

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

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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 *Surdisorex*, 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.

Résumé

Nous rapportons la découverte, en forêt de plaine du bassin du Congo occidental, d'une petite espèce de musaraigne à queue courte rappelant l'enigmatique *Congosorex polli* connu par un unique spécimen collecté en 1955 au sud du fleuve Congo. Une nouvelle population, représentée par 15 spécimens, est attribuée à une nouvelle espèce de ce genre. Nous discutons de ses différences avec *Myosorex* et *Surdisorex*, deux autres genres de myosoricinés africains. *Congosorex* est désormais connu de quatre localités du bloc forestier d'Afrique centrale, les deux espèces étant géographiquement séparées, l'une de l'autre, par le fleuve Congo.

Mots-clés: Insectivora, Soricidae, *Congosorex*, systématique, biodiversité, Afrique.

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 systematic 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.

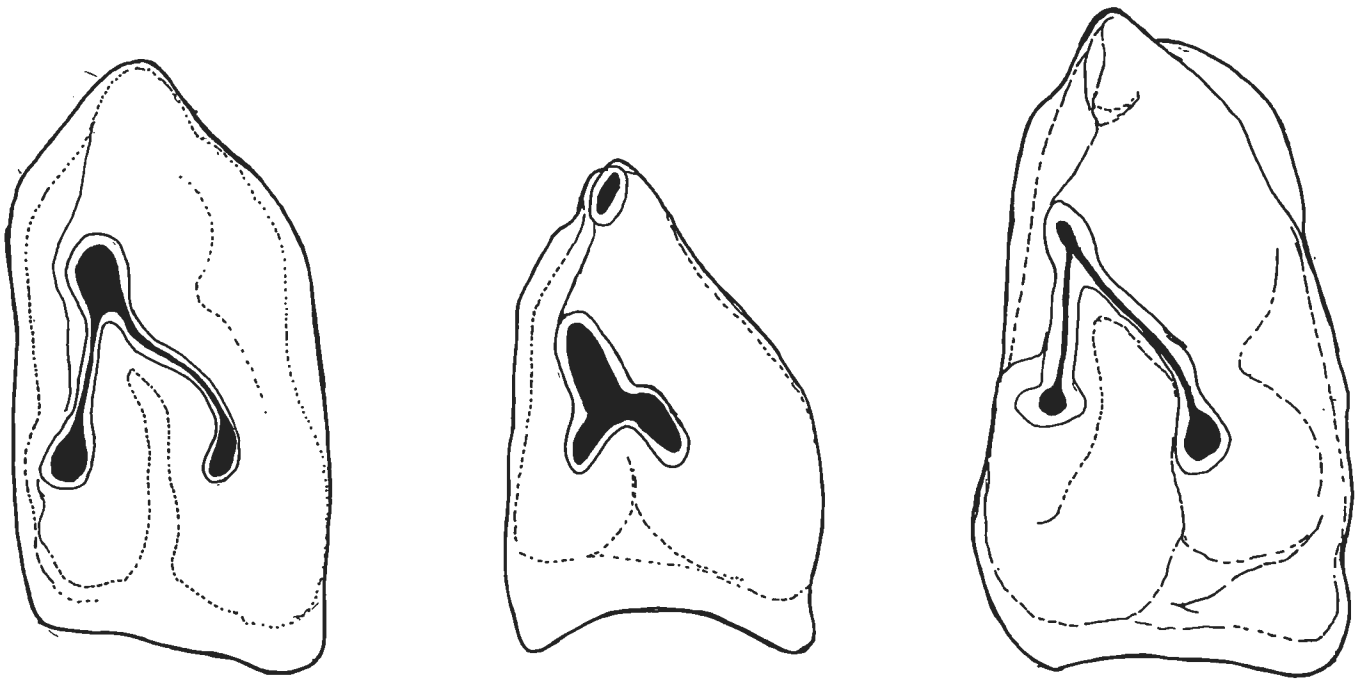


Fig. 1. – Myosoricine crown pattern of the lower p4 in (from left to right) *Myosorex longicaudatus* (ZFMK 81.1293), *Congosorex verheyeni* n. sp. (R 16854), and *Surdisorex norae* (AMNH 87262).

