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# *Mammillichnis monstrum* isp. nov., a new sea anemone trace fossil from the Carboniferous of the Donets Basin, Ukraine

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## abstract

A new ichnospecies *Mammillichnis monstrum* isp. nov. (Domichnia) is described from turbidite sandstone in the upper part of the Mospyne Formation (late Bashkirian, Early Pennsylvanian) of southern Luhansk Oblast, eastern Ukraine. *Mammillichnis monstrum* isp. nov. is represented by hypichnial, hemispherical, slightly flattened passive fillings of a large burrow; the apex of burrow casts has concentric depression or a small rounded tubercle. *Mammillichnis monstrum* isp. nov. differs from *Mammillichnis aggeris* Chamberlain, 1971 (Vendian–Oligocene) and *Mammillichnis jakubi* Pokorny et al., 2017 (late Miocene, Neogene) by its much larger size. The depth of burrows varies greatly, which seems to be related to the different preservation of burrow casts, as well as, apparently, different maturity of burrow producers. In addition, such an important diagnostic feature as a rounded tubercle at the apex of the burrow casts is not observed in all specimens, which is probably also due to the different types of preservation of the trace fossils. Perhaps, the differences in the morphology of the apex of some examined specimens are due to the activity of organisms that lived in the burrows after the death of the trace fossil producer. The producers of the trace fossils *Mammillichnis* are apparently sea anemones (Actiniaria). The fossil record of Actiniaria has significant gaps because these animals lack a mineral skeleton that can be preserved as a fossil. The oldest sea anemones are known from the Vendian; there is no data on post-Carboniferous fossil Actiniaria. It seems that the only way to study the evolution of this group of animals is studying of their trace fossils, such as burrows (e.g. ichnogenera *Astropolichnus*, *Bergaueria*, *Conostichus*, and *Kulindrichnus*), which demonstrate some details of the body morphology of their producers. The trace fossils *Mammillichnis monstrum* apparently marks insignificant pauses in sedimentation preceding the accumulation of turbidite sandstones. In the coarse sandy sediments are preserved mainly large depressions left by sessile coelenterates. Trace fossils are well preserved in some sandstone lenses and poorly preserved in others. This circumstance is apparently related to the different intensity of erosive activity of turbidity currents.

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# *Mammillichnis monstrum* isp. nov., нова іхнофосилія актинії з карбону Донецького басейну, Україна

Віталій Дернов

**Резюме.** Новий іхновид *Mammillichnis monstrum* isp. nov. (Domichnia) описано з турбідитних пісковиків, що залягають у верхній частині моспінської світи (верхня частина башкирського ярусу, ранній пенсильваній) південної частини Луганської області, східна Україна. *Mammillichnis monstrum* isp. nov. представлено напівсферичними, слабо сплюснутими пасивними заповненнями порівняно великих нірок з концентричними депресіями та маленьким округлим горбком на вершині ядра нірки. Ці іхнофосилії розміщені на нижніх поверхнях прошарків та лінз пісковиків. *Mammillichnis monstrum* isp. nov. відрізняється від *Mammillichnis aggeris* Chamberlain, 1971 (венд–олігоцен) та *Mammillichnis jakubi* Pokorny et al., 2017 (верхній міоцен, неоген) своїми значно більшими розмірами. Глибина нірок суттєво варіює, що може бути пов'язано з різною повнотою збереження ядер нірок та іхньою належністю продуцентам різної зрілості. Крім того, така важлива діагностична ознака як округлий горбок на вершині ядра нірки спостерігається не на всіх вивчених екземплярах; це вірогідно пов'язано з активністю організмів, що існували в нірці після смерті її продуцента. Продуцентами іхнофосилій *Mammillichnis* були, ймовірно, морські анемони. Викопний літопис актиній має значні пробіли, оскільки ці тварини не мають мінерального скелету, який здатен зберегтися у вигляді фосилій. Найдавніші анемони відомі з венду; дані щодо пост-карбонівих актиній відсутні. Ймовірно, єдиним шляхом вивчення морфологічної еволюції цієї групи тварин є дослідження їхніх іхнофосилій, таких як нірки (наприклад, *Astropolichnus*, *Bergaueria*, *Conostichus* та *Kulindrichnus*), які демонструють деякі деталі будови тіла іхнього продуцента. Іхнофосилії *Mammillichnis monstrum* ймовірно маркують несуттєві паузи в седиментації, що передували накопиченню турбідитних пісковиків. Іхнофосилії є гарно збереженими в деяких пісковикових лінзах і погано збережені в інших. Ця обставина, ймовірно, пояснюється різною інтенсивністю ерозійної діяльності турбідитного потоку.

Ключові слова: карбон, пізній башкир, іхнофосилії, *Mammillichnis*, Донбас, Україна.

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## Introduction

The fossil record of Actiniaria has significant gaps because these animals lack a mineral skeleton that can be preserved as a fossil [McMahon *et al.* 2017]. The oldest sea anemones are apparently known from the Vendian; for example, the potential sea anemone *Inaria karli* Gehling, 1988 was found in the Ediacaran sediments of Australia [Gehling 1988]. The perfectly preserved Cambrian sea anemones *Archisaccophyllia kunmingensis* Hou *et al.*, 2005 and *Eolympia pediculata* Han *et al.*, 2010 were described from China [Hou *et al.* 2005, Han *et al.* 2010]. The affiliation of some Cambrian fossils, such as *Mackenzia costalis* Walcott, 1911 and *Xianguangia sinica* Chen and Erdtman, 1991, with Actiniaria is doubtful [Chang *et al.* 2018]. The Carboniferous sea anemone *Palaeoanemona marcusii* Lech, 1986 is known from Argentina [Lech 1986]. There are no data on post-Carboniferous fossil Actiniaria. Apparently, the only way to study the evolution of this group of animals is to study their trace fossils, such as burrows (e.g. *Astropolichnus*, *Bergaueria*, *Conostichus*, and *Kulindrichnus*), which demonstrate some details of the body morphology of their producers.

