



## A new species of mole-rat (Rodentia, Bathyergidae) from the Horn of Africa

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### Abstract

A new species of mole-rat with a striking colour pattern is described from a single mounted specimen in the historical collection of the ‘Museo Civico di Zoologia’ in Rome, Italy. The lack of skull and original collecting data does not allow the gathering of firm evidences about its taxonomic relationships, geographical range and ecological preferences. This taxon is provisionally allocated to the recently created genus *Fukomys* Kock, Ingram, Frabotta, Honeycutt and Burda 2006 on the grounds of pelage colour pattern and geographical origin. All the available evidence, including label and other fragmentary historical data, supports *Fukomys ilariae* **sp. nov.** as originating from the Lower Shebelle region near Mogadishu, Somalia, historically known as Benadir. This discovery highlights the relevance for biodiversity conservation of the Horn of Africa and the need of further faunistic research to describe its fauna.

**Key words:** Historical collections, Museo Civico di Zoologia, Mammalia, *Fukomys*, Horn of Africa

### Introduction

The mole-rat family Bathyergidae is endemic to sub-Saharan Africa. This family is commonly divided into two subfamilies, Bathyerginae (with grooved upper incisors) represented by the genus *Bathyergus*, and Georychinae (with ungrooved upper incisors), which includes *Heterocephalus*, *Heliophobius*, *Georychus*, *Cryptomys* and *Fukomys* (Woods & Kilpatrick, 2005). Two genera are restricted to southern Africa (*Georychus* and *Bathyergus*) and two other genera are distributed in eastern Africa (*Heterocephalus* and *Heliophobius*). *Cryptomys* and *Fukomys* are the most speciose and widely distributed genera with 16 species currently recognized (Ingram *et al.*, 2004). Nevertheless, with the growing contribution of genetics, it is probable that more species will be formally described in the future (cf Kock *et al.*, 2006; van Daele *et al.*, 2007). A brief description of each genus is provided following De Graaf (1981), Kingdon (1974) and Meester & Setzer (1977): *Bathyergus*—upper incisors not extending behind toothrows, foreclaws much enlarged for digging; *Heterocephalus*—cheekteeth either 3/3 or 2/2, fur reduced to a few scattered hairs, third digit of manus longer than fourth; *Heliophobius*—cheekteeth at full dentition 6/6, hairs of pelage about 20–25 mm in length, palate not extending behind tooth row; *Georychus*—cheekteeth at full dentition 4/4, black cap on head, white ring round ear, cheeks black and nose white; *Cryptomys*—cheekteeth at full dentition 4/4, simplified to ring-pattern in adult, face not contrastingly coloured. *Fukomys* has been separated from *Cryptomys* (= *Coetomys*) on molecular evidence by Ingram *et al.* (2004), but it cannot be separated from *Cryptomys* on the basis of morphological and/or morphometric characters (Kock *et al.*, 2006).

During the revision of part of the mammal collections stored at the “Museo Civico di Zoologia” of Rome (MCZR), one of us (S.G.) came across a mounted specimen of a mole-rat that could not be readily assigned to a known species. The absence of a skull and lack of detailed information on the origin of this specimen (MCZR 7016) greatly hampered its identification. However, the uniqueness of the skin colour pattern and the reliability of the few available historical data concerning its origin justified the description of a new species of mole-rat from the family Bathyergidae, with the aim also to encourage *ad hoc* efforts to secure more specimens. This record is noteworthy as north-east Africa is considered to be only inhabited by the naked-mole rat *Heterocephalus glaber* (Rüppell 1842).

**Historical notes.** As with many other Italian natural history museums at that time, the Zoological Museum of the Rome University (further referred to MCZR) received specimens from north-east Africa between the second half of XIX<sup>th</sup> and the first half of the XX<sup>th</sup> Century. However, despite the good intentions of Antonio Carruccio, director between 1883–1914, the Museum played a secondary role in the scientific exploration of overseas regions, and especially Africa, compared to other Italian museums such as, Milan, Turin, Florence (Gippoliti, 2005) and Genoa, where the mammalogist Oscar de Beaux was particularly active in the study of Somali mammals (Gippoliti, 2006b).

Most of the mammals stored in MCZR, coming from the Horn of Africa, originated from the collections of Leopoldo Traversi and other Italian explorers (Pietro Antonelli, Orazio Antinori, Vincenzo Ragazzi etc.) in Ethiopia. These specimens were donated to MCZR by the Società Geografica Italiana and the Ministero della Guerra at the end of XIX Century.

Somali mammals are scarcely represented in the MCZR collections. Many came from the Rome Zoological Garden or from Tedesco Zammarano's expedition (1921–22), the latter —consisting of big game trophies— having been studied by de Beaux (1923). Only four rodents seem to originate directly from the Italian Somaliland (specifically, from the part of the country which was first colonized by Italians at the beginning of XX<sup>th</sup> Century). Three of these rodents were wet specimens of *Heterocephalus glaber* originally labelled 'R. Università di Roma', and the fourth was a mounted rodent, without the original University label, probably assignable to Bathyergidae.

