ACADEMY OF SCIENCES OF UKRAINE

INSTITUTE OF GEOLOGICAL SCIENCES

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Gaptolites and stratigraphy of the Silurian of Ukraine

K y i v – T o r o n t o
2000

UDC 563.719:551.733.3] (477)
Graptolites and stratigraphy of the Silurian of Ukraine / Tsegelnyuk P.D., responsible. ed. Vdovenko M.V., Academy of Sciences of Ukraine. Geol Institute Sciences. Kyiv, 2000. - 267 p.

The monograph describes 47 species and 7 subspecies of graptolites belonging to 25 genera of 5 families of the order Graptoloidea. Of these, one genus is new to science and a new name has been proposed for one genus. Also described are 3 genera and 2 species of unclear taxonomic position.

Photographs of graptolite rhabdosome fragments are shown on 50 paleontological tables, 14 of which are microscopic drawings of rhabdosome fragments. Photos and drawings are made by the author.

The description of the stratigraphic scheme of the Silurian system in the southwest of the East European Platform (EEP) is illustrated by 34 drawings made by the author.

Biostratigraphy of the Silurian of Volyno-Podolia shows that the paleontological criterion for subdividing rock sections of outcrops and boreholes makes it possible to divide the Silurian Period (System) into three Epochs (Subsystems) - Early (Lower), Middle (Middle) and Late (Upper).

Epochs (Subsystems) of the Silurian Period (System) are divided into Etapes (Belts), Etapes (Belts) - into Ages (Stages), Ages (Stages) - into Phases (Zones).

The zonal subdivision of the studied sections of outcrops and boreholes is substantiated according to the data of the stratigraphic distribution of the remains of brachiopods (83), graptolites (84, 85, 87, 99, 100), and chitinozoans (94) personally studied by the author monographically.

The most detailed (accurate to Stages and Zones) subdivision of deep-sea deposits of the Silurian, containing the remains of graptolites, chitinose, and other planktonic groups of organisms, is possible.

The Bolotynian, Furmanovian, and Nevridian horizons (Stages) of the Silurian of Volyno-Podolia correspond in terms of stratigraphic volume, method of substantiation, and age to the Telychian, Sheinwoodian, and Gorstian Stages of the stratotype area of the Silurian of Wales (Great Britain) and the ISS (see Fig. 2).

The Alizonian and Paralatian Stages are correlated in terms of brachiopod and graptolite remains with the Whitwellian and Gleedonian Stages of Great Britain. The boundary between them was established long ago and is now known as the paleobiological event *Cyrtograptus lundgreni* (222). This is the boundary of a high paleontological rank (therefore, it coincides with the boundary between the indicated Stages) - it divides the Middle Epoch (Middle Subsystem) of the Silurian of Volyno-Podolia into two major Etapes (Belts): the Kitaygorodian and Tiritian.

The Ludfordian “Stage” of the Silurian in the stratotype region of Great Britain has insufficient paleontological substantiation due to the rare occurrence of fossil remains. Until recently, it was considered the last Stage of the Silurian system. It is overlain by the “Devonian”, as it was believed, Old Red Sandstones sequence.

It turned out that in the Dniester reference section (and within the southwest of the EEP), starting from the Ludfordian “Age” (above the *Saetograptus leintwardinensis* graptolitic zone) and up to the end of the Silurian period (up to the foot of the *Tirassograptus uniformis* graptolitic zone), the geological history of the Earth was documented in the remains fossil organisms of 5 (five!) Ages (from bottom to top): Konovian, Tagrian, Metonian, Stavanian and Sklavian.

Therefore, we recommend using the indicated Stages above the Gorstian Stage of the modern ISS of the Silurian system in the future updated ISS.

We recommend that the Silurian, as well as other geological systems of the Phanerozoic, be distinguished in the ISS as subdivisions of paleontological substantiation of such a rank as a Belt (Etape).

For stratigraphic practice and science, biostratigraphic units of the Belt rank are no less, but more important than the Stage, since the Stage is less likely than the Belt to be established from the study of the remains of benthic groups of organisms and plants that make up the predominant part of paleontological objects in the sedimentary sequence of Earth.

The absence of a biostratigraphic subdivision of the rank of a Belt (Etape) in the ISS gave rise in statigraphic practice and science to such concepts as “Regiostage”, “Suprahorizon” and “Subsystem”, which are understood and interpreted by “specialists” ambiguously, which leads to additional and unjustified errors in stratigraphic schemes (32) and research results.

It is also obvious that further use in the ISS of the Silurian and other geological Periods (Systems) in an explicit or veiled form of litho-stratigraphic units of the “Series” and “Formation” type will not contribute to “... a common language in stratigraphy” (109, p. 87).

For paleontologists, stratigraphers, university students and general geologists.

34 illustrations, 50 paleontological tables. Bibliography: p. 139 - 148 (223 titles).

Responsible editor: Doctor of Geological and Mineralogical Sciences M.V.Vdovenko.

Approved for publication by the Academic Council of the Institute of Geological Sciences of the Academy of Sciences of Ukraine.

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Introduction

In the western and southwestern regions of Ukraine, pelagic (open sea) and hemipelagic (transitional to shelf) sediments of the Silurian and Lower Devonian are widespread with numerous remains of graptolites of good and very good preservation. The most reliable biostratigraphic subdivision and their correlation is provided by graptolitic zones.

Zonal stratigraphy is one of the urgent tasks of modern geological science and practice, especially now, when detailed stratigraphic schemes and legends are being developed for large-scale geological mapping, in which the patterns of the deep structure of the studied territories and the peculiarities of location are most fully revealed variety of minerals.

With the increase in the detail of geological works, there is a need to improve the methodology of zonal stratigraphy, which, in turn, requires a comprehensive study of the remains of various organisms of the geological past.

This monograph is devoted to the monographic study and systematics of one of the most important groups of organisms for biostratigraphy - the Silurian and Early Devonian graptolites.

Graptolites were widespread ancient Paleozoic organisms of animal origin - their remains are often found in rocks of geological sections of outcrops and boreholes. Being very numerous, morphologically diverse and rapidly changing in time, they are of paramount importance for the biostratigraphy of host deposits and paleogeographic reconstructions during the Ordovician, Silurian and Devonian periods in the history of the Earth.

The graptolites described in this paper were collected by the authors during 1969-1986 during the study of Silurian and Lower Devonian deposits, which are exposed in the Dniester basin and recovered by deep boreholes in the western regions of Ukraine, in southern Moldova (Fig. 1) and in the southwestern part Belarus (82, 86, 91).

47 species and 7 subspecies belonging to 25 genera of five families of the order Graptoloidea Lapworth, 1875 are described. Of these, one genus is new to science, three genera and two species of unclear taxonomic position.

They are depicted on 50 paleontological tables, 14 of which are drawings of rhabdosomes. 31 species and one subspecies are described for the first time from the Silurian deposits of Ukraine.

The types of graptolites described in this paper were studied by the author at the Institute of Geological Sciences of the National Academy of Sciences of Ukraine (Kyiv). The results of the study were discussed and tested at the Institute at two international colloquia (1981, 1983) by well-known paleontologists from the Russian Federation (T.N. Koren), Estonia (D.L. Kalyo), Lithuania (I.Yu. Pashkevichius) , Latvia (R.Zh.Ulst), Poland (A.Urbanek, L.Teller), Germany (G.Jäger) and China (E.Mu).

The colloquia also discussed issues of the scope and boundaries of species and genera, topical issues of the taxonomy of graptolites and their significance for the development of the zonal and stage subdivision of the Silurian system.

In my monographic study of graptolites, I used the remains of rhabdosomes on the surface of rock slabs, as well as fragments of rhabdosomes extracted from rocks by chemically dissolving them in hydrochloric and hydrofluoric acids.

Since 1969, thousands of fragments of rhabdosomes of various sizes have been extracted from rocks. In many cases, they are not inferior in preservation to the chitinoid shells of modern animals. As a result, a very rare opportunity appeared to study graptolites not only at the level of rhabdosomes, but as the remains of modern zoological objects at the level of colony elements - sicula (pro- and metasicules) and theca (pro- and metathecus).

By clarifying the fragments with rhabdosomes an oxidizing agent, it became possible to study the fuselage and microfuselage structures of sicules, thecae, and various aperture formations, that is, the patterns of growth of the inner layer of the periderm of all morphological elements of rhabdosomes without exception.

This made it possible to study in detail the astogenetic development of colonies at various time levels of the Silurian period. A unique opportunity has arisen to study the ontogeny of various types of graptolites during their existence in paleobasins framing the East European Platform (EEP) from the West and Southwest.

As a result of comparative morphological studies, new data were obtained on possible ways and regularities of the historical development of various groups of graptolites. They allowed us to discuss and outline the main directions of morphological changes in graptolite rhabdosomes.

The results of this study are reflected in the classification of graptolites adopted in the work and the zonal division of the Silurian according to graptolites.

At various stages of the study of graptolites, we used the advice of professors I. Yu. Pashkevichius (Vilnius), D. L. Kaljo (Tallinn), T. N. Koren (St.), R. Zh. Ulst (Riga), in connection with which we express our sincere appreciation and gratitude to them.

Photographing of graptolites was carried out by us on FMN-2, drawings of rhabdosomes were made using a drawing apparatus RA-4 and binocular microscope MSSO.

The described collection of graptolites is stored in the monographic department of the Central Museum of Natural History (CNR Museum) of the Academy of Sciences of Ukraine (Kyiv, Bohdan Khmelnitsky St., 15) under the number 2275.

Accepted methodology for studying graptolites

When searching for graptolite remains in field expeditionary conditions, borehole cores and rock samples from outcrops should be split in such a way that the planes of the chips coincide with the surfaces of sediment stratification.

Fragments of rhabdosomes often have to be dissected mechanically in laboratory conditions. For this, a set of needles is usually used, which are attached to the needle holder. Rock samples are placed on the stage of a binocular microscope. The increase in the latter is selected depending on the size of the dissected part of the rhabdosome.

Mechanical preparation gives good results when rhabdosomes are located on the surface of marls or relatively soft clayey limestones.

The chemical method of preparation of graptolites with rhabdos is highly effective. Suitable for this are rocks of different lithological composition, not subject to significant diagenetic changes and not broken by cleavage cracks.

Particularly good results can be obtained by dissolving various compacted clays, marls, argillaceous limestones and fine-grained argillaceous sandstones.

Pieces of rock, on the surface of which there are no well-preserved rhabdosomes, but only indeterminate fragments of them, are placed in glassware and filled with water. Depending on the carbonate content of the rock, such an amount of hydrochloric acid (usually technical) is added to the water so that the chemical reaction proceeds without the rapid release of carbon dioxide bubbles. Otherwise, the usually very fragile graptolite rhabdosomes will break.

As the fragments of rhabdosomes are released from the dissolved part of the rock, they should be sucked off with a pipette of the appropriate diameter and transferred to glass or plastic bottles with water.

If the rock sample has not completely dissolved in the first portion of the hydrochloric acid solution, it is poured a second time, then a third time, and so on until the entire rock sample is completely dissolved.

Before each re-dissolution, it is necessary to wash the sediment of the dissolved rock remaining at the bottom of the dish and remove fragments of graptolite rhabdosomes and other acid-resistant microfossils (chitinozoans, scolecodonts, etc.) with a pipette.

Typically, substantially argillaceous and slightly calcareous rocks do not dissolve completely in a hydrochloric acid solution.

We transfer such rock samples to plastic dishes and continue to fill them with a hydrofluoric acid solution. The concentration of the latter is selected experimentally.

Usually 2-3 portions of fresh solution completely dissolve even "graptolitic mudstones".

The sediment remaining at the bottom of the dish is carefully washed with water. Remains of graptolites, chitinose and other organisms are extracted from it and transferred to bottles with water for further paleontological study.

The described work must be carried out in a chemical fume hood.

Sample containers should be covered with glass or plastic lids. It is necessary to add a few drops of hydrochloric acid or formalin to bottles with water in which graptolites extracted from rocks are stored in order to prevent the development of a fungus, which is difficult to get rid of later.

For long-term storage of graptolites with rhabdosomes, after their study, they are placed in bottles with glycerin. The latter almost does not evaporate during long-term storage and has good antiseptic properties (the fungus does not grow in it).

In the period from 1969 to 1986, using the method of chemical preparation of graptolites described above, we dissolved 1676 samples of rocks from the interval of the geological section from the Upper Llandovery to the Lower Devonian inclusive.

The types and subspecies of graptolites described below were studied, as a rule, using numerous rhabdosomes extracted from rocks. Their study was supplemented by the study of the remains of colonies on the core of wells drilled in various geological and structural regions of the southwestern margin of the EEP.

To study the inner fuselage layer of rhabdosomes and the astogenetic development of colonies, their remains are macerated (discolored) after being removed from the rocks. For this, bertolet salt, nitric and hydrochloric acids are used in approximately equal amounts. Some rhabdosomes take a day to whiten, while others take hours. As a result of maceration, they become transparent to varying degrees and are suitable for studying the structure of the fuselage layer, but at the same time they become more brittle than before oxidation.

The described technique for extracting rhabdosomes from rocks by dissolving them in acids and maceration with various chemical oxidizing agents has not yet found wide distribution among paleontologists.

It should be noted that the cost of paleontological laboratory equipment is small: a fume hood, a laboratory table, glass and polyethylene dishes, technical hydrochloric and hydrofluoric acids.

Underestimation of the method of chemical preparation of graptolites leads to the impossibility of comparison and comparison of paleontological materials of different paleontologists. This slows down paleontological research, especially in the field of systematics of graptolites, which makes it difficult to solve many pressing problems.

Photographing of rhabdoses extracted from rocks and dissected was carried out by us on a microphoto attachment-2 (FMN-2).

The information content of photographs reflects the advantages and disadvantages of chemical and mechanical methods of rhabdosome preparation. The first of them is characterized by good preservation and availability for the study of all morphological features and their details, which often play a major role in the identification of genera and species, while the second is characterized by larger fragments of colonies, giving an idea of their size and general shape.

The modern method of studying graptolites is based on the study of both fragments of rhabdosomes extracted from rocks and found on rock tiles.

Drawings of graptolites were made by us using a RA-4 drawing apparatus and a binocular microscope of the MSSO brand.

On some controversial issues of the taxonomy of fossil organisms on the example of the study of graptolites

The notion that similarities between organisms (and their remains) are due to kinship is based on numerous observations from the pioneers of taxonomy and has long been used to classify them.

The latter is called upon, as is known, to distribute an innumerable multitude of organisms among a relatively small number of species, genera, families, and other taxonomic categories. In a detailed hierarchical classification, neontologists seek to show the similarities and differences between living organisms (on a planer surface), paleontologists - the relationship between organisms that lived at different times, that is, the life history of a particular group (34).

Although taxonomy is in most cases not based on phylogeny, phylogenetic considerations are important in the choice of morphological characters that are used in the taxonomy of various groups of organisms (70, 211).

In those rare cases where taxonomy reflects phylogeny, it is based on the maximum number of characters common to closely related taxa. This helps to explain the origin of homologous traits, as well as to distinguish similarities due to common origin (kinship) from convergent similarities that arise in unrelated lineages as a response to close or similar living conditions (63).

Considering the classification of a particular group, the taxonomist operates with the taxa known to him at the moment, which, of course, do not exhaust the entire diversity of its representatives in nature.

First of all, this is due to the well-known conventionality of all existing classifications of organisms, including natural ones (128). However, this should not become an obstacle to new attempts to improve the taxonomy of organisms as new data become available.

Obviously, some transitional or linking taxa will become known to us only in the future. This will require new additions and clarifications. For example, according to the presence of lateral lobes in the proximal theca *Monograptus (Pristiograptus) lochkovensis* Prib. recently assigned to the subgenus *Saetograptus (Colonograptus)* Prib., 1942. With the establishment of the genus *Skalograptus* Tsegelnjuk, 1976, it became possible to reconsider the genus of this species. Its assignment to the genus *Skalograptus* is also confirmed by stratigraphic data – *colonograpts* disappeared from the geological record in all studied regions of the Earth much earlier than *skalograpts* appeared.

A taxonomist paleontologist constantly faces various objective difficulties in his work, the main of which are the debatable methods and criteria for systematization (187), the lack of information about the already described taxa of this group, the inaccessibility of many museum collections for familiarization with them, the incompleteness of the paleontological record, and others.

In each group of organisms, specialists are aware of examples when the rank of taxa and their position in the classification system are debatable. "There is no reliable criterion that would allow us to decide whether a given group of species should be elevated in the hierarchy of categories to the rank of genus, tribe, subfamily, family, and so on" (35, p. 264). There are only recommendations to establish the rank of a taxon based on the selection criteria, since a necessary and sufficient condition for its independence is isolation from related similar categories.

In this regard, the boundaries and volume of higher (supraspecific) taxa are subjective to a greater extent than species ones. For example, the genera *Pristiograptus, Colonograptus,* and *Saetograptus* are considered by A. Przybl (175) to be so closely related that he refers them not only to the same subfamily *Pristiograptinae* Gurich, 1908, but also to the same genus *Pristiograptus* as subgenera. On the contrary, the point of view of A. Urbanek (206) on this, according to A. Przybl, polytypic genus is directly opposite. He considers it not mono-, but polyphyletic, combined, consisting of representatives of various subfamily groups. At the same time, the distribution of species among these genera does not cause much controversy.

The species is thus the elementary and basic unit of both the history of the development of organisms (76) and taxonomy. On the one hand, a species represents the level of organization of individuals in a population that allows one to judge the degree of relationship (genetic succession) with other species, and on the other hand, it determines the maximum accuracy of dividing a certain set of organisms (classification scale).

Comparative analysis of characters (including morphological ones) leads to certain logical conclusions about the mutual relationship of species at any given moment (in the area) and in time. Consequently, the arrangement of species in a natural biological system and the elucidation of phylogenies, that is, the sequences of groups of species, are based on the same data, namely, on their relative relationship, which we judge by the similarity or difference of morphological characters of the same name (103).

The overwhelming majority of paleontological works are devoted to the description of species. At this stage of the study of each collection, a certain set of remains of organisms is distributed among a relatively small number of morphotypes (phenones). These are morphological species - more indivisible collections of organic remains, grouped on the basis of common features.

Such groupings are separated from one another by a break in the sequence of morphological characters (37). Biologists believe that a species taxon based on a morphotype has no "biological, and, therefore, scientific meaning" (35, p. 38).

Morphological species, in their opinion, are subjective and unreal, are a fiction. Nevertheless, the paleontologist has to work precisely with morphotypes, and with those that are understood by the structures of the skeleton that can be preserved in a fossil state. We know very little about non-skeletal life forms from the geological past.

The antagonism between the concepts of "biological" and "morphological" species is known as "species problems" in paleontology.

In our opinion, it is exaggerated, to which there is a lot of evidence from the biologists themselves. E. Mayr, for example, writes that "primitive natives in the mountains of New Guinea distinguish the same types of organisms that a specialist in large national museums distinguishes completely independently of them” (35, pp. 23-24) using modern biological methods of research .

This is based on the fact that organisms with a common "genetic pool" also have a common "morphological pool". “Being logically independent, the concepts of biospecies and morphospecies at the same time represent two sides of the same coin” (69, p. 191). Both neontologists and paleontologists, despite the theoretical controversy surrounding the problem of species, successfully use this reliable principle in their daily work.

Moreover, they find new evidence for it in the fact that the phenotypic diversity of the animal world at the crisis moments of the geological history of the Earth is not continuous, but discrete (discontinuous). Only due to discontinuity (including morphological features) modern and extinct species of animals and plants were able to acquire and consolidate the unique specific features of their organization, and not dissolve in the faceless mass of living beings.

Discreteness in the sequence of morphological characters is naturally derived from the same biological concept of a species, the core of which is reproductive isolation - a mechanism for protecting the gene pool of a species from genes of other species alien to it.

The discreteness of the gene pools leads, with very rare exceptions (twin species), to the discontinuity of phenotypes. It is on this theoretical basis that the distribution of the diversity of modern and extinct animals and plants observed in nature into species is based.

Such discontinuity is observed, for example, by zoologists in modern groups of animals, usually combined into a superspecies - a monophyletic group of "closely related and largely or completely allopatric species" (35, p. 70).

Of course, reproductive isolation, cytological and other features of organisms cannot be observed on the remains of fossil organisms. “However, the classification of living species in most cases is also carried out without these data, and when they finally become available, they usually confirm the existing classification” (35, p. 5).

A detailed analysis of morphological gaps between taxa of fossil organisms was given by D. Simpson (73). He came to the conclusion that the frequent absence of transitional forms between allochronous, as well as between allopatric species, does not testify in favor of the saltation theory of the development of organisms.

A logical explanation of phylogenetic breaks is derived from the very process of geographic speciation, which occurs, for example, in peripheral isolates. Upon reaching reproductive isolation and morphological isolation, which takes a certain time, the new species spreads.

The distribution ranges of the new and parent species may partially or completely overlap without breaking the isolation.

The observed breaks in the sequence of morphological characters between such species correspond to the period of time that was required for the formation of a new species.

Periodic changes in the range of the species also contribute to the occurrence of morphological breaks in the case of phyletic speciation. The probability of finding intermediate populations of emerging species, always narrowly localized, is extremely low. Therefore, the boundaries between chronological taxa (primarily between species) are in most cases drawn where there are gaps in morphological characters.

To the taxonomy of the order *GRAPTOLOIDEA* Lapworth, 1875

The paleontological tables for this work show mainly rhabdosomes, which were extracted from lithologically diverse rocks by chemical preparation. The degree of preservation of their various morphological elements is so good that it makes it possible to study a variety of morphological features.

We strive to use these data both to identify species and to improve the taxonomy of the studied graptolites. In this regard, when describing species, special attention is paid to the characterization of the proximal parts of the colonies, the sicula, and the first theca, which are important for species recognition, the study of ontogenies, and the tracing of the phylogenesis of various groups of graptolites from the late Llandovery to the end of the Silurian period.

Morphological features of graptolites are numerous and distinct: the general shape of rhabdosomes (straight, curved ventrally or dorsally, curved throughout the rhabdosome or in separate parts) and their width, size and number of thecae per unit of measurement at various stages of colony development, sizes and ratios of various morphological elements rhabdosomes and tec and others (47). Their measurement was carried out according to the generally accepted method.

The creation of a hierarchically subordinated classification of graptoloids, consisting of monophyletic groups, is preceded, as is known, by an analysis of the subordination of morphological features of rhabdosomes. Specialists strive to decide which of them should be accepted as species characters, and which ones should be used as the basis for distinguishing genera and higher taxonomic categories.

The most stable and accessible for study on fossil material are the aperture structures of the theca and their combination in various parts of rhabdosomes. Usually they are well preserved in the fossil state, they are easily and unambiguously established even on small fragments of colonies. One or another type of the end of the tec can be traced over the course of geological centuries, stages and epochs in various regions of the world.

These formations are accepted by various researchers as generic features of graptoloids. At the same time, the aperture structures of the techs are variable within certain limits. For example, the genus Saetograptus Pribyl, 1942 is determined by the presence of spines on the lateral walls of the thecae, predominantly in the proximal and middle parts of rhabdosomes.

In the species Saetograptus chimaera (Barr.) they are located in the upper part of the lateral walls of the thecae, while in Saetograptus leintwardinensis (Lapw.) they are located mainly in the very tops of the lateral walls (the dorsal sicular spine is also an important feature of the latter).

Thus, the presence of spines on the lateral walls of the theca determines the genus, and their location determines the type of graptolites.

In addition, the species of this genus are characterized by a large number of thecae per rhabdosome unit, which gives them a uniquely original and peculiar morphological form.

All this allows us to conclude that the aperture structures of the theca species of the genus Saetograptus (their shape, size, and location) are correlated with the general shape of rhabdosomes and theca. A similar correlation is also observed in species of other genera.

Therefore, we consider these and other morphological characters not as an independent series of characters, but as a single complex (phenotype) adaptive to the environment, which makes it possible to determine genera and, in some cases, species of graptoloids.

The sizes of rhabdosomes and theca, the nature of the proximal parts of rhabdosomes (narrow or wide, straight, curved ventrally or dorsally), the size of the sicula and the location of its apex relative to the proximal theca, etc., are also used as specific features.

Subfamilies give an idea of the development of individual branches of graptoloids and usually unite several closely related genera. Several related subfamilies form a family.

When determining the taxonomic composition of graptolites, we were guided by their taxonomy adopted in Fundamentals of Paleontology (56) and Treatise on Invertebrate Paleontology (200, 201). The subsequent additions and changes to the systematics of Graptoloids, which were made by A.M. Obut (49), A.M. Obut, R.F. Sobolevskaya, V.I. Bondarev (54), A.M. Obut, R. F.Sobolevskaya, A.N.Nikolaev (55), A.M.Obut, R.F.Sobolevskaya (53), A.M.Obut, N.V.Sennikov (51), Z.M.Abduazimova (1), N.V. Sennikov (71), N.F. Mikhailova (38, 39), P.D. Tsegelnjuk (85, 87, 99, 100), I.Yu. Pashkevichius (57, 58), T. N.Koren (22, 25, 150), A.Urbanek (203, 204, 205, 206, 207, 208, 209, 210, 213, 214), D.Palmer (169), R.B.Rickards, J.E.Hutt, W.B.N. Berry (183), R.B. Rickards (181), R.B.Rickards, D.Palmer (185), A.Pribyl (171, 172, 175, 178, 179), L.Teller (190, 191, 193, 194, 195), H.Jaeger (136 , 138, 139, 141, 142, 143) and other scientists.

Description of graptolites

Class *Graptolithina* Bronn, 1846
Order of *Graptoloidea* Lapworth, 1875
Suborder *Monograptina* Lapworth, 1880
Family *Monograptidae* Lapworth, 1873

Subfamily *Monograptinae* Lapworth, 1873 nom. transl. Yin, 1937 (ex *Monograptidae* Lapworth, 1873)

Genus *Monograptus* Geinitz, 1852

Monograptus flemingii (Salter, 1852)

Tab. 1, draw. 1. 2; tab. XV, fig. 1-3, 10

Graptlolites flemingii: Salter, 1852, p. 390, tab. 21, fig. 5-7.

Monograptus flemingii: Lapworth, 1876, c. 504, tab. 20, fig. 8; Tullberg, 1883, p. 23, tab. 2, fig. 25; Elles and Wood, 1913, p. 425, tab. 17, fig. 5, fig. 287; Lenz, 1972, p. 1154, fig. 3(G, H); Berry and Murphy, 1975, p. 49, tab. 4, fig. 6, fig. 18a; Lenz, 1980, p. 1081, tab. 1, fig. N-P, fig. 1 (10).

Monograptus (Monograptus) flemingi flemingi: Pribyl, 1952, p. 5, tab. 1, fig. 6.

Monograptus flemingi: Hundt, 1924, p. 65, tab. 5, fig. 22, tab. 7, fig. 28; Obut, Sobolevskaya, Bondarev, 1965, p. 44, tab. 4, fig. 1-4; Obut, Sobolevskaya, Nikolaev, 1967, p. 90, tab. 9, Fig.7-9; Koren, Ulst, 1967, p. 234, tab. 27, fig. 2, fig. 48; Abduazimova, 1970, p. 42, tab. 1, fig. 6-9, fig. 2; Obut, Sobolevskaya, 1975, p. 165, tab. 77, fig. 3, 4; Obut, Sennikov, 1977, p. 113, tab. 1, fig. 3, 4; Teller, 1986, p. 56, tab. 1, fig. 1, 2, tab. 5, fig. 1-5, tab. 6, fig. 1-5, fig. 5-7.

Lectotype. Salter, 1852, pl. 21, fig. 5; top wenlock of Scotland (51).

Description. Large straight rhabdosomes over 60 mm long. Their proximal parts within the first 2-4 ducts are distinctly curved dorsally. The width of the colonies at the level of the aperture of the first theca is 0.9-1 mm, directly above it - 0.7-0.8 mm, at the level of the mouth of the fifth theca - 1.5-1.6 mm, above the mouth - 1.2 -1.3 mm, in the middle part of the rhabdosome - 2-2.4 mm, in the distal part - 3.1-3.2 mm.

Theca are represented by straight tubes. They are inclined to the axis of the rhabdosomes at angles of 30-40°. The upper free parts of the teka are hook-shaped. The ventral walls have the shortest length after bending. Their edges are thickened. The dorsal and lateral walls completely cover the mouths of the theca. They are formed by fuseluses, which are widest on the dorsal walls (193, fig. 7). The edges of the latter are not thickened. Their width increases from bottom to top along rhabdosomes from 0.4 to 0.8 mm, height - from 0.54 to 0.8 mm. They make up 1/2 - 1/3 of the width of rhabdosomes at the beginning of the colony and 1/4 - 1/5 of their part within the distal.

The dorsal walls of the curved parts of the theca descend below the mouths to 0.4 mm. Their lateral edges in 4-8 proximal thecae are equipped with spines 0.25-0.4 mm long. Up the colony, their length gradually decreases. They become shorter and wider, take the form of small, downwardly drawn blades.

The length of the first rhabdosome theca is 0.9-1.1 mm, its leaks are 0.6-0.7 mm, metatheca are 0.2-0.3 mm. The length of the fifth theca is 1.2-1.4 mm, its leaks are 0.3-0.5 mm, metatheca are 0.7-1 mm. The length of distal thecae is 2.6-3.1 mm, their protecus is 0.7-1.5 mm, metathecus is 1.9-2.3 mm. The degree of overlap of the proximal theca 1/3 - 3/5, distal - 2/3. The length of the proximal theca exceeds their width by 2–2.6 times, and that of the distal ones by 3–4 times.

There are 13-14 thecae in 10 mm of proximal length, and 9-10 thecae in distal parts.

The **sicula** is narrow. The width of the mouth is 0.36-0.4 mm, its length is 1.6-2 mm. The apex of the sicula reaches the level of the mouth of the second theca. The base of the first theca is 0.2-0.5 mm above the mouth of the sicula. The distance from its base to the end of the first theca is 1.1-1.25 mm.

Variability. The degree of dorsal curvature of the proximal rhabdosomes, the number of proximal thecae with lateral spines, and the size of the lateral lobes of thecae vary.

Comparison. In terms of the shape and size of rhabdosomes and thecae, as well as the presence of lateral spines and lobes on the hook-shaped free parts of thecae, this species is closest to *Monograptus priodon* (Bronn), from which it differs more quickly. a wide increase in the width of the proximal parts of the rhabdosomes, a large number of techs per unit of measurement and a shorter length of the techs.

From *Monograptus mutuliferus* Menegh. et Gort. the described species is distinguished by the presence of lateral spines and lobes on the curved parts of the theca.

Association. Within Podolia and Volyn *Monograptus flemingii* (Salt.) occurs together with *Pristiograptus pseudodubius* (Bouc.).

Distribution. Middle Silurian, middle part of the Wenlock Group, Whitwelian Stage (= Alizonian Horizon of Volyno-Podolia), *Monograptus flemingii* zone, Ternavskaya suite of Podolia, middle parts of the Schedrogorskaya and the Kladnevskaya suites of the Polessky ledge of the basement, the Lipnovskaya suite of the Brest depression.

M a t e r i a l. 12 fragments of rhabdosomes on the surface of marls drilled by the Koropets-3 boreholes, int. 1277-1282 m, Koropets-1, int. 1272.8-1273.5 m, Brest-10, depth 879 m, Mosyr-5372, depth 312 m, Harsy-1873, depth 396.5 m, 414 m, 418 m; Sukachi-1903 depth 381 m, Kordovtsy-16916, depth 261 m; Guscha-4015, int. 992-996 m.

There are 5 fragments of rhabdosomes extracted from the rocks of borehole Cordovzy-16916, depth 261 m.

Subfamily *Uncinatograptinae* Tsegelnjuk, 1976

Type genus – *Uncinatograptus* Tseg., 1976

Diagnoz. Straight or slightly dorsally curved rhabdosomes with slight dorsal or ventral proximal curvature.

Theca are represented by straight tubes. They terminate in hood-like aperture formations in all theca colonies or only in proximal thecae. Aperture structures in the form of large symmetrical lateral lobes are widespread, including in proximal thecae. The thecae of the middle and distal parts of rhabdosomes often have smooth edges of the orifices (pristiograptid appearance).

Composition in subfamily. Three genera: *Uncinatograptus* Tseg., 1976; *Dulebograptus* Tseg., 1976; *Skalograptus* Tseg., 1976 (= junior synonym of *Neocolonograptus* Urbanek, 1997, p. 165).

Comparison. This subfamily differs from *Heisograptinae* Tseg., 1976 in the absence of excavations near the thecae and aperture formations in the form of dorsal or dorsal-lateral peaks, as well as in the presence of hood-like aperture formations, lateral lobes and smooth the edges of the mouths of the flow.

Distribution. Middle and upper Silurian, Kitaigorodian, Tiritian, Ulichian, and Przhidolian Belts of the International Stratigraphic Scale (ISS) of Europe and Asia.

Genus *Uncinatograptus* Tsegelnjuk, 1976

Monograptus: Lapworth, 1876, p. 355; Tullberg, 1883, p. 23; Elles and Wood, 1913, p. 424; Hundt, 1924, p. 65; Shoe, 1958, p. 62; Jaeger, 1959, p. 112; Teller, 1964, p. 56; Obut, Sobolevskaya, 1966, p. thirty; Koren, Ulst, 1967, p. 233; Tsegelnyuk, 1976, p. 241; Pashkevichius, 1979, p. 164; Koren, 1983, p. 424; Root, 1986, p. 109.

Monograptus (*Pomatograptus*): Pribyl, 1940 a, c. 71 (pars.).

Monograptus (*Monograptus*): Urbanek, 1958, p. 48.

Uncinatograptus: Tsegelnyuk, 1976, p. 96.

Monograptus (*Uncinatograptus*): Urbanek, 1997, p.140.

Diagnoz. Straight throughout or with dorsally curved proximal parts of the rhabdosome. Less common are slightly dorsally curved throughout the colony.

Theca are represented by straight short tubes. Their endings are equipped with hood-like aperture structures, which were studied in detail by prof. A. Urbanek (205) in the species *Monograptus uncinatus* Tullb. from the lower Ludlow.

In stratigraphically younger species of the genus, the dorsal walls of the hoods were elongated. They, smoothly bending downwards, descend below the ventral margins of the mouths of the thecae.

Composition of the genus: *Monograptus uncinatus* Tullb., 1883; *M. riccartonesis* Lapw., 1876; *M. prognatus* Koren, 1983; *Uncinatograptus caudatus* Tseg., 1976; *U. rectus* Tseg., 1976.

Comparison. Representatives of this genus differ from *Dulebograptus* Tseg., 1976 in the presence of hood-like aperture formations in all the thecae rhabdosomes.

Distribution. Middle and Upper Silurian, Kitaigorodian, Tiritian, Ulichian and Przhidolian Belts of Europe and Asia.

Uncinatograptus riccartonensis (Lapworth, 1876)

Tab. 1, draw. 3, 4; tab. XV, fig. 4-9

Monograptus riccartonensis: Lapworth, 1876, p. 355, tab. 13, fig. 2; Tullberg, 1883, p. 23, tab. 2, fig. 26, 27; Elles and Wood, 1913, p. 424, tab. 42, fig. 8, fig. 286; Hundt, 1924, p. 65, tab. 5, fig. 8, 9; Shoe, 1958, p. 62, tab. 4, fig. 12, tab. 5, fig. 1, 2, fig. eleven; Obut, Sobolevskaya, 1966, p. 30, tab. 6, fig. 1, fig. 22; Koren, Ulst, 1967, p. 233, tab. 27, fig. 1, fig. 47; Tsegelnyuk, 1976, p. 241, tab. 2, fig. 6, draw. 6; Pashkevichius, 1979, p. 164, tab. 10, fig. 10-13, tab. 25, fig. 11-13, tab. 26, fig. 1.

Lectotype. C. Lapworth, 1876, pl. 13, fig. 2a, large rhabdosome; lower wenlock of Scotland (52).

Description. Large straight rhabdosomes over 30 mm long. Their proximals within the first 2-3 theca are curved dorsally. The width of the colonies at the level of the aperture of the first theca is 0.9-1.1

mm, directly above it - 0.6-0.8 mm, at the level of the mouth of the fifth theca - 1.2-1.3 mm, the tenth - 1.6- 1.8 mm, fifteenth - 1.8-1.85 mm, twentieth - 2 mm and then does not change.

Thecae are in the form of narrow tubes inclined to the axis by the rhabdos at angles of 30-40°. Their free ventral walls, starting from the first theca, form a smooth thickened edge of the mouth, that is, the curved parts of all theca have no ventral walls.

Both proximal and distal thecae have hood-like aperture endings that grow on the continuation of the interthecal septa and the lateral walls of the thecae (87). They completely cover the mouths of all the thecae, and in the procsimal part of the colonies, the dorsal walls descend below the apertures to a distance of up to 0.2 mm. These structures protrude beyond the ventral edge with rhabdos by 0.2-0.45 mm, which is 1/3 - 1/4 of their total width. The height of the aperture ends is 0.4-0.6 mm.

The length of the first theca is 0.85-0.95 mm, its leaks are 0.6-0.7 mm, the metatheca is 0.25 mm. The length of the fifth theca is 1.25-1.3 mm, its leaks are 0.5-0.6 mm, the metatheca are 0.6-0.7 mm. The length of the tenth and subsequent theca varies from 1.9 to 2.2 mm, their leak is 0.9-1.1 mm, metathecus is 1-1.1 mm. The thecae overlap for 1/2 - 2/3 of their length. The length of the proximal theca exceeds their width by 1.5–3 times, and that of the distal ones by 3–4 times.

In 10 mm of proximal length there are 12-12.5 thecae, distals - 10-10.5 thecae.

The **sicula** is narrow. Its length is 1.6-1.8 mm, the width of the mouth is 0.25-0.4 mm. The apex of the sicula reaches the level of the mouth of the second or third theca. The base of the first theca is 0.2 mm above the mouth of the sicula. The distance from the end of the first theca to the mouth of the sicula is 0.9-1.15 mm. Virgella length 0.2-0.3 mm.

Variability. The dorsal curvature of the proximals varies. From the bottom up along the rhabdosomes, the length of the hood-like structures decreases.

Comparison. In terms of shape and size of rhabdosomes and thecae, this species is closest to *Uncinatograptus uncinatus* (Tullb.), from which it differs in the dorsally curved extreme proximals and a large number of thecae per unit of measurement (10-12 thecae per 10 mm of rhabdosome length, in contrast to 7-10 flowed in *U. uncinatus*). From *Uncinatograptus caudatus* Tseg. *U. riccartonensis* (Lapw.) is distinguished by a wider rhabdosome, a smaller dorsal proximal curvature, and a higher position of the apex of the siculum.

Remarks. The Volyno-Podolian specimens of this species differ from the English ones by a large number of thecae per unit of measurement (12.5-10 thecae per 10 mm of length, in contrast to 10-8 thecae in the English representatives of the species). In this respect they are much closer to those Lithuanian specimens of *Uncinatograptus riccartonensis* (Lapw.), which have 12-9 thecae per 10 mm of rhabdosome length (58).

Association. *Monograptus priodon* (Bronn) and brachiopods *Eoplectodonta duvalii* (Dav.) are occasionally found together with this species.

Distribution. Middle Silurian, lower Wenlock Group, upper Sheinwoodian, *Uncinatograptus riccartonensis-Cyrtograptus murchisoni* zone; the lower parts of the Furmanovskaya suite of Podolia, the Kladnevskaya suite of the western slope of the Polessky ledge of the basement, the Lipnovskaya suite of the Brest depression.

M a t e r i a l. 11 fragments of rhabdosomes on the surface of marls, uncovered by Brest-1 wells at depth 782 m; Koropets-3 in int. 1315-1319.5 m; Mosyr-5372 on depth 345 m; Olkhovtsy-16912 on depth 214 m; Chemerovtsy-16915 on depth 229.5 m; Harsy-1873 on depth 417.6 m; Shiev-4109 in int. 524-526 m.

There are 10 fragments of colonies extracted from the rocks of wells Shiev-4109 in int. 524-526 m.

Uncinatograptus caudatus Tsegelnjuk, 1976

Table 1, draw. 5, 6; tab. XV, fig. 11; tab. XVI, fig.1-8

Uncinatograptus caudatus: Tsegelnjuk, 1976, p. 97, tab. 31, fig. 5-9.

Holotype. Specimen No. 1788/28, TsNP Museum. Tsegelnjuk, 1976, pl. 31, fig. 5, proximal rhabdosome; Milovanian Formation, Metonian Stage, lower part of the *Formosograptus formosus-Bugograptus spineus* Zone.

Description: Straight rhabdosomes over 22 mm long. Their proximals are dorsally curved in the area of the first 6-8 theca. The width of the colonies at the level of the aperture of the first theca is 0.8-0.95 mm, directly above it - 0.35-0.45 mm; at the level of the mouth of the fifth theca - 1.1-1.25 mm, above it - 0.6-0.8 mm; at the level of the tenth theca - 1.3-1.5 mm and then does not change.

Theca are narrow tubes inclined to the axis of the rhabdosome in the proximal part at an angle of 35-43°, in the distal - 20-30°. The mouths of the thecae are equipped with hood-like formations. Their dorsal walls in the proximals descend below the ventral edge of the apertures by 0.1-0.2 mm, in the distal parts of the rhabdosomes they are at the level of the theca mouths or fall below them by 0.05-0.1 mm. The width of the aperture structures is 0.35-0.5 mm, which is 1/4 - 2/3 of the total width of rhabdosomes. Their height is 0.35-0.6 mm.

The length of the first theca is 1.1-1.2 mm, its leaks are 0.9-1 mm, metatheca are 0.2 mm; fifth theca - 1.3-1.4 mm, leaks - 0.6 mm, metatheca - 0.75-0.8 mm; tenth theca - 1.7-2.1 mm, leaks - 1-1.1 mm, metatheca - 0.8-1.1 mm and then without increasing, varies within small limits. The proximal theca overlap for 1/2 -2/5 of their length, the distal - for 1/2 - 3/5. The length of the proximal theca exceeds their width by 3–4 times, and that of the distal ones by 4–5 times. There are 13-11 techs in 10 mm of rhabdosome length.

The **sicula** is narrow. Its length is 1.3-1.4 mm, the mouth width is 0.25-0.35 mm. The apex of the sicula reaches the level of the dorsal wall of the aperture structure of the first theca or is below it up to 0.3 mm. The base of the first theca is located 0.3-0.4 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.35-1.55 mm. The length of the virgella is 0.6-0.8 mm.

Variability. 11The degree of dorsal curvature of the proximals and the position of the apex of the sicula relative to the level of the mouth of the first theca vary.

Comparison. According to the structure of rhabdosomes and tecs, this species is closest to *Uncinatograptus rectus* Tseg., from which it differs in the dorsal curvature of the proximals.

Remarks. *Uncinatograptus caudatus* Tseg. determined by us in the Baltic in the well Dubovskoye on depth 1266, 9 m in the collection, kindly provided for viewing by prof. D. L. Kalyo.

Association. Together with this species, *Formosograptus formosus* Bouc., *F. uncatus* Tseg., *Wolynograptus acer* (Tseg.), *Ludensograptus latilobus* (Tseg.), *Bugograptus aculeatus* (Tseg.), *Pristiograptus tumescens* (Wood), *P. fragmentalis* Bouc., *Monograptus (Slovinograptus) balticus* (Tell.).

Distribution. Upper Silurian, Ulichian Belt, lower part of the Metonian Stage, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the upper part of the Novinskaya and the lower part of the Milovanskaya suites of the Polessky basement ledge, the upper part of the Peremyshlyanskaya suite of the Lvov trough.

Material. 40 rhabdosomes on the surface of marls exposed by boreholes Kusnishche-5394 on depth 453 m; Przemyshlyany-1 in int. 2729.5-2739.9 m; Litovezh-1 int. 2583.2-2590.5 m; Guscha-4015 in int. 763.5-768.5 m, 773.5-778.5 m, 789.9-794.9 m; Pulemets-1884 on depths 671 m, 679 m, 680 m, 697 m, 709 m, 710 m, 711 m; Selyakhi-1883 on depths 386 m, 395 m, 400 m, 402 m.

There are 15 fragments of colonies extracted from the rocks of the well. Guscha-4015 at interval 758.5-763.5 m, 763.5-768.5 m, 773.5-778.5 m.

Uncinatograptus prognatus (Koren, 1983)

Tab. II, draw. 1; tab. XVI, fig. 9, 10; tab. XVII, fig.1-4

Monograptus prognatus: Koren, 1983, p. 424, tab. 51, fig. 8-14, tab. 52, fig. 1-5, 8-10, fig. 6; Root, 1986, p. 109, tab. 24, fig. 8-13, tab. 25, fig. 1-8, fig. 22, 23; Jaeger, 1986, p. 332, tab. 4, fig. 7.

Uncinatograptus similis: Tsegelnjuk, 1978 a, p. 91, table 2, fig. 4, 5.

Holotype. Specimen No. 10876/51, ZNIGR Museum. Koren, 1983, pl. 51, fig. 8, proximal rhabdosome; Tokrau horizon, Przhidolian stage, *Serenograptus microdon aksajensis* zone.

Description. Medium-sized straight proximal parts of rhabdosomes up to 16 mm long. Within the first 3-4 thecas they are slightly curved ventrally. Their width at the level of the mouth of the first theca is 0.75-0.9 mm, directly above 0.5-0.6 mm, at the level of the fifth theca - 1.1-1.2 mm, the tenth - 1.3-1.45 mm, fifteenth - 1.4-1.5 mm. The largest width of rhabdosome fragments in our collection is 1.6 mm.

Thecaes are in the form of narrow tubes, smoothly curved sigmoidally. They are inclined to the axis of the rhabdosomes at angles of 15-20°. Their endings are equipped with hood-like aperture structures that have grown on the continuation of the interthecal septa and the lateral walls of the thecae. They completely cover the mouths of the thecashecas. Their dorsal walls descend below the level of the mouths by 0.25-0.35 mm. Aperture structures protrude beyond the ventral edge of the rhabdos by 0.25-0.5 mm. Their height is 0.3-0.6 mm. They make up 1/3-1/5 of the total width of rhabdosomes.

The edges of the cane-like structures are uneven, especially in the second and subsequent thecae. The dorsal walls are shortened, and their dorsal-lateral parts stand out in the form of small lobes. The latter are formed by additional 1-2 fuseluses.

The length of the first theca is 1.1-1.15 mm, its leaks are 0.9 mm, the metatheca are 0.2-0.25 mm; fifth theca - 1.5-1.6 mm, its leaks - 0.7 mm, metatheca - 0.8-0.9 mm; tenth - 1.9-2.5 mm, leaks - 0.9-1.1 mm, metatheques - 1-1.4 mm; the fourteenth - 2.6 mm, leaks - 0.8 mm, metatheques - 1.8 mm.

It can be seen from the above measurements that the length of the theca and metatheca steadily increases from bottom to top along the rhabdosome, while the length of the theca changes within a small range. In this regard, the bases of the interthecal septa reach the level of the mouths of the 8th-10th thecas already at 9-11 thecas.

Therefore, horizontal lines at the level of the mouths of the twelfth and subsequent thecae cross two mezhtecal septa. These characters (large length of the thecae, metathecae, and interthecal septa) are decisive for this species. Thecae overlap by 1/2-2/3 of their length.

In 10 mm of proximal length, there are 10, 8-11 thecae**.**

Sicula narrow, ventrally curved. Its length is 1.6-1.9 mm, width is 0.3 mm, the apex of the sicula is 0.3-0.4 mm higher than the level of the first theca. The base of the first theca is located 0.3-0.35 mm above the mouth of the sicula. The distance from the base of the sicula to the end of the first theca is 1.1-1.45 mm. The length of the virgella is 0.6-0.7 mm.

Comparison. According to the type of structure of rhabdosomes and aperture structures, this species is close to *Uncinatograptus caudatus* Tseg. It differs from the latter in a straight or slightly ventrally curved proximal part of the rhabdosomes, an irregular edge of hood-like structures, and a longer thecas.

Association. Together with this species, *Ludensograptus parultimus* (Jaeg.), *Tirassograptus difficilis* (Tseg.), *Pristiograptus kolednikensis* Prib.

Distribution. Upper Silurian, lower part of the Przhidolian Belt, middle part of the Stavanian Stage, upper part of the *Istrograptus ultimus-Ludensograptus parultimus* Zone, lower parts of the

Skalograptus lochkovensis Zone; the upper part of the Milovanskaya and lower parts of the Gushchinskaya suite of the Polessky ledge of the basement.

Material. Two proximal rhabdosomes on the surface of marls from wells Pulemets-1884 in int. 562-563 m.

5 fragments of colonies recovered from the rocks of the borehole Guscha - 4015 int. 622.4-626.8 m, 626.8-640 m.

Genus Dulebograptus Tsegelnjuk, 1976

Dulebograptus: Tsegelnjuk, 1976, p. 98.

Monograptus (Dulebograptus): Urbanek, 1997, p. 154.

Type species - *Dulebograptus bresticus* Tseg., 1976.

Diagnoz. Direct rhabdosomes. Thecae are represented by straight tubes. Their endings are equipped with polymorphic aperture formations (from bottom to top along the rhabdosome):

1) the first one or three procoimal thecae are similar to the thecae of the species *Uncinatograptus uncinatus* (Tullb.),

2) starting from the second (rarely first) - fourth theca, the “hood” of the *uncinatus* type begins to gradually divide into two lateral lobes. Lobes are seen in four to five or more subsequent thecae. Up the rhabdosome, the lateral lobes gradually shorten;

3) in the middle or distal parts of the rhabdosomes, the lateral edges of the mouths of the theca acquire a pristiograft appearance.

Composition of the genus: *Dulebograptus bellus* Tseg., 1976; *D. bresticus* Tseg., 1976; *D. trimorphus* Tseg., 1976.

Comparison. This genus differs from *Uncinatograptus* Tseg., 1976 in the presence of the theca type *Uncinatograptus uncinatus* only in the proximal parts of rhabdosomes. The endings of subsequent theca are represented by lateral lobes and (above) even lateral margins of theca mouths. This genus differs from *Skalograptus* Tseg., 1976 in the presence of *uncinate* thecae in the proximal parts of rhabdosomes.

Distribution. Middle and Upper Silurian, Tiritian, Ulichian and the lower part of the Przhidolian Belt of Europe.

Dulebograptus trimorphus Tsegelnjuk, 1976

Tab. XVII, fig. 5-7

Dulebograptus trimorphus: Tsegelnjuk, 1976, p. 100, tab. 32, fig. 1; Tsegelnjuk, 1978a, pl. 2, fig. 1, 6, tab. 3, fig. 1, 3, 5; Tsegelnjuk, 1988 b, p. 85, tab. 1, fig. 6.

Monograptus (Dulebograptus) trimorphus: Urbanek, 1997, p. 154, tab. 14, fig. 42.

Holotype. Specimen No. 1788/37, TsNP Museum. Tsegelnjuk, 1976, c. 100, pl. 32, fig. 1, proximal and middle parts of the rhabdosome; Guschinskaya Formation, Przhidolsky Belt, Stavan Stage, lower part of the *Skalograptus lochkovensis* Zone.

Description: Small straight rhabdosomes over 15 mm long. Their proximal parts in the interval of the first 5-6 thecae are slightly ventrally curved. Beginnings of proximals, covering 2-3 thecae, almost straight or slightly bent to the dorsal side. The width of the colonies at the level of the aperture of the first theca is 1.05-1.15 mm. Increasing gradually, it reaches 1.7-1.85 mm 10 mm from the beginning of the procoimals and then does not change.

Thecae are represented by straight and narrow tubes. The first one to three proximal theca terminate in hood-like aperture structures similar to those of the species *Monograptus uncinatus* Tullb. (205, fig. 22). The dorsal walls of the hoods are bent downwards, blocking the mouths of the thecae.

In the interval of subsequent 3-4 proximal thecae, the hood-like formations gradually separate into two isolated dorsal-lateral lobes (87), (Tsegelnyuk, 1978 a, Table 2, Fig. 1, Table 3, Fig. 1).

There are rhabdosomes in which the hood of the first theca begins to divide into lobes. The length of the blades is 0.3-0.5 mm, their width reaches 0.37 mm. The ends of the blades are rounded. The blades hang over the mouths of the stream. Without overlapping, they are bent down. Blades are usually present in 4-5 thecae. Their length gradually decreases from bottom to top along the rhabdosome to 0.1 mm.

The twelfth-thirteenth and subsequent thecae are devoid of aperture formations. They are cylindrical tubes of the pristiograft type.

The length of the first theca is 1.05-1.1 mm, the fifth - 1.45-1.8 mm, the tenth - 2.7-2.8 mm, the thirteenth - 3.3 mm. The length of the proximal thecae is 0.55-0.8 mm, the distal one is 0.8-1 mm. The length of the proximal metathecus is 0.4-0.8 mm, the distal one is 1.3-1.6 mm. The degree of overlap of the proximal thecae 1/2-2/5, distal - 1/2. The length of proximal thecae exceeds their width by 3.8-4 times, distal by 4.6-5 times.

The proximal thecae are inclined to the axis of the rhabdosomes at angles of 35-45°, the distal ones - at angles of 20-25°.

There are 9-10 thecae in 10 mm of rhabdosome length.

Sicula weakly ventrally curved. Its length is 1.8-2.1 mm, the mouth width is 0.45 mm. The apex of the sicula reaches the level of the aperture of the second theca. The base of the first theca is located 0.3 mm above the base of the sicula. Virgella length 0.4-0.5 mm.

Variability. The number of thecae equipped with hood-like aperture formations varies. The length of the blades is variable, the degree of their curvature downwards.

Comparison. From *Dulebograptus bresticus* Tseg. this species is distinguished by a smaller number of thecae with dorsal-lateral lobes, a longer thecae of the middle and distal parts of the rhabdosomes, and a smaller number of thecae per unit of measurement (9-10 thecae, in contrast to 11-12 thecae in *D. bresticus*).

Remark. The proximal part of the rhabdosome of *Dulebograptus sp*., depicted earlier (87, pl. 3, Fig. 2), apparently occupies an intermediate position between the species *Dulebograptus trimorphus* Tseg. and *Skalograptus vetus* Tseg.

Association. *Tirassograptus difficilis* (Tseg.), *Skalograptus vetus* Tseg., *Ludensograptus parultimus* (Jaeg.) occur together with this species.

Distribution. Upper Silurian, Przhidolian Belt, Stavanian Stage, *Skalograptus lochkovensis* zone; the upper parts of the Milovanskaya and lower parts of the Gushchinskaya suites of the Polessky ledge of the basement.

Material. 5 rhabdosomes on the surface of marls exposed by the Guscha-4015 borehole in int. 622, 4-626.8,

7 fragments of rhabdosomes were recovered from the rocks of borehole Guscha-4015 in int. 615-620 m, 622, 4-626.8 m, 626.8-640 m.

Genus *Skalograptus* Tsegelnjuk, 1976

Monograptus (Pristiograptus): Pribyl, 1940 a, c. 69.
Skalograptus: Tsegelnjuk, 1976, p. 100.
Saetograptus (Colonograptus): Pribyl, 1983, p. 160.

