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New geological and palaeontological data of the Dyakove Group (Carboniferous) and age-related rock formations of the central Donets Basin, Ukraine

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Нові дані про геологію та палеонтологічну характеристику дяковської серії (карбон) Центрального Донбасу (Україна)

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Ключові слова: морська фауна; наземна флора; карбон; дяковська серія; Донецький басейн.

New finds of fossil assemblages of brachiopods, mollusks, crinoids, arthropods and fishes, as well as terrestrial plants from a part of the Dyakove Group, which corresponds to the coal-bearing Mandrykyne Formation and the lower part of the Mospyne Formation and is exposed in the southern part of the Luhansk Region, were studied. For the first time, a brachiopod assemblage consisting of species of the genera *Crurithyris, Tiramnia, Alphachoristites, Lissochonetes* were identified in these rocks. In addition, phyllocarids and impressions of terrestrial plants of the genera *Halonia, Calamites, Pinnularia, Paripteris, Eusphenopteris, Artisia* and *Cordaites* were found in the Dyakove Group for the first time. Bivalves and gastropods in the studied collection are represented by the genera *Phestia, Palaeoneilo, Nuculavus, Solenomorpha, Sanguinolites, Posidoniella, ?Euchondria, ?Nodospira, Euphemites, Retispira, Glabrocingulum, Rhineoderma, Angyomphalus*, and *Naticopsis.* Cephalopods are represented by the species of the genera *Gzheloceras, ?Pseudogzheloceras, Melvilloceras, Retites, Gastrioceras* and *?Owenoceras*. In addition to the above groups, the rocks also contain the crinoids *Platyplateium, Platycrinites, ?Unilineatocrinus* and *Bicostulatocrinus* as well as fragments of fin spines of acanthodians Gyracanthidae indet. and isolated unidentified fish scales.

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Introduction

In the central part of the Donets Basin of eastern Ukraine (i.e., in the Kovpakove-Nagol'chyk Zone *sensu* Poletaev et al. (1991)), a rhythmic shale sequence with rare sandstone beds of the Dyakove Group is exposed (Reznikov, 1978, 1987, 1993). Palaeontological features of these deposits are insufficient compared to the same-aged Carboniferous paralic coal-bearing strata of the northern and southern parts of the Donets Basin, as fossils are quite rare here (Novik, 1939; Reznikov, 1987; Dernov, 2016, 2023a, b).

The insufficient state of palaeontological study of the lithologically monotonous Dyakove Group prevents a more detailed subdivision of this stratigraphic unit and also reduces the reliability of reconstructions of depositional environments of these deposits. Despite the fact that the record of the Carboniferous marine fauna and terrestrial plants in these deposits have been known for almost 100 years (Novik, 1939), in recent decades there have been unfounded claims about the Triassic and Jurassic age of the group (Ulanovskaya et al., 2013) based only on the lithological similarities between this unit and the Triassic–Jurassic flysch of the Crimean Mountains (southern Ukraine).

It should be noted that rocks under consideration have a significant mineral resource potential, e.g. in the hydrocarbon, polymetallic ores and native gold and silver (Reznikov, 1993; Lukin, 2011, 2013). In addition, they play an important role in the geological structure of the central part of the Donets Basin and Dnipro-Donets Depression, as they form a significant part of the Mississippian and Lower Pennsylvanian strata here (Poletaev et al., 1991; Nemyrovska and Yefimenko, 2013). It is likely that the Mississippian, Lower and Middle Pennsylvanian shale-dominated deposits have a much wider geographical distribution. According to Dubinsky (1982: Fig. 1), they form a narrow sublatitudinal belt that extends at least from the platform part of the Crimean Peninsula in the west to the Caspian region in the east.

To expand the palaeontological characteristics of the Dyakove Group and details the sedimentation conditions of these deposits, the first author studied sections of this unit during field seasons of 2010–2013. The results of the study of new finds of brachiopods, bivalves, cephalopods and representatives of some other fossil groups in the Dyakove Group are presented here. Some results of the study of palaeontological materials were already published (Dernov, 2016, 2023a, b). The aim of this paper is to outline the taxonomic composition of the fossil assemblages from the Dyakove Group and to discuss their stratigraphic and palaeoecological significance.

Geological setting

Dyakove Group is exposed in the partly eroded Pivnichna, Golovna and Pivdenna anticlines of the Linear Folding Zone of the so-called Folded Donets Basin (Reznikov, 1993). The main research area is located on the northern periphery of the outcrop area of these deposits, where the first author studied nine fossil sites (Fig. 1, *a–c*); only one fossil site is located in the stratotype area of the group in the Nagol'nyi Ridge in the southern part of the Luhansk Region.

The Dyakove Group is composed of a sequence of shales and siltstones (80–90 % of the section thickness) with rare sandstone beds; a few thin coal and limestone layers do not play a significant role in the composition (Fissunenko and Reznikov, 1985). The thickness laterally ranges from 1900 to 3310 m (Fissunenko and Reznikov, 1985; Reznikov, 1993) or even more than 6000 m (Reznikov, 1978; Poletaev et al., 1991) (see Fig. *1, d*).

The sedimentary rocks, especially those exposed in the Golovna Anticline, are enriched in the organic carbon (1.2 to 2.3 % in shales) (Fissunenko and Reznikov, 1985). Therefore, these rocks are carbon-poor black shales according to the classification of Yudovich and Ketris (1988).

Shales are predominantly black (Fig. 2, *f*), composed of the carbonaceous thinly scaly quartz-chlorite-sericite basic mass, in which grains of quartz, rarely plagioclase and mica are evenly scattered. Depending on the prevailing material, interlayers of quartz-sericite, quartz-carbonate, sericite-chlorite-quartz and carbonaceous-chlorite-quartz and so on are distinguished in shales (Fissunenko and Reznikov, 1985).

Sandstones are predominantly grey, fine- to medium-grained, massive and horizontally and wavy-bedded. The clastic material is angular-rounded, semi-rounded, and consists of the quartz (75–95 %), feldspar (2–3 %), muscovite (3–5 %), chlorite (1–5 %), sericite (up to 5 %), and carbonates (5–10 %). Feldspar is represented by acidic plagioclase. Zircon, ilmenite, rutile, apatite predominate among accessory minerals. Tourmaline, chromite, monazite, sphene also occur. Inclusions of irregularly distributed plant-generated organic matter (3–15 %) are

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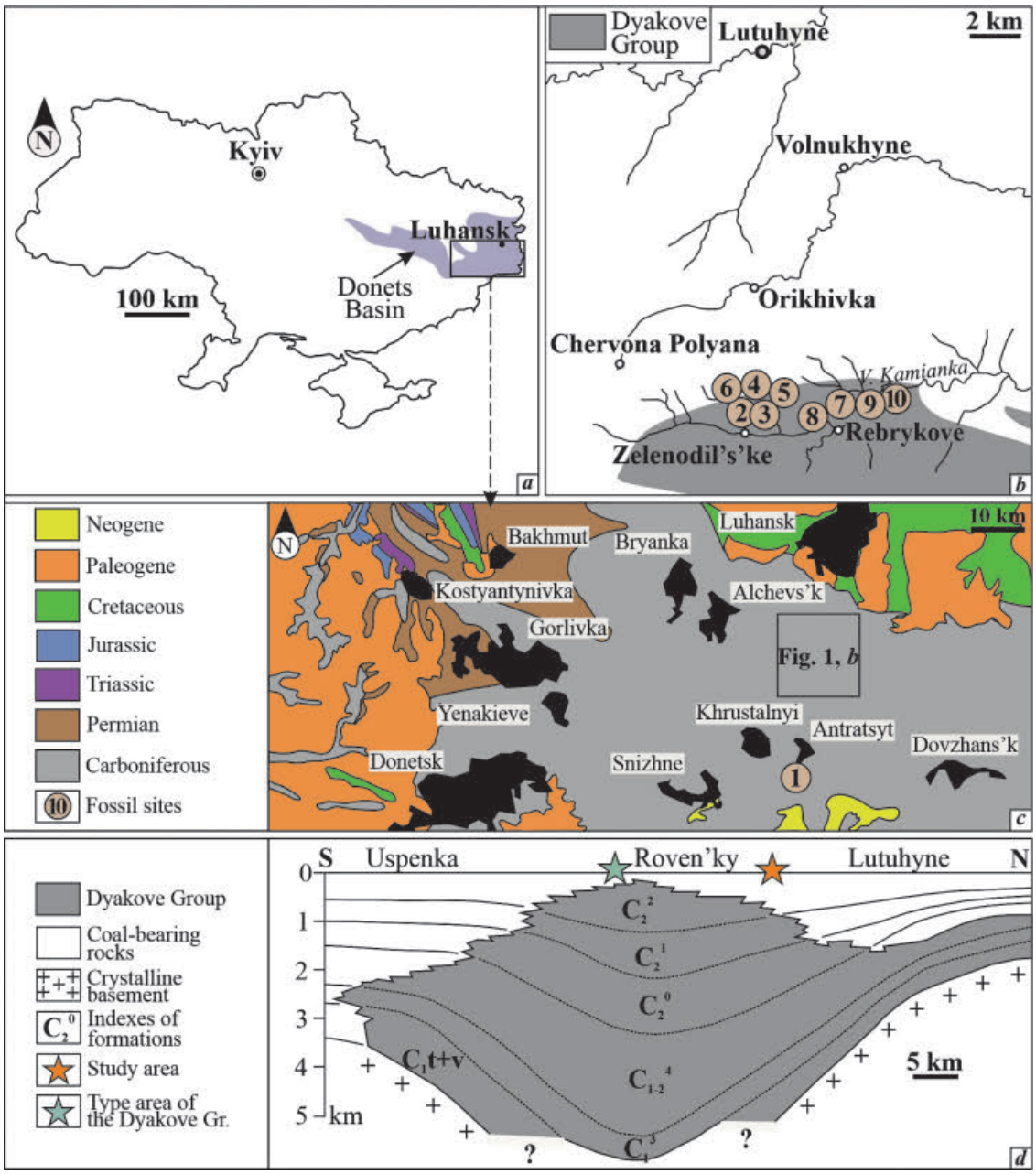

Fig. 1. Geographical location of the studied sections *(a–c)* and lateral replacement of the rocks of the Dyakove Group by the coal-bearing strata *(d)* (modified from Poletaev et al. (1991: Fig. 6)). Abbreviation of the lithostratigraphic units in Fig. 1, *d*: C_1^{t+v} – Tournaisian and Viséan strata (not subdivided), C_1s_1 – lower Serpukhovian strata, C_1s_2 – upper Serpukhovian strata, C_2^0 – age analogue of the Amvrosiyivka Fm., C_2^1 – age analogue of the Mandrykyne Fm., C_2^2 – age analogue of the Mospyne Fm.

sometimes occur (Fissunenko and Reznikov, 1985; Reznikov, 1987; Reznikov et al., 1989).

