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A new look at the taxonomic status of *Ochotona argentata* HOWELL, 1928

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Abstract. The Silver Pika, *Ochotona argentata,* inhabits a restricted area in the Helan Shan where it occupies rocky mountainous habitat (SMITH et al. 1990). It was originally described as a subspecies of the Altai pika (*Ochotona* [*Pika*] *alpina argentata*) from the Helan Shan in Ningxia (former northern Gansu) by HOWELL in 1928. Additional five specimens were collected by MA Yong in 1985-1987. Close study of these materials and the type specimens supports the hypothesis that this form is a distinct species (ERBAJEVA 1997). Subsequently, N. A. FORMOZOV gathered new specimens at the type locality (FORMOZOV 1997) and showed that *O. argentata* possesses the same number of chromosomes (2n = 38) as *O. pallasi* (BAKLUSHINSKAYA & FORMOZOV 1999; FORMOZOV et al. 2004). YU et al. (2000) and NIU et al. (2004) referred the pikas from the Helan Shan to *O. pallasi helanshanensis.* A comparative analysis of *O. argentata*, *O. alpina* and *O. pallasi* indicates that *O. argentata* differs from each of the last two species by its slightly larger size, by having silvery light gray winter and bright red summer pelage, by possessing a rather robust mandibular ramus and by other dental and skull morphological traits. Moreover, the chromosome number of *O. argentata* and *O. pallasi* contrasts with the diploid number in *O. alpina* (2n = 42).

Key words: *Ochotona argentata*, Ochotonidae, Lagomorpha, Mammalia, taxonomy, Helan-Shan, China.

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I. INTRODUCTION

The history of *Ochotona* begins in the late Miocene where its first occurrence is described from several localities of the Central Asia (SCHLOSSER 1924; QIU 1987; ERBAJEVA 2003). During the late Neogene and Quaternary periods several fossil representatives of this genus are known which are widely distributed in Eurasia and North America. The living species have a more reduced distribution, mainly in Asia, and in the easternmost parts of Europe, as well as north-western North America (GUREEV 1964; SMITH et al. 1990). During the history of *Ochotona* research different species and subspecies of living pikas have been described, however no single view on *Ochotona* taxonomy exists. According to different systematic studies, 12 to 30 living species of *Ochotona* are known (ARGYROPULO 1948; CORBET 1978; ELLERMANN & MORRISON-SCOTT 1951; ERBAJEVA 1997; GUREEV 1964; SMITH et al. 1990; SOKOLOV 1977; YU et al. 2000;. HOFFMANN and SMITH 2005.

During the last four decades several new species were discovered in Asia (*Ochotona himalayana* FENG, 1973; *O. iliensis* LI and MA, 1986; *O. muliensis* PEN and FENG, 1962; *O. gaoligongensis* WANG, GONG and DUAN, 1988) and some taxa were restored (*Ochotona nubrica* THOMAS, 1922; *O. cansus* LYON, 1907; *O. forresti* THOMAS, 1923, as well as *O. argentata* HOWELL, 1928). The latter species was previously referred to *O. alpina* (HOWELL 1928) and later to *O. pallasi* (YU et al. 2000; NIU et al. 2004).

The Silver Pika (*O. argentata*) was described for the first time as a subspecies of the Altai pika (*O.* [*Pika*] *alpina argentata*) from the Helan Shan in Ningxia (at that time, northern Gansu, at present Ningxia Autonomous region) (Fig. 1) (HOWELL 1928). YU et al. (2000) stated that "*Ochotona helanshanensis,* a recently described new species…*"* and recognized it as *O. pallasi helanshanensis.* The specimen used by YU et al. in their study (based probably on the collection number - "02") was apparently one of these animals collected by MA from the type locality of the Silver Pika in the Helan Shan range. At present its collection number is 30889.

Fig. 1. Localization of the Helan Shan where *Ochotona argentata* was described for the first time.

The karyological study (BAKLUSHINSKAYA & FORMOZOV 1999; FORMOZOV et al. 2004) revealed that *O. argentata* possesses the same number of chromosome (2n = 38) as *O. pallasi* GRAY, 1867. The present paper is based on a detailed study of the holotype specimens stored at the United States National Museum (Smithsonian Institution), Washington, and new material collected by MA that are kept at the Institute of Zoology, Beijing.

A c k n o w l e d g m e n t s. The present study would not have been possible without the help of many colleagues. We are especially grateful to the following persons for granting us permission to study the specimens and to discuss our results: L. MARCUS, R. TEDFORD, R. VOSS (AMNH, New York), R. HOFFMANN (USNM, Washington), A. SMITH (Arizona State University, Tempe), T. FENG (Institute Zoology, Beijing), ZHENG S. and LI Ch. (IVPP, Beijing). We thank Dr. Andrew T. SMITH (ASU, Tempe) for correcting our English and the anonymous reviewer for the important comments.

II. MATERIALS AND METHODS

The specimens here described belong to adult animals. Two specimens are stored in the collections of the U.S. National Museum (USNM); they are numbers 240726 (female) and 240727 (male).

Five specimens are housed in the collections of the Institute of Zoology, Beijing, China (IZB): they are numbers: 30890 (01 – previous number; male), 30889 (02; female), 30888 (87017; male), 30887 (0086; male), 30886 (0089; male).

Of these seven specimens, five were collected in May; they are in winter pelage at the beginning of the molting stage. Two specimens were captured at the end of August and beginning of September; these are in summer pelage.

Detailed comparative analyses of *O. argentata*, *O. alpina* and *O. pallasi* are provided on tooth and skull morphology, as well as on colour of pelage and karyology. The terminology used here to describe tooth and dental morphology is adapted from N. LOPEZ MARTINEZ (1989) and, in part, from ERBAJEVA (1988). The measurements have been taken from the occlusal surface of teeth, outside of the borders of enamel. These measurements indicate the maximum length (L) and width (W) of teeth and are given in millimeters.

A b b r e v i a t i o n s. USNM – United States National Museum, Washington, DC, USA; IZB – Institute of Zoology, Beijing, China; ZIN – Zoological Institute, Saint-Petersburg, Russia.