Monograptus: Jaeger, 1977, p. 340; Jaeger, 1986, p. 324; Root, 1986, p. 99.
Neocolonograptus: Teller, 1997, p. 77; Urbanek, 1997, p. 165.
Type species - *Skalograptus vetus* Tseg., 1976.

Diagnoz. Rhabdosomes are straight. Thecae are represented by straight short tubes. The lateral edges of the proximal theca are provided with symmetrical lobes, the length of which decreases in the distal direction. They are smoothly bent down, hang over the mouths of the theca, but do not overlap one another.

The lateral edges of the orifices of the middle and distal parts of rhabdosomes acquire a pristiograft appearance.

Composition of the genus: *Skalograptus vetus* Tseg., 1976; *Monograptus (Pristiograptus) lochkovensis* Prib., 1940; *Monograptus branikensis* Jaeg., 1986.

Comparison. This genus differs from *Dulebograptus* Tseg., 1976 in the absence of hood-like aperture formations in proximal theca rhabdosomes.

It differs from the genus *Pristiograptus* Jaek., 1889 in the presence of lateral lobes in proximal thecae.

The rhabdosomes of the described genus differ from the genus *Colonograptus* Prib., 1942 in the rounded ends of the lateral lobes (in the proximal theca *Colonograptus*, the lobes are essentially spikes rapidly expanding towards the lateral walls of the theca rhabdosome).

It differs from the genus *Monograptus* Gein., 1852 *Skalograptus* Tseg., 1976 in the absence of free curved parts of the theca, as well as in the nature of the aperture formations of the proximal and subsequent theca (respectively, lateral lobes and smooth edges of the theca mouths).

Remarks. In addition to the species listed in this genus, we previously included monograptids from the groups *Monograptus transgrediens* Pern., 1899 and *Pristiograptus bugensius* Tell., 1964 (85, p. 101).

During the study of rhabdosomes extracted from rocks in the deposits of the *Formosograptus formosus-Bugograptus spineus* zone of Volyn-Podolia, the species *Pristiograptus rarus* Tell., 1964 was found, which, in our opinion (see description), should be attributed to the genus *lstrograptus* Tsegelnjuk, 1988.

On the great similarity of this species with *Pristiograptus bugensius* Tell. and *Monograptus ultimus* Pern., 1899 have already been written (139, 142). In connection with the above, the above groups of monograptids are assigned in this work to the genus *Istrograptus* Tsegelnjuk, 1988.

The genus *Neocolonograptus* Urbanek, 1997 (type species *Monograptus lochkovensis* Prib.) is a junior synonym of the genus *Skalograptus* Tsegelnjuk, 1976, since specimens of the type species of the latter (*Skalograptus vetus* Tseg., 1976) were assigned by A. Urbanek (214, p. 168, pl. 23, Fig. 1-4) to *Neocolonograptus lochkovensis branikensis* (142).

Distribution. Upper Silurian, Przhidolian Belt, Stavanian Stage.

Skalograptus vetus Tsegelnjuk, 1976

Tab. 1, draw. 7; tab. II, draw. 7; tab. XVII, fig. 8-10;
tab. XVIII, fig. 1-5

Skalograptus vetus: Tsegelnjuk, 1976, p. 101, tab. 32, fig. 2-5; Tsegelnyuk, 1988 b, p. 85, tab. 1, fig. 2, 3, 7.

Neocolonograptus lochkovensis branikensis: Urbanek, 1997, p. 168, tab. 23, fig. 1-4, fig. in text 8D.

Holotype. Specimen No. 1788/38, TsNP Museum. Tsegelnjuk, 1976, 101, pl. 32, fig. 2, proximal rhabdosome; Milovanskaya suite, Przhidolian belt, Stavanian stage, *Istrograptus ultimus-Ludensograptus parultimus* zone.

Description. Small, slightly ventrally curved rhabdosomes up to 16.5 mm long. The proximal origins within the first 2–3 theca are slightly bent dorsally. Their width at the level of the aperture of the first theca is 1-1.2 mm, the fourth - 1.2-1.5 mm. In the tenth theca, the width of most rhabdosomes does not exceed 1.3–1.4 mm. In some chemically prepared colonies, it reaches 1.6 mm.

The proximal thecae are slightly sigmoidally curved, the distal ones are straight short tubes. The structure of the fuselage layer shows that already at the initial stage of the growth of the leak of the first theca, the fuseluses narrowed within the ventral wall. As a result, small ventral-lateral elevations are formed.

At the stage of formation of the metatheca of the first theca, there was a uniform growth of the lateral walls and the canal septum. Within the ventral wall of the metatheca, all fuseluses of this stage narrowed 2–3 times. As a result, ventral-lateral elevations 0.12-0.15 mm high were formed.

At the final stage of growth of the metatheca, there was further growth of the lateral walls of the first theca and, in part, of the adjacent parts of the intertheca septa. In the direction of the ventral wall, and subsequently in the dorsal direction, additional fuseluses wedged out. This led to the formation of symmetrical lateral lobes of the first theca, 0.4–0.6 mm long. They are always bent towards the sicula and slightly hang over the mouth of the first theca.

The formation of aperture lobes of the second and subsequent theca also occurred in two stages: first, ventral-lateral elevations were formed during the growth of their proteca and metatheca, and then the lobes were built up with additional fuseluses, which wedged out near the ventral wall and in the dorsal direction. For example, at least 5 additional fuseluses participate in the formation of the blades of the first and second techs, at least 4 of the fourth techs. The number of blades bent downwards is not constant. Some colonies have 2-6, others 10-15. The blades of some techs grew in the direction of the tech growth. From bottom to top along the rhabdosome, the length of the lobes gradually decreases. In distal theca they are replaced by ventral-lateral elevations. The ventral margins of the mouths of the distal thecae are distinctly concave.

The length of the first theca is 1-1.1 mm, the fifth - 1.3-1.4 mm, the tenth - 1.5-1.7 mm, the extreme distal - 1.8-1.9 mm. The length of proximal leaks is 0.5-0.8 mm, distal - 0.7-0.9 mm. The length of the proximal metathecus is 0.5-0.9 mm, the distal one is 0.7-1.2 mm. The degree of overlap of the proximal theca 1/3-2/5, distal - 1/2-2/5. The length of the proximal theca exceeds their width by 2-2.5 times, the distal - by 2.5-3.2 times.

The proximal thecae are inclined to the axis of the rhabdosomes at an angle of 30-40°, the distal ones - at an angle of 25-30°.

In 10 mm of rhabdosome length, there are 13-14 thecae.

Sicula narrow, ventrally curved. Its length is 2-2.2 mm, the width of the mouth is 0.3-0.5 mm. The top of the sicula reaches the level of the aperture of the second theca or is located 0.2-0.3 mm above it. The base of the first theca is located 0.2-0.4 mm above the mouth of the sicula. The length of the virgella is 0.2-0.5 mm.

Variability. The width of rhabdosomes changes within small limits. The number of proximal theca with downwardly curved lobes is very variable.

Comparison. According to the astogenetic development of colonies, this species is closest to *Skalograptus lochkovensis* (Prib.). It differs from the latter in small and narrow rhabdosomes (1.5-1.6 mm instead of 2-2.3 mm in *S. lochkovensis*), as well as in a large number of thecae per unit of measurement (13-14 thecae instead of 8-12 in *S. lochkovensis*).

The shape and size of the rhabdosomes *Skalograptus vetus* Tseg. close to *S. branikensis* (Jaeg.), from which it clearly differs in a large number of thecae per unit of measurement (13-14 in 10 mm of length instead of 9-12 thecae in *S. branikensis*).

Remarks. According to G. Jaeger (139), *Pristiograptus aduncus* Tell. and *P. separabilis* Tell. are synonymous with the species *Monograptus transgrediens* Pern. L.Teller (195) and A.Urbanek (215) attributed the first of them to *Neocolonograptus lochkovensis* (Prib.), and the second to *Istrograptus transgrediens* (Pern.).

G. Jäger (139) and A.Urbanek (215) included *Skalograptus vetus* Tseg. synonymous with, respectively, *Monograptus ultimus* Pern. and *Neocolonograptus ultimus* (Pern.), thereby expanding the distribution of the *Istrograptus ultimus* Zone to the base of the pridolium. However, these authors showed the stratigraphic position of this zone in their works above the *Ludensograptus parultimus* Zone (142, fig. 24; 215, fig. 3).

In the same work, A. Urbanek described rhabdosomes of the species *Skalograptus vetus* Tseg. (215, p. 168, pl. 23, figs. 1-4) under the name *Neocolonograptus lochkovensis branikensis* (Jaeg., 1986).

The solution to the problem of the species *Skalograptus vetus* Tseg., 1976, in our opinion, is not to attribute its dwarf (in comparison with *Skalograptus lochkovensis* Prib.) rhabdosomes to one or another already known species, but to establish the reason for the existence of such small rhabdosomes of the new monograptids of the same structural type at the very beginning of the Przhidolsk stage of their life (and before the appearance in the geological record of large rhabdosomes of the same monograptid structure type *Skalograptus lochkovensis* Prib.).

G. Jaeger (143) traced the distribution of small rhabdosomes of the species (subspecies) *Pristiograptus parvus* Ulst within Europe immediately above the *Cyrtograptus lundgreni* zone and explained the possible reasons for their dwarfism. His conclusions are of great importance for the geochronology of the adjacent Wenlockian-Ludlow deposits.

Association. Within Volyno-Podolia this species occurs together with *Ludensograptus parultimus* (Jaeg.), *Tirassograptus difficilis* (Tseg.), *Dulebograptus trimorphus* Tseg., *Bohemograptus tenuis* (Bouc.), *Pristiograptus fecundus* Prib., *Linograptus sp., Formosograptus formosus* (Bouc.).

Distribution. Upper Silurian, Przhidolian Belt, lower part of the Stavanian Stage, *Istrograptus ultimus-Ludensograptus parultimus* zone; the upper part of the Milovanskaya and the lower part of the Gushchinskaya suites of the Polessky ledge of the basement, the lower part of the Mukhavetskaya suite of the Brest depression, the lower part of the Darakhovskaya and Zadarovskaya suites of Podolia.

M a t e r i a l. More than 45 fragments of rhabdosomes on the surface of marls and limestones, uncovered by boreholts Dublyany-4 in int. 4028-4037 m; Guscha-4015 in int. 642.2-646.6 m, 659-662.4 m, 663.4-667.8 m; Brest-10 on depth 534.3 m; Zavadovka-6 on depths: 1274.2 and 1284.6 m; Pulemets-1884 on depth 556 m.

We also obtained 75 chemically prepared rhabdosomes from marls and limestones of the borehole Guscha-4015 in int. 591.4-595.9 m, 602.9-606.3 m, 615.1-620.5 m, 622.4-626.8 m, 626.8-640 m.

Skalograptus lochkovensis (Pribyl, 1940)

Tab. III, draw. 1; tab. XVIII, fig. 6-9

Monograptus (Pristiograptus) lochkovensis: Pribyl, 1940 a, c. 69, tab. 1, fig. 6.

Saetograptus (Colonograptus) lochkovensis: Pribyl, 1983, pl. 1, fig. 12.

Monograptus lochkovensis: Jaeger, 1977, p. 340, fig. 3; Root, 1986, p. 99, tab. 21, fig. 1-6, fig. 17; Jaeger, 1986, p. 324, tab. 1, fig. 16, tab. 3, fig. 16.17, fig. in text 39.

Monograptus ultimus: Jaeger, 1986, p. 321 (pars), fig. 37 a.

Neocolonograptus lochkovensis: Teller, 1997, p. 77 (pars), pl. 3, fig. 1-5, 7-9 (non pl. 3, fig. 6 = *Istrograptus rarus* Tell., 1964).

Neocolonograptus lochkovensis lochkovensis: Urbanek, 1997, p. 169, tab. 24-26, fig. 49-55, 56 A.

Holotype. Pribyl, 1940 a, pl. 1, Fig.6, rhabdosome procoimal, Przhidolian Belt, *Skalograptus lochkovensis* zone of the Czech Republic (142).

Description. Large, slightly ventrally curved proximal rhabdosomes, more than 40 mm long. Some of them are slightly curved dorsally in the interval of the first 2-3 tech. Their width at the level of the aperture of the first theca is 0.9-1.1 mm, directly above -0.6-0.7 mm, at the level of the mouth of the fifth theca - 1.4-1.5 (0.6-1) mm, tenth - 1.55-2 (1.3-1.4) mm, twentieth - 2-2.1 (1.7-1.8) mm, twenty-fifth - 2.2-2.3 (1 .7-1.8) mm and then does not change.

Theca are represented by narrow straight tubes inclined to the axis by rhabdos at angles of 25-30°.

The lateral walls of the first 7-12 proximal thecae are equipped with lobes that hang over the mouths of the theca and smoothly fold down. The length of the blades is 0.3- 0.5 mm. The largest of them are located near the first theca.

In the distal direction, the length of the blades decreases. Gradually they are replaced by symmetrical lateral elevations. The lateral margins of the subsequent theca acquire a pristiograft appearance.

The length of the first theca is 1-1.2 mm, its leaks are 0.75-0.8 mm, metatheca are 0.2-0.45 mm; fifth - 1.35-1.5 mm, leaks - 0.8-0.9 mm, metatheques - 0.55-0.6 mm; tenth - 1.65-2 mm, leaks - 0.8-0.85 mm, metatheques - 0.85-1.2 mm; the twentieth - 2.6-2.95 mm, leaks - 1.1-1.15 mm, metatheques - 1.5-1.85 mm; twenty-fifth - 3-3.3 mm, leaks - 1.1-1.2 mm, metatheques - 1.9-2.1 mm.

From the given measurements, it can be seen that the length of the flow increases slightly from bottom to top along the rhabdosomes. The increase in the length of the theca occurred mainly due to the elongation of the metathecus.

In this regard, the length of the interthecal septa rapidly increased in the distal direction. At the level 8-9 of the theca, its base reaches the level of the mouth of the previous theca, and in the middle part of the rhabdosome its base descends to the level of the mouth of the n-2 theca and does not fall any more.

Proximal theca overlap by 1/2-1/4, distal - by 2/3 of their length.

The length of proximal thecae exceeds their width by 4-5 times, distal - by 7-8 times.

In 10 mm length of the proximal parts of rhabdosomes there are 11-12 thecae, distal - 8-9 thecae.

Sicula narrow, straight or slightly curved ventrally. Its length is 1.8-2 mm, the width of the mouth is 0.4-0.6 mm. The top of the sicula reaches the level of the mouth of the second theca or is located 0.1-0.15 mm above it. The base of the first theca is located 0.35-0.45 mm above the mouth of the sicula. The distance from the last to the end of the first theca is 1.3-1.4 mm. Virgella length 0.25-0.5 mm. The large dorsal lobe of the siculum is well developed. Its length reaches 0.3 mm.

Variability. The width of the rhabdosomes, the degree of ventral bending of the proximals, and the number of proximal thecae equipped with lateral lobes vary.

Comparison. According to the astogenetic development of colonies, this species is closest to *Skalograptus branikensis* (Jaeg.), from which it essentially differs only in longer and wider rhabdosomes.

L.Teller (195) included *S. branikensis* (Jaeg.) in the synonymy of the described species, and A.Urbanek (215, pl. 23, figs. 1-4) attributed to *S. branikensis* (Jaeg.) rhabdosomes of the species *Skalograptus vetus* Tseg .

From *Skalograptus vetus* Tseg. the described species is distinguished by large rhabdosomes, often a shorter sicula, and a smaller number of thecae per unit of measurement.

Remarks. The Volynian specimens of this species differ from the Czech and Kazakh specimens by a somewhat smaller width of rhabdoses in their distal parts (2.2-2.3 mm instead of 2.25-3 mm).

Rhabdosomes assigned to *Colonograptus cf. lochkovensis* (Prib.) (30, p. 54, pl. 10, fig. 1, 2) do not belong to the described species.

Association. In the interval 551-555 m borehole Pulemets-1884 met in a large number of rhabdosomes of this type only. Below (depth 560 m), *Ludensograptus parultimus* (Jaeg.), higher (depth 526 m), *Istrograptus transgrediens* (Pern.) were found in the indicated borehole.

Distribution. Upper Silurian, Przhidolian Belt, upper part of the Stavanian Stage, *Skalograptus lochkovensis* zone; the tops of the Milovanskaya, the bottoms of the Guschinskaya suite of the Polessky ledge of the basement, the Zadarovskaya suite of the submerged part of the Lvov trough.

G. Eger (142, fig. 37a) depicted a fragment of the proximal of *Skalograptus lochkovensis* (Prib.) from the very bottom of the *Istrograptus ultimus* zone in the Kosov quarry (see ibid., fig. 21). This indicates that the *Istrograptus ultimus* zone in the type sections of the Czech Republic constitutes the lower part of the *Skalograptus lochkovensis* zone.

In this regard, in our opinion, we should agree with the opinion of L. Teller (195) that *Monograptus branikensis* Jaeg., 1986, found in the geological section of the Silurian of the Czech Republic above the *Istrograptus ultimus* zone (142, p. 326), was established according to proximal fragments of rhabdosomes of the species *Skalograptus lochkovensis* (Prib.). L. Teller (195) and A. Urbanek (215) further expanded the volume of the *Skalograptus lochkovensis* zone (to the base of the pridolium) by placing *Pristiograptus bugensius* Tell. into the synonymy of *Neocolonofraptus lochkovensis* (Prib.).

Rather, apparently, one should agree with G. Jaeger (142), who placed *Pristiograptus bugensius* Tell. into the synonymy of *Monograptus ultimus* Pern. In this case, the *Skalograptus lochkovensis* zone would be located above the *Istrograptus ultimus-Ludensograptus parultimus* zone, which is confirmed by the distribution of *Skalograptus lochkovensis* (Prib.) in many regions of the world.

Material. 32 fragments of rhabdosomes on the surface of marls recovered from wells Pulemets-1884 on depths 551 m, 552 m, 553 m, 554 m, 555 m; Kusnishche-5394 on depths 372 m, 372.5 m, 373 m, 375 m, 390 m, 391 m; Davideny-1 in int. 2628-2630 m.

Subfamily *Pristiograptinae* Gurich, 1908, emend.

Type genus - *Pristiograptus* Jaek., 1889.

Diagnoz. Straight or dorsally curved (rarely) rhabdosomes with slightly curved ventrally or dorsally proximal parts of them.

Thecae are represented by straight tubes. Their ends are even or equipped with symmetrical lateral or ventral-lateral elevations, lobes or spikes.

Subfamily composition. Genera: *Pristiograptus* Jaek., 1889; *Ludensograptus* Tseg., 1978; *Colonograptus* Prib., 1942; *Saetograptus* Prib., 1942; *Istrograptus* Tseg., 1988.

Comparison. The rhabdosomes of this subfamily differ from *Heisograptinae* Tseg., 1976 in the absence of excavations of the ventral margin and aperture structures in the form of dorsal or dorsal-lateral visors.

From *Uncinatograptinae* Tseg., 1976, which have lateral lobes in proximal thecae (genus *Skalograptus* Tseg., 1976), *Pristiograptinae* equipped with lobes (genus *Colonograptus* Prib., 1942, *Istrograptus* Tseg., 1988) differ in the shape and location of the lobes.

Distribution. Lower, Middle and Upper Silurian, Tarannonian, Kitaigorodian, Tiritian, Ulichian and Przhidolian Belts of Europe, Asia, America, Africa.

Genus *Pristiograptus* Jaekel, 1889

Pristiograptus dubius (Suess, 1851)

Tab. II, draw. 2; tab. XVIII, Fig.10-12

Graptolithus dubius: Suess, 1851, p. 115, Table 9, Fig. 5 a, b.

Monograptus dubius: Tullberg, 1883, p. 29 (pars), pl. 2, fig. 20, 21 (none of Table 1, figs. 28, 29); Holm, 1890, p. 16, tab. 1, fig. 18-26; Wood, 1900, p. 454, tab. 25, fig. 1, fig. nine; Elles and Wood, 1911, p. 376, tab. 37, fig. 7 a-d, fig. 247; Chernyshev, 1941, p. 82, tab. 3, fig. I; Walker, 1953, p. 365, fig. 2, 3; Kuhne, 1955, p. 360, fig. 2; Willefert, 1962, p. 33, fig. 14.

Pristiograptus dubius: Pribyl, 1943, c.3, pl. 1, fig. 4-6; Urbanek, 1958, p. 83, tab. 5, fig. 12; Abduazimova, 1970, p. 49, tab. 2, fig. 9, fig. 7; Lenz, 1975, p. 86, fig. 3(E-G); Root, 1986, p. 119, tab. 29, fig. 2-9, fig. 27, 28.

Pristiograptus dubius dubius: Lenz, 1975, p. 86, fig. 3e-g.

Priatiograptus (Pristiograptus) dubius cf. dubius: Urbanek, 1953, p. 285, fig. 8.

Holotype. Suess, 1851, pl. 9, fig. 5; Wenlock Series, *Uncinatograptus riccartonensis* Zone of the Czech Republic (174).

Description. Straight rhabdosomes, more than 40 mm long, with a slight ventral bend of the proximals within the first 5-8 tech. During the first 2-3 days, the rhabdosomes are almost even. Their width increases very gradually from 0.7-0.8 mm to 2 mm. At the level of the aperture of the first theca, it reaches 0.7-0.8 mm, the second - 0.9-1.1 mm, the fifth - 1.2-1.4 mm, the tenth - 1.5-1.7 mm, the fifteenth - 1.9-2 mm and then does not change.

Theca are represented by straight cylindrical tubes. The lateral margins of the mouths are slightly concave or even. They are located in planes that are located at obtuse angles to the ventral walls of the theca.

The plane of the mouth of the first theca is especially strongly inclined downwards, which is a characteristic feature of this species. The length of the proximal leaks is 0.6-0.8 mm, the metathecus is 0.4-1 mm, the distal leak is 0.7-1.1 mm, the metathecus is 1.2-1.5 mm.

The total length of proximal theca is 1-1.8 mm, distal - 2.1-2.5 mm. The degree of overlap of proximal theca 1/2, distal - 1/2 or slightly more than their length.

The angles of inclination to the axis of the rhabdos were 30-35 degrees.

In 10 mm of the length of the proximal parts of rhabdosomes there are 10-11 tecae, distal - 8-9 tecae.

Sicula narrow, slightly ventrally curved. Its apex is located 0.2-0.3 mm above the level of the mouth of the first theca. The base of the latter descends almost to the base of the sicula or is located 0.1-0.15 mm above its mouth. Sicula length 1.6-2.1 mm, aperture width 0.3-0.4 mm. Virgella length 0.4-0.6 mm.

Variability. The ventral bending of the proximals varies, apparently due to the position of the rhabdosomes on the samples and their unequal deformation during rock diagenesis.

Comparison. This species differs from all species of the genus *Pristiograptus* Jaek., 1889 by a strong downward inclination of the plane of the mouth of the first theca. In addition, *P. dubius* (Suess) differs from the closest species *Pristiograptus tumescens* (Wood) in a very gradual increase in the width of rhabdosomes. This species differs from *Pristiograptus ludlowensis* (Bouc.) in the greater width of the rhabdoses.

Remarks. Volyno-Podolian representatives of *Pristiograptus dubius* (Suess) are very similar to Polish, Czech and English forms. They differ from the forms from the Northern Balkhash region (25) in their greater width of rhabdosomes (in the collection of T.N. Koren, rhabdosomes 1.25-1.35 mm wide predominate).

Association. Together with this species, there are *Pristiograptus tumescens* (Wood), *P. gotlandicus* (Pern.), *Ludensograptus latilobus* (Tseg.), *Gothograptus nassa* Holm, *Colonograptus colonus* (Barr.), *Heisograptus micropoma* (Jaek.), *"Monograptus" operculatus* Munch, *Neodiversograptus beklemishevi* Urb.

Distribution. Middle and Upper Silurian, upper part of the Kitaigorodian, Tiritian and Ulichian Belts, *Monograptus flemingii*, *Ludensograptus ludensis-Gothograptus nassa*, *Neodiversograptus nilssoni-Saetograptus chimaera*, *Saetograptus leintwardinensis*, *Neocucullograptus kozlowskii-Neolobograptus auriculatus*, *Formosograptus formosus-spineus* zones; the Zabrodskaya, Oleshkovichskaya, Novinskaya, and Milovanskaya suites of the western part of the Polessky ledge of the basement.

Material. 39 rhabdosomes on the surface of marls and mudstones recovered by the wells of Kharsy-1873 in int. 336-336.5 m, 348.5-349 m, 350.7-351.3 m, at depths 354.5 m, 356 m, 381 m, 390 m; Brest-1 on depths 641 m, 685 m, 696 m, 708 m, 715 m, 738 m, 748 m; Mosyr-5372 on depths 295 m, 297 m; Stavky-5376 on depth 334 m; Guscha-4015 in int. 738-743 m, 763-768 m, 768-773 m, 786-790 m, 790-795 m, 795-800 m, 817-820 m, 822-830 m, 933.4-936.9 m, 941 .8-952.6 m, 952.6-961.8 m, 967-972 m, 981.1-989 m; Pulemets-1884 at depths 723.5 m, 739 m, 743 m, 744.5 m, 745.7 m; Priluky-1844 on depths 387 m, 485 m; Smolary Rogovy-1892 on depth 396 m, 398 m; Koropets-2 in int. 1228-1230 m; Peremyshlyany-1 in int. 2861-2870.3 m; Great Mosty-30 in int. 3929.4-3939.6 m; Davideny-1 in int. 2932-2939 m, etc.

There are 10 fragments of rhabdosomes extracted from the marls of borehole Guscha-4015 in int. 681.1-685.6 m, 789.9-794.9 m, 844.5-847 m; Shiev-4109 in int. 469.3-470.3 m, 473-474 m as well as from the *Neodiversograptus nilssoni* zone of the Świętokshyskie mountains.

Pristiograptus gotlandicus (Perner, 1899)

Tab. II, draw. 3; tab. XIX, fig. 1-5

Monograptus gotlandicus: Perner, 1899, c. 12, tab. 14, fig. 22; Wood, 1900, p. 460, tab. 25, fig. 7; Boucek, 1956, p. II, fig. I a-c; Tsegelnyuk, 1988 a, p. 85, tab. 1, fig. 2.

Monograptus cf. gotlandicus: Elles and Wood., 1911, p. 382, tab. 37, fig. 8, fig. 252.

Pristiograptus gotlandicus: Munch, 1942, c. 251, tab. 5, fig. 12; Pribyl, 1943, p. 23, tab. 2, fig. 5, fig. 3 V; Shoe, Sobolevokaya, Bondarev, 1965, Fr. 67, tab. 21, fig. 4, 5.

Holotype. Perner, 1899, pl. 14, fig. 22; Czech Republic, Ludlov series (174).

Description. Straight large rhabdosomes more than 75 mm long with a distinctly curved ventrally proximal part within 10-15 tec. In the interval of the first two or three thecae, they are curved in the opposite direction, and therefore the beginnings of the proximals are almost straight. Their width rapidly increases from 0.75-0.85 mm at the level of the mouth of the first theca to 2.1-2.5 mm in 13-15 theca. Further, rhabdosomes slowly expand to 2.4-2.5 mm.

Thecae are long cylindrical tubes of the stiograft type. In the curved part of the proximals, they are uniformly slightly curved ventrally, and in the straight part of the rhabdosome, they are even.

The aperture margins of the thecae are thickened, their lateral parts are slightly concave or even. The planes of the mouths of the flow are inclined downwards. The length of the proximal leaks is 0.7-0.9 mm, the metathecus is 0.5-2 mm; distal leaks - 0.8-1.1 mm, metathecs - 2.1-2.2 mm. The total length of the proximal theca is 1.1-2 mm, the distal one is 5-5.2 mm. The degree of overlap of the proximal theca 1/2-2/5, distal - 4/5-5/6. The angles of inclination to the axis of the rhabdosome were 55–40°.

In 10 mm of proximal length there are 11-11.5 thecae, distals - 10-10.5 thecae.

Sicula narrow, ventrally curved. Its length is 1.8-1.9 mm, the mouth width is 0.5 mm. Its top is located below the level of the mouth of the second theca by 0.15-0.2 mm. The base of the first theca is 0.2-0.25 mm above the mouth of the sicula. Virgella length 0.4-0.5 mm.

Variability. In relatively small limits, the width of rhabdosomes, the degree of overlap of the thecae, and their number per unit of measurement vary.

Comparison. According to the general form of rhabdosomes, this species is closest to *Pristiograptus kosoviensis* (Bouc.), which is in our collection (85, p. 108, pl. 29, fig. 5). The latter differs from *Pristiograptus gotlandicus* (Pern.) in a large number of thecae 10 mm long in rhabdosomes (11-13) and in a large overlap of thecae, reaching up to 11/12 in *Pristiograptus kosoviensis* (Bouc.).

P. gotlandicus (Pern.) differs from other representatives of the genus *Pristiograptus* Jaek., 1889 in its greater width of rhabdoses, very long thecae, and their large overlap.

Remarks. A. Urbanek (206) described in detail and depicted the astogenetic development of rhabdosomes, which, according to their general shape and size, as well as the number of thecae per unit of measurement, he attributed to the species Pristiograptus gotlandicus (Pern.).

C.Holland, R.Rickards and P.Varen (132) established that the rhabdosomes described by A.Urbanek should be attributed to another species - *Monograptus ludensis* (Murch..). On this basis they placed Pristiograptus gotlandicus (Pern.) synonymously with *Monograptus ludensis* (Murch.).

The specimens described by us in shape and size of rhabdosomes fully correspond to the species *Pristiograptus gotlandicus* (Pern.). They do not have lateral eminences on the first procoimal thecae. Therefore, there is no reason to consider *Pristiograptus gotlandicus* (Pern.) as a synonym for *Monograptus ludensis* (Murch.). In our opinion (see below), these species belong to different genera, respectively, *Pristiograptus* Jaek., 1889 and *Ludensograptus* Tseg., 1978.

Association. *Pristiograptus dubius* (Suess), *Ludensograptus ludensis* (Murch.), *Bohemograptus bohemicus* (Barr.) occur together with this species.

Distribution. Middle Silurian, Tiritian Belt, upper Glydonian, Gorstian and lower part of Konovian Stage, upper *Ludensograptus ludensis-Gothograptus nassa* zone, *Neodiversograptus nilssoni-Saetograptus chimaera* zone, and lower part of zone *Saetograptus leintwardinensis*; the upper part of the Kladnevskaya, Zabrodskaya and lower part of the Turskaya suites of the Polessky ledge of the basement.

Material. 3 fragments of rhabdosomes on the surface of marls drilled by the boreholes of Kharsy-1873 in int. 346.5-346.8 m, on depth 381.7 m; Samoilichy-1859 on depth 407.6 m.

We also studied 3 rhabdosomes on the surface of marls and 4 colonies extracted from them from the *Pristiograptus gotlandicus* zone of the Świętokrzysky Mountains (village of Bardo, Prongowiec ravine).

Pristiograptus vicinus (Perner, 1899)

Tab. II, draw. 6; tab. XIX, fig. 8. 9; tab. XX, fig. 1. 2

Monograptus vicinus: Perner, 1899, c. 11, tab. 14, fig. 25.

Pristiograptus vicinus: Munch, 1942, c. 247, tab. 1, fig. 7; Pribyl, 1943, p. 15, tab. 1, fig. 10.11, fig. N. O. P, Figure 2; Krandievsky, 1968, p. 48, tab. 9, fig. 9-12. *Monograptus comis*: Wood., 1900, c. 459, tab. 25, fig. 8, fig. 12; Elles and Wood, 1911, p. 381, tab. 37, fig. 9, fig. 251.

Monograptus compressus: Boucek, 1936, c. 7, tab. 1, fig. 11, 12.

Holotype. Perner, 1899, pl. 14, fig. 25, Czech Republic, Ludlow series (174).

Description. Small narrow rhabdosomes up to 20 mm long.

Their proximal parts are distinctly ventrally curved within the first 7-9 thecae. The width of the colonies gradually increases from 0. 65-0.8 mm at the level of the aperture of the first theca to 1. 2-1. 3

mm at the 7-8 theca. In the middle part of rhabdosomes, it does not change. In the distals, the width usually gradually decreases to 0. 9-1 mm.

Thecae are straight cylindrical tubes. Their mouth margin is thickened. The lateral parts of the mouths are even or slightly concave, the ventral parts often form slight depressions, which, however, do not reach 0. 1 mm. Usually they are somewhat thicker than the lateral margins, with which, apparently, the ventral curvature of the aperture margin is associated. The planes of the latter are inclined downwards.

The length of the proximal leaks is 0.6-0.7 mm, the metathecus is 0. 7-0. 8 mm, the distal leak is 0. 8-0. 9 mm, the metathecus is 0.8-1 mm. The total length of proximal techs is 1. 1-1. 6 mm, distal - 1. 7-1. 9 mm. The length of the proximal theca exceeds their width by 3-3. 5 times, the distal - four times. The degree of overlap of the proximal and distal theca 1/2.

The angles of inclination to the axis of the rhabdosome were 25-30°.

There are 11 techs in 10 mm of rhabdosome length.

Sicula narrow, slightly curved ventrally. Its apex is at the level of the aperture of the second theca. Sicula length 1.8-1.9 mm, opening width 0.4-0.5 mm. The latter is located 0.15-0.2 mm below the base of the first theca. Virgella length 0.4-0.5 mm.

Variability. The outline of the mouths of the tech is the most variable. Usually the lateral margins are slightly concave or nearly even. Due to the lowering of the ventral margins, their lateral parts take the form of low gentle elevations. The width of rhabdosomes is also variable. However, it does not exceed 1. 3 mm.

Comparison. This species differs from *Pristiograptus ludlowensis* (Bouc.) in shorter rhabdosomes, their smaller width, and a large number of thecae 10 mm long.

It differs from *Pristiograptus pseudodubius* (Bouc.) in shorter rhabdosomes, their somewhat wider width, and shorter ventral curvature of the proximal part.

This species differs from *Pristiograptus praedubius* (Bouc.) in a large number of thecae 10 mm long in rhabdosomes.

It differs from *Pristiograptus parvus* Ulst in the greater width of rhabdosomes, lesser ventral proximal curvature, and fewer thecae per unit of measurement.

Remarks. The synonymy of *Pristiograptus vicinus* (Pern.) does not include specimens attributed to this species by T.N. Koren and R.Zh. Ulst (28, p. 247, pl. 29, fig. 8, fig. 62). They differ from the Volyno-Podolsk, Czech and English forms by a larger width of rhabdosome and a denser arrangement of the thecae, which is also noted in the description of these authors.

According to these features, the Baltic forms are close, in our opinion, to the subspecies *Pristiograptus tumescens minor* (Mc Coy).

We have not included in the synonymy of this species (see above) the specimens described by V.S. Krandiewsky. The study of them showed that their rhabdosomes differ from *Pristiograptus vicinus* (Pern.) in their greater width, smaller ventral bending of the proximal rhabdosomes, and a large number of thecae per unit of measurement.

Association. Together with *Pristiograptus vicinus* (Pern.) there are *Bohemograptus bohemicus* (Barr.), *Lobograptus exspectatus* Urb., *Pseudomonoclimacis tauragensis* (Pask.).

Distribution. Middle and Upper Silurian, upper part of the Konovian, Tagrian and lower part of the Metonian Stages, *Saetograptus leintwardinensis, Neocucullograptus kozlowskii-Neolobograptus auriculatus*, *Formosograptus formosus-Bugograptus spineus* zones; Zabrodskaya, Oleshkovichskaya, Novinskaya, Milovanskaya suites of the Polessky ledge of the basement, Rusilovskaya and Lesnyanskaya suites of the Brest depression, Zheldetskaya and Peremyshlyanskaya suites of the Lvov trough.

Matepial. 8 rhabdosomes on the surface of mudstones and marls drilled by boreholes Gushcha-4015 in the int. of 804.9-809.4 m, 933.4-936.9 m; Brest-1 on depths 540 m, 550.5 m, 558 m; Litovezh-1 int. 2609.4-2614 m; Peremyshlyany-1 in int. 2861-2870.3 m; Zagaipol-1in int. 2799-2806 m.

There are also 15 semi-volumetric rhabdosomes chemically extracted from the marls of boreholes Guscha-4015 in int. 712.6-717.5 m, 717.5-722.5 m, 842.5-844.5 m, 844.5-847 m, 933.4-936.9 m; Brest-1 on depths 550.3 m, 566 m, 640 m, 645 m.

Pristiograptus tumescens (Wood, 1900)

Tab. XIX, fig. 4-7; tab. XX, fig. 3, 4

Monograptus tumescens: Wood, 1900, p. 458, pl. 25, fig. 5A, 5B; Elles and Wood, 1911, p. 379, tab. 37, fig. 12, draw. 249.

Pristiograptus (Pristiograptus) tumescens: Tomczyk, 1956, p. 54, tab. 7, fig. 2, draw. l5b; Lenz, 1975, p. 86, draw. 2 (N, O).

Pristiograptus tumescens: Krandievsky, 1968, p. 47, tab. 9, fig. 5, 6.

Holotype. Not specified. The syntypes come from the *Pristiograptus tumescens* zone of the Ludlow Group of Great Britain.

Description. Straight rhabdosomes more than 35 mm long with a distinctly ventrally curved proximal part within the first 8-10 thecae. The width of the flattened rhabdosomes rapidly increases in the curved part of the proximal from 0.75-0. 8 mm to 2 mm. Further up the rhabdosome, it decreases to 1. 9-1. 7 mm. In varying degrees, volumetric specimens reach the largest width of 1. 7-1. 8 mm at a level of 10-13 theca.

Thecae are straight cylindrical tubes. Their mouth margin is thickened. Often, the ventral or lateral edges are selectively thickened, and therefore it becomes uneven due to the concavity of the ventral or lateral parts of the apertures.

These uneven thickenings do not lead to the formation of regular elevations or depressions of the aperture edge. The aperture planes form approximately right angles with the ventral walls. This feature is characteristic of this species.

The length of the proximal leaks is 0.6-0.8 mm, the metathecus is 0.4-1.2 mm, the distal leak is 0.9-1 mm, the metathecus is up to 1.8-1.9 mm. The total length of the proximal theca is 1.1-2.1 mm, the distal one is up to 2.5 mm. The length of the proximal theca exceeds their width by 3 times, the distal - by 4 times.

The degree of overlap of the proximal theca 1/3-3/5, distal - 3/5-5/6.

The angles of inclination to the axis of the rhabdosome were 25–35°. In 10 mm of proximal length, there are 11-11.5 techs, distals - 9-10 techs.

Sicula narrow, slightly curved ventrally. Its apex is at the level of the aperture of the second theca or 0.1-0.15 mm below it. The mouth of the sicula is located 0.2-0.25 mm below the base of the first theca. The length of the sicula is 1.9-2.1 mm, the width of the mouth is 0.4-0.6 mm.

Variability. The width of the rhabdosomes and the ventral bend of the proximals vary. The thecae length and their overlap change significantly, especially in the middle and distal parts of rhabdosomes.

Comparison. This species differs from *Pristiograptus dubius* (Suess), which is similar in shape and size, in a significantly faster increase in width within the proximal limits, as well as in a large overlap of the thecae in the middle and distal parts.

From *Pristiograptus fecundus* Prib. it is distinguished by the greater width of the rhabdoses, longer thecae, and their greater overlap.

This species differs from *Pristiograptus kosoviensis* (Bouc.) in the smaller width of the rhabdosomes and shorter distal thecae.

Association. Together with *Pristiograptus tumescens* (Wood), *P. dubius* (Suess), *Ludensograptus latilobus* (Tseg.), *Saetograptus leintwardinensis* (Lapw.), *Bohemograptus bohemicus* (Barr.), *Wolynograptus acer* (Tseg.), *Uncinatograptus caudatus* Tseg.

Distribution. Middle and Upper Silurian, Tiritian and Ulichian Belts, *Neodiversograptus nilssoni-Saetograptus chimaera*, *Saetograptus leintwardinensis*, *Neocucullograptus kozlowskii-Neolobograptus auriculatus*, F*ormosograptus formosus-Bugograptus spineus* zones of Volyno-Podolia; the Turskaya, Zabrodskaya, Novinskaya, Gornikskaya and lower part of the Milovanskaya suites of the Polessky ledge of the basement; the Rusilovskaya suite of the Brest depression.

Material. 34 rhabdosomes on the surface of marls and argillites penetrated by wells in Peremyshlyany-1, int. 2887-2890 m; Priluki-1 on depth 387 m; Davideny-1 in int. 2755-2761 m; Zagaipol-1 int. 2650-2657 m; Guscha-4015 in int. 732-738 m, 748-753 m; 783-785.5 m, 816-820 m; Samoilichi-1859 on depth 284.3 m, in the interval 287-288 m, on depth 287.5 m; Kharsy-1873 in int. 346.5-347 m, 350.7-351.3 m, at depths 353 m, 367.8 m; Selyakhi-1883 on depths 395.5 m, 396 m, 402 m; Pulemets-1884 on depths 703 m, 708 m, 771 m.

Extracted by 9 rhabdos from marls from well Brest-1 on depth 547 m, 586.5 m, 640 m.

Genus *Ludensograptus* Tsegelnjuk, 1978.

Graptolithus: Murchison, 1839, p. 694(pars).

Monograptus: Wood, 1900, p. 465; Elles and Wood, 1911, p. 394; Jaeger, 1959, p. 126; Holland, Rickards, Warren, 1969, p. 673; Palmer, 1970, p. 338; Jaeger, 1975, p. 119; Jaeger, 1986, p.318; Jaeger, 1991, p. 318.

Pristiograptus: Tomczyk, 1956, p. 53; Urbanek, 1959, p. 11 Krandievsky, 1968, p. 50(pars); Ulst, 1974, p. 117; Lenz, 1975, p. 86; Berry and Murphy, 1975, p. 73.

Monoclimacis: Krandievsky, 1968, p. 38; Pashkevichius, 1979, p. 160.

Pseudomonoclimacis: Tsegelnjuk, 1976, p. 106; Urbanek, 1997, p. 161. *Colonograptus:* Tsegelnjuk, 1976, p. 109.

Ludensograptus: Tsegelnjuk, 1978 a, p. 88 (87).

Type species - *Graptolithus ludensis* Murch., 1839.

Diagnosis. Straight or slightly curved dorsally small and large rhabdosomes. The thecae are represented by straight or slightly sigmoidally curved tubes. A characteristic generic sign of rhabdosomes are lateral elevations at the mouths of the thecae. There is a certain regularity in their arrangement:

1) elevations are located at the mouths of the first 1-7 proximal thecae, and the mouths of all subsequent thecae have a pristiograptid appearance,

2) elevations are developed in the thecae of the lower parts of the rhabdosomes, in all subsequent thecae the aperture edges are even,

3) elevations are present in all the thecae rhabdosomes.

In the specified sequence, species of this genus are also found in the geological record, forming a distinctly discontinuous morphological series in the transition from one species to another.

Composition of the genus: *Graptolithus ludensis* Murch., 1839; *Monograptus gerhardi* Kuhne, 1955; *M. deubeli* Jaeg., 1959; *M. praedeubeli* Jaeg., 1990; *M. parultimus* Jaeg., 1975; *M. vulgaris* Wood, 1900; *M. massai* Jaeg., 1991; *Colonograptus latilobus* Tseg., 1976; *Pseudomonoclimacis podolicus* Tseg., 1976; *Saetograptus (Colonograptus) insignitus* Prib., 1983.

This genus differs from *Colonograptus* Prib., 1942 and *Istrograptus* Tseg., 1988 by the absence of lateral lobes in proximal thecae rhabdosomes, from *Pristiograptus* Jaek., 1889 by the presence of lateral elevations in proximal or all thecae colonies .

Distribution. Middle and Upper Silurian, Tiritian, Ulichian and lower part of the Przhidolian Belts of Europe.

Ludensograptus ludensis (Murchison, 1839) sensu Wood, 1900

Tab. XX, fig. 5-7

Graptolithus ludensis: Murchison, 1839, c. 694 (pars), pl. 26, fig. 2 (non of fig. 1).

Monograptus vulgaris: Wood, 1900, p. 455 (pars), pl. 25, fig. 2, fig. 10 b (non fig. 10 a); Elles and Wood, 1911, p. 378 (pars), pl. 37, fig. 10 a-e, fig. 248 b (non fig. 248 a).

Monograptus colonus var. ludensis: Wood, 1900, p. 465, tab. 25, fig. 11; Elles and Wood, 1911, p. 394, tab. 38, fig. 9a-c, fig. 262.

Pristiograptus (Pristiograptus) vulgaris vulgaris: Tomczyk, 1956, p. 53, tab. 6, fig. 1, tab. 7, fig. 1, fig. 15 a.

Pristiograptus gotlandicus: Urbanek, 1959, c. 11, tab. I, 2, tab. in text 1, draw. 1-3.

Monograptus ludensis: Holland, Rickards, Warren, 1969, p. 673, tab. 130, fig. 2, draw. 2 a-j, 3 a-e; Palmer, 1970, p. 338, tabl. 14, draw. a-g, tabl. 13, fig. a, b.

Pristiograptus sp. B: Ulst, 1974, p. 117, tab. 12, fig. 9-10, tabl. 11, fig. 8.

Pristiograptus ludensis: Lenz, 1975, p. 86, tabl. 1, fig. 6,16,18, draw. 3(H-K); Berry and Murphy, 1975, p. 73, tabl. 8, fig. 8,9, draw. 21 b, e.

Lectotype. Holland, Rickards, Warren, 1969, draw. 2 f, 3 b; large rhabdosome; Wenlock Series, *Ludensograptus ludensis* zone of Great Britain.

Description. Large straight rhabdosomes over 60 mm long. The proximal parts are straight, slightly curved ventrally or dorsally. Their width increases gradually from 0.8-1 mm at the level of the mouth of the first theca to 2.5 mm (rarely up to 2.8 mm) in the distal part.

Differences are observed in the structure of the theca of this species. All the thecae, with the exception of the first, sometimes the second and third, are represented by long cylindrical tubes, similar to the tubes of the theca pristiografts.

The streaks of the first two or three thecae are also similar to those of the species of the genus Pristiograptus Jaek., 1889. At the growth stage of their metathecae, as in the fully formed first thecae, the lateral margins of the mouths have symmetrical elevations. The ventral walls are always shorter than the lateral ones. They are concave in the metathecal part. The degree of concavity increases in proportion to the magnitude of the lateral elevations.

A distinct downward bending of the ventral margin of the apertures of the first ducts is a characteristic feature of this species. Sometimes a very weak bending of the ventral margin of the mouth is also observed in the fourth theca Ludensograptus ludensis (Murch.).

In adult rhabdosomes, the lateral elevations of the first theca did not tend to grow until the formation of true lateral lobes. On the contrary, they were somewhat smoothed out, as shown by A. Urbanek (206), due to the appearance of the so-called angular fuseluses in the dorso-lateral parts of the margins of the mouths. In this regard, the lateral elevations are most developed in the first theca rhabdosomes. In the second and third theca they gradually decrease.

The total length of the theca equipped with elevations is 1-1. 6 mm. The height of the elevations is 0. 06-0. 15 mm. Their length was 0. 6-0. 9 mm, metatec - 0. 45-0. 8 mm. Subsequent proximal thecae do not have lateral elevations.

Unlike species of the genus Pristiograptus Jaek., 1889, they are equipped with angular fuseluses, which leads to concavity of the lateral margins, the planes of which are obliquely located at angles of 20–35° to the virgula. Their length was 0.6-0.8 mm, metatek - 0.5-0.9 mm. The total length of the tec is 1.3-2 mm.

The overlap of the proximal theca varies from 2/5 to 2/3.

The ratio of the width of the flow to their length is 1/5-1/3.

Medial and distal thecae in the form of cylindrical tubes, the length of which is 4-6 times their width. The lateral edges of the mouths are concave, the ventral ones are even. The length of the leak is 0.9-1.3 mm, the metatec is 1.5-2 mm. The total length of the tec is 2.2-3.3 mm. The degree of their overlap is 3/5-3/4. They are inclined to the virgula at angles of 35-45°.

In 10 mm of the length of the proximal parts of the rhabdosomes 11-12 thecae, medial and distal - 9-10 thecae.

Sicula narrow, straight or more often ventrally curved. Its length is 1.9-2.1 mm, the width of the mouth is 0.35-0.45 mm. Its apex is located at the level of the mouth of the second theca or 0.1-0.2 mm below it. The base of the first theca is located 0.25-0.35 mm above the mouth of the sicula. Virgella length 0.3-0.8 mm.

Variability. The width of the rhabdosomes and the direction of the bend of the proximals vary from weakly ventral to slightly dorsal.

Inconstant in form and sikula. Apparently, this is due to the variable number of the first proximal theca equipped with lateral eminences. Rhabdosomes are more common, in which they are present only on the first theca.

The proximals of such rhabdosomes are curved ventrally. However, rhabdosomes with elevations on two thecae are not uncommon. Less common are specimens with elevations on the first three thecae. In the latter, the beginnings of the proximals are bent dorsally.

It should be noted that the Ukrainian, Latvian, and Polish representatives of the species have fewer thecae in the proximal parts than the English ones (up to 13 thecae per 10 mm of length).

Comparison. In terms of the shape and size of rhabdosomes, as well as the type of structure of proximal and distal thecae, the described species is closest to *Monograptus gerhardi* Kuhne.

It differs from the latter in fewer thecae with lateral eminences (1-3 instead of 10 in M. gerhardi) and a longer sicula (1.9-2.1 mm instead of 1.5 mm in *M. gerhardi).*

According to G. Jaeger (136), *Monograptus gerhardi* Kuhne is a synonym of the species *M. vulgaris* Wood, which we placed in the synonymy of *Ludensograptus ludensis* (Murch.). The latter is, in our opinion, the ancestor of *Ludensograptus gerhardi* Kuhne.

These two species are well distinguished from each other by the different number of theca equipped with lateral eminences.

This species differs from the closely related species *Ludensograptus latilobus* (Tseg.) in a smaller number of thecae with lateral elevations.

It differs from *Ludensograptus deubeli* (Jaeg.), which also has lateral elevations only on the first proximal thecae, in larger and wider rhabdosomes. In the first of them, the width of rhabdosomes does not exceed 1.4-1.5 mm. *Ludensograptus parultimus* (Jaeg.) differs from *L. ludensis* (Murch.) in a significantly smaller width of rhabdosomes and in the presence of lateral elevations in both proximal and distal thecae.

Remark. The rhabdosomes of *Monograptus vulgaris* Wood (140, figs. 10-11) depicted in the work of G. Eger do not, in our opinion, belong to the species *Ludensograptus ludensis* (Murch.).

They are distinguished from the latter by the presence of subtriangular lateral elevations on all proximal rhabdosome thecae. They most likely belong to *Ludensograptus gerhardi* Kuhne.

Association. This species occurs together with *Pristiograptus dubius* (Suess), *P. gotlandicus* (Pern.) and with brachiopods *Strophochonetes cingulatus* (Lindatr.), *Protozeuga bicarinata* (Vern.).

Distribution. Middle Silurian, lower Tiritian Belt, Glydonian Stage, *Ludensograptus ludensis-Gothograptus nassa* zone and lower *Neodiversograptus nilssoni-Saetograptus chimaera* zone; the upper parts of the Kladnevskaya and Shchedrogorskaya, as well as the lower parts of the Zabrodskaya suites of the Polessky ledge of the basement, the upper parts of the Lipnovskaya suite of the Brest depression and the Ternavskaya suite of Podolia.

Material . 35 fragments of rhabdosomes on the surface of marls recovered by boreholes Koropets-2 in int. 1227-1230 m, 1230-1232 m; Koropets-4 int. 1337.8-1340.8 m, 1347-1348 m; Harsy-1873 on depths 375 m, 378.5 m, 381.5 m; Samoilichi-1859 on depths 462 m, 467.4 m; Galina Volya-1893 on depth 257.5 m; Brest-1 on depth 739 m; Mooyr-5372 on depths 300 m, 304 m; Stavry-5376 on depth 334m; Semaki-1904 on depth 412 m; Shiev-4109 in int. 476-477 m; Zaluzhye-27 on depths 444 m, 446 m, 448 m; Pyscha-16 on depth 306.5 m.

Also studied by 5 rabdosomes on the surface of marls from the outcrop of the *Pristiograptus gotlandicus* zone of the Sventokshyskie Mountains (Bardo village, Prongovets ravine). There are 10 chemically prepared rhabdosomes from marls of the *gotlandicus* zone of the Swietokshyskie Mountains, as well as from rocks recovered by bjreholes. Brest-1 on depths 736 m, 742 m.

Ludensograptus praedeubeli (Jaeger, 1990)

Tab. II, draw. 5; tab. III, draw. 2; tab. XX, fig. 8. 9;
tab. XXI, fig. 1

cf. *Pristiograptus jaegeri:* Berry et Murphy, 1975, c. 71, draw. 21 a, b, e, tab. 8, fig. 3, 9.

Monograptus deubeli: Jaeger et Robardet, 1979, p. 693 (on section No. 1), pl. 2, fig. 9.

Monograptus praedeubeli: Barca et Jaeger, 1990, pl. 11, fig. 11,12; Jaeger, 1991, p. 318, fig. 4-6, fig. 7-11, table 26, fig. 1-8, tab. 27, fig. 1-11,14, tab. 29, fig. 11, tab. 30, fig. 3, 4, 9, 10.

Holotype. Jaeger, 1990, pl. 11, fig. 11, proximal rhabdosome; recovered from a glacial boulder in Skåne (Sweden), Ludlow series, *Ludensograptus praedeubeli* Zone (143).

Description: Small, slightly curved dorsally rhabdosomes over 17 mm long. Their width at the level of the mouth of the first theca is 0.65 mm, immediately above - 0.5 mm, the second theca - 0.7 (0.6) mm, the third - 0.9 (0.65) mm, the fifth - 1 (0 .7) mm, eighth -1.3 (1) mm, tenth - 1.1 (0.7) mm.

The thecae are represented by straight short tubes, which are inclined to the axis of the rhabdos at angles of 45-55°. On the lateral edges of the mouths of the first 6-7 theca, gentle low (0.04-0.08 mm) symmetrical elevations are developed, the tops of which are located on the continuation of the middle parts of the lateral walls.

Within the ventral walls of these thecae, there are depressions at the edges of the mouths. The planes in which the mouths of the first two thecae are located are strongly inclined downwards relative to the horizontal line (55-60°). A similar inclination of the mouth of the first theca is characteristic of rhabdosomes of the species *Pristiograptus dubius* (Suess).

The lateral edges of the mouths of 7-8 and subsequent theca acquire a pre-stiograft appearance.

The length of the first theca is 1.2 mm, its leaks are 0.8 mm, the metatheca are 0.4 mm; the second theca - I.2 mm, leaks - 0.9 mm, metatheca - 0.3 mm; fifth - 1.26 mm, leaks - 0.8 mm, metatheques - 0.46 mm; tenth - 1.32 mm, leaks - 0.9 mm, metatheques - 0.42 mm. Thecae overlap by 1/2-1/3 of their length. The length of the theca exceeds their width by 2.5-4 times.

There are 11-11,4 thecae in 10 mm of rhabdosome length.

