African highlands as mammal diversity hotspots: new records of *Lamottemys okuensis* Petter, 1986 (Rodentia: Muridae) and other endemic rodents from Mt Oku, Cameroon

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ABSTRACT
The Cameroon volcanic line (CVL), which represents a major topographical feature of Central Africa, is poorly known concerning its small-mammal biodiversity. Situated in the Bamenda-Banso highland plateau, Mt Oku is the second highest peak (3011 m) of the CVL after Mt Cameroon. Despite intensive cultivation and cattle grazing, especially in the Kilum-Idjim zone, Mt Oku has retained some relict mountain forests, which yielded many endemic small mammals. We conducted new taxonomic inventories for small mammals and present the results for rodents focussing on morphology and morphometry. We also present the skull characters and morphological variability of the Oku endemic genus *Lamottemys* Petter, 1986 and provide characters for the identification of other endemic species such as *Otomys occidentalis* Dieterlen & Van der Straeten, 1992, *Praomys hartwigi* Eisentraut, 1968, *Paraxerus cooperi* Hayman, 1950, *Lophuromys dieterleni* Verheyen, Hulselmans, Colyn & Hutterer, 1997 and *Lemniscomys mittendorfi* Eisentraut, 1968. We provide an update of the faunal list of Mt Oku and also include a revision of previous collections. We found an exceptional diversity of 26 rodent species, including two species never recorded before on Oku (*Dendromus* sp. Smith, 1829 and *Funisciurus leucogenys* F. Cuvier, 1842). A comparison with East African highlands and Mt Cameroon confirms the conservation importance of the West African mountains of the CVL as biodiversity hotspots.

KEY WORDS
Biodiversity,
Conservation,
Endemism,
Rodentia,
Africa,
new records.

RÉSUMÉ
Les régions montagneuses d'Afrique comme points chauds de biodiversité : nouvelles signalisations de Lamottemys okuensis *Petter, 1986 (Rodentia: Muridae) et autres rongeurs endémiques du Mt Oku, Cameroun.*
La chaîne volcanique du Cameroun (Cameroun volcanique, CVL), qui représente un élément topographique majeur d'Afrique Centrale, est peu connue en ce qui concerne la biodiversité des petits mammifères. Situé sur les hauts-plateaux de Bamenda-Banso, le Mt Oku est le second plus haut sommet (3011 m) de la CVL après le Mt Cameroun. Malgré des cultures et du pâturage intensifs des troupeaux, spécialement dans la zone Kilum-Idjim, le Mt Oku a conservé des

forêts de montagne relictuelles, qui abritent de nombreux petits mammifères endémiques. Nous avons réalisé de nouveaux inventaires taxonomiques pour les petits mammifères et nous présentons ici nos résultats pour les rongeurs, principalement du point de vue de leur morphologie et sur leur morphométrie. Nous présentons également les caractères crâniens et la variabilité morphologique du genre endémique d'Oku *Lamottemys* Petter, 1986, et fournissons des caractères pour l'identification des autres espèces endémiques telles qu'*Otomys occidentalis* Dieterlen & Van der Straeten, 1992*, Praomys hartwigi* Eisentraut, 1968*, Paraxerus cooperi* Hayman, 1950*, Lophuromys dieterleni* Verheyen, Hulselmans, Colyn & Hutterer, 1997 et *Lemniscomys mittendorfi* Eisentraut, 1968. Nous actualisons la liste faunique du Mont Oku et incluons une révision des collections précédentes. Nous avons trouvé une diversité exceptionnelle de 26 espèces de rongeurs, dont deux inédites pour le Mont Oku (*Dendromus* sp. Smith,1829, *Funisciurus leucogenys* F. Cuvier, 1842). Une comparaison avec les faunes des montagnes d'Afrique de l'Est et avec le Mont Cameroun confirme l'originalité et l'importance des montagnes de l'Afrique de l'Ouest de la CVL comme points chauds de la biodiversité.

MOTS CLÉS
Biodiversité,
Conservation,
Endémisme,
Rongeurs,
Afrique,
nouveaux signalements.

INTRODUCTION

Small mammals receive less attention than larger one despite their importance in vegetation regeneration, their contribution to animal biomass and their position in food webs. The conservation status of most species of rodents is poorly known and very few protection programs focus on them. In tropical Africa, the mountain highlands represent exceptional biodiversity hotspots (Kingdon 1990; Olson *et al.* 2001) but most of these ecosystems are subject to strong anthropogenic pressure and climate change. Afromontane forests and afroalpine grasslands are known to harbour a large number of endemic and threatened species of primates (Eeley & Lawes 1999; Oates *et al.* 2004), amphibians (Lawson 1993; Schiøtz 1999), birds (Collar & Stuart 1988; Stattersfield *et al.* 1998), butterflies (Larsen 1997; Congdon *et al.* 2010), dragonflies (Vick 1999), reptiles (Branch & Bayliss 2009; Branch & Tolley 2010), fish (Reid 1989), invertebrates (Daniels & Bayliss 2011) and vascular plants (Cable & Cheek 1998) species. Considerable attention has focused on the conservation of these high altitude forests (Collar & Stuart 1988; Smith & McNiven 1993; Pérez del Val *et al.* 1994; Larison *et al.* 2000; Smith *et al.* 2000) and new species have been described from the Eastern Arc mountains of Africa (Stanley *et al.* 1998, 2005; Burgess *et al.* 2007; Hundorf *et al.* 2007) and Albertine Rift, Kenyan and Ethiopian Highlands (Lavrenchenko 2000; Taylor *et al.* 2009, 2011). Lesser known is the western equivalent of these eastern high altitude zones, called the Cameroon volcanic line (CVL, 1600 km long), which represents a major topographical feature of Central Africa (Ubangho *et al.* 1998, Marzoli *et al.* 2000) (Fig. 1).

Mt Oku is the second highest mountain in Cameroon, after Mt Cameroon. It reaches 3011 m asl. According to Cheek *et al.* (2000), the Kilum-Ijim Forest on the Oku massif is the largest remaining patch of afromontane forest in West Africa. The forest covers 200 km^2, half of which is montane forest, and the rest corresponds to degraded montane grasslands, various types of scrubland, and a small area of afro-subalpine grassland (Letouzey 1985; Thomas 1986, 1987; Macleod 1987; Tame & Asonganyi 1995; Maisels & Forboseh 1997; Maisels 1998; Maisels *et al.* 2000). The forest occurs above 2000 m up to a maximum altitude of 3000 m (Maisels *et al.* 2001). Only small patches of natural forest persist below 2000 m, due to clearing for agriculture

and grazing (Stuart 1986). Mt Oku is situated in a high altitude plateau called the Bamenda-Banso highlands. Along with other mountains of the CVL, such as Mt Lefo, and Mt Bambili, this constitutes a region with exceptional small mammal diversity (Eisentraut 1963, 1973; Dieterlen 1978, 1983; Van der Straeten & Hutterer 1986).

The montane forest of Mt Oku is relatively well studied for some groups of animals and plants. Fifteen mountain bird species, of which two are classified as Endangered according to World Conservation Union (IUCN) criteria (Smith *et al.* 2000), are endemic to this mountain. At least 40 species of plants endemic to Cameroon are found in Mt Oku, with new species still being discovered (Cheek *et al.* 2000). However, several taxa, such as small mammals, remain poorly studied. Recently, Maisels *et al.* (2001) documented 77 species of (mostly small) mammals in the forest based on records covering the past 50 years. The authors enumerated seven strictly endemic micromammals on Oku and three known only in Bamenda-Banso highlands. Most of these species are known only from a few specimens. For example, the endemic murid genus *Lamottemys* Petter, 1986 is known only from seven specimens (Fülling 1992; Amori & Gippoliti 2003) housed in the MNHN (two specimens) and in the ZFMK (five specimens). Since the expeditions of Eisentraut and Lamotte in the 1950s, 1960s and 1970s (Eisentraut 1968, 1973; Petter 1986; Van der Straeten & Hutterer 1986; Dieterlen & Van der Straeten 1988; Verheyen *et al.* 1997), and more recently Fülling in 1990 and 1991 (Fülling 1992; Hutterer & Fülling 1994), Mt Oku has remained poorly studied with regard to small mammals. Moreover, neither molecular nor phylogeographical studies have been undertaken on this fauna. The most recent data based on fieldwork is an abstract presented by Hutterer & Fülling (1994).

Despite its biological importance, the future of Kilum-Ijim Forest is uncertain. Human pressure in the area is intense. Populations living in the Bamenda Highlands region rank among the densest in Africa, with densities reaching 300 to 400 people per square kilometre in some areas (Gardner, unpublished data from the Kilum-IjimProject, http://www.birdlife.org/action/ground/bamenda/bamenda3.htm). As a result, the remaining montane forest on Mt Oku is threatened by grazing, wood harvesting, burning, debarking of *Prunus africana* (Hook.f.) Kalkman, 1965, and over-exploitation of small mammals as bushmeat (Smith *et al.* 2000). The resulting degradation of the montane habitats of the Kilum-Ijim Forest and the high trapping level of small mammals for food consumption highlight a critical need for investigation.

In December 2006, December 2007 and January 2008, we conducted new small mammal inventories on Mt Oku. We present here an updated systematic inventory based upon morphological identifications of the newly collected rodent specimens in many cases validated by molecular analyses. This work is the first comprehensive account of variability in the endemic *Lamottemys okuensis* Petter, 1986 and other endemic species on Mt Oku. Finally, we discuss the conservation importance of Oku Mountain forest compared to other highlands of tropical Africa with well-documented rodent faunas.

MATERIAL AND METHODS

Trapping took place in December 2006 in the mountain forest of Kilum-Ijim, on the northern flank of Mt Oku. Rodents were captured using Sherman traps (23 × 9 × 8 cm, spaced at 5 m), metal snap traps (10 × 15 cm; spaced at 5 m) and pitfall traps with drift fences set in two lines of 20 buckets for 11 consecutive nights (see detailed methodology in Nicolas *et al.* 2003). Sherman traps were baited with a mixture of peanut butter, dry fish and wheat flour. Snap traps were baited either with the same mixture or with pieces of fallen *Carapa* fruit. Trapping was mostly limited to the forest between 2500 and 2700 m asl., but some Sherman traps were also placed at the forest/savanna boundary. The total trapping effort was 229 trap-nights for snap traps, 2451 trap-nights for Sherman traps and of 440 trap-nights for pitfall traps. A previous study on afrotropical small mammals showed that removal trapping, with similar conditions, neither adversely affected the species richness nor local population numbers (Nicolas *et al.* 2003). Additional captures using traditional

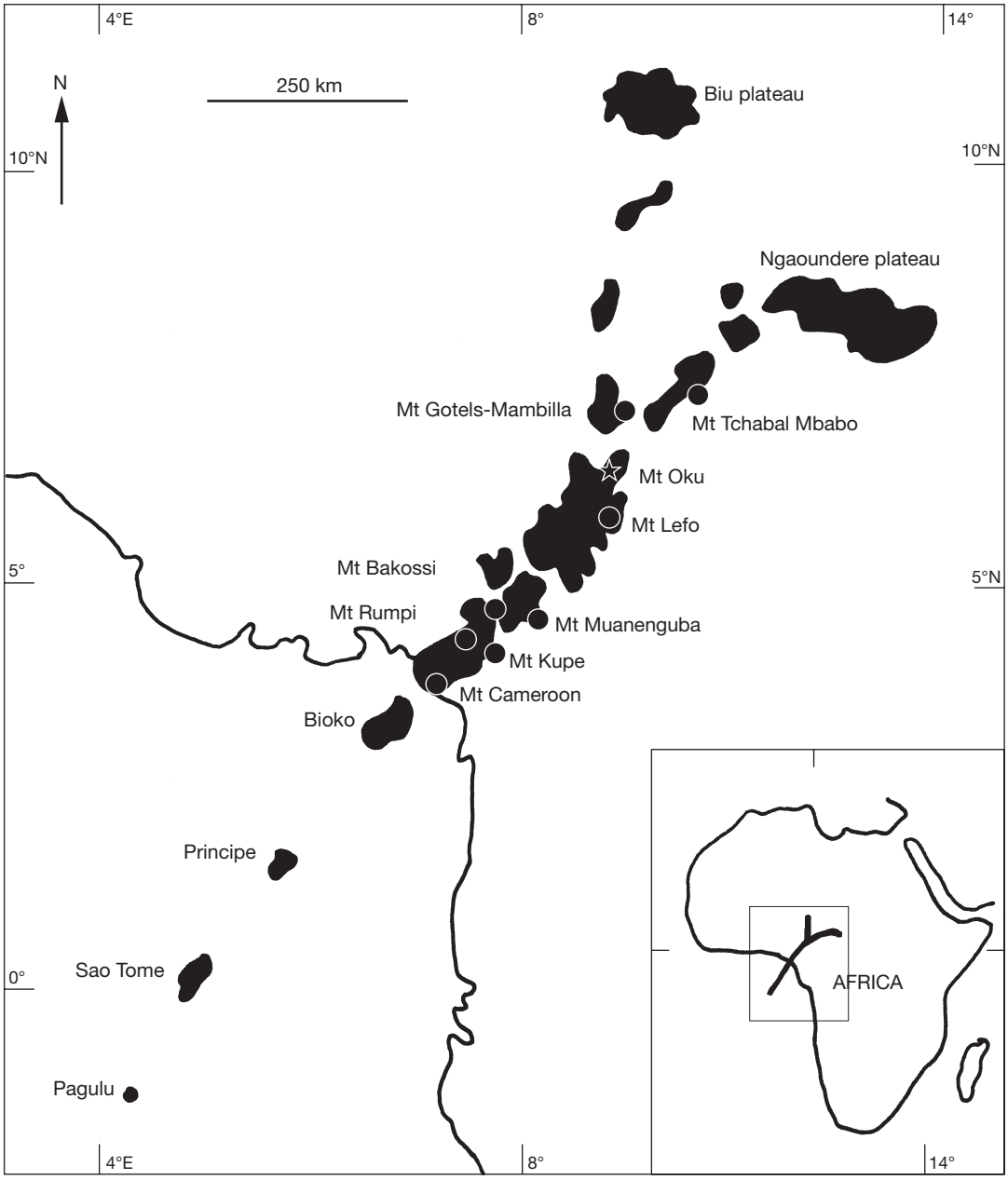

FIG. 1. — Map of the CVL and position of Mt Oku. Symbols, ●, Mounts, ★, Mt Oku.

traps were made in the same area in December 2007 and January 2008 for which trapping effort was not evaluated. All specimens are housed in the MNHN collections and are listed below.

We also added the unpublished material collected by Fülling between 2000 m to 3000 m in 1990 and 1991. This also includes well-preserved skeletal material from owl pellets collected in a

TABLE 1. — Faunal list of Oku trapped rodents in December 2006, 2007 and 2008 with number of individual and frequency percentages. We recorded 22 species listed below using Sherman, pitfalls and traditional traps.

Species	Number of individual	Percentage
Lamottemys okuensis Petter, 1986	53	18.66
Hybomys eisentrauti Van der Straeten & Hutterer, 1986	15	5.28
Praomys hartwigi Eisentraut, 1968	97	34.15
Praomys jacksoni (de Winton, 1897)	2	0.7
Hylomyscus grandis Eisentraut, 1969	7	2.46
Hylomyscus alleni cf. *montis* Eisentraut, 1969	1	0.35
Hylomyscus walterverheyeni Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008	4	1.41
Dasymys sp.	9	3.17
Grammomys poensis Eisentraut, 1965	5	1.76
Grammomys sp.	10	3.52
Lemniscomys striatus (Linnaeus, 1758)	7	2.46
Lemniscomys mittendorfi Eisentraut, 1968	1	0.35
Mastomys sp.	1	0.35
Mus setulosus Peters, 1876	5	1.76
Oenomys h. albiventris Eisentraut, 1968	2	0.7
Otomys occidentalis Dieterlen & Van der Straeten, 1992	45	15.85
Lophuromys dieterleni Verheyen, Hulselmans, Colyn & Hutterer, 1997	5	1.76
Cricetomys sp.	3	1.06
Dendromus sp.	3	1.06
Graphiurus lorraineus Dollman, 1910	5	1.76
Funisciurus leucogenys (Waterhouse, 1842)	1	0.35
Paraxerus cooperi Hayman, 1950	3	1.06
Total	**284**	**100.00**

cave near Lake Oku. These specimens are housed in the ZFMK collections and are also listed below.

Due to the existence of several sibling species, the identification of many Afrotropical small mammals is not possible by external characters alone. As a result, the taxonomy of numerous species groups is still unresolved. For this reason, all newly captured animals were euthanized by cervical dislocation after being anesthetized with ether according to the protocol approved by the Ethic Committee Cuvier (MNHN). Standard external measurements, weight, head and body length, tail length, ear length and hind-foot length, were taken, and sex and reproductive condition were noted. Tissue samples (muscle or liver) were kept in 90% ethanol for molecular studies. Carcasses were fixed in 4% formalin for later preparation of skin and skull. Skulls were prepared by one of us (AD). Generally, taxonomy follows Wilson & Reeder (2005) or more recent revisions for some genera.

