

First record of the Caucasus field mouse *Apodemus ponticus* Sviridenko, 1936 (Rodentia Muridae) from Iran

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ABSTRACT

This study is the first record of six specimens of *Apodemus ponticus* Sviridenko, 1936 (Rodentia Muridae) from the Zagros Mountains, north western Iran. Four external features besides 13 linear measurements of the skull and 14 dental characters were measured. This species was identified by its extensive and well-marked boundary throat spot. In addition, *A. ponticus* shows morphometric characters including head and body length (mean = 90.86 ± 2.54), length of bullae (mean = 6.34 ± 0.11), breadth of bullae (mean = 4.77 ± 0.12) and dental characters consisting of maxillary tooth row (mean = 3.85 ± 0.06) and mandibular tooth row (mean = 3.90 ± 0.05) which are different from the sympatric species *A. witherbyi* Thomas, 1902. Based on our results, the distributional range of *A. ponticus* extends to oak forests of the Zagros Mountains, west Iran which is considered to be the easternmost boundary of its range.

KEY WORDS

Apodemus ponticus; sympatric; Zagros Mountains; Iran.

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INTRODUCTION

Caucasus field mouse *Apodemus ponticus* Sviridenko, 1936 (Rodentia Muridae) is one of the most ambiguous members of the genus *Apodemus* Kaup, 1829. It was first described from Olginka Village, northwest Caucasus and supposed to be endemic to southern Caucasus region (Azerbaijan and Georgia; Ellerman & Morrison-Scott, 1951; Musser & Carleton, 2005). Its limit expansion reaches up to south Russia.

Initially, it had been considered intermediate hybrid between *A. sylvaticus* (Linnaeus, 1758) and *A. flavicollis* (Melchior, 1834) or included in a superspecies namely *A. flavicollis* (Heptner, 1940; Neithammer, 1978). Vereshchagin (1959) misclas-

sified *A. ponticus* as a form of *A. fulvipectus* (Ognev, 1924). However, subsequent studies indicated that Caucasus field mouse is a separate species.

Differences between Allozyme-electroforetic patterns of *A. ponticus* from *A. uralensis* (Pallas, 1811) (as *A. ciscaucasicus* Ognev, 1924), *A. witherbyi* (Thomas, 1902) (as *A. fulvipectus*) and *A. flavicollis* were described by some authors (Mezhzherin, 1990; Mezhzherin et al., 1992; Lavrenchenko & Likhnova, 1995). In addition, some diagnostic karyological features of *A. ponticus* were identified (Kozlovsky et al., 1990; Orlov et al., 1996a, b). The Caucasus field mouse can be diagnosed from *A. witherbyi* by multivariate analysis (Lavrenchenko & Likhnova, 1995).

Although, based on mt DNA cytb gene sequences, Balakirev et al. (2007) proposed unity between *A. ponticus* and *A. flavicollis*. Suzuki et al. (2008) clustered it as a sister clade of *A. flavicollis* based on trees constructed applying four nuclear and one mitochondrial genes but with weak support for the formers.

Until recently five species of wood mice of the genus *Apodemus* including the following species: *A. witherbyi*, *A. uralensis*, *A. hyrcanicus* Vorontsov, Boyeskorov et Mezhzherin, 1992, *A. flavicollis* and *A. mystacinus* were recorded (Javidkar et al., 2005; Krystufek & Hutterer, 2006; Darvish et al., 2010; Darvish et al., 2014) and *A. avicennicus* has been described by Darvish et al. (2006) from Iran.

In this study, the first record of *A. ponticus* as a member of murine rodents would be added to the checklist of rodent fauna of Iran.

MATERIAL AND METHODS

The study was done in Kordestan Province, west Iran from June 2013 to July 2013, using live-traps and snack baits (Fig. 1).

Specimens were captured and determined based on cranial and external morphological features, using keys including: Mezhzherin et al. (1992) and Vorontsov et al. (1992). Standard vouchers of specimens (skins, skulls, tissues) were deposited in the Zoology Museum of Ferdowsi University of Mashhad (ZMFUM).

Specimens were weighted, sexed and four external characters were measured; besides, 13 linear measurements of the skull were taken using a vernier calliper accurate to the nearest 0.05 mm (Table 1). 14 dental measurements were performed with a measuring microscope to 0.001 mm (Table 1).

