Vestnik zoologii, **35**(1): 43–46, 2001

UDC 567.9 : 551.782.2(477, 478)

NEW RECORDS OF PROTEID SALAMANDERS (AMPHIBIA, CAUDATA) FROM THE PLIOCENE OF UKRAINE AND LOWER PLEISTOCENE OF MOLDAVIA

A. O. Averianov

Zoological Institute Russian Academy of Sciences, Universitetskaya nab., 1, St.-Petersburg, 199034 Russia
E-mail: sasha@AA1923.spb.edu

Accepted 24 April 2000

New Records of Proteid Salamanders (Amphibia, Caudata) from the Pliocene of Ukraine and Lower Pleistocene of Moldavia. Averianov A. O. — Two isolated proteid vertebrae are described: the first is from the Pliocene Kotlovina locality, Ukraine, and is referred to *Mioproteus* sp., whereas the second is from the lower Pleistocene Chishmikioi locality in Moldavia (former USSR) and is referred to "*Mioproteus*" *wezei*. This problematic species is distinct from the Miocene *M. caucasicus* and may pertain to a distinct genus that includes aquatic ancestors for the modern troglobitic *Proteus.*

Key words: Amphibia, Caudata, Proteidae, *Mioproteus*, Pliocene, Pleistocene, Ukraine, Moldavia.

Новые находки протеидных хвостатых амфибий (Amphibia, Caudata) из плиоцена Украины и нижнего плейстоцена Молдавии. Аверьянов А. О. — Описаны два позвонка, отнесенные к *Mioproteus* sp. и «*Mioproteus*» *wezei* и происходящие из соответственно плиоценового местонахождения Котловина в Украине и раннеплейстоценового местонахождения Чишмикиой в Молдавии. Последний вид отличен от миоценового *M. caucasicus* и, возможно, его следует выделить в особый род, объединяющий речных предков современных пещерных *Proteus.*

Ключевые слова: Amphibia, Caudata, Proteidae, *Mioproteus*, плиоцен, плейстоцен, Украина, Молдавия.

Introduction

Proteids (Proteidae) are a family of specialized, paedomorphic, perennibranchiate salamanders with an elongate body. Extant proteids are confined to Europe and North America, but in the past the family's range extended as far eastwards as Kazakhstan or, possible, Kirghisia. The fossil record for the Proteidae is limited (Estes, 1981), particularly from the territory of the former Soviet Union. Badly preserved vertebrae of Proteidae? were reported from the lower Eocene Andarak II locality in Kirghisia (Чхиквадзе, 1984). The middle Miocene (middle Sarmatian, Vallesian) *Mioproteus caucasicus* Estes, Darevsky, 1977 was described on the basis of isolated vertebrae and some cranial elements from the Maikop locality in the North Caucasus, Russia (Estes, Darevsky, 1977). *Mioproteus* sp. was reported from the Miocene Kentyubek locality in western Kazakhstan (Бендукидзе, Чхиквадзе, 1976; Чхиквадзе, 1984; Estes, 1981). Chkhikvadze (Чхиквадзе, 1981: 152) stated that "probably all the salamander amphicoelous vertebrae from the [Mio-Pliocene Moldavian and Ukrainian] localities Buzhory, Male, Novoelisavetovka, Novaya Emetovka, Cherevichnoe, and Kuchurgan should be referred to the genus *Mioproteus.*" These records were repeated in Chkhikvadze (Чхиквадзе, 1984) and Chkhikvadze & Lungu (Чхиквадзе, Лунгу, 1984), who referred a fragmentary vertebra from the middle Sarmatian (Vallesian, MN 9) Moldavian Buzhory locality to *Mioproteus* sp. However, amphicoelous vertebrae are also characteristic for many salamander families, including the Cryptobranchidae and Hynobiidae, both of which are also known from the Neogene of Eurasia (Roček, 1994; Averianov, Tjutkova, 1995; Venczel 1999). For example, the cryptobranchid *Andrias* [sp.] was reported from the Ruscinian (MN 14) Kuchurgan locality in Moldavia (Чхиквадзе, 1981, 1984) and some Miocene localities in Moldavia (Чхиквадзе, 1984). The ZIN PH collection contains an undescribed dentary fragment of a cryptobranchid from the lower Ruscinian (MN 14) Antipovka locality, Voronezh Region of Russia. None of the vertebrae from the localities mentioned by Chkhikvadze has been described or illustrated and their attribution to proteid salamanders remains to be demonstrated; these records are not considered future here. The only reliable, published records of fossil European Proteidae are the following: *M. caucasicus* from the middle Miocene of Maikop, western Russia and Appertshofen, Germany; *Orthophyia longa* Meyer, 1845 from the upper Miocene of Oeningen, Germany; "*Mioproteus*" *wezei* (Estes in Młynarski et al. 1984) from the lower Pliocene of Węże II, Poland and upper Pliocene of Balaruc II, France; and *Proteus bavaricus* Brunner, 1956 from the Pleistocene of Kleinen

