A new myosoricine shrew from the Congo Basin referable to the forgotten genus *Congosorex* (Mammalia: Soricidae)

by R. HUTTERER, P. BARRIERE & M. COLYN

**Abstract**

We report on the discovery of a small, short-tailed species of shrew in lowland forest of the western Congo Basin, which resembles the enigmatic *Congosorex polli*, known from a single specimen collected in 1955 south of the Congo River. A new population, represented by 15 specimens, is referred to a new species of that genus. Differences to *Myosorex* and *Sundisorex*, two other African myosoricine genera, are discussed. *Congosorex* is now known from four localities in the central African forest block. The two species are separated by the Congo River.

**Key-words:** Insectivora, Soricidae, *Congosorex*, systematics, biodiversity, Africa.

**Introduction**

The African shrew *Congosorex polli* (HEIM DE BALSAC & LAMOTTE. 1956) is one of the least known mammals of the world, being the only representative of its genus, and known by only one specimen, the holotype. This unique animal was collected by Stuart A. MARKS in 1955 at Lubondaie [near Tshimbulu] in Kasai province, southern Democratic Republic of Congo (DRC), and subsequently named *Myosorex (Congosorex) polli* by HEIM DE BALSAC & LAMOTTE (1956). The new subgenus was occasionally (HEIM DE BALSAC, 1967) treated as a full genus or subgenus (MEESTER & DIPPENAAR, 1978), but in principal remained a synonym of what was formerly regarded as genus *Myosorex*. HUTTERER (1993, 1995), after having examined the holotype specimen in the Tervuren Museum, raised *Congosorex* again to generic level. However, as the type species *C. polli* was never collected again, the genus remained an enigma.

In 1995 and 1996, faunal surveys were conducted in three different forest sites in the Republic of Congo (RC) and in the Central African Republic (CAR) by the two junior authors of the University of Rennes 1 for the ECOFAC project. During these surveys, 15 small and short-tailed shrews were obtained which at close inspection turned out to belong to the long-forgotten genus *Congosorex*. Forty-five years after its description the genus is now re-discovered, but the species turned out to be different from the type species of the genus, *Congosorex polli*. The present paper serves to define the new species and to discuss its biogeographical and systematical significance.

**Material and methods**

15 specimens of the new shrew were collected in pitfall traps during inventory studies in the CAR and in the RC. Specimens were weighed in the field and subsequently preserved in fluid. Voucher specimens form part of the collections currently stored at the Station Biologique de Paimpont, Université de Rennes 1. Other specimens mentioned in this report form part of the collections of the following institutions: Musée Royal de l’Afrique Central, Tervuren (MRAC), Museum National d’Histoire Naturelle, Paris (MNHN), Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK), American Museum of Natural History, New York (AMNH), Carnegie Museum of Natural History, Pittsburgh (CM).

External and cranial measurements presented in this study (Tab. 3) were taken by RH from the preserved fluid specimens and the dry skulls using an electronic caliper. All measurements are given in millimetres (mm) and body masses in grams (g). Names of authors and publication dates of species discussed in the text are listed in HUTTERER (1993, 1995) and WOLSAN & HUTTERER (1998) where complete citations of species and type localities can be found.
Fig. 1. – Myosoricine crown pattern of the lower p4 in (from left to right) Myosorex longicaudatus (ZFMK 81.1293), Congosorex verheyni n. sp. (R 16854), and Sundisorex norae (AMNH 87262).

Fig. 2. – Sketches of head and right forefoot of Myosorex varius (CM 94953, upper left figure), Congosorex verheyni n. sp. (R18344, upper right figure), and Sundisorex polulus (CM 2841, bottom); based on study skins and fluid-preserved specimens.
What is a myosoricine shrew?