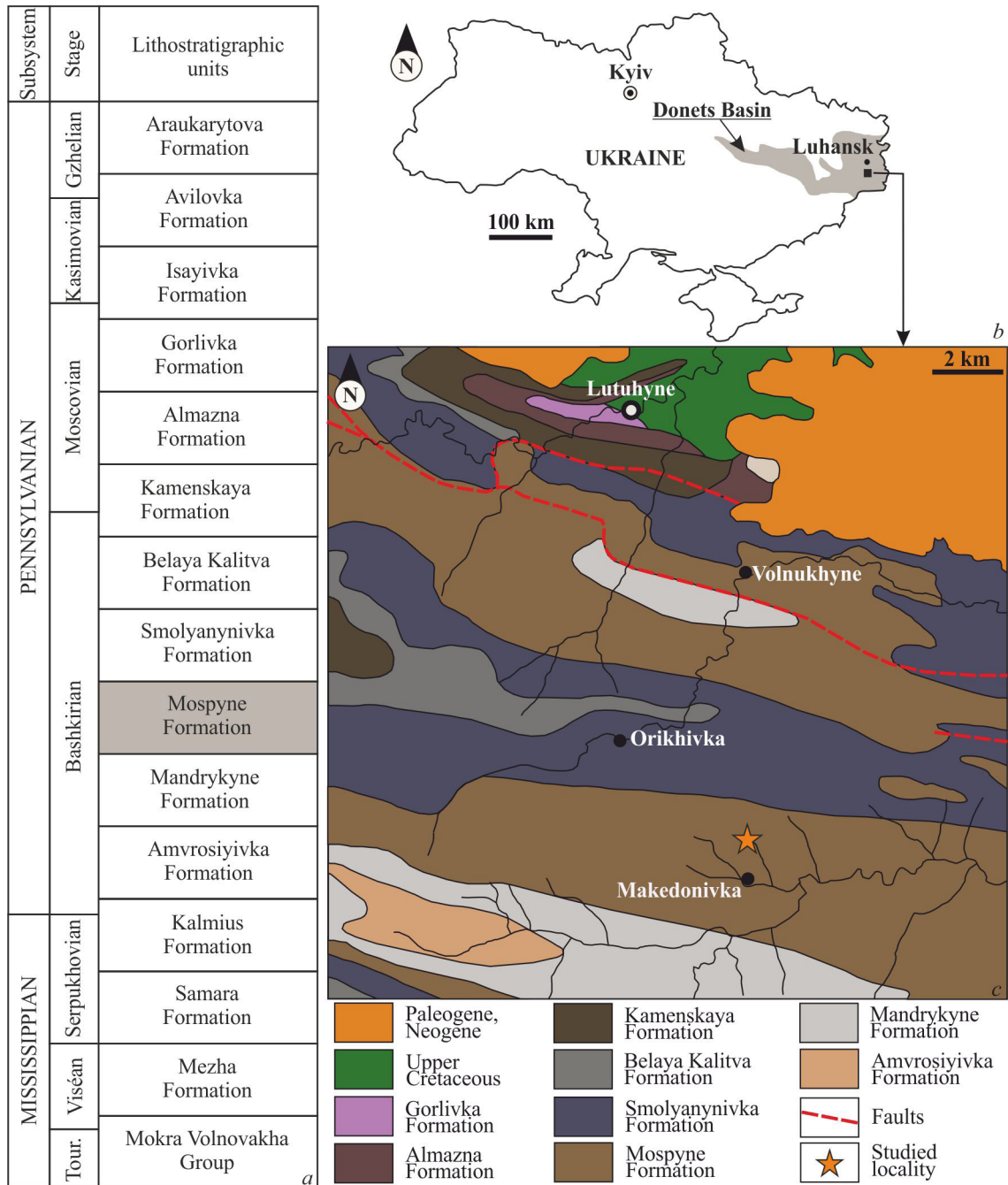
Here I describe the late Bashkirian trace fossil *Mammillichnis monstrum* isp. nov. from the Mospyne Formation in the southern part of Luhansk Oblast, Ukraine. The trace fossils *Mammillichnis* Chamberlain, 1971 were interpreted as sea anemone burrows [Seilacher 2007]. The results of the study clarify the content and occurrence of the ichnogenus *Mammillichnis*.

## Material and Methods

The seven specimens described in this paper (GMLNU-1/1213, GMLNU-1/5163, GMLNU-1/6401, GMLNU-1/6522, GMLNU-1/7575, GMLNU-1/7650, and GMLNU-1/7651) were collected by the author in 2010–2013 in an old quarry 1.5 km north of Makedonivka, Luhansk Oblast,

Ukraine (coordinates: 48°14'59.5" N, 39°17'50.1" E) (Fig. 1 *b, c*). These specimens are stored in the Geological Museum of Luhansk Taras Shevchenko National University (Poltava, Ukraine).

Abbreviations used in the description of trace fossils:  $d_1, d_2$  — two mutually perpendicular diameters of the aperture part of the burrow cast;  $D$  — arithmetic mean diameter of the aperture part of the burrow cast ( $(d_1 + d_2) / 2$ );  $h$  — height of the burrow cast (=burrow depth);  $h/D$  — ratio of arithmetic mean diameter of the burrow cast to height of the burrow cast.



