

UDC 563.3:51.733 (477.4)

**SOME REMARKS ON PALEOBIOLOGY OF CNIDARIA - CASE OF STUDY
SILURIAN FOSSIL CORALS FROM PODILLIA, UKRAINE**

V. Grytsenko

National natural history museum of NAS of Ukraine
favosites@ukr.net

Abstract. The article deal with paleobiological features of Silurian fossil corals reconstructed on study its taphonomy, structure of the skeletons with using paleoenvironment affinities and literature resources. Diversity Silurian Cnidarians was shown on many examples studying samples. There were used many years collections of author. Special attention was paid on morphology and microstructure of the skeleton elements of different Cnidarians. Canadian researchers discovered fossil polyps of tabulate corals which show features provide probably exact their connection with modern *Alcyonarians*.

Key words: Silurian, *Cnidarians*, structure, microstructure, diversity, Podolian

Silurian geological sequence is well outcropped in the Dniester valley [1, 12, 14-16 etc.]. Part of the collections cropped from boreholes cores in the west part of Ukraine. Silurian fossil corals are relatively well studied. Many paleontologists paid an attention on the biological affinities of fossil cnidarians such as shape, measurements, speed of their increase, mode of the biomineralization, ways of classification, and so on. In the last time occurs some publication deal with shape and structure of coral polyps. N.N. Jakovlev [6] thought that hornlike shape of the rugosans corals depend on currents and it is reason of bilateralism. The conduct of life of fossil corals was discussed in investigations of B.S. Sokolov [12 etc], B.V. Preobrazhensky [11] and others. On B.V. Preobrazhensky idea thick and thin zones alternation in skeleton of corals depends on periodicity of their sexual cycles [11]. It has been assumed that conduct of life fossil corals like modern one. Most of coral investigators support idea and methods of actually approach for study fossil cnidarians. The lithological research supports adopted conception about environment condition friendly to rugosans, tabulate corals and other cnidarians. As usual polyps (soft tissue) disappear soon after the animal death. There are some publications based on studies of fossil polyps which were discovered in Silurian of Canada [2, 4, 5]. Very interesting things consists in the unusual preservation of polyps of *Favosites aff. forbesi* Milne-Edwards et Haime, *Heliolites thernyshovi* Bondarenko, *Heliolites greneri* Dixon and *H. fuiryi* Dixon in which fossil polyps were conserved.

In the article has been used revision of big collection of corals from Silurian mainly Podolian outcrops and cores of boreholes too. There was examination of thin sections more than 2000 specimens from different viewpoints. Main attention has been paid to microstructure and mode of preservation with hope to repeat lackey finds of fossil polyps made by Canadian researchers [2]. Here has been implemented method of actualism, and detail field description of the sequence sections and lithological revision of the thin sections. The referent Silurian section of Podolian was described many times (Tsegelnyuk, Grytsenko et al., 1983). But the

research could be more intensive and detail on the reason of international significance of the stratigraphical sequence.

There are studied structure of inner composition of different groups of the cnidarians i.e. Tabulate, Rugosans corals and Stromatoporates. On the authors opinion all the animals lived on shallow water basin with normal salinity, in high turbulence conditions. The currents and waves carried meals and oxygen for the animals. Climatic conditions were advantageous for the animal life and asexual and sexual reproduction. Favorable live conditions were reason for bioherms and biostroms construction. Among all Silurian cnidarians were species which life was short and long-lived species. There were species which had endemism and cosmopolitanism [15]. So, cnidarians is favorable object for study. Especially useful are forms which had skeletons. Affinities of skeleton development allowed following links of close form and helps construct logical classification.

The Biological affinities of fossil coral reconstructed on base of study Podolian Silurian one.