Some confusion exists in the literature about the correct taxonomic assignment of Myosorex and related forms. Here we place Myosorex, Congosorex, and Surdisorex provisionally in the tribe Myosoricini Kretzoi, 1965, of which Myosorex is the type genus (Kretzoi, 1965). It has long been known that this genus shows some ancestral characters (Heim de Balsac, 1966, 1967). A biochemical study by Maddalena & Bronner (1992) showed that Myosorex is not closely related to either Soricinae or Crocidurinae, the latter being the taxon in which Myosorex was most often placed. Although Kretzoi’s name is available, as pointed out for example by Jammot (1983) and Hutterer (1993, 1995), extant Myosorex were recently regarded by some authors (Maddalena & Bronner, 1992; Bedfor, Bernard & Baxter, 1998) as members of the Crocidurinae, a taxon named by Reumer (1987) to cover some extinct Miocene shrews of Europe. The phylogenetic relationships between Crocidurinae and extant Myosorex have never been investigated, but even if investigations demonstrate a closer relationship between the two groups the name Myosoricini would have formal priority. Querouil et al. (2001) studied 16S rRNA sequences of Congosorex (samples of the new species described herein) and Myosorex and their results show that both genera are sister taxa and belong to a lineage which is ancestral to Crocidura, Suncus, Sylvisorex, Scutisorex, Ruvenzorisor and Pararucodirus. The taxon Myosoricini therefore certainly includes Congosorex and Myosorex, while the inclusion of Surdisorex is yet based on morphological characters alone. The key character for the definition of the Myosoricini (Jammot, 1983) and Crocidurinae (Reumer, 1987, 1998) was the shape of the fourth lower premolar (Fig. 1): the V-shaped pattern of the occlusal surface occurs in all three extant genera, and is also shared by Carposorex, Clapasorex, Crocidosorex, Florinia, Lartetium, Miosorex, and a number of other fossil taxa (Reumer, 1998). However, the phylogenetic relationships between the fossil and extant taxa have not been studied properly, and the inclusion of all taxa sharing a single tooth character into one clade is highly hypothetical.

Meester (1953) convincingly discussed the generic distinction of Myosorex and Surdisorex, while Congosorex has only recently been recognized (Hutterer, 1993, 1995). Tables 1 and 2 present some characters which define the three taxa.

Table 1. Some distinguishing characters of the three African myosoricine genera.

<table>
<thead>
<tr>
<th>Character</th>
<th>Myosorex</th>
<th>Congosorex</th>
<th>Surdisorex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tail</td>
<td>medium to long</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>Claws of foot</td>
<td>short</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>Scales on foot</td>
<td>small</td>
<td>large</td>
<td>large</td>
</tr>
<tr>
<td>Ear conch</td>
<td>normal</td>
<td>normal/reduced</td>
<td>absent</td>
</tr>
<tr>
<td>Eye opening</td>
<td>normal</td>
<td>minute</td>
<td>minute</td>
</tr>
<tr>
<td>Upper unicuspid</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lower p3</td>
<td>present</td>
<td>present/absent</td>
<td>absent</td>
</tr>
</tbody>
</table>

Table 2. Relative tail length RTL (% of head and body length) and condyloincisive length CIL (mm) in myosoricine shrews of Africa, based on the respective holotype specimens where available.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>RTL</th>
<th>CIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surdisorex norae</td>
<td>23.1</td>
<td>26.5</td>
</tr>
<tr>
<td>Surdisorex politus</td>
<td>32.6</td>
<td>24.5</td>
</tr>
<tr>
<td>Congosorex verheyenii n. sp.</td>
<td>30.2</td>
<td>17.8</td>
</tr>
<tr>
<td>Congosorex pollii</td>
<td>40.0</td>
<td>20.3</td>
</tr>
<tr>
<td>Myosorex kiluwele</td>
<td>41.7</td>
<td>22.7</td>
</tr>
<tr>
<td>Myosorex babaulti</td>
<td>47.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Myosorex cafer</td>
<td>50.0*</td>
<td>23.2*</td>
</tr>
<tr>
<td>Myosorex varius</td>
<td>50.6*</td>
<td>22.4*</td>
</tr>
<tr>
<td>Myosorex geata</td>
<td>53.3</td>
<td>21.0</td>
</tr>
<tr>
<td>Myosorex sclateri</td>
<td>53.5</td>
<td>25.2</td>
</tr>
<tr>
<td>Myosorex eisenbraun</td>
<td>56.3</td>
<td>22.6</td>
</tr>
<tr>
<td>Myosorex blarina</td>
<td>56.8</td>
<td>22.1</td>
</tr>
<tr>
<td>Myosorex akustens</td>
<td>58.3</td>
<td>21.9</td>
</tr>
<tr>
<td>Myosorex tenus</td>
<td>59.2</td>
<td>21.7</td>
</tr>
<tr>
<td>Myosorex zinki</td>
<td>64.0</td>
<td>23.2</td>
</tr>
<tr>
<td>Myosorex longicandatus</td>
<td>75.3</td>
<td>22.9</td>
</tr>
<tr>
<td>Myosorex schallereri</td>
<td>83.8</td>
<td>18.9</td>
</tr>
</tbody>
</table>

