

## **Pliocene lagomorphs and rodents from Udunga, Transbaikalia, eastern Russia**

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### **Abstract**

Hundreds of lagomorph and rodent fossils from the Middle Pliocene of Udunga are stored in the Southern Scientific Center, Russian Academy of the Sciences. They have been studied taxonomically. The lagomorph fossils include three forms of ochotonids such as *Ochotona* cf. *gromovi*, *Ochotona* sp. (large form) and *Ochotonoides complicidens*, and two forms of leporids such as *Hypolagus* sp. and Leporidae, gen. and sp. indet. The rodent fossils include one castorid species (*Castor anderssoni*), one siphneid form (*Prosiphneus* cf. *praetingi*) and one arvicolid form (*Villanyia* sp.). Among them, *Castor anderssoni* is highly predominant, and attains to more than 50 % of all the lagomorph and rodent specimens identifiable at the family, genus or species level. These fossils provide additional knowledge to the small mammal fauna of Udunga already reported.

### **Introduction**

Udunga is a well-known fossil locality of Pliocene mammals in Transbaikalia (Figure 1). The sediments of the locality are only 8.5–9.5 m in total thickness, and are divided into the lower, middle and upper units (Alexeeva *et al.*, 2001). The middle unit consisting of loam and sandy loam yields abundant mammal fossils, which are considered to be Middle Pliocene age by their faunal characters (Erbajeva and Alexeeva, 2000). The fossils from this units stored in the Southern Scientific Center, Russian Academy of the Sciences, in Rostov-on-Don, Russia, have been studied as the Japan-Russia Collaborate Research Project titled “Paleontological study on the evolution of the Tertiary primates in the northern Eurasian continent.” This fossil collection includes a number of lagomorph and rodent fossils, which were allotted to us to study as a part of the work of the project. This paper presents the results of our study on these fossils.

### **Studied material**

The fossils were tentatively identified and given numbers with the prefix Udg by Japanese members of the project who visited the Southern Scientific Center in 2007 and



**Figure 1.** Locations of Udunga and the other fossil localities mentioned in the text.

2008. Among the fossils, those identified as lagomorphs and rodents were transported to Japan (Primate Research Institute, Kyoto University and Aichi University of Education) for the present study. They were already returned to, and are now stored in the center.

The fossils transported are 377 in total specimen number, and have been reidentified as listed in Appendix 1. Most of the fossils are lagomorphs and rodents, but few of them are regarded as indeterminate or misidentified ones.

Among the fossils of lagomorphs and rodents, 246 specimens are upper and lower jaws (maxilla and/or premaxilla and mandible) which are identifiable at the family, genus or species level. They are allocated to five families (Table 1). Of the families, Castoridae (beavers) is the most abundant, and Ochotonidae (pikas) is the next. On the other hand, Leporidae (hares and rabbits), Siphneidae (zokors) and Arvicolidae (voles) are few.

### Measuring method and terminology

In the present material, the size difference is one of important characters which distinguishes the lagomorph and rodent forms included. Thus the lengths and widths of the cheek teeth were measured on their occlusal surfaces, because the cheek teeth are abundant in the material and generally suitable for taxonomic work. The measuring methods for representative cheek teeth of lagomorphs and rodents (Castoridae, Siphneidae and Arvicolidae) are shown in Figures 2 and 3 respectively. These figures also show the terminology of the teeth used in the following taxonomic chapters.

Before measuring the cheek teeth, we fixed each of them as its occlusal surface was horizontal. Then the teeth of the lagomorphs, siphneid and arvicolid were measured with a measurescope (Nikon: MM-11) with an electric digital counter (Nikon: CM-6S). On the

## Lagomorphs and rodents from Udunga

**Table 1.** Number of the maxillae (including premaxillae), mandibles and isolated cheek teeth identified at the family, genus or species level with confidence in the Southern Scientific Center collection from Udunga.

| Taxon                                      | Number of specimens identified |          |                      |
|--------------------------------------------|--------------------------------|----------|----------------------|
|                                            | Maxilla and premaxilla         | Mandible | Isolated cheek teeth |
| LAGOMORPHA                                 |                                |          |                      |
| Ochotonidae                                |                                |          |                      |
| <i>Ochotona</i> cf. <i>gromovi</i>         | –                              | –        | 6                    |
| <i>Ochotona</i> sp. (large form)           | –                              | 1        | 1                    |
| <i>Ochotonoides complicitens</i>           | –                              | 1        | 6                    |
| <i>Ochotona</i> or <i>Ochotonoides</i> sp. | 2                              | 15       | 38                   |
| Leporidae                                  |                                |          |                      |
| <i>Hypolagus</i> sp.                       | –                              | 4        | 18                   |
| Leporidae, gen. and sp. indet.             | –                              | 1        | 3                    |
| RODENTIA                                   |                                |          |                      |
| Castoridae                                 |                                |          |                      |
| <i>Castor anderssoni</i>                   | 2                              | 10       | 119                  |
| Siphneidae                                 |                                |          |                      |
| <i>Prosiphneus</i> cf. <i>praetingi</i>    | –                              | 3        | 11                   |
| Arvicolidae                                |                                |          |                      |
| <i>Villanyia</i> sp.                       | –                              | 1        | 4                    |

other hand, those of the castorid were photographed with a scale, and were measured on the photographs taken.

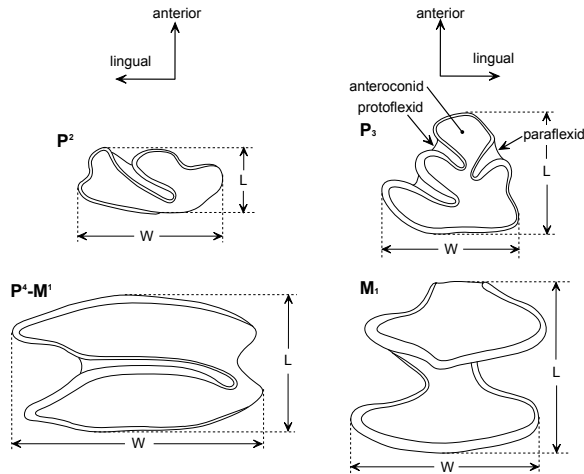
### Taxonomy of the lagomorph fossils

Most of the lagomorph fossils can be classified into Ochotonidae and Leporidae by mandibular and dental morphology. The fossils assigned to Ochotonidae are further divided into a larger-sized and smaller-sized groups. In the larger-sized group, isolated  $P_3$  and mandibles with  $P_3$  are referable to *Ochotona* sp. (large form) and *Ochotonoides complicitens* on the basis of the enamel pattern of  $P_3$ , because the pattern is generally regarded as the most important character for generic and specific distinction of lagomorph fossils. The remaining fossils of the larger-sized group are referred only to *Ochotona* or *Ochotonoides* sp., because ochotonid genera known from the Pliocene and Pleistocene of eastern Eurasia are restricted to *Ochotona* and *Ochotonoides*. On the other hand, all the fossils of the smaller-sized group are referred to *Ochotona* cf. *gromovi*, because  $P_3$  of this group shows the *Ochotona*-type enamel pattern which distinguishes them from *Ochotonoides*, and resembles that of *O. gromovi*.

The fossils assigned to Leporidae can be classified into a large-sized and small-sized forms. The fossils of the large-sized form include  $P_3$ , and are referable to *Hypolagus* sp. on the basis of the  $P_3$  pattern. Those of the small-sized form lack  $P_3$ , and are referable only to Leporidae, gen. and sp. indet.

The measurements of the cheek teeth of all the lagomorph forms are given in Appendices 2 to 9 which show the size differences among the forms mentioned above.

***Ochotona* cf. *gromovi* Erbajeva, 1976** (Pl. 1, fig. 1):



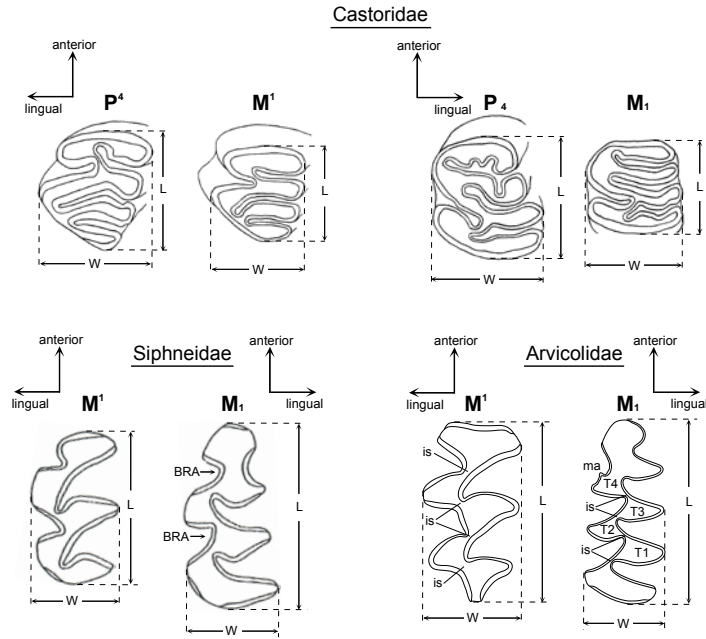
**Figure 2.** Measuring method for cheek teeth of lagomorphs, and terminology used in the text.

Six specimens are allocated to the smaller-sized group, but include only one  $P_3$  which has no flexid on the anterior wall of the anteroconid. Thus the fossils of this group are referred to *Ochotona*. In the same tooth, the enamel walls of the protoflexid and paraflexid are not plicated. The measurements of the fossil species known from the Pliocene and Lower Pleistocene of Transbaikalia and Mongolia are given in Erbajeva (1970, 1988), Bazarov *et al.* (1976), and Agadjanian and Erbajeva (1983). They show that the cheek teeth of the group are larger than those of *O. dodogolica*, *O. gureevi*, *O. intermedia*, *O. bazarovi* and *O. sibirica*, but are smaller than those of *O. zasuchini*.  $P_3$  of the present fossils seems to be most similar to that of *O. gromovi*. The present fossils are referred to *O. cf. gromovi*, because of the scarcity of the available material. Erbajeva *et al.* (2003) already reported the occurrence of *O. aff. gromovi* from Udunga.

***Ochotona* sp. (larger form) (Pl. 1, figs. 2–3):**

The fossils assigned to this form are only one mandible with  $P_3$ – $M$  and one isolated  $P_3$ . This form is much larger than *Ochotona gromovi*, *O. tologoica*, *O. zazhigini*, *O. dodogolica*, *O. gureevi*, *O. intermedia*, *O. bazarovi* and *O. sibirica*, judging from the data given by Erbajeva (1970, 1988), Bazarov *et al.* (1976) and Agadjanian and Erbajeva (1983). It is nearly as large as *Ochotonoides complicidens* mentioned below (Appendices 3 and 4), but differs in  $P_3$  without any flexid on the anterior wall of the anteroconid. Its  $P_3$  also lacks placcation on the enamel walls of the protoflexid and paraflexid. Erbajeva *et al.* (2003) described *Ochotona* aut *Ochotonoides* from Udunga, which is as large as the present form and lacks any flexid on the anterior wall of the anteroconid, but has plicated protoflexid and paraflexid. The present form seems to be different from the known *Ochotona* species from Transbaikalia, but is referred only to *Ochotona* sp. (large form), because of the scarcity of the examined material.

***Ochotonoides complicidens* (Boule and Teilhard de Chardin, 1928) (Pl. 1, figs. 4–7; Pl. 2, fig.1):**



**Figure 3.** Measuring method for cheek teeth of rodents (castorids, siphneids and arvicolids), and the terminology used in the text. BRA: buccal reentrant angle, is: isthmus, L: Length of occlusal surface, ma: *Mimomys* angle, T: triangle, W: width of occlusal surface.

In the isolated  $P_3$  and mandible with  $P_3$  of the ochotonids, those assigned to *Ochotonoides complicitens* are the most abundant, and comprise seven specimens.  $P_3$  of this species is characterized by one or two flexids on the anterior wall of the anteroconid. Of the seven, five specimen have one flexid on the anterobuccal wall of the anteroconid (Pl.1, figs. 4, 5, 7). The remaining two (Udg 523 and 584) have anterobuccal and anterolingual flexids (Pl.1, fig. 6). The enamel walls of the protoflexid and paraflexid are sometimes plicated. Of the seven, both or one of the walls are plicated in three specimens (Udg 523, 563, 584; Pl.1, fig. 6), but the walls are not plicated in the remaining specimens.

*Ochotonoides complicitens* is an extinct species, and was already recorded from Udunga (Erbajeva *et al.*, 2003 and others). This species is also known from the Pliocene of Berezovaya (Bazarov *et al.*, 1976), and of Tologoi 1 (Alexeeva *et al.*, 2001) in Transbaikalia (Figure 1). Furthermore *O. cf. complicitens* was recorded from the Pliocene of Shamar in Mongolia (Zazhigin, 1989). *O. complicitens* has occurred from many localities of Pliocene to early Middle Pleistocene age in northern China (Boule *et al.*, 1928; Teilhard de Chardin and Piveteau, 1930; Teilhard de Chardin and Young, 1931; Teilhard de Chardin, 1940, 1942; Chow and Li, 1965; Ji, 1976; Hu and Qi, 1978; Zheng *et al.*, 1985; Erbajeva and Zheng, 2005; Cai *et al.*, 2008).

#### ***Ochotona* or *Ochotonoides* sp. (Pl. 2, fig. 2):**

The ochotonid fossils of the larger-sized group other than the isolated  $P_3$  and mandibles with  $P_3$  attain to 55 in specimen number (Table 1), and are collectively referred to *Ochotona* or *Ochotonoides* sp. Most of them seem to be derived from *Ochotonoides complicitens*, because  $P_3$  of *O. complicitens* are much more than those of *Ochotona* sp. (large form) in the larger-size group of the ochotonids.