Almost all fossil corals were when live mostly planktonophagous. N.Ya. Spasskiy has presupposed that corals with big gullet could be probably predator [13]. Most Cnidarians has cells-cnidoblasts which armed by poison for enemy attack. Fossil corals could be has same adaptation. The immobility of corals contributes development of shimmering epithelium of tentacles produce water current to gullet and coelenteron. Only fill of planktonic was condition for coral life. Most of cnidarians has adopted bigger tentacles for caching food and folded coelenteron for better food assimilation. The rest of assimilated food and other products of metabolism go out through oral mouth. Gas exchange be going on through pellucid epithelium membrane. Modern Scleractinians has symbiotic relation into soft tissue with algae Zooxanthellae which raise gas change and do better metabolic processes. No any doubt that for fossil coral like modern one was inherent sexual reproduction and vegetative dividing. The process of sexual reproduction could be happening like modern. After joining of gametes was organizing larva (planula) which has leaved coelenteron and drifted from few to thirty days (like modern cnidarians). Very often planula could be food for any animals (fishes, for example). When planula has good place for landing, it forms basal disk (or protocoralite) and start own growth. N.Y. Spasskiy has considered that planula way in better case drift by currents on 3000 cm. The same deal with fossil corals. The coral expansion in a new place could be explained by such way. The corals setting in the best places lied to form of bioherms or coral meadows [15]. The migration of coral stopped after attaching to hard ground or very frequently on fossil skeletons of crinoids. We suppose migration of ball-like colonies by currents or just waves on some distance. Such modus of migration could be pointed for *Calamopora alveolaris* Goldfuss and other corals which form are close to ball.

Speculation on fossil corals mod of life has based on modern one. Most of Cnidarians generally accepted as marine animal benthos. Among modern Coelenterate is only one exception - freshwater habitant representative genus Hydra. Almost all modern Cnidarians prefer worm water (18-28°C with normal salinity (24-29 ‰)). They died when temperature or salinity extra limited. Tropic zone favorable for coral actual reef. Depth of coral setting could be achieved 100 and even 200 m upon transparency of water. Only deep-water corals could habitat on depth 1600-2800 m in absolutely dark. In such condition coral lost zooxantella and had very small growth.

In the processes of evolution the corals adopted for life in different conditions. The origin diversity of ecological specialized forms happens. For example, the biotope with weak

turbulence is characterized by branching colonies. Conditions of high turbulence are comfortable for crust-like and massive and incrusting forms of corals.

We have got imaging about the affinities special parts (zones) of paleobasins by studying lithological and mineralogical consist, structure and texture of sedimentary rocks, list and form of fossils and so on. Fossil corals could be often met as in massive limestone and in clayey limestone in Silurian of Podollian region. The finds of fossil corals exclusively rear argillaceous rocks (mudstones). The dolostones and domerites fossil corals are absent. The free-lies, attached and cemented corals were found on different bottom and under various hydrodynamic conditions.

The mud ground has called special adaptation until submersion, such as flattened base with rhizoids (*Rhizophyllum*); tabulate has constructed big flat colonies; wide cone discoid forms are usual for solitary Rugosans, which lived on soft ground (Plate III, fig. 9).

Some free-lies rugosans (*Phaulactis cyathophylloides* Ryder) which has deposits stereoplasma in two quadrants in lower side of corallites against wave turning (Plate III, fig. 8). The species which has good speed of growth could to survive when conditions of sedimentation were intensive. For the example, fasceloid *Holacanthia (Aphyllum) sociale* Soshkina and dendroid *Entelophyllum articulatum* Wehlenberg (Plate II, fig. 6; plate III, fig. 1, 2) which mostly were found in mudstone of Zvenigirod suite (Pridoli) and Konivka suite (Ludlow).

Morphology of corals.

G. Fougat made first attempt to create coral systematic based on their shape (Fougat, 1745). Now among solitary rugosans have been distinguished such shapes.

The shapes of solitary rugosans could be: a – discoidal, b – patelloidal, c – turbinate, d – curved turbinate, e – curved ceratoidal, f – curved cylindrical, g – scoleoidal, h – pyramidal, i – shoe-like [10].