The **sicula** is slightly curved ventrally, rapidly expanding towards the mouth. Its length is 1.7-1.8 mm, the mouth width is 0.4 mm. Its apex reaches the level of the ventral margin of the mouth of the second theca. The base of the first theca is located almost at the level of the lateral margins of the mouth of the si-kula, which is a characteristic feature of this species. Virgella length 0.3 mm.

Comparison. In terms of astogenetic development of rhabdosomes, this species is closest to *Ludensograptus deubeli* (Jaeg.), from which it differs in a narrow ventrally curved sicle (in *L. deubeli*, the sicle is about twice as wide as in *Monograptus hercynicus* Pern.).

The described species differs from *Ludensograptus ludensis* (Murch.) in a somewhat smaller width of rhabdosomes and in a large number of procoimal thecae equipped with lateral eminences (6–7 thecae versus 1–3 in *L. ludensis).*

Association. On dehth 390.5 m in borehole Harsy-1873 were found by *Gothograptus nassa* Holm, below on dehth 391.3 m, remains of the described species were found, and even lower in the same borehole at dehth 396.5 m set *Monograptus flemingii* (Salt.).

Distribution. Middle Silurian, lower Tiritian belt, Gleedonian Stage, Ludensograptus ludensis-Gothograptus nassa zone of Volyno-Podolia, upper part of the Kladnevskaya Formation of the Polessky basement ledge, Zheldets Formation of the Lvov Trough , the upper part of the Lipnovskaya Formation of the Brest Depression.

M a t e r i a l. 4 fragments of rhabdosomes on the surface of marls drilled by the boreholes of Kharsa-1873 at depth 391.3 m; Great Mosty-30 int. 3929.4-3939.8 m; Shiev-4109 in int. 471-472 m, 473-474 m.

3 rhabdosomes were recovered from rocks recovered by wells Zaluzhye-27 at Ch. 445 m; Brest-1 on Ch. 739 m; Guscha-4015 in int. 989.5-992.5 m.

Ludensograptus latilobus (Tsegelnjuk, 1976)

Tab. III, draw. 3; tab. XXI, fig. 2-9

Colonograptus latilobus: Tsegelnjuk, 1976, p. 109, tab. 29, fig. 9-11.

Ludensograptus latilobus: Tsegelnjuk, 1988 a, p. 81, tab. 1, fig. 3.

Monograptus massai: Jaeger, 1991, p. 339, tab. 29, fig. 12, tab. 30, fig. 7, 8, fig. in text 31, 32.

Pseudomonoclimacis latilobus: Urbanek, 1997, p. 161, tab. 17, fig. 1-11, tab. 19, fig. 2-5, fig. in text 45-47.

non *Ludensograptus latilobus*: Urbanek, 1997, p. 161 (pars), pl. 18, fig. 1-6 = Istrograptus rarus (Tell., 1964), fig. 7, 8 =?

non *Ludensograptus latilobus*: Urbanek, 1997, p. 161, tab. 19, fig. 1 = *Pseudomonoclimacis haupti* (Kuhne, 1955).

non *Ludensograptus latilobus*: Urbanek, 1997, p. 161, tab. 19, fig. 6 = *Pseudomonoclimacis tauragensis* (Pask., 1974).

Holotype. Specimen No. 1788/11, TsNP Museum. Tsegelnjuk, 1976, pl. 29, fig. 11, distal part of the rhabdosome, Zabrodskaya suite; upper part of the Tiritian belt, Konovian Stage, *Saetograptus leintwardinensis* zone.

Description. Large straight rhabdosomes over 52 mm long. The proximal parts are ventrally curved. Their width at the level of the aperture of the first theca is 0.85-1 mm, the fifth - 1.35-1.5 mm, the tenth - 1.75-2 mm, the twelfth - 2.2-2.3 mm. Further, the width does not change or gradually increases to 2.5-2.6 mm.

Thecae are straight cylindrical tubes. The aperture margins of all the thecae are uniformly thickened and provided with symmetrical lateral elevations 0.15–0.3 mm high. The tops of the elevations are located on the continuation of the middle parts of the lateral walls of the thecae.

The length of the proximal leaks is 0.7-0.9 mm, the metathecus is 0.45-1.5 mm; distal leaks - 0.8-1.1 mm, metathecs - 1.7-2 mm. The total length of the proximal theca is 1.1-2.2 mm, the distal - 2.5-2.9 mm. The degree of overlap of procoimal theca 1/2-3/5, distal - 2/3-3/4.

The angles of inclination of the proximal thecae to the axis of the rhabdosomes are 30–35 degrees, and that of the distal ones, 25–30°. The length of the proximal theca exceeds their width by 2.5-3 times, the distal - by 4-5 times.

In 10 mm of proximal length there are 12-13 techs, in distal parts - 10-11 thecae.

Sicula weakly ventrally curved. Its length is 1.9-2.2 mm, the width of the mouth is 0.4-0.5 mm. The apex of the sicula is located 0.1-0.2 mm below the level of the mouth of the second theca. The base of the first theca is 0.2-0.3 mm above the mouth of the sicula. The length of the virgella is 0.3-0.4 mm.

Variability. The width of the rhabdosomes and the degree of overlap of the proximal and distal theca vary.

In terms of shape and astogenetic development of colonies, this species is closest to *Ludensograptus gerhardi* (Kuhne) and *L. ludensis* (Murch.), from which it differs in the presence of lateral elevations in all rhabdosome thecae.

The described species differs from *Ludensograptus parultimus* (Jaeg.), which also has lateral elevations in all the thecae, by significantly larger and wider rhabdosomes.

Remarks. *Ludensograptus latilobus* (Tseg.) is very similar in size and shape to *Saetograptus (Colonograptus) insignitus* Prib. from the upper part of the Kopanin Formation of the Czech Republic.

In the latter, the aperture margins of only the first 3-5 thecae are, judging by the description, "slightly crescent-shaped" (179). However, it was proximal, shown in Table. 1, fig. 5, 8 and on the table. 4, fig. 13 (179), have up to 18 theca with lateral eminences similar to those of *Ludensograptus latilobus* (Tseg.).

The thecae of the distal parts of *Saetograptus (Colonograptus) insignitus* Prib. also have lateral elevations (179, pl. 1, fig. 7), as in *Ludensograptus latilobus* (Tseg.). have smooth or concave lateral edges of the apertures. It is possible that they were partially broken off during the preparation of the rhabdosome chosen as the holotype.

For a reliable comparison of Ukrainian and Czech representatives of these species, it is necessary to obtain chemically prepared rhabdosomes from the Kopanin formation.

Now we can only note that the rhabdosomes depicted in the work of A. Przhibl (179) in Table. 1, fig. 5, 7, 8 and in the table. 4, fig. 13, have no morphological differences from the Volyno-Podolya representatives of the species *Ludensograptus latilobus* (Tseg.). Apparently, in connection with this, A. Urbanek (215, p. 161) included them in the synonymy of the latter.

Association. Occurs together with *Uncinatograptus caudatus* Tseg., *Formosograptus formosus* (Bouc.), F. uncatus Tseg., *Pseudomonoclimacis tauragensis* (Pask.), *Serenograptus hamulosus* (Tseg.), *Monograptus (Slovinograptus) balticus* (Tell.), *Bugograptus aculeatus* (Tseg.), *B. spineus* (Tseg.), *Neocucullograptus kozlowskii* Urb., *Wolynograptus acer* (Tseg.), *Istrograptus rarus* (Tell.), *Pristiograptus tumescens* (Wood), P. *dubius* (Suess).

Distribution. Middle and Upper Silurian, upper Tiritian and Ulichian Belts, *Ludensograptus leintwardinensis*, *Neocucullograptus kozlowskii-Neolobograptus auriculatus*, *Formosograptus formosus-Bugograptus spineus* zones; the upper part of the Zabrodskaya, Oleshkovichskaya, Novinskaya and lower part of the Milovanskaya Formation of Volyny, the Peremyshlyanskaya suite of the Lvov trough, the Upper Bagovitskaya suite of Podolia.

Material. 40 fragments of rhabdosomes on the surface of marls recovered by wells Gushcha-4015 in int. 783-785.5 m, 800-804 m, 830-832 m, 936.9-941.8 m; Peremyshlyany-1 in int. 2817-2817.6 m, 2861-2870 m; Pulemets-1884 on depths 653 m, 658 m, 662 m, 750 m, 751 m, 762 m; Okopy-5 in int. 117-120 m; Brest-1 on depths 546.5 m, 597.5 m; Selyakhy-1883 on depths 357.5 m, 360 m, 361 m, 379 m, 380 m, 381.5 m, 383 m, 386 m; Davideny-1 in int. 2755-2761 m; Kusnishche-5394 on depths 431 m, 436 m, 440 m, 460 m, 467 m, 469 m.

There are 25 chemically prepared with rhabdos from the rocks of wells. Guscha-4015 at interval 708-712.5 m, 735.5-743.5 m, 743.5-748.5 m, 748.5-753.5 m, 821.7-830.1 m, 860 -863.4 m, 915-920 m, 920-923 m.

Ludensograptus parultimus (Jaeger, 1975)

Tab. II, draw. 4; tab. XXII, fig. 1- 4

Monoclimacis ultimus: Krandievsky, 1968, p. 38, tab. 7, fig. 14, 15.

Pristiograptus spectatus: Krandievsky, 1968, p. 50 (pars), pl. 9, fig. 8 (non of fig. 7).

Linograptus sp.: Krandievsky, 1968, p. 59 (pars), pl. 10, fig. 7 (non Fig. 6).

Pristiograptus (?) ultimus: Pashkevichius, 1974, pl. 14, fig. 3-8, tab. 18, fig. 3-8.

Monograptus parultimus: Jaeger, 1975, p. 119, tab. 2, fig. 4, 8, fig. 4a; Jaeger, 1986, p. 318, tab. 1, fig. 1, 2, 5, 8, 9, tab. 2, fig. 3-6, 23, 24; tab. 4, fig. 12, fig. in text 29-34.

Pseudomonoclimacis ultimus: Tsegelnjuk, 1976, p. 106, tab. 30, fig. 10-12.

Monoclimacis parultimus: Pashkevichius, 1979, p. 160, tab. 10, fig. 1-5, tab. 24, fig. 16-19, tab. 25, fig. 1-5.

Ludensograptus parultimus: Tsegelnjuk, 1988 a, c. 81, tab. 1, fig. 5.

Holotype. Jaeger, 1975, fig. 4a, rhabdosome proximal, Przhidolian belt, *Istrograptus ultimus* zone of the Czech Republic.

Description: Straight rhabdosomes over 25 mm long. Their proximal parts are slightly curved ventrally. In the interval of the first two or three thecae, they are almost straight or slightly bent to the dorsal side. The width of the rhabdosome at the level of the aperture of the first theca is 0.7-0.8 mm. By the fifth theca, it increases to 1.2-1.25 mm, by the tenth - up to 1.3-1.5 mm and then does not change or slightly decreases (up to 1.4-1.3 mm).

Thecae are represented by sigmoidally curved tubes. In the proximal parts, they are inclined to the axis of the rhabdosomes at angles of 20-30°. Up the rhabdosome, the slope of the free ventral walls decreases to 10°.

In its lower part, the ventral walls are smoothly curved in the dorsal direction. Together with the mouths of the previous thecae, they form shallow excavations, which makes this species somewhat similar to representatives of the genus *Monoclimacis* Frech., 1897.

Interthecal septa in the lower part are bent towards the rhabdosomes, in the upper part they are almost straight. Proximal and distal thecae are provided with symmetrical lateral elevations not exceeding 0.06-0.1 mm. In the direction of the ventral walls, they are replaced by distinct depressions of the aperture edges with a depth of 0.06-0.1 mm. As a result, the mouths of all the thecae acquire the same appearance as the first 1-3 thecae of Ludensograptus ludensis (Murch.).

The planes of the orifices of the proximal theca are almost at right angles to the axis of the rhabdosomes. In distal theca they are inclined at angles of 110-120°.

The length of the proximal leaks is 0.5-0.75 mm, the metathecus is 0.3-0.6 mm, the distal leak is 0.8-1 mm, the metathecus is 0.6-0.7 mm. The total length of proximal theca is 0.8-1.25 mm, distal - up to

1.4-1.65 mm. The degree of overlap of the proximal thecae 1/3-3/5, distal -1/2-2/5. The length of the proximal thecae exceeds their width by 2.4-3 times, the distal - by 3-3.3 times.

There are 11-14 thecae in the proximal parts of the rhabdosomes, and 11-13 thecae per 10 mm of their length in the distal parts.

Sicula ventrally curved. Its length is 1.7-1.9 mm, the width of the mouth is 0.3-0.45 mm. The top of the sicula reaches the level of the aperture of the second theca or is located up to 0.1 mm below its ventral edge. The base of the first theca is located 0.2-0.25 mm above the mouth of the siculus. Virgella length 0.3-0.6 mm.

Variability. The width of rhabdosomes and the ventral curvature of their proximal parts change within small limits. The Baltic representatives of the species have a slightly longer sicula (1.9-2.1 mm instead of 1.7-1.9 mm).

Numerous rhabdosomes of *L. parultimus* from the Przhidolsky belt of the Czech Republic (0.3 m above their soles), which are present in our collection, do not differ significantly from Volyno-Podolya ones in terms of the general shape of rhabdosomes, their width, and the number of thecae per unit of measurement.

Comparison. In terms of the shape of rhabdosomes and the number of thecae in 10 mm of their length, this species is closest to *Ludensograptus latilobus* (Tseg.). It differs from the latter in the smaller width of the rhabdoses and their shorter length.

The described species differs from *Ludensograptus podolicus* (Tseg.) in a smaller width of rhabdoses (1.3-1.5 mm versus 1.9 mm in L. podolicus) and their noticeably ventrally curved proximal parts.

Remark. Under the name *Istrograptus transgrediens rarus* (190), A. Urbanek (215, p. 165, pl. 20, figs. 1–5) describes, in our opinion, rhabdosomes of the species *Ludensograptus parultimus* (Jaeg., 1975).

Association. This species occurs together with *Istrograptus ultimus* (Pern.), *Skalograptus vetus* Tseg., *Tirassograptus difficilis* Tseg., *Dulebograptus trimorphus* Tseg., *Formosograptus formosus* (Bouc.), *Bohemograptus bohemicus tenuis* (Bouc.), *Pristiograptus fragmentalis* (Bouc.), *Uncinatograptus prognatus* (Koren).

Distribution. Upper Silurian, lower part of the Przhidolian Belt, Stavanian Stage, *Istrograptus ultimus-Ludensograptus parultimus* zone and lower parts of the *Skalograptus lochkovensis* zone of Volyno-Podolya, upper part of Milovanskaya suite of the Polessky basement ledge, Zadarovskaya and the lower part of the Glinyanskaya suite of the Lvov trough.

This species is also known in Lithuania, Poland, the Czech Republic, Yugoslavia and Austria (137).

M a t e r i a l. 77 rhabdosomes on the surface of argillites, marls and limestones recovered by boreholes Pulemets-1884 at depths 560 m, 575 m, 576 m, 577 m, 579 m, 580 m, 582 m, 584 m; Guscha-4015 in int. 603-606 m, 610-615 m, 622-626 m, 642.2-646.6 m, 650-654.5 m, 654.5-659 m, 659-662.4 m, 662.4-663 .4 m, 663.4-667.8 m, 667-676 m, 676.6-681.1 m; Zavadovka-6 on depths 1289 m, 1291 m; Litovezh-1 int. 2469.1-2473 m, 2491.1-2495.8 m; Rava-Rusokaya-5 in int. 1866.1-1870 m; Kusnishche-5394 on depths 385 m, 399 m, 400 m, 401 m, 403.5 m.

There are 50 chemically prepared with rhabdos from rocks drilled through wells. Guscha-4015 in int. 591-596 m, 626-640 m, 640-645 m, 654.5-659 m, 663.4-667.8 m, 667.8-672.2 m.

Genus *Colonograptus* Pribyl, 1942

Colonograptus colonus (Barrande, 1850)

Tab. III, draw. 4; tab. XXII, fig.5- 8; tab. XXIII, fig.1- 3

Graptolithus colonus: Barrande, 1850, c. 42 (pars), pl. 2, fig. 2,3 (non figs. 1, 4, 5).

Monograptus colonus: Wood, 1900, c. 463, tab. 25, fig. 10 a-d, fig. 14: Elles and Wood, 1911, p. 391, tab. 38, fig. 8 a-d, fig. 260a-c; Gortani, 1920, p. 32, tab. 2, fig. 28, 29; Averyanov, 1929, p. 701, tab. 34, fig. thirteen; Boucek, 1936, p. 13, fig. 2 a-e; Kuhne, 1955, p. 370, fig. 5 A, B; Jaeger, 1978, pp. 40, 41 (pars), fig. 6, 7 (non-fig. 8); Jaeger and Robardet, 1979, pl. 1, fig. 8, 11.

Pristiograptus colonus: Munch, 1942, p. 251, tab. 3, fig. 5, 6.

Pristiograptus (Colonograptus) colonus colonus: Pribyl, 1942, p. 4, tab. 2, fig. 1-3; Pribyl, 1952, p.31, pl. 1, fig. 8-11.

Monograptus (Pristiograptus) colonus: Obut, 1949, c. 22, tab. 4, fig. 2a, 2b.

Monograptus colonus colonus: Kraatz, 1958, p. 46, tab. 2, fig. 24-28.

Colonograptus colonus: Urbanek, 1958, p. 50, tab. 1, fig. 4, 5, fig. 23-25; Obut, Sobolevskaya, Bondarev, 1965, p. 75, tab. 13, fig. 7; Koren, Ulst, 1967, p. 256, tab. 30, fig. 5, fig. 70; Krandievsky, 1968, p. 51, tab. 9, fig. 14, 15; Abduazimova, 1970, p. 50, tab. 3, fig. 8, 9, fig. eight; Golikov, 1975, p. 89, table 2, Fig.14; Shoe, Sobolevskaya, 1975, p. 172, tab. 89, fig. 3.

Saetograptus colonus colonus: Berry and Murphy, 1975, p. 77, tab. 8, fig. 1, 2, 6.

non *Monograptus colonus:* Lapworth, 1876, p. 505, tab. 20, fig. 9.

Lectotype. Barrande, 1850, pl. 2, fig. 2, Bohemia, lower Ludlow (176).

Description . Straight rhabdosomes more than 35 mm long with a distinctly ventrally curved proximal within 5–9 thecae. During the first 3-4 thecae proximal straight or slightly bent to the dorsal side. The width of rhabdosomes at the level of the mouth of the first theca is 0.7-0.95 mm, the fifth - 1.15-1.6 mm, the tenth - 1.4-2.1 mm, the fifteenth - 1.7-2.3 mm , the twentieth - 1.8-2.2 mm, the twenty-fifth - 2-2.1 mm.

Measurements show that the width gradually increases up to the fifteenth theca, and then does not change or slightly decreases.

Theca are represented by straight cylindrical tubes. In the proximal part they are inclined to the axis of the rhabdosomes at angles of 40-50, in the distal - 30-35°.

The lateral margins of the mouth of the first theca have subtriangular lobes, which are always enlarged with downwardly curved spines. The blades grew on the continuation of the upper parts of the lateral walls of the theca. They are formed by additional fuseluses, which wedged out in the dorsal and ventral directions (205, Fig. 24, 25). Occasionally there are rhabdosomes in which these lobes are connected by a short dorsal wall that has grown on the continuation of the interthecal septum (155, fig. 5c; 140, fig. 7).

In some rhabdosomes, even the second and third theca spines grew on the continuation of the lateral-dorsal aperture formations (140, fig. 7). In most rhabdosomes, the aperture apparatus of the first theca consists of two parts: subtriangular lobes 0.08–0.2 mm long and spines 0.12–0.4 mm long. In two to five subsequent proximal theca, aperture formations are similar to those of the first theca.

The difference is that the width of the subtriangular lobes rapidly decreases from bottom to top along the rhabdosome. Therefore, they are usually observed in the form of spikes rapidly expanding towards the base.

The lateral edges of the mouths of the fifth-ninth thecae can be of three types:

1) smooth (pristiograft type),

2) have symmetrical gentle lateral elevations (ludensograft type) and

3) have symmetrical subtriangular lateral elevations (it is proposed to call them the colonograft type of elevations).

The fifth and all subsequent thecae may have a smooth aperture edge. But more often in the interval from the fifth to the ninth theca of rhabdosomes, colonograptal elevations are first developed (in the 2nd or 3rd thecae), and then ludensograptal elevations (also in the 2nd or 3rd thecae).

And only the apertures of all subsequent techs have even edges.

The length of the first theca is 0.85-1 mm, its leaks are 0.6 mm, the metatheca are 0.4-0.5 mm. The length of subsequent proximal thecae is 0.9-1.9 mm, their protecus is 0.4-0.7 mm, metathecus is 0.4-1.7 mm. The length of distal thecae is 2-2.7 mm, their protecus is 0.6-1 mm, metathecus is 1.7-1.9 mm. The degree of overlap of the proximal theca 1/2-2/3, distal - 2/3-3/4.

The length of the proximal thecae exceeds their width by 2-3.5 times, the distal - by 4-5.5 times.

In 10 mm of the length of the proximal parts of the rhabdosomes, there are 14-15.5 thecae, in the distal - 11-12 thecae.

Sicula narrow, ventrally curved. Its apex reaches the level of the aperture of the second theca. The base of the first theca is located 0.25-0.3 mm above the mouth of the sicula. The length of the latter is 1.7-2.1 mm, the width of its mouth is 0.3-0.35 mm. The length of the virgella is 0.3-0.4 mm.

Variability. The width of rhabdosomes varies considerably. The number of thecae with symmetrical lateral lobes and spines, as well as the elevations of the *colonograpt* and *ludensograpt* types, is very variable.

Sometimes the symmetry of the lateral aperture formations (blades, spikes and elevations) is not observed. The length of aperture formations changes significantly.

A relatively stable feature is the number of theca per unit of measurement within the proximal and distal parts of rhabdosomes.

Comparison. In terms of rhabdosome shape and astogenetic development, *Colonograptus colonus* (Barr.) is closest to *C. roemeri (Barr.).* The latter differs from this species in significantly wider rhabdosomes and the absence of spines on the subtriangular lateral lobes of the proximal thecae.

According to the nature of aperture formations in proximal thecae, *Colonograptus varians* Wood is very close to the described species, which differs from *C. colonus (Barr.)* in a somewhat smaller width of rhabdosomes, fewer thecae with lateral lobes and spines, as well as less overlap tech. It should be noted, however, that these characters are also very variable in *Colonograptus colonus* (Barr.).

Remarks. We do not see significant differences between the Volyno-Podolian representatives of this species from the Polish, Czech, German and English forms. They differ from the Central Asian and Taimyr representatives of this species in a longer sicula (1.7-2.1 mm instead of 1.5-1.6 mm) and a more dense arrangement of theca in their distal parts (11-12 thecae instead of 8-10) .

Association. *Colonograptus colonus* (Barr.) occurs together with *Pristiograptus dubius* (Suess), *Saetograptus chimaera* (Barr.), *Lobograptus progenito*r Urb., *L. exspectatus* Urb., *Bohemograptus bohemicus* (Barr.), *Heisograptus micropoma* (Jaek.), *Plectograptus macilentus* (Tornq.).

Distribution. Middle Silurian, Tiritian Belt, Gorstian and Leintwardinian Stages, *Neodiversograptus nilssoni-Saetograptus chimaera* zone and the lower part of the *Saetograptus leintwardinensis* zone; the Zabrodskaya and Turskaya suites of the Polessky ledge of the basement, the Zheldetskaya suite of the Lvov trough, the lower part of the Franopolskaya suite of the Brest depression.

M a t e r i a l. 32 rhabdosomes on the surface of marls and mudstones penetrated by the Guscha-4015 boreholes in int. 933.4-936.9 m, 962-967.2 m, 967.2-971.6 m; Brest-1 on depths 666 m, 681 m, 694 m, 706 m; Pishcha-16 in int. 284-288 m; Kharsy-1873 in int. 348.2-348.5 m, on depths 354.5 m, 356.5 m, 357.5 m, 360.8 m; Samoilichi-1859 on depth 428.4 m; Brest-10 on depth 858 m; Mosyr-5372 on depth 287.5 m; Zaluzhye-27 on depth 440 m; Shiev-4109 in int. 449.8-450.8 m, 450.8-454 m; Dublyany-4 in int. 4198-4207 m; Peremyshlyany-1 in int. 2887-2896 m.

Extracted by 5 well-preserved rhabdoses from the marls of the Guscha-4015 wells in int. 933.4-936.9 m, 937-941.8 m, 941.8-952.6 m, 968-971.6 m; Shiev-4109 in int. 449.8-450.8 m, 450.8-452.8 m.

Genus *Saetograptus* Pribyl, 1942

Saetograptus *chimaera* (Barrande, 1850)

Tab. III, draw. 5; tab. XXII, fig. 4-9

Graptolithus chimaera: Barrande, 1850, c. 52, tab. 4, fig. 34, 35.

Monograptus chimaera: Wood, 1900, p. 471, table 25, Fig.18 a-d; Elles and Wood, 1911, p. 398, tab. 39, fig. 3a-d, fig.266; Averyanov, 1929, p. 702, tab. 35, fig. l a, b; Averyanov, 1931, p. 130, tab. 1, fig. 4, 5, fig. 2; Boucek, 1936, p. 17, fig. For-with; Walker, 1953, p. 370, fig. 4-6; Kuhne, 1955, p. 372, fig. 6.

Monograptus (Pristiograptus) chimaera: Obut, 1949, p. 22, tab. 4, fig. 3 a, b.

Priatiograptus (Saetograptus) chimaera chimaera: Pribyl, 1942, p. 13, tab. 3, fig. 1-3; Tomczyk, 1956, p. 55, tab. 8, fig. 2, fig. l6b.

Saetograptus chimaera: Urbanek, 1958, c. 53 (pars), pl. 2, fig. 1-4, tab. 3, fig. 1, 2 (non Fig. 3), tab. in the text 2, 3, fig. 26-31; Root, Ulst, 1967, p. 255, tab. 30, fig. 10-12, fig. 69; Krandievsky, 1968, p. 57, tab. 10, fig. 3; Berry and Murphy, 1975, p. 76, tab. 9, fig. 5, 6.

Holotype. Barrande, 1850, pl. 4, fig. 34, 35; Kopanin beds of the Czech Republic, Ludlow series (173).

Description: Straight rhabdosomes over 30 mm long. Their proximal parts are usually curved ventrally within the first 4-8 thecae. Occasionally there are forms with almost straight proximals. The width of the colonies (excluding lateral spines) at the level of the first theca is 0.7-0.9 mm, the fifth - 1.2-1.4 mm, the tenth - 1.6-1.7 mm, the fifteenth - 1.8 -2 mm, twentieth - 2-2.1 mm. Further, the width does not change, or in a small part of the rhabdosome it increases to 2.2-2.3 mm. More often, however, in the distal part it decreases to 1.8-1.9 mm.

Thecae are represented by straight cylindrical tubes. In the proximal parts they are inclined to the axis of the rhabdosomes at angles of 40-50°, in the distal - 35-40°. The lateral margins of the mouth of the first theca always have subtriangular lobes 0.05-0.2 mm long, which grow with downwardly curved spines up to 0.4 mm long.

The first theca does not differ from the first theca of the species Colonograptus colonus (Barr.) in the form of aperture formations. The aperture structures of the second to fifth subsequent proximal thecae are very close to those of the first theca. Their difference is that the width of the subtriangular lobes rapidly decreases from bottom to top along the rhabdosome. As in the first theca, they all grow with downwardly curved spines up to 0.3-0.4 mm long.

The aperture formations of the sixth and subsequent theca consist of curved spines expanding towards the base. Most of them are located directly on the continuation of the upper parts of the lateral walls of the theca. Only some spines grew small subtriangular elevations of the lateral walls.

Up the rhabdosomes, the length of the spines gradually decreases, although in the middle and distal parts of some of them the length of the spines is not less than in the proximal thecae. Usually in the middle parts of rhabdosomes the spines are small (0.1-0.2 mm), in the distal parts they are rather not spines, but narrow and high elevations located mainly along the upper parts of the lateral walls of the theca.

The lateral lobes, spines and subtriangular elevations consist of additional fuseluses, which wedged out in the dorsal and ventral directions. Their fuselage structure is similar to the structure of aperture formations of Saetograptus chimaera (Barr.), described by M. Walker (Walker, 1953, fig. 5, 6) and A. Urbanek (Urbanek, 1958, fig. 26, 27).

The length of the first theca is 0.8-0.85 mm, its leaks are 0.5-0.55 mm, metatheca are 0.35-0.55 mm. The length of subsequent proximal thecae is 0.7-1.45 mm, their protecus is 0.45-0.9 mm, metathecus is 0.5-1.45 mm. The length of the distal thecae is 2.2–2.4 mm, their protecus is 0.9–1 mm, and the metathecus is 1.4–1.5 mm. The degree of overlap of the proximal theca 1/2-3/5, distal -2/3. The length of the proximal theca exceeds their width by 2-3 times, the distal - by 3-4 times.

In 10 mm of the length of the proximal parts of the rhabdo-somes there are 12-13.5 thecae, distal - 11, rarely 10 thecae.

The **sicula** is narrow, slightly curved ventrally, its apex is located in the interval between the mouths of the second and third theca. Length 1.8-2 mm, opening width 0.3 mm. The base of the first theca is 0.03-0.2 mm above the mouth of the sicula. The length of the virgella is 0.3-0.5 mm.

Variability. The width of the rhabdosomes and the degree of ventral curvature of the proximals vary considerably. The number of proximal thecae, equipped with subtriangular lateral lobes, is variable. The length of the spines in different parts of the colonies and their location in the upper part of the lateral walls of the theca are variable. The position of the base of the first theca relative to the mouth of the sicula changes significantly.

Comparison. *Saetograptus chimaera chimaera* (Barr.) is closest to *S. chimaera semispinosus* (Elles et Wood) and *S. chimaera salweyi* (Lapw.) in terms of the shape of rhabdosomes and the number of thecae per unit of measurement.

It differs from the first of them in a smaller width of rhabdoses and a slightly larger number of thecae 10 mm long, from the second only in a greater width (1.8-2.3 mm instead of 1.6 mm in *S. chimaera salweyi*).

From *Saetograptus daristanensis* Abduas. this species is distinguished by a smaller width of rhabdosomes and a ventral bending of the proximals (*S. daristanensis* is characterized by a dorsal bending in the sicular part of the rhabdosomes). It differs from *Saetograptus leintwardinensis* (Lapw.) in its greater width of rhabdosomes, fewer thecae per unit of measurement, and the absence of a dorsal sicular spine.

Remarks. Four subspecies are usually distinguished within this polytypic species: *Saetograptus chimaera chimaera* (Barr.), *S. chimaera salweyi* (Lapw.), *S. chimaera semispinosus* (Elles et Wood), *S. chimaera cervicornis* Urb. (205). In the paleontological literature, however, the description of only the first of them is relatively common, which apparently reflects the objective difficulties in identifying all these subspecies (155).

Taking into account the important stratigraphic significance of this group of graptolites, G. Eger proposed instead of two traditional English zones *Lobograptus scanicus* and *Pristiograptus tumescens* (the lower part of the Ludlov Group) to single out one *Saetograptus chimaera* zone (138). It should be noted that in the underlying zone of *Neodiversograptus nilssoni* its own scheme also occurs (221) *Saetograptus chimaera chimaera* (Barr.), *S. chimaera salweyi* (Lapw.).

Association. Within Volyno-Podolia, *Saetograptus chimaera* (Barr.) occurs together with *Neodiversograptus nilssoni* (Lapw.), *Bohemograptus bohemicus* (Barr.), *Colonograptus colonus* (Barr.), *Lobograptus simplex* Urb., *L. scanicus* (Tullb.), *Heisograptus micropoma* (Jaek.), *Dulebograptus bellus* Tseg., *Uncinatograptus* uncinatus (Tullb.).

Distribution. Middle Silurian, Tiritian Belt, Gorstian and Konovian Stages, *Neodiversograptus nilssoni-Saetograptus chimaera* zone and the lower part of the *Saetograptus leintwardinensis* zone; the Zabrodskaya and Turskaya suites of the Polessky ledge of the basement, the lower part of the Franopilskaya suite of the Brest depression, the Zheldetskaya and lower part of the Peremyshlyanskaya suite of the Lvov trough.

Material. 31 rhabdosomes on the surface of marls and mudstones drilled by Brest-1 boreholess, depths 635 m, 640 m, 644 m, 649 m, 678 m, 682 m, 690 m, 696 m; Guscha-4015 at 933.4-936.9 m, 936.9-941.8 m, 941.8-952.6 m, 953.7-962.5 m, 962.5-967.2 m , 971.6-976 m; Priluky-1844 on depths 475.5 m, 483.5 m; Samoilichy-1859 on depth 364 m; Harsy-1873 on depth 337.5 m, int. 343.6-344 m, 346-346.5 m, 348.5-349 m, 350.7-351.3 m 353 m; Dublyany-4 in int. 4207-4215.2 m; Davideny-1 in int. 2932-2939 m; Brest-10 on depths 816 m, 818 m, 820 m; Shiev-4109 in int. 442.5-450 m; Great Mosty-30 in int. 3848.3-3855.4 m, 3867.3-3878.8 m, 3882.9-3873.8 m.

15 rhabdosomes were extracted from the marls of the Brest-1 borehole at depth 639 m; Guscha-4015 in int. 941.8-952.6 m, 962.5-967.2 m, 971.6-976 m.

Saetograptus leintwardinensis leintwardinensis (Lapworth, 1880)

Tab. III, draw. 6; tab. IV, draw. 1; tab. XXIII, fig.10;
tab. XXIV, fig. 1- 9; tab. XXV, Fig.1, 2

Monograptus leintwardinensis: Lapworth, 1880, p. 149, tab. 4, fig. I a-d; Wood, 1900, p. 474, tab. 25, fig. 21 A, 21 B, fig. 19 a, b; Elles and Wood, 1911, p. 401, tab. 39, fig. 8 a-f, fig. 268a-c; Averyanov, 1931, p. 131, tab. 1, fig. 2a-c.

Pristiograptus (Saetograptus) leintwardinensis leintwardinensis: Pribyl, 1942, p. 18, tab. 3, fig. 11, 12; Tomczyk, 1956, p. 57, tab. 8, fig. 4, 6 a, b, draw. 17a-c.

Lektotype. Lapworth, 1880, pl. 4, fig. 1; Leintwardine Beds of Great Britain, Ludlow series (173).

Description. Small straight rhabdosomes up to 15 mm long. Their proximal parts are slightly ventrally curved in the interval of the first 4-6 thecae. The width at the level of the first theca is 0.7-0.95 mm, the fifth - 1.1-1.2 mm, the tenth - 1.45-1.65 mm, the fifteenth - 1.5-1.6 mm. The rhabdosomes in the collection do not reach a greater width.

Thecae are straight, relatively short cylindrical tubes. In the proximal and distal parts, they are inclined to the axis of the rhabdosomes at angles of 35-40°. The lateral edges of the mouth of the first theca have small subtriangular symmetrical lobes up to 0.2 mm long, which grow with thin spines 0.2-0.6 mm long. The lobes are located on the continuation of both the lower and upper parts of the lateral walls, as in the species *Saetograptus chimaera* (Barr.). In the second and all subsequent thecae, lateral lobes are usually absent, and spines widening toward the base are located mainly at the junction of the lateral walls and interthecal septa, sometimes somewhat lower, but always in the uppermost part of the lateral walls. The indicated location of the spines is a characteristic feature of this species of rhabdosomes. From the bottom up along the rhabdosomes, the length of the spines gradually decreases. In the distal parts, they look like narrow subtriangular elevations.

The length of the first theca is 0.8-1.05 mm, the fifth - 1.6-1.65 mm, the tenth - 2 mm, the fifteenth - 2-2.1 mm. The length of proximal leaks is 0.4-0.7 mm, distal - 0.7-0.95 mm. The length of the proximal metathecus is 0.42-0.95 mm, the distal one is 1-1.2 mm. The degree of overlap of the proximal theca 1/2-3/5, distal - 2/3. The length of the proximal theca exceeds their width by 3.2-3.6 times, the distal - by 3.6-4.2 times.

There are 14-16 thecae per 10 mm length of rhabdosomes.

Sicula narrow, slightly curved ventrally. Its top is located at the level of the upper part of the mouth of the second theca or in the interval between the mouths of the second and third theca. The length of the sicula is 1.5-2 mm, the width of its mouth is 0.3-0.35 mm. The base of the first theca is 0.06-0.18 mm above the mouth of the sicula. The length of the virgella is 0.3-0.5 mm. Dorsal margin of sicula drawn downwards and towards virgella. On the continuation of this peculiar elevation of the dorsal edge of the mouth of the siculum, there is a spine 0.15-0.3 mm long. It is the most important diagnostic feature of this species.

Variability. The length and width of the colonies, as well as the density of the Volyno-Podolian representatives of this species correspond to those of the Polish and English forms, which indicates a small range of variability of the main morphological features of rhabdosomes. The location of the lateral spines also changes within small limits. However, their length varies considerably. The length of the dorsal sicular spines is also highly variable.

Comparison. This subspecies differs from *Saetograptus leintwardinensis incipiens* (Wood) in shorter length and width of rhabdosomes, as well as in the presence of lateral spines (or high narrow elevations) along the entire length of the colonies (*S. leintwardinensis incipiens* has lateral spines only in proximal thecae).

It differs from *Saetograptus leintwardinensis primus* (Bouc.) in shorter length and ventrally curved proximal parts of rhabdosomes (the proximals of *S. leintwardinensis primus* are curved dorsally).

The described subspecies differs from *Saetograptus chimaera* (Barr.) in small colonies, the location of lateral spines, a large number of thecae per unit of measurement, and the presence of a spine on the dorsal margin of the sicula.

Remarks. This subspecies is very difficult to identify. On the slabs of the rhabdosome rock, in size and location of the lateral spines, it is very close to the fragments of the proximal *Saetograptus chimaera chimaera* (Barr.) and *S. chimaera salweyi* (Lapw.). The dorsal spine of the sicula is located in the plane of symmetry of the colonies and is usually located in the rock 0.5–1 mm below the surface of the tiles. It is observed mainly in rhabdosomes, chemically dissected from the rock.

Association. In Volynia it occurs together with *Cucullograptus hemiaversus* Urb., *Lobograptus exspectatus* Urb., *Bohemograptus bohemicus* (Barr.), *B. praecornutus* Urb., *Pristiograptus tumescens* (Wood), *Pseudomonoclimacis haupti* (Kuhne).

Distribution. Middle and Upper Silurian, the upper part of the Tiritian and the lowest part of the Ulichian Belts, the *Saetograptus leintwardinensis* zone and the lower parts of the *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the Zabrodskaya and upper part of the Turskaya suites of the Polessky ledge of the foundation, the Franopolskaya and Rusilovskaya suites of the Brest depression, the upper part of the Zheldetskaya suite of the Lvov trough.

M a t e p i a l. 25 fragments of rhabdosomes on the surface of marls recovered in boreholes Gushcha-4015 in int. 933.4-936.9 m, 936.9-942 m, 942-952.6 m; Brest-1 on depths 545 m, 639 m, 645.5 m; Priluky-1844 on depth 419.5 m, int. 442.3-442.8 m; Samoilichy-1859 on depth 370.2 m; Kladnev-5396 on depths 410.6 m, 419 m, 428 m; Brest-10 on depths 745 m, 774 m; Dublyany-4 in int. 4200-4204 m.

Genus *Istrograptus**/ Tsegelnjuk, 1988

*/ Genus name from the ancient name of the Danube River - Istr.

Monograptus: Perner, l899, p. thirteen; Jaeger, 1975. p. 119; Jaeger, 1977, p. 339; Jaeger, 1978 a, p. 44; Jaeger, 1986, p. 321; Root, 1986, p. 115.

Pristiograptus: Pribyl, 1943, p. 28; Teller, 1964, p. 40; Root, 1973, p. 135.

Skalograptus: Tsegelnjuk, 1976 c, p. 102.

Istrograptus: Tsegelnjuk, 1988 b, p. 85; Teller, 1997, p. 74; Urbanek, 1997, p. 165.

Type species - *Monograptus transgrediens* Pern., 1899.

Diagnoz. Rhabdosomes are straight or slightly ventrally curved in the proximal parts.

Thecae are represented by wide short tubes. The ends of the first proximal thecae are equipped with ventral-lateral lobes, rounded at the ends, slightly hanging down or growing in the direction of thecae growth. Up the rhabdosomes, their length decreases. They are replaced by ventral-lateral elevations.

Distal thecae have smooth edges of thecae mouths, as in species of the genus *Pristiograptus* Jaekel, 1889.

Composition of the genus: *Pristiograptus rarus* Tell., 1964; *Monograptus ultimus* Pern., 1899; *M. transgrediens* Pern., 1899; *Colonograptus princeps* Abduas., 1970.

Comparison. This genus differs from the genus *Ludensograptus* Tsegelnjuk, 1978, which is close in morphological features, by the presence of ventral-lateral lobes in proximal thecae.

In terms of the presence of lobes, the described genus is close to the genera *Skalograptus* Tseg., 1976 and *Colonograptus* Prib., 1942. Their difference lies in the fact that the rounded lobes at the ends of species of the genus *Istrograptus* Tseg., 1988 grew on the continuation of the ventral-lateral walls of the theca , while in the genus *Skalograptus* Tseg., 1976 they are lateral.

The proximal lobes of species of the genus *Colonograptus* Prib., 1942 rapidly narrow towards the lateral walls of the theca (135, figs. 6, 7, 9).

Distribution. Upper Silurian, upper part of the Ulichian and Przhidolian Belts of Europe and Asia.

Istrograptus rarus (Teller, 1964)

Tab. IV, draw. 5; tab. XXV, fig.3- 9; tab. XXVI, fig.1

Pristiograptus rarus: Teller, 1964, p. 38, tab. 1, fig. 1-3, tab. 9, fig. 10-12, fig. 3a-c.

Saetograptus cf. rarus: Rickards and Jordan, 1975, p. 251, fig. 4 l, m.

Skalograptus rarus: Tsegelnjuk, 1976, p. 102 (pars), pl. 32, fig. 6-8 (none of Fig. 9).

Istrograptus rarus: Tsegelnjuk, 1988 b, p. 84, tab. I, fig. 5.

Neocolonograptus lochkovensis: Teller, 1997, p. 77 (pars), pl. 3, fig. 6 (non figs. 1-5, 7-9).

non *Istrograptus transgrediens rarus*: Urbanek, 1997, p. 165 (pars), pl. 20, fig. 1-5 = *Ludensograptus parultimus* (Jaeg., 1975).

non *Istrograptus transgrediens aff. rarus:* Urbanek, 1997, p. 165, tab. 20, fig. 6 = *Istrograptus ultimus* (Pern., 1899).

Holotype. Teller, 1964, pl. 1, fig. 1, tab. 9, fig. 10, fig. 3 a, large rhabdosome; Poland, *Formosograptus formosus* zone.

Description: Small straight rhabdosomes over 26 mm long. Their proximal parts within 6-9 thecae are slightly curved ventrally. The beginnings of the proximals, covering the first one or two thecae, are almost straight or slightly curved dorsally. The width of rhabdosomes at the level of the aperture of the first theca is 0.9-1.1 mm. It increases gradually, reaching 1.6-1.8 mm in 8-10 thecae, and then does not change or increases to 1.9-2.1 mm in the distal parts of the colonies.

Thecae are represented by cylindrical tubes. In the structure of their aperture formations, a distinct polymorphism is observed. The leaks and metatheques of the first theca rhabdosomes developed similarly to those of *Ludensograptus latilobus* (Tseg.). At the final stage of growth of the metathecae of the first thecae, the predominant growth of their dorsal-lateral parts occurred. This was achieved by wedging in the ventral direction of the last three fuseluses of the inner layer of the periderm. In the dorsal direction, only the last fusellus wedged out. It was wedged out within the ventral-lateral parts of the first theca. As a result, the ventral walls of the first theca were shorter than the lateral ones by three fuseluses. The latter formed short (0.15-0.4 mm) symmetrical ventral-lateral lobes on the first theca of the rhabdosome, which extend approximately at a right angle to the ventral edge of the rhabdosome. Occasionally they hang down slightly.

On the lateral margins of the orifices of the second and subsequent proximal thecae, two fuseluses wedge out in the ventral direction, and only one (the last one) in the dorsal direction. Wedging out of it occurred even within the ventral-lateral parts of the mouths of the theca. At the same time, the formation of angular fuseluses (196), as in species of the genus *Ludensograptus* Tsegelnjuk, 1978, is not observed. This led to the formation of symmetrical ventral-lateral elevations 0.06-0.2 mm high in the second and subsequent theca proximals.

Only one fusellus wedges out ventrally on the lateral margins of the openings of the distal thecae. Corner fuseluses were not formed. Therefore, the ventral-lateral elevations of the orifices flowing up the rhabdosome gradually decrease to 0.1 mm and then become weakly expressed. However, the edges of the mouths of the distal theca are usually uneven - their ventral parts are slightly concave.

The length of the first rhabdosome theca is 1.1-1.2 mm, the fifth is 1.5-1.65 mm, the tenth is 1.8-1.95 mm, the extreme distal theca are up to 2.5 mm. The length of the leakage of the first theca is 0.7-0.85 mm, its metatheca is 0.45-0.5 mm. The length of the second and subsequent proximal leaks is 0.6-0.8 mm, the metathecs are 0.45-1 mm. The length of the distal leaks is 1-1.1 mm, the metathecus is 1.25-1.4 mm. The degree of overlap of the proximal theca 1/2-2/5, distal -1/2-3/5. The proximal and distal thecae are 3–5 times as long as wide.

The angles of inclination of the proximal theca to the axis of the rhabdosome are 25-35°, the distal - 20-30°.

In 10 mm of the length of the proximal parts of the rhabdosomes, there are 10-11 thecae, the distal ones - 9-9.5 thecae.

Sicula ventrally curved. Its length is 1.8-2.1 mm, the mouth width is 0.45-0.55 mm. The apex of the sicula reaches the level of the aperture of the second theca or is located up to 0.1 mm below its ventral edge. The base of the first theca is 0.25-0.35 mm higher than the base of the sicula. Virgella length 0.4-0.5 mm.

Variability. The width of the rhabdosomes and the height of the ventral-lateral eminences of the theca mouths vary markedly. The length of the lobes of the first theca also changes. However, no matter how small they are (for example, 0.15-0.2 mm), they are always recognized, if they are satisfactorily preserved, as lobes, and not as elevations.

Comparison. In terms of shape and size of rhabdosomes, this species is so close to *Istrograptus ultimus* (Pern.) that G. Eger (139) not without reason admitted the possibility of their synonymization.

Istrograptus rarus (Tell.) is distinctly different from the indicated species by the presence of ventral-lateral lobes only in the first theca of rhabdosomes (as our material shows, in the second and subsequent thecae, only ventral-lateral elevations are present), the greater length of the proximal and distal theca, as well as a smaller number of them per unit of measurement.

Istrograptus rarus (Tell.) is very similar in shape to rhabdosomes and the number of theca per unit of measurement to *Istrograptus transgrediens* (Pern.). These species are also similar in the presence of almost identical lobes in the first theca. They differ in that in Istrograptus rarus (Tell.) ventral-lateral elevations are present in the second and almost all subsequent theca rhabdosomes. In *Istrograptus transgrediens* (Pern.), ventral-lateral eminences are present only in the second to eighth proximal thecae.

The aperture margins of the ninth and all subsequent thecae, on our material, are similar to those of species of the genus *Pristiograptus* Jaek., 1889, that is, they have slightly concave lateral margins of thecae mouths.

Remarks. In shape, aperture formations of the second and subsequent rhabdosomes of *Istrograptus rarus* (Tell.) resemble those of *Ludensograptus latilobus* (Tseg.). The difference between them lies in the fact that in the latter, the elevations are strictly lateral, that is, the highest points of the elevations are located on the continuation of the middle of the lateral walls of the thecae.

In *Istrograptus rarus* (Tell.), the eminences are ventral-lateral, that is, the highest points of the eminences are significantly shifted closer to the ventral walls of the thecae. In this regard, rhabdosomes of *Istrograptus rarus* (Tell.) with lateral and dorsal-lateral flattening on rock slabs usually look like they are depicted by L.Teller (190, p. 39) in fig. 3a-c - the lateral margins of the mouths of the second and subsequent thecae seem to be slightly concave, as in species of the genus *Pristiograptus* Jaek., 1889. Therefore, such rhabdosomes can easily be assigned to the genus *Pristiograptus* if the lobes of the first thecae are damaged or not preserved.

Association. This species occurs together with *Ludensograptus latilobus* (Tseg.), *Formosograptus formosus* (Bouc.).

Distribution. Upper Silurian, upper part of the Ulichian Belt and lower parts of the Przhidolian, *Formosograptus formosus-Bugograptus spineus* zone and lower parts of the *Istrograptus ultimus-Ludensograptus parultimus* zone; the Novinskaya and Milovanskaya suites of the Polessky ledge of the basement, the Zadarovskaya suite of Volyno-Podolia.

Material. 32 fragments of rhabdosomes on the surface of marls and argillites, uncovered by boreholes Pulemets-1884 at depths 605 and 750 m; Zgorany-409 on depth 277.1 m; Kusnitsa-402 in int. 288.5-293.2 m; Glynyany -1 in int. 2765-2769 m, 2793-2797 m; Peremyshlyany-1 in int. 2673.9-2685.9 m.

18 chemically prepared with rhabdosomes from marls exposed by boreholes Gushcha-4015 in int. 703.3-708.5 m, 712.6-717.5 m, 717.5-722.5 m, 816.8-820.8 m; Zgorany-409 on depth 277.1 m.

Istrograptus ultimus (Perner, 1899)

Tab. IV, draw. 2, 3; tab. XXV, fig. 10; tab. XXVI,
fig. 2-11; tab. XXVII, fig. 1.

Monograptus ultimus: Perner, 1899, c. 22, tab. 16, fig. 4, 5, 11 a, b, fig. 14 a, b; Jaeger, 1975, p. 119, fig. 4b; Jaeger, 1977, p. 339, fig. 2 A; Jaeger, 1978a, c. 44, fig. 12; Jaeger, 1986, p. 321 (pars), pl. 1, fig. 3, 4, 7, 11, 13, tab. 2, fig. 7, 8, fig. 35 a, b, 36 a-c, 37 b-d (non 37 a = *Skalograptus lochkovensis* Prib., 1940).

Pristiograptus ultimus: Pribyl, 1943, p. 33 (pars), fig. 2 A (non Table 4, Figs. 7-11, Fig. 2 B).

Pristiograptus bugensius: Teller, 1964, p. 40, tab. 2, fig. 4, 5, 9, tab. 7, fig. 13-15, tab. 9, fig. 1-3, fig. 4 a-e.

Istrograptus ultimus: Tsegelnjuk, 1988 b, p. 84, tab. I, fig. 4, 8.

Istrograptus transgrediens rarus: Urbanek, 1997, p. 165 (pars), table 20, fig. 6 (non pl. 20, figs. 1-5 = *Monograptus parultimus* Jaeg., 1975).

Neocolonograptus ultimus: Urbanek, 1997, p. 167 (pars), pl. 22, fig. 1 (non tab. 22, figs. 2-5 = ?).

non *Monograptus ultimus:* Wood, 1900, c. 461, tab. 25, fig. 9A, 9B, fig. thirteen; Willefert, 1962, p. 33, tab. 2, fig. 7, fig. 7.

non *Monograptus cf. ultimus:* Elles and Wood, 1911, p. 383, tab. 37, fig. 14 a-d, fig. 253a-c.

non *Monograptus (Pristiograptus) ultimus:* Pribyl, 1940 a, c. 69, tab. 1, fig. 9-11.

non *Pristiograptus (Pristiograptus) cf. ultimus:* Tomczyk, 1956, p. 54, tab. 7, fig. 3 a-c, fig. 15 c, d.

non *Pristiograptus ultimus:* Root, Ulst, 1967, p. 250, tab. 29, fig. 10, 11, fig. 65; Krandievsky, 1963, p. 44, tab. 8, fig. 11, 12.

non *Monoclimacis ultimus:* Willefert, 1966, p. 95, fig. 34; Krandievsky, 1968, p. 38, tab. 7, fig. 14, 15.

non *Pseudomonoclimacis ultimus:* Tsegelnjuk, 1976, p. 106, tab. 30, fig. 10-12.

Lectotype. Perner, 1899, fig. 14a, rhabdosome proximal, Przhidolian Belt of the Czech Republic (174).

Description. Straight rhabdosomes up to 20 mm long with distinctly curved ventrally proximal parts within the first 6-8 thecae. Their width at the level of the aperture of the first theca is 0.85-1 mm. It quickly increases to 1.6-1.7 mm and then does not increase or decreases to 1.4-1.5 mm.

Thecae are straight, short, wide cylindrical tubes. Interthecal septa at the base smoothly curved dorsally. The lateral edges of the orifices of the proximal and medial thecae are provided with symmetrical ventral-lateral lobes. They have different shapes and sizes. The largest and slightly bent downward lobes are developed in the first 2–8 proximal thecae. Often, however, the lobes of the second, third, and subsequent proximal and medial theca "stick out" in the direction of their growth, which makes such rzbdosomes similar to rhabdosomes of *Istrograptus rarus* (Tell.), which have developed ventral-lateral elevations. Apparently, this was the basis for the identification (with a question mark) of the species *Pristiograptus rarus* Tell. and *Monograptus ultimus* Pern. (139, 142).

There are two stages in the formation of aperture structures of this type. In the first of these, symmetrical elevations grew on the continuation of the lateral walls of the theca, as in species of the genus *Ludensograptus* Tsegelnjuk, 1978, due to the expansion of the periderm fuseluses in the direction of the elevations and their narrowing (without wedging out) in the dorsal and ventral directions (206). The formation of corner fuseluses is not observed.

In the second stage, the elevations were built up to the lobes. This was achieved by wedging out additional fuseluses in the dorsal and ventral directions. On the blades of the first theca on our material, there are from 4 to 9 additional fuseluses, on the blades of the second theca - from 4 to 6, the eighth - up to four fuseluses. The lobes of the middle parts of the rhabdosomes, reaching a width of 1.6 mm, have 2-3 additional fuseluses. It should be noted that the width of the additional fuseluses on the lobes of the theca increases up the rhabdosome.

The length of the lobes of the first theca is 0.24-0.34 mm, the second - 0.24-0.33 mm, the fifth - 0.15-0.3 mm, the middle parts of the rhabdosomes - up to 0.28 mm. Up the rhabdosome, the ventral-lateral lobes are gradually replaced by symmetrical ventral-lateral elevations up to 0.1-0.15 mm high. The ventral margins of the mouths of the distal theca have distinct depressions.

The length of the first theca is 0.9-1 mm, its leaks are 0.6-0.7 mm, metatheca are 0.45-0.5 mm; the second and subsequent proximal theca - 0.75-1.4 mm, their leak - 0.5-0.7 mm, metathecus - 0.45-0.7 mm. The length of distal thecae is 1.25-1.4 mm, their protecus is 0.5-0.8 mm, metathecus is 0.5-0.95 mm. Procoimal theca overlap by 1/2-1/3, distal - by 2/3-2/5 of their length. The length of the theca exceeds their width by 2-3 times.