***Hypolagus* sp.** (Pl. 2, figs. 3–5)

The large-sized form is much more abundant than the small-sized form in the leporid fossils (Table 1), and is referred to the genus *Hypolagus*. Its  $P_3$  shows the simple occlusal pattern characteristic to *Hypolagus*, where no reentrant fold is observed on the enamel wall of the anterior and lingual sides, and one or two reentrant folds are present on the buccal enamel wall (protoflexid and/or hypoflexid). Erbajeva *et al.* (2003) recorded two species of *Hypolagus* from Udunga (*H. transbaikalicus* and *H. multiplicatus*). These species were originally allocated to the genus *Pliolagus* by Bazarov *et al.* (1976). Their measurements and figures indicate that the present fossils are near to both of the species in size and cheek tooth pattern. In northern China, *Hypolagus* is represented by *H. schreuderi*, which occurs from Pliocene and Early Pleistocene localities (Teilhard de Chardin, 1940; Cai, 1989; Zheng *et al.*, 1997). The cheek teeth of *H. schreuderi* are also similar to those of the present fossils. Owing to the limited material, we refer the fossils to *Hypolagus* sp. herein.

**Leporidae, gen. and sp. indet.:**

The small-sized form of the leporids (Leporidae, gen. and sp. indet.) is few in specimen number (Table 1), and is much smaller than *Hypolagus* sp. (Appendices 7–9).

**Taxonomy of the rodent fossils**

The rodent fossils in the collection are easily classified into three forms by striking difference in size. They are very large, medium and small forms, which are assigned to a form of castorids, siphneids and arvicolids respectively. The size difference is well represented in Appendices 10 to 13.

***Castor anderssoni* (Schlosser, 1924)** (Pls. 3–6):

Castorid fossils are 158 in specimen number (including isolated incisor), and are referable to a single species. In his study on Chinese fossil castorids, Xu (1994) recognized three categories in cheek tooth patterns (*Asiacastor* dental pattern, *Castor* dental pattern and *Castoroides* dental pattern), and four categories in root formation of cheek teeth (cheek teeth with strong root, cheek teeth with weak roots, closed cheek teeth and open cheek teeth). He concluded that castorid fossils from the Chinese Neogene and Quaternary belonged to seven genera, such as *Youngofiber*, *Anchitheriomys*, *Trogontherium*, *Eucastor*, *Dipoides*, *Steneofiber* and *Castor*. The cheek teeth of the present fossils show *Castor* dental pattern, and are high crowned and very weakly rooted or closed. These features distinguish the present remains from *Youngofiber*, *Anchitheriomys*, *Trogontherium*, *Eucastor*, *Dipoides* and *Steneofiber*. The cheek teeth of the remaining genus *Castor* are well coincident with those of the present fossils. Additionally, the incisors of the present fossils have weakly convex and smooth enamel surfaces, and their edge angles are apparently observed. These features also agree

with those of *Castor*.

Judging from the descriptions of Schlosser (1924), Teilhard de Chardin and Young (1931), Teilhard de Chardin (1942), Xu (1994), and Qiu and Storch (2000), the present fossils are referable to *Castor anderssoni* known from the Upper Miocene to Pleistocene of northern China, which is distinct from the living *Castor* species, *C. fiber* and *C. canadensis* as shown by Xu (1994), because the size, and dental and mandibular morphology of the present fossils are well coincident with those of *C. anderssoni*. Furthermore, the present fossils are different from *C. canadensis* in larger size and somewhat more primitive condition in root formation of cheek teeth.

Additionally we compared the fossils with the mandible assigned to *C. anderssoni* from the Upper Pliocene (= Lower Pleistocene in Chinese sense) of Longdan, Gansu (Figure 1). This mandible (V 13572.1) was described by Wang (2005) and has been stored in the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing. It shows no basic difference in morphology from the present fossils, although it is somewhat smaller.

The other extinct species *C. zdanskyi* is known from the Pliocene and Pleistocene of northern China (Young, 1927; Teilhard de Chardin, 1942; Zhang *et al.*, 1986). All the examined cheek teeth except one M<sup>1</sup> (Udg 447) are different from those of *C. zdanskyi* in having simpler enamel fold, but Udg 447 shows the complicated enamel fold which recalls that of *C. zdanskyi*. As pointed out by Xu (1994), *C. zdanskyi* is a problematic species, and its diagnostic characters may be attributable to intraspecific variation. We regard Udg 447 as a variant in the cheek teeth of *C. anderssoni*.

***Prosiphneus cf. praetingi* Teilhard de Chardin, 1942 (Pl. 7, figs. 1–4):**

Fossils showing siphneid or myospalacine dental characters are relatively few in the present material, and comprise three mandibles with molars and 11 isolated molars (Table 1). The fossils are assignable to the genus *Prosiphneus*, because the molars are rooted. The crown heights of the molars are moderate, and the occlusal outlines of the molars are somewhat elongated antero-posteriorly. These characters distinguish the fossils from late Miocene and early Pliocene primitive species such as *P. quianensis*, *P. qiui*, *P. haoi*, *P. licenti*, *P. murinus*, *P. tianzuensis*, *P. ericksoni*, *P. truncates*, *P. sinensis* and *P. lyratus*, on the basis of the descriptions and figures by Schlosser (1924), Teilhard de Chardin and Young (1931), Teilhard de Chardin (1942) and Zheng *et al.* (2004). In the present fossils, the roots of the molars are divided in old individuals (for example, M<sub>1</sub> with three roots). The buccal reentrant angles of the lower molars (BRA in Figure 3) are shallow so that they easily become enamel islands on the occlusal surface in earlier stage of wear. Judging from Teilhard de Chardin and Young (1931) and Teilhard de Chardin (1940), these characters distinguish the present fossils from late Pliocene and Early Pleistocene advanced species *P. intermedius* and *P. pseudarmandi*. On the other hand, the present fossils are similar to *P. youngi*, *P. praetingi*

and *P. paratingi* described by Teilhard de Chardin (1940, 1942) in the crown height and root morphology of the molars. These species are intermediate between the above-mentioned primitive and advanced species in geological age as well as molar morphology. The size of the present fossils seems to be nearest to that of *P. praetingi*, although sufficient dental measurements of these three species are not available. Thus the fossils are referred to *P. cf. praetingi*. Additionally Erbajeva *et al.* (2003) already recognized *P. praetingi* in the Udunga fauna.

***Villanyia* sp. (Pl. 7, figs. 5-8):**

Fossils allocated to arvicolid rodents comprise a mandibular fragment with  $M_2$  and four isolated molars (Table 1). The molars are rooted and have no cementum in their reentrant angles. Their salient angles are pointed and isthmuses are not closed. The enamel of the molars is not differentiated in thickness.  $M^1$  has three roots, while  $M_1$  and  $M_2$  has two roots. The lagurine structure and enamel islet are absent in  $M^1$  and  $M_1$  respectively, but *Mimomys* angle is present on the anterior wall of T4 of  $M_1$ . These characters indicate that the fossils are allocated to *Villanyia*, according to Zhang *et al.* (2008) and Kawamura and Zhang (2009) who provided differential characters distinguishing it from the allied genus *Borsodia*. They included eight species in the genus, such as *V. exilis*, *V. petenyii*, *V. eleonora*, *V. novoasorica*, *V. steklovi*, *V. betekensis*, *V. hengduanshanensis* and *V. fanchangensis*. The examined specimens are larger than *V. exilis*, but smaller than *V. petenyii*, *V. novoasorica*, *V. betekensis*, *V. hengduanshanensis*, judging from the measurements given by Gromov and Polyakov (1977), Zazhigin (1980), Zong (1987). On the other hand, *V. eleonora*, *V. steklovi* and *V. fanchangensis* have similar sizes to the present fossils, and the former two resemble the fossils in the  $M_1$  pattern, on the basis of the descriptions and figures given by Erbajeva (1976), Gromov and Polyakov (1977), Zazhigin (1980) and Zhang *et al.* (2007). Erbajeva *et al.* (2003) already reported the occurrence of *V. gr. ex. eleonora* from Udunga, but the determination at the species level is reserved here, owing to the insufficiency of the examined fossils.

## Discussion

Erbajeva *et al.* (2003) already presented the relative abundance of the small mammal forms which had been collected from the middle unit of Udunga by washing the sediments with screens of 0.5 and 1 mm meshes. They listed five forms of ochotonid lagomorphs (*Ochotona* aut *Ochotonoides*, *Ochotona* aff. *gromovi*, *Ochotona* sp. with middle size, *Ochotona* aff. *sibirica*, and *Ochotonoides complicidens*), two species of leporid lagomorphs (*Hypolagus transbaikalicus* and *H. multiplicatus*), one form of castorid rodents (*Castor* sp.), one form of murid rodents (*Orientalomys* cf. *sibirica*), three forms of cricetid rodents (*Cricetinus* cf. *varianus*, *Gromovia daamsi*, *Kowalskia* sp.), four forms of arvicolids (*Promimomys* cf. *gracilis*, *P. cf. stehlini*, *Mimomys* cf. *minor*, *Villanyia* ex. gr. *eleonora*) and



two forms of siphneid rodents (*Prosiphneus praetingi* and *Prosiphneus* sp.). Among these, *Ochotonoides complicidens* and *Prosiphneus praetingi* are predominant. In comparison with the fossils examined here, the following differences are recognized between them:

- 1) Murids and cricetids are present in the material of Erbajeva *et al.* (2003), while they are absent from the examined fossils. The isolated molars of these families are generally smaller than those of arvicolids, which are exceeded by lagomorphs, castorids and siphneids in size.
- 2) Arvicolids are more diversified in the material of Erbajeva *et al.* (2003).
- 3) Fossils assigned to castorids are much fewer in the material of Erbajeva *et al.* (2003). They are the largest in the lagomorph and rodent forms from Udunga.

These differences are attributable to the difference between the collecting method for the material of Erbajeva *et al.* (2003) and that for the fossils examined here. The former fossils well represent smaller forms in the fauna of Udunga, while the latter fossils well represent larger forms. Thus the fossils examined here supplement knowledge on the small mammals with relatively large size to the data provided by Erbajeva *et al.* (2003).

The predominance of the castorid species, *Castor anderssoni*, is the most remarkable feature in the fossils examined here. It attains to more than 60 % of all the specimens identifiable to the family, genus or species level. The morphological characters of the fossils indicate that this species is very similar to the living beaver species, and thus it probably enjoyed semiaquatic life in forested riverine areas as they do today. Such habitat is well coincident with the depositional and vegetational environments of Udunga already suggested by Vislobokova *et al.* (1995), Erbajeva and Alexeeva (2000) and Erbajeva *et al.* (2003), who inferred the deposition of an ancient river in a forested area under warmer climate.

Such warmer and forested environments were also inferred in the middle Pliocene of northern China, which was represented by the Yunan Fauna of Shandong Province (Jin *et al.*, 1999; Figure 1). It seems to be correlative with the fauna of Udunga. Rather warm and humid climate possibly prevailed in East Asia during rather short period of the middle Pliocene (around 3.5 Ma).

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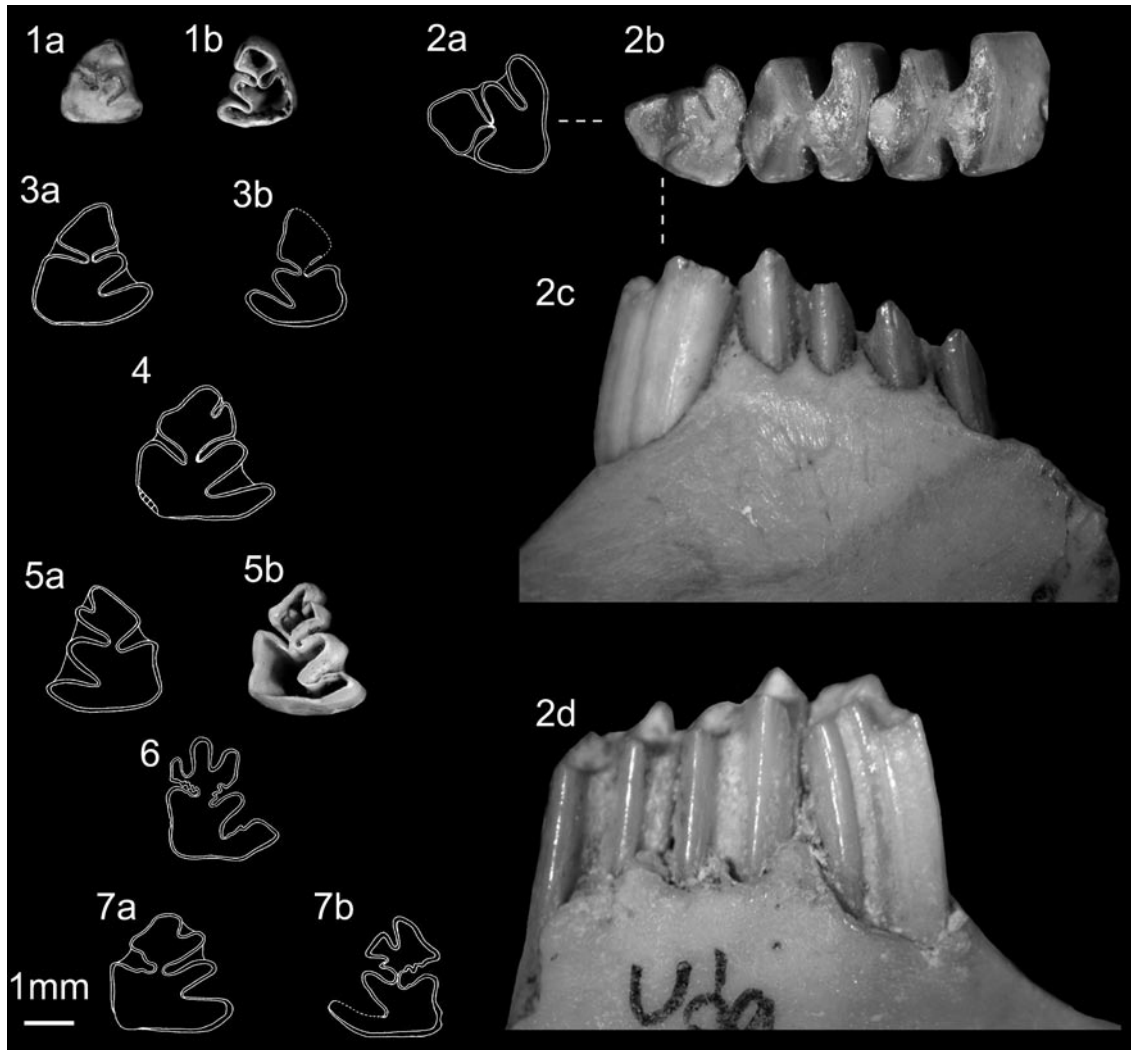
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**Plate 1.**

