Acta zoologica cracoviensia, **48A**(1-2): 93-117, Kraków, 30 June, 2005

New data on Late Miocene – Pleistocene ochotonids (Ochotonidae, Lagomorpha) from North China

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Received: 12 Jan., 2005
Accepted for publication: 13 May, 2005

ERBAJEVA M. A., ZHENG Sh. 2005. New data on Late Miocene – Pleistocene ochotonids (Ochotonidae, Lagomorpha) from North China. *Acta zoologica cracoviensia*, **48A**(1-2): 93-117.

Abstract. Detailed study of ochotonids from the Late Miocene-Pleistocene of North China revealed more than fifteen ochotonid taxa. They include *Ochotona plicodenta* sp. nov., *O. gracilis* sp. nov., *O. lingtaica* sp. nov., *O. youngi* sp. nov., *O. magna* sp. nov., *O. zhangi* sp.nov., *O*. cf. *O. lagreli, O.* cf. *O. minor*, *O*. cf. *O. cansus, O.* aff. O. *tibetana*, *O*. aff. O. *bazarovi*, *O.* aff. O. *dodogolica*, *O*. aff. O. *intermedia*, *Ochotona* sp. (small), *O. complicidens* and *O. complicidens* near to *Ochotonoma*. Of these species, the former ten are the endemics to China and the other forms are widely-distributed in Asia. Evolutionary history of ochotonids is shortly discussed.

Key words: Late Miocene, Pliocene, Pleistocene, North China, Lagomorpha, *Ochotona*, systematics, evolution, history.

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I. INTRODUCTION

The Late Miocene-Pleistocene ochotonids from North China, including the genera *Ochotonoides* and *Ochotona*, have been extensively studied and are relatively well known (SCHLOSSER 1924; BOULE & TEILHARD DE CHARDIN 1928; TEILHARD DE CHARDIN & PIVETEAU 1930; TEILHARD DE CHARDIN & YOUNG 1931; JI et al. 1980; ZHENG 1982; ZHENG & LI 1982; CAI 1989; QIU 1987; QIU & STORCH 2000).

While we were reviewing all ochotonids from the Late Miocene-Pleistocene of North China we discovered many taxa which are either new species of the genus *Ochotona,* or new forms of ochotonid faunas of the region.

The specimens described in this paper were collected from Leijiahe sections, Wenwanggou, Lingtai County, Gansu Province (ZHANG & ZHENG 2000, 2001; ZHENG & ZHANG 2000, 2001), from Danangou sections, Yuxian County (ZHENG & CAI 1991; CAI et al. in press) and from the Majuangou Locality, Yangyuan County, Hebei Province (CAI & LI 2003), from the fissure-fillings of Sunjiashan, south of city Zibo, and Xiaoxishan Locality, both of Pingyi County, Shandong Province (ZHENG et al. 1997, 1998). All the materials are now stored at the Institute of Vertebrate Palaeontology and Palaeoanthropology, Chinese Academy of Sciences, Beijing.

From Leijiahe sections, 10 taxa, *Ochotona plicodenta* sp. nov., *O. lingtaica* sp. nov., *O. gracilis* sp. nov., *O. minor* BOHLIN, 1942, *O.* cf. *lagreli* SCHLOSSER, 1924, *O.* aff. *intermedia* ERBAJEVA, 1976, *O.* aff. *bazarovi* ERBAJEVA, 1983, *Ochotona* sp.(small), *Ochotonoides complicidens* TEILHARD DE CHARDIN & YOUNG, 1931 and *O. complicidens* near to *Ochotonoma* are recognized. Their distribution in Biozone I-VI (Late Miocene or Mammal units or zones 12-13 (MN12-13) to early Early Pleistocene, or MN17) are given in Table I.

In Danangou section, *Ochotona* sp.(small) is distributed in layers 1-26 (from Late Pliocene, or MN16 to Middle Pleistocene); *O. youngi* sp. nov. – in layers 4-23 (from early Early Pleistocene, or MN17 to Middle Pleistocene); *O.* cf. *youngi* sp. nov. in layers 13-15 (late Early Pleistocene); both *O. magna* sp. nov. and *O.* aff. *dodogolica* ERBAJEVA, 1966 in layer 15 (late Early Pleistocene); *O.* aff. *tibetana* MILNE-EDWARDS, 1871 in layer 18 (late Early Pleistocene) (Table II).

At Loc. Majuangou, there exist *O. youngi* sp. nov., *O.* aff. *intermedia* and *O. complicidens*. They can be estimated to place into the layer 5 of the Danangou section (early Early Pleistocene, or MN 17) (see Table II).

At Locs. 1 and 4 of Xiaoxishan (Middle Pleistocene), only *Ochotona zhangi* sp. nov. is recognized, but at Locs. 1 and 2 of Sunjiashan (MN17), both *O.* aff. *intermedia* and *O.* cf. c*ansus*, respectively are present. They can also be correlated with the Danangou section (see Table II).

Six new species, *O. plicodenta* sp. nov., *O. magna* sp. nov.,*O. lingtaica* sp. nov., *O. gracilis* sp. nov., *O. youngi* sp. nov., *O. zhangi* sp. nov., and two another species, one tentatively reffered to *O. cansus* and *O. complicidens* are described in this paper in detail. The other taxa need futher study and await the discovery of additional material.

To correlate the stratigraphic range of Chinese ochotonids with European continental stages we use the Neogene mammal units or zones (MN) initially proposed by MEIN (1975, 1989).

Tooth terminology used here primarily follows LOPEZ MARTINEZ (1989) but also ERBAJEVA (1988). Capital and lower-case letters, P/p (premolar) and M/m (molars) used in the tables indicate the upper and lower cheek teeth, respectively. Tooth-measurements were made on occlusal surface and are given millimeters as the length (L) and width (W) of the tooth. In the tables, the anteroconid and posteroconid are abbreviated as “ac” and “pc,” respectively.

A c k n o w l e d g m e n t s. We are grateful for assistance from our colleagues Professors ZHANG ZHAOQUN, LI CHUANKUI, QIU ZHUDING and WU WENYU in the field investigation and in the course of research work. We thank Alisa WINKLER, Southern Methodist University, Dallas for correction of our English. This study was supported by the project of National Natural Science Foundation of China (No.40472012) and partially by grant N 05-05-97212, Baikal-RFFI.

II. SYSTEMATIC PALEONTOLOGY

Order Lagomorpha BRANDT, 1855

Family Ochotonidae THOMAS, 1897

Subfamily Ochotoninae THOMAS, 1897

T y p e g e n u s: *Ochotona* LINK, 1795.

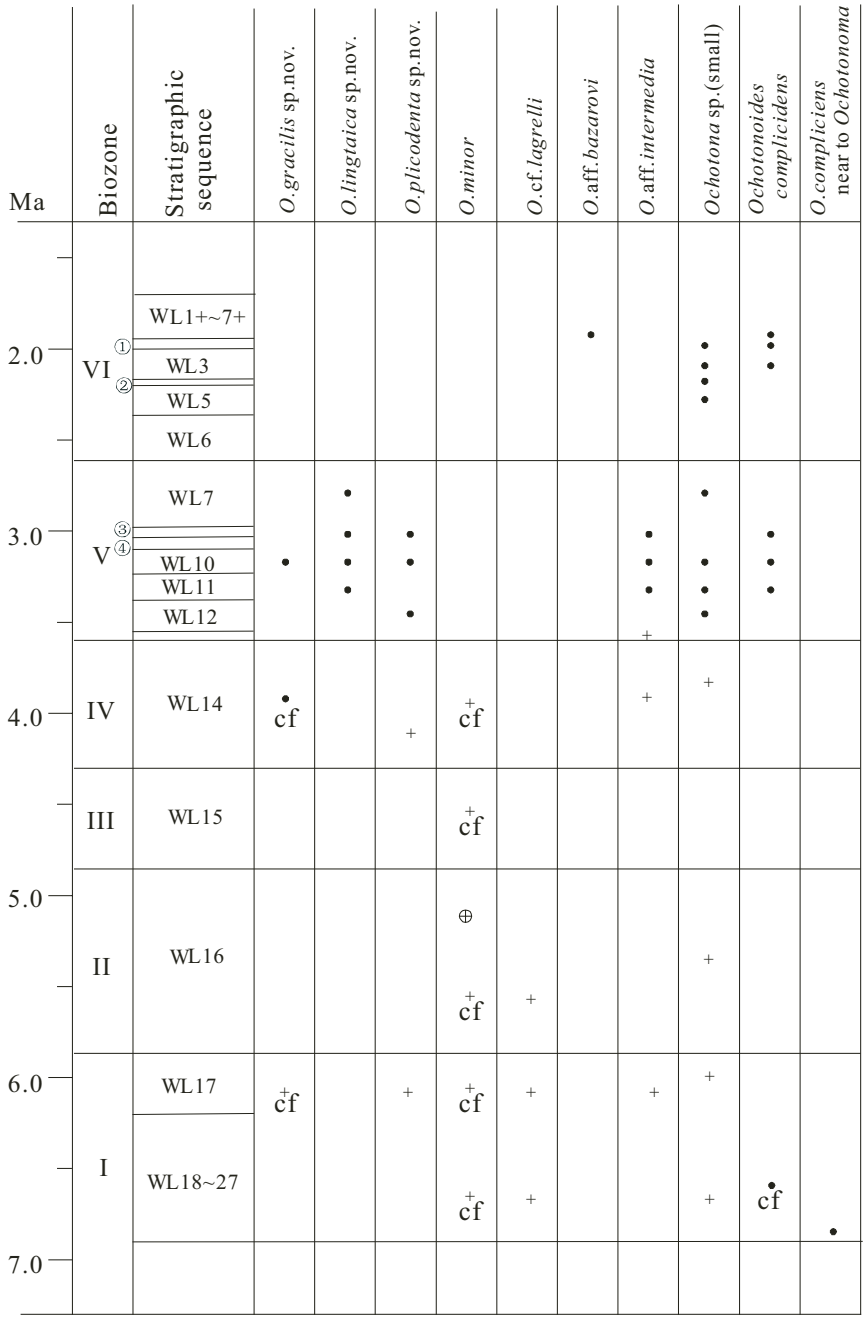
I n c l u d e d g e n e r a: *Marcuinomys* GROIZET, 1839, *Lagopsis* SCHLOSSER, 1884, *Proochotona* CHOMENKO, 1914, *Ochotonoides* TEILHARD DE CHARDIN and YOUNG, 1931, *Paludotona* DAWSON, 1959, *Alloptox* DAWSON, 1961, *Pliolagomys* ERBAJEVA, 1983, *Albertona* LOPEZ MARTINEZ, 1986, *Ochotonoma* SEN, 1998.