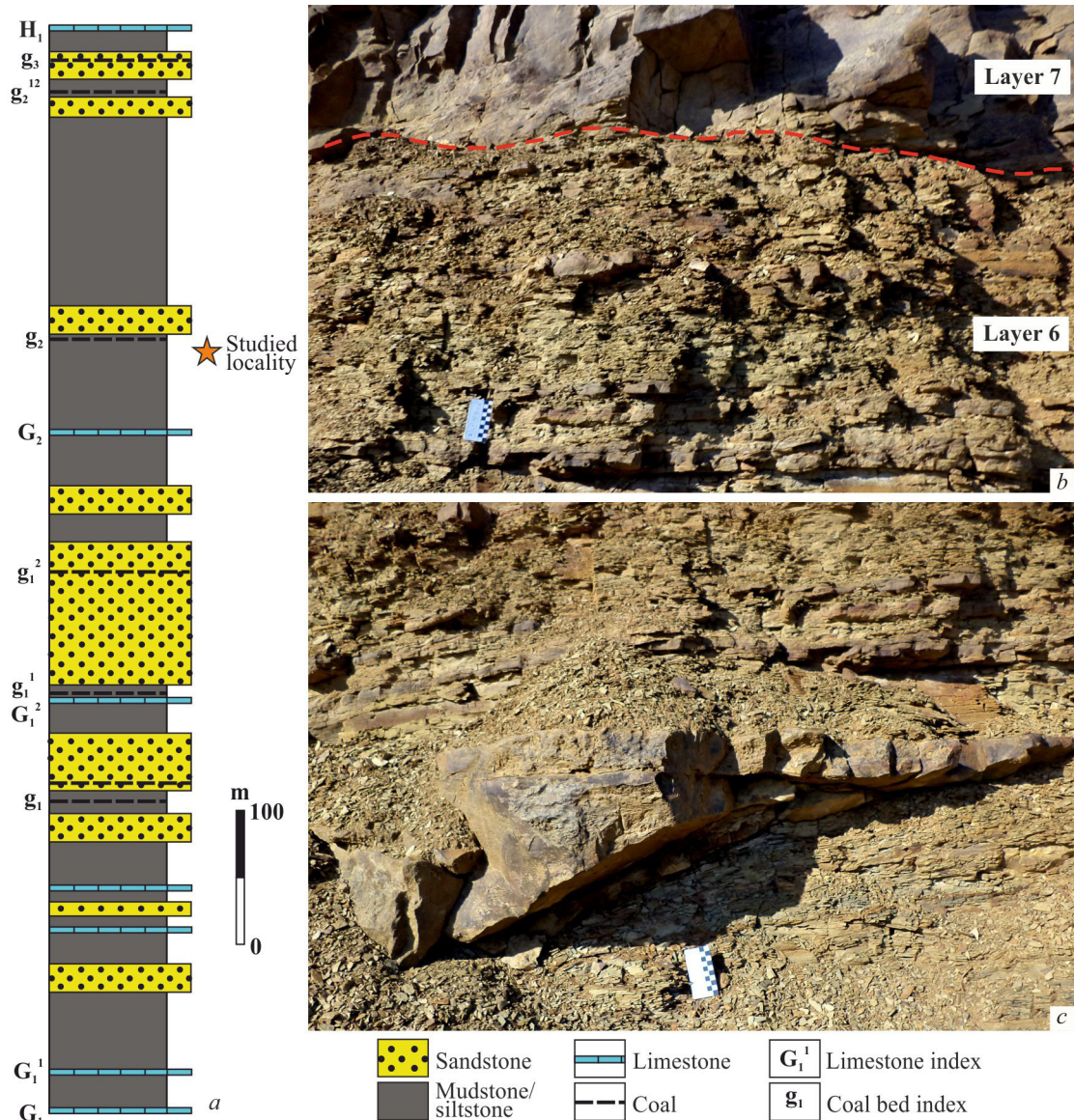
**Fig. 1.** Stratigraphic position of the Mospyne Formation in the Carboniferous sequence of the Donets Basin (*a*) and geographic situation of the studied locality (*b, c*). Abbreviations: Tour.—Tournaisian.

**Рис. 1.** Стратиграфічне положення моспінської світи в розрізі карбону Донбасу (*a*) та географічне положення вивченого місцезнаходження (*b, c*). Скорочення: Tour.—турнейський.

## Geological Setting

The studied material comes from the Mospyne Formation ( $C_2^2$  or G), which consists of a sequence of sandstones, siltstones, mudstones, coals (10–12 layers), and limestones (8 beds) [Nemyrovska & Yefimenko 2013] (Fig. 2 a). The age of this stratigraphic unit is late Bashkirian (Early Pennsylvanian). The thickness of the Mospyne Formation varies laterally from 315 to 730 m [Nemyrovska & Yefimenko 2013].

Trace fossils were collected from sandstone lenses in siltstones 10 m below the  $g_2$  coal bed (Layer 6 in the text of the section description below). The traces are on the lower surface of (?) turbidite sandstone lenses.



**Fig. 2.** The position of the type locality of *Mammillichnis monstrum* isp. nov. in the section of the Mospyne Formation (a) and general view of type locality (b — siltstone of the Layer 6; c — sandstone lens in the siltstone of the Layer 6).

**Рис. 2.** Положення типового місцезнаходження *Mammillichnis monstrum* isp. nov. в розрізі моспінської світи (a) та його загальний вигляд (b — алевроліти шару № 6, c — пісковикова лінза в алевролітах шару № 6).