*Ochotona cf. gromovi*

1: Right  $P_3$  numbered Udg 565 (1a: occlusal view, 1b: radical view)

*Ochotona* sp. (large form)

2: Right mandible with  $P_3$ – $M_1$  numbered Udg 475 (2a: occlusal pattern of  $P_3$ , 2b: occlusal view of tooth row, 2c: lingual view, 2d: buccal view)

3: Right  $P_3$  numbered Udg 561 (3a: occlusal pattern, 3b: enamel pattern in radical view)

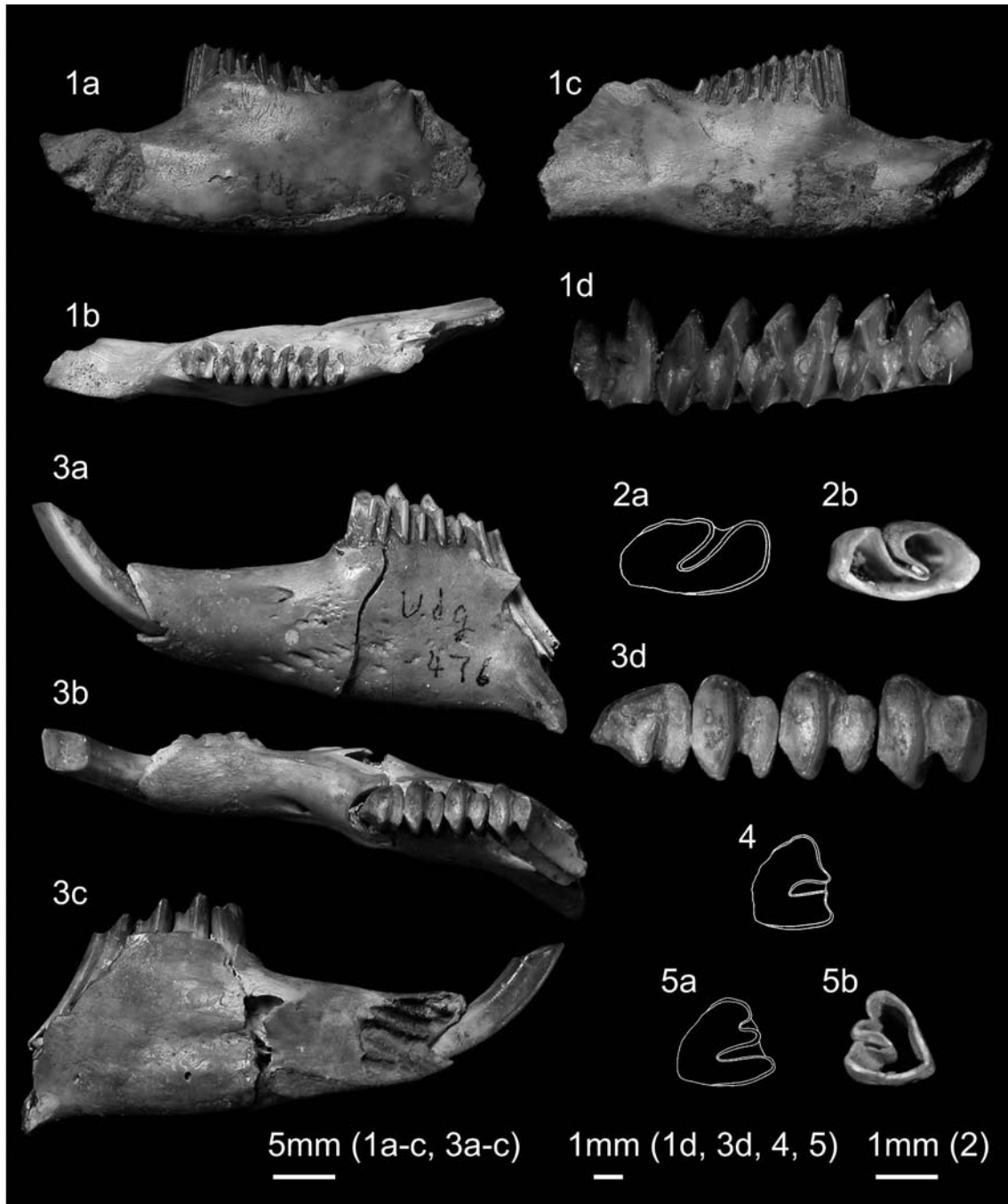
*Ochotonoides complicidens*

4: Right  $P_3$  numbered Udg 516 (occlusal pattern)

5: Left  $P_3$  unnumbered (5a: occlusal pattern, 5b: enamel pattern in radical view)

6: Left  $P_3$  numbered Udg 523 (enamel pattern in radical view)

7: Right  $P_3$ , numbered Udg 563 (7a: occlusal pattern, 7b: enamel pattern in radical view)



**Plate 2.**

*Ochotonoides complicidens*

1: Right mandible with  $P_3$ – $M_3$  numbered Udg 584 (1a: lingual view, 1b: dorsal view, 1c: buccal view, 1d: occlusal view of cheek tooth row)

*Ochotona* or *Ochotonoides* sp.

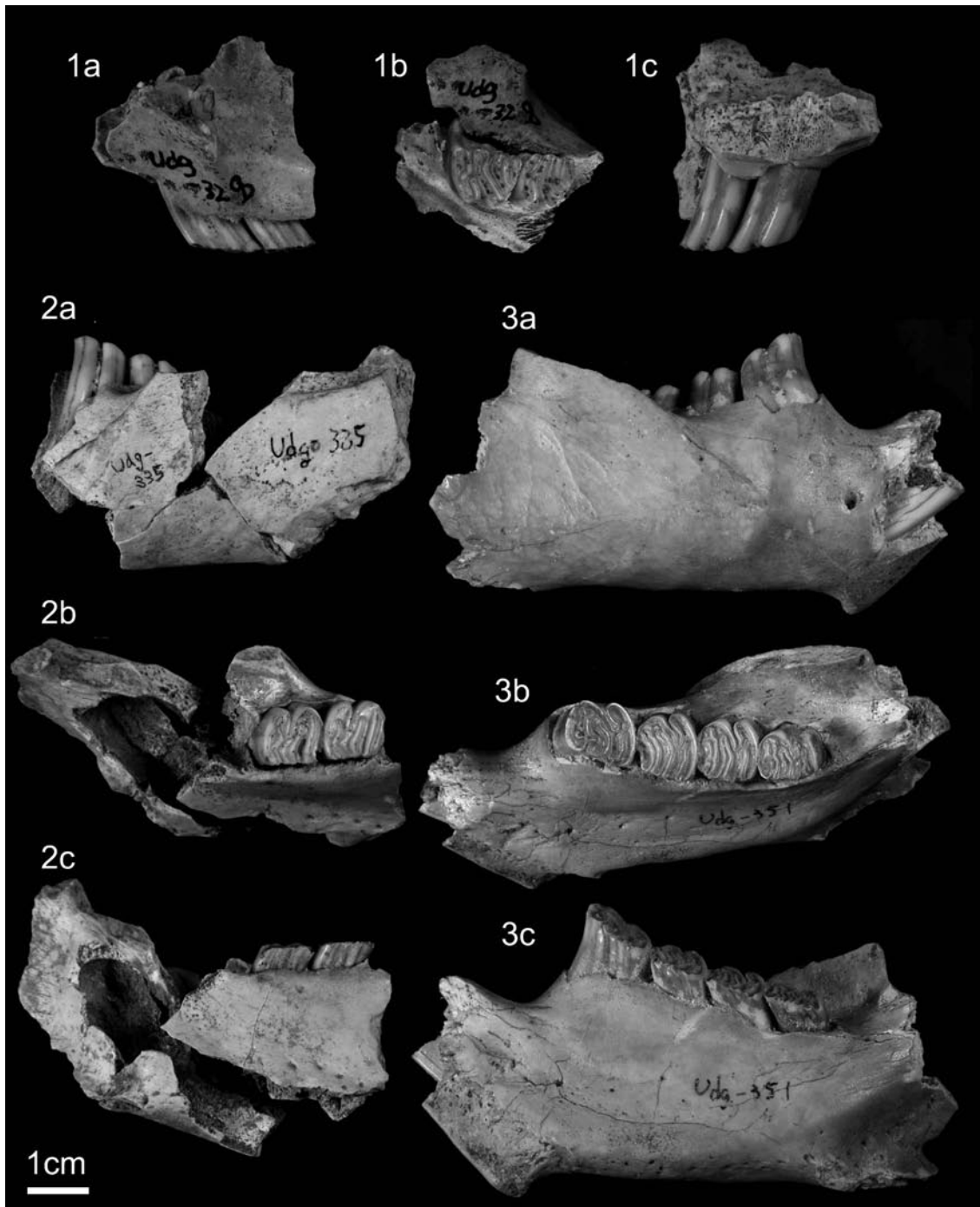
2: Right  $P^2$  numbered Udg 519 (2a: occlusal pattern, 2b: radical view)

*Hypolagus* sp.

3: Left mandible with I and  $P_3$ – $M_2$  numbered Udg 476 (3a: buccal view, 3b: dorsal view, 3c: lingual view, 3d: occlusal view of cheek tooth row)

4: Right  $P_3$  numbered Udg 517 (occlusal pattern)

5: Right  $P_3$  numbered Udg 592 (5a: occlusal pattern, 5b: radical view)



**Plate 3.**

*Castor anderssoni*

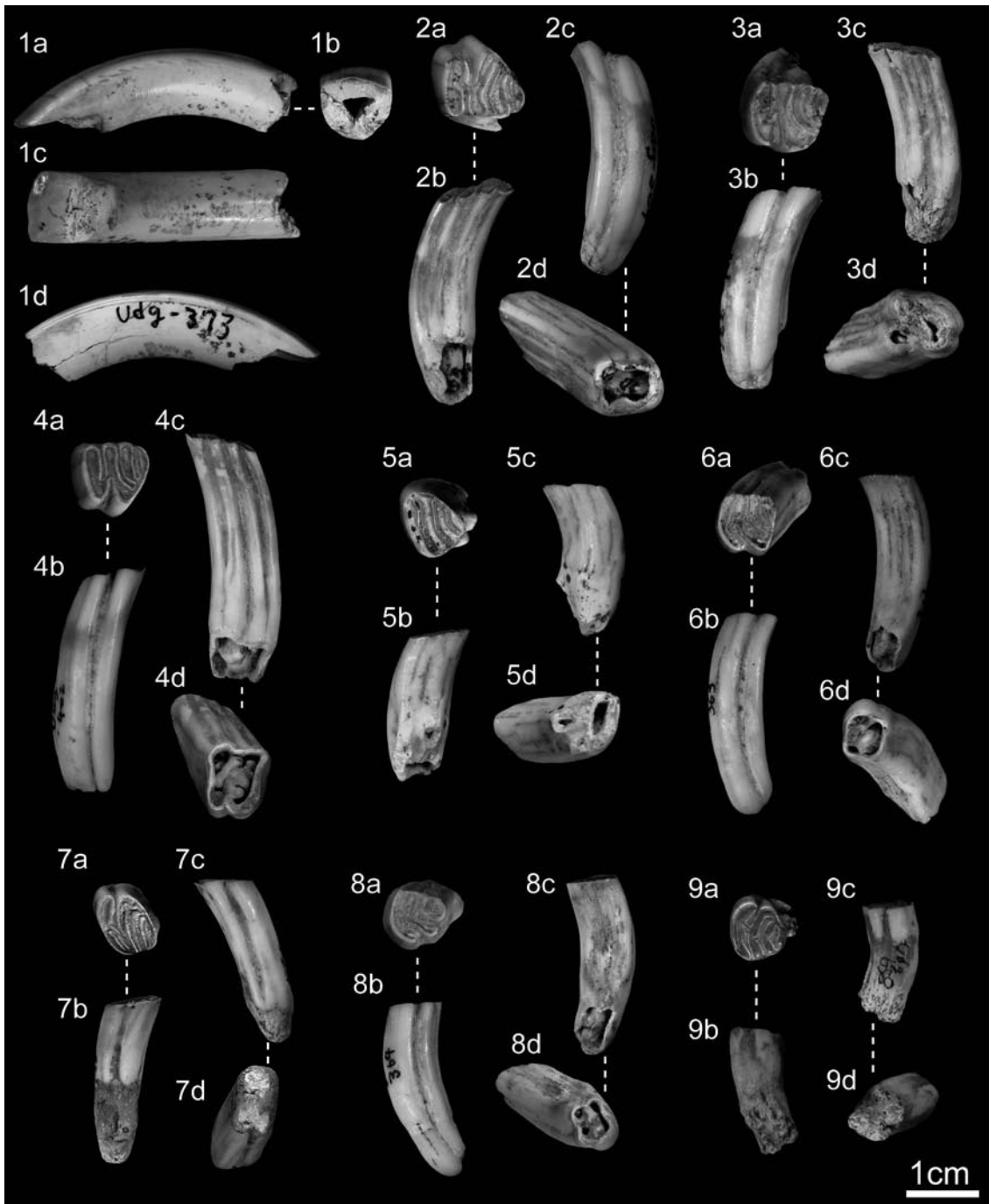
- 1: Left maxilla with  $P^4$  and  $M^1$  numbered Udg 328 (1a: buccal view, 1b: palatal view, 1c: lingual view)  
 2: Left mandible with  $M_1$  and  $M_2$  numbered Udg 335 (2a: buccal view, 2b: occlusal view, 2c: lingual view)  
 3: Right mandible with  $I$  and  $P_4-M_3$  numbered Udg 351 (3a: buccal view, 3b: occlusal view, 3c: lingual view)



**Plate 4.**

*Castor anderssoni*

- 1: Right mandible with I and P<sub>4</sub>-M<sub>3</sub> numbered Udg 352 (1a: buccal view, 1b: occlusal view, 1c: lingual view)
- 2: Right mandible with P<sub>4</sub>-M<sub>1</sub> numbered Udg 353 (2a: buccal view, 2b: occlusal view, 2c: lingual view)
- 3: Left mandible with I, P<sub>4</sub> and M<sub>1</sub> numbered Udg 354 (3a: buccal view, 3b: occlusal view, 3c: lingual view).

