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Pseudopus apodus (PALLAS, 1775) from Jordan, with notes on its ecology

(Sqamata: Sauria: Anguidae)

Pseudopus apodus (PALLAS, 1775) von Jordanien, mit Bemerkungen zu seiner Ökologie
(Sqamata: Sauria: Anguidae)

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KURZFASSUNG

Weitere Exemplare der Panzerschleiche *Pseudopus apodus* (PALLAS, 1775) werden aus Jordanien beschrieben. Morphologische und ökologische Merkmale sowie die gegenwärtig bekannte Verbreitung werden dargestellt. *Pseudopus apodus* ist in seinem jordanischen Vorkommen auf die Berge im mediterran beeinflußtenen Norden beschränkt. Die mittlere Anzahl der Rücken- und Bauchschuppenquerreihen sowie das Verhältnis von Kopflänge zu Kopfbreite jordanischer Exemplare werden mit Angaben für *P. apodus apodus* und *P. apodus thracicus* (OBST, 1978) verglichen. Im Magen und Darm von sieben Exemplaren aus Jordanien fanden sich Überreste von Arthropoden und Mollusken, wobei Orthopteren den zahlenmäßig größten Anteil an Nahrungsobjekten ausmachten.

ABSTRACT

Further specimens of the Glass Lizard *Pseudopus apodus* (PALLAS, 1775) are described from Jordan. Morphological and ecological characters as well as the currently known distribution in Jordan are presented. In Jordan, *Pseudopus apodus* is confined to the northern Mediterranean mountains. The median number of dorsal and ventral scales and the head length-width index of specimens from Jordan are compared to that in *P. apodus apodus* and *P. apodus thracius* (OBST, 1978). The analysis of stomach and intestinal contents for seven specimens revealed remains of arthropods and mollusks with orthopterans constituting the highest number of consumed animals.

KEY WORDS

Reptilia: Sqamata: Sauria: Anguidae: *Pseudopus apodus*, morphology, systematics, ecology, diet, distribution, Jordan

INTRODUCTION

In the Levant, the genus *Pseudopus* MERREM, 1820 is represented by a single species, *Pseudopus apodus* (PALLAS, 1775). Our knowledge on the distribution of this species in Jordan has been limited to the record of PERRACA (1894) from "Es Salt". Since then, no further localities were indicated, until recently (DISI et al. 2001). The North and central West of Jordan as well as northern Palestine represent the southernmost distribution range for the European Glass Lizard (HAAS 1951; DISI et al. 2001).

OBST (1978) distinguished between *P. apodus* of eastern and southern Europe based on scale counts and head proportions. According to this author, *P. apodus apodus* refers to populations from the eastern Caucasus to Afghanistan, Kazakhstan and the Kirghiz region, and *P. apodus thracius* (OBST, 1978) to those of the Balkans, western Turkey and Crimea (OBST 1978, 1981). The allocation of the southern Levantine populations was not analyzed, however, OBST (1978) addressed the pressing need to clarify their status.

BARAN et al. (1988) recognized the subspecies *Pseudopus apodus thracius* as a form inhabiting all coasts of Turkey, with local distribution along the Black Sea coast and *Pseudopus apodus apodus* as an inland species occurring to the extreme east of Turkey. CLARK & CLARK (1973) found no differences in measurements and pholidosis between Turkish and Greek specimens.

In this account we present morphological and ecological data of Jordanian specimens of *P. apodus* collected in the last two decades and discuss their systematic status.

Table 1: *Pseudopus apodus* (PALLAS, 1775) from Jordan. Materials examined.
Tab. 1: *Pseudopus apodus* (PALLAS, 1775) aus Jordanien. Untersuchtes Material.

Specimen No. Exemplar Nr.	Sex Geschlecht	Locality Fundort	Date of collecting Sammeldatum
JUMR 899	M	Al'al	15.5.1882
JUMR 1415	F	Irbid	1983
JUMR 1161	JUV	Deir Abu Sa'id	1982
JNHM 848	F	Malka	23.10.1988
JNHM 1104	F	Sahm Al-Kufarat	31.10.1998
JNHM 1148	F	Deir Abu Sai'd	2.7.1996
JNHM 1223	JUV	Al- Shalalah	6.4.2000
JNHM 1002	M	Jajin, close to Sum Al Sharaq	23.5.1992
JNHM 1195	JUV	Ibeen	31.10.1999
JNHM 849	JUV	Aqraba	1.10.1988
JUSTM 0193	M	Irbid, Kufr Soum (south)	12.5. 1998

MATERIALS AND METHODS

A total of 11 specimens of *P. apodus* housed at the Jordan University Museum, Amman (JUMR), the Jordan Natural History Museum, Irbid (JNHM) and the Jordan University of Science & Technology Museum, Irbid (JUSTM) were examined (table 1). Pholidosis data and measurements were recorded (table 2).