Sandstone beds occur as thin (5 to 20 cm thick) layers within shales, but sometimes form thick beds, 5–25 m in thickness. The bedding is usually present in the lower and upper parts of these beds, while in the middle part the beds are usually massive. Lower and upper contacts of the beds are gradual (Reznikov, 1987; Reznikov et al., 1989). Characteristic features of sandstones and, less often, siltstones are microbially-induced sedimentary structures (see Fig. 2, *a, b, d*) and small submarine slumpings (Reznikov and Lobanov, 1973; Dernov, 2013) (see Fig. 2, *c, e, g*).

Limestones form very rare layers, no more than 5–10 cm thick. They are usually dark grey and consist of calcite with an admixture of the iron carbonate (siderite and ankerite). The organic matter content in limestone reaches 0.15–0.40 % (Reznikov, 1987; Reznikov et al., 1989).

In the most recent reports on the Carboniferous stratigraphy of Ukraine (Nemyrovska and Yefimenko, 2013; Poletaev and Vdovenko, 2013), the age of the Dyakove Group was interpreted as

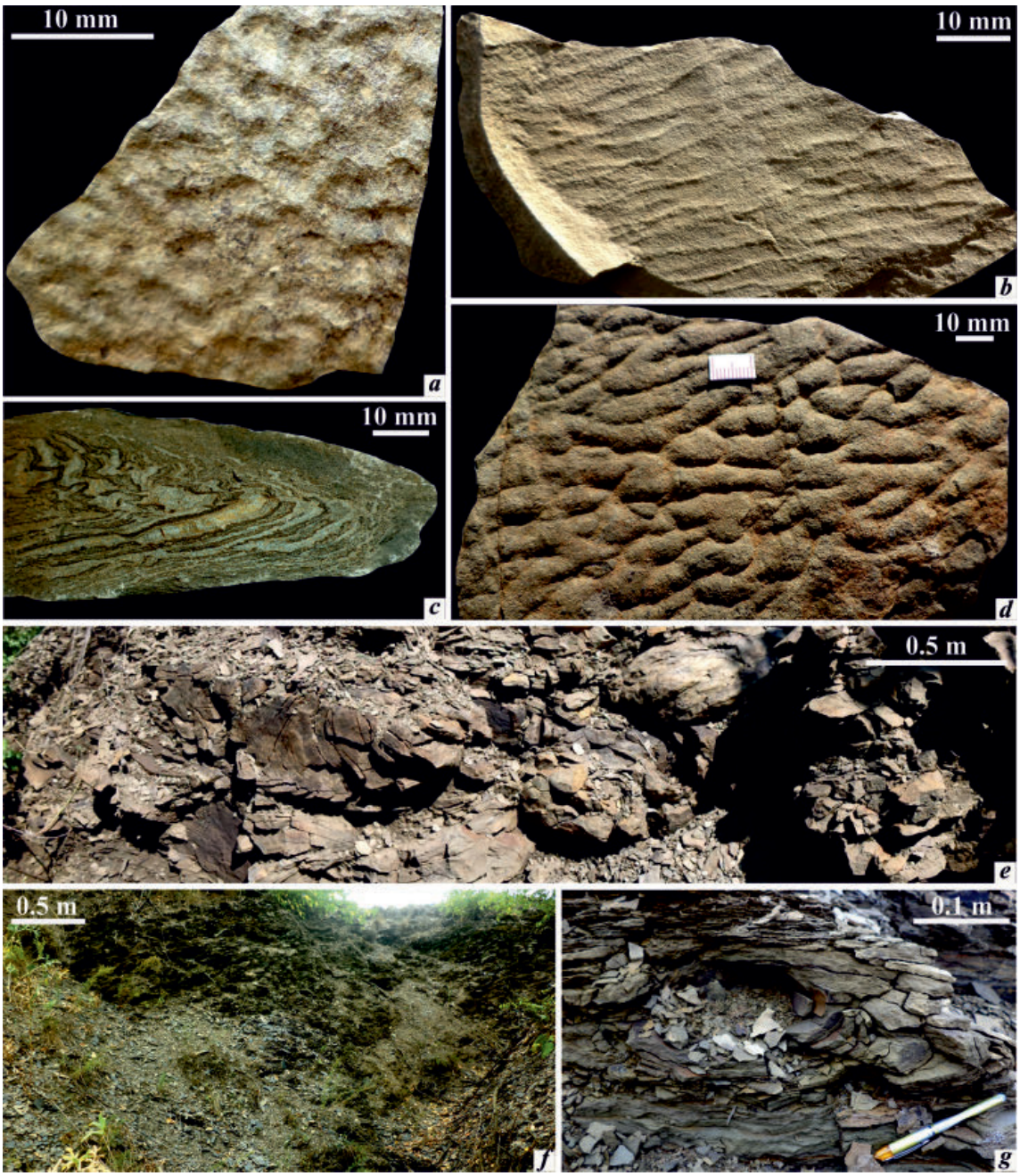

Fig. 2. Some lithological features of the Dyakove Group: *a, b, d* – microbially-induced sedimentary structures (*a* – age equivalent of the Mospyne Formation, 1 km NE of the village of Rebrykove; *b, d* – age equivalent of the Mandrykyne Formation, 2 km E of the village of Zelenodil's'ke); *c, e, g* – submarine slumpings (*c* – age equivalent of the Mospyne Formation, 1 km NE of the village of Rebrykove, *e* – age equivalent of the Mospyne Formation, 4 km E of the village of Makedonivka; *g* – age equivalent of the Mospyne Formation, 1 km NE of the village of Rebrykove); *f* – black shales, typical rocks of the Dyakove Group (1 km W of the village of Rebrykove)

Serpukhovian to Bashkirian, but its upper boundary is heterochronous and varies from the late Viséan to the early late Bashkirian (Reznikov, 1993) (see Fig. 1, *d*). In the stratotype section, located south of the town of Antratsyt in the Luhansk Region, its upper boundary is at the base of a thick alluvial sandstone bed above the H_1 limestone layer of the late Bashkirian Smolyanynivka Formation (Fig. 3). The lower boundary is not recorded in the stratotype (Reznikov, 1993), but in the Bobrykove-1 reference borehole (village of Bobrykove, Antratsyt District), which expossed a 2910-m-thick shale sequence, several Viséan–early Namurian bivalve taxa were found in a depth interval of 1800–2400 m; spores typical for the upper Viséan strata of the southern Donets Basin has been found at the depth 2491–2493 m (Reznikov et al., 1989). Thus, in a stratotype area, lower boundary reaches at least the base of the late Viséan.

In the study area (upper reaches of the Velyka Kamianka river), the upper boundary is located in the stratigraphic interval corresponding to the

System	Subsystem	Stage	Lithostratigraphic unit
CARBONIFEROUS	PENNSYLVANIAN	Gzhelian	Araukarytova Fm.
			Avilovka Fm.
		Kasimovian	Isayivka Fm.
		Moscovian	Gorlivka Fm.
			Almazna Fm.
			Kamenskaya Fm.
		Bashkirian	Belaya Kalitva Fm.
			Smolyanynivka Fm.
			Mospyne Fm.
			Mandrykyne Fm.
			Amvrosiyivka Fm.
	MISSISSIP.	Serpukhov.	Kalmius Fm.
			Samara Fm.
		Viséan	Mezhova Fm.
		Tournaisian	M. Volnovakha Gr.

Fig. 3. Carboniferous stratigraphy of the Donets Basin. Abbreviations: M. Volnovakha Gr. – Mokra Volnovakha Group, Mississip. – Mississippian, Serpukhov. – Serpukhovian

lower half of the coal-bearing Mospyne Formation (early late Bashkirian) (Dernov, 2022b). This area is characterised by rapid lateral replacement of the Dyakove Group in the northern and northwestern directions by the coal-bearing Amvrosiyivka, Mandrykyne and Mospyne formations (see Fig. 1, *d*). In this regard, due to a wider range of rock types and, accordingly, depositional conditions, the section of the group has a more variegated appearance here compared to its stratotype area.

Rare and poorly preserved terrestrial plants, e.g. *Mesocalamites ramifer* (Stur) Hirmer, 1927, *M. cistiformis* (Stur) Hirmer, 1927, *M.* sp., *Calamites suckowii* Brongniart, 1828, *C. cistii* Brongniart, 1828, *C. carinatus* Sternberg, 1823, *C.* sp., *Sphenophyllum tenerrimum* (Ettingshausen) Stur, 1877, *S.* sp., *Lepidodendron obovatum* Sternberg, 1820, *L. ophiurus* Brongniart, 1828, *Sigillaria (Eusigillaria) elegans* Brongniart, 1828, *Stigmaria ficoides* Sternberg, 1822, *Syringodendron* sp., *Cordaites principalis* (Germar) Geinitz, 1855, *C.* sp., *Artisia approximata* (Brongniart) Corda in Sternberg, 1838 and *Paripteris gigantea* (Sternberg) Gothan, 1941 were identified from these rocks by Novik (1939, 1968) and Fissunenko (1964).

Remains of poorly preserved rugose corals, brachiopods, bivalves, gastropods, cephalopods, crinoid stems and a single insect body impression are also known (Novik, 1939; Reznikov et al., 1989; Dernov, 2016). However, it is impossible to verify the correctness of Novik's and Sergeeva's (in Reznikov et al., 1989) identification of fossils, as these specimens are not figured and are probably lost.

Formally, some of the ammonoids described by Popov (1979) originate from the Dyakove Group, as their localities are in the outcrop area of this lithostratigraphic unit showed by Reznikov (1993: Fig. 1). Among these are the ammonoids *Stenopronorites* sp., *Cancelloceras cancellatum* Bisat, 1923, *C. delicatum* Librovitch in Popov, 1979, *C. solidum* Popov, 1979 and *C. tenerum* Popov, 1979 from the E_8 and E_9 limestone layers (Amvrosiyivka Formation), exposed at the slopes of the Dubova ravine near the village of Dmytrivka (16 km south of the town Khrustal'nyi in the Luhansk Region), as well as *Bilinguites pavlovensis* Popov, 1979, *Paraverneuilites linter* Popov, 1979, *Cancelloceras infans* Popov, 1979 and *C.* sp. from the F_2 limestone layer (Mandrykivka Formation) near the village of Miusyns'k (former Novopavlovka near the town of Khrustal'nyi).