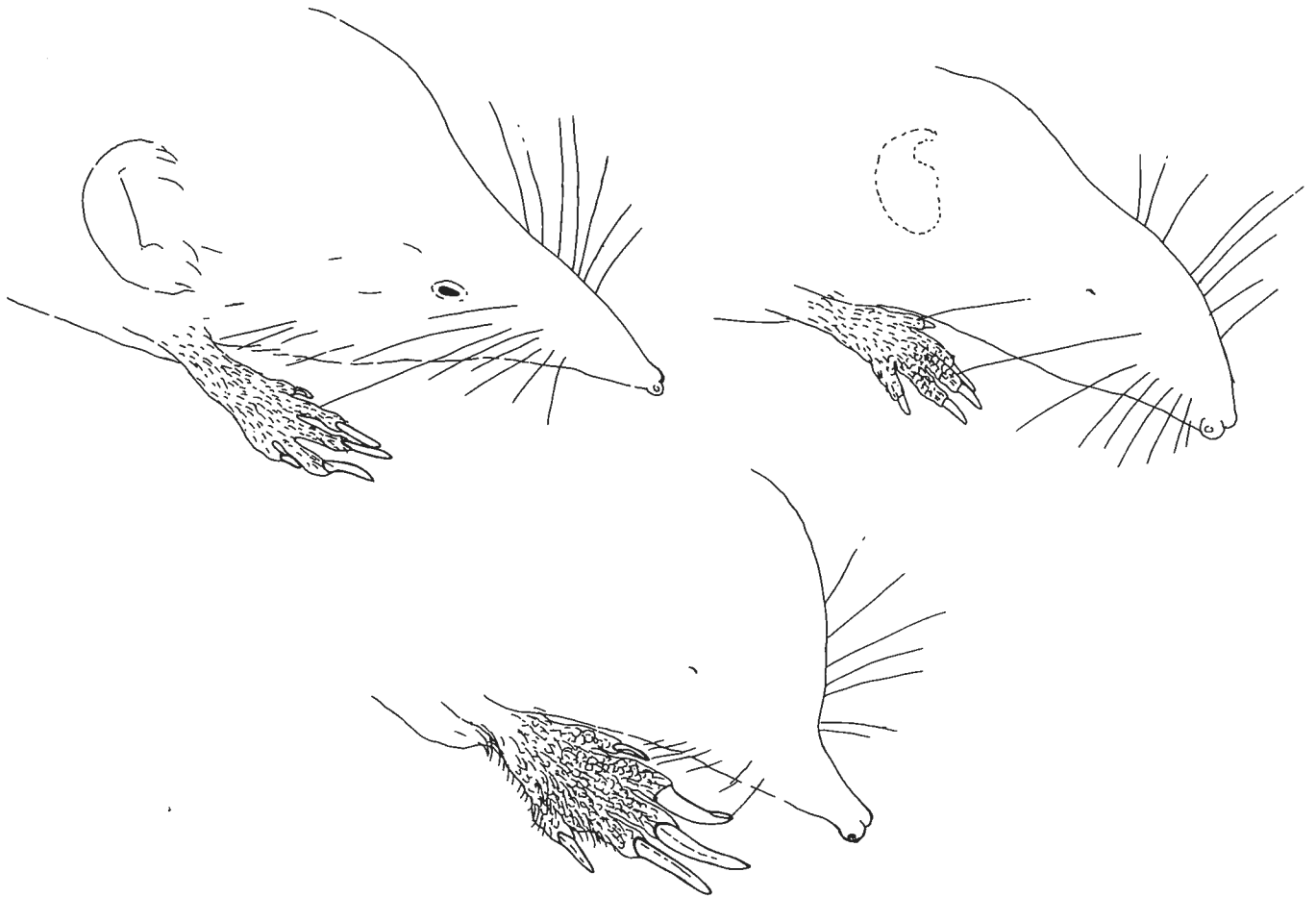


Fig. 2. – Sketches of head and right forefoot of *Myosorex varius* (CM 94953, upper left figure), *Congosorex verheyeni* n. sp. (R18344, upper right figure), and *Surdisorex polulus* (CM 2841, bottom); based on study skins and fluid-preserved specimens.

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 Soricini/ae or Crocidurini/ae, 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; BEDFORD, BERNARD & BAXTER, 1998) as members of the Crocidosoricinae, a taxon named by REUMER (1987) to cover some extinct Miocene shrews of Europe. The phylogenetic relationships between Crocidosoricinae 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. QUÉROUIL *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*, *Ruwenzorisorex* and *Paracrocidura*. 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 Crocidosoricinae (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.

Character	<i>Myosorex</i>	<i>Congosorex</i>	<i>Surdisorex</i>
Tail	medium to long	short	short
Claws of forefoot	short	short	long
Scales on forefoot	small	large	large
Ear conch	normal	normal/reduced	absent
Eye opening	normal	minute	minute
Upper unicuspid	4	3	3
Lower p3	present	present/absent	absent

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.