In the following we detail identification criteria for each species based upon the morphological keys by Rosevear (1969) and Eisentraut (1973) and comparisons with museum collections. In order to confirm the distinction between the rodent sibling species of *Praomys* Thomas, 1915, *Lemniscomys* Trouessart, 1881, *Hylomyscus* Thomas, 1926, *Hybomys* Thomas, 1910, *Cricetomys* Waterhouse, 1840, *Otomys* F. Cuvier, 1824 and *Mus* Linnaeus, 1758, we validated identifications with molecular cytochome-*b* (Cytb) sequences (Missoup *et al.* 2009, 2012; Missoup 2010; Olayemi *et al.* 2012; Taylor *et al.* 2014). The taxonomic status of some other species like *Dendromus* Smith, 1829, *Grammomys* Thomas, 1915 have yet been validated by molecular analyses but are not yet published (Voelker *et al.* pers. comm.; Bryja *et al.* pers. comm.).

Standard univariate statistics were calculated from external and skull measurements. Thirteen craniodental measurements were taken using Mitutoyo callipers (0.1 mm precision). Drawings of the molars were made with camera lucida, and SEM pictures were taken by using a JEOL45 microscope. Morphological comparisons were performed by using the MNHN (Lamotte and Heim de Balsac) collections and ZFMK (Eisentraut and Fülling) collections.

New Oku specimens were compared to those from Cameroon (Nditam and Dja regions, CVL regions), Gabon (Makokou, Belinga), Central African Republic (La Maboké). When needed, univariate and multivariate statistics, like Principal Component Analysis and Canonical Variates Analysis, were performed on log-transformed skull and external measurements by using the XLSTAT 9.1 software (Addinsoft 2010).

Abbreviations

Institutions

MNHN	Muséum national d'Histoire naturelle, Paris;
ZFMK	Zoologische Forschung Museum Alexander Koenig, Bonn.

Geography

CAR	Central African Republic;
CVL	Cameroon Volcanic Line;
DRC	Democratic Republic of Congo;
Mt, Mts	Mount, Mountains.

External measurements

E	ear length;
HB	head and body length;
HF	hindfoot length;
TL	tail length;
W	weight.

Skull measurements

CIO	interorbital constriction;
HMDB	height of the mandible;
intT4	width of the palate between cusps t4 of the upper M1/;
LBT	length of the tympanic bulla;
LGT	greatest length of the skull;
LMDB	maximum length of the mandible;
LNAS	nasal length;
LPALFOR	length of the incisor foramen;
LPALPOST	length of the pterygoid fossae from the posterior part of the palate to the anterior border of foramen magnum;
LTR	lower tooth row length;
UTR	length of the upper molar row;
WM1	width of the upper M1/;
WNAS	nasal width;
WPAR	maximal width of the braincase;
WZYG	maximum zygomatic width.

Dental nomenclature

M1, M2	first molar, second molar;
M2/, M3/...	upper second molar, upper third molar;
M/1	first lower molar;
P3/	upper third premolar;
t1 to t9	cusps t1 to t9;
tE	cusp tE;
tF	cusp tF;
tma	cusp antero-medial.

Statistical analyses

CA	canonical analysis;
N	number of individuals;
PCA	principal component analysis;
SD	standard deviation;
Vc	variation coefficient.

Conservation categories

LC	Least concerned;
NA	no data;
DD	data deficient;
E	Endangered;
CR	Critically endangered.

RESULTS

Small mammals diversity

In December 2006, we collected a total of 116 rodents. In 2007 and 2008, 180 rodents were captured by a local guide using traditional traps. This represents a total of 22 species (Table 1). We added four additional species caught by O. Fülling in 1990 and 1991 resulting in an updated list of 26 rodent species for Mt Oku.

Species assignment and taxonomic assessment

Family Muridae Illiger, 1811
Genus *Lamottemys* Petter, 1986

Lamottemys okuensis Petter, 1986

Lamottemys okuensis Petter, 1986: 98.

Type locality. — Cameroon, Mt Oku.

Material examined. — MNHN: 1984-493 (holotype); 1984-494, 2011-946 to 2011-966, 2013-49 to 2013-80.
ZFMK: 69.171, 69. 183, 91.230 to 91.233 2003-891 to 899.
ZFMK (Lake Oku Cave owl pellet material): 91.116 to 91.129.

TABLE 2. — External standard measurements (in mm) for the newly collected *Lamottemys* Petter, 1986 specimens (including the holotype, ZFMK specimens, but without the 32 new specimens collected in 2008, which were too degraded) and comparison with *Hybomys* Thomas, 1910 from Oku (except 2 specimens of 2008) and other holotypes. Abbreviations: see Material and methods.

	W (in g)	HB (in mm)	TL (in mm)	HF (in mm)	E (in mm)	Ratio of %HB/TL
L. okuensis Petter, 1986						
Number of individuals	30	30	30	30	30	30
Minimum	43.00	103.00	104.00	25.00	12.00	90.40
Maximum	85.00	149.00	140.00	32.00	19.50	121.148
Mean	65.47	129.07	123.43	29.00	16.68	104.76
Variation coefficient	0.16	0.09	0.07	0.06	0.1	0.08
Standard deviation	2.43	2.14	1.7	0.34	0.3	1.6
H. eisentrauti Van der Straeten & Hutterer, 1986						
Number of individuals	6	19	18	20	19	18
Minimum	29.5	105.0	91.5	25.5	10.0	92.92
Maximum	66.0	139.0	128.0	32.0	20.0	134.30
Mean	54.75	121.0	110.33	29.6	15.42	110.59
Variation coefficient	0.22	0.08	0.08	0.05	0.16	0.08
Standard deviation	5.36	2.31	2.03	0.34	0.57	2.23

Morphological characters

This genus endemic of Mt Oku was known initially from two type specimens described by Petter and two supplementary broken specimens from Lake Oku initially attributed to *Hybomys eisentrauti* Van der Straeten & Hutterer, 1986 by Eisentraut and redescribed as *Lamottemys* by Dieterlen & Van der Straeten (1988). We collected 53 new specimens, Fülling collected 13 specimens and owl pellets yielded 13 skull fragments. This allowed us to describe for the first time, morphological and natural history parameters of this unique murine genus. We revise the genus diagnosis and compare it with the three closely related genera *Hybomys*, *Desmomys* Thomas, 1910 and *Oenomys* Thomas, 1904. None of the previous studies compared the endemic genus with *Hybomys*. Preliminary molecular investigations confirm *Lamottemys* distinct generic status (Missoup 2010).

Lamottemys okuensis is similar externally with a uniform brown fur and no dorsal stripe as *Hybomys eisentrauti* also recorded on Mt Oku. Moreover, the two species fit in the category of medium sized rats (Table 2). Both have a tail length, which is slightly longer than the head and body length (*Lamottemys* average: 105%, *Hybomys* average: 111%). According to Dieterlen & Van der Straeten (1988), *Lamottemys* and *Desmomys* have a nail on Digit 5 on the hand, while *Oenomys* and *Hybomys* have a claw.

The three newly collected pregnant females carried only one embryo each. The mammary formula is 0 + 2, as mentioned in Dieterlen & Van der Straeten (1988), but differing from that of *Hybomys eisentrauti* (1 + 2). According to Fülling (1992), the formula of the palatal ridges of *L. okuensis* is 2 + 6 = 8, which differs from that of *Oenomys hypoxanthus albiventris* Eisentraut, 1968 (2 + 5 = 7).

The skull of *Lamottemys* is massively built with a broad enlarged anterior part of the nasal and a wide, long interorbital constriction with marked frontal crests continuing onto the parietal bone in older individuals (Fig. 2A). The incisors are orange with traces of very shallow striation not always visible. The long nasal, ends before the incisors and is convex in lateral view (Fig. 2C). In the same view, the zygomatic process is narrow; its anterior border makes first an oblique and then a vertical crest. The zygomatic arch is inflated in the middle in the maxillary-jugal suture region. The optic foramen is large. The postglenoid fossa has a relatively large ovoid shape. *Lamottemys okuensis* has a long tympanic hook, which is oblique and directed toward the front of the skull. The mastoid process is large and slightly inflated. In the ventral view, the incisive foramen ends before the first root of the upper M1. The tooth rows are wide and parallel, and the narrow palate displays a small anterior palatal

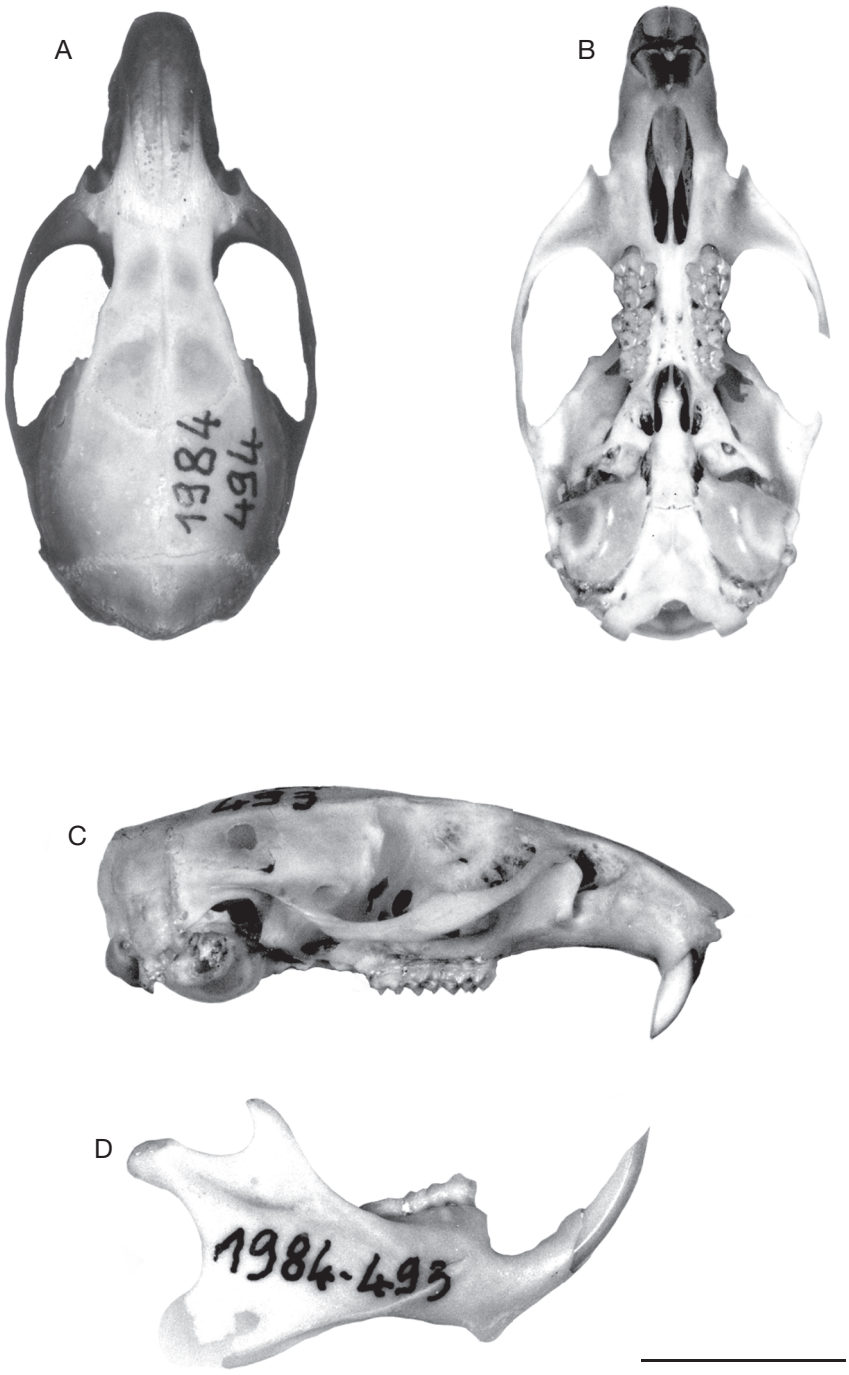

FIG. 2. — *Lamottemys okuensis* Petter, 1986 Holotype, paratype specimen (MNHN 1984-493, 1984-494): **A**, dorsal view of the skull; **B**, ventral view; **C**, lateral view; **D**, detail of the mandible. Scale bar: 1 mm.

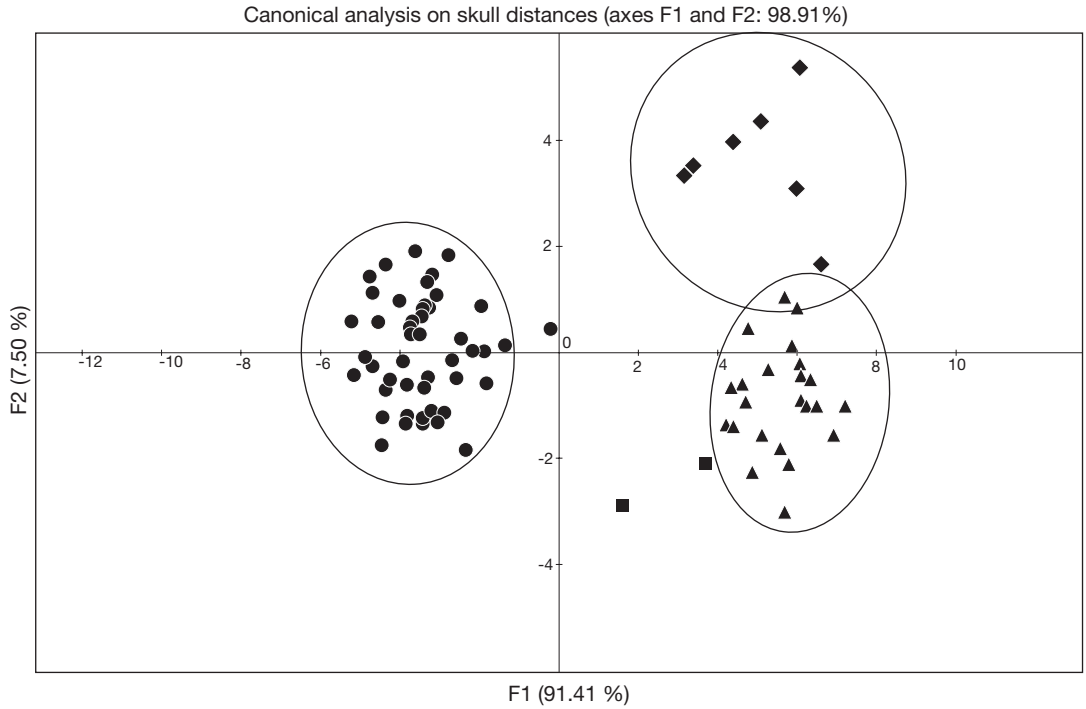

FIG. 3. — Canonical analysis based upon 12 skull distances including *Hybomys eisentrauti* Van der Straeten & Hutterer, 1986, *H. badius* Osgood, 1936, *H. univittatus* (Peters, 1876), *Desmomys harringtoni* (Thomas, 1902) (Ethiopia), *Lamottemys okuensis* Petter, 1986, *Oenomys hypoxanthus albiventris* Eisentraut, 1968 from CVL and immediate surroundings. Symbols: ◆, *Hybomys* Thomas, 1910; ●, *Oenomys* Thomas, 1904; ▲, *Lamottemys* Petter, 1986; ■, *Desmomys* Thomas, 1910.

foramen (Fig. 2B). The tympanic bullae are not inflated but the periotic bones are well developed and the carotid canal is wide and well visible. The oval foramen is large. The middle lacerate foramen is small. On the mandible, the shape of the coronoid process is short with a curve aspect between coronoid and condyloid crests (Fig. 2D). The coronoid crest is slightly higher or at the same level with the condyloid crest. The mental foramen is situated in front of the massetric crest and the dental crest is poorly marked.

Compared to *Hybomys*, the skull of *Lamottemys* is larger and displays a longer interorbital constriction and a more developed rostrum. *Hybomys* retains an amphora-shaped skull with a more globular braincase and less developed fronto-parietal crests. In ventral view, the very large size of *Lamottemys* molars constitutes an immediate diagnostic character for the genus. A comparison with *Desmomys harringtoni* (Thomas, 1902) from Ethiopia, *Hybomys eisentrauti* and *Oenomys hypoxanthus albiventris* CVL specimens using canonical analyses shows that the representatives of the four genera are well discriminated along axes 1 and 2 (Fig. 3). *Hybomys* is smaller and proportionally has a wider interorbital constriction compared to others genera, all having a larger skull than *Hybomys*. The plot of the two first components of the PCA shows that *Oenomys* can be distinguished from *Lamottemys* and *Desmomys* by its broader nasal and longer incisor foramen. Althought we have a relative small sample of *Desmomys*, our morphometric data seems to suggest a very close relationship with *Lamottemys*. All individuals of *Oenomys* were well classified, except one, which was a posteriori classified among *Lamottemys*.