Numerous trace fossils, including ichnogenera *Alcyonidiopsis, Arborichnus, Aulichnites, Chondrites, Diplichnites, Glockerichnus, Gordia, Hankoichnus, Helminthopsis, Lockeia, Monocraterion, Nereites, Palaeophycus, Phycosiphon, Planolites, Protovirgularia, Rhizocorallium, Rusophycus, Skolithos,* and *Zoophycos* were collected by the first author (Dernov, 2023a, b and some unpublished data). Less diverse trace fossil assemblage was studied by Fissunenko et al. (1984), Tatoli and Fissunenko (1987) and Tatoli (1990) from several boreholes located in the stratotype area of this unit.

The views on the depositional conditions of described rocks proposed by previous researchers (e.g., Reznikov and Lobanov, 1973; Fissunenko and Reznikov, 1985; Ischenko et al., 1993; Fissunenko, 2001) should be revised, as they are based mainly on the points of view that prevailed in the Soviet geology regarding the depositional conditions of the flysch successions and related rock associations, which also included the Dyakove Group according to Fissunenko et al. (1984), Reznikov (1987, 1993), Tatoli and Fissunenko (1987). Probably, these rocks are a complex of (?)subaqueous deltaic and prodeltaic deposits common in the marginal parts of the palaeobasin, as well as predominantly

black shale succession of the starved paleobasin with low sedimentation rate, which are distributed in its central part (Fig. 4).

These two facies zones probably correspond to the two types of sections identified by Reznikov et al. (1989). The first is represented by shales and siltstones with laterally unconformable sandstone beds (up to 40 % of the section thickness) and very rare thin coal layers, as well as signs of the sedimentation rhythmicity, which is typical for the coal-bearing paralic strata of the Donets Basin. The second is a monotonous black shale sequence with rare siltstone and sandstone beds (up to 4 m thick) (Reznikov et al., 1989). It is likely that these two types of sections, which that laterally replace each other, can be attributed to two different formations, but this issue requires further research, which is not possible at this time.

In the northern Donets Basin (starting from the Northern Small Folding Zone), these rocks are replaced by a paralic succession accumulated mainly in a large alluvial-deltaic plain, which was flooded periodically by the warm epicontinental seas (see Fig. 4).

Material and methods

The studied collections include about 100 poorly preserved specimens (Table 1). Shells of mollusks and brachiopods are usually crushed, leached and replaced by the limonite or secondary calcite; crinoid stems are leached and represented by impressions, etc. Remains of terrestrial plants are represented mainly by impressions of pinnules, leaves, roots and stem casts. Due to poor preservation, many of the studied fossils are identified in the open nomenclature. Brachiopods were studied by the second author (VP) and all other fossils were examined by the first author (VD). The correlation of fossiliferous rocks with the Bashkirian coal-bearing formations of the Donets Basin, and hence the determination of the stratigraphic position of the fossil sites, is based mainly on the tracing of marker levels (e.g., limestone layers, coal seams and rarely sandstone beds) or rocks that laterally replace them (e.g., interlayers of carbonate concretions).

The key for the description of Palaeozoic ammonoid species proposed in the work of Korn (2010) is used here. The abbreviations used in the ammonoid

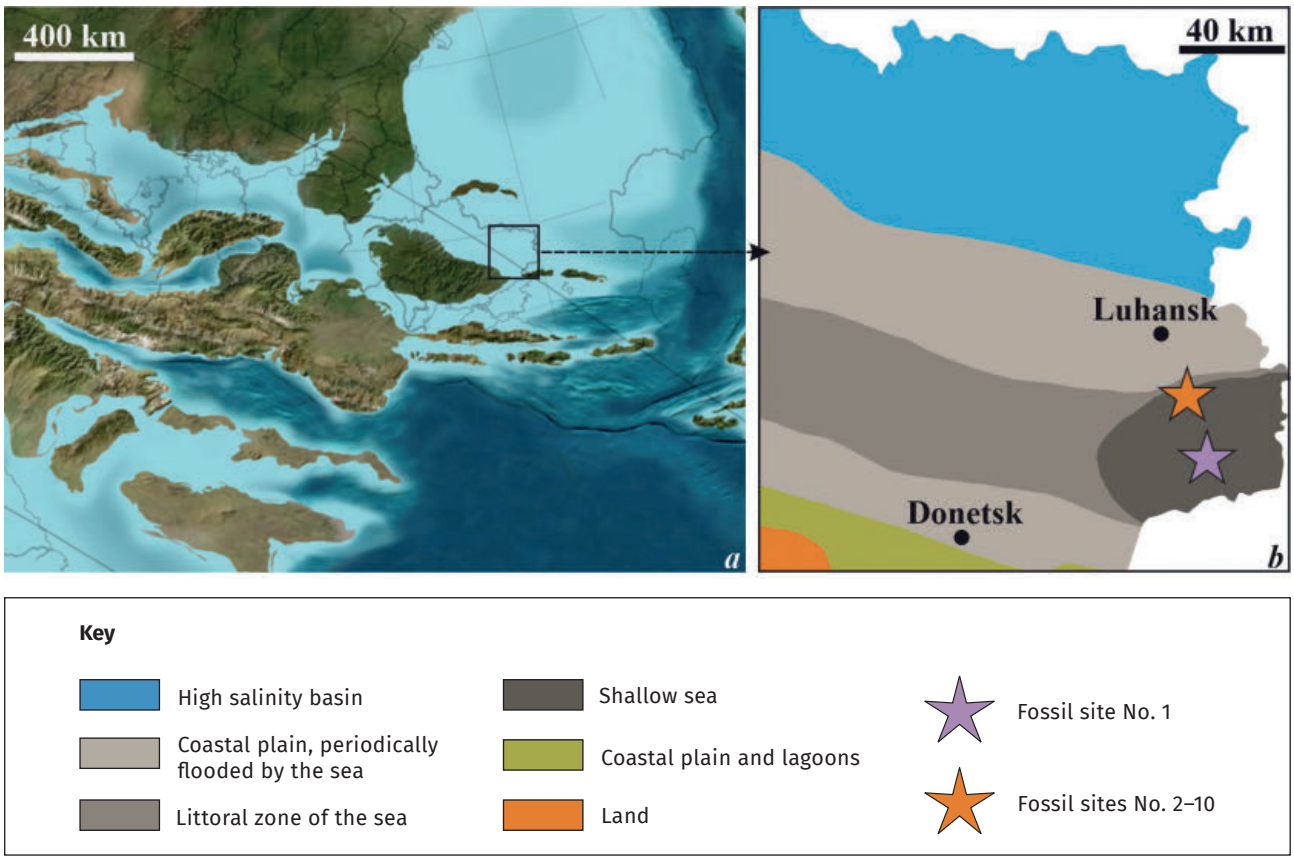

Fig. 4. Bashkirian palaeogeography of eastern Ukraine (*c* – palaeogeographic map of Europe in the Pennsylvanian (https://deeptimemaps.com), *d* – Bashkirian palaeogeography of the Donets Basin (modified from (Ischenko et al., 1993: Fig. 33)

species description are: dm = conch diameter, wh = whorl height, ww = whorl width, uw = umbilical width; whorl expansion rate (WER) = $(dm_1/dm_2)^2$ or $[dm_1/(dm_1–ah)]^2$, imprint zone rate (IZR) = $wh_1–ah/wh_1$ or $(wh_1–(dm_1–dm_2))/wh_1$ (Korn, 2010; Korn and Klug, 2012).

Studied fossil sites

The studied fossils were found at ten stratigraphic levels, which are briefly described below.

(1) Black shale with large carbonate nodules, laterally replaced by the F_1 limestone layer (basal layer of the Mandrykyne Formation). It is exposed in an old polymetallic ore mine near the village of Yesaulivka, south of the town of Antratsyt in the Luhansk Region. The carbonate nodules contain the ammonoid *Retites* sp. (see "Systematic palaeontology" section). The black shale also contains the phyllocarid resting traces *Hankoichnus bandersnatchi* Dernov, 2023a (Fig. 5, *g*) and poorly preserved phyllocarid body fossils (Fig. 6, *l*).

(2) Siderite nodules in the shales corresponding to the middle part of the Mandrykyne Formation, exposed near the village of Zelenodil's'ke.

Table 1. Studied material

Collection	Fossil group/taxa	Place of storage
IGS NASU-4 IGS NASU-7	Cephalopods	Department of Stratigraphy and Palaeontology of Paleozoic Sediments of the Institute of Geological Sciences, NAS of Ukraine, Kyiv
IGS NASU-10	*Listracanthus*	
NMNHU-G 6544	Brachiopods	Department of Geology of the National Museum of Natural History, NAS of Ukraine, Kyiv
GMLNU-5 GMLNU-12	Trace fossils	Geological Museum of the Luhansk Taras Shevchenko National University, Poltava
GMLNU-15	Plants, gastropods, bivalves, Gyracanthidae	
GMLNU-16	*Tanaisina* Dernov, gen. nov.	