The northwest wall of the quarry exposed the following upward sequence of rocks:

- (1) Grey mudstone with remains of gastropods, bivalves *Solenomorpha* sp., plant debris, rare trace fossils and thin interlayers of brownish-yellow fine-grained siltstone (0.3 m).
- (2) Brownish-grey and fine-grained siltstones, which are often laterally replaced by greyish-blue and whitish fine-grained siltstones with rare plant remains (*Cyperites bicarinatus* Lindley and Hutton, *Lepidodendron* sp., *Lepidostrobus* sp., *Stigmara ficoides* (Sternberg) Brongniart, *Calamites* sp., and *Paripteris gigantea* (Sternberg) Gothan), fish scales, bivalves *Sanguinolites* sp., and fragments of marine arthropod carapaces (0.1 m).
- (3) Greyish-yellow and fine-grained sandstone with plant debris and remains of marine arthropods (0.02–0.04 m).
- (4) Conglomerate consisting of re-deposited limonite concretions cemented by coarse-grained kaolinite sandstone, with brachiopod shells bearing traces of bioerosion *Rogerella* isp. previously described as *Bascomella* [Dernov 2016], and allochthonous axes of *Calamites* sp. (0–0.4 m).
- (5) Grey, yellowish-grey, and fine-grained siltstone with small (up to 1 cm) sandy limonite concretions and rare plant debris (1.5 m).
- (6) Grey fine-grained siltstone with lenses and interlayers of grey fine-grained sandstone (Fig. 2 b, c) with *Mammillichnis monstrum* isp. nov. and *Bergaueria perata* Prantl, 1945 (in the lenses of the upper part of the layer). *Bergaueria hemisphaerica* Crimes et al., 1977 and *B. perata* are in the lowest sandstone lens, but *Mammillichnis monstrum* is absent here. Allochthonous remains of terrestrial plants *Knorria* sp. and *Stigmara ficoides* (Sternberg) Brongniart were found in some sandstone interlayers (2.0 m).
- (7) Brownish-grey fine-grained sandstone with siltstone pebbles up to 2 cm in diameter and rare allochthonous remains of terrestrial plants *Sigillaria davreuxii* Brongniart, *Sigillaria* sp., *Calamites* sp., *Cyclopteris* sp., and *Paripteris gigantea* (Sternberg) Gothan (7.0 m).

## Associated Ichnofauna

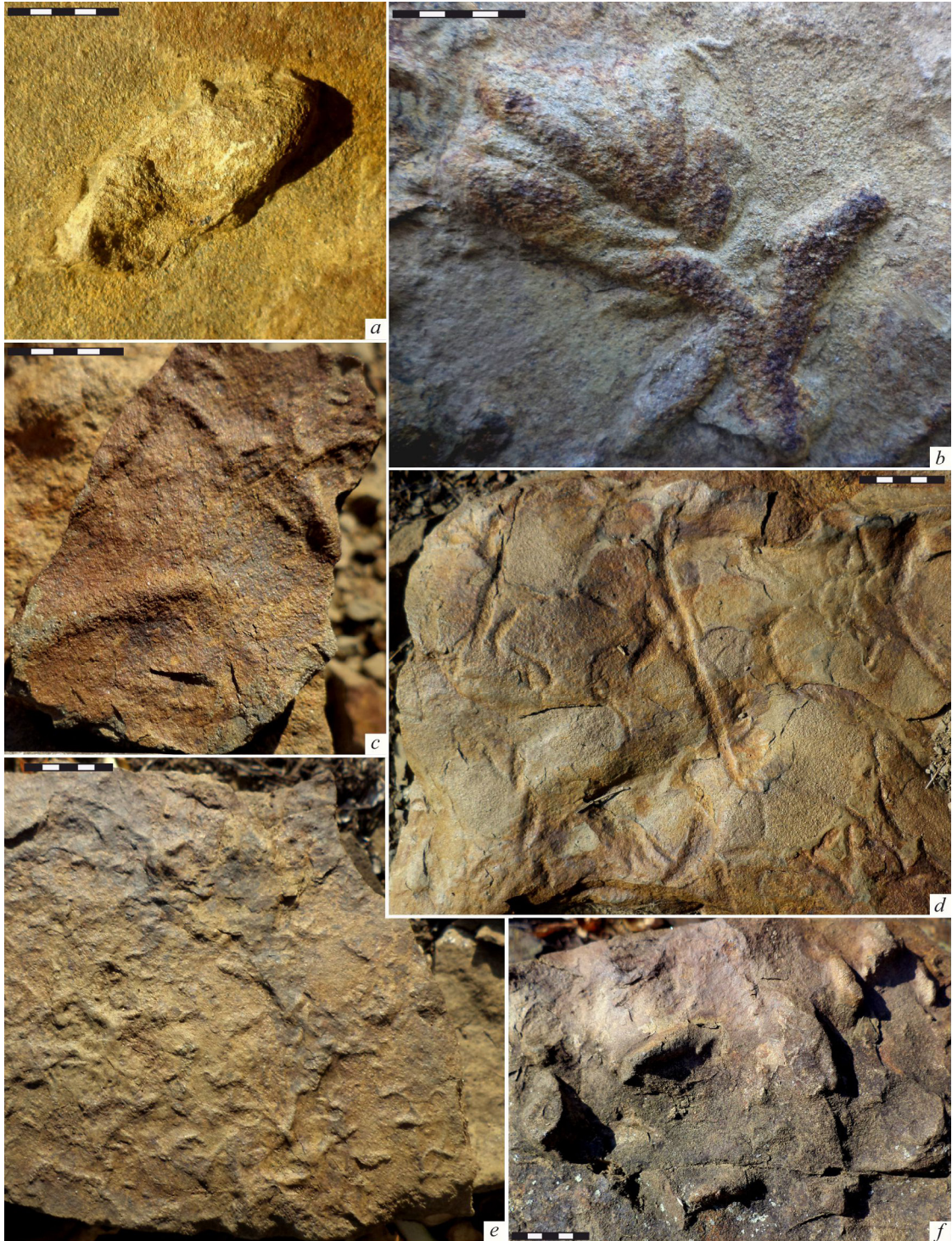
Trace fossils from the Mospyne Formation have been studied only partially to date [Dernov 2019 a, b]. The ichnogenera *Arenicolites*, *Avetoichnus*, *Archaeonassa*, *Aulichnites*, *Bergaueria*, *Circulichnis*, *Conichnus*, *Diplichnites*, *Diplocraterion*, *Diplopodichnus*, *Gordia*, *Helminthopsis*, *Kouphichnium*, *Lockeia*, *?Lophoctenium*, *?Merostomichnites*, *Monocraterion*, *Monomorphichnus*, *Paleophycus*, *Planolites*, *Protovirgularia*, *Ptychoplasma*, *Rhizocorallium*, *Rusophycos*, *Saerichnites*, *Scolithos*, *Selenichnites*, and *Treptichnus* are known from deltaic sandstones of the middle part of the Mospyne Formation [Dernov, 2019a]; *Chondrites*, *Phycosiphon*, and *Planolites* are known from marine black mudstones [Dernov & Udovichenko 2019] of this formation. The ichnocoenosis of lacustrine siltstones and mudstones consists of *Cochlichnus* and *Planolites* [Dernov 2019 b].

