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THE PALEOBIOLOGY OF CNIDARIA – CASE STUDY SILURIAN FOSSIL CORALS FROM PODILLIA, UKRAINE

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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 skeleton elements of different Cnidarians. Canadian researchers discovered fossil polyps of tabulate corals which show features provides their possible connection with modern *Alcyonaria.*

Key words: Silurian, *Cnidaria,* structure, microstructure, biological diversity, Volyno-Podillia.

Silurian geological sequent are well outcropped in west part of Ukraine. The fossil corals are relatively well studied but field for more deep investigation are free still. Many paleontologists paid attention on different biological affinities of fossil cnidarians such as classification, study of shape, measurements, speed of skeleton increasing, mod of biomineralization and so on. N. N. Yakovlev thought that hornlike shape of Rugoses corals depend on currents and it is reason of bilaterally. In the last time occurs some publication deal with shape and structure of coral polyps. The conduct of life of fossil corals was discussed in investigations of B. S. Sokolov (Sokolov, 1962), O. G. Kravtsov (1971), B. V. Preobrazhensky (1967) and others. On B. V. Preobrazhensky idea thick and thin zones alternation in skeleton of corals depends on periodicity of their sexual cycles (Preobrazhenskiy, 1967). It has been assumed that conduct of life fossil corals like modern one. Most of coral investigators support idea and methods of approach for study fossil cnidarians based on investigation of living corals. The lithological research supports adopted conception about environment condition friendly to corals and other cnidarians. As usual polyps disappear soon after animal (coral) death. There are some publications based on studies of fossil polyps which were discovered in Silurian of Canada (Copper, 1985; Copper, & Plusquellec, 1993; Chatterton, Copper, Dixon, & Stacey, 2008). Very interesting things consists in the unusual preservation of polyps of *Favosites aff. forbesi* Milne-Edwards et Haime and some samples of *Heliolites tchernyshovi* Bondarenko, *Heliolites greneri* Dixon and *H. fuiryi* Dixon which has well conservated (fossil) polyps and spicula.

In the article has been used revision of big mainly Podillian collection of corals from Silurian outcrops and cores of boreholes too. The examination of thin sections more than 2000 specimens was done from different viewpoints. Main attention has paid to microstructure and mode of preservation with hope to repeat lackey finds of fossil polyps has made by Canadian researchers. Here has implemented present value method, and detail field description of sequence sections and lithological study, paleontological identification, definition and revision of the thousandth microsections. The referent Silurian section of Podillia described many times (Nikiforova, 1954; Tsegelnyuk, Grytsenko et al., 1983).

The collections of Cnidaria had mined from Silurian basins mainly of Podillia and Moldova. It is comprise few thousand specimens. Most exemplars of the collections are represented by specimens from outcropped sequences and some – from borehole cores. More than two thousand thin sections were made. Thin sections of corals studying in digital microscope under scale from x4 to x30.

The material is stored in the collections of National Natural History Museum of NAS of Ukraine in department of monographic collection. Collections numbers are: Rugosans – 1985, Heliolitoidea – 1986, Tabulates – 1987 and Stromatoporates – 1988.

There are studied structure of inner composition of different groups of cnidarians i.e. Tabulata, Heliolitoidea, Rugosans corals and Stromatoporates. All specimens are link to stratigraphical scale (Tsegelnjuk, Grytsenko and all, 1983). The collections analyze had help to study facial and species diversity of the basin of sedimentation. The communities of fossil fauna of Silurian and Lower Devonian were made (Grytsenko, Tsegelyuk at al., 1999).

The Biological affinities of fossil coral reconstructed on base of study samples from Podillian Silurian referent section.

