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The sheltopusik (*Pseudopus apodus*) in southwestern Ukraine? Insights from the museum collection

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Abstract

We provide data on the historical record of *Pseudopus apodus* (Anguidae) from Odesa, Ukraine based on the specimen re-discovered in the museum collection of the National Science and Natural History Museum of the National Academy of Sciences of Ukraine in Kyiv (NMNH) in 2021. The data show that the specimen belongs most likely to the nominotypical subspecies, *P. a. apodus* (Pallas, 1775). We discussed the possible origin of the record and we concluded that the specimen was introduced to Odesa most probably from its native range (Crimea or Caucasus). The uniqueness of the record and the past human-mediated interactions thus suggest an allochthonous origin rather than the historical sign of the relict population. Thus, our data clarify the situation on species distribution in the north-western Black Sea region from where we have still limited knowledge.

Key Words

Biogeography, museum collection, Eastern Europe, Anguidae

Introduction

Pseudopus apodus (Pallas, 1775) (Anguidae) is the only living member of the genus distributed in the Western Palearctic from the Balkans through Anatolia and Caucasus to Central Asia (Obst 1981; Sindaco and Jeremchenko 2008). Recently, the evolutionary history and taxonomy of the species were studied and showed the existence of three evolutionary lineages, corresponding with the following subspecies: *P. a. apodus* (from Crimea, through the Caucasus to Central Asia), *P. a. thracius* (Balkans and western and northern Anatolia), and *P. a. levantinus* (Middle East in the limits of historical Levant; Jandzik et al. 2018; Jablonski et al. 2021). However, several regions within the species distribution range remain unclear as to subspecies affiliation and/or the species' presence. This is also the case of the western part of the Northern Black Sea region in Ukraine (Tarashchuk 1989).

Currently, the distribution of the species in the northern part of the Black Sea region is only known from the Crimean and Taman Peninsula (Szczerbak 1966; Starkov and Orlova 2007; Tuniyev and Tuniyev 2007). However, there is also a historical but unclear record from continental Ukraine reported by Tarashchuk (1989) that was probably taken over by other authors (Gasc et al. 1997; Sindaco and Jeremčenko 2008). According to Tarashchuk (1989), the specimen was collected at the beginning of the 20th century and found in the vicinity of the city of Odesa by the Ukrainian zoologist Oleksandr O. Brauner (1857–1941). According to the author, the specimen was stored in the National Museum of Natural History at the National Academy of Sciences of Ukraine in Kyiv (NMNH; Tarashchuk 1989). However, the specimen was not added to the museum's catalogue, which led to further confusion regarding the distribution of this species in

this part of Ukraine (Dotsenko and Radchenko 2005; Tarashchuk 2007; Smirnov 2017). Only Kotenko (2007) explicitly suggested that it was probably a mistake because O. Browner never mentioned Odesa as part of the range of *P. apodus* (Brauner 1923). Later, Gasc et al. (1997) considered this record as an extinct population, while Sindaco and Jeremčenko (2008) reported the north-western part of the Northern Black Sea Coast in Ukraine as a part of the native species range. Thus, we here discuss the most plausible explanations of this long-running story.

Materials and methods

During renovation of the museum collection room of the National Museum of Natural History at the National Academy of Sciences of Ukraine in Kyiv (NMNH) in 2021, we accidentally found the specimen of *P. apodus* originating from Odesa Oblast (Province) among other collected reptiles. The specimen was stored under the voucher number № ОФЗ-SR1868\OFZ-SR1868. We identified and photographed the specimen, confirming this record from the territory of southwestern Ukraine (cf. Tarashchuk 1989). We also took basic morphometric data according to Kukushkin and Dovgal (2018) and Jablonski et al. (2021): dorsal scales longitudinal (DSL); ventral scales longitudinal (VSL); dorsal scales transversal (DST); ventral scales transversal (VST); subcaudal scale rows (SCR); preanal scales (PAN); and supralabial scales (left and right sides; SPLl/r). Coloration was not considered due to the specimen's age and colour change in the fixative. A map was created in QGIS (QGIS Development Team, 2020). The subspecies assignment of the specimen follows Obst (1978) and Jablonski et al. (2021).