A striking feature of *Lamottemys* are the molar teeth, which are very large and broad, and can be described as macrodont (ratio of upper teeth row

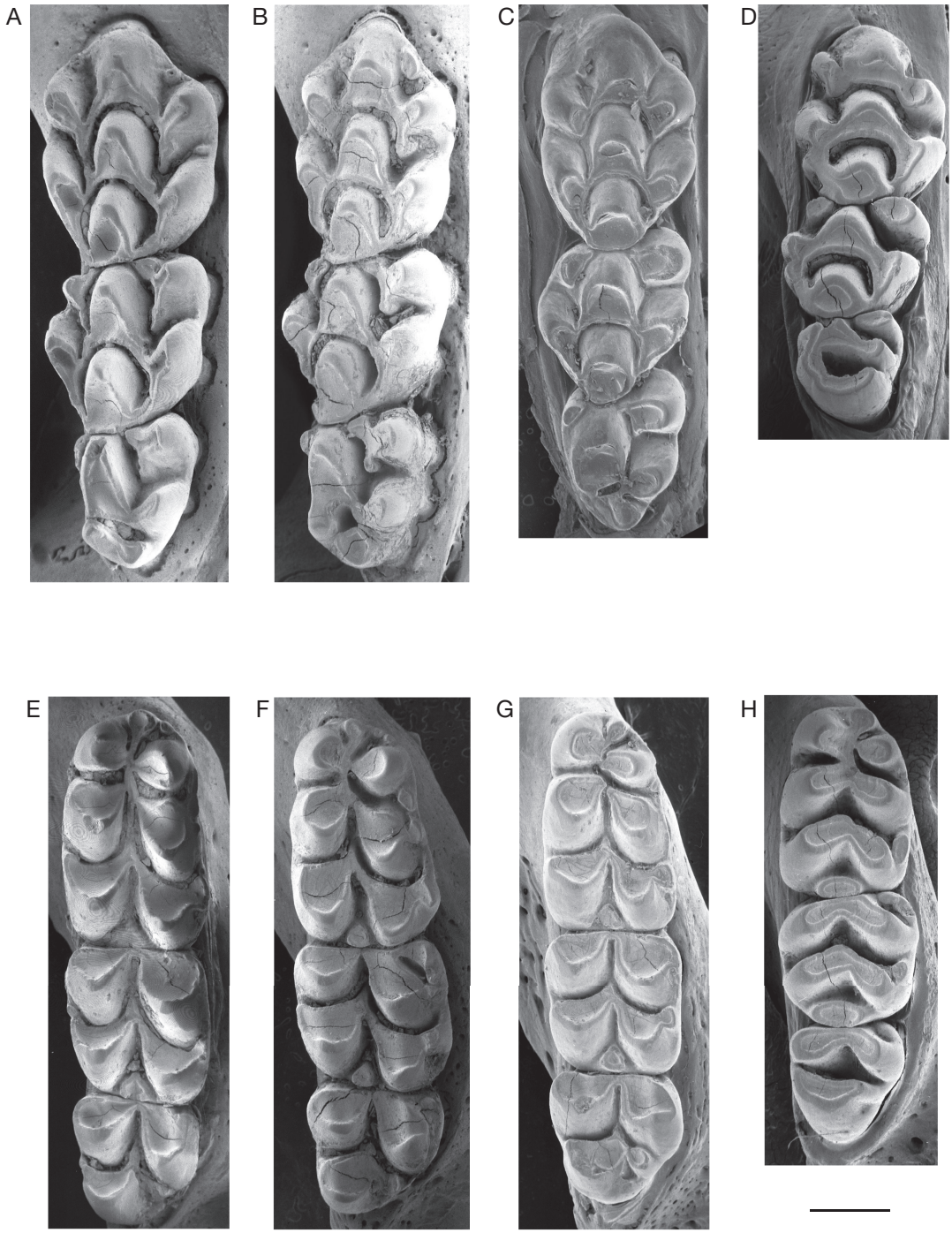

FIG. 4. — SEM pictures of upper and lower molar rows: **A**-**D**, top row; **E**-**H**, bottom row; **A**, **E**, *Lamottemys okuensis* Petter, 1986 CG MNHN1984-494 paratype; **B**, **F**, *Oenomys hypoxanthus albiventris* Eisentraut, 1968, Ethiopia CG1981-538; **C**, **G**, *Desmomys harringtoni* (Thomas, 1902), Ethiopia BMNH 8.6.88; **D**, **H**, *Hybomys univittatus* CAR CG 1966-97. Scale bar: 1 mm.

TABLE 3. — Mean values, Minimum and Maximum values of the ratio of the upper toothrow length on the greatest length of the skull (UTR/LGT) for different specimens of the CVL (after MNHN and ZFMK specimens measurements). Abbreviations: see Material and methods.

Species	Number of individual	Mean	Min-Max
H.eisentrauti Van der Straeten & Hutterer, 1986	6	0.166	0.161-0.175
O. h. albiventris Eisentraut, 1968	12	0.188	0.177-0.21
L. okuensis Petter, 1986	50	0.199	0.185-0.216
D. harringtoni (Thomas, 1902)	1	0.225	

length/greatest skull length: 0.185 to 0.216; Table 3). In this aspect, *Lamottemys* resembles *D. harringtoni* and can be easily distinguished from *H. eisentrauti*. There is some overlap with *Oenomys hypoxanthus albiventris*.

The molars were well illustrated and described in Petter's (1986) original description. We provide here SEM pictures for the paratype of *Lamottemys* (Fig. 4A, E).

According to Petter (1986), the upper incisors are opisthodont and display no or only a tiny groove. The lower incisors have a shallow groove that was figured by Petter (1986) but it is not found in all the new individuals collected. Cusps are well separated from each other and the third upper molar (M3/), although not very reduced, has a smaller size than the M2/. As evidenced by Petter (1986), stephanodont crests are well developed on all cusps; there is no t7, and the number of cingular cusplets is relatively low. The posterior cingulum is small both on the upper and lower M/1. There is a median antero cusp (tma) on the first lower molar related by an oblique crest at the junction of tE and tF on the lower M/1.

Stephanodonty, is characterized by the development of longitudinal crests at the back of the cusps and relating the internal and external rows of cusps. It is well developed and visible in all the wear age classes identified. Indeed, following an earlier work on *Aethomys* Thomas, 1915 (Denys & Tranier 1992) we classified the new *Lamottemys* specimens into six molar wear stages. The description of the different molar wear stages can be made as follow:

– stage 0 (unerupted M3/3) and stage 1 (very fresh molars) are not represented in our sample (not figured);

– stage 2 (Fig. 5A, E): specimens display high cusps with stephanodont crest visible, but the internal and external row of cusps are not connected longitudinally by crests. On the lower molars the cusps are well separated and the posterior cingulum is small;

– stage 3 (Fig. 5B, F): the longitudinal link occurs between t3-t5 and t9. There is a very small posterior cingulum on the upper M1 and M2. The wear facets are broad and the cusps are lower on the molar rows;

– stage 4 (Fig. 5C, G): the longitudinal links are wider between external cusps. Cusps show lower and broader wear facets, but they are still wellindividually defined;

– stage 5 (Fig. 5D, H): besides the external link, a longitudinal crest occurs between t1-t4 and t8. Cusps are low, very wide, linked longitudinally on the lower M1 and poorly individualized;

– stage 6 (not figured): Cusps are very low and unrecognizable.

As suggested by Dieterlen & Van der Straeten (1988), the molar pattern of *Lamottemys* seems to be very similar to that of *Oenomys*, especially due to the development of stephanodont crests (Fig. 4B, F). However, *Oenomys* molars are larger (Table 3) and their proportions relative to the total length of the skull are smaller. Three main differences allow us to distinguish between the two genera. First, the stephanodont crest of the t3 on upper M1 never reaches the t5 in *Oenomys,* while it is always fused with the t5 in *Lamottemys*. Second, the cusps of the second lobe of the upper M3 are never fused or only at very advanced wear stages with the ones of the first lobe in *Lamottemys,* while in *Oenomys* there is always a link between the t5 and the t9. Third, on the lower M1, the main cusps are more alternated in *Oenomys* than in *Lamottemys*. Compared to *Hybomys*, *Lamottemys* displays a more median

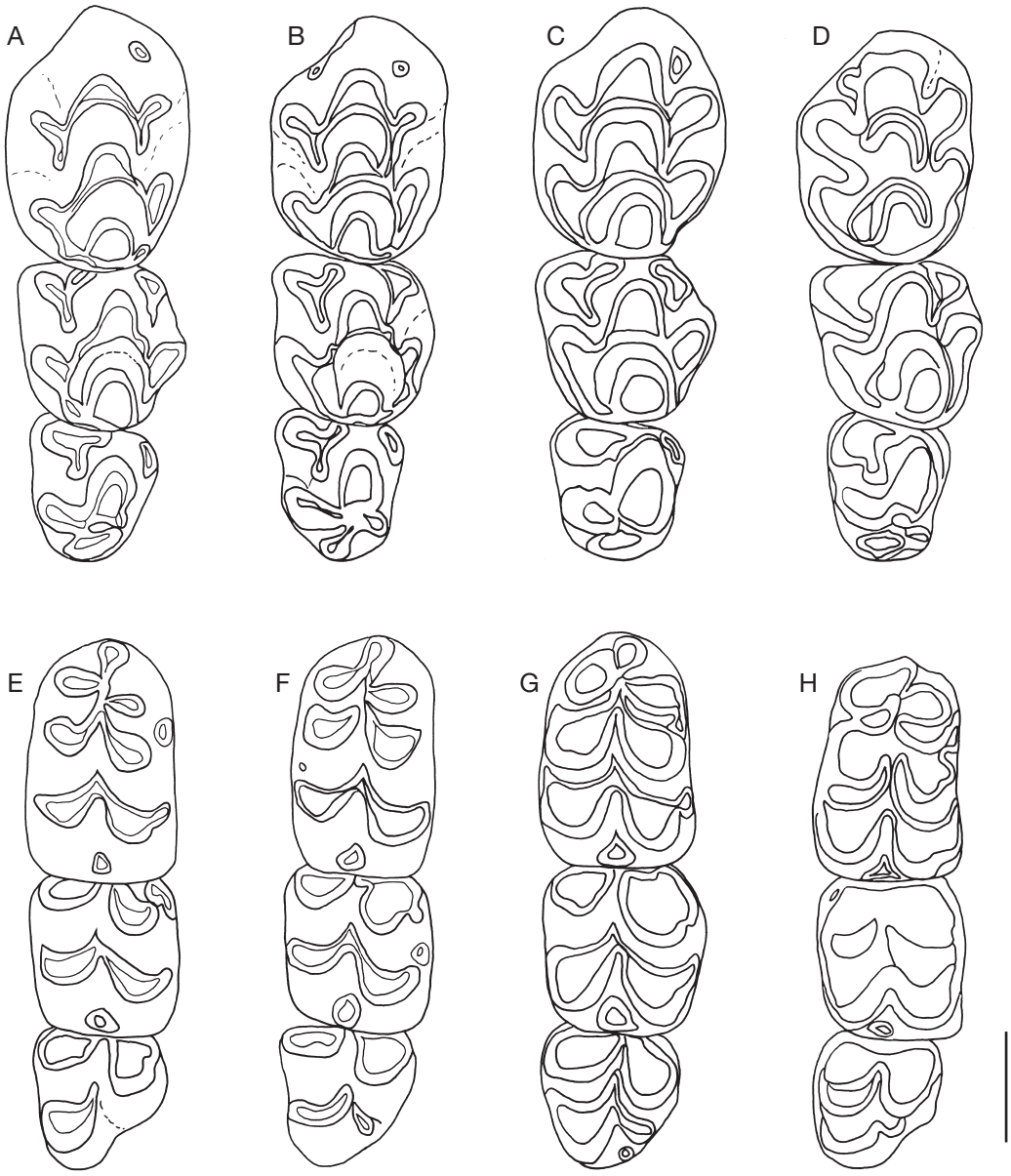

FIG. 5. — Wear stages for upper and lower molars of different *Lamottemys okuensis* Petter, 1986 specimens: **A**-**D**, top row; **E**-**H**, bottom row; **A**, **E**, CG 2011-961 stage 2; **B**, **F**, CG 2011-956 stage 3; **C**, **G**, CG 2011-947 stage 4; **D**, **H**, ZFMK91.233 stage 5. Scale bar: 1 mm.

cusp and a larger labial cingular margin, as well as a more developed stephanodonty. *Desmomys* does not display such pronounced stephanodonty and cusps are more transversally aligned than in *Lamottemys* (Fig. 4C, G). Both have macrodont molars. *H.* (*Typomys*) *trivirgatus* (Temminck, 1853) possesses some small stephanodont crests on the t3 and t1 of the first upper molar, and has alternate cusps

TABLE 4. — Skull dimensions (in mm) of *L. okuensis* Petter, 1986 representatives (including the holotype, paratype, new found specimens, ZFMK specimens). Abbreviations: see Material and methods.

	LGT	WZYG	CIO	LNas	Wnas	WPAR	LPALFOR	UTR	LBT	LPALPOS	intT4	WM1	LTR	LMDB	HMDB
N	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Min.	29.03	13.72	4.280	10.040	3.950	12.050	5.460	6.210	5.190	6.480	1.320	2.000	5.940	18.480	8.950
Max.	34.090	16.640	5.270	12.990	5.340	13.550	6.900	7.040	6.320	12.470	1.900	2.350	6.620	21.740	10.980
Mean	31.865	15.792	4.820	11.432	4.530	12.750	6.316	6.560	5.623	11.116	1.601	2.183	6.229	20.158	9.735
Vc	0.040	0.043	0.051	0.064	0.068	0.031	0.066	0.032	0.057	0.108	0.110	0.043	0.026	0.045	0.060
SD	0.274	0.146	0.052	0.157	0.066	0.085	0.089	0.044	0.068	0.261	0.037	0.020	0.035	0.201	0.133

(Fig. 4D, H). It has shorter sized molars rows and more transversally fused cusps. *Hybomys univittatus* (Peters, 1876) molars display a very transverse first lobe of the M1/ and trace of a stephanodont crest on the t4 and t6, as well as a wide M3/ with well-fused cusps. The first lower molar displays a stephanodont crest and an antero-median cusp (tma) on the prelobe. The molars of *H. eisentrauti* are not macrodont (ratio UTR/LGT: 0.166) compared to those of *Lamottemys* (0.199) and *Desmomys* (0,225)(Table 3).

In conclusion we can summarize here some diagnostic characters for *Lamottemys okuensis:* medium sized rat with uniform brown-yellow dorsal and ventral coloration (no stripe, no red nose), with a tail equivalent to HB size. Females have two pairs of pectoral mammae. There are 2 + 6 palatal ridges. The skull displays a wide and long rostrum, a long interorbital constriction with fronto-parietal crests well marked on old adults, large stephanodont molars, macrodonty, upper incisors slightly grooved and opisthodont (Table 4). The stephanodont character, as well as molar cusps disposition has allowed Ducroz *et al.* (2001) to postulate an affiliation between *Lamottemys* and the tribe Arvicanthini. Further molecular and morphological phylogenetic analyses are ongoing to answer the question of the affinity of this endemic genus.

Our new collections confirm that *L. okuensis* lives in mountain forest between 2100 and 2900 m (Petter 1986; Dieterlen & Van der Straeten 1988). It is a terrestrial species and its stomach contents analyzed by one of us (OF) revealed exclusively green plant matter, suggesting an entirely herbivorous diet.

Genus *Hybomys* Thomas, 1910

Species of *Hybomys* from the Cameroon volcanic line require taxonomic revision (Musser & Carleton 2005). They all belong to the so-called *Hybomys univittatus* (Peters, 1876) species complex. Pending further molecular analyses, we keep the old nomenclature by recognizing *H. eisentrauti* Van der Straeten & Hutterer, 1986 from Mt Lefo and Oku, *H. badius* Osgood, 1936 from Mt Cameroon, and *H. basilii* Eisentraut, 1965 from Bioko at specific rank. In fact, Musser & Carleton (2005) placed *H. eisentrauti* and *H. badius* in synonymy because no clear morphometric distinction was shown between the two species by Van der Straeten & Hutterer (1986). However, the small size of the available sample prevented correct morphometric assessment of the variability for these species. For this study, 16 new *Hybomys* samples of Mt Oku were examined in order to test the evidence of skull variability among the CVL taxa.

