

FIRST FINDINGS OF THE REDEPOSITED DEVONIAN ICHTHYOFAUNA IN THE QUATERNARY DEPOSITS OF BELARUS

D.P. Plax

Belarusian National Technical University,
Nezavisimosti Avenue, 65, 220013, Minsk, Belarus
E-mail: agnatha@mail.ru

The paper presents some data on the redeposited skeleton elements of the Devonian vertebrates found for the first time in the Quaternary deposits of Belarus and gives their short description. A conclusion is drawn about the relative age of the rocks enclosing these remains and about their redeposition types.

INTRODUCTION

The findings of the redeposited organic remains in morainic or fluvio-glacial deposits of the Quaternary system have been known for a long time in the territory of Belarus. A number of publications has been devoted to this subject (Armashevsky, 1892, 1896; Hedroitz, 1895; Karnozhitsky, 1895; Terletsky, 1927; Kadatsky, 1975; Burlak, Kruchek, 1992; Kruchek, Yakubovskaya, 1990; Kruchek, 1998, etc.) that described the taxonomic composition of the redeposited organic remains, on the one hand, and on the another hand, made attempts of their classification according to their burial place peculiarities. The above-mentioned references and personal data of the author suggest that in the Quaternary deposits of Belarus the most abundant redeposited remains are microphytofossils (pollen and spores), macrofauna of invertebrates (sponges, stromatopores, corals, trilobites, gastropods, bivalves, cephalopods, tentaculites, brachiopods, bryozoans, echinoderms and graptolites) and flora remains (algae, fruits and seeds of plants) are rather abundant, and microfauna remains (foraminiferans, scolecodonts, ostracods, conodonts) and cyanobionts (stromatolites and oncolites) are less abundant. The age of these representatives of the organic life varies in a wide range – from the Ordovician to the Quaternary. As to remains of the redeposited Palaeozoic lowest vertebrates, namely, the Devonian agnathans and fishes in the Quaternary deposits, no reliable findings of them were reported until recently. The palaeontologist Yu.V. Zaika succeeded in finding them. He carried out the field works for collecting palaeontological samples in sandy and sandy-gravel quarries of the Minsk region and found three small rounded fragments of rocks (two pieces of limestone from 7 to 15 cm in diameter and one piece of siltstone about 10 cm in size). These fragments contained visually definable remains of ske-

leton elements of the Devonian vertebrates. Subsequently, he has kindly provided the author with these samples for their dissolution, extraction of micro- and macroremains of ichthyofauna from them and their study.

RESULTS OF RESEARCH

The research performed has established that the rocks provided for their study contain besides visible skeleton elements of vertebrates abundant small remains of ichthyofauna and other fossil organisms. So, a light grey, slightly clayey, micaceous, fine-grained, feldspar-quartz, dense, not clearly layered, rounded siltstone found in a sandy quarry near the town of Stariye Dorogi of the Minsk region (Figure 1) contains single dentine tubercles of psam-



Text-figure 1 – Location of places of the findings of the redeposited Devonian ichthyofauna in the Quaternary deposits in the territory of Belarus. 1 – city; 2 – places of the findings of the redeposited Devonian ichthyofauna in the Quaternary deposits; 3 – frontiers.

mosteids Psammosteiformes gen. et sp. indet., numerous discrete scales of acanthodians *Cheiracanthus* sp., *C. longicostatus* Gross and *Acanthoides* ? sp., single teeth of Sarcopterygii indet. and one skeleton element from pharyngeal part of Osteichthyes indet. Besides vertebrates, it contains scolecodonts and small fragments of shells of lingulids.

A light grey, sometimes brownish, detrital, slightly clayey, cavernous, rounded limestone contains one small fragment of a plate of Coccosteioidea fam., gen. et sp. indet., rare fragments of scales of Sarcopterygii indet., small scales of Osteichthyes indet., as well as some fragments of shells of bivalves and brachiopods, and segments of crinoids.

Both rocks which contain the abovesaid organic remains are Middle Devonian, most likely, Givetian in age.