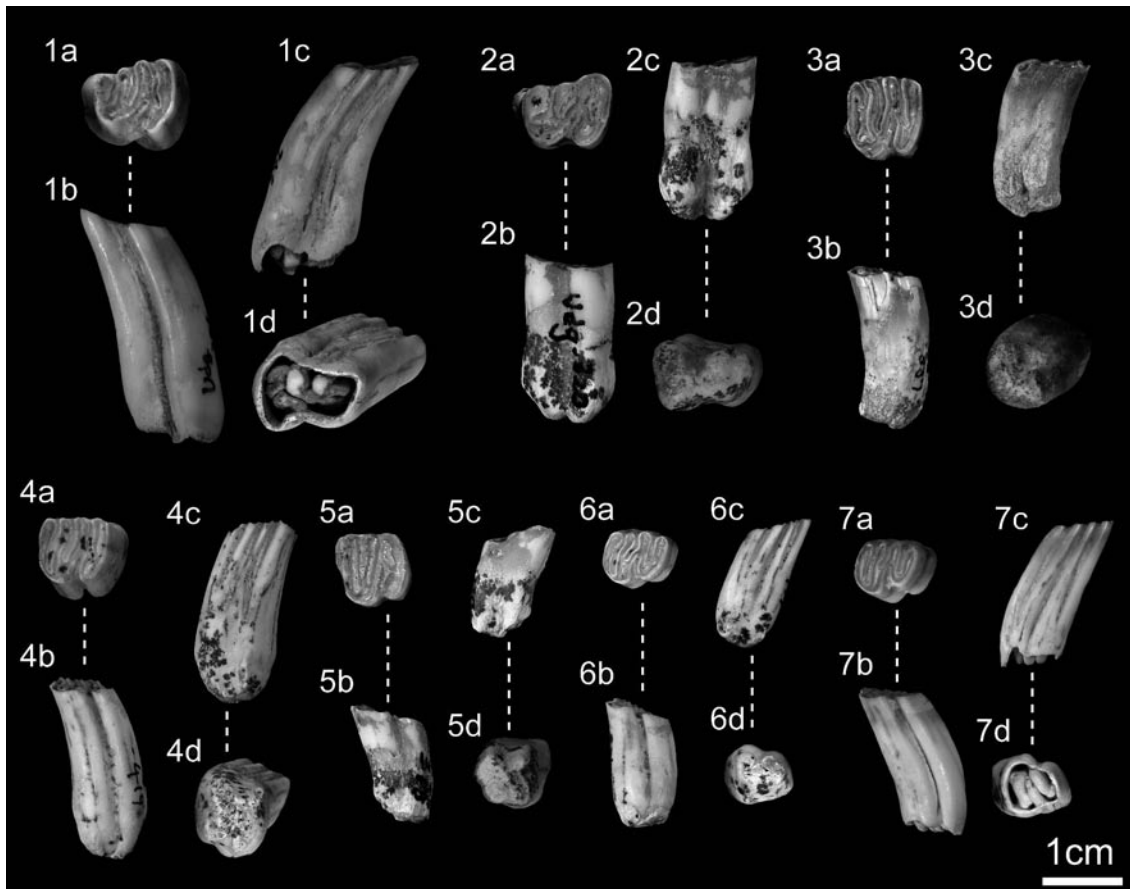


**Plate 5.**

*Castor anderssoni*

- 1: Left upper incisor numbered Udg 373 (1a: mesial view, 1b: posterior view, 1c: palatal view, 1d: distal view)
- 2: Right  $P^3$  numbered Udg 309 (2a: occlusal view, 2b: buccal view, 2c: lingual view, 2d: radical view)
- 3: Left  $P^1$  numbered Udg 336 (3a: occlusal view, 3b: lingual view, 3c: buccal view, 3d: radical view)
- 4: Left  $M^1$  numbered Udg 402 (4a: occlusal view, 4b: lingual view, 4c: buccal view, 4d: radical view)
- 5: Right  $M^1$  numbered Udg 339 (5a: occlusal view, 5b: buccal view, 5c: lingual view, 5d: radical view)
- 6: Left  $M^2$  numbered Udg 363 (6a: occlusal view, 6b: lingual view, 6c: buccal view, 6d: radical view)
- 7: Right  $M^2$  numbered Udg 434 (7a: occlusal view, 7b: buccal view, 7c: lingual view, 7d: radical view)
- 8: Left  $M^3$  numbered Udg 364 (8a: occlusal view, 8b: lingual view, 8c: buccal view, 8d: radical view)
- 9: Right  $M^3$  numbered Udg 658 (9a: occlusal view, 9b: buccal view, 9c: lingual view, 9d: radical view)

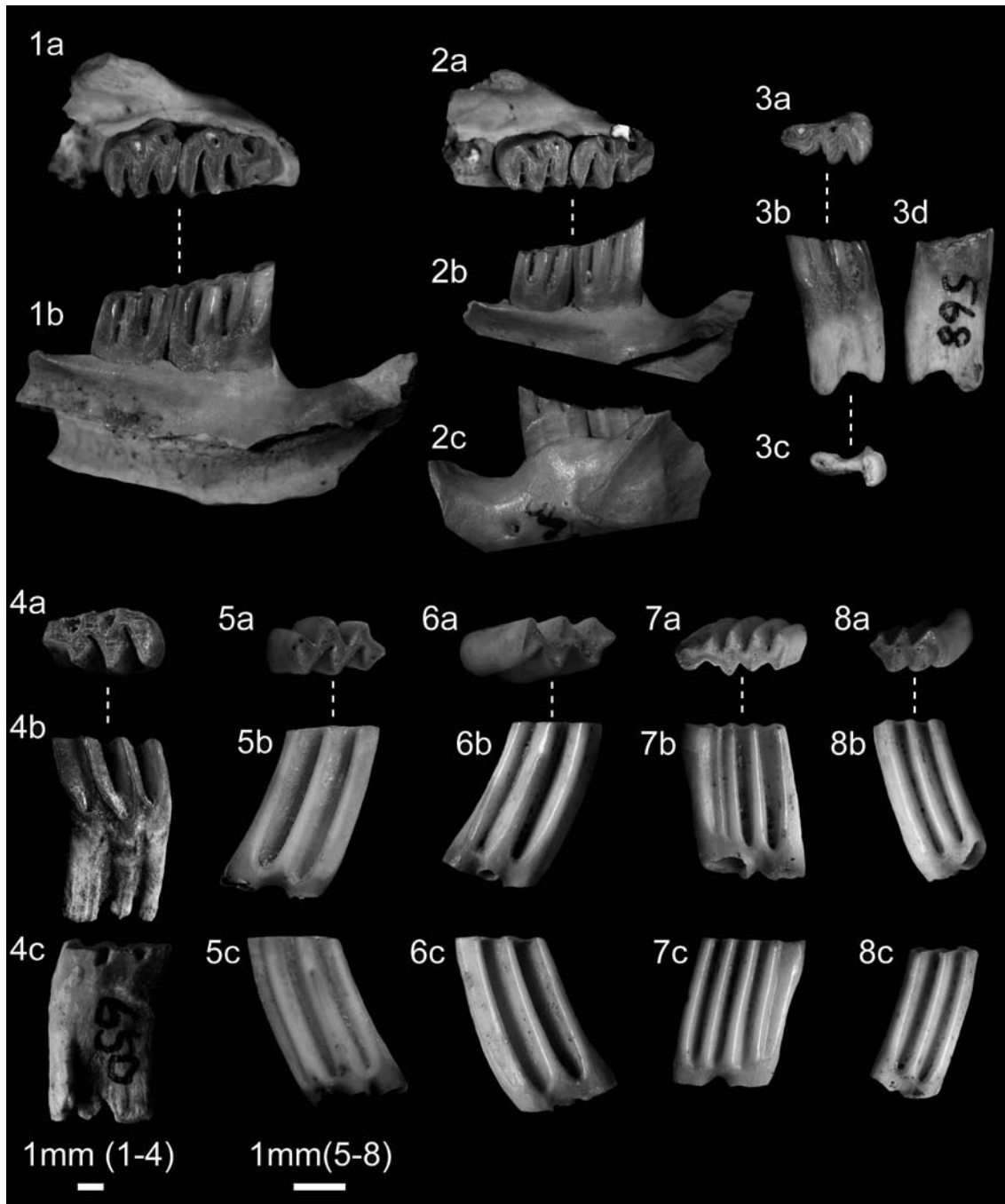




**Plate 6.**

*Castor anderssoni*

- 1: Left  $P_4$  numbered Udg 346 (1a: occlusal view, 1b: buccal view, 1c lingual view, 1d: radical view)
- 2: Left  $P_4$  numbered Udg 320 (2a: occlusal view, 2b: buccal view, 2c lingual view, 2d: radical view)
- 3: Left  $M_1$  numbered Udg 337 (3a: occlusal view, 3b: buccal view, 3c lingual view, 3d: radical view)
- 4: Left  $M_2$  numbered Udg 419 (4a: occlusal view, 4b: buccal view, 4c lingual view, 4d: radical view)
- 5: Left  $M_2$  numbered Udg 313 (5a: occlusal view, 5b: buccal view, 5c lingual view, 5d: radical view)
- 6: Left  $M_3$  numbered Udg 426 (6a: occlusal view, 6b: buccal view, 6c lingual view, 6d: radical view)
- 7: Left  $M_3$  numbered Udg 322 (7a: occlusal view, 7b: buccal view, 7c lingual view, 7d: radical view)



**Plate 7.**

*Prosiphneus* cf. *praetingi*

- 1: Left mandible with  $M_1$  and  $M_2$  numbered Udg 536 (1a: occlusal view, 1b: lingual view)
- 2: Left mandible with  $M_1$  and  $M_2$  numbered Udg 602 (2a: occlusal view, 2b: lingual view, 2c: buccal view)
- 3: Right  $M_1$  numbered Udg 568 (3a: occlusal view, 3b: lingual view, 3c: radical view, 3d: buccal view)
- 4: Right  $M_1$  numbered Udg 650 (4a: occlusal view, 4b: lingual view, 4c: buccal view)

*Villanyia* sp.