The trace fossils *Bergaueria*, *Helminthopsis*, *Lockeia*, and some others were found together with *Mammillichnis monstrum* isp. nov. in the sandstone lenses of the Layer 6 (Table 1; Figs 3–4).

**Table 1. Trace fossils from sandstone lenses and interlayers in the siltstone (Layer 6) of the type locality of *Mammillichnis monstrum* isp. nov.**

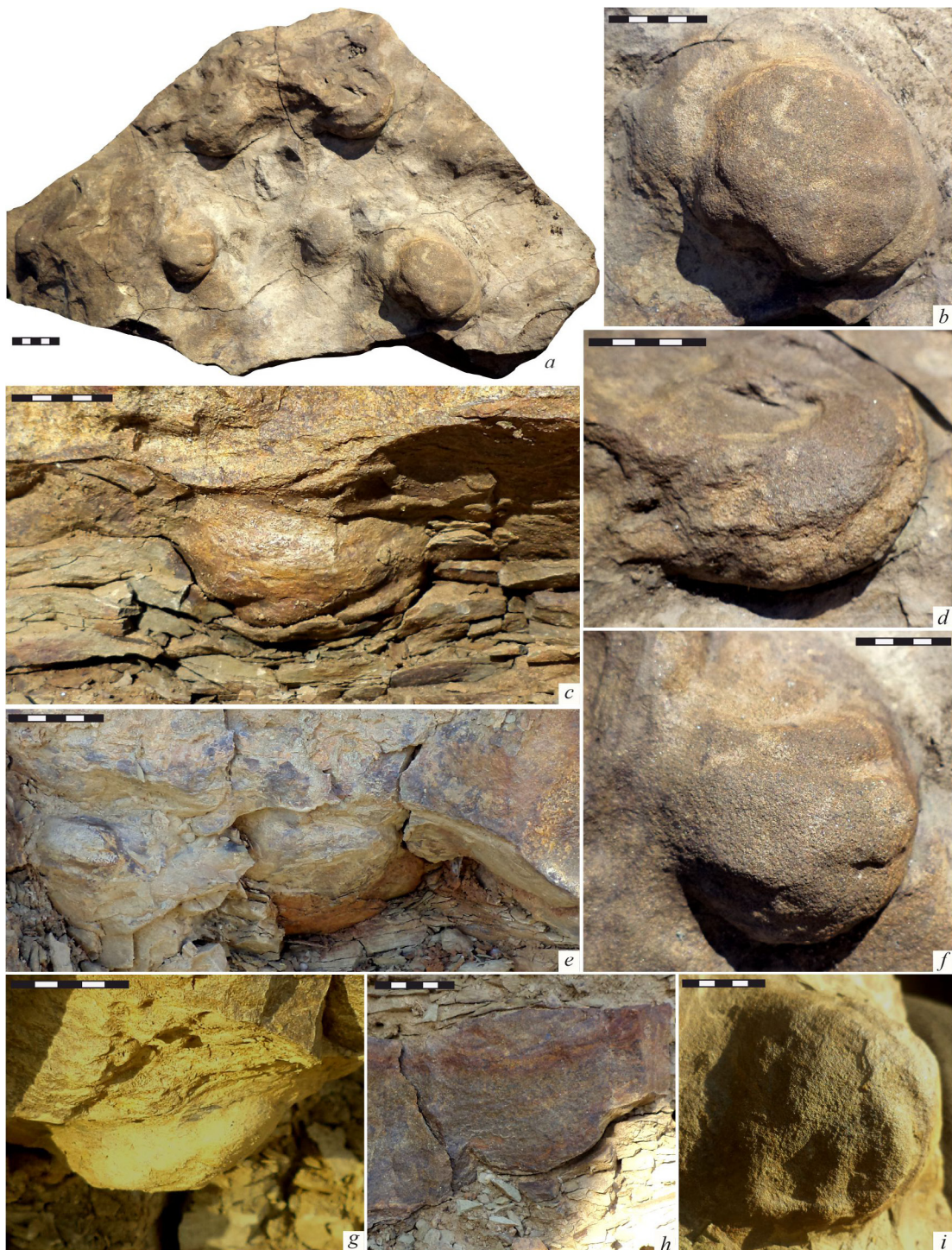
**Таблиця 1. Іхнофосилії з лінз та прошарків пісковика в алевроліті (Шар 6) типового місцезнаходження *Mammillichnis monstrum* isp. nov.**

