

STRATIGRAPHY OF MIDDLE DEVONIAN DEPOSITS OF THE WESTERN PART OF THE PRIPYAT TROUGH (ACCORDING TO RESULTS OF THE STUDY OF ICHTHYOFAUNA)

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The paper presents the results of palaeoichthyological study of the core from the Pinsk-10 and Pinsk-26 boreholes, drilled in the territory of the western part of the Pripyat Trough within the Turov and Starobin Centroclines. References with data on vertebrates of the Middle Devonian within the investigated area are given to complete the information. According to the vertebrate assemblages and guide taxa of agnathans and fishes that have been established, the stratigraphic division of the Middle Devonian deposits is executed. Apart from that the correlation of deposits with the synchronous sediments developed in the adjacent territories of Ukraine, Russia and the Baltic States is carried out on vertebrates. The paper replenishes the previously known composition of the stratigraphic vertebrate assemblages of the Middle Devonian in this area and provides both their full list and stratigraphic distribution. The Stratigraphic Chart of the Devonian deposits of Belarus (2010) has been taken as a stratigraphic basis of the division of the Middle Devonian deposits in the studied area.

INTRODUCTION

Deposits of the Devonian system within the western part of the Pripyat Trough have rather wide development. In the structural plan they are restricted by peripheral closing of the Pripyat Trough and correspond to its Turov and Starobin Centroclines which in the form of a gulf run deep from the east to the territory of the Polesie Saddle. They are limited by tectonic dislocations of sublatitudinal and submeridional course from the western underground continuation of the Mikashevichi-Zhitkovichi bench of the crystalline basement where only the Upper Proterozoic deposits are developed now (Geology..., 2001).

As far as stratigraphy is concerned, Devonian deposits within the western part of the Pripyat Trough are represented by all three divisions: Lower, Middle and Upper. Stratigraphic completeness and thickness of the Devonian section considerably increase in the eastern direction, towards the central regions of the Pripyat Trough. In the western direction, on the contrary, one can observe that more recent Devonian deposits are being gradually and regularly cut up to their full pinching out by the overlapping Mesozoic and Cenozoic deposits. The Upper Devonian sediments (Frasnian and Famennian Stages) in the studied area are characterized by bigger stratigraphic completeness and thickness

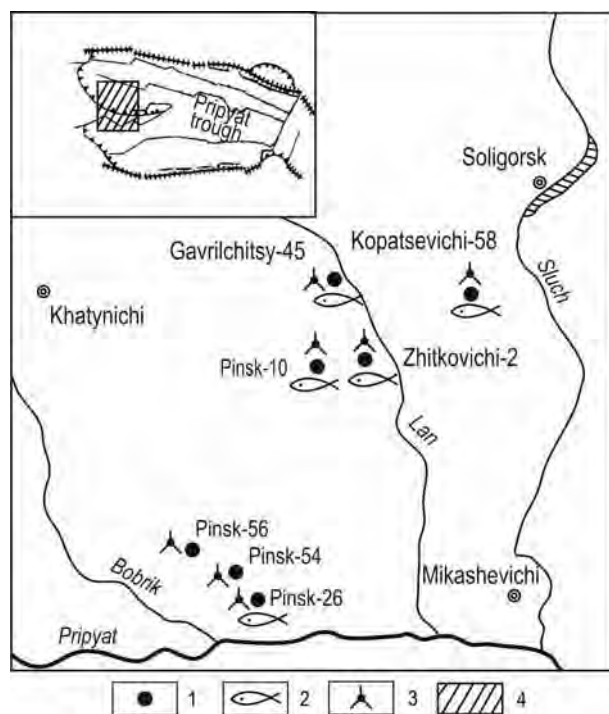
of the section, than deposits of the Lower (the Upper substage of the Emsian Stage) and Middle Devonian (Eifelian and Givetian Stages). On the whole, the Devonian deposits here underlie sharply transgressively, with great stratigraphic and, probably, angular unconformity on the Upper Proterozoic deposits. They are in some parts overlapped by the Lower Carboniferous deposits and everywhere – by Mesozoic and Cenozoic sediments.

The Middle Devonian fish fauna remains in the studied territory are confined mainly within terrigenous and carbonate-terrigenous rocks, and in a lesser degree – within carbonate deposits. On the whole the vertebrates are represented by one reliably established subclass of agnathans – heterostracans and four classes of fishes – acanthodians, placoderms, chondrichthyans and osteichthyans. Detailed study of changes of generic and species composition of the above-named groups of agnathans and fishes in a section of deposits has allowed the authors to single out characteristic vertebrate assemblages, and to use them as a basis of the biostratigraphic division of enclosing rocks, and to correlate them with the synchronous heterofacies deposits in the adjacent territories of Ukraine, Russia and the Baltic States. The division and correlation of some parts of deposits of a section without vertebrate remains is made with the help of

the data available on other groups of fossil organisms (Obukhovskaya et al., 2002), as well as the data of logging, the material composition of rocks and their stratigraphic position in a section.

STRATIGRAPHIC DIVISION OF MIDDLE DEVONIAN DEPOSITS OF SECTIONS OF THE PINSK-10 AND PINSK-26 BOREHOLES

The palaeontological and stratigraphic study of the core from the Pinsk-10 and Pinsk-26 boreholes drilled in the territory of the western part of the Pripyat Trough (Figure 1) within the Turov and Staro-



Text-Figure 1 – Location of the studied borehole sections. 1 – borehole sections; 2 – sections in which ichthyofauna remains were found; 3 – sections in which miospores were found; 4 – area of studies.

bin Centroclines has allowed to carry out the ichthyofaunistic division of the Middle Devonian deposits into a number of successive assemblages, each of them having distinctive features. The division has been carried out according to the accepted Stratigraphic Chart of the Devonian deposits of Belarus (Stratigraphic..., 2010) The Table below includes the summarized data on the stratigraphic distribution of the Middle Devonian and Lower Frasnian fish fauna in the Pinsk-26 (Figure 2) and Pinsk-10 (Figure 3) boreholes. To complete the ichthyofaunistic information the table is supplied with the data on the Middle Devonian vertebrates from the previously studied boreholes: Gavrilchitsy-45, Kopatsevichi-58 and Zhitkovichi-2 (Plax, Kruchek, 2010). The Table is also supplemented with the identifications of ichthyofauna in the Pinsk-26 borehole executed by A.O. Ivanov, which are cited in the manuscript work

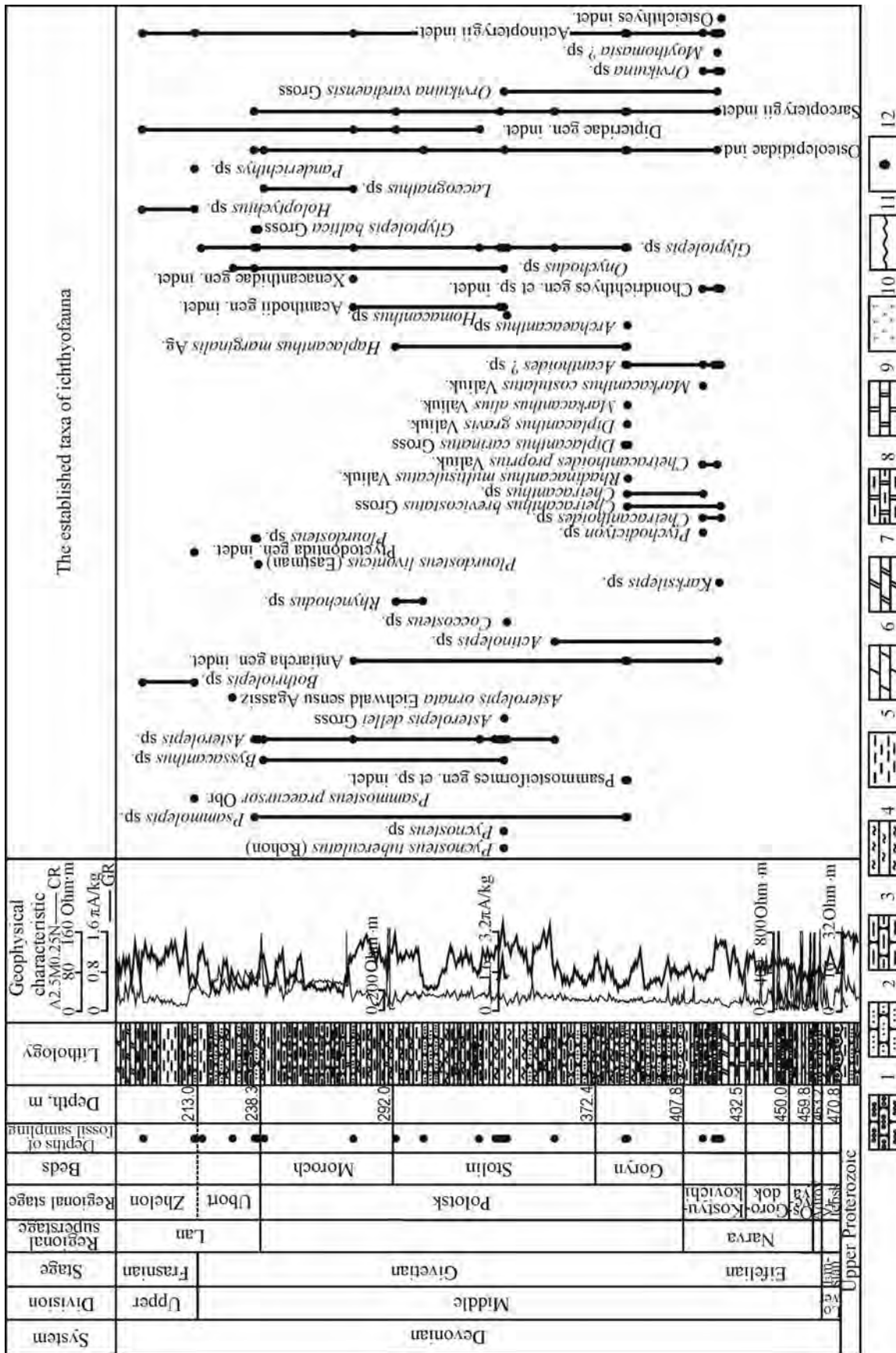
(Golubtsov et al., 1990). Palaeoichthyologically well-studied section of the Zhitkovichi 2 borehole (Figure 4) is given for making comparison with the investigated boreholes. Some skeletal elements of agnathans and fishes are shown separately in six plates (Plate I, II, III, IV, V and VI).

The information below concerns fish fauna and stratigraphy of the sections of the Pinsk-10 and Pinsk-26 boreholes.