Physiology. Almost all fossil corals were (when live) mostly planktonophagous. N. Ya. Spaskiy has presupposed that corals with big gullet could by probably predator (Spasskiy, 1967). Most Cnidarians has cells-cnidoblasts which armed by poison for enemy attack. Fossil corals could be having same adaptation. The immobility of corals contributes development of shimmering epithelium of tentacles produce water current to gullet and coelenterons. Only fill of plankton was need condition for coral life. Most of cnidarians has adopted bigger tentacles for caching food and folded coelenterons for better food assimilation. The rest of assimilated food and other products of metabolism go out through oral mouth. Gas exchange is going on through pellucid epithelium membrane. Modern Scleractinia 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 developing larva (planula) which has leaved away through coelenteron and drifted from few to thirty days (lake 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 could drift by currents on 3 000 km. 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 had lied to form of bioherms or so-called coral "medows" (Tesakov, 1974). The migration of coral stopped after attaching to hard ground or very frequently the animal larva settle 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.

Environment and paleoecology. Speculation on fossil corals mod of life has based on manner vital activity of resent Scleractinia. Most of Cnidarians generally has 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 achieves extra limited. Tropic zone is favorable for creation of actual coral 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 1 600–2 800 m in dark (Keller, 1978). In such deep-water condition the corals lost zooxantella and that appearance by very small growth.

In the processes of evolution corals were adopted for life in different conditions. The origin diversity of ecological specialized forms happens. For example, marine biotope with weak turbulence is characterized by developing of branching colonies. The biotopes (growth medium) of high turbulence were probably comfortable for massive and incrusting (crust-like) forms of corals (Gritsenko, Konstantinenko, Tsegelnyuk and Ischenko, 1993). We had got imaging about the affinities special parts (zones) of paleobasins by studying lithological and mineralogical consist, structure and texture of sedimentary rocks, list of species and form of fossils and so on. Fossil corals could be often met as in massive limestone and in clayey limestone in Silurian of Podillian region. The finds of fossil corals exclusively rear in argillaceous rocks (mudstones). In the dolostones and domerites fossil corals are absent. The free-lied, attached and cemented corals were found on different bottoms and under differing hydrodynamic conditions respectively.

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

Some free-lies rugoses, for exsample *Phaulactis cyathophylloides* Ryder, which has deposits stereoplasma in two quadrants on lower side of copalites against wave turning (tabl. 2, fig. 7). The species which has adequate speed of growth could to survive when velocity of sedimentation was intensive. For the example, phaceloid *Holacanthia (Aphyllum) sociale* Soshkina (tabl. 2, fig. 6) and dendroid *Entelopyllum articulatum* Wehlenberg (tabl. 2, fig. 3, tabl. 3, fig. 7), which mostly were found in mudstone of Zvenigirod suite (Přidoli) and Konivka suite (Ludlow) correspondingly.

Morphology of corals. G. Fougt made first attempt to create coral systematic based on their shape (Hill, 1935). Now among solitary rugoses have been distinguished nine shapes as minimum (text fig. 1).

Tabulata and Heliolitoidea polypariums divided on ramose and massive one. Massive colonies have flat, convex, spherical, cylindrical and irregular shapes. The orders of corallites position among of ramose corals have been distinguished: dendroid (*a*) and phaceloid (*b*). Massive polyparium grade on: *d* – cerioid (the corallites divided by epitheca), *c* – placoid (epitheca is reduced). Among placoid: *e* – epitheca of corallites is absent, but septa not reduced, and *g* – aphroid (epitheca absolutely reduced and septa not achieves peripheral part of corallites) – in that case is very complicated to determine limits contacted corals (text fig. 2). 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 (text fig. 3).

