Isolated pharyngeal and jaw teeth of bony fishes, as well as numerous bones of other vertebrates dated by Late Miocene (middle late Sarmatian s.l. = early Tortonian, 9.8 Ma), were found in the alluvial sediments of Pocşeşti site (Republic of Moldova). Six fish taxa were identified and described in the paper; the majority of them (4 species) are representatives of Cyprinidae family. Taxonomic list also includes sturgeons (Acipenseridae gen. et sp. indet.) and pikes (Esox sp.). Mixed character of fauna, joint presence of freshwater and marine species suggests that the burial of remnants took place in close proximity to large marine basin in river avandelta. Fish assemblage of Pocşeşti shows an affinity to other early Tortonian localities in Europe and reflects paleobiogeographic changes on the territory of Paratethys during the Late Miocene.

**Keywords:** bony fishes, Late Miocene, Sarmatian s.l., MN 10, Pocşeşti, Eastern Europe.

**INTRODUCTION**

European bony fish fauna began to be formed in the second half of the Paleogene. This process was continued in the Neogene, accompanied by a large-scale restructuring of ecosystems on the background of significant climatic changes. Numerous remnants of freshwater and marine bony fishes from the Late Miocene of Eastern Europe need careful handling and detailed study.

Pocşeşti (Pokshesht) site was discovered by G.M. Bilinskis in 1975 [11] and is dated to Balta suite. It is located near eponymous village on the border of Orgeevskyi and Strashenskyi districts in the Republic of Moldova (Fig. 1). Fossil bones are concentrated on the right side of Ikel River valley at the attitude of 195-200 m. According to palaeomagnetic analysis, provided by I.A. Pevzner with colleagues [18], fossiliferous horizon of Pocşeşti has right magnetization and dated to the 9th epoch of magnetic polarity (between 10 and 9 Ma).
The following vertebrates are known from the Pocşeşti site: mammals (Lagomorpha: Proochotona cf. kalfense Lungu, 1981, Alilepus sp.; Rodentia: Neocricetodon (Kowalska) sp., Collimys sp.; Sirenia: Dugongidae (cf. Metaxytherium), Dugongidae indet.; Cetacea: Physeteroidea indet., Delphinidae indet.; Carnivora: Parataxidea sp., Protictitherium sp., Metailurus cf. parvulus (Hensel, 1862), Machairodus cf. giganteus Wagner, 1848; Proboscidea: Tetralophodon longirostris Kaup, 1835; Perissodactyla: Hipparion aff. verae Gabunia, 1959, Hipparion aff. giganteum Gromova, 1952, Chiloitherium (Acerorhinus) cf. zernovi Borissiak, 1914, Chiloitherium (Chiloitherium) aff. sarmaticum Korotkevich, 1958; Artiodactyla: Aechtiaria aff. mol-davicus Godina, 1975, Miotragocerus leskevitschi (Borissiak, 1914), Gazella (Miogazella) schlosseri Pavlov, 1913, Gazella cf. deperdita Gaudry, 1873, birds (Struthio sp.), reptiles (Protestudo sp.) and amphibians (Hyla sp., Bombina sp.) [6, 11–14].

Here we describe fossil bony fish bones from the middle late Sarmatian strata of Pocşeşti site.

ABBREVIATIONS USED IN TEXT: IZ – Institute of Zoology of the Academy of Sciences of the Republic of Moldova; Poc – locality Pocşeşti.

MATERIAL AND METHODS

The present article is based on the study of 12 fish bones, 8 of which are determinable to species or at least to genus level. The investigated material was collected by A.N. Lungu in 1980s and also V.A. Marareskul and T.F. Obada during the 2011–2013.

Collection of fossil fishes from Pocşeşti was obtained by the screen-washing (mesh diameter = 1.0 mm) of the bonyferous rock from the 6th layer and recently is housed in the IZ. This material contains by the following specimens: 1 – pharyngeal tooth Leuciscus sp. (IZ Poc/01); 2 – pharyngeal tooth Rutilus frisii (IZ Poc/02); 3 – pharyngeal tooth Scardinius sp. (IZ Poc/03); 4 – pharyngeal tooth Tinca sp. (IZ Poc/04); 5 – jaw tooth, 2 vertebrae Esox sp. (IZ Poc/05-07); 8-10 – 3 vertebrae (IZ Poc/8-10); 11 – fragment of dermalia Acipenseridae (IZ Poc/11); 12 – fragment of dermalia (IZ Poc/12).