III. SYSTEMATIC STUDY

Order Lagomorpha BRANDT, 1855

Family Ochotonidae THOMAS, 1897

Genus *Ochotona* LINK, 1795

Ochotona argentata HOWELL, 1928

(Fig. 2 a-d, 3 a-c, 4 a-h, 5 a-k, 6 a-c, Tables I, II, III)

S y n o n y m y: 1928, HOWELL: *Ochotona (Pika) alpina argentata*, p. 116; 2000, YU et al.: *O. pallasi helanshanensis*, p. 88; 2004, NIU et al.: *O. pallasi helanshanensis*, p. 145.

H o l o t y p e: No. 240726. Female adult, skin, skull and skeleton, USNM.

T y p e l o c a l i t y: "15 miles north-northwest of Ninghsia, northern Kansu", China.

D i s t r i b u t i o n: Restricted to Helan Shan range, Ningxia, China.

D i a g n o s i s (emended): Large sized pika, winter pelage a paler silvery gray with yellowish tinge over the back very much reduced. Head paler, face and rump pronouncedly yellowish. Feet white above and grayish below. Summer pelage bright reddish-rufus over entire back and head, ears not reddish. P^2 wide with slightly sharp lingual border. Anteroconid of P_3 with straight antero-external and antero-internal borders.

D e s c r i p t i o n: Light silver gray hairs with black tips in winter pelage; hairs longer than summer rufus hairs. Because of the molting stage, winter-spring pelage is variable in color. Silver gray hairs alternate with rufus spots which are scarce in some specimens or numerous in others; a light brown stripe is visible on the neck, and a small bright rufus spot appears below the ears; underparts are dark silver gray. No white stripe along the border of ears. Summer pelage of sides slightly paler, underpart is light silver gray.

The skull (Fig. 2 a-d) is slightly convex. The nasals (Fig. 2 a, 3 a) are relatively long, on average they are around 30% of the total length of skull. The anterior part of nasals is significantly wider than posterior one, which ends in the line posterior to the anterior border of orbits. The latter are large and oval in shape. The interorbital region is broad and flat, and there are no fenestrae in the frontals. The parietals are slightly convex in the mid part and posteriorly they become flat. No crest on the parietals of most skulls, although, a crest is found in one specimen (30886). Anterior process of the jugal bone is well-developed; the posterior process is short. Incisive and palatal foramina are

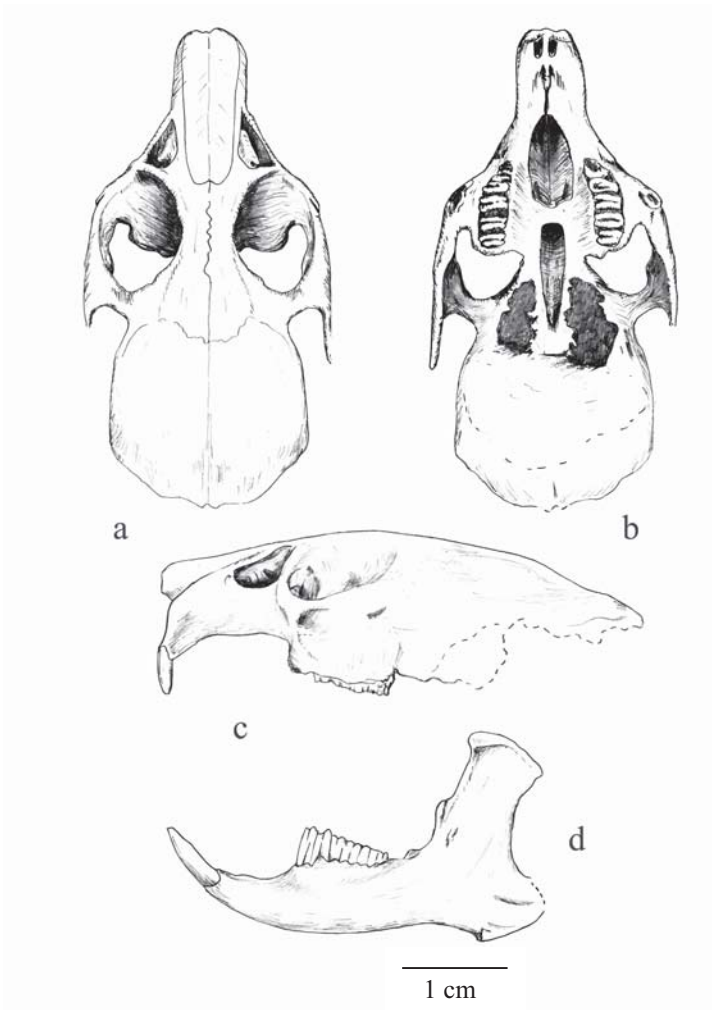

Fig. 2. Sketch of skull of *Ochotona argentata* HOWELL, 1928. a-d – 240726, (holotype, USNM); a – dorsal view of the skull, b – ventral view of the skull, c – labial view of the skull, d – labial view of the mandible.

separated by a bridge formed of premaxillae bones connected with the vomer. Palatal foramina are pear shaped; its length is variable, as well as the length of palatal bone. The bullae are relatively small.

Teeth. P^2 (Fig. 4 a, b). The teeth are much wider than long, with a deep paraflexus filled with thin cement and oriented postero-labially; the labial border is slightly rounded. The specimen 30889 is defective, its left P^2 is very small, without an anterior flexid (Fig. 4 g) and its right P^2 is completely absent. The P^3 (Fig. 4 a, b, g; 5 a, b, h, k) is trapezoidal in shape; its anterior width is much less than the posterior one; its hypostria is small, filled with thin cement. The P^4, M^1 and M^2 have deep hypostria filled with cement; the M^2 (Fig. 5 c) is characterized by the presence on its posterior lobe a well-developed posterolingual process directed posteriorly.