Tabulata and Heliolitoida polypariums divided on ramose and massive one. Massive colonies are flat, convex, spherical, cylindrical and irregular shapes. In the order of orientation of ramose corals distinguish: dendroidal and phaceloidal. Massive polyparium grade on: a – cerioid (the corallites divided by epitheca), b – placoid (epitheca is reduced). Among placoid b1 – corallite epitheca are absent, but septa not reduced, and b2 – aphroid (epitheca absolutely reduced and septa not achieves peripheral part) – in that case is very complicated to determine limits contacted corals [10].

In the mode of coral joining in tabulate corals distinguish net-like (Aulopora), chain-like or catenimorph (spread among Favositida, Heliolitida and Rugosans but characteristic for Halysitida) and verticillate.

Among the main types of colonies and reproduction Rugosans there are: a – phaceloidal, b – dendroidal, c – almost massive, d – cerioidal, e – afroidal, f – astroidal, partial tannasteroidal, g – budding, i Some types polyparies of Tabulata are: a – massive - *Favosites gothlandicus* Lam, b – Syringoporoidal - *Syringopora ramulosa* (Goldf.); c – Halysitoidal (chane) - *Halysites labirinticus* (Goldf.); d – whorled- *Romingeria umbellifera* (Bill).

Dimensions and speed of growth of corals depend on genetic and complex of external factors.

The high of solitary rugosans rates in limits from 2-3 up to 200 mm, but sometimes we can to find bigger one. Maximum high among Silurian corals in Dniester River outcrops has achieves even 100-150 cm. Colony *Entelophyllum articulatum* (Wahl.) which was outcropped on nodular limestone near Velyka Slobidka Village had dimensions from 1-1, 5 m up to 2-3 m. The outcrop is now submerged by water storage of Dniester Hydroelectricity station. Modern

corals life-time reaches to ten and more years. The speed of growth hermatypic corals could be achieving 240 mm per year.

The speed of growth fossil corals and individual age could be easily calculated by season fissures on skeleton surface polyps and polyparies. These characteristic behaviors have varied on different species of fossils corals in broad limits. Some species of Tabulata corals had increase of poliparies from 10 to 40 mm per year. Individual age of samples *Favosites gothlandicus* Lamarck from Konivka suite in our collection vary 4 – 12 years. There are samples which age near 18-20 years. Poliparies of Rugosans *Acervularia ananas sokoliensis* Kadlets from Konivka suite has incremental part of skeleton 15-25 cm per years. Any polyparies older than eight years were found there. One examined specimen of *Endophyllum commodus* Sytova from Pridolian troubchin suite has four years and speed of skeleton secretion up to 50 mm per year. The sample collection *Rhegmaphyllum slitense* Wdkd from Bagovitsa suite were accurately examined. The statistical data determine amount of growth as 3-5 mm per year. The maximum age - 15 years. The average annual increase of Rugosans had range from 5 to 12 mm on data N.Ya. Spasskiy [13]. The present-day hexacorals have speed of skeleton increasing which achieves from 20-30 mm to 80 mm per year. So, velocity of growth Silurian corals has been proportional with rate of growth present day scleractinia. It proved possibility of ancient one to create reef construction in favorable climate and tectonic conditions in the past

The soft tissues of corals as usually could not be preserved in fossilized conditions in contrast to skeletons. Although surprised finds in Silurian of Canadian Anticosti island has proved contrary in some case preservation of fossil polyps [4, 5]. As happens that finds was not unique – later were discovered some new cases of fossilized polyps with spicula, which were described and shown by [2].

The hexactinal symmetry and existing of spicules could to proves systematical position of the corals among Alcionaria.