Teufelshöle, Germany (Dehm 1961; Estes, Darevsky, 1977; Estes, 1981; Młynarski et al., 1984 and references therein). The proteid vertebrae from the Miocene of Kentyubek, western Kazakhstan (Бендукидзе, Чхиквадзе, 1976) are probably referable to *M. causcasicus* (Estes, 1981: 27), but they still not described.

In this note I describe two isolated proteid vertebrae: one is from the Pliocene Kotlovina locality, Ukraine, and is referred to *Mioproteus* sp.; the second vertebra is from the lower Pleistocene Chishmikioi locality, Moldavia (former USSR Republic), and is referred to "*Mioproteus*" *wezei*.

The materials described herein are housed in the Paleoherpetological collection of the Zoological Institute, Russian Academy of Sciences, St.-Petersburg (ZIN PH).

Order CAUDATA Oppel, 1811

Family Proteidae Hogg, 1838

Mioproteus Estes & Darevsky, 1977

***Mioproteus* sp.** (fig. 1)

Material. ZIN PH 1/14, trunk vertebra. Kotlovina, Odessa Province, Ukraine. Pliocene.

Description. The vertebra is relatively broad transversely and short anteroposteriorly. The centrum is amphicoelous, without peripheral calcification in the cotyles. The ventromedian keel is shallow. Weak posterior basapophyses are present. The centrum is deeply excavated to either side and below the transverse processes. There are two separate subcentral foramina on the right side and large single foramen on the left side. The transverse process is unicipital, without a trace of the rib articulation surface. There is a prominent, flange-like and horizontal ventral lamina on the transverse process. The posterior edge of the lamina extends posterolaterally. A prominent vertical lamina originates from the underside of the interzygapophyseal ridge and extends posteroventrally to join with the ventral lamina at the posterior edge of the latter. Just anterior and posterior to the vertical lamina there are two foramina that are confluent with the subcentral foramen. The neural arch is flattened. The neural spine is a poorly developed keel. The posterior surface of the neural arch is deeply incised, but lacks the posteriorly directed "forks" that are characteristic for trunk vertebrae in *M. caucasicus*. The centrum length is 6.20 mm.

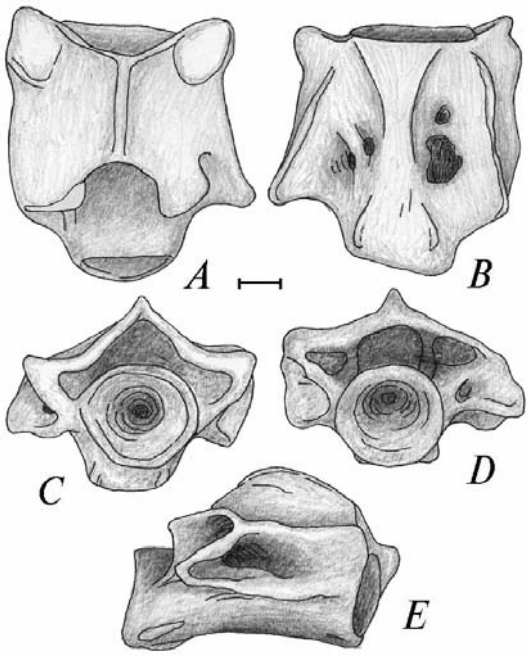

Fig. 1. *Mioproteus*, ZIN PH 1/14, trunk vertebra. Kotlovina, Odessa Province, Ukraine. Pliocene: *A* — dorsal; *B* — ventral; *C* — anterior; *D* — posterior; *E* — right lateral views. Scale — 1 mm.

Рис. 1. *Mioproteus* ЗИН РН 1/14, туловищный позвонок. Котловина, Одесская обл, Украина. Плиоцен: *A* — дорсально; *B* — вентрально; *C* — спереди; *D* — сзади; *E* — справа. Масштаб — 1 мм.