The mandible is relatively long, not robust; it is higher below the P_4 than the M_3 (Table I), the incisor extends to the end of the P_3, with the foramen mentale below the M_2. The ascending ramus is rather high, the coronoid process well-developed, the condylar process is wide in the anterior part

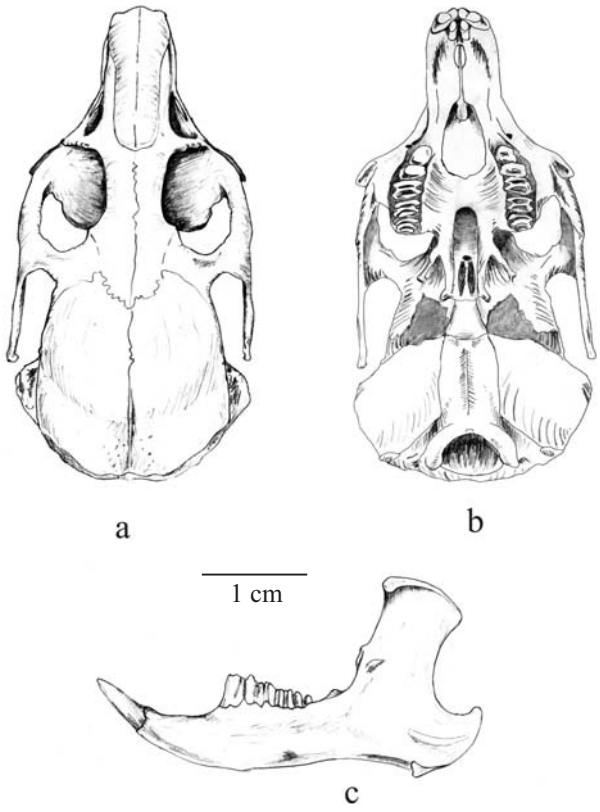

Fig. 3. Sketch of skull of *Ochotona argentata* HOWELL, 1928. a-c – 30886 (IZB); a – dorsal view of the skull, b – ventral view of the skull, c – labial view of the mandible.

and becomes narrower posteriorly. The angular process has visible ridges running along its ventral border with a well-developed ridge on its labial face (Fig. 2 d; 3 c).

The P_3 is large, consists of two conids, the confluence between which is very narrow in the holotype and other specimens (Fig. 4 c-f; Fig. 5 g, j) although weak in some (Fig. 5 d, e); however, in specimen 30890 it is very broad (Fig. 5 f, i). The anteroconid is large and rhomboid in shape; its anterior margin is relatively sharp or slightly rounded; the enamel band is thick on the edge of the tooth and becomes thinner towards the labial and lingual margins and is completely absent on its posterior borders. The posteroconid is wider than long except in the right P_3 in specimen 30889 (Fig. 4 f) which is defective due to the absense of an opposite upper P^2. The internal and external flexids of most P_3 teeth are almost the same depth and are filled with thick cement. The P_4-M_2 trigonid and talonid widths are variable. The trigonid of P_4 is slightly narrower than the talonid, while in contrast the M_2 talonid is slightly narrow.

C o m p a r i s o n: Because *Ochotona argentata* was first described as a subspecies of *O. alpina* and later referred to *O. pallasi*, we provide a comparison of these three species.

Ochotona argentata differs from both *O. alpina* and *O. pallasi* by the coloration of pelage. Its winter (spring) pelage is silvery gray in contrast to *O. alpina*, the winter pelage of which varies from

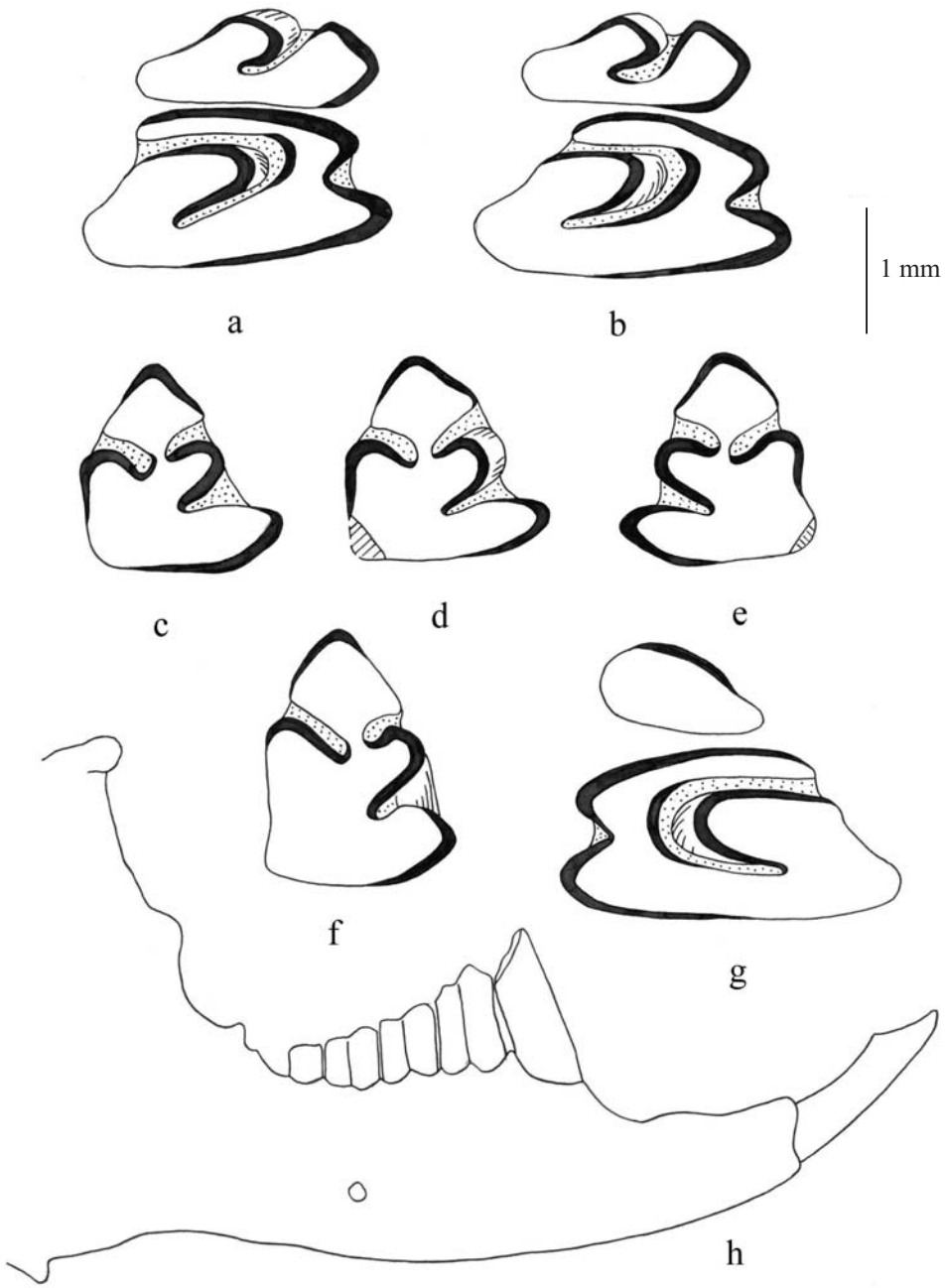

Fig. 4. The dentition and fragments of mandible of *Ochotona argentata* HOWELL, 1928. a, c – 240726 (holotype, USNM); b, d – 240727, (paratype, USNM); a, b – P^2-P^3 ; c, d – P_3; e-h – 30889 (IZB); e, f – P_3; g – P^2-P^3; h – right mandible with P_3-M_3 (not to scale).