S t r a t i g r a p h i c r a n g e: Early Miocene to Recent.

G e o g r a p h i c d i s t r i b u t i o n: Eurasia, North America.

Table I

Stratigraphic distribution of the Ochotonids in Leijiahe sections, Lingtai



• Loc. 93001 section, + Loc. 72074 (3~4) section, ⊕ Loc. 93002 section; ①=WL1~2, ②=WL4, ③=WL8, ④=WL9; WL1+~WL27: stratigraphic sequence from top to bottom (after ZHENG & ZHANG 2001).

Table II

Stratigraphic distribution of the Ochotonids in Nihewan sections

	Stratigraphic sequence	Sample sequence	*O.youngi* sp.nov.	*O.*cf.*youngi* sp.nov.	*O.magna* sp.nov.	*O.zhangi sp.nov.*	*O.*aff. *tibetana*	*O.*aff.*intermedia*	*O.cf.cansus*	*O.*aff.*dodogolica*	*Ochotona* sp. (Small)	*Ochotonoides complicidens*
	27											
	26	L1									•	
	25	L2									•	
	24											
⑦			•									
	22	L4				⊕						
⑥												
⑤												
	19											
	18	L6~8	•				•				•	
④												
	16	L9~10	•								•	
	15	L11~14	•	•						•	•	
			•								•	
③				•	•							
	13	L15		•				○			•	
②												•
	11											
	10											
	9	L16	•									
	8											
①												
	6	L18	•									
	5		+					+	○			+
	4	L19	•									
	3	L20										
	2	L21										
	1	L22									•	

• Loc. Danangou section, + Loc. Majuangou, ⊕ Locs.1 and 4 of Xiaoxishan, ○ Loc.1 and Loc.2 of Sunjiashan; ①=7=L17, ②=12, ③=14, ④=17, ⑤=20=L5, ⑥=21, ⑦=23=L3; L1+~L27: stratigraphic sequence from bottom to top (after CAI et al. 2004).

Genus *Ochotona* LINK, 1795

Ochotona plicodenta sp. nov.

(Fig. 1a-g, Tables III, IV)

H o l o t y p e: Fragment of right mandibular ramus with p3-m2, lacking incisor, angular process and condyle, IVPP, V14182.

T y p e l o c a l i t y: Loc. 93001, Wenwanggou, Lingtai county, Gansu Province, level =WL8.

A g e: Late Pliocene (MN 16).

E t y m o l o g y: "plicodenta" – plication, denta - tooth.

H y p o d i g m: Loc. 93001: WL8: 1 left and 2 right P2, 1 left p3; WL10: 1 left P2, 2 left p3; WL12: 1 damaged right p3. Loc. 72074(4): L5: 1 damaged right p3.

M e a s u r e m e n t s: Holotype: crown length of p3-m2 7.0 mm; length and width of p3 1.8 x 1.7 mm.

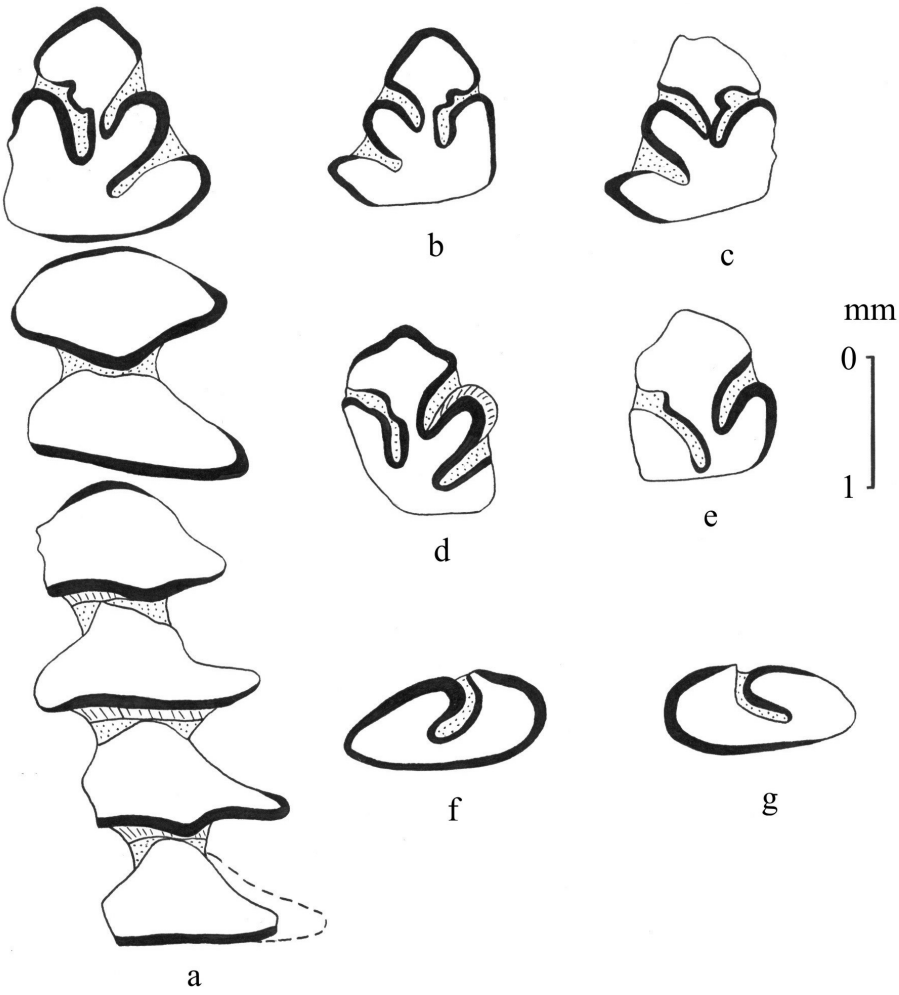


Fig. 1. *Ochotona plicodenta* sp. nov. a – p3-m2 dex., holotype; b, c – p3 sin.; d, e – p3 dex.; f – P2 dex.; g – P2 sin.

Table III

Measurements (in mm) of *Ochotona plicodenta* sp. nov. (upper teeth); L – length; W – width

		n	Mean	Min	Max	SD
P2	L	2	0.7	0.7	0.75	
	W	2	1.6	1.5	1.6	
P3	L	7	1.1	0.95	1.35	0.138
	W	6	2.1	1.9	2.3	0.126
M2	L	5	1.2	1.1	1.3	0.084
	W	5	1.9	1.8	2	0.084

Table IV

Measurements (in mm) of *Ochotona plicodenta* sp. nov. (lower teeth); L – length; W – width

	n	Mean	Min	Max	SD
Alveolar L of p3-m2	1	7.8			
Crown L of p3-m2	1	7			
Crown L of p4-m2	1	5.4			
p3 L	5	1.5	1.35	1.8	0.175
ac L	5	1	0.9	1.25	0.152
pc L internally	5	0.96	0.85	1.15	0.124
pc L externally	5	0.84	0.7	1.05	0.177
ac W	5	0.8	0.7	0.9	0.076
pc W	4	1.4	1.25	1.7	0.210
Mandible ramus depth at p4	1	3.25			

D i a g n o s i s: Medium-sized pika (Tables III, IV). Lower third premolar with anterointernal and posteroexternal flexids deeper than anteroexternal ones; anteroconid rhomboid type with rather sharp anterior end covered by enamel and plicated posterointernal border.

D i f f e r e n t i a l d i a g n o s i s: *Ochotona plicodenta* sp. nov. differs from all known extinct and extant species of the genus *Ochotona* by having a plicated anterointernal flexid on p3. Moreover it differs from *O. gracilis* sp. nov., *O. lingtaica* sp. nov., *O. youngi* sp. nov., *O. intermedi*a, *O. bazarovi*, *O. dodogolica*, *O. gureevi* (ERBAJEVA, 1966), *O. sibirica* (ERBAJEVA, 1983) by its larger size. *Ochotona plicodenta* sp. nov. differs from *O. zhangi* sp.nov., *O. nihewanica* QIU, 1985, *O. tologoica* HABAEVA, 1958, *O. gromovi* ERBAJEVA, 1976 and *O. zazhigini* ERBAJEVA, 1983 by having a deep anterointernal flexid of p3. It is slightly smaller in size than *O. magna* sp. nov.

D e s c r i p t i o n: The occlusal outline of P2 is oval with one deep cement-filled anterior flexus in the midline of the tooth (Fig. 1, 6-7). The tooth is longer internally than externally. The mandibular ramus is rather robust, with its external surface is rough and unequal, because of damaged by post-depositional diagenetic processes. The lower incisor extends posteriorly along the ventral border of a mandible in a line below p4. The lower third premolar is longer than wide with a large and long anteroconid. The anteroconid has a narrow confluence with posteroconid in the holotype and in some paratypes, however in some specimens of paratypes conids are completely separated from posteroconid (Fig. 1a-e). The internal and external borders of the posteroconid are comparable in length. The anterointernal flexid is deeper than anteroexternal one and directed posteriorly, whereas the anteroexternal flexid directed posterointernally.

Ochotona magna sp. nov.

(Fig. 2a-d, Table V)

H o l o t y p e: Right p3, IVPP, V14183.
T y p e l o c a l i t y: Loc. Danangou, Yuxian County, Hebei Province, layer = L15.
A g e: Late Early Pleistocene (late Nihewanian, or MN17).
E t y m o l o g y: "magna" - large.
H y p o d i g m: Two right p3 from Loc. Danangou: layer = L15.