The structure coral skeletons in detail were studied by many researchers [7, 9, 10, and 17] and others. They have showed diversity of the skeleton tissue arrangement. The main units of the structure are sclerodermits, which was created after crystallization of a gel-like secretion by special foil of ectoderm. The sclerodermit it is microscopic elongated crystal, which is oriented transversely to surface of exoderma [12]. All types of skeleton elements of corals have depended from sculpture of their basal surface. Commonly diagenetic influence was negative factor for primary microstructure of coral skeletons. The process of re-crystallization could to disfigure coral skeleton absolutely. Nevertheless D. Jell and Dorothy Hill had consider that differ types of skeleton structure would gave special shapes of diagenesis, which could be useful for determining systematic group.

The best magnifying power for studying of corals microstructure are in limits from x 10 up to x 40. Such magnification and good preservation allows distinguishing affinities of microstructure of skeleton elements. The optic microscopes give opportunity to observe two main types of microstructure lamellar and trabecular (see plates I-IV). These types of microstructure are characteristic for all investigating groups. The sclerenchima of lamellar type (stereoplasma) had constituted most of horizontal elements of coral skeletons – walls, epitheca, tabulae and dissepiments. The stereoplasma had precipitated on thick septa too.

The trabecules of different types had created base of acanthine septa of Rugosans corals (plate II, fig. 2, 6, 9). The trabecular microstructure was wide spread among Heliolitids. (plate IV, fig. 1, 2). The trabecular tissue was less inherent for Tabulata. (plate I, fig. 2-4, 6). The

evolution of trabecular tissue distinctly shows the tendency to completely from holacanth to rhabdacanth and up to polyserial (multitrabecular) structure (plate II, fig. 2, 6; plate III, fig. 12).

Nowadays electronic microscopes allow using much more enlarging that depend from objects and goals of investigations. For instance, it could be using for studying ultramicrostructure of crystalline mater of fossil corals [7]. Most of investigators and me use thin section or polished surface for studying corals or other invertebrates which has mineral skeleton. Fossil corallites, shells, phragmacone, et cetera mostly constructed by calcite from which we can easy to produce serial thin sections.

But different stages of crystallization could to change the structure of skeleton elements. Best case of preservation the materials in clayey limestone and worth one in pure limestone. The whole alternation of limestone to dolomite as usual eliminates structure of the fossils and even leads to disappearing rests. Sometimes we will find only holes on the fossils places.

Cnidarians very good object for investigation which allows get information on structure of skeletons, facial affinities and environment condition of locations and the type evolution.

I am much appreciated all professors of Kyiv national university named by Taras Shevchenko were I got education and started scientific career. Many thanks for direction of Institute of Geological Science and especially department of stratigraphy and paleontology of Paleozoic deposits for support in joint field work.

EXPLANATION OF PLATES

Plate I

Fig. 1. *Syringolites kunthianus* Ldm., transversal section, x10: NNHM, N1987/5922, Wenlock, Podollian, borehole 3630, depth 1164 m. Characteristic for species is present tabulae closely set and deeply concaved like tube. The depression could be centrally or excentrally seted.

Fig. 2, 3. *Mesofavosites alveolitoides konovskiensis* Tesakov & Sokolov, tangential section, x10, NNHM: 2 – N 1987/1944, 3 – N 1987/1543; both from Konivka suite, Ludlow, outcrop near Moshanets village. Corallites are connected by oval pores, bigger one set in corners of wall and joining three corallites. Septa developed and sometimes brown colored, like squamula.

Fig. 4. *Squameofavosites intricatus* Počta, longitudinal section, x10, NNHM, N1987/3713, Pridolian, Zvinogorod suite, near Dniestrove village, Podollian. For the species characteristic are three rows of pores on one grain of walls, and very long spines, which sometimes joined in center of corallites and connected with tabulae.

Fig. 5. *Scalites prostrates* Tesakov, longitudinal section, x10, NNHM, N1987/3897, Pridolian, Darakhiv Suite near Darakhiv Village, depth 668-670 m. Corallites have irregular shape and creeps along substratum.

Fig. 6. *Mesofavosites alveolitoides konovskiensis* Tesakov & Sokolov, transversal section, x10, NNHM, N 1987/4121, borehole 7, near Moldova, Ikelska suite, Ludlov, outcrop Moshanets, Dniester River, left bank. Transversal section show colored spins which set pairwise on both side of walls.