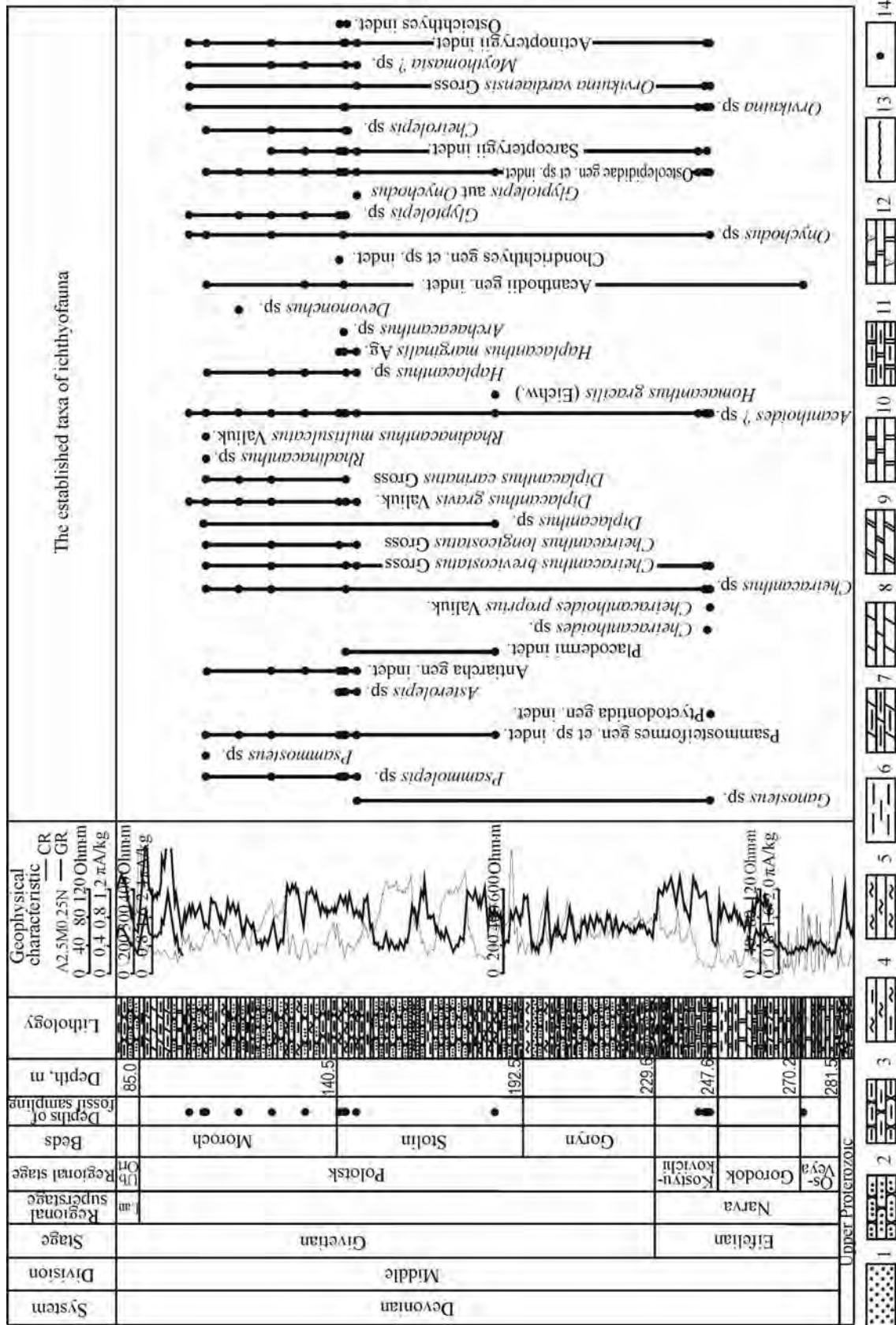
The vertebrates in deposits of the **Vitebsk Regional Stage** of the Emsian Stage of the Lower Devonian, as well as in deposits of the **Adrov** and **Goro-dok Regional Stages** of the Eifelian Stage of the Middle Devonian in the sections of the Pinsk-10 and Pinsk-26 boreholes are not found. The age of these deposits is established due to the data on miospores (Obukhovskaya et al., 2002), the data of logging, the material composition of the rocks and their stratigraphic position in a section, as well as on correlation with sections of boreholes of the adjacent territories.

Deposits of the **Osveya Regional Stage** of the Eifelian Stage of the Pinsk-10 borehole (depth of 270.2–281.5 m) composed of dolomitic light grey, dense, platy marls, with inclusion of small fragments and grains of gypsum, contain only the fragment of a fin spine of *Acanthodii* gen. indet. Invertebrates in deposits of this Regional Stage are not established and as far as flora is regarded, miospores are only known. Vertebrates in deposits of the **Osveya Regional Stage** of the Pinsk-26 borehole (depth of 450.0–459.8 m) are not found.

Agnathans and fishes of the **Kostyukovichi Regional Stage** of the Eifelian Stage are established in two considered boreholes – Pinsk-10 (depth of 229.6–247.6 m) and Pinsk-26 (depth of 407.8–432.5 m) in grey, light grey, dense, cryptocrystalline, strong, platy, massive dolomites and clayey dolomites. These are rather diverse in their taxonomic composition. Acanthodians and actinopterygians are mainly dominant, heterostracans, placoderms, chondrichthyans and sarcopterygians are not numerous. Isolated acanthodian scales in rocks of the Kostyukovichi Regional Stage are more numerous and taxonomically diverse. The generic and species composition of acanthodians is as follows: *Cheiracanthoides* sp., *C. proprius* Valiuk., *Cheiracanthus* sp., *C. brevicostatus* Gross, *Markacanthus costulatus* Valiuk., *Ptychodictyon* sp. and *Acanthoides* ? sp. Actinopterygians are less abundant and are represented by scales of *Orvikuina* sp., *O. vardiaensis* Gross, *Moythomasia* ? sp. and *Actinopterygii* indet., as well as by small teeth of *Actinopterygii* indet. Psammosteid heterostracans are rare and represented by dentine tubercles of *Ganosteus* sp. Fragments of exoskeletons of placoderms and chondrichthyans are rarely found. Placoderms are represen-

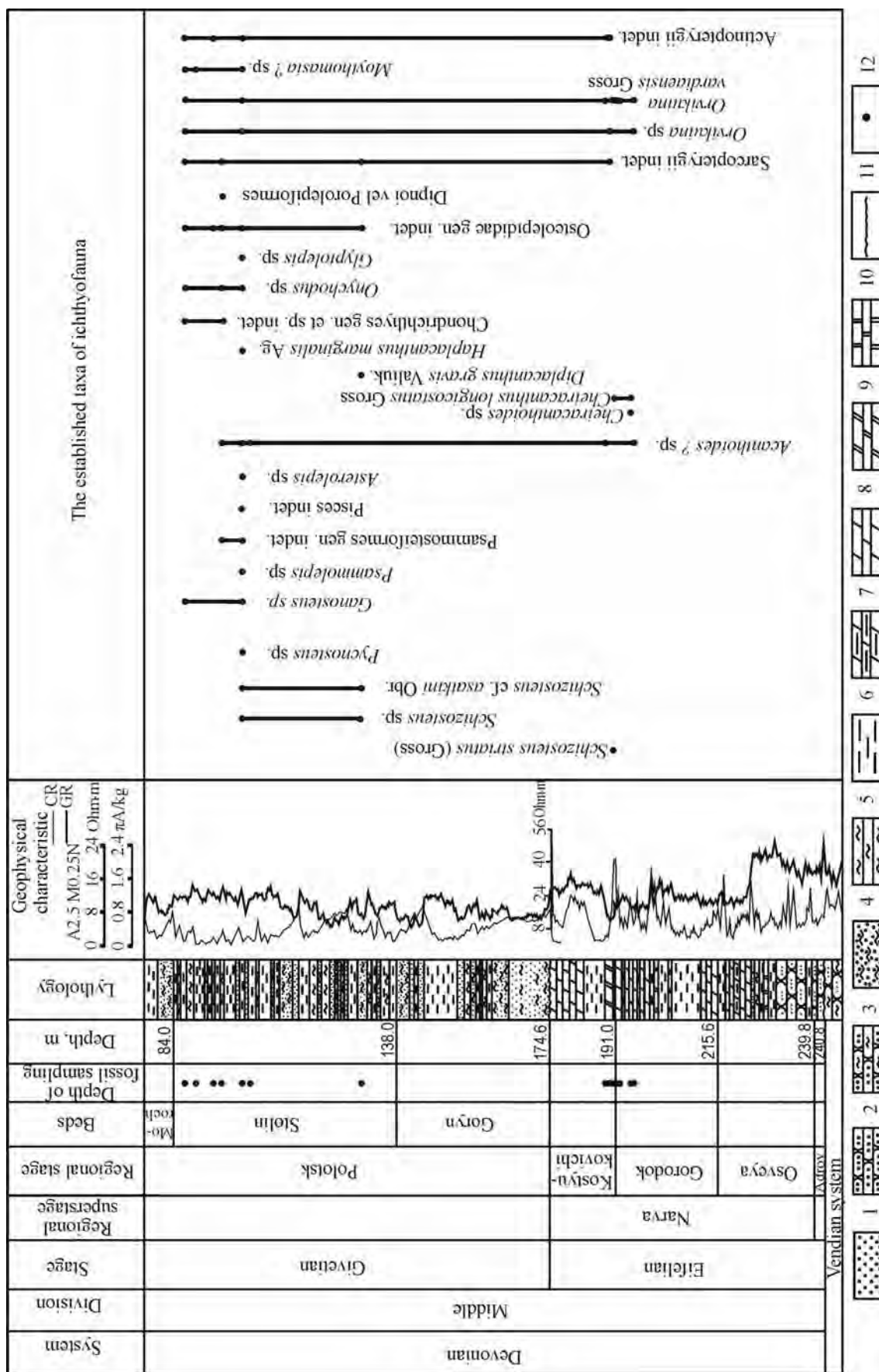


Text-figure 2 – Geological section of the Devonian deposits of the Pinsk-26 borehole with representation of distribution of ichthyofauna. Legend. Rocks: 1 – gritstones, 2 – sandstones, 3 – clayey sandstones, 4 – siltstones, 5 – clays, 6 – marls, 7 – dolomitic marls, 8 – clayey dolomites, 9 – dolomites, 10 – sulfatic rocks (gypsums and anhydrites). Other symbols: 11 – discontinuity surfaces, 12 – places of fossil sampling.



Text-figure 3 – Text-Figure 3 – Geological section of the Pinsk-10 borehole with representation of distribution of ichthyofauna.
 Legend. Rocks: 1 – sands, 2 – sandstones, 3 – clayey sandstones, 4 – clayey siltstones, 5 – siltstones, 6 – clays, 7 – clayey marls, 8 – marl, 9 – dolomitic marls, 10 – dolomites, 11 – clayey dolomites, 12 – dolomites with gypsum intercalations. Other symbols: 13 – discontinuity surfaces, 14 – places of fossil sampling.

ТЕАВОТІЯ



Text-figure 4 – Geological section of the Middle Devonian deposits of the Zhitkovichi-2 borehole with representation of distribution of ichthyofauna.
 Legend. Rocks: 1 - sands, 2 – sandstones, 3 – aleuritic sandstones, 4 – sandy siltstones, 5 – siltstones, 6 – clays, 7 – clayey marls, 8 – marl, 9 – dolomitic marls, 10 – dolomites. Other symbols: 11 – discontinuity surfaces, 12 - places of fossil sampling.

Table – Stratigraphic distribution of vertebrates in the Middle Devonian deposits of the western part of the Pripyat Trough

System		Devonian									
Series		Middle					Upper				
Stage		Eifelian		Givetian			Frasnian		Upper		
Substage		Lower	Middle	Upper	Lower	Middle	Upper	Lower	Middle	Upper	Lower
Regional superstage		Narva			Polotsk			Lan			
Regional stage		Adrov	Osveya	Kostyukovich	Goryn	Stolin	Moroch	Ubort	Zhelon		
Beds		2	3	4	5	6	7	8	9	10	
(H)	<i>Schizosteus striatus</i> (Gross)										
(H)	<i>Schizosteus</i> cf. <i>asaikini</i> Obr.										
(H)	<i>Schizosteus</i> sp.										
(H)	<i>Pycnosteus</i> sp.										
(H)	<i>Pycnosteus tuberculatus</i> (Rohon)										
(H)	<i>Psammolepis</i> sp.										
(H)	<i>Ganosteus</i> sp.										
(H)	<i>Psammosteus</i> sp.										
(H)	<i>Psammosteus praecursor</i> Obr. *										
(H)	<i>Psammosteiformes</i> gen. et sp. indet.										
(P)	<i>Ptyctodontida</i> gen. indet.										
(P)	<i>Rhynchodus</i> sp. *										
(P)	<i>Actinolepididae</i> gen. indet.										
(P)	<i>Actinolepis</i> sp.										
(P)	<i>Coccoosteus cuspidatus</i> Miller ex Ag										
(P)	<i>Coccoosteus</i> sp. *										
(Ch)	<i>Karksilepis</i> sp. *										
(P)	<i>Plourdosteus</i> sp. *										
(P)	<i>Plourdosteus livonicus</i> (Eastman) *										
(P)	<i>Byssacanthus</i> sp.										
(Ps)	<i>Osteichthyes</i> indet.										
(P)	<i>Asterolepis</i> sp.										
(P)	<i>Asterolepis estonica</i> Gross										
(P)	<i>Asterolepis dellet</i> Gross										
(P)	<i>Asterolepis ornata</i> Eichw. sensu Ag.										
(P)	<i>Bothriolepis</i> sp. *										
(P)	<i>Antiarcha</i> gen. indet.										
(P)	<i>Placodermi</i> indet.										
(P)	<i>Microbrachius</i> sp.										

Table continuation

	1	2	3	4	5	6	7	8	9	10
(Ps) Pisces indet.										
(Ac) <i>Cheiracanthus longicostatus</i> Gross										
(Ac) <i>Cheiracanthus brevicostatus</i> Gross										
(Ac) <i>Cheiracanthus</i> sp.										
(Ac) <i>Homacanthus gracilis</i> (Eichw.)										
(Ac) <i>Homacanthus</i> sp. *										
(Ac) <i>Haplacanthus marginalis</i> Ag.										
(Ac) <i>Haplacanthus</i> sp.										
(Ac) <i>Cheiracanthoides</i> sp.										
(Ac) <i>Cheiracanthoides proprius</i> Valiuk.										
(Ac) <i>Markacanthus costulatus</i> Valiuk.										
(Ac) <i>Markacanthus alius</i> Valiuk.										
(Ac) <i>Psychodicyon</i> sp.										
(Ac) <i>Acanthoides</i> ? sp.										
(Ac) <i>Archaeacanthus</i> sp.										
(Ac) <i>Diplacanthus</i> sp.										
(Ac) <i>Diplacanthus gravis</i> Valiuk.										
(Ac) <i>Diplacanthus carinatus</i> Gross										
(Ac) <i>Devononchus</i> sp.										
(Ac) <i>Rhadmaceanthus</i> sp.										
(Ac) <i>Rhadmaceanthus multisulcatus</i> Valiuk.										
(Ac) <i>Acanthodii</i> gen indet.										
(Ch) Chondrichthyes gen. et sp. indet.										
(Ch) Xenacanthidae gen. indet. *										
(S) <i>Onychodus</i> sp.										
(S) <i>Glyptolepis</i> sp.										
(S) <i>Glyptolepis</i> aut <i>Onychodus</i>										
(S) <i>Glyptolepis ballica</i> Gross										
(S) <i>Laccognathus</i> sp.										
(S) <i>Holopychius</i> sp. *										
(S) Osteolepididae gen. indet.										
(S) <i>Panderichthys</i> sp. *										
(S) Dipteridae gen. indet. *										
(S) Dipnoi vel Porolepiformes										
(S) Sarcopterygii indet.										
(AU) <i>Orvikaina</i> sp.										
(AU) <i>Orvikaina vardiaensis</i> Gross										
(AU) <i>Cheirolepis</i> sp.										
(AU) <i>Moythomasia</i> ? sp.										
(AU) Actinopterygii indet.										

Note – Zonal taxa are shown by bold italics.

Ac – Acanthodii, At – Actinopterygii, Ch – Chondrichthyes, H – Heterostraci, P – Placodermi, Ps – Pisces, S –Sarcopterygii.

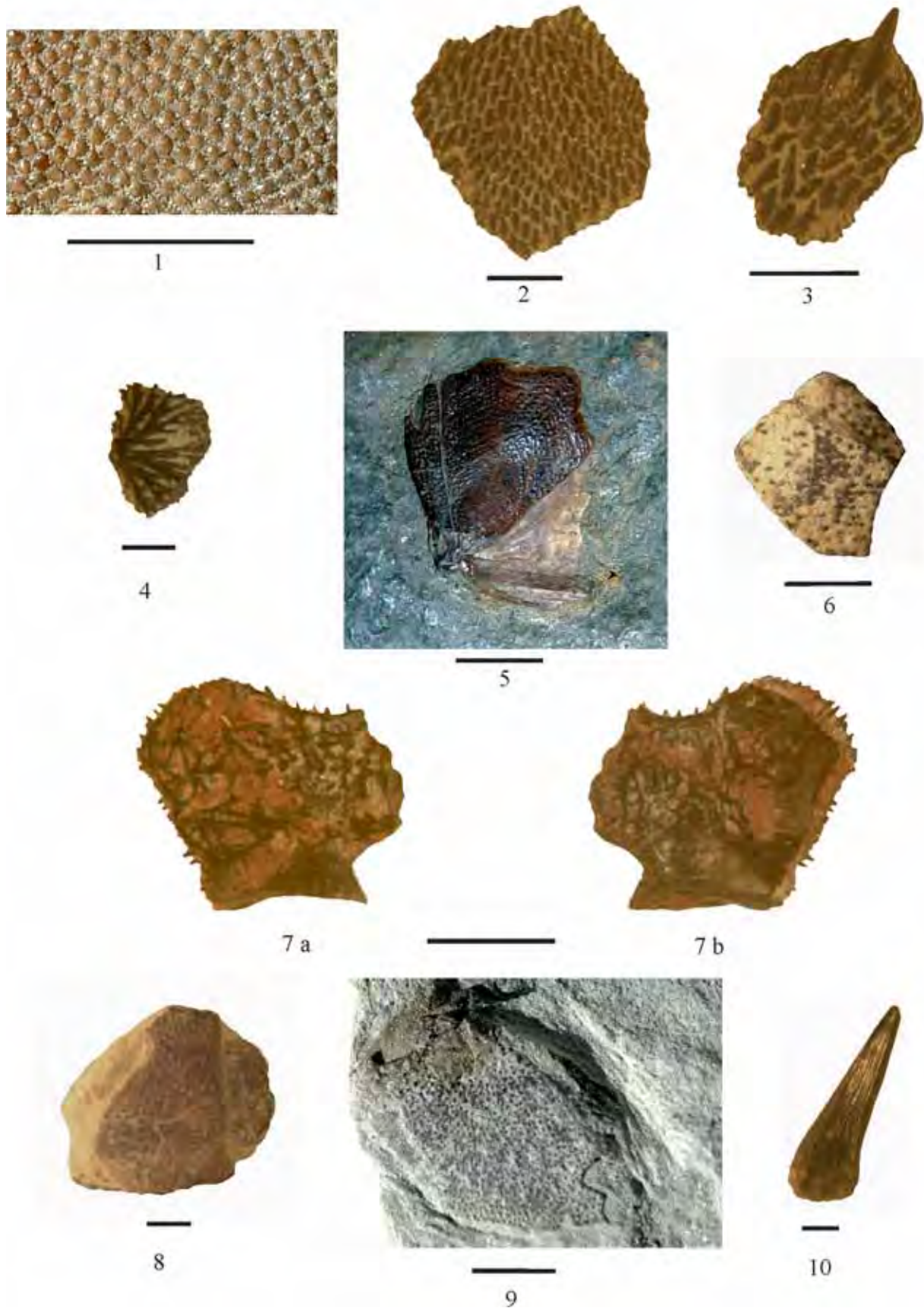


Plate I – Heterostracan dentine tubercle and plate fragments, placoderm plates and sarcopterygian tooth from the Zhitkovichi-2, Pinsk-10, Pinsk-26 and Gavrilchitsy-45 boreholes drilled in the territory of the western part of the Pripyat Trough. The skeleton elements of agnathans and fishes are from the Eifelian

and Givetian Stages, Middle Devonian. Scale bar of 2 mm for Figures 2, 3 and 4; 2.5 mm for Figures 7 and 10; 5 mm for Figures 1, 5, 6 and 8; 1 cm for Figure 9.

Figure 1 – *Schizosteus striatus* (Gross). Specimen № 57/5r-2, Zhitkovichi 2 borehole, depth range of 186.6–191.0 m, plate fragment in external view, Kostyukovichi Regional Stage. Figure 2 – *Schizosteus* cf. *asatkini* Obruchev. Specimen № 57/28r-486, Zhitkovichi-2 borehole, depth range of 98.0–103.0 m, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 3 – *Schizosteus* cf. *asatkini* Obruchev. Specimen № 57/28r-44a, Zhitkovichi-2 borehole, depth range of 98.0–103.0 m, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 4 – *Ganosteus* sp. Specimen № 57/316-2, Zhitkovichi-2 borehole, depth range of 84.0–89.0 m, dentine tubercle, top view, Polotsk Regional Stage, Stolin beds. Figure 5 – *Coccosteus cuspidatus* Miller ex Agassiz. Specimen PIN № 2921/3, Gavrilchitsy 45 borehole, A.V. Fursenko's collection 1954, paranuchal plate in external view, Kostyukovichi Regional Stage. Figure 6 – *Asterolepis* sp. Specimen № 85/15-3a, Pinsk-10 borehole, depth 146.0 m, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 7 – *Asterolepis* sp. Specimen № 57/28r-46, Zhitkovichi 2 borehole, depth range of 98.0–103.0 m, nuchal plate (possibly from the juvenile form): a – external surface, b – internal surface; Polotsk Regional Stage, Stolin beds. Figure 8 – *Asterolepis* sp. Specimen № 85/15-6, Pinsk-10 borehole, depth 146.0 m, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 9 – *Asterolepis* sp. Specimen № 41/7-3, Pinsk-26 borehole, depth 333.4 m, left posterior ventrolateral plate, Polotsk Regional Stage, Stolin beds. Figure 10 – Sarcopterygii indet. Specimen № 41/7-1, Pinsk-26 borehole, depth 333.4 m, tooth, Polotsk Regional Stage, Stolin beds.

ted by small fragments of articular process of *Antiarcha* gen. indet., spinal plate of *Actinolepis* sp. and fragment of tritor of *Ptyctodontida* gen. indet; Chondrichthyans are represented by discrete scales of *Chondrichthyes* gen. et sp. indet. and *Karksilepis* sp. Separated scales of *Osteolepididae* gen. et sp. indet. can be sometimes often met in deposits of the Kostyukovichi Regional Stage but teeth of *Onychodus* sp. and Sarcopterygii indet. appear far more rarely. Along with vertebrates the rocks of the Regional Stage include miospores, acritarchs, single corals, scolecodonts, calcareous tubes of worms of *Spirorbis* sp., fragments of shells of bivalves, fragments of lingulid shells and shells of articulate brachiopods, crinoids and conodonts. In particular, the last mentioned in the Kostyukovichi Regional Stage of the Pinsk-54 borehole located near to the section of the Pinsk-26 borehole, are characterized by taxa: *Polygnathus linguiformis linguiformis* Hinde, *P. parawebbi* Chatterton, *P. linguiformis klapperi* Clausen, Leuteritz et Ziegler, *Tortodus variabilis variabilis* (Bischoff et Ziegler), *Icriodus orri* Barrick et Klapper, *I. stecki* Chatterton, *I. stephensoni* Sparling etc., corresponding to the Eifelian zone of *ensensis* (Narkiewicz, Kruczek, 2008).

Deposits of the Kostyukovichi Regional Stage are correlated in their ichthyofauna composition with deposits of the Veliky Most Subformation of the lower part of the Lopushany Formation of the Eifelian Stage of Volyn-Podolia region (Plax, 2011), with deposits of the Chernyi Yar Regional Stage in the territory the Central Devonian field (Russia) (Valiukevicius, Kruczek, 2000), with rocks of the Kernave Regional Substage in the territory of Lithuania (Valiukevicius, 1985; Valiukevicius, Golubtsov, 1986; Valiukevicius, Kruczek, 2000).

Deposits of the **Goryn beds** of the Polotsk Regional Stage of the Givetian Stage are established in

two boreholes – Pinsk-10 (depth of 192.5–229.6 m) and Pinsk-26 (depth of 372.4–407.8 m). They are represented mainly by pale-yellow, light greenish-grey and light-yellow, fine-grained, weak micaceous, feldspar-quartz, quartz, with clayey cement, well cemented sandstones and light grey, light greenish-grey, fine-grained, weak micaceous, feldspar-quartz, quartz, well cemented siltstones. Sandstones in the bottom of the Goryn beds with a small break in sedimentation overlap the deposits of the Kostyukovichi Regional Stage. The taxonomic composition of vertebrates which was found in rocks of the Goryn beds is not very diverse. Heterostracans are not numerous here. They are represented by separate dentine tubercles of *Psammolepis* sp., *Psammosteiformes* gen. et sp. indet. Placoderms are even rarer. They are represented by indefinable plates and small fragments of plates from pectoral fin of *Antiarcha* gen. indet. Acanthodians are the most numerous vertebrates in taxonomic regard. They are represented mainly by scales, and to a lesser degree by fragments of fin spines. From here the following are known: *Markacanthus alius* Valiuk., *Cheiracanthus* sp., *C. brevicostatus* Gross, *Rhadinacanthus multisulcatus* Valiuk., *Diplacanthus carinatus* Gross, *D. gravis* Valiuk., *Acanthoides* ? sp., *Archaeacanthus* sp. and *Haplacanthus marginalis* Ag. The species of *Markacanthus alius* Valiuk., *Rhadinacanthus multisulcatus* Valiuk. and *Diplacanthus gravis* Valiuk. appear for the first time at this stratigraphic level. Sarcopterygians are represented by scales of *Glyptolepis* sp., *Osteolepididae* gen. et sp. indet. and by teeth of *Onychodus* sp. and Sarcopterygii indet. In taxonomic and quantitative terms they are much inferior to acanthodians, but are superior to heterostracans, placoderms and actinopterygians. The latter are represented by rare indefinable scales of Actinopterygii indet. Together

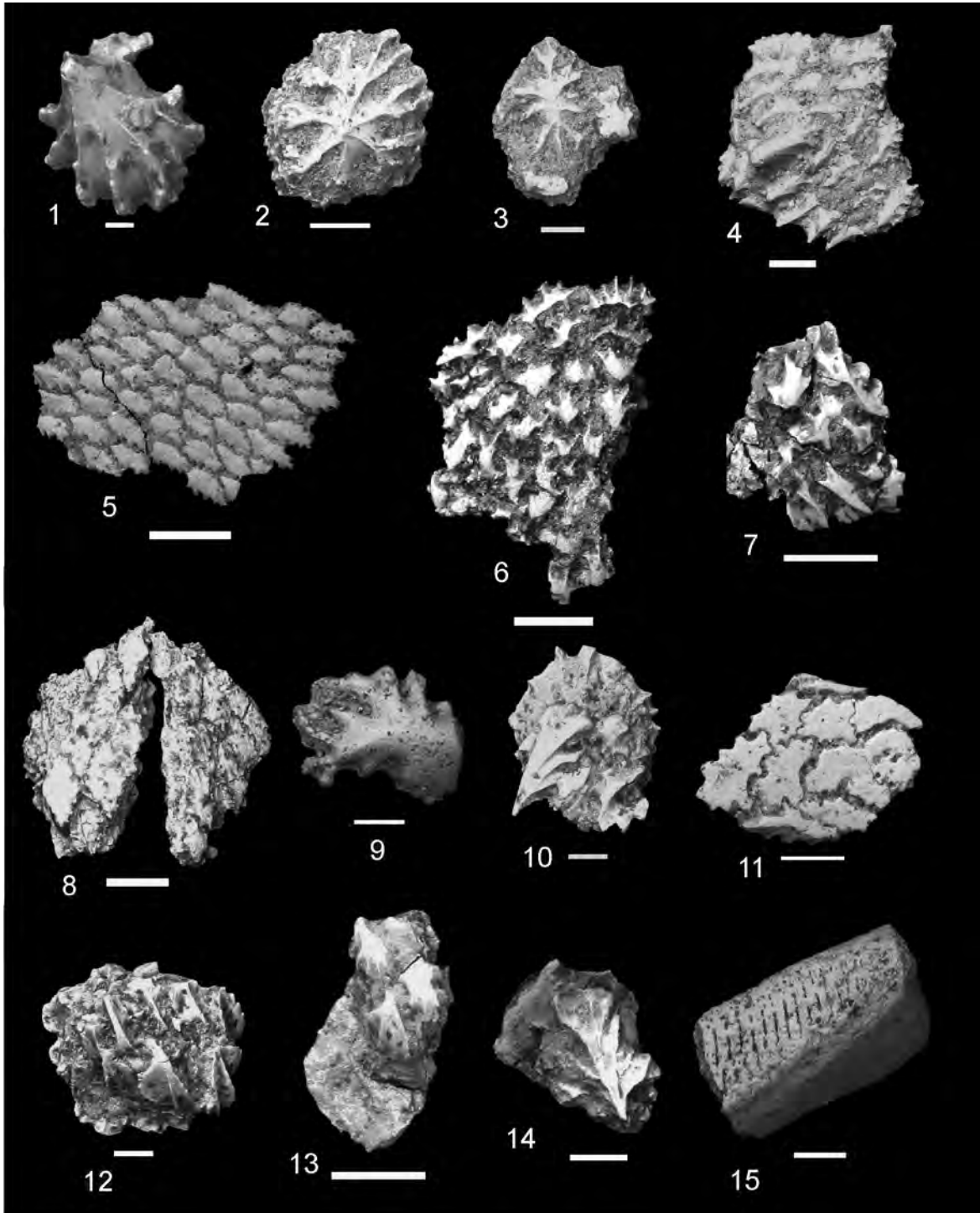


Plate II – Heterostracan dentine tubercles and plate fragments, placoderm tritor from the Zhitkovichi-2, Pinsk-10 and Pinsk-26 boreholes drilled in the territory of the western part of the Pripyat Trough. The skeleton elements of vertebrates are from the Eifelian and Givetian Stages, Middle Devonian. Scale bar of 100 μ m for Figures 1 and 14; 200 μ m – for Figures 10 and 12; 500 μ m – for Figures 2, 3, 4, 6, 7, 8, 9, 11, 13 and 15; 1 mm – for Figure 5.

Figure 1 – *Psammosteiformes* gen. et sp. indet. Specimen N^o 41/6a-1e, Pinsk-26 borehole, depth 385.2 m, 150, dentine tubercle, top view, Polotsk Regional Stage, Goryn beds. Figure 2 – *Pycnosteus* sp. Specimen N^o 41/8-12a, Pinsk-26 borehole, depth 333.6 m, $\times 50$, dentine tubercle, top view, Polotsk Regional Stage, Stolin beds. Figure 3 – *Pycnosteus* sp. Specimen N^o 41/8-12b, Pinsk-26 borehole, depth 333.6 m, $\times 35$, dentine tubercles, top view, Polotsk Regional Stage, Stolin beds. Figure 4 – *Schizosteus* cf. *asatkini* Obruchev. Specimen N^o 57/28r-30a, Zhitkovichi-2 borehole, depth range of 98.0–103.0 m, $\times 30$, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 5 – *Schizosteus* cf. *asatkini* Obruchev. Specimen N^o 57/28r-29a, Zhitkovichi-2 borehole, depth range of 98.0–103.0 m, $\times 25$, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure

6 – *Psammolepis* sp. Specimen № 85/16-3b, Pinsk-10 borehole, depth 142.9 m, $\times 35$, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 7 – *Psammolepis* sp. Specimen № 85/16-3c, Pinsk-10 borehole, depth 142.9 m, $\times 50$, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 8 – *Psammolepis* sp. Specimen № 85/19-1, Pinsk-10 borehole, depth 141.0 m, $\times 35$, plate fragment in external view, Polotsk Regional Stage, Stolin beds. Figure 9 – *Psammosteiformes* gen. et sp. indet. Specimen № 85/15-2a, Pinsk-10 borehole, depth 146.0 m, $\times 35$, dentine tubercle, top view, Polotsk Regional Stage, Stolin beds. Figure 10 – *Psammosteiformes* gen. et sp. indet. Specimen № 85/23-7, Pinsk-10 borehole, depth 103.7 m, $\times 75$, dentine tubercles, top view, Polotsk Regional Stage, Moroch beds. Figure 11 – *Psammolepis* sp. Specimen № 85/19-2g, Pinsk-10 borehole, depth 141.0 m, $\times 50$, fragment of a plate, top view, Polotsk Regional Stage, Stolin beds. Figure 12 – *Psammosteiformes* gen. et sp. indet. Specimen № 85/19-2f, Pinsk-10 borehole, depth 141.0 m, $\times 70$, dentine tubercles, top view, Polotsk Regional Stage, Stolin beds. Figure 13 – *Psammolepis* sp. Specimen № 85/16-3a, Pinsk-10 borehole, depth 142.9 m, $\times 35$, fragment of a plate or scale, top view, Polotsk Regional Stage, Stolin beds. Figure 14 – *Psammosteiformes* gen. et sp. indet. Specimen № 85/21-1q, Pinsk-10 borehole, depth 122.0 m, $\times 200$, dentine tubercle, top view, Polotsk Regional Stage, Moroch beds. Figure 15 – *Ptyctodontida* gen. indet. Specimen № 85/7a-1, Pinsk-10 borehole, depth 245.2 m, $\times 35$, fragment of a tritor, Kostyukovich Regional Stage.

with vertebrates in deposits of these beds there are rare fragments of lingulid shells, miospores; sometimes the carbonified plant remains.

Vertebrates of the **Stolin beds** of the Polotsk Regional Stage of the Givetian Stage are established both in the Pinsk-10 borehole (depth of 140.5–192.5 m) and in the Pinsk-26 borehole (depth of 292.0–372.4 m). They are characterized by their large number and big taxonomic diverse. They are found basically in light greenish-grey, bluish-grey, brown small-, fine-grained, quartz, micaceous, with clayey cement and horizontal lamination, sometimes weak carbonaceous, well cemented, dense, platy siltstones and light grey, greenish – and bluish-grey lump, homogeneous clays. The plates, scales, ridge-scales and dentine tubercles of heterostracans of *Psammolepis* sp., *Ganosteus* sp., *Pycnosteus* sp., *P. tuberculatus* (Rohon) and *Psammosteiformes* gen. et sp. indet. are identified here. Acanthodians are represented by scales of *Cheiracanthus* sp., *C. longicostatus* Gross, *C. brevicostatus* Gross, *Diplacanthus* sp., *D. gravis* Valiuk., *D. carinatus* Gross, *Acanthoides?* sp., fragments of fin spines of *Haplacanthus* sp., *H. marginalis* Ag., *Archaeacanthus* sp., *Homacanthus* sp., *H. gracilis* (Eichw.) and *Acanthodii* gen. indet., placoderms – fragments of anterior ventrolateral plate, posterior ventrolateral plate, fragments of indefinable plates, small fragments of distal parts of pectoral fins, terminal plates and scales of *Antiarcha* gen. indet., spinal plates and fragments of plates of *Actinolepididae* gen. indet., *Actinolepis* sp., fragments of tooth plates of *Rhynchodus* sp., fragments of plates of *Cocosteus* sp., *Dickosteus?* sp., *Byssacanthus* sp., *Asterolepis* sp., *A. dellei* Gross and fragments of indefinable plates of *Placodermi* indet., chondrichthyans – *Chondrichthyes* gen. et sp. indet., sarcopterygians – scales of *Glyptolepis* sp., *Glyptolepis* aut *Onychodus*, *Osteolepididae* gen. et sp. indet., *Dipteridae* gen. indet., teeth of *Onychodus* sp.,

indefinable bones and teeth of *Sarcopterygii* indet., actinopterygians – scales of *Orvikuina* sp., *O. vardiaensis* Gross, *Cheirolepis* sp., *Moythomasia?* sp. and *Actinopterygii* indet. The jaw fragment and element from a pharyngeal part of *Osteichthyes* indet. are found. A dominant fish group is acanthodians. Representatives of heterostracans, placoderms, sarcopterygians and actinopterygians are less abundant, and those of chondrichthyans are very rare. There are zone species of *Pycnosteus tuberculatus* (Rohon), *Diplacanthus gravis* Valiuk. and *Asterolepis dellei* Gross. The species of *Pycnosteus tuberculatus* (Rohon) and *Asterolepis dellei* Gross are characteristic of the upper part of the Stolin beds. The species of *Diplacanthus gravis* Valiuk besides the Stolin beds happen in the Goryn and Moroch beds; they are zonal species for the Polotsk Regional Stage. Diagnostic species of vertebrates exclusively for this level are unknown. On the whole, assemblages of agnathans and fishes established in the Stolin beds differ well enough from the prior vertebrate assemblages due to their peculiar distinctiveness and some new taxa having appeared here. Apart from vertebrates fragments of shells of lingulids and miospores have been identified in rocks of the Stolin beds.

The ichthyofauna in deposits of the **Moroch beds** of the Polotsk Regional Stage of the Givetian Stage has been determined from both boreholes. Vertebrates are found in the Pinsk-10 borehole in a depth range of 85.0–140.5 m, and in the Pinsk-26 borehole – in a depth range of 238.3–292.0 m. Agnathans and fishes are found mainly in light grey, light greenish-grey, fine-grained, feldspar-quartz, weak micaceous, with clayey cement, weak cemented, platy sandstones and light grey, light-brown, fine-grained, feldspar-quartz, quartz, weak micaceous, with clayey cement, weak cemented, weak carbonaceous, platy siltstones. Heterostracans are represented here by dentine tubercles

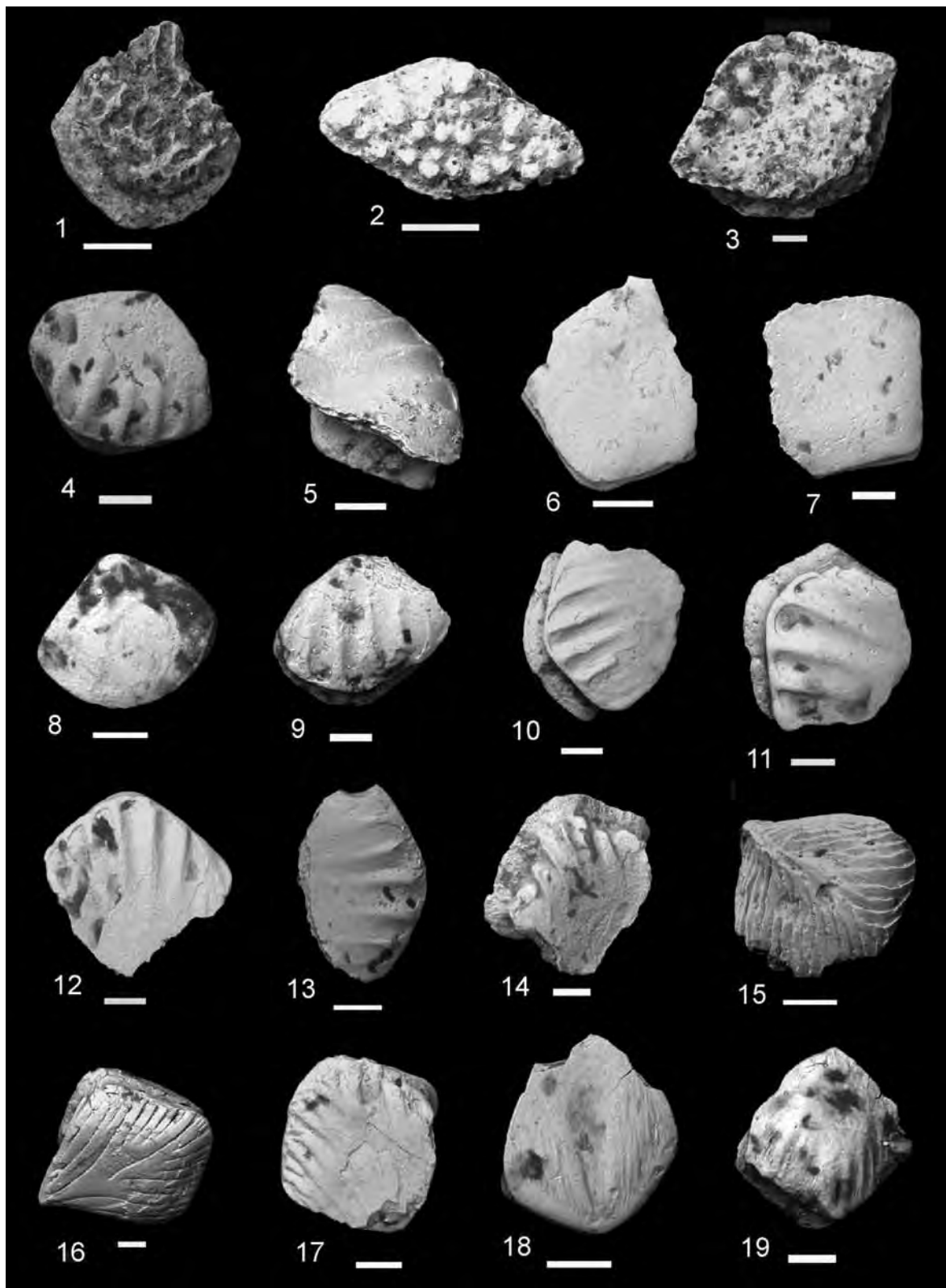


Plate III – Placoderm and acanthodian scales from the Pinsk-10 and Pinsk-26 boreholes drilled in the territory of the western part of the Pripyat Trough. The scales of fishes are from the Eifelian and Givetian Stages, Middle Devonian. Scale bar of 100 μm for Figures 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19; 200 μm for Figure 3; 500 μm for Figures 1 and 2.

Figure 1 – *Antiarcha* gen. indet. Specimen № 85/19-2d, Pinsk-10 borehole, depth 141.0 m, $\times 50$, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 2 – *Antiarcha* gen. indet. Specimen № 85/17-7, Pinsk-10 borehole, depth 142.3 m, $\times 50$, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 3 – *Antiarcha* gen. indet. Specimen № 85/16-1a, Pinsk-10 borehole, depth 142.9 m, $\times 75$, scale in crown view, Polotsk

Regional Stage, Stolin beds. Figure 4 – *Cheiracanthoides* sp. Specimen № 57/6-1a, Zhitkovichi-2 borehole, depth range of 191.0–196.0 m, $\times 150$, scale in anterior crown view, Gorodok Regional Stage. Figure 5 – *Cheiracanthoides* sp. Specimen № 41/26-1b, Pinsk-26 borehole, depth 422.4 m, $\times 150$, scale in posterior crown view, Kostyukovichi Regional Stage. Figure 6 – *Acanthoides* ? sp. Specimen № 41/3b-1a, Pinsk-26 borehole, depth 421.8 m, $\times 200$, scale in crown view, Kostyukovichi Regional Stage. Figure 7 – *Acanthoides* ? sp. Specimen № 41/4a-1a, Pinsk-26 borehole, depth 421.2 m, $\times 150$, scale in crown view, Kostyukovichi Regional Stage. Figure 8 – *Acanthoides* ? sp. Specimen № 41/6a-1b, Pinsk-26 borehole, depth 385.2 m, $\times 200$, scale in crown view, Polotsk Regional Stage, Goryn beds. Figure 9 – *Cheiracanthoides* sp. Specimen № 41/66-1a, Pinsk-26 borehole, depth 415.7 m, $\times 150$, scale in anterior crown view, Kostyukovichi Regional Stage. Figure 10 – *Cheiracanthoides* sp. Specimen № 85/7a-4a, Pinsk-10 borehole, depth 245.2 m, $\times 160$, scale in anterior crown view, Kostyukovichi Regional Stage. Figure 11 – *Cheiracanthoides* sp. Specimen № 85/7a-4b, Pinsk-10 borehole, depth 245.2 m, $\times 150$, scale in crown view, Kostyukovichi Regional Stage. Figure 12 – *Cheiracanthoides* sp. Specimen № 85/7a-4d, Pinsk-10 borehole, depth 245.2 m, $\times 150$, scale in crown view, Kostyukovichi Regional Stage. Figure 13 – *Cheiracanthoides* sp. Specimen № 41/26-1d, Pinsk-26 borehole, depth 422.4 m, $\times 180$, scale in crown view, Kostyukovichi Regional Stage. Figure 14 – *Cheiracanthoides proprius* Valiuk. Specimen № 41/4a-1d, Pinsk-26 borehole, depth 421.2 m, $\times 150$, scale in posterior crown view, Kostyukovichi Regional Stage. Figure 15 – *Diplacanthus carinatus* Gross. Specimen № 41/6a-1c, Pinsk-26 borehole, depth 385.2 m, $\times 200$, scale in anterior crown view, Polotsk Regional Stage, Goryn beds. Figure 16 – *Diplacanthus carinatus* Gross. Specimen № 41/76-2, Pinsk-26 borehole, depth 384.5 m, $\times 100$, scale in crown view, Polotsk Regional Stage, Goryn beds. Figure 17 – *Rhadinacanthus multisulcatus* Valiuk. Specimen № 41/6a-2e, Pinsk-26 borehole, depth 385.2 m, $\times 150$, scale in crown view, Polotsk Regional Stage, Goryn beds. Figure 18 – *Cheiracanthus longicostatus* Gross. Specimen № 85/19-2e, Pinsk-10 borehole, depth 141.0 m, $\times 200$, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 19 – *Cheiracanthus* sp. Specimen № 85/21-2e, Pinsk-10 borehole, depth 122 m, $\times 150$, scale in anterior crown view, Polotsk Regional Stage, Moroch beds.

and scales of *Psammolepis* sp., *Psammosteus* sp. and *Psammosteiformes* gen. et sp. indet. The genus of *Psammosteus* sp. appears for the first time at this stratigraphic level. Placoderms are rather rare and represented by small fragments of plates of *Byssacanthus* sp., *Asterolepis* sp., small fragment of distal parts of pectoral fin and small indefinable plates of *Antiarcha* gen. indet. Scales and teeth of sarcopterygians (*Glyptolepis* sp., *Onychodus* sp., *Laccognathus* sp., *Osteolepididae* gen. et sp. indet., *Dipteridae* gen. indet., *Sarcopterygii* indet.) are rather numerous. Acanthodians are more numerous. They are represented by scales of *Cheiracanthus* sp., *C. brevicostatus* Gross, *C. longicostatus* Gross, *Diplacanthus* sp., *D. gravis* Valiuk., *D. carinatus* Gross, *Haplacanthus* sp., *Rhadinacanthus* sp., *R. multisulcatus* Valiuk., *Acanthoides* ? sp. and fragments of fin spines of *Haplacanthus* sp., *Devononchus* sp., *Acanthodii* gen. indet. Chondrichthyans are extremely rare. They are represented by *Xenacanthidae* gen. indet. Actinopterygians are frequent enough and represented by scales of *Orvikuina* sp., *O. vardiaensis* Gross, *Cheirolepis* sp., *Moythomasia* ? sp. and *Actinopterygii* indet. Together with the vertebrates there are sporadic scolecodonts, fragments of shells of lingulids, numerous oogonia of charophytes of *Sycidium* sp., carbonified plant remains and miospores.

As for acanthodians, the Polotsk Regional Stage of the Givetian Stage of the Middle Devonian corresponds, in general, to *Diplacanthus gravis* zone (Valiukevičius, 1994; Valiukevičius et al., 1995; Valiukevičius, Kruczek, 2000). The Goryn beds and

the lower part of the Stolin beds of the Polotsk Regional Stage are age analogues of the Aruküla Regional Stage of the Givetian Stage of the Middle Devonian of the Main Devonian field (Devonian..., 1981; Mark-Kurik, 2000; Ivanov and Lebedev, 2011). The upper part of the Stolin beds and the Moroch beds are correlated with the Burtneki Regional Stage of the Givetian Stage of the Middle Devonian of the Main Devonian field. The upper part of the Stolin beds corresponds in the placoderms to *Asterolepis dellei* zone and in the heterostracans to *Pycnosteus tuberculatus* zone, and the Moroch beds corresponds in the placoderms to *Microbrachius* zone. In central regions of the East European platform the Polotsk Regional Stage shows correlation with the Vorob'ev, Ardatov and Mullin Regional Stages of the Staryi Oskol Regional Superstage of Givetian Stage of the acanthodian zone of *Diplacanthus gravis* (Valiukevičius, Kruczek, 2000), and in Volyn-Podolia – with the Podliptsy Subformation of the upper part of the Lopushany Formation, the Pelcha, Kryzhov and Batyatykh Formations (Plax, 2011).

Vertebrates of the **Ubor Regional Stage** of the Lan Regional Superstage of the Givetian Stage of the Middle Devonian are established only in the Pinsk-26 borehole (depth of 213.0–238.3 m) in light grey, greenish-grey, small-, fine-grained, quartz-micaceous, weakly cemented sandstones and particoloured clays. They are represented by small plates of heterostracans of *Psammolepis* sp., plates of antiarchs of *Asterolepis* sp. and *A. ornata* Eichwald sensu Agassiz, plates of euarthrodians of *Plourdosteus* sp., *P. livonicus* (Eastman), scales and teeth

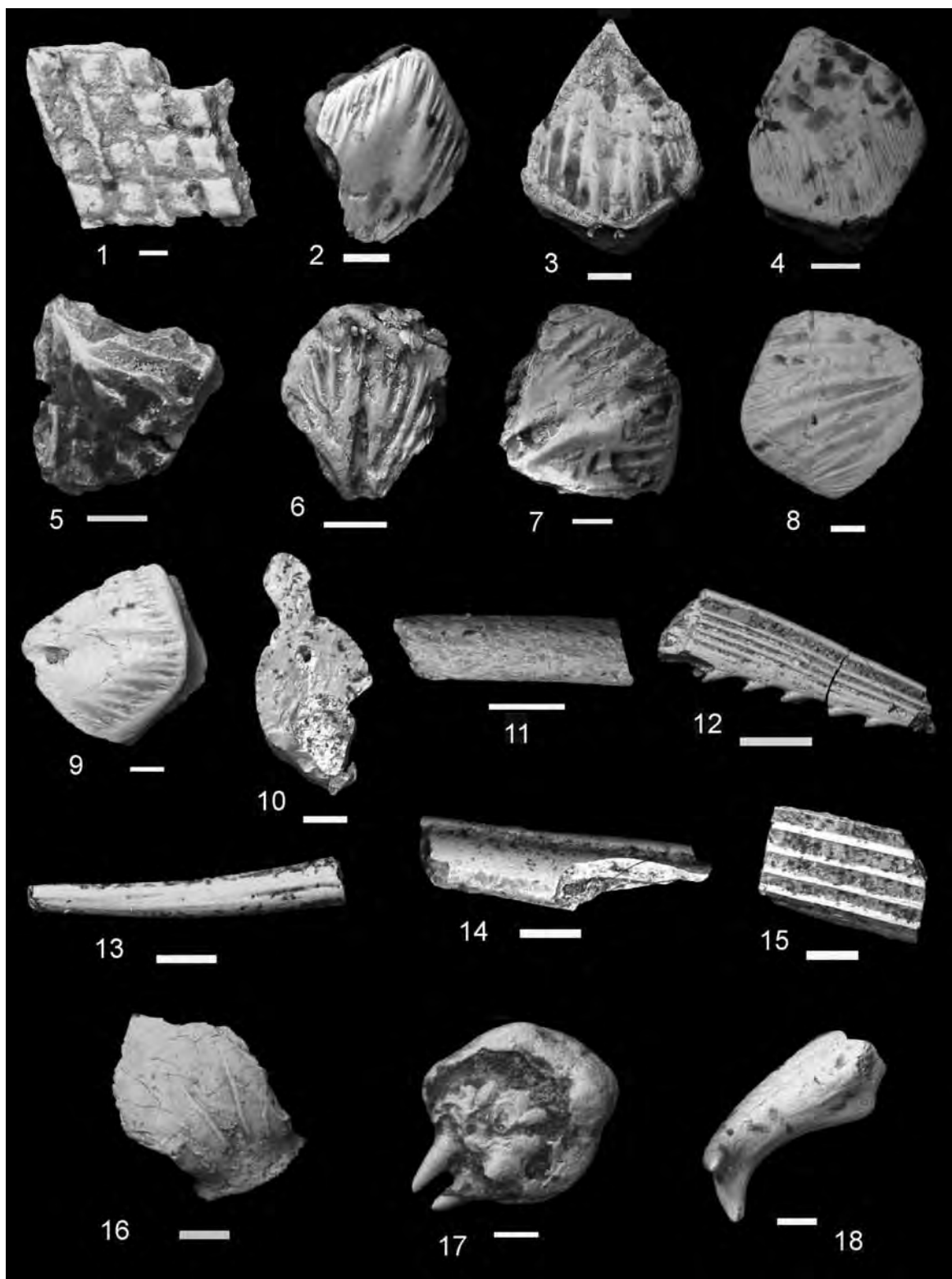


Plate IV – Acanthodian and chondrichthyan scales and acanthodian fin spines, as well as undetermined skeleton element of osteichthyan from the Pinsk-10 and Pinsk-26 boreholes drilled in the territory of the western part of the Pripyat Trough. The skeleton elements of fishes are from the Eifelian and Givetian Stages, Middle Devonian. Scale bar of 100 μm for Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 16, 17 and 18; 200 μm for Figure 10; 500 μm for Figures 11, 13, 14 and 15; 1 mm for Figure 12.

Figure 1 – Acanthodii gen. indet. Specimen № 85/16-6b, Pinsk-10 borehole, depth 142.9 m, $\times 100$, scales, Polotsk Regional Stage, Stolin beds. Figure 2 – *Cheiracanthus* sp. Specimen № 85/21-1a, Pinsk-10 borehole, depth 122.0 m, $\times 150$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 3 – *Cheiracanthus longicostatus* Gross. Specimen № 85/21-2d, Pinsk-10 borehole, depth 122.0 m, $\times 150$, scale in anterior crown

view, Polotsk Regional Stage, Moroch beds. Figure 4 – *Cheiracanthus longicostatus* Gross. Specimen № 85/16-10k, Pinsk-10 borehole, depth 142.9 m, $\times 150$, scale in anterior crown view, Polotsk Regional Stage, Stolin beds. Figure 5 – *Diplacanthus* sp. Specimen № 85/22-2c, Pinsk-10 borehole, depth 113.0 m, $\times 200$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 6 – *Diplacanthus gravis* Valiuk. Specimen № 85/15-10a, Pinsk-10 borehole, depth 146.0 m, $\times 200$, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 7 – *Diplacanthus gravis* Valiuk. Specimen № 85/21-1p, Pinsk-10 borehole, depth 122.0 m, $\times 150$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 8 – *Haplacanthus* sp. Specimen № 85/23-5c, Pinsk-10 borehole, depth 103.7 m, $\times 100$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 9 – *Cheiracanthus longicostatus* Gross. Specimen № 85/23-7b, Pinsk-10 borehole, depth 103.7 m, $\times 100$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 10 – *Haplacanthus marginalis* Ag. Specimen № 41/6a-1d, Pinsk-26 borehole, depth 385.2 m, $\times 70$, fin spine, Polotsk Regional Stage, Goryn beds. Figure 11 – *Acanthodii* gen. indet. Specimen № 85/23-3, Pinsk-10 borehole, depth 103.7 m, $\times 45$, fin spine in lateral view, Polotsk Regional Stage, Moroch beds. Figure 12 – *Homacanthus gracilis* (Eichw.). Specimen № 85/13-2, Pinsk-10 borehole, depth 184.4 m, $\times 25$, fin spine in lateral view, Polotsk Regional Stage, Stolin beds. Figure 13 – *Haplacanthus* sp. Specimen № 85/16-1b, Pinsk-10 borehole, depth 142.9 m, $\times 35$, fin spine in lateral view, Polotsk Regional Stage, Stolin beds. Figure 14 – *Haplacanthus marginalis* Ag. Specimen № 85/17-5a, Pinsk-10 borehole, depth 142.3 m, $\times 35$, fragment of fin spine in lateral view, Polotsk Regional Stage, Stolin beds. Figure 15 – *Archaeacanthus* sp. Specimen № 85/17-5b, Pinsk-10 borehole, depth 142.3 m, $\times 35$, fragment of fin spine in lateral view, Polotsk Regional Stage, Stolin beds. Figure 16 – *Chondrichthyes* gen. et sp. indet. Specimen № 41/66-1, Pinsk-26 borehole, depth 415.7 m, $\times 150$, scale in anterior crown view, Kostyukovich Regional Stage. Figure 17 – *Karksilipsis* sp. Specimen № 41/26-1a, Pinsk-26 borehole, depth 422.4 m, $\times 150$, scale in crown view, Kostyukovich Regional Stage. Figure 18 – *Osteichthyes* indet. Specimen № 41/4a-1b, Pinsk-26 borehole, depth 421.2 m, $\times 150$, undetermined skeleton element, Kostyukovich Regional Stage.

of sarcopterygians of *Onychodus* sp., *Glyptolepis* sp., *G. baltica* Gross, Osteolepididae gen. et sp. indet., Sarcopterygii indet. and scales of actinopterygians of Actinopterygii indet. Representatives of placoderms and sarcopterygians happen here more often than representatives of heterostracans and actinopterygians. Chondrichthyans have not been established. The species of *Plourdosteus livonicus* (Eastman), *A. ornata* Eichwald sensu Agassiz and *Glyptolepis baltica* Gross. happen for the first time at this stratigraphic level. Others taxa are transit. *A. ornata* Eichwald sensu Agassiz can be the diagnostic taxon of the Regional Stage. Apart from ichthyofauna the carbonified plant remains are found in deposits of this Regional Stage.

Deposits of the Ubert Regional Stage of the Lan Regional Superstage are correlated in their composition of ichthyofauna with the Gauja Regional Stage in the territory of the Main Devonian field (Devonian..., 1981; Esin et al., 2000; Ivanov and Lebedev, 2011) and with the Yastrebovka Formation in the territory of the Central Devonian field (Obruceva, Obruceva, 1977). They are also correlated to Pashija Regional Stage widespread on the western slope of Ural, in Volga-Ural region and in the east of the central regions of the East European platform (The Devonian..., 1995).

Finds of the Upper Devonian, namely, the Lower Frasnian vertebrates within the studied territory are known only in section of the Pinsk-26 borehole. The representative assemblage of agnathans and fishes in it originates from deposits of the **Zhelon Regional Stage** of the Lan Regional Superstage (depth of 180.6–213.0 m) which is represented by

clayey stratum with prolayers of marls, dolomites, silts and rare sandstones. Vertebrates are found in grey, light grey, fine-grained, quartz, cemented, platy sandstones and greenish-dark-grey, dense clays. Their taxonomic composition is not very diverse. They are represented by discrete plates of *Psammosteus praecursor* Obr., *Bothriolepis* sp., Ptyctodontida gen. indet., scales of *Glyptolepis* sp., *Panderichthys* sp., *Holophthychius* sp., Dipteridae gen. indet. and Actinopterygii indet. Together with the vertebrates in deposits of the Regional Stage there are fragments of shells of inarticulate brachiopods, conchostracans and miospores.