- 5: Right  $M_1$  numbered Udg 645 (5a: occlusal view, 5b: buccal view, 5c: lingual view)
- 6: Left  $M_1$  numbered Udg 645 (6a: occlusal view, 6b: lingual view, 6c: buccal view)
- 7: Left  $M_1$  numbered Udg 645 (7a: occlusal view, 7b: buccal view, 7c: lingual view)
- 8: Right  $M_2$  numbered Udg 645 (8a: occlusal view, 8b: lingual view, 8c: buccal view)

## Lagomorphs and rodents from Udunga

**Appendix 1.** List of the fossil specimens examined.\* Udg means Udunga. \*\* The same Udg number was given.

| Specimen no.* | Identification             | Part                                                | Remarks                          |
|---------------|----------------------------|-----------------------------------------------------|----------------------------------|
| Udg 301       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                |                                  |
| Udg 302       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                |                                  |
| Udg 303       | <i>Castor anderssoni</i>   | Left P <sub>4</sub>                                 | Juvenile                         |
| Udg 304       | <i>Castor anderssoni</i>   | Left P <sub>4</sub>                                 |                                  |
| Udg 305       | <i>Castor anderssoni</i>   | Left M <sub>3</sub>                                 |                                  |
| Udg 306       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                |                                  |
| Udg 307       | <i>Castor anderssoni</i>   | Left M <sup>3</sup>                                 |                                  |
| Udg 308       | <i>Castor anderssoni</i>   | Left M <sub>1</sub>                                 |                                  |
| Udg 309       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                | Pl. 5, fig. 2                    |
| Udg 310       | <i>Castor anderssoni</i>   | Right M <sub>1</sub>                                |                                  |
| Udg 311       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                 |                                  |
| Udg 312       | <i>Castor anderssoni</i>   | Right M <sub>1</sub>                                |                                  |
| Udg 313       | <i>Castor anderssoni</i>   | Left M <sub>2</sub>                                 | Pl. 6, fig. 5                    |
| Udg 314       | <i>Castor anderssoni</i>   | Left M <sup>3</sup>                                 |                                  |
| Udg 315       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                 |                                  |
| Udg 316       | <i>Castor anderssoni</i>   | Right M <sub>1</sub>                                | Considerably worn                |
| Udg 317       | <i>Castor anderssoni</i>   | Right P <sub>4</sub>                                | Juvenile                         |
| Udg 318       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                 |                                  |
| Udg 319       | <i>Castor anderssoni</i>   | Left P <sup>4</sup>                                 |                                  |
| Udg 320       | <i>Castor anderssoni</i>   | Left P <sub>4</sub>                                 | Considerably worn; Pl. 6, fig. 2 |
| Udg 321       | <i>Castor anderssoni</i>   | Right M <sup>1</sup>                                |                                  |
| Udg 322       | <i>Castor anderssoni</i>   | Left M <sub>3</sub>                                 | Pl. 6, fig. 7                    |
| Udg 323       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                |                                  |
| Udg 324       | <i>Castor anderssoni</i>   | Right M <sub>3</sub>                                | Considerably worn                |
| Udg 325       | <i>Castor anderssoni</i>   | Right P <sub>4</sub>                                | Considerably worn                |
| Udg 326       | <i>Castor anderssoni</i>   | Right M <sub>2</sub>                                | Considerably worn                |
| Udg 327       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                 |                                  |
| Udg 328       | <i>Castor anderssoni</i>   | Left maxilla with P <sup>4</sup> and M <sup>1</sup> | Pl. 3, fig. 1                    |
| Udg 329       | <i>Castor anderssoni</i>   | Right P <sub>4</sub>                                |                                  |
| Udg 330       | <i>Castor anderssoni</i>   | Right M <sub>2</sub>                                |                                  |
| Udg 331       | <i>Castor anderssoni</i>   | Left lower incisor                                  |                                  |
| Udg 332       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                |                                  |
| Udg 333       | <i>Castor anderssoni</i>   | Right M <sub>2</sub>                                |                                  |
| Udg 334       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                | Fragmentary                      |
| Udg 335       | <i>Castor anderssoni</i>   | Left mandible with P <sub>4</sub> –M <sub>3</sub>   | Pl. 3, fig. 2                    |
| Udg 336       | <i>Castor anderssoni</i>   | Left P <sup>4</sup>                                 | Pl. 5, fig. 3                    |
| Udg 337       | <i>Castor anderssoni</i>   | Left M <sub>1</sub>                                 | Pl. 6, fig. 3                    |
| Udg 338       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                 |                                  |
| Udg 339       | <i>Castor anderssoni</i>   | Right M <sup>1</sup>                                | Considerably worn; Pl. 5, fig. 5 |
| Udg 340       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                 |                                  |
| Udg 341       | <i>Castor anderssoni</i>   | Left upper incisor                                  |                                  |
| Udg 342       | <i>Castor anderssoni</i>   | Right lower incisor                                 |                                  |
| Udg 343       | <i>Castor anderssoni</i>   | Right lower incisor                                 | Fragmentary                      |
| Udg 344       | <i>Castor anderssoni</i>   | Left lower incisor                                  | Fragmentary                      |
| Udg 345       | <i>Castor anderssoni</i> ? | Right upper incisor                                 | Fragmentary                      |
| Udg 346       | <i>Castor anderssoni</i>   | Left P <sub>4</sub>                                 | Pl. 6, fig. 1                    |
| Udg 347       | <i>Castor anderssoni</i>   | Left P <sup>4</sup>                                 |                                  |
| Udg 348       | <i>Castor anderssoni</i>   | Left upper incisor                                  |                                  |
| Udg 349       | <i>Castor anderssoni</i>   | Right lower incisor                                 |                                  |

## Appendix 1. Continued.

| Specimen no.* | Identification             | Part                                                                 | Remarks                                                             |
|---------------|----------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|
| Udg 350       | <i>Castor anderssoni</i>   | Right mandible with fragmentary I and P <sub>4</sub> –M <sub>2</sub> |                                                                     |
| Udg 351       | <i>Castor anderssoni</i>   | Right mandible with I and P <sub>4</sub> –M <sub>3</sub>             | Pl. 3, fig. 3                                                       |
| Udg 352       | <i>Castor anderssoni</i>   | Right mandible with I and P <sub>4</sub> –M <sub>3</sub>             | Pl. 4, fig. 1                                                       |
| Udg 353       | <i>Castor anderssoni</i>   | Right mandible with P <sub>4</sub> –M <sub>3</sub>                   | Pl. 4, fig. 2                                                       |
| Udg 354       | <i>Castor anderssoni</i>   | Left mandible with I, P <sub>4</sub> and M <sub>1</sub>              | Pl. 4, fig. 3                                                       |
| Udg 355       | <i>Castor anderssoni</i>   | Right mandible with M <sub>1</sub> –M <sub>3</sub>                   |                                                                     |
| Udg 356       | <i>Castor anderssoni</i>   | Right maxillary fragment with P <sup>4</sup>                         |                                                                     |
| Udg 357       | <i>Castor anderssoni</i>   | Left mandible with fragmentary P <sub>4</sub>                        |                                                                     |
| Udg 358       | <i>Castor anderssoni</i>   | Left P <sub>4</sub>                                                  | Considerably worn                                                   |
| Udg 359       | <i>Castor anderssoni</i>   | Right femur                                                          |                                                                     |
| Udg 360       | <i>Castor anderssoni</i>   | Left femur                                                           |                                                                     |
| Udg 361       | <i>Castor anderssoni</i> ? | Left pelvis                                                          |                                                                     |
| Udg 362       | ? Leporidae                | Left tibia                                                           |                                                                     |
| Udg 363       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                                  | Pl. 5, fig. 6                                                       |
| Udg 364       | <i>Castor anderssoni</i>   | Left M <sup>3</sup>                                                  | Pl. 5, fig. 8                                                       |
| Udg 365       | <i>Castor anderssoni</i>   | Left M <sub>2</sub>                                                  |                                                                     |
| Udg 366       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                                  |                                                                     |
| Udg 367       | <i>Castor anderssoni</i>   | Right M <sup>3</sup>                                                 |                                                                     |
| Udg 368       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 |                                                                     |
| Udg 369       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 |                                                                     |
| Udg 370       | <i>Castor anderssoni</i>   | Right lower incisor                                                  | Fragmentary                                                         |
| Udg 371       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                                  |                                                                     |
| Udg 372       | <i>Castor anderssoni</i>   | Left M <sub>1</sub>                                                  |                                                                     |
| Udg 373       | <i>Castor anderssoni</i>   | Left upper incisor                                                   | Pl. 5, fig. 1                                                       |
| Udg 374       | <i>Castor anderssoni</i>   | Left P <sup>4</sup>                                                  |                                                                     |
| Udg 375       | <i>Castor anderssoni</i>   | Right upper incisor                                                  | Fragmentary                                                         |
| Udg 376       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                                 |                                                                     |
| Udg 377       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 |                                                                     |
| Udg 378       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                                  |                                                                     |
| Udg 379       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 |                                                                     |
| Udg 380       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                                  |                                                                     |
| Udg 381       | <i>Castor anderssoni</i>   | Right M <sup>3</sup>                                                 | Fragmentary                                                         |
| Udg 382       | Indeterminate ?            | Costa                                                                |                                                                     |
| Udg 383       | Indeterminate ?            | Metapodial                                                           |                                                                     |
| Udg 384       | ? Rodentia                 | Left femur                                                           | Smaller than <i>C. anderssoni</i> , but larger than arviculids      |
| Udg 385       | <i>Castor anderssoni</i>   | Left M <sup>1</sup>                                                  | Considerably worn; otherwise numbered 987/242                       |
| Udg 386       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 | Otherwise numbered 987/252-1                                        |
| Udg 387       | <i>Castor anderssoni</i>   | Left P <sup>4</sup>                                                  | Considerably worn; with massive roots; otherwise numbered 987/252-2 |
| Udg 388       | <i>Castor anderssoni</i>   | Right P <sup>4</sup>                                                 | Considerably worn; with massive roots; otherwise numbered 987/252-3 |
| Udg 389       | <i>Castor anderssoni</i>   | Left M <sup>3</sup>                                                  | Otherwise numbered 987/252-4                                        |
| Udg 390       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                                  | Otherwise numbered 987/252-5                                        |
| Udg 391       | <i>Castor anderssoni</i>   | Right upper incisor                                                  | Otherwise numbered 987/252-6                                        |
| Udg 392       | <i>Castor anderssoni</i>   | Right upper incisor                                                  | Fragmentary; otherwise numbered 987/252-7                           |
| Udg 393       | <i>Castor anderssoni</i>   | Right M <sup>1</sup>                                                 | Otherwise numbered 987/252-8                                        |
| Udg 394       | <i>Castor anderssoni</i>   | Left M <sup>2</sup>                                                  | Otherwise numbered 987/252-9                                        |
| Udg 395       | <i>Castor anderssoni</i>   | Right M <sup>3</sup>                                                 | Otherwise numbered 987/252-10                                       |
| Udg 396       | <i>Castor anderssoni</i>   | Right M <sup>2</sup>                                                 |                                                                     |
| Udg 397       | <i>Castor anderssoni</i>   | Right M <sup>3</sup>                                                 |                                                                     |
| Udg 398       | Indeterminate              | Metapodial                                                           | ? Mammal                                                            |

# Lagomorphs and rodents from Udunga

## Appendix 1. Continued.

| Specimen no.* | Identification           | Part                     | Remarks                               |
|---------------|--------------------------|--------------------------|---------------------------------------|
| Udg 399       | ? Rodentia               | Left humerus             |                                       |
| Udg 400       | Indeterminate            | Fragmentary left scapula | Mammal                                |
| Udg 401       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 402       | <i>Castor anderssoni</i> | Left M <sup>1</sup>      | Pl. 5, fig. 4                         |
| Udg 403       | <i>Castor anderssoni</i> | Right M <sup>1</sup>     |                                       |
| Udg 404       | <i>Castor anderssoni</i> | Left M <sup>2</sup>      |                                       |
| Udg 405       | <i>Castor anderssoni</i> | Left M <sup>2</sup>      |                                       |
| Udg 406       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 407       | <i>Castor anderssoni</i> | Right M <sup>3</sup>     |                                       |
| Udg 408       | <i>Castor anderssoni</i> | Right lower incisor      |                                       |
| Udg 409       | <i>Castor anderssoni</i> | Right upper incisor      |                                       |
| Udg 410       | <i>Castor anderssoni</i> | Right upper incisor      |                                       |
| Udg 411       | <i>Castor anderssoni</i> | Right upper incisor      |                                       |
| Udg 412       | <i>Castor anderssoni</i> | Left P <sup>4</sup>      |                                       |
| Udg 413       | <i>Castor anderssoni</i> | Left P <sup>4</sup>      |                                       |
| Udg 414       | <i>Castor anderssoni</i> | Right P <sup>4</sup>     | With massive roots                    |
| Udg 415       | <i>Castor anderssoni</i> | Left P <sub>4</sub>      |                                       |
| Udg 416       | <i>Castor anderssoni</i> | Right P <sub>4</sub>     |                                       |
| Udg 417       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 418       | <i>Castor anderssoni</i> | Left P <sup>4</sup>      | With massive roots                    |
| Udg 419       | <i>Castor anderssoni</i> | Left M <sub>2</sub>      | Pl. 6, fig. 4                         |
| Udg 420       | <i>Castor anderssoni</i> | Right M <sup>1</sup>     | Otherwise numbered 162                |
| Udg 421       | <i>Castor anderssoni</i> | Right M <sub>1</sub>     | Considerably worn; with massive roots |
| Udg 422       | <i>Castor anderssoni</i> | Right P <sub>4</sub>     | Considerably worn                     |
| Udg 423       | <i>Castor anderssoni</i> | Left M <sup>1</sup>      | Considerably worn; with massive roots |
| Udg 424       | <i>Castor anderssoni</i> | Left M <sup>1</sup>      |                                       |
| Udg 425       | <i>Castor anderssoni</i> | Right M <sup>1</sup>     |                                       |
| Udg 426       | <i>Castor anderssoni</i> | Left M <sub>3</sub>      | Considerably worn; Pl. 6, fig. 6      |
| Udg 427**     | <i>Castor anderssoni</i> | Right M <sub>2</sub>     | Considerably worn; with massive roots |
| Udg 427**     | <i>Castor anderssoni</i> | Right M <sup>2</sup>     | Otherwise numbered 987/378-4          |
| Udg 428       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     | Otherwise numbered 987/378-2          |
| Udg 429       | <i>Castor anderssoni</i> | Left M <sup>2</sup>      | Otherwise numbered 987/378-3          |
| Udg 430       | <i>Castor anderssoni</i> | Right lower incisor      |                                       |
| Udg 431       | <i>Castor anderssoni</i> | Right upper incisor      | Fragmentary                           |
| Udg 432       | <i>Castor anderssoni</i> | ? Right lower incisor    | Fragmentary                           |
| Udg 433       | <i>Castor anderssoni</i> | Left M <sup>2</sup>      |                                       |
| Udg 434       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     | Pl. 5, fig. 7                         |
| Udg 435       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 436       | <i>Castor anderssoni</i> | Left M <sup>3</sup>      |                                       |
| Udg 437       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 438       | <i>Castor anderssoni</i> | Left M <sup>1</sup>      |                                       |
| Udg 439       | <i>Castor anderssoni</i> | Right M <sup>2</sup>     |                                       |
| Udg 440       | <i>Castor anderssoni</i> | ? Right M <sup>1</sup>   | Extremely worn                        |
| Udg 441       | <i>Castor anderssoni</i> | Right M <sup>3</sup>     |                                       |
| Udg 442       | <i>Castor anderssoni</i> | Right P <sup>4</sup>     | Otherwise numbered 161                |
| Udg 443       | <i>Castor anderssoni</i> | Left P <sup>4</sup>      |                                       |
| Udg 444       | <i>Castor anderssoni</i> | Right P <sup>4</sup>     |                                       |
| Udg 445       | <i>Castor anderssoni</i> | Right M <sub>2</sub>     |                                       |
| Udg 446       | <i>Castor anderssoni</i> | Right M <sub>1</sub>     |                                       |