Fig. 7. *Taxopora xenia* Sokolov, x10: longitudinal section, x10, NNHM, N1987/5157, Pridolian, Trubchyn Suite, Moldova borehole 5, depth 100-102 m. Small branches of corals constructed fan-shaped corallites with thick walls.

Fig. 8. *Hilaepora ramosa* (Mironova), x10: longitudinal section, NNHM, N1987/4446, Pridolian, Darakhov suite, borehole Koropets-Pyshkivtsy-3, depth 1203 m near Koropets Village. The colony constructed by vertical corallites.

Fig. 9. *Favosites gothlandicul* (Lamarck), transversal section, x10, NNHM, N1987/5062, Ludlow, Rhykhta suite, borehole 3641, north of Podollian, depth 98 m. The honeycomb polyparies consist from regular hexagon corallites.

Fig. 10. *Tuvaelites podolicus* sp. nov. longitudinal section, x10, NNHM, N1987/355, Pridolian, Darakhov suite, Ternopil' oblast, borehole near Pidhaisy village, depth 1102 m. The colony of thick flatted and contrast (brown and grey) colored corallites.

Fig. 11. *Thecia saaremica* Klammann, transversal section, x10, NNHM, N1987/714, Pridolian, Zadarivska suite, Ternopil' oblast, borehole near Pidhaisy village, depth 1183 m.

Fig. 12. *Laceripora cribrosa* Eichwald, transversal and at the same case longitudinal section, x10, NNHM, N1987/542, probably Ludlow, near Konivka Suite, outcrope 153 near Holoskiv Village.

Plate II

Fig. 1. *Syrigaxon siluriensis* McCoy. x8, transversal section, NNHM, N1985/3987, Podillia, Pridoli, Zavadvka borehole – 3, depth 1250 m. The twisted septa have developed aulos.

Fig. 2. *Tryplasma loveni* Wd kd. x10, transversal section, NNHM, N1985/3924, Podillia, Ludlow, Rhykhta suite, Darakhov borehole – 1, depth 800-801 m. Acanthine septa separate out separate type – rhabdacanth (Hill, Jell,).

Fig. 3. *Entellophyllum articulatus* (Wahl.), x10, transversal section, NNHM, N1987/5056, Podillia, Ludlow, Rhykhta suite, borehole – 3641, depth 158-159 m. The vesicular zone achieves almost two third of diameter of corallites'.

Fig. 4. *Mesosolenia reliqua* Sokolov, x10, longitudinal section, NNHM, N1985/6091, Podillia, Ludlow, Rhykhta suite, Koropets-Pyshkivtsy borehole – 2, depth 1095.7 m. That species is characteristic by comparatively large oval pores which are situated in corner of walls.

Fig. 5. *Aulopora cf. serpens* sp. x10, transversal section, NNHM, N1987/4415, Podillia, Ludlow, Rhykhta suite, outcrop – 39-12T. The network of small hornlike corallites which has simple contracture and incrusting solid base (others fossils, rocks, hard ground).

Fig. 6. *Holacanthia sociale* Soshk. x10, longitudinal section, NNHM, N1985/4022, Podillia, Zadariv suite, Koropets-Pyshkivtsy borehole – 3338, depth 1016.5. There is phaceloid colony. Corallites have thin and short roots on basal part. Tabula are very thin. The septa represent short holacanth. The epitheca is very special.

Fig. 7. *Phaulactis cyathophylloides* Ryder, x10, transversal section, NNHM, N1985/5944, Podillia, Ludlow, Rhykhta suite, Koropets-Pyshkivtsy borehole – 3338, depth 80 m. There is solitary coral with developed lamellar stereozone on early stage of developing, which correspond on basal part of free corallites incumbent on soft ground.