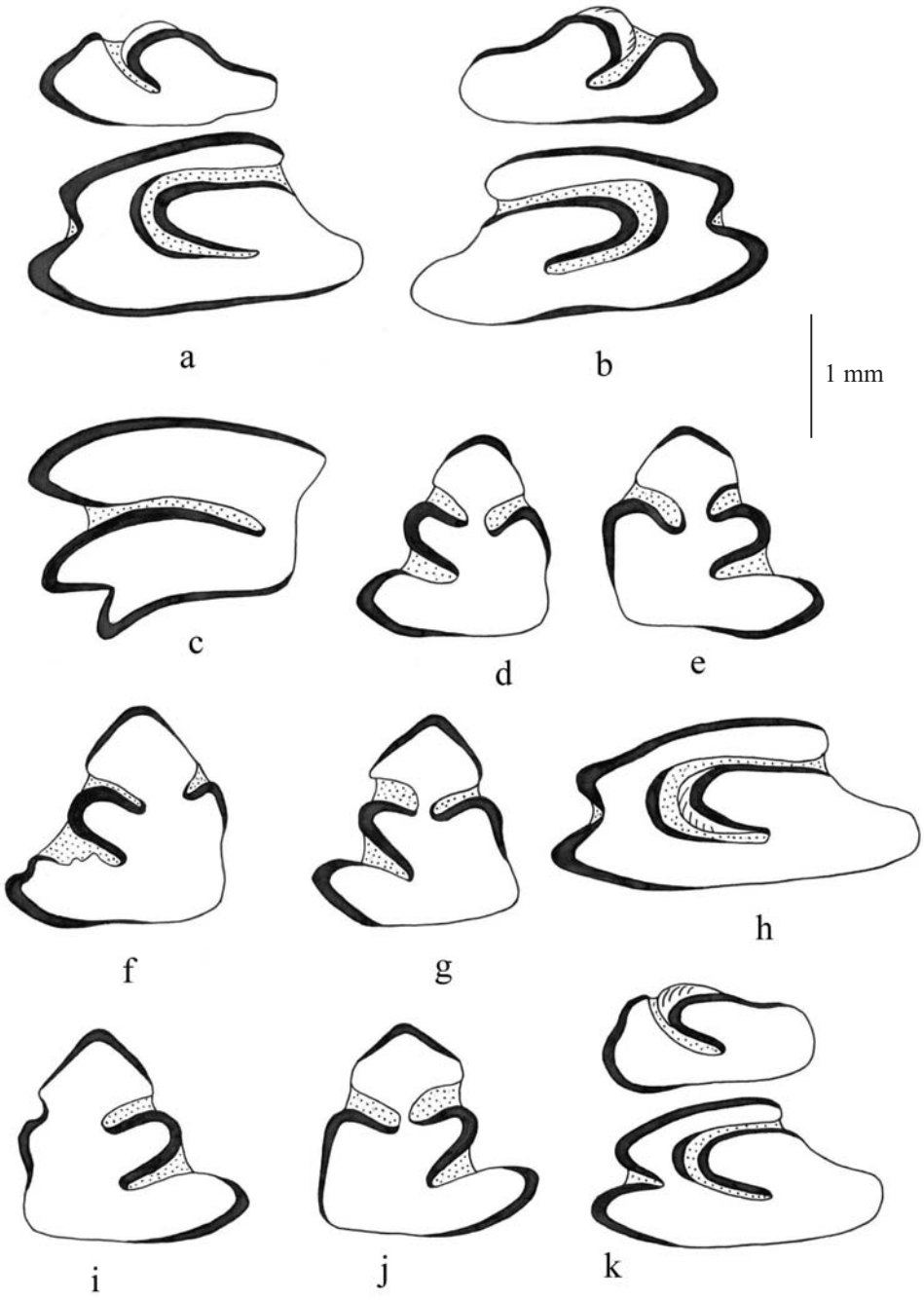

Fig. 5. The dentitions of *Ochotona argentata* HOWELL, 1928. a, c, f, i – 30890 (IZB); b, d, e, h – 30888 (IZB); g, j, k – 30886 (IZB); a, b, k – P^2-P^3; c – M^2; d-g, i, j – P_3; h – P^3.