From Carruccio's annual reviews and other available information (Carruccio, 1913; Lepri, 1911; Masi, 1912), it appears that very few specimens were received from Italian residents in Somalia. Captain Ugo Casale sent a number of vertebrates and invertebrates from near Mogadishu (Benadir, now lower Shebele Region) between 1910 and 1915. His collection includes a number of snakes that were studied by Lepri (1911), a *Heterocephalus glaber* (current number: MCZR 116), and an unidentified '*Mus*' received on 15 November 1915 (unpublished data in the archive of the former Animal and Human Biology Department of Sapienza University). It is of relevance that on the retirement of Carruccio in 1914, the scientific activities of the university museum, including the publication of the *Bollettino della Società Zoologica Italiana*, ceased. This may help explain why the Somali rodent reported above was never studied or published. The two other *Heterocephalus* specimens were an individual collected by Capt. Bottego in 1894 (MCZR 117) and donated by the Museo di Storia Naturale, Genoa, and a specimen that was collected in 1908 by Dr Ruberti in Mogadishu (MCZR 118). Further *Heterocephalus* specimens were received from the same region in 1921 by Saverio Patrizi, but appear to have since been lost.

Of the specimens sent to Rome by Casale, other than snakes, only scorpions were studied (Masi, 1912). In a general study of the scorpion collection, Masi identified a new taxon (*Babycurus johnstoni ochraceus*) from two specimens collected at Mogadishu. In the same article, he also described *Buthus trilineatus fuscatus* from one specimen collected by Carlo Mucciarelli in the Benadir Region (near Mogadishu), and *Pandinus imperator benadiriensis* from several specimens collected at Mogadishu. Subsequently, Ugo Casale also sent materials to the Museo di Storia Naturale (Genoa), including mammals from Afgoi (Afgoye) and Balad (de Beaux, 1924), in the Benadir Region.

In 1932 most (but not all) of the university collections were loaned to the Municipality of Rome to create the Museo Civico di Zoologia, inside the Rome Zoological Garden, under the scientific directorship of Giuseppe Lepri, who had already served as curator of the University Museum. Regrettably, skulls often did not follow their respective mounted skins (Gippoliti & Bruner, 2007), while new labels and catalogue numbers were assigned and old labels often discarded. Thus, it is impossible to find any direct link between the current specimen and the '*Mus*' donated by Casale in 1915. The unknown bathyergid was labelled '*Georychus* sp.; *Talpa striata somala* [Somalian striped mole]; Somalia' (Fig. 1). This specimen remained on exhibition for 70 years without attracting the interest of any zoologists (probably owing to its faded state!). In this note, we describe the mounted specimen as a new species of Bathyergidae from the Horn of Africa, probably endemic to Somalia.

## Material and methods

The mounted skin MCZR 7016 was compared to the described species of the family Bathyergidae, and particularly with species of *Fukomys* distributed north of the equator, through literature review and direct examination of specimens at the American Museum of Natural History, New York by one of us (G.A.). These included *Fukomys* from

Ghana, Botswana, Zimbabwe, Angola, Uganda, Democratic Republic of Congo, and Zambia. Thirteen skulls of *Heterocephalus* from Giohar (Somalia), recovered from *Tyto alba* pellets and stored at the Museo Zoologico of Florence, were also re-examined to search for any overlooked *Cryptomys sensu lato* skulls, but none was found. An attempt was made to extract DNA from skin and hairs using a commercial kit (Qiagen, Valencia, CA, USA), but without success. X-ray radiography (VR1020, Medison Acoma Ltd, Japan) with digital development (CRTech CDCR 5020S, Haifa, Israel) using exposure values of 50 kV and 2,5 mAs was used to explore the presence of skeletal elements within the mounted skin. No skeletal remains were detected inside the mounted skin with the exception of a very small fragment of radius in the right anterior leg.

***Fukomys ilariae* sp. nov.**

Somali striped mole-rat

**Etymology.** The species is dedicated to Miss Ilaria Alpi, an Italian journalist, who together with her cameraman Miran Hovratin, was assassinated in Mogadishu in 1994, while investigating trade in toxic cargoes between Italy and Somalia.

**Type material.** Holotype. Mounted skin (MCZR 7016), 11.8 cm head and body length. No distinctive tail is apparent, but a very short peduncle seems to represent a vestigial tail, as reported for *Heliophobius* Peters, 1846 (De Graaf, 1981). Left side of the specimen is severely faded because of exposure to sunlight.