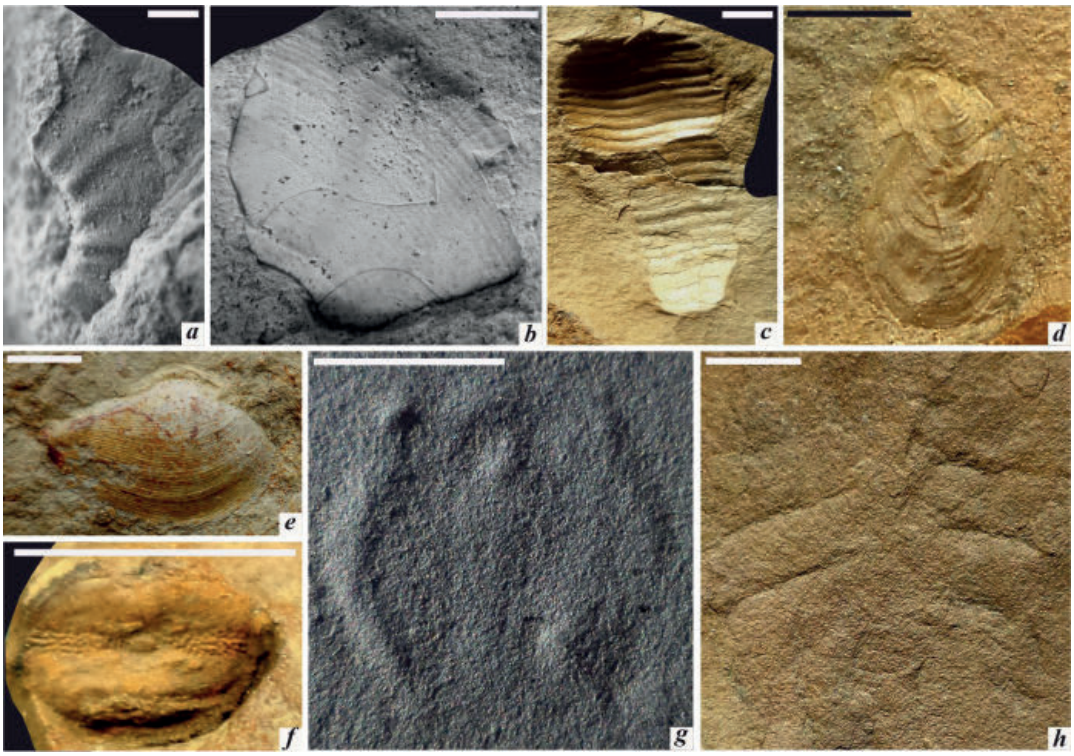

Fig. 5. Some body fossils and trace fossils from the Dyakove Group: *a* – *?Pseudogzheloceras* sp. (IGS NASU-4/10; 8); *b* – *?Owenoceras* sp. (IGS NASU-7/1367; 6); *c* – ammonoid shell impression (unnumbered; south of the village of Zelenodil's'ke); *d* – *Selenimyalina minor* (Brown, 1841) (GMLNU-15/01; 9); *e* – *Phestia* sp. (GMLNU-15/09; 6); *f* – *Platyplateium texanum* Moore & Jeffords, 1968 (GMLNU-15/06; 3); *g* – trace fossil *Hankoichnus bandersnatchi* Dernov, 2023a (GMLNU-12/01; 1); *h* – trace fossil *Arborichnus repetitus* Romano & Meléndez, 1985 (GMLNU-5/5853; Skelevata Ravine, below the G1 limestone layer). The fossiliferous stratigraphic level numbers are in brackets, after the specimen number. Scale bars = 5 mm

Fig. 6. Some fossils from the Dyakove Group: *a* – *Calamites suckowii* Brongniart, 1828 (GMLNU-15/14; 10); *b* – *Calamites* sp. (GMLNU-15/02; fossil site is unknown); *c* – *Cordaites principalis* (Germar) Geinitz, 1855 (GMLNU-15/08; 10); d – pteridosperm pinnule (unnumbered; 6); *e* – *Pinnularia capillacea* Lindley & Hutton, 1834 (GMLNU-15/10; 7); *f* – *Calamites* sp. (GMLNU-15/04; 4); *g, h* – problematics (unnumbered; 3); *i* – *Cordaites principalis* (Germar) Geinitz, 1855 (GMLNU-15/11; 8); *j* – *Halonia* sp. (GMLNU-15/14; 4); *k* – *Phestia snjatkovi* (Fedotov, 1932) (GMLNU-15/12; 6); *l* – phyllocarid (GMLNU-15/20; 1); *m* – *?Sanguinolites* sp. GMLNU-15/15; 4); *n* – *Solenomorpha rossica* Chernyshov, 1950 (GMLNU-15/13; 10). The fossiliferous stratigraphic level numbers are in brackets, after the specimen number. Scale bars = 5 mm

These concretions contain remains of the terrestrial plants *Calamites suckowii* Brongniart, 1828 and the bivalve *Phestia* sp.

(3) Limonite nodules in the shales corresponding to the upper part of the Mandrykyne Formation, exposed at the right slope of the Shchotova ravine 1.5 km NW of the village of Zelenodil's'ke. These concretions contain the brachiopods *Crurithyris* sp. (see Fig. 7, *b*), *Tiramnia* sp. (see Fig. 7, *i–l*), *Brachythyrina* ex gr. *proba* (Rotai, 1951) (see Fig. 7, e), ?Krotoviini indet. (see Fig. 7, a), *Alphachoristites* sp., rugose corals, gastropods, crinoid stems *Platyplateium texanum* Moore & Jeffords, 1968 (see Fig. 5, *f*) and macroscopic problematic fossils (see Fig. 6, *g*, *h*).

(4) Siderite interlayer (equivalent of the middle part of the Mandrykyne Formation) exposed at the left slope of the Skelevata ravine 2 km east of the village of Zelenodil's'ke. This interlayer contains poorly preserved rugose corals, the brachiopod *Crurithyris* sp. (see Fig. 7, *d*), the bivalves *Palaeoneilo* sp. and *?Sanguinolites* sp. (see Fig. 6, *m*), the gastropod *Rhineoderma* sp., orthocerids and the crinoid *Platycrinites* sp. The terrestrial plants *Cordaites* sp. and *Halonia* sp. (see Fig. 6, *j*) were recorded from the siderite nodules within the siltstones 2 m above the siderite interlayer.

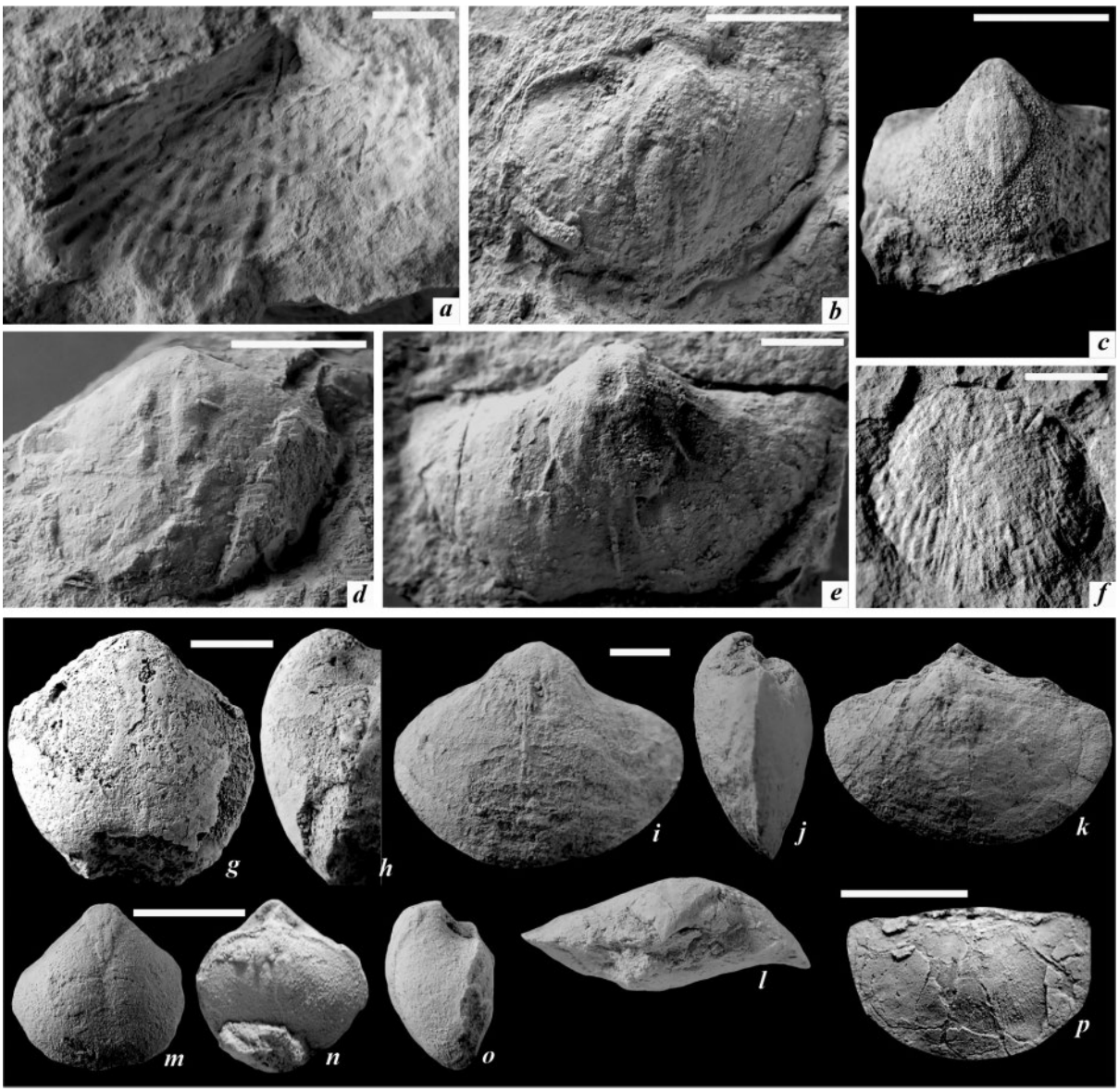

Fig. 7. Some brachiopods from the Dyakove Group: *a* – ?Krotoviini indet., impression of the ventral valve (NMNHU-G 6544/07; 3); *b* – *Crurithyris* sp., inner mould of the ventral valve (NMNHU-G 6544/04; 3); *c* – *Tiramnia* sp., inner mould of the ventral valve (NMNHU-G 6544/24; 8); *d* – *Crurithyris* sp., inner mould of the ventral valve (NMNHU-G 6544/01; 4); *e* – *Brachythyrina* ex gr. *proba* (Rotai, 1951), inner mould of the ventral valve (NMNHU-G 6544/03; 3); *f* – Juresaniinae indet., impression of the ventral valve (NMNHU-G 6544/06; 6); *g, h* – *Phricodothyris* sp., ventral valve in ventral and lateral views (NMNHU-G 6544/05; 8); *i–l* – *Tiramnia* sp., complete shell in ventral, dorsal, lateral and posterior views (NMNHU-G 6544/02; 3); *m–o* – *Tiramnia* cf. semiglobosa (Tschernyschew, 1902), complete shell (NMNHU-G 6544/23; 4);); *p* – *Lissochonetes* sp., ventral valve (NMNHU-G 6544/08; 4). The fossiliferous stratigraphic level numbers are in brackets, after the specimen number. Scale bars = 5 mm

The chonetidine brachiopod *Lissochonetes* sp. (see Fig. 7, *p*) was found in a limonite nodule within the shale of the age equivalent of the upper part of the Mandrykyne Formation exposed in the upper reaches of the Skelevata ravine. *Tiramnia* cf. *semiglobosa* (Tschernyschew, 1902) (see Fig. 7, *m–o*) was found in the shales corresponding to the upper part of the Mandrykyne Formation, which are exposed in the road cut between the village of Rebrykove and the town of Kamiane.