Taxon	RTL	CIL
<i>Surdisorex norae</i>	23.1	26.5
<i>Surdisorex polulus</i>	32.6	24.5
<i>Congosorex verheyeni</i> n. sp.	30.2	17.8
<i>Congosorex polli</i>	40.0	20.3
<i>Myosorex rumpii</i>	41.7	22.7
<i>Myosorex kihaulei</i>	47.0	20.0
<i>Myosorex babaulti</i>	48.0	21.7
<i>Myosorex cafer</i>	50.0*	23.2*
<i>Myosorex varius</i>	50.6*	22.4*
<i>Myosorex geata</i>	53.3	21.0
<i>Myosorex sclateri</i>	53.5	25.2
<i>Myosorex eisentrauti</i>	56.3	22.6
<i>Myosorex blarina</i>	56.8	22.1
<i>Myosorex okuensis</i>	58.3	21.9
<i>Myosorex tenuis</i>	59.2	21.7
<i>Myosorex zinki</i>	64.0	23.2
<i>Myosorex longicaudatus</i>	75.3	22.9
<i>Myosorex schalleri</i>	83.8	18.9

*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 polli 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 unicuspid 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 BALSAC & 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), Kasai 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 BALSAC & 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 1 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 genetical 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.

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

*the original label gives 55 mm, but RH measured 60 mm from the holotype



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 VANLEEUEWE, 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 unicuspid (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 tooththrow and a shorter skull length of the new species. The

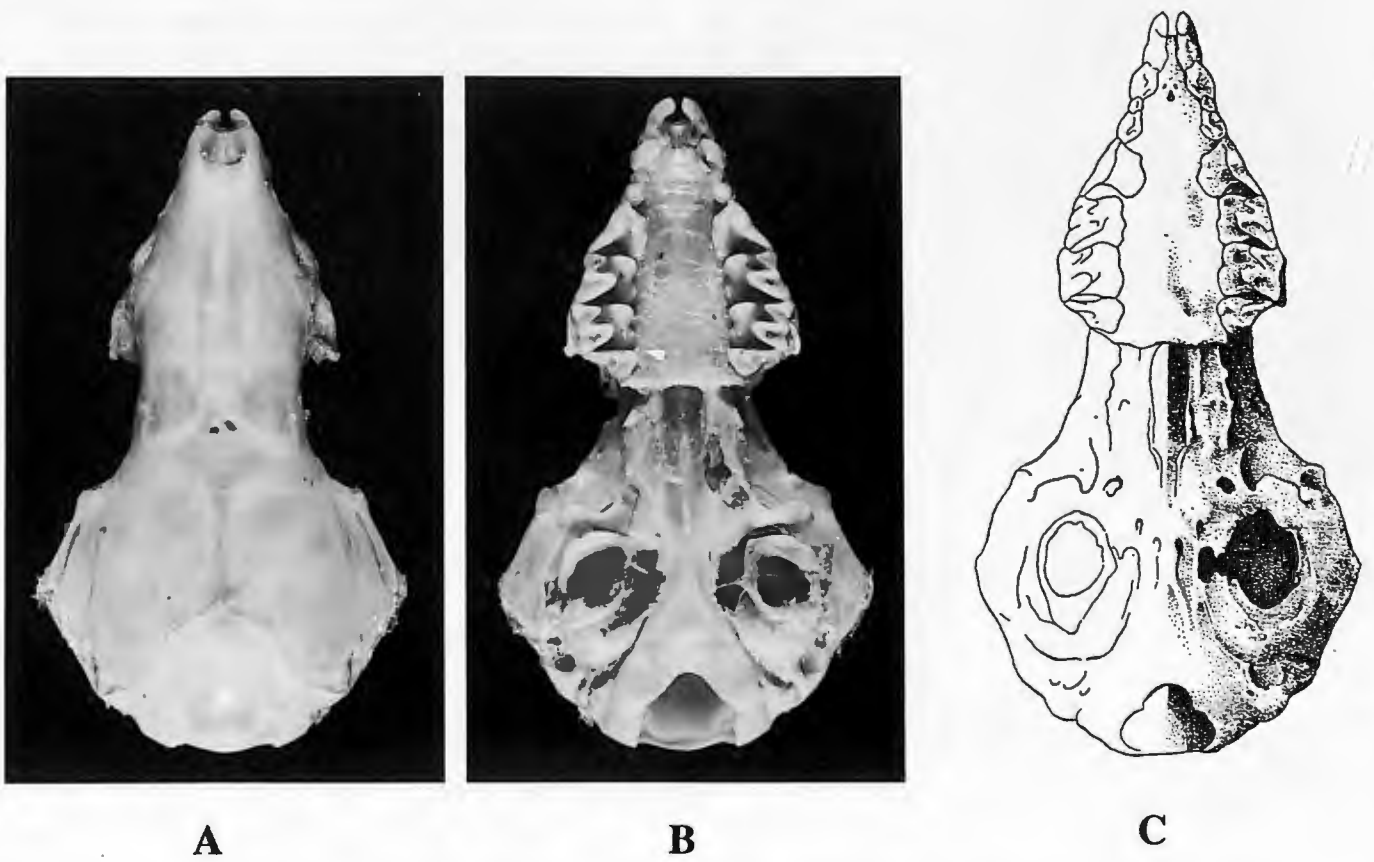


Fig. 4A-C. – A, *Congosorex verheyeni* n. sp., (holotype ZFMK 99.932), skull in dorsal view; B, same specimen, ventral view (total length of skull 17.8 mm); C, *Congosorex polli*, holotype skull in ventral view (total length 20,34 mm, reproduced from HEIM DE BALSAC & LAMOTTE 1956, fig. 5).