The proximal theca is inclined to the axis of the rhabdosome at an angle of 30-40°, the distal - 30-35°.

In 10 mm of proximal length, there are 12-13 thecae, distals - 11-12 thecae.

Sicula narrow, ventrally curved. Its length is 2-2.2 mm, the width of the mouth is 0.35-0.4 mm. The apex of the sicula reaches the level of the aperture of the second theca or is located up to 0.2 mm above it. The base of the first theca is 0.2-0.3 mm above the mouth of the sicula. The length of the virgella is 0.3-0.5 mm.

Variability. The number of techs equipped with blades is not constant. The width of the rhabdosomes, the length of the lobes, and the ventral bend of the proximals vary.

Comparison. This species differs from *Istrograptus rarus* (Tell.), which is the closest in shape and size to rhabdosomes, by the presence of ventral-lateral lobes in the thecae of the initial and middle parts of rhabdosomes (the first of them has lobes only in the first theca), shorter proximal and distal thecae, as well as a large number of them 10 mm long in rhabdosomes (II-13 thecae in *I. ultimus* instead of 9-11 thecae in *I. rarus*).

This species differs from *Istrograptus transgrediens* (Pern.) in a large number of thecae having ventral-lateral lobes (thecae of the proximal and middle parts of rhabdosomes instead of one or three first thecae in *I. transgrediens*), a smaller width of rhabdosomes and a large number of thecae in unit of measure.

Remarks. From the synonymy it can be seen how difficult it is to identify the species *Istrograptus ultimus* (Pern.), which, moreover, has a very important stratigraphic value. A contradictory interpretation of this species was laid down already when it was established by I. Perner. He compared the structure of the theca of this species with that of two very different groups of monograptids: *Monoclimacis vomerina* (Nich.) and *Colonograptus colonus* (Barr.).

Later A. Przybl (174) assigned it to the genus *Pristiograptus* Jaek., 1889 and pointed out the mistakes made by I. Perner in describing the species. According to him, the maximum width of the rhabdosomes of *Pristiograptus ultimus* (Pern.) is 1.3 mm (and not 2 mm, as I. Perner pointed out), the number of rhabdosomes in 10 mm of length is 11-14 (and not 6, as stated in the work of I. Perner). The same errors of I. Perner were pointed out by E. Wood (221).

I believe that in the work of A. Przybl, *Pristiograptus ultimus* (Pern.) clearly refers only to the rhabdosome shown in fig. 2 A, since the same rhabdosome is shown in Fig. 14a in the work of I. Perner (170, p. 22). The rest of the rhabdosomes assigned by A. Przybl to *Pristiograptus ultimus* (Pern.) on the grounds that they are “similar to species of the genus *Monoclimacis* Frech” (174, p. 34) belong, in our opinion, to the genus *Pseudomonoclimacis* Mikh., 1975.

Until recently, paleontologists were guided by the ideas of A. Przybl in the understanding of *Monograptus ultimus* Pern., and therefore their definitions of this species could not be correct. G. Jaeger (138, 139) was the first to give a correct, in our opinion, idea of *Monograptus ultimus* Pern.

Numerous specimens of our collection fully correspond to those Czech representatives of this species, which are depicted by G. Jäger.

They also correspond to the Polish *Pristiograptus bugensius* Tell., which the author was able to study thanks to the courtesy of L. Teller, who brought them in 1985 to the Institute of Geological Sciences of the Academy of Sciences for comparison with *Istrograptus ultimus* (Pern.) from the Silurian of Volyno - Podolia.

Association. This species occurs together with *Ludensograptus parultimus* (Jaeg.), *Pristiograptus fecundus* Prib., *Wolynograptus canaliculatus* (Tseg.), *Linograptus sp*.

Distribution. Upper Silurian, Przhidolian belt, Stavanian Stage, *Istrograptus ultimus-Ludensograptus parultimus* zone and the lower part of the *Skalograptus lochkovensis* zone; the upper part of the Milovanskaya and lower parts of the Gushchinskaya suite of the Polessky ledge of the basement.

Material. 32 rhabdosomes on the surface of marls and mudstones drilled by Pulemets-1884 boreholes at depths 568 m, 570 m, 580 m; Guscha-4015 in int. 583-587 m, 587-591 m, 591-594.5 m, 603-606 m, 622-626 m; Zavadovka-6 on depths 1282.8 m; Glynyany-1 in int. 2793-2797 m; Davideny-1 in int. 2628-2636 m.

Also recovered 18 fragments of rhabdosomes from the rocks of the borehole Guscha-4015 in int. 643.5-644.5 m, 659-662.4 m, 662.4-663.4 m, 663.4-667.8 m.

Istrograptus transgrediens (Perner, 1899)

Tab. IV, draw. 4; tab. XXVII, fig. 2-11

Monograptus transgrediens: Perner, 1899, p. 13, tab. 17, fig. 24; Jaeger, 1975, p. 117, fig. 2e, tab. 1, fig. 7, tab. 2, fig. 5, 6; Jaeger, 1977, p. 339, fig. 2 V; Koren, 1978, p. 117, tab. 1, fig. 1, fig. 3a-f; Root, 1986, p. 115, tab. 27, fig. 1-6, tab. 28, fig. 1-5, fig. 25; Jaeger, 1986, p. 326, tab. 1, fig. 15, 17, 18, tab. 2, fig. 12, 16, 17, 19, 22, 25, fig. in text 41 a-c.

Pristiograptus transgrediens transgrediens: Pribyl, 1943, p. 28, tab. 2, fig. 7, tab. 3, fig. 7.

Pristiograptus transgrediens: Teller, 1964, p. 52, table 2, fig. 3, tab. 3, fig. 1-4, tab. 7, fig. 8-12, fig. 11 a-c; Root, 1973, p. 135, tab. 1, fig. 1-12.

Monograptus transgrediens praecipuus: Lenz and Jackson, 1971. p. 14, tab. 2, fig. 5-8, fig. 4.

Istrograptus transgrediens: Tsegelnjuk, 1988 b, p. 84, tab. 1, fig. 1.

Holotype. Perner, 1899, pl. 17, fig. 24, Przhidol layers of the Czech Republic (174).

Description. Large rhabdosomes over 40 mm long. Their proximal parts are slightly ventrally curved within the first 6-10 thecae. The width of the colonies at the level of the apertures of the first theca is 1-1.1 mm, the fifth - 1.2-1.45 mm, the tenth - 1.7-2.2 mm, the fifteenth - 1.8-2.3 mm. In the distal parts, the width of rhabdosomes varies from 1.9 to 2.5 mm.

Thecae are represented by straight cylindrical tubes. The ventral walls of the first theca are variable - even, sometimes slightly concave or convex. The lateral edges of the first 4-6 ducts of most rhabdosomes are equipped with ventral-lateral symmetrical lobes. Their length in the first 2-3 techs is 0.28-0.32 mm. Usually they are bent down. The structure of the lobes of the first theca involves at least 5 fuseluses of the periderm, which wedged out in the dorsal and ventral directions. The length of the blades of the subsequent 2-3 techs is 0.12-0.2 mm. Their size decreases in the distal direction. They grew in the direction of the growth of the theca, as in the medial theca of the species Istrograptus ultimus (Pern.).

The fifth-seventh and subsequent 8-11 theca have not lobes, but gentle elevations of the lateral edges of the mouths 0.04-0.08 mm high.

The lateral margins of the mouths of all subsequent flows are even or concave, as in species of the genus *Pristiograptus* Jaek., 1889.

In our collection there are rhabdosomes, the second-sixth thecae of which are equipped not with lobes, but with ventral-lateral elevations 0.04-0.12 mm high. The lateral walls of the seventh and all subsequent thecae of such rhabdosomes have slightly concave edges, as in species of the genus *Pristiograptus* Jaek., 1889. Thus, a distinct polymorphism of thecae mouths is observed only in the proximal parts of rhabdosomes. The rest of the thecae are monomorphic - of the pristiograpt type.

The length of the first theca was 0.7 mm, the metathecus was 0.5-0.6 mm, the total length of the first theca was 0.95-1.1 mm. The length of the leak of the second and subsequent proximal theca is 0.6-0.9 mm, the metathecus is 0.6-1.5 mm, their total length is 1.1-2.3 mm. The length of the distal leaks is 0.9-1.2 mm, the meta-tecs are 1.8-2.1 mm, their total length is 2.7-3.2 mm. The degree of overlap of the proximal theca 1/2-2/3, distal - 2/3-3/5. The length of the proximal theca exceeds the width by 2.4-3 times, the distal - by 3.5-4.5 times.

The angles of inclination of the proximal theca 40°, distal - 35-40°.

In 10 mm of the length of the proximal parts of the rhabdosomes, there are 11-12 thecae, and the distal parts - 9 thecae.

Sicula slightly ventrally curved. Its length is 2.2-2.3 mm, the width of the mouth is 0.45-0.5 mm. The apex of the sicula reaches the level of the aperture of the second theca or is located 0.2-0.3 mm above it. The base of the first theca is located 0.3-0.4 mm above the mouth of the sicula. The length of the virgella is 0.6-0.7 mm.

Variability. The width of the rhabdosomes and the number of the thecae equipped with aperture vanes change.

Comparison. In terms of astogenetic development of rhabdosomes, *Istrograptus transgrediens* (Pern.) is the closest to *I. ultimus* (Pern.). The most important distinguishing feature of these species is the number of theca equipped with ventral-lateral lobes. The first of them always has noticeably fewer of them. It also differs in the greater length of the thecae and the smaller number of them in 10 mm rhabdos (9-12 thecae instead of 11-13 thecae in *Istrograptus ultimus*). The width of rhabdosomes of these species cannot be used for their diagnosis by proximal parts due to the high intraspecific variability of this trait.

The distal parts of the described species are usually noticeably wider than those of *Istrograptus ultimus* (Pern.).

This species differs from *Colonograptus princeps* Abduas., which, in our opinion, belongs to the genus *Istrograptus* Tseg., 1988, in the shorter length of the thecae, their smaller overlap, and the smaller number of thecae per unit of measurement (9-12 thecae in 10 mm length instead of 10-13 in *Istrograptus princeps*).

Remarks. According to G. Jaeger (139), *Pristiograptus chelmiensis* Tell., *P. samsonoviczi* Tell., *P. admirabilis* Tell., *P. perbrevis* Tell. are synonymous with the species *Monograptus transgrediens* (Pern.).

The identification of these species is based mainly on the length and width of rhabdosomes, as well as the number of proximal thecae "with hooks" (190, p. 44).

In 1985, thanks to the kindness of L.Teller, we had the opportunity to study the syntypes of these species. It should be noted that we failed to find fundamental morphological or systematic quantitative differences between them and the species *Istrograptus transgrediens* (Pern.).

Such differences, for example, as an unequal number of proximal thecae with lobes, changes in the width or length of rhabdosomes, can be explained, in our opinion, by intraspecific variability or by the conditions of burial, collection, and preparation of graptolites.

The same can be said about the subspecies *Pristiograptus transgrediens proximus* Prib., 1940; *P. transgrediens praecipuus* Prib., 1940; *P. transgrediens concretus* Prib., 1943, which are found in the geological sections of Volyno-Podolia together with *Istrograptus transgrediens* (Pern.).

According to L.Teller (195, p. 75), *Pristiograptus chelmiensis* Tell., 1964 and *P. samsonoviczi* Tell., 1964 are subspecies of the species *Istrograptus transgrediens* (Pern., 1899), and *Pristiograptus perbrevis* Tell., 1964 should be included in the synonymy *Istrograptus transgrediens* (Pern., 1899).

Association. *Tirassograptus bouceki* (Prib.), *T. perneri* (Bouc.) are occasionally found together with the described species in the southwest of the East European Platform. *Tirassograptus uniformis angustidens* (Prib.) was found in the upper part of the Zvenigorod formation in Podolia (borehole Podgaytsy-2, depth 992.8-993.4 m), along with *Istrograptus transgrediens* (Pern.).

Distribution. Upper Silurian, Przydolian Belt, Sklavian Stage, *Istrograptus transgrediens-Tirassograptus bouceki* zone; the Guschinskaya and Tomashevskaya suites of the western slope of the Polessky ledge of the basement, the Glinyanskaya and Poltvinskaya suites of the Lvov trough, the Zadarovskaya and Zvenigorodskaya suites of Podopia and Volhyn.

Material. 33 fragments of rhabdosomes on the surface of marls and mudstones drilled by the Tomashevka-4116 boreholes in int. 639.8-641.5 m, 641.5-643.5 m; Pulemets-1884 on depths 470 m, 473 m, 474 m, 476 m, 477 m, 514 m, 519 m; Zavadovka-6 on depths 1163 m, 1194 m, 1210 m; Glynyany-1 in int. 2622.4-2628.9 m, 2651-2656 m; Kusnishche-5394 on depths 308 m, 338.6 m, 345 m, 360 m, 362 m, 364 m; Dublyany - 4 in int. 3737.5-3742 m, 3756.1-3762 m, 3785-3790 m; Podgaytsy-2 int. 992.8-997 m, 997-1001.2 m; Davideny-1 in int. 2227-2232 m, 2256-2263 m, 2391-2397 m; Zagaipol-1 int. 2504-2508 m.

10 specimens of rhabdosomes were obtained by dissolving marls from the borehole Tomashevka - 4116 int. 614.5-616.2 m, 641.5-643.5 m.

Subfamily *Heisograptinae* Tsegelnjuk, 1976, emend.

Type genus - *Heisograptus* Tseg., 1976.

Diagnoz. Direct rhabdosomes. The thecae are represented by sigmoidally curved tubes, which, together with the mouths of the previous thecae, form excavations of the ventral margin.

Aperture formations are absent (genus *Pseudomonoclimacis* Mikh., 1975) or are represented by dorsal and dorsal-lateral lobes ("visors"), which consist (composed) of microfuselluses (from microfusellar "tissue"). They hang over the mouths of the thecae.

Visors are developed only in proximal (genus *Monoclimacis* Frech, 1897) or in proximal and medial thecae of rhabdosomes (genus *Heisograptus* Tseg.).

Composition in subfamily. Genera: *Heisograptus* Tseg., 1976; *Monoclimacis* Frech, 1897, emend. Prib., 1940b; *Pseudomonoclimacis* Mikh., 1975.

Comparison. This subfamily differs from *Uncinatograptinae* Tseg., 1976 in the absence of lateral lobes and hood-like aperture endings in the thecae, which consist of ordinary fuselage tissue.

It differs from *Pristiograptinae* Gurich, 1908 in the presence of visor-shaped aperture structures made of microfuselage tissue and climacograpt-type thecae.

Distribution. Lower, Middle and upper Silurian, upper Llandovery, Kitaigorodian, Tiritian and Ulichian Belts of Europe, Asia, America, Africa.

Genus *Heisograptus* Tsegelnjuk, 1976, emend.

Pomatograptus: Jaekel, 1889, p. 682 (pars).

Monograptus: Wood, 1900, c. 477; Elles and Wood, 1913, p. 428 (pars); Kitchen, 1955, p. 379; Jaeger, 1959, p. 117; Root, Ulst, 1967, p.238.

Monoclimacis: Urbanek, 1958, p. 92; Teller, 1988, p. 39.

Heisograptus: Tsegelnjuk, 1976, p. 103.

Type species - *Pomatograptus micropoma* Jaek., 1889.

Diagnoz. Direct rhabdosomes. Thecae are represented by short sigmoidally curved tubes. Their free ventral walls are parallel to the axis of rhabdosomes.

The ends of the proximal and medial theca are equipped with aperture formations in the form of dorsal-lateral visors, consisting of microfuselage tissue and growing on the continuation of the dorsal and, in part, lateral walls. They hang over the mouths of the thecae.

Composition of the genus: *Pomatograptus micropoma* Jaek., 1889; *Monograptus micropoma nannopoma* Jaeg., 1959; *Monoclimacis praemicropoma* Tell., 1988.

Comparison. This genus differs from *Monoclimacis* Frech., 1897 in the presence of dorsal-lateral aperture endings in the thecae rhabdosomes.

Remarks. Previously (81), we attributed to the genus *Heisograptus* Tseg., 1976 those Late Silurian monograptid species whose thecae endings are equipped, at least in the proximal parts of rhabdosomes, with aperture structures in the form of a visor ("roof"). These were the species *Pomatograptus micropoma* Jaek., 1889; *Heisograptus acer* Tseg., 1976; *H. difficilis* Tseg., 1976.

Later, when studying rhabdosomes extracted from rocks by dissolving them in acids, it turned out that the dorsal and dorsal-lateral lobes of the thecae in the above-mentioned species were constructed differently.

In the type species of the genus *Heisograptus* Tseg., 1976 *(H. micropoma),* they consist of microfuselage tissue. At the same time, small rhabdosomes of *"Heisograptus" difficilis* Tseg., 1976 have the same dorsal lobes above the orifices of the thecus throughout the rhabdosome as in *Tirassograptus uniformis* (Prib., 1940).

The dorsal-lateral structures of the thecae of *"Heisograptus" acer* Tseg., 1976 are similar to those *Wolynograptus valleculosus* Tseg., 1976

L.Teller (194) believes that *Monograptus micropoma nannopoma* Jaeg., 1959 can, apparently, belong to the group of species *Monoclimacis vomerina* (Nich., 1872). The latter is the type species of the genus *Monoclimacis* Frech, 1897. The aperture structures of its visor-shaped rhabdosomes consist of microfuselage tissue (193). This confirms the need to assign the genus *Monoclimacis* to the subfamily *Heisograptinae* Tseg., 1976.

Distribution. Middle Silurian, upper Kitaigorodian and Tiritian Belts of Europe and North America.

Heisograptus micropoma (Jaekel, 1889)

Table V, draw. 1, 2; tab. XXVII, fig.12-15; tab. XXVIII, Fig.1-3

Pomatograptus micropoma: Jaekel, 1889, p. 682, pl. 29, fig. 4-6.

Monograptus uncinatus var. micropoma: Wood, 1900, c. 477, tab. 25, fig. 24, fig. 21; Elles and Wood, 1913, p. 428, tab. 43, fig. 2, fig. 291.

Monograptus micropoma: Kuhne, 1955, p. 379, fig. eight; Jaeger, 1959, p. 117, tab. 1, fig. 5, tab. 6, fig. 7-9, tab. 7, fig. 3-7, fig. 18 a, 19 a-e; Root, Ulst, 1967, p. 238, tab. 27, fig. 3, fig. 53; Jaeger and Robardet, 1979, pl. 1, Fig.10.

Monoclimacis micropoma: Urbanek, 1958, c. 92, tab. 5, fig. 4, fig. 66-68; Lenz, 1972, p. 1156, fig. 2 Q, R.

Lectotype. Jaeger, 1959, pl. 6, fig. 7, proximal rhabdosome; Ludlow, *Lobograptus scanicus* zone.

Description. Small straight rhabdosomes up to 35 mm long. Their procoimal parts in the area of the first 4-6 thecae are slightly curved ventrally. Width at the level of the mouth of the first theca 0.7-0.85 mm (0.4-0.6 mm directly above the mouth of the first theca), at the level of the fifth theca - 1-1.3 mm (0.8-1 mm), the tenth - 1.1-1.5 mm (0.9-1.2 mm) and then does not change or increases occasionally to 1.6-1.7 mm.

Thecae are narrow, sigmoidally curved tubes. They are inclined to the axis by rhabdosomes at angles of 10-18°. The orifices of all the thecae of rhabdosomes form low (0.25-0.3 mm) excavations, which are covered from above by dorsal lobes in the form of visors, consisting of microfuselage tissue. In the proximal parts, they usually hang over the mouths of the theca, bending downwards to varying degrees.

In the middle and distal parts of the colonies, the dorsal mouths are located mainly at a right angle to the ventral edge. The lobes protrude beyond the edge with a rhabdos by 0.25-0.4 mm, which is 1/5-1/6 of their total width. In the distal direction, the length of the blades gradually decreases.

The length of the first theca is 1-1.1 mm, its leaks are 0.45-0.5 mm, metatheca are 0.6-0.7 mm; fifth theca - 1.6-1.9 mm, leaks - 0.7-0.9 mm, metatheca - 0.9-1 mm; tenth - 2-2.1 mm, leaks - 1-1.1 mm, metatheques - 0.9-1.1 mm; fifteenth - 2.2-2.3 mm, leaks - 1.1-1.2 mm, metatheques - 1.1-1.2 mm; the thirtieth - 2.5-2.6 mm, leaks - 1.2 mm, metatheques - 1.4 mm and then does not change on our material. Proximal theca overlap for 1/2-3/5 of their length, distal - half. The length of the proximal theca exceeds their width by 4.5-5 times, the distal - by 6.5-6 times.

In 10 mm length of colonies, there are 9-10.5 thecae.

Sicula narrow, ventrally curved. Its length is 1.1-1.8 mm, the width of the mouth is 0.3-0.35 mm. The apex of the sicula is located 0.1-0.3 mm above the level of the mouth of the first theca. The base of the first theca is 0.1-0.2 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.15-1.4 mm. Virgella length 0.2-0.3 mm.

Variability. The location of the apex of the sicula, the length of the dorsal aperture lobes, and the width of the rhabdosomes vary within small limits.

Comparison. In terms of the shape of rhabdosomes and thecae, *Heisograptus micropoma* (Jaek.) is closest to *H. praemicropoma* (Tell., 1988), from which it differs in a shorter thecae length and a large number of them per unit of measurement (10 ,5-9 thecae per 10 mm length of rhabdosomes in *H. micropoma* instead of 8-7 thecae in *H. praemicropoma*).

Remarks. The discussion about the generic affiliation of this species continues after the publication of the works indicated in the synonymy. B.Rickards and D.Palmer (185) supported the proposal of A.Urbanek (205) to assign it to the genus *Monoclimacis* Frech, 1897, and G.Jäger (141) insists on including it in the genus *Monograptus* Gein., 1852.

In our opinion, the described species does not belong to either the first or the second of the above genera. We assign it, like other species, the thecae of which are equipped with aperture formations in the form of microfuselage dorsal lobes, to the genus *Heisograptus* Tseg., 1976 (85).

It is difficult to judge the generic and species affiliation of the distal part of the rhabdosome assigned to *Monograptus micropoma* (Jaek.) by S. Wielefert (218, p. 35, fig. 16).

Association. *Bohemograptus bohemicus* (Barr.), *Lobograptus exspectatus* Urb., *Saetograptus chimaera* (Barr.), *Pristiograptus dubius* (Suess), *Colonograptus colonus* (Barr.) occur together with this species.

Distribution. Middle Silurian, Gorstian and lower Konovian Stage, upper part of the *Neodiversograptus nilssoni-Saetograptus chimaera* zone and lower part of the *Saetograptus leintwardinensis* zone; the Zabrodskaya and lower part of the Peremyshlyanskaya suite of Volyno-Podolia, the lower part of the Franopilskaya suite of the Brest depression, and the lower part of the Tiritian belt (lower Ldlow) of the Dobrudzhian trough.

Material. 15 fragments of rhabdosomes on the surface of marls and argillites drilled by the boreholes of Kharsy-1873 at depth 338.6 m, int. 346.5-346.8 m, 348.2-348.5 m, 348.5-349 m, 350.7-351.3 m, at 353 m; Brest-1 on depths 693 m, 697 m, 707 m; Shiev-4109 in int. 450-451 m; Guscha-4015 in int. 941-943 m, 943-952 m; Peremyshlyany-1 in int. 2861-2870.3 m; Kazakliya-1 in int. 4006-4013 m.

There are also 6 fragments of colonies extracted from the rocks of the borehole. Guscha-4015 in int. 953.7-962.5 m, 962.7-967.2 m; Shiev-4109 in int. 443.7-445.6 m, 449.8-450.8 m.

Genus *Monoclimacis* Frech, 1897, emend. Pribyl, 1940b

Monoclimacis crenulata (Tornquist, 1881)

Tab. VI, draw. 7; tab. VII, draw. 1; tab. XXXI, fig. 14, 15;
tab. XXXII, fig. 1-11

Monograptus crenulatus: Tornquist, 1881, c. 438, tab. 17, fig. 4.

Monograptus vomerinus var. crenulatus: Elles and Wood, 1911, p. 412, tab. 41, fig. 4, fig. 278.

Monoclimacis crenulata: Pribyl, 1940 b, c. 6, tab. 2, fig. 17.18; Cocks and Toghill, 1973, pl. 2, fig. one; Tsegelnyuk, 1976 , p. 235, tab. 1, fig. 2, 3, fig. 2 a, b.

Lectotype. Tornquist, 1881, pl. 17, fig. 4; Sweden, Llandoverian series (172).

Description: Straight rhabdosomes, more than 60 mm long, with slightly dorsally curved proximals within the first 3-5 thecae. Their width at the level of the first theca is 0.45-0.5 mm, the second

- 0.5-0.55 mm, the seventh - 0.65-0.7 mm, the tenth - 0.8-0.85 mm, the fifteenth - 1-1.05 mm. Equally gradually, the width increases to 1.8 mm in the distal parts of rhabdosomes.

Thecae of the climacograft type, monotonous, sigmoidally curved with a straight ventral edge and excavations 0.15-0.4 mm high, 0.1-0.3 mm deep, which is 1/4-1/5 of the total width of the colonies.

Dorsal lobes in the form of "visors" hang over the mouths of the proximal thecae. They are located approximately at right angles to the ventral edge of the colonies. Their length is 0.12-0.3 mm. From bottom to top along the colonies, the length of the lobes gradually decreases - in their middle and distal parts, on the dorsal edges of the mouths, instead of lobes, only narrow (0.06-0.08 mm) strips or only thickenings of the periderm are developed.

The length of the first theca is 1.4-1.45 mm, the leaks are 1-1.1 mm, the metatheca are 0.35-0.45 mm; the second - 1.3-1.4 mm, leaks - 0.9-0.95 mm, metateks - 0.37-0.5 mm; the fourth - 1.45-1.5 mm, leaks - 0.65-0.7 mm, metatheques - 0.8 mm; seventh - 1.65-1.7 mm, leaks - 0.8-0.85 mm, metatheques - 0.8-0.9 mm; tenth - 1.6-1.8 mm, leaks - 0.75-0.9 mm, metatheques - 0.8-0.9 mm. The length of the distal thecae is 2.2-2.4 mm, the proteca is 1-1.1 mm, the metatheca is 1.2-1.3 mm. The degree of overlap of proximal theca 1/3-2/5, distal - 1/2-3/5 of their length.

There are 8-10.5 thecae per 10 mm length of rhabdosomes.

Sicula straight or slightly dorsally curved. Its length is 1.5-1.95 mm, the mouth width is 0.3-0.35 mm. The apex of the sicula reaches the level of the mouth of the first theca or is located 0.2-0.3 mm higher. The beginning of the first theca is 0.3-0.4 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.7-1.75 mm. The length of the virgella is 0.55-0.9 mm.

Variability. The width of the rhabdosomes, the degree of dorsal curvature of the proximals, the length of the dorsal aperture lobes, and the location of the apex of the sicula relative to the level of the mouth of the first theca vary.

Comparison. In terms of shape and size of rhabdosomes and thecae, this species is closest to *Monoclimacis vomerina* (Nich.), from which it differs in dorsally curved proximals, smaller width of rhabdosomes, less deep excavations, less overlap of the thecae, and more long aperture lobes of the proximal thecae.

The described species differs from *Monoclimacis flumendosae* (Gort.) in less deep excavations of the mouths of the thecae and in a large number of proximal thecae equipped with dorsal lobes.

This species differs from *Monoclimacis gracilis* (Elles et Wood) in a smaller number of thecae per unit of measurement and in less deep excavations of theca mouths.

Association. *Monograptus priodon* (Bronn), *M. parapriodon* Bouc., as well as brachiopods *Plagiorhyncha analoga* (Wen.), *Cyrtia trapezoidalis* (His.), etc., occur together with this species.

Distribution. Lower Silurian, upper part of upper Llandovery, Telichian Stage (= Bolotian horizon of Volyno-Podolia), *Monoclimacis crenulata* zone; the lower parts of the Furmanovskaya suite of Podolia, the Dublyanskaya suite of the Lvov trough, the Kladnevskaya suite of Volhyny, and the Zelvyanskaya suite of the Brest depression.

Material. 25 fragments of rhabdosomes on the surface of marls in an outcrop of the right slope of the Ternava River near the village of Kitaygorod, as well as those discovered by boreholes Mosyr-5372 on depth 370 m; Zagaipol-1 int. 2911-2911.5 m; Shidlovtsy-16902 on depth 296.6 m; Harsy-1873 on depths 441.4 m, 442.1 m; Davideny-1 in int. 2994-3001 m.

There are also 13 fragments of colonies recovered from the rocks of the borehole Brest-1 on depth 805.6 m.

Monoclimacis linnarsoni (Tullberg, 1883)

Tab. V1, draw. 8; tab. VII, draw. 2; tab. XXXII, fig. 12-15;
tab. XXXIII, fig. 1-4

Monograptus linnarsoni: Tullberg, 1883, p. 20, tab. 2, fig. 5-9; Rickards, 1965, p. 250, tab. 30, fig. 5, fig. 2 a-b.

Monoclimacis linnarsoni: Pribyl, 1940 b, c. 7, tab. 3, fig. 11-12; Obut, Sobolevskaya, Bondarev, 1955, p. 57, tab. 7, fig. 15-18; Obut, Sobolevskaya, Nikolaev, 1967, p. 107, tab. 13, fig. 8, 9; Root, 1972, p. 81, tab. 3, fig. 7-10; Sennikov, 1976, p. 190, tab. 13, Fig.1; Pashkevichius, 1979, p. 157, tab. 9, fig. 3-7, tab. 24, fig. 7-10.

Lectotype. Tullberg, 1883, pl. 2, fig. 5, proximal rhabdosome; Sweden, Llandoverian Group, *Cyrtograptus lapworthi* zone (172).

Description. Straight rhabdosomes with slightly curved dorsally extreme proximals. Their width at the level of the mouth of the first theca is 0.3-0.36 mm, the second - 0.4 mm. The width of the procoimals available in the collection is 0.4-0.45 mm, the distal parts are 0.8-1.2 mm.

The thecae of monoclimacis type, sigmoidally curved, monotonous, with an almost straight ventral edge and excavations 0.18-0.3 mm high, 0.09-0.18 mm deep, which is 1/4-1/5 of the total width of rhabdosomes. The mouths of the tech open in the excavation. Their ventral and lateral parts are thickened. The dorsal parts of the excavations of the proximal and medial theca are equipped with very short (0.01-0.05 mm) dorsal "lobes", which are essentially narrow strips of the periderm on the continuation of the interthecal walls. The excavations of the distal thecae are devoid of dorsal outgrowths.

The length of the first theca is 1.25-1.3 mm, the leaks are 0.85-1.1 mm, the metatheca are 0.3-0.4 mm; the second - 1.25-1.3 mm, leaks - 0.85-0.9 mm, metateks - 0.4 mm; the third - 1.5 mm, leaks - 1 mm, metatheques - 0.5 mm. In fragments of rhabdosomes 0.8–1.2 mm wide, the length of the thec is 1.95–2 mm, the protec is 1.1 mm, and the metathecus is 0.85–0.9 mm. The proximal thecae overlap for 1/3-1/4 of their length, the distal - for 1/2-2/5.

In 10 mm long colonies, there are 8-10 thecae.

The **sicula** is straight. Its length is 1.45-1.55 mm, the mouth width is 0.25-0.3 mm. The apex of the sicula does not reach the level of the dorsal part of the excavation of the first theca by 0.06-0.25 mm. The base of the first theca is located 0.3-0.5 mm above the mouth of the siculum. From the mouth of the sicula to the end of the first theca 1.55-1.7 mm. The length of the virgella is 0.35-0.5 mm.

Variability. Based on the available material, the width of the dorsal "lobes" (strips) overhanging the excavations of the thec varies.

Comparison. This species differs from *Monoclimacis crenulata* (Tornq.) in the smaller width of the rhabdosomes and the absence of true dorsal lobes above the excavations of the proximal thecae. From *Monoclimacis sublinnarsoni* Prib. the described species is distinguished by a weak dorsal curvature of the proximal parts of the rhabdosomes.

Association. *Monoclimacis linnarsoni* (Tullb.) occurs together with *Oktavites spiralis* (Gein.), *Streptograptus anguinus* Prib.

Distribution. Lower Silurian, tops of the upper Llandovery, *Monoclimacis crenulata* zone; Zelvyanskaya suite of the Brest depression.

Material. 8 fragments of rhabdosomes recovered from the rocks of the borehole Brest-1 on depths 808 m, 817 m.

Genus *Pseudomonoclimacis* Mikhailova, 1975

Monograptus: Elles and Wood, 1911, p. 383; Kuhne, 1955, p. 365.

Pristiograptus (Pristiograptus): Tomczyk, 1956, p. 54.

Pristiograptus: Root, Ult, 1967, p. 250.
Pristiograptus (?): Pashkevichius, 1974, p. 130.
Monoclimacis: Urbanek, 1958, p. 88; Willefert, 1970, p. 27; Pashkevichius, 1979, p. 158.
Pseudomonoclimacis: Mikhailova, 1975, p. 156; Tsegelnyuk, 1976, p. 105; Root, 1986, p. 123.
non *Pseudomonoclimacis:* Urbanek, 1997, p. 161.
Type *Pseudomonoclimacis elegans* Mikh., 1975.

Diagnoz. Straight rhabdosomes, slightly curved ventrally in the proximal parts. Thecae are represented by sigmoidally curved tubes. Their mouths are usually even, devoid of any aperture structures. They open in the excavation of the ventral margin of the rhabdosome. In the distal direction, the distinctness of excavations often decreases. Therefore, the ventral side of the middle and distal parts of rhabdosomes may acquire a pri-stiograft appearance during lateral burial.

Composition of the genus: *Monograptus haupti* Kuhne, 1955; *Pristiograptus (Colonograptus) dalejensis* Bouc., 1936; *Pristiograptus (?) tauragensis* Pask., 1974; *Pseudomonoclimacis elegans* Mikh., 1975; *P. bandaletovi* Mikh., 1975; *P. minimus* Mikh., 1975; *P. medius* Tseg., 1976; *P. cinctutus* Koren, 1986; *P. lidiae* Koren, 1986.

Comparison. This genus differs from *Pristiograptus* Jaek., 1889 in the sigmoid bend of the thecae and the presence of excavations on the ventral side of the colonies (especially in the procoimal and middle parts).

It differs from the genus *Monoclimacis* Frech, 1897 in the absence of aperture structures in the form of dorsal "visors" in all rhabdosomes.

This genus differs from the genus *Monograptus* Gein., 1852 in sigmoidally curved thecae and the absence of hook-shaped free parts of thecae.

Distribution. Middle and Upper Silurian, Tiritian, Ulichian and Przhidolian Belts of Europe and Asia.

Pseudomonoclimacis haupti (Kuhne, 1955)

Табл. VII, draw. 3, 4; табл. XXXIII, фиг. 5-10, 12

Monograptus cf. *ultimus*: Elles, Wood, 1911, с. 383, табл. 37, фиг. 14, рис. 253.
Monograptus haupi: Kuhne, 1955, p. 365, fig. 3 A-B, D-F; Jaeger and Robardet, 1979, pl. 1, fig. 3.
Pristiograptus (Pristiograptus) cf. ultimus: Tomczyk, 1956, p. 54, tab. 7, fig. 3a-c, fig. 15c-d.
Monoclimacis haupi: Urbanek, 1958, p. 88, tab. 4, fig. 5, fig. 59-64.
Monoclimacis cf. haupi: Willefert, 1966, p. 88, Fig.27, 28.
Monoclimacis tomczyki: Willefert, 1970, p. 27, tab. I, fig. 1-7, fig. 1-20.
Pseudomonoclimacis latilobus: Urbanek, 1997, p. 161 (pars), pl. 19, fig. 1 (non fig. 2-5 = *Ludensograptus latilobus* Tseg., 1976; non fig. 6 = *Pseudomonoclimacis tauragensis* Pask., 1974; non fig. 7-14 = ?).

Holotype. Kuhne, 1955, fig. 3 A, F, middle part of rhabdosome; Ludlow series.

Description. Small rhabdosomes up to 10 mm long. The proximal parts are straight or slightly ventrally curved within the first 5-7 tech. The width at the level of the mouth of the first theca is 0.55-0.6 mm, the second - 0.6-0.7 mm, the third - 0.65-0.8 mm, the fourth - 0.8 mm, the fifth - 0.85- 0.9 mm, sixth - 1 mm. The greatest width of the distal fragments is 1-1.1 mm.

Thecae are represented by short sigmoidally curved tubes, which are inclined to the axis of the rhabdosomes at angles of 30-40°.

Interthecal septa at the level of the mouths of the thecae are bent in a knee-like manner towards the free ventral walls. Together with the mouths of the previous thecae, they form excavations of the ventral edge of the rhabdosome 0.25-0.3 mm high and 0.12-0.25 mm deep, which is 1/3-1/5 of the total width of the colonies.

The length of the first theca is 0.9-0.95 mm, the leaks are 0.55-0.7 mm, the metatheca are 0.25-0.45 mm; second theca - 1-1.1 mm, leaks - 0.55-0.65 mm, metatheca - 0.55-0.65 mm; the third - 1 mm, leaks - 0.6-0.65 mm, metatheques - 0.35-0.4 mm; the fourth - 1.1-1.15 mm, leaks - 0.5-0.6 mm, metatheques - 0.5-0.6 mm; fifth - 1.15 mm, leaks - 0.6-0.7 mm, metatheques - 0.55 mm. The collection contains rhabdosomes, the length of the eighth theca of which is 1.05 mm, the leaks - 0.55 mm, metatheca - 0.5 mm. Thecae overlap for 1/2-2/5 of their length. The length of the techs exceeds their width by 2.8-3.2 times.

There are 6-7 thecae in 5 mm length of rhabdosomes.

Sicula ventrally curved. Its length is 1.5-1.6 mm, the width of the mouth is 0.3-0.35 mm. The top of the sicula reaches the level of the third theca. It is located below the level of the mouth of the theca by 0.3-0.35 mm. The beginning of the first theca is 0.15-0.2 mm above the mouth of the sicula. The distance from the mouth of the sicula to the mouth of the first theca is 1-1.2 mm. Virgella length 0.25-0.35 mm.

Variability. The width of rhabdosomes, especially their proximal parts, the length of the leaks and metathecus varies.

Comparison. According to the shape of rhabdosomes, this species is apparently closest to *Pseudomonoclimacis cinctutus* Koren, from which it differs in the shorter length of the colonies, their slightly wider width (1-1.1 mm instead of 0.9 -0.95 mm in *P. cinctutus)* and a higher location of the apex of the siculum.

The described species is also very close in shape and size to rhabdosoma and flowed to *Pseudomonoclimacis lidiae* Koren. Apparently, the only distinguishing feature of these species is the location of the apex of the sicula. In *Pseudomonoclimacis lidiae* Koren it reaches the base of the septum between the second and third thecae, while in *Pseudomonoclimacis haupti* Kuhne its apex usually reaches the middle of the leakage of the third theca.

From *Pseudomonoclimacis elegans* Mikh. this species is distinguished by a greater width of the rhabdosome (1-1.1 mm versus 0.65-0.75 mm in P. elegans), its shorter length, and a significantly higher location of the apex of the siculum. From Pseudomonoclimacis tauragensis (Pask.), *P. bandaletovi* Mikh. it differs in significantly smaller rhabdosomes.

Remarks. It is possible that *Monograptus haupi* Kuhne, 1955 may be a junior synonym of *Pristiograptus praeultimus* Munch, 1942. A. Münch pointed out that the theca of the ultimus type is typical for the last of them (163, p. 247). At the same time, in our opinion, he had in mind those specimens of monograptids that A. Przhibl erroneously attributed to *Monograptus ultimus* Pern. (171, pl. I, figs. 9-11; 174, pl. 4, figs. 7-11). Following A. Przhibl, similar monograptids within Volyno-Podolia were described (85, p. 106, pl. 30, figs. 10-12) as *Pseudomonoclimacis ultimus* (Pern.).

G. Jaeger singled them out into a new species - *Monograptus parultimus* Jaeg. (142, p. 318). Consequently, speaking of the thecae of the *Istrograptus ultimus* (Pern.) type in *Pristiograptus praeultimus* Munch, A. Münch had in mind their resemblance to the thecae of the *Ludensograptus parultimus* (Jaeg.) type, with which they are really similar. But there is also a significant difference between them - the mouths of the theca parultimus type are equipped with symmetrical lateral elevations (142), while *Pristiograptus praeultimus* Munch has lateral elevations, judging by the description and image of rhabdosomes on rock samples (164, p. 247, table 1, Fig. 8-11, Table 7, Fig. 3), no. They are absent in *Pseudomonoclimacis haupti* Kuhne, which is clearly seen in the rhabdosomes we extracted from the rocks by their dissolution. For an accurate comparison of *Pristiograptus praeultimus* Munch with it, it is necessary to extract the rhabdosomes of the latter from the type localities.

G. Jaeger (142, p. 320) and A. Urbanek (214, p. 127, 161) consider the species *Pseudomonoclimacis haupti* (Kuhne, 1955) to be a junior synonym of *P. dalejensis* (Bouc., 1936). In our opinion, these species are distinctly different in all morphological characters except for the type of structure of rhabdosomes. However, for this reason, these authors do not reduce the diversity of, for example, species of the genus *Pristiograptus* Jaek., 1889 to one species.

Synonymy shows how difficult to identify are the dwarf rhabdosomes of *Pseudomonoclimacis haupti* Kuhne, which were first described from the Silurian deposits of Great Britain in the *Saetograptus leintwardinensis* Zone. It is known that the rhabdosomes of this zonal species in the British Isles are also "very small" (212, p. 40), which is explained, as in the case of the pygmy rhabdosomes Pristiograptus parvus Ulst, by unfavorable environmental conditions (212).

Association. This species occurs together with *Saetograptus leintwardinensis* (Lapw.), *Bohemograptus bohemicus* (Barr.), *Pseudomonoclimacis tauragensis* (Pask.).

Distribution. Middle and upper Silurian, upper Tiritian and Ulichian Belts, upper part of the *Saetograptus leintwardinensis* zone, *Neocucullograptus kozlowskii–Neolobograptus auriculatus, Formosograptus formosus–Bugograptus spineus* zones; the upper part of the Zabrodskaya and the lower parts of the Milovanskaya and Gornikskaya suites of the Polessky ledge of the basement, the Lesnyanskaya suite of the Brest depression.

Material. 6 rhabdosomes on the surface of marls drilled by boreholes Samoilichi-1858 on depths 269.5 m, 277 m; Guscha-4015 in int. 933.4-936.9 m.

There are 10 fragments of colonies extracted from the rocks of the boreholes Brest-1 on depths 518.5 m, 532.3 m, 544 m, 561.8 m; Guscha-4015 in int. 727.5-732.5 m, 933.4-936.9 m.

Pseudomonoclimacis tauragensis (Paskevicius, 1974)

Tab. VII, draw. 5; tab. XXXIII, fig. 11, 13, 14; tab. XXXIV, fig. 1-7

Pristiograptus ultimus: Root, Ulst, 1967, p. 250, tab. 29, fig. 10.11, fig. 65 a, b.

Pristiograptus (?) tauragensis: Pashkevichius, 1974, p. 130, tab. 17, fig. 7-10, fig. 3 A, B.

Pseudomonoclimacis tauragensis: Tsegelnjuk, 1976, p. 105, tab. 30, fig. 8, 9.

Monograptus sp.: Rickards and Palmer, 1977, fig. 8B, C, fig. A-D, H, fig. 10 A-C, F-H.

Monograptus tauragensis: Pashkevichius, 1979, p. 158, tab. 9, fig. 8, 9, tab. 24, fig. 11-15.

Pseudomonoclimacis latilobus: Urbanek, 1997, p. 161 (pars), table 19, fig. 6 (non fig. 1 = *Pseudomonoclimacis haupti* Kuhne, 1955; non fig. 2-5 = Ludensograptus latilobus Tseg., 1976; non fig. 7-14 = ?).

Holotype. Pashkevichius, 1974, pl. 9, fig. 7, proximal rhabdosome; Pagegyai beds of the Baltic, Ludlow Group, *Pseudomonoclimacis tauragensis* zone.

Description. Straight rhabdosomes up to 16 mm long. The proximal parts are slightly ventrally curved within the first 6–8 thecae. The extreme proximals are straight or slightly curved dorsally. Their width at the level of the mouth of the first theca is 0.6-0.7 mm, the second - 0.75-0.8 mm, the fifth - 1.2-1.3 mm, the tenth - 1.4-1.8 mm , fifteenth -1.65-1.75 mm and then does not change or reaches 2.2 mm in some rhabdosomes.

Thecae are represented by relatively short tubes inclined to the axis by rhabdos at angles of 30-40°. Mouths are even. The free ventral walls of the proximal theca are connected to the interthecal septa by smooth knee-shaped bends. Together with the mouths of the previous thecae, they form distinct excavations 0.25–0.35 mm high and 0.15–0.4 mm deep. They make up 1/4-1/5 of the total width of rhabdosomes.

Up the colonies, the knee-shaped bends gradually disappear during the transition from the ventral walls to the interthecal septa. In this regard, excavations are becoming less and less pronounced. Therefore, the ventral side of the middle and distal parts of rhabdosomes acquires a pristiograft appearance during lateral burial.

The length of the first theca is 0.7-1 mm, the leaks are 0.4-0.65 mm, the metatheca are 0.25-0.35 mm; the second - 0.8-1 mm, leaks - 0.5-0.6 mm, metatheques - 0.3-0.5 mm; fifth - 1.1-1.3 mm, leaks - 0.6 mm, metatheques - 0.5-0.7 mm; tenth - 1.5-1.65 mm, leaks - 0.7-0.85 mm, metatheques - 0.8 mm; fifteenth - 1.6 mm, distal tech - up to 1.9 mm. The degree of overlap of the proximal theca 1/2-2/3, distal - 2/3-3/4.

There are 13-15 thecae in 10 mm of rhabdosome length.

Sicula ventrally curved. Its length is 1.15-1.6 mm, the width of the mouth is 0.25-0.3 mm. The apex of the sicula is located 0.1-0.2 mm below the level of the mouth of the second theca. The beginning of the first theca is 0.15-0.2 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1-1.1 mm. Virgella length 0.2-0.3 mm.

Variability. the width of rhabdosomes and the degree of ventral bending of the proximals vary.

Comparison. In terms of the shape of the rhabdosome and the current, this species is closest to *Pseudomonoclimacis medius* Tseg., from which it differs in the greater width of the rhabdosome (1.75-2.2 mm instead of 5 mm in *P. medius*).

From *Pseudomonoclimacis bandaletovi* Mikh. it is distinguished by a shorter length, a large number of thecae in the distal parts of the rhabdosomes, and a higher location of the apex of the siculum relative to the level of the mouth of the second thecae.

The described species differs from *Pseudomonoclimacis haupti* Kuhne, *P. elegans* Mikh., *P. cinctutus* Koren, *P. lidiae* Koren by a much wider rhabdosome.

Remarks. An opinion is expressed that *Pristiograptus (?) tauragensis* Pask., 1974; *Monograptus haupti* Kuhne, 1955; *Monograptus dalejensis* Bouc., 1936 are synonymous (142).

We agree with H. Jaeger that these species apparently belong to the same genus. The same genus also includes *Pseudomonoclimacis elegans* Mikh., *P. bandaletovi* Mikh., *P. cinctutus* Koren, *P. lidiae* Koren, *P. medius* Tseg. All of them differ from one another in morphological features. For example, *Monograptus dalejensis* Bouc. differs from *Pseudomonoclimacis tauragensis* (Pask.), according to the descriptions and images that are available to us for comparison, in the greater width of the rhabdosomes, strongly curved dorsally proximals, the greater number of thecae per unit of measurement, and the shorter siculum.

Association. This species occurs together with *Pseudomonoclimacis haupti* (Kuhne), *Ludensograptus latilobus* (Tseg.), *Bohemograptus bohemicus* (Barr.), *Neocucullograptus kozlowskii unicornus* Urb., *Wolynograptus acer* (Tseg.), *W. valleculosus* Tseg., *Pristiograptus vicinus* (Pern.) , *Neolobograptus auriculatus* Urb.

Distribution. Middle and upper Silurian, upper part of the Tiritian and Ulichian Belts, upper part of the *Neodiversograptus nilssoni-Saetograptus chimaera* zone, *Saetograptus leintwardinensis, Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the Zabrodskaya, Oleshkovichskaya, Novinskaya, Gornikskaya and lower parts of the Milovanskaya and Turskaya suites of the Polessky ledge of the foundation, the upper part of the Franopolskaya and the lower part of the Rusilovskaya suites of the Brest depression.

In Great Britain, *Pseudomonoclimacis tauragensis* (Pask.) is established, in our opinion (see the works indicated in the synonyms), in the upper part of the *Lobograptus scanicus* zone, in Romania - in the *Lobograptus scanicus* zone (185, pp. 67, 68).

Material. 30 fragments of rhabdosomes on the surface of marls, uncovered by boreholes Gushcha-4015 in int. 795-800 m, 822-830 m, 873-878 m, 886-891 m, 897-901 m, 911-915 m, 920-923 m, 928-931 m; Harsy-1873 on ch. 340 m; Samoilichi-1859 on depths 277 m, 279 m, 281 m, int. 286.5-287.5 m; Priluki-1844 on depth 501 m; Brest-1 on depths 540.5 m, 541.5 m, 543.5 m, 551.4 m, 586.5 m; Brest-10 on depths 636.7 m, 672.6 m, 674 m.

There are 15 fragments of colonies extracted from the rocks of the boreholes Brest-1 on depths 548 m, 550.3 m; Guscha-4015 in int. 758-763 m, 886-891 m, 897-902 m, 915-920 m, 933-937 m, 952-961 m.

Family *Wolynograptidae* Tsegelnjuk, 1976, emend.

Type genus - *Wolynograptus* Tseg., 1976

Diagnoz. Small all-round dorsally curved or straight rhabdosomes with prominent dorsal proximal curvature.

Thecae are straight narrow tubes, the isolated parts of which are slightly hook-like curved. On the continuation of the dorsal and lateral walls of the theca, predominantly long hood-like aperture structures grew, which were oriented almost perpendicular to the axis of the rhabdosomes.

They consist of normal periderm fuseluses. Their ventral walls are reduced or completely absent. From the front edge of the aperture hoods (on the right and on the left), lobes or spines (genus *Bugograptus*) grew.

Composition of the family. Genera: *Wolynograptus* Tseg., 1976; *Bugograptus* nom. nov.

Comparison. This family differs from *Monograptidae* Lapworth, 1873 in shape, size, and placement of aperture structures.

Remarks. In some representatives of *Wolynograptidae* Tseg., 1976 (*Wolynograptus canaliculatus* Tseg., 1976, which, in our opinion, is the older - more ancient - synonym of *Monograptus hornyi* Jaeg., 1986), there are signs of isolation of one or two proximal thecae from subsequent ones, which may indicate on possible proximity to species of the genus *Formosograptus* Boucek, Mihailovic, Veselinovic, 1976.

Distribution. Upper Silurian, upper part of the Ulichian and lower part of the Przhidolian Belts of Europe and Asia.

Genus *Wolynograptus* Tsegelnjuk, 1976, emend.

Monograptus: Jaeger, 1986, p. 330.

Monograptus (Uncinatograptus): Urbanek, 1995, p. thirteen; Urbanek, 1997, p. 140.

Type species - *Wolynograptus valleculosus* Tseg., 1976.

Diagnoz. Small straight rhabdosomes with flat or dorsally curved proximal parts. Thecae are in the form of straight tubes. Their isolated parts are provided with large dorsal-lateral aperture structures in the form of hoods. They consist of normal fuseluses and are oriented almost perpendicular to the axis of the rhabdosomes or are smoothly bent downwards.

Composition of the genus: *Wolynograptus valleculosus* Tseg., 1976; *W. canaliculatus* Tseg. (= *Monograptus hornyi* Jaeg., 1986); *Heisograptus acer* Tseg., 1976.

Comparison. In terms of shape, location, and orientation of aperture structures, this genus is closest to *Bugograptus* nom. nov., from which it differs in larger and straighter or almost straight rhabdosomes throughout.

This genus differs from *Uncinatograptus* Tseg., 1976, whose species also have aperture structures in the form of dorsal-lateral hoods, in the form and orientation of aperture structures.

Remarks. Previously (85, p. 110), when studying fragments of rhabdosomes of the genus *Wolynograptus* Tseg., 1976, which were voluminous to varying degrees, grooves (concavities) were observed along the dorsal walls of the aperture structures of the theca.

An additional study of chemically prepared fragments of well-preserved rhabdosomes from the core of the same wells showed that the above grooves were the result of compression by rhabdosomes during rock diagenesis.

Distribution. Upper Silurian, upper part of the Ulichian and lower part of the Przhidolian Belt of Europe and Asia.

Wolynograptus acer (Tsegelnjuk), 1976

Table V, draw. 3, 4; tab. XXVIII, Fig. 4-15; tab. XXIX, Fig.1

Heisograptus acer: Tsegelnjuk, 1976, p. 103, tab. 30, fig. 1, 2.

Monograptus (Uncinatograptus) acer acer: Urbanek, 1995, p. 3, fig. A; Urbanek, 1997, p. 140, tab. 9, 10, fig. in text 25-32.

Holotype. Specimen No. 1788/12, TsNP Museum. Tsegelnjuk, 1976, p. 103, pl. 30, fig. 1, whole rhabdosome; Milovanskaya suite, Ulichian Belt, *Formosograptus formosus-Bugograptus spineus* zone.

Description. Almost straight or slightly ventrally curved rhabdosomes over 30 mm long. Their proximal parts within the limits of the first 2-4 techs are markedly curved dorsally. Width at the level of the mouth of the first theca 0.8-0.95 mm, directly above - 0.4-0.5 mm, at the level of the fifth theca 1.3-1.45 mm (0.8 mm), tenth - 1, 6 mm (1-1.1 mm), the fifteenth - 1.6-1.8 mm (1-1.1 mm) and then does not change or occasionally increases to 1.9 mm.

Thecae are in the form of narrow sigmoidally curved tubes. In the proximal parts they are inclined to the axis of the rhabdosomes at angles of 42-46°, in the distal parts - 15-23°. Above the mouths of all the thecae, lateral-dorsal "visors" (blades) hang. In the first 3-4 thecae they are usually slightly curved downwards, in the rest they are located mainly at right angles to the ventral margin or slightly bent upwards. The length of the lobes is 0.4-0.6 mm, which is 1/2-1/3 of the total width of the rhabdosomes.