(5) Tempestitic crinoidal sandy limestone interlayers occur in the basal part of the fine-grained deltaic sandstone bed of the age equivalent of the upper part of the Mandrykyne Formation, exposed in the lower reaches of the Zaborina ravine 1.5 km east of the village of Zelenodil's'ke. *Cordaites* sp., *Platycrinites* sp., ?*Unilineatocrinus* sp., *Bicostulatocrinus* sp. (Dernov, 2016), as well as remains of poorly preserved gastropods, brachiopods and fragments of fin spines of the non-marine acanthodians Gyracanthidae indet. (see Dernov, 2016 for discussion) were found in these rocks.

(6) Siltstone above the G_1 limestone layer, exposed in small old coal pits and mines 1 km north of the village of Zelenodil's'ke. This siltstone contains *Calamites* cf. *cistii* Brongniart, 1828, *Paripteris gigantea*

(Sternberg) Gothan, 1941, *Artisia approximata* (Lindley & Hutton) Corda in Sternberg, 1838, rugose corals, the brachiopod Juresaniinae indet. (see Fig. 7, *f*), bivalves *Posidoniella* sp., *Phestia* sp. (see Fig. 5, *e*), *Palaeoneilo* sp., gastropods *Angyomphalus* sp., cephalopods *Gzheloceras* sp., *Gastrioceras* sp., *?Owenoceras* sp. (see Fig. 5, *b*) and some unidentified ammonoids, as well as the trace fossils *Planolites* and *Chondrites* (Dernov, 2016, 2022b).

Crurithyris sp. was found in a siderite interlayer, which is probably laterally replaced by the G_1 limestone layer. *Nodospira* sp., *?Euphemites* sp., *Retispira* sp. and *Glabrocingulum* sp., *Phestia snjatkovi* (Fedotov, 1932) (see Fig. 6, *k*) were found in the shales below the sandstone bed with the trace fossils *Arborichnus repetitus* Romano & Meléndez, 1985 (see Fig. 5, *h*), which lie below the G_1 limestone layer (Dernov, 2023b). The G_1^1 limestone layer, which lies slightly higher the G_1 limestone layer contains *?Naticopsis* sp. and poorly preserved brachiopods, bivalves, bryozoans and crinoid stems.

(7) Siltstone with limonite nodules in the stratigraphic interval corresponding to the lower part of the Mospyne Formation and exposed in the ravines 0.6 km NE of the village of Rebrykove (Roven'ky District). The terrestrial plants *Pinnularia capillacea* Lindley & Hutton, 1834 (see Fig. 6, *e*) and *Cordaites principalis* (Germar) Geinitz, 1855 were collected in the siltstone.

(8) Siltstone lens in shales corresponding to the lower part of the Mospyne Formation and exposed at the slope of the Velyka Kamyanka river terrace 0.7 km west of the village of Rebrykove. The siltstone contains *Cordaites principalis* (Germar) Geinitz, 1855 (see Fig. *6, i*), *Phricodothyris* sp. (see Fig. 7, *g, h*), *Tiramnia* cf. *semiglobosa* (Tschernyschew, 1902), *T.* sp. (Fig. 7, *c*), *?Pseudogzheloceras* sp. (see Fig. *5, a*), and *Melvilloceras rotaii* (Librovich in Popov, 1979).

(9) Siltstone layer that correspond to the lower part of the Mospyne Formation and exposed in a ravine opening into the floodplain of the Velyka Kamianka river 1 km NE of the village of Rebrykove. A single impression of a very small shell of the bivalve *Selenimyalina minor* (Brown, 1841) (see Fig. 5, *d*) was collected from the siltstone.

(10) Sandstone bed 120–130 m below the G_1^2 limestone layer exposed in old quarries on the left bank of the Velyka Kamianka river 1.5 km NE of the village of Rebrykove. This sandstone contains *Calamites suckowii* Brongniart, 1828 (see Fig. 6, *a*) and *Cordaites principalis* (Germar) Geinitz, 1855 (see Fig. 6, *c*). Rare remains of pteridosperms *Eusphenopteris* sp., bivalves *Solenomorpha rossica* Chernyshov, 1950 (see Fig. 6, *n*), *Phestia* sp., *Posidoniella* sp., *Euchondria* sp., unidentified gastropods, coiled nautiloids, the ammonoid *Melvilloceras rotaii* (Librovitch in Popov, 1979), fish scales and the trace fossils *Chondrites intricatus* (Brongniart, 1823), *Nereites* isp., *Phycosiphon* isp. and *Planolites* isp. were found in the siltstone layer, that lie about 1 m above this sandstone bed. In addition to the above-mentioned fossils, uncertain macroscopic problematics *Tanaisina mavka* gen. and sp. nov. were found in the interlayer of siderite nodules in these shales. Overlying the shale is a 1-m-thick layer of quartzite-like sandstone with terrestrial plants *Lepidophloios laricinus* (Sternberg) Goldenberg, 1857, *Stigmaria ficoides* (Sternberg) Brongniart, 1822 and signs of a sedimentary gap in the lower part of the layer, represented by a 0.3-m-thick interlayer of sandy brown ironstone with fragments of the green, crimson and purple siltstone.

Palaeontological features of the age-related to the Dyakove Group rock formations

The upper boundary of the Dyakove Group in the study area is located in the rocks corresponding to the lower part of the Mospyne Formation. The brachiopod assemblages of this formation are characterized by a low taxonomic diversity (see, for example, Aizenverg, 1950, 1951; Rotai, 1951, 1952; Aizenverg et al., 1963; Poletaev, 2018), since limestone layers, which are the main fossiliferous rocks of the marine fauna in the Donets Basin, are quite rare in this formation. For example, the total proportion of limestones in the Mospyne Formation is about 0.40 % (first author data), which is considerably less than in the Mandrykyne Formation, which directly underlies this formation, and is generally quite low for the Pennsylvanian strata in the Donets Basin.

A relatively diverse brachiopod assemblage was identified from a layer of the fine-grained calcareous sandstone, which lie near the upper boundary of the Dyakove Group (*c.* 55 m below the G_1^2 limestone layer: the fossiliferous stratigraphic level No. 11). This layer contains various trace fossils *(Crescentichnus, Planolites, Zoophycos,* fish coprolites, etc.), terrestrial plants *(Calamites, Sigillaria),* bryozoans, spiriferid brachiopods *Angiospirifer* sp. (Fig. 8, *a–e, i*), *Brachythyrina* ex gr. *proba* (Rotai, 1951) (Fig. 9, *c*), *Alphachoristites (A.) kschemyschensis* (Semichatova, 1941) (Fig. 9, *h–k*), *A. (A.)* ex gr.

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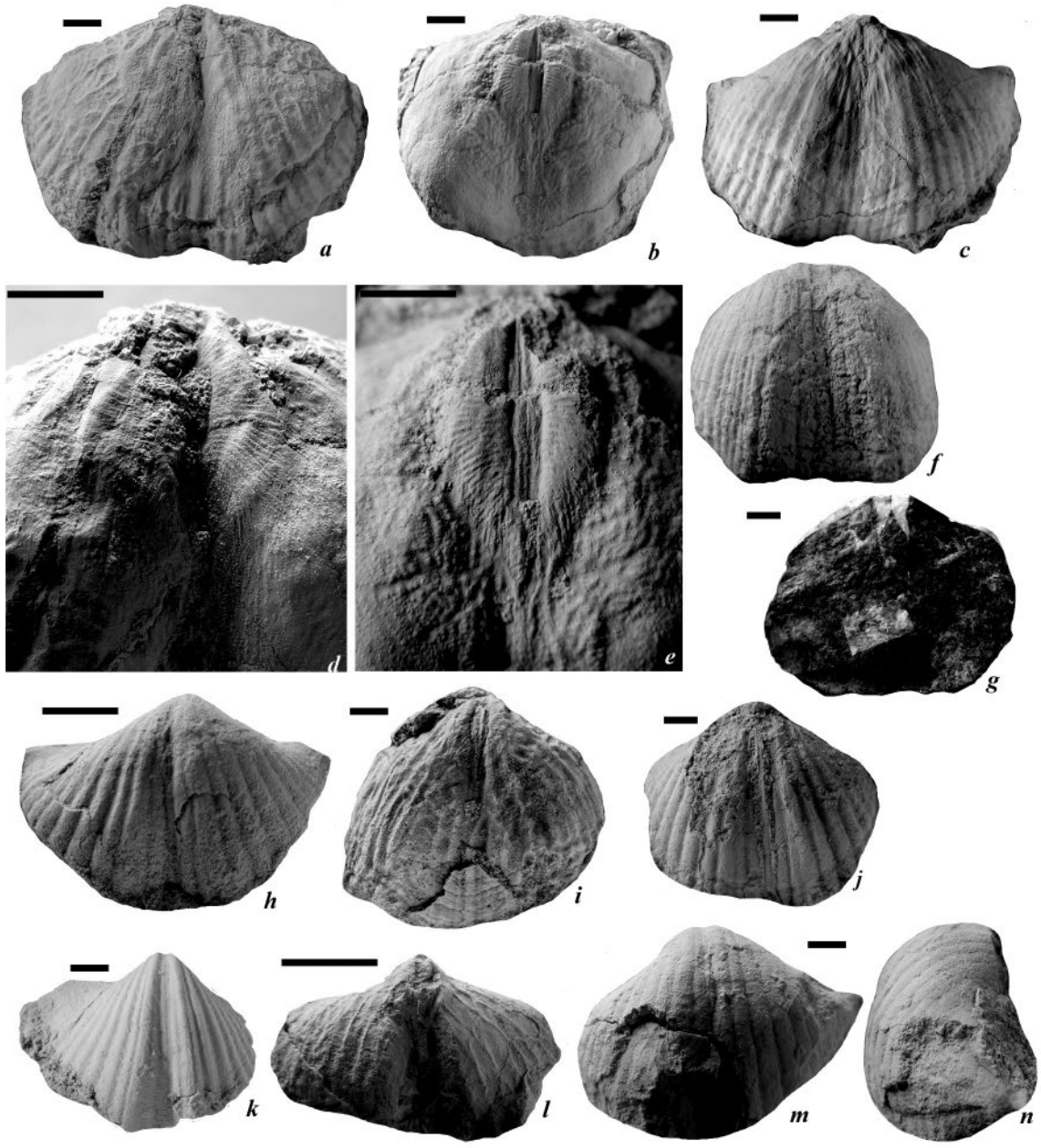