Hybomys eisentrauti
Van der Straeten & Hutterer, 1986

Hybomys eisentrauti Van der Straeten & Hutterer, 1986: 36.

Hybomys badius – Musser & Carleton 2005: 1330, 1331.

TYPE LOCALITY. — Cameroon, Mt Lefo.

MATERIAL EXAMINED. — MNHN: 2011-927, 2011-929 to 2011-941, 2013-42, 2013-43.
ZFMK: Holotype Mt Lefo 74.377, paratype Mt lefo 74.374, Mt Lefo 74.376, Mt Oku 69.175, 91.226, 91.225.
ZFMK: Owl pellets from Lake Oku Cave: 91.92.

Morphological characters
This rodent has a similar size to *Lamottemys* but can be distinguished easily from its skull and molars. It is characterized by a dark pelage with a dorsal black stripe that is poorly visible compared to *H. badius*. Specimens of Mt Oku have a more woolly, dense pelage than those from Mt Lefo. Compared to *H. badius, H. eisentrauti* specimens share very similar size. Only *H. basilii* is noticeably larger, as indicated previously by Van der Straeten (1985) (Table 2).

The skulls of the new Oku specimens are smaller and have a more rounded braincase, and a poorly marked interorbital constriction with no crests developing, compared to the Mt Lefo holotype (Fig. 6). The *H. eisentrauti* molars display well-aligned cusps and small stephanodont crests on the cusps t3 and t1 of M1/, and on the prelobe of M/1 (Fig. 7). They have similar size to the Lefo type serie, and are slightly smaller compared to other CVL *Hybomys* species. We did not find distinct characters in cusp disposition and shape between all CVL specimens and *H. univittatus* representatives from Gabon.

The new Mt Oku specimens have similar skull size and general shape compared to the type serie of *H. eisentrauti* from Mt Lefo. Some slight morphological differences are however apparent, such as the presence of lightly marked fronto-parietal crests and a more constricted interorbital region in Mt Oku specimens. The skull of *H. eisentrauti* is smaller for nearly all its dimensions (Table 5). The total length of the skull of *H. basilii* is greater than that of *H. eisentrauti,* but no significant differences can be observed in other measurements (Missoup 2010)

Many species may be found in sympatry on mountains of the CVL. However, these morphological and size differences observed in CVL *Hybomys* specimens could just be the result of an adaptation to high altitude of the typical *H. univittatus* species (Missoup 2010). Pending molecular analyses, we considered here *H. eisentrauti* as a valid species endemic to Bamenda Highlands (Mt Lefo and Mt Oku), following Van der Straeten & Hutterer (1986).

Genus *Praomys* Thomas, 1915

Two species of *Praomys*: *P. hartwigi* Eisentraut, 1968 and *P. jacksoni* (de Winton, 1897) have already been observed on Mt Oku by Fülling (1992), while Hutterer *et al.* (1992) also reported *P. obscurus* Hutterer & Dieterlen, 1992 in the northeast of Bamenda Plateau (Gotel Mountains and Mambilla plateau). The standard external measurements for the new specimens are presented in Table 6.

Praomys hartwigi Eisentraut, 1968

Praomys hartwigi Eisentraut, 1968: 8-11.

TYPE LOCALITY. — Cameroon, Mt Oku.

MATERIAL EXAMINED. — MNHN: 1984-495, 2011-200, 2011-201 to 2011-266, 2011-990, 2013-123 to 2013-151.
ZFMK: Eisentraut Collections: 68.7, 74.356, 69.1073, 69.1075 to 69.1079, 69.1081.
ZFMK: Fuelling collection: 91.241 to 91.248.
ZFMK: from the cave, owl pellets: 91.99, 91.171 to 91.179, 91.107, 91.180 to 91.188, 91.190 to 91.194, 91.195 to 91.198, 91.202, 91.203, 91.205, 91.206, 91.208, 91.209, 91.210, 91.211.

Morphological characters
This soft-furred rat of the so-called *P. tullbergi* (Thomas, 1894) complex was described from Lake Oku at about 5 km from our new records. Here it represents the most abundant rodent (34% of our captures). The 97 newly collected individuals morphologically fit well with the ZFMK paratypes. Their molecular and morphological distinctiveness towards other *Praomys* species of the *tullbergi* complex were recently confirmed (Missoup *et al.* 2012).

Praomys jacksoni (de Winton, 1897)

Mus jacksoni de Winton, 1897: 318.

Praomys jacksoni – Allen 1939: 410.

TYPE LOCALITY. — Uganda, Entebbe.

TABLE 5. — Skull dimensions (in mm) of *Hybomys* sp. representatives (including the holotype of *H. eisentrauti* Van der Straeten & Hutterer, 1986, new found specimens, ZFMK specimens). Abbreviations: see Material and methods.

	LGT	WZYG	CIO	LNAS	WNAS	WPAR	LPALFOR	UTR	LBT	LPALPOST	WM1/	LTR	LMDB	HMDB
H. eisentrauti Van der Straeten & Hutterer, 1986														
N	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Minimum	29.92	12.75	5.33	10.90	3.87	12.25	5.80	4.95	4.57	9.60	1.61	4.99	18.39	7.19
Maximum	34.13	16.13	6.23	14.08	5.27	14.18	7.00	5.77	6.32	11.80	1.93	5.42	20.83	9.17
Mean	32.33	14.51	5.66	12.88	4.53	13.24	6.40	5.33	5.14	10.64	1.75	5.26	19.62	8.15
Variance (N)	1.48	0.60	0.06	0.80	0.12	0.30	0.16	0.04	0.15	0.28	0.00	0.01	0.48	0.22
Standard deviation (N)	1.22	0.78	0.24	0.89	0.35	0.55	0.40	0.20	0.39	0.53	0.07	0.12	0.70	0.47
Variation coefficient	0.04	0.05	0.04	0.07	0.08	0.04	0.06	0.04	0.08	0.05	0.04	0.02	0.04	0.06
H. univittatus (Peters, 1876)														
N	13	13	13	13	13	13	13	13	13	13	13	13.	13	13
Minimum	27.34	11.61	4.84	10.31	3.70	11.28	4.95	4.82	4.41	8.51	1.70	5.03	16.63	6.04
Maximum	35.75	16.96	6.87	14.84	5.64	14.40	7.39	5.72	6.14	12.35	1.88	5.65	22.43	9.86
Mean	32.56	14.85	5.83	13.04	4.72	13.12	6.27	5.28	5.11	10.72	1.80	5.35	20.28	8.21
Variance (N)	6.29	2.44	0.24	1.73	0.27	0.59	0.62	0.06	0.29	1.42	0.00	0.04	3.14	1.04
Standard deviation (N)	2.51	1.56	0.49	1.32	0.52	0.77	0.79	0.24	0.54	1.19	0.05	0.20	1.77	1.02
Variation coefficient	0.08	0.11	0.08	0.10	0.11	0.06	0.13	0.04	0.11	0.11	0.03	0.04	0.09	0.12
H. badius Osgood, 1936														
N	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Minimum	30.94	13.98	5.06	12.48	4.19	12.05	5.75	5.09	4.33	9.48	1.72	4.92	19.55	7.54
Maximum	35.73	16.64	6.46	15.10	5.43	14.67	7.54	5.83	5.75	11.92	1.91	5.78	22.32	9.74
Mean	34.08	15.28	5.84	13.98	4.74	13.50	6.71	5.54	5.02	10.91	1.83	5.47	20.92	8.85
Variance (N)	1.30	0.44	0.10	0.50	0.11	0.38	0.18	0.05	0.14	0.40	0.00	0.05	0.49	0.34
Standard deviation (N)	1.14	0.67	0.32	0.70	0.33	0.62	0.43	0.23	0.37	0.64	0.05	0.22	0.70	0.58
Variation coefficient	0.03	0.04	0.06	0.05	0.07	0.05	0.06	0.04	0.07	0.06	0.03	0.04	0.03	0.07

Fig. 6. — *Hybomys eisentrauti* Van der Straeten & Hutterer, 1986 skull (MNHN 2011-935): **A**, dorsal view; **B**, ventral view; **C**, lateral view; **D**, mandible view. Scale bar: 1 cm.

TABLE 6. — External measurements of Mt Oku rodents (Murinae, Nesomyidae, Graphiuridae). For each species: first line, Average values; second line, minimum and maximum values. Note that the specimens from 2008 are not presented here due the poor preservation state of their skins. Abbreviations: see Material and methods.

Measurements	HB	TL	HF	E
Praomys hartwigi Eisentraut, 1968	149	170.3	31	18
(N = 69)	(110-168.5)	(93-194)	(23-36)	(13-20)
Praomys jacksoni (de Winton, 1897)	137.7	161	35.3	20.3
(N = 2)	(130-142)	(151-167)	(32-35)	(20-21)
Hylomyscus grandis Eisentraut, 1969	100.8	137	18.6	13
(N = 5)	(89-112)	(129-154)	(17-21)	(8-17)
H. walterverheyeni Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008	86	126.3	18	15.5
(N = 2)	(80-92)	(120-132.5)	(17-19)	(12-19)
H. montis Eisentraut, 1969	80.7	114	17.8	17
(N = 3)	(77-84)	(106-125)	(17-18.5)	
Lemniscomys striatus (Linnaeus, 1758)	107	130	25	15.3
(N = 7)	(102-116)	(118-139)	(24-26)	(13-17)
Lemniscomys mittendorfi Eisentraut, 1968	84	72.6	19	14
(N = 5)	(60-98)	(50-85)	(18-21)	(13-16)
Mastomys sp.	116	105.5	21.5	16.5
(N = 2)	111-121	99-112	21-22	16-17
Otomys occidentalis Dieterlen & Van der Straeten, 1992	142.3	73.1	27.4	17.9
(N = 12)	(102-180)	(54-88.5)	(20-31)	(14-21)
Lophuromys sikapusi (Temminck, 1853)	108	73	23	18
(N = 1)				
Gerbilliscus kempi (Wroughton, 1906)	145	146	33	18
(N = 1)				
Cricetomys sp.	348.5	349	64.5	38.8
(N = 2)	342-355	343-355	67-70	38-39.5
Graphiurus lorraineus Dollman, 1910	87.5	82.8	16.25	14.2
(N = 4)	(80-94)	(75-92)	(10-20)	(10-19.5)

MATERIAL EXAMINED. — MNHN: 2011-991, 2011-992. ZFMK: 91.49

Morphological characters

The *Praomys* species of the *jacksoni* complex can easily be differentiated from species of the *tullbergi* complex by the well marked fronto-parietal crests on the skull and the presence of a separate t3 on the first upper molar (Lecompte *et al.* 2001). Two specimens were newly captured during our study, confirming the previous record of Fülling (1992). In the Northern part of the CVL, this species is also reported in Gotel Mountains (Hutterer *et al.* 1992) and the Adamaoua Plateau (Hutterer & Joger 1982). Two specimens were sequenced by one of us and included in a phylogeny (Missoup 2010). They represented a distinct genetic group (close to North Gabon and Congo specimens) within the highly divergent West central African *P. jacksoni* (de Winton, 1897) clade.

Genus *Hylomyscus* Thomas, 1926

There are three *Hylomyscus* species on Mt Oku.

Hylomyscus grandis Eisentraut, 1969

Hylomyscus grandis Eisentraut, 1969: 300.

TYPE LOCALITY. — Cameroon, Mt Oku.

MATERIAL EXAMINED. — MNHN: 2011-944, 2011-945, 2012-1007, 2012-1008, 2012-1009, 2013-47, 2013-48. ZFMK: Eisentraut collections 69.732, 69.733, 69.734, 91.96.

Morphological characters

This species is only known from the slopes of Mt Oku and is characterized by its larger size (Table 6) compared to other *Hylomyscus* species. We collected seven specimens of this rare species during our study.

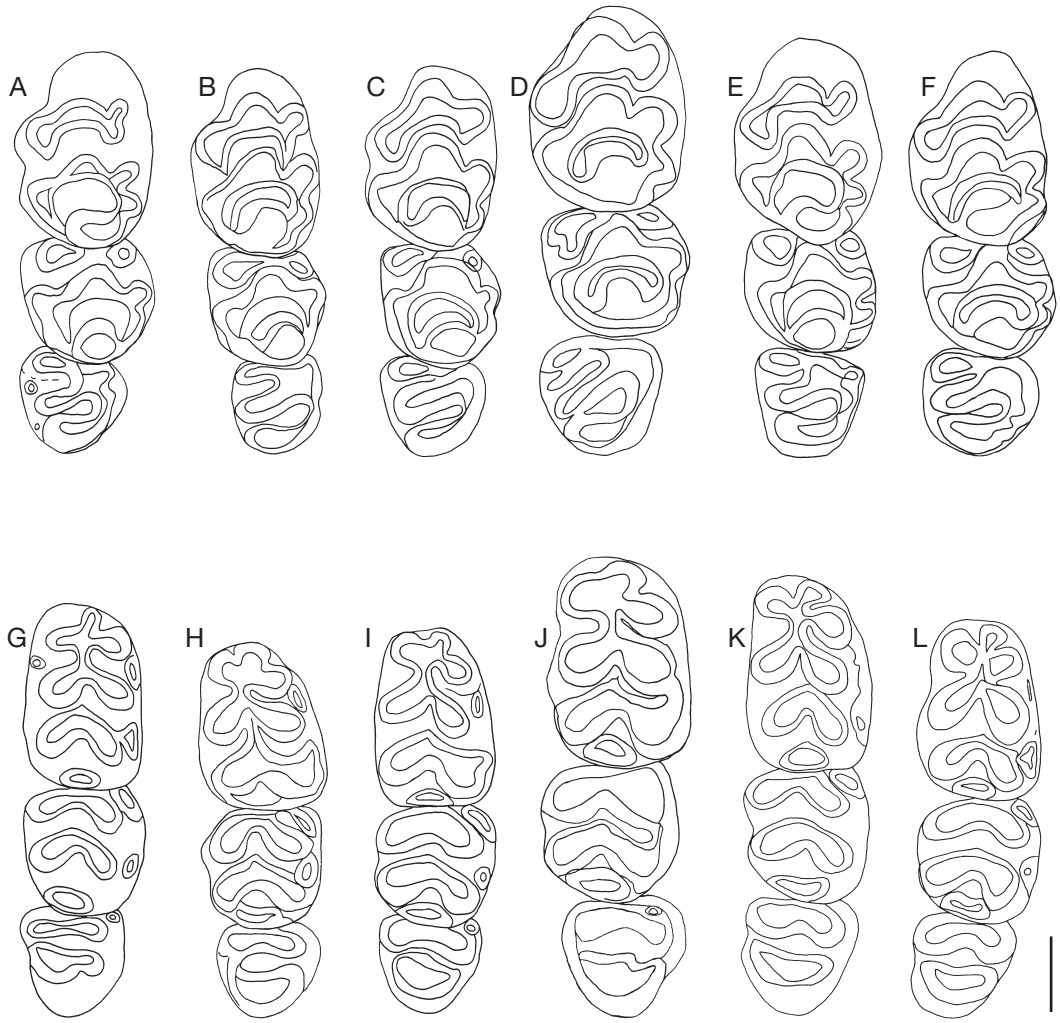

FIG. 7. — Upper and lower molars of *Hybomys* spp.: **A**, **G**, MNHN 2011-941 newly collected, *H. eisentrauti* Van der Straeten & Hutterer, 1986, Oku; **B**, **H**, ZFMK 69.175, *H. eisentrauti,* Oku; **C**, **I**, ZFMK 74.374, holotype, *H. eisentrauti*, Mt Lefo; **D**, **J**, ZFMK 63.670, holotype, *H. basilii* Eisentraut, 1965, Bioko; **E**, **K**, MSP103 *H. badius* Osgood, 1936 new collects Mt Cameroon; **F**, **L**, GA144 *H. univittatus* (Peters, 1876), Gabon. Scale bar: 1 mm.

H. grandis belongs to the *aeta* complex, which is characterized by a broad wedge-shaped interorbital area, well marked supraorbital crests, relatively large molars and a less fragile skull than other species. Our specimens clearly belong to this complex of species. Molecular sequencing confirms his distinctiveness to other species of the *aeta* complex (Missoup, pers. comm.). Their skulls, as well as their external measurements, are similar to those of specimens of *H. grandis* already described from Mt Oku.

Hylomyscus alleni cf. ***montis***
Eisentraut, 1969

Hylomyscus montis Eisentraut, 1969, 302.

Hylomyscus alleni – Waterhouse 1838: 77.

Hylomyscus alleni montis – Musser & Carleton 2005: 1335.

TYPE LOCALITY. — Equatorial Guinea, Bioko.