The length of the first theca is 1-1.25 mm, the leak is 0.7-0.9 mm, the metathecus is 0.2-0.3 mm; fifth theca - 1.35-1.5 mm, leaks - 0.6-0.8 mm, metatheca - 0.55-0.9 mm; tenth theca - 1.75-2 mm, leaks - 0.8-0.9 mm, metatheca - 1.1 mm; fifteenth - 1.9-2.2 mm, leaks - 0.9-1 mm, metatheques - 1.2 mm. The length of the distal theca does not exceed 2.2 mm, the protecus is 1.1 mm, and the metathecus is 1.2 mm. The proximal theca overlap for 1/2-1/3 of their length, the distal - half. The length of the proximal theca exceeds their width by 3.5-4 times, the distal - by 4.5-5 times.

There are 10-12 thecae per 10 mm length of rhabdosomes.

Sicula weakly ventrally curved. Its length is 1.4-1.6 mm, the mouth width is 0.35-0.4 mm. The apex of the sicula is located at the level of the mouth of the first theca. The base of the latter is located 0.3-0.4 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.4-1.6 mm. The length of the virgella is 0.4-0.6 mm.

Variability. The degree of dorsal bending of the proximals and the width of the rhabdosomes vary within small limits.

Comparison. In terms of rhabdosome shape, this species is closest to *Wolynograptus canaliculatus* Tseg., 1976 (= *Monograptus hornyi* Jaeg., 1986), from which it differs in a smaller rhabdosome width (1.6-1. 7 mm instead of 2.2-2.3 mm in *Wolynograptus canaliculatus*) and a large number of thecae per unit of measurement in the distal parts of rhabdosomes.

This species differs from *Wolynograptus valleculosus* Tseg., 1976 in the almost straight proximal rhabdos or its weak dorsal curvature.

Remarks. Prof. A. Urbanek (213, 214) drew attention to the illogicality of assigning this species to the genus *Heisograptus* Tseg., 1976, the type species of which *Heisograptus micropoma* (Jaek., 1889) has aperture formations in the form of dorsal-lateral structures built (consisting) of the microfuselage fabrics.

However, in our opinion, it is illogical to attribute this species to the genus (or subgenus) *Uncinatograptus* Tseg., 1976 (see synonymy), the type species of which has aperture structures in the form of short "hoods".

Association. Together with this species, there are *Ludensograptus latilobus* (Tseg.), *Pseudomonoclimacis tauragensis* (Pask.), *Uncinatograptus caudatus* Tseg., *Formosograptus formosus* (Bouc.), *Pristiograptus tumescens* (Wood), *Monograptus (Slovinograptus) balticus* (Tell.), *Bugograptus aculeatus* (Tseg.), *B. spineus* (Tseg.), *B. protospineus* (Urb.).

Distribution. Upper Silurian, Ulichian Belt, Metonian Stage, *Formosograptus formosus-Bugograptus spineus* zone; the lower part of the Milovanskaya and the upper part of the Novinskaya suites of the Polessky basement ledge, the Peremyshlyanskaya suite of the Lvov trough.

Wolynograptus acer (Tseg). determined by us in the Baltic in the borehole Dubovskoye on depths 1282.7 m, 1283.2 m, 1288.8 m in the collection, kindly provided for viewing by prof. D.L.Kalio.

Material. 33 fragments of rhabdosomes on the surface of marls recovered by boreholes Gushcha-4015 in int. 758.5-763 m, 768.5-773.5 m, 773.5-778.5 m; Pulemets-1884 on depths 616 m, 687 m, 693 m, 702 m, 732 m, 735 m; Kusnishche-5394 on depths 453 m, 455 m, 456 m; Peremyshlyany-1 in int. 2728.5-2739.9 m, 2817-2817.6 m; Zagaipol-1 int. 2715-2717 m.

There are 17 fragments of rhabdosomes extracted from the rocks of borehole Guscha-4015 in int. 715-722 m, 758-763.5 m, 765.5-768.5 m, 773.5-778.5 m.

Genus *Bugograptus**/ nom. nov.

*/ Name of the genus after the name of the river "Western Bug" in Volhyn.

Acanthograptus: Tsegelnjuk, 1976, p. 113.

Monograptus (Uncinatograptus): Urbanek, 1995, p. 13; Urbanek, 1997, p. 147.

Type species - *Acanthograptus spineus* Tseg., 1976, p. 113.

Diagnoz. Small dorsally curved in one plane rhabdosomes. The thecae are monomorphic, tubular, slightly hook-shaped in their isolated part.

The endings of the theca are equipped with large hood-like aperture formations that grew on the continuation of the dorsal and lateral walls of the isolated parts of the theca.

On the anterior edge of the aperture endings, long spikes or downward-sloping lobes are developed.

Composition of the genus: *Acanthograptus spineus* Tseg., 1976; *A. aculeatus* Tseg., 1976; *Monograptus (Uncinatograptus) protospineus* Urb., 1995.

Comparison. This genus differs from the closest genus *Wolynograptus* Tseg., 1976 in the dorsally curved rhabdosomes throughout and the presence of additional morphological formations in the form of spines or lobes on the anterior margin of the aperture structures.

Remarks. Species of this genus were originally identified within the new genus *Acanthograptus* Tseg., 1976 (81, p. 113). This name turned out to be pre-occupied (182, p. 461). Instead, a new genus name is proposed - Bugograptus nom. nov.

Distribution. Upper Silurian, upper part of the Ulichian Belt of Volyno-Podolia, Poland and (according to the oral report of Prof. T.N. Koren, St. Petersburg, VSEGEI) Central Asia.

Bugograptus spineus (Tsegelnjuk, 1976)

Table V1, draw. 1, 2; tab. XXIX, Fig.15; tab. XXX, figures 1-10

Acanthograptus spineus: Tsegelnjuk, 1976, p. 113, tab. 34, fig. 6-9.

Monograptus (Uncinatograptus) spineus: Urbanek, 1995, fig. 1 D, 2, 5, 7 A, C-E; Urbanek, 1997, p. 149, tab. 11, fig. 3-6, tables 12, 13, figs. 13, fig. 35-41.

Holotype. Specimen No. 1788/58, TsNP Museum. Tsegelnjuk, 1976, p. 113, tab. 34, fig. 6, proximal rhabdosome; Milovanskaya suite, Ulichian Belt, *Formosograptus formosus-Bugograptus spineus* zone.

Description. Small, significantly curved dorsally in the proximal and arcuate - in the middle and distal parts of the rhabdosome more than 11 mm long. Their width at the level of the first theca is 0.9-1 mm, directly above its mouth - 0.35-0.40 mm; at the level of the second theca - 0.95-1.1 mm (0.4-0.6 mm), the fifth - 1.1-1.3 mm (0.6-0.7 mm), the tenth - 1.2 -1.4 mm (0.7-0.8 mm), fifteenth - 1.2-1.5 mm (0.8-1 mm). The maximum width of some rhabdosomes is 1.6-1.7 mm.

Thecae are in the form of short tubes inclined to the axis by the rhabdos at angles of 30-45°. Their endings are slightly curved and equipped with large lateral-dorsal hood-like structures that hang over the mouths of all the thecae, located approximately at a right angle to the ventral edge. The length of the endings is 0.4-0.6 mm, which is 1/2-1/3 of the total length of the current. Along the edges of the anterior part of the aperture structures, there are symmetrical processes in the form of thin spikes 0.2-0.75 mm long. The length of the first theca is 1-1.05 mm, its leakage is 0.7-0.8 mm, the metathecus is 0.2-0.35 mm; second theca - 0.95-1.05 mm, leaks - 0.7-0.75 mm, metatheca - 0.2-0.35 mm; fifth - 1.1-1.2 mm, leaks - 0.6-0.7 mm, metatheques - 0.4-0.6 mm; tenth -1.4-1.5 mm, leaks - 0.7-0.8 mm.

In 5 mm of the length of the rhabdosome, there are 6, 4 – 6, 8 thecae.

Variability. The width of rhabdosomes and the degree of their dorsal curvature vary within small limits.

Comparison. In terms of shape and size of rhabdosomes, thecae, and aperture structures, this species is closest to *Bugograptus protospineus* (Urb.). It differs from it in the presence of thin long spines on the anterior margin of the aperture structures (in *B. protospineus*, small lobes hanging down are developed in the same location).

This species differs from *Bugograptus aculeatus* (Tseg.) in the presence of spines on the anterior margin of the aperture structures of the thecae.

Association. It occurs together with *Ludensograptus latilobus* (Tseg.), *Formosograptus formosus* (Bouc.), *Wolynograptus acer* (Tseg.).

Distribution. Upper Silurian, upper part of the Ulichian Belt, Metonian Stage, *Formosograptus formosus-Bugograptus spineus* zone; the lower and middle parts of the Milovan formation of Volyny, the Peremyshlyanskaya suite of the Lvov trough, the Rykhtovskaya suite of Podolia.

Material. 35 fragments of rhabdosomes on the surface of marls and argillites drilled by boreholes Gushcha-4015 in int. 753.5-758.5 m, Kusnishche-5394 on depth 425 m, Peremyshlyany-1, int. 2732-2739.9 m, Zavadovka-6 on depth 1319 m, Selyakhi-1883 in int. 359-360 m, at depths 381.5 m, 382 m, 383 m, 384 m, 386 m; Pulemets-1884 on depth 661 m, 705 m; Zagaipol-1 int. 2715-2722 m.

8 fragments of rhabdosomes were recovered from the rocks of borehole Guscha-4015 in int. 732.6-737.5 m, 743.5-748.5 m, 753.5-758.5 m.

Bugograptus aculeatus (Tsegelnjuk, 1976)

Table V, draw. 7- 9; table XXX, Fig.11, 12; table XXXI, Fig.1- 6

Acanthograptus aculeatus: Tsegelnjuk, 1976, p. 113, tab. 34, fig. 10.

Holotype. Specimen No. 1788/62, TsNP Museum. Tsegelnjuk, 1976, p. 113, pl. 34, fig. 10, the middle part of the rhabdosome; Milovanskaya suite, Ulichian Belt, *Formosograptus formosus-Bugograptus spineus* zone.

Description. Small, strongly curved dorsally in the initial and arched in the middle and distal parts of the rhabdosome, more than 30 mm long. Their width at the level of the mouth of the first theca is 0.85-1.1 mm, directly above the aperture 0.35-0.45 mm; at the level of the mouth of the second theca - 1-1.1 mm (0.4 mm), the fifth theca - 1.3-1.4 mm (0.75-0.8 mm), the tenth - 1.4-1 .5 mm (0.8 mm), fifteenth - 1.3-1.4 mm (0.7-0.8 mm) and then does not change or varies from 1.3 to 1.5 mm.

Thecae are in the form of straight tubes located at angles of 30-45° to the axis of the rhabdosomes. Their ends are slightly curved. They are equipped with laterally-dorsal hood-like structures that hang over the mouths of all the thecae, slightly bending downwards. Their length is 0.5-0.7 mm, which is 3/5 of the total width of the proximal parts and 1/2-2/5 of the middle and distal parts of the colonies. The length of the first theca is 0.95-1.25 mm, its leaks are 0.6-0.7 mm, metatheca are 0.2-0.4 mm; the second - 0.95-1.3 mm, leaks - 0.55-0.8 mm, metatheques - 0.4-0.5 mm; fifth - 1.5-1.6 mm, leaks - 0.8 mm, metatheques - 0.8 mm; tenth - 1.6 mm, leaks - 0.8-0.85 mm, metateks - 0.75-0.8 mm; fifteenth - 1.7 mm, leaks - 0.8-0.9 mm, metatheques - 0.8-0.9 mm. There is no further increase in the length of the distal thecae.

From the above measurements, it can be seen that the length of the leak, starting from the first leak, varies within a small range - 0.6-0.9 mm. Metatheca, starting from the fifth theca, do not increase in length, which is a characteristic feature for this species. Procoimal theca overlap for 1/3-2/5 of their length, distal - for 1/2-1/3.

There are 5-7 thecae in 5 mm length of rhabdosomes.

Sicula narrow, slightly curved ventrally. Its length is 1.45-1.6 mm, the mouth width is 0.3-0.35 mm. the apex of the sicula is located at the level of the mouth of the first theca or slightly higher than it (0.1-0.15 mm). The base of the first theca is located 0.35-0.4 mm above the mouth of the sicula. The distance from the mouth of the sicula to the dorsal lobe of the first theca is 1.3–1.65 mm. Virgella length 0.25-0.6 mm.

Variability. The degree of dorsal bending of the rhabdosome and the location of the apex of the sicula relative to the level of the mouth of the first theca vary.

Comparison. In terms of the shape of rhabdosomes and aperture structures, this species is similar to *Bugograptus spineus* (Tseg.) and *B. protospineus* (Urb.). It differs from these species in longer rhabdosomes, more dorsally curved proximals, and also in the absence of spines or lobes on the anterior margin of the aperture structures of the theca.

Remark. When describing *Bugograptus aculeatus* (Tseg.) earlier (85, p. 114), it was erroneously stated that the hood-like structures of the theca of this species are equipped with spines on the anterior margin. An additional study of rhabdosomes extracted from rocks shows that this species of the genus *Bugograptus* nom. nov. spikes or other formations on these structures are absent.

Association. *Formosograptus formosus* (Bouc.), *Wolynograptus acer* Tseg., *Monograptus (Slovinograptus) balticus* (Tell.), *Ludensograptus latilobus* (Tseg.), *Uncinatograptus caudatus* Tseg., *Bugograptus protospineus* (Urb.) occur together with this species.

Distribution. Upper Silurian, upper part of the Ulichian Belt, Metonian Stage, *Formosograptus formosus-Bugograptus spineus* zone; the lower part of the Novinskaya, lower and middle parts of the Milovanskaya suite of Volyny, the Peremyshlyanskaya suite of the Lvov trough, the Rykhtovskaya suite of Podolia.

Material. 29 fragments of rhabdosomes on the surface of marls and mudstones drilled by boreholes Gushcha-4015 in int. 732.5-737.5 m, 783-785.5 m; Zavadovka-6 on depth 1316.5 m, Kusnishche-5394 on depth 440 m, Dublyany-4 int. 4038-4048 m, Davideny-1 in int. 2755-2761 m, Pupemets-1884 on depth 648 m, int. 703-704 m, at ch. 725 m, 746.7 m.

There are 7 fragments of colonies extracted from the rocks of the borehole Guscha-4015 in int. 717.5-722.5 m, 732.5-737.5 m, 752-757m, 786-790 m, 789.9-794.9 m, 820.8-821.7 m.

Bugograptus protospineus (Urb., 1995)

Tab. VI, draw. 3-6; tab. XXXI, fig. 7-13

Monograptus (Uncinatograptus) protospineus: Urbanek, 1995, p. 13, fig. 1 B-C, 6 A-F, 7 A, B; Urbanek, 1997, p. 147, tab. 11, fig. 1, 2, fig. in text 33, 34.

Holotype. Urbanek, 1995, figs. 7 A, a fragment of the distal part of the rhabdosome from the core of the Melnik-1 well (depth 773.15 m) in Poland; Ludlow (upper part), *Bugograptus protospineus* zone.

Description. Small arcuately curved rhabdosomes more than 10 mm long. Their width at the level of the aperture of the first theca is 0.8-1 mm, directly above it - 0.3-0.4 mm; at the level of the mouth of the second theca - 0.9-1.1 mm (0.35-0.4 mm); the fifth - 1.3-1.4 mm (0.6-0.7 mm) and then does not increase.

Theca are short straight tubes located at an angle of 40-45° to the axis of the rhabdosome. The endings of the thecae are slightly curved and equipped with large lateral-dorsal hood-like structures that slightly hang over the orifices of the proximal thecae. In the middle and distal parts of the rhabdosomes, they are located almost at right angles to the ventral margin. The length of aperture structures is 0.6-0.7 mm, which is 1/2-3/5 of the total width of rhabdosomes.

Along the edges of the anterior part of the hood-like structures, small symmetrical lobes are developed, hanging down. Their length is 0.15-0.25 mm. They are formed by wide fuseluses. The length of the first theca is 1-1.1 mm, its leaks are 0.7-0.8 mm, metatheca is 0.3 mm; the second theca - 0.95-1.15 mm, its leaks - 0.7-0.85 mm, metatheca - 0.15-0.3 mm; fifth - 1.45-1.5 mm, leaks - 0.6-0.8 mm, metatheques - 0.6-0.8 mm; eighth - 1.6-1.65 mm, leaks - 0.8 mm, metatheques - 0.75-0.8 mm. Proximal theca overlap by 1/3-1/4 of their length, distal - by 1/3.

In 5 mm long rhabdosomes, there are 5-7 thecae.

Sicula narrow, slightly curved ventrally. Its length is 1.25-1.5 mm, the width of the mouth is 0.25-0.3 mm. The apex of the sicula is located at the level of the dorsal wall of the aperture structure of the first theca or up to 0.15 mm below it. The base of the first theca is located 0.2-0.4 mm above the mouth of the sicula. The distance from the mouth of the siculum to the dorsal wall of the aperture structure of the first theca is 1.35–1.7 mm. The length of the virgella is 0.3-0.4 mm.

Variability. The length of the aperture structures of the techs, the length of the paired vanes at their leading edge, and the number of techs per unit of measurement vary.

Comparison. The described species differs from *Bugograptus spineus* (Tseg.) in the presence of symmetrical lobes on the anterior margin of the aperture structures of the thecae and in the lower apex of the sicle.

This species differs from *Bugograptus aculeatus* (Tseg.) in the presence of lobes on the anterior margin of the aperture structures of the thecae.

Association. Occurs together with *Bugograptus aculeatus* (Tseg.), *Wolynograptus acer* Tseg.

Distribution. Upper Silurian, upper part of the Ulichian Belt, lower part of the Metonian Stage, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the middle part of the Milovanskaya suite of the Polessky basement ledge.

Material. 12 fragments of rhabdosomes on the surface of marls recovered from wells Selyakhi-1883 on depths 385 m, 402.5 m.

There are 6 fragments of colonies extracted from the rocks of the well. Guscha-4015 in int. 758.5-763 m, 785.9-788.9 m.

Family *Tirassograptidae* Tsegelnjuk, 1976

Type of genus - *Tirassograptus* Tsegelnjuk, 1976; lower Devonian, lower part of the Lochkov belt of Europe.

Diagnoz. Same as the type genus.

Compound. So far, one genus *Tirassograptus* Tseg., 1976 is known.

This family differs from *Monograptidae* Lapworth, 1873 in the *climacograptid* type of thecae excavations and aperture formations in the form of dorsal-lateral and dorsal lobes, consisting of normal fuseluses.

This family differs from *Wolynograptidae* Tseg., 1976 in the climacograptid excavations of the thecae and in the structure of the aperture apparatus of thecae. In the first of them, it consists of dorsal-lateral hoods extended from the ventral edge by the rhabdos; in the second, it consists of dorsal-lateral and dorsal lobes.

Distribution. Upper Silur-lower Devon, Skalian (Przhidolian) and Lokhkovian Belts.

Genus *Tirassograptus* Tsegelnjuk, 1976, emend.

Monograptus (Pomatograptus): Pribyl, 1940, c. 71 (pars).

Monograptus: Munch, 1952, p. 108 (pars); Jaeger, 1959, p. 94; Teller, 1964, p. 60; Root, 1968, p. 938; Shoe, 1968, p. 945; Obut, 1974, p. 137.

Type species - *Monograptus (Pomatograptus) uniformis* Pribyl, 1940.

Diagnoz. Rhabdosomes are straight, sometimes with slight ventral or ventral-dorsal proximal curvature.

Thecae are narrow, sigmoidally curved tubes. Their free ventral walls are nearly parallel to the dorsal axis of the rhabdosomes. The mouths of the thecae, together with the ventral walls of subsequent thecae, form relatively shallow and low excavations.

The mouse of the thecae are covered from above by dorsal-lateral (in the proximal parts of rhabdosomes) and predominantly dorsal lobes in most thecae rhabdosomes.

The dimensions of the aperture structures gradually decrease in the distal direction of the rhabdosomes.

Composition of the genus: *Monograptus (Pomatograptus) uniformis* Prib., 1940; *Heisograptus difficilis* Tseg., 1976. With some degree of conventionality, *Monograptus perneri* Bouc., 1931 can be assigned to the same genus; *M. bouceki* Prib., 1940. Concerning the last two species, doubts are caused by the fact that the morphological features of their rhabdosomes on the remains of colonies extracted from the rocks have not yet been studied.

Comparison. According to the shape of rhabdosomes and aperture structures of the proximal thecae, representatives of this genus are closest to the genus *Uncinatograptus* Tseg., 1976, from which they differ in the shape of the aperture structures of the predominant part of the theca rhabdosomes (dorsal lobes instead of dorsal-lateral hoods). in species of the genus *Uncinatograptus* and the presence of mouth excavations in tyrasograptids.

Remarks. In describing *Monograptus uniformis* Prib. G. Eger called the thecae of his rhabdosomes “monotonous of the uncinatus type” (136, p. 95).

Previously, we assigned to the genus *Tirassograptus* Tseg., 1976, in addition to the type species, *Monograptus hercynicus* Pern., 1899 and M. *praehercynicus* Jaeg., 1959. However, there is still no exact information about the shape of the theca and their aperture structures, and therefore the scope and boundaries of the genus *Tirassograptus* remain unclear.

In this work, we attribute to it the species *Heisograptus difficilis* Tseg., 1976. The morphological features of the latter turned out to be fundamentally similar to the type species during the study of numerous fragments of its rhabdosomes extracted from rocks.

However, the sizes of rhabdosomes and theca of these two species are strikingly different. *Tirassograptus difficilis* Tseg., 1976 is represented in the geological record by very small (dwarf) rhabdosomes compared to very large rhabdosomes of *Tirassograptus uniformis* Prib.

Distribution. Upper Silurian-lower Devonian, Skalian (Przhidolian) and Lokhkovian Belts of Europe.

Tirassograptus difficilis (Tsegelnjuk), 1976

Tab. V, draw. 5, 6; tab. XXIX, fig. 2-14

Monograptus (Pomatograptus) similis: Pribyl, 1940 a, c. 72, tab. 1, fig. 5, fig. thirteen).

Heisograptus difficilis: Tsegelnjuk, 1976, p. 104, tab. 30, fig. 3.4.

Monograptus pridoliensis: Pribyl, 1981, p. 371, pl. I, fig. 1, tab. 2, fig. 6, fig. 1 (3- 6); Jaeger, 1986, p. 328, tab. 3, fig. 1, 12, tab. 4, fig. 2, 3, 8, 9, 11.

Holotype. Specimen No. 1788/14, TsNP Museum. Tsegelnjuk, 1976, tab. 30, fig. 3, middle part of the rhabdosome, Gushchinskaya suite; Przhidolian belt, *Skalograptus lochkovensis* zone.

Description: Small straight rhabdosomes over 20 mm long. Their proximal parts (the first 8-10 thecae) are slightly curved ventrally. Beginnings of colonies in the interval of the first two theca are bent slightly dorsally.

Their width at the level of the mouth of the first theca is 0.7-0.8 mm, directly above it - 0.45-0.6 mm; fifth theca - 1-1.2 mm (0.85-1 mm); tenth - 1.3-1.4 mm (1.05 mm); fifteenth -1.3-1.4 mm (1-1.1 mm). The maximum width of rhabdosomes does not exceed 1.6 mm (1.2 mm).

Thecae are narrow, sigmoidally curved tubes. Their mouths form low (0.1-0.2 mm) excavations, which are covered from above by lateral-dorsal lobes in the form of "visors". The lobes of the first 4-7 thecae are slightly curved downwards; the lobes of the remaining thecae are located almost at a right angle to the ventral margin. The length of the lobes is 0.3-0.4 mm, which is 1/4-1/5 of the total width of the rhabdosomes. Thecae are inclined to their axis at angles of 13-25°.

The length of the first theca is 0.8-0.95 mm, the leaks are 0.5-0.6 mm, the metatheca are 0.25-0.3 mm; fifth theca - 1.1-1.2 mm, leaks - 0.45-0.6 mm, metatheca - 0.6-0.75 mm; tenth - 1.65-1.85 mm, leaks - 0.8 mm, metatheques - 1-1.05 mm; fifteenth - 1.75-2.1 mm, leaks - 0.9 mm, metateks - 1.2 mm. The length of distal thecae in our material does not exceed 2.2 mm; The proximal theca overlap by 1/2-3/5 of their length, the distal ones - by half.

In 10 mm of proximal length, there are 12-13 thecae, distals - 11 thecae.

Sicula nearly straight or slightly curved ventrally. Its length is 1.3-1.5 mm, the width of the mouth is 0.25-0.35 mm. The apex of the siculum almost reaches the level of the mouth of the second theca or is located 0.1-0.3 mm below it. The base of the first theca is 0.3 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.05-1.15 mm. Virgella length 0.4-0.5 mm.

Variability. The width of the rhabdosomes and the ventral-dorsal bend of their proximals vary.

Comparison. This species differs from *Tirassograptus uniformis* Prib., 1940 in significantly smaller and narrower rhabdosomes, as well as in a large number of thecae per unit of measurement (13-11 thecae instead of 11-8.5 thecae in *T. uniformis*).

In terms of the shape of rhabdosomes and thecae, as well as their size, the described species is close to *Monograptus bouceki* Prib., 1940, from which it differs in a large number of thecae per unit of measurement (11–10 thecae in *Monograptus bouceki*).

Remarks. This species was established long ago in the Czech Republic under the name *Monograptus similis* Prib., 1940. This name turned out to be a junior synonym of *Monograptus fimbriatus similis* Elles et Wood, 1913. A new name was proposed for the first of these species - *Monograptus pridoliensis* Prib., 1981 , which, in our opinion, turned out to be a junior synonym of the species *Heisograptus difficilis* Tseg., 1976.

Association. Together with this species, there are *Ludensograptus parultimus* (Jaeg.), *Wolynograptus canaliculatus* Tseg., *Skalograptus vetus* Tseg., *Dulebograptus trimorphus* Tseg., *Pristiograptus kolednikensis* Prib., *Uncinatograptus prognatus* (Koren) and brachiopods *Dayia navicula* (Sow.), *Coelospira pusilla* (His .).

Distribution. Upper Silurian, Skalian (Przhidolian) Belt, Stavanian Stage, upper part of the *Istrograptus ultimus-Ludensograptus parultimus* zone and lower part of the *Skalograptus lochkovensis* zone; the upper part of the Milovanskaya and lower Gushchinskaya suites of the Polessky ledge of the basement, the Zadarovskaya suite of the Lvovsky trough.

Material. 23 fragments of rhabdosomes on the surface of marls, uncovered by boreholes Pulemets-1884 at depth 561 m, Guscha-4015 at 602.9-606.3 m, 615.1-620.5 m, 623.4-626.8 m, 654.5-659 m; Kusnishche-5394 on depths 381 m, 382 m; Litovezh-1 int. 2491.1-2495.8 m.

There are 15 fragments of rhabdosomes recovered from the rocks of well Guksha-4015 in int. 602.9-606.3 m, 615.1-620.5 m, 622.4-626.8 m, 626.8-640 m, 654.5-659 m.

Incertae Subfamiliae

Genus *Formosograptus* Boucek, Mihailovic, Veselinovic, 1976

Formosograptus formosus (Boucek, 1931)

Tab. VII, draw. 6, 7; tab. XXXIV, fig. 8, 9; tab. XXXV, fig. 1-10; tab. XXXVI, fig. 12

Monograptus formosus: Boucek, 1931, p. 300 (pars), fig. 9 b, c (non fig. 9 d); Willefert, 1962, p. 33, tab. 2, fig.18, fig. eight; Jaeger, 1967, p. 286, tab. 14, fig. b, c; Root, 1973, p. 151, tab. 1, fig. 13-16; Pashkevichius, 1974, pl. 14, fig. 11, 12, tab. 20, fig. 3, 4; Mikhailova, 1976, pl. 1, fig. 14-16; Koren, 1979, p. 85, fig. 4 (16); Root, 1986, p. 97, tab. 20, fig. 5-7, tab. 21, fig. 7, fig. sixteen; Jaeger, 1986, p. 316, tab. 3, fig. 4.5, tab. 4, fig. 13, fig. 28.

Monograptus ex gr. formosus: Tomczyk, 1962, pl. 3, fig. 1, 2, tab. 4.

Monograptus (? Spirograptus) convexus: Pribyl, 1940 a, c. 73, tab. 1, fig. 12.

Spirograptus formosus: Krandievsky, 1968, p. 37, tab. 7, fig. 10-13.

Tamplograptus formosus: Tsegelnjuk, 1976, p. 115, tab. 35, fig. 6, 7.

Tamplograptus convexus: Tsegelnjuk, 1976, p. 114, table 35, fig. 1-5.

Formosograptus formosus: Boucek, Mihajlovic, Veselinovic, 1976, p. 85, tab. 1, fig. 1-3, tab. 3, fig. 5, fig. one.

Monograptus (Formosograptus) formosus: Urbanek, 1997, p. 134, tab. 4-6; tab. 7, fig. 1-4; tab. 8, fig. 7-8, fig. in text 19-24.

Lectotype. Boucek, 1931, fig. 9b, proximal rhabdosome; *Istrograptus ultimus* zone of the Czech Republic.

Description. Strongly curved dorsally in the extreme proximal and arcuate - in the remaining parts of the rhabdosome more than 47 mm long. Their width at the level of the mouth of the first theca is 0.6-0.9 mm, directly above it - 0.15-0.2 mm; the second theca - 0.65-1 mm (0.2-0.25 mm), the fifth - 1.1-1.2 mm (0.4-0.5 mm), the tenth - 1.2-1, 3 mm (0.6-0.8 mm), fifteenth - 1.1-1.4 mm (0.5-0.8 mm), twentieth - 1.2-1.5 mm (0.5 -0.8 mm) and then does not change or increases to 1.6 (0.9) mm.

Thecae are in the form of tubes, which are inclined to the axis of the rhabdosomes in the proximal parts at an angle of 15-35°, in the distal - 20-35°.

A characteristic feature of rhabdosomes of this type is that the metatheques of the extreme proximal theca in their predominant part are free. They grew beyond the ventral edge by 0.55-0.7 mm, which is 2/3-4/5 of the total width of rhabdosomes. In the middle and distal parts of the colonies, the free parts of the cells are smoothly hook-shaped downwards. They protrude beyond the ventral edge by 0.6-0.7 mm, which is 1/2-2/5 of the width of the rhabdosomes.

The mouths of all the thecae are even from the side of the ventral and most of the lateral walls of the thecae. They are overlapped from above and in front by wide dorsal lobes that grow on the continuation of the dorsal walls of the free parts of the theca.

In the lateral-dorsal angles of the lobes of the middle and distal parts of the rhabdosomes, open funnel-shaped and tubular folds are developed.

The length of the first theca is 1.2-1.35 mm, its leaks are 0.9-1 mm, metatheca are 0.2-0.35 mm; the second - 1.4-1.5 mm, leaks - 0.9-1.1 mm, metatheques - 0.4-0.55 mm; fifth - 1.45-1.65 mm, leaks - 0.8 mm, metatheques - 0.8 mm; tenth - 1.7-1.8 mm, leaks - 0.8 mm, meta-teks - 0.9-1 mm; fifteenth - 1.7-1.8 mm, leaks - 0.8-0.9 mm, metatheques - 0.8-0.9 mm. The maximum length of distal thecae is 2.3-2.4 mm, their protecus is 1-1.1 mm, metathecus is 1.2-1.3 mm. Proximal theca overlap by 2/5-1/11 of their length, distal - by 1/2. The length of the proximal theca exceeds their width by 6-8 times, the distal - by 6 times.

There are 8-10 thecae per 10 mm length of rhabdosomes, rarely up to 11 thecae in the proximal parts.

Sicula straight or slightly curved ventrally. Its length is 1.1-1.45 mm, the mouth width is 0.3-0.35 mm. The apex of the sicula is located 0.3–0.5 mm below the dorsal wall of the first theca. The base of the first theca is 0.3–0.35 mm above the mouth of the sicula. The distance from the base of the sicula to the dorsal wall of the first theca is 1.5–1.7 mm. The length of the virgella is 0.3-0.4 mm.

Variability. The degree of dorsal bending of the rhabdosomes, their width and the number of techs per unit of measurement are varied.

Comparison. In terms of shape and size of rhabdosomes, this species is closest to *Formosograptus paraformosus* (Jacks. et Lenz). It differs from the latter in less dorsally curved proximal parts, shorter free (unoverlapped) parts of the theca, and a lower location of the apex of the sicula relative to the curved parts of the first theca.

The described species differs from *Formosograptus corymbifer* (Tseg.) by dorsally curved extreme proximals and longer thecae.

Remarks. Previously, we assigned this species to the genus *Tamplograptus* Tseg., 1976 (85). Subsequently, it turned out that a few months earlier, in the same 1976, a work of Czech and Yugoslav scientists was published (115), in which this species was assigned to the genus *Formosograptus* Bouc., Mihail., Vesel., 1976.

Among the species of this genus, *Formosograptus formosus* (Bouc.), *F. convexus* (Prib.) previously differed within Volyno-Podolia (85). The study of rhabdosomes extracted from rocks showed a high intraspecific variability of these species. In this regard, we agree with Prof. I.Y. Pashkevichius (58) about the inexpediency of separating them as independent species.

Association. Found with this species *Uncinatograptus caudatus* Tseg., *Pristiograptus fragmentalis* (Bouc.), *Bugograptus aculeatus* (Tseg.), *B. spineus* (Tseg.), *Wolynograptus acer* (Tseg.), *Skalograptus vetus* Tseg., *Serenograptus hamulosus* (Tseg.) , *Monograptus (Slovinograptus) balticus* (Tell.), *Ludensograptus latilobus* (Tseg.), *L. parultimus* (Jaeg.), *Istrograptus rarus* (Tell.).

Distribution. Upper Silurian, upper part of the Ulichian and lower part of the Przhidolian Belt, *Formosograptus formosus-Bugograptus spineus, Istrograptus ultimus-Ludensograptus parultimus* zones, and lower parts of the *Skalograptus lochkovensis* zone; the upper part of the Novinskaya and Milovanskaya suites of the western part of the Polessky ledge of the basement, the Peremyshlyanskaya and Glinyanskaya suites of the Lvov trough, the Zadarovskaya suite of Podolia.

Material. 84 fragments of rhabdosomes on the surface of marls and mudstones drilled by the Gushcha-4015 wells in int. 677-681 m, 703.3-708.6 m, 722.5-727.5 m, 737-743 m, 753.3-758.5 m, 758.5-763 m, 783-786 m, 790 -795 m, 800-805 m; Zavadovka-6 on depths 1298.3 m, 1303 m, Glinyany-1 in int. 2728-2733 m, 2814-2820 m; Kusnishche-5394 on depth 444 m, Zagaipol-1 in int. 2650-2657 m, Litovezh-1, int. 2469-2473 m, 2491-2495.8 m, Selyakhi-1883 on depths 388 m, 390 m, 393 m, 394 m, 395 m, 399.5 m; Pulemets-1884 on depths 585 m, 594 m, 597 m, 599 m, 600 m, 601 m, 602 m, 605 m, 607 m, 627 m, 628 m, 665 m, 669 m, 671 m, 672 m, 673 m.

There are 16 fragments of rhabdosomes extracted from the rocks of the borehole Guscha-4015 in int. 663-668 m, 703-707 m, 718-721 m, 721-726 m, 753.5-758.5 m, 758.5-763.5 m, 816-820 m.

Formosograptus uncatus (Tsegelnjuk, 1976)

Tab. VII, draw. 8, 9; tab. XXXVI, fig. 3-12

Tamplograptus uncatus: Tsegelnjuk, 1976, p. 117, tab. 36, fig. 1- 4.

Holotype. Specimen No. 1788/63, TsNP Museum. Tsegelnjuk, 1976 tab. 36, fig. 1, the middle part of the rhabdosome; Novinskaya suite of Volyn, Ulichian Belt, *Formosograptus formosus-Bugograptus spineus* zone.

Description. Strongly curved dorsally in the extreme proximal and arcuate - in the middle and distal parts of the rhabdosome more than 25 mm long. Their width at the level of the aperture of the first theca is 0.5-0.6 mm, immediately above - 0.2-0.25 mm, at the level of the second theca - 0.6-0.7 mm (0.3 mm), the fifth - 0.8-0.9 mm (0.4-0.5 mm), the tenth -0.9-1.1 mm (0.4-0.5 mm) and then does not change or reaches 1.2 mm.

Thecae are in the form of tubes inclined to the axis by the rhabdos at angles of 10-20 degrees. Their free parts are smoothly hook-shaped downwards. They protrude beyond the ventral edge by 0.25-0.7 mm, which is 1/2-3/5 of the total width of rhabdosomes. From the side of the ventral and most of the lateral walls, the mouths flowed equal. They are covered by dorsal lobes bent downwards and towards the ventral margin of the rhabdosomes, which grow on the continuation of the dorsal walls of the free parts of the thecae. Small tubular folds are developed in the lateral-dorsal angles of the lobes.

The length of the first theca is 1-1.35 mm, its leaks are 0.7-0.9 mm, metatheca are 0.25-0.4 mm; second theca - 1.1-1.2 mm, leaks - 0.6-0.85 mm, metatheca - 0.35-0.5 mm; fifth - 1.2-1.7 mm, leaks - 0.8-1.2 mm, metatheques - 0.4-0.5 mm; tenth - 1.8-2 mm, leaks - 1.2-1.3 mm, metatheques - 0.6-0.7 mm. The maximum length of the distal theca is 2.3-2.4 mm. The thecae overlap for 1/4-1/5 of their length.

In 5 mm of the length of the proximal parts of rhabdosomes, there are 4.5-5 thecae, distal - 4-4.5 thecae.

Sicula slightly ventrally curved. Its length is 0.7-1.15 mm, the width of the mouth is 0.2-0.25 mm. The apex of the sicula is located 0.3-0.6 mm below the level of the dorsal wall of the first theca. The beginning of the first theca is located 0.3-0.4 mm above the mouth of the sicula. The distance from the mouth of the siculum to the dorsal wall of the first theca is 1-1.5 mm. The length of the virgella is 0.2-0.25 mm.

Variability. The dorsal curvature of the proximals, the length of the theca, and the location of the apex of the sicula relative to the curved part of the first theca vary.

Comparison. In terms of the shape of rhabdosomes, this species is closest to *Formosograptus angustus* (Tseg.), from which it differs in the greater width of rhabdosomes, their more strongly curved dorsally proximal parts, and the higher location of the apex of the si cools.

The described species differs from *Formosograptus formosus* (Bouc.) in the smaller width of the rhabdosome and the shorter length of the siculum.

Association. *Uncinatograptus caudatus* Tseg., *Ludensograptus latilobus* (Tseg.) occur together with this species.

Distribution. Upper Silurian, upper part of the Ulichian Belt, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the upper part of the Novinskaya suite of the Polessky basement ledge.

Material. 25 fragments of rhabdosomes on the surface of marls, drilled by wells Kusnishche-5394 on depths 462 m, 466 m; Pulemets-1884 on depth 728 m, 730 m, 731 m, 732 m, 734 m; Guscha-4015 in int. 816.8-820.8 m.

There are also 10 fragments of rhabdosomes recovered from the rocks of the borehole Guscha-4015 in int. 799.9-804.9 m, 804.9-809.4 m, 816.8-820.8 m.

Genus *Monograptus (Slovinograptus)* Urbanek, 1997

Monograptus (Slovinograptus) balticus (Teller, 1966)

Tab. XIII, draw. 1, 2; tab. XLVI, fig. 1-14; tab. XLVII, fig. 1-6

Monograptus balticus: Teller, 1966, p. 556, tab. 1, fig. 6-11, fig. 4; Pashkevichius, 1979, p. 168, tab. 12, fig. 4-8, tab. 28, fig. 1-12; Koren, Rinenberg, Lytochkin, 1988, pl. 17, fig. 1.

"Monograptus" balticus: Pashkevichius, 1974, pl. 15, fig. 1-5; tab. 19, fig. 4-11.

Wolynograptus balticus: Tsegelnjuk, 1976, p. 111, tab. 33, fig. 5.

Monograptus (Slovinograptus) balticus: Urbanek, 1997, p. 129, tab. 3, fig. 1-12, fig. in the text 14 V, C 3, C 4, 15-18.

Holotype. Teller, 1966, pl. 1, fig. 6, proximal and middle parts of a rhabdosome from the upper Ludlow of Poland (borehole Leba-3).

Description. Medium-sized straight rhabdosomes over 30 mm long. Their proximal parts in the area of the first 4-6 theca are distinctly curved dorsally. The width at the level of the mouth of the first theca is 0.5-0.65 mm, directly above the mouth - 0.35-0.4 mm; at the level of the fifth theca - 0.9-1.1 mm (0.7-0.8 mm), the tenth - 1.3-1.45 mm (0.8-1 mm), the fifteenth - 1.5-1 .65 mm (1-1.1 mm), the twentieth - 1.7-1.8 mm (1.1-1.15 mm). Above the rhabdosomes, the width usually decreases to 1.6 mm.

The thecae are represented by narrow long tubes, which are slightly bent in the metathecal part. The proximal thecae are inclined to the axis of the rhabdosomes at angles of 12-15°, the distal -5-10°. The isolated parts of all techs are smoothly curved in a hook-like manner. The length of the curved ventral walls of the theca does not exceed 0.1-0.15 mm. The mouths of all the thecae are covered with wide lateral-dorsal lobes.

In the proximal thecae, they are strongly curved downwards and turned towards the ventral edge of the rhabdosome. In the thecae of the middle and distal parts of the colonies, the lateral parts of the lobes are only slightly bent downwards. Their dorsal parts are much more strongly curved towards the ventral margin. In this regard, distinct depressions are systematically developed along them, which increase towards the front edge of the lobes. Grooves can also be traced on the free dorsal walls of the metathecus. The curved parts of the theca extend from the ventral edge of the colonies by 0.3-0.7 mm, which is 1/2-1/4 of their total width.

The length of the first theca is 1.5-1.75 mm, its leaks are 1-1.2 mm, the metatheca is 0.5-0.55 mm; fifth theca - 1.7-2 mm, leaks - 0.8-1 mm, metatheca - 0.8-1 mm; tenth - 1.9-2.2 mm, leaks - 0.8-0.9 mm, metatheques - 1-1.3 mm; fifteenth - 2.4-2.9 mm, leaks - 1-1.1 mm, metatheques - 1.4 mm; the twentieth - 2.5-3.1 mm, leaks - 1-1.1 mm, metatheques - 1.5-2 mm.

A further increase in the length of the theca, the leak, and metathecus was not observed in our material. From these measurements, it can be seen that the length of the leak throughout the rhabdosome varies within a small range - 0.8-1.2 mm. The steady increase in the length of the thecae from bottom to top occurs due to the elongation of the metathecae (by a factor of four). Therefore, the bases of interthecal septa of 5-9 procoimal ducts reach the level of mouths of 4-8 ducts. However, subsequent interthecal septa do not descend below the middle of the ventral walls of the theca (with a few exceptions). The horizontal line at the level of the middle and distal rhabdosomes crosses 1-2 interthecal septa. Thecae overlap by 1/2-3/5 of their length.

There are 11-10 thecae in 10 mm of the proximals, 9- 9,5 thecae in the distal parts.

Sicula narrow, slightly curved ventrally. Its length is 1.25-1.6 mm, the width of the mouth is 0.25-0.3 mm. Its top is located below the level of the mouth of the first theca by 0.3-0.6 mm. The beginning of the first theca is 0.25-0.4 mm above the mouth of the sicula. The distance from the mouth of the siculum to the end of the first theca is 1.9-2.1 mm. The length of the virgella is 0.2-0.7 mm.

Variability. The degree of dorsal curvature of the procoimals and the width of the rhabdosomes vary within small limits.

Comparison. *Monograptus (Slovinograptus) balticus* (Tell., 1966) is most similar to *Monograptus kallimorphus* Kraatz, 1958. The latter is described from the Valentian (Llandoverian) deposits of the Harz massif. According to G. Eger (142, p. 333), these species are synonyms. For an accurate comparison of their complexly built rhabdosome, it is necessary, in our opinion, to extract the remains of *Monograptus kallimorphus* Kraatz from the rock.

The described species differs from the Canadian *Monograptus (Slovinograptus) cf. balticus* (Tell.) (l35) with narrower rhabdosomes in the proximal part, narrower and longer thecae, and a lower location of the sicula relative to the level of the mouth of the first thecae.

This species was previously assigned (85) to the genus *Wolynograptus* Tseg., 1976. Prof. A.Urbanek singled out a new subgenus *Monograptus (Slovinograptus)* Urb., 1997 with the type species *Monograptus balticus* Tell., 1966. In our opinion, we should agree with this, since this species clearly differs, as the study of rhabdosomes extracted from rocks, from typical representatives of the genus *Wolynograptus.*

Association. This species occurs together with *Formosograptus formosus* (Bouc.), *Uncinatograptus caudatus* Tseg., *Wolynograptus acer* (Tseg.), *Ludensograptus latilobus* (Tseg.), *Bugograptus aculeatus* (Tseg.).

Distribution. Upper Silurian, upper part of the Ulichian Belt, Metonian Stage, *Formosograptus formosus-Bugograptus spineus* zone; the upper part of the Novinskaya and lower parts of the Milovanskaya suite in the western part of the Polessky ledge of the basement, the middle part of the Peremyshlyanskaya suite of the Lvov trough.

Material. 28 fragments of rhabdosomes on the surface of marl gels drilled by Pulemets-1884 wells at depths 731 m, 732 m, 734 m, 746.7 m; Kusnishche-5394 on depths 450 m, 466 m; Zagaipol-1 int. 2718-2719 m, 2720-2721 m; Guscha-4015 in int. 773.5-778.5 m, 794.9-799.9 m.

There are 22 fragments of colonies recovered from the rocks of the well Guscha-4015 in int. 732-737.5 m, 794.9-799.9 m, 799.9-804.9 m, 804.9-809.4 m, 820.8-821.7 m.

Genus *Serenograptus**/ gen. nov.

*/ Genus name from serenus (lat.) - clear, expressive.

Monograptus: Richter, 1875, p. 268; Jaeger, 1959, p. 107; Koren, 1983, p. 419; Jaeger, 1986, p. 333.

Wolynograptus: Tsegelnjuk, 1976, p. 112.

Monograptus (Wolynograptus): Pribyl, 1983, p. 159.

Monograptus (Slovinograptus): Urbanek, 1997, p. 129.

Type species - *Monograptus microdon* Reinh. Richter, 1875; lower Devonian, upper Thuringian graptolite schists, Lochkov belt, *Monograptus praehercynicus* zone.

Diarnoz. Medium and small, straight, narrow rhabdosomes, to varying degrees (usually weakly) dorsally curved in the proximal parts.

The proximal endings within the siculum and the first theca are slightly curved ventrally. Theca are represented by long thin sigmoidally curved tubes, the ventral walls of which are parallel to the axis of the rhabdosomes.

Free endings are curved. Their ventral walls are short.

The mouths of the theca are covered with long transversely widened lobes, which grew mainly on the continuation of the free dorsal walls of the theca (see also 142, p. 333, figs. 44 a-d).

Composition of the genus: *Monograptus microdon microdon* Reinh. Richt., 1875; *M. microdon silesicus* Jaeg., 1959; *M. microdon aksajensis* Koren, 1983; *Wolynograptus hamulosus* Tseg., 1976; *Monograptus (Wolynograptus) abhorrens* Prib., 1983.

Comparison. From representatives of the genus *Uncinatograptus* Tseg., 1976 similar in size and shape to rhabdosomes, species of the genus *Serenograptus* gen. nov. they differ in the shape and size of the thecae, as well as in their aperture structures (of the *uncinatus* type in the former, in contrast to the dorsal lobes hanging over the mouths of the thecae in the latter).

Distribution. Upper Silurian - Lower Devonian, the upper part of the Ulichian and Przhidolian Belts, as well as the Lokhkovian Belt of Europe, Asia.

Serenograptus hamulosus (Tsegelnjuk, 1976)

Tab. XIII, draw. 5, 6; tab. XLVII, fig. 7-11; tab. XLVIII,
fig. 1-13; tab. XLIX, fig. 1-4

Wolynograptus hamulosus: Tsegelnjuk, 1976, p. 112, tab. 33, fig. 6, 7.

Monograptus (Slovinograptus) hamulosus: Urbanek, 1997, p. 129, tab. 2, fig. 1-6, fig. in the text 14 A, C 1, C 2.

Holotype. Specimen No. 1788/51, TsNP Museum. Tsegelnjuk, 1976, tab. 33, fig. 6, proximal part of the rhabdosome, Novinskaya formation of Volyn; upper Silurian, Ulichian belt, Lower Metonian stage, *Formosograptus formosus-Bugograptus spineus* zone.

Description. Small straight lines along the entire length of the rhabdosome, more than 30 mm long. Often there are forms, the proximals of which within the first 6-10 theca are slightly curved dorsally or ventrally.

The width of the colonies at the level of the aperture of the first theca is 0.45-0.55 mm, directly above it - 0.3-0.35 mm; at the level of the mouth of the second theca - 0.5-0.6 (0.35-0.4) mm, the third - 0.55-0.65 (0.4-0.5) mm, the fourth - 0.6- 0.7 (0.4-0.55) mm, fifth - 0.65-0.85 (0.4-0.65) mm, tenth - 1.1-1.2 (0.9) mm, fifteenth - 1.25-1.4 (0.9-1.1) mm, twentieth - 1.6-1.7 (1.2-1.3) mm and does not increase further.

Thecae are long narrow sigmoidally curved tubes that are inclined to the axis of the rhabdosom at angles of 5-10 degrees. The stomata of the thecae are even on the side of the ventral and partly lateral walls, located in planes that are inclined at slight downward angles. They are overlapped from above by dorsal lobes of the same subtriangular shape as in *Monograptus microdon* R.Richter (142, p. 333, fig. 44 a-d).

The vanes completely cover the mouths of all the thecae. They only slightly bend down (in *M. microdon* they are located parallel to the vertral edge of the rhabdosome). The length of the lobes increases upward along the rhabdosomes from 0.12 to 0.55 mm, which is 1/2-2/5 of their total width.

The length of the first theca is 1.2-1.4 mm, its leaks are 0.7-0.9 mm, metatheca are 0.5 mm; second theca - 1.35-1.45 mm, leaks - 0.75 mm, metatheca - 0.6-0.7 mm; the third - 1.6 mm, leaks - 0.8-0.85 mm, metatheques - 0.8 mm; the fourth - 1.7-1.75 mm, leaks - 0.8 mm, metatheques - 0.9-0.95 mm; fifth - 1.9-2.2 mm, leaks - 0.8-0.9 mm, metatheques - 1-1.1 mm; tenth - 2.5-2.9 mm, leaks - 1.1-1.2 mm, metatheques - 1.5-1.8 mm; fifteenth - 2.7-3.3 mm, leaks - 1-1.2 mm, metatheques - 1.7-2.1 mm. The maximum length of the distal thecae does not exceed 3.3 mm.

As can be seen from the above measurements, the length of the theca and metathecus steadily increases from bottom to top along the rhabdosomes, while the length of the leak varies within a small range - 0.7-1.2 mm. In this regard, the base of the interthecal septum of the fifth theca descends to the level of the mouth of the fourth theca. Therefore, a horizontal line crossing the rhabdosoma above the orifice of the fifth theca intersects two interthecal septa. This feature is important for this species. Thecae overlap for 1/2-2/5 of their length.

In 10 mm length rhabdosomes 9.5-10 thecae.

Sicula narrow, ventrally curved. Its length is 1.2-1.5 mm, the width of the mouth is 0.2-0.25 mm. Its top is located below the level of the mouth of the first theca. The beginning of the latter is 0.15-0.3 mm above the mouth of the sicula. From the mouth of the sicula to the end of the first theca 1.35-1.65 mm. The length of the virgella is 0.2-0.4 mm.

Variability. The proximal shape varies from straight to slightly curved dorsally or ventrally.

The location of the apex of the sicula relative to the level of the mouth of the first theca, the length of the sicula, the location of the first theca relative to the mouth of the sicula, and the distance from the mouth of the sicula to the end of the first theca also vary.

Comparison. In terms of shape and structure of rhabdosomes, thecae, and aperture dorsal lobes, this species is closest to *Serenograptus microdon* (R.Richt.). It differs from the latter in the greater width of the rhabdosome and the absence of isolated parts of the theca within the distal sections of the rhabdosome (142, p. 333, fig. 44 a-d).

The large width of rhabdosomes distinguishes *Serenograptus hamulosus* (Tseg.) from *Serenograptus abhorrens* (Prib.), which is similar to it in terms of the structure of aperture structures.

This species differs from *Serenograptus microdon silesicus* (Jaeg.) in a significantly wider rhabdosome and in the shape of their proximals. Larger width of colonies, fewer thecae per unit of measurement distinguish it from *Serenograptus microdon aksajensis* (Koren).

Remarks. Previously (85), the described species belonged to the genus *Wolynograptus* Tseg., 1976. The study of rhabdosomes extracted from rocks by dissolving them in acids shows that it belongs to a group of species similar to *Serenograptus microdon* (Reinh. Richter, 1875), distributed in late Silurian and early Devonian of the Czech Republic, Germany, Ukraine (Volyn) and Central Asia.

Association. Together with this species, *Ludensograptus latilobus* (Tseg.), *Formosograptus formosus* (Bouc.), *Linograptus sp.*

Distribution. Upper Silurian, upper part of the Ulichian Belt, lower part of the Metonian Stage, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the upper part of the Novinskaya suite of the Polessky basement ledge, the middle part of the Peremyshlyanskaya suite of the Lvov trough.

Material. 30 fragments of rhabdosomes on the surface of marls recovered by wells Gushcha-4015 in int. 794.9-799.9 m, 799.9-804.9 m, 811.9-816.4 m; Zagaipol-1 int. 2715-2716 m, Pulemets-1884 on depths 729.5 m, 736 m, 738 m, 743 m, 744.5 m, 745.7 m, 746 m, 750 m, 751 m.

There are 20 fragments of rhabdosomes recovered from the rocks of the borehole. Guscha-4015 in int. 799.9-804.9 m, 804.9-809.4 m, 811.9-816.4 m, 816.8-820.8 m.

Family *Cucullograptidae* Urbanek, 1958, nom. transl. Boucek, 1976 (ex *Cucullograptinae* Urbanek, 1958)

Type genus - *Cucullograptus* Urb., 1954.

Diagnoz. Ventrally curved rhabdosomes. Thecae are straight or slightly ventrally curved.

Symmetric or asymmetric aperture structures grew only on the continuation of the lateral walls of the theca. They consist of conventional fuselages or microfuselage strips.

Composition of the family. Three subfamilies: *Neolobograptinae* Tseg., 1976; *Cucullograptinae* Urb., 1958; *Neocucullograpbinae* Urb., 1970.

Comparison. This family differs from *Monograptidae* Lapw., 1873 in the ventral curvature of rhabdosomes, predominantly narrow and long thecae, and also in the presence of microfuselage aperture additions, elevations, and lobes in some representatives.

Remarks. The subfamilies *Cucullograptinae* Urb., 1958 and *Neocucullograptinae* Urb., 1970 were assigned to the family *Monograptidae* Lapw., 1873 (195, 200).

According to the totality of morphological features of rhabdosomes and theca (ventral bending of rhabdosomes, the nature and location of the aperture structures of theca, etc.), they differ sharply from representatives of monograptids.