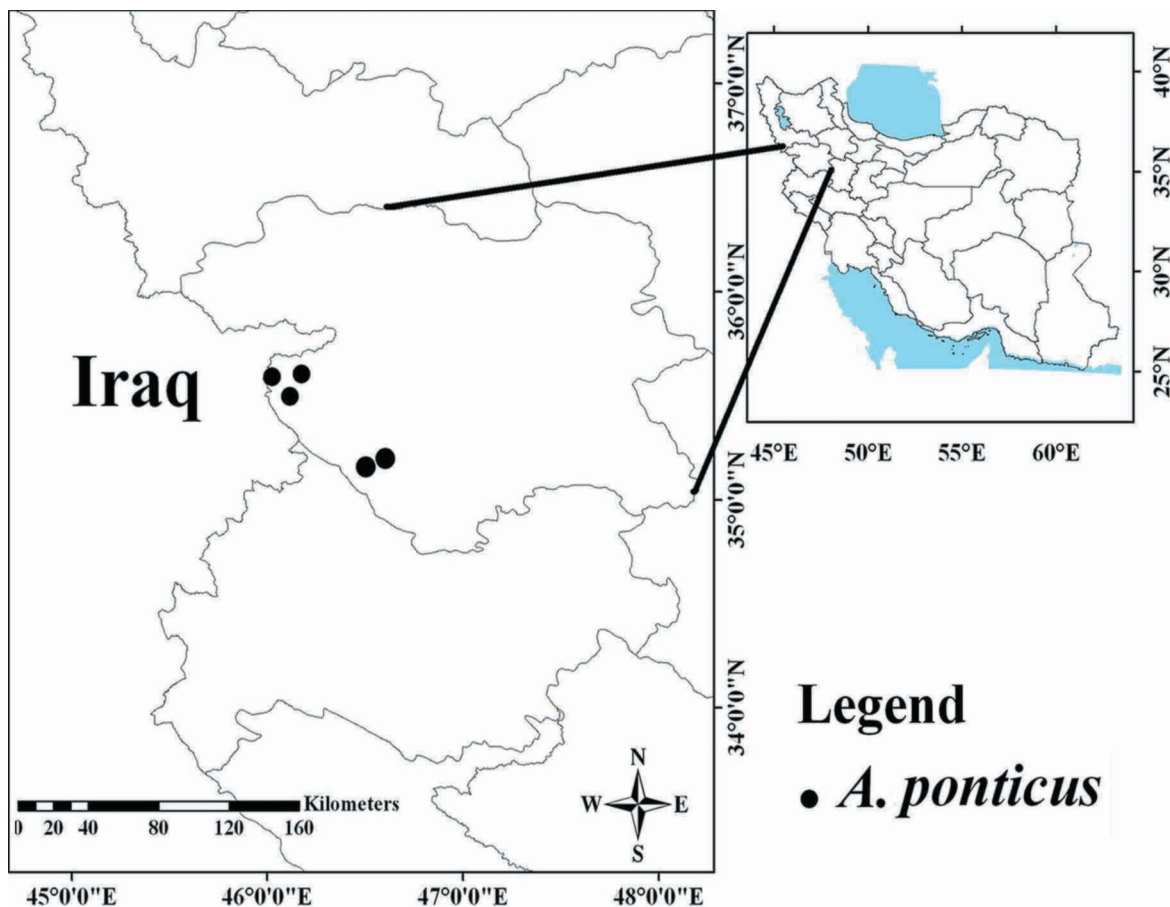


Figure 1. Location of the study areas: Zagros Mountains, northwestern Iran.

Variables	<i>A. ponticus</i> n=6			<i>A. witherbyi</i> n=38		
	Mean ± SE	Min	Max	Mean ± SE	Min	Max
HBL	89.86±2.54	83	103	90.40±1.18	77	103
TL	101.33±1.09	97	104	99.56±1.17	78	117
HFL	22.71±0.47	21	24	21.37±0.24	15	24
EL	17.43±0.33	14	21	15.79±0.28	11	26
CBL	24.14±0.34	23.28	25.24	23.31±0.10	21.24	24.72
FL	12.51±0.14	11.94	13.20	12.28±0.05	11.32	12.90
PAL	4.88±0.08	4.58	5.34	4.79±0.05	4.12	5.46
ZYGB	13.18±0.18	12.64	14.02	12.72±0.08	11.40	13.88
RW	4.28±0.082	4.00	4.52	4.43±0.04	3.66	4.84
IOC	4.30±0.07	3.92	4.52	4.33±0.02	4.10	4.66
BCW	11.97±0.11	11.56	12.38	11.70±0.04	11.23	12.32
IBW	11.40±0.13	10.94	11.98	10.98±0.50	10.44	12
RH	6.21±0.09	5.72	6.54	5.94±0.04	5.40	6.38
BCBH	9.42±0.15	8.54	9.88	8.93±0.04	8.34	9.46
TBL	6.34±0.11	5.76	6.78	5.91±0.05	5.32	6.82
TBW	4.77±0.12	4.28	5.22	4.40±0.02	4.08	4.76
ML	11.98±0.33	10.82	13.44	11.57±0.07	10.34	12.52
M1.L	1.86±0.05	1.55	2.08	1.85±0.01	1.69	1.96
M1.W	1.17±0.04	0.92	1.27	1.16±0.01	1.02	1.26
M2.L	1.15±0.02	1.06	1.21	1.13±0.01	1.03	1.20
M2.W	1.10±0.03	0.94	1.17	1.11±0.01	1.01	1.22
M3.L	0.87±0.02	0.82	1.04	0.84±0.01	0.76	0.98
M3.W	0.82±0.03	0.63	0.95	0.81±0.01	0.67	0.93
M.1L	1.77±0.02	1.63	1.89	1.66±0.01	1.17	1.78
M.1W	1.04±0.03	0.84	1.13	1.03±0.01	0.88	1.12
M.2L	1.18±0.01	1.11	1.25	1.14±0.01	1.04	1.25
M.2W	1.06±0.03	0.89	1.18	1.04±0.01	0.90	1.19
M.3L	0.96±0.03	0.79	1.05	0.97±0.01	0.88	1.06
M.3W	0.89±0.07	0.74	0.96	0.89±0.04	0.80	1
MxTR	3.83±0.06	3.54	4.14	3.78±0.01	3.54	3.95
MnTR	3.90±0.05	3.68	4.14	3.76±0.01	3.37	3.94