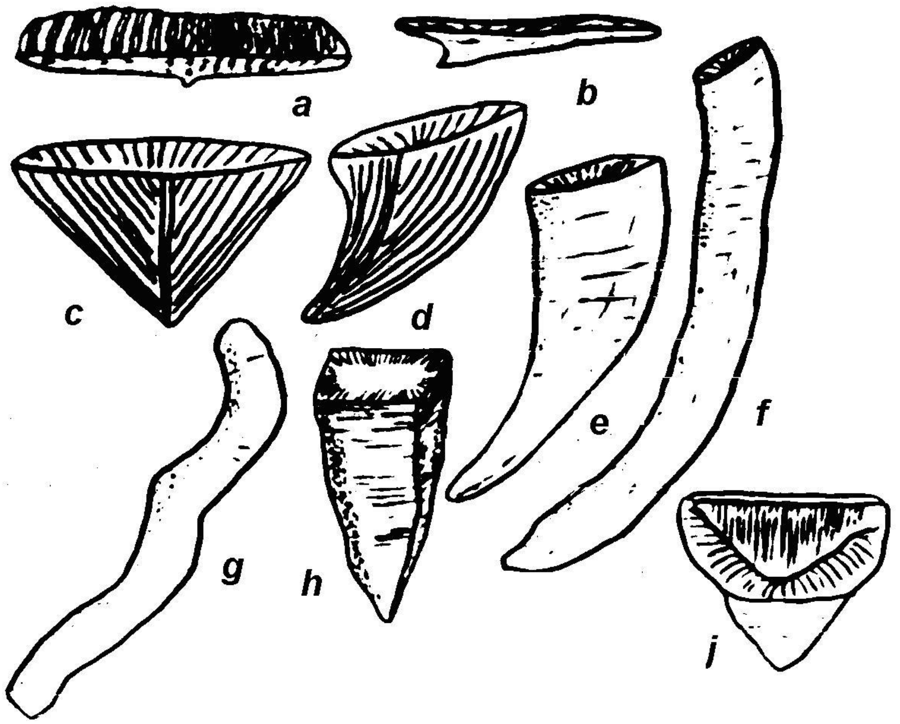

Fig. 1. The shape of solitary rugoses: *a* – discoid, *b* – patellate, *c* – turbinate, *d* – curved turbinate, *e* – curved ceratoid, *f* – curved cylindrical, *g* – scoleoid, *h* – pyramidal, *j* – shoe-like (Hill, 1935)

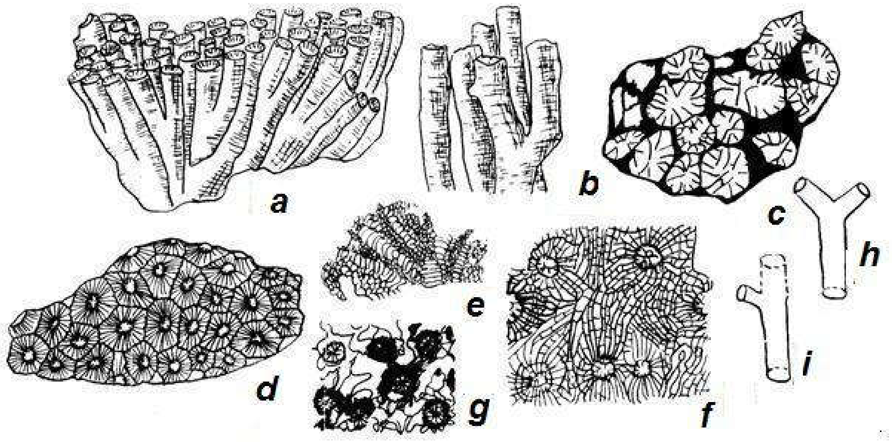

Fig. 2. The main types of colonies and reproduction Rugosans: *a* – phaceloid, *b* – dendroid, *c* – almost massive, *d* – cerioid, *e* – aphroid, *f* – astroid, partial tamnasteroid, *g* – schema of parricidal budding, *h* – schema nonparricidal budding (after Hill, 1956; Shimer, Shrock, 1959; Ivanovskiy, 1971)