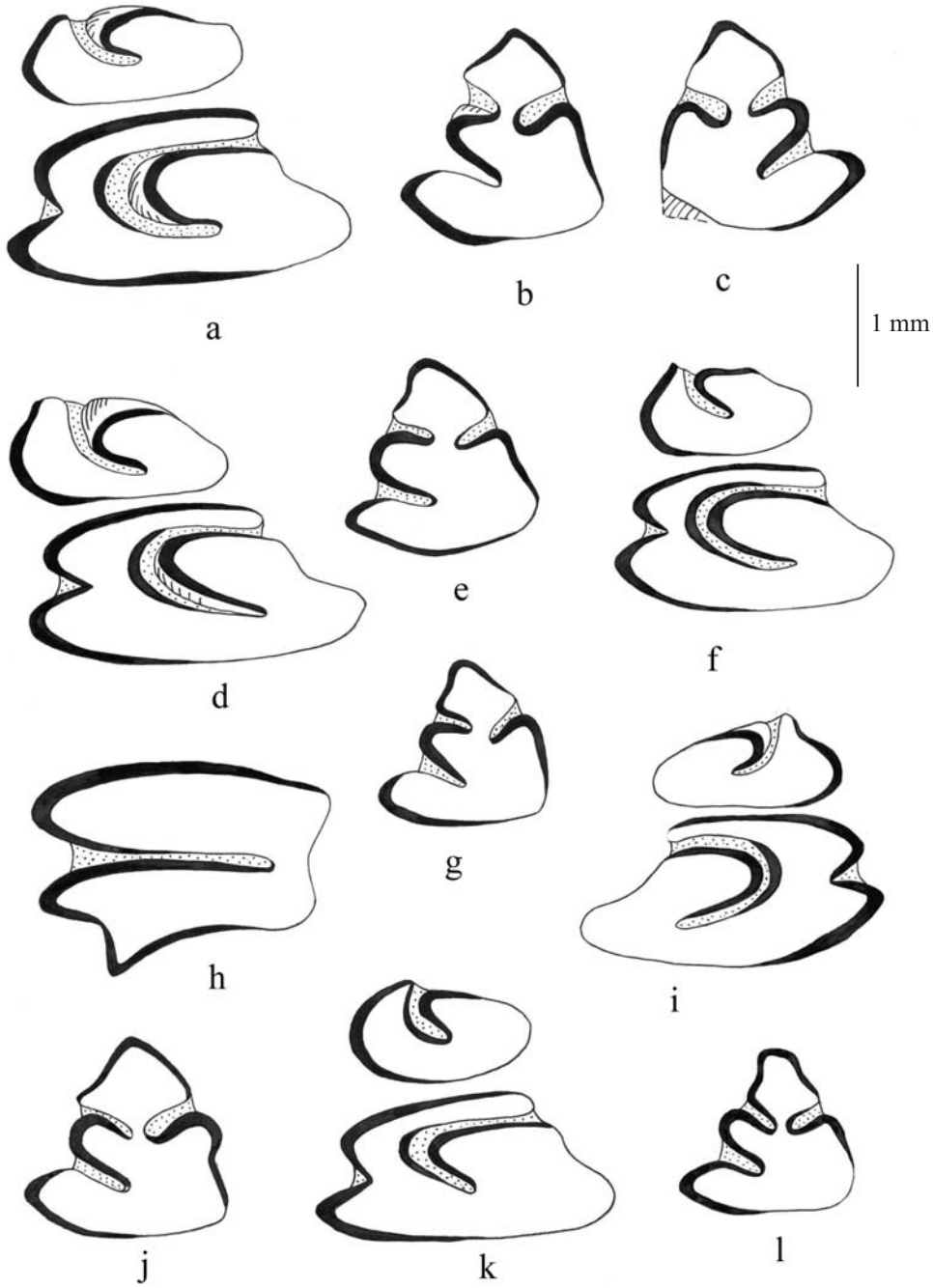

Fig. 6. The dentitions of *Ochotona argentata* HOWELL, 1928. a-c – 30887 (IZB); a – P^2-P^3; b, c – P_3. The dentitions of *Ochotona alpina alpina* PALLAS, 1773. (from terra typica) d – P^2-P^3; h – M^2; j – P_3. The dentitions of *Ochotona alpina changaica* OGNEV, 1940. e – 20220 (ZIN); f – 49777 (holotype, ZIN); e – P_3; f – P^2-P^3. The dentitions of *Ochotona alpina svatoshi* TUROV, 1924. g, i – 19833 (ZIN); g – P_3 (reversed); i – P^2-P^3. The dentitions of *Ochotona alpina scorodumovi* SCALON, 1935. k, l – 25009 (holotype, ZIN); k – P^2-P^3; l – P_3.

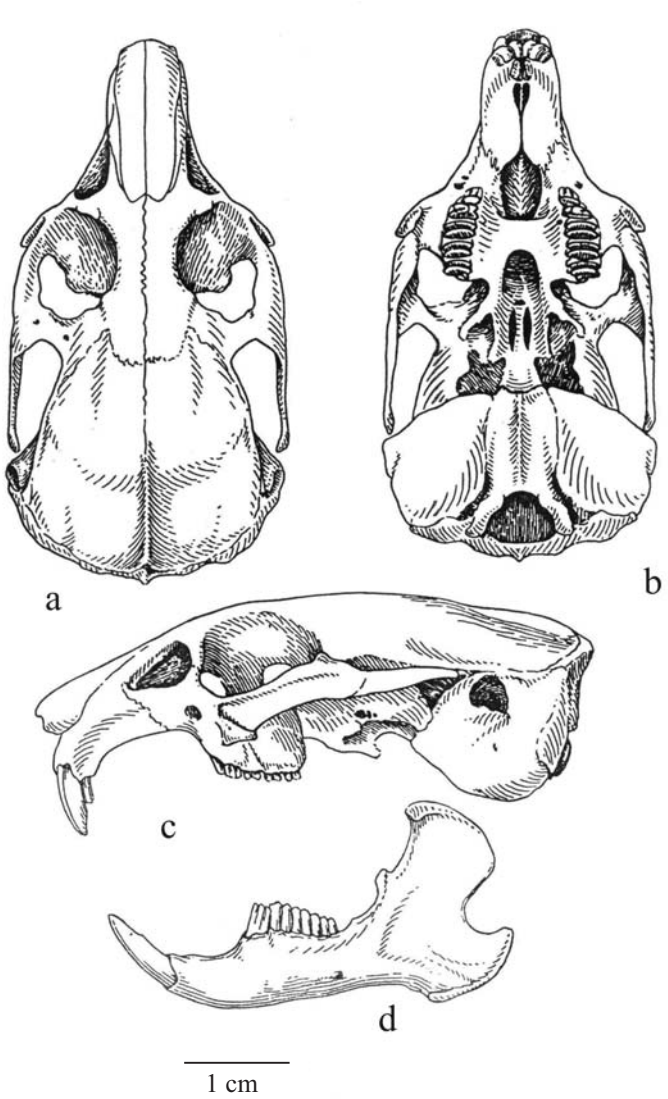

Fig. 7. Sketch of skull of *Ochotona alpina* PALLAS, 1773. a – dorsal view of the skull, b – ventral view of the skull, c – labial view of the skull; d – labial view of the mandible (after ERBAJEVA, 1988, fig. 29, p. 114).

a dark brown to pale ashy-gray with their underparts a dark gray with a rust coloration. They also differ in the summer pelage which is a much brighter rufus in pikas from the Helan Shan and ochre-brownish-yellowish in *O. alpina.* The winter pelage of *O. pallasi* is a bright straw-gray with a rusty tinge color, and the summer pelage varies from a drab sandy or dirty grayish to light grayish brown with a yellowish tinge.