Fig. 8. *Parastriatopora coreaniformis* Klammann. x10, transversal section, NNHM, N1987/5838, Podillian, Ludlow, Rhykhta suite, borehole – 3642, depth 151 m. Tabulate coral has elongate colony with radiate polygonal corallites and massive stereozone on peripheral part of branch.

Fig. 9. *Tryplasma loveni* W d k d . x10, transversal section, NNHM, N1985/4356, Podillian, Pridoli, Koropets-Pyshkivtsy borehole – 3, depth 116 m. The solitary coral have thin concave tabula, two orders of spiny septa of rhabdacanth type and vesicular tissue on peripheral zone of corallite.

Fig. 10. *Halysites catenularis* L a m a r c k , x10, transversal section, NNHM, N1987/182, Podillia, Wenlock, Ternava suite, outcrope 21A. There is tabulate chain-like coral. The tabula concave thin septa weakly developed. Two or three separate corallites connect into junction.

Fig. 11, 12. *Acidolites lateseptatus* L d m . x10, Podillia, Telych, borehole – 7, depth 694 m.: 11 – longitudinal section, NNHM, N1986/92-250, 12 – transversal section, NNHM, N1986/92-249. The coral differ from *Stelliporella* by thickened walls and septa. It has coenenchymal tubuli controversy coenenchymal vesicle characteristic for *Stelliporella*.

Plate III

Fig. 1, 2. *Entelophyllum* sp. x4, transversal sections, NNHM, N1985/4217, Ludlow, Tviklivtsy Suite, Podillia, borehole – 2, near Koropets and Pyshkivtsy villages, depth 922 m. 1 – The section show deposition of stereoplasma in central zone of corallum; 2 – budding.

Fig. 3. *Acmophyllum armatum* S y t o v a , x4, transversal sections, NNHM, N1985/4876, Podillia, Pridoli, borehole – 7, depth 259 m. The coral has yard-arm septa into central part and stereozone on peripheries one.

Fig. 4. *Lophiostroma schmidti* Y a v o r s k i , x15, longitudinal section, NNHM, N1988/6020, Pridoli, Varnitsa Suite, Ternopil' oblast', near Sataniv village.

Fig. 5. *Streptelasma* sp. x10, transversal section, NNHM, N1985/5839, Goraivka suite, borehole 3662, depth 149,4 m. Septal lamella had created septotheca.

Fig. 6. *Spongophylloides perfecta* W d k d . x10, transversal sections, NNHM, N1985/6091, Podillia, Pridoli, borehole – 3642, depth 163 m. The coral has yard-arm minor and major waved septa.

Fig. 7. *Weissermellia lindsrtoemi* (Smith & Tr.), x6, longitudinal section, NNHM, N1985/5770, Ludlow, Rhykhta suite, Ternopil' oblast', borehole 3641, depth 155-156 m. There is colonial coral with developed broad peripheral vesiculate zone and walls of corallites. The settlement of parasitic worms had detected among corallites.

Fig. 8. *Phaulactis cf. cyathophylloides* R y d e r , x10, transversal section, NNHM, N1985/6091, Ludlow, Rhykhta suite, Ternopil' oblast', borehole 3655, depth 209,3 m. There is solitary coral with developed broad peripheral dissepimentarium, which had replacing stereozone zone on ephebic (adult) stage of life of the coral.

Fig. 9. *Rhyzophyllum gothlandicus* R o e m , x6, transversal section, NNHM, N1985/5256, Ludlow, Rhykhta suite, Chernivtsy oblast', outcrop 21 left bank of Dniester River opposite Malynivtsy village. There is "shoe-like solary" coral with developed vesiculate zone which achieving cap. The cap of the corals often is closed by operculum. Basal surface of the corals almost flat (could be curved), always are developed short roots. The septa belonging to acanthine type. Median row of septa is much stronger than others.

Fig. 10. *Clathrodictyon* sp ind., x10, transversal sections, NNHM, N1988/5826, Podolian, Ludlow, borehole – 3642, depth 162,5 m. The stromatoporoid species is characteristic by wavy lamina connected by short trabeculae.