Results

At the beginning of the 20th century (Tarashchuk 1989), O. Brauner collected one specimen of *P. apodus* (adult male with the voucher number № ОФЗ-SR1868\OFZ-SR1868; Figs 1, 2) near the Malyi Fontan Cape (Small Fountain or Малий Фонтан; ~ 46.446°N, 30.771°E), Primorsky District of Odesa city (Figs 3, 4) that was deposited at the NMNH in Kyiv, Ukraine. At the time of collection, the locality was a small village but has now become part of the city of Odesa. The exact date of the find is not specified. The total length of the lizard is 970 mm. The specimen had a yellowish colour that was possibly a result of the primary fixation process. The specimen is old but overall in good condition. The tail and most scales were intact and undamaged. We obtained the following morphological data: DST = 12, VST = 10, DSL = 110, VSL = 124, SCR = 199, PAN = 5, SPLl = 12 (Table 1) and we expect that the specimen represents *P. a. apodus* (see below).

Table 1. Summary of the variation of morphological characters in *Pseudopus apodus*. Morphological data for the specimen from Odesa, Ukraine are presented in the context of data from Jablonski et al. (2021).

Meristic characters	*P. a. apodus* from Odesa	*P. a. apodus*	*P. a. thracius*	*P. a. levantinus*
Dorsal scale transversal (DST)	12	11–14	12	12
Ventral scale transversal (VST)	10	10–11	10	10
Dorsal scales longitudinal (DSL)	110	88–119	92–110	88–119
Ventral scales longitudinal (VSL)	124	111–129	108–124	115–137
Subcaudal scale rows (SCR)	199	175–249	173–237	199–222
Preanal scales (PAN)	5	5–11	5–8	10
Supralabial scales left (SPLl)	12	9–13	10–12	11–14

Discussion

Pseudopus apodus is a conspicuous species that, due to its body size and characteristic aspect, can hardly be confused with any other species in its range. In recent times, the subspecific taxonomy of the species was revised, showing variation in genetics and morphology (Jablonski et al. 2021). Nevertheless, some questions, especially regarding the distribution of the species, remain. One of these questions arises from the record from the north-western corner (SW Ukraine) of the Black Sea region mentioned by Tarashchuk (1989). Although Sindaco and Jeremčenko (2008) did not mention Tarashchuk (1989) or any additional information, we think the record shown on their map (136: 348 p.) in the SW Ukraine is based on specimen discussed here. Considering the geographical and historical context, we suspect that the specimen from Odesa belongs to *P. a. apodus* (Obst 1978; Jablonski et al. 2021), rather than *P. a. thracius* known from the Balkans. Both subspecies differ in morphology, especially in coloration and pattern, which is clearly visible when they are alive (Obst 1978). However, due to the age of the specimen and its long time in the preservative medium, coloration and pattern could not be studied.

Since there are no other records of *P. apodus* in the territory of SW Ukraine (Sindaco and Jeremčenko 2008), we suggest three possible explanations of the origin in Odesa: i) unintentional human-mediated introduction with soil or ornamental vegetation from the Crimea or the Caucasus; ii) intentional human-mediated introduction; iii) an isolated relict population. One of the possible explanations is that the lizard could have been accidentally transported from the Crimea or the Caucasus with plants for the botanical garden built at the end of 19th Century in Malyi Fontan Cape area (Fig. 2). The closest population of *P. apodus* to Odesa lives in Crimea (Szczerbak 1966), approximately 300 km of air distance, and belongs to *P. a. apodus* (Jandzik et al.