On average *O. argentata* is larger than *O. alpina* and *O. pallasi*; its skull length varies from 45.5 to 50.2 mm, in *O. alpina* it ranges from 40.6 to 48.2 mm, and in *O. pallasi* from 37.7 to 47.0 mm (Table II). They differ as well by the length of the lower teeth row (Table I). These three species differ

Table I

Measurements of mandible and lower teeth (in mm) of *Ochotona argentata, O. alpina* and *O. pallasi* [M – mean, OR – observed range]

	O. argentata n = 7	*O. alpina* n = 60	*O. pallasi* n = 32
Alveolar length P_3-M_3	M 9.26±0.190 OR 9.0–9.6	M 8.37±0.612 OR 7.3–9.5	M 8.7±0.355 OR 7.8–9.5
Coronar length P_3-M_3	M 8.13±0.214 OR 7.8–8.4	M 7.15±0.517 OR 6.3–8.0	M 7.6±0.308 OR 6.6–8.0
Coronar length P_3-P_4	M 3.43±0.138 OR 3.2–3.6	M 3.03±0.259 OR 2.5–3.5	M 3.1±0.163 OR 2.7–3.4
Length P_3	M 1.69±0.190 OR 1.65–1.75	M 1.43±0.139 OR 1.25–1.7	M 1.5±0.095 OR 1.25–1.7
Anteroconid length	M 0.85±0.104 OR 0.75–1.0	M 0.67±0.101 OR 0.55–0.95	M 0.7±0.100 OR 0.5–0.9
Posteroconid length	M 1.0±0.035 OR 0.95–1.05	M 0.85±0.102 OR 0.6–1.0	M 0.9±0.083 OR 0.7–1.0
Anteroconid width	M 0.93±0.076 OR 0.85–1.0	M 0.78±0.109 OR 0.5–1.0	M 0.8±0.090 OR 0.6–1.0
Posteroconid width	M 1.7±0.065 OR 1.6–1.75	M 1.5±0.135 OR 1.3–1.85	M 1.6±0.123 OR 1.3–1.8
Diastema	M 6.53±0.198 OR 6.2–6.8	M 5.96±0.661 OR 4.8–7.5	M 5.7±0.633 OR 4.5–6.8
Mandible height at P_4	M 6.27±0.221 OR 6.0–6.6	M 5.33±0.529 OR 4.5–6.7	M 5.7±0.419 OR 4.2–6.4
Mandible height at M_3	M 5.73±0.125 OR 5.5–5.9	M 4.89±0.377 OR 4.3–6.0	M 5.3±0.363 OR 4.3–6.2
Mandible depth at P_4	M 3.66±0.190 OR 3.5–3.8	M 3.61±0.383 OR 2.8–4.8	M 4.0±0.249 OR 3.0–4.3
Mandible depth at M_3	M 3.3±0.153 OR 3.1–3.5	M 3.02±0.281 OR 2.6–3.8	M 3.1±0.163 OR 2.5–3.3

significantly by skull and tooth morphology. The interorbital region of *O. argentata* is wide, but on average it is much narrower than in *O. alpina* and much wider than in *O. pallasi* (Figs. 2 a; 3 a; 7 a; 9 a). The nasals of the Silver Pika are longer than in the other two species, however, the nasal width is close to that of the Altai Pika and much wider than found in *O. pallasi* (Table II). However, significant differences exist in the shape of their palatal foramina (Fig. 2 b; 3 b; 7 b; 9 b). In *O. argentata* it is long and pear shaped, in *O. alpina* it is short and egg shaped, and in *O. pallasi* the palatal foramina is a trapezoidal shape. Moreover, tooth (P^2, P^3, P_3) dimensions of *O. argentata* are on average larger

Table II

Measurements of upper teeth and skull (in mm) of *Ochotona argentata, O. alpina* and *O. pallasi* [M – mean, OR – observed range]

	O. argentata n = 7	*O. alpina* n = 60	*O. pallasi* n = 30
Alveolar length P^2-M^2	M 8.49±0.334 OR 8.0–8.9	M 7.88±0.572 OR 6.8–9.2	M 8.44±0.433 OR 7.5–9.2
Coronar length P^2-M^2	M 7.59±0.398 OR 7.0–8.1	M 6.88±0.501 OR 6.0–7.8	M 7.36±0.396 OR 6.5–8.0
Coronar length P^3-M^2	M 6.83±0.364 OR 6.2–7.2	M 6.18±0.462 OR 5.4–7.0	M 6.72±0.287 OR 5.9–7.3
Coronar length P^3-P^4	M 3.19±0.327 OR 2.8–3.9	M 2.76±0.218 OR 2.3–3.2	M 3.0±0.171 OR 2.6–3.2
Length P^2	M 0.79±0.049 OR 0.75–0.85	M 0.68±0.086 OR 0.5–0.85	M 0.73±0.052 OR 0.6–0.85
Width P^2	M 1.83±0.098 OR 1.75–2.0	M 1.52±0.195 OR 1.05–1.85	M 1.54±0.112 OR 1.25–1.8
Length P^3	M 1.31±0.061 OR 1.2–1.4	M 1.17±0.099 OR 0.9–1.35	M 1.25±0.075 OR 1.1–1.35
Width P^3	M 2.69±0.121 OR 2.5–2.85	M 2.47±0.203 OR 1.95–2.9	M 2.66±0.197 OR 2.15–3.0
Interorbital width	M 4.92±0.196 OR 4.64–5.18	M 5.19±0.501 OR 4.1–6.6	M 3.93±0.512 OR 3.0–4.84
Diastema	M 11.68±0.498 OR 10.7–12.0	M 10.67±1.264 OR 8.6–13.3	M 10.35±0.900 OR 8.3–12.0
Palate length	M 2.16±0.333 OR 1.8–2.8	M 2.15±0.345 OR 1.17–3.5	M 1.84±0.385 OR 1.08–2.76
Skull length	M 48.23±1.846 OR 45.51–50.22	M 44.88±2.275 OR 40.57–48.15	M 43.26±2.849 OR 37.76–46.96
Nasal length	M 15.64±0.544 OR 14.8–16.37	M 13.69±0.889 OR 12.27–15.12	M 14.37±1.415 OR 11.3–16.31
Nasal width anterior	M 5.76±0.205 OR 5.39–5.98	M 5.71±0.325 OR 5.13–6.18	M 5.19±0.407 OR 4.55–5.95
Nasal width posterior	M 3.93±0.086 OR 3.81–4.05	M 4.24±0.350 OR 3.73–4.97	M 3.06±0.308 OR 2.54–3.44
Jugal width	M 23.59±0.761 OR 22.25–24.35	M 22.01±0.672 OR 20.3–22.94	M 22.31±0.574 OR 21.54–23.41
Width between P^4	M 8.1±0.157 OR 8.0–8.43	M 7.53±0.311 OR 6.99–8.33	M 7.15±0.283 OR 6.76–7.65