The third piece of rock, namely, an organogenic, slightly dolomitic, light grey, sometimes brownish, massive, dense, hard, rounded limestone found in the sandy quarry «Zosino» located near the town of Fanipol (Dzerzhinsk district, Minsk region) (Figure 1) contains rather abundant spicules of sponges, sclerites of Octocoralla, calcareous tubes of worms, segments of crinoids, conodonts *Polygnathus* sp., *P. sculptilis* Kuzmin, *Mehlina gradata* Youngquist (definitions are made by palaeontologist K. Narkiewicz from Polish Geological Institute, Warsaw), fragments of brachiopod shells, single ostracods, microgastropods, small fragments of bryozoans, a considerable amount of isolated scales of actinopterygians *Moythomasia* sp., more seldom, scales of *Mimipiscis* sp., single fragments of plates of placoderms *Ctenurella* sp., Placodermi indet., rare tritons of Ptyctodontidae gen. indet. and fragments of scales of *Glyptolepis* sp., Osteolepididae gen. indet., Sarcopterygii indet., teeth of Sarcopterygii indet. and Osteichthyes indet. The ichthyofauna and, to a lesser degree, conodonts, which are contained in this organogenic limestone permit a conclusion, that this rock is Late Devonian, namely, Early Frasnian in age, or more exactly it corresponds to the Early Sargaevo (Early Plavinas) age. The similar vertebrate assemblage is known from the Snetnaya Gora beds of the Plavinas Regional Stage of the Lower Frasnian of the Main Devonian field (Devonian..., 1981; Esin et al., 2000).

It is necessary to note that according to T.B. Yanin's classification (1983) the discovered rocks with organic remains are related to the glacial type of redeposition, i. e., these had been reburied from the more ancient deposits, in our case, from Devonian into the younger ones – Quaternary.

TAXONOMIC COMPOSITION OF ICHTHYOFAUNA AND ITS BRIEF DESCRIPTION

The brief palaeontological description of taxa of the Devonian vertebrates found in the Quaternary deposits of Belarus is given below. The collection of

skeleton elements of agnathans and fishes is stored in the Belarusian State University, in the Zoological museum, Kurchatov str., 10, Minsk, Belarus, under № 3 Pl.

Phylum CHORDATA Haeckel, 1874
Subphylum VERTEBRATA Lamarck, 1801
Superclass AGNATHA Cope, 1889
Class DIPLORHINA Kiaer, 1924
Subclass HETEROSTRACI Lankester, 1868
Order PSAMMOSTEIFORMES Berg, 1940
 Psammosteiformes gen. et sp. indet.

Plate I, Figures 1, 2 and 3

Description. Dentine tubercles are roundish, oval or elongated, large, high, with a flattened or slightly smoothed apex. They have on each side well expressed crenulations which are divided in two or more branches. The maximum diameter of the found tubercles is 4 mm, the height is 1 mm.

Material. Seven separated dentine tubercles of good safety; a sandy quarry near the town of Staroye Dorogi of the Minsk region.

Branch GNATHOSTOMATA Gegenbaur, 1874
Superclass PISCES Linnaeus, 1758
Class PLACODERMI M'Coy, 1848
Order PTYCTODONTIDA Gross, 1932
Family PTYCTODONTIDAE Woodward, 1891
Genus *Ctenurella* Ørvig, 1960

Ctenurella sp.

Plate I, Figure 4

Description. The fragment of an indeterminate plate is 2 mm long. The thickness of the plate is no more than 0.15 mm. The surface sculpture is in the form of distinct tubercles and fossae. The internal surface of the plate is without the sculpture.

Material. One fragment of the plate of good safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Ptyctodontidae gen. indet.

Plate I, Figures 5 and 6

Description. The tritons are elongated, smooth, flat, with well expressed rubbing surface.

Material. Three tritons of good safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Order EUARTHRODIRA Gross, 1932
Superfamily COCCOSTEOIDEA Denison, 1978
 Coccosteioidea fam., gen. et sp. indet.

Plate I, Figure 7

Description. The fragment of an indeterminate plate is 2 cm long; its thickness is no more than 1.1 mm. Its surface sculpture is in the form of distinct small, roundish tubercles located closely to each other. The tubercles are 0.65–0.70 mm long,