Fig. 11. *Acervularia ananas konovskiensis* K a d l e z , x6, transversal sections, NNHM, N1985/4894, Podillia, Ludlow, Konivka suite, borehole – 7, depth 367,5 m. The colonies had

been considered to cerioid type but sometimes it is dendroidal one. Inner wall is characteristic feature of the genus.

Fig. 12. *Stortophyllum* sp. x10, transversal sections, NNHM, N1985/5263, Podillia, Ludlow, Rhykhta suite, outcrop 228.

Plate IV

Fig. 1. *Plasmopora scita* Milne-Edwarda et Haim, transversal section, x20, NNHM, N1986/62, Wenlock, Ternava suite, outcrop near Vroublivtsy Village.

Fig. 2. *Pachyhelioplasma podolica* Bondarenko, transversal section, x20, NNHM, N1986/90-34, Pridoli, borehole 7-V, Moldova, depth 338 m, Zvenigorod suite, borehole 7 near Village, depth 338 m.

Fig. 3. *Heliolites interstinctus* Linne, x15, transversal section, NNHM, N1986/92-39, Ludlow, Tviklivtsy Suite, near Moshanets Village.

Fig. 4. *Heliolites interstinctus* Linne, x15, Ludlow, Rhykhta Suite, near Zhvanets Village: 4 – NNHM, N1986/292-39, transversal section.

Fig. 5, 6. *Saaremolotes* sp. x15, transversal section, x10, NNHM, N1986/90-243, 6 – NNHM, N1986/90-242, longitudinal section Ludlow, Konivka Suite, near Konivka Village, II level of bioherms.

Fig. 7. *Heliolites decipiens* MacCoy, x15, transversal section, NNHM, N1986/92-153, Ludlow, Rhykhta Suite, borehole 5483, depth 249 m.

Fig. 8. *Stelliporella intricate* (Ldm), x15, transversal section, NNHM, N1986/1474, Ludlow, Rhykhta Suite, Koropets-Pyshkivtsy borehole 3 near Koropets and Pyshkivtsy Villages, depth 1230,6 m.

Fig. 9. *Heliolites diseptatus* Bondarenko, x15, transversal section, NNHM, N1986/1474, Ludlow, Rhykhta Suite, outcrop 20 – near Malynivtsy village.

Fig. 10 *Cystihalysites* sp. nov. longitudinal section, x20, NNHM, N1986/3888, Ludlow, Rhykhta Suite, borehole – 1 near Darakhov village, depth 834-836 m.

Fig. 11. *Stelliporella*, x10, longitudinal section, NNHM, N1986/4133, Vrublivtsy suite, near Vrublivtsy village, left bank of niester River.

Fig. 12 *Syringoheliolites contrarius* Bondarenko, x10, transversal section, NNHM, N1986/4201, Rhykhta suite, borehole 7-V, Moldova, near village, depth 249 m [1].

-
1. Bondarenko O.B. 1971. Verticalnoe rasprostranenie heliolithoidej v Podolii I vozrast vmeschajuschikh otlozhenij // Vestnik MGU, geol., N.2. – pp.42-48 (in Russian).
 2. Chatterton, Brian & Copper, Paul & Dixon, Owen & Gibb, Stacey. 2008. Spicules in Silurian tabulate corals from Canada, and implications for their affinities. *Palaeontology*. 51. 173 - 198.
 3. Chernyshev B.B. 1951. Silurijskie i devonskie Tabulata i Heliolitida okrain Kuznetskogo uglennogo basseina. M: Gosgeoltekhizdat. – pp. 3-160 (in Russian).
 4. Copper, P. 1985. Fossilized polyps in 430-Myr-old Favosites corals. *Nature*, 3 16: 142-144.
 5. Copper, P. & Plusquellec, Y. 1993. Ultrastructure of the walls, tabulae and "polyps" in Early Silurian Favosites from Anticosti Island, Canada. *Cour. Forsh. Senckenberg*, 1 64: 301-308.

