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Short Note

Raquel López-Antoñanzas*

The tetralophodont pattern of the upper molars in juvenile *Cannomys badius* (Rodentia, Spalacidae)

Abstract: *Cannomys* and *Rhizomys* are the only living genera of the tribe Rhizomyini (Rhizomyinae, Spalacidae, Rodentia), which is known since the early Late Miocene (at approximately 10 Ma). The dental morphology of all living Rhizomyinae has been already described in detail. However, due to the scarcity of specimens of *Cannomys* in zoological collections, the teeth of juveniles in this taxon had not been described to date. The study of a specimen of this early age (MNCN 8449) shows that the second upper molars of *Cannomys* are tetralophodont like those of *Rhizomys*. One of the assumed differences between *Cannomys* and *Rhizomys*, namely the trilophodont second molars of *Cannomys*, is therefore inaccurate.

Keywords: *Cannomys*; dental morphology; Rhizomyini; Rhizomyinae.

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The subfamily Rhizomyinae (Spalacidae, Rodentia) is known since the Late Oligocene Epoch (approximately 25 Ma). Today, it is represented by the Asian bamboo rats [*Rhizomys* (Thomas 1915a) and *Cannomys* (Gray 1831) (Figure 1) and the African mole rats [*Tachyoryctes* (Rüppel 1836)]. The Asian bamboo rats belong to the tribe Rhizomyini, whereas *Tachyoryctes* is the only extant genus of the Tachyoryctini (Flynn 2009, López-Antoñanzas et al. 2012).

The lesser bamboo rat, *Cannomys badius*, was originally named *Rhizomys badius* by Hodgson (1841: 60) on the basis of a male specimen obtained “some miles north of the great valley” of Nepal. The type specimen is BMNH 1843.1.12.61 (skull and skin) (P. Jenkins, personal communication, 2012). Thomas (1915a) established the new genus *Cannomys* with *Rhizomys badius* as a type species, but he

also included two other species: *Rhizomys castaneus* Blyth 1843 and *Rhizomys minor* Gray 1842. A short time later, Thomas (1915b) created another species of *Cannomys*, *C. pater*, and split *C. castaneus* into two subspecies (*C. castaneus castaneus* and *C. castaneus plumbescens*). Gyldenstolpe (1916) described a new subspecies of *Cannomys minor* (*C. minor lönnbergi*). All these taxa are currently regarded as *C. badius* (Musser and Carleton 2005), the only species of the genus.

Cannomys badius ranges from eastern Nepal, through northeast India, Bhutan, southeastern Bangladesh, Burma, south China, northwest Vietnam, Thailand and Cambodia (Musser and Carleton 2005). It is known to live in a wide variety of habitats, from bamboo forest to cultivated land and other modified areas (IUCN 2010).

The dental morphology of all living Rhizomyinae has been described recently in detail (López-Antoñanzas 2012a,b). However, the teeth of juvenile individuals with unerupted third molars in *Cannomys* have not yet been described. The only reference to a juvenile specimen of *Cannomys badius* is a discrete mention in the outstanding work of Forsyth Major (1897: 708, Pl. XL). *Cannomys badius* is poorly represented in European zoological collections, and juvenile individuals are particularly rare. I have examined all the specimens of *Cannomys* housed in the Muséum national d'Histoire naturelle, Paris, France (C.G. 1860-382, C.G. 2000-761) and in the Museum für Naturkunde, Berlin, Germany (ZMB 3424, ZMB 44768, ZMB 44769), but they all belonged to individuals whose third molars had already erupted. The zoological collections of the Museo nacional de Ciencias naturales (Madrid, Spain) house three specimens of this taxon: MNCN 8447, MNCN 8448 and MNCN 8449. These specimens were part of the large zoological collection amassed by L. Fea during his expedition to Burma (1885–1889). Fea collected many individuals of *Cannomys badius* from several Burmese localities (see Thomas 1892), but only three of them, all from Kawkareik, were purchased by the Museo nacional de Ciencias naturales (Cabrera 1912).

Figure 1 *Cannomys badius* provided by Anderson (1878).