Fig. 8. Some spiriferids from the Mospyne Formation: *a–e – Angiospirifer* sp., internal moulds of the ventral valves (NMNHU-G 6544/17 *(a, d)*, NMNHU-G 6544/18 *(b, e)* and NMNHU-G 6544/13 (c); 11); *f, g – Alhpachoristites (Prochoristites) medovensis* (Rotai, 1951): *f* – external view of the ventral valve, *g* – internal view of the ventral valve (NMNHU-G 6544/27; 12); *h – Alhpachoristites (A.)* sp., ventral valve (NMNHU-G 6544/20; 11); *i – Angiospirifer* sp., internal mould of the ventral valve (NMNHU-G 6544/22; 11); *j – Alphachoristites (A.)* ex gr. *bisulcatiformis* (Semichatova, 1941), ventral valve (NMNHU-G 6544/11; 11); *k, l – Brachythyrina* ex gr. *proba* (Rotai, 1951), *k* – ventral valve (NMNHU-G 6544/26; 14), *l* – internal mould of the ventral valve (NMNHU-G 6544/21; 14); *m, n – Alphachoristites (A.)* ex gr. *bisulcatiformis* (Semichatova, 1941), ventral valve (NMNHU-G 6544/25; 13). The fossiliferous stratigraphic level numbers are in brackets, after the specimen number. Scale bars = 5 mm

bisulcatiformis (Semichatova, 1941) (Fig. *8, j*), *A. (A.)* sp. (Fig. 8, *h*), *?Anthracospirifer* sp. (Fig. 9, d, l), scaphopods, gastropods, bivalves *(Phestia, Sanguinolites, Palaeoneilo,* etc.), nautiloids *(Gzheloceras* sp., *Planetoceras yefimenkoi* Dernov, 2021, *Megaglossoceras* sp., etc.) (Dernov, 2021b and unpublished data of the first author), ammonoids *(Melvilloceras rotaii* (Librovitch in Popov, 1979), *Gastrioceras angustum* Patteisky, 1964, *Branneroceras* sp.) (Dernov, 2022b), crinoids, trilobites *Ditomopyge (Carniphillipsia) kumpani* (Weber, 1933), and fishes *Listracanthus hystrix* Newberry & Worthen, 1870 (see Fig. 11, *c*), *Lagarodus*, etc. Several specimens of *Tanaisina mavka* gen. et sp. nov. were found in the black shale directly above this sandstone layer.

The brachiopods *Alphachoristites (A.) kschemyschensis* (Semichatova, 1941) (see Fig. 9, *a, b*), *A. (Prochoristites) pseudobisulcatus* (Rotai, 1951)

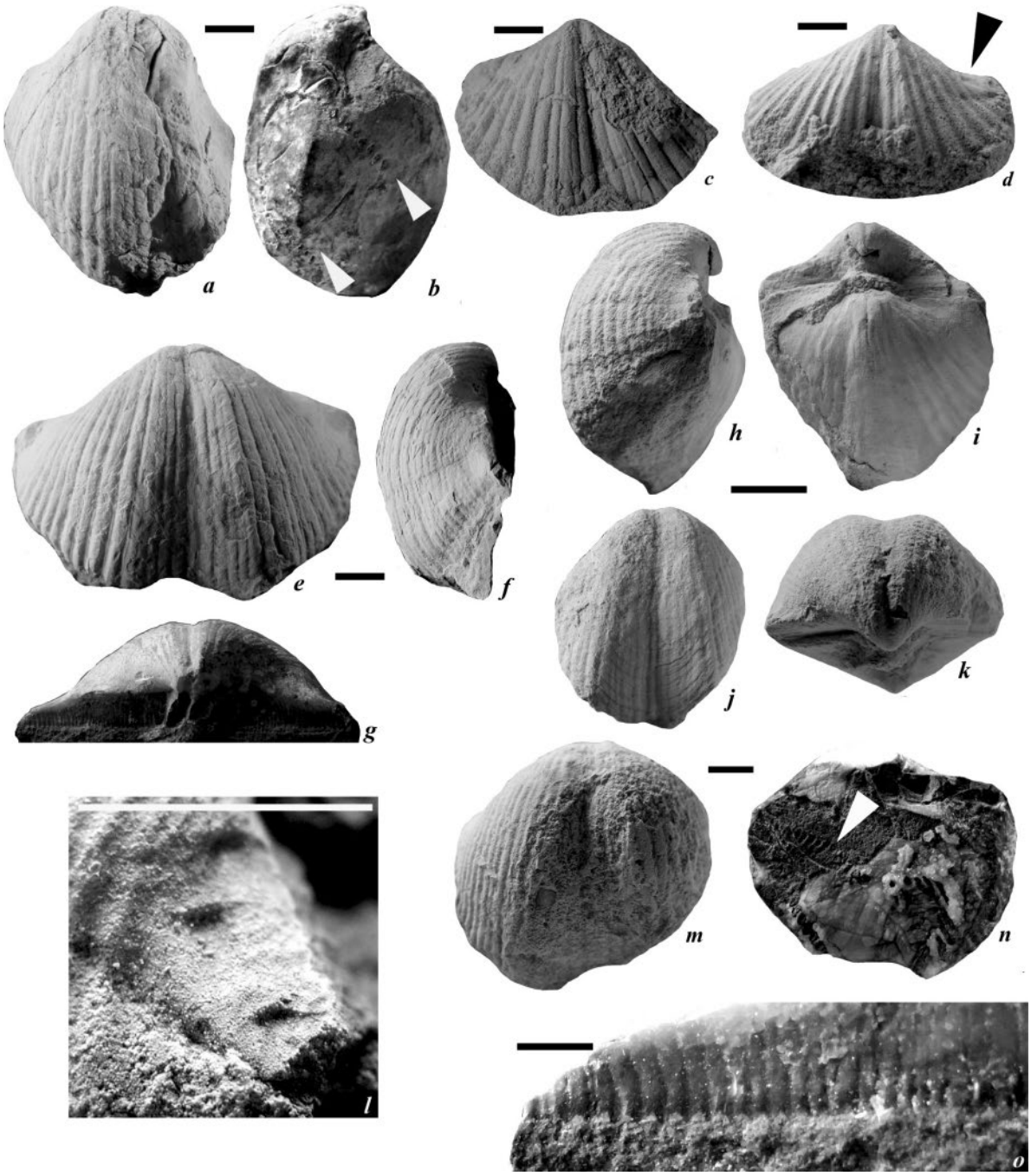

Fig. 9. Some spiriferids from the Mospyne Formation: *a, b – Alphachoristites (A.) kschemyschensis* (Semichatova, 1941), ventral valve with remains of spiralium (arrowed) (NMNHU-G 6544/16; 12); *c – Brachythyrina* ex gr. *proba* (Rotai, 1951) ventral valve (NMNHU-G 6544/12; 11); *d, l – ?Anthracospirifer* sp., ventral valve with a shell injury (NMNHU-G 6544/15; 11); *e–g, o – Alphachoristites (Prochoristites) pseudobisulcatus* (Rotai, 1951), ventral valve (NMNHU-G 6544/12; 12); *h–k – Alphachoristites (A.) kschemyschensis* (Semichatova, 1941), complete shell in the lateral, dorsal, ventral and posterior views (NMNHU-G 6544/14; 11); *m, n – Alphachoristites (Prochoristites) medovensis* (Rotai, 1951), ventral valve with remains of spiralium showed by arrows (NMNHU-G 6544/13; 12). The fossiliferous stratigraphic level numbers are in brackets, after the specimen number. Scale bars = 5 mm

(see Fig. 9, *e–g, o*), *A. (P.) medovensis* (Rotai, 1951) (see Fig. 9, *m, n*) were found in the G_1^2 limestone layer (the fossiliferous stratigraphic level No. 12). The G_2 limestone layer in the middle part of the Mospyne Formation (the fossiliferous stratigraphic level No. 13) contains brachiopods *Alphachoristites (A.)* ex gr. *bisulcatiformis* (Semichatova, 1941) (see Fig. 8, *m, n*). Slightly higher, in the siderite layer within black shales of the upper part of the Mospyne Formation (the fossiliferous stratigraphic level No. 14), *Brachythyrina* ex gr. *proba* (Rotai, 1951) (see Fig. 8, *k, l*) was found. The above spiriferid species are described or revised in the works of the second author (e.g., Poletaev, 1986, 2000a, b, 2001, 2004, 2012, 2018), therefore, there is no need to describe these taxa again here.

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Systematic palaeontology

Phylum Mollusca Linnaeus, 1758
Class Cephalopoda Cuvier, 1797
Superorder Ammonoida Haeckel, 1866
Order Goniatitida Hyatt, 1884
Suborder Goniatitina Hyatt, 1884
Superfamily Gastrioceratoidea Hyatt, 1884
Family Reticuloceratidae Librovitch, 1957

Genus *Retites* McCaleb, 1964
Type species: *Retites semiretia* McCaleb, 1964; by original designation.