MATERIAL EXAMINED. — MNHN: 2013-45.
ZFMK: 69.670, 69.663, 69.662.

Morphological characters
The specimens attributed to *H. alleni montis* (form C, sensu Eisentraut 1969) were initially described from Bioko and later from Oku where they were represented only by three adult specimens plus a new skull collected in 2008. They are characterized by orthodont incisors and a smaller skull size and smaller external measurements compared to the two other Oku *Hylomyscus* species (Table 6). We keep the name *montis* pending a further revision of the whole *H. alleni* Waterhouse, 1838 complex.

Hylomyscus walterverheyeni Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008

Hylomyscus walterverheyeni Nicolas , Wendelen, Barrière, Dudu & Colyn, 2008: 226.

TYPE LOCALITY. — Gabon, Dudu Mt.

MATERIAL EXAMINED. — MNHN: 2011-942, 2011-943, 2013-44, 2013-46.

Morphological characters
Besides the large *H. grandis* and the small *H. a. montis,* one can recover a medium size *Hylomyscus* that morphologically can be attributed to the *alleni-stella* complex (Table 6). Eisentraut (1969) described *H. alleni* on Mt Oku and named a subspecies (*alleni montis*) from Bioko. He also described *H. stella* Thomas, 1911 from Nyasoso and Mt Cameroon. The taxonomy of this group has benefited from recent molecular and morphometric advances (Nicolas *et al.* 2008a, Missoup *et al.* 2009), which allow us to report the first record of *H. walterverheyeni* from Mt Oku. Four specimens of this species (among which two have been sequenced) were collected during this study.

Genus *Dasymys* Peters, 1875

Different revisions have attempted to clarify the taxonomic situation in *Dasymys* from west-central Africa (Carleton & Martinez 1991; Verheyen *et al.* 2003; Mullin *et al.* 2004). Nine species are actually recognized for the genus by Musser & Carleton (2005). In West Africa, *D. foxi* Thomas, 1912 is restricted to Jos Plateau (Nigeria) and *D. rufulus* Miller, 1900 is widely distributed from Senegal to Nigeria. *D. incomtus* (Sundevall, 1847) is reported from central South Africa. Among the recognized subspecies of *D. incomtus, D. incomtus bentleyae* Thomas, 1892 was reported from Ngombi in the Lower Congo. It was considered a valid species by Verheyen *et al.* (2003). Eisentraut (1963) described *D. incomtus longipilosus* Eisentraut, 1963 from Mt Cameroon but this name is actually considered as a synonym of *D. bentleyae* (Verheyen *et al.* 2003). However, Musser & Carleton (2005) keep *D. bentleyae* and *D. longipilosus* as subspecies of *D. incomtus*. Cameroon rodents of the genus *Dasymys* are poorly known. Most of them are listed as *D. incomtus.* According to Mullin *et al.* (2004) this name should be restricted to Zimbabwe and South Africa while *D. rufulus* should have a larger range than previously suggested. Based on geometric morphometric analyses, these authors also suggested the specific validity of the Mt Cameroon endemic *Dasymys* species, *D. longipilosus*, pending further genetic analyses. In the present study, no species name was attributed to the nine specimens newly collected pending further revision of the genus *Dasymys*.

Dasymys sp.

MATERIAL EXAMINED. — MNHN: 1984-498, 2011-902 to 2011-909; 2011-928.
ZFMK: 91.221, 2003-902 to 2003-904.
ZFMK: Owl pellets Oku Cave: 91.97 to 91.101.

Morphological characters
Dasymys incomtus longipilosus Eisentraut, 1963 was initially reported on Mt Cameroon at around 2200 m. The author pointed out its long hair. This species is also found on Mt Manengouba.

TABLE 7. — External standard measurements for the new Oku *Dasysmys* specimens compared to Mt Cameroun *D. longipilosus* Eisentraut, 1963 ones. Abbreviations: see Material and methods.

	HB	TL	HF	E	%TL/HB
Oku					
Dasymys sp.					
N	8	8	8	8	8
Minimum	119.0	117.0	28.0	12.0	86.7
Maximum	145.0	133.0	32.0	20.0	100.8
Mean	130.8	122.6	30.1	17.8	93.9
Vc	0.069	0.050	0.037	0.172	0.050
SD	3.43	2.33	0.42	1.15	1.77
Mt Cameroun					
D. longipilosus					
N	8	8	8	8	8
Minimum	115	107	26	17.5	86.1
Maximum	137	124	28	20	99.1
Mean	126	116	26	18.6	92.1
SD	8.1	5.35	2.42	1.09	0.03

TABLE 8. — External measurements for new collected specimens of Oku *Grammomys* Thomas, 1915 compared to the Holotype of *G. poensis* Eisentraut, 1965. Abbreviations: see Material and methods.

	HB	TL	HF	E
G. poensis				
Oku				
N	5	5	5	5
Minimum	92	163	26	12
Maximum	143	194	28	18
Mean	126.9	181.4	26.7	15.8
G. poensis				
Holotype	139	195	26	17
Grammonys sp.				
N	6	6	6	6
Minimum	127	190	27	17
Maximum	146	214	30.5	19
Mean	137.9	200.4	28.6	17.8

Fülling (1992) named the specimens he trapped on Mt Oku *D.* cf. *rufulus*. According to Rosevear (1969), *D. i. longipilosus* has a smaller hindfoot (about 26 mm) than *D. rufulus* and *D. foxi* (about 28.5 mm for *D. rufulus* and 31 mm for *D. foxi*). According to Mullin *et al.* (2004) the small size of the skull, the dark pelage and the short tail characterize *D. longipilosus*. We compare our newly collected specimens to *D. longipilosus* of Mt Cameroon. The specimens of Mt Cameroon are darker and the hairs are longer. In the ventral view, the skull of *D. longipilosus* exhibits a long incisive foramen extending far between the molar rows, while in *D.* sp. and *D. rufulus* from West Africa it end before the molar rows. External measurements of eight of the nine new specimens trapped in Mt Oku are presented in Table 7.

According to Rosevear (1969) all *D. rufulus* have a TL/HB ratio of 99% while this value reaches 98 % for *D. foxi* and 95% for *D. longipilosus* from Mt Cameroon. The HF of Mt Cameroon specimens are clearly smaller, as with the TL/HB ratio. The holotype of *D. longipilosus* is an adult with a short HF (24 mm) and a TL/HB ratio of 91 %. The Mt Oku specimens have a shorter TL/HB ratio of 94 % (mean), a greater HF (30 mm) and a HB of 131 mm. These measurements are similar to those of *D. foxi* specimens from Panyam (Rosevear 1969). However, the TL of Oku specimens is very short (122.6 mm in average) and significantly smaller than the HB (mean: 94 %, Min: 87 %, Max: 101 %). We thus consider the specimens of Oku as belonging to a distinct, possibly undescribed species.

Genus *Grammomys* Thomas, 1915

The *Grammomys* specimens collected in Mont Oku were assigned to two different species due to evident size and morphological differences.

Grammomys poensis Eisentraut, 1965

Grammomys poensis Eisentraut, 1965: 26.

Mus rutilans Peters, 1876: 478.

Grammomys rutilans – Musser & Carleton 1993: 594.

TYPE LOCALITY. — Equatorial Guinea, Moca, Bioko.

MATERIAL EXAMINED. — MNHN: 2011-916, 2011-918, 2011-920, 2011-921, SPOT 10143.
ZFMK: 69.207, 69.206.

Morphological characters

The species name *rutilans* used by Eisentraut (1968) for some specimens of Mt Oku is no

longer valid and has been replaced by *poensis* (Musser & Carleton 2005). We collected five new specimens fitting well with the holotype of *G. poensis* described by Eisentraut (1965) from Bioko (Table 8). The adult females examined (n = 3) all possessed a mammary formula of 0 + 2. *Grammonys poensis* is present all over the CVL mountains of Cameroon from Mt Oku to Mt Cameroon, as well as in Bioko (Eisentraut 1973), Mt Kupe (Denys *et al.* 2009) and Mamfé (Sanderson 1940).

Grammomys sp.

MATERIAL EXAMINED. — MNHN: 1984-496, 1984-497, 2011-913 to 2011-915, 2011-917, 2011-919, 2011-922, SPOT 10147 (CAM347), 2013-39, 2013-40.

Morphological characters
Grammomys sp. is a much larger *Grammomys,* and displays a longer foot (Table 8). It probably belongs to a yet undescribed genus and species (Hutterer & Tranier 1999).

Genus *Lemniscomys* Trouessart, 1881

Two species of the genus occur on Mt Oku: *L. striatus* (Linnaeus, 1758) and *L. mittendorfi* Eisentraut, 1968. Described by Eisentraut (1968) as a sub-species of *L. striatus*, *L. mittendorfi* was finally raised to species level based upon its palatal morphology, morphometrics and chromosome formula (Van der Straeten & Verheyen 1980; Fülling 1992; Musser & Carleton 2005). However, no clear comparison with *L. striatus* was made. Based upon the external characters of the two species housed in ZFMK, and acccording to Fülling's (1992) observations of palatal ridges differences, we confirm the presence of both species on Mt Oku. *Lemniscomys mittendorfi* representatives are characterized by a large dorsal black stripe and five discontinuous lines of red spots on each side of the median line, while in *L. striatus* the median black stripe is narrow. *Lemniscomys mittendorfi* specimens have a short tail compared to HB, a small hindfoot (18-21 mm, against 24-26 mm in *L. striatus*) and are smaller than *L. striatus* representatives (Table 6).

Lemniscomys striatus (Linnaeus, 1758)

Mus striatus Linnaeus, 1758: 62.

Lemniscomys striatus – Trouessart 1881: 124.

TYPE LOCALITY. — Sierra Leone.

MATERIAL EXAMINED. — MNHN: 2011-967 to 2011-973. ZFMK Fuelling Collections: 91.234, 2003-888 to 2003-890

Morphological characters
We collected seven new specimens of *L. striatus* and Fülling captured four. The single female has a 1 + 2 mammary formula. External measurements of these new specimens are provided in Table 6. Molecular sequencing confirms their specific status and their close relationship with the west central African clade of Nicolas *et al.* (2008b), Missoup (pers. comm.). *Lemniscomys striatus* is known from other CVL regions like Mamfe (Sanderson 1940).

Lemniscomys mittendorfi Eisentraut, 1968

Lemniscomys mittendorfi Eisentraut, 1968: 7.

TYPE LOCALITY. — Cameroon, Mt Oku.

MATERIAL EXAMINED. — MNHN: 2013-81.
ZFMK: Eisentraut collections 69.259 to 69.262.
ZFMK: Fülling collections: 91.235, 91.236, 2003-882 to 2003-887.
ZFMK: Owl pellets Lake Oku cave 91.94.

Morphological characters
The specimen newly collected were poorly preserved (few external data available, only skulls, no DNA sequencing possible). Their small size of skull, the small HF (21 mm) and the size and shape of the molars fit well with type series specimens housed in ZFMK (Table 6).

Genus *Mastomys* Thomas, 1915

Mastomys sp.

MATERIAL EXAMINED. — MNHN: 2013-82.
ZMFK: 91.254, 91.255, 2003-905 to 2003-908.

Morphological characters

The genus *Mastomys* is widespread all over tropical Africa and prefers anthropogenic habitats. In Cameroon *M. natalensis* Smith, 1834 is known from several CVL villages, like Nyassoso (Denys *et al.* 2009) or Mt Lefo (Eisentraut 1973). Three species of *Mastomys*, *M. natalensis*, *M. erythroleucus* Temminck, 1853 and *M. kollmanspergeri* Petter, 1957, were reported in Northern Cameroon (Dobigny *et al.* 2011). In Oku, two young adult females were collected by Fülling (1992) from fallow land at 2210 and 2240 m. Their relatively large weight and size, relatively short tail and the contrast between dark brown upper and grey lower part may allow to attribute them to *M. kollmanspergeri* (Dobigny *et al.* 2008) (Table 6). The species was recently found in northern Cameroon and its southern limits, as well as its morphological variability are not yet known for this country. However, without a molecular study we cannot confirm this identification. We collected one damaged specimen of this species during our fieldwork and it seems to have a smaller size compared to *M. erythroleucus* and *M. kollmanspergeri* specimens (HF = 22 mm and TL = 98 mm).

Genus *Mus* Linnaeus, 1758

Mus* (*Nannomys*) *setulosus Peters, 1876

Mus (*Nannomys*) *setulosus* Peters, 1876: 480.

TYPE LOCALITY. — Cameroon, Limbe.

MATERIAL EXAMINED. — MNHN: 2011-974, 2011-975, 2011-976, 2013-83, 2013-84.
ZFMK owl pellets Lake Oku Cave: 91.93.

Morphological characters

Five specimens of a rather large *Mus* (*Nannomys*) species have been captured on Mt Oku. Only one individual was previously collected at Lake Oku at 2100 m (Eisentraut 1968). Owing to a HF length greater than 15 mm and their short tail, the new Oku specimens fall within the range variation of *M. setulosus,* whose holotype is from Limbé (Victoria) in SW Cameroon. Two of our new specimens were captured at an altitude of 2550 m on the Oku slope, while the others (three) were brought in by local people. The species is also reported from Manengouba crater lake (1800 m), from Mt Cameroon at 2200 m and from the Gotel Mountains around 1900 m (Eisentraut 1973; Hutterer *et al.* 1992). The morphological variability of this species is not well known but the five newly collected Oku specimens have a longer tail than other CVL specimens (Table 9). Their skulls and molars display the typical features of *M. setulosus*.

TABLE 9. — *Mus* (*Nannomys*) *setulosus* Peters, 1876 external measurements (in mm) from CVL sites. Abbreviations: see Material and methods.

Locality	W	HB	TL	HF	E
Oku					
N	3	3	3	3	3
Mean	9.5	74.7	63.3	15.7	9.7
(Min-Max)	(8-10)	(71-77)	(61-66)	(14-17)	(7-11)
Limbé					
N	2	2	2	2	2
Mean		78	51	15.5	9
(Min-Max)			(49-53)	(15-16)	
Kupe 850 m					
N	6	6	6	6	6
Mean	13	75.8	53.2	15.7	12.2
(Min-Max)	(7.5-16)	(63.5-85)	(52-54)	(15-17)	(11-14)
Manengouba 1800 m					
N	4	4	4	4	4
Mean	14	74.8	56.8	15	12
(Min-Max)	(12-15)	(72-77)	(54-60)		
Cameroon Mt 2200 m					
N	1	1	1	1	1
	10.5	68	52	16	11

Mus musculus Linnaeus, 1758

Mus musculus Linnaeus, 1758: 62.

MATERIAL EXAMINED. — FMK: 91.259.

Morphological characters
In the Oku village, at an altitude of 2000 m, one male specimen of *M. musculus* probably *domesticus* subspecies was collected by Fülling (1992).

Genus *Mylomys* Thomas, 1906

Mylomys dybowskii (Pousargues, 1893)

Golunda dybowskii Pousargues, 1893: 163.

Mylomys dybowskii – Thomas, 1906: 224.

TYPE LOCALITY. — CAR, Kemo River.

MATERIAL EXAMINED. — ZFMK Owl pellets Lake Oku: 91.91.

Morphological characters
A half skull of a juvenile *Mylomys* has been recovered in owl pellets from a Lake Oku cave. It displays the very characteristic dental pattern of the species (Fig. 8), which is known from western Guinea to Tanzania, in very moist grasslands at altitudes up to 2500 m.

Genus *Oenomys* Thomas, 1904

Oenomys hypoxanthus albiventris
Eisentraut, 1968

Oenomys hypoxanthus albiventris Eisentraut, 1968: 8.

TYPE LOCALITY. — Cameroon, Mt Oku.

MATERIAL EXAMINED. — MNHN: 2013-85, 2013-86.
ZFMK: Eisentraut collections: 69.197 to 69.199.
ZFMK: Fülling collections: 91.222, 2003-900.
ZFMK: owl pellets Lake Oku cave: 91.113 to 91.115.

Morphological characters
The red nose rats are quite easy to identify and are present in all forests of tropical Africa from Ethiopia to West Africa. They comprise two species: the West African *O. ornatus* Thomas, 1911 and the east-central African *O. hypoxanthus* Pucheran, 1855. Eisentraut (1968) described a new subspecies from Mt Oku (*O. h. albiventris*) and distinguished it from *O. hypoxanthus* from Nyasoso and Musake (base of Mt Cameroon) based on the differences in pelage colour. Based on the study of molar outlines Renaud (1999) showed that the central African group is distinct from the Ethiopian one. Here we keep the subspecies name *O. h. albiventris* as valid only for Oku specimens because: 1) the holotype of *O. hypoxanthus* comes from Gabon; and 2) we collected our new specimens in the type locality of the subspecies *albiventris.* Molecular data are needed to revise the taxonomy of this genus.