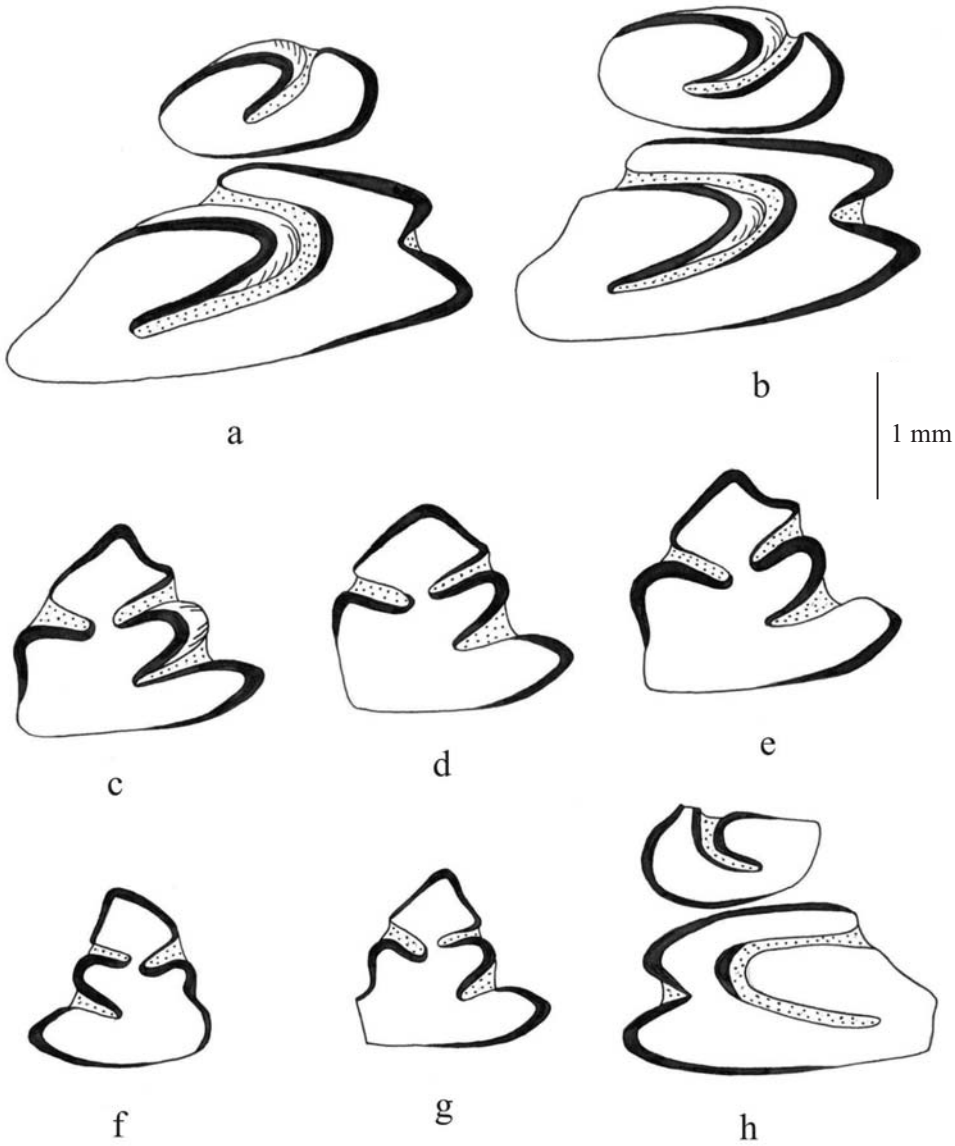

Fig. 8. The dentitions of *Ochotona pallasi pricei* THOMAS, 1911. a, d – 2939 (ZIN); b, e – 5-1900 (ZIN); c – 50332 (ZIN); a, b – P^2-P^3; c-e – P_3. The dentitions of *Ochotona pallasi pallasi* GRAY, 1867. f-h – 19987 (ZIN); f, g – P_3; h – P^2-P^3.

than in the other two species (Tables I, II). The P^2 of Pallas's and Altai pikas is oval in shape, with a rounded lingual margin that is significantly narrower than in the Silver Pika (Fig. 6 d; f, i, k; 8 a, b). These three species also differ by the length of lower diastema and the height of the mandible (Table I). The P_3 of the Silver Pika has straight anterior margins of the anteroconid, while the P_3 of *O. alpina* and *O. pallasi* have slightly concave antero-external borders.

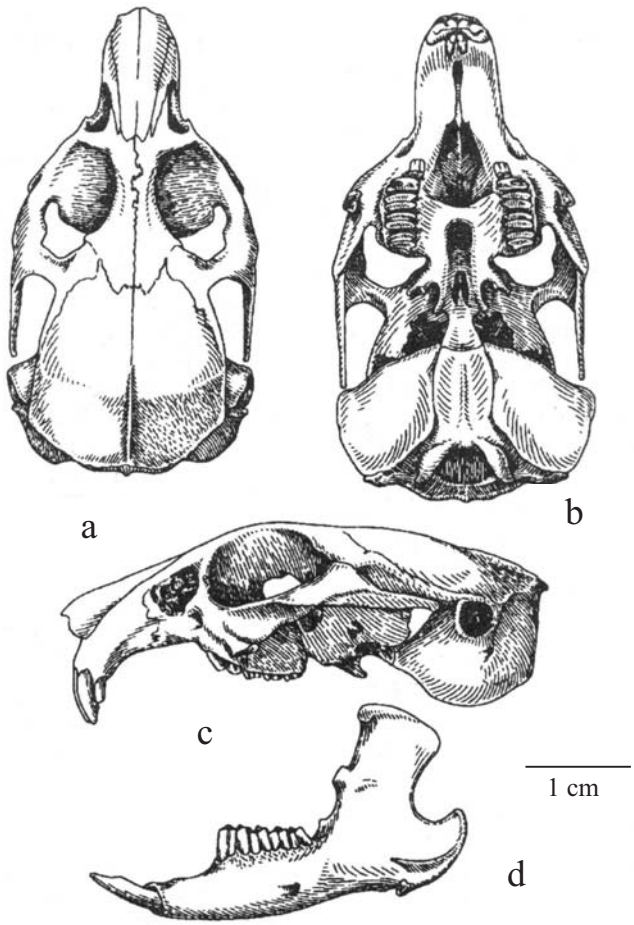

Fig. 9. Sketch of skull of *Ochotona pallasi* GRAY, 1867. (after GROMOV, ERBAJEVA, 1995, fig. 17, p. 46).