A direct determination of fossil remnants was provided by authors using diagnostic features. For comparative purposes bones from the osteological collections of the National Museum of Natural History NAS of Ukraine were used. Ichthyologic systematics in this paper follows Yu.V. Movchan [15].

Current correlation of the Paratethys stages with European Mammal Neogene Zones was essentially taken from V.A. Nesin and A. Nadachowski [16]. Measurements were taken with digital caliper, with accuracy to 0.1 mm. Fossil remnants were photographed...
using the research microscope Leica M168C. Pharyngeal tooth terminology, used in the article, follows E. Rutte [21], E.K. Sytchevskaya [24] and J. Lepiksaar [9] (Fig. 2).

GEOLOGICAL SETTING

The following layers were identified by A.N. Lungu in 1979 [11] in the geological section of Pocşeşti:

1) Top soil, 0.2–0.3 m;
2) Brown loam, 0.2–0.4 m;
3) Lumpy non-laminated greenish-gray clay with nodules of carbonates and charred plant remnants, 1.8 m;
4) Sandy gray clay with calcareous concretions, gradually moving up in dark green lumpy clay with bones of terrestrial vertebrates, 0.5 m;
5) Lumpy non-laminated gray clay with charred plant remnants and fragments of vertebrate bones, 0.5–1.0 m;
6) Sandy gray clay, contain with clay nodules and bones of terrestrial vertebrates, 1.0–2.5 m;
7) Fine clay, slightly cross-bedded sand with gravel lenses, 0.5–2.5 m;
8) Sandy shaly gray clay with rusty spots, 1.5–2.0 m.

Khersonian deposits on the Moldavian plate are composed by clastic sediments [20]. On the described territory only lower horizon is clearly identified and represented by marine greenish-gray clays interbedded with siltstone and fine-grained quartz sand.

Upper horizon is composed by alluvial sediments and is not separated from younger lithologically similar Balta suite formations. Balta sandy-clay deposits are widespread within the central and southern part of the Dniester–Prut interfluve and between Dniester – Southern Bug. Formation time of these sediments is associated with the end of the middle Sarmatian to Pontian. They are represented by lake-marsh, river, and deltaic facies. Their stratigraphic division is not clear [8].

SYSTEMATIC PALEONTOLOGY

ACIPENSERIFORMES Berg, 1940
Family ACIPENSERIDAE Bonaparte, 1831
Acipenseridae gen. et sp. indet.
Referred specimen: fragment of dermalia (IZ Poc/11).
Description: Small dermal fragment (l = 8 mm) is preserved. There are small rounded recesses with smooth edges on the bone surface. Dense bone is laminar and so broken.

CYPRINIFORMES Goodrich, 1909
Family CYPRINIDAE Fleming, 1822
Leuciscus Cuvier, 1816
Leuciscus sp.
Referred specimen: pharyngeal tooth (IZ Poc/01) (Fig. 3, 1).
Description: Pharyngeal tooth is slender, with relatively low rounded crown, broken at the base. Tooth back is straight, top of the tooth is elongated in the blunt robust hook. Its edge is targeted forward and upward. Grinding surface has two small jags. Tooth belly is slightly convex. Height of the crown is 2.3, width is 1.4 mm. Tooth belongs to small (juvenile?) specimen.

*Rutilus* Rafinesque, 1820
*Rutilus frisii* (Nordmann, 1840)
Referred specimen: pharyngeal tooth (IZ Poc/02) (Fig. 3, 2).
Description: Tooth is rough, with fungiform, laterally compressed crown. Tooth back is convex and arcuate, top without hook. Grinding surface is narrow, slightly convex, with weekly marked longitudinal furrow and has traces of intravital obliteration. Tooth belly is convex and hangs over the neck. Pedicle is partly broken, oval in the cross-section. Crown is coarcted to neck and a little larger than its width. Height of the tooth is 3.2, width of the crown is 3.1 mm.