## Appendix 1. Continued.

| Specimen no.* | Identification                             | Part                                                    | Remarks                                                                                             |
|---------------|--------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Udg 447       | <i>Castor anderssoni</i>                   | Left M <sup>1</sup>                                     | Strong enamel folds on the occlusal surface, which recall the molar pattern of <i>C. zdanskyi</i> . |
| Udg 448       | <i>Castor anderssoni</i>                   | Left M <sub>2</sub>                                     |                                                                                                     |
| Udg 449       | <i>Castor anderssoni</i>                   | Right P <sup>4</sup>                                    |                                                                                                     |
| Udg 450       | <i>Castor anderssoni</i>                   | Right lower incisor                                     | Fragmentary                                                                                         |
| Udg 451       | <i>Castor anderssoni</i>                   | Left upper incisor                                      | Fragmentary                                                                                         |
| Udg 452       | <i>Castor anderssoni</i>                   | Right P <sub>4</sub>                                    | Considerably worn                                                                                   |
| Udg 453       | <i>Castor anderssoni</i>                   | Left upper incisor                                      | Otherwise numbered 9871782                                                                          |
| Udg 454       | <i>Castor anderssoni</i>                   | Right mandibular fragment                               | Coronoid process                                                                                    |
| Udg 455       | Indeterminate                              | Left calcaneum                                          |                                                                                                     |
| Udg 456       | <i>Castor anderssoni</i>                   | Left lower incisor                                      | Fragmentary                                                                                         |
| Udg 457       | <i>Castor anderssoni</i>                   | Left P <sub>4</sub>                                     | Considerably worn                                                                                   |
| Udg 458       | <i>Castor anderssoni</i>                   | Left M <sup>1</sup>                                     |                                                                                                     |
| Udg 459       | <i>Castor anderssoni</i>                   | Left M <sup>2</sup>                                     |                                                                                                     |
| Udg 460       | <i>Castor anderssoni</i>                   | Left P <sub>4</sub>                                     |                                                                                                     |
| Udg 461       | <i>Castor anderssoni</i>                   | Right M <sub>2</sub>                                    |                                                                                                     |
| Udg 462       | Indeterminate                              | Indeterminate                                           |                                                                                                     |
| Udg 463       | <i>Castor anderssoni</i>                   | Left lower incisor                                      |                                                                                                     |
| Udg 464       | ? <i>Castor anderssoni</i>                 | Left lower incisor                                      |                                                                                                     |
| Udg 465       | <i>Castor anderssoni</i>                   | Left mandibular fragment with P <sub>4</sub>            |                                                                                                     |
| Udg 466       | Rodentia                                   | Right upper incisor                                     | Small-sized form                                                                                    |
| Udg 467       | Rodentia                                   | Left ulna                                               | Small-sized form                                                                                    |
| Udg 468       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Right mandible with M <sub>1</sub> –M <sub>3</sub>      |                                                                                                     |
| Udg 469       | Indeterminate                              | Phalanx                                                 |                                                                                                     |
| Udg 470       | Indeterminate                              | ? Calcaneum                                             |                                                                                                     |
| Udg 471       | Indeterminate                              | Humerus                                                 |                                                                                                     |
| Udg 472       | ? Sciuridae                                | Left mandible with P <sub>4</sub> –M <sub>3</sub>       | Cheek teeth strongly worn                                                                           |
| Udg 473       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left mandible with M <sub>1</sub> –M <sub>3</sub>       |                                                                                                     |
| Udg 474       | <i>Hypolagus</i> sp.                       | Left mandible with P <sub>4</sub> –M <sub>3</sub>       |                                                                                                     |
| Udg 475       | <i>Ochotona</i> sp. (large form)           | Left mandible with P <sub>3</sub> –M <sub>1</sub>       | Pl. 1, fig. 2                                                                                       |
| Udg 476       | <i>Hypolagus</i> sp.                       | Left mandible with I and P <sub>3</sub> –M <sub>2</sub> | Pl. 2, fig. 3                                                                                       |
| Udg 477       | ? Lagomorpha                               | Left femur                                              | Distal part                                                                                         |
| Udg 478       | Indeterminate                              | ? Phalanx                                               |                                                                                                     |
| Udg 479       | Indeterminate                              | Indeterminate                                           |                                                                                                     |
| Udg 480       | Rodentia                                   | Right lower incisor                                     |                                                                                                     |
| Udg 481       | Rodentia or Lagomorpha                     | Right lower incisor                                     |                                                                                                     |
| Udg 482       | Rodentia or Lagomorpha                     | Right lower incisor fragment                            |                                                                                                     |
| Udg 483       | Indeterminate                              | Cheek tooth fragment                                    | Small- or medium-sized mammal                                                                       |
| Udg 484       | ? Rodentia                                 | Right lower incisor fragment                            |                                                                                                     |
| Udg 485       | Indeterminate                              | ? Cheek tooth                                           | Columnar shape; small- or medium-sized mammal                                                       |
| Udg 486       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left premaxilla with I <sup>1</sup> and I <sup>2</sup>  |                                                                                                     |
| Udg 487       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>4</sup> or M <sup>1</sup>                   |                                                                                                     |
| Udg 488       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandibular fragment with M <sub>2</sub>           | Anterior half of M <sub>2</sub> preserved                                                           |
| Udg 489       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>3</sup>                                     |                                                                                                     |
| Udg 490       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>4</sup> or M <sup>1</sup>                   |                                                                                                     |
| Udg 491       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>4</sup> or M <sup>1</sup>                   |                                                                                                     |
| Udg 492       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sup>2</sup>                                     |                                                                                                     |
| Udg 493       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left mandible                                           | Detached cheek teeth also preserved                                                                 |
| Udg 494       | Lagomorpha                                 | Right tibia                                             | Distal part                                                                                         |
| Udg 495       | Lagomorpha                                 | Right lower incisor                                     |                                                                                                     |

# Lagomorphs and rodents from Udunga

## Appendix 1. Continued.

| Specimen no.* | Identification                             | Part                                                 | Remarks          |
|---------------|--------------------------------------------|------------------------------------------------------|------------------|
| Udg 496       | Rodentia                                   | Right lower incisor                                  | Small-sized form |
| Udg 497       | <i>Hypolagus</i> sp.                       | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 498       | <i>Hypolagus</i> sp.                       | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 499       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 500       | <i>Hypolagus</i> sp.                       | Left P <sup>3</sup>                                  |                  |
| Udg 501       | <i>Hypolagus</i> sp.                       | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 502       | <i>Hypolagus</i> sp.                       | Left P <sub>3</sub>                                  |                  |
| Udg 503       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sub>4</sub>                                 |                  |
| Udg 504       | ? Rodentia                                 | ? Right upper incisor fragment                       |                  |
| Udg 505       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left mandible with P <sub>4</sub> and M <sub>1</sub> |                  |
| Udg 506       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left mandible                                        |                  |
| Udg 507       | Indeterminate                              | ? Skull fragment                                     | Small mammal     |
| Udg 508       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left maxilla                                         |                  |
| Udg 509       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>1</sub> (fragmentary)                   | Anterior half    |
| Udg 510       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>1</sub> (fragmentary)                   | Posterior half   |
| Udg 511       | <i>Hypolagus</i> sp.                       | Left P <sub>4</sub> (fragmentary)                    | Anterior half    |
| Udg 512       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sup>4</sup> or M <sup>1</sup>               |                  |
| Udg 513       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>3</sup>                                  |                  |
| Udg 514       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sup>3</sup>                                 |                  |
| Udg 515       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sup>4</sup> or M <sup>1</sup>               |                  |
| Udg 516       | <i>Ochotonoides complicitens</i>           | Right P <sub>3</sub>                                 | Pl. 1, fig. 4    |
| Udg 517       | <i>Hypolagus</i> sp.                       | Right P <sub>3</sub>                                 | Pl. 2, fig. 4    |
| Udg 518       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>2</sub>                                 |                  |
| Udg 519       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sup>2</sup>                                 | Pl. 2, fig. 2    |
| Udg 520       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sup>2</sup>                                  |                  |
| Udg 521       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sub>4</sub>                                 |                  |
| Udg 522       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 523       | <i>Ochotonoides complicitens</i>           | Left P <sub>3</sub>                                  | Pl. 1, fig. 6    |
| Udg 524       | <i>Hypolagus</i> sp.                       | Right P <sub>4</sub>                                 |                  |
| Udg 525       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sub>1</sub>                                  |                  |
| Udg 526       | <i>Hypolagus</i> sp.                       | Right P <sub>4</sub>                                 |                  |
| Udg 527       | <i>Hypolagus</i> sp.                       | Right M <sub>2</sub>                                 |                  |
| Udg 528       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sub>2</sub>                                  |                  |
| Udg 529       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sub>3</sub>                                  |                  |
| Udg 530       | Rodentia                                   | Left lower incisor                                   | Small-sized form |
| Udg 531       | Rodentia                                   | Left lower incisor                                   | Small-sized form |
| Udg 532       | Rodentia                                   | Left lower incisor                                   | Small-sized form |
| Udg 533       | ? <i>Hypolagus</i> sp.                     | Left upper incisor                                   |                  |
| Udg 534       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left upper incisor                                   |                  |
| Udg 535       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>3</sub>                                 |                  |
| Udg 536       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Left mandible with M <sub>1</sub> and M <sub>2</sub> | Pl. 7, fig. 1    |
| Udg 537       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Right M <sup>1</sup>                                 |                  |
| Udg 538       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Right M <sup>2</sup>                                 |                  |
| Udg 539       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right I <sup>1</sup>                                 |                  |
| Udg 540**     | ? <i>Prosiphneus</i> cf. <i>praetingi</i>  | Left humerus                                         | Distal part      |
| Udg 540**     | <i>Hypolagus</i> sp.                       | ? Left P <sub>4</sub>                                | Posterior half   |
| Udg 540**     | Lagomorpha                                 | Upper incisor fragment                               |                  |
| Udg 540**     | Lagomorpha                                 | Upper incisor fragment                               |                  |
| Udg 540**     | Lagomorpha                                 | Upper incisor fragment                               |                  |

## Appendix 1. Continued.

| Specimen no.* | Identification                             | Part                                                   | Remarks                                        |
|---------------|--------------------------------------------|--------------------------------------------------------|------------------------------------------------|
| Udg 540**     | Lagomorpha                                 | Upper incisor fragment                                 |                                                |
| Udg 540**     | Lagomorpha                                 | Maxillary fragment                                     |                                                |
| Udg 540**     | Lagomorpha                                 | Maxillary or mandibular fragment                       |                                                |
| Udg 540**     | Rodentia                                   | Lower incisor                                          |                                                |
| Udg 541       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandible                                         |                                                |
| Udg 542       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandibular fragment                              |                                                |
| Udg 543       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandible                                         |                                                |
| Udg 544       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandible with P <sub>4</sub> –M <sub>3</sub>     |                                                |
| Udg 545       | Leporidae, gen and sp. indet.              | Left P <sup>4</sup> or M <sup>1</sup>                  | Considerably smaller than <i>Hypolagus</i> sp. |
| Udg 546       | Leporidae, gen and sp. indet.              | Right M <sup>2</sup>                                   | Considerably smaller than <i>Hypolagus</i> sp. |
| Udg 547       | <i>Hypolagus</i> sp.                       | Right P <sup>2</sup>                                   |                                                |
| Udg 548       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>2</sub> (fragmentary)                     | Posterior half                                 |
| Udg 549       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>2</sub> (fragmentary)                     | Anterior half                                  |
| Udg 550       | <i>Ochotonoides complicidens</i>           | Left P <sub>3</sub>                                    |                                                |
| Udg 551       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right P <sub>4</sub>                                   |                                                |
| Udg 552       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left P <sub>4</sub>                                    |                                                |
| Udg 553       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sub>2</sub>                                    |                                                |
| Udg 554       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>1</sub>                                   |                                                |
| Udg 555       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left M <sub>1</sub>                                    |                                                |
| Udg 556       | Rodentia                                   | Right lower incisor                                    |                                                |
| Udg 557       | Rodentia                                   | Right lower incisor                                    |                                                |
| Udg 558       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right M <sub>2</sub> (fragmentary)                     | Posterior half                                 |
| Udg 559       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right M <sub>2</sub> (fragmentary)                     | Anterior half                                  |
| Udg 560       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>2</sub> (fragmentary)                     | Anterior half                                  |
| Udg 561       | <i>Ochotona</i> sp. (large form)           | Right P <sub>3</sub>                                   | Pl. 1, fig. 3                                  |
| Udg 562       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right P <sub>4</sub>                                   |                                                |
| Udg 563       | <i>Ochotonoides complicidens</i>           | Right P <sub>3</sub>                                   | Pl. 1, fig. 7                                  |
| Udg 564       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right M <sub>1</sub>                                   |                                                |
| Udg 565       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right P <sub>3</sub>                                   | Pl. 1, fig. 1                                  |
| Udg 566       | <i>Ochotona</i> cf. <i>gromovi</i>         | Right M <sub>3</sub>                                   |                                                |
| Udg 567       | Rodentia                                   | Right lower incisor                                    | Small-sized form                               |
| Udg 568       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Right M <sub>1</sub>                                   | Pl. 7, fig. 3                                  |
| Udg 569       | Indeterminate                              | ? Tibia (distal epiphysis)                             | ? Small mammal                                 |
| Udg 570       | Indeterminate                              | ? Caudal vertebra                                      | ? Small mammal                                 |
| Udg 571       | ? Lagomorpha                               | Right calcaneum                                        |                                                |
| Udg 572       | Indeterminate                              | Right pelvis                                           | Small mammal                                   |
| Udg 573       | Indeterminate                              | Left ulna                                              | Small mammal                                   |
| Udg 574       | Indeterminate                              | Left calcaneum                                         | Small mammal                                   |
| Udg 575       | Indeterminate                              | Long bone                                              | ? Aves                                         |
| Udg 576       | Indeterminate                              | ? Left humerus                                         | ? Small mammal                                 |
| Udg 577       | Indeterminate                              | ? Left humerus                                         | ? Small mammal                                 |
| Udg 578       | Indeterminate                              | ? Metapodial                                           | ? Small mammal                                 |
| Udg 579       | Indeterminate                              | ? Metapodial                                           | ? Small mammal                                 |
| Udg 580       | Indeterminate                              | Indeterminate                                          | Bone fragment                                  |
| Udg 581       | ? Lagomorpha                               | Left humerus                                           | Distal epiphysis                               |
| Udg 582       | Indeterminate                              | ? Phalanx                                              | ? Aves                                         |
| Udg 583       | ? Lagomorpha                               | ? Left tibia                                           |                                                |
| Udg 584**     | Indeterminate                              | Long bone fragment                                     | ? Small mammal                                 |
| Udg 584**     | <i>Ochotonoides complicidens</i>           | Right mabddible with P <sub>3</sub> –M <sub>3</sub>    | Pl. 2, fig. 1                                  |
| Udg 585       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mabddible with P <sub>4</sub> and M <sub>1</sub> |                                                |
| Udg 586       | <i>Hypolagus</i> sp.                       | Right mabddible with P <sub>4</sub>                    |                                                |
| Udg 587       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Left mandible                                          |                                                |
| Udg 588       | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mabddible with M <sub>3</sub>                    |                                                |