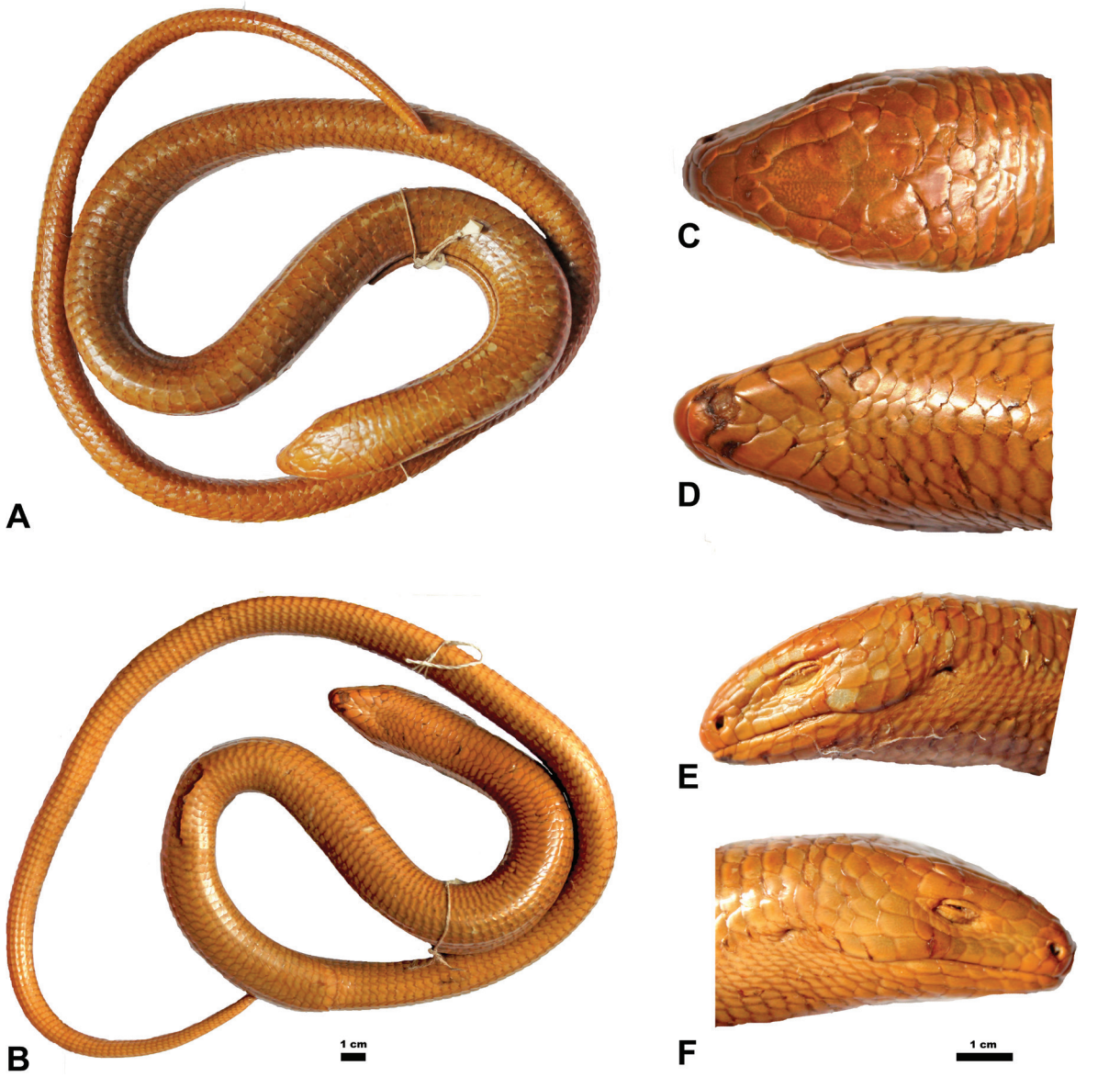

Figure 1. The specimen of *P. apodus* № ОФЗ-SR1868\OFZ- SR1868, adult from Odesa, Ukraine. **A.** Dorsal view; **B.** Ventral view; **C.** Dorsal view of the head; **D.** Ventral view; **E, F.** Lateral views. Scale bars: 1 cm. Photos credit Roman Lysenko, modified by Oleksandra Oskyrko.