**Type locality.** The precise collecting locality of the type specimen is unknown because the label (Fig. 1) indicates only Somalia. However, Somali specimens received by the museum were donations from the first Italian residents (military personnel and physicians) living in or near Mogadishu, and no Italian expedition to East Africa (including Eritrea, an older colony) is known to have deposited specimens to the Rome Museum. All the historical data in our possession, including the few catalogues published at the time that included Somali specimens (Lepri, 1911; Masi, 1912) suggest that the mole-rat originated from the Lower Shebelle region in central-southern Somalia, practically the only region of Somalia occupied by Italians until the 1920s. The climate there is semi-arid, with a mean yearly rainfall of around 500 mm (480 mm: Mogadishu; 530 mm: Afgoye). An open shrub vegetation type—locally known as ‘boscaglia’—grows on the big Somali dunes, which are 20–30 km wide and extend parallel to the coast (Pignatti & Warfa, 1983).

**Diagnosis.** The description of the pelage coloration is based mainly on the right (unfaded) side of the specimen. Head shows a broad whitish midline that extends over the dorsal area, except on a small region over the neck (Fig. 1). The whitish midline divides along the posterior dorsal area, forming a ‘swift tail’ 49.5 mm long. Rest of the body, including ventral area (Fig. 1) and limbs, is Sienna hearth / burnt Sienna. No white patch is evident ventrally. Hairs are longer dorsally: c. 10 mm along the neck, 7.5 mm over the legs. The specimen shows reduced eyes covered with hairs. The absence of vibrissae on the head is probably caused by poor preservation of the skin.

**Comparison with other bathyergid species and taxonomic assignment.** In general, the skin is sparsely haired—instead of appearing velvety as in most *Fukomys*—as in some bathyergid species that are adapted to xeric habitats (De Graaf, 1981). Digits show five concave nails (Fig. 2). Hindlimb nails differ from those of other members of the genus *Fukomys* that show elongated and horizontally flattened ‘finger-nails’ (Kingdon, 1974; pers. obs.). Anterior limbs appear more robust. The specimen belongs without doubt to a subterranean-adapted lineage. The shape of the nails excludes its belonging to the Chrysochloridae (Kingdon, 1996). Absence of pinnae and the habitat spectrum of the assumed capture site also led us to dismiss the genus *Tachyoryctes* (Spalacidae), a mountain specialist (Kingdon, 1996), although the latter genus is known to occur on the mountains of northern Somalia (Funaioli, 1971; Agnelli *et al.*, 1990). Absence of any trace of pinnae suggests that the specimen belongs to the family Bathyergidae (in accordance with the specimen label). It should be noted that at the time of its first taxonomic assignment, the skull was probably present. Owing to the absence of adaptation to burrowing of the forefeet claws, the new species should belong to the subfamily Georychinae Roberts, 1951. Concerning the pelage pattern, the shape of the markings on the back is quite different from that found in other members of the family. The elaborate colour pattern of the skin is consistent with its assignment to the genus *Cryptomys* ‘sensu lato’ (Honeycutt *et al.*, 1991), the only bathyergid genus showing a great variability in pelage coloration. We compared the colour pattern of our Somali specimen with those of other species of *Fukomys* found north of the equator, as described in the relevant literature. The westernmost species, *F. zechi* (Matschie, 1900) from Ghana, is described as “pale buffish or



**FIGURE 1.** Holotype of *Fukomys ilariae* sp. nov. (MCZR 7016): a) dorsal view; b) ventral view; c) right lateral view and the original label of the specimen.

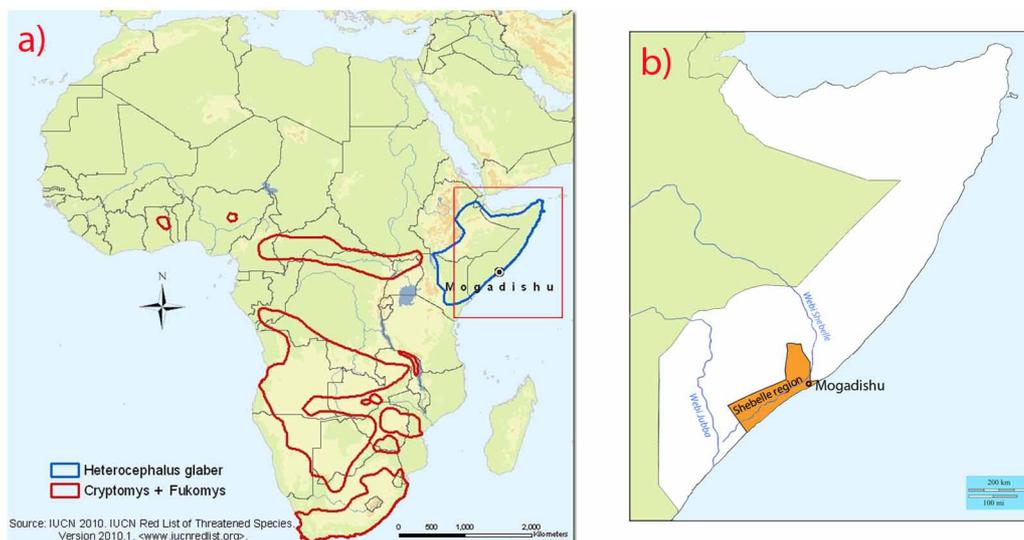


**FIGURE 2.** Detail of a) anterior foot and b) posterior foot from the holotype of *Fukomys ilariae* **sp. nov.** (MCZR 7016).