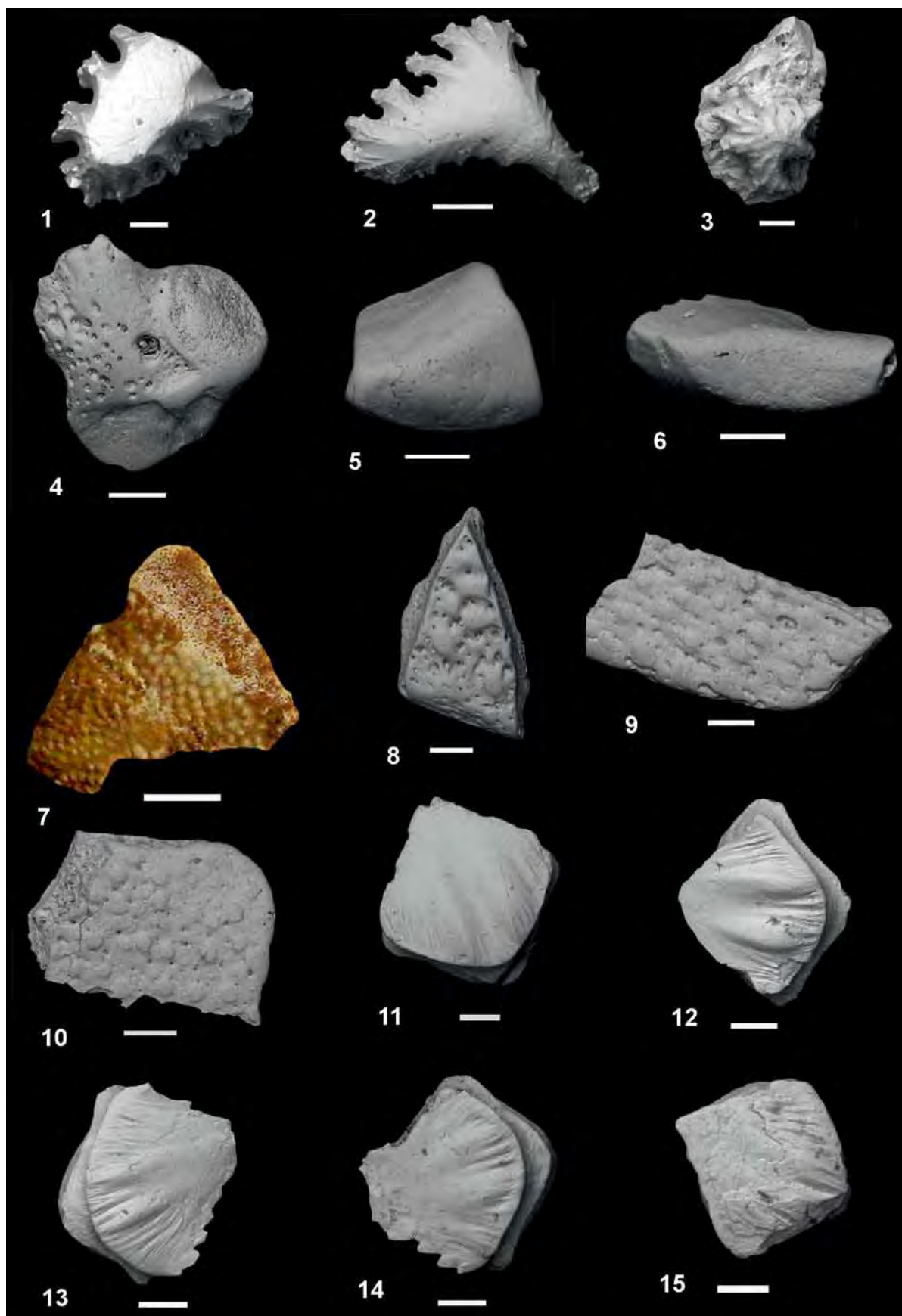


Plate I – Skeleton elements of the Devonian agnathans and fishes found in the Quaternary deposits of the sandy quarry «Zosino» in the Dzerzhinsk district and near the town of Stariye Dorogi of the Minsk region. Scale bar of 100 μm for Figures 11 and 15; 200 μm for Figures 1, 3, 12, 13 and 14; 500 μm for Figures 2,

4 and 8; 1 mm for Figures 5, 6, 9 and 10; 5 mm for Figure 7. Figure 1 – *Psammosteiformes* gen. et sp. indet. Specimen № 88/1-6, $\times 70$, dentine tubercle, top view; a sandy quarry near the town of Stariye Dorogi. Figure 2 – *Psammosteiformes* gen. et sp. indet. Specimen № 88/1-7, $\times 50$, dentine tubercle, top view; a sandy quarry near the town of Stariye Dorogi. Figure 3 – *Psammosteiformes* gen. et sp. indet. Specimen № 88/1-8, $\times 70$, dentine tubercle, top view; a sandy quarry near the town of Stariye Dorogi. Figure 4 – *Ctenurella* sp. Specimen № 91/1-12, $\times 40$, a plate fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 5 – *Ptyctodontidae* gen. indet. Specimen № 91/1-18, $\times 25$, a fragment of the tritor, top view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 6 – *Ptyctodontidae* gen. indet. Specimen № 91/1-9, $\times 25$, a fragment of the tritor, top view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 7 – *Coccosteioidea* fam., gen. et sp. indet. Specimen № 88/1a-2, a plate fragment in external view; a sandy quarry near the town of Stariye Dorogi. Figure 8 – *Placodermi* indet. Specimen № 91/1-20, $\times 27$, a plate fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 9 – *Placodermi* indet. Specimen № 91/1-30, $\times 18$, a plate fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 10 – *Placodermi* indet. Specimen № 91/1-26, $\times 20$, a plate fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 11 – *Cheiracanthus longicostatus* Gross. Specimen № 88/1-10, $\times 150$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 12 – *Cheiracanthus longicostatus* Gross. Specimen № 88/1-9, $\times 80$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 13 – *Cheiracanthus longicostatus* Gross. Specimen № 88/1-4, $\times 80$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 14 – *Cheiracanthus longicostatus* Gross. Specimen № 88/1-12, $\times 80$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 15 – *Cheiracanthus* sp. Specimen № 88/1-1, $\times 150$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi.

and these are 14–15 per 1 cm. There is a small part of the sutural surface without ornament. The internal surface of the plate is without sculpture.

Material. One fragment of the plate of good safety; sandy quarry near the town of Stariye Dorogi of the Minsk region.

Placodermi indet.

Plate I, Figures 8, 9 and 10

Description. Small fragments the armour plates are covered by either stellar, or roundish pretty well-marked, small and relatively large tubercles, which are usually randomly distributed over the plate surface.

Material. Some disconnected fragments of plates of an armour of satisfactory and good safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Class ACANTHODII Owen, 1846

Order ACANTHODIFORMES Berg, 1940

Family ACANTHODIDAE Agassiz, 1833

Genus *Cheiracanthus* Agassiz, 1835

Cheiracanthus longicostatus Gross, 1973

Plate I, Figures 11, 12, 13 and 14

Description. Scales are 0.7–1.0 mm long, rhombic and round-rhombic. The crown sculpture is in the form of fan-shaped converging ridges. Two central ridges are distinct along the whole length of the crown only are lowered a little to the level of lateral ridges toward the anterior margin of the crown. There is a distinct furrow-shaped elongated-oval groove between the central ridges. There are numerous low lateral ridges and thin grooves between them which are stretched along the whole crown

adjoining to the central ridges in the posterior part. The neck is high, smooth. The base is convex slightly smaller than the crown. The apex is located in the central part or is slightly shifted forward.

Material. About twenty five well preserved scales; a sandy quarry near the town of Stariye Dorogi of the Minsk region.

Cheiracanthus sp.

Plate I, Figure 15

Description. Scales are small, 0.35–0.40 mm long. The crown is rhombic. In the medial part there are two very poorly expressed elevations with a shallow flat depression in the centre. In the anterior half of the crown there are low thin ridges located side-by-side and gradually converging to the posterior part. The posterior division of the crown is smooth. The neck is well-marked, relatively high, smooth. The base is convex, smaller than the crown. The apex is located in the centre.

Material. Three scales of good safety; a sandy quarry near the town of Stariye Dorogi of the Minsk region.

Genus *Acanthoides* Brotzen, 1934

Acanthoides ? sp.

Plate II, Figure 1 and 2

Description. Scales are from 0.6 mm to 1.0 mm long. The crown is rhombic, round-rhombic or elongated-rhombic, flat. The size of the crown does not exceed that of the neck. The neck is low, poorly pronounced. The base is very massive, strongly convex usually exceeds the size of the crown. The apex is slightly shifted forward. It can be relatively sharp, but usually obtuse; it is roundish, oval in the plan.

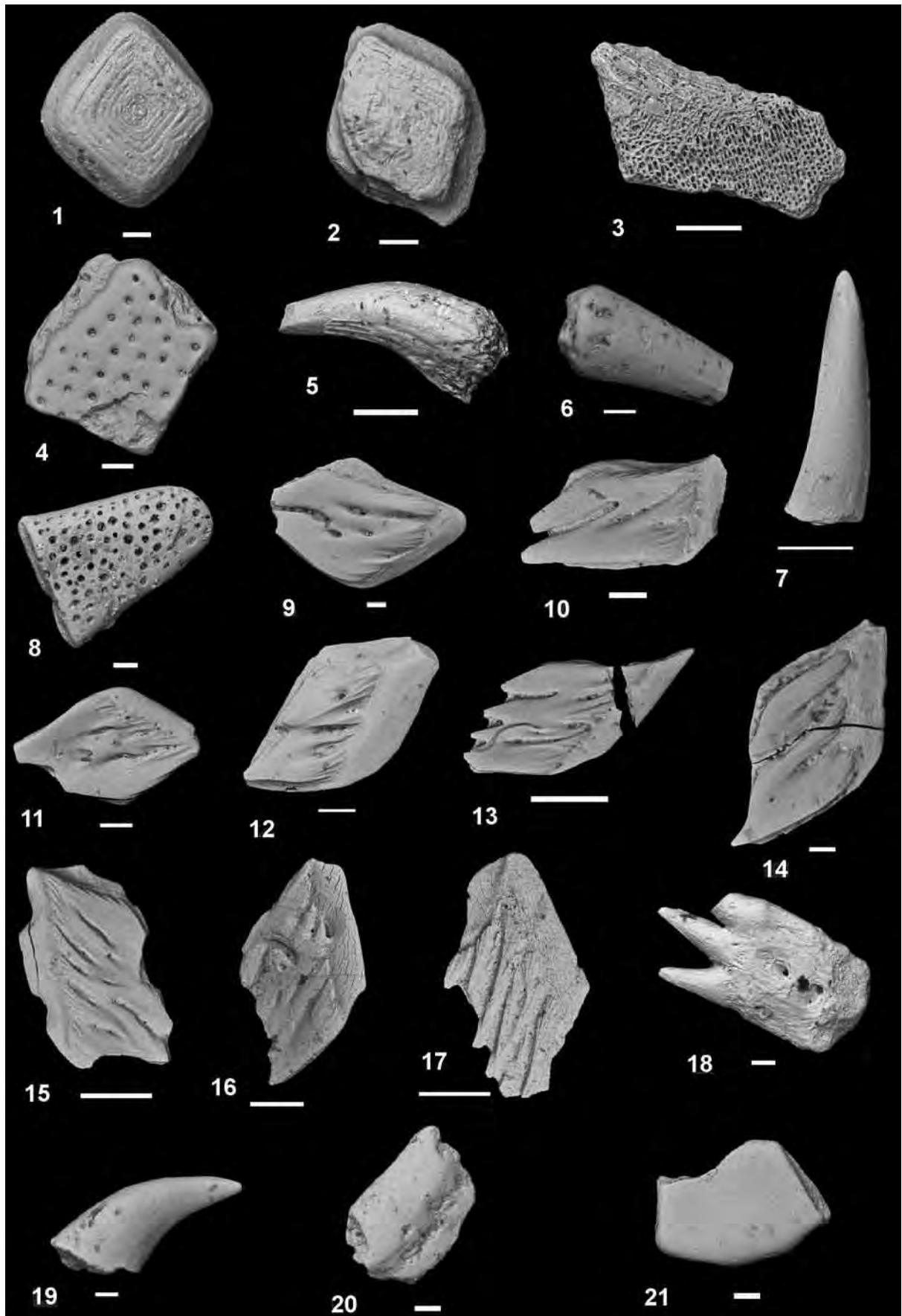


Plate II – Skeleton elements of the Devonian fishes found in the Quaternary deposits of the sandy quarry «Zosino» in the Dzerzhinsk district and near the town of Stariye Dorogi of the Minsk region.

Scale bar of 100 μm for Figures 1, 8, 9, 14, 18, 19, 20 and 21; 200 μm for Figures 2, 4, 6, 10, 11 and 12; 500 μm for Figures 3, 5, 7, 13, 15, 16 and 17. Figure 1 – *Acanthoides* ? sp. Specimen N^o 88/1-11, $\times 100$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 2 – *Acanthoides* ? sp. Specimen N^o 88/1-3, $\times 75$, a scale in crown view; a sandy quarry near the town of Stariye Dorogi. Figure 3 – *Glyptolepis* sp. Specimen N^o 91/1-16, $\times 50$, a scale fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 4 – Osteolepididae gen. indet. Specimen N^o 91/1-24, $\times 60$, a scale fragment in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 5 – Sarcopterygii indet. A. Specimen N^o 88/1-2, $\times 50$, a tooth in lateral view; a sandy quarry near the town of Stariye Dorogi. Figure 6 – Sarcopterygii indet. B. Specimen N^o 91/1-21, $\times 80$, a tooth in lateral view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 7 – Sarcopterygii indet. C. Specimen N^o 91/1-22, $\times 45$, a tooth in lateral view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 8 – Sarcopterygii indet. D. Specimen N^o 88/1a-2, $\times 100$, a scale fragment in external view; a sandy quarry near the town of Stariye Dorogi. Figure 9 – *Moythomasia* sp. Specimen N^o 91/1-4, $\times 100$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 10 – *Moythomasia* sp. Specimen N^o 91/1-8, $\times 65$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 11 – *Moythomasia* sp. Specimen N^o 91/1-15, $\times 80$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 12 – *Moythomasia* sp. Specimen N^o 91/1-23, $\times 80$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 13 – *Moythomasia* sp. Specimen N^o 91/1-1, $\times 50$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 14 – *Moythomasia* sp. Specimen N^o 91/1-2, $\times 100$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 15 – *Moythomasia* sp. Specimen N^o 91/1-11, $\times 50$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 16 – *Moythomasia* sp. Specimen N^o 91/1-10, $\times 45$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 17 – *Mimipiscis* sp. Specimen N^o 91/1-28, $\times 43$, a scale in external view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 18 – Osteichthyes indet. A. Specimen N^o 88/1-5, $\times 100$, an element from the pharyngeal part; a sandy quarry near the town of Stariye Dorogi. Figure 19 – Osteichthyes indet. B. Specimen N^o 90/1-5, $\times 100$, a tooth in lateral view; the sandy quarry «Zosino» in the Dzerzhinsk district. Figure 20 – Osteichthyes indet. C. Specimen N^o 88/1a-7, $\times 100$, a scale in external view; a sandy quarry near the town of Stariye Dorogi. Figure 21 – Osteichthyes indet. D. Specimen N^o 88/1a-4, $\times 100$, a scale fragment in external view; a sandy quarry near the town of Stariye Dorogi.

Material. Five well preserved scales; a sandy quarry near the town of Stariye Dorogi of the Minsk region.

Class OSTEICHTHYES Huxley, 1880
Subclass SARCOPTERYGII Romer, 1955
Superorder DIPNOMORPHA Ahlberg, 1991
Order POROLEPIFORMES Jarvik, 1942
Family HOLOPTYCHIIDAE Owen, 1860
Genus *Glyptolepis* Agassiz, 1844

Glyptolepis sp.
 Plate II, Figure 3

Description. Small fragments of scales, which external surface is ornamented by sculpture in form of thin, narrow, low, numerous branching ridges. The interior part of scales is without sculpture and relatively smooth.

Material. Two fragments of scales of satisfactory safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Superorder RHIPIDISTIA Cope, 1887
Order OSTEOLEPIFORMES Berg, 1940
Family Osteolepididae Cope, 1889
Osteolepididae gen. indet.

Plate II, Figure 4

Description. Small fragments of scales with a shining cosmine surface and numerous small pores, as well as with a vertical ridge on the interior part.

Material. Three fragments of scales of satisfactory safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Sarcopterygii indet. A, B and C
 Plate II, Figures 5, 6 and 7

Description. Three teeth were found. A tooth (*Sarcopterygii* indet. A, Figure 5) is 2.0 mm long, arciform, roundish in cross-section, with rows of distinct ridges running along its length. A tooth (*Sarcopterygii* indet. B, Figure 6) is small (1.2 mm long), slightly curved, with a broken apex, roundish in cross-section with rows of narrow undulate thin ridges running along its length. A tooth (*Sarcopterygii* indet. C, Figure 7) is 1.5 mm long, slightly curved, smooth, with slightly flattened apex, lateral ridges and a roundish cross-section of the base.

Material. Three well preserved teeth; a sandy quarry near the town of Stariye Dorogi and the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Sarcopterygii indet. D
 Plate II, Figure 8

Description. A fragment of an oval, slightly elongated scale about 0.7 mm in size. The external surface is rather smooth with small and abundant pores located close to each other.

Material. Three fragments of scales of satisfactory safety; a sandy quarry near the town of Stariye Dorogi and the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

Subclass ACTINOPTERYGII Klein, 1885
Infraclass ACTINOPTERI Cope, 1871

**Superorder PALAEONISCI Berg,
Kazantseva & Obruchev, 1964
Order PALAEONISCIFORMES Hay, 1902
Family MOYTHOMASIIDAE Kazantseva, 1971
Genus *Moythomasia* Gross, 1950
Moythomasia sp.**

Plate II, Figures 9, 10, 11, 12, 13, 14, 15 and 16

Description. Scales are small, thin, rhombic, 0.6–1.5 mm in length. The length of some scales is approximately twice their height, while that of the others is twice less than the height. The lower anterior corner of scales is slightly rounded; the upper corner is slightly attenuatous and pointed. The scale external surface is covered by curved longitudinal ridges with thin lateral beams going forward and in sides. There is a joint like a fossa and a hill. The scale surface is shining and is covered with ganoine. The posterior margin is jagged, with two or four teeth. On the internal surface of the scale one ridge running from its central part to the lower posterior margin is distinctly observed. On each side from this ridge the scale surface is relatively smooth.

Material. Fifteen scales of good and satisfactory safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

**Family MIMIIDAE Gardiner, 1993
Genus *Mimipiscis* Choo, 2011
Mimipiscis sp.**

Plate II, Figure 17

Description. Scales are small, thin, rhombic, about 1.8 mm long. The sculpture of the external surface of scales is formed by slightly curved, thin, low, separate, well-marked ridges. The posterior margin of a scale is formed by 5–6 pointed ends of ridges. The external surface of a scale is shining and is covered with ganoine. On the internal surface there is one relatively wide ridge. On each side from this ridge the scale surface is smooth.

Material. Two well preserved scales; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

**Osteichthyes indet. A
Plate II, Figure 18**

Description. There is three small teeth having rather sharp tips except of the last tooth which has a broken tip on a massive base.

Material. One well preserved skeleton element from a pharyngeal part; a sandy quarry near the town of Stariye Dorogi of the Minsk region.

**Osteichthyes indet. B
Plate II, Figure 19**

Description. The tooth is about 0.7 mm long, curved, roundish in cross-section. The tip of the tooth is aiguille. The external surface is smooth.

Material. A tooth of satisfactory safety; the sandy quarry «Zosino» located near the settlement of Fanipol of the Minsk region.

**Osteichthyes indet. C and D
Plate II, Figures 20 and 21**

Description. Two small, thin, rhombic scales with a smooth external surface.

Material. Two satisfactorily preserved scales; a sandy quarry near the town of Stariye Dorogi of the Minsk region.

CONCLUSIONS

Macro- and micromeric skeleton elements of various groups of the redeposited Devonian ichthyofauna: heterostracans, placoderms, acanthodians and bone fishes (sarcopterygians and actinopterygians) were revealed for the first time in the Quaternary deposits of the territory of Belarus, namely, the Minsk region, and their descriptions and photographs are presented. Unfortunately, because of fragmentariness, scattered occurrence and a small number of the found skeleton elements, the majority of these ichthyofauna representatives could not be identified even to a genus. The author believes that in the future task-oriented searches and continuous investigations of the Devonian vertebrates found in secondary bedding in the Quaternary deposits, will allow the more accurate species definitions, will supplement their taxonomic composition, clarify the ways they travelled with glaciers together with enclosing rocks and that initiate the profound studies of the redeposited Devonian ichthyofauna in the territory of Belarus.

The author would like to express his gratitude to Yu.V. Zaika, candidate of geological and mineralogical sciences for stone materials containing the Devonian agnathan and fish remains he kindly provided for the study, and also expresses the gratitude to the candidate of geological and mineralogical sciences S.A. Kruchek for the information on the publications of the previous researchers in which data about findings of the redeposited organic remains in the Quaternary deposits in the territory of Belarus are cited.

REFERENCES

- ARMASHEVSKY P. The preliminary report on the geological investigations in the Mogilev province in 1891 // Transactions of the Geological Committee. – Kiev, 1892. – Vol. XI. – P. 163–167 (in Russian).
ARMASHEVSKY P. The preliminary report on the geological investigations in the Mogilev province in 1893 // Transactions of the Geological Committee. – Saint Petersburg, 1896. – Vol. XIV. № 6–7 – P. 229–234 (in Russian).