Comparison. The vertebra described is referred to Proteidae by the following combination of characters: 1) transverse process unicipital; 2) there is no trace of rib articulation surface; 3) transverse process with prominent ventral and vertical laminae. It is referred to *Mioproteus* by posterior basapophyses present, neural arch relatively wide, and ventral surface of centrum flattened. The specimen described is within the size range of the type species, *M. caucasicus* (centrum length 2.50–6.65 mm, Estes, Darevsky, 1977: 165). It differs from the latter in lacking a distinct "fork" at the posterior margin of neural arch and in lacking an anteriorly projecting process arising from the ventral lamina of the transverse process.

Comments. There are three fossiliferous levels at the Kotlovina locality, one Ruscinian and two early Villafran-

chian (Топачевский, Несин, 1989). The stratigraphic provenance ZIN PH 1/14 is uncertain because it is not known from which level the specimen was collected.

"*Mioproteus*" *wezei* (Estes in Młynarski et al. 1984) (fig. 2)

Material. ZIN PH 2/14, anterior trunk vertebra. Chishmikioi, Moldavia. Lower Pleistocene.

Description. The vertebra amphicoelous, lightly ossified, and relatively elongate. The prezygapophysis is large, projects anterolaterally, and bears a well defined articular facet. The ventromedian keel is flattened anteriorly, but the form of the more posterior part of the keel is unknown because the remainder of the centrum is broken. Along the middle part the crest was probably sharply crested. The centrum is deeply excavated in the region of the transverse processes. There are two separate subcentral foramina on the left side and large single foramen on the right side. The transverse process is unicipital, without a trace of the rib articulation surface. There is a prominent ventral lamina on the transverse process, with the posterior edge of the lamina directed posterolaterally. In lateral view the interzygapophyseal ridge is bent dorsally to form an arc. A prominent vertical lamina originates from the interzygapophyseal ridge and extends posteroventrally to join with the ventral lamina at the posterior edge of the latter. Just anterior and posterior to the vertical lamina there are two foramina that are confluent with the subcentral foramen. The neural arch is flattened. The neural crest is a low keel and the neural spine is a low, posterodorsally projecting process. The posterior edge of the neural arch is not incised and has no "forks". The centrum length is 8.05 mm.

Comparison. The specimen described is referred to the Proteidae using the same characters listed above for ZIN PH 1/14. ZIN PH 2/14 is most similar to vertebrae of the Pliocene "*Mioproteus*" *wezei* having delicate, elongate, and lightly ossified vertebrae, a deeply amphicoelous centrum, lateral cavities delimited by ventral and vertical laminae deep and voluminous, and zygapophyses protuberant. The most striking similarity between the Polish and Moldavian specimens is a great dorsal curvature of the interzygapophyseal ridge, which may be a diagnostic feature at the specific or generic level. As in a supposed anterior vertebra of "*Mioproteus*" *wezei* (Młynarski et al., 1984: 212) in ZIN PH 2/14 the neural arch is not forked posteriorly; instead the neural spine is a single median projection. ZIN PH 2/14 thus appears to be an anterior trunk vertebra. The specimen described exceeds the known size range for "*Mioproteus*" *wezei* vertebrae from Węże II (centrum length 4.3–7.5, M=5.6 mm, Młynarski et al., 1984: 212).

Comments. "*Mioproteus*" *wezei* apparently was not a troglobitic but normally aquatic animal, judging from the associate fauna and from lack of

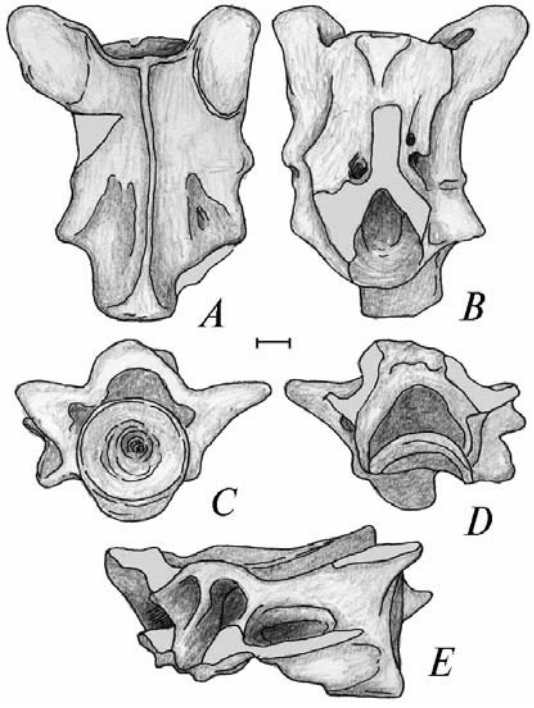

Fig. 2. "*Mioproteus*" *wezei*, ZIN PH 2/14, anterior trunk vertebra. Chishmikioi, Moldavia. Early Pleistocene: *A* — dorsal; *B* — ventral; *C* — anterior; *D* — posterior; *E* — right lateral views. Scale — 1 mm.