very light sepia-brown” in colour. Most individuals have a more or less developed white head-spot (Rosevear, 1969). The Nigerian species, *F. foxi* (Thomas, 1911) is described as “very deep sepia”, above and below. The only marking is a sharply defined pure white head spot, not found in all individuals (Rosevear, 1969). A third species, *F. ochraceocinereus* (Heuglin, 1864), is found from Cameroon to southern Sudan and northwestern Uganda (Honeycutt *et al.*, 1991). *Fukomys ochraceocinereus oweni* Setzer 1956, from southern Sudan has blackish brown upper parts but it is a little paler below. The dorsal head spot, lips, chin, and line on mid-throat converge into a pure white spot on the breast (Setzer, 1956). According to Delany (1975), mole-rats of southern Sudan, Uganda and eastern Democratic Republic of Congo, assigned to the taxon *F. ochraceocinereus lechei* (Thomas, 1895), may have a patch of white fur on top of the head and a backwardly projected white stripe about 3 cm long, extending over the neck. As already stated, molecular data supported the split of *Cryptomys* Gray, 1864 in two genera, with *Fukomys* (Kock *et al.*, 2006) containing all the eastern, central and southern African taxa, except those of the *Cryptomys hottentotus* (Lesson, 1862) group, which is limited to the southern African subregion (Faulkes *et al.*, 2004; Ingram *et al.*, 2004). On morphological and biogeographical grounds, we preliminarily assign the new species of mole-rat to the genus *Fukomys*.

## Discussion

Currently, only one species of mole-rat is recognised from Somalia, the distinctive naked mole-rat *Heterocephalus glaber* (Honeycutt *et al.*, 1991; Burda, 2001). The new species described here is also the first recent record of a non-*Heterocephalus* bathyergid in north-east Africa, east of the Rift Valley (Fig. 3). It may be speculated that *Fukomys ilariae* could represent an ancient lineage that remained isolated from the core of the *Fukomys* evolutionary radiation, west of the Rift Valley, or alternatively, a *Fukomys* lineage that spread along the east African coast northwards. A second hypothesis that cannot be ruled out is an affinity with *Heliophobius*, which is known also from East Africa (Kenya and Tanzania) and shares with the new species such characters as a short tail and rather long fur (see Sumner *et al.*, 2003). The actual phylogenetic relationship of *Fukomys ilariae* within Bathyergidae requires further clarification when additional material, including skulls and molecular data, are available.



**FIGURE 3.** a) Map of Africa showing the approximate geographical ranges of the genera *Cryptomys*, *Fukomys* and *Heterocephalus*, together with the geographical location of Mogadishu; b) map of Somalia showing Lower Shebelle region.

Although traditional morpho-taxonomic traits (body size, pelage coloration, skull morphometrics) have so far failed to satisfactorily describe mole-rat diversity in areas of high taxonomic diversity (Van Daele *et al.*, 2004; 2007), we feel confident that in the case of *Fukomys ilariae* the coexistence of a unique pelage coloration, other morphological characters and geographical origin strongly supports the existence of a new bathyergid species.

This discovery has implications for setting conservation priorities for African biodiversity. It should be noted that the arid region of the Horn of Africa is already recognised as an important area for mammal biodiversity and

conservation (Amori & Gippoliti, 2001). However, this new *Fukomys* species is probably associated with more mesic habitats along the Somali coast (Fig. 3).

As far as Somali biogeography is concerned, three major regions —northern, central and southern— are usually recognised (Lanza, 1990), the southern region extending south of the Shebelle River. An interesting coincidence with our new mole-rat species is represented by the unique record of another fossorial mammal, a golden mole (*Chlorotalpa tytonis*), only known from a single specimen (Giohar; 2° 46'N, 45° 30' E) recovered from an owl pellet along the Shebelle River (Simonetta, 1968). The presence of another small mammal species in the interfluvial region of southern Somalia (i.e. the area between the Shebelle and the Juba rivers) seems to provide further evidence of the biogeographical uniqueness of this region compared with the area extending south of the Juba River, that is part of the so-called 'Tana centre of endemism' (Agnelli *et al.*, 1990; Gippoliti, 2006).

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