*Scardinius* Bonaparte, 1837
*Scardinius* sp.
Referred specimen: pharyngeal tooth (IZ Poc/03) (Fig. 3, 3).
Description: Small pharyngeal tooth on the long pedicle has high laterally slender cylindrical crown with broad base. Tooth back is straight, with robust hook at the top. Grinding surface is narrow with a higher edge that has 3 robust pointed jags and a lower edge without jags. Tooth belly is rounded and compressed, without keel. Height of the tooth is 3.2, width of the crown is 1.5 mm.

*Tinca* Cuvier, 1816
*Tinca* sp.
Referred specimen: pharyngeal tooth (IZ Poc/04) (Fig. 3, 4).
Description: Flattened pharyngeal tooth has low crown. Pedicle is rounded and slightly deflexed. Neck is expressed well, tooth back is convex and arcuate. Tooth belly is also slightly convex. Grinding surface is narrow, laterally compressed, having a deep

Fig. 3. Fossil bony fish bones from the Pocșești site in Moldova: 1 – *Leuciscus* sp. (IZ Poc/01); 2 – *Rutilus frisii* (IZ Poc/02); 3 – *Scardinius* sp. (IZ Poc/03); 4 – *Tinca* sp. (IZ Poc/04); 5 – *Esox* sp. (IZ Poc/05)

Рис. 3. Кістки викопних костистих риб із місцевознаходження Покшешти у Молдові: 1 – *Leuciscus* sp. (IZ Poc/01); 2 – *Rutilus frisii* (IZ Poc/02); 3 – *Scardinius* sp. (IZ Poc/03); 4 – *Tinca* sp. (IZ Poc/04); 5 – *Esox* sp. (IZ Poc/05)
longitudinal wrinkle with slightly convex roller edges. Wrinkle on the lower edge of the
grinding surface is jagged by transverse corrugations and forms a fin scroll on the pos-
terior surface of the crown. Height of the tooth is 5.6, width of the crown is 5.8 mm.

ESOCIFORMES Bleeker, 1858
Family ESOCIDAE Cuvier, 1816
Esox Linnaeus, 1758
Esox sp.

Referred specimen: jaw tooth, 2 vertebrae (IZ Poc/05-07) (Fig. 3, 5).

Description: The long, slender, pointed tooth has two sharp edges. Its conical crown
with slightly worn apex is partly broken. Cross-section is interiorly smooth and exteriorly
convex. Height of the tooth is 5.5 mm, width of the crown is 2.1 mm. The attribution of
vertebrae to pike was based on morphological similarities and remains more unclear.

DISCUSSION

All the above-mentioned bony fish species from Pocșești were identified based on
single disarticulated specimens. Nevertheless, it is possible to provide a view on
composition fish community in the late Sarmatian of that area. It includes reophiles
(Leuciscus, Rutilus) and limnophiles (Scardinius, Tinca, Esox). Fishes from Pocșești
are presented by four different trophic groups (herbivorous, malacophagous, piscivo-
rous and omnivorous).

The majority of identified fish taxa (4 species) are representatives of the family Cy-
prinidae. Other families (Acipenseridae, Esocidae) are presented by single species. It
must be noted that all identified genera are still available in the recent Dniester River
delta fish community [4, 23].

Fish fauna from Pocșești is mixed – freshwater and marine species are presented
together. It suggests that the burial of remnants took place in close proximity to large
marine basin in the river avandelta [17]. Described fish assemblage shows affinity to
other late Sarmatian (early Tortonian) localities in Europe on faunistic composition and
taxonomic diversity. It is the most similar to Mikhailovka on Bug 1 and 2 in Ukraine (all
species are common, except Acipenseridae). Bony fish complex from Pocceet can be
also compared with Sandberg near Gözendorf in Austria (remnants of Leuciscus, Ru-
tilus, Scardinius and Tinca are common for both localities) [1, 5, 7], Schernham b. Haag
(Rutilus, Scardinius, Tinca) [3], Hammerschmiede 1 and 3 (Leuciscus and Esox) [2],
Höwenegg in Germany (Rutilus and Tinca) [26] and Borský Svätý Jur in Slovakia (Scar-
dinius and Tinca) [3]. Other late Sarmatian localities (Csákvár in Hungary [3], Kocgasi
ASK and Sofca in Turkey [3, 22], Baghmisheh-Marzdaran, Tabriz-Basin in Iran [19],
München-Aufmeister (Isarufer) in Germany [26] and Richardhof-Golfplatz in Austria [7])
are less similar to the fish community of Pocșești.

Taxonomic composition of terrestrial oriktokomplex from Pocșești indicates its ar-
chaic appearance and brings it with hipparion fauna from Varnitsa, as well as hipparion
assemblages from Eldar in Transcaucasia, Berislav and Grebeniki in Ukraine [10]. Ter-
restrial fauna of Pocșești occupies an intermediate position between the earliest and
late hipparion faunas on the Northern Black Sea Coast and stands as an independent
faunal complex [12]. Most of its representatives inhabited savanna landscapes of the
steppe type, as well as wetlands, forested floodplains and riparian forests [10, 12]. This
community suggests be related to the first half of the late Sarmatian s.l. (9.8 Ma, MN10).
CONCLUSIONS

1. Six bony fish taxa of 6 genera, 3 families (Acipenseridae, Cyprinidae, Esocidae) and 3 orders (Acipenseriformes, Cypriniformes, Esociformes), dated to the late Sarmatian s.l., were identified in the alluvial sediments of Pocşeoşti site (Republic of Moldova, Eastern Europe).

2. Mixed character of fauna, joint presence of freshwater and marine species, suggests that the burial of remnants took place in close proximity of large marine basin in the river avandelta.

3. Bony fish assemblage of Pocşeoşti is more or less similar to other late Sarmatian (early Tortonian) localities within the territory of Paratethys on faunistic composition and taxonomic diversity.

4. Described community can be dated by the first half of the late Sarmatian s.l. (= early Khersonian, early Tortonian, 9.8 Ma, MN10).

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ПІЗНЬОМІОЦЕНОВІ КОСТИСТІ РИБИ
З МІСЦЕЗНАХОДЖЕННЯ ПОКШЕШТИ (РЕСПУБЛІКА МОЛДОВА)

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Ізольовані глоткові та щелепні зуби костистих риб, а також численні кістки інших хребетних тварин, датовані пізньоміоценом (серединою пізнього сармату = раннім
тортоном, 9,8 млн р.т.), були знайдені в алювіальних відкладах місцезнаходження Покшешти (Республіка Молдова). Установлено наявність решток шести таксонів риб, які описані у статті; більшість із них (4 види) є представниками родини Cyprinidae. Таксономічний список включає також осетрових (Acipenseridae gen. et sp. indet.) і щукоподібних (Esox sp.). Змішаний характер фауни, сумісне знаходження прісноводних і морських видів дає змогу висловити припущення, що захоронення решток відбувалось у безпосередній близькості від крупного морського басейну в річковій авандельті. Угруповання риб із Покшешт виявляє подібність до інших місцезнаходжень раннього тортона Європи і є відображенням палеобіогеографічних змін на території Паратетису протягом пізнього міоцена.

**Ключові слова:** костисті риби, пізній міоцен, сармат, MN 10, Покшешти, Східна Європа.

### Позднемiocеноvые kostистыe рыбы из местонахождения Покшешты (Республика Молдова)

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Изолированные глоточные и челюстные зубы костистых рыб, а также многочисленные кости других позвоночных, датированные поздним миоценом (срединой позднего сармата = ранним торгоном, 9,8 млн л. н.), были обнаружены в алювиальных отложениях местонахождения Покшешты (Республика Молдова). Установлено наличие остатков шести таксонов рыб, которые описаны в статье; большинство из них (4 вида) являются представителями семейства Cyprinidae. Таксономический список включает также осетровых (Acipenseridae gen. et sp. indet.) и щукообразных (Esox sp.). Смешанный характер фауны, совместное наличие пресноводных и морских видов позволяют предположить, что захоронение остатков происходило в непосредственной близости от крупного морского бассейна в речной авандельте. Сообщество рыб из Покшешт проявляет сходство с другими местонахождениями раннего тортона Европы и является отражением палеобіогеографічних змін на території Паратетиса на протяжении позднього міоцена.

**Ключевые слова:** костистые рыбы, поздний миоцен, сармат, MN 10, Покшешты, Восточная Европа.

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