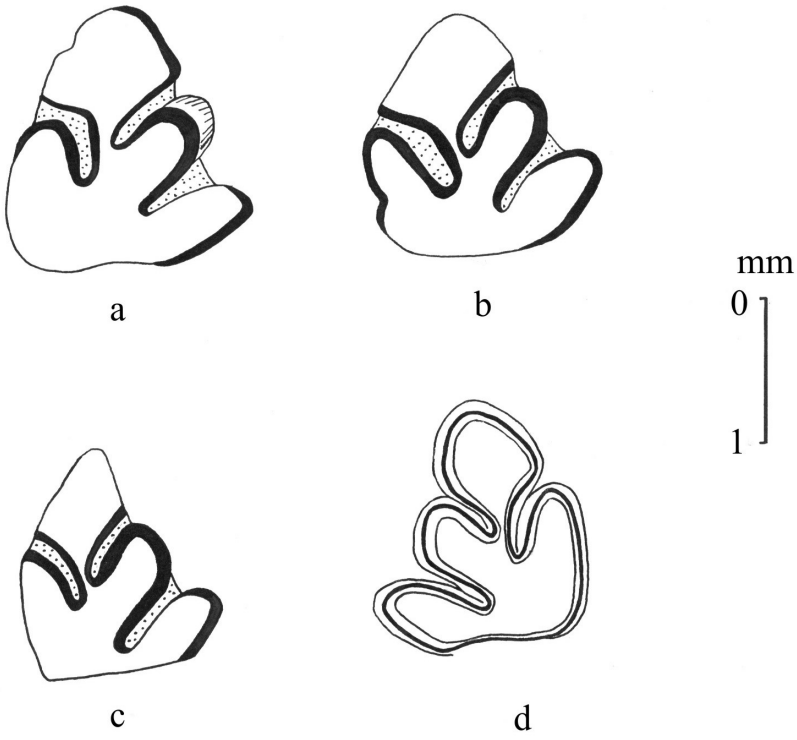


Fig. 2. *Ochotona magna* sp. nov. a – p3 dex., holotype; b – p3 dex.; c, d – p3 dex.: c – occlusal view, d - bottom view.

Table V

Measurements (in mm) of *Ochotona magna* sp. nov. (lower teeth); L – length; W – width

	n	Mean	Min	Max	SD
p3 L	3	1.8	1.75	1.85	0.05
ac L	3	1.25	1.2	1.3	0.05
pc L internally	3	1.0	0.95	1.05	0.076
pc L externally	3	1.1	1.05	1.15	0.05
ac W	3	0.82	0.7	0.95	0.126
pc W	3	1.63	1.5	1.8	0.153

M e a s u r e m e n t s. Holotype: length and width of p3 1.85 x 1.8 mm.

D i a g n o s i s: Large-sized (Table V). Lower third premolar with robust rhomboid anteroconid, deep anterointernal flexid extending posterointernally, the posteroconid wider than long, and posteroexternal loop relatively short.

D i f f e r e n t i a l d i a g n o s i s: *Ochotona magna* sp. nov. is close to *O. plicodenta* sp. nov., *O. zasuchini* ERBAJEVA, 1983, *O. zazhigini* and *O. gromovi* in size, but differs from the latter three species by having a deeper anterointernal flexid. It differs especially from *O. plicodenta* sp. nov. by absence of a plication in the anterointernal flexid. *O. magna* sp. nov. is larger than *O. gracilis* sp. nov., *O. youngi* sp. nov., *O. lingtaica* sp. nov., *O. zhangi* sp. nov.and *O. nihewanica.* Moreover, *O. magna* sp. nov. differs from all of them by its p3 having a deeper anterointernal flexid, and a relatively short and wide posteroconid. It is larger than all extant species and has a more robust rhomboid anteroconid.

D e s c r i p t i o n: The anteroconid of p3 is very large and has a narrower confluence with posteroconid, which is shorter than wide. The enamel is rather thick on the labial border and absent on the posterior border of the tooth. All flexids on p3 are of similar depth and filled with thin cement. The anterointernal flexid in the holotype extends first transversely and then turns suddenly posteriorly; it is directed posteroexternally in the other specimens (Fig. 2a-d).

Ochotona youngi sp. nov.

(Fig. 3a-h, 4a-u, 8r-u, Tables VI, VII)

H o l o t y p e: Right p3, IVPP, V14184.

T y p e l o c a l i t y: Loc. Danangou, Yuxian County, Hebei Province, layer = L15.

A g e: Early Early Pleistocene (MN17) – Middle Pleistocene.

E t y m o l o g y: For the Prof. C.C.YOUNG - a well-known paleontologist.

H y p o d i g m: Locality Danangou: L23: 1 left p3; L18: 2 P3, 2 M2, 8 p3; L16: 1 M2, 1 p3; L15: 5 fragments of skull with different numbers of tooth, 15 fragments of lower jaw with different numbers of teeth, 14 P2, 22 P3, 21 M2, 25 p3; L9: 2 P2, 8 P3, 3 P4, 8 M1, 3 M2, 2 p3; L6: 2 M2, 1 p3; L4: 1 p3; Loc. Majuangou: 1 P2, 5 P3, 3 P4, 5 M1, 6 M2, 2 p3.

M e a s u r e m e n t s: Holotype: length and width p3 1.3 x 1.55 mm.

D i a g n o s i s: Small-sized pika (Tables VI, VII). Lower third premolar with a rectangular anteroconid consisting of short anteroexternal and posterointernal borders, and longer anterointernal and posteroexternal borders; an asymmetric posteroconind which is wider than long and longer external compared to internal borders; all flexids of equal depth.

D i f f e r e n t i a l d i a g n o s i s: By its smaller size *Ochotona youngi* sp. nov. differs from *O. magna* sp. nov., *O. zhangi* sp. nov. and *O. plicodenta* sp. nov. Other than size, the main difference with *O. plicodenta* sp. nov. is the absence of plication on the anterointernal flexid of p3. Differs from *O. magna* sp. nov., *O. lingtaica* sp. nov., *O. zhangi* sp. nov. and *O. gracilis* sp. nov. in its asymmetric posteroconid; from *O. youngi* sp. nov. in its rhomboid posteroconid.

O. youngi sp. nov. differs from the other extinct and extant larger species of *Ochotona*, *O. lagreli, O. gromovi, O. tologoica, O. nihewanica, O. zazhigini, O. zasuchini, O. guizhongensis* JI, XU & HUANG, 1980,*O whartoni* GUTHRIE & MATTHEWS, 1971, *O. koslovi* BUECHNER, 1894, *O. rutila* SEVERTZOV, 1873, *O. ladacensis* GUENTHER, 1875, and *O. alpina* PALLAS, 1773 by its smaller size. Compared to the smaller species, *O. minor, O. bazarovi, O. gureevi, O. sibirica, O. hyperborea* PALLAS, 1811, *O. thomasi* ARGYROPULO, 1948, *O. pusilla* PALLAS, 1769, and pikas of the "*tibetana*" group it is larger in size, has a more rectangular anteroconid, and a wider posteroconid, which is completely separated from or has a narrow confluence with the anteroconid on p3.

D e s c r i t p i o n: P2 is wider than long and the lingual border is longer than the external one. The anterior flexus is filled with thin cement and extends posteroexternally close to the posterior border of the tooth. The posterior border is almost straight in contrast to the convex anterior bor-

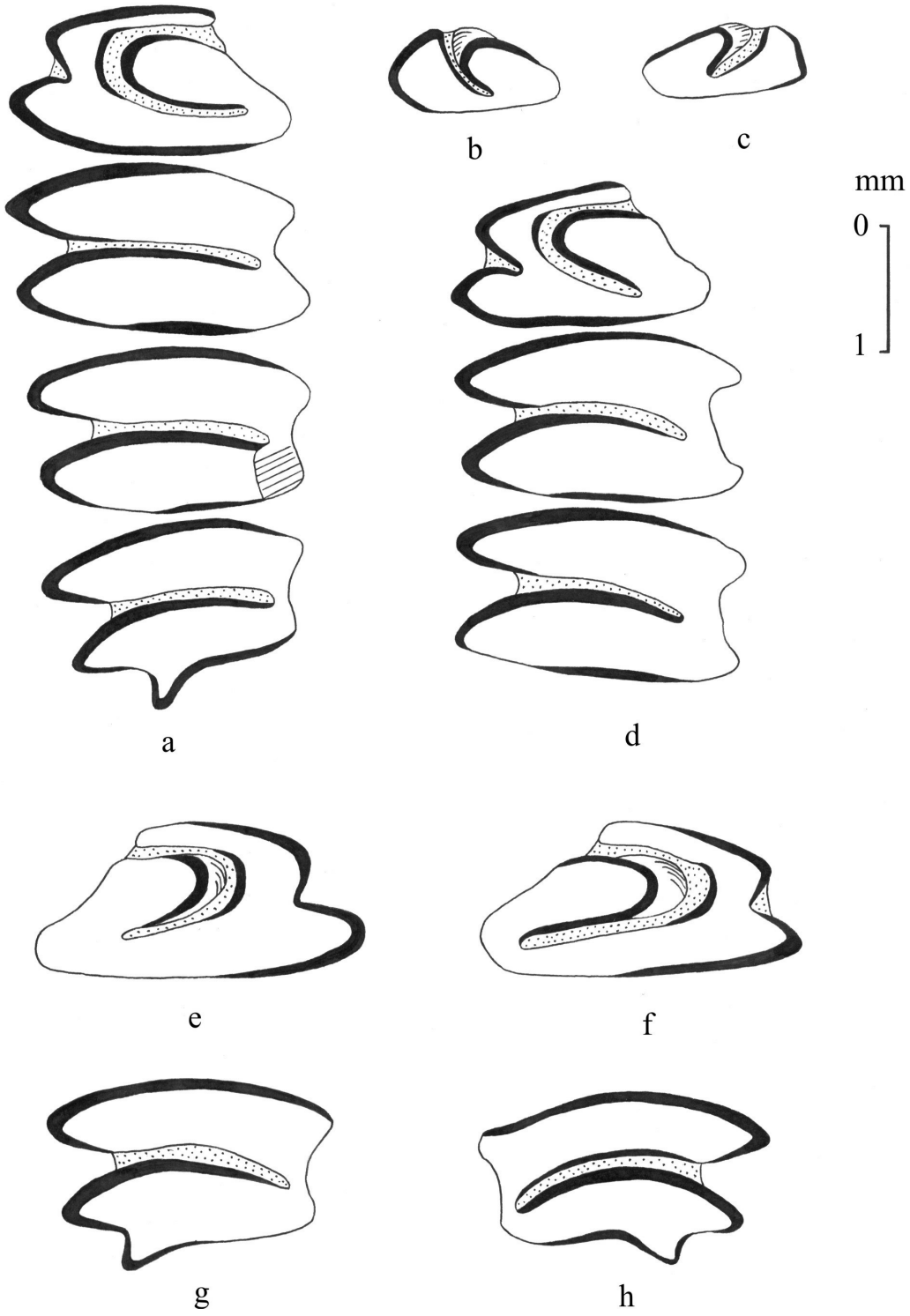


Fig. 3. *Ochotona youngi* sp. nov. a – P3-M2 sin.; b – P2 sin.; c – P2 dex; d – P3-M1 sin.; e, f – P3 dex.; g – M2 sin.; h – M2 dex.