MNCN 8447 (cranium and skin) and MNCN 8448 (skull and skin) are from adult individuals (Figure 2). The morphology of the occlusal surface of MNCN 8447 (Figure 2A and B) perfectly fits with stage 3 of wear as defined in López-Antoñanzas (2012b: Figure 2c and f) and that of MNCN 8448 (Figure 2C–F) is intermediate between stages 1 and 2 of wear as described in the same work (see Figure 2a–d in López-Antoñanzas 2012b).

More interestingly, MNCN 8449 (skull and skin) is from a juvenile. The second molars are still unworn, and the third ones have not yet emerged from their crypts.

For the description of this specimen, I follow the dental terminology of López-Antoñanzas (2012b: Figure 1). The equivalence between this terminology and that of Forsyth Major (1897: Pl. XL; each loph was assigned a number) is as follows: anteroloph/id→1, mesoloph/id→2, posteroloph/id→3, protoloph/metalophid→4 and metaloph/hypolophid→5.

MNCN 8449 has tetralophodont first upper molars with anteroloph, protoloph, mesoloph and metaloph-posteroloph (Figure 3A, B). The anteroloph connects to the protocone, and the protoloph is isolated. The anterior part of the tooth is isolated from the rest of the crown by a long and continuous sinus (the mure is lacking). The mesoloph is a long continuation of the hypocone, and the metaloph-posteroloph nearly joins the hypocone. All reentrants are open. The second upper molars of this specimen (Figure 3A, B) are much smaller than the first ones, but have similar morphology. When unworn, they show a tetralophodont dental pattern with anteroloph, protoloph, mesoloph and metaloph-posteroloph. The anteroloph is a long continuation of the protocone, and the protoloph is isolated. The anterior part of the tooth is isolated from the rest of the crown by a long and continuous sinus (the mure is lacking). The mesoloph is a long continuation of the hypocone, and the metaloph-posteroloph nearly joins the hypocone. All reentrants are open.

Figure 2 Tooth rows of adult individuals of *Cannomys badius* in occlusal view. MNCN 8447: (A) left maxilla with M1–M3; (B) right maxilla with M1–M3. MNCN 8448: (C) left maxilla with M1–M3; (D) right maxilla with M1–M3; (E) left hemimandible with m1–m3; (F) right hemimandible with m1–m3. Scale bar=2 mm.

Figure 3 Tooth rows of a juvenile individual of *Cannomys badius* in occlusal view. MNCN 8449: (A) left maxilla with M1–M2; (B) right maxilla with M1–M2; (C) right hemimandible with m1–m2; (D) left hemimandible with m1–m2. Scale bar=2 mm.

Regarding the lower dentition, the first lower molars show a basic pentalophodont dental pattern with anterolophid, metalophid, mesolophid, hypolophid and posterolophid (Figure 3C, D). The anterolophid is connected lingually to the metalophid, which in turn connects to the lingual part of the protoconid. The mesolophid is a long posterior continuation of the protoconid. The anterior part of the tooth is isolated from the posterior part by a long sinusid (the mure is lacking). The hypolophid joins the long posterolophid through the hypoconid. All reentrants, except for the most anterolingual one, remain open. The second lower molars of MNCN 8449 have a square and anteroposteriorly compressed occlusal outline (Figure 3C, D). These teeth show a peculiar trilophodont morphology. The first lophid (anterolophid-metalophid) joins the second one (mesolophid) through the protoconid. The mesolophid is divided; the lingual cuspid could be called a mesostylid. This cuspid joins the third lophid (hypolophid-posterolophid) and connects to the first one, isolating an anterior enamel lake. The mure is lacking. The narrow labial reentrant is open.

The examination of an individual of *Cannomys badius* at this early age is pivotal because it leads to a reassessment of one of the assumed differences between the only two extant genera of the tribe Rhizomyini (*Cannomys* and *Rhizomys*), namely, that *Cannomys* has a trilophodont dental pattern on the second upper and lower molars throughout its life span (Flynn 2009, López-Antoñanzas 2012b). Actually, this holds true for the lower teeth but not for the upper ones. As MNCN 8449 (Figure 3) shows, in an

unworn condition, the second upper molars of *Cannomys* have a tetralophodont dental pattern like those of *Rhizomys*. Thus, *Cannomys* is characterized by having second upper molars with anteroloph and protoleph fusing early through wear to yield a trilophodont pattern after the juvenile stage (figure 2a in López-Antoñanzas 2012b). The third upper molars of *Cannomys* would probably display the same condition.

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