Ichnotaxa	Ethological category	Potential producer
<i>Bergaueria hemisphaerica</i> Crimes et al., 1977	A resting or dwelling trace of suspension feeders	Anthozoa: Actiniaria
<i>Bergaueria perata</i> Prantl, 1945	the same	the same
? <i>Diplocraterion</i> isp.	Dwelling burrow of a suspension feeder	Crustaceans
? <i>Halopora annulata</i> (Książkiewicz, 1977)	Feeding burrow of a deposit-feeding organism	Worms
<i>Helminthopsis tenuis</i> Książkiewicz, 1977	Deposit feeding or grazing	Polychaete worms or priapulids
<i>Lockeia siliquaria</i> James, 1879	Resting trace	Bivalves
<i>Phycodes</i> isp.	Feeding burrow	?Worms
<i>Planolites montanus</i> Richter, 1937	Deposit feeding, dwelling	Invertebrate burrowing organisms



**Fig. 3.** Trace fossils from the Layer 6 of the type locality of *Mammillichnis monstrum* isp. nov.: (a) *Lockeia siliquaria* James (lower surface of the layer); (b) *Phycodes* isp. (lower surface of the layer); (c, e) *Planolites montanus* Richter (upper surface of the layer); (d) *Helminthopsis tenuis* Ksiazkiewicz (upper surface of the layer); (f) ?*Diplocraterion* isp. (lower surface of the layer). Scale segment equals 3 mm.

**Рис. 3.** Іхнофосилії з шару № 6 типового місцезнаходження *Mammillichnis monstrum* isp. nov.: (a) *Lockeia siliquaria* James (нижня поверхня шару); (b) *Phycodes* isp. (нижня поверхня шару); (c, e) *Planolites montanus* Richter (верхня поверхня шару); (d) *Helminthopsis tenuis* Ksiazkiewicz (верхня поверхня шару); (f) ?*Diplocraterion* isp. (нижня поверхня шару). Ціна поділки масштабної лінійки — 3 мм.



**Fig. 4.** Trace fossils *Mammillichnis* and *Bergaueria* from the Carboniferous of the Donets Basin: (a) lower surface of a sandstone slab with several *Bergaueria perata* Prantl; (b, d, f) *Bergaueria perata* Prantl from the sandstone slab surface in Fig. 4a; (c, e) *Mammillichnis monstrum* isp. nov. *in situ*; (g–h) *Bergaueria perata* Prantl *in situ*; (i) *Bergaueria perata* Prantl. Figs c, e, g, h — lateral view; a, b, d, f, i — apical view. Scale segment equals 4 mm.

**Рис. 4.** Іхнофосилії *Mammillichnis* та *Bergaueria* з карбону Донбасу: (a) нижня поверхня плити пісковика з декількома нірками *Bergaueria perata* Prantl; (b, d, f) *Bergaueria perata* Prantl з пісковикової плити, зображеної на рис. 4a; (c, e) *Mammillichnis monstrum* isp. nov. *in situ*; (g–h) *Bergaueria perata* Prantl *in situ*; (i) *Bergaueria perata* Prantl. Рисунки c, e, g, h — вид збоку; a, b, d, f, i — апікальний вид. Ціна поділки масштабної лінійки — 4 мм.

## Systematic Palaeoichnology

### Ichnogenus *Mammillichnis* Chamberlain, 1971

Type ichnospecies. *Mammillichnis aggeris* Chamberlain, 1971; original designation.

Diagnosis. Hypichnial mound with a convex or concave apex and a teat-like tubercle at the centre of the apex [after Uchman 1998].

Other included ichnospecies. *Mammillichnis jakubi* Pokorný et al., 2017 (Miocene, Neogene).

Occurrence. Vendian to Miocene; Europe and North America.

### *Mammillichnis monstrum* isp. nov.

Figs 4 c, e; 5 c–d; 6 a–d.

Etymology. The name comes from *monstrum* (Latin)—*unusual*.

Material. Seven trace fossils and a few photos of trace fossils *in situ*.

Holoichnotype. Specimen GMLNU-1/7575 housed in the Geological Museum of Luhansk Taras Shevchenko National University (Poltava, Ukraine).

Type locality and horizon. Ukraine, Luhansk Oblast, Luhansk Raion, quarry 1.5 km north of Makedonivka; upper Bashkirian, Mospyne Formation, sandstone bed 10 m below the g<sub>2</sub> coal layer.

Diagnosis. Hypichnial, hemispherical, slightly flattened passive fillings of large burrows; concentric depression or small rounded tubercle located on the apex of burrow casts.

Description. Hemispherical, slightly flattened in the upper-lower direction hypichnial passive fillings of depressions in the seafloor (burrow casts) with a rounded horizontal cross section. The casts were formed as a result of passive filling of the cavity, in which the producer of traces was located during life. The surface of the casts is not smooth, but forms concentric ridges and concave areas. A rounded or slightly ellipsoidal low tubercle, 10–13 mm in diameter, is observed on the apical part of the burrow casts (Fig. 5 c–d). A concentric depression, characteristic for the ichnogenus *Mammillichnis* Chamberlain, 1971, is observed on the apex of the holoichnotype of *Mammillichnis monstrum* isp. nov. (Fig. 6 c–d). The rock structure of the burrow casts is massive and homogeneous.