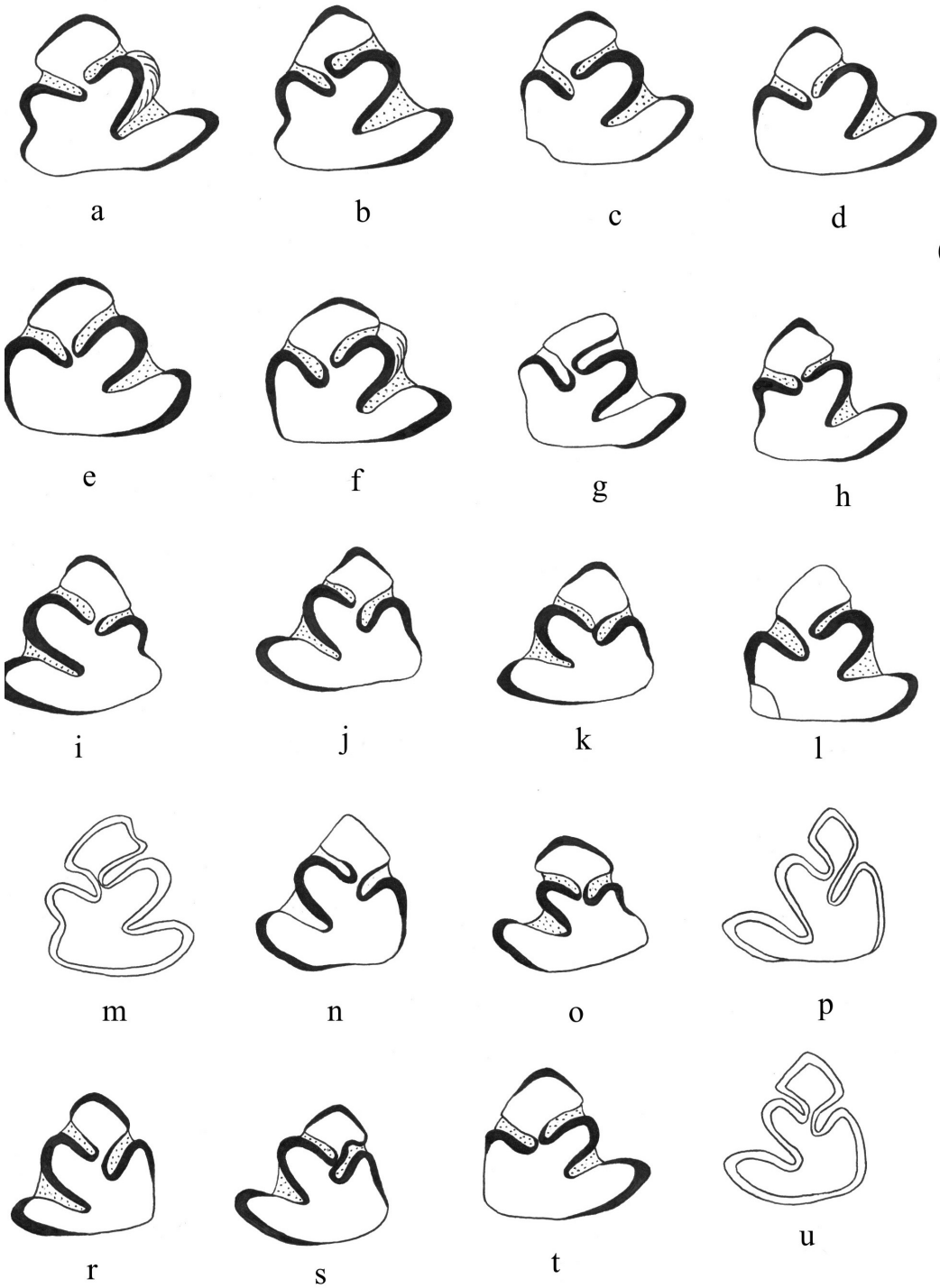


Fig. 4. *Ochotona youngi* sp. nov. a – p3 dex., holotype; b-h – p3 dex., j, k, n, o, r, s – p3 sin.; i, m – p3 sin.: i – occlusal view, m – bottom view; l, p – p3 dex.: l – occlusal view, p – bottom view; t, u – p3 dex.: t – occlusal view, u – bottom view.

Table VI

Measurements (in mm) of *Ochotona youngi* sp. nov. (upper cheek teeth); L – length; W – width

		n	Mean	Min	Max	SD
Alveolar L of P2-M2		2	7.3	6.8	7.8	
Alveolar L of P3-M2		2	5.75	5	6.5	
Crown L of P3-M2		1	6.1			
Crown L of P3-M1		1	4.5			
Crown L of P3-P4		2	2.7	2.4	3	
Crown L of P4-M1		2	3			
P2	L	2	0.5			
	W	2	1.12	1.1	1.15	
P3	L	30	1.04	0.9	1.2	0.090
	W	30	2.11	1.7	2.5	0.214
M2	L	21	1.39	1.15	1.7	0.122
	W	21	2.01	1.6	2.6	0.254

Table VII

Measurements (in mm) of *Ochotona youngi* sp. nov. (lower cheek teeth); L – length; W – width

	n	Mean	Min	Max	SD
Alveolar L of p3-m3	8	7.48	6.8	8	0.417
Alveolar L of p3-m2	12	6.47	6	7	0.345
Crown L of p3-m2	1	5.7			
Crown L of p3-p4	1	2.7			
Crown L of p4-m3	4	5.2	5	5.3	0.126
Crown L of p4-m2	12	4.68	4.2	5.2	0.319
p3 L	34	1.15	0.95	1.35	0.101
ac L	34	0.65	0.5	0.85	0.092
pc L internally	34	0.70	0.6	0.8	0.057
pc L extenally	34	0.83	0.7	1	0.075
ac W	34	0.55	0.4	0.7	0.069
pc W	34	1.30	1	1.55	0.133

der (Fig. 3b-c). P3 is trapezoidal in shape and has a short anterior and a long posterior border. Its short hypostria filled with thin cement (Fig. 4, 1-20; Fig. 9, 17-20). P4-M2 have deep hypostria filled with cement (Fig. 3a, d-h).

The mandibular ramus is slender (Table VII) and the diastema is relatively short. The lower incisor extends posteriorly along the ventral border to the root end under p4, where it forms a visible tubercle on lingual side of the ramus. The anterior mental foramen is situated below p3 and the posterior one is below m3.

Ochotona lingtaica sp. nov.

(Fig. 5a-l, Tables VIII, IX)

H o l o t y p e: Right p3, IVPP, V14185.

T y p e l o c a l i t y: Loc. 93001 , Wenwanggou, Lingtai County, Gansu Province, layer =WL8.

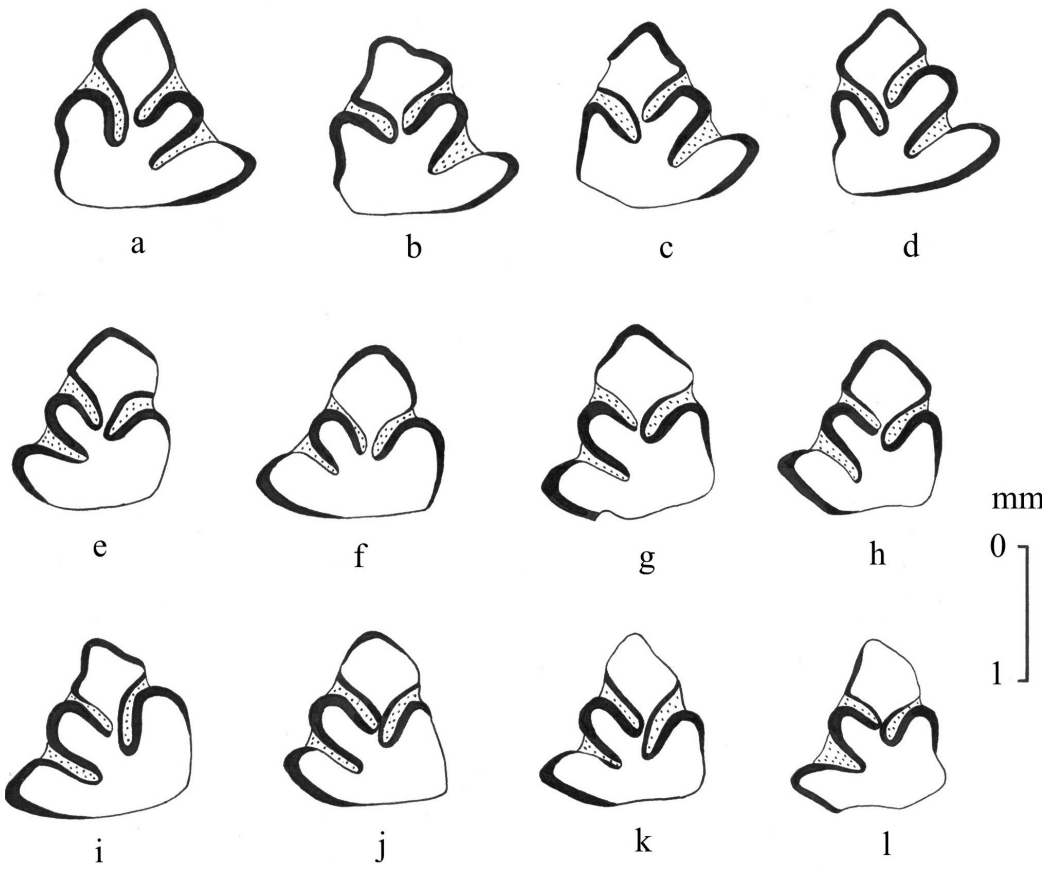


Fig. 5. *Ochotona lingtaica* sp. nov. a – p3 dex., holotype; b-d – p3 dex., e-l – p3 sin.

A g e: Late Pliocene (MN 16).

E t y m o l o g y: The name is from Lingtai County where it is found.