# Lagomorphs and rodents from Udunga

## Appendix 1. Continued.

| Specimen no.* | Identification                               | Part                                                 | Remarks          |
|---------------|----------------------------------------------|------------------------------------------------------|------------------|
| Udg 589       | ? <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right mandibular fragment                            |                  |
| Udg 590       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left P <sup>3</sup>                                  |                  |
| Udg 591       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left P <sup>4</sup> or M <sup>1</sup>                |                  |
| Udg 592       | <i>Hypolagus</i> sp.                         | Right P <sub>3</sub>                                 | Pl. 2, fig. 5    |
| Udg 593       | <i>Hypolagus</i> sp.                         | Right M <sub>2</sub>                                 |                  |
| Udg 594       | <i>Hypolagus</i> sp.                         | Right P <sub>4</sub>                                 |                  |
| Udg 595       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Right M <sub>1</sub>                                 |                  |
| Udg 596       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left P <sub>4</sub>                                  |                  |
| Udg 597       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left I <sup>1</sup>                                  |                  |
| Udg 598       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Right I <sup>1</sup>                                 |                  |
| Udg 599       | Lagomorpha                                   | Right lower incisor                                  |                  |
| Udg 600       | Rodentia                                     | Left lower incisor                                   | Small-sized form |
| Udg 601       | Rodentia                                     | Left lower incisor                                   | Small-sized form |
| Udg 602       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Left mabdbile with M <sub>1</sub> and M <sub>2</sub> | Pl. 7, fig. 2    |
| Udg 603       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>1</sub>                                 |                  |
| Udg 604       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>3</sub>                                 |                  |
| Udg 605       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>1</sub>                                 |                  |
| Udg 606       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>2</sub>                                 |                  |
| Udg 607       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>1</sub>                                 |                  |
| Udg 608       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Right M <sub>2</sub>                                 |                  |
| Udg 609       | <i>Prosiphneus</i> cf. <i>praetingi</i>      | Left M <sub>1</sub>                                  |                  |
| Udg 610       | Rodentia                                     | Right lower incisor                                  | Small-sized form |
| Udg 611       | <i>Villanyia</i> sp.                         | Left mandible with M <sub>2</sub>                    |                  |
| Udg 612       | Rodentia                                     | Left lower incisor                                   | Small-sized form |
| Udg 613       | Lagomorpha                                   | Left lower incisor                                   |                  |
| Udg 614       | ? Rodentia                                   | ? Right upper incisor                                |                  |
| Udg 615       | ? Lagomorpha or Rodentia                     | ? Phalanx (fragmentary)                              |                  |
| Udg 616       | ? Lagomorpha or Rodentia                     | Proximal phalanx                                     |                  |
| Udg 617       | ? Lagomorpha or Rodentia                     | ? Humerus                                            |                  |
| Udg 618       | ? Lagomorpha or Rodentia                     | ? Metapodial                                         |                  |
| Udg 619       | ? Lagomorpha or Rodentia                     | ? Humerus                                            |                  |
| Udg 620       | ? Lagomorpha or Rodentia                     | ? Tibia                                              |                  |
| Udg 621       | ? Lagomorpha or Rodentia                     | ? Ulna                                               |                  |
| Udg 622       | Lagomorpha                                   | Left lower incisor                                   |                  |
| Udg 623       | ? Rodentia                                   | ? Upper incisor fragment                             |                  |
| Udg 624       | <i>Castor anderssoni</i>                     | Right upper incisor                                  |                  |
| Udg 625       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left mandible                                        |                  |
| Udg 626       | <i>Hypolagus</i> sp.                         | Right P <sub>4</sub>                                 |                  |
| Udg 627       | ? Lagomorpha or Rodentia                     | ? Left femur                                         |                  |
| Udg 628       | ? Lagomorpha or Rodentia                     | Proximal phalanx                                     |                  |
| Udg 629       | ? Lagomorpha or Rodentia                     | Metapodial                                           |                  |
| Udg 630       | Indeterminate                                | Vertebra                                             | ? Anura          |
| Udg 631       | Indeterminate                                | ? Scapula                                            | ? Anura          |
| Udg 632       | Indeterminate                                | Long bone                                            | ? Anura          |
| Udg 633       | Indeterminate                                | ? Epiphysis of a long bone                           | ? Small mammal   |
| Udg 634       | Indeterminate                                | Long bone                                            | ? Small mammal   |
| Udg 635       | Indeterminate                                | ? Pelvis                                             |                  |
| Udg 636       | Indeterminate                                | ? Pelvis                                             |                  |
| Udg 637       | Indeterminate                                | Long bone                                            | ? Anura          |
| Udg 638       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left mabdbile with P <sub>4</sub> –M <sub>2</sub>    |                  |
| Udg 639       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Right P <sub>4</sub> (fragmentary)                   | Posterior half   |
| Udg 640       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Right P <sub>4</sub> (fragmentary)                   | Anterior half    |
| Udg 641       | <i>Ochotona</i> or <i>Ochotonoides</i> sp.   | Left M <sub>3</sub>                                  |                  |
| Udg 642       | <i>Ochotonoides complicidens</i>             | Right P <sub>3</sub>                                 |                  |
| Udg 643       | Rodentia                                     | Right lower incisor                                  | Small-sized form |
| Udg 644       | Rodentia                                     | Left lower incisor                                   | Small-sized form |

## Appendix 1. Continued.

| Specimen no.* | Identification                             | Part                                               | Remarks                                        |
|---------------|--------------------------------------------|----------------------------------------------------|------------------------------------------------|
| Udg 645**     | <i>Villanyia</i> sp.                       | Right M <sup>1</sup>                               | Pl. 7, fig. 5                                  |
| Udg 645**     | <i>Villanyia</i> sp.                       | Left M <sup>1</sup>                                | Pl. 7, fig. 6                                  |
| Udg 645**     | <i>Villanyia</i> sp.                       | Left M <sub>1</sub>                                | Pl. 7, fig. 7                                  |
| Udg 645**     | <i>Villanyia</i> sp.                       | Right M <sub>2</sub>                               | Pl. 7, fig. 8                                  |
| Udg 645**     | Rodentia                                   | Right lower incisor                                | Small-sized form                               |
| Udg 646       | Leporidae, gen. and sp. indet.             | Right mandible with P <sub>4</sub> –M <sub>2</sub> | Considerably smaller than <i>Hypolagus</i> sp. |
| Udg 647       | Leporidae, gen. and sp. indet.             | Right P <sup>2</sup>                               | Considerably smaller than <i>Hypolagus</i> sp. |
| Udg 648       | <i>Hypolagus</i> sp.                       | Right M <sup>2</sup>                               |                                                |
| Udg 649       | <i>Hypolagus</i> sp.                       | Right P <sup>4</sup> or M <sup>1</sup>             |                                                |
| Udg 650       | <i>Prosiphneus</i> cf. <i>praetingi</i>    | Right M <sub>1</sub>                               | Pl. 7, fig. 4                                  |
| Udg 651       | Indeterminate                              | ? Cheek teeth                                      | ? Small mammal                                 |
| Udg 652       | Rodentia                                   | Left lower incisor                                 | <i>Villanyia</i> size                          |
| Udg 653       | Rodentia                                   | Left lower incisor                                 | <i>Villanyia</i> size                          |
| Udg 654       | ? Lagomorpha                               | Proximal phalanx                                   |                                                |
| Udg 655       | ? Lagomorpha or Rodentia                   | Proximal phalanx                                   |                                                |
| Udg 656       | Indeterminate                              | Indeterminate                                      | Bone fragments                                 |
| Udg 657       | <i>Castor andessoni</i>                    | Left M <sup>3</sup>                                |                                                |
| Udg 658       | <i>Castor andessoni</i>                    | Right M <sup>3</sup>                               | Pl. 5, fig. 9                                  |
| Udg 2440      | <i>Castor andessoni</i>                    | Right M <sub>2</sub>                               |                                                |
| Udg 2441      | <i>Hypolagus</i> sp.                       | Right mandible with P <sub>4</sub> –M <sub>2</sub> | Otherwise numbered 99/283                      |
| Unnumbered    | Rodentia                                   | Left lower incisor                                 | Small-sized form                               |
| Unnumbered    | <i>Ochotonoides complicitens</i>           | Left P <sub>3</sub>                                | Pl. 1, fig. 5                                  |
| Unnumbered    | <i>Ochotona</i> or <i>Ochotonoides</i> sp. | Right M <sub>2</sub>                               |                                                |

## Lagomorphs and rodents from Udunga

**Appendix 2.** Measurements of the cheek teeth of *Ochotona* cf. *gromovi* in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sub>3</sub> |      | P <sub>4</sub> |      | M <sub>1</sub> |      | M <sub>3</sub> |      |
|--------------|----------------|------|----------------|------|----------------|------|----------------|------|
|              | L              | W    | L              | W    | L              | W    | L              | W    |
| Udg 562      | –              | –    | 1.71           | 1.85 | –              | –    | –              | –    |
| Udg 564      | –              | –    | –              | –    | 1.77           | 1.93 | –              | –    |
| Udg 565      | 1.71           | 1.69 | –              | –    | –              | –    | –              | –    |
| Udg 566      | –              | –    | –              | –    | –              | –    | 0.81           | 1.57 |

**Appendix 3.** Measurements of the cheek teeth of *Ochotona* sp. (larger form) in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sub>3</sub> |      | P <sub>4</sub> |      | M <sub>1</sub> |      |
|--------------|----------------|------|----------------|------|----------------|------|
|              | L              | W    | L              | W    | L              | W    |
| Udg 475      | 2.52 ±         | 2.49 | 2.43           | 2.71 | 2.63           | 2.88 |
| Udg 561      | 2.33           | 2.32 | –              | –    | –              | –    |

**Appendix 4.** Measurements of the lower cheek teeth of *Ochotonoides complicidens* in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sub>3</sub> |      | P <sub>4</sub> |      | M <sub>1</sub> |      | M <sub>2</sub> |      | M <sub>3</sub> |        |
|--------------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|--------|
|              | L              | W    | L              | W    | L              | W    | L              | W    | L              | W      |
| Udg 516      | 2.62           | 2.88 | –              | –    | –              | –    | –              | –    | –              | –      |
| Udg 523      | 2.80           | 2.75 | –              | –    | –              | –    | –              | –    | –              | –      |
| Udg 550      | 2.62           | 2.43 | –              | –    | –              | –    | –              | –    | –              | –      |
| Udg 563      | 2.39           | 2.45 | –              | –    | –              | –    | –              | –    | –              | –      |
| Udg 584      | 2.57           | 2.62 | 2.55           | 2.96 | 2.75           | 3.02 | 2.69           | 2.92 | 1.10 ±         | 1.58 ± |
| Udg 642      | 2.46           | 2.47 | –              | –    | –              | –    | –              | –    | –              | –      |
| Unnumbered   | 2.57           | 2.40 | –              | –    | –              | –    | –              | –    | –              | –      |