Table 2. Dimensions of trace fossils *Mammillichnis monstrum* isp. nov. (in mm)

Таблиця 2. Розміри іхнофосилії *Mammillichnis monstrum* isp. nov. (у мм)

Specimen	d <sub>1</sub>	d <sub>2</sub>	D	h	h/D
GMLNU-1/1213	45.0	48.0	46.5	23.0	0.49
GMLNU-1/7650	70.0	63.0	66.5	35.0	0.53
GMLNU-1/7651	~70.0	60.0	~65.0	25.0	0.38
GMLNU-1/6401	105.0	~105.0–110.0	~107.5	65.0	~0.60
GMLNU-1/7575 (holoichnotype)	110.0	124.0	122.0	36.0	0.30

Remarks. The depth of burrows varies greatly (see Table 2), which seems to be related to the different preservation of burrow casts, as well as, apparently, different maturity of the burrow producer individuals. In addition, such an important diagnostic feature as a rounded tubercle at the apex of the burrow casts is not observed in all specimens, which is probably also due to the different types of the preservation of trace fossils. Perhaps, the differences in the morphology of the apex of some examined specimens (e.g. Figs 5 c–d and 6 a–d) are due to the activity of organisms that lived in the burrows after the death of the trace fossil producer.

Discussion. *Mammillichnis monstrum* isp. nov. differs from *Mammillichnis aggeris* Chamberlain, 1971 and *Mammillichnis jakubi* Pokorný et al., 2017 by its much larger sizes, absence of a concentric depression on the apex of burrow casts, and weakly expressed apical tubercle in most specimens. *Mammillichnis monstrum* is probably more closely related to representatives of the ichnogenus *Bergaueria* Prantl, 1945, especially to the ichnospecies *Bergaueria hemisphaerica* Crimes et al., 1977 in

morphology and size. Nevertheless, the absence of an apical tubercle in *Bergaueria hemisphaerica* indicates that *Mammillichnis monstrum* and *Bergaueria hemisphaerica* are different ichnotaxa.

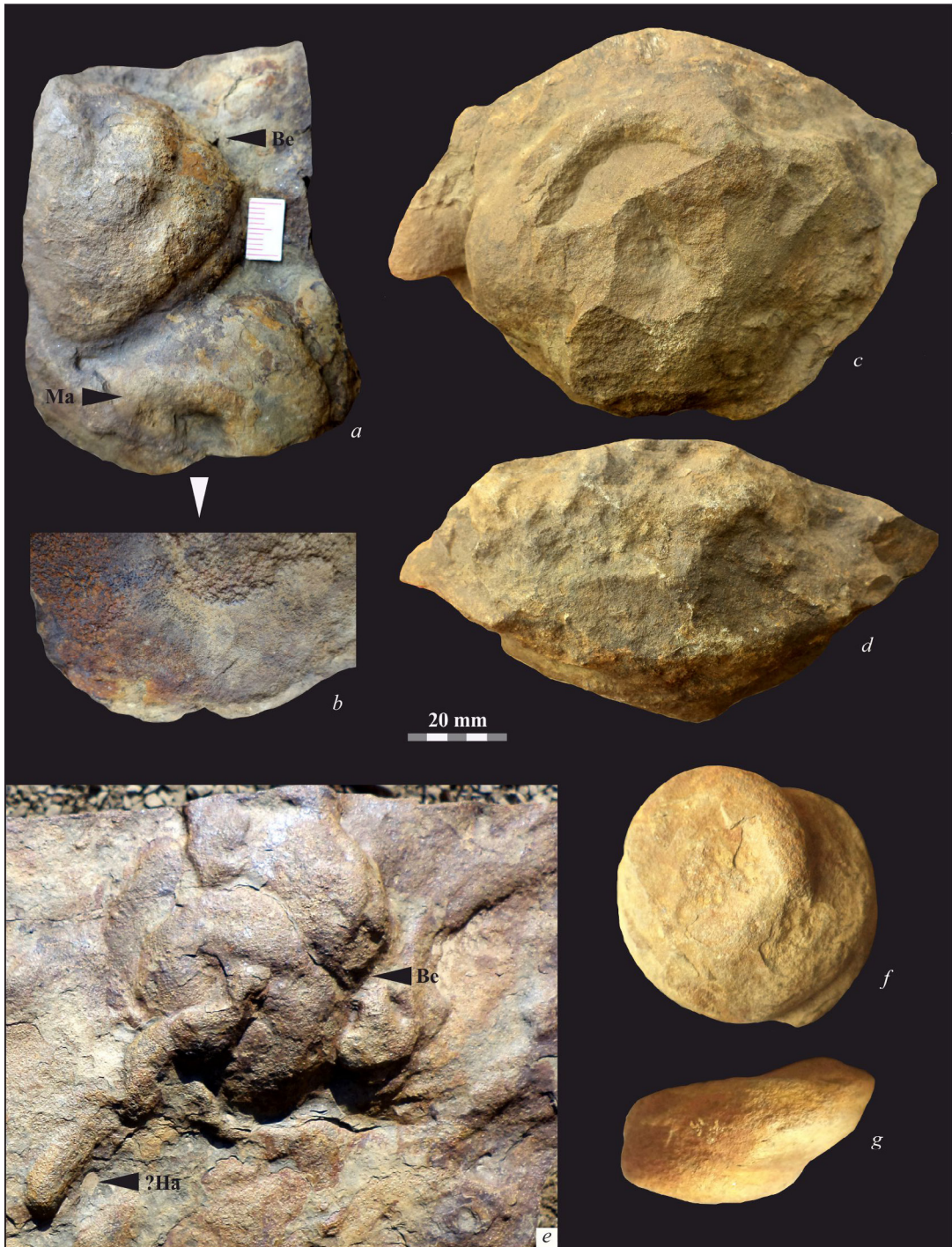
Locality. Ukraine, Luhansk Oblast, Luhansk Raion, quarry 1.5 km north of Makedonivka; upper Bashkirian, Mospyne Formation, sandstone lenses 10 m below the  $g_2$  coal layer.