H y p o d i g m: Loc. 93001: WL7: 2 p3; WL8: 1 P2, 6 P3, 5 P4, 4 M1, 5 M2 ; 3 p3; WL10: 2 P2, 2 P3, 1 P4 , 5 M1 , 2 M2 , 1 p3; WL11: 4 P2, 8 P3, 5 P4, 2 M1, 4 M2, 13 p3.

M e a s u r e m e n t s: Holotype: length and width of p3 1.55 x 1.45 mm.

D i a g n o s i s: Medium-sized pika (Tables VIII, IX). Lower third premolar with rhomboid anteroconid relatively large, posteroconid wider than long, posteroexternal "loop" significantly long, anterointernal flexid deeper than anteroexternal one and directed posteroexternally.

D i f f e r e n t i a l d i a g n o s i s: *Ochotona lingtaica* sp. nov. is close in size to *O. nihewanica*, but is smaller than all known extinct and extant "large-sized" species, *O. plicodenta* sp. nov., *O. zhangi* sp. nov., *O. magna* sp. nov., *O. guizhongensis, O. lagreli, O. gromovi, O. tologoica, O. zasuchini, O. koslovi, O. rutila, O. ladacensis,* and *O. alpina*. *O. lingtaica* sp. nov. is larger than extinct and extant "small-sized" species, *O. gracilis* sp. nov., *O. minor, O. sibirica, O. pusilla, O. thomasi* and pikas of the "*tibetana*" group. Unlike *O. youngi* sp. nov. the p3 of *O. lingtaica* sp. nov. has a rhomboid anteroconid and asymmetric posteroconid.

Table VIII

Measurements (in mm) of *Ochotona lingtaica* sp. nov. (upper teeth); L – length; W – width

		n	Mean	Min	Max	SD
P2	L	3	0.73	0.7	0.8	
	W	3	1.3	1.2	1.35	
P3	L	13	1.0	0.95	1.2	0.068
	W	12	2.1	1.9	2.4	0.148
P4	L	9	1.1	1.05	1.35	0.087
	W	9	2.1	1.85	2.4	0.186
M1	L	10	1.2	0.95	1.4	0.130
	W	10	2.1	1.9	2.25	0.123
M2	L	10	1.2	1	1.4	0.125
	W	10	1.8	1.5	2.05	0.144

Table IX

Measurements (in mm) of *Ochotona lingtaica* sp. nov. (lower teeth); L – length; W – width

	n	Mean	Min	Max	SD
p3 L	14	1.38	1.25	1.5	0.070
ac L	14	0.91	0.75	1	0.174
pc L internally	14	0.80	0.65	0.95	0.072
pc L externally	14	0.87	0.8	0.95	0.043
ac W	14	0.70	0.55	1.05	0.126
pc W	14	1.32	1.2	1.5	0.097

D e s c r i p t i o n: P2 has an almost straight internal border which is slightly longer than the external one, and a deep anterior flexus filled with cement. P3 is trapezoidal in shape, its posterior border is wider than the anterior one. The short hypostria of P3 is filled with thin cement The anteroconid may have a sharp or rounded top and be covered with thick to thin enamel. It is completely separated from the posteroconid with the internal wall slightly curved to straight or with shallow depression.

Ochotona gracilis sp. nov.

(Fig. 6a-c, Table X)

H o l o t y p e: Right p3, IVPP, V14186.

T y p e l o c a l i t y: Loc. 93001, Wenwanggou, Lingtai county, Gansu Province, layer =WL10.

A g e: Late Pliocene (MN 16).

E t y m o l o g y:"gracilis" means delicate.

H y p o d i g m: Loc. 72074 (3): 1 right p3 (MN13?); Loc. 72074 (4), L4: 1 left left p3 (MN15).

M e a s u r e m e n t s: Holotype: length and width of p3 1.2 x 1.1 mm.

D i a g n o s i s: Small-sized pika (Table X). Lower third premolar with a square-shaped posteroconid, internal and external borders of the tooth of equal length, and with comparable depth of both anterointernal and anteroexternal flexids. These flexids are directed toward the midline of the tooth and are inclined slightly posteriorly.

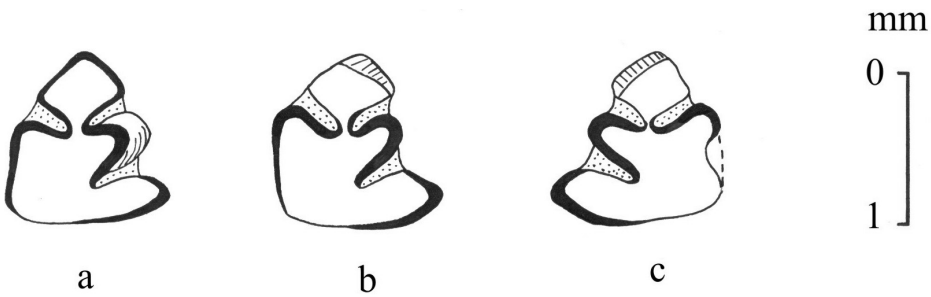


Fig. 6. *Ochotona gracilis* sp. nov. a – p3 dex., holotype; b – p3 dex., c – p3 sin.

Table X

Measurements (in mm) of *Ochotona gracilis* sp. nov. (lower teeth); L – length; W – width

	n	Mean	Min	Max
p3 L	3	1.2		
ac L	3	0.5		
pc L	3	0.77	0.7	0.8
ac W	3	0.52	0.5	0.55
pc W	3	1.08	1.05	1.1

D i f f e r e n t i a l d i a g n o s i s: *Ochotona gracilis* sp. nov. is close in size to small extant ochotonids, *O. thomasi*, *O. pusilla* and pikas of the "*tibetana*" group, as well as to the extinct species, *O. minor*, *O. sibirica* and extinct pikas of the "*pusilla*" group. However, in p3 morphology, it differs from all extant and extinct taxa of the "*pusilla*" group in having a larger anteroconid and a narrow or completely separated antero- and posteroconid, nd by the straight inner border of the posteroconid. *O. thomasi* and ochotonids of the "*tibetana*" group are different from *O. gracilis* sp. nov. by their slightly larger size and deeper internal flexids on p3.

Ochotona gracilis sp. nov. differs from *O. plicodenta* sp. nov., *O. lingtaica* sp. nov., *O. magna* sp. nov., *O. youngi* sp. nov., *O. intermedia*, *O. bazarovi*, *O. dodogolica*, *O. gureevi*, *O. zhangi* sp.nov., *O. nihewanica*, *O. tologoica*, *O. gromovi* and *O. zazhigini* by its smaller size and almost square-shaped posteroconid on p3.

D e s c r i p t i o n: All four sides of the rhomboid anteroconid of p3 are almost equal in length. The anteroconid has a narrow confluence or is completely separated from the posteroconid, which has a straight internal border, and the posteroconid internal and external borders of equal length.

Ochotona zhangi sp. nov.

(Fig. 7 a-j, 8i-j, n, Tables XI, XII)

Synonymy:1998 *Ochotona daurica*, ZHENG et al., p.37, textfig.3, A and B

H o l o t y p e: Fragment of left mandibular ramus with incisor and p3-m2, angular process and condyle lacking, IVPP, V14187.

T y p e l o c a l i t y: Loc.1 of Xiaoxishan, Pingyi County, Shandong Province.

A g e: Middle Pleistocene.

E t y m o l o g y: Named after Prof. ZHANG ZHAOQUN who excavated this locality in 1996.

H y p o d i g m: Loc.1 of Xiaoxishan: fragments of four skulls of different condition, all with P2-M2, fragments of 12 lower jaws with different numbers of teeth; Loc. 4 of Xiaoxishan: 6 p3.

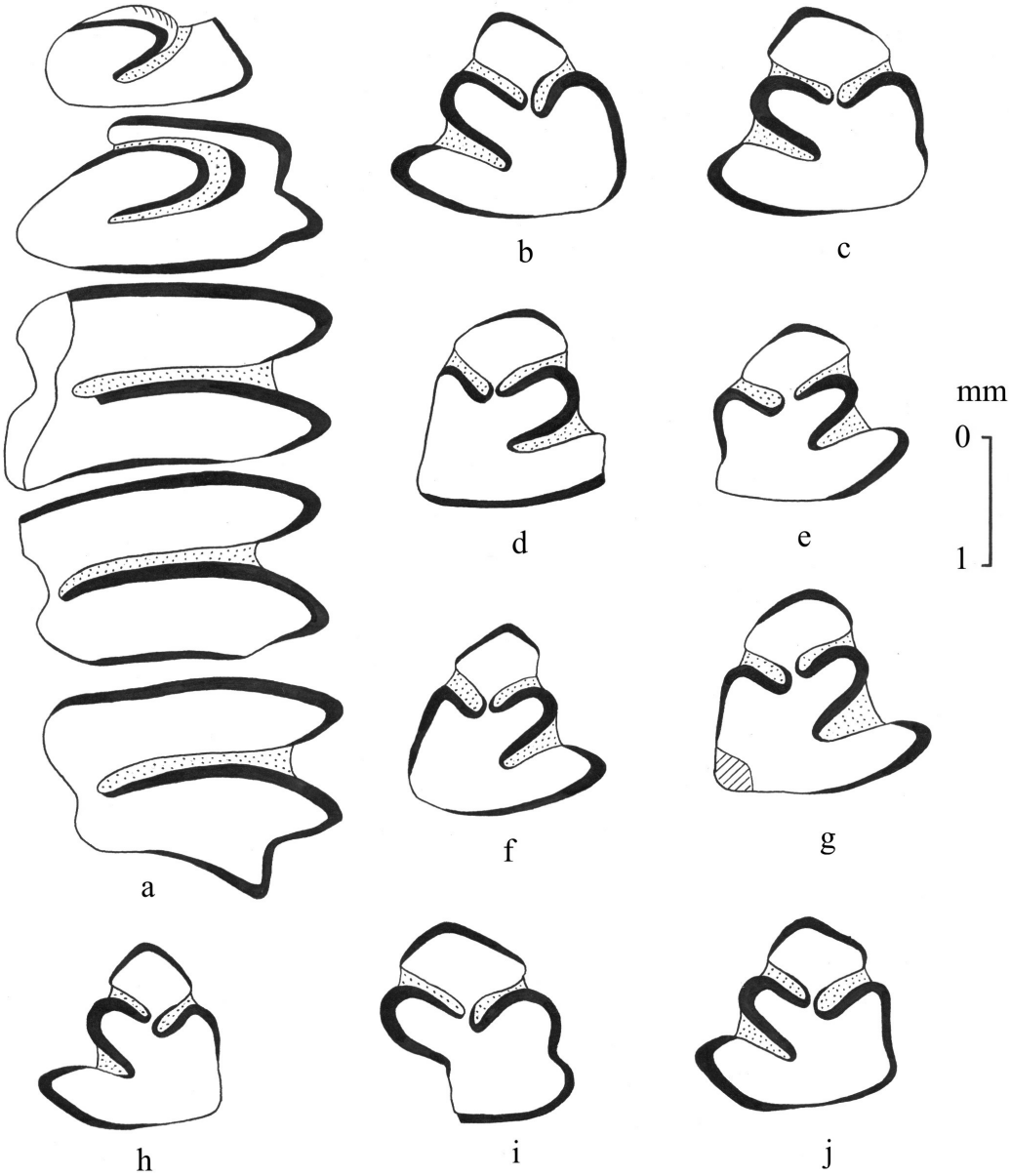


Fig. 7. *Ochotona zhangi* sp. nov. a – P2-M2 dex.; b – p3 sin., holotype; c – p3 sin.; d-f – p3 dex.; h-j – p3 sin.