Genus *Otomys* F. Cuvier, 1824

Two species of this genus have been recorded in the CVL. The first one, *Otomys occidentalis* Dieterlen & Van der Straeten, 1992, is known only from Gotel Mountains (type locality), East Nigeria and Mt Oku. The second one, *O. burtoni* Thomas, 1918, is endemic to Mt Cameroon (Musser & Carleton 2005). Fülling (1992) illustrated the differences in the palatal ridges disposition between *O. occidentalis* from Oku and *O. burtoni* from Mt Cameroon. Both species are genetically distinct (Taylor *et al.* 2014).

Otomys occidentalis
Dieterlen & Van der Straeten, 1992

Otomys occidentalis Dieterlen & Van der Straeten, 1992: 386.

TYPE LOCALITY. — Nigeria, Gotel Mtns, Chappal Waddi.

MATERIAL EXAMINED. — MNHN: 1980-60, 1981-1370 (described in Petter 1982), 2011-977 to 2011-988, 2013-87 to 2013-120.
ZFMK: 69.218.
ZFMK: Fülling collection: 91.227 to 91.229.
ZFMK: Lake Oku cave owl pellets: 91.136-8, 91.140-170.

Morphological characters
The newly trapped specimens display the typical *Otomys* laminated tooth pattern. The females have 0 + 1 mammae. On the molars we observe the

presence of five laminae on M/1, the deeply grooved incisors (one striation 1/1) and a 7-8 laminae pattern in the upper M3. But, based on their morphology and external measurements (Table 6), we assigned the new samples to the endemic *O. occidentalis* species. This was confirmed in a molecular and morphometrical revision of the 5 laminae species complex (Taylor *et al.* 2014).

Genus *Rattus* Fischer, 1803

Rattus rattus (Linnaeus, 1758)

Mus rattus Linnaeus, 1758: 61.

Rattus rattus – Fischer 1803: 128.

TYPE LOCALITY. — Sweden, Uppsala.

MATERIAL EXAMINED. — ZFMK: Fülling collections: 91.258.

Morphological characters
One specimen was found at 2000 m in Oku village by Fülling (1992). The species was already found in Nyassoso village (Denys *et al.* 2009) in the CVL. It is widespead all over the Africa.

Subfamily DEOMYINAE Thomas, 1888

Genus *Lophuromys* Peters, 1874

In their revision of the *Lophuromys* genus, Verheyen *et al.* (1997) recorded five specimens from Mt Oku as belonging to a new species, *L. dieterleni* Verheyen, Hulselmans, Colyn & Hutterer, 1997, and endemic to this mountain. This species is different from Mt Lefo *L. eisentrauti* Dieterlen, 1979 and from Mt Cameroon *L. roseveari* Verheyen, Hulselmans, Colyn & Hutterer, 1997. The common species, *L. sikapusi* (Temminck, 1853), is also reported in CVL lowland forests (Eisentraut 1973) and could coexist with *L. dieterleni* on Mt Oku. We collected five *Lophuromys* specimens with traditional traps. Skins were in poor condition, so we limit ourselves here mostly to their skull characteristics.

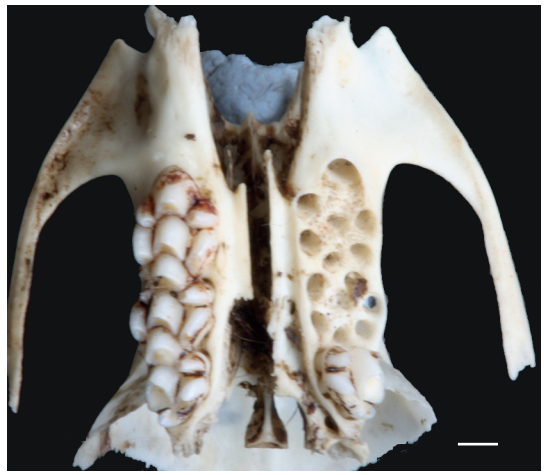

FIG 8. — Ventral view of *Mylomys dybowskii* (Poursargues, 1893) half skull ZFMK 91.91, found by O. Fülling in owl pellets from Lake Oku cave. Scale bar: 1 mm.

Lophuromys dieterleni
Verheyen, Hulselmans, Colyn & Hutterer, 1997

Lophuromys dieterleni Verheyen , Hulselmans, Colyn & Hutterer, 1997: 173.

TYPE LOCALITY. — Cameroon, Mt Oku.

MATERIAL EXAMINED. — MNHN: 2012-1010 to 2012-1014.
ZFMK: Holotype (69.289), 69.286 to 69.288, 69.290.

Morphological characters
The length of the tail of the best-preserved specimens varies between 56 and 75 mm (average: 66 mm) and the hind foot length varies between 20 and 23 mm (average: 21 mm). These values fit with the range of previous collections of *L. dieterleni* (including the holotype) from Mt Oku, reaching 75 mm (N = 3) and 21 mm (N = 5), respectively. These measurements are smaller than those of *L. roseveari* for HF (Mean: 22 mm; N = 10) as well as for the tail length (Mean: 61 mm; N = 10). They are larger than those of the *L. eisentrauti* holotype (TL=53; HF=19).

The new collected specimens of *L. dieterleni* display a nasal bone that is enlarged in front of the rostrum but less than in *L. sikapusi* specimens. The

mandible is low and long, the posterior margin of the palate is rectilinear and the pterygoid processes (U shaped pterygoid fossa) are large and parallel as in the holotype (Fig. 9). In contrast, in *L. roseveari* the pterygoid processes are divergent and the posterior margin of the palate is narrow (V shape of the pterygoid fossa); the palate is very short and ends before the level of the third upper molar. *Lamottemys eisentrauti* displays an intermediate disposition of the pterygoid region with a curved posterior margin of the palate, with an inflexion in the middle, and the pterygoid process are not parallel.

The skulls of *L. dieterleni* display a larger interorbital constriction, zygomatic width and parietal width compared to *L. sikapusi*, *L. roseveari* and *L. eisentrauti* representatives (Table 10). *Lophuromys dieterleni* is smaller than the other species for the greatest length of the skull, the nasal length, the upper molar row length and the tympanic bulla length.

The molars of the new collected specimens all display stephanodont crests at t3 and t6 of the upper molars M/12 (Fig. 10). On the lower M1 there is trace of an antero median cusp (tma), as seen in some *L. sikapusi* but not in *L. eisentrauti* or *L. roseveari*. *Lamottemys roseveari* displays much more bunodont cusps and larger molars than *L. dieterleni*.

Pending further molecular works, all these differences allow us to retain the species as valid.

Lophuromys sikapusi (Temminck, 1853)

Mus sikapusi Temminck, 1853: 160.

Lasiomys afer Peters, 1866: 409.

Lophuromys afer – Peters 1874: 234.

Lophuromys sikapusi – Allen 1939: 395.

TYPE LOCALITY. — Ghana, Dabracom.

MATERIAL EXAMINED. — ZFMK: 91.223.

Morphological characters

This specimen was caught by Fülling at 2050 m asl. Its external measurements (Table 6) fit within the range of other *L. sikapusi* of the CVL (Denys *et al.* 2009). The skull is broken and its posterior part is missing.

Subfamily GERBILLINAE Gray, 1825
Genus *Gerbilliscus* Thomas, 1897

Gerbilliscus kempi (Wroughton, 1906)

Tatera kempi Wroughton, 1906: 375.

Gerbilliscus kempi – Musser & Carleton 2005: 1219.

TYPE LOCALITY. — Nigeria, Aguleri.

MATERIAL EXAMINED. — ZFMK Fülling collections: 91.224.

Morphological characters

A single female was trapped at 1500 m asl in a fallow land by Fülling. Its external measurements are provided in Table 6, the skull and molars are illustrated in Fig. 11. Initially it was named *G. validus* Bocage, 1890 by Fülling (1992), but following Bates (1988), Musser & Carleton (2005) restricted the presence of this species to southern savannas of Africa. However, the whole *Gerbilliscus* genus is still in need of revisions (Granjon *et al.* 2012). Pending further revisions of the genus in west-central Africa we keep the name *G. kempi* for the single Oku specimen. The species was recently reported in the extreme part of northern Cameroon (Dobigny *et al.* 2011).

Family NESOMYIDAE Major, 1897
Subfamily CRICETOMYINAE Roberts, 1951
Genus *Cricetomys* Waterhouse, 1840

Cricetomys sp.

MATERIAL EXAMINED. — MNHN: 2011-900, 2011-901, 2013-38;
ZFMK: 69.229, 92.171 (skull), Lake Oku, 29.01.1967;
ZFMK: owl pellets cave Lake Oku: 91.218

Morphological characters

Three adult males were trapped with traditional traps (two in 2006 and one in 2008). They fit within the size range variation of *C. emini* Wroughton, 1910 *sensu lato* of Cameroon and East Nigeria for their HB length, but have a proportionally smaller tail length (Table 6). Their hindfeet and ear length measurements fit well within the variability

TABLE 10. — Skull measurements of the different CVL *Lophuromys* Peters, 1874 species in mm. Abbreviations: see Material and methods.

	LGT	WZYG	CIO	LNAS	WNAS	WPAR	LfI	LPALFOR	UTR	LBT	LMDB	HMDB	LTR
L. dieterleni Verheyen, Hulselmans, Colyn & Hutterer, 1997													
N	8	8	8	8	8	8	8	8	8	8	8	8	8
Minimum	26.28	14.47	6.33	9.92	3.36	12.54	5.43	10.35	4.54	4.85	17.33	6.19	4.44
Maximum	31.14	16.07	7.46	12.88	4.19	13.24	6.71	12.37	4.92	5.85	21.22	8.09	5.01
Mean	29.88	15.28	6.99	11.32	3.83	12.85	6.09	11.50	4.68	5.46	20.17	7.50	4.65
Variance (N)	2.42	0.33	0.11	0.97	0.09	0.06	0.15	0.51	0.02	0.08	1.51	0.32	0.04
SD	1.56	0.57	0.32	0.99	0.30	0.24	0.38	0.71	0.13	0.29	1.23	0.56	0.19
CV	0.05	0.04	0.05	0.09	0.08	0.02	0.06	0.06	0.03	0.05	0.06	0.08	0.04
L. sikapusi (Temminck, 1853)													
N	4	4	4	4	4	4	4	4	4	4	4	4	4
Minimum	29.45	13.93	6.54	10.11	3.20	12.34	6.54	12.27	4.80	5.34	19.88	7.16	4.62
Maximum	31.68	15.23	6.96	12.75	4.16	13.19	7.10	13.73	4.99	6.17	22.15	7.37	5.10
Mean	30.76	14.62	6.77	12.03	3.84	12.78	6.75	12.95	4.93	5.81	21.26	7.26	4.86
Variance (N)	0.93	0.28	0.03	1.24	0.14	0.12	0.05	0.28	0.01	0.09	0.76	0.01	0.03
SD	0.96	0.53	0.17	1.11	0.37	0.34	0.22	0.53	0.08	0.30	0.87	0.08	0.18
CV	0.03	0.04	0.02	0.09	0.10	0.03	0.03	0.04	0.02	0.05	0.04	0.01	0.04
L. roseveari Verheyen, Hulselmans, Colyn & Hutterer, 1997													
N	9	9	9	9	9	9	9	9	9	9	9	9	9
Minimum	28.88	11.47	6.05	10.66	3.30	11.80	5.74	7.71	4.58	5.28	18.66	5.83	4.02
Maximum	32.55	14.43	7.09	13.89	3.81	13.27	7.43	13.56	4.98	6.28	22.24	8.61	4.85
Mean	30.61	13.51	6.46	12.19	3.48	12.66	6.41	11.87	4.81	5.65	20.51	7.12	4.46
Variance (N)	1.13	0.83	0.11	0.84	0.03	0.24	0.23	2.80	0.02	0.13	1.34	0.70	0.05
SD	1.07	0.91	0.33	0.92	0.17	0.49	0.48	1.67	0.13	0.36	1.16	0.84	0.23
CV	0.03	0.07	0.05	0.08	0.05	0.04	0.08	0.14	0.03	0.06	0.06	0.12	0.05
L. eisentrauti Van der Straeten & Hutterer, 1986													
N	3	3	3	3	3	3	3	3	3	3	3	3	3
Minimum	24.39	10.51	5.79	8.37	3.17	11.22	4.47	8.67	3.66	4.93	15.53	5.47	4.21
Maximum	31.11	14.77	6.72	12.59	4.40	12.87	6.39	9.93	5.06	5.61	21.14	7.54	4.93
Mean	27.41	12.73	6.27	10.50	3.71	12.07	5.37	9.30	4.37	5.31	18.02	6.47	4.54
Variance (N)	7.76	3.04	0.14	2.97	0.26	0.46	0.62	0.40	0.33	0.08	5.44	0.72	0.09
SD	2.79	1.74	0.38	1.72	0.51	0.67	0.79	0.63	0.57	0.28	2.33	0.85	0.30
CV	0.10	0.14	0.06	0.16	0.14	0.06	0.15	0.07	0.13	0.05	0.13	0.13	0.07

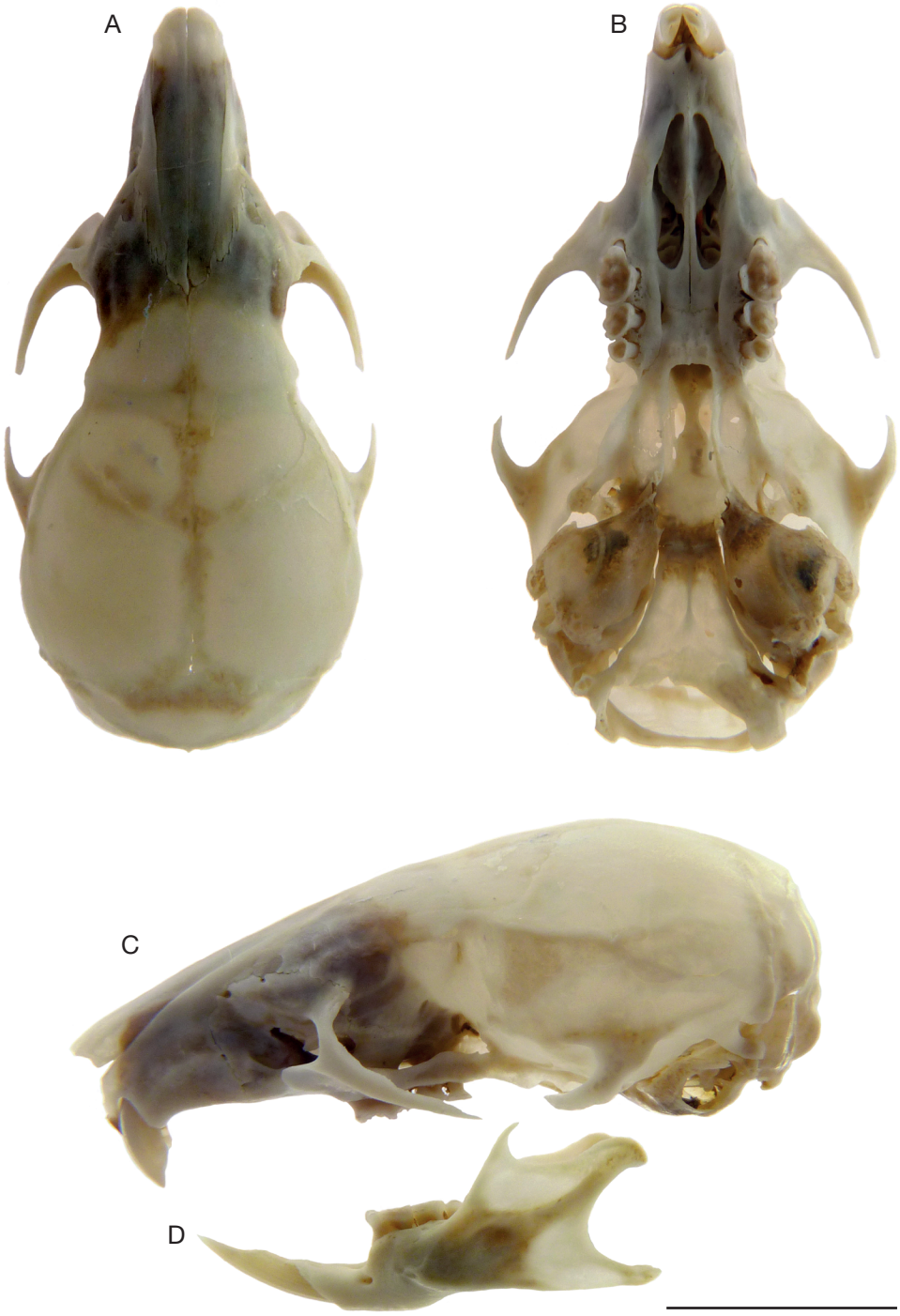

FIG. 9. — *Lophuromys dieterleni* Verheyen, Hulselmans, Colyn & Hutterer, 1997 skull (MNHN 2012-1010) from Oku: **A**, dorsal view, **B**, ventral view; **C**, lateral view; **D**, mandible view. Scale bar: 1 cm.