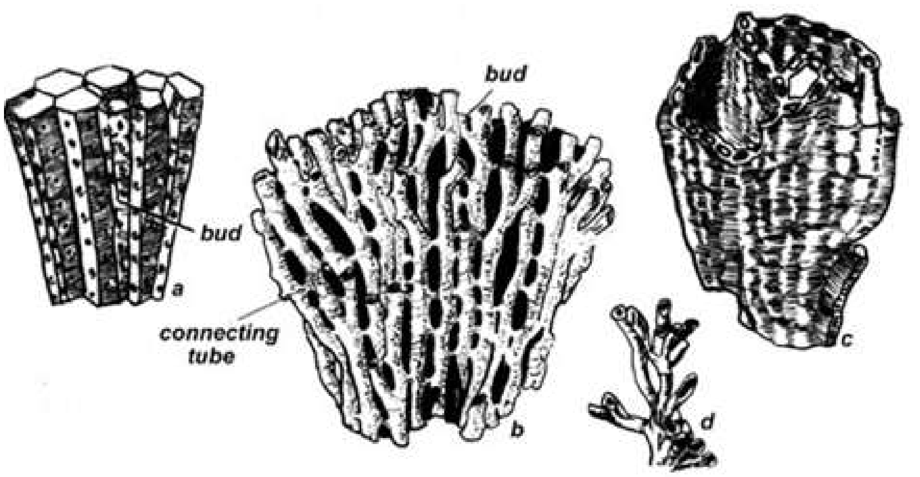

Fig. 3. Some types poliparies of Tabulata: *a* – massive – Favosites gothlandicus Lam, *b* – Syringoporoid – Syringopora ramulosa (Goldf.), *c* – Halysitoid (chain-like) – Halysites labirinticus (Goldf.), *d* – whorled – Romingeria umbellifera (Bill) (after Hill, 1956)

Dimensions and speed growth of corals depend on genetic and complex of external factors, such as light, temperature and so on. The high of solitary rugoses rates in limits from 2–3 up to 200 mm, but sometimes we meet bigger one. Maximum high among Silurian corals in Dniester River outcrops has achieves even 100–150 cm. Colony *Entelophyllum articulatum* (Wahl.) which was outcropped from nodular limestone near Velyka Slobidka Village had dimensions 2–3–1–1,5 m. The outcrop now submerged by water storage of Dniester Hydroelectricity station. Modern corals lifetime span tens years now. The speed of growth hermatypic corals could be archives 240 mm per year on (Poliakov, Krasnov, 1977) data.

The speed of growth fossil corals and individual edge 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 Tabulate corals had increase of polypariums from 10 to 40 mm per year. Individual edge of samples *Favosites gothlandicus* Lamarck from Konivka suite in our collection vary 4–12 years. There are samples which edge near 18–20 years. Polypariums of Rugoses *Acervularia ananas sokoliensis* Kadlets from Konivka suite has incremental part of skeleton 15–25 mm per years. Any polypariums older than eight years were found there. One examined specimen of *Endophyllum commodus* Sytova from Přidolian 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 and maximum edge 15 years. The average annual increase of Rugoses had range from 5 to 12 mm on data N. Ya. Spasskiy (Spasskiy, 1967). The present-day hexacorals has increased skeleton with speed from 20–30 mm to 80 mm per year (Kravtsov, 1971). So, velocity of growth Silurian corals has been proportional with rate present Scleractinia. It proved possibility of ancient one to create reef construction under favorable climate and tectonic conditions in the past.

The soft tissues of corals as usually could not to be preserved in fossilized conditions in contrast to skeletons. Although surprised find in Silurian of Canadian Anticosti island has proved contrary in some case preservation of fossil polyps (Copper, Plusquellec, 1993). As happens that find was not unique – later were discovered some new cases of fossilized polyps with spicula, which were described and shown by (Chatterton, Brian & Copper, Paul & Dixon, Owen & Gibb, Stacey (2008).

The octactinal symmetry and existing of spicules can be reason to prove systematical position of the corals among *Alcyonaria*.

Microstructure of coral skeletons. The structure coral skeletons in detail was studied by many researchers (Swaan, 1947), (Wang, 1947), (Jell and Hill**,** 1974) and others. They had showing 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 sclerodermits are microscopic elongated crystals, which are oriented transversely to surface of exoderms. (Sokolov, 1962). All types of skeleton elements of corals have depended from sculpture of their basal surface. Commonly diagenesis influence was negative factor for primary microsculpture of coral skeletons. The process of crystallization could to disfigure coral skeleton absolutely. Nevertheless D. Jell and Dorothy Hill (1974) had considered that differ types of skeleton structure would give 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 10x up to x 40. Such magnification and good preservation allows distinguishing affinities of microsculpture of skeleton elements. The optic microscopes give opportunity to observe two main types of microstructure lamellar and trabecular. 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, tabula and dissepiments. The stereoplasma had precipitated on thick septa too.