M e a s u r e m e n t s: Holotype: length and width of p3 1.6 x 2.0 mm.

D i a g n o s i s: Large-sized pika (Tables XI, XII). Lower third premolar proportionally large, with rectangular anteroconid separated completely from posteroconid which is wider than long, with internal and external borders of comparable length.

D i f f e r e n t i a l d i a g n o s i s: *Ochotona zhangi* sp. nov. is larger than *O. gracilis* sp. nov., *O. lingtaica* sp. nov., *O. youngi* sp. nov., *O. sibirica, O. minor* and the extant "small-sized" pikas *O. hyperborea, O. thomasi* and *O. pusilla.* Moreover, the p3 of *O. zhangi* sp. nov. has a

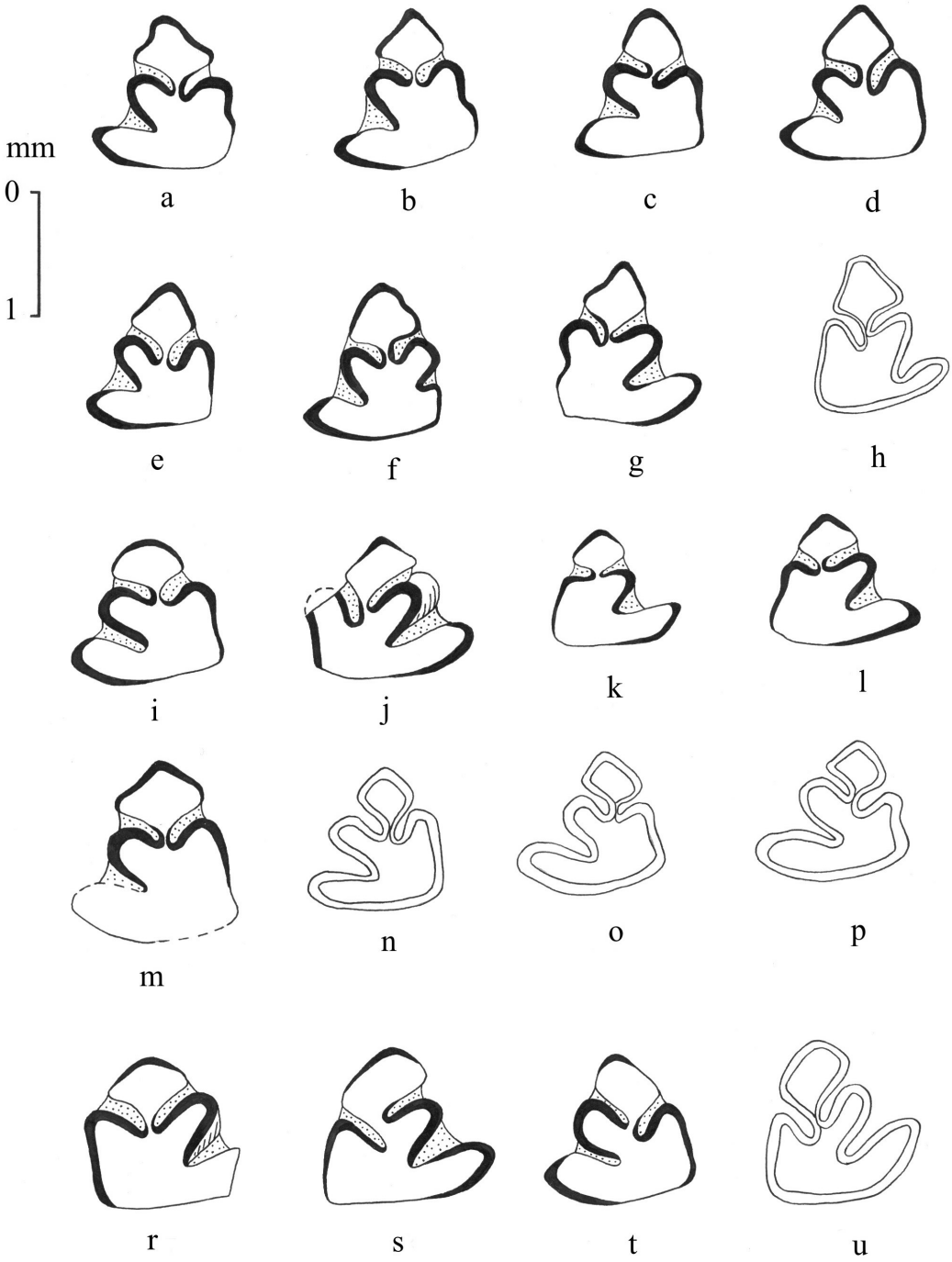


Fig. 8. *Ochotona* cf *cansus* LYON, 1907. a-c, 13 – p3 sin., d, h – p3 sin.: d – occlusal view, h – bottom view; e – p3 sin., recent; f – p3 sin., g – p3 dex.; *Ochotona zhangi* sp. nov. i – p3 sin., j, n – p3 dex.: j – occlusal view, n – bottom view; *Ochotona* aff. *intermedia*. k, l, o, p – p3 dex.: k, l – occlusal view, o, p – bottom view. *Ochotona youngi* sp. nov. r, s – p3 dex., t, u – p3 sin.: t – occlusal view, u – bottom view.

Table XI

Measurements (in mm) of *Ochotona zhangi* sp. nov. (upper teeth); L – length; W – width

		n	Mean	Min	Max
Alveol L of P2-M2		4	9	8.5	9.3
Alveol L of P2-M1		4	6.75	6.5	7
Alveol L of P3-M1		4	5.3	4.8	5.8
Crown L of P2-M2		4	7.95	7.3	8.5
Crown L of P3-M2		4	5.5	4.8	6.7
Crown L of P3-M1		4	6.58	4.7	7.7
Crown L of P3-P4		4	3.1	3	3.3
P2	L	3	0.75	0.7	0.8
	W	3	1.63	1.6	1.7
P3	L	4	1.28	1.2	1.4
	W	4	2.63	2.25	3
M2	L	4	1.85	1.65	2.1
	W	4	2.44	2.2	2.7
Diastema		2	10.3	8.8	11.8
Interorbital width		2	4.2	4.1	4.3
Skull width at bullae		2	23.2	22.68	23.71

shorter and wider posteroconid than that of *O. gracilis* sp. nov. and a more inclined posterointernal border of the posteroconid than that of *O. lingtaica* sp. nov. The p3 of *O. zhangi* sp. nov. has a trapeziodal posteroconid compared to that of *O. youngi* sp. nov. *O. zhangi* sp. nov. can be distinguished by its slightly smaller size and absence of the plication on the anterointernal flexid of p3 from *O. magna* sp. nov., *O. plicodenta* sp. nov., and with other Asian extinct and extant species, such as *O. guizhongensis, O. lagreli, O. tologoica, O. gromovi, O. ladacensis, O. koslovi, O. alpina.*

D e s c r i p t i o n: Skull is relatively flat, except a weak convex near the parietofrontal boundary. Interorbital region is narrow and has a shallow groove in the midline. Orbits are oval in shape. Jugal bones first extends posteriorly and slightly dorsally, and has a robust anterior process. The diastema on the maxilla is relatively long. The incisive foramina are confluent with the pear-shaped palatal foramen. The palate is rather wide. The mandibular ramus is relatively low, but robust. Diastema on the mandible is long (Table XI). On the outer surface of the lower jaw there is a well-developed depression just below p3 and p4. The lower incisor extends posteriorly along the ventral border of mandibular ramus approximately in a line. It ends below p4 and m1 and produces well-developed tubercles on both the lingual and labial sides of the ramus. The mental foramen is just below m2. On the labial side of the mandible there are many small foramina below p3.

P2 is oval in outline, wider than long, and has a slightly sharp internal border, and a deep anterior flexus filled with cement and directed posteroexternally. P3 is trapezoidal, has a narrower anterior border than posterior one, and a shallow hypostria lacking cement. The hypostriae of P4-M2 are deep and filled with thin cement. The upper teeth have thick enamel on their anterior and internal borders but the enamel is rare or absent on their posterior and external borders.

The lower third premolar is shaped like as an asymmetrical triangle, and is wider than long. The flexids are of comparable depth. The apex of anteroconid is gently convex and is covered with thin cement. The shape of the anteroconid is variable, especially in young individuals when it is near square. Structure of the p4-m2 is that of a typical ochotonid. The talonid of p4 is wider than the trigonid; the talonid is proportionally narrower on m2 while it is contrary on m2 (Table XII).