Retites sp.
Table 2; Fig. 10
Material. One poorly preserved specimen (IGS NASU-04/77).
Description. The specimen IGS NASU-04/77 is a siderite steinkern with 24.0 mm conch diameter. The conch is thickly discoidal (ww/dm = 0.54) with the moderate umbilicus (uw/dm = 0.31), moderately depressed whorl profile (ww/wh = 1.52) and moderate coiling rate (WER = 1.99); the venter is broadly convex; the ventrolateral shoulder is broadly rounded. The flanks are weakly convex, they slightly converge towards the ventrolateral shoulders. The umbilical margin is rounded. The surface of the conch is covered with weak elongated umbilical nodes spaced about 0.9 to 1.0 mm apart, but they are absent on the penultimate whorl (Fig. 10, *d*); growth lines are concavo-convex and form a deep, broad ventral sinus and a broad, shallow lateral sinus. Two weak concavo-convex constrictions with a low ventrolateral projection and a very shallow ventral sinus are prominent on the whorl.
Remarks. *Retites* sp. differs from *R. semiretia* McCaleb, 1964 (Early Pennsylvanian of the USA) by a narrower umbilicus (uw/dm = 0.31 at 24.0 mm diameter in *Retites* sp. and 0.50 at 23.0 mm diameter in *R. semiretia*). *Retites* sp. differs from *R. ortivus* Ruzhencev & Bogoslovskaya, 1978 by a less convex venter and a sharper umbilical margin. *Retites* sp. is very similar to *R. obscurus* Ruzhencev & Bogoslovskaya, 1978, to which it probably belongs, but the insufficient amount of material and its poor preservation do not allow us to assign the studied ammonoid to *R. obscurus*.
Locality. Fossil-bearing stratigraphic level No. 1 (for details, see the section “Studied fossil sites”).
Distribution. The genus *Retites* is ranged in the early Bashkirian of the USA, Portugal, Spain, Russia, Kazakhstan, Uzbekistan, Kyrgyzstan and China.

Phylum Chordata Haeckel, 1874
Class Acanthodii Owen, 1846
Order incertae sedis
Family Gyracanthidae Woodward, 1906
Gyracanthidae indet.
Fig. 11, *a, b*
2016 *Gyracanthus* sp. – Dernov, fig. 3, 4.
Material. Two poorly preserved fragments of fin spines (GMLNU-15/01 and GMLNU-15/02) from the fossiliferous stratigraphic level No. 5.

Table 2. Dimensions (in mm) of *Retites* sp.

Specimen	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
IGS NASU-04/77	24.0	13.0	9.0	7.5	7.0	0.54	1.52	0.31	1.99	0.22

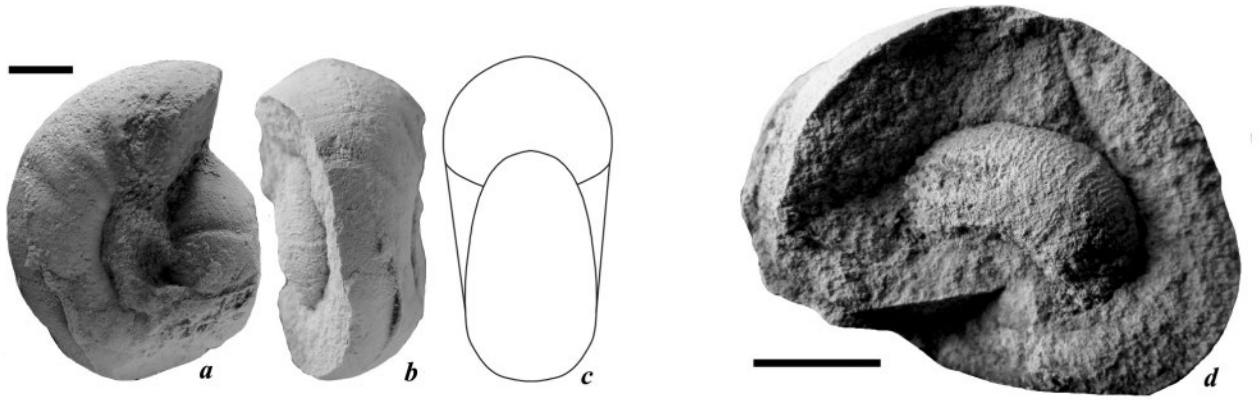

Fig. 10. Ammonoid *Retites* sp. (IGS NASU-04/77) from the Dyakove Group: *a* – lateral view of the conch, *b* – ventral view of the conch, *c* – reconstruction of the conch’s dorsal projection, *d* – ornamentation of the penultimate whorl. Scale bars = 5 mm

Description. A better preserved specimen (GMLNU-15/01; Fig. 11, *b*) is represented by a fragment of a tapering spine, broken at both ends, 25 mm in length and 15 mm wide at the narrow edge and 18 mm wide at the wide edge. The spine surface ornamented with oblique ridges spaced approximately 1.5 mm apart and bearing very small tubercles.

Remarks. Previously, the fin spines *Gyracanthus formosus* Agassiz, 1837 from the Donets Basin were described by Yefimova (1932) and Karlov (1968) from the late Bashkirian Smolyanynivka Formation. In addition, an undescribed fragment of a spine *Gyracanthus formosus* is known from the Moscovian part of the Kamenskaya Formation exposed by the unknown coal mine in the city of Antratsyt (Dernov, 2016). It is likely that the fragments of the spines described above belong to the genus *Gyracanthus,* as previously reported (Dernov, 2016), but the poor preservation of the material does not allow us to make this conclusion with confidence.

The fin spines Gyracanthidae indet. were found in the tempestitic crinoidal sandy limestone interlayer in the fine-grained sandstone bed with normal marine fauna (e.g., brachiopods and crinoids). This interlayer or lens was probably formed as a result of a storm that concentrated and mixed skeletal remains of marine and non-marine animals; the latter were brought to the marine basin by rivers. However, gyracanthid spines (i.e., species of the formal genera *Aganacanthus, Antacanthus, Oracanthus, Gyracanthus* and *Gyracanthides)* are found in both coastal and freshwater deposits (Ó Gogáin, 2022), so the co-occuring of the marine fauna and gyracanthids may not be accidental, and these animals did indeed co-occur.

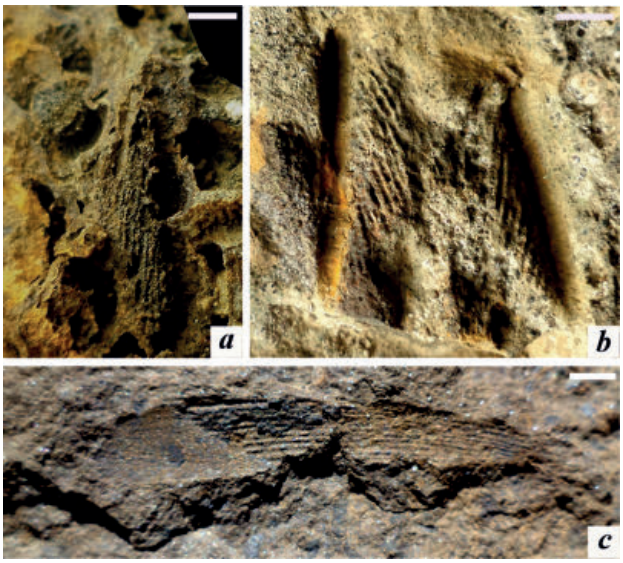

Fig. 11. Fish remains from the Dyakove Group and Mospyne Formation: *a, b* – Gyracanthidae indet. (a – GMLNU-15/02, b – GMLNU-15/01); *c* – *Listracanthus hystrix* Newberry & Worthen, 1870 (c – IGS NASU-10/02). Scale bars = 5 mm

Phylum, class, order and family incertae sedis

Genus *Tanaisina* Dernov, gen. nov.

Etymology. After *Tanais*, the ancient Greek name for the Siverskyi Donets river in eastern Ukraine.

Gender. Feminine.

Type species. *Tanaisina mavka* sp. nov. from the late Bashkirian deposits of the Donets Basin (Ukraine); by monotypy.

Other species. The genus is monospecific.

Diagnosis. Fossils in the form of a two-toothed fork, the branches of which form straight, apparently rounded or ellipsoidal in cross-section, longitudinally folded, tubular and narrowly conical organs, which pass at their base into an attachment organ in the form of a stalk, which is smaller in thickness and length than the arms.

Remarks. *Tanaisina* gen. nov. bear a remote external resemblance to the monotypic enigmatic genus *Escumasia* Nitecki & Solem, 1973 from the Pennsylvanian Mazon Creek Konservate-Lagerstätte in Illinois, USA. Nevertheless, the described fossils have some significant morphologic differences, e.g., absence of the so-called trunk sac and shorter stalk length in the *Tanaisina* gen. nov.; in addition, none of the specimens studied had the attachment disk known from *Escumasia roryi* Nitecki & Solem, 1973, the type species of *Escumasia*.

Another similar genus to *Tanaisina* gen. nov. is *Caledonicratis* Zapalski & Clarkson, 2015 (?Cnidaria) from the Viséan Granton Konservate-Lagerstätte near Edinburgh (Scotland). However, there are several important morphological features that allow us to distinguish between these genera, namely: (1) the remains of *Caledonicratis* look like branched enigmatic structures (branching may be very irregular, but the general pattern can be described as monopodial with secondary dichotomous outgrowths), while *Tanaisina* has only two equivalent “branches”; (2) besides dendroidal colonies, several isolated fan-like structures have been found in *Caledonicratis,* but this is not observed in *Tanaisina* gen. nov.; (3) the dimensions of *Caledonicratis* is an order of magnitude less than that of *Tanaisina* gen. nov.

Tanaisina gen. nov. also shares some external morphological similarities with the hydrozoans *Drevotella proteana* Nitecki & Richardson, 1972 from the Mazon Creek Lagerstätte, but *Tanaisina* gen.

nov. does not have the sub-rounded structures interpreted as polyps by Nitecki & Richardson (1972). Until new data on the morphology of *Tanaisina* are available, it is impossible to resolve the problem of its systematic position.

Occurrence. Late Bahkirian of the Donets Basin, Ukraine.

Tanaisina mavka Dernov, sp. nov.

Figs 12 and 13

Holotype. Specimen GMLNU-16/01 (Fig. 12, *a*) in the Geological Museum of the Luhansk Taras Shevchenko National University, Poltava; marine shale in the uppermost part of the Dyakove Group (late Bashkirian) exposed on the left bank of the

Fig. 12. *Tanaisina mavka* Dernov, sp. nov. from the Dyakove Group and Mospyne Formation: *a* – GMLNU-16/01 (holotype), b – GMLNU-16/04, *c* – GMLNU-16/02, *d* – GMLNU-16/03, *e* – GMLNU-16/06, *f* – GMLNU-16/05, *g*, *h* – GMLNU-16/07, *i* – GMLNU-16/29. Scale bars = 2 mm *(h)* and 5 mm *(a–g, i)*

Velyka Kamianka river, 1.5 km NE of the village of Rebrykove (Luhansk Region, Ukraine).