Рис. 2. "*Mioproteus*" *wezei*, ЗИН РН 2/14, переднетуловищный позвонок. Чишмикиой, Молдавия. Ранний плиоцен. *A* — дорсально; *B* — вентрально; *C* — спереди; *D* — сзади; *E* — справа сбоку. Масштаб — 1 мм.

mountains close to the locality areas. "*Mioproteus*" *wezei* differs from *M. caucasicus* in having more delicate and elongate vertebrae and, for these reasons, the former species probably should be referred to another genus. This undescribed genus possibly was the aquatic ancestor for the modern troglobitic *Proteus*.

The late Miocene *Orthophyia longa* from Germany resembles *M. caucasicus* in having long and narrow vertebrae and relatively short skull. These resemblances may indicate that *O. longa* and *M. caucasicus* are congeners or even the same species (Estes, 1981: 29). However, the relatively more elongate vertebrae in *O. longa* seem to preclude this possibility. Nevertheless, *Orthophyia* may prove to be the appropriate name for the aquatic European Plio-Pleistocene proteids that are ancestral to modern *Proteus*.

Acknowledgements

I am grateful to Igor Danilov (ZIN) and James Gardner (University of Alberta, Canada) for reading of the manuscript and providing useful comments.

Бендукидзе О. Р., Чхиквадзе В. М. Предварительные результаты изучения ископаемых амфибий, рептилий и птиц Тургая и Устюрта // Бюл. Моск. об-ва испыт. природы, отд. геол. — 1976. — **51**, вып. 5. — С. 156.

Топачевский В. А., Несин В. А. Грызуны молдавского и хапровского фаунистических комплексов Котловинского разреза. — Киев : Наук. думка, 1989. — 136 с.

Чхиквадзе В. М. Обзор сведений об ископаемых остатках амфибий и рептилий из неогеновых отложений Северного Причерноморья // Вопросы герпетологии / Под ред. И. С. Даревского : Автореф. докл. V Всесоюз. герпетол. конф., Ашхабад, 22–24 сент. 1981 г. — Л. : Наука, 1981. — С. 151–152.

Чхиквадзе В. М. Обзор ископаемых хвостатых и бесхвостых земноводных СССР // Изв. АН ГрузССР, Сер. биол. — 1984. — **10**, № 1. — С. 5–13.

Чхиквадзе В. М., Лунгу А. Н. Новые данные о миоценовой герпетофауне Молдавии и Кавказа // Палеобиогеографические исследования мезозоя и кайнозоя Днестровско-Прутского междуречья / Под ред. А. Н. Лунгу. — Кишинев : Штиинца, 1984. — С. 72–87.

Averianov A. O., Tjutkova L. A. Ranodon cf. sibiricus (Amphibia, Caudata) from the Upper Pliocene of Southern Kazakhstan: the first fossil record of the family Hynobiidae // Paläont. Z. — 1995. — **69,** Hf. 1/2. — P. 255–262.

Bailon S. Présence de Mioproteus wezei (Amphibia, Proteidae) dans le Pliocène supérieur (MN 16) d'Europe de l'Ouest // N. Jb. Geol. Paläont. Mh. — 1995. — **1**. — P. 1–8.

Dehm R. Über neue tertiäre Spaltenfüllungen des süddeutschen Jura- und Muschelkalk-Gebietes // Mitt. Bayer. Staatsamml. Pal. Hist. Geol. — 1961. — **1**. — S. 27–56.

Estes R. Encyclopedia of Paleoherpetology. Part 2. Gymnophionia, Caudata. — Stuttgart ; New York : Gustav Fischer, 1981. — 115 p.

Estes R., Darevsky I. Fossil amphibians from the Miocene of the North Caucasus, USSSR // J. Paleontol. Soc. India. — 1977. — **20**. — P. 164–169.

Mlynarski M., Szyndlar Z., Estes R., Sanchíz B. Amphibians and reptiles from the Pliocene locality of Węże II near Działoszyn (Poland) // Acta Palaeontol. Polonica. — 1984. — **29**, N 3–4. — P. 209–226.

Roček Z. A review of the fossil Caudata of Europe // Abhandl. Berichte Naturk. — 1994. — **17**. — P. 51–56.

Venczel M. Land salamanders of the family Hynobiidae from the Neogene and Quaternary of Europe // Amphibia-Reptilia. — 1999. — **20**, N 4. — P. 401–412.