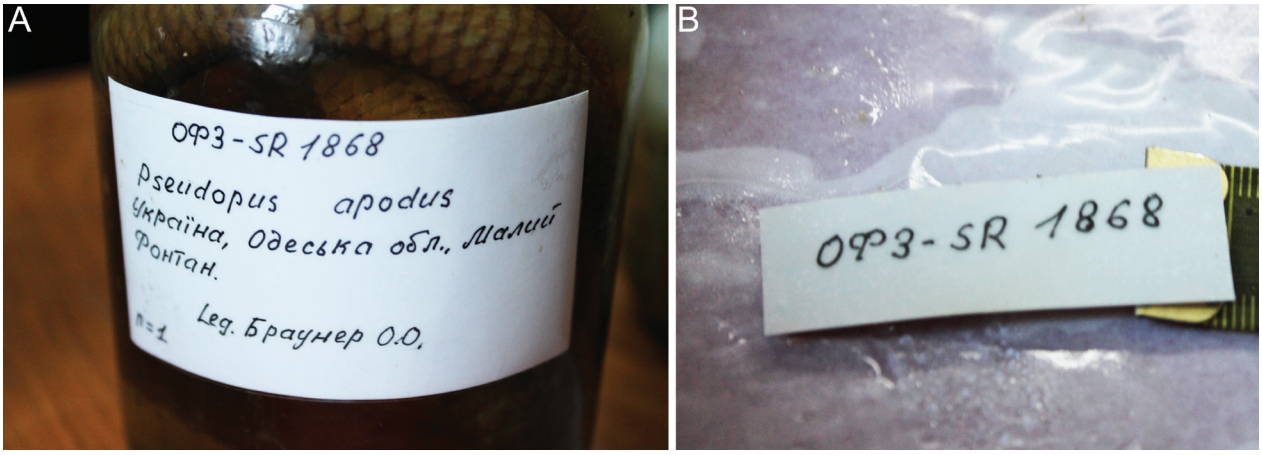

Figure 2. Label and information about the specimen of *Pseudopus apodus* from the museum's collection in Ukrainian. **A.** Specimen with the name of the location, specimen's number and the name of the possible collector **B.** Specimen number № ОФЗ-SR1868 (in Cyrillic), duplicated in Latin № OFZ-SR1868.