- BURLAK A.F., KRUCHEK S.A. The redeposited microphytofossils in the Cenozoic formations of Belarus // Proceedings of the National Academy of Sciences of Belarus. – 1992. – Vol. 36. № 2. – P. 149–152 (in Russian).
- ESIN D., GINTER M., IVANOV A., LUKSEVICS E., AVKIMOVICH V., GOLUBTSOV V., PETUKHOVA L. Vertebrate correlation of the Upper Devonian and Carboniferous on the East European Platform // Courier Forschungsinstitut Senckenberg (Final Report of IGCP 328 project). – Frankfurt a. M., 2000. – Vol. 223 – P. 341–359.
- HEDROITZ A.E. Geological investigations in provinces of Vilno, Grodno, Minsk, Volyn and the northern part of the Polish Kingdom // Materials on Geology of Russia. – Saint Petersburg, 1895. – Vol. 17. – P. 133–325 (in Russian).
- KADATSKY V.B. Allochthonous microfossils // Stratigraphy and Palaeogeography of the Anthropogene. – Minsk: Nauka i Technika Publ., 1975. – P. 98–99 (in Russian).
- KARNOZHITSKY A.N. Geological investigations in the southwestern part of the Vitebsk province and in the northern parts of the Minsk and Mogilev provinces // Materials on Geology of Russia. – Saint Petersburg, 1895. – Vol. 17. – P. 113–131 (in Russian).
- KRUCHEK S.A., YAKUBOVSKAYA T.V. Types of the redeposited remains of ancient organisms in the Quaternary deposits of Byelorussia and their importance for stratigraphy and palaeogeography // Quaternary Period: Research Methods, Stratigraphy, Ecology. – Theses of VII All-Union Meeting. – Tallinn, 1990. – Vol. II. – P. 104–105 (in Russian).
- KRUCHEK S.A. Types of the redeposited organic remains in the sedimentary deposits of the territory of Belarus / Palaeoecology and Modern Conditions of Geological Environment of Belarus: Minsk: Belarusian Research Geological Exploration Institute, – 1998. – P. 18–22 (in Russian).
- TERLETSKY B.K. A find of the Devonian deposits in the Bobruisk district of the BSSR // Bulletin of the Geological Committee. – 1927, № 6. – P. 12–14 (in Russian).
- DEVONIAN and Carboniferous of the Baltic States // V.S. Sorokin, L.A. Lyarskaya, A.S. Savvaitova et al. – Riga, Zinatne Publ., 1981. – 502 p. (in Russian).
- YANIN B.T. Fundamentals of Taphonomy // – Moscow: Nedra Publ., 1983. – 184 p. (in Russian).

Рецензент С.А. Кручек

Поступила 21.04.2014

ПЕРШЫЯ ЗНАХОДКІ ПЕРААДКЛАДЗЕНАЙ ДЭВОНСКАЙ ІХТЯФАЎНЫ
Ў ЧАЦВЯРЦІННЫХ АДКЛАДАХ БЕЛАРУСІ
Дз.П. Плакс

Артыкул прысвечаны першым знаходкам пераадкладзенай дэвонскай іхтыяфаўны сумесна з умяшчальнымі пародамі ў чацвярцічных адкладах Беларусі. У ім прыводзяцца поўны сістэматычны агляд і кароткія апісанні таксонаў агнат і рыб, з указаннем матэрыялу, характару яго захаванасці і месцазнаходжання, а таксама меркаванні адносна ўзросту ўмяшчальных парод, якія змяшчаюць рэшткі іхтыяфаўны, і аб тыпах іх пераадкладаў.

ПЕРВЫЕ НАХОДКИ ПЕРЕОТЛОЖЕННОЙ ДЕВОНСКОЙ ИХТИОФАУНЫ В ЧЕТВЕРТИЧНЫХ
ОТЛОЖЕНИЯХ БЕЛАРУСИ
Д.П. Плакс

Статья посвящена первым находкам переотложенной девонской ихтиофауны совместно с вмещающими породами в четвертичных отложениях Беларуси. В ней приводятся полный систематический обзор и краткие описания таксонов агнат и рыб, с указанием материала, характера его сохранности и местонахождения, а также приведены предположения относительно возраста вмещающих пород, содержащих остатки ихтиофауны, и о типах их переотложения.