In our opinion, *monograptids* and *cuculograptids* are characterized by different structural plans of rhabdosomes and theca, as well as independent stages of their development, which allows us to consider these taxa as families (114) or even superfamilies (85).

Distribution. Middle and upper Silurian, Ludlow, Ulichian and Przhidolian Belts of Europe, Asia, America.

Subfamily *Neolobograptinae* Tsegelnjuk, 1976

Type genus - *Neolobograptus* Urb., 1970.

Diagnoz. Ventrally folded in the proximal, arcuately curved in the middle and almost straight in the distal parts of the rhabdosome.

Theca are represented by straight narrow long tubes.

The endings of thecae are smooth, slightly concave or equipped with lateral elevations, which may consist of normal fuseluses and microfuselage strips (additives).

Composition in subfamily. Two genera: *Neolobograptus* Urb., 1970; *Polonograptus* Tseg., 1976 (= *Alexandrograptus* Prib., 1981; see also 173).

Comparison. This subfamily differs from *Neocucullograptinae* Urb., 1970 in long narrow thecae and the absence of lateral lobes.

This subfamily differs from the early *Cucullograptinae* Urb., 1958 (*Lobograptus progenitor* Urb., 1966) by the ventral bend of the proximals, and from all other *Cucullograptinae* by the absence of lateral lobes.

Remarks. The genus *Neolobograptus* Urb., 1970 was assigned to the subfamily *Neocucullograptinae* Tseg., 1976, all of whose representatives have thecae and siculae of elevations or lobes at the mouths, consisting of microfusellar stripes (210).

Other features of the structure of rhabdosomes of this genus (narrow long thecae) bring it closer to representatives of the genus *Polonograptus* Tseg., 1976. In this regard, these genera were assigned to the subfamily *Neolobograptinae* Tseg., 1976 (85).

Distribution. Middle and upper Silurian, upper part of the Tiritian and lower part of the Ulichian Belts of Europe and Asia.

Genus *Neolobograptus* Urbanek, 1970

Neolobograptus auriculatus Urbanek, 1970

Tab. VIII, draw. 1-3; tab. XXXVI, fig. 13; tab. XXXVII, fig. 1-7

Neolobograptus auriculatus: Urbanek, 1970, p. 321, tab. 29-30; Tsegelnjuk, 1976, p. 121, tab. 37, fig. 3- 6.

Holotype. Urbanek, 1970, pl. 29, fig. B, proximal rhabdosome; Sedlec layers of Poland, *Neolobograptus auriculatus* zone.

Description. Ventrally folded in the proximal, arcuate - in the middle and almost straight in the distal parts of the rhabdosome more than 26 mm long. Their width at the level of the top of the sicula is 0.15-0.2 mm, at the level of the mouth of the first theca - 0.3 mm, immediately above - 0.12-0.15 mm. The width of the colonies at the level of the mouths of the subsequent proximal thecae is 0.39-0.42 mm, above them - 0.18-0.24 mm. The maximum width of the distal fragments is 0.85-0.95 mm, above the mouths of the flow - 0.6 mm. The width of the proximal metathecus is 0.2-0.27 mm, the leak at their base is 0.12-0.15 mm; distal metathecus - 0.42 mm, leak at the base - 0.27-0.3 mm.

The thecae are inclined to the axis of the rhabdosomes at angles of 5-15°. Their mouths are equipped with low lateral symmetrical elevations. They consist of 1-2 fuseluses, which wedged out in the dorsal-ventral directions. The height of elevations in procoimal thecae is 0.04-0.06 mm, in distal ones - 0.1-0.12 mm. Elevations are replaced by shallow depressions of the ventral margin of the theca mouths. The elevations are also separated from the ventral-lateral walls of neighboring thecae.

The length of the first theca is 1.45-1.8 mm, the leaks are 1.44-1.65 mm, the metatheca are 0.18-0.35 mm. The length of subsequent procoimal thecae is 1.47-2.2 mm, their protecus is 1.2-1.3 mm, metathecus is 0.36-0.85 mm. The length of the distal thecae is 2.5-3 mm, their protecus is 1.14-1.38 mm, the metathecus is 0.93-1.62 mm. Proximal theca overlap by 1/5-1/6, distal - by 2/5 of their length.

There are 3.6-4 thecae in 5 mm of the proximal length, and 4 thecae in the distal parts.

Sicula straight or slightly ventrally curved. Its length is 1.35-1.5 mm, the width of the mouth is 0.24-0.3 mm. Its top is below the level of the mouth of the first theca by 0.57-0.72 mm. The beginning of the latter is located 0.36 mm above the mouth of the sicula.

The dorsal edge of the metasiculum is provided with a lobe up to 0.18 mm long, from which small elevations are developed in the ventral direction. The length of the virgella is 0.36-0.6 mm. The distance from the mouth of the sicula to the end of the first theca is 2-2.2 mm.

Variability. The degree of ventral bending of the rhabdosomes varies. At the mouths of only some proximal thecae, narrow strips consisting of microfuseluses are developed.

Comparison. In terms of the shape and size of rhabdosomes and thecae, this species is closest to *Neolobograptus fragilis* Tseg., from which it differs in a smaller width of the proximal parts of the colonies, a longer thecae, a smaller overlap of the proximal thecae, and a lower the location of the apex of the siculum and the great distance from the base of the siculum to the end of the first theca.

According to the size of *Neolobograptus auriculatus* Urb. it is also close to *N. iniquus* Tseg., from which it differs by a higher location of the apex of the siculum, shorter proximal thecae, and a greater number of thecae of 5 mm proximal length (3.6-4 instead of 2-3.4 thecae in *N. iniquus*).

Remark. This species is characterized by narrow long rhabdosomes, which does not favor the discovery of fragments of well-preserved colonies, especially on rock chips. Therefore, *Neolobograptus auriculatus* Urb. considered a rare species.

Association. Together with this species, *Neocucullograptus inexspectatus* (Bouc.), *Pseudomonoclimacis tauragensis* (Pask.), and (in the lower part of the Rusilov formation) *Neolobograptus fragilis* Tseg.

Distribution. Middle Silurian, Ulichian Belt, Tagrian Stage, *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper part of the Zabrodskaya, Oleshkovichskaya and lower part of the Gornikskaya suites of the Polessky basement ledge, the lower part of the Peremyslyanskaya suite of the Lvov trough, the Rusilovskaya suite of the Brest depression.

Material. 17 fragments of rhabdosomes on the surface of marls, drilled by the Brest-1 wells at depths 514.5 m, 544 m, 561.8 m; Kusnishche-5394 on depths 495 m, 504 m; Samoilichi-1859 on depths 269.5 m, 271 m, 272 m, 281 m; Dublyany-4 in int. 4136-4138 m.

There are 8 fragments of colonies extracted from the rocks of wells Brest-1 on depths 543.5 m, 544 m, Guscha-4015 int. 860-863 m, 891-897.4 m, 897.4-902.4 m, 911.3-915.7 m, 920.3-923 m.

Neolobograptus fragilis Tsegelnjuk, 1976

Tab. VIII, draw. 4-6; tab. XXXVII, fig. 8-15

Neolobograptus fragilis: Tsegelnjuk, 1976, p. 124, tab. 39, fig. 1-3.

Holotype. Specimen No. 1788/88, TsNP Museum. Tsegelnjuk, 1976, tab. 39, fig. 1, middle and distal parts of the rhabdosome; Rusilovskaya suite of the Brest depression, upper part of the Tiritian Belt, *Saetograptus leintwardinensis* zone.

Description. Ventrally folded in the proximal and arcuately curved in the middle and distal parts of the rhabdosome more than 40 mm long. Their width at the level of the top of the sicula is 0.3 mm, at the level of the mouth of the first theca - 0.33-0.36 mm, directly above the mouth - 0.18 mm, at the level of the mouth of the second theca - 0.42 mm, above the mouth - 0.24 mm. The width of rhabdosomes at the level of the mouths of the subsequent proximal thecae is 0.33-0.55 mm, directly above them - 0.18-0.36 mm.

The width of the proximal metathecus is 0.18-0.3 mm, the leak at their base is 0.12-0.18 mm. The width of the distal fragments of the colonies is 0.6-0.75 mm. Their width above the mouths of the flow is 0.36-0.48 mm. The width of the metathecus is 0.33-0.36 mm, the leak at their base is 0.24-0.27 mm.

Theca are thin tubes, slightly ventrally curved in the proximal direction and widening towards their mouths. They are inclined at angles of 10-20°. The length of the first theca is 1.17-1.45 mm, its leaks are

0.97-1.2 mm, metatheca are 0.2-0.21 mm; the second - 1.32 mm, its leaks - 0.99 mm, metatheques - 0.33 mm. The length of subsequent proximal thecae is 1.35-1.44 mm, their protecus is 0.95-1.1 mm, metathecus is 0.3-0.48 mm. The length of the distal thecae is 1.47-1.8 mm, their protecus is 0.93-1.08 mm, the metathecus is 0.54-0.78 mm.

The theca ends in low symmetrical lateral elevations, which are formed by one or two normal fuseluses wedging out in the dorsal-ventral direction. In proximal thecae, the height of the elevations does not exceed 0.02-0.04 mm, in distal ones - 0.04-0.06 mm. Proximal theca overlap by 1/4-1/5, distal - by 1/3-2/5 of their length.

In 5 mm of proximal length, there are 4-5 thecae, in the distal parts of the colonies - 4.5-5 thecae.

Sicula straight or slightly curved ventrally. Its length is 1.47-1.6 mm, the mouth width is 0.3 mm. The apex of the sicula is located at the level of the mouth of the first theca or 0.1-0.2 mm below the mouth. The beginning of the first theca is located 0.3 mm above the mouth of the sicula, the dorsal edge of which ends in a lobe 0.12 mm long drawn downwards. The distance from the mouth of the siculum to the end of the first theca is 1.6-1.74 mm. Virgella length 0.78 mm.

Variability. The degree of bending of the rhabdosomes and the length of the proximal thecae vary.

Comparison. This species is similar in general shape to rhabdosomes and is similar to *Neolobograptus auriculatus* Urb., from which it differs in the greater width of the proximals, noticeably shorter thecae length, greater overlap of the proximal thecae, and higher location of the apex of the siculum. and a smaller distance from the base of the sicula to the end of the first theca.

Association. This species occurs together with *Bohemograptus praecornutus* Urb., *Cucullograptus hemiaversus* Urb., and also (in the lower part of the Rusilovskaya formation) with *Neolobograptus auriculatus* Urb.

Distribution. Middle and lower upper Silurian, upper Tiritian and lower Ulichian Belts, *Saetograptus leintwardinensis* zone and lower *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the lower part of the Rusilovskaya suite of the Brest depression, the upper part of the Zabrodskaya and the lower part of the Gornikskaya suite of the Polessky ledge of the basement.

Material. 6 fragments of rhabdosomes on the surface of clayey limestones recovered by wells Brest-1 on depths 544 m, 550.9 m, 562.3 m; Samoypichi-1859 in int. 281-282 m.

There are also 8 fragments of rhabdosomes extracted from the rocks of well Brest-1 on depths 544 m, 547 m, 549.5 m, 557.8 m; Guscha-4015 in int. 920.3-923 m, 941.8-952.6 m.

Genus *Polonograptus* Tsegelnjuk, 1976

Monograptus: Boucek, 1936, c. 4; Jaeger, 1975, p. 116.

Pristiograptus (Pristiograptus): Munch, 1952, p. 95; Tomczyk, 1956, p. 52.

Bohemograptus?: Urbanek, 1970, p. 266.

"Monograptus" : Urbanek, 1970, p. 367.

Polonograptus: Tsegelnjuk, 1976, p. 124; Pribyl, 1983, p. 158; Urbanek and Teller, 1997, p. 39, 44.

Alexandrograptus: Pribyl, 1981, p. 373.

Neolobograptus?: Root, 1986, p. 133.

Type species – *Monograptus butovicensis* Boucek, 1936; middle Silurian, *Neodiversograptus nilssoni* zone of Bohemia.

Diagnoz. Large ventrally folded (wrapped) in the short proximal, arcuately bent in the middle and slightly curved in the distal parts of the rhabdosome. The latter are narrow in the proximal parts. Their width rapidly increases in the distal direction.

Theca are narrow, straight, ventrally curved, long tubes. They are separated from each other by long interthecal septa.

In the proximal and middle parts of the rhabdosomes, the lateral walls of the theca have distinct lateral elevations, while the ventral walls have depressions (Table 14, figs. 6, 7). In the distal direction, their height decreases and the edges of the mouths of the theca become, at least in some species, even (see 85, p. 125, pl. 39, fig. 4b).

Sicula small, short.

Composition of the genus: *Monograptus butovicensis* Bouc., 1936; *Polonograptus licis* Tseg., 1976; *P. podoliensis* Prib., 1983; *"Monograptus" egregius* Urb., 1970; *Neolobograptus? proprius* Koren, 1986.

Comparison. According to the shape of rhabdosomes, species of the genus *Polonograptus* Tseg., 1976 closest, according to Prof. A. Przybl (178, 179) and prof. A.Urbanek and L.Teller (216), to the genus *Bohemograptus* Prib., 1967, but differ from it very well in their very original narrow and long thecae.

Remarks. A. Urbanek and L. Teller (216, p. 43) think that the paratype of the type species *Monograptus butovicensis* Bouc., 1936 of the genus *Polonograptus* Tseg., 1976 is a distal fragment of *Colonograptus roemeri* (Barr., 1850).

In our opinion, the fragment of the distal rhabdosome, which was chosen as the paratype of *Monograptus butovicensis* Bouc. (113, pl. 1, fig. 7), is a distal fragment of a typical representative of the *genus Polonograptus*.

Prof. A. Przhibl believes that *Polonograptus licis* Tseg., 1976 (85, p. 125, pl. 39, figs. 4-6) does not belong to the genus *Polonograptus*, for the reason that the width of the distal (or middle) parts of the rhabdosomes of this species does not exceeds 1.3 mm.

However, we are not aware of other genera of cuculograptids from the *Neocucullograptus kozlowskii-Neolobograptus auriculatus* Zone or the Silurian deposits of Volyno-Podolia and other regions adjacent to it, the distal (or middle) fragments of which are so clearly and naturally (without the influence of tectonics and cleavage) ventrally curved.

Distribution. Middle and upper Silurian, Tiritian and lower part of the Ulichian Belt, *Neodiversograptus nilssoni-Saetograptus chimaera, Saetograptus leintwardinensis, Neocucullograptus kozlowskii-Neolobograptus auriculatus* zones of Europe.

Polonograptus egregius Urbanek, 1970

Tab. XIV, draw. 5-7; tab. L, fig. 1-10

"Monograptus" egregius: Urbanek, 1970, c.367, pl.42-43.

Holotype. Urbanek, 1970, pl. 43, fig. D1, D2, fragment of the distal rhabdosome; Sedlec Beds of Poland, *Cucullograptus aversus* zone.

Description. Significantly ventrally curved throughout the rhabdosomes. Very long (more than 4 mm) flow of the first theca is straight. A strong ventral bending of the rhabdosomes starts from the base of the metatheca of the first theca, which is one of the characteristic features of this species.

The width of rhabdosomes at the level of the apex of the sicula is 0.18 mm, at the level of the orifices of the proximal thecae - 0.45-0.7 mm, immediately above them - 0.3-0.45 mm, at the level of the orifices of the distal thecae - 1.1-1 .2 (0.8-0.9) mm.

Thecae are represented by extremely long and thin ventrally curved tubes. The length of proximal thecae is 4.12-4.59 mm, their protecus is 2.64-2.76 mm, metathecus is 1.36-1.95 mm. The length of the interthecal septa rapidly increases from bottom to top along the rhabdosomes. In this regard, even in the proximal parts of the rhabdosomes, the length of the metathecus (1.85–1.92 mm) exceeds the length of the protecus (1–1.14 mm). The length of the distal thecae is 3.3 mm; The width of the proximal metathecus is 0.2-0.25 mm, the distal one is 0.3-0.35 mm.

The mouths of all rhabdosomes are equipped with symmetrical lateral elevations. In the proximal parts, they consist of 1-2 fuseluses, rapidly wedging out in the ventral-dorsal direction. In connection with this, distinct depressions are developed at the ventral margins of the mouths of the theca. The aperture eminences are also separated from the ventral walls of subsequent thecae by a significant decrease in the lateral-dorsal margins of the metathecae. The height of elevations in proximal thecae is 0.1-0.12 mm.

In the distal thecae, the lateral eminences consist of 3-4 fuseluses wedging out in the dorsal-ventral direction. They reach a height of 0.15-0.26 mm. Proximal thecae overlap by 1/3-3/5, distal ones by 2/3 of their length.

There are 4 thecae in 5 mm of the proximals, and 5 thecae in the distal parts of the rhabdosomes.

Sicula straight or slightly curved ventrally. Its length is 1.15-1.3 mm, the width of the mouth is 0.2-0.25 mm. The length of the prosicle is 0.36 mm, the metasicles are 0.72–0.85 mm. The beginning of the first theca is located 0.2-0.3 mm above the mouth of the sicula. Virgella length 0.4 mm.

Variability. The degree of ventral curvature of the rhabdosoma and the theca, as well as the length of the theca and the height of the eminences, vary within small limits.

Comparison. According to the shape and structure of rhabdosomes, this species is closest to *Neolobograptus ? proprius* Koren, from which it differs in a smaller width of colonies (1.1-1.2 mm versus 2.6-2.7 mm in *N.? proprius*) and a large number of proximal theca per unit of measurement (4 to 5 mm in length instead of 2 for *N.? proprius*).

Remark. Unusually long and thin thecae, the mouths of which are equipped with peculiar lateral elevations, distinguish this species together with *Neolobograptus ? proprius* Koren and others into the group of species of the genus *Polonograptus,* morphologically different from all known Tiritian and Ulichian cuculograptids.

Association.This species occurs together with *Neocucullograptus kozlowskii unicornus* Urb., *Bohemograptus cornutus* Urb., *B. praecornutus* Urb.

Distributian. Upper Silurian, Ulichian Belt, Tagrian Stage, *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper part of the Zabrodskaya and Oleshkovichskaya suites of the Polessky ledge of the basement, the lower part of the Lesnyanskaya suite of the Brest depression.

M a t e r i a l . 10 fragments of rhabdosomes recovered from the rocks of wells Gushcha-4015 in int. 860-863 m, 915-920 m and Brest-1 on depth 500.7 m.

Subfamily *Cucullograptinae* Urbanek, 1958

Genus *Lobograptus* Urbanek, 1958

Lobograptus progenitor Urbanek, 1966

Tab. VIII, draw. 7- 9; tab. XXXVIII, fig. 1-14

Monograptus nilssoni: Lapworth, 1876, p. 315, tab. 10, fig. 7; Wood, 1900, p. 482, tab. 25, fig. 28, fig. 24; Elles and Wood, 1911, p. 369, tab. 37, fig. 1, fig. 241; Hundt, 1924, p. 70, tab. 3, fig. 2-4, tab. 8, fig. 4; Averyanov, 1929, p. 698, pl. 34, fig. ten; Chernyshev, 1941, p. 80, tab. 2, fig. 7, 8; Kuhne, 1955, p. 384, fig. 10.

Monograptus (Pristiograptus) nilssoni: Obut, 1949, p. 20, tab. 3, fig. 5.

Pristiograptus (Pristiograptus) nilssoni: Tomczyk, 1956, p. 51, tab. 5, fig. 2, fig. thirteen.

Lobograptua progenitor: Urbanek, 1966, p. 384, tab. 11-14, fig. 3, 4; Pashkevichius, 1979, p. 180, tab. 32, fig. 6, tab. 33, fig. 6, tab. 17, fig. 6.

Cucullograptus (Lobograptus) progenitor: Palmer, 1971, p. 377, fig. 1, 2, 11, fig. 12-14.

Holotype. Urbanek, 1966, pl. 14, fig. A, rhabdosome proximal; Miller Beds of Poland, Ludlow Group, *Neodiversograptus nilssoni* zone.

Description. Strongly ventrally curved in the predominant part of the proximal and arcuate - in the middle and distal parts of the rhabdosome more than 40 mm long. In the extreme proximals (in the interval of the first 5-6 techs), the rhabdosomes are significantly curved dorsally. Their width at the level of the mouth of the first theca is 0.3-0.36 mm, directly above it 0.15-0.18 mm; at the level of the fifth theca - 0.42-0.48 (0.26-0.3) mm, the tenth - 0.45-0.54 (0.28-0.35) mm, the fifteenth - 0.6-0 .65 (0.36-0.4) mm. The width of the colonies also gradually increases to 0.65-0.7 (0.3-0.36) mm in the distal parts.

The extreme proximal thecae are slightly curved dorsally, the subsequent ones - ventrally. The stomata of the proximal and middle parts of the rhabdosomes are even or with barely visible lateral elevations.

In the distal direction, they gradually increase to 0.08-0.12 mm. Elevations are formed by 1-2 fuseluses of the periderm, which wedged out in the ventral-dorsal directions. The length of the first theca is 1.26-1.65 mm, its leaks are 1.14-1.38 mm, metatheca are 0.12-0.27 mm; fifth - 1.5-1.56 mm, leaks - 1.26-1.3 mm, metatheques - 0.24-0.3 mm; tenth - 1.74-1.86 mm, leaks - 1.32-1.38 mm, metateks - 0.36-0.54 mm; fifteenth - 1.8-1.85 mm, leaks - 1.14-1.3 mm, metatheques - 0.55-0.66 mm.

The length of the distal thecae according to the fragments of rhabdosomes available in our collection is 1.53-1.74 mm, their leak is 1.2-1.32 mm, metathecus is 0.21-0.54 mm. The width of the proximal metathecus is 0.18-0.27 mm, the distal one is 0.3-0.35 mm. The width of the proximal ducts at their bases is 0.06-0.14 mm, the distal ones - 0.18-0.24 mm. Proximal theca overlap by 1/4-1/5, distal - by 1/3-2/5 of their length.

In 10 mm proximals, there are 7.5-8 thecae, in the distal parts of the colonies - 8 thecae.

Sicula straight or slightly curved ventrally. Its length is 1.17-1.56 mm, the mouth width is 0.25-0.27 mm. The apex of the sicula is located 0.3-0.54 mm below the level of the mouth of the first theca. The base of the latter is located 0.3-0.42 mm above the mouth of the sicula. From the mouth of the sicula to the end of the first theca 1.59-2.13 mm. The length of the virgella is 0.3-0.5 mm.

Variability. The degree of dorsal curvature of the extreme proximal rhabdosomes, the length of the sicula, and the location of its apex relative to the level of the mouth of the first theca vary.

The height of the lateral elevations of the current distal parts of the colonies is variable.

Comparison. In terms of the general shape of the distal and, to some extent, middle parts of rhabdosomes, this species is closest to *Lobograptus simplex* Urb. It differs from the latter by a strong ventral-dorsal bending of the proximals, as well as by the development of aperture eminences at the mouths of the theca rather than lobes, as in *Lobograptus simplex* Urb.

Remarks. Until recently, paleontologists identified this species, as can be seen from the synonymy, with *"Monograptus" nilssoni* (Barr.).

This is a very difficult species to determine, especially from samples on the surface of rocks in the absence of chemically extracted rhabdos from them. Difficulties are caused by the fact that the small width of the rhabdosomes does not contribute to their good preservation, and the inconspicuous morphological features of the theca make it difficult to understand their structure and diagnosis.

Association. This species occurs together with *Neodiversograptus nilssoni* (Barr.), *Cucullograptus hemiaversus* Urb., *Colonograptus colonus* (Barr.).

Distribution. Middle and upper Silurian, Tiritian Belt, Gorstian and Konovian Stages, *Neodiversograptus nilssoni-Saetograptus chimaera, Saetograptus leintwardinensis* zones; Zabrodskaya and lower parts of the Oleshkovichskaya suite of the Polessky ledge of the basement, the lower parts of the Franopolskaya suite of the Brest depression.

M a t e r i a l. 15 fragments of rhabdosomes on the surface of marls, uncovered by the wells of Kharsy-1873 at depths 341 m, 348.2 m, 354.5 m, 356.5 m, 358 m; Brest-1 on thecae 708 m, 710.5 m; Guscha-4015 in int. 936.9-941.8 m, 962.7-967.2 m.

There are also 17 fragments of colonies recovered from the rocks of the Gushcha-4015 wells in int. 911.3-915.7 m, 920-923 m, 937-941.8 m, 941.8-952.6 m, 962-967 m, 967-971 m, 976-980 m and Shiev-4109 in . 442.7-443.7 m, 446.6-447.6 m, 447.6-449.8 m, 449.8-450.8 m.

Lobograptus simplex Urbanek, 1960

Tab. IX, draw. 1; tab. XXXIX, fig. 1- 6

Lobograptua simplex: Urbanek, 1960, p. 211, tab. 1, fig. I, fig. 13 A, 14 A, 19, 20; Urbanek, 1966, p. 396, tab. 15-17, fig. 5, 6.

Holotype. Urbanek, 1960, pl. 1, fig. 1, the middle part of the rhabdosome; recovered from a glacial boulder in Poland.

Description. Straight and slightly curved dorsally or ventrally fragments of rhabdosomes more than 50 mm long. The extreme proximal parts of the colonies were not found. The thinnest fragments of proximals reach a width of 0.33-0.36 mm at the level of the mouths of the thecae, directly above them - 0.16 mm. In the distal direction, their width gradually increases in the middle parts of the colonies up to 0.4-0.54 (0.3-0.36) mm. The maximum width of the distal fragments does not exceed 0.9–0.95 (0.5–0.6) mm.

Thecae are narrow, gradually expanding upward tubes. The length of proximal thecae is 1.98-2.37 mm, their protecus is 1.14-1.74 mm, metathecus is 0.63-0.84 mm. The width of the latter is 0.15-0.2 mm, the leak in their base is 0.12-0.2 mm. The thecae overlap for 1/4 of their length. The length of the distal thecae is 2.16-2.34 mm, their protecus is 1.08-1.14 mm, the metathecus is 1.08-1.2 mm. The width of the latter is 0.3-0.33 mm, the leak at their base is 0.24-0.3 mm. Thecae overlap for 1/2-2/5 of their length.

There are 7.5-9 thecae in 10 mm length of rhabdosomes.

All thecae terminate in symmetrical lateral lobes, which are built by normal fuseluses. Their height in the proximal ones is 0.08-0.1 mm, in the distal ones - 0.16-0.2 mm. They elongate in the ventral direction, bend slightly downwards and hang over the mouths of the theca. The right and left lobes protrude (grow) beyond the ventral walls of the thecae by 0.03–0.06 mm in the proximal thecae and by 0.14–0.16 mm in the distal ones.

Another characteristic feature of this species is the rapid elongation of the interthecal septa - in the distal fragments, their bases almost reach the level of the lateral edges of the lobes.

Variability. The degree of dorsal or ventral bending of the rhabdosomes and the size of the lateral lobes vary.

Comparison. In terms of the shape and size of the rhabdosomes and the thecae, this species is closest to *Lobograptua exspectatus* Urb. long interthecal septa. From *Lobograptus progenitor* Urb., which has elevations on the lateral walls of the theca, the described species differs in the larger size of the lobes and their shape.

Assotiation. This species occurs together with *Neodiversograptus nilssoni* (Barr.), *Saetograptus chimaera* (Barr.).

Distribution. Middle Silurian, Tiritian Belt, upper *Neodiversograptus nilssoni-Saetograptus chimaera* zone and lower *Saetograptus leintwardinensis* zone; the Franopolskayal suite of the Brest depression, the Zabrodskaya suite of the Polessky ledge of the basement, the Zheldetskaya suite of the Lvov trough.

Material. 20 fragments of rhabdosomes on the surface of marls and mudstones drilled by the wells of Kharsy-1873 in int. 346.5-347 m, 348.2-348.5 m, at ch. 353 m, 354 m; Brest-1 on depths 684 m, 687 m, 694 m, 697 m; Guscha-4015 in int. 953.7-962.5 m; Shiev-4109 in int. 443.7-445.6 m, Brest-10 on depth 820 m, Davideny-1 at interval 2932-2939 m.

There are also 6 fragments of colonies recovered from the rocks of well Shiev-4109 in int. 443.7-445.6 m, 445.6-447.5 m and Guscha-4015 int. 941.8-952.6 m, 953.7-962.5 m.

Lobograptus scanicus scanicus (Tullberg, 1883)

Tab. IX, draw. 2- 4; tab. XXXIX, fig. 7-11

Monograptus scanicus: Tullberg, 1883, p. 26, tab. 2, fig. 38-44; Bulman, 1953, p. 131, fig. 1-3; Kuhne, 1955, p. 391, fig. fourteen; Willefert, 1962, p. 34, tab. 2, fig. 9, fig. eleven; Krandievsky, 1968, p. 31, tab. 7, fig. 1.

Lobograptus scanicus: Urbanek, 1958, p. 72 (pars), pl. 2, fig. 6 (non tab. 2, fig. 5), fig. 41, 42; Koren, Ulst, 1967, p. 240, tab. 28, fig. 3,4, fig. 54; Abduazimova, 1970, p. 62, tab. 4, fig. 12, 13, fig. 19; Lenz, 1972, p. 1157, fig. 3 j, k.

Lobograptus scanicus scanicus: Urbanek, 1966, p. 444, tab. 27, tab. 47, fig. 2, fig. 11.12.

non *Monograptus scanicus:* Munch, 1942, c. 258, tab. 6, fig. 5-7.

Holotype. Tullberg, 1883, pl. 2, fig. 38, middle part of rhabdosome; Lower Ludlow deposits of Sweden.

Description. Weakly ventrally curved rhabdosomes over 50 mm long throughout. Their width at the level of the apex of the sicula is 0.09 mm, at the level of the lateral lobes of the first theca - 0.2 mm, immediately above - 0.05 mm, in the middle parts of the rhabdosomes - 0.5-0.6 mm, in the distal - 0, 9-0.95 mm.

The length of the first theca is 1.8 mm. The length of the proximal theca does not exceed 2.1 mm. The main part of the tech is leaks - 1.62-1.8 mm. Short metathecus (0.18-0.3 mm) almost parallel to the dorsal margin of the rhabdosomes. Their width is 0.08-0.12 mm. Almost throughout their entire length, they overlap with leaks of subsequent leaks for 1/6-1/7 of their length. The width of the leak at the base is 0.05-0.08 mm.

The length of the thecae of the middle parts of the colonies is 2-2.2 mm, their leak is 1.4-1.5 mm, the metathec is 0.6-0.7 mm. They overlap by 1/3-1/4 of their length. The ventral walls of the thecus are sigmoidally curved in their metathecal part. The length of distal thecae does not exceed 2.6 mm, their length is 1.2-1.4 mm, metathecus is 0.84-1.2 mm. Thecae overlap by 2/5 of their length. It can be seen from the above measurements that the length of the metatheca steadily increases in the distal direction, and therefore, in the distal fragments of their bases, they almost reach the level of the apertures of the previous theca.

There are 6-8 thecae in 10 mm of rhabdosome length.

All the theca terminate in lateral lobes of unequal size - the right lobes are distinctly larger than the left. The proximal lobes are oval in shape. The width of the right blades is 0.12-0.24 mm, their height is 0.08-0.2 mm. It should be noted that the right and left lobes are already developed near the first theca. The right lobes of the middle and distal theca remain generally oval in shape. Their width increases to 0.42-0.45 mm, height - up to 0.19-0.24 mm.

The part of the left lobes remote from the ventral side of the rhabdosome is variable. In the middle part of the colonies, it lengthens and twists somewhat downward and towards the ventral walls of the theca, without reaching, however, the latter. The endings of the left lateral lobes, characteristic only for this type, are formed, which A. Urbanek (209, p. 447) called "beak-shaped endings". In the distal parts of the colonies, the latter reach the ventral-lateral walls of the theca. The right blades completely overlap the left ones.

Sicula curved slightly dorsally. Its length is 1.02 mm, the mouth width is 0.14 mm. The dorsal sicular lobe, 0.12 mm long, is well developed. The apex of the sicula is located below the level of the lobes of the first theca by 1.05 mm. The beginning of the latter is 0.24 mm above the mouth of the siculus. The distance from the mouth of the sicula to the end of the first theca is 2.04 mm. Virgella length 0.3 mm.

Variability. The degree of ventral curvature of the rhabdosomes and the length of the tech.

Comparison. The described subspecies differs from *Lobograptus scanicus parascanicus* (Kuhne) in a large elongation of the left lateral lobes.

In terms of shape and size of rhabdosomes, this subspecies is close to *Lobograptus invertus* Urb., from which it differs in greater overlap of the thecae, longer metathecae, and beak-shaped ends of the left lateral lobes of the theca middle parts of rhabdosomes (the latter in *L. invertus* are much more strongly twisted to form cone-shaped siphons).).

Assotiation. This species occurs together with *Lobograptus invertus* Urb., *Saetograptus chimaera* (Barr.).

Distributian. Middle Silurian, upper part of the Tiritian Belt, upper part of the Gorstian and lower part of the Konovian stage, upper part of the *Neodiversograptus nilssoni-Saetograptus chimaera* zone and lower part of the *Saetograptus leintwardinensis* zone; the Zabrodskaya suite of the Polessky ledge of the basement, the Zheldetskaya suite of the Lvov trough, and the Franoposkaya suite of the Brest depression.

Material. 15 fragments of rhabdosomes on the surface of marls and argillites drilled by wells Samoilichi-1859 at depth 408.6 m, Dublyany-4 int. 4207-4215.2 m, Ivano-Frankivsk-1, int. 3532-3536 m, Harsy-1873 in int. 336.5-337 m, 341-342 m, 343.6-344 m, 346.5-346.8 m, 350.7-351.3 m, at 353 m; Brest-1 on depths 640 m, 660 m, 695 m.

There are also 5 fragments of colonies recovered from the rocks of the well. Guscha-4015 in int. 941.8-952.6 m, 954-962 m.

Lobograptus invertus Urbanek, 1966

Tab. X, draw. 1, 2; tab. XXXIX, fig. 12-14; tab. XL, fig. 1, 2

Lobograptus invertus: Urbanek, 1966, p. 458, tab. 29-31.

non *Lobograptus invertus:* Tsegelnjuk, 1976, p. 126, tab. 37, fig. 1, 2.

Holotype. Urbanek, 1966, pl. 30, fig. E, fragment of the distal part of the rhabdosome; Miller layers of Poland; Ludlow, *Lobograptus invertus* zone.

Description. Narrow, slightly ventrally curved throughout the rhabdosome. Their greatest bend is confined to the middle part of the colonies.

The length of the chemically prepared fragments present in the collection does not exceed 6 mm. Their width at the level of the top of the sicula is 0.1-0.12 mm, directly above the level of the mouth of the first theca - 0.06-0.08 mm, above the mouth of the second theca - 0.08 mm. Gradually, the width increases to 0.7-0.78 mm in the distal parts at the level of the aperture structures of the thecae.

The length of the first theca is 1.53 mm. Its main part is a leak 1.41 mm long. The short metatheca (0.12 mm) is almost completely isolated from the leakage of the second theca and is inclined at an angle of 35°. Starting from the second theca, a short (0.18 mm) interthecal septum is distinguished. However, the main part of the proximal theca metathecae is isolated from the subsequent thecae.

In the distal direction, the length of the interthecal septa gradually increases, and the isolation of the metathecus decreases. However, even in the middle parts of the colonies, the theca overlap only by 1/6-1/7 of their length. The length of the second theca is 1.82 mm, its leaks are 1.71 mm, and the metatheca is 0.11 mm. The width of the latter is 0.14 mm.

The length of the thecae of the middle parts of the rhabdosomes is 1.86-2.04 mm, their protecus is 1.32-1.38 mm, the metathecus is 0.54-0.66 mm. The width of the metatecs is 0.15-0.18 mm. They are insulated for half their length. The maximum length of distal thecae is 2.1 mm, their protecus is 1.38 mm, metathecus is 0.72 mm. The width of the latter is 0.15-0.18 mm. They completely overlap with the leaks of subsequent leaks. The degree of their overlap is 1/4-1/5.

In 10 mm of length rhabdosomes, there are 6-7 thecae.

All theca are equipped with a complex asymmetric aperture apparatus, consisting of lateral lobes of unequal size and shape.

The right lobe is distinctly larger than the left. In proximal thecae, its shape is oval. The width of the right lobe of the first ones is 0.2-0.24 mm, the height is 0.18-0.2 mm.

The lateral lobes of the thecae of the middle and distal parts of the rhabdosome are almost rounded. The width of the right blades is 0.39-0.42 mm, their height is 0.27-0.36 mm. Their edges are bent towards the mouths of the teki and slightly overlap the left lobes.

The edges of the left lobes distant from the ventral side of the rhabdosoma, starting from the first theca, rapidly elongated and twisted around their axis by at least 360°, forming short but distinct cone-shaped siphons. They are oriented at right angles to the blades. This morphological feature is characteristic only for this species.

The **sicula** is straight. Its length is 0.95-1 mm, the width of the mouth is 0.12-0.15 mm. The apex of the sicula is located 0.78 mm below the level of the aperture lobes of the first theca. The beginning of budding of the latter occurred 0.18 mm above the mouth of the sicula. From the base of the last to the end of the first theca 1.71 mm.

The length of the virgella is 0.42 mm. The dorsal lobe of the mouth of the siculum is well developed.

Variability. The degree of ventral curvature of the rhabdosomes and the overlap of the thecae of the proximal and middle parts of the colonies vary.

Comparison. In terms of the shape and size of rhabdosomes and theca, this species is close to Lobograptus scanicus (Tullb.), from which it differs in a smaller overlap of the theca, a shorter metathecus length, and a much more elongated and twisted end of the left labium. thermal blade.

Remark. This species is very difficult to identify on the surface of rock samples. Its characteristic morphological features are reliably established only on fragments of rhabdosomes extracted from rocks by dissolving the latter in acids.

Association. *Lobograptus scanicus* (Tullb.) was found with this species.

Distribution. Middle Silurian, upper part of the Tiritian Belt, lower part of the *Saetograptus leintwardinensis* zone; the Zabrodskaya suite of the Polessky ledge of the basement.

Material. 5 fragments of rhabdosomes, which were extracted from the rocks passed by the borehole. Guscha-4015 in int. 941.8-952.6 m.

Genus *Cucullograptus* Urbanek, 1954

Cucullograptus hemiaversus Urbanek, 1960

Tab. IX, draw. 5-7; tab. XL, fig. 3-10

Cucullograptus hemiaversus: Urbanek, 1960, p. 215, tab. 2, fig. 2, fig. 2 A, 6, 13 E, 14 C; Urbanek, 1966, p. 480, tab. 35, 36, tab. 47, fig. 4, fig. 14-16.

Holotype. Urbanek, 1960, pl. 2, fig. 2, fragment of the distal part of the rhabdosome; recovered from a glacial boulder in Poland.

Description. Almost straight or slightly ventrally curved along the entire length of the rhabdosome, more than 40 mm long. Their width at the level of the mouth of the first theca is 0.22-0.24 mm, directly above the mouth - 0.06-0.07 mm, at the level of the mouth of the sixth theca - 0.28 (0.12) mm. Just as slowly, the width increases to 0.8 (0.3) mm in the distal parts of the colonies.

The thecae are thin and relatively long tubes that gradually widen from the base of the theca. In the metathecal part, their ventral walls are sigmoidally curved.

Proximal thecae have long leaks (0.9-1.16 mm) and very short metathecus (0.16-0.28 mm). The latter are inclined to the axis of the rhabdosomes at angles of 15-20 degrees. The metatheca of the distal thecae are almost parallel to the dorsal margin of the colonies.

The mouths of all the theca have lateral lobes consisting of normal fuseluses. They are asymmetrical, starting from the first theca.

The right lobes grew on the continuation of the lateral walls. Their height at the first proximal thecae is 0.08-0.15 mm, width is 0.14-0.24 mm.

The left lobes quickly elongated and smoothly curved towards the orifices, completely overlapping them already in the proximal parts of the rhabdosomes. Their edges hung below the edges of the right lobes and the ventral edges of the mouths of the thecae. In this regard, the height of the right lobes did not increase up the rhabdosome, but even slightly decreased (up to 0.04-0.06 mm in the distal thecae).

The length of the first theca is 1.35-1.44 mm, its leaks are 1.14-1.28 mm, metatheca are 0.16-0.21 mm; the second - 1.12 mm, leaks - 0.88 mm, metatheques - 0.24 mm; the third - 1.12 mm, leaks - 0.9 mm, metateks - 0.22 mm; fourth - 1.32 mm, leaks - 1.16 mm, metatheques - 0.16 mm; the sixth - 1.36 mm, leaks - 1.08 mm, metatheques - 0.28 mm. The thecs also increased slowly up to the distal parts of rhabdosomes.

The length of distal thecae is 2.04-2.48 mm, their protecus is 1.44-1.6 mm, metathecus is 0.62-1.04 mm. The width of the distal metathecus is 0.2-0.24 mm, the proximal one is 0.09-0.1 mm.

The width of proximal leaks at their base is 0.1-0.12 mm, distal - 0.2-0.22 mm. Proximal theca overlap by 1/5-1/6, distal - by 1/3-2/5 of their length.

There are 9-10 thecae in 10 mm proximals, 6-7 thecae in distals.

The **sicula** is straight. Its length is 0.72-0.84 mm, the mouth width is 0.15 mm. The apex of the sicula is located 0.6-0.68 mm below the end of the first theca. The base of the latter is 0.12-0.16 mm above the mouth of the sicula. From the base of the sicula to the end of the first theca 1.47-1.68 mm. Virgella length 0.3 mm.

Variability. The width and degree of the ventral curvature of the rhabdosomes, as well as the convexity of the ventral walls of the thecae in their metathecal part, vary.

Comparison. This species is closest to *Cucullograptus aversus* (Eis.), from which it differs in the presence of a well-developed right lateral lobe and a shorter left lobe of the aperture apparatus.

Association. Together with this species, there are *Lobograptus progenitor* Urb., *Saetograptus leintwardinensis* (Lapw.), *Neolobograptus fragilis* Tseg.

Distribution. Middle Silurian, upper part of the Tiritian Belt, Konovian Stage, *Saetograptus leintwardinensis* zone; the Franopolskaya suite of the Brest depression, the upper part of the Zabrodskaya suite of the western part of the Polessky Ledge, the upper part of the Zheldetskaya suite and the lower part of the Peremyshlyanskaya suite of the Lvov trough.

Material. 9 fragments of rhabdosomes on the surface of argillites and marls drilled by wells Priluky-1844 on depth 419.5 m, Kladnev-5396 on depth 426.5 m, Zagaipol-1 int. 2804-2805.5, Guscha-4015 int. 933.9-936.3 m, 936.9-941.8 m; Brest-1 on depths 639 m, 660 m, 685.7 m; Brest-10 on depth 819 m, Davideny-1 int. 2932-2939 m, Great Mosty-30 int. 3848.3-3855.4 m, 3882.9-3873.8 m; Ivano-Frankivsk-1 in int. 3452-3456 m.

10 fragments of rhabdosomes were recovered from the rocks of the well Guscha-4015 at interval 928.2-931.1 m, 933.4-936.9 m, 936.9-941.8 m, 941.8-952.6 m.

Subfamily *Neocucullograptinae* Urbanek, 1970,
emend. Tsegelnjuk, 1976

Type genus - *Neocucullograptus* Urb., 1970.

Diagnoz. Ventrally folded in the procoimal, arcuate in the middle and slightly curved in the distal parts of the rhabdosome.

Thecae are represented by straight or ventrally curved tubes. Their ends are devoid of aperture structures or are equipped with symmetrical or asymmetric lateral blades, consisting of microfuselage strips.

Tubular outgrowths are sometimes found in the aperture formations.

Composition in subfamily. Three genera: *Bohemograptus* Prib., 1967; *Neocucullograptus* Urb., 1970; *Fterograptus* Tseg., 1976.

Comparison. This subfamily differs from *Neolobograptinae* Tseg., 1976 in short wide thecae (in the genus *Bohemograptus* Prib., 1967) and the presence of large lateral lobes.

Remarks. A. Urbanek included the genus *Neolobograptus* Urb., 1970 (210) into this subfamily. At the mouths of the thecae, the species of this genus have developed not lobes, but lateral elevations. In this regard, we assign it to the subfamily *Neolobograptinae* Tseg., 1976.

Distribution. Middle and upper Silurian, Tiritian and Ulichian Belts, lower part of Przhidolian Belt of Europe, Asia, America, Africa.

Genus *Bohemograptus* Pribyl, 1967

Bohemograptus bohemicus bohemicus (Barrande, 1850)

Tab. XL, fig. 11-13; tab. XLI, fig. 1-5

Graptolithus bohemicus: Barrande, 1850, p. 40, tab. I, fig. 15-18.

Monograptus bohemicus: Tullberg, 1883, c. 28, tab. 3, fig. 3-5; Geinitz, 1890, p. 14, tab. Ah, fig. ten; Wood, 1900, p. 483, tab. 25, fig. 27, fig. 25; Elles and Wood, 1911, p. 367, tab. 36, fig. 4 a-d, fig. 239; Gortani, 1920, p. 26, tab. 2, fig. 9, 10; Hundt, 1924, p. 72, tab. 3, fig. 6; Averyanov, 1929, p. 108, tab. 34, fig. 9a-c; Boucek, 1936, p. 3, tab. 1, fig. 1-3; Chernyshev, 1941, p. 79 (pars), pl. 2, fig. 9-13 (non Fig. 14); Willefert, 1962, p. 34, tab. 2, fig. 14, fig. fifteen.

Monograptus (Pristiograptus) bohemicus: Obut, 1949, c. 20, tab. 3, fig. 4 a, b.

Pristiograptus (Pristiograptus) bohemicus bohemicus: Pribyl, 1952, p. 23, fig. 5, 6.

Pristiograptus bohemicus: Munch, 1942, c. 246, tab. 1, fig. one; Urbanek, 1958, p. 77, tab. 4, fig. 1-3, fig. 46-51; Obut, Sobolevskaya, Bondarev, 1965, p. 62, tab. 9, fig. 5-11, tab. 10, fig. 1-3; Koren, Ulst, 1967, p. 253, tab. 29, fig. 6, fig. 68; Krandievsky, 1968, p. 40, tab. 8, fig. 2-6; Lenz, 1972, p. 1152, fig. 2 (H, I, J).

Bohemograptus bohemicus: Pribyl, 1967, p. 136, tab. I, fig. 1-6; Tsegelnjuk, 1976, p. 126, tab. 39, fig. 7-10; Pribyl, 1981, p. 374, fig. 2, fig. 4, 5.

Bohemograptus bohemicus bohemicus: Urbanek, 1970, p. 267, fig. 10, 11, tab. 10, tab. 13, fig. C, tab. 20, fig. BUT; Lenz, 1972, p. 1150, fig. 2 (H-J); Berry and Murphy, 1975, p. 80, tab. 9, fig. 1-3.

Bohemograptus bohemicus tenuis: Holland and Palmer, 1974, p. 219 (pars), fig. 2 a-i (non tab. 21, figs. 1-3).

Bohemograptus caperatus: Tsegelnjuk, 1976, p. 127, pl. 40, fig. 1-3.

Bohemograptus insuetus: Tsegelnjuk, 1976, p. 128, tab. 40, fig. 4.5.

Bohemograptus arcuatus: Tsegelnjuk, 1976, p. 128, table 40, fig. 6-9.

Lectotype. Pribyl, 1981, fig. 2 (5), distal part of the rhabdosome; Kopanin beds of the Czech Republic, Ludlow Group, *Neodiversograptus nilssoni* zone.

Description. Colonies are large. The length of individual fragments exceeds 70-90 mm. They are ventrally curved in the proximal and arcuate - in the middle and distal parts. The distals of some colonies are nearly straight. The degree of curvature of the proximals also varies widely.

Their width at the level of the aperture of the first theca is 0.45-0.6 mm, directly above it - 0.15-0.3 mm, at the level of the mouth of the second theca - 0.55-0.7 mm, the fifth - 0.8- 1.1 mm, tenth - 1.1-1.2 mm, fifteenth - 1.2-1.3 mm, twentieth - 1.3-1.4 mm. Just as gradually, the width of the rhabdosomes increases further. In many specimens, it reaches 1.5-1.6 mm in the extreme distal parts. But often it continues to increase to 1.8-2 mm.

Thecae is represented by simple cylindrical tubes, which slightly expanded during the growth stage of the leak. In the procoimal parts of the colonies, they are inclined to the axis of the rhabdosomes at angles of 15-35°, in the distal - 20-30°.

The ventral walls of the metathecae of the proximal and distal thecae are parallel to the interthecal septa. The lateral edges of the apertures of the proximal and medial theca are usually slightly convex, the ventral edge is slightly concave. Distal thecae have smooth, slightly convex or slightly concave lateral margins of the mouths. Their dorsal-lateral edges are symmetrical. Microfuselage structures in the form of narrow strips that build up the aperture edges of the theca are very rare.

The length of the first theca is 0.95-1.2 mm, the second - 1.1-1.3 mm, the fifth - 1.5-1.85 mm, the tenth - 2.2-2.3 mm. The length of subsequent theca does not exceed 2.3-2.4 mm. The length of proximal leaks is 0.65-1.1 mm, distal - 0.8-1.2 mm. The length of the proximal metathecus is 0.2-0.9 mm, the distal one is 1-1.4 mm. The width of the proximal metathecus at the level of their mouths is 0.25-0.6 mm, the distal one is 0.7-0.8 mm. The degree of overlap of the proximal theca 1/4-2/5, distal - 1/2-2/3. The length of the proximal and distal theca exceeds their width by 3-4 times.

There are 10-11 thecae in 10 mm of proximal length, 8-10 thecae in distals.

Sicula narrow, ventrally curved. Its length is 1.4-1.95 mm, the width of the mouth is 0.3-0.4 mm. The apex of the sicula is located in the range from the level of the aperture of the first theca to 0.35 mm above it. The base of the first theca is located 0.2-0.4 mm above the mouth of the sicula. Virgella length 0.4-0.8 mm.

Variability. The degree of curvature of the procoimal parts of rhabdosomes, the length and width of the colonies vary within a significant range. A fairly stable sign is the position of the apex of the siculum relative to the aperture of the first theca.

Comparison. Based on the degree of curvature of rhabdosomes and the width of their proximal parts, *Bohemograptus bohemicus bohemicus* (Barr.) is difficult to distinguish from *B. bohemicus tenuis* (Bouc.).

In modern paleontological literature, there is an opinion that "only differences in the size of the extreme proximal can be used to differentiate the two compared subspecies, while the distal parts of the rhabdosome are close" (25, p. 132).

Measurements of numerous rhabdosomes show that their width within the first ten proximal theca is within the limits of variability of each of these subspecies. For rhabdosomes of *Bohemograptus bohemicus tenuis* (Bouc.), it ceases to increase, starting from the tenth theca, or increases very slightly (up to 1.2 mm).

Colonies of *Bohemograptus bohemicus bohemicus* (Barr.) are characterized by a continuous increase in width and after the tenth theca up to 1.6-2 mm. An important feature for distinguishing between these taxa is the position of the apex of the sikula. In *B. bohemicus bohemicus* (Barr.), it is located at the level of the aperture of the first theca or up to 0.35 mm above it. In *B. bohemicus tenuis* (Bouc.), the apex of the sicle sometimes does not reach the indicated level. Usually it is significantly lower (0.2-0.3 mm on average).

The convex lateral margins of the mouths of the thecae of the proximal and middle parts of the rhabdosoma of *Bohemograptus bohemicus bohemicus* (Barr.) bring it closer to *B. praecornutus* Urb., whose proximal thecae have very low lateral elevations. The difference between them is that the first of them have large rhabdosomes, and the lateral edges of all the theca do not have systematically developed distinct lateral elevations.

From *Bohemograptus urbaneki* Tseg. *B. bohemicus bohemicus* (Barr.) is distinguished by significantly larger rhabdosomes and their smaller width in the proximal and middle parts.

Remarks. The study of numerous chemically prepared rhabdosomes, previously related to *Bohemograptus careratus* Tseg., *B. arcuatus* Tseg., *B. insuetus* Tseg. (85) showed that the intraspecific variability of the width of their colonies and the length of the distal thecae are within the limits of the variability of the above characters of *Bohemograptus bohemicus bohemicus* (Barr.). In connection with this, they are placed in the synonymy of the latter.

Assignment of rhabdosomes depicted in the work of C. Holland and D. Palmer (131) in fig. 2 a-i, to *Bohemograptus bohemicus tenuis* (Bouc.), in our opinion, is not justified. The apex of the sicula in these colonies is located at the level of the aperture of the first theca or somewhat higher. A similar arrangement of it, judging by the chemically prepared collection of *Bohemograpts* from the Silurian of Volyno-Podolia, is characteristic of *Bohemograptus bohemicus bohemicus* (Barr.).

Assotiation. *Bohemograptus bohemicus tenuis* (Bouc.), *Pristiograptus gotlandicus* (Pern.), *P. vicinus* (Pern.), *P. tumescens* (Wood), *Saetograptus chimaera* (Barr.), *S. leintwardinensis* (Lapw.), *Colonograptus colonus* (Barr.), *Pseudomonoclimacis tauragensis* (Pask.), *P. haupti* (Kuhne), *Heisograptus micropoma* (Jaek.), *"Monograptus" huckei* (Munch), *Neodiversograptus beklemishevi* Urb.

Distributian. Middle and upper Silurian, Tiritian and lower part of the Ulichian Belt, *Neodiversograptus nilssoni-Saetograptus chimaera, Saetograptus leintwardinensis, Neocucullograptus kozlowskii-Neolobograptus auriculatus* zones; the Zabrodskaya, Oleshkovichskaya and Turskaya suites of the Polessky ledge of the basement; the Franopolskayal and Rusilovskaya suites of the Brest depression.

Material. More than 160 fragments of rhabdosomes on the surface of rocks recovered by wells Dublyany-4 in int. 4130-4138 m, Great Mosty-30 int. 3768.2-3774 m, Samoypichi-1859 on depths 408.6 m, 428.5 m, Shiev-4109 int. 443.7-445.6 m, 446.6-447.6 m; Guscha-4015 in int. 844-846 m, 860-863.4 m, 891.3-894.2 m, 894.2-895.8 m, 897.4-902.4 m, 902.4-906.4 m, 911, 3-915.7 m, 920-923 m, 953.7-962.5 m; Brest-1 on depths 513.6 m, 531.5 m, 534.3 m, 549.5 m, 550.3 m, 557.8 m, 559.7 m, 560.4 m, 586 m, 642 m, 686 m, 702 m; Ivano-Frankivsk-1 in int. 3492-3497 m, Harsy-1873 int. 339.5-340 m, 341-342 m, 342.7-343.7 m, 345.5-346 m, 346-346.5 m, 348.2-348.5 m, 348.5-349 m , 350.7-351.3 m, depth 353 m, 354.5 m, 356 m, 356.5 m, 357.8 m, 358.3 m, 362.5 m, 367.7 m, 372.9 m.