Table 1. External, cranial and dental measurements (in mm) of *A. mystacinus* and *A. witherbyi* from northwest of Iran.

ABBREVIATIONS. Abbreviations of characters are as follows (for descriptions of characters see Frynta et al., 2001; Javidkar et al., 2005, 2007 and Kryštufek & Vohralik, 2009): HBL: head and body length; TL: tail length; HFL: hind foot length; EL: ear length; CBL: condylobasal length; FL: facial length; PAL: palatal length; ZYGB: zygomatic breadth; RW: rostrum width; IOC: interorbital constriction; BCW: braincase width; IBW: interbullae width; RH: height of rostrum; BCBH: height of braincase with tympanic bulla; TBL: tympanic bulla length; TBW: tympanic bulla width; ML: mandible length; M1.L: length of first upper molar; M1.W: width of first upper molar; M2.L: length of second upper molar; M2.W: width of second upper molar; M3.L: length of third upper molar; M3.W: width of third upper molar; M.1L: length of first lower molar; M.1W: width of first lower molar; M.2L: length of second lower molar; M.2W: width of second lower molar; M.3L: length of third lower molar; M.3W: width of third lower molar; MxTR: length of maxillary tooth row; MnTR: length of mandibular tooth row.

RESULTS

Apodemus ponticus is sympatric and syntopic with *A. witherbyi* at 1545 m (a.s. l.) in the western slopes of the Zagros Mountains. This species was identified by its extensive and well-marked boundary throat spot.

The length of sole is more than 21 mm. *A. ponticus* shows morphometric characters including head and body length (mean = 90.86 ± 2.54), length of bullae (mean = 6.34 ± 0.11), breadth of bullae (mean = 4.77 ± 0.12) and dental characters consisting of maxillary tooth row (mean = 3.85 ± 0.06) and mandibular tooth row (mean = 3.90 ± 0.05) which are different from the sympatric species *A. witherbyi* (Table 1).

DISCUSSION

The Zagros Mountains is a part of the Irano-Anatolian hotspot, one of the richest biodiversity and endemism hotspot regions in the world (Mittermeier et al., 2012). Irano-Anatolian hotspot also encompasses the Ponto-Caspian realm including

the regions between Black and Caspian Sea and southern coast of Caspian Sea proposed the refugial area for evolution of some endemic lineages of rodents such as *Glis glis* (Linnaeus, 1766) (Naderi et al., 2013) and some insectivores (Dubey et al., 2007a; Dubey et al., 2007b).

In addition, terrestrial exchange is partially conceivable via some corridors (i.e. Aras River valley; Missone, 1959) between the region and the Caucasus hotspot where the Caucasus field mice were supposed to be endemic.

The Caucasus field mice are sympatric with congener species *A. witherbyi* and *A. mystacinus* in Kordestan province. *A. ponticus* is syntopic with *A. witherbyi* in bushy foothills of the Zagros Mountains in 1545 m (a.s.l.) however; it has not been collected with *A. mystacinus* at the same altitude. So, the Caucasus field mice could pass the Aras valley and establish the populations in the Zagros Mountains.

Moreover, the Zagros Mountains are the southernmost boundary of the distributional range of the species. Finally, the Caucasus field mice from Iran show lower average in size (i.e. CBL = 24.14; MxTR = 3.83) comparing to that of specimens reported from Caucasus (CBL = 25.53; MxTR = 3.98) and the minimum of the foot length (21 vs 22.5); based on measurements published by Vorontsov et al. (1992).

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