Materials examined: JUMR 899, ♂, Al'al, 15.5.1982. JUMR 1415, ♀, Irbid, 1983. JUMR 1161, juv., Deir Abu Sa'id, 1982. JNHM 848, ♀, Malka, 23.10.1988. JNHM 849, juv., Aqraba, 1.10.1988. JNHM 1002, ♂, Jajin, 23.5.1992. JNHM 1104, ♀, Sahm Al-Kufarat, 31.10.1998. JNHM 1148, ♀, Deir Abu Sai'd, 2.7.1996. JNHM 1195, juv., Ibeen, 31.10.1999. JNHM 1223, juv., Al- Shalalah, 6.4.2000. JUSTM 0193, ♂, Kufr Soum, 12.5. 1998.

Abbreviations: SVL – snout-vent length (mm), TL – tail length (mm), UL – upper labials, LL – lower labials, MDR – longitudinal dorsal scale rows at midbody, VSR – longitudinal ventral scale rows, VS – transversal ventral scale rows, SC – transversal subcaudal scale rows, DR – transversal dorsal scale rows, DC – transversal scale rows on dorsal side of the tail, HL – head length (mm), HW – head width (mm). Head length was measured from the tip of the snout up to the posterior end of the occipital shield, in while head width was measured across the posterior eyes edges, as indicated by OBST (1978).

RESULTS AND DISCUSSION

Morphology

The specimens from Jordan are characterized by a median number of 100 (90-107, STD ± 4.6, n = 11) dorsal and 115 (101-121, STD ± 5.7, n = 11) ventral longitudinal scale rows (table 2). The head is broad and compact with an average length-width index of 1.56 (1.28 - 1.90, STD ± 0.17, n = 11). The lateral and dorsal aspect is dark brown to slightly green brown with scattered darker brown scales. The dorsum of the tail is slightly lighter than the body coloration. The head is lighter than the rest of the body being light brown green in contrast to the dorsal head and body as well as the tail. The ventral aspect is uniformly light.

The tail of juveniles (figs. 1a, 1b, 2) from Jordan is elongate and prehensile towards the end. Dorsal coloration is light brown. The ventral side is light blue anteriorly and becomes silvery towards the tail. Head with four pairs of dark brown transversal stripes which do not meet dorsally, the anteriormost being located posterior to the nasal, a second extending anteriorly from the upper labials just under the eye, the third from the 10th and 11th upper labials to the

Table 2: Measurements and counts of 11 specimens of *Pseudopus apodus* (PALLAS, 1775) from Jordan. JUMR - Jordan University Museum, Amman, JNHM - The Jordan Natural History Museum, Irbid, JUSTM - The Jordan University of Science & Technology Museum, Irbid, SVL - snout-vent length, TL - tail length, UL - upper labials, LL - lower labials, MDR - longitudinal dorsal scale rows at midbody, VSR - longitudinal ventral scale rows, VS - transversal ventral scale rows, SC - transversal subcaudal scale rows, DR - transversal dorsal scale rows, DC - transversal scale rows on dorsal side of the tail, HL - head length, HW - head width. * - Specimen with broken tail.

Tab. 2: Meß- und Zähldaten der 11 untersuchten Exemplare von *Pseudopus apodus* (PALLAS, 1775) aus Jordanien. JUMR - Jordan University Museum, Amman, JNHM - The Jordan Natural History Museum, Irbid, JUSTM - The Jordan University of Science & Technology Museum, Irbid, SVL - Kopf-Rumpf-Länge, TL - Schwanzlänge, UL - Anzahl Oberlippenschilder, LL - Anzahl Unterlippenschilder, MDR - longitudinale Rückenschuppenreihen in Rumpfmitte, VSR - longitudinale Bauchschuppenreihen, VS - transversale Bauchschuppenreihen, SC - transversale Schuppenreihen der Schwanzunterseite, DR - transversale Rückenschuppenreihen, DC - transversale Schuppenreihen der Schwanzoberseite, HL - Kopflänge, HW - Kopfbreite, * - Exemplar mit Schwanzdefekt.

Specimen No. Museums-Nr.	SVL (mm)	TL (mm)	UL	LL	MDR	VSR	VS	SC	DR	DC	HL (mm)	HW (mm)
JUMR 899	405	620	12/12	9/10	12	10	120	187	100	195	54.5	36
JUMR 1415*	390	380	11/11	9/9	12	10	115	107	103	108	50	30.5
JUMR 1161	160	290	11/11	9/8	10	10	101	189	90	203	21.5	11.3
JNHM 848	380	522	12/12	9/8	12	10	118	203	99	198	43.7	28.5
JNHM 1104	400	650	12/12	9/9	12	10	119	206	101	106	55	38
JNHM 1148	400	600	11/11	9/9	12	10	121	208	102	215	52.8	38
JNHM 1223	280	450	11/12	8/9	12	10	116	209	107	215	39.8	24.2
JNHM 1002	320	500	12/12	9/9	12	10	115	214	102	207	37.8	26
JNHM 1195	185	300	10/10	8/8	12	10	113	204	96	195	21	16.3
JNHM 849	120	165	11/11	8/8	12	10	109	206	95	200	18.5	11
JUSTM 0193	290	370	11/11	9/9	12	10	114	150	101	161	38.8	24

lower posterior side of the eye and the fourth laterally from the ear opening to the base of the head. There are 52 - 54 transversal W-shaped stripes present along the dorsal side of the juvenile animals, being wider towards the anterior part and narrower posteriorly. The ventral side of the head possesses a series of stripes which originate at the lower labials and never meet. Small irregular dark markings are situated along the margins of the ventral and the lateral sides.

Variation within measurements and pholidosis data in juveniles: n = 4, SVL 120-280 (186.3), TL 165-450 (301.3), HL 18.5-39.8 (25.2), HW 11-24.2 (15.7), UL 10-12, LL 8-9, VS 101-116 (109.8), SC 189-209 (202), DR 90-107 (97), DC 195-215 (203.3). TL/SVL 1.60.

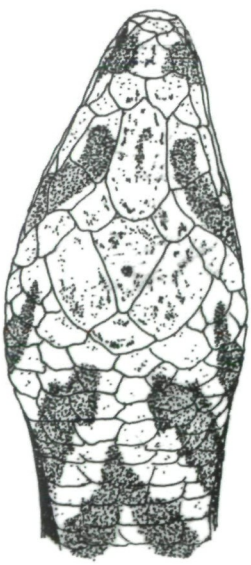
In adults (figs 3, 4), the body is usually of uniform light green to dark brown color. The head is lighter than the body, with scattered small brown spots on the dorsal side. Ventral side is uniformly light brown. The lateral fold extends on both sides as far as to the anal opening and ending with a pair of vestigial limbs of 2-3 mm length.

Variation within measurements and pholidosis data in adults. Males (n = 3): SVL 290-405 (338.3), TL 370-620 (496.7), HL 37.8-54.5 (43.7), HW 24-36 (28.7), UL 11-12, LL 9-10, VS 114-120 (116.3), SC 150-214 (183.7), DR 100-102 (101), DC 161-207 (187.7). mean TL/SVL 1.46, mean HL/HW 1.53. Females (n = 4): SVL 380-400 (392.5), TL 380-650 (538), HL 43.7-55 (50.4), HW 28.5-38 (33.8), UL 11-12, LL 8-9, VS 115-121 (118.3), SC 107-208 (181), DR 99-103 (101.3), DC 161-215 (173). mean TL/SVL 1.50 (n = 3; female with broken tail JUMR 1415 not considered), mean HL/HW 1.50.

According to OBST (1978), the typical subspecies *Pseudopus apodus apodus* (PALLAS, 1775) is characterized by the higher number of dorsal and ventral scale rows (mean values: 106 [range: 96-110] and 120 [114-124], respectively) as well as relatively slim heads (length-width index averages 2.16 [range: 1.88-2.33]) [n=38]. The coloration is conspicuously light with slight or without contrast between the dorsal head and the body as well as the tail. Characteristic is a washed out to clear, irregular light-dark mosaic on the body sides, dorsum and dorsal tail. This mosaic is formed by single scales. The ventral side is light not differing in coloration from the dorsal sides of body and tail. In rare cases the light-dark mosaic

1a 1b

2 3



of the dorsal area is also found in the ventral area (but then very pale). This subspecies never exhibits a uniform, full to dark brown, dorsal coloration with clear contrast to the much lighter head.

The distribution of this subspecies extends over the eastern Caucasus countries from the south over Georgia to Armenia, eastwards over Iran, Turkmenistan, Afghanistan, to the southern coast of the Lake Balkhash. The western border of this subspecies is within the Turkish territory, which otherwise is populated by the following subspecies (OBST 1987).

The subspecies *Pseudopus apodus thracius* (OBST, 1978) is characterized by the lower number of dorsal and ventral scale rows (mean values: 98 [range: 93-106] and 117 [112-123], respectively, as well as a relatively short and broad head (length-width index averages 1.93 [range: 1.72-2.12]) [n=33]. Coloration is conspicuously dark with apparent contrast to the lighter head. There is never a light-dark-mosaic through interspersed light scales. The ventral side is usually dark and may be lighter in the tail region. Rarely, the ventral side has a light-dark mosaic appearance. More common are adult specimens with dark contour lines on the scales, both ventrally (especially in the posterior part) and in the lateral and dorsal parts. The uniformly dark appearance of the dorsum is not influenced by these pattern elements (OBST 1987).

The distribution of *P. a. thracius* extends from Istria and Dalmatia up to southern Greece, eastwards over Bulgaria into southeastern Rumania as well as the European part of Turkey and Western Anatolia and some Aegean islands (OBST 1987). KUMLUTAŞ et al. (2004) gave average measurements for three specimens collected from the western Taurus, Turkey (transversal

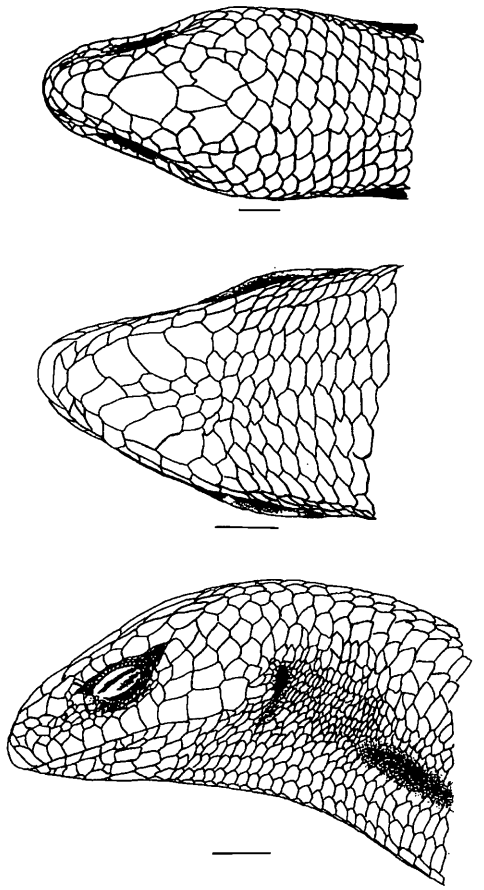


Fig. 4. Dorsal, ventral and lateral views of the head of *Pseudopus apodus* (PALLAS, 1775) from Jordan (JNHM 1148) (scale 10mm). Drawing by M. ABU BAKER (Irbid).

Abb. 4: Dorsal-, Ventral- und Lateralansicht des Kopfes von *Pseudopus apodus* (PALLAS, 1775) aus Jordanien (JNHM 1148) (Maßstab = 10 mm). Graphik: M. ABU BAKER (Irbid).

Figs. 1-3 (opposite page): *Pseudopus apodus* (PALLAS, 1775) from Jordan.

Abb. 1-3 (gegenüberliegende Seite): *Pseudopus apodus* (PALLAS, 1775) aus Jordanien.

Fig. 1. Dorsal (a) and ventral (b) views of a juvenile (JNHM 849).

Abb. 1: Dorsal- (a) und Ventralansicht (b) eines Jungtieres (JNHM 849).

Fig. 2: Dorsal aspect of the head of a juvenile (JNHM 849) (scale = 10 mm). Drawing: M. ABU BAKER (Irbid).

Abb. 2: Dorsalansicht des Kopfes eines Jungtieres (JNHM 849) (Maßstab = 10 mm). Graphik: M. ABU BAKER (Irbid).

Fig. 3: Dorsal view of an adult male (JUSTM 0193).

Abb. 3: Dorsalansicht eines adulten Männchens (JUSTM 0193).

rows of ventral and dorsal scales 118 and 99 respectively, 12 and 10 longitudinal rows of dorsal and ventral scales, respectively, with head length/head width index of 1.44). The head length/head width index is far below the lowest values given by OBST (1978).

The sample from Jordan showed a median number of 100 [range: 90-107] dorsal and 115 [101-121] ventral transversal scale rows compared to 106 and 120 in *P. a. apodus* and 98 and 117 in *P. a. thracius*, respectively. Head length-width index for the Jordanian population averages 1.56 [range: 1.29-1.90] measured as described by OBST (1978) compared to 2.16 and 1.93 in *P. a. apodus* and *P. a. thracius* respectively. Color pattern of the Jordanian specimens is similar to *P. a. thracius*.

OBST (1978) speculated on the presence of geographic variation in *P. apodus* and pointed out that the taxonomic status of the populations in the south-east of Turkey including the Iraqi-Syrian-Israeli glass lizards is unclear. Regarding their external features, the specimens from Jordan resemble those referred to as *P. apodus thracius* by OBST (1978) in many respect, however, they differ from this western subspecies by their clearly more compact heads as described by the head length-width index. Molecular biological methods should be applied to shed additional light on the systematic status of the southeastern populations of the European Glass Lizard.

Habitats

The range area of *P. apodus* in Jordan is confined to the northern Mediterranean mountains (fig. 5). Their altitude ranges from 600 to 1000 m a.s.l., with annual rainfall reaching 600 mm, where *terra rossa* soil is the dominant type. *Pseudopus* is found in open areas near natural forests of oak (*Quercus calliprinos* or *Qu. ithaburensis*) and Palestine pistachio (*Pistacia palaestina*). Usually burrows are located near shrubs of *Sarcopoterium spinosum* and *Artemisia herba-alba*. Burrows were also found at the edges of agricultural fields among stones removed from the fields. This species is also common in rocky habitats of northern Jordan; it was found along rock piles and stone terraces. Individuals may use rodent burrows or seek refuge among stone piles or walls.

Specimens from Aqraba and Deir Abu Sa'id were taken from open slopes, with scattered vegetation and relatively medium-sized stones. The European Glass Lizard is diurnal and could be observed during the early day hours or late afternoon coiled or uncoiled near rocks or bushes of *S. spinosum*.

Other reptiles associated with the habitats of *P. apodus* include *Hemidactylus turcicus*, *Ptyodactylus puiseuxi*, *Chamaeleo chamealeon*, *Lacerta laevis*, *L. media*, *Ophisops elegans*, *Ablepharus rueppellii*, *Chalcides guentheri*, *Ophiomorus latastii*, *Laudakia stellio*, *Rhinotyphlops simoni*, *Typhlops vermicularis*, *Eryx jaculus*, *Coluber jugularis*, *C. nummifer*, *C. rogersi*, *C. rubriceps*, *Eirenis decemlineata*, *E. lineomaculata*, *E. rothi*, *Malpolon monspessulanus*, *Micrelaps muelleri* and *Vipera palaestinae*.

In Turkey, CLARK & CLARK (1973) found this species under large boulders and near banks and fields hiding among vegetation or in the shade of thick bushes. They stated that it appears in the early morning hours when the air temperature is about 14°C. In Iran, ANDERSON (1999) found this species in open grassy areas among riparian vegetation and around irrigated fields surrounded by *Artemisia*. BARAN et al. (1988) found that the distribution of *P. apodus* is mostly confined to coastal areas, and other sites in the hinterland of the Aegean and Marmara seas. Also, they pointed out that the Glass Lizard occurs in two ecotypes (i. e. subspecies as described by OBST 1978) with distinct ranges, however, intergradient zones are not recognized.

Diet

Stomach and intestinal contents of seven Jordanian specimens (three females, one male and three juveniles) were analyzed. In total 65 prey items were found in the seven specimens. The contents revealed remains of arthropods and mollusks. Orthopterans were represented by the highest number of consumed animals (55.8% of prey items) from two families - Tettigoniidae (52.5%) including three species (*Ruspolia nitidula*, *Decticus albifrons*, *Platycleis* (*De-*

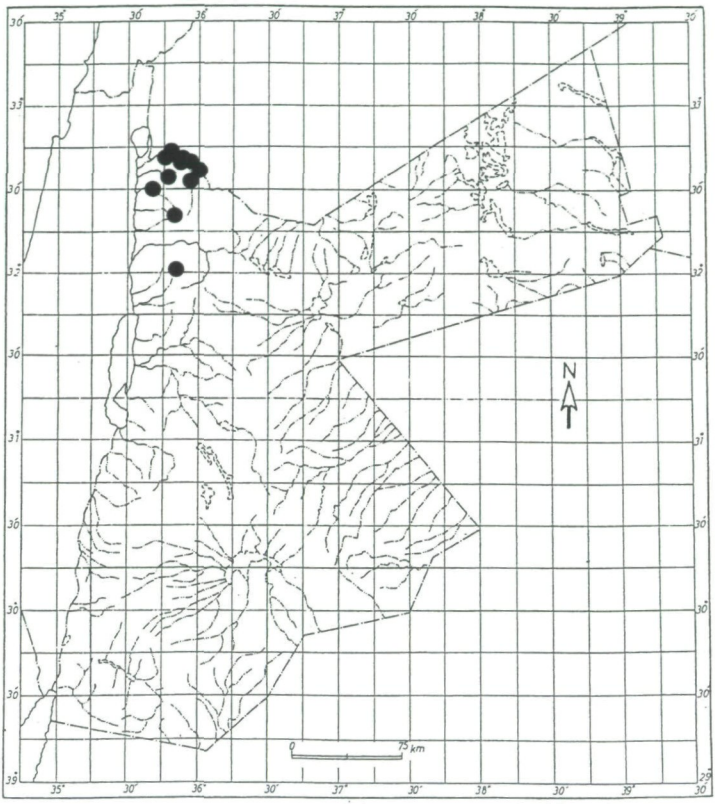


Fig. 5: Map of Jordan. The black dots represent the locations where *Pseudopus apodus* (PALLAS, 1775) was found.

Abb. 5: Karte von Jordanien. Die Fundorte von *Pseudopus apodus* (PALLAS, 1775) sind mit schwarzen Kreissymbolen dargestellt.

corana) *erecta*), and Acrididae (3.3%). Coleoptera ranked second (19.1%) with four families identified - Carabidae (13.9%), Tenebrionidae (*Pimelia.* sp.) (1.9%) Cetonidae (*Aethiessa mesopotamica*, *Netocia afflicta* and *Protaetia afflicta*) (2%) and Glaphyridae (*Eulasia* sp.) (1.3%). Blattaria constituted 10.6% of the prey items with *Heterogamodes* sp. as the only identified species. Lepidopteran larvae (2%), hymenopterans (0.6%) and saw bugs (0.6%) were the least consumed preys. Land snails comprised 5.3% of the examined material and were represented by *Helix* sp. Other unidentified materials constituted 6 %. No differences in diet were observed between sexes or life stages.

In the Caucasus, 98.1% of all stomachs analyzed contained insects, especially beetles like tenebrionids, carabids (often *Calosoma*), scarabaeids (*Cetonia aurata*), curculionids and cleonids; orthopterans (among which acrididae exceeded the tettigoniidae), and lepidopterans (sphingids, especially *Celerio* larvae). Mollusks were found in 27% of the examined stomachs, while vertebrates in 17.3% (shrews, *Crocidura suaveolens*, and lizards of the genera *Lacerta* and *Eremias*). Only in single cases cicadas, bumble bees (*Bombus*), spiders, isopods as well as one European Sandboa (*Eryx jaculus*) were found (SYROJECKOWSKIJ 1958; PETZOLD 1971). Specimens from the Crimea predominantly contained mollusks

(60.7%), isopods (28.6%), Lepidoptera larvae (14.2%), as well as Cerambycidae, Scarabaeidae (each 7.3%) and cicadas (SČERBAK 1966).

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