R e m a r k s: Among ochotonids from Sunjiashan Localities 1 and 4, Shandong, a smaller-sized pikas reffered to *Ochotona* aff. *intermedia* (Fig. 8k-l, and o-p) can be distinguished from *O.*

Table XII

Measurements (in mm) of *Ochotona zhangi* sp. nov. (lower teeth); L – length; W – width

	n	Mean	Min	Max	SD
Alveolar L of p3-m3	2	9.3	8.5	10	
Alveolar L of p4-m3	2	7.4	7	7.7	
Crown L of p3-m3	2	8.1	7.5	8.7	
Crown L of p3-m2	3	7.3	6.7	7.7	
Crown L of p3-m1	4	5.5	5	5.7	
Crown L of p3-p4	4	3.5	3.2	3.7	
Crown L of p4-m2	3	5.7	5.2	6.1	
Crown L of p4-m3	2	6.5	6	7	
p3 L	15	1.58	1.4	1.75	0.105
ac L	15	0.79	0.7	0.95	0.069
pc L	15	1.08	0.9	1.2	0.084
ac W	15	0.90	0.7	1.05	0.107
pc W	14	1.70	1.45	2	0.188
p4 L	4	1.86	1.6	2	
Trigonid L	4	1	0.9	1.05	
Talonid L	4	0.85	0.75	0.95	
Trigonid W	4	1.69	1.5	1.9	
Talonid W	4	1.85	1.75	2.1	
m2 L	3	1.92	1.75	2	
Trigonid L	3	1	0.9	1.1	
Talonid L	3	0.83	0.8	0.85	
Trigonid W	3	1.9	1.7	2	
Talonid W	3	1.75	1.7	1.85	
Diastema	1	7.4			
Mandible height at p4	4	6.75	6	7	
Mandible height at m3	2	6.5	5.8	7.2	
Mandible depth at p4	4	4.25	3.9	4.3	
Mandible depth at m3	2	3.25	3	3.5	

zhangi sp. nov. by the structure of its teeth. The taxonomic status of *Ochotona* aff. *intermedia* will be established when more abundant materials is recovered.

Ochotona cf. *cansus* LYON, 1907

(Fig. 8a-h, Table XIII)

M a t e r i a l. Six isolated p3, Loc. 2 of Sunjiashan, Zibo, Shandong Province.

A g e: Late Early Pleistocene (MN17).

D e s c r i p t i o n: Both shape and size of third premolar are close to that of the recent smaller-sized species, *Ochotona cansus* (Fig. 8a-h, Table XIII). The lower p3 has a relatively large rhomboid anteroconid separated almost completly from the posteroconid by anteroexternal and anterointernal flexids. These flexids have almost the same depth. The enamel bands on the anterior and external and partially on the posterointernal borders of the tooth are well developed. The internal border of the posteroconid is variable in shape, most of them are straight or slightly convex, but on one specimen it is concave and filled with thin cement.

Table XIII

Measurements (in mm) of *Ochotona cansus*; L – length; W – width

	Ochotona cansus					*O.* cf. *cansus*				
	Recent					Shandong (Locs. 1 and 2)				
	n	Mean	Min	Max	SD	n	Mean	Min	Max	SD
p3	6	1.3	1.3	1.3		6	1.26	1.2	1.35	0.049
ac L	6	0.73	0.65	0.8	0.052	6	0.80	0.7	0.9	0.071
pc L	6	0.81	0.75	0.85	0.038	6	0.73	0.65	0.8	0.052
ac W	6	0.61	0.55	0.65	0.038	6	0.62	0.55	0.7	0.052
pc W	6	1.21	1.05	1.35	0.102	6	1.22	1.1	1.35	0.098

Ochotonoides TEILHARD DE CHARDIN et YOUNG, 1931

Ochotonoides complicidens (BOULE et TEILHARD DE CHARDIN, 1928)

(Fig. 9a-j, Tables XIV-XVI)

M a t e r i a l: Lingtai County, Gansu Province: Loc. 93001: WL7+: 1 P2; WL2: 1 dp3; WL3: 1 P3; WL8: 2 P2, 2 P3, 1 P4, 1 M1, 3 p3; WL10: 1 deformed fragment of mandibular ramus with p3-p4; 1 deformed fragment of mandibular ramus with p3-m1; 1 deformed fragment of mandibular ramus with p4-m3; 4 P2, 2 P3, 3 M2, 5 p3; WL11: 3 P3, 3 p3; WL27: 1 p3. Nihewan basin: Loc. Danangou: L12: 1 P2, 1 P4, 1 p3; Loc. Majuangou: 2 P2, 1 P3, 1 M2, 2 p3.

D e s c r i p t i o n: Large-sized ochotonid (Tables XIV, XV). P2 is wider than long. The deep anterior flexus is directed posteroexternally. The enamel on the lingual and anterior borders of the tooth are thick, but they are thin or absent on the labial and posterior margins. The internal wall is straight or round, or with a shallow depression (Fig. 9f, h, j).

P3 is trapezoidal in shape. The anterior margin of the tooth is narrower than the posterior one. A "U"-shaped paraflexus begins and ends at about one-fourth of the tooth width from the labial side. The hypostria is short and filled with thin cement (Fig. 9g).

Each P4, M1 andM2 consits of two lophs separated by a deep hypostria filled with cement. The enamel are thicker on the anterior than on the posterior borders of the lophs.

Lower third premolar is generally longer than wide. The occlusal surface is triangular in shape. The rhomboid-shaped anteroconid is relatively large and separated completely from the posteroconid. It has an anteroexternal flexid that is filled with thin cement. The posteroconid is wider than long and usually has a straight internal border. Both the anteroexternal and anterointernal flexids are of comparable depth, but the posteroexternal flexid is also deep. All the flexids are filled with cement. Plications on the flexids are variably developed, as observed in other material from China, Transbaikalia, Mongolia and Kazakhstan. The trigonids are wider than the talonids on p4 and m1.

R e m a r k s: The only adult p3 from the level WL27 of the Late Miocene in age of the Loc. 93001, can be referred tentatively to *Ochotonoides complicidens* by its tooth structure. However, it differs from the nominative taxon by its much smaller size (Table XVI, Fig. 9i), and from *Ochotonoma* taxa by its longer and more square posteroconid.

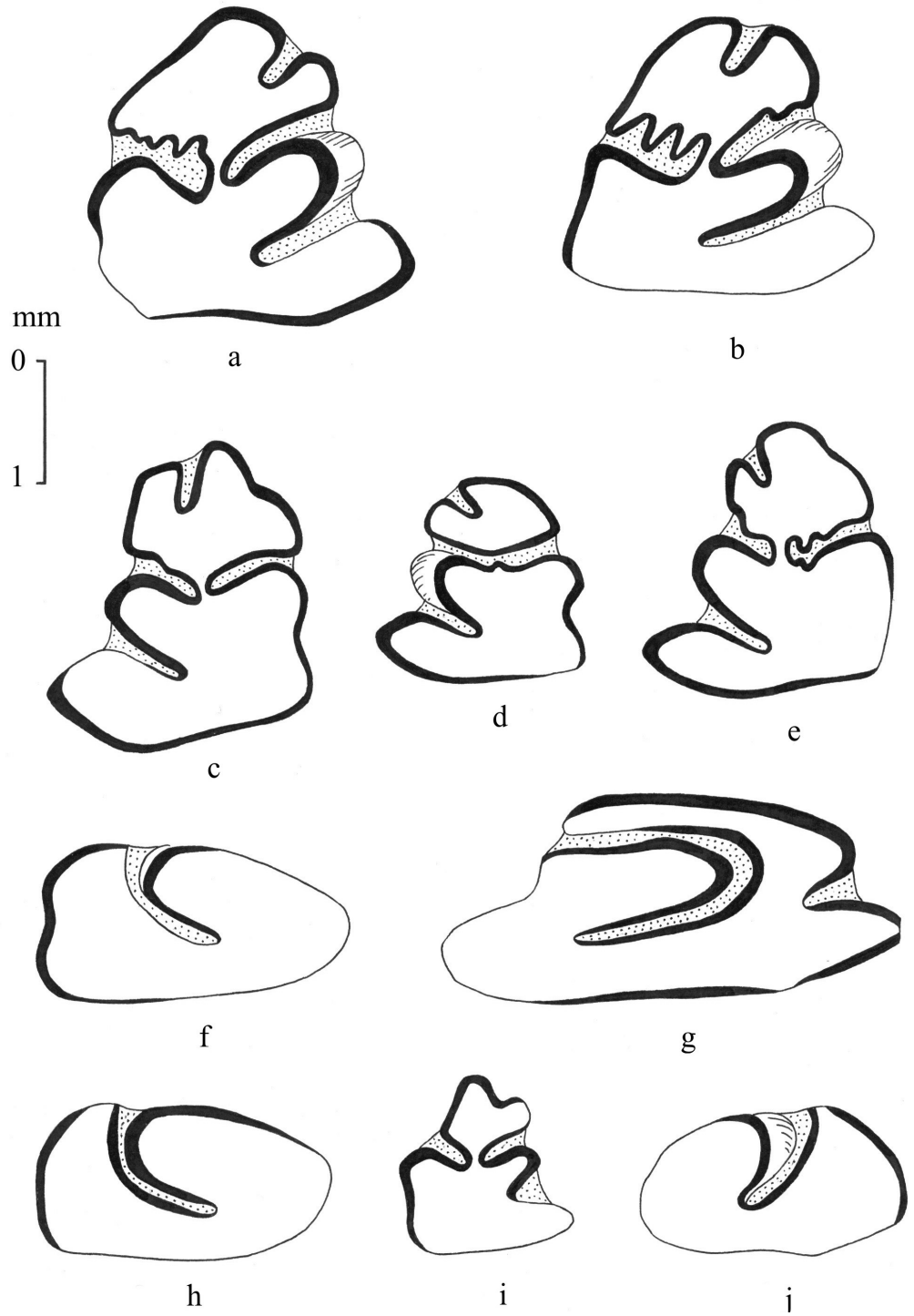


Fig. 9. *Ochotonoides complicidens* (BOULE et TEILHARD DE CHARDIN, 1928). a, b – p3 dex., c-e – p_3 sin., d – juv., f, h – P2 sin., j – P2 dex., g – P3 dex.; *Ochotonoides* cf. *complicidens* near to *Ochotonoma.* i – p3 dex.