The trabecula of differ types had created base of acanthine septa of Rugusans corals. The trabecular microstructure was wide spread among Heliolitids. The trabecular tissue is less prevailing for Tabulata corals. The evolution of trabecular tissue had distinctly showed the tendency to completely from holacanth to rhabdacanth and up to polyserial (multitrabecular) structure.

Nowadays electronic microscopes allow using much more enlarging that depend from objects and goals of investigations. For instance, it could be using for differentiating ultramicrostructure crystalline mater.

The studding collections show significant diversity of morphology, microstructure and systematic. The corals wide spread in Silurian deposits and could be collected not only in outcrops but in cores of boreholes which was drilled on west of Ukraine from 1966 year. The specification of some species has been very easy on base specific affinities. On the other hand, different species has distinctive stratigraphic spread and facies preference. Very interesting find of fossil polyps in Silurian of Canada define task to carry out reexamination of our museum coral collections accurately to discover the same fossil structure in future.

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EXPLANATION OF PLATES

Plate *I*

Fig. 1. *Syringolites kunthianus* Ldm., x10, transversal section, NNHM, N 1987/5922, Wenlock, Vroublevtsy Suite, Podillia, borehole 3 630, depth 1 164 m. Characteristic for species present tabulae closely set and deeply concaved like tube. The depression could be centrally or excentrally set

Fig. 2, 3. *Mesofavosites alveolitoides konovskiensis* Tesakov & Sokolov, x10, tangential section, 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*,* x10, longitudinal section, NNHM, N 1987/3713, Přidoli, Zvinogorod Suite, near Dniestrove village, Podillia. For the species characteristic are three rows of pores on one grain of walls, and very long spines, which sometimes joined in center of corallite and connected with tabulae

Fig. 5. *Scalites prostrates* Tesakov*,* x10, longitudinal section, NNHM, N 1987/3897, Přidoli, Darakhiv Suite near Darakhiv Village; depth 668–670 m. Corallites have irregular shape and creeps along substratum

Fig. 6. *Mesofavosites alveolitoides konovskiensis* Tesakov & Sokolov, x10, transversal section, NNHM, N 1987/4121, borehole 7, near Moldova, Ikelska suite, Ludlow, 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, NNHM, N 1987/5157, Přidoli, Trubchyn Suite, Moldova borehole 5, depth 100–102 m. Small branches of corals constructed fan-shaped corallites with thick walls

Fig. 8. *Hilaepora □amose* (Mironova), x10, longitudinal section, NNHM, N 1987/4446, Přidolian, Darakhov suite, borehole Koropets-Pyshkivtsy-3, depth 1 203 m near Koropets Village. The colony consists from vertical corallites

Fig. 9. *Favosites gothlandicul* (Lamarck), x10, transversal section, NNHM, N 1987/5062, Ludlow, Rhykhta suite, borehole 3 641, north of Podillia, depth 98 m. The honeycomb polyparies consist from regular hexagon corallites

Fig. 10. *Tuvaelites sp. nov.,* x10, longitudinal section, NNHM, N 1987/355, Přidolian, Darakhov suite, Ternopil' oblast, borehole near Pidhaitsy village, depth 1 102 m. The colony of thick flatted and contrast (brown and grey) colored corallites

Fig. 11. *Thecia saaremica* Klaamann, x10, transversal section, NNHM, N 1987/714, Přidolian, Zadarivska suite, Ternopil' oblast, borehole near Pidhaitsy village, depth 1 183 m

Fig. 12. *Laceripora cribrosa* Eichwald, x10, transversal and at the same case longitudinal section, NNHM, N 1987/542, Ludlow, near Konivka Suite, outcrope 153 near Holoskiv Village

Plate *II*

Fig. 1. *Syrigaxon siluriensis* McCoy, x8, transversal section, NNHM, N 1985/3987, Podillia, Přidoli, Zavadivka borehole – 3, depth 1 250 m. The twisted septa have developed aulos

Fig. 2. *Tryplasma loveni* Wdkd., x10, transversal section, NNHM, N 1985/3924, Podillia, Ludlow, Rhykhta suite, Darakhov borehole – 1, depth 800–801 m. Acanthine septa separate out separate type – rhabdacanth (Hill, Jell)

Fig. 3. *Entellopyllum articulatus* (Wahl.), x10, transversal section, NNHM, N 1987/5056, Podillia, Ludlow, Rhykhta suite, borehole – 3 641, depth 158–159 m. The vesicular zone achieves almost two third of diameter of the corallite.