*no types available, means taken from Meester & Dippenaar 1978

Externally, the long-clawed forefoot and the reduction of the ear conch separates Surdisorex from the other two genera. The differences between Myosorex and Congosorex are more subtle: Congosorex has a minute eye opening, and the scales on the forefeet are large versus small in Myosorex. The tail length also separates the three taxa: relative tail length (Tab. 2) is shortest in Surdisorex (23-33%), medium in Congosorex (30-40%), and long in Myosorex (42-84%). The extant Myosoricini of Africa contain 18 species: 14 species of Myosorex (Stanley & Hutterer, 2000), two species of Congosorex (this study), and two species of Surdisorex (Heim de Balsac & Meester, 1977). The fossil record of the group is poor: only Myosorex is documented from Miocene to Holocene sites in Africa (Butler & Greenwood, 1979; Butler, 1998).

Systematic descriptions

Family Soricidae G. Fischer, 1817
Subfamily Soricinae G. Fischer, 1817
Tribe Myosoricini Kretzoi, 1965

Genus Congosorex (Heim de Balsac & Lamotte, 1956)

TYPE SPECIES
Myosorex pollii Heim de Balsac & Lamotte, 1956
Emended diagnosis: Terrestrial shrews of the central African forest with reduced ear, eye, tail and limbs and a myosoricine dentition. Tail 30-40% of head and body length; claws of forefoot of medium length. Upper dentition with 3 unicuspids teeth and lower dentition with only one unicuspid tooth; p3 absent in most specimens. Additional cusplets present on the lingual side of upper unicuspids, lower p4 with V-shaped crown pattern.

DISTRIBUTION
Confined to the Congo Basin, Africa.

Congosorex polli (HEIM DE BAL SAC & LAMOTTE, 1956)

HOLOTYPE
MRAC 23.234, animal in spirit, skull extracted; collected by STUART A. MARKS 1955 at 'Lubondaie via Tshimbulu' (06.30S, 22.39E), Kazai province, DRC.

DIAGNOSIS
«... un Myosorex dont la denture a évolué selon la ligne orthogénétique générale vers le type Surdisorex, mais qui n’a pas subi l’évolution secondaire de l’oreille et des extrémités de ce dernier » (HEIM DE BAL SAC & LAMOTTE, 1956: 155). Other characters mentioned in the original description are: head large compared to the rest of the body; ears proportionally larger than in Myosorex varius and M. cafer; hindfeet short, forefeet not elongated as in Myosorex; tail extremely short (24 mm); colour very dark; hair very short; dentition remarkable for the absence of the P3 (as in Surdisorex) and the presence of a tiny p3 (as in Myosorex); m3 very large; for measurements see table 3.

DISTRIBUTION
Known only from the type locality (Fig. 7).

REMARKS
Congosorex polli has not been collected again and thus remains known from the holotype only. By application of the IUCN Red List criteria, the species should be considered as «extinct». We suspect, however, that a careful survey of suitable habitats near the type locality will show that the species still exists. A faunal survey has not been conducted in that region since the work of Stuart A. MARKS.

Congosorex verheyeni n. sp.