There are 65 fragments of rhabdosomes, which were extracted from the rocks of the borehole. Guscha-4015 in int. 860-863.4 m, 887-891 m, 891-894.2 m, 894.2-897 m, 897-902 m, 902-906 m, 911-915 m, 920-923 m, 927-931 m , 933-937 m, 941.8-952.6 m, 952.6-961.8 m, 961.8-967 m, 972-976 m; Brest-1 on Ch. 534.3 m, 557.8 m, 559.7 m.

Bohemograptus bohemicus tenuis (Boucek, 1936)

Tab. XLI, fig. 6.7; tab. XLII, fig. 1- 6

Monograptus bohemicus tenuis: Boucek, 1936, c. 4, tab. I, fig. 4, 5.

Monograptus bohemicus: Chernyshev, 1941, p. 79 (pars), pl. 2, fig. 14 (non Figs. 9-13).

Pristiograptus bohemicus af. tenuis: Obut, Sobolevskaya, Bondarev, 1965, p. 64, tab. 10, fig. 4.

Pristiograptus bohemicus tenuis: Root, Ulst, 1967, p. 254, tab. 29, fig. 7.

Pristiograptus bohemicus pawlinovi: Krandievsky, 1968, p. 42, tab. 8, fig. 7.

Bohemograptus bohemicus tenuis: Urbanek, 1970, p. 275, tab. 11, 12, tab. 13, fig. A, B, tab. 14-19, tab. 20, fig. B, tab. 21, 22, fig. 12-15; Holland and Palmer, 1974, p. 219 (pars), pl. 21 (non fig. 2a-i); Mikhailova, 1976, pl. 1, fig. 8, 9; Pribyl, 1981, p. 374, fig. 2, fig. 6; Root, 1986, p. 131, tab. 34, fig. 1-5, fig. 36.

Bohemograptus tenuis: Tsegelnjuk, 1976, p. 129, tab. 41, fig. 1-5.

Bohemograptus circinatus: Tsegelnjuk, 1976, p. 130, tab. 41, fig. 6-8.

Holotype. Bousek, 1936, pl. 1, fig. 5, distal rhabdosome; Kopanin beds of the Czech Republic, Ludlow Group, *Saetograptus leintwardinensis primus* zone.

Description. Rhabdosomes are strongly ventrally curved in the proximal and arcuate in the middle and distal parts. The length of individual fragments exceeds 25-30 mm. Their width at the level of the mouth of the first theca is 0.45-0.6 mm, immediately above - 0.2-0.3 mm, at the level of the mouth of the second theca - 0.45-0.65 mm, the fifth - 0.55-0 .95 mm, the tenth - 0.9-1.05 mm and then does not change or gradually increases in the distal parts to 1.1-1.2 mm.

The thecae are represented by tubes expanded from bottom to top. In the proximal parts they are inclined to the axis of the rhabdosomes at angles of 13-20°, in the distal - 25-30°.

The lateral margins of the distal thecae are usually concave, those of the procoimals are almost straight or slightly convex. They often have microfuselage "additives" (210) up to 0.15 mm high. The lateral-dorsal parts of the walls of the proximal and distal thecae of some rhabdosomes show a distinct asymmetry - the edges of the left walls of the theca are slightly higher than those of the right ones. This is also characteristic of the Polish representatives of this species (210, fig. 12 A, B).

The length of the first theca is 1.3-1.5 mm, the second is 1.2-1.7 mm, the fifth is 1.3-1.95 mm, and the tenth is 1.9-2 mm. The length of subsequent leaks does not exceed 2-2.2 mm. The length of proximal leaks is 0.9-1.4 mm, distal - 1.3-1.4 mm. The length of the proximal metathecus is 0.2-0.8 mm, the distal one is 0.7-1.1 mm. The width of the proximal metathecus at the level of their mouths is 0.24-0.4 mm, the distal one is 0.5-0.6 mm. The degree of overlap of the proximal theca 1/5-2/5, middle and distal parts of rhabdosomes - 1/2. The length of proximal theca exceeds their width by 3-5 times, distal - by 4-4.5 times.

There are 10-12 thecae in 10 mm proximals, 7-10 thecae in distals.

Sicula narrow, ventrally curved. Its length is 1.15-1.5 mm, the width of the mouth is 0.33-0.38 mm. The apex of the sicula is located 0.1-0.36 mm below the level of the aperture of the first theca, and the beginning of the latter is 0.13-0.24 mm above the base of the sicula. The length of the virgella is 0.4-0.7 mm. The edges of the mouths of the siculae of some rhabdosomes, like the virgellas, are provided with microfuselage formations.

Variability. According to the width of rhabdosomes in our collection there are two groups of forms. The maximum width of the first of them does not exceed 0.8 mm, the second reaches 1.1-1.2 mm. Narrow forms are described from the Silurian of Barrandien (113) and Taimyr (54). In the limits of Volyno-Podolia, they were identified as a separate species *Bohemograptus circinatus* Tseg. (85). The study of numerous chemically dissected rhabdosomes leads to the conclusion that they are highly intraspecific in terms of this trait.

Comparison. In terms of the degree of curvature of rhabdosomes and the width of their proximal parts, this subspecies is very close to *Bohemograptus bohemicus bohemicus* (Barr.). It differs from the latter in the smaller width of the middle and distal parts of the colonies (0.8-1.2 mm compared to 1.6-2 mm in *Bohemograptus. bohemicus bohemicus*) and the position of the apex of the siculum below the level of the mouth of the first theca. The length of the latter is also a good sign for the separation of these subspecies. In *Bohemograptus bohemicus bohemicus* (Barr.) it does not exceed 1.2 mm, while in *B. bohemicus tenuis* (Bouc.) it is more than 1.3 mm.

From *Bohemograptus cornutus* Urb. this subspecies is distinguished by the absence of ventral-lateral microfusellar aperture lobes and the position of the apex of the sicula indicated above.

Association. Together with *Bohemograptus bohemicus tenuis* (Bouc.), there are *B. bohemicus bohemicus* (Barr.), *B. cornutus* Urb., *Skalograptus vetus* Tseg., *Neocucullograptus inexspectatus* (Bouc.), *N. kozlowskii unicornus* Urb., *Ludensograptus parultimus* (Jaeg.) .

Distributian. Upper Silurian, Ulichian and lower Przhidolian Belts, upper *Saetograptus leintwardinensis* zone, *Neocucullograptus kozlowskii-Neolobograptus auriculatus, Formosograptus formosus-Bugograptus spineus* zone, and lower *Istrograptus ultimus-Ludensograptus parultimus* zone; the upper part of the Zabrodskaya, the upper part of the Turskaya, the lower part of the Gornikskaya, Oleshkovichskaya, Novinskaya and Milovanskaya suites of the Polessky ledge of the foundation, the upper parts of the Franopolskaya, Rusilovskaya and lower parts of the Lesnyanskaya suites of the Brest depression, the upper part of the Zheldetskaya and Peremyshlyanskaya suites of the Lvov trough.

Material. More than 100 fragments of rhabdosomes on the surface of marls and mudstones, uncovered by the Gushcha-4015 wells in the int. 667-672 m, 690-694 m, 760-763 m, 786-790 m, 790-794 m, 860-863 m, 886-891 m, 895.8-897.4 m, 897.4-902, 4 m, 902.4-906.4 m, 906.4-911.3 m, 920-923 m, 928-931 m; Brest-1 on depths 513.6 m, 518 m, 532.5 m, 543.5 m, 545.5 m, 546.5 m, 547 m, 561.8 m, 562.3 m; Litovezh-1 on depth 2588 m, Dublyany-4 in int. 4097-4104.6 m, 4130-4138 m; Pulemets-1884 on ch. 776 m, Kusnishche-5394 on depths 495 m, 502 m, 509 m; Pripuki-1844 on ch. 239 m, 327 m, 350 m, 387 m; Zagaipol-1 int. 2800-2802 m.

There are 15 rhabdosomes extracted from the rocks of the borehole. Guscha-4015 in int. 789.9-794 m, 860-863.4 m, 891.3-894.2 m, 906.4-911.3 m, 915.7-920.3 m, 920-923 m; Brest-1 on depths 499.7 m, 516.2 m, 559.7 m.

Bohemograptus praecornutus Urbanek, 1970

Tab. X, draw. 3, 4; tab. XLIII, fig. 4-12

Bohemograptus praecornutus: Urbanek, 1970, p. 301, tab. 20, fig. C, tab. 23, 24, fig. sixteen.

Holotype. Urbanek, 1970, pl. 23, fig. C 1-C 3, proximal rhabdosome; Sedlec beds of Poland, Ludlow Group, *Bohemograptus praecornutus* zone.

Description. Small ventrally curved rhabdosomes. Our collection contains fragments of proximal, middle, and distal parts of colonies 3–5 mm long. Their width at the level of the mouth of the first theca is 0.55-0.7 mm, directly above - 0.25-0.45 mm, at the level of the second theca - 0.65-0.8 mm, the fourth - 0.8-1 mm , fifth - 1.3-1.4 mm. The maximum width of the distal fragments is 1.5 mm.

Thecae are straight or slightly ventrally curved cylindrical tubes. They are inclined to the axis of the rhabdos at angles of 27-35 degrees.

The lateral edges of the mouths are provided with gentle wide elevations. The height of the latter in the first two or three proximal theca does not exceed 0.02-0.04 mm. In subsequent thecae, their height increases to 0.06-0.08 mm. The greatest height of elevations in the distal theca, in which they reach 0.12 mm. Lateral elevations are replaced by distinct ventral depressions of the theca mouths. Elevations and depressions are formed by normal fuseluses.

The lateral eminences of only some distal theca were enlarged by filamentous microfuseluses. The height of the microfuselage parts of the elevations is 0.03-0.06 mm. Despite the relatively low height of the lateral elevations and the depth of the ventral depressions, they give all the thecae of this species a characteristic shape.

The length of the first theca is 1-1.2 mm, the second - 0.95-1.2 mm, the fourth - 1-1.4 mm, the fifth - 1.3 mm; tec of middle parts of rhabdosomes - 1.6-1.9 mm, distal tec - 2.4-2.5 mm. The length of proximal leaks is 0.75-0.95 mm, distal - 1-1.1 mm. The length of the proximal metathecus is 0.2-0.5 mm, the distal one is 0.75-1.3 mm. The degree of overlap of the proximal theca 1/5-1/3, distal - 1/2. The length of the proximal theca exceeds their width by 2.9-3.2 times, the distal - by 3.2-3.8 times.

In 5 mm of the length of the proximal parts of the rhabdosomes, there are 5.4-5.7 theecae, the distal ones - 4.5-5.9 thecae.

Sicula slightly ventrally curved. Its length is 1.65-1.8 mm, the mouth width is 0.4-0.45 mm. The apex of the sicula is located 0.06-0.36 mm above the level of the aperture of the first theca. The base of the latter is located 0.3-0.35 mm above the mouth of the sicula. Virgella length 0.5-0.7 mm.

Variability. The degree of curvature of the proximal parts of the rhabdosomes and the height of the lateral elevations of the proximal theca vary markedly. The position of the apex of the siculum relative to the level of the aperture of the first theca is also variable.

Comparison. According to the general form of the rhabdosome *Bohemograptus praecornutus* Urb. closest to *Bohemograptus cornutus* Urb. It differs from the latter in the shape of the aperture structures of the theca in the form of wide lateral elevations, the size of which gradually increases from bottom to top along the rhabdosomes. Microfuselage aperture formations in *Bohemograptus praecornutus* Urb. are rare. They only slightly increase the lateral elevations. In addition, the rhabdosomes of *Bohemograptus praecornutus* Urb. differ from rhabdosomes of this species in greater width (1.5 mm instead of 0.8-1 mm in *B. cornutus*) and longer distal thecae (2.4-2.5 mm instead of 1.4-1.68 mm in *B. cornutus).*

Remark. A.Urbanek identified the *Bohemograptus praecornutus* subzone based on the stratigraphic distribution of this species above the finds of *Saetograptus leintwardinensis* (Lapw.) in the well Melnik (210). Our data show that *Bohemograptus praecornutus* Urb. appeared in the geological record (in sections of outcrops and boreholes) at the very beginning of the *Saetograptus leintwardinensis* zone.

Association. Together with this species, there are *Bohemograptus cornutus* Urb., *Polonograptus egregius* Urb., *Saetograptus leintwardinensis* (Lapw.), *Neolobograptus fragilis* Tseg.

Distribution. Middle and upper Silurian, upper part of the Tiritian and lower part of the Ulichian belt , Konovian and lower part of the Tagrian Stages, *Saetograptus leintwardinensis* zone and lower part of the *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper part of the Zabrodskaya and the lower part of the Oleshkovichskaya suite of the Polessky ledge of the basement, the upper part of the Franopolskaya and the lower part of the Rusilovskaya suites of the Brest depression.

Material. 28 fragments of rhabdosomes recovered from rocks recovered by wells Gushcha-4015 in int. 860-863.4 m, 886-891 m, 902-906 m, 915-920 m, 920-923 m, 941.8-952.6 m and Brest-1 on depth 550.3 m, 557.8 m.

Bohemograptus cornutus Urbanek, 1970

Tab. X, draw. 5, 6; tab. XLII, fig. 7-13; tab. XLIII, fig. 1-3

Bohemograptus cornutus: Urbanek, 1970, p. 310, tab. 20, Fig. D, tab. 25-28.

Holotype. Urbanek, 1970, pl. 25, fig. A 1, A 2, proximal rhabdosome; Sedlec Beds of Poland, *Bohemograptus cornutus* zone.

Description. Small ventrally curved colonies. The length of individual fragments prepared chemically is 2-4.5 mm. Their width at the level of the mouth of the first theca is 0.55-0.72 mm, directly above the mouth 0.3-0.32 mm, at the level of the mouth of the second theca - 0.6-0.72 mm. The width of the distal fragments of the colonies is 0.8-1 mm.

Thecae are represented by straight short cylindrical tubes. In the extreme proximal they are inclined to the axis of the rhabdosom at angles of 13-15°, in the distal part - 22-32 degrees. The edges of the mouths of the thecae, especially the proximal and middle parts of the rhabdosomes, are equipped with complex aperture structures, the formation of which occurred in two stages of colony growth.

In the first of them, elevations 0.04-0.06 mm high were formed on the lateral walls of the theca. In the distal direction, they increase to 0.18 mm. On the side of the ventral walls, depressions of the aperture edge are observed due to the narrowing and wedging out in the ventral direction of the last ordinary (normal) fuseluses. Further growth of the aperture structures of the tech was carried out by filamentous microfuseluses (210, pp. 310-321).

The lateral elevations of the proximal theca were enlarged by ribbon-like ventral-lateral lobes up to 0.32 mm long. Their width is 0.05-0.08 mm. The lower and upper edges of these blades were overgrown with concentric microfuseluses. They formed membranous circular structures, the diameter of which varies from 0.8 to 0.92 mm. Up the rhabdosome, the length of the ribbon-like lobes gradually decreases. They are replaced by wide lateral elevations of microfuseluses up to 0.26 mm high.

The depression of the ventral margins of the theca reaches 0.2–0.3 mm. The height of the microfuselage elevations in the distal direction also decreases. Our collection contains fragments of the distal parts of rhabdosomes, whose lateral elevations decrease in the interval of three theca from 0.12 mm to hardly distinguishable.

The length of the first theca is 1.02-1.2 mm, the second is 1.08-1.24 mm. The length of the distal theca is 1.4-1.98 mm. The length of proximal leaks is 0.6-1 mm, distal - 0.8-0.9 mm. The length of the proximal metathecus is 0.4-0.42 mm, the distal one is 0.6-1 mm. The degree of overlap of the proximal theca 1/3, distal - 1/2-2/5. The length of the proximal and distal theca exceeds their width by 3-3.6 times.

In 5 mm of the proximal parts of rhabdosomes, there are approximately 5 thecae, in the distal - 4-6 thecae.

Sicula slightly ventrally curved. Its length is 1.5-1.56 mm, the width of the mouth is 0.3-0.36 mm. The apex of the sicula is located 0.06-0.08 mm above the level of the aperture of the first theca. The base of the latter is 0.21-0.24 mm above the mouth of the sicula. Virgella length 0.36-0.42 mm. The edges of the mouth of the sicula and virgella are enlarged by microfuseluses.

Variability. Aperture formations are subject to the greatest variability - their shape and size. It should also be taken into account that relatively large microfuselage and membranous structures are very fragile and are subject to destruction when rhabdosomes are extracted from rocks.

Comparison. This species is the closest in form of rhabdosomes to *Bohemograptus praecornutus* Urb. It differs from the latter by the wide development of microfusellar aperture structures in the proximal and middle parts of the colonies in the form of ribbon-like ventral-lateral lobes and elevations, which gradually decrease in the distal direction.

From *Bohemograptus bohemicus tenuis* (Bouc.), which occasionally has similar microfuselage aperture formations, *B. cornutus* Urb. differs in the constant presence of ribbon-like ventral-lateral lobes in the theca of the proximal and middle parts of the rhabdosomes, as well as in the location of the apex of the siculum above the level of the aperture of the first theca (in *B. bohemicus tenuis* Bouc., the apex of the siculus is usually located below this level).

Canadian *Monograptus cf. cornutus* Urb. differ from the Ukrainian (Volyno-Podolian) forms by a greater width of rhabdos and the absence of lateral lobes on the first two or three proximal thecae (135).

Remarks. Based on the stratigraphic distribution of *Bohemograptus cornutus* Urb. in the section of the well Melnik A.Urbanek (210) proposed to allocate the *Bohemograptus cornutus* zone. Within Volyno-Podolia, the base of this zone coincides with the top of the *leintwardinensis* zone. This level is a biostratigraphic boundary between the Tiritian and Ulichian chronostratigraphic belts (above horizons) of the southwestern margin of the East European Platform.

Assotiation. It occurs together with *Polonograptus egregius* Urb., *Bohemograptus bohemicus tenuis* (Bouc.), *B. praecornutus* Urb.

Distribution. Upper Silurian, lower part of Ulichian Belt, lower *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper part of the Zabrodskaya and the lower part of the Oleshkovichskaya suites of the Polessky ledge of the basement.

Material. 10 fragments of rhabdosomes extracted from the rocks of the borehole Guscha-4015 in int. 891.3-894.2 m, 897.4-902.4 m, 902.4-906.4 m, 906.4-911.3 m, 915.7-920.3 m, 920.3-923 m.

Genus *Neocucullograptus* Urbanek, 1970

Neocucullograptus inexspectatus (Boucek, 1932)

Tab. XI, draw. 1-3; tab. XLIV, fig. 1-11

Neocucullograptus inexspectatus inexspectatus: Urbanek, 1970, p. 329, tab. 31-34, figs. 17; Tsegelnjuk, 1976, p. 132, tab. 42, fig. 1, 2.

Holotype. Boucek, 1932, p. 151, fig. 1 (E, F); Kopanin layers of the Czech Republic (210).

Description. Ventrally folded in the proximal and arcuately curved in the middle and distal parts of the rhabdosome more than 40 mm long. Their width at the level of the mouth of the first theca is 0.35-0.43 mm, directly above the mouth - 0.16-0.2 mm, at the level of the fifth theca - 0.52 mm, the tenth - 0.7 mm, the fifteenth - 0.9 mm, in the extreme distal parts - 1.2-1.25 mm.

Thecae are represented by straight narrow tubes. In the proximal part, they are inclined to the axis of the rhabdos at angles of 13-23, in the distal - 10-14 degrees.

The mouths of all the thecae are equipped with lateral symmetrical elevations 0.05-0.25 mm high, which are formed by 1-3 normal fuseluses wedging out in the dorsal-ventral direction. These elevations were the basis on which, as the colonies grew, a complex asymmetric aperture apparatus was formed.

It is the simplest in the first or second proximal theca - the indicated elevations grew in narrow strips of numerous filiform microfuseluses (210).

In subsequent proximal and distal thecae, the right lateral eminences, which were later slightly built up by microfuseluses, are located on the continuation of the lateral walls of the thecae.

In contrast to the right ones, the left elevations of the theca grew extremely rapidly with microfuseluses and turned into large lobes that curved towards the mouths, completely overlapping them and the ventral edges of the theca. The spatulate ends of the left lateral lobes hang over the anterior (ventral) edges of the theca mouths. In distal thecae, they even hang down, covering the ostia of the ventral walls.

Thus, two stages are distinguished in the formation of the described aperture structures:

1) the formation of symmetrical lateral blades from normal fuseluses and

2) sharply uneven growth of their filamentous microfuseluses.

It should be noted the amazing accuracy and clarity in the repeated repetition of such a complex aperture structure in all the theca rather large colonies.

The length of the first theca is 1.35-1.75 mm, its leaks are 1.2-1.4 mm, metatheca are 0.15-0.3 mm; second theca - 1.4-1.56 mm, leaks - 1-1.26 mm, metatheca - 0.3-0.4 mm; the third - 1.6 mm, leaks - 1.2 mm, metatheques - 0.4 mm; fifth - 1.7 mm, tenth - 2.08 mm, fifteenth - 2.12 mm, twentieth - 2.5 mm, twenty-seventh - 3.02 mm. The length of the metathecae of the first ten thecae increases from 0.15 to 0.9 mm, their width is 0.17-0.27 mm. The length of the metathecus of the middle and distal parts of the colonies is 1-1.75 mm, their width is 0.27-0.33 mm. Proximal theca overlap 1/4-1/5, distal - 1/2-3/5 of their length.

In 10 mm length of rhabdosomes, there are 8.8-10 thecae.

Sicula straight or slightly curved ventrally. Its length is 1.45-1.6 mm, the mouth width is 0.25-0.28 mm. The apex of the sicula is located 0.36-0.55 mm below the level of the mouth of the first theca. Budding of the first theca occurred at a height of 0.35-0.4 mm from the mouth of the sicula. The distance from the last to the end of the first theca is 1.9-1.95 mm. Virgella length 0.4-0.5 mm. The length of the dorsal outgrowth of the sicula does not exceed 0.12 mm.

The mouths of the sicules also have microfusellar "additives" (200). The study of them shows that they begin to build up the edges of the mouth only after the first theca is completely formed. At the first stage of growth, filamentous microfuseluses form narrow strips, which are located on the edge of the siculum completely formed by normal fuseluses. Subsequently, symmetrical elevations 0.06-0.09 mm high grew on the lateral edges of the mouths of the siculum.

Variability. The length of the sicula, its location relative to the level of the mouth of the first theca, the length of the theca and metatheca vary.

Comparison. This subspecies differs from *Neocucullograptus kozlowskii kozlowskii* Urb. the absence of lateral and rostral outgrowths of the aperture apparatus of the theca, as well as a smaller overlap of the proximal and distal theca.

Remark. The measurements of the size of sicula and theca given in the description do not allow distinguishing this subspecies from *Neocucullograptus kozlowskii kozlowskii* Urb., although these taxa differ quite clearly in other characters (see the "Comparison" section).

Association. It occurs together with *Neolobograptus auriculatus* Urb., *Bohemograptus bohemicus tenuis* (Bouc.).

Distribution. Middle and upper Silurian, upper Tiritian and lower part of the Ulichian Belts, upper *Saetograptus leintwardinensis* zone and *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the Rusilovskaya suite of the Brest depression, the upper part of the Zabrodskaya and the lower part of the Oleshkovichskaya suites of the Polessky ledge, the Peremyshlyanskaya suite of the Lvov trough.

Material. 10 fragments of rhabdosomes on the surface of argillites, marls, and limestones drilled by the Gushcha-4015 wells in int. 920-923 m, 928.2-931.1 m, 933.4-936.9 m; Brest-1 on depths 501.5 m, 534.3 m, 536.9 m; Dublyany-4 in int. 4130-4138 m, 4143-4148.1 m.

There are also 15 fragments of colonies extracted from the rocks of the borehole Guscha-4015 in int. 886.6-891.3 m, 895.8-897.4 m, 902.4-906.4 m, 906.4-911.1 m, 911.3-915.7 m.

Neocucullograptus kozlowskii kozlowskii Urbanek, 1970

Tab. XI, draw. 4, 5; tab. XII, draw. 3; tab. XLV, fig. 1-4

Neocucullograptus kozlowskii: Urbanek, 1970, p. 348, tab. 37-39, fig. 18-20; Tsegelnjuk, 1976, p. 132, tab. 41, fig. eleven; Root, 1986, p. 135, tab. 36, fig. 4, 6-8, fig. 38.

Holotype. Urbanek, 1970, fig. 20, fragment of the distal rhabdosome; Sedlec layers of Poland, *Neocucullograptus kozlowskii* zone.

Description.. Significantly curved ventrally in the proximal and arched in the middle and distal parts of the rhabdosome more than 13 mm long.

A strong ventral bending of the rhabdosomes begins immediately above the mouth of the first theca, where their width is 0.36 mm. The width of the proximal fragments in the collection at the level of the mouths of the flow is 0.54-0.65 mm, directly above them - 0.2-0.3 mm. The width of the distal fragments, taking into account the aperture structures of the tech, is 1.2–1.55 mm.

Thecae - straight narrow tubes inclined at angles of 10-20 degrees.

They have a complex asymmetric aperture apparatus similar to that described above in *Neocucullograptus inexspectatus* (Bouc.). It consists of vertically located elevations of the right parts of the thecae and very long, overlapping the mouths of the theca, left lobes built of filamentous microfuseluses.

Its difference lies in the fact that *Neocucullograptus kozlowskii kozlowskii* Urb. on the lateral edges of the left lobes and in the lateral-dorsal parts of the right eminences, unclosed (open on one side) tubular outgrowths up to 0.4 mm long grew. In the rhabdosomes present in the collection, for example, the length of rostral outgrowths reaches 0.12 mm already in the first theca.

The length of the first theca is 1.53 mm, its leaks are 1.32 mm, the metatheca are 0.21 mm; procoimal theca - 1.26-1.62 mm, their leak - 0.78-1.08 mm, metathecus - 0.48-0.57 mm; distal techs - 2.2-3.1 mm, their duct - 0.8-1.2 mm, metathecus - 1.4-1.9 mm. The width of the procoimal metathecus is 0.18-0.21 mm, the distal metathecus is 0.25-0.33 mm. The degree of overlap of the proximal theca 1/3-2/5, distal - 2/3-3/4.

There are 9-11 thecae in 10 mm of rhabdosome length.

Sikula and first theca straight or only slightly curved ventrally. Its length is 1.29 mm, the mouth width is 0.24 mm. The apex is located below the level of the mouth of the first theca by 0.49 mm. The beginning of the first theca is 0.35 mm above the mouth of the sicula. From the base of the last to the end of the first theca 1.86 mm. Virgella length 0.25 mm. The length of the microfuselage lateral vanes of the sicle does not exceed 0.06 mm.

Variability. The degree of ventral curvature of the rhabdosomes, the width of the left aperture lobes, and the length of the rostral outgrowths vary.

Comparison. From the closely related *Neocucullograptus kozlowskii unicornus* Urb. this subspecies is distinguished by the presence of both lateral and rostral tubular outgrowths of the aperture apparatus of the thecae, as well as by the greater width of the rhabdosomes.

Remark. In the interval 860-863.4 m wells. Gushcha-4015, together with fragments of rhabdosomes of this subspecies, were found *Neocucullograptus kozlowskii unicornus* Urb., which are also found further down the section of this borehole. Fragments of colonies of *Neocucullograptus kozlowskii kozlowskii* Urb.

Consequently, in the interval of 860-863.4 m of this well in a continuous geological section, a phylogenetic change in time of closely related taxa was established.

Association. This subspecies occurs together with *Neocucullograptus kozlowskii unicornus* Urb., *Ludensograptus latilobus* (Tseg.).

Distribution. Upper Silurian, lower part of the Ulichian Belt, Tagrian Stage, *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper parts of the Oleshkovichskaya, the lower parts of the Novinskaya and Gornikskaya suites of the Polessky ledge of the basement, the Rusilovskaya suite of the Brest depression.

Material. Two distal fragments of rhabdosomes on the surface of marls recovered from well Priluky-1844 on depth 346.4 m.

There are also 3 proximal fragments of colonies recovered from the rocks of the Brest-1 wells at depth 518.5 m, Guscha-4015 int. 842.5-844.5 m, 860-863.4 m.

Neocucullograptus kozlowskii unicornus Urbanek, 1970

Tab. XII, draw. 4; tab. XIV, draw. 4; tab. XLIV, fig. 12-14; tab. XLV, fig. 5-8.

Neocucullograptus kozlowskii var. unicornus: Urbanek, 1970, p. 360, tab. 40.

Holotype. Not specified. Syntypes are shown in Urbanek, 1970, pl. 40, fragments of distal thecae from the Sedlec beds of Poland, *Neocucullograptus kozlowskii* zone.

Description. Arcuately curved ventrally throughout the entire length of the rhabdosome. A noticeably stronger bend is observed only within the leakage of the second theca.

The width at the level of the mouth of the first theca is 0.42 mm, directly above - 0.18 mm, at the level of the second theca - 0.54 (0.28) mm, the third - 0.6 (0.3) mm, fourth -0.65 (0.36) mm. The width of the proximal parts of the colonies in the collection is 0.6-0.66 (0.24-0.36) mm, the distal - 0.7-0.8 (0.5-0.6) mm.

Thecae is a long narrow tube inclined to the axis of the rhabdos at an angle of approximately 15 degrees.

The mouth of the first theca has almost symmetrical lateral elevations of normal fuseluses 0.08 mm high, on which there are strips 0.02 mm high of filiform microfuseluses. The depth of depression of the ventral edge of the orifice is 0.1 mm. The lateral-dorsal edge of the microfusellar strip of the right lateral eminence is turned approximately at a right angle to the theca wall and forms an open small tubular outgrowth.

In the second and subsequent thecae, it gradually grows with filamentous microfuseluses. The left microfusellar eminence rapidly increases to a lobe that overlaps the mouth of the second theca. Its spatulate end is at the level of the edge of the ventral wall. It descends below the edge by 0.04 mm already at the third theca. In the distal ducts, the lobe descends below the edges of the mouths to 0.15 mm. the lateral tubular outgrowth of the right lateral eminence gradually increases to 0.3-0.4 mm.

The left lobe remains comparatively narrow in all theca colonies. There is no isolated rostral outgrowth.

The length of the first theca is 1.56 mm, its leaks are 1.38 mm, the metatheca are 0.18 mm; the second - 1.5 mm, leaks - 1.14 mm, metatheques - 0.36 mm; the third - 1.35 mm, leaks - 0.93 mm, metatheques - 0.42 mm; fourth - 1.44 mm, leaks - 1.02 mm, metatheques - 0.42 mm.

In general, the length of the proximal theca is 1.35-1.62 mm, their protecus is 0.93-1.38 mm, metathecus is 0.18-0.48 mm. The length of the distal thecae is 1.9–2 mm, their protecus is 1 mm, and the metathecus is 0.9–1 mm. The width of the proximal metathecus is 0.18-0.23 mm, the distal one is 0.24-0.3 mm. Proximal theca overlap by 1/3-1/4, distal - by 1/3-2/5 of their length.

There are 4 thecae in 5 mm of the proximal part, and 5 thecae in the distal parts.

Sicula slightly ventrally curved. Its length is 1.38 mm, the width of the mouth is 0.3 mm. The apex of the sicula is located 0.6 mm below the level of the mouth of the first theca. Budding of the first theca occurred at a distance of 0.4 mm from the mouth of the sicula. The distance from the last to the end of the first theca is 1.98 mm. The height of the lateral microfuselage elevations does not exceed 0.09 mm.

Variability. The length of the lateral outgrowths of the right elevations of the proximal thecae varies.

Comparison. From the nominal subspecies *Neocucullograptus kozlowskii unicornus* Urb. differs in the absence of rostral tubular outgrowths of the left lobes of the theca, as well as in the smaller width of the rhabdosomes and less overlap of the proximal and distal theca.

Remarks. From the measurements given in the description, it can be seen that this subspecies does not differ from the nominal one in terms of the size of the sicula and thecae. However, they differ well in other features, which, apparently, is sufficient for the species rank of these taxa.

Association. Occurs together with *Bohemograptus bohemicus tenuis* (Bouc.), *Pseudomonoclimacis tauragensis* (Pask.), *Neocucullograptus kozlowskii kozlowskii* Urb., *Polonograptus egregius* Urb.

Distribution. Upper Silurian, upper part of the Ulichian Belt, Tagrian Stage, *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; Oleshkovichskaya suite of the western slope of the Polessky ledge of the basement.

M a t e r i a l. 10 fragments of rhabdosomes extracted from the rocks of the borehole Guscha-4015 in int. 860-863.4 m, 894.2-895.8 m.

Family *Cyrtograptidae* Boucek, 1933

Subfamily *Linograptinae* Obut, 1957
nom. transl. Teller, 1962 (ex *Linograptidae* Obut, 1957)

Genus *Neodiversograptus* Urbanek, 1963

Neodiversograptus nilssoni (Barrande, 1850)
emend. Urbanek, 1963; Palmer, 1971

Tab. XII, draw. 1, 2; tab. XLV, fig. 9-12

Pristiograptus (Pristiograptus) nilssoni: Pribyl, 1952, p. 28, tab. 1, fig. 1-3; Urbanek, 1954, p. 300, fig. 13-16.

Pristiograptus nilssoni: Urbanek, 1958, p. 80 (pars), fig. 52-55, 56 C (non 56 A, B).

Monograptus nilssoni: Jaeger, 1959, c. 138, fig. 22 b 1 (? 22 b 2); Jaeger and Robardet, 1979, pl. 1, fig. 9, 15.

Neodiversograptus nilssoni: Urbanek, 1963, p. 150, tab. 2-4; Obut, Sobolevskaya, Bondarev, 1965, p. 97, tab. 19, fig. 5-9; Willefert, 1966, p. 87, fig. 26a-b; Koren, Ulst, 1967, p. 262, tab. 30, fig. 13, 14, tab. 31, fig. 1, fig. 76; Abduazimova, 1970, p. 64, tab. 2, fig. 10, 11, fig. 21; Palmer, 1971, p. 366, fig. 3, 5, 9, fig. 4, 6, 8, 10; Berry and Murphy, 1975, p. 96, tab. 14, fig. 3, 4; Pashkevichius, 1979, p. 191, tab. 17, fig. 7.

non *Graptolithus nilssoni:* Barrande, 1850, c. 51, tab. 2, fig. 16-18.

non *Monograptus nilssoni:* Lapworth, 1876, c. 315, tab. 10, fig. 7; Wood, 1900, p. 482, tab. 25, fig. 28, fig. 24; Elles and Wood, 1911, p. 369, tab. 37, fig. 1, fig. 241; Hundt, 1924, p. 70, tab. 3, fig. 2-4, tab. 8, fig. 4; Boucek, 1936, p. 5, tab. 1, fig. 18-20; Haberfelner, 1936, p. 212, fig. 1a; Willefert, 1962, p. 35, fig. 12.

non *Monograptus (Pristiograptus) nilssoni*: Obut, 1949, p. 20, tab. 3, fig. 5.

non *Pristiograptus (Pristiograptus) nilssoni:* Tomczyk, 1956, p. 51, tab. 5, fig. 2, fig. thirteen.

non *Pristiograptus nilssoni:* Munch, 1942, c. 246, tab. 1, fig. 2.3; Krandievsky, 1968, p. 39, tab. 8, fig. one.

Neotyp. Palmer, 1971, figs. 5 D, fig. 8 (A, B), bipolar rhabdosome, Ludlow deposits of Great Britain, *Neodiversograptus nilssoni* zone.

Description. The fragments of straight, as well as slightly ventrally and dorsally curved rhabdosomes more than 36 mm long, present in our collection, represent only the monograptid stage of this species.

Their width at the level of the top of the sicula is 0.24 mm, at the level of the mouth of the first theca - 0.3-0.36 mm, directly above it - 0.12-0.15 mm. In the distal direction, the width of rhabdosomes increases very gradually up to 0.54-0.66 mm at the level of the mouths of the thecae, directly above them - up to 0.3-0.36 mm.

Thecae are in the form of tubes rapidly expanding towards the mouths. The edges of the proximal techs are even, the planes of their mouths are inclined downward (relative to the horizontal line) at angles of 8-10 degrees.

In the middle and distal parts of the rhabdosomes, the planes of the stomata are located almost horizontally. The lateral walls of the theca end, judging by the well-preserved samples, in small symmetrical elevations, the height of which does not exceed 0.03 mm.

The width of the proximal leaks at their base is 0.18-0.24 mm, the width of the metathecus at the level of the mouths of the leaks is 0.26-0.28 mm. The length of the first theca is 1.26-1.6 mm, the leaks are 1.11-1.43 mm, the metatheca are 0.15-0.17 mm. The length of the flow of the middle and distal parts of the rhabdosome is 1.74-1.98 mm, the length of the flow is 1.44-1.68 mm, the metathek is 0.3-0.38 mm. The width of the leaks at their base is 0.2-0.26 mm, the width of the metathecus at the level of the mouths of the leaks is 0.28-0.42 mm. Proximal theca overlap by 1/4-1/5, middle and distal - by 1/3-1/4 of their length.

There are 6-7 thecae in 10 mm of rhabdosome length.

Sicula slightly ventrally curved. Its length is 1.2-1.32 mm, the mouth width is 0.3 mm. The apex of the sicula is located 0.42 mm below the level of the mouth of the first theca. The latter begins 0.35 mm above the mouth of the sicula. The distance from the mouth of the sicula to the end of the first theca is 1.62 mm. Virgella length 0.54 mm.

The lateral-dorsal margins of the mouth of the sicula end in symmetrical low elevations (up to 0.03 mm). On the dorsal side, they are separated by distinct depressions of the margin of the mouth. In one of the fragments of rhabdosomes we have, a dorsal sicular spine grew on the continuation of the left eminence (specimen no. 475). The length of the broken spike is 0.4 mm. In the second specimen, consisting of the siculum and the first theca (no. 476), the dorsal spine grew from the right eminence of the siculum mouth. Most of the spike is broken off, its preserved part is 0.08 mm. Sicular spines and elevations are important diagnostic features of this type of rhabdosomes.

Unfortunately, they are usually available for study only on fragments of procoimal parts of rhabdosomes extracted from rocks.

Variability. The general shape of rhabdosomes, the inclination of the mouths of the theca, and the length of the first theca vary.

Comparison. The primary branches of rhabdosomes of this species described above differ from those of *Neodiversograptus beklemishevi* Urb. greater width, greater length of interthecal septa, greater overlap of the thecae, shorter thecae length, and a large number of them in 10 mm length of rhabdosomes.

Remarks. The species *Graptolithus nilssoni* Barr., 1850 was described by I. Barand and entered stratigraphic practice as a zonal species of the lower part of the Ludlov Group (108, p. 51, pl. 2, figs. 16-18).

Subsequently, it turned out that it was established from fragments of rhabdosomes, which belong to various known Wenlock species of the genus *Cyrtograptus* Carr., 1867. In this regard, the lectotype of this species was chosen (113) from Ch. Lapworth's samples (157, pl. 10, fig. 7 a), found in the Lower Ludlov shales of Great Britain, which in itself is not eligible.

It is known that the lectotype must be chosen from the syntypes of the author of the species, and if this is not possible, as in this case, then the indicated specific name should be discarded in order to avoid confusion.

The indicated lectotype, as it turned out, belongs to the species *Lobograptus progenitor* Urb., 1966 (209). Therefore, as *Neodiversograptus nilssoni* (Barr.), the International Commission on Zoological Nomenclature approved the species first described by A. Urbanek (194) under the name *Pristiograptus (Pristiograptus) nilssoni* Barr. The neotype of the latter was proposed by D. Palmer (169).

Until recently, it was believed that this species is quite common in the Silurian deposits of various regions of the world. From the synonymy, it is clear that, in our opinion, rhabdosomes of other species often referred to it.

It should be noted that so far this species has not been studied enough. For example, we do not know clear criteria for diagnosing branches that were formed by budding from the mouths of sicules of monograptid branches, especially if the latter are separated (torn off, broken off) from the primary branches.

Association. This species occurs together with *Lobograptus simplex* Urb., *L. progenitor* Urb., *Saetograptus chimaera* (Barr.).

Distribution. Middle Silurian, Tiritian Belt, Gorstian stage, *Neodiversograptus nilssoni-Saetograptus chimaera* zone; the lower part of the Zabrodskaya suite of the Polessky ledge of the basement, the lower part of the Francopolskaya suite of the Brest depression.

M a t e r i a l. 5 fragments of rhabdosomes on the surface of marls, uncovered by wells Zaluzhye-27 at depth 440 m, Harsy-1873 at depths 346.5 m, 378 m; Brest-1 on depth 681 m, Guscha-4015 in int. 971.6-976 m.

There are 3 fragments of proximals extracted from the rocks of the well Guscha-4015 in int. 953.7-962.5 m, 967.2-971.6 m; Brest-1 on Ch. 721.5 m.

Neodiversograptus beklemishevi Urbanek, 1963

Tab. XIII, draw. 3, 4; tab. XLV, fig. 13, 14

Neodiversograptus beklemishevi: Urbanek, 1963, p. 162, tab. 5, 6, fig. 2.

Holotype. Urbanek, 1963, pl. 5, fig. C, proximal of the monograptid part of the rhabdosome; Ludlow deposits of Poland, *Lobograptus scanicus* zone.

Description. The monograptid stage of this species is represented by straight, as well as slightly curved ventrally or dorsally, rhabdosomes more than 23 mm long. Their width at the level of the top of the sicula is 0.24 mm, at the level of the mouth of the first theca - 0.3 mm, directly above it - 0.1 mm. The maximum width of the fragments of colonies that we have on the surface of marls at the level of the mouths of the flow is 0.3-0.36 mm, directly above them - 0.12-0.16 mm.

Theca are thin long tubes, gradually expanding towards their mouths. The edges are smooth or with barely noticeable symmetrical lateral elevations. The planes of the mouths of the proximal theca are inclined downward (relative to the horizontal line) at an angle of 30°, the middle and distal parts of the rhabdosomes - at an angle of 20-25°. The length of the first theca is 1.32 mm, its leaks are 1.26 mm, and the metatheca is 0.06 mm. The length of the theca in two fragments of rhabdosomes (longer than 23 mm) is 2.2-2.32 mm, their leak is 2.06-2.18 mm, metathecus is 0.08-0.14 mm.

These measurements show that the theca of this type is 94-96% composed of leak. Accordingly, there is very little overlap of current. The width of the metatheca of the first theca is 0.22 mm, the width of the leakage of the second theca at its base is 0.09 mm. The width of the metathecus of older theca is 0.24-0.3 mm, the prote at their bases is 0.1-0.14 mm.

There are only 5 thecae in 10 mm of rhabdosome length.

Sikula. Its mouth near one proximal fragment extracted from the rock is damaged. Its length is more than 1.26 mm, the width of the mouth is more than 0.27 mm. The apex of the sicula is located 0.33 mm below the level of the mouth of the first theca.

Comparison. The primary branches of rhabdosomes of this species differ from those of *Neodiversograptus nilssoni (*Barr.) in their smaller width, shorter interthecal septa, less overlap of the thecae, longer thecae, and fewer them per unit of measurement.

Association. *Pristiograptus dubius* (Suess), *Bohemograptus bohemicus* (Barr.) occur together with this species.

Distribution. Middle and lower upper Silurian, upper Tiritian and lower Ulichian Belts, Konovian and lower Tagrian Stages, *Saetograptus leintwardinensis* zone and lower *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone; the upper part of the Zabrodskaya and the lower part of the Oleshkovichskaya suite of the Polessky ledge of the basement, the lower part of the Franopolskaya suite of the Brest depression.

Material. 4 fragments of rhabdosomes on the surface of marl, uncovered by the wells of Kharsy-1873 on depth 340 m, Brest-10 on depths 817 m, 819 m.

One proximal part of the rhabdosome was extracted from the marl borehole Guscha-4015 in int. 920.3-923 m.

Incertae sedis

"Monograptus" operculatus Munch, 1938

Tab. XIV, draw. 1-3; tab. XLIX, fig. 10-14

Barrandeograptus operculatus: Kuhne, 1955, p. 397 (pars), fig. 18 A (non fig. 18 B-F).

Holotype. Comes from a glacial boulder on the territory of Poland (155).

Description. Straight, slightly curved dorsally or ventrally fragments of rhabdosomes more than 6 mm long. Their width at the level of the orifices of the proximal thecae is 0.18-0.22 mm, directly above them - 0.1-0.16 mm. The width of the distal fragments present in the collection does not exceed 0.37 (0.32) mm.

Thecae are very narrow and long tubes almost parallel to the dorsal edge of the colonies. The mouths of the theca open into small excavations 0.02-0.04 mm high and 0.05-0.1 mm deep in the proximal parts, 0.12-0.15 mm in the distal parts, which is, respectively, 1/ 2-1/4 and 2/5 of the total width of the rhabdosomes.

On the continuation of the dorsal parts of the excavations, small dorsal lobes in the form of "visors" are developed. In proximal thecae, their length is 0.16-0.18 mm. They completely cover the mouth. Up the rhabdosomes, the length of the lobes decreases. In distal thecae, the length of the lobes does not exceed 0.06 mm. They hang only over a part of the mouths of the theca.

The length of proximal thecae is 2.14-2.2 mm, their protecus is 1.8-1.86 mm, metathecus is 0.3-0.35 mm. The degree of their overlap is 1/8-1/9. The length of the theca exceeds their width by 12-14 times. The length of the distal theca is 2.52 mm, its leaks are 2.12 mm, and the metatheca is 0.4 mm.

4-5 thecae is placed in 10 mm lengths of rhabdosomes.

Sicula (one specimen each) straight, small. Its length is 1 mm, the width of the mouth is 0. 2 mm. The beginning of the first theca is located 0.2 mm above the mouth of the sicula. Its apex does not rise beyond the flow of the first theca. Virgella length 0.1 mm.

Comparison. In terms of the shape of the proximal parts of rhabdosomes, the theca, and dorsal lobes, this species is somewhat similar to *"Monograptus" huckei* Munch, from which it differs in the smaller width of the colonies, the shorter sicula, and the presence of completely covering mouths of dorsal lobes only in procoimal thecae.

Remarks. A. Münch (163) and V. Kühn (155) attributed this species to the cyrtograptids of the genus *Barrandeograptus* Bouc., 1933. In our opinion, it may belong to the monograptids. The lack of material does not allow us to resolve the issue of the systematic position of the described species.

Association. Found together with *Pristiograptus dubius* (Suess).

Distribution. Upper Silurian, upper part of the Ulichian Belt, lower part of the Metonian Stage, lower part of the *Formosograptus formosus-Bugograptus spineus* zone; the upper part of the Novinskaya and lower parts of the Milovanskaya suite of the Polessky basement ledge.

Material. 5 fragments of rhabdosomes extracted from the rocks of the borehole Guscha-4015 in int. 780.6-783 m, 799.9-804.9 m, 811.9-816.4 m.

"Monograptus" huckei Munch, 1938

Tab. XII, draw. 5, 6; tab. XLIX, fig. 5- 9

Barrandeograptus operculatus: Kuhne, 1955, p. 397 (pars), fig. 18 B-F (non fig. 18 A).

Holotype. Comes from a glacial boulder on the territory of Poland (155).

Description. Long narrow (more than 70 mm), weakly ventrally curved rhabdosomes. Their width at the level of the mouth of the first theca is 0.32 mm, directly above - 0.25 mm. The width of the proximal theca at the level of the mouths is 0.3-0.35 mm, above them - 0.12-0.25 mm. The width of rhabdosomes in the distal parts on the material of our collection does not exceed 0.4 (0.25) - 0.5 (0.3) mm.

Thecae - long narrow tubes parallel to the dorsal edge of the colonies or inclined to the axis at slight angles.

Mouths are even. They are in planes approximately perpendicular to the axis of the rhabdosomes.

Overhanging the mouths of all the thecae are small dorsal lobes, apparently consisting of microfusellar "tissue" (we failed to "enlighten" the dorsal lobes with an oxidizing agent).

The length of the lobes in the proximal theca is 0.12-0.18 mm, in the distal - 0.25-0.3 mm. The length of the first theca is 1.6 mm, its leakage is 1.1 mm, the metathecus is 0.5 mm. The length of proximal thecae is 1.6-1.8 mm, their protecus is 1.1-1.6 mm, metathecus is 0.2-0.5 mm. The length of the distal thecae is 1.9-2.15 mm, their duct is 1.2-1.6 mm, the metathecus is 0.5-0.6 mm.

From the given measurements it can be seen that this species is characterized by long leaks and short metatheques. In this regard, the proximal thecae overlap by 1/5-1/6 of their length, and the distal ones by 1/3-2/5.

There are 6-7 thecae in 10 mm of rhabdosome length.

Sicula ventrally curved. Its length is 1.4 mm, the width of the mouth is 0.35-0.4 mm. The apex of the sicula almost reaches the base of the interthecal septum of the first theca, being located 0.5 mm below the dorsal lobe of the first theca. The base of the latter is 0.25 mm above the mouth of the sicula. The distance from its base to the dorsal lobe of the first theca is 1.9 mm. Virgella length 0.35 mm.

Variability. The degree of dorsal bending of the rhabdosomes, the length of the theca, and the length of the dorsal lobes vary.

Comparison. This species differs from *"Monograptus" operculatus* (Munch) in the greater width of the rhabdosomes, the presence of dorsal aperture lobes in all theca colonies, and the greater length of the siculum.

Remarks. A. Münch (163) and V. Kühn (155) attributed this species to the genus *Barrandeograptus* Bouc., 1933 from the family *Cyrtograptidae* Bouc., 1933. Our collection includes fragments of rhabdosomes of this species extracted from rocks. They are similar to those depicted in the work of V. Kuhn (155, fig. 18 B-F).

Rhabdosomes on the surface of marls are very long, slightly curved ventrally colonies of a non-cyrthograpt structure plan.

The insufficiency of the material does not allow us to resolve the issue of the systematic position of the described species.

Association. *Bohemograptus bohemicus* (Barr.) occurs together with this species.

Distribution. Middle Silurian, lower Tiritian Belt, Gorstian Stage, upper *Ludensograptus ludensis-Gothograptus nassa* zone and *Neodiversograptus nilssoni-Saetograptus chimaera* zone; the upper parts of the Lipnovskaya suite of the Brest depression, the middle part of the Zabrodskaya suite of the Polessky ledge of the basement.

Material. 7 fragments of rhabdosomes on the surface of marl gels drilled by the wells of Kharsa-1873 at depth 354.5 m, Guscha-4015 in int. 953.7-962.5 m.

There are also 6 fragments of colonies extracted from the rocks of the borehole Shiev-4109 in int. 442.7-443.7 m, 443.7-445.6 m, 446.6-447.6 m, 447.6-450 m, 450-451 m; Brest-1 on depth 738.4 m.

Zoogeography of the Silurian and Early Devonian graptolites

The paleontological part of the work shows that most of the Silurian graptolites of Ukraine are found, as a rule, on different continents (106). Therefore, regularities similar to the distribution of zooplankton are assumed in the geographical distribution of their remains (14, 62). This conclusion is based on the fact that the habitats of graptolites were associated mainly with pelagic areas of sedimentation (21, 23), located outside the shelves of the Early Paleozoic platforms.

These were depths exceeding those at which the brachiopods of the deepest communities of *Visbyella, Clorinda* of the fifth benthic complex (6, 9, 126) could live - more than 200 m.

To explain the wide geographical distribution of graptolites, the hypothesis of paleolatitude climate control is also involved, according to which they lived mainly within the tropical zone of the Earth (23).

It is believed that graptolites inhabited the epi- and mesopelagic strata of the World Ocean. A certain role in their settlement in depth was probably played by the temperature gradient.

Biocenotic relationships, the composition and amount of food, the degree of water transparency and their illumination were also important parameters of their habitat. Apparently, transgressions and regressions caused by an increase or decrease in the level of the World Ocean, enrichment or depletion of water with oxygen, etc., had a significant effect on the graptolitic biotope (16, 151).

These and some other parameters of the habitat are associated with both the wide geographical distribution of the graptolite taxa of the same name at the species level, and the morphological changes in their colonies (rhabdosomes) over time.

Most of the zones established in the Silurian deposits of Ukraine can be traced, as will be shown below (Fig. 27), in Europe, Northwest Africa, Asia and North America. Five of them have age analogues in Australia, and the “Lower Ludlow” was determined from graptolites in South America as well (121). This explains the fact that the interregional and intercontinental correlation of the Silurian deposits is now based largely on graptolites.

However, the mass finds of their remains, mainly in pelagic and hemipelagic formations, indicate a rather narrow facies confinement of graptolites. Therefore, the interregional correlation for them suggests the closeness of the compared deposits in terms of sedimentation conditions.

An analysis of the distribution of planktonic organisms of the Silurian of Ukraine (graptolites, as well as chitinoses studied together with them) shows (94) that they lived in the water column above a deep paleobasin.

Chitinozoans lived above the open shelf and along the slope of the platform. The graptolites were concentrated above the shelf margin and further towards the open sea of a geosynclinal nature. This suggests that the living conditions of the Early Paleozoic microplankton in the water column depended both on the distance from the paleoshore and, possibly, to some extent on the influence of sea bottom conditions on the water column (17).

State of knowledge of the stratigraphy of the Silurian system

R. I. Murchison divided the Silurian system into two parts, which for a long time were considered as divisions of the Silurian (165). As part of the lower section, he singled out the Llandale and Caradok formations, and in the upper section, the Wenlock and Ludlow formations.

The Llandoverian formation was subsequently established in the lower part of the Upper Silurian (166).

These formations are, as shown by direct acquaintance with them by the author of this work in the stratotype area of Wales in October 1985, thanks to the courtesy of the famous British geologist M. Bassett (109), thick transgressive-regressive rock strata (165). According to the method of identifying and tracing them in the area, they fully correspond to subdivisions of local stratigraphic schemes of the rank of series of both domestic (75) and foreign stratigraphic schools (104).

The 21st session of the International Geological Congress (IGC) decided to divide the Silurian system in the amount established by R.I. Murchison into two independent systems: the Ordovician and the Silurian (Copenhagen, 1960).

After that, English scientists continued to divide the now separate Silurian system into the same series (Llandovery, Wenlock and Ludlov), into which they had previously divided the Upper Silurian in the volume established by R.I. Murchison (88).

This met with no objections, since it seemed to be obvious that these series began to be considered as parts (that is, at the rank of departments) of the Silurian system, and not as stages, as was the case before 1960.

Geologists from various countries agreed with the change in the stratigraphic rank of the British Silurian series, since it seemed more correct to divide the Silurian into three divisions from the point of view of the decisions of the second session of the IGC (Bologna, 1881), according to which the following hierarchy of divisions of the international stratigraphic scale was established (single, general, global, standard stratigraphic scale and other names of various authors: system, series, stage, unit.

Since 1951, in the former USSR, it was customary to divide the Silurian into two divisions, the boundary between which was drawn at the base of the Ludlovian Stage (43).

The Kyiv session of the International Union of Geological Sciences, the Stratigraphic Committee of the International Union of Geological Sciences (IUGS) and the 27th CIM (Moscow, 1984) approved the boundary between the Silurian subsystems at the base of the Ludlow Series (129). Note that, in our opinion, there was and is no reason to divide the Silurian at this time level into two divisions (epochs or subsystems).