**Appendix 5.** Measurements of the upper cheek teeth of *Ochotona* or *Ochotonoides* sp. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sup>2</sup> |      | P <sup>3</sup> |        | P <sup>4</sup> or M <sup>1</sup> |      | M <sup>2</sup> |      |
|--------------|----------------|------|----------------|--------|----------------------------------|------|----------------|------|
|              | L              | W    | L              | W      | L                                | W    | L              | W    |
| Udg 487      | –              | –    | –              | –      | 2.01                             | 3.89 | –              | –    |
| Udg 489      | –              | –    | 1.92           | 4.23   | –                                | –    | –              | –    |
| Udg 490      | –              | –    | –              | –      | 2.18                             | 4.42 | –              | –    |
| Udg 491      | –              | –    | –              | –      | 2.25                             | 4.93 | –              | –    |
| Udg 492      | –              | –    | –              | –      | –                                | –    | 2.42           | 4.08 |
| Udg 499      | –              | –    | –              | –      | 2.34                             | 4.78 | –              | –    |
| Udg 512      | –              | –    | –              | –      | 2.21                             | 4.56 | –              | –    |
| Udg 513      | –              | –    | 1.88           | 4.13   | –                                | –    | –              | –    |
| Udg 514      | –              | –    | 1.90           | 4.02   | –                                | –    | –              | –    |
| Udg 515      | –              | –    | –              | –      | 2.19                             | 4.46 | –              | –    |
| Udg 519      | 1.31           | 2.50 | –              | –      | –                                | –    | –              | –    |
| Udg 520      | –              | –    | –              | –      | –                                | –    | 2.47           | 3.37 |
| Udg 522      | –              | –    | –              | –      | 2.13                             | –    | –              | –    |
| Udg 590      | –              | –    | 2.04           | 3.72 ± | –                                | –    | –              | –    |
| Udg 591      | –              | –    | –              | –      | 2.27                             | –    | –              | –    |

**Appendix 6.** Measurements of the lower cheek teeth of *Ochotona* or *Ochotonoides* sp. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sub>4</sub> |      | M <sub>1</sub> |      | M <sub>2</sub> |      | M <sub>3</sub> |      |
|--------------|----------------|------|----------------|------|----------------|------|----------------|------|
|              | L              | W    | L              | W    | L              | W    | L              | W    |
| Udg 473      | —              | —    | 2.55           | 3.08 | 2.60           | 2.94 | 1.19           | 2.01 |
| Udg 503      | 2.55           | 3.23 | —              | —    | —              | —    | —              | —    |
| Udg 505      | 2.47           | 2.76 | 2.86           | —    | —              | —    | —              | —    |
| Udg 518      | —              | —    | —              | —    | 2.63           | 2.78 | —              | —    |
| Udg 521      | 2.50           | 3.26 | —              | —    | —              | —    | —              | —    |
| Udg 525      | —              | —    | —              | —    | 2.58           | 2.66 | —              | —    |
| Udg 528      | —              | —    | —              | —    | 2.62           | —    | —              | —    |
| Udg 529      | —              | —    | —              | —    | —              | —    | 1.15           | 2.01 |
| Udg 535      | —              | —    | —              | —    | —              | —    | 1.17           | 2.00 |
| Udg 544      | 2.25           | 2.37 | 2.38           | 2.52 | 2.32           | —    | 1.03           | 1.77 |
| Udg 551      | 2.37           | 2.72 | —              | —    | —              | —    | —              | —    |
| Udg 552      | 2.30           | 2.66 | —              | —    | —              | —    | —              | —    |
| Udg 553      | —              | —    | —              | —    | 2.35           | 2.99 | —              | —    |
| Udg 554      | —              | —    | 2.36           | 3.30 | —              | —    | —              | —    |
| Udg 555      | —              | —    | 2.38           | 3.06 | —              | —    | —              | —    |
| Udg 585      | 2.38           | 2.98 | 2.59           | 2.88 | —              | —    | —              | —    |
| Udg 588      | —              | —    | —              | —    | —              | —    | 1.17           | 2.15 |
| Udg 595      | —              | —    | 2.59           | —    | —              | —    | —              | —    |
| Udg 596      | 2.40           | 2.85 | —              | —    | —              | —    | —              | —    |
| Udg 638      | 2.52           | 3.04 | 2.60           | 3.10 | 2.60           | 2.94 | —              | —    |
| Unnumbered   | —              | —    | —              | —    | 2.57           | 2.96 | —              | —    |

**Appendix 7.** Measurements of the upper cheek teeth of *Hypolagus* sp. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sup>2</sup> |      | P <sup>3</sup> |      | P <sup>4</sup> or M <sup>1</sup> |      | M <sup>2</sup> |   |
|--------------|----------------|------|----------------|------|----------------------------------|------|----------------|---|
|              | L              | W    | L              | W    | L                                | W    | L              | W |
| Udg 497      | —              | —    | —              | —    | 2.27                             | —    | —              | — |
| Udg 498      | —              | —    | —              | —    | 2.52                             | 4.30 | —              | — |
| Udg 500      | —              | —    | 2.14           | 4.12 | —                                | —    | —              | — |
| Udg 501      | —              | —    | —              | —    | 2.32                             | 4.24 | —              | — |
| Udg 547      | 1.60           | 3.10 | —              | —    | —                                | —    | —              | — |
| Udg 648      | —              | —    | —              | —    | —                                | —    | 2.13           | — |
| Udg 649      | —              | —    | —              | —    | 2.46                             | —    | —              | — |

**Appendix 8.** Measurements of the lower cheek teeth of *Hypolagus* sp. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sub>3</sub> |      | P <sub>4</sub> |      | M <sub>1</sub> |      | M <sub>2</sub> |      | M <sub>3</sub> |      |
|--------------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|              | L              | W    | L              | W    | L              | W    | L              | W    | L              | W    |
| Udg 474      | —              | —    | 2.99           | 3.66 | 3.10           | 3.47 | 3.21           | 3.51 | 2.00           | 1.87 |
| Udg 476      | 3.05           | 2.92 | 2.89           | 3.55 | 3.17           | 3.46 | 3.17           | 3.49 | —              | —    |
| Udg 502      | 3.17           | 2.94 | —              | —    | —              | —    | —              | —    | —              | —    |
| Udg 517      | 3.11           | 2.73 | —              | —    | —              | —    | —              | —    | —              | —    |
| Udg 524      | —              | —    | 3.08           | 3.61 | —              | —    | —              | —    | —              | —    |
| Udg 526      | —              | —    | 2.84           | 3.37 | —              | —    | —              | —    | —              | —    |
| Udg 527      | —              | —    | —              | —    | —              | —    | 2.82           | 3.34 | —              | —    |
| Udg 586      | —              | —    | 2.98           | 3.63 | —              | —    | —              | —    | —              | —    |
| Udg 592      | 3.06           | 3.43 | —              | —    | —              | —    | —              | —    | —              | —    |
| Udg 593      | —              | —    | —              | —    | —              | —    | 2.96           | 3.24 | —              | —    |
| Udg 594      | —              | —    | 2.96           | 3.29 | —              | —    | —              | —    | —              | —    |
| Udg 626      | —              | —    | 2.88           | 3.60 | —              | —    | —              | —    | —              | —    |
| Udg 2441     | —              | —    | 3.16           | 3.55 | 3.11           | 3.62 | 3.43           | 3.35 | —              | —    |

# Lagomorphs and rodents from Udunga

**Appendix 9.** Measurements of the cheek teeth of Leporidae, gen. and sp. indet. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 2.

| Specimen no. | P <sup>2</sup> |   | P <sup>4</sup> or M <sup>1</sup> |      | M <sup>2</sup> |   | P <sub>4</sub> |      | M <sub>1</sub> |       | M <sub>2</sub> |
|--------------|----------------|---|----------------------------------|------|----------------|---|----------------|------|----------------|-------|----------------|
|              | L              | W | L                                | W    | L              | W | L              | W    | L              | W     |                |
| Udg 545      | –              | – | 1.63                             | 2.79 | –              | – | –              | –    | –              | –     | –              |
| Udg 546      | –              | – | –                                | –    | 1.54           | – | –              | –    | –              | –     | –              |
| Udg 646      | –              | – | –                                | –    | –              | – | 1.97           | 2.14 | 1.90           | 2.22± | 1.83           |
| Udg 647      | 1.23           | – | –                                | –    | –              | – | –              | –    | –              | –     | –              |

**Appendix 10.** Measurements of the upper cheek teeth of *Castor anderssoni* in mm. L: length of crown, W: width of crown. For the measuring method see Figure 3.

| Specimen no. | P <sup>4</sup> |      | M <sup>1</sup> |     | M <sup>2</sup> |     | M <sup>3</sup> |     |
|--------------|----------------|------|----------------|-----|----------------|-----|----------------|-----|
|              | L              | W    | L              | W   | L              | W   | L              | W   |
| Udg 309      | 11.6           | 9.2  | –              | –   | –              | –   | –              | –   |
| Udg 328      | 11.9           | 11.0 | 9.1            | 8.9 | –              | –   | –              | –   |
| Udg 336      | 11.7           | 10.4 | –              | –   | –              | –   | –              | –   |
| Udg 363      | –              | –    | –              | –   | 8.8            | 8.8 | –              | –   |
| Udg 364      | –              | –    | –              | –   | –              | –   | –              | –   |
| Udg 402      | –              | –    | 9.3            | 8.7 | –              | –   | –              | –   |
| Udg 434      | –              | –    | –              | –   | 8.1            | 9.4 | –              | –   |
| Udg 658      | –              | –    | –              | –   | –              | –   | 8.0            | 7.8 |

**Appendix 11.** Measurements of the lower cheek teeth of *Castor anderssoni* in mm. L: length of crown, W: width of crown. For the measuring method see Figure 3.

| Specimen no. | P <sub>4</sub> |      | M <sub>1</sub> |      | M <sub>2</sub> |      | M <sub>3</sub> |     |
|--------------|----------------|------|----------------|------|----------------|------|----------------|-----|
|              | L              | W    | L              | W    | L              | W    | L              | W   |
| Udg 313      | –              | –    | –              | –    | 9.3            | 9.5  | –              | –   |
| Udg 320      | 11.8           | 9.4  | –              | –    | –              | –    | –              | –   |
| Udg 322      | –              | –    | –              | –    | –              | –    | 7.7            | 6.7 |
| Udg 335      | –              | –    | 10.4           | 10.2 | 10.7           | 10.0 | –              | –   |
| Udg 337      | –              | –    | 9.6            | 10.8 | –              | –    | –              | –   |
| Udg 346      | 10.6           | 9.3  | –              | –    | –              | –    | –              | –   |
| Udg 351      | 12.0           | 10.7 | 9.9            | 9.7  | 10.3           | 10.1 | 9.9            | 7.9 |
| Udg 352      | 11.8           | 9.6  | 9.2            | 9.5  | 9.5            | 9.7  | 9.6            | 7.8 |
| Udg 353      | 12.1           | 9.4  | 10.9           | 9.9  | 10.6           | 9.8  | 11.3           | 7.6 |
| Udg 354      | 12.2           | 10.5 | 10.9           | 10.8 | –              | –    | –              | –   |
| Udg 419      | –              | –    | –              | –    | 8.9            | 9.1  | –              | –   |
| Udg 426      | –              | –    | –              | –    | –              | –    | 8.5            | 7.1 |

**Appendix 12.** Measurements of the cheek teeth of *Prosiphneus* cf. *praetingi* in mm. L: length of crown, W: width of crown. For the measuring method see Figure 3.

| Specimen no. | M <sup>1</sup> |      | M <sup>2</sup> |      | M <sub>1</sub> |       | M <sub>2</sub> |      | M <sub>3</sub> |      |
|--------------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|
|              | L              | W    | L              | W    | L              | W     | L              | W    | L              | W    |
| Udg 536      | –              | –    | –              | –    | 4.00           | 2.50  | 3.10           | 2.56 | –              | –    |
| Udg 537      | –              | 2.20 | –              | –    | –              | –     | –              | –    | –              | –    |
| Udg 538      | –              | –    | 2.56           | 2.62 | –              | –     | –              | –    | –              | –    |
| Udg 568      | –              | –    | –              | –    | 3.48           | 1.86  | –              | –    | –              | –    |
| Udg 602      | –              | –    | –              | –    | 3.86           | 2.18  | 3.06           | 2.20 | –              | –    |
| Udg 603      | –              | –    | –              | –    | 3.23           | 1.97  | –              | –    | –              | –    |
| Udg 604      | –              | –    | –              | –    | –              | –     | –              | –    | 2.41           | 2.00 |
| Udg 605*     | –              | –    | –              | –    | 2.73           | 1.60  | –              | –    | –              | –    |
| Udg 606      | –              | –    | –              | –    | –              | –     | 2.91           | 2.15 | –              | –    |
| Udg 607      | –              | –    | –              | –    | 3.50           | 2.37  | –              | –    | –              | –    |
| Udg 608      | –              | –    | –              | –    | –              | –     | 2.96           | 2.51 | –              | –    |
| Udg 609*     | –              | –    | –              | –    | –              | 1.79± | –              | –    | –              | –    |
| Udg 650      | –              | –    | –              | –    | 3.96           | 2.26  | –              | –    | –              | –    |

**Appendix 13.** Measurements of the cheek teeth of *Villanyia* sp. in mm. L: length of crown, W: width of crown. For the measuring method see Figure 3.

| Specimen no. | <b>M<sup>1</sup></b> |          | <b>M<sub>1</sub></b> |          | <b>M<sub>2</sub></b> |          |
|--------------|----------------------|----------|----------------------|----------|----------------------|----------|
|              | <b>L</b>             | <b>W</b> | <b>L</b>             | <b>W</b> | <b>L</b>             | <b>W</b> |
| Udg 611      | –                    | –        | –                    | –        | 1.96                 | 1.27     |
| Udg 645      | –                    | –        | 2.45                 | 0.98     | –                    | –        |
| Udg 645      | 1.96                 | 1.12     | –                    | –        | –                    | –        |
| Udg 645      | 1.92                 | 1.07     | –                    | –        | –                    | –        |
| Udg 645      | –                    | –        | –                    | –        | 1.50                 | 0.85     |