Some features of skull morphological structure that *O. argentata* and *O. alpina* have in common are probably the result of the adaptation of these pikas to similar habitats. They are both rock-dwelling species. In spite of the significant differences between *O. argentata* and *O. pallasi* in fur coloration and tooth and skull morphology, they are characterised by the same chromosome number (2n = 38), in contrast to *O. alpina* which has a 2n = 42 (BAKLUSHINSKAYA & FORMOZOV 1999). *Ochotona argentata* differs from other recent forms in its larger size, its peculiar pelage coloration, skull and tooth morphology, as well as by karyological characters.

IV. CONCLUSIONS

Our detailed comparative study of *Ochotona argentata, O. pallasi* and *O. alpina* shows conclusively that pikas from the Helan Shan differ significantly from the latter species by several characters and features. They also differ significantly from *O. pallasi*. The differences are given in Table III.

Table III

Main differences between *Ochotona argentata*, *O. alpina* and *O. pallasi*

Features	*O. argentata*	*O. alpina*	*O. pallasi*
Winter pelage	Silvery gray	Dark brown to pale ashy-gray	Bright straw-gray
Summer pelage	Bright rufus	Ochre-brownish-yellowish	Sandy grayish
Chromosome number	38	42	38
Skull length	45.5 - 50.2	40.6 – 48.2	37.8 – 47.0
Nasals	Long	Shorter	Relatively shorter
Posterior width of nasals	Relatively wide	Wide	Narrow
Interorbital width	Wide	Much wider	Much narrower

All data given above allow us to confirm the taxonomical status of *O. argentata* as an independent species inhabiting Central Asia.

REFERENCES

ARGYROPULO A. I. 1948. A review of Recent species of the family Lagomyidae LILLJEB., 1886 (Lagomorpha, Mammalia). *Trudy Zoolgicheskogo Instituta Akademii Nauk SSR (Proceedings of the Zoological Institute of the USSR*]. Leningrad, **7**: 124-128. (In Russian).

BAKLUSHINSKAYA I. Y., FORMOZOV N. A. 1999. New species of the 38-chromosomal pikas. [In:] Abstract of the VI Meeting of the Theriological Society of RAS. Moscow, p. 17. (In Russian).

CORBET G. B. 1978. The mammals of the Palaearctic region: a taxonomic review. British Museum (Natural History). London, pp. 65-74.

ELLERMANN J. R, MORRISON-SCOTT T. C. S. 1951. Checklist of Palaearctic and Indian mammals 1758-1946. British Museum (Natural History). London, pp. 419-456.

ERBAJEVA M. A. 1997. The history and systematics of the genus *Ochotona*. [In:] E. MARBOUTIN, J.-C. BERTOS (eds) – Proceeding of XIIth Lagomorph Workshop, Game and Wildlife. **17**(3): 505.

ERBAJEVA M. A. 1988. Pischukhi kainozoya (taxonomia, systematica, filogenia) [Cenozoic pikas taxonomy, systematics, phylogeny)]. – Nauka, Moscow. (In Russian).

ERBAJEVA M. A. 2003. Late Miocene ochotonids (Mammalia, Lagomorpha) from Central Mongolia. *Neues Jahrbuch für Geologie und Paläeontologie Monatshefte*, **4**: 212-222.

FORMOZOV N. A. 1997. Pikas (*Ochotona*) of the world: Systematics and Conservation. [In:] E. MARBOUTIN, J.-C. BERTOS (eds) – Proceeding of XIIth Lagomorph Workshop, Game and Wildlife. **17**(3): 506-507.

FORMOZOV N. A, BAKLUSHINSKAYA I. Yu., MA Y. 2004. Taxonomic status of the Helan-Shan pika, *Ochotona argentata*, from the Helan-Shan ridge (Ningxia, China). *Zoological Journal*, **83**(8): 995-1007. (In Russian).

GUREEV A. A. 1964. Fauna of the USSR, mammals. Lagomorpha. **3**, part 10. Nauka, Moscow-Leningrad. (In Russian).

HOFFMANN R. S., SMITH A. T. 2005. Lagomorpha. [In:] D. E. WISLON, D. M. REEDER (eds) – Mammal Species of the World, 3rd edition: A Taxonomic and Geographic Reference, John Hopkins University Press, pp. 185-211.

HOWELL A. B. 1928. New Asiatic mammals collected by F. R. WULSIN. *Proceedings of the Biological Society of Washington*, **41**: 115-120.

LOPEZ MARTINEZ N. 1989. Revision sistematica y biostratigrafica de los Lagomorpha (Mammalia) del Terciario y Cuaternario de Espana. *Memorias del Museo Paleontologico de la Universidad de Zaragoza*, **3**(3): 1-343.

NIU Y, WEI F., LI M., LIU X., FENG Z. 2004. Phylogeny of pikas (Lagomorpha, *Ochotona*) inferred from mitochondrial cytochrome *b* sequences. *Folia Zoologica*, **53** (2): 141-155.

QIU Z. H. 1987. The Neogene mammalian faunas of Ertemte and Harr Obo in Inner Mongolia (Nei Mongol), China. 6: Hares and pikas – Lagomorpha. Leporidae and Ochotonidae. *Senckenbergiana Lethaea*, **67**(5/6): 375-399.

SCHLOSSER M. 1924. Tertiary vertebrates from Mongolia. *Palaeontologica Sinica, C*, **1.** Beijing: 1-119.

SMITH A. T, FORMOZOV N. A., HOFFMANN R. S., ZHENG Ch., ERBAJEVA M. 1990. Pikas. [In:] J. A. CHAPMAN, J. E. C. FLUX (eds) – Rabbits, Hares and Pikas: Status Survey and Conservation Action Plan. IUCN, Gland, Switzerland, 14-60.

SOKOLOV V. E. 1977. Systematics of mammals. Order Lagomorpha, Rodentia. Vysshaya shkola Press, Moscow. (In Russian).

YU N., ZHENG CH., ZHANG Y.-P., LI W.-H. 2000. Molecular systematics of pikas (genus Ochotona) inferred from mitochondrial DNA sequences. *Molecular Phylogenetics and Evolution*, **16**(1): 85-95.