 diagnostic characters (positions 6, 11, 12, 63, 67, 135, 147, 183, 213, 237, 279, 294, 315, 321, 342, 378, 399, 426, 444, 445, 477, 489, 511, 566, 570, 579, 607, 621, 624, 631, 634, 672, 675, 705, 708, 725, 804, 882, 888, 904, 905, 909, 910, 946, 958, 963, 993, 1058, 1071, 1074, 1086, 1111 and 1134 of the gene). The few morphometric data which are available at the moment indicate that *L. sahamalaza* is smaller and lighter than *L. tymerlachsonorum*. The tibia of *L. sahamalaza*

seems to be longer than in *L. tymerlachsonorum*, although tarsus length does not differ (for statistical evidence see footnote of Appendix 4).

Distribution

The species is restricted to the type locality of the Sahamalaza Peninsula, with the Sambirano River most likely as its northern boundary. Further field studies are required to determine the exact distribution range.

Etymology of new nomen

Lepilemur sahamalaza is named after the type locality, the Sahamalaza Peninsula. The specific epithet is a noun in apposition, therefore grammatically invariable. It is slightly shorter than the unavailable epithet used for this species in the work of Andriaholinirina *et al.* (2006).

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APPENDIX 1. Morphometric measurements (mm) of the *L. aeeclis* sp. nov. holotype skull (hUM 2003-Lem-100).

Skull			
Skull length			59.0
Zygomatic width			40.0
Bicanine width			14.5
Facial length			29.5
Maxillary tooththrow			21.8
Mandibular tooththrow			24.1
Orbital diameter min (average left and right)			14.3
Orbital diameter max (average left and right)			15.1
Postorbital width			20.4
Mandible			
Hight of ramus mandibularis (average left and right)			23.7
Length of mandible (average left and right)			45.4
Dentition			
Tooth comb length			6.3
Tooth comb basal width			4.7
Tooth apical width			3.9
Premolar tooth row length			10.8
Molar tooth row length			13.0
Upper dentition L × W		Lower dentition L × W	
C	4.7 × 2.2	P2	4.5 × 2.2
P2	3.7 × 2.2	P3	3.8 × 2.2
P3	3.5 × 3.0	P4	3.7 × 2.2
P4	3.2 × 3.4	M1	4.3 × 2.9
M1	4.3 × 4.3	M2	4.2 × 3.0
M2	4.4 × 4.5	M3	4.6 × 2.7
M3	3.7 × 3.9		

APPENDIX 2. Morphometric measurements of *L. randrianasoloi* sp. nov., *L. ruficaudatus* Grandidier, 1867 and *L. aeecelis* sp. nov.

	<i>L. randrianasoloi</i> (n = 9) Locality: Andramasay		<i>L. ruficaudatus</i> (n = 45) Locality: Kirindy/CFPF		<i>L. aeecelis</i> (n = 5) Locality: Antafia/Anjahamena	
	Females (n = 4)	Males (n = 5)	Females (n = 24)	Males (n = 21)	Females (n = 2)	Males (n = 3)
¹ Body mass (g)**	793 (740 – 880)	717 (660 – 760)	803 (670 – 930)	806 (712 – 896)	909 (845 – 972)	868 (763 – 940)
² Head-body length (mm)			309 (289 – 335)	308 (287 – 344)	300 (295 – 305)	303 (285 – 315)
³ Head length (mm)	63.6 (60.8 – 66.2)	63.9 (63.1 – 66.0)	62.2 (57.8 – 65.3)	62.8 (60.4 – 65.8)	63.0 (62.0 – 64.0)	63.0 (60.0 – 65.0)
⁴ Head width (mm)**	37.4 (36.5 – 38.8)	38.0 (37.3 – 38.8)	39.2 (37.2 – 42.0)	39.7 (37.3 – 43.0)	39.0 (n=1)	43.3 (37.0 – 48.0)
⁵ Lower hind leg length (mm)	102 (100 – 105)	101 (97 – 107)			101 (100 – 102)	99 (94 – 105)
⁶ Hind foot length (mm)***	78.8 (78 – 80)	78.2 (74 – 81)	68.7 (63 – 74)	68.2 (63 – 74)	79.0 (79 – 79)	77.7 (75 – 80)
⁷ Tail length (mm)	240 (220 – 253)	226 (209 – 244) (n=4)	249 (203 – 281)	238 (209 – 270) (n=20)	255 (250 – 260)	252 (240 – 260)

¹ ANOVA body mass: locality $F_{2,53} = 7.18$, $p < 0.01$; sex: $F_{1,53} = 2.45$, ns; locality \times sex $F_{2,53} = 1.63$, ns.
² ANOVA head-body length: locality $F_{1,46} = 1.19$, ns; sex: $F_{1,46} = 0.03$, ns; locality \times sex $F_{1,46} = 0.11$, ns.
³ ANOVA head length: locality $F_{2,53} = 1.78$, ns; sex: $F_{1,53} = 0.21$, ns; locality \times sex $F_{2,53} = 0.08$, ns.
⁴ ANOVA head width: locality $F_{2,52} = 6.19$, $p < 0.01$; sex: $F_{1,52} = 6.06$, $p < 0.05$; locality \times sex $F_{2,52} = 1.83$, ns.
⁵ ANOVA lower hind leg length: locality $F_{1,10} = 0.69$, ns; sex: $F_{1,10} = 0.82$, ns; locality \times sex $F_{1,10} = 0.03$, ns.
⁶ ANOVA hind foot length: locality $F_{2,53} = 59.53$, $p < 0.001$; sex: $F_{1,53} = 0.49$, ns; locality \times sex $F_{2,53} = 0.04$, ns.
⁷ ANOVA tail length: locality $F_{2,51} = 2.27$, ns; sex: $F_{1,51} = 1.91$, ns; locality \times sex $F_{2,51} = 0.15$, ns.
****** Difference significant, $p < 0.05$ or $p < 0.01$.
******* Difference highly significant, $p < 0.001$.