After the 21st session of the IGC (Copenhagen, 1960), British experts began to divide the Llandoverian, Wenlock, and Ludlow series into tiers (stages). Llandovery was divided first into two (166), then into three parts (119, 120, 146, 147). In the former USSR, it was customary to divide it into three substages (59).

The Wenlock Group was divided into three parts in the stratotype. In the former USSR, the eponymous stage was divided into three substages (64). The ISSS divided the Wenlock into two tiers: Shanewood and Homer, which was approved by the 27th session of the IGC (129).

R.I. Murchison divided the Ludlovskaya series into three parts: lower, middle (Aymestri limestones) and upper (165).

C. Lapworth divided the same series into two tiers: Ludlovsky and Downton. He assigned deposits with graptolite remains to the former, and without them to the latter (158). The Ludlian Stage of C. Lapworth was recently subdivided into three stages: Eltonian, Brinjwoodian, and Lentworthian (130, 218).

In the former USSR, ludls were divided into two (42), then into three sub-tiers (44), then into two stages - the Lower ludlow and the Upper Ludlow.

The latter was later called the Tirasian, then the Tiverian stage. The Skalsky horizon (42) was attributed to the lower Ludlow, and the Borshchovsky and Chortkovsky horizons of the “Silurian” of Podolia (44) were assigned to the upper Ludlow.

It was proved that the latter belong to the Zhedinian Stage of the Lower Devonian, and the Skalsky horizon is post-Ludlow - pre-Zhedin (116).

In recent years, British scientists have subdivided the Landoverian series of the stratotype section according to paleontological data into the Rudanian, Eronian and Telichian stages, the Wenlockian series into the Shanewoodian and Homerian, and the Ludlowian series into the Horstian and Ladfordian stages.

The 27th International Geological Congress (IGC) was planned to be held in 1984 in Moscow.

In 1979, Academician B.S. Sokolov, Vice-President of the USSR Academy of Sciences, created a working group to prepare and conduct the Kyiv session of the International Subcommittee on the Stratigraphy of the Silurian System (ISSS) and a geological excursion to the outcrops in the basin of the river Dniester.

The group included employees of the Institute of Geological Sciences of the Academy of Sciences of Ukraine (P.D. Tsegelnjuk, V.P. Gritsenko, A.A. Ishchenko, V.S. Zaika-Novatsky, L.I. Konstantinenko), Lviv University (D.M. Drigant), VSEGEI (A.F. Abushik, O.V. Bogoyavlenskaya, N.M. Kadlets), St. Petersburg University (G.N. Kiselev, V.A. Sytova).

The group summarized the paleontological and stratigraphic materials from a long-term study of one of the best reference sections of the Silurian system of the Earth in the basin of the river Dniester (Ukraine) and published in the book “Silur of Podolia. Excursion guide” (72, 224 pages).

The group submitted for consideration by the Fourth (Kyiv) Session of the ISSS a well-founded regional biostratigraphic scheme of the Silurian of the Dniester basin as a possible prototype of the biostratigraphic scheme of that part of the ISS that builds up the section of the Silurian stratotype area of Great Britain.

The session was held in the cities of Kyiv and Kamenetz-Podolsky from May 20 to June 3, 1983.

Problems of dividing the Silurian system into Sections (Subsystems) and Stages

The purpose of the ISS of each Phanerozoic geological system is to reflect the continuous sequence of rock subdivisions in time without gaps and overlaps of geological time intervals.

Until now, the ISS of the Silurian has been created by "assembling" it from regional litho-stratotypes that have historically been included in stratigraphic practice (74). A recent example of this is the "build-up" of the Ludlow series by the Przhidolian formation (109).

The method of assembling the ISS of geological systems (including the Silurian) is based on the decisions of the second session of the IGC (Bologna, 1881) on the priority of traditional lito-stratigraphic units of local schemes of a particular country in their stratotype regions over chronological units of rocks (Table 1).

Stratigraphic units	Chronological units
Group	Era
System	Period
Serie	Epoch
Stage	Age
Packet	-
Layer	-

Tab. 1. Scheme of the stratigraphic classification of the second session of the IGC (13)

The duration of geological time intervals (geochronological units) - eras, periods, epochs and ages, according to the indicated decisions, was made dependent on the volume of litho-stratigraphic units, respectively, groups, systems, series and stages in their stratotypes.

For example, until recently the Silurian period was thought to have ended with the Ludlovian epoch (epoque) on the grounds that:

1) R.I. Murchison (165) was the first to determine the upper boundary of the Silurian in the stratotype region of Great Britain along the top of the Ludlow Formation and

2) The priority rule (in the understanding of those specialists in whose countries the stratotypes of the ISS units are located) prohibits changing the position of the level of the boundary between the Silurian and Devonian systems (15).

However, it turned out that, from the point of view of the general planetary laws of the development of the organic world, the Silurian period continued even after the Silurian system, in the understanding of its stratigraphic volume by English geologists, ended in the stratotype in the British Isles.

Therefore, on the recommendation of the ISSS and in accordance with the decision of the IUGS at the 27th session of the IGC (Moscow, 1984), the Silurian system had to be “accreted” by the Przidol formation, the stratotype of which is located in Czechoslovakia (109).

This example shows that the duration of the Silurian period has been unsuccessfully determined for more than a century, based on the stratigraphic volumes of the Landoverian, Wenlockocke and Ludlow regional series, which reflect the paleotectonic and paleogeographic patterns of sedimentation in the territory of Great Britain.

The geological time (Periods, Epochs, Ages) included in the Silurian ISS (chronological subdivisions in Table 1) turned out to be secondary and derived (and, in general, arbitrary) from the regional history of the geological development of the territory of Great Britain. Therefore, it turned out to be accidental in relation to the general planetary laws of the development of the organic world as a whole.

As a result of this, objective prerequisites appeared for the passage of the Silurian system (in the Earth's geological time scale) into the ISS of the post-Ludlow - pre-Zhedyn (116) and post-Ludlow - pre-Przhidol (= pre-Skalion of Ukrainian geologists) (96- 98).

The first of these Etapes in the development of the organic world has recently found its place in the ISS of the Silurian under the name of the Przhidolian Serie (109), the second - the Ulichian Superhorizon (72, 96) - was rejected (and lost) in 1983 by the Kyiv session ISSS (97) and has not yet found its official place in the Earth's geological time scale - that is, in the ISS of the Silurian period.

Why did this become possible at such a high (international) scientific forum, which lasted from May 20 to June 3, 1983?

I am asking this question as a former scientific leader of the above working group on “Scientific preparation and holding of the Kyiv session of the ISSS”. I then agreed to take up this work on the condition that no one from the scientific authorities, including foreign ones, would interfere in the scientific work of the group.

The working group prepared and published the book “Silur of Podolia. Excursion Guide, 1983, 224 pages.

The regional stratigraphic scheme (p. 110) shows that the deposits of the Ulichian Superhorizon in the Dniester basin lie above the *Saetograptus leitwardinensis* graptolitic zone and extend up to the base of the *Istrograptus ultimus-Ludensograptus parultimus* zone.

In the river basin Dniester and its tributaries during the Ulichian Etape (in the sense of the time interval) accumulated a huge thickness of clayey lumpy limestones of the Malinovetskaya Serie, replete with remains of good and excellent preservation of all benthic groups of fossil organisms.

Along the strike of the Silurian along the southwestern slope of the Ukrainian Shield and across the strike to the West, the Silurian, including the stratum of the Malinovets series and its facies analogues with the remains of graptolites, were recovered by numerous wells, from the core of which the author selected (collected) and monographically studied the remains of graptolites (84, 85, 87, 99, 100), brachiopods (83), chitinozoans (94) (see paleontological tables of grptoliths and drawings of their stratigraphic distribution at the end of this work).

These paleontological data obtained in the South-West of the EEP show that the Ulichian Etape of the development of the organic world of the Earth is commensurate (that is, of the same “huge” scale) with the scale of its (organic world) development during the Tiritian Etape (previous in geological time) and the Skalian (= Przhidolian) Etape (subsequent in geological time).

I spoke to the chairman of the MPSS Professor C. Holland (Ireland) in 1983 during stratigraphic excursions on outcrops in the river basin. The Dniester that the Ulich superhorizon should fill the second hiatus in the MSS Silurian - post - Ludlow - pre - Skalian (= Przidolian).

By the way, about the Etapes and Epochs of the development of the organic world of the Earth and the Epochs in the ISS of the Slurian system. According to the decision of the Stratigraphic Committee of the International Union of Geological Sciences (IUGS) and the 27th IGC (Moscow, 1984), there are two of them in the Silurian period. But in support of this decision there is not a single intelligible argument. With the same success of provability, it can be argued that there are 4 or 5 of them.

Three major stages of evolution (morphological changes in *Graptoloidea* colonies over time) during the Silurian period are substantiated in this work. They reflect, in our opinion, the three epochs of the Silurian period.

Of course, this is only one of the arguments in favor of dividing the Silurian into three geological epochs. Paleontologists have yet to confirm or refute our conclusion. The taxonomic diversity, for example, of the Silurian brachiopods of the Dniester basin and the patterns of their distribution in time confirm, in our opinion, the division of the Silurian period into three epochs (72, tables 1-11 and others; 83) .

It should be added that during the work of the Kyiv session of the ISSS, a special paleontological colloquium of specialists was held for three days at the Institute of Geological Sciences of the Academy of Sciences of Ukraine, who studied (in cuvettes), analyzed and discussed the collection of graptolites of the author of this work. Numerous fragments of rabosomes were cured by me from rocks after dissolving them in acids and placed in plastic cuvettes with water or glycerin for examination under a binocular microscope.

These graptolites are described for the first time in this work (see above).

The prospect of improving the international Stratigraphic scale of Silurian system

By now, it has become obvious that Stages, Series, and even Systems that reflect the natural stages of the geological history of stratotype regions and areas are gradually losing their expressiveness and significance laterally. Therefore, it becomes relevant to coordinate on an international scale the hierarchy of such subdivisions of the ISS of geological systems that would be recognized in different regions of the Earth.

The collective experience of the work of international working groups on the boundary between the Ordovician and Silurian (118), on the stratigraphy of the Silrian (129) and Devonian (223) systems leads to the conclusion that:

1) The ISS of the Phanerozoic systems should be developed and improved only on a paleontological basis,

2) zones are the smallest provincial, as well as regional and local (individual geological and structural regions of the region or individual geological sections of the region) biostratigraphic units,

3) the boundaries of the stratons of the ISS of any rank must coincide with the boundaries of the zones.

4) only the soles of the zones should be determined, since the soles of the zones that follow along the section become their roof.

This new method for determining the boundaries and volumes of ISS units (and biostratigraphic units in general) now allows us to implement the decisions of the eighth session of the IGC (Paris, 1900), which adopted the following stratigraphic classification scheme (Table 2):

Chronological units	Stratigraphic units
Ere	-
Periode	Systeme
Epoque	Section
Age	Etage
Phase	Zone

Tab. 2. Scheme of the stratigraphic classification of the eighth session of the IGC (13)

This scheme differs from the scheme of the second session of the IGC in that it is based on intervals of geological time (that is, subdivisions of paleontological substantiation, see the left side of Table 2), determined paleontologically and dated in the geological time scale by the radiometric method. During them, the corresponding stratigraphic (chronostratigraphic) units of rocks were formed in different regions of the world (see the right side of Table 2).

Biostratigraphy of the Silurian of Volyno-Podolia, presented in this paper, shows that the paleontological criterion for subdividing sections of outcrops and boreholes according to graptolites and brachiopods makes it possible to reasonably divide the Silurian into three epochs (sections): early (lower), middle (middle) and late (upper)

The epochs (Epoques) of the Silurian period (system) are confidently divided, according to our paleontological data, into etapes (belts), etapes (belts) into ages (stages), ages (stages) into phases (zones).

The most detailed (accurate to stages and zones) subdivision of deep-sea sediments containing the remains of graptolites and other planktonic organisms is possible.

Shelf deposits based on the remains of benthic groups of organisms, such as brachiopods, can, in most cases, be dissected up to an etape (belt) due to insufficiently good preservation and rare occurrence of remains, for example, in the core of small-diameter wells.

That is why in stratigraphic practice and science, horizons have long been distinguished according to the remains of planktonic organisms, and overhorizons of shelf (benthic) organisms [accordingly, ages (stages) and etapes (belts)].

Thus, in our opinion, the time has come to improve the stratigraphic classification scheme of the eighth session of the IGC with a new pair of taxa of the ISS (and biostratigraphy in general) – Etape / Belt.

Chronological units	Stratigraphic units
Ere	Groupe
Periode	Systeme
Epoque, Subperiod	Subsystem, Section
Etape	**Belt**
Age	Stage, Etage
Phase	Zone

Tab. 3. Scheme of the stratigraphic classification of the author of this work (The author's suggestion is highlighted).

The boundaries of systems, subsystems, belts and stages should be drawn between zones of various groups of fossil organisms (for example, graptolites, conodonts, brachiopods, etc.), which are established in monofacial or close to them geological sections of outcrops and boreholes. As a result, stages, belts, subsystems and systems consist of a certain amount of biostratigraphic (at the species level) zones. They naturally reflect the corresponding etapes of morphological changes (age, etape, epoch, period) of the indicated or other groups of organisms.

The emphasis of the scheme of the stratigraphic classification of the eighth session of the IGC on geological time (see Table 2) reverses the idea that existed until now about the ISS of geological systems.

The method of its "assembly" from regional litho-stratotypes is being replaced by the method of marking the "arrow of time" (12, p. 77) based on scientifically established natural processes:

1) morphological changes in the organic world and the etapes of these changes, as well as

2) the half-life of radioactive elements. The latter makes it possible to determine (in years) the age of biostratigraphic boundaries and, accordingly, the duration of ages, stages, etapes, epochs, periods, and eras.

An acceptable definition of the etape of morphological changes in organisms was given by academician D.V. Nalivkin. This is a period of time "during which the organic world (or a separate group) has distinctive features" (41, p. 11). Paleontologists fix the boundaries of the etapes in sections of outcrops and boreholes by changing the systematic composition of organisms (in monofacial or similar sections). These are the biostratigraphic boundaries.

Therefore, the chronostratigraphic subdivisions of the ISS of Phanerozoic systems of various ranks (see the right side of Table 2) are nothing but biostratigraphic subdivisions.

The smallest of them (elementary) is the zone. It is obvious that the zones (and, consequently, the stages, belts and subsystems, and, possibly, systems, such as the Mississippians and Pennsylvanias) according to benthic and terrestrial groups of organisms are biochoral.

Zones according to planktonic groups, especially in thalassocratic periods of the Earth's history, can be subglobal, as evidenced by the geographical distribution of taxa and zones of the same name, for example, graptolites.

The division of the Silurian Period / System into Epochs / Subsystems, Etapes / Belts and Ages / Stages (see figs. 2, 3)

Silurian deposits make up a significant part of the geological section of the Lower Paleozoic of the western and southwestern regions of Ukraine, but are exposed only in the Middle Transnistria, where mainly shallow-water shelf formations of the Silurian are developed.

The rocks come to the surface in the steep high and picturesque slopes of the river valley Dniester and its tributaries, as well as in numerous ravines and beams in the territory of three regions: Khmelnitsky, Chernivtsi and Ternopil.

The good exposure and slight metamorphism of the rocks, their almost horizontal occurrence and the clarity of the stratigraphic relationships of the layers throughout the section, the abundance and diversity of the remains of benthic fossils contributed to the wide popularity of the Dniester section to specialists from various countries of the world. It is rightfully considered to be the base for the East European Platform and one of the best offshore geological sections of world importance.

Representative international stratigraphic conferences and geological excursions were held here twice (in 1968 and 1993) (45, 72, 97).

River valleys the Dniester and its tributaries were flooded by the reservoir of the high-altitude Mogilev-Podolsk hydroelectric power station until 1990, built in the Middle Transnistria. The best geological sections of the Upper Proterozoic (Vendian) and Silurian were under water, and therefore they are difficult to study at present.

In this regard, I note that the “Dniester Geological Expedition” was created in the mid-eighties of the last age at the Institute of Geological Sciences of the Academy of Sciences of Ukraine by decision of the Presidium of the Academy of Sciences and the Council of Ministers of Ukraine. The staff of the expedition became (part-time) the staff of scientists from many scientific departments of the Institute, including the author of this work as the leader of the expedition.

“Set the boundary of the flood zone, study the geological structure of the flooded area and collect a reference collection of rock samples for long-term storage and study” - this was the program of the expedition for 3 years of its work.

As a result of the implementation of the program, the Vendian, Ordovician and Silurian geological sections were studied and documented, many rock samples were collected (They were transferred to the museum for storage), a scientific report on the work carried out was prepared and defended at the Academic Council of the Institute (Transferred to the State Geological Foundation).

A significant part of the general stratigraphic and paleontological information on the Silurian geological sections of the flooded part of the Dniester river basin is given in this work.

The lower boundary of the Silurian was established only recently at the foot of the *Parakidograptus acuminatus* Zone (118), the upper one, at the base of the *Tirassograptus uniformis* Zone of the Lower Devonian of Volyn-Podolia (109).

It has also been proved that cardinal transformations of the systematic composition of ecologically diverse planktonic and benthic groups of organisms took place at the lower and upper boundaries of the Silurian (4, 71, 72).

Within the Silurian period (system), two biostratigraphic boundaries of a particularly high rank have been identified.

The first one was found at the base of the *Uncinatograptus riccartonensis - Cyrtograptus murchisoni* Zone. In Ukraine, it is recorded by us by the appearance in the geological record of *Cyrtograptus murchisoni* Carr., *C. murchisoni bohemicus* Bouc., as well as by the disappearance of *Monoclimacis crenulata* (Tornq.), *Retiolites angustidens* E. et W., *Streptograptus anguinus* (Prib.), *Oktavites spiralis* (Gein.), *Monograptus parapriodon* Bouc. and others (84, 85).

In the shelf deposits of Volyn-Podolia at this boundary, major changes in the systematic composition of acritarchs, chitinosoas, conodonts, cephalopods, brachiopods, trilobites, tabulates, heliolithids, rugose, stromatoporates, and algae have been established (72).

Similar large changes in the systematic composition of graptolites were established by the author at the base of the *Neocucullograptus kozlowskii - Neolobograptus auriculatus* zone. At this level, representatives of the genera *Colonograptus* Prib., 1942, *Saetograptus* Prib., 1942, *Neodiversograptus* Urb., 1963, *Lobograptus* Urb., 1958 and the family *Retiolitidae* Lapw., 1873 extinct in deep sea sediments.

Remains of a new genus *Linograptus* Frech, 1897 (Fig. 5) and species *Neocucullograptus kozlowskii* Urb., *Neolobograptus auriculatus* Urb., *N. iniquus* Tseg., *Polonograptus egregius* Urb., *Bohemograptus cornutus* Urb. and others (72, 85, 92, 95) appeared at this stratigraphic level in the geological record.

Major changes in the systematic composition of acritarchs, chitinoses, conodonts, brachiopods, trilobites, cephalopods, ostracods, tabulates, heliolithids, rugoses, stromatoporates, and algae have been established at the same stratigraphic level (72, 94, 96).

At the above four levels, the Silurian period is clearly divided according to paleontological data into three large time intervals, which, in the author's opinion, correspond to the three Epochs of the Silurian (Epoque, Epoch): Early, Middle, and Late.

Their stratigraphic material equivalents (perceivable in the field for the hands of geologists) are the Lower, Middle and Upper Sections (Subsystems) of the future (adjusted) Silurian ISS (Fig. 4).

Early Epoch / Lower Subsystem (see fig. 2)

Bolotian Age / Horizon, Stage

The lower Silurian is represented in the southwest of the EEP by only one (uppermost) Bolotinian horizon. In the considered stratigraphic volume, it was distinguished earlier in the Silurian of Volyno-Podolia under the name of the Adaverian horizon of the Baltic states (72, 94). This is shown in the regional stratigraphic scheme of the Silurian of the South-West of the EEP, which was approved by the National Stratigraphic Committee of Ukraine on December 26, 1982.

The stratotype of the horizon is located in the interval 426.6 - 455 m well Bolotino-1 (Glodyany district of Moldova Republic). It includes the Morosheshtskaya, Step-Sochskaya and Chok-Maidanskaya formations of Moldova with a total thickness of 17-30 m, as well as the Teremtsy erosion remnants of the Dniester basin and the lower parts of the Furmanovskaya, Dublyanskaya, Shchedrogorskaya and Kladnevskaya formations of Volyno-Podolia (Fig. 32).

It occurs with a large stratigraphic hiatus (break) in places on the Upper Ordovician Subochskaya Formation, in places on the Middle Ordovician Goraevskaya Formation, and in places on Cambrian or Vendian (Upper Proterozoic) deposits.

The remains of brachiopods *Pentamerus oblongus* Sow., *Stricklandia laevis* (Sow.), *Costistricklandia lirata* (Sow.), *Clorinda undata* (Sow.), *Atrypa hedei* Struve, *Visbyella visbyensis* (Lindstr.), *Dicoelosia aff. osloensis* Wright, *Glassia obovata* (Sow.), trilobites, rugoses, conodonts, ostracods established in the shelf facies of the Kovel-Kishinev structural-facies region (72).

Graptolites (Fig. 8, 9, 10, 13, 15, 20) *Monoclimacis crenulata* (Tornq.), M. gracilis (E. et W.), *M. linnarsoni* (Tullb.), *Streptograptus anguinus* (Prib.), *Oktavites spiralis (*Gein.), *Monograptus parapriodon* Bouc., *M. priodon* (Bronn.), *Retiolites angustidens* E. et W. found in pelagic and hemipelagic deposits of the Bolotinsky horizon (84).

Middle Epoch / Middle Subsystem (see fig. 2)

Two large complexes of graptolites have been identified in the Middle Silurian pelagic and hemipelagic facies of the Lvov-Kolomiya structural-facies region of the southwest of the EEP.

The boundary between them runs at the base of the *Ludensograptus ludensis-Gothograptus nassa* Zone. Here appeared in the geological record the founding species of new lines of development: *Ludensograptus praedeubeli* (Jaeg.) and closely related *L. ludensis* (Murch.), *Gothograptus nassa* (Holm), *Pristiograptus parvus* Ulst.

At this stratigraphic level, representatives of the family Cyrtograptidae Bouc., 1933, subfamily Plectograptinae Bouc. et Munch 1952, as well as Monograptus flemingii (Salt.) (87, 92) became extinct in deep-sea sediments of the southwestern EEP.

In other regions of the Earth, *Monograptus sherrardae* Sherw. also appeared at this level and disappeared from geological sections of outcrops and wells of *Testograptus testis* (Barr.) (27, 29, 78). This milestone is now known as the *Cyrtograptus lundgreni* paleobiological event.

It was first established in Great Britain by E. Wood at the foot of the *Monograptus vulgaris* Zone, along which she drew the boundary between the Wenlock and Ludlow Formations in the areas of Bilt, Long Mountain, and others (222).

Monograptus vulgaris Wood has recently been shown to be a junior synonym of *Graptolitus ludensis* Murch. In the stratotype of the Wenlock Series of Great Britain, it occurs in the upper part of the Wenlock Shale (60 m thick) together with *Gothograptus nassa* (Holm) and in the lowest part of the Wenlock Limestone (132). The boundary at the base of the *Ludensograptus ludensis-Gothograptus nassa* zone is a reliable biostratigraphic boundary between the lower and upper units of the middle epoch (subsystem) of the Silurian period (system) in the pelagic facies of the southwest of the EEP.

In the shelf facies of the Kovel-Kishinev structural-facies region of the southwest of the EEP, we traced this stratigraphic level by changing the systematic composition of benthic and planktonic organisms between the Kitaigorodian and Tiritian superhorizons (= Belts) of the middle Silurian (94).

The brachiopods *Lepidoleptaena poulseni* (Kelly), *Pentamerus gothlandicus* Leb., *Coolinia pecten* (L.), *Strophochonetes cingulatus* (Lindstr.), *Protochonetes minimus* (Sow.), *Meristina obtusa* (Sow.), *Glassina usitata* T. Modz., *Cyrtia exporrecta* (Wahl.), *Howellella cuneata* Rub., *H. cuniculi* Rub.; chitinozoans *Conochitina conica* (Taug. et Jekh.), *C. proboscifera* Eis., trilobites, tabulates, heliolithids, rugoses, stromatoporates, ostracods here for the first time appeared in the geological record of the Earth (7, 72, 94).

The Kitaigorodian and Tiritian Superhorizons should be called Stages (Etage), following the biostratigraphic logic of the recent division of the British Silurian Series.

However, the 27th IGC (Moscow, 1984) named the Sheinwoodian and Homerian, as well as the Gorstian and Ludfordian intervals of the stratotype Series (the Wenlock and Ludlovian, respectively) as Stages.

In addition, judging by their paleontological substantiation based on the study of brachiopods and graptolites, these Stages are parts of the Kitaigorodian and Tiritian Superhorizons of the Middle Silurian of Ukraine (see Fig. 2).

In connection with such interpretations and discrepancies in stratigraphic and paleontological materials, it is necessary to consider this problem separately.

The concept and term “Stage” (Etage) was proposed a long time ago by A. Orbigny in the study of the Jurassic and Cretaceous deposits of Europe. He defined the Stages “biostratigraphically through the complexes of fossils inherent in them” (33, p. 11). “Zone or stage,” wrote this author, naming the stage divisions after characteristic representatives of the fauna, for example, calling the Toarcian the *Lima gigantea* and Ammonites bifrons zone, the Bajocian - the Trigonia costata and *Ammonites interruptus* zone” (31, p. 11).

In the Jurassic, A. Orbigny identified 10 Stages, seven of them were included in the modern ISS of the Jurassic System.

Now many experts believe that the Silurian Stage in the interpretation of this term of the 27th IGC corresponds to the concepts of “Horizon” or “Regional Stage” of the Russian stratigraphic school (98).

For example, Stages such as the Telichian, Sheinwoodian, and Gorstian Silurian of Wales fully correspond in terms of stratigraphic volume, method of their determination, and age to the Bolotinian, Furmanovian, and Neuridian Horizons of the Silurian of Ukraine (see Fig. 2).

In our opinion, the indicated Stages and Horizons also correspond, according to the method of their determination and in terms of stratigraphic volumes, to the Stages of the Jurassic System in the understanding of A. Orbigny.

The volumes of other Stages of the Silurian of Wales, which were approved by the 27th IGC, require only clarification or revision, such as the Ludfordian, taking into account paleontological data obtained by specialists in other regions (72, 77, 105, 107, 112, 127, 139, 148, 149, 188, 198).

Taking into account the above, it becomes obvious that the hierarchy of stratigraphic units of the ISS proposed by the eighth session of the IGC (Paris, 1900) lacks a stratigraphic unit, which has long been distinguished in Russian stratigraphic practice in the development of regional schemes and is called the Suprahorizon or Subsection.

The missing unit in the International Stratigraphic Scale was named by the author in 1983 under the term "Belt". Its chronostratigraphic equivalent is proposed to be called the term “Etape” (96, 98).

Thus, the hierarchy of subdivisions of the Scheme of Stratigraphic Classification of geological systems is presented in the following form (see table 3 above): Ere (Groupe), Periode (Systeme), Epoch (Subsystem, Section), Etape (Belt), Age (Stage), Phase (Zone).

In this regard, according to paleontological data, we divide the middle Epoch (Subsystem, Section) of the Silurian Periode (System) of Ukraine (as well as other regions) into two Etapes (Belts): Kitaigorodian and Tiritian.

The Kitaigorodian Etape / Belt (see fig. 2) of the development of the Dniester paleobasin is represented by the Furmanovskaya and the lower part of the Ternavskaya Formation (Fig. 2). The typical sections of these formations with a total thickness of 40–52 m are taken as its stratotype (72, 94).

Remains of brachiopods *Dolerorthis rustica* (Sow.), *Resserella canalis* (Sow.), Leangella segmentum (Lindstr.), *Eoplectodonta duvalii* (Dav.), *Anastrophia deflexa* (Sow.), *Antirhynchonella linguifera* (Sow.), Stegerhynchus borealis (Buch), *Estonirhynchia davidsoni* (Mc Coy), *Plectatrypa imbricata* (Sow.), *Cyrtia trapezoidalis* His., *Eospirifer radiatus* (Sow.), *Striispirifer plicatelus* (L.), *Nucleospira pisum* (Sow.), *Howellella globosa* Tseg.; chitinozoans *Conochitina claviformis* Eis., *Margachitina margaritana* (Eis.), *Linochitina erratica* (Eis.), *Ancyrochitina pura* Tseg. were identified in the shelf deposits of this Etape.

Pelagic and hemipelagic deposits of the Kitayporodian Etape of Volyno-Podolia have remains of graptolites (Fig. 6, 10) *Cyrtograptus murchisoni* Carr., *C. murchisoni bohemicus* Bouc., *Monograptus flemingii* (Salt.), *Uncinatograptus riccartonensis* (Lapw.), *Monoclimacis flumendosae* (Gort.), *Monograptus priodon* (Bronn), *Pristiograptus dubius* (Suess), *P. praedubius* (Bouc.), *P. pseudodubius* (Bouc.).

Thus, the stratigraphic distribution of brachiopods, chitinozoans, graptolites, and other groups of organisms (72), the Kitaygorodian Etape of Volyno-Podolia is divided into two Ages (horizons, regiostages): Furmanovian and Alizonian.

According to the stratigraphic volume, judging by the paleontological data, and the method of identification, they correspond to the Sheinwoodian and Whitwelian Stages of the Silurian of Wales and the ISS.

The Furmanovian Age / Horizon, Stage is established in the Dniester basin and within the South-West of the EEP in limestone-argillaceous deposits by the presence of brachiopods *Resserella concavoconvexa* (Twenh.), *R. sabrinae* Bass., *Dicoelosia paralata* Bass., *D. biloba* (L.) , *Nanospira lindstroemi* (Wen.), *Atrypina barrandei* (Dav.), *Atrypa harknessi* Alex., *Dictyonella capewellii* (Dav.), *Platystrophia cf. regularis* Shaler, *Meristina podolica* (Nikif.), *Streptis grayi* (Dav.), *Cyrtia wenjukovi* Tseg., *C. nikiforovae* Tseg.; chitinozoans *Bursachitina cylindrica* (Taug. et Jekh.), *Calicichitina oblonga* (Taug. et Jekh.), *C. orbiculata* Tseg., *Conochitina incerta* Eis., *Agathochitina primitiva* (Eis.), *Ancyrochitina obesa* Tseg., *A. angustata* Tseg., graptolites (Fig. 10, 13, 15, 17, 18) *Cyrtograptus murchisoni* Carr., *C. murchisoni bohemicus* Bouc., *Uncinatograptus riccartonensis* (Lapw).

Its stratotype is taken as the type section of the Furmanov Formation in outcrop 30 near Kitaygorod village with a total thickness of 17-26 m (89).

It also includes the lower parts of the Kladnevskaya and Shchedrogorskaya suites of the Kovel uplift of Volyn and the lower part of the Dublyanskaya suite of the submerged part of the Lvov trough.

***The Alizonian Age* / Horizon, Stage** (72, 94) covers the lower part of the Ternavskaya suite of the Dniester section of the Silurian with a total thickness of 23–26 m. The typical section of the suite (89) is taken as its stratotype. It also includes the upper parts of the Kladnevskaya and Shchedrogorskaya suites of the Kovel uplift of the crystalline foundation (Volyn), the upper part of the Dublyanskaya suite of the Lvov trough.

The Alizonian Age (from the Scythian tribe Alizona, who lived in the 4th-6th centuries BC in southern Podolia) includes those deposits of the Silurian of Volyno-Podolia and other regions, which are characterized by the brachiopods *Isorthis (Protocortezorthis) slitensis* Walmsl., *Leptaena depressa restricta* Bass., *Anastrophia podolica* (Wen.), *Pentlandina lewisii* (Dav.), *Strophoprion euglypha* (Dalm.), *Amphistrophiella (Amphistrophiella) funiculata* (Mc Coy), *Protomegastrophia semiglobosa* (Dav.), *Pholidostrophia (Mesopholidostrophia) laevigata* (Sow.), *Gypidula galeata* (Dalm.), *Atrypa lapworthi* Alex., *Meristina bilobata* T. Modz.; chitinozoans *Clathrochitina clathrata* Eis., *Linochitina cingulata* (Eis.), *Conochitina pachycephala* Eis., C. tuba Eis., *Clavachitina mira* (Dic.), *Oochitina brevicornis* Tseg., *Ancyrochitina deltoidea* Tseg.; graptolites (Fig. 16, 18, 19, 28) *Monograptus flemingii* (Salt.), *Pristiograptus praedubius* (Bouc.), *P. pseudodubius* (Bouc.), *Monoclimacis flumendosae* (Gort.), trilobites, tabulates, heliolithids, conodonts, ostracods , algae (72).

According to these paleontological data, the Alizonian Age is reliably correlated with the Whitwelian Stage of Wales.

The Tiritian Etape / Belt (see fig. 2) in the Dniester section of the Silurian covers the upper part of the Ternavskaya, Bagovitskaya, and most of the lower part of the Konovskaya (up to metabentonite M 2) suites with a total thickness of 75-117 m.

For its stratotype (from the tribe of the Tirits, who lived in the lower reaches of the Dniester in the 4th-6th centuries BC), the typical sections of these formations and their parts (94) are taken. It also includes the Zabrodskaya and Turskaya suites of the Kovel uplift of the basement, the Zheldetskaya suite of the submerged part of the Lvov trough, the Strusovskaya and Stublinskaya suites of the eastern slope of the Lvov trough.

Based on the stratigraphic distribution of brachiopods, graptolites, chitinoses, and other groups of organisms (72), the Tiritian Etape is subdivided into three Ages: Paralatian, Nevridian, and Konovian.

The Paralatian Age / Horizon, Stage is distinguished for the first time in connection with the discovery of original complexes of organisms in the shelf and pelagic deposits of the Silurian of Volyno-Podolia, which clearly differ from those of the adjacent Alizonian and Neuridian ages (the name of the horizon comes from the ancient Scythian tribe Paralaty, who lived in VI-IV centuries BC).

It includes the upper part of the Ternavskaya suite with a total thickness of 15-25 m, as well as the upper parts of the Suskaya suite of the western slope of the Ukrainian Shield (USh) and the Shchedrogorskaya suite of the Kovel uplift.

The upper part of the type section of the Ternavskaya Formation (94) is taken as the stratotype of the horizon. The shelf deposits of the Paralat Horizon are characterized by brachiopods *Pentamerus oblongus* Leb., *Strophochonetes cingulatus* (Lindstr.), *Protochonetes minimus* (Sow.), *Coolinia pecten* (L.), *Cyrtia exporrecta* (Wahl.); chitinozoans *Conochitina proboscifera* Eis., *C. conica* (Taug. et Jekh.), *Sclerochitina urceolata* Tseg., trilobites, heliolithids, rugoses, ostracods (72).

Together with them, there are also taxa found in the underlying Alizona horizon: *Resserella elegantula* (Dalm),) *Isorthis (Protocortezorthis) slithensis* Walmsl., *Pentlandina lewisii* (Dav.), *Strophoprion euglypha* (Dalm.), Protomegastrophia semiglobosa (Dav.) , Anastrophia podolica (Wen.), *Atrypa lapworthi* Alex., *Meristina bilobata* T. Modz., *Clathrochitina clathrata* Eis., *Conochitina tuba* Eis., *C. pachycephala* Eis., *Linochitina cingulata* (Eis.), *Ancyrochitina deltoidea* Tseg.

The Paralat horizon also includes the upper parts of the Dublyanskaya suite of the Lvov trough and the Kladnevskaya suite of the western slope of the Kovel uplift, the deep-water rocks of which (black mudstones and marls) contain the remains of graptolites (Fig. 16, 17, 18, 19, 23, 24) *Ludensograptus ludensis* (Murch .), L. praedeubeli (Jaeg.), Gothograptus nassa (Holm), *Pristiograptus parvus* Ulst, *P. jaegeri* Holl., Rick. et Warr.

These paleontological data allow the Paralatian Horizon to be correlated with the Glydonian Stage of Wales.

The Nevridian Age / Horizon, Stage (72, 94) combines on the shelf of the Kovel-Kishinev structural-facies region the large lower parts of the Bagovitskaya, Stublinskaya, Strusovskaya and Turskaya formations (<u>from the Scythia of the Nevrida, stretching from the upper reaches of the Zbruch River to the Pripyat and Western Bug river)</u>.

The typical section of the Bagovitskaya Formation 28–35 m thick, was taken as its stratotype (89). Previously, the very tops of the Ternav Formation (the fifteenth cyclite of the Sursha Subformation) also belonged to the Nevridian Horizon, which we now attribute to the Paralatian Stage based on their paleontological characteristics.

The shelf formations of the Nevridian Horizon are characterized by the brachiopods *Isorthis (Protocortezorthis) orbicularis* (Sow.), *Levenea muldensis* Walmsl. et Bouc., *Ancillotoechia bidentata* (His.), *Rhynchotreta cuneata* (Dalm.), *Trigonirhynchia stricklandii* (Sow.), *Septatrypa linguata* (Buch), *Protozeuga bicarinata* (Vern.), *Atrypa sowerbyi* Alex., *Plectotreta lindstroemi* Ulr. et Coop., *Kozlowskiellina deltidialis* (Hedstr.), *Howellella cuneata* Rub., *H. elegans* (M.-W.); chitinozoans *Discochitina diabolo* (Eis.), *Leiochitina elegans* (Beju et Danet), trilobites, tabulates, rugoses, stromatoporates, conodonts, ostracods, algae (72).

The pelagic (lower part of the Zheldetskaya suite of the submerged part of the Lvov trough) and hemipelagic (lower part of the Zabrodskaya suite of the western slope of the Kovel uplift) deposits of the Nevrid horizon are represented by black mudstones and marls with graptolites (Figs. 8, 9, 14, 15, 17, 19, 21, 23, 24) *Neodiversograptus nilssoni* (Barr.), *Lobograptus progenitor* Urb*., L. simplex* Urb., *L. scanicus* (Tullb.), *Uncinatograptus uncinatus* (Tullb.), *Dulebograptus bellus* Tseg., *Colonograptus colonus* (Barr.), *C roemeri* (Barr.), *Saetograptus chimaera* (Barr.), *Heisograptus micropoma* (Jaek.), *Pristiograptus gotlandicus* (Pern.), *Holoretiolites balticus* Eis., *“Holoretiolites” cf. munchi* Eis., *Spinograptus clathrospinosus* Eis., *S. spinosus* (Wood), *Plectograptus macilentus* (Tornq.) and others (85).

These paleontological data make it possible to correlate the Nevridian Horizon of the Silurian of Ukraine with the Horstian Stage of the Silurian of Wales and the ISS.

The Konovian Age / Horizon, Stage of the Tiritian Belt of the Middle Silurian of Volyno-Podolia and, I hope, of the ISS of the Silurian system, were distinguished earlier in the volume under consideration under the name of the Leintwardian Horizon of the Silurian of Great Britain (72, 94) due to the complete similarity of their paleontological characteristics.

It covers the upper part of the Bagovitskaya (upper part of the Ustye Subformation) and almost the entire Konovskaya Formation. Its thickness in the Dniester basin is 33-52 m. The indicated parts of the typical sections of the suites are taken as the stratotype of the stage (89).

It also includes the upper parts of the Strusovskaya, Stublinskaya, and Turskaya formations, developed within the Silurian shelf of Vodyno-Podolia and hosting the brachiopods *Salopina lunata* (Sow.), *Kirkidium knightii* (Sow.), *Protochonetes ex gr. ludloviensis* Muir Wood, *“Camarotoechia” baltica* Gag., *Homoeospira baylei* (Dav.), *Stegerhynchus diodontus* (Dalm.), *Septatrypa linguata* (Buch), *Atrypa sowerbyi* Alex., *Glassina pentagona* T. Modz., *Didymothyris biohermica* Rub., *Atrypoidea sulcata* (Lindstr.), *Janius pyramidalis* (Wen.), *Delthyris elevata* Dalm.; chitinozoans *Euconochitina latifrons* (Eis.), trilobites, tabulates, heliolithids, rugoses, stromatoporates, cephalopods, ostracods, algae (72).

The pelagic (upper part of the Zheldetskaya Formation of the Lvov Trough) and hemipelagic (upper part of the Zabrodskaya Formation of the western slope of the Kovel uplift) deposits of the Konovian Stage are represented by black, almost carbonate-free mudstones and marls with limestone interlayers with graptolites (Figs. 8, 9, 15, 16, 19, 20, 21, 23) *Saetograptus leintwardinensis* (Lapw.) , *Neolobograptus fragilis* Tseg. and others (85).

According to these paleontological data, the Konovian Stage of Ukraine is compared with the lower part of the Ludfordian Stage of Wales and the ISS.

Late Epoch / Upper Subsystem (see fig. 3)

The Late Epoch in the pelagic and hemipelagic facies of the Silurian of Ukraine is divided, judging by the significant scale of changes in the systematic composition of graptolites at the level of generic and species taxa, into two biostratigraphic units of the same rank as the Kitaigorodian and Tiritian Etapes / Belts of the middle Silurian.

A cardinal change in the systematic composition of graptolites has been established within the Late Silurian Epoch at the base of the *Istrograptus ultimus-Ludensograptus parultimus* zone (Fig. 19, 21, 25). In addition to the indicated zonal species, representatives of the new genera *Skalograptus vetus* Tseg., *Tirassograptus difficilis* (Tseg.), *Ludensograptus podolicus* (Tseg.).

Wolynograptus acer (Tseg.), *Bugograptus spineus* (Tseg.), *B. aculeatus* (Tseg.), *Pristiograptus fragmentalis* (Bouc.), *Uncinatograptus caudatus* Tseg., *Ludensograptus latilobus* (Tseg.) , *Istrograptus rarus* (Tell.), *Monograptus (Slovinograptus) balticus* (Tell.) died out on the indicated border.

The same milestone was established in the Czech Republic by the appearance of Ludensograptus parultimus (Jaeg.) in sections of outcrops and by the disappearance of Pristiograptus fragmentalis (Bouc.) from sections of outcrops.

Equally dramatic changes in the systematic composition of benthic and planktonic organisms have been established at the indicated boundary in the shelf deposits of Volyno-Podolia. New taxa of brachiopods *Protochonetes dniestrensis* (Kozl.), *Atrypa dzwinogrodensis* Kozl., *Atrypoidea gigantus* Jones, etc., chitinosa *Margachitina poculum* Coll. et Schw. and others, trilobites, tabulate, heliolithid, rugose, stromatoporate, cephalopods, ostracods, algae have appeared here (72).

The Lower Etape / Belt of the Upper Silurian was identified by the author earlier in the shelf deposits of Ukraine under the name of the Ulichian superhorizon (94) and the Ulichian Stage as a post-Ludlowian - pre-Skalian (96).

The “Stage” rank of the latter was substantiated (see above), but unsuccessfully, at the Kyiv session of the International Subcommittee on the Stratigraphy of the Silurian System (ISSS) in May-June 1983 in Kyiv and Kamenets-Podolsky (Ukraine) (97).

The Late Etape / Belt - Skalian - apparently is equal in terms of stratigraphic volume to the Przhidol formation of the Czech Republic, which was approved by the 27th IGC (Moscow, 1984) as the fourth (Upper) Series og the ISS of Silurian.

Note that the term “Series” and other similar terms from lithostratigraphy (for example, formation) should not be used in biostratigraphy in general, including the International Stratigraphic Scale.

We emphasize that due to the absence of *Skalograptus vetus* Tseg. in the Przhidol (= Požariski) formation of the Czech Republic, doubts arise as to the stratigraphic completeness of the lower part of the Przhidol formation (as a biostratigraphic unit) in its stratotype.

The Ulichian Etape / Belt (see fig. 3) in the Dniester section unites the tops of the Konovskaya, Tsviklevskaya and Rykhtovskaya suites with a total thickness of 70-90 m (<u>the name comes from the Ulichy tribe that lived in the Dniester river basin in the 6th-8th centuries AD)</u>.

Its typical sections are taken as its stratotype (89). It is characterized by the brachiopods *Leptostrophia filosa* (Sow.), *Shaleriella delicata* Harp. et Bouc., *Morinorhynchus crispus* (Lindstr.), *Gypidula magna* Rybn., *Microsphaeridiorhynchus nucula* (Sow.), *Sphaerirhynchia wilsoni* (Sow.), *Didymothyris didyma* (Dalm.), *Delthyris elevata* Dalm.; chitinozoans *Gotlandochitina tomentosa* (Taug. et Jekh.), *Ceratochitina testicularis* Tseg., cephalopods, trilobites, ostracods, tabulates, heliolithids, rugoses (72).

Deep-water clay deposits of the Ulichian Belt of the Lvov-Kolomiya structural-facies region host numerous graptolites *Neocucullograptus inexspectatus* (Bouc.), *Bohemograptus bohemicus tenuis* (Bouc.), *Ludensograptus latilobus* (Tseg.), *Pristiograptus fecundus* Prib., *Pseudomonoclimacis haupti* (Kuhne), *Linograptus sp.* and many others (see below).

According to the stratigraphic distribution of the remains of benthic and planktonic groups of organisms, the Ulichian Etape / Belt is divided into two Ages / Stages: Tagrian and Metonian.

The Tagrian Age / Stage (72, 94) in outcrops along the Dniester covers the upper part of the Konovskaya and the greater lower part of the Tsviklevskaya suite with a total thickness of 35-45 m (<u>from the Tagry tribe that lived in the Dniester river basin in the 1st-2nd centuries AD</u>). The type sections of the upper part of the Shutnovskaya, Sokolskaya, and lower parts of the Bernovskaya Subformation were taken as the stratotype of the Stage (89).

It also includes the lower part of the Gornikskaya Formation of the Kovel uplift of the crystalline basement. The shelf deposits of the Stage are characterized by the brachiopods *Isorthis (Arcualla) crassa* (Lindstr.), *Janius pyramidalis* (Wen.), *Protochonetes ex gr. ludloviensis* Muir Wood, *Atrypa ex gr. sowerbyi* Alex.; chitinozoans *Gotlandochitina ornata* Tseg., *G. spinellosa* Tseg., *Ancyrochitina ancyrea* Eis., *Idiochitina platycera* Tseg., trilobites, rugoses, stromatoporates, cephalopods, ostracods (72).

Pelagic (lower part of the Peremyshlyanskaya suite of the Lvov trough) and hemipelagic (Oleshkovichskaya and lower part of the Novinskaya suite of the western part of the Kovel uplift) black mudstones and marls of the Tagrian stage host graptolites (Fig. 7, 11, 9, 16, 19, 20, 21, 22, 23, 24) *Neocucullograptus kozlowskii* Urb., *N. kozlowskii unicornus* Urb., *Neolobograptus auriculatus* Urb., *N. iniquus* Tseg., *N. evolvens* Tseg., *N. longiseptum* Tseg., *Bohemograptus urbaneki* Tseg., *B. cornutus* Urb., *Polonograptus egregius* Urb., *Pristiograptus kosoviensis* (Bouc.), *Holorethiolites sp.* (85).

According to the stratigraphic position in the geological section of the Silurian deposits above the Konovian Stage and partly according to paleontological data, the Tagrian Stage of the Silurian of Ukraine is comparable with the middle part of the Ludford Stage of Wales and the ISS Silurian, approved by the 27th IGC.

The Metonian Age / Stage of the Upper Silurian (72, 94) in the Dniester basin covers the tops of the Tsviklevskaya and Rykhtovskaya suites with a total thickness of 35-45 m (<u>from the city of Metoniy, a trading center on the Dniester River in the 2nd century AD</u>). Its stratotype is taken as the typical sections of the upper part of the Bernovskaya, Grinchukskaya, and Isakovetskaya subformations (89).

It also includes the upper parts of the Gornikskaya and Velitskaya formations. Shelf deposits of the stage contain typical brachiopods *Levenea canaliculata* (Lindstr.), *Protochonetes striatella* (Dalm.), *Dayia navicula* (Sow.), *Atrypoidea prunum* (Dalm.), *Janius barrandi* (Vern.), *Howellella bragensis* (Wen.) ; chitinozoans *Oochitina ceratophora (Eis.), Euconochitina communis* (Taug.), *Discochitina flexilis* Tseg., *Agathochitina cistula* Tseg., *Angochitina elongata* Eis., *A. echinata* Eis., *A. densebarbata* Eis., *Sclerochitina intermeia* (Eis.), *Ancyrochitina exilis* Tseg., trilobites, tabulates, heliolithids, rugoses, stromatoporates, cephalopods, ostracods (72).

Pelagian (upper part of the Peremyshlyanskaya suite of the Lvov trough) and hemipelagic (upper part of the Novinskaya and lower part of the Milovanskaya suite of the western slope of the Kovel uplift) black mudstones and marls of the Metonian stage contain graptolites characteristic of it (Fig. 7, 8, 11, 12, 14, 19 , 20, 22, 25) *Formosograptus formosus* (Bouc.), *F. uncatus* (Tseg.), *F. angustus* (Tseg.), *Bugograptus spineus* (Tseg.), *B. aculeatus* (Tseg.), *B. protospineus* Urb. , *Wolynograptus acer* Ts*eg., W. valleculosus* Tseg., *Pristiograptus longus* (Bouc.), *P. fragmentalis* (Bouc.), *Serenograptus hamulosus* (Tseg.), *Monograptus (Slovinograptus) balticus* (Tell.), *Dulebograptus bresticus* Tseg., *Uncinatograptus caudatus* Tseg., *Istrograptus rarus* (Tell.), *"Monograptus" cf. lebanensis* Tell., *"Monograptus" operculatus* Munch (85).

According to these paleontological data, the Methonian Stage is comparable in terms of stratigraphic position in the geological section of the Silurian above the Tagrian Stage and, in part, in terms of brachiopods, with the upper part of the Ludfordian Stage of Wales and the ISS, approved by the 27th IGC in 1984.

The Skalian Etape / Belt (see fig. 3) in the Dniester section of the Upper Silurian includes the Prigorodokskaya, Varnitskaya, Trubchinskaya, and Zvenigorodskaya formations with a total thickness of 126–175 m. The typical sections of these formations (90) are taken as its stratotype (72 94).

It also includes the Radoshinsky and Koshlyakskaya formations of the western slope of the Ukrainian shield, the Markovichskaya and Darakhovskaya formations of the eastern slope of the Lvov trough and the Kovel uplift of the crystalline basement.

Brachiopods *Protochonetes dniestrensis* (Kozl.), *Atrypa dzwinogrodensis* Kozl. and others (see below), chitinozoans *Sclerochitina neglecta* Tseg. and others (see below), trilobites, tabulates, heliolithids, rugoses, stromatoporates, conodonts, ostracods, algae are established in the shelf deposits of the belt of the Kovel-Kishinev structural-facies region (72).

According to the stratigraphic distribution of the remains of benthic and planktonic organisms, the Skalian Etape / Belt is divided into two Ages / Stages: Stavanian and Sklavian.

The Stavanian Age / Stage (72, 94) in the river basin Dniester unites of the Prihorodokskaya and lower parts of the Varnitskaya suites with a total thickness of 65-75 m (<u>from the Stavan tribe, who lived in Volhynia from the 2nd century AD</u>). Their typical sections are taken as its stratotype (90).

It also includes the Radoshinskaya and the lower part of the Koshlyakskaya Formation of the western slope of the Ukrainian Shield, the Markovichskaya and lower part of the Darakhovskaya Formation of the eastern slope of the Lvov trough and the Kovel uplift.

Shelf deposits of the stage contain numerous brachiopods *Dalejina staszici* (Kozl.), *Hemitoechia distincta crebra* T. Modz. et Nikif., *Atrypoidea gigantus* Jones, *Collarothyris canaliculata* (Wen.); chitinozoans *Margachitina poculum* Coll. et Schw., *Calycichitina streptoccoca* (Obut), trilobites, tabulates, heliolithids, rugoses, stromatoporates, conodonts, ostracods, algae (72).

Pelagic (Zadarovskaya and lower part of the Glinyanskaya Formation of the Lvovsky Trough) and hemipelagic (upper part of the Milovanskaya Formation and Gushchinskaya Formation of the western part of the Kovel Uplift) black mudstones and marls of the Stavan Stage contain graptolites (Figs. 7, 8, 11, 12, 14, 19, 21, 25) *Istrograptus ultimus* (Pern.), *Ludensograptus parultimus* (Jaeg.), *Tirassograptus difficilis* (Tseg.), *Skalograptus vetus* Tseg., *S. lochkovensis* (Prib.), *Dulebograptus trimorphus* Tseg., *Uncinatograptus prognatus (*Kor.*), Wolynograptus canaliculatus* Tseg. *(= Monograptus hornyi* Jaeg., 1986), *Formosograptus formosus* (Bouc.), *Pristiograptus fecundus* Prib. (85).

According to these paleontological data, the Stavanian Stage of the Upper Silurian of Ukraine is comparable with the lower part of the Przhidolian Belt of the ISS.

The Sklavian Age / Stage (72, 94) unites in Podolia the upper part of the Varnitsky, Trubchinskaya and Zvenigorodskaya suites with a total thickness of 60-100 meters (from the Sklavin tribe, who lived in the interfluve of the Dniester and Danube in the 4th-7th centuries AD). Its typical sections are taken as its stratotype (90).

It also includes the upper parts of the Koshlyakskaya and Darakhovskaya formations on the eastern slope of the Lvov trough.

The shelf deposits of the Stage are characterized by the brachiopods *Dolerorthis tanta* T. Modz. et Nikif., *Isorthis (Ovalella) ovalis* (Pask.), *Salopina crassiformis* (Kozl.), *Shaleria (Protoshaleria) dzwinogrodensis* (Kozl.), *Hemitoechia serrata* T. Modz. et Nikif., *Stegerhynchus pseudobidentata* (Rybn.), *Sphaerhynchia gibbosa* (Nikif.), *Dayia bohemica* Bouc., *Pseudoprotathyris infantilis* (Kozl.), *Zygospiraella sublepida* (Vern.), *Dnestrina gutta* Nikif. et T. Modz., *Delthyris magnus* Kozl., *Clavachitina denigrata* Tseg., *Oochitina fugax* Tseg., *Euconochitina lagenomorpha* (Eis.), *E. ochrea* Tseg., *Linochitina deminuta* Tseg., *Discochitina discoidea* Tseg., *Agathochitina turgida* Tseg., *Gotlandochitina hispida* Tseg., *Angochitina strigosiuscula* Tseg., *Ancyrochitina tumida* Tseg., *Calycichitina basifixa* Tseg., *Spaerochitina sphaerocephala* (Eis.), cephalopods, trilobites, tabulates, heliolithids, rugoses, stromatoporates, conodonts, ostracods, algae (72).

Graptolites were found in pelagic (upper part of the Glinyanskaya and Poltvinskaya suites of the Lvov trough) and hemipelagic (Tomashevskaya suite of the western part of the Kovel uplift) black mudstones and marls of the Sklavinian Stage (Fig. 7, 8, 11, 12, 14, 20, 25, 26) *Istrograptus transgrediens* (Pern.), *Tirassograptus bouceki* (Prib.), *T. perneri* (Bouc.). *Tirassograptus uniformis angustidens* (Prib.).

It should be noted that *Tirassograptus uniformis angustidens* (Prib.) is quite common in the uppermