

## КАРОТКІЯ ПАВЕДАМЛЕННІ

UDC 567+551.791:734.5 (476.1)

ON THE FINDINGS OF REDEPOSITED REMAINS OF THE DEVONIAN ICHTHYOFAUNA  
IN THE QUATERNARY DEPOSITS IN THE VICINITY  
OF STARIYE DOROGI (MINSK REGION, BELARUS)

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To date, evidence on the findings of redeposited remains of the Devonian ichthyofauna in Quaternary deposits in the territory of Belarus is presented in only two papers [4; 5]. In the paper by D. P. Plax, published in 2014 [4], data were presented on the findings of redeposited skeletal elements of the Devonian vertebrates in the Pleistocene deposits from two locations within the Minsk region: in a sandy quarry near the town of Stariye Dorogi and in a sandy quarry in the vicinity of the

settlement of Fanipol. In the paper by D. P. Plax and V. V. Melnikov, published in 2023 [5], evidences were presented on the findings of redeposited remains of the Devonian ichthyofauna in the Quaternary deposits in the vicinity of the city of Mogilev, namely, in the sandy quarry "Pavlovskoe".

This paper is devoted to recent discoveries of redeposited remains of Devonian ichthyofauna in the Pleistocene deposits of the Quaternary system in the vicinity of the town of Stariye Dorogi (Text-figure 1).



**Text-figure 1** – Location of place of the finding of the redeposited Devonian ichthyofauna in the Quaternary deposits in the territory of Belarus: 1 – place of the finding of the redeposited Devonian ichthyofauna in the Quaternary deposits; 2 – frontiers

This is the second location with findings of redeposited remains of the Devonian ichthyofauna made in the vicinity of this town. The new location (Stariye Dorogi 2) is situated approximately 1,4 km northeast of School № 1 in Stariye Dorogi. It is a section of exposed clayey sands with inclusions of gravel, pebbles and boulders in the riverbed of a drainage channel. A relatively large piece of light-grey clayey limestone was found here. This piece is dense, cryptocrystalline, weakly dolomitized, unclearly layered and has weakly expressed brown spots and streaks. On the surface of this limestone, small fragmentary scales of ichthyofauna were clearly visible. Subsequently, this rock was subjected to dissolution with 9–10 % acetic acid, which made it possible to establish in it, in addition to small fragments of scales, quite a lot of different micromeric skeletal elements of ichthyofauna and a few remains of invertebrates and plants. The remains extracted from the rock were studied using a stereoscopic binocular microscope MBS-1 and a scanning electron microscope JSM-5610 LV (JEOL, Japan). Fossil identification was based mainly on the study of their morphology. Below we will consider in more detail what was revealed in the found rock fragment.

So, in a piece of weakly dolomitized clayey limestone were found several ostracod valves, not very numerous small fragmented shells of inarticulate brachiopods, two oogonia of *Sycidium* sp., rare small detritus of carbonized plant remains, two dentine tubercles of *Psammosteoides* indet., one scale of *Chondrichthyes* indet., single discrete scales of *Diplacanthus* sp., *Ptychodictyon* sp., *Rhadinacanthus primaris* Valiukevičius, 1986 [7], *Cheiracanthus* cf. *splendens* Gross, 1973 [2], rather numerous isolated scales of *Cheiracanthus* sp., *C. gibbosus* Valiukevičius, 1986 [7], *C. brevicostatus* Gross, 1973 [2], *Acanthodes* ? sp., *Acanthodii* gen. et sp. indet., rare scattered fragments of fin spines of *Acanthodii* gen. indet., one element of the submandibular series, single isolated fragments of scales of *Osteolepididae* gen. indet., not numerous discrete scale fragments of *Onychodontiformes* indet., *Porolepiformes* indet., *Sarcopterygii* indet., *Sarcopterygii* indet., indefinable skeletal element fragments and lepidotrichia of *Sarcopterygii* indet., a few scattered teeth of *Onychodontiformes* indet., *Sarcopterygii* indet. and

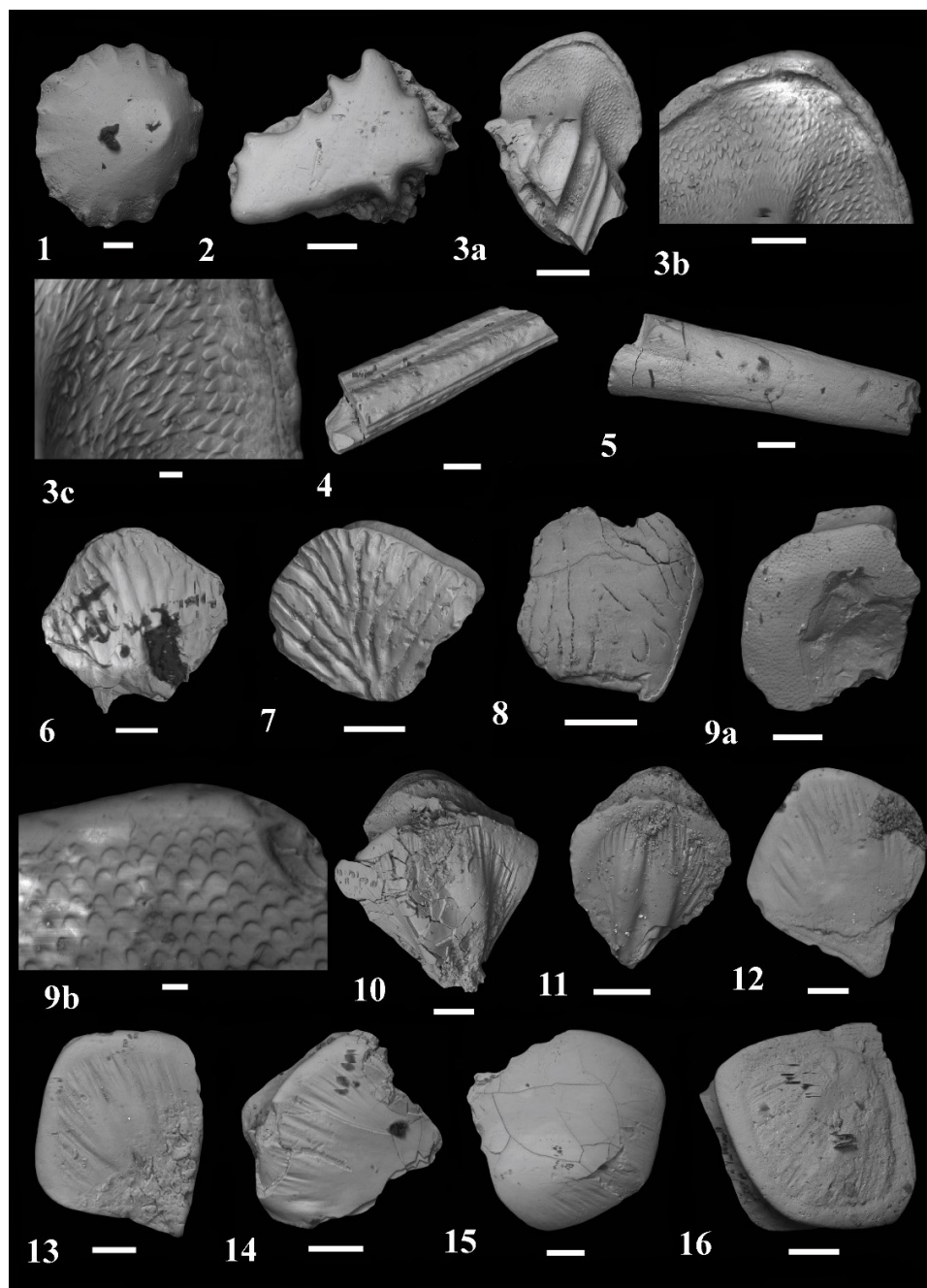
single fragments of scales and teeth of *Actinopterygii* indet. (Plates I, II, III and IV).

The organic remains extracted from the rock piece are characterized by a predominantly satisfactory, and to a lesser extent, good preservation of specimens. Most of the remains collected from the soluble sediment are highly fragmentary, worn out, cracked and rounded, with the exception of single ostracod valves, two oogonia of charophytes, as well as some acanthodian scales and sarcopterygian teeth, which are characterized by relatively good preservation and insignificant roundness. Such preservation of organic remains may indicate, in all likelihood, their rather lengthy mechanical transportation before burial, as well as their subsequent transformations in the process of fossilization and lithification.

Based on the remains of ichthyofauna found in the weakly dolomitized clayey limestone, it can be concluded that this rock can be dated to the Lepelian-Adrovian time interval. If the dating is carried out more precisely, then its age, in all likelihood, can still correspond to the Adrovian time [6]. Similar taxa of ichthyofauna and oogonia of charophytes, for example, are well known from the deposits of the Pärnu Regional Stage of the Eifelian of the Main Devonian Field [1, 3, 8].

In conclusion, it would not be superfluous to note that, according to the classification of T. B. Yanin [9], the discovered rock with organic remains belongs to the glacial type of redeposition. It could very likely have been moved by a glacier in the Pleistocene time from the current territory of the Baltic states or the northwestern part of Russia, where the Pärnu deposits are widely developed and currently in places exposed to the surface.

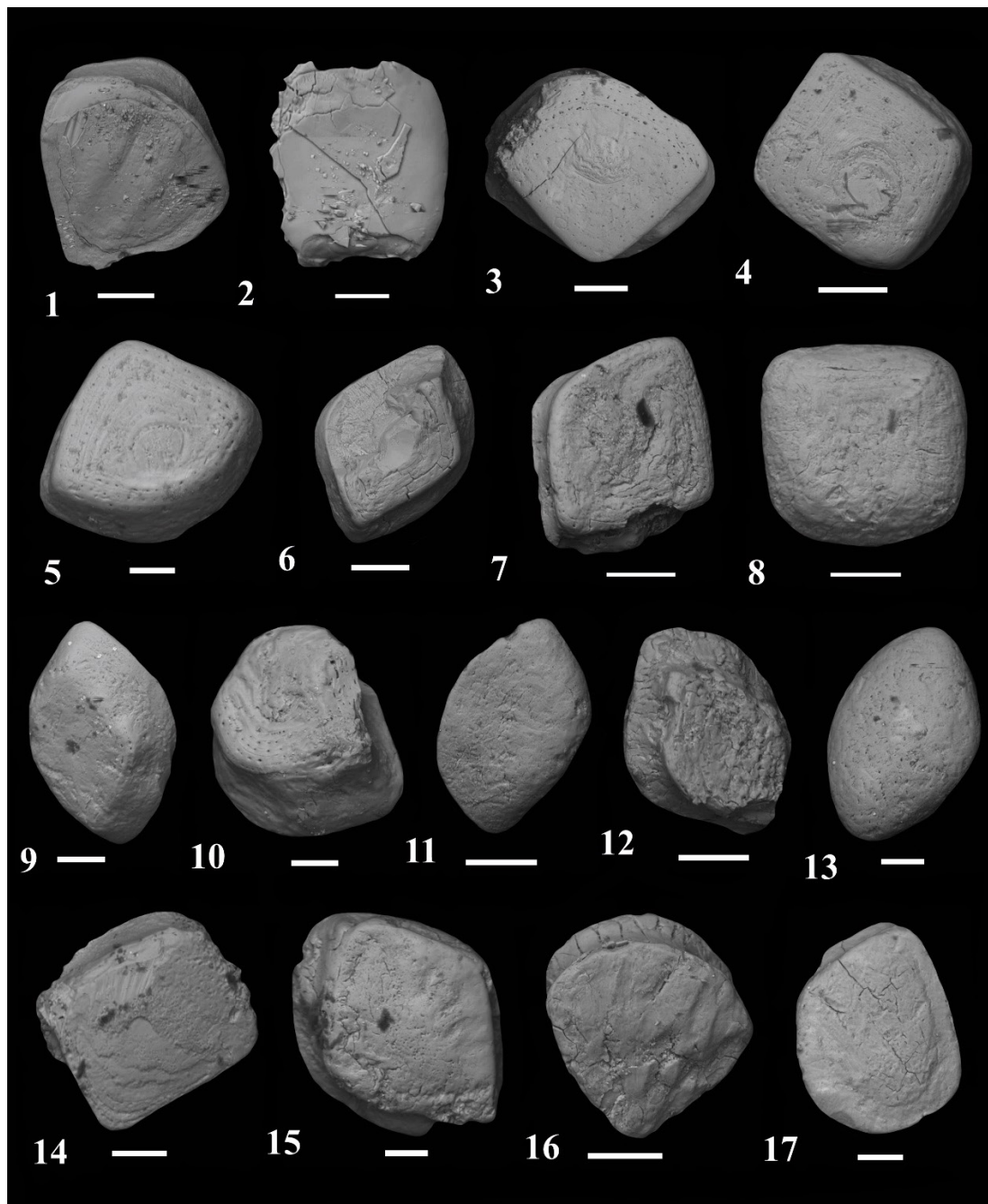
The author of the paper expresses deep gratitude to Dr. Yu. V. Zaika (State enterprise "GEOSERVIS") for the material containing the remains of the Devonian ichthyofauna provided for study, and is also grateful to V. G. Lugin (Belarusian State Technological University, Center for Physical and Chemical Research) for assistance in photographing organic remains on an electron microscope and to Dr. R.B. Blodgett for assistance in editing the manuscript text in English.



**Plate I** – Heterostracan tubercles, chondrichthyan and acanthodian scales extracted from clayey limestone found in the Quaternary deposits outcropping in the riverbed of a drainage channel near Stariye Dorogi, Minsk Region. Scale bar of 10  $\mu\text{m}$  for Figures 3c and 9b; 50  $\mu\text{m}$  for Figures 3b, 12 and 13; 100  $\mu\text{m}$  for Figures 1, 2, 3a, 4, 6, 7, 8, 9a, 10, 11, 14, 15 and 16; 200  $\mu\text{m}$  for Figure 5

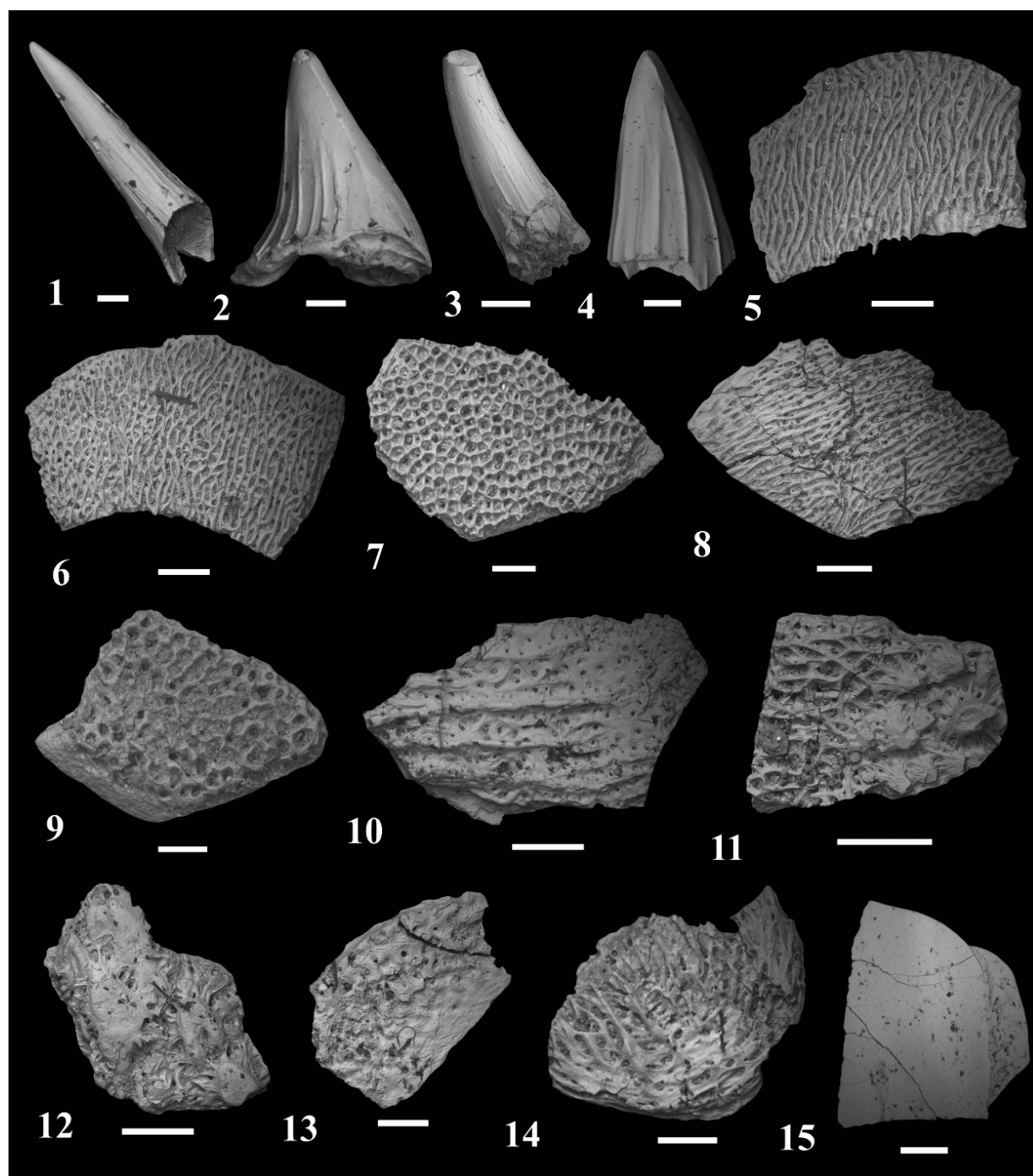
Figure 1 – Psammosteoides indet. Specimen № 175/1-38, dentine tubercle,  $\times 100$ , top view. Figure 2 – Psammosteoides indet. Specimen № 175/1-56, dentine tubercle,  $\times 170$ , top view. Figure 3 – Chondrichthyes indet. Specimen № 175/1-31, scale fragment: a – crown view,  $\times 180$ ; b and c – close-up of the anterior part of the surface of the scale base,  $\times 500$  and  $\times 1000$ . Figure 4 – Acanthodii gen. indet. Specimen № 175/1-70, fragment of fin spine,  $\times 100$ , lateral view. Figure 5 – Acanthodii gen. indet. Specimen № 175/1-44, fragment of fin spine,  $\times 60$ , lateral view. Figure 6 – *Rhadinacanthus primaris* Valiukevičius, 1986. Specimen № 175/1-74, scale,  $\times 150$ , crown view. Figure 7 – *Diplacanthus* sp. Specimen № 175/1-18, scale,  $\times 200$ , crown view. Figure 8 – *Ptychodictyon* sp. Specimen № 175/1-67, scale,  $\times 250$ , crown view, the surface of the crown is worn. Figure 9 – *Cheiracanthus cf. splendens* Gross, 1973. Specimen № 175/1-45, scale fragment: a – crown view,  $\times 170$ ; b – close up of crown,  $\times 1000$ . Figure 10 – *Cheiracanthus gibbosus* Valiukevičius, 1986. Specimen № 175/1-64, scale,  $\times 150$ , crown view. Figure 11 – *Cheiracanthus gibbosus* Valiuk. Specimen № 175/1-72, scale,  $\times 200$ , crown view. Figure 12 – *Cheiracanthus brevicostatus* Gross, 1973. Specimen № 175/1-35, scale,  $\times 300$ , crown view. Figure 13 – *Cheiracanthus brevicostatus* Gross, 1973. Specimen № 175/1-30, scale,  $\times 300$ , crown view. Figure 14 – *Cheiracanthus* sp. Specimen № 175/1-36, scale fragment,  $\times 200$ , crown view. Figure 15 – *Cheiracanthus* sp. Specimen № 175/1-32, scale fragment,  $\times 140$ , crown view. Figure 16 – *Cheiracanthus* sp. Specimen № 175/1-24, scale fragment,  $\times 200$ , crown view, the surface of the crown is worn.





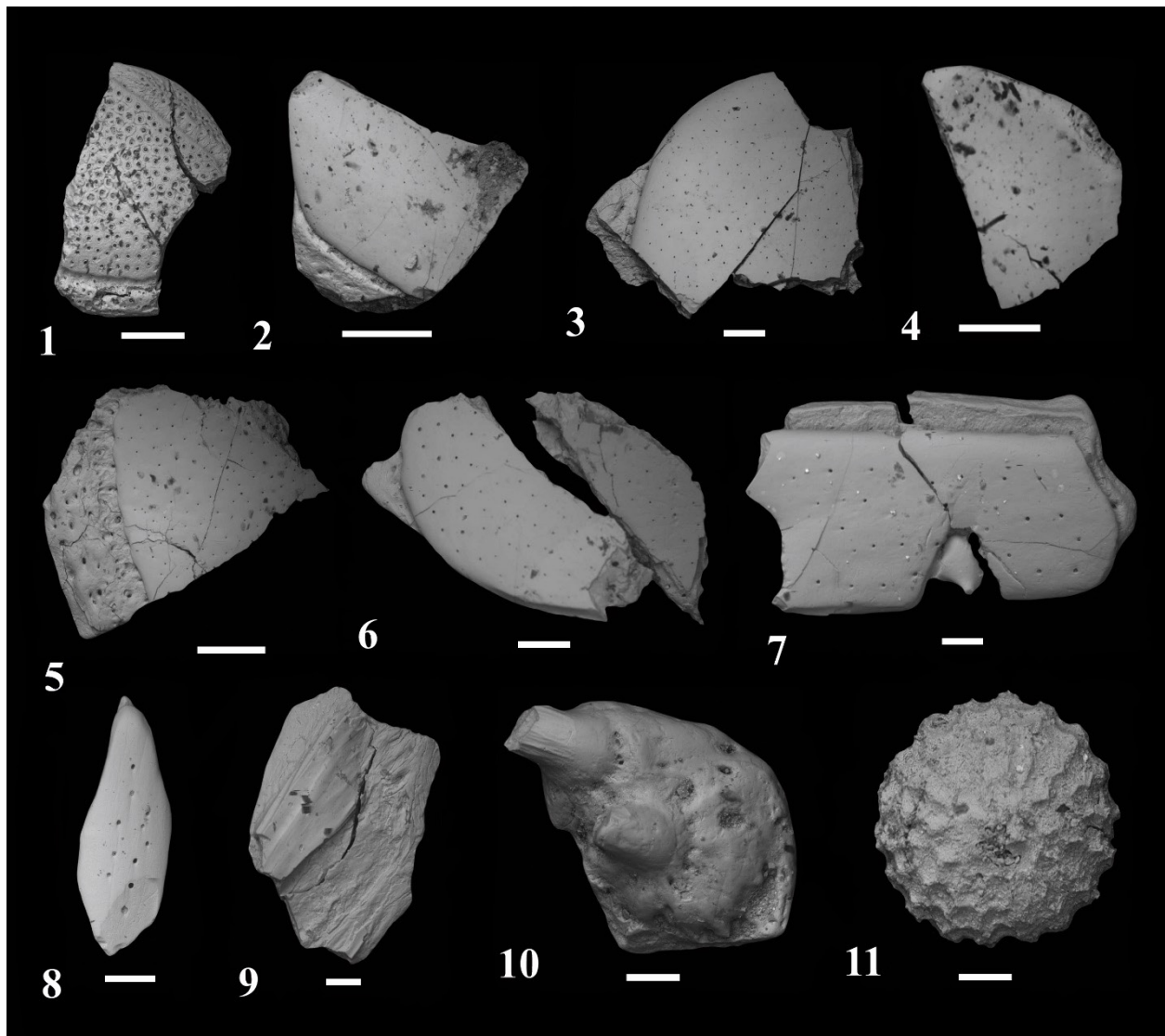
**Plate II** – Acanthodian scales extracted from clayey limestone found in the Quaternary deposits outcropping in the riverbed of a drainage channel near Stariye Dorogi, Minsk Region. Scale bar of 50 for Figures 2, 5, 10, 13, 15 and 17; 100  $\mu$ m for Figures 1, 3, 4, 6, 7, 8, 9, 11, 12, 14 and 16

Figure 1 – *Cheiracanthus* sp. Specimen № 175/1-69, scale,  $\times 200$ , crown view, the surface of the crown is worn. Figure 2 – *Acanthodes* ? sp. Specimen № 175/1-34, scale,  $\times 350$ , crown view. Figure 3 – *Acanthodes* ? sp. Specimen № 175/1-19, scale,  $\times 150$ , crown view. Figure 4 – *Acanthodes* ? sp. Specimen № 175/1-20, scale,  $\times 250$ , crown view. Figure 5 – *Acanthodes* ? sp. Specimen № 175/1-52, scale,  $\times 300$ , crown view. Figure 6 – *Acanthodes* ? sp. Specimen № 175/1-75, scale,  $\times 200$ , crown view, the surface of the crown is worn. Figure 7 – *Acanthodes* ? sp. Specimen № 175/1-37, scale,  $\times 250$ , crown view. Figure 8 – *Acanthodes* ? sp. Specimen № 175/1-21, scale,  $\times 200$ , crown view, the surface of the crown is worn. Figure 9 – *Acanthodes* ? sp. Specimen № 175/1-33, scale,  $\times 150$ , oblique crown view. Figure 10 – *Acanthodes* ? sp. Specimen № 175/1-65, scale,  $\times 300$ , crown view. Figure 11 – *Acanthodes* ? sp. Specimen № 175/1-43, scale,  $\times 250$ , basal view. Figure 12 – *Acanthodes* ? sp. Specimen № 175/1-79, scale,  $\times 250$ , crown view, the surface of the crown is worn. Figure 13 – *Acanthodii* gen. et sp. indet. Specimen № 175/1-42, scale,  $\times 300$ , basal view. Figure 14 – *Acanthodii* gen. et sp. indet. Specimen № 175/1-77, scale,  $\times 200$ , crown view, the surface of the crown is worn. Figure 15 – *Acanthodii* gen. et sp. indet. Specimen № 175/1-26, scale,  $\times 300$ , crown view, the surface of the crown is worn. Figure 16 – *Acanthodii* gen. et sp. indet. Specimen № 175/1-22, scale,  $\times 250$ , crown view, the surface of the crown is worn. Figure 17 – *Acanthodii* gen. et sp. indet. Specimen № 175/1-85, scale,  $\times 300$ , crown view, the surface of the crown is worn



**Plate III** – Sarcopterygian remains extracted from clayey limestone found in the Quaternary deposits outcropping in the riverbed of a drainage channel near Stariye Dorogi, Minsk Region. Scale bar of 100  $\mu\text{m}$  for Figures 1 and 4; 200  $\mu\text{m}$  for Figures 2, 7, 9 and 13; 500  $\mu\text{m}$  for Figures 3, 5, 6, 8, 10, 11, 12, 14 and 15

Figure 1 – Sarcopterygii indet. Specimen № 175/1-1, tooth,  $\times 100$ , lateral view. Figure 2 – Sarcopterygii indet. Specimen № 175/1-2, tooth,  $\times 85$ , lateral view. Figure 3 – Sarcopterygii indet. Specimen № 175/1-3, tooth,  $\times 43$ , lateral view. Figure 4 – Sarcopterygii indet. Specimen № 175/1-63, tooth,  $\times 150$ , lateral view. Figure 5 – Sarcopterygii indet. Specimen № 175/1-5, scale fragment,  $\times 35$ , external view. Figure 6 – Sarcopterygii indet. Specimen № 175/1-4, scale fragment,  $\times 35$ , external view. Figure 7 – Sarcopterygii indet. Specimen № 175/1-55, scale fragment,  $\times 75$ , external view. Figure 8 – Sarcopterygii indet. Specimen № 175/1-82, scale fragment,  $\times 35$ , external view. Figure 9 – Sarcopterygii indet. Specimen № 175/1-62, skeletal element fragment,  $\times 85$ , external view. Figure 10 – Probably Porolepiformes indet. Specimen № 175/1-60, scale fragment,  $\times 45$ , external view. Figure 11 – Onychodontiformes indet. Specimen № 175/1-59, scale fragment,  $\times 50$ , external view. Figure 12 – Sarcopterygii indet. Specimen № 175/1-16, scale fragment,  $\times 50$ , external view. Figure 13 – Sarcopterygii indet. Specimen № 175/1-11, indefinable skeletal element fragment,  $\times 90$ , external view. Figure 14 – Sarcopterygii indet. Specimen № 175/1-7, scale fragment,  $\times 40$ , external view. Figure 15 – Osteolepididae gen. indet. Specimen № 175/1-85, scale fragment,  $\times 37$ , external view



**Plate IV** – Sarcopterygian and actinopterygian remains, as well as one oogonium of charophyte extracted from clayey limestone found in the Quaternary deposits outcropping in the riverbed of a drainage channel near Stariye Dorogi, Minsk Region. Scale bar of 100  $\mu\text{m}$  for Figures 7, 9, 10 and 11; 200  $\mu\text{m}$  for Figures 3, 6 and 8; 500  $\mu\text{m}$  for Figures 1, 2, 4 and 5.

Figure 1 – Sarcopterygii indet. Specimen № 175/1-10, scale fragment,  $\times 37$ , external view. Figure 2 – Osteolepididae gen. indet. Specimen № 175/1-9, scale fragment,  $\times 50$ , external view. Figure 3 – Osteolepididae gen. indet. Specimen № 175/1-12, scale fragment,  $\times 60$ , external view. Figure 4 – Osteolepididae gen. indet. Specimen № 175/1-8, scale fragment,  $\times 50$ , external view. Figure 5 – Osteolepididae gen. indet. Specimen № 175/1-61, scale fragment,  $\times 43$ , external view. Figure 6 – Osteolepididae gen. indet. Specimen № 175/1-47, scale fragment,  $\times 75$ , external view. Figure 7 – Osteolepididae gen. indet. Specimen № 175/1-51, element of the submandibular series,  $\times 100$ , external view. Figure 8 – Sarcopterygii indet. Specimen № 175/1-54, lepidotrichia,  $\times 70$ , external view. Figure 9 – Actinopterygii indet. Specimen № 175/1-46, scale fragment,  $\times 100$ , external view. Figure 10 – Actinopterygii indet. Specimen № 175/1-39, teeth,  $\times 150$ , top view. Figure 11 – *Sycidium* sp. Specimen № 175/1-76, oogonium,  $\times 150$ , external view

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