HOLOTYPE
ZFMK 99.932, female specimen preserved in alcohol with the skull extracted and cleaned. Field number R16761. Collected on 19 October 1996 by members of the University of Rennes I and the ECOFAC team at Mbomo (00.24N, 14.44E), Parc National d’Odzala, RC.

PARATYPES
4 males, 1 female, field numbers R16746, R16764, R16854, R22903, R23014 (=MNHN CG 2000-467), all collected 1996 at the same locality as the holotype. All specimens preserved in fluid, with most skulls extracted and cleaned.

REFERRED MATERIAL
2 females, R16825, R16835, collected in 1996 by a team of the University of Rennes 1 at the Great Escarpment (01.04N, 14.29E), Parc National d’Odzala, Republic of Congo; 4 males, 3 females, R18126, R18283, R18298, R18299, R18321, R18341, R18344, collected 1995 by a team of the University of Rennes 1 at Bambio, Ngotto Forest (02.47N, 16.25E), Central African Republic. All specimens preserved in fluid, with skulls extracted and cleaned. Tissues of several specimens are kept for genetic research, some of which have already been studied (QUÉROUIL et al., 1998).

ETYMOLOGY
The species is named for our colleague and friend Walter Verheyen in recognition of his broad and stimulating research on the systematics and biogeography of African mammals.

Table 3. Body mass (g), external and cranial measurements (mm) of Congosorex polli and C. verheyeni n. sp.

<table>
<thead>
<tr>
<th>Character</th>
<th>C. polli holotype</th>
<th>C. polli ZFMK 99.932</th>
<th>C. verheyeni n. sp. holotype</th>
<th>C. verheyeni n. sp. ZFMK 99.932</th>
<th>mean±SD. (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body mass</td>
<td>-</td>
<td>5</td>
<td>7.07±2.23</td>
<td>(14)</td>
<td></td>
</tr>
<tr>
<td>Head and body length</td>
<td>60*</td>
<td>61.5</td>
<td>59.24±1.84</td>
<td>(15)</td>
<td></td>
</tr>
<tr>
<td>Tail length</td>
<td>24</td>
<td>18.6</td>
<td>19.59±1.63</td>
<td>(15)</td>
<td></td>
</tr>
<tr>
<td>Hindfoot c.u.</td>
<td>11.2</td>
<td>10.2</td>
<td>10.34±0.45</td>
<td>(15)</td>
<td></td>
</tr>
<tr>
<td>Hindfoot s.u.</td>
<td>10</td>
<td>9.5</td>
<td>9.21±0.36</td>
<td>(15)</td>
<td></td>
</tr>
<tr>
<td>Ear length</td>
<td>6.5</td>
<td>5.7</td>
<td>6.14±1.03</td>
<td>(12)</td>
<td></td>
</tr>
<tr>
<td><strong>Cranial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condylar-incisive length</td>
<td>20.34</td>
<td>17.77</td>
<td>18.44±0.38</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Palatal length</td>
<td>8.01</td>
<td>6.94</td>
<td>7.72±0.40</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Interorbital width</td>
<td>4.36</td>
<td>4.37</td>
<td>4.34±0.17</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Zygomatic breadth</td>
<td>6.31</td>
<td>6.33</td>
<td>6.34±0.11</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Greatest width</td>
<td>10.38</td>
<td>10.02</td>
<td>9.98±0.19</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Height of cranial capsule</td>
<td>5.20</td>
<td>4.86</td>
<td>5.06±0.24</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Postglenoid width</td>
<td>7.08</td>
<td>6.91</td>
<td>6.90±0.15</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Upper toothrow length</td>
<td>8.74</td>
<td>7.71</td>
<td>8.10±0.23</td>
<td>(11)</td>
<td></td>
</tr>
<tr>
<td>Lower toothrow length</td>
<td>7.94</td>
<td>7.04</td>
<td>7.37±0.22</td>
<td>(10)</td>
<td></td>
</tr>
<tr>
<td>Coronal height</td>
<td>5.24</td>
<td>4.79</td>
<td>4.86±0.16</td>
<td>(11)</td>
<td></td>
</tr>
</tbody>
</table>

*a*the original label gives 55 mm, but RH measured 60 mm from the holotype.
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Fig. 3. — Congosorex verheyeni n. sp., freshly captured specimen photographed by Ch. RATIER in January 1997 at the Great Escarpment, Odzala National Park, Republic of Congo. About twice natural size.