Fig. 10. — Dental rows (top row upper molars, bottom lower molars) of *Lophuromys dieterleni* Verheyen, Hulselmans, Colyn & Hutterer, 1997 from Oku: **A**, **E**, MNHN 2012-1014; **B**, **F**, MNHN 2012-1013; **C**, **G**, holotype *L. dieterleni* ZFMK 69.289; **D**, **H**, holotype *L. eisentrauti* Dieterlen, 1979 ZFMK 74.436 from Mt Lefo. Scale bar: 1 mm.

of *C. emini s.l.* (Genest-Villard 1967; Rosevear 1969). The recent molecular and morphometrical revision of Olayemi *et al.* (2012) highlighted an unexpected diversity in *Cricetomys,* and included the specimens collected in Mt Kupe (Denys *et al.* 2009) and Mt Manengouba (Missoup 2010) in a new clade named "*Cricetomys* sp. 3". Our specimens fit within the range values for specimens collected by Eisentraut (1973) on Kupe, Manenguba and Oku and may belong to the same undescribed clade.

Subfamily Dendromurinae G. M. Allen, 1939

Genus *Dendromus* Smith, 1829

The genus awaits a complete revision. According to Musser & Carleton (2005) and Eisentraut (1968), the Cameroon fauna has yielded *Dendromus messorius* Thomas, 1903*,* whose holotype comes from Efulen. It is a typical inhabitant of tropical lowlands forests, and is also found in Mt Kupe (Denys *et al.* 2009). Another species, *Dendromus oreas* Osgood, 1936*,* is endemic to

TABLE 11. — External measurements of the CVL *Dendromus* sp. specimens (For *D. oreas* Osgood, 1936 and *D. messorius* Thomas, 1903 the present data include the holotype measurements from the literature (Osgood 1936 and Thomas 1903), plus ZFMK specimens described by Eisentraut and specimen KPE32 described by Denys *et al.* (2009). For *D. messorius,* specimens from BMNH of Efulen (Cameroon) have been included. Abbreviations: see Material and methods.

Species/Locality	W	HB	TL	HF	E
Dendromus sp.					
Oku					
N	3	3	3	3	3
Mean	7.0	58.7	86.7	20.3	11.5
(Min-Max)	(6-8)	(52.5-64.5)	(83-91.5)	(20-21)	(11-12)
Manengouba 1800 m					
N	2	2	2	2	2
Mean	7.75	58.5	93.5	17.5	13
(Min-Max)	(7-8.5)	(56-61)	(90-97)	(17-18)	13
Nyassoso 850 m					
N	2	2	2	2	2
Mean	11	61.5	93	17.5	10.5
(Min-Max)		(68-55)	(84-102)	(16-19)	(10-11)
D. oreas					
Mt Cameroon					
N	8	8	8	8	8
Mean	9.7	70.1	98.7	19.9	13.9
(Min-Max)	(8-13)	(61-76.5)	(91-110)	(18-21.5)	(13-19)
D. messorius					
Efulen/Bitye					
N		5	5	5	5
Mean		72.4	81.8	17.2	12.2
(Min-Max)		(68-80)	(76-87)	(16-18)	(12-13)

Mt Cameroon. Denys & Aniskine (2012) recognized that *D. messorius* is probably a species complex and these authors highlighted the differences between *D. messorius, D. oreas* and the specimens collected from Mt Oku which may represent a new taxon.

Dendromus sp.

MATERIAL EXAMINED. — MNHN: 2011-910 to 2011-912.

Morphological characters

Three specimens were trapped in Oku above 2000 m. *Dendromus* was not yet reported on Mt Oku by Eisentraut (1973) or Fülling (1992). Size comparison shows that, compared to Rosevear (1969), the Oku new representatives have a longer HF of 20-21 mm length, compared to 16-18 mm length for *D. messorius* (Table 11; Denys & Aniskine 2012). Molecular analyses suggested the specific distinctiveness of Mt Oku specimens (Voelker *et al.* pers. comm.).

Family GLIRIDAE Muirhead, 1819

Genus *Graphiurus* Smuts, 1832

Two representatives of African dormice family have already been collected in the CVL by Eisentraut (1970, 1973): *G. lorraineus* Dollman, 1910 and *G. crassicaudatus* Jentink, 1888. They differ by relative size, *G. crassicaudatus* being the largest one.

Graphiurus lorraineus Dollman, 1910

Graphiurus lorraineus Dollman, 1910: 285.

TYPE LOCALITY. — DRC, Molegbwe.

MATERIAL EXAMINED. — MNHN: 1981-852, 2001-104, 2011-923 to 2011-926, 2013-41.
ZFMK: Eisentraut collections: 69263 to 69283.
ZFMK: Fülling collections: 91272.

TABLE 12. — External size dimensions (in mm) of new collected sciurid Oku specimens compared with ZFMK ones of the CVL collected by Eisentraut. Abbreviations: see Material and methods.

Species	HB	TL	HF	E
Paraxerus cooperi Hayman, 1950 Oku				
N	3	3	3	3
(Min-Max)	(181-200)	(170-210)	(41-46)	(16-17)
Mean	191	190	43	16.3
Paraxerus cooperi Hayman, 1950 LVC ZFMK				
N	10	10	10	10
Mean	202.2	188.7	42.1	16.3
(Min-Max)	(190-209)	(179-204)	(39-45)	(15-17)
SD	8.56	13.03	1.91	0.86
Funisciurus leucogenys (Waterhouse, 1842) Oku				
N	1	1	1	1
	228	157	51	16
Funisciurus leucogenys (Waterhouse, 1842) LVC				
N	2	2	2	2
Rumpi Hills 69.317	205	158	55	18
Mt Cameroon 61.700	190	170	48	19

Morphological characters

The five newly collected specimens from Mt Oku are identical: uniform grey colour and relatively short tail. They are characterized by a medium size and tympanic bullae inflated in the mastoid region. The same characteristics are found in *G. lorraineus*. Eisentraut (1968) mentioned the presence of *G. haedulus* Dollman, 1912 in Oku. This species is now considered as a synonym of *G. lorraineus* (Holden 2005). *Graphiurus lorraineus* was already reported in Mt Lefo, Mt Oku and Mt Cameroon by Eisentraut (1973) while *G. crassicaudatus* is known from the Rumpi Hills. The external dimensions of our specimens are provided in Table 6.

Family SCIURIDAE Fischer, 1817

Genus *Funisciurus* Trouessart, 1880

Funisciurus leucogenys (Waterhouse, 1842)

Sciurus leucogenys Waterhouse, 1842: 202.

Funisciurus leucogenys – Trouessart 1880: 293.

TYPE LOCALITY. — Equatorial Guinea, Bioko.

MATERIAL EXAMINED. — MNHN: CAM 174.

Morphological characters

The Red-cheeked Rope Squirrel is easily recognizable by its colored muzzle, the back head contrasting sharply with the front and being dark brown, the lateral thin cream-colored line continued by little spots. The tail has no rings; it is black above with scattered white hairs, and below it is orange in the midlle. Contrary to *F. pyrrhopus* F. Cuvier, 1833, which has a yellow-white belly, *F. leucogenys* has an orange one. Eisentraut (1968, 1973) highlighted the presence of this squirrel in the Rumpi Hills at around 1100 m, on Mt Kupe, Mt Cameroon (Lager VI and III) and in Bamenda; but these specimens are slightly smaller than ours. The upper incisors are orange. There is a P3/. Our specimen was brought to us by local guides. Its external measurements fit within the size range of *F. leucogenys* according to Rosevear (1969) (Table 12).

Genus *Paraxerus* Forsyth Major, 1893

Two species of green squirrels are already recorded in Cameroon. *Paraxerus poensis* (A. Smith, 1830) is the smallest, the holotype comes from Bioko (Equatorial Guinea) and it is widely distributed in West Central Africa. The largest species, *P. cooperi* Hayman, 1950, was described from the Rumpi

Fig. 11. — Detail of upper molar row of *Gerbilliscus kempi* (Wroughton, 1906) ZFMK 91.224 collected by Fülling in owl pellets from Lake Oku cave: **A**, dorsal view; **B**, **C**, ventral view.

Hills and Banso mountains of Bamenda region, it is considered as Vulnerable by IUCN (2012).

Paraxerus cooperi Hayman, 1950

Paraxerus cooperi Hayman, 1950: 262.

TYPE LOCALITY. — Cameroon, Rumpi Hills.

MATERIAL EXAMINED. — MNHN: CAM 318, 2013-121, 2013-122.
ZFMK: Eisentraut collections (78.50, 78.59, 78.54, 69.335 to 69.339, 69.341 to 69.347, 69.349 to 69.357, 69.377.
ZFMK: Fülling collection 91.220.

Morphological characters
This green olive squirrel is characterized by a long pelage and a HB size about 190 mm (according to Rosevear 1969's key, Table 12). *Paraxerus cooperi* was placed in the genus *Aethosciurus* Thomas, 1916 by Moore (1959), and in a new subgenus *Montisciurus* Eisentraut, 1976 by Eisentraut (1976) based on palatal ridges features. According to this author, *P. cooperi* has seven palatal ridges, instead of four to five in *P. poensis*. A male and a female were trapped by local guides. The skull, teeth and size characters allow us to attribute the new specimens to *P. cooperi*.

DISCUSSION

FAUNAL LISTS COMPARISONS

In total, our respective surveys allowed to capture 26 species on Mt Oku. Of these species, 12 were intially reported by Eisentraut (1968, 1973). Thirty species were listed by Maisels *et al.* (2001), who used a previous list by Hutterer & Fülling (1994). Due to their large size Anomaluridae Gervais, 1849, Hystricidae G. Fischer, 1817, and Thryonomyidae Pocock, 1922 were not sampled during our study, in contrast to the study of Maisels *et al.* (2001) (Table 13). Our 2005-2008 trapping sessions were focused in mountain forest above 2500 m, while Fülling (1992) also investigated lower altitude zones of Oku and found *R. rattus, Mus musculus, Mastomys* sp. and *G. kempi* in anthropogenic habitats close to Oku village at around 2000 m. Similarly, we did not collect *Stochomys longicaudatus* (Tullberg, 1893) which is considered a lowland forest rodent species, restricted to an altitude below 900 m (Eisentraut 1963, 1973). This species was reported in Maisels *et al.* (2001). Eisentraut (1963, 1973) considered *Cricetomys* and *Dasymys* low altitude rodents, but the two genera were also recovered on Mt Oku at altitudes between 2200 and 2700 m. *Cricetomys* specimens are also known from higher elevation (1900 m) in Mt Kupe (Denys *et al.* 2009). On Mt Oku, *Hylomyscus walterverheyeni* reaches 2500 m, while it was trapped at 1500 and 2000 m on Mt Kupe (Denys *et al.* 2009; Missoup *et al.* 2009). *Dendromus* has not been collected previously on Mt Oku and for the first time we report the genus for all of the Bamenda Highlands. *Funisciurus leucogenys* is also mentioned for the first time on Mt Oku, but it was previously known to occur in Bamenda (Eisentraut 1968).

On Mambilla Plateau (Mt Gangirwal), Nikolaus & Dowsett (1989) and Hutterer *et al.* (1992) recorded *O. occidentalis* and *P. obscurus* Hutterer and Dieterlen, 1992. Missoup *et al.* (2012) confirmed the validity of *P. hartwigi* and suggested further investigations for *P. obscurus* pending a definitive conclusion on his specific status. Fülling (1992) already mentioned the presence of *P. hartwigi* and *P. jacksoni* on Mt Oku based on old Eisentraut material. Hutterer *et al.* (1992) indicated the presence of *L. striatus, G. poensis, M. setulosus, L. sikapusi* and *Mastomys* sp. in the Gotel Mountains (Southeast Nigeria) and Riegert *et al.* (2007) also found these species in owl pellets on Mt Bambili. In the present survey, we recorded these species on Mt Oku. In the Gotel Mountains and Mt Mambilla, as well as in Mt Bambili, Hutterer *et al.* (1992) and Riegert *et al.* (2007) also collected *Mus* of the *minutoides-musculoides* species complex. In the present study we confirm the presence of three *Hylomyscus* species on Mt Oku: *H. grandis, H. alleni* cf. *montis* and *H. walterverheyeni*. The status of *H. alleni* cf. *montis* is not yet clarified and is awaiting a general revision of the *H. alleni* complex. Riegert *et al.* (2007) and Fülling (1992) obtained *Dasymys* remains in owl pellets. Based upon cranio-dental characters they attributed the specimens to *D. rufulus,* but we could not reach the same conclusion for the

TABLE 13. — Comparisons of the faunal lists of Oku Mt and surroundings Mountains after our work and litterature data. We updated nomenclature for some species: *Hylomyscus stella* Thomas, 1911 was considered as a species complex by Nicolas *et al.* (2006, 2008) placed here in synonymy with *H. walterverheyeni* Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008 (Missoup *et al.* 2009). Similarly *M. hildebrandti* Peters,1878 is no longer valid name and has been replaced by *M. natalensis* Smith, 1834. The Oku *Otomys* F. Cuvier, 1824 was first described as *O. irroratus burtoni* Thomas, 1918 but later included into *O. occidentalis* Dieterlen & Van der Straeten, 1995 by Dieterlen & Van der Straeten (1992). *Grammonys rutilans* Dollman, 1912 is a synonym of *G. poensis* Eisentraut, 1965 according to Musser & Carleton (2005).

	this work Oku	Eisentraut 1957-1973 Oku	Riegert *et al.* 2007 Bamenda highlands	Hutterer *et al.* 1992 Gotel Mts Mambilla	Hutterer & Joger 1982 Adamaoua	Maisels *et al.* 2001
Graphiurus murinus haedulus Dollman, 1912		×				
Graphiurus lorraineus Dollman, 1910	×					×
Cricetomys gambianus Waterhouse, 1840						×
Cricetomys sp.	×	*C. emini* Wroughton, 1910 *s. l.*				×
Dasymys sp.	×		*D. rufulus* Miller, 1900		*D. incomtus* (Sundevall, 1847)	*D. rufulus* Miller, 1900
Dendromus sp.	×					
Hybomys eisentrauti Van der Straeten & Hutterer, 1986	×	×				×
Otomys occidentalis	×	×	×	×		×
Grammomys sp.	×					×
Grammomys poensis	×	×		×		×
Aethomys hindei Thomas, 1902					×	
Gerbilliscus validus Bocage, 1890	×					×
Oenomys hypoxanthus albiventris Eisentraut, 1968	×	×			×	×
Lemniscomys striatus (Linnaeus, 1758)	×		×	×	×	×
Lemniscomys mittendorfi Eisentraut, 1968	×	×				×
Lophuromys sikapusi (Temminck, 1853)	×	×	×	×	×	×
Lophuromys dieterleni Verheyen, Hulselmans, Colyn & Hutterer, 1997	×					×
Mus setulosus Peters,1876	×	×	×	×	×	×
Mus musculoides Temminck, 1853			×	×	×	×
Mus musculus Linnaeus, 1758						×
Mastomys sp.	×		×	×	×	×
Mylomys dybowskii (Pousargues, 1893)	×					×
Praomys jacksoni (de Winton, 1897)	×			×	×	×
Praomys hartwigi Eisentraut, 1968	×	×	×			×
Praomys obscurus Hutterer & Dieterlen, 1992				×		
Uranomys ruddi Dollman, 1909					×	
Hylomyscus walterverheyeni	×					

TABLE 13. — Continuation.

	this work Oku	Eisentraut 1957-1973 Oku	Riegert *et al.* 2007 Bamenda highlands	Hutterer *et al.* 1992 Gotel Mts Mambilla	Hutterer & Joger 1982 Adamaoua	Maisels *et al.* 2001
Hylomyscus grandis Eisentraut, 1969	×			×		×
Hylomyscus alleni cf. *montis* Eisentraut, 1969	×	×		×		×
Rattus rattus (Linnaeus, 1758)	×					×
Stochomys longicaudatus (Tullberg, 1893)						×
Funisciurus leucogenys (Waterhouse, 1842)	×					
Paraxerus cooperi Hayman, 1950	×	×				×
Xerus erythropus Geoffroy, 1803						×

new specimens catpured on Mt Oku. Compared to the Mt Adamaoua faunas (Hutterer & Joger 1982) we were unable to recover the savannah genera like *Uranomys* Dollman, 1908*, Aethomys* Thomas, 1915 or *Cryptomys* Gray, 1864. This may be related to the presence of a rather pervasive mountain forest vegetation in South Cameroon compared to the more arid northern parts of the Cameroon Volcanic line.