Other material. 20 specimens (GMLNU-16/02 to GMLNU-16/21) from the type locality and eight specimens (GMLNU-16/22 to GMLNU-16/29) from black shales c. 34–54 m below the G_1^2 limestone layer of the Mospyne Formation exposed by a small pit near the western outskirts of the village of Makedonivka and at the slope of a small ravine in the northwestern part of the village (detailed description of this fossil sites see in Dernov and Udovychenko (2019) and Dernov (2022c)).

Etymology. After *mavka* (Latinized Ukrainian), a mermaid-like character in the Ukrainian mythology.

Diagnosis. The same as for the genus.

Description. Examined material is mainly in the form of squeezed limonitized and, more rarely, pyritized longitudinally folded (Figs 12, *c;* 13, *d*), tubular and narrowly conical fossils. The surface folds are irregular and of varying thickness. They testify that lifetime tissues of the described organisms were rather elastic. The edges of the fossils are sharp; sometimes small marginal notches are observed, apparently traces of life-time injuries or postmortem feedings by scavengers. The surface of the fossils is finely roughened (Fig. 12, c). These remains are narrowed towards the tips, but the rate of narrowing is very low. Often the narrowing of the fossils is masked by their frequent bending, tearing due to the development of longitudinal folding and other reasons. The thinnest fossils are very rarely sinuously curved; the thicker ones are often more or less straight or show very slight curvature.

On the best preserved specimens (e.g., Figs 12, *a, b, d, e;* 13) it is noticeable that the described fossils are disconnected parts of the body, most probably, of non-skeletal organisms (?cnidarians), having the form of a two-toothed fork, the branches of which form organs, which can be conditionally called “arms”. The specimen GMLNU-16/01 demonstrates that the arms pass

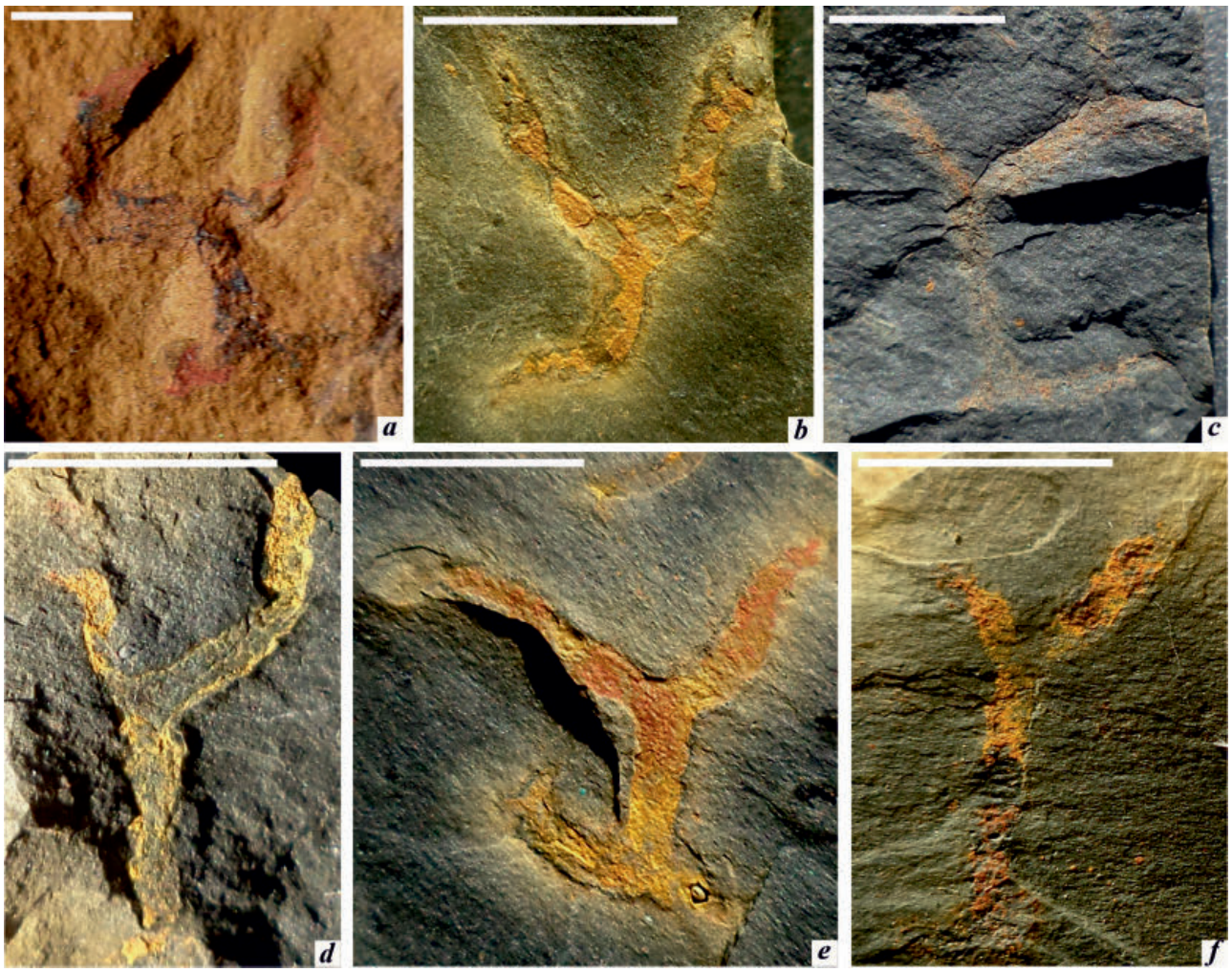

Fig. 13. *Tanaisina mavka* Dernov, sp. nov. from the Mospyne Formation: *a* – GMLNU-16/22, *b* – GMLNU-16/24, *c* – GMLNU-16/23, *d* – GMLNU-16/26, *e* – GMLNU-16/25, *f* – GMLNU-16/27. Scale bars = 5 mm

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at their base into an attachment organ(?) in the form of a stalk, which is thinner and shorter in length than the arms. The arms are straight, apparently rounded or ellipsoidal in cross-section. They are much (three or more times) longer than the stalk. The overall body size of the animals is not clear, but some of them apparently reached 70–80 mm in lifetime height (or length), most of which is made up by the arms. The morphology of longitudinal folds and other features of preservation show that the studied remains are apparently hollow cylindrical and tube-shaped organic-walled organisms. At the base of the stalk in fossils from the black shales of the Mospyne Formation (Fig. 13, *a–c, e*), enigmatic structures are sometimes preserved, which may be attachment organs of these organisms.

Occurrence. Dyakove Group and the same-aged Mospyne Formation, late Bahkirian of the Donets Basin, Ukraine.

Concluding remarks

The following biota was identified from the Dyakove Group.

(1) Terrestrial plants: *Halonia* sp., *Lepidophloios laricinus* (Sternberg) Goldenberg, *Stigmaria ficoides* (Sternberg) Brongniart, *Calamites suckowii* Brongniart, *C.* cf. *cistii* Brongniart, *C.* sp., *Pinnularia capillacea* Lindley & Hutton, *Paripteris gigantea* (Sternberg) Gothan, *Eusphenopteris* sp., *Artisia approximata* (Lindley & Hutton) Corda, *Cordaites principalis* (Germar) Geinitz and *C.* sp.

(2) Corals: undetermined rugose corals.

(3) Brachiopods: Juresaniinae indet., ?Krotoviini indet., *Lissochonetes* sp., *Tiramnia* cf. *semiglobosa* (Tschernyschew), *T.* sp., *Crurithyris* sp., *Phricodothyris* sp., *Brachythyrina* ex gr. *proba* (Rotai), *Alphachoristites* sp.

(4) Bivalves: *Phestia snjatkovi* (Fedotov), *Ph.* sp., *Parallelodon* sp., *Palaeoneilo* sp., *Nuculavus* sp., *Solenomorpha rossica* Chernyshov, *?Sanguinolites* sp., *Selenimyalina minor* (Brown), *P.* sp., *?P.* sp. and *?Euchondria* sp.

(5) Gastropods: *Nodospira* sp., *?Euphemites* sp., *Retispira* sp., *Glabrocingulum* sp., *Rhineoderma* sp., *Angyomphalus* sp. and *?Naticopsis* sp.

(6) Cephalopods: *Gzheloceras* sp., *?Pseudogzheloceras* sp., *Melvilloceras rotaii* (Librovitch in Popov), *Retites* sp., *Gastrioceras* sp. and *?Owenoceras* sp.

(7) Crinoids: *Platyplateium texanum* Moore & Jeffords, *Platycrinites* sp., *?Unilineatocrinus* sp. and *Bicostulatocrinus* sp.

(8) Arthropods: undetermined phyllocarid.

(9) Fishes: Gyracanthidae indet., isolated fish scales.

(10) Problematics: *Tanaisina mavka* Dernov, sp. nov.

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Із частини розрізу дяковської серії, що відповідає вугленосним відкладам мандрикинської світи та нижній частині моспинської світи південної частини Луганської області, вивчено нові знахідки решток морської фауни (брахіопод, молюсків, кріноідей, артропод та риб) і наземної флори. Вперше із зазначених відкладів визначено рештки брахіопод, що представлені родами *Crurithyris, Tiramnia, Alphachoristites* та *Lissochonetes*. Крім того, вперше серед відкладів дяковської серії знайдено рештки філокарид, а також відбитки наземних рослин, що відносяться до родів *Halonia, Calamites, Pinnularia, Paripteris, Eusphenopteris, Artisia* та *Cordaites*. Бівальвії у вивченій колекції представлені представниками родів *Phestia, Parallelodon, Palaeoneilo, Nuculavus, Solenomorpha, Sanguinolites, Posidoniella* та *?Euchondria*. Серед гастропод визначено роди *Nodospira, ?Euphemites, Retispira, Glabrocingulum, Rhineoderma, Angyomphalus, ?Naticopsis;* серед цефалопод – *Gzheloceras, ?Pseudogzheloceras, Melvilloceras, Retites, Gastrioceras* та *?Owenoceras*. Крім названих груп у дяковській серії також встановлено присутність кріноідей *Platyplateium, Platycrinites, ?Unilineatocrinus* та *Bicostulatocrinus*, а також фрагментів іхтіодорулітів акантод Gyracanthidae indet. та ізольованої риб'ячої луски. Отримані дані свідчать про гарні перспективи створення палеонтологічно обґрунтованої схеми розчленування монотонної потужної товщі дяковської серії.

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