TYPE LOCALITY
Mbomo (00.24N, 14.44E), Parc National d’Odzala, RC. For a map of the park, see VANLEEUWE, CAJANI & GAUTHIER-HION (1998).

DIAGNOSIS
Differs from Congosorex polli by smaller size, much shorter tail and feet, and by shorter ears. Skull smaller and stouter, particularly the snout. Lower p3 absent in most specimens. For measurements, see table 3.

DESCRIPTION
A very small and stout shrew (Fig. 3) with a very short tail; body proportions recall small species of Blarina or Cryptotis. Tail length less than one third of combined head and body length (Tab. 3). Colour aspect of body dark brown, with no contrast between dorsum and venter. Body hairs short, 5mm on dorsum and 3mm on venter. Head comparatively large; distance from tip of nose to back of ear conch about one third of head and body length. Nose and lips flesh-coloured. Vibrissae sparse and short; longest vibrissa 12 mm. Eye opening minute and hidden in the fur. Ear conch present but reduced in size and covered by body hairs. Forefeet short with moderately developed digits and claws; scales covering the dorsal surface of the manus large. Hindfoot also short with short claws (Fig. 3) and large scales. Tail very short, with 11 short and weak caudal vertebrae (Figs 5, 6); pale coloured and covered with short black hairs over its entire length.

Skull (Figs 4a-b) short and stout; greatest width of skull half of its total length (Tab. 3). Snout portion of skull short, interorbital constriction wide, and braincase large and strongly angular. Upper and lower dentition principally as described for C. polli by HEIM DE BALSAC & LAMOTTE (1956), except for size. Upper unicuspid teeth with additional lingual cusplets, upper M3 very large. Lower p4 with the typical V-pattern of a myosoricine shrew (Fig. 1).

GEOGRAPHIC VARIATION
No size or colour variation was noted among the samples studied. In the Odzala population, two specimens had additional teeth: R22903 had a tiny pair of additional unicuspsids (P3) in the maxillary, and R23014 showed a tiny p3 on the labial side of the left mandible.

COMPARISON
From the holotype of Congosorex polli the new species differs by much shorter limbs, and by a shorter ear (Tab. 3). The skulls are similar in overall shape (Fig. 4), but the anterior part of the skull is more compressed in C. verheyeni, the interorbital constriction is shorter and wider, whereas the size of the braincase is similar. This results in a much shorter toothrow and a shorter skull length of the new species. The
Fig. 4A-C. – A, *Congosorex verheyeni* n. sp., (holotype ZFMK 99.932), skull in dorsal view; B, same specimen, ventral view (total length of skull 17.8 mm); C, *Congosorex polli*, holotype skull in ventral view (total length 20.34 mm, reproduced from Heim de Balsac & Lamotte 1956, fig. 5).

Fig. 5A,B. – A, X-ray of a specimen of *A, Myosorex varius* (ZFMK 79.274) and B, *Congosorex verheyeni* n. sp. (R18321); note the short tail and hind limbs of the new species. Slightly enlarged.
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Fig. 6A, B. - X-rays of the pelvic region, hind limbs and tail of A, *Myosorex varius* (ZFMK 79.274) and B, *Congosorex verheyeni* n. sp. (R18321). P = pelvis, F = femur, T = tibia; caudal vertebrae 1-5 numbered.

Tooth formula differs between the two species in that the lower p3 is absent in most skulls (20 out of 22 mandibles examined) of *C. verheyeni*, while it is present in the single specimen of *C. polli*. Unless further specimens of *C. polli* will be found, it remains unclear whether this is the typical condition in that species. If the absence of p3 will turn out to be a typical trait of *Congosorex*, then this character would be shared with *Surdisorex*, along with the reduction of P3, in contrast to *Myosorex*. A low degree of variation in the presence/absence of P3 or p3 is known from *Myosorex* and *Surdisorex* as well (Meester, 1953, 1955), and probably reflects the close relationship between these genera.