Importance of Mt Oku for conservation

In the present work we recovered four strictly endemic rodent species of Mt Oku: *Lamottemys okuensis*, *Hylomyscus grandis*, *Lophuromys dieterleni* and *Lemniscomys mittendorfi*. These rare rodents are classified as Endangered or Critically Endangered by IUCN (2012) because: 1) they live only on the mountain forest slopes of Mt Oku; and 2) the degradation of the forest implies their population decrease (Table 14). For the first time we recorded the presence of *Dendromus* on this mountain, which may represent new endemic species. We also found three of the Bamenda highlands endemics (*P. hartwigi, H. eisentrauti, O. occidentalis*), classified as endangered or vulnerable (IUCN 2012). For squirrels, we found for the first time *Funisciurus leucogenys* and new specimens of *Paraxerus cooperi* on Mt Oku, both considered Data Deficient (Table 14).

Such exceptional level of endemism for Mt Oku has no equivalent in Africa, except maybe for Mt Cameroon and the highlands of East Africa. No endemic rodent genus occurs on Mt Cameroon, although five endemic species are known from this mountain (*D. oreas* Osgood, 1936*, H. badius, D. bentleyae* (Thomas, 1892)*, O. burtoni, L. roseveari* Verheyen, Hulselmans, Colyn & Hutterer, 1997) and their morphological and genetic differences from species of the same genera from Mt Oku are attested (Missoup 2010; Taylor *et al.* 2014). The closest mountains to Oku are the Gotel Mountains, which do not harbour any endemic genera but share one of the Bamenda highlands endemic species (*O. occidentalis*). Looking eastwards, the nearest similar altitudinal zones are found in Central Africa, in the Western margin of the western Rift or in the East African Rift (Ethiopia, Kenya, Tanzania). The Kivu Mountains (Rahm & Christiaensen 1963) yielded no endemic genus and five endemic species (*Cricetomys kivuensis* Lönnberg, 1917*, Lophuromys aquilus* (True, 1892)*, L. rahmi,* Verheyen, 1964*, Dendromus kahuzensis* Dieterlen, 1969*, Grammomys dryas* Thomas, 1917). In the Virungas (Verschuren *et al.* 1983), there is one endemic genus (*Delanymys* Hayman, 1962) and four endemic species (*Dasymys rwandae* W. Verheyen, Hulselmans, Dierck, Colyn, Leirs & Verheyen, 2003*, Otomys typus* (Heuglin, 1877), *Lophuromys luteogaster* Hatt, 1934*, Praomys verschureni* Verheyen & Van der Straeten, 1977. The Ruwenzori highlands (Misonne 1963) harbour three endemic species (*Otomys dartmouthi* Thomas,

TABLE 14. — Faunal list and IUCN status of the Oku Mt Rodents (after IUCN 2012). Abbreviations: see Material and methods.

Rodentia	This work	Anterior works	IUCN status	Vernacular name
Cricetomys sp.	×		NA	Forest giant pouched rat
Cricetomys emini Wroughton, 1910 *sensu lato*		×	LC	Forest giant pouched rat
Cricetomys gambianus Waterhouse, 1840		×	LC	Northern giant pouched rat
Dasymys sp.	×		NA	
Dasymys rufulus Miller, 1900		×	DD	West African Dasymys
Dendromus sp.	×		NA	Climbing mouse
Funisciurus leucogenys (Waterhouse, 1842)	×		LC	Red-cheeked rope squirrel
Gerbilliscus kempi (Wroughton, 1906)	×	×	LC	Kemp's Gerbil
Grammomys poensis Eisentraut, 1965	×	×	LC	Western rainforest thicket rat
Grammomys sp.	×	×	NA	
Graphiurus lorraineus Dollman, 1910	×	×	LC	Lorrain's dormouse
Hybomys eisentrauti Van der Straeten & Hutterer, 1986	×	×	E	Eisentraut's stripped mouse
Hylomyscus alleni cf. *montis* Eisentraut, 1969	×	×	LC	Allen's Hylomyscus
Hylomyscus grandis Eisentraut, 1969	×	×	CR	Mt Oku Hylomyscus
Hylomyscus walterverheyeni Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008	×		NA	Verheyen's Hylomyscus
Lamottemys okuensis Petter, 1986	×	×	E	Mount Oku rat
Lemniscomys mittendorfi Eisentraut, 1968		×	E	Mittendorf's stripped mouse
Lemniscomys striatus (Linnaeus, 1758)	×	×	LC	Typical stripped mouse
Lophuromys dieterleni Verheyen, Hulselmans, Colyn & Hutterer, 1997	×	×	E	Mount Oku brushed-fur rat
Lophuromys sikapusi (Temminck, 1853)		×	LC	Rusty-bellied Brush-furred Rat
Mastomys sp.	×		LC	Multimammate rat
Mastomys natalensis Smith, 1834		×	LC	Natal Multimammate rat
Mus setulosus Peters, 1876	×	×	LC	Peter's pygmy mouse
Mus musculoides Temminck, 1853		×	CR	Subsaharan Pygmy Mouse
Mus musculus Linnaeus, 1758		×	LC	House mouse
Mylomys dybowskii (Pousargues, 1893)	×	×	LC	Dybowski's three-toed grass rat
Oenomys hypoxanthus albiventris Eisentraut, 1968	×	×	LC	Common rufous-nosed rat
Otomys occidentalis Dieterlen & Van der Straeten, 1992	×		V	Western vlei rat
Paraxerus cooperi Hayman, 1950	×	×	DD	Cooper's mountain squirrel
Praomys hartwigi Eisentraut, 1968	×	×	E	Hartwig's soft furred mouse
Praomys jacksoni (de Winton, 1897)	×	×	LC	Jackson's soft furred mouse
Rattus rattus (Linnaeus, 1758)		×	LC	Roof Rat
Thryonomys swinderianus Temminck, 1827		×	LC	Greater Cane Rat
Xerus erythropus Geoffroy, 1803		×	LC	Striped Ground Squirel

1906*, Dasymys montanus* Thomas, 1906*, Hybomys lunaris* Thomas, 1906). Stanley & Goodman (2011) recently described *Hylomyscus arcimontensis* from the Usambara (Tanzania). Taylor *et al.* (2011) identified *Otomys jacksoni* from Mt Elgon. *Hylomyscus vulcanorum* Lönnberg & Gyldenstolpe, 1925 was reported for the first time from the highlands of Eastern Africa by Carleton *et al.* (2006). The highest level of endemicity is found in the Ethiopian highlands where five genera (*Muriculus* Thomas, 1903*, Megadendromus* Dieterlen & Rupp, 1978*, Nilopegamys* Osgood, 1928*, Desmomys* Thomas, 1910*, Stenocephalemys* Frick, 1914) and about 12 species or subspecies (*Lophuromys brevicaudus* Osgood, 1936*, L. chrysopus* Osgood, 1936*, L. melanonyx* Petter, 1972*, L. brunneus* Thomas, 1906*, Mus mahomet* Rhoads, 1896*, Mus tenellus* (Thomas, 1903)*, Mus setulosus, Grammomys minnae* Hutterer & Dieterlen, 1984*, Dendromus lovati* de Winton, 1900*, Mylomys rex* (Thomas, 1906), *Desmomys harringtoni* (Thomas, 1902), *D. yaldeni* Lavrenchenko, 2003, are endemic (Yalden *et al.* 1996; Lavrenchenko 2000). However, the Ethiopian highlands occupy a much wider area than Mt Oku and are constituted of different massifs harbouring various endemic species.

The exceptional importance of Mt Oku for conservation is shared by other taxa. An endemic subspecies of golden mole, *Chrysochlorys stuhlmanni balsaci* Lamotte & Petter, 1981, was described recently. The level of endemicity is also remarkable for other vertebrates like Amphibians, with the endemic species *Phrynobatrachus chukuchuku* Zimkus, 2009 and the Lake Oku Clawed Frog *Xenopus longipes* Loumont & Kobel, 1991. Many plants (Cheek *et al.* 2000; Maisels *et al.* 2000) and birds (like *Tauraco bannermani* Bates, 1923 and *Platysteira laticincta* Bates, 1926) occur only on Mt Oku and in the Bamendas Highlands (Smith *et al.* 2000; Njabo & Sorenson 2009).

Compared to Mt Cameroon, Mt Oku has a different rodent faunal composition, despite its relative geographic close proximity: 1) both volcanoes only have three species in common (*Mus setulosus, Hylomyscus walterverheyeni, Funisciurus leucogenys*); and 2) they are characterized by different endemic species (Table 15, Fig. 12). In this work the presence of some endemic rodents reported in the Bamenda highlands (Lefo and Gotel-Mambilla mountains) was confirmed from Mt Oku, validating some previous biogeographical suggestions. Hutterer *et al.* (1992), for example, reported the close relationship between Mt Kupe and Mt Cameroon on one side, between Mt Oku, Mt Lefo and Mt Manengouba on the other side, and the geographical distinctiveness of Gotel and Mambilla mountains in respect to rodent and shrew faunas. The distinction between Bamenda highlands region in the north of the CVL (including Mt Lefo - Mt Oku) and Mt Cameroon (including Mt Kupe - Rumpi Hills) in the south seems consistent with different histories of these mountains, which represent islands of high altitude vegetation. A similar pattern has been recovered for birds (Smith *et al.* 2000). Clearly some Oku endemics, like *Otomys occidentalis* and *Lamottemys okuensis,* indicate eastern and southern African affinities, and possibly an old wave of colonisation for eastern highlands (Missoup 2010; Taylor *et al.* 2014). Other endemics, like those in the genus *Praomys*, would have differentiated from lowland forests taxa during the Pleistocene (Missoup *et al.* 2012). This biogeographic pattern may be related to the older age of Bamenda Highlands volcanoes (which originated as early as 31-28 Ma; Marzoli *et al.* 2000) compared to the more recent Mt Cameroon (9 Ma; Fitton & Dunlop 1985) and Mt Kupe (1 Ma; Wild 2004).

CONCLUSION

On Mt Oku, a conservation program managed by Birdlife International and the National Ministry of Environment and Forest ran for six years (1997-2003; Njabo 2006). The aim of this program was to preserve the Kilum-Ijim forest, not only for its biodiversity but also for its sustainable use by the local population. Our survey took place in 2006-2008, and allowed us to recover most of the endemic rodents of Mt Oku. However, the Kilum-Ijim Afro-mountain forest does not cover a wide surface and human pressure is high. Moreover, this forest suffers from overgrazing by cattle belonging to local farmers on the summit, overgrazing by

TABLE 15. — Faunal lists (presence-absence) of Mt Oku (this work), Kupe (Denys *et al.* 2009) and Mt Cameroon (Eisentraut 1973, 1975; Missoup 2010).

Species	Mt Cameroon	Mt Kupe	Mt Oku
Myosorex okuensis Heim de Balsac, 1968	0	0	1
Sylvisorex morio (Gray, 1862)	1	0	0
Sylvisorex camerounensis Heim de Balsac, 1968	0	0	1
Suncus megalura (Jentink, 1888)	0	0	1
Sylvisorex isabellae Heim de Balsac, 1968	0	0	1
Paracrocidura schoutedeni Heim de Balsac, 1956	1	0	0
Crocidura poensis (Fraser, 1843)	0	1	0
Funisciurus leucogenys (Waterhouse, 1842)	1	0	1
Funisciurus isabella (Gray, 1862)	1	0	0
Funisciurus pyrrhopus F. Cuvier, 1833	1	0	0
Paraxerus poensis (A. Smith, 1830)	1	1	0
Paraxerus cooperi Hayman, 1950	0	0	1
Helisociurus rufobrachium Waterhouse, 1842	1	1	0
Protoxerus stangeri (Waterhouse, 1842)	1	0	0
Graphiurus lorraineus Dollman, 1910	0	0	1
Graphiurus murinus (Desmarest, 1822)	1	0	0
Dasymys longipilosus Eisentraut, 1963	1	0	1
Lophuromys roseveari Verheyen, Hulselmans, Colyn & Hutterer, 1997	1	0	0
Lophuromys dieterleni Verheyen, Hulselmans, Colyn & Hutterer, 1997	0	0	1
Lophuromys sikapusi (Temminck, 1853)	0	1	0
Mus setulosus Peters,1876	1	1	1
Oenomys hypoxanthus albiventris Eisentraut, 1968	1	1	1
Hylomyscus aeta (Thomas,1911)	1	1	0
Praomys tullbergi (Thomas, 1894)	0	1	0
Praomys morio (Trouessart, 1881)	1	0	0
Praomys hartwigi Eisentraut, 1968	0	0	1
Praomys jacksoni (de Winton, 1897)	0	1	1
Dendromus sp.	0	1	1
Dendromus oreas Osgood, 1936	1	0	1
Otomys burtoni Thomas, 1918	1	0	0
Otomys occidentalis Dieterlen & Van der Straeten, 1992	0	0	1
Hybomys rufocanus (Tullberg, 1893)	0	1	1
Hybomys badius Osgood,1936	1	0	0
Cricetomys emini Wroughton, 1910 *sensu lato*	1	1	1
Deomys ferrugineus Thomas,1888	1	1	0
Hylomyscus walterverheyeni Nicolas, Wendelen, Barrière, Dudu & Colyn, 2008	1	1	1
Hylomyscus grandis Eisentraut, 1969	0	0	1
Grammomys poensis Eisentraut, 1965	0	1	1
Grammomys sp.	0	0	1
Lamottemys okuensis Petter, 1986	0	0	1
Lemniscomys striatus (Linnaeus, 1758)	0	1	1
Lemniscomys mittendorfi Eisentraut, 1968	0	0	1
Malacomys longipes Milne-Edwards, 1877	0	1	0

goats in the mountain forest, bushmeat hunting (including rodents), firewood harvesting and agriculture. Maisels *et al.* (2001) suggested that the extirpation of large mammals may have completely changed the equilibrium of this unique environment. Casual discussions with trappers revealed that one could have about 200 killing rat traps out at one time in the forest yielding 5-10 rodents per visit. Unfortunately, we do not have new information except that rodents are sold in the weekly market and hunters continue to collect them in the forest. Moreover, global change, by increased dry season

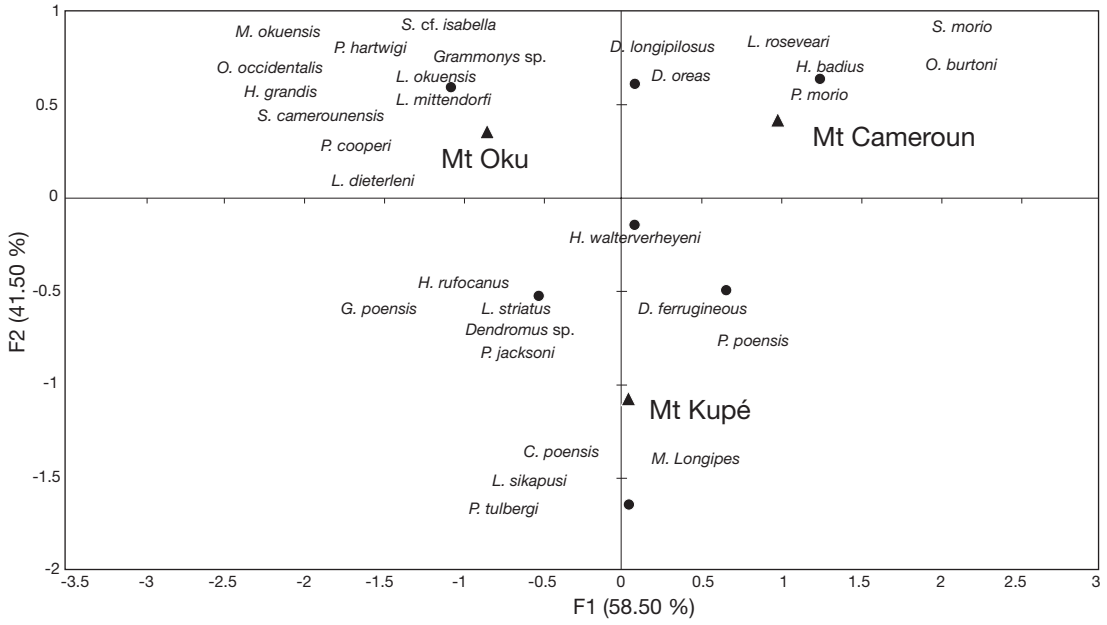

FIG. 12. — Correspondence analysis graph of axis 1 and 2 (on presence or absence of rodents and shrews from Mt Cameroon [Missoup 2010], Mt Kupe [Denys *et al.* 2009], Mt Oku [this work]).

and natural fires, may have drastic consequences on this fragile ecosyteme. Urgent action plans for conservation are required to preserve the unique mountain forest of Mt Oku.

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