Distribution. Bashkirian of the Donets Basin, eastern Ukraine.



**Fig. 5.** Trace fossils *Mammillichnis* and *Bergaueria* from the Carboniferous of the Donets Basin: (a–b) *Bergaueria hemisphaerica* Crimes et al. (very low apical tubercle is shown by an arrow); (c–d) *Mammillichnis monstrum* isp. nov.; (e) *Bergaueria hemisphaerica* Crimes et al. Figs a, c, e—lateral view; b, d—apical view.

**Рис. 5.** Іхнофосилії *Mammillichnis* та *Bergaueria* з карбону Донбасу: (a–b) *Bergaueria hemisphaerica* Crimes et al. (дуже низький апікальний горбок показано стрілкою); (c–d) *Mammillichnis monstrum* isp. nov.; (e) *Bergaueria hemisphaerica* Crimes et al. Фіг. a, c, e — вид збоку, b, d — апікальний вид.



**Fig. 6.** Trace fossils *Mammillichnis* and *Bergaueria* from the Carboniferous of the Donets Basin: (a–b) *Mammillichnis monstrum* isp. nov. (Ma) and *Bergaueria perata* Prantl (Be) (a) and *Mammillichnis monstrum* in lateral view (b); (c–d) *Mammillichnis monstrum* isp. nov. (holoichnotype showing a central depression and a rounded tubercle); (e) *Bergaueria perata* Prantl (Be) and ?*Halopoa annulata* (Książkiewicz) (?Ha); (f–g) *Bergaueria perata* Prantl. Figs b, d, g—lateral view; a, c, e, f—apical view.

**Рис. 6.** Іхнофосилії *Mammillichnis* та *Bergaueria* з карбону Донецького басейну: (a–b) *Mammillichnis monstrum* isp. nov. (Ma) та *Bergaueria perata* Prantl (Be) (a) та *Mammillichnis monstrum* збоку (b); (c–d) *Mammillichnis monstrum* isp. nov. (голоіхнотип, який демонструє центральну депресію та округлий горбок); (e) *Bergaueria perata* Prantl (Be) та ?*Halopoa annulata* (Książkiewicz, 1977) (?Ha); (f–g) *Bergaueria perata* Prantl. Рис. b, d, g — вид збоку, a, c, e, f — апікальний вид.

## Taphonomy and Ecology

Trace fossils *Mammillichnis aggeris* Chamberlain usually occur in turbidites [Uchman 1998]. For example, they are known in the Jurassic flysh of Crimea, Ukraine [Baraboshkin 2020], the Paleocene flysh of Italy [Uchman 2007], the Cretaceous–Paleogene flysh of Poland [Książkiewicz 1977, Uchman 1998], the Eocene flysh of Turkey [Demircan & Uchman 2017], the Eocene–Oligocene flysh of France [Knaust *et al.* 2014], and other localities. In the Carboniferous of Great Britain, *Mammillichnis* have been found in deltaic sediments [Eagar *et al.* 1985]; they also have been found in the Cretaceous and Paleogene deep-water fan sediments of Switzerland [Crimes *et al.* 1981]. Pokorný *et al.* [2017] reported *Mammillichnis jakubi* Pokorný *et al.*, 2017 from lacustrine turbidite sediments. All of the trace fossils *Mammillichnis monstrum* examined in this study also come from turbidite rocks.

The trace fossils *Mammillichnis monstrum* apparently mark insignificant pauses in sedimentation preceding the accumulation of turbidite sandstones. In the coarse sandy sediments are preserved mainly large depressions left by sessile coelenterates. Trace fossils are well preserved in some sandstone lenses and poorly preserved in others. This circumstance is apparently related to the different intensity of erosive activity of turbidity currents.

Chamberlain [1971] suggested several variants of possible producers and ethological categories of *Mammillichnis*: (1) resting traces of worm-like organisms; (2) remains of egg clutches; and (3) a vertical tube with a feeding or faecal protrusion on the top, belonging to an unidentified organism.

Książkiewicz [1977] thought that the producer of *Mammillichnis* is Actiniaria. Uchman [1998] revised the originals to Książkiewicz's monograph [1977] and came to the conclusion on the proximity of the ichnogenera *Mammillichnis* and *Laevicyclus*. The model of *Mammillichnis* formation proposed by him [Uchman, 1998: Fig. 2] represented the burrow *Mammillichnis* with a vertical shaft extending from its apical part. I do not agree with this interpretation of the trace fossil *Mammillichnis*, because there is no vertical shaft on the apical part of the burrows *Mammillichnis monstrum* preserved *in situ* in the sandstone layer (Fig. 4 c, e).

By analogy with the morphologically close to *Mammillichnis* ichnogenera *Bergaueria* and *Conichnus* [Pemberton *et al.* 1988, Seilacher 2007], the producers of *Mammillichnis* were probably coelenterates (e.g. Actiniaria). Nevertheless, the ichnogenus *Bergaueria* apparently also includes resting traces of sponges [Dashtgard & Gingras 2012]. It is interesting to note that the remains of hexactinellid sponges are very similar to *Conichnus* [Klug & Hoffmann 2018].

## Conclusions

A new Carboniferous ichnospecies *Mammillichnis monstrum* isp. nov. is described from the Donets Basin, Ukraine. *Mammillichnis monstrum* morphologically differs from *Mammillichnis jakubi* Pokorný *et al.*, 2017. Apparently, *Mammillichnis* are burrows of large sedentary coelenterates, such as Actiniaria. The new finds expand the geographic distribution of *Mammillichnis* and provide additional evidence for their predominant occurrence in turbidite sediments. In addition, these findings indicate the existence of large coelenterates in the Carboniferous marine benthic communities of the Donets Basin.

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