Fig. 4. *Mesosolenia reliqua* Sokolov, x10, longitudinal section, NNHM, N 1985/6091, Podillia, Ludlow, Rhykhta suite, Koropets-Pyshkivtsy borehole – 2, depth 1 095,7 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, N 1987/4415, Podillia, Ludlow, Rhykhta suite, outcrop – 39–12 T. It is network of small hornlike corallites which has simple contracture and incrusting solid base (other fossils, rocks, hard ground)

Fig. 6. *Holacanthia sociale* Soshk., x10, longitudinal section, NNHM, N 1985/4022, Podillia, Zadariv suite, Koropets-Pyshkivtsy borehole – 3 338, depth 1 016,5. 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, N 1985/5944, Podillia, Ludlow, Rhykhta suite, Koropets-Pyshkivtsy borehole – 3 338, depth 80 m. There is solitary coral with developed lamellar stereozone on early stage of developing, which corresponds on basal part of free corallite incumbent on soft ground

Fig. 8. *Parastriatopora coreaniformis* Klaamann, x10, transversal section, NNHM, N 1987/5838, Podillia, Ludlow, Rhykhta suite, borehole – 3 642, depth 151 m. Tabulata coral has elongate colony with radiate polygonal corallites and massive stereozone on peripheral part of branch

Fig. 9. *Tryplasma loveni* Wdkd., x10, transversal section, NNHM, N 1985/4356, Podillia, Přidoli, 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* Lamarck, x10, transversal section, NNHM, N 1987/182, Podillia, Wenlock, Ternava suite, outcrope 21A. There is tabulate chain-like coral. The tabula concave thin septa weekly developed. Two or three separate corallites connect into junction

Fig. 11, 12. *Acidolites lateseptatus* Ldm., x10, Podillia, Telych, borehole – 7, depth 694 m.: 11 – longitudes section, NNHM, N1986/92–250, 12 – transversal section, NNHM, N 1986/92–249. The coral differs from *Stelliporella* by thickened walls and septa. It has coenenchymal tubules controversy coenenchymal vesicle characteristic for *Stelliporella.*

Plate *III*

Fig. 1, 2. *Entelophyllum sp.,* x4, transversal sections, NNHM, N 1985/4217, 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* Sytova, x4, transversal sections, NNHM, N 1985/4876, Podillia, Přidoli, borehole – 7, depth 25 m. The coral has yard-arm septa into central part and stereozone on peripheries one

Fig. 4. *Lophiostroma schmidti* Yavorski, x15, longitudinal section, NNHM, N 1988/6020, Přidoli, Varnitsa Suite, Ternopil' oblast', near Sataniv village

Fig. 5. *Streptelasma* sp., x10, transversal section, NNHM, N 1985/5839, Goraivka suite, borehole 3 662, depth 149,4 m. Septal lamella had created septotheca

Fig. 6. *Spongophylloides perfecta* Wdkd., x10, transversal sections, NNHM, N 1985/6091, Podillia, Přidoli, borehole – 3 642, depth 163 m. The coral has yard-arm minor and major waved septa

Fig. 7. *Weissermellia lindsrtoemi* (Smith & Tr.), x6, longitudinal section, NNHM, N 1985/5770, Ludlow, Rhykhta suite, Ternopil' oblast', borehole 3 641, depth 155–156 m. There is cerioid colonial coral with developed broad peripheral vesiculate zone and walls of corallites. The settlement of parasitic vermes had detected among corallites