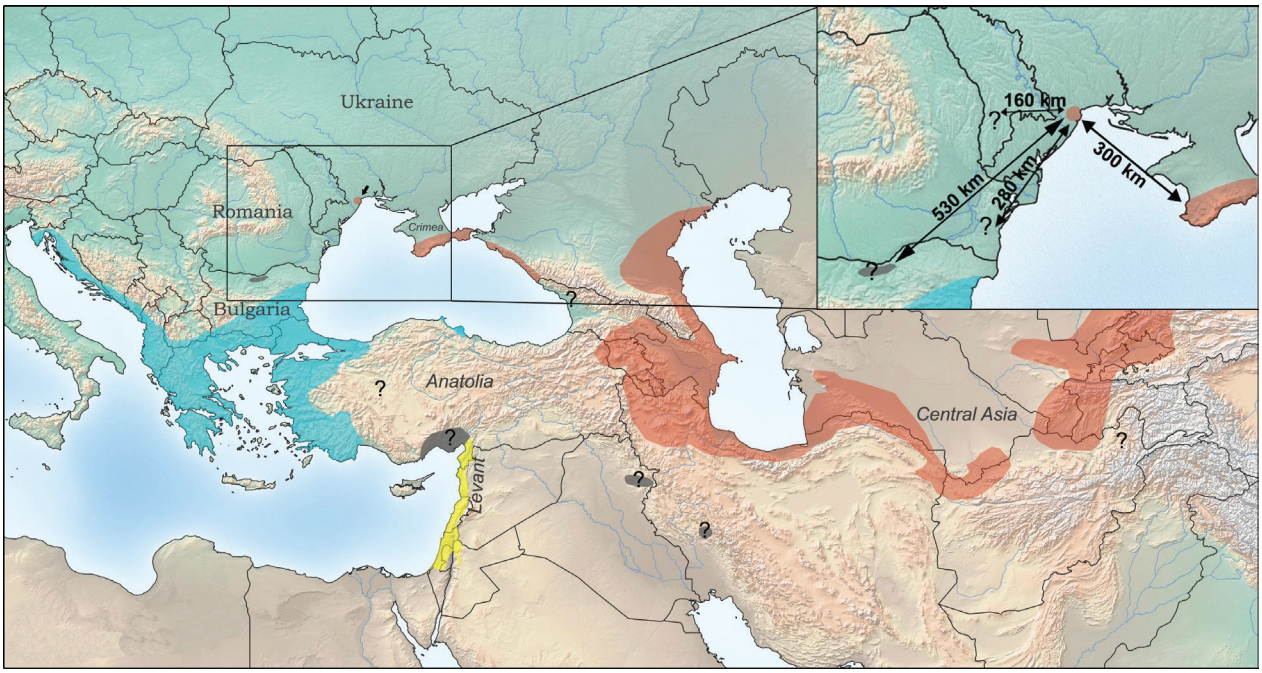

Figure 3. The geographic distribution of *Pseudopus apodus*. The range is according to Sindaco and Jeremčenko (2008) and its colour for subspecies follows Jablonski et al. (2021). An unclear subspecies affiliation is in grey colour. Odesa, Ukraine is indicated by the black arrow on the main map, with details and distances to the closest records of *P. apodus* given in the inlay map.