Compared to a typical *Myosorex* (Figs 5, 6), *Congosorex verheyeni* is a stoutly built animal with very short limbs. All elements of the skeleton are reduced in length; in the hindlimb, for example, not only the digits of the foot are short, but also the tibia, femur and pelvis (Fig. 6). The short tail is not only caused by a reduction of the number of caudal vertebrae (11 versus 14 in *Myosorex*), but also by a shortening of the vertebrae.

**DISTRIBUTION**

Known from three localities in the Republic of Congo and one locality in the Central African Republic (Fig. 7). Both localities are within the western Congo basin (Colyn, 1999) and on the right bank of the Congo River.

**ECOLOGY**

In the Parc National d’Odzala most specimens were caught in pitfalls placed in primary forest, and some were caught in degraded primary forest next to a road where palm trees and other anthropogenic vegetation grew. In the Ngotto Forest (CAR), one *C. verheyeni* was caught in secondary forest, and further six in primary forest. In the Parc National d’Odzala, the new species occurs together with at least 15 other shrew species. Almost all of them are forest species. Some are widely distributed in the lowland forest of the Congo Basin (*Sylvisorex johnstoni, Crocidura dolichura, C. littoralis, C. hildegardeae*), and some are confined to the western part of the Congo Basin. Examples are *Suncus remyi, Sylvisorex*
ollula, S. cf. konganensis, Paracrocidura schoutedeni, Crocidura crenata, and C. grassei. A detailed study of the ecology of the shrew communities occurring at these localities is in preparation by one of the authors (PB).

Conclusions

The discovery of a new species of shrew which shares most characters with the enigmatic Myosorex (Congosorex) polli, supports the recognition of Congosorex as a separate taxonomic unit. HEIM DE BALSAC & LAMOTTE (1956) regarded Congosorex as a transition form between Myosorex and Surdisorex, a view partly supported by the set of characters summarized in Table 1. Whether this idea reflects phylogeny will be unknown until a larger set of species of Myosorex, Surdisorex, and Congosorex has been studied in a phylogenetic context. At present it seems best to treat all three taxa as separate genera.

The distribution of Congosorex is interesting: all known specimens of Congosorex verheyeni are from localities on the right bank of the Congo River, while the single specimen of C. polli was collected on the left bank of the Congo River (Fig. 7). Such a pattern was found also in other mammals, for example in rodents of the genus Lophuromys (L. nudicaudatus north and L. huttereri south of the Congo River; VERHEYEN, COLYN & HULSELMANS, 1996). Until recently the scattered records of shrews in the Congo Basin did not show any biogeographical pattern. With increasing knowledge patterns emerge, and will be more evident after all the material assembled during the various inventories will have been identified and analyzed. In addition Congosorex verheyeni seems to have a very special ecology. Apart from the present study, the species was not collected during previous inventories in the Congo Basin where the same methodology (pitfall trap lines with drift fences) were used. Such studies were conducted in central and northern Gabon (BROSSET, 1988; GOODMAN, HUTTERER & NONEGUEU, 2001), in western and southern Cameroon (HUTTERER & SCHLITTER, 1996; COLYN, CORNELIUS & PERPÉTE, 1996), and in Equatorial Guinea (LASSO, HUTTERER & RIAL, 1996). Also the study of RAY & HUTTERER (1996), who analyzed remains of shrews from carnivore scats in Central African Republic, failed to record any Congosorex. Some specimens in our study were collected in «borderline habitat», such as secondary forest, open forest with grass cover, and not in primary forest where most of the other studies were conducted. The minute eyes, short ears and the short tail suggest that Congosorex verheyeni may be somehow adapted to a subterranean life, although the short claws tell that the species is not a specialized digger. Congosorex verheyeni is a most interesting discovery among the insectivores of the Congo Basin, which would deserve a careful biological and ecological study in the future.
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