Fig. 8. *Phaulactis cf. cyathophylloides* Ryder, x10, transversal section, NNHM, N 1985/6091, Ludlow, Rhykhta suite, Ternopil' oblast', borehole 3 655, depth 209,3 m. There is solitary coral with developed broad peripheral dissepimentarium, which had replacing stereozone zone on ephebical (adult) stage of life of coral

Fig. 9. *Rhyzophillum gothlandicus* Roem, x6, transversal section, NNHM, N 1985/5256, Ludlow, Rhykhta suite, Chernivtsy oblast', outcrop 21 left bank of Dniester River opposite Malynivtsy village. There is shoe-like solitary coral with developed vesiculate zone which achieving cap. The cap of the corals often is closing by operculum. Basal surface of the corals almost flat (could be curved), always are developed short roots. The septa belong to acanthine type. Median row of septa is much stronger than others

Fig. 10. *Clathrodictyon* sp ind., x10, transversal sections, NNHM, N 1988/5826, Podillia, Ludlow, borehole – 3 642, depth 162,5 m. The stromatoporoid species is characteristic by wavy lamina connected by short trabeculae

Fig. 11. *Acervularia ananas konovskiensis* Kadlez*,* x6, transversal sections, NNHM, N 1985/4894, 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, N 1985/5263, Podillia, Ludlow, Rhykhta suite, outcrop 228.

Plate *IV*

Fig. 1. *Plasmopora scita* Milne-Edwarda et Haim, transversal section, x20, NNHM, N 1986/62, Wenlock, Ternava Suite, outcrop near Vroublevtsy Village

Fig. 2. *Pachyhelioplasma podolica* Bondarenko, transversal section, x20, NNHM, N 1986/90–34, Přidoli, 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, N 1986/92-39, Ludlow, Tviklivtsy Suite, near Moshanets Village

Fig. 4, 6. *Heliolites interstinctus* Linne, x15, Ludlow, Rhykhta Suite, near Zhvanets Village: 4 – NNHM, N 1986/292–39, transversal section; 6 – NNHM, N 1986/90–242, longitudinal section

Fig. 5. *Heliolites interstinctus* Linne, x15, transversal section, section, x10, NNHM, N 1986/292, Ludlow, Rhykhta Suite, near Zhvanets Village

Fig. 7. *Heliolites decipiens* MacCoy, x15, transversal section, NNHM, N 1986/92–153, Ludlow, Rhykhta Suite, borehole 5 483, depth 249 m

Fig. 8. *Stelliporella intricate* (Ldm), x15, transversal section, NNHM, N 1986/1474, Ludlow, Rhykhta Suite, Koropets-Pyshkivtsy borehole 3 near Koropets and Pyshkivtsy Villages, depth 1 230,6 m

Fig. 9. *Heliolites diseptatus* Bondarenko, x15, transversal section, NNHM, N 1986/1474, Ludlow, Rhykhta Suite, outcrop 20 – near Malynivtsy village

Fig. 10 *Cystihalysites* sp. nov. longitudinal section, x20, NNHM, N 1986/3888, Ludlow, Rhykhta Suite, borehole – 1 near Darakhov village, depth 834–836 m

Fig. 11. *Syringoheliolites contrarius* Bondarenko, x10, longitudinal section, NNHM, N 1986/4133, Rhykhta suite, borehole 7-V, Moldova, near village, depth 249,6 m.

Fig. 12. *Syringoheliolites contrarius* Bondarenko, x10, transversal section, NNHM, N 1986/4201, Rhykhta suite, borehole 7-V, Moldova, near village, depth 249 m.

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ПАЛЕОБІОЛОГІЯ КНІДАРІЙ НА ПРИКЛАДІ ВИКОПНИХ КОРАЛІВ СИЛУРУ ПОДІЛЛЯ

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На прикладі вивченої колекції викопних кнідарій (корали та строматопори переважно силуру Поділля) описано деякі їхні біологічні особливості. На багатьох прикладах показано різноманітність кнідарій силуру. Використано багаторічні збори автора. Особливу увагу приділено морфології та мікроструктурі скелетних елементів кнідарій. За матеріалами дослідження можливий зв'язок табулятоморфних коралів з сучасними коралами альціонарія.

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

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