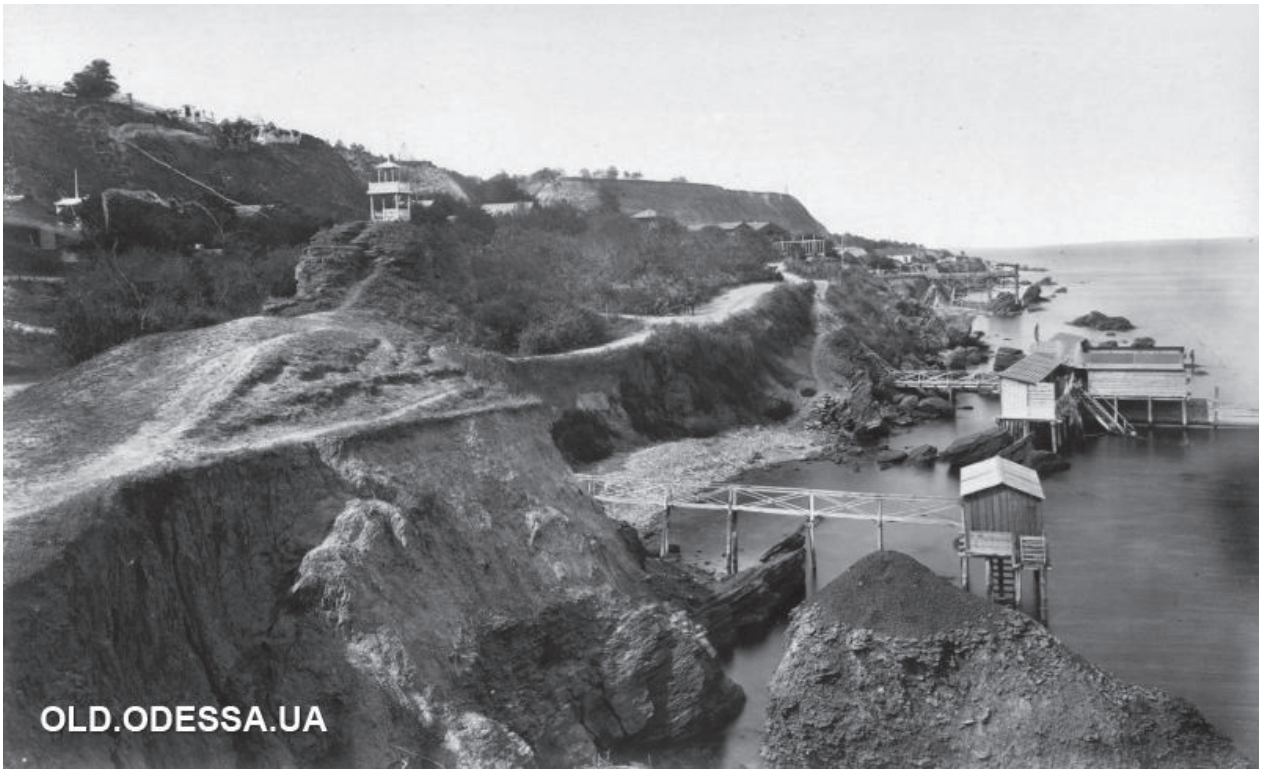

Figure 4. Photo of the area Malyi Fontan Cape, Odesa city (Odesa Oblast, Ukraine) in the early 20th century (source http://vikna-Odesa.od.ua/old-photo/?malyy-fontan).

2018; Jablonski et al. 2021). Alternatively, the individual may have been deliberately released. Such cases are known for *Pseudopus* and have been reported from Italy, Austria or Slovenia (Werner 1897; Schreiber 1912; Obst 1981). All these attempts were unsuccessful (Obst 1981). However, in a well-documented case, *P. apodus* was introduced to the area north of the Caucasus for experimental purposes (Tertyshnikov and Garanin 1984; Kukushkin et al. 2017). We consider human-mediated introduction, intentional or not, without later

established population as the most likely explanation for the record from Odesa.

The above mentioned evidence does not support any possible relict population in Odesa, although this possibility should be also discussed in the broader context. It is true that the type of the habitat and microclimatic conditions in the Odesa area were historically similar to parts of the species native range, e.g., in Crimea (Fig. 4). Also, isolated records of the species from several other regions of the western Black Sea area (Lepşi 1926; Tofan 1965; Fallgatter and Günthert 1966) could be seen as a support of a formerly wider contiguous distribution of the species, which has become fragmented today (Khosatzky 1967; Jablonski et al. 2021). According to Villa and Delfino (2019), the distribution of this genus has declined southward, starting from a wide range during the Miocene and narrowing towards south European countries in the Pliocene and the Early Pleistocene. In such context, we cannot exclude populations, e.g., in Dobruja (530 and 280 km of air distance from Odessa; see the single records from Bulgaria or Romania) that are small, overlooked, or already extinct due to drastic habitat changes (Lepşi 1926; Fallhatter and Günthert 1966; Cogălniceanu et al. 2008, 2013). However, due to missing data and further observations of the species in the mainland of Ukraine and accidental species introductions (Brauner 1923; Dotsenko and Radchenko 2005; Kotenko 2007; Tarashchuk 2007; Smirnov 2017), we consider the idea of a relict population of *P. apodus* in Odesa territory rather unlikely. The finding of only one individual cannot, unfortunately, confirm any historical or current population presence in the territory. Tofan (1965) also assumed the occurrence of the species in Moldova (160 km from Odesa), although exact data are not provided and further reports do not support it (Popa and Tofan 1982; Kozar 1987; Borkin et al. 1997). However, it is not fully excluded and further effort regarding the distribution of *P. apodus* in the western Black Sea region could bring new evidence.

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