Table XIV

Measurements (in mm) of *Ochotonoides complicidens* (upper teeth); L – length; W – width

		n	Mean	Min	Max	SD
P2	L	9	1.29	1.05	1.45	0.120
	W	9	2.39	2	2.65	0.244
P3	L	15	1.70	1.5	1.85	0.096
	W	15	3.28	2.95	4.05	0.387
P4	L	4	2.00	1.9	2.1	0.100
	W	4	3.89	3.6	4	0.202
M1	L	4	1.93	1.8	2	0.141
	W	4	3.50	3.25	3.5	0.141
M2	L	4	1.75	1.5	2.1	0.250
	W	4	2.70	2.25	3.25	0.507

Table XV

Measurements (in mm) of *Ochotonoides complicidens* (lower teeth); L – length; W – width

	n	Mean	Min	Max	SD
Alveolar L of p4-m3	1	12			
Crown L of p3-p4	1	4.5			
Crown L of p4-m3	1	8.2			
Crown L of p4-m2	1	7.1			
Crown L of p4-m1	1	4.7			
P3 L	13	2.42	2.05	2.6	0.152
ac L	13	1.36	1.1	1.5	0.120
pc L	13	1.44	1.3	1.55	0.084
ac W	13	1.40	1.2	1.7	0.131
pc W	13	2.20	1.85	2.5	0.201
P4 L	2	2.1	2	2.2	
Trigonid L	2	1.12	1.05	1.2	
Talonid L	2	0.97	0.95	1	
Trigonid W	2	2.25			
Talonid W	2	2.37	2.25	2.5	
M1 L	2	2.3	2.2	2.4	
Trigonid L	2	1.22	1.2	1.25	
Talonid L	2	1			
Trigonid W	2	2.12	2	2.25	
Talonid W	2	2.2	2	2.4	

Table XVI

Measurements (in mm) of *Ochotonoides complicidens* near to *Ochotonoma*; L – length; W – width

L			W	
p3	ac	pc	ac	pc
1.5	0.75	0.9	0.65	1.5

III. EVOLUTIONARY HISTORY OF OCHOTONIDS

The earliest record of the ochotonids is from the middle Oligocene of China and Mongolia, represented only by the genus *Sinolagomys* BOHLIN, 1937. At the beginning of the Miocene an arid environment existed in Eurasia and adjacent regions; this aridity favored a wide adaptive radiation of the ochotonids. 17 genera belonging to two subfamilies, Sinolagomyinae and Ochotoninae, occurred in Europe, Africa, Asia and North America. At the beginning of the Late Miocene almost all genera of the Sinolagomyinae except the genus *Bellatona* DAWSON, 1961 and the archaic type genus *Marcuinomys* of true pikas of the Ochotoninae disappeared. The genera *Bellatona, Alloptox, Bellatonoides* SEN, *Ochotonoma, Proochotona, Ochotonoides* and *Ochotona* of the Ochotoninae replaced those of the Sinolagomyinae. The genus *Ochotona* may have evolved from the *Bellatona*-group. The early Late Miocene pika, cf. *Bellatona* from the Amuwusu Locality, China may be considered as a transitional form from *Bellatona* to *Ochotona* (QIU 1996).

During the latter part of the late Miocene, significant environmental change took place worldwide. This global event led to the formation of the steppe zone in the Eurasia continent (SINITSIN 1965) and there was a new explosive radiation of ochotonids, especially in the genus *Ochotona*.

It should be stressed that ochotonids are remarkably homogeneous and morphologically conservative in their evolutionary history. Judging from the cranium and postcranium, the main skeletal features of ochotonids have remained almost invariable from the extinct to the Recent taxa. However, general evolutionary trends from rooted to rootless cheek teeth, and from simple to complicated occlusal surface on P3 and p3, from shallow to deep hypostriae on P4-M2, and from narrow to wide talonids on p4-m2 can be observed.

The genus *Ochotona* is characterized by rootless teeth, by deep hypostria on P4-M2 and by the talonid width close or slightly larger than the trigonid width on p4-m2. The main differences between the extinct and extant taxa are body size, details of the structure of teeth (P3 and p3) and some morphological features of the skull and lower jaw. Differences among the living species also include habitat, colour of the pelage, and the number of chromosomes.

The study of the late Miocene ochotonid remains from Asia shows that there are at least six taxa of the genus *Ochotona* distributed from Kazakhstan through Mongolia to China (*Ochotona guizhongensis, O. lagreli, O. minor, O. gracilis* sp. nov. and another two new taxa, *Ochotona* sp. A and *Ochotona* sp. B from North China, not discribed yet). With the exception of *O. minor,* they all are large-sized.

At the end of Miocene – beginning of Pliocene *Ochotona* migrated to North America. *O. spanglei* is known from McKay Reservoir, Oregon (SHOTWELL 1956).

During the Pliocene and early Pleistocene the genus *Ochotona* became diverse and widely distributed in Europe and Asia. They were represented at that time by taxa of large, medium and small size. Large-sized Pliocene species include *Ochotona ursui* SIMIONESCU, 1932 in Europe and *O. plicodenta* sp. nov. and *O. gromovi* in Asia. However, the medium and small-sized *Ochotona* were abundant in Eurasia at that time. Medium-sized pikas *Ochotona* sp. (Maritsa 1 Locality, Greece) and *O. antiqua* (several sites of Moldavia and Ukraine) are known from the Pliocene of Europe (DE

BRUIJN et al. 1970; ERBAJEVA & SHUSHPANOV 1988). A number of medium-sized taxa were widely distributed in Asia. These include *O. agadjianiani* MELIK-ADAMIAN, 2003 (Nurnus Locality, Armenia), *O. intermedia* (Mongolia and Transbaikalia), *O. lingtaica* sp. nov. (China). The small-sized pika *O. sibirica* is known from the Pliocene of Mongolia and Transbaikalia and *O. gracilis* sp. nov., *O*. cf. *minor* from China, but there are no pikas in North America at that time.

In the Early Pleistocene, Eurasian species of the ochotonids are rather abundant, they were also of large, medium and small-sized. The large-sized Asian taxa are known in Transbaikalia (*O. tologoica, O. zasuchini)*, in Mongolia (*O. zazhigini*), in China (*O. magna* sp. nov.) and in North America (*O. whartoni)* (ERBAJEVA 1988; GUTHRIE & MATTHEWS 1971). However, at the end of the early Pleistocene large-sized species of *Ochotona* except of *O. transcaucasica* VEKUA from Georgia, as well as all other ochotonid genera disappeared.

The medium and small-sized pikas were rather abundant in Eurasia during the Early Pleistocene. The European taxa included *O. polonica* SYCH, 1980 *O. pseudopusilla* GUREEV & SCHEVTSCHENKO, 1964, *O. dehmi* ERBAJEVA, 2005, *O. valerotae* ERBAJEVA et al., 2001 and *O. horaceki* CERMAK, 2005 and Asian taxa were *O. youngi* sp. nov., *O. nihewanica, O. bazarovi, O. filippovi* ERBAJEVA, 1999, *O.* aff. *tibetana, O*. cf. *cansus* and *O. intermedia,* as well as an extinct subspecies of steppe pika *O. pusilla aktogaiensis* SAVINOV et al., 1981.

At the beginning of the middle Pleistocene the Eurasian ochotonids decreased greatly in number of species; a few taxa are known in Asia: in China - *O. zhangi* sp. nov., *O.* cf. *cansus* and in the Transbaikal region - *O. dodogolica* and *O. gureevi.* From some Transcaucasian sites the middle-sized species *O. azerica* and large-sized pika *O. transcaucasica* are known (ALIEV 1969; VEKUA 1967). The fossil remains of the living species *O. rufescens* GRAY and *O. macrotis* GUENTHER were collected from Sel' Ungur site, Kirgizia and Kopaly Locality, Kazakhstan respectively (TYUTKOVA 1990).

In North America only a small-sized pika (*Ochotona* sp. and *O.* cf. *O. princeps*) is known from Cumberland, Trout, Hamilton and Porcupine Caves in this stage (GUILDAY 1979; MEAD and GRADY 1996; MEAD et al 2004).

A periglacial environment was established in Europe at the end of the middle Pleistocene-beginning of the late Pleistocene which led to the formation of tundra-steppes inhabited by mammoth faunas. In the late Pleistocene. *O. pusilla* became a dominant species in the vast territory of the Europe from south of England, France, northern Italy, Yugoslavia, Romania, the Netherland, Poland, Czech Republic and Slovakia, Moldova, the Ukraine and Russian plain (ERBAJEVA & CURRANT 2003; ERBAJEVA et al. 2001; DIMITRIJEVIC 1996; TERZEA 1995, KOLFSCHOTEN 1985; SYCH 1980; LOZAN 1970; REKOVETS 1985 and others). Moreover, the area of distribution of *O. pusilla* at that time extended eastwards through the Urals to the western border of the Lake Baikal (ERBAJEVA et al. 2001; TETERINA 2004). Numerous medium and small-sized species, mainly fossil forms of extant species *(O.pusilla, O. alpina, O. hyperborea, O. daurica, O. tibetana*) lived in Asia, from the Ural mountains through Siberia, Mongolia to China and from Yakutia to North East (ERBAJEVA 1988). In addition, only *O. princeps* (RICHARDSON) lived in North America at that time (MEAD 1987; MEAD & GRADY 1996; MEAD & SPAULDING 1995).

At present there are about 30 living species *Ochotona* of the world (HOFFMANN & SMITH, in press).

IV. CONCLUSIONS

More than fifteen ochotonid taxa have been recovered from recent excavations in Chinese Miocene-Pleistocene strata. The taxa include *Ochotona plicodenta* sp. nov., *O. gracilis* sp. nov., *O. lingtaica* sp. nov., *O. youngi* sp. nov., *O. magna* sp. nov., *O. zhangi* sp.nov., *O*. cf. *O. cansus, O.* cf. *O. minor*, *O.* aff. O. *dodogolica*, *O*. aff. O. *intermedia*, *O.* aff. O. *tibetana*, *O*. aff. O. *bazarovi*, O. cf. O. *lagreli, Ochotona* sp. (small), *O. complicidens* and *O. complicidens* near to *Ochotonoma*. Of

these, *O. plicodenta* sp. nov., *O. gracilis* sp. nov., *O. lingtaica* sp. nov., *O. youngi* sp. nov., *O. magna* sp. nov., *O. zhangi* sp.nov., *O*. cf. *O. cansus, O.* aff. *O*. *tibetana* and *O*. cf. *O*. *lagreli* are the endemic forms to China. The species, *O.* aff. *O*. *dodogolica*, *O*. aff. *O*. *intermedia* and *O*. aff. O. *bazarovi*, are also known from Transbaikalia and widely-distributed in Central Asia. *Ochotonoides complicidens* has also been found in the vast Asian territory from western Kazhakhstan throughout Transbaikalia and Mongolia to northern China.

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