APPENDIX 3. Diploid number (2 N) and chromosomal rearrangements among *Lepilemur* species.

	2 N	Lae	Lru	Lra	Led	Lmu	Ldo	Lsa	Lse	Lan	Lle	Lmi	n
Lae	20	-											2 (2)
Lru	20	0	-										5 (2)
Lra	20	0	0	-									1
Led	22	12	12	12	-								5 (1)
Lmu	34	17	17	17	19	-							2 (2)
Ldo	26	10	10	10	8	15	-						15 (2)
Lsa	26	10	10	10	8	15	0	-					3 (2)
Lse	34/36	11	11	11	13	14	9	9	-				28 (3)
Lan	36/38	12	12	12	14	15	10	10	1	-			31 (2)
Lle	26	12	12	12	12	17	6	6	11	12	-		5 (1)
Lmi	24	11	11	11	3	18	7	7	12	13	11	-	2 (2)
Total													99 (19)

Abbreviations: Lae, *L. aeechis* sp. nov. (north of Tsiribihina); Lru, *L. ruficaudatus* Grandidier, 1867 (south of Tsiribihina); Lra, *L. randrianasoloi* sp. nov. (south of Betsiboka); Led, *L. edwardsi* (Forsyth Major, 1894); Lmu, *L. mustelinus* I. Geoffroy, 1851; Ldo, *L. dorsalis* Gray, 1871 (Ambanja) and *L. tymerlachsonorum* Louis *et al.*, 2006 (Nosy Be); Lsa, *L. sahamalaza* sp. nov. (Sahamalaza Peninsula); Lse, *L. septentrionalis* Rumpler & Albignac, 1975; Lan, *L. ankaranensis* Rumpler and Albignac, 1975; Lle, *L. leucopus* (Forsyth Major, 1894); Lmi, *L. microdon* (Forsyth Major, 1894); n, number of individuals karyotyped from 1975 to 2005, in brackets with R-banding.

APPENDIX 4. Morphometric measurements of *L. sahamalaza* sp. nov. and *L. tymerlachsonorum* Louis *et al.*, 2006.

	<i>L. sahamalaza</i> (n = 6) Locality: Ankarafa forest		<i>L. tymerlachsonorum</i> (n = 18) Locality: Nosy Be	
	Males (n = 2)	Females (n = 4)	Males (n = 9)	Females (n = 9)
¹ Body mass (g)*	691 (687 – 694)	787 (740 – 892)	817 (700 – 900)	923 (660 – 1110)
² Head-body length (mm)***	258 (252 – 264)	259 (254 – 266)	305 (250 – 340)	319 (280 – 355)
Head length (mm)	56.5 (56.2 – 56.8)	57.1 (55.6 – 58.4)		
Head width (mm)	35.2 (34.6 – 35.8)	35.1 (34.1 – 36.8)		
³ Tibia length (mm)***	103.0 (102 – 104)	100.5 (98 – 105)	86.4 (80 – 93)	87.8 (81 – 102)
⁴ Tarsus length (mm)	48.2 (48 – 49)	49.3 (47 – 52)	48.2 (45 – 52)	47.4 (45 – 51)
⁵ Tail length (mm)	260 (n = 1)	271 (267 – 274) (n = 2)	257 (244 – 270) (n = 8)	249 (230 – 270) (n = 8)
⁶ Ear length (mm)	25.4 (24 – 27)	25.3 (23 – 28)	22.6 (21 – 25)	23.6 (19 – 31) (n = 8)

¹ ANOVA body mass: locality $F_{1,20} = 5.91$, $p < 0.05$; sex: $F_{1,20} = 3.51$, $p < 0.08$; locality \times sex $F_{1,20} = 0.01$, ns.

² ANOVA head-body length: locality $F_{1,20} = 17.31$, $p < 0.001$; sex: $F_{1,20} = 0.37$, ns; locality \times sex $F_{1,20} = 0.30$, ns.

³ ANOVA tibia length: locality $F_{1,20} = 29.16$, $p < 0.001$; sex: $F_{1,20} = 0.04$, ns; locality \times sex $F_{1,20} = 0.51$, ns.

⁴ ANOVA tarsus length: locality $F_{1,20} = 0.70$, ns; sex: $F_{1,20} = 0.02$, ns; locality \times sex $F_{1,20} = 0.73$, ns.

⁵ ANOVA tail length: locality $F_{1,15} = 2.13$, ns; sex: $F_{1,15} = 0.02$, ns; locality \times sex $F_{1,15} = 1.29$, ns.

⁶ ANOVA tail length: locality $F_{1,19} = 3.10$, $p < 0.10$; sex: $F_{1,19} = 0.11$, ns; locality \times sex $F_{1,19} = 0.17$, ns.

** Difference significant, $p < 0.05$.

*** Difference highly significant, $p < 0.001$.

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