6. *Jakovlev N.N.* 1926. Razlichnye ob'jasnenija dvustoronnej simmetrii corallov Rugosa. – Zapiski Gornogo institute, 1926. – pp.27-33 (in Russian). (Яковлев Н.Н. Различные объяснения двусторонней симметрии кораллов – Записки Горного института, 1926, с. 27-33).
7. *Jell J.S., Hill D.* 1974. The microstructure of corals. *Drevnie Cnidaria*. Vol. I, Novosibirsk: Nauka. 1974. – pp.8-14.
8. *Klaamann E.R.* 1970. Izmenchivost s taksonomicheskoe polozhenie Angopora hisingeri (Jones). // Trans. AS of Estonia (chemistry, geology), v. XIX, n.1. - 62-67 (in Russian).
9. *Lindstroem G.* 1899. Remarks on the Heliolitidae. *Kgl. Svenska Vat. Handl.*, 32, 1. – pp. 3-140.
10. *Moore R.C. (ed.)*. 1956. Treatise on Invertebrate Paleontology. Part F. Coelenterata. University of Kansas Press, 1956, pp.1-498.
11. *Preobrazhenskiy B.V.* 1967. Znachenie zonalnykh javleniy v skelete tabulatomorphnykh corallov // Paleont. Jurnal, N. 3. – pp. 3-8 (in Russian).
12. *Sokolov B.S.* 1955. Tabulaty paleozoja Evropeiskoi hasti SSSR. Trudy VNIGRI, new ser., vyp 85. – pp.1-527 (in Russian).
13. *Spasskij N.Ja.* 1967 Paleoecology chetyriokhluchevykh corallov // Paleont. Jurnal, N. 2. – pp. 7-14 (in Russian). (Спасский Н.Я. 1967. Палеоэкология четырехлучевых кораллов. – Палеонтологический журнал, №2, с. 7-14).
14. *Sytova V.A.* 1968. Tetracorally skalskogo i borschovskogo gorizontovPodolii // Silurian and Devonian fauna Podolii. L: LGU, - pp. 57-71 (in Russian).
15. *Tesakov Yu.I.*, 1971. Favositidy Podolii. – Moscow: “Nauka”. – pp.5-116 (in Russian).
16. *Tsegelnjuk P.D., V.P. Grytsenko, L.I. Konstantinenko, A.A. Ischenko, A.F. Abushik, O.V. Bogoyavlenskaia, D.M. Drygant, V.S. Zaika-Novatsky, G.N.Kiselev, V.A.Sytova* .The Silurian of Podolia: A guide to the excursion. Kiev: “Naukova dumka”. – 224 p. (in Russian and English)
17. *Wang H.C.*, 1950 A revision of the Zoantharia Rugosa in the light of their skeletal structures. Philos. Trans. Royal Society, London, ser.B., v.234, p. 175-246, pl. 4-9.

ЗАУВАЖЕННЯ ПРО ПАЛЕОБІОЛОГІЮ КНІДАРІЙ НА ПРИКЛАДІ ВИКОПНИХ КОРАЛІВ СИЛУРУ ПОДІЛЛЯ

Володимир Гриценко

*Національний науково-природничий музей НАН України,
вул. Богдана Хмельницького, 15, 01022, Київ, Україна*

На прикладі вивченої колекції викопних кнідарій (корали та строматопори переважно силуру Поділля) описані деякі їхні біологічні особливості. На багатьох прикладах показана різноманітність кнідарій силуру. Використані багаторічні збори автора. Особливу увагу приділено морфології та мікроструктурі скелетних елементів кнідарій. За матеріалами дослідження канадійськими колегами викопних поліпів, вважається можливим зв'язок табулятоморфних коралів з сучасними коралами альціонарія.

Ключові слова: силур, кнідарії, будова, мікроструктура, біологічна різноманітність, Поділля.

Стаття надійшла до редколегії 14.03.2018
Прийнята до друку 18.04.2018