The established assemblage of vertebrates enables us to correlate these deposits with the rocks of the Amata Regional Stage in the territory of the Main Devonian field (Devonian..., 1981; Esin et al., 2000; Ivanov and Lebedev, 2011) and with the Chaplygin Formation in the territory of the Central Devonian field (Obruceva, Obruceva, 1977; Esin et al., 2000; Moloshnikov, 2008).

CONCLUSIONS

The palaeoichthyological study of beds of the Middle Devonian deposits exposed in two boreholes – Pinsk-10 and Pinsk-26 in the western part of the Pripyat Trough, as well as the use of the previously known data on agnathans and fishes of the considered time interval within the studied area have made it possible to conduct a more comprehensive analysis and characterization with vertebrates evidences of separate stratigraphic subdivisions of the Middle Devonian (Eifelian and Givetian) and, to a lesser degree, Lower Frasnian of the given

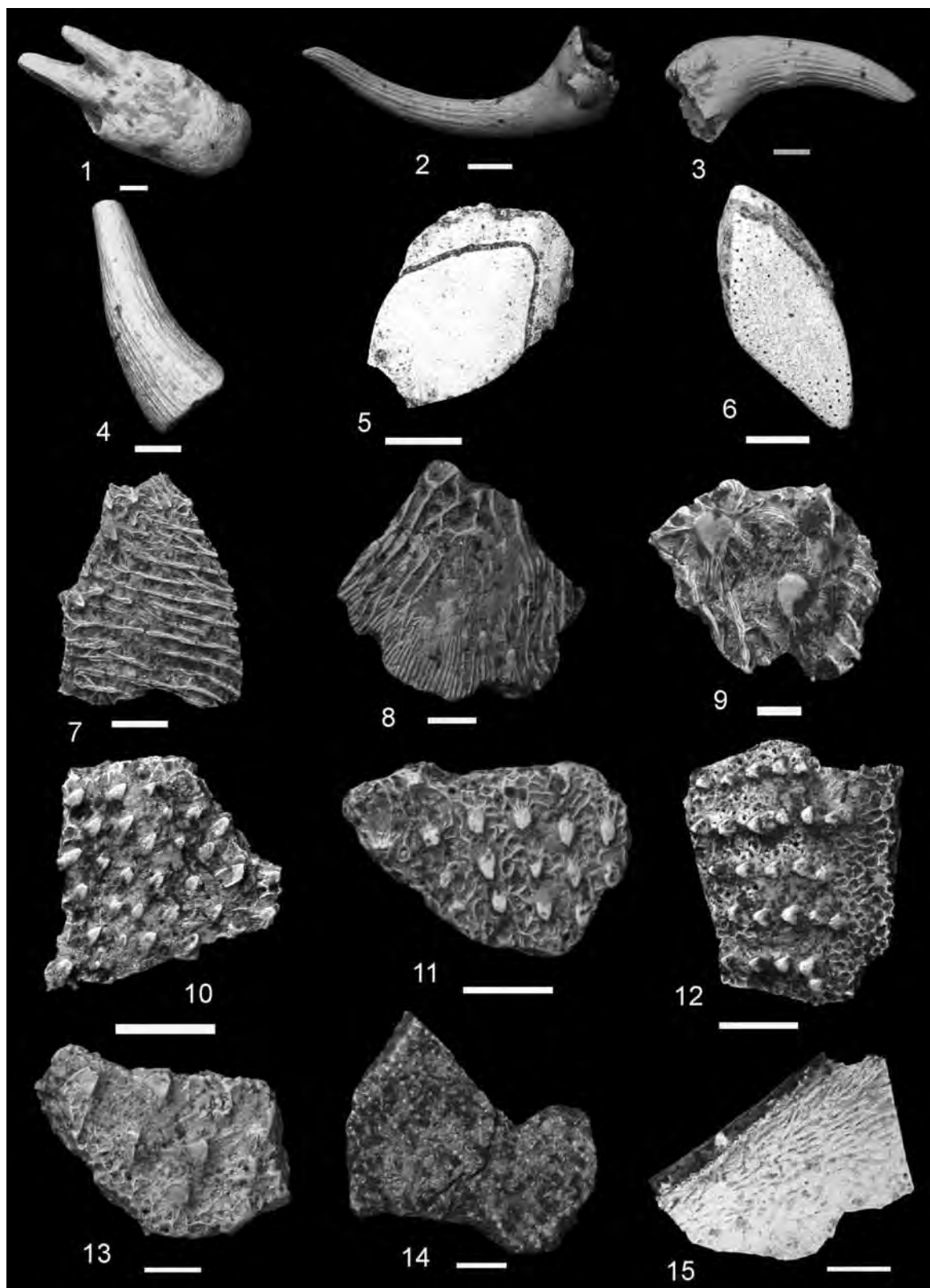


Plate V – Sarcopterygian scales and teeth, and osteichthyan skeleton elements from the Pinsk-10 and Pinsk-26 boreholes drilled in the territory of the western part of the Pripyat Trough. The skeleton elements of fishes are from the Givetian Stage, Middle Devonian. Scale bar of 100 μm for Figure 1; 200 μm for Figures 2, 3, 4, 8, 9 and 14; 500 μm for Figures 6, 7, 10, 11, 13 and 15; 1 mm for Figures 5 and 12. Figure 1 – Osteichthyes indet. Specimen N^o 85/16-4, Pinsk-10 borehole, depth 142.9 m, $\times 100$, element from a pharyngeal part, Polotsk Regional Stage, Stolin beds. Figure 2 – *Onychodus* sp. Specimen N^o 85/24-1c, Pinsk-10 borehole, depth 99.0 m, $\times 70$, tooth in lateral view, Polotsk Regional Stage, Moroch beds. Figure 3 – *Onychodus*

sp. Specimen № 85/23-6, Pinsk-10 borehole, depth 103.7 m, $\times 70$, tooth in lateral view, Polotsk Regional Stage, Moroch beds. Figure 4 – *Onychodus* sp. Specimen № 85/17-2b, Pinsk-10 borehole, depth 142.3 m, $\times 75$, tooth in lateral view, Polotsk Regional Stage, Stolin beds. Figure 5 – Osteolepididae gen. indet. Specimen № 41/76-4, Pinsk-26 borehole, depth 384.5 m, $\times 25$, scale in crown view, Polotsk Regional Stage, Goryn beds. Figure 6 – Osteolepididae gen. indet. Specimen № 85/17-2a, Pinsk-10 borehole, depth 142.3 m, $\times 35$, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 7 – *Glyptolepis* sp. Specimen № 85/16-7c, Pinsk-10 borehole, depth 142.9 m, $\times 35$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 8 – *Glyptolepis* sp. Specimen № 85/19-2g, Pinsk-10 borehole, depth 141.0 m, $\times 75$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 9 – *Glyptolepis* sp. Specimen № 85/16-7b, Pinsk-10 borehole, depth 142.9 m, $\times 70$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 10 – *Glyptolepis* sp. Specimen № 85/16-7a, Pinsk-10 borehole, depth 142.9 m, $\times 50$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 11 – *Glyptolepis* sp. Specimen № 85/19-2a, Pinsk-10 borehole, depth 141.0 m, $\times 50$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 12 – *Glyptolepis* sp. Specimen № 85/16-7d, Pinsk-10 borehole, depth 142.9 m, $\times 25$, fragment of scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 13 – *Glyptolepis* sp. Specimen № 85/19-2e, Pinsk-10 borehole, depth 141.0 m, $\times 45$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 14 – *Glyptolepis* sp. Specimen № 85/16-7e, Pinsk-10 borehole, depth 142.9 m, $\times 80$, fragment of scale in external view, Polotsk Regional Stage, Stolin beds. Figure 15 – Osteichthyes indet. Specimen № 85/19-2f, Pinsk-10 borehole, depth 141.0 m, $\times 45$, jaw fragment, Polotsk Regional Stage, Stolin beds.

territory. It has become possible to generalize data on the stratigraphic distribution of vertebrates, to replenish their list from the Middle Devonian deposits and to obtain their new data from the Upper Devonian (Lower Frasnian) deposits of the research area. In other words, joint palaeoichthyological data

presented in the paper supplement the information of the paleogeographical distribution of vertebrates, their taxonomic composition and stratigraphic distribution in the Middle Devonian and the Lower Frasnian deposits of the western part of the Pripyat Trough and allow the confident correlation with synchronous deposits of the adjacent territories.

REFERENCES

- 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).
- ESIN D., GINTER M., IVANOV A., LUKŠEVIČ 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). – Vol. 223. 2000. – P. 341–359.
- GEOLOGY OF BELARUS / R.G. Garetski et al.; National Academy of Sciences of Belarus, Institute of Geological Sciences; Edited by R.G. Garetski, A.V. Matveyev, A.S. Makhnach. – Minsk, 2001. – 815 p. (in Russian).
- GOLUBTSOV V.K., PISKUN L.V., MOISEEVA T.I. ET AL. Study of the reference sections of deposits of sedimentary cover of areas of joint of the Belarusian anticline with the Zhlobin and Polessie saddles and the Pripyat trough / The report of funds of the Belarusian Research Geological Exploration Institute. – Minsk, 1990. (in Russian).
- IVANOV A., LEBEDEV O. Devonian vertebrate localities in the Luga River basin (Leningrad Region, Russia) // Guidebook for the field trip. – St. Petersburg, 2011. – P. 1–37.
- MARK-KURIK E. The Middle Devonian fishes of the Baltic States (Estonia, Latvia) and Belarus // Courier Forschungsinstitut Senckenberg (Final Report of IGCP 328 project). – Vol. 223. 2000. – P. 309–324.
- MOLOSHNIKOV S.V. Devonian Antiarchs (Pisces, Antiarchi) from Central and Southern European Russia // Paleontological Journal. – 2008. – Vol. 42. № 7. – P. 691–773.
- NARKIEWICZ K., KRUCHEK S.A. Conodont-based correlation of the Middle Devonian in SE Poland and Belarus: preliminary data // Actual problems of geology of Belarus and adjacent territories. Materials of the International conference dedicated to the 90th birthday of the academician of Belarus A.S. Makhnach. – Minsk, 2008. – P. 188–194.
- OBRUCHEVA O.P., OBRUCHEVA E.D. Fishes of the Central Devonian field // Sketches on the phylogeny and systematics of extinct fishes and agnathans. – Moscow, 1977. – P. 24–28 (in Russian).
- OBUKHOVSKAYA T.G., OBUKHOVSKAYA V.Yu., KRUCHEK S.A. Palynological characteristic and stratigraphy of the Devonian deposits of the western closure of the Pripyat trough // Stratigraphy and oil of Palaeozoic deposits of Belarus. – Minsk., 2002. – P. 51–67 (in Russian).
- PLAX D.P., KRUCHEK S.A. Stratigraphy and fish fauna from Middle Devonian deposits of the southern part of the Starobin Centrocline of the Pripyat Trough // Lithosphere. – 2010. № 2 (33). – P. 32–48 (in Russian).
- PLAX D.P. Devonian ichthyofauna of the Volyn Monocline // Lithosphere. – 2011. № 2 (35). – P. 12–21.