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.



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*

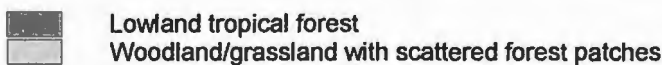
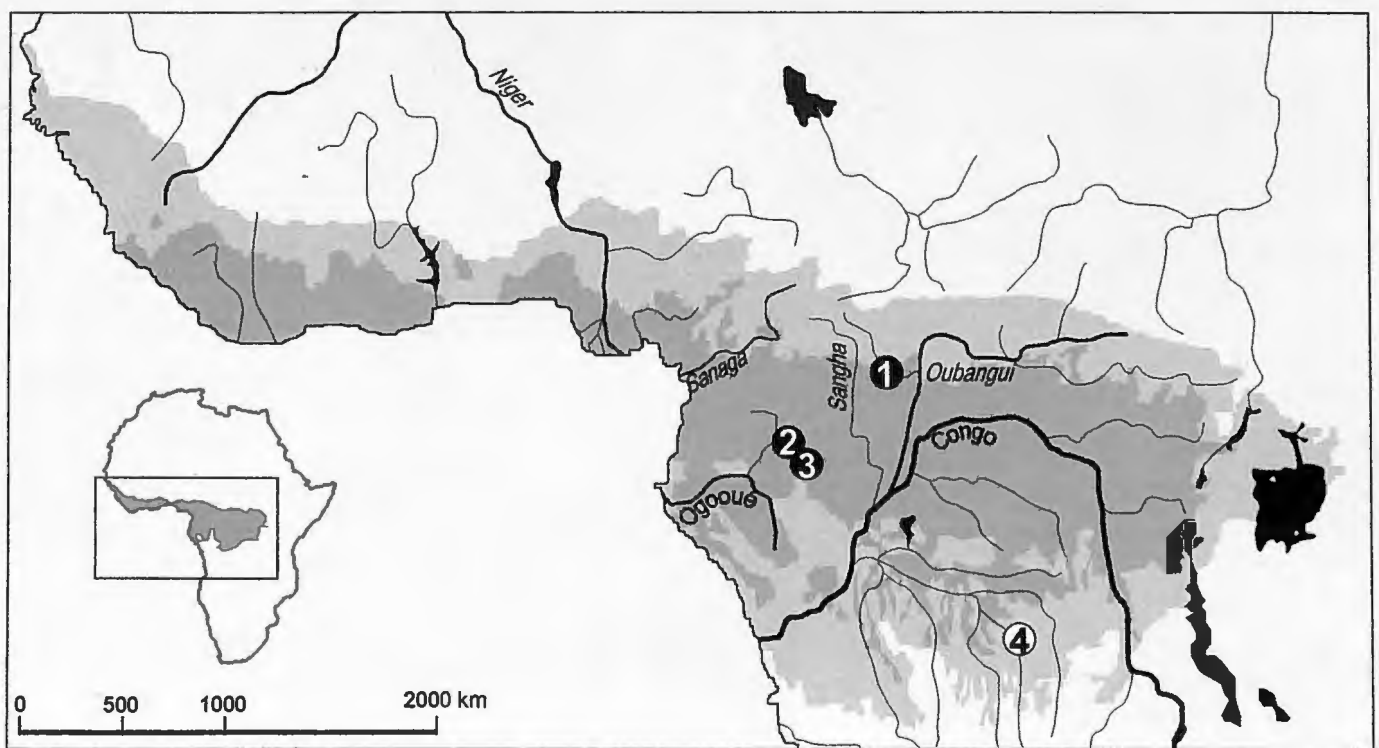


Fig. 7. – Localities where *Congosorex verheyeni* n. sp. (1, 2, 3) and *C. polli* (4) were found. (1) Ngotto forest, Central African Republic; (2) Great Escarpment, Republic of Congo; (3) Mbomo, Odzala National Park, Republic of Congo; (4) Lubondaie, Democratic Republic of Congo.

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 re-

cently 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 & NGNEGUEU, 2001), in western and southern Cameroon (HUTTERER & SCHLITZER, 1996; COLYN, CORNELIUS & PERPÊTE, 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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