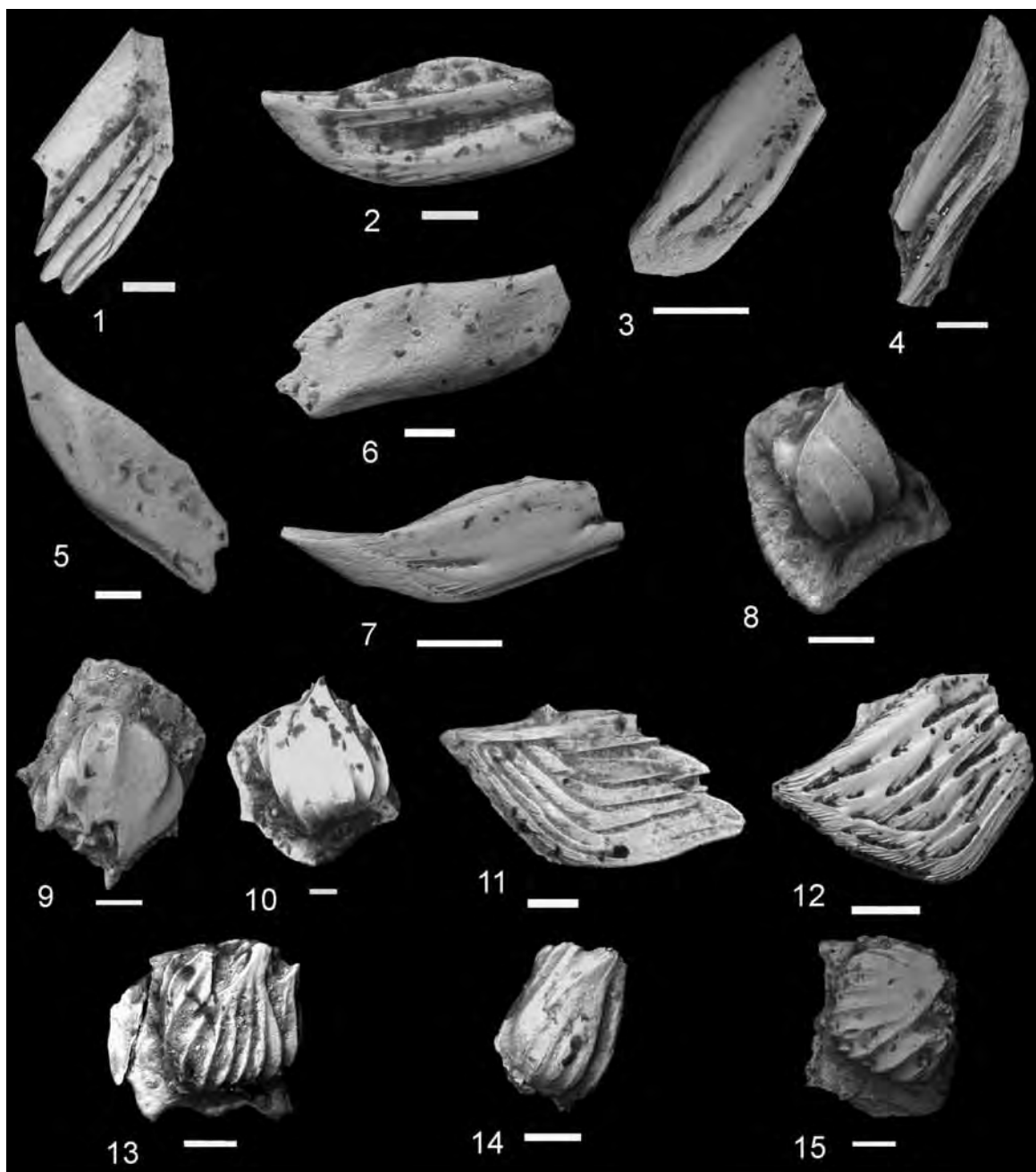


Plate VI – Actinopterygian scales from the Pinsk-10, Pinsk-26 and Pinsk-54 boreholes drilled in the territory of the western part of the Pripyat Trough. The scales of actinopterygians are from the Eifelian and Givetian Stages, Middle Devonian. Scale bar of 100 μm for Figures 8, 9, 10, 13 and 14; 200 μm for Figures 1, 2, 4, 5, 6, 11 and 15; 500 μm for Figures 3, 7 and 12.

Figure 1 – Actinopterygii indet. Specimen N^o 41/4a-1c, Pinsk-26 borehole, depth 421.2 m, $\times 70$, scale in external, Kostyukovichi Regional Stage. Figure 2 – *Orvikuina vardiaensis* Gross. Specimen N^o 41/4a-1, Pinsk-26 borehole, depth 421.2 m, $\times 80$, scale in external view, Kostyukovichi Regional Stage. Figure 3 – *Orvikuina vardiaensis* Gross. Specimen N^o 58/956-1a, Pinsk-54 borehole, depth range of 460.0–465.0 m, $\times 50$, scale in external, Kostyukovichi Regional Stage. Figure 4 – *Orvikuina vardiaensis* Gross. Specimen N^o 85/24-1b, Pinsk-10 borehole, depth 99.0 m, $\times 70$, scale in external view, Polotsk Regional Stage, Moroch beds. Figure 5 – *Orvikuina vardiaensis* Gross. Specimen N^o 58/956-2b, Pinsk-54 borehole, depth range of 460.0–465.0 m, $\times 60$, scale in internal view, Kostyukovichi Regional Stage. Figure 6 – *Orvikuina vardiaensis* Gross. Specimen N^o 58/956-2c, Pinsk-54 borehole, depth range of 460.0–465.0 m, $\times 75$, scale in internal view, Kostyukovichi Regional Stage. Figure 7 – *Orvikuina vardiaensis* Gross. Specimen N^o 58/956-2a, Pinsk-54 borehole, depth range of 460.0–465.0 m, $\times 50$, scale in external view, Kostyukovichi Regional Stage. Figure 8 – *Cheirolepis* sp. Specimen N^o 85/21-2g, Pinsk-10 borehole, depth 122.0 m, $\times 200$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 9 – *Cheirolepis* sp. Specimen N^o 85/23-7d, Pinsk-10 borehole, depth 103.7 m, $\times 150$, scale in crown view, Polotsk Regional Stage, Moroch beds. Figure 10 – *Cheirolepis* sp. Specimen N^o 85/23-5a, Pinsk-10 borehole, depth 103.7 m, $\times 100$, scale in crown view, Polotsk Regional

Stage, Moroch beds. Figure 11 – *Moythomasia* ? sp. Specimen № 85/21-1b, Pinsk-10 borehole, depth 122.0 m, ×60, scale in external view, Polotsk Regional Stage, Moroch beds. Figure 12 – *Moythomasia* ? sp. Specimen № 85/21-2a, Pinsk-10 borehole, depth 122.0 m, ×45, scale in external view, Polotsk Regional Stage, Moroch beds. Figure 13 – *Cheirolepis* sp. Specimen № 85/16-10b, Pinsk-10 borehole, depth 142.9 m, ×200, scale in anterior crown view, Polotsk Regional Stage, Stolin beds. Figure 14 – *Cheirolepis* sp. Specimen № 85/16-10e, Pinsk-10 borehole, depth 142.9 m, ×200, scale in crown view, Polotsk Regional Stage, Stolin beds. Figure 15 – *Cheirolepis* sp. Specimen № 85/21-1f, Pinsk-10 borehole, depth 122.0 m, ×80, scale in crown view, Polotsk Regional Stage, Stolin beds.

STRATIGRAPHIC CHART OF PRECAMBRIAN AND PHANEROZOIC DEPOSITS OF BELARUS: Explanatory note (S.A. Kruchek, A.V. Matveyev, T.V. Yakubovskaya et al.). – Minsk. State Enterprise «BelNGRI». 2010. – 282 p. with 15 stratigraphic chart appended (in Russian).

THE DEVONIAN OF THE VORONEZH ANTECLISE AND THE MOSCOW SYNCLISE // G.D. Rodionova, V.T. Umnova, L.I. Kononova, et al. – Moscow, 1995. – 265 p. (in Russian).

VALIUKEVIČIUS J. Acanthodians from the Narva Regional Stage of the Main Devonian field. – Vilnius, 1985. – 144 p. (in Russian).

VALIUKEVIČIUS J., GOLUBTSOV V.K. The Devonian system // Geological map of the USSR. Scale of 1:1,000,000 (new series). Explanatory Note. Sheet № - (34) – Vilnius. Leningrad, 1986. – P. 53–68. (in Russian).

VALIUKEVIČIUS J. Acanthodian zonal sequence of Early and Middle Devonian in the Baltic basin // Geologija, 17. – Vilnius, 1994. – P. 115–125.

VALIUKEVIČIUS J., TALIMAA V. and KRUCHEK S. Complexes of vertebrate microremains and correlation of terrigenous Devonian deposits of Belarus and adjacent territories // Ichthyolith Issues. Special Publication 1 Socorro, – New Mexico, 1995. – P. 53–59.

VALIUKEVIČIUS J., KRUCHEK S. Acanthodian biostratigraphy and interregional correlations of the Devonian of the Baltic States, Belarus, Ukraine and Russia // Courier Forschungsinstitut Senckenberg (Final Report of IGCP 328 project). – Vol. 223. 2000. – P. 271–289.

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Поступила 27.11.2013

СТРАТЫГРАФІЯ АДКЛАДАЎ СЯРЭДНЯГА ДЭВОНУ ЗАХОДНЯЙ ЧАСТКІ ПРЫПЯЦКАГА ПРАГІНУ (ПА ДАДЗЕНЫМ ВЫВУЧЭННЯ ІХТЫЯФАУНЫ)

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У артыкуле выкладзены вынікі палеаіхтыялагічнага вывучэння керна свідравін Пінск-10 і Пінск-26, прабураных на тэрыторыі заходняй часткі Прыпяцкага прагіну ў межах Туравскай і Саробінскай цэнтрыкліналяў. Для паўнаты інфармацыі выкарыстоўваюцца літаратурныя крыніцы, у якіх прыводзяцца звесткі аб хрыбетных сярэдняга дэвону ў межах даследуемага раёну. Зроблена стратыграфічнае расчлененне сярэднядэвонскіх адкладаў па сустрэтых у іх комплексах хрыбетных і кіраўнічым таксонам бясківічных і рыб, а таксама выканана па хрыбетных супастаўленне адкладаў з утварэннямі таго ж самага ўзросту, якія развіты на сумежных тэрыторыях Украіны, Расіі і краін Балтыі. У артыкуле таксама істотна папоўнены вядомы раней склад стратыграфічных комплексаў хрыбетных сярэдняга дэвону ў гэтым раёне, прадстаўлены поўны іх спіс і прыводзіцца іх стратыграфічнае распаўсюджванне. За стратыграфічную аснову расчленення сярэдняга дэвону ў даследуемым раёне прынята стратыграфічная схема дэвонскіх адкладаў Беларусі 2010 г.

СТРАТИГРАФИЯ ОТЛОЖЕНИЙ СРЕДНЕГО ДЕВОНА ЗАПАДНОЙ ЧАСТИ ПРИПЯТСКОГО ПРОГИБА (ПО ДАННЫМ ИЗУЧЕНИЯ ИХТИОФАУНЫ)

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В статье приводятся результаты палеоихтиологического изучения керна скважин Пинск-10 и Пинск-26, пробуренных на территории западной части Припятского прогиба в пределах Туровской и Старобинской центриклиналей. Для полноты информации используются литературные источники, в которых приводятся сведения о позвоночных среднего девона в пределах исследуемого района. Выполнено стратиграфическое расчленение среднедевонских отложений по установленным в них комплексам позвоночных и руководящим таксонам бесчелюстных и рыб, а также по позвоночным проведено сопоставление отложений с одновозрастными образованиями, развитыми на смежных территориях Украины, России и стран Балтии. В статье существенно пополнен известный ранее состав стратиграфических комплексов позвоночных среднего девона в этом районе, представлен полный их список и приводится их стратиграфическое распространение. За стратиграфическую основу расчленения среднего девона в исследуемом районе принята стратиграфическая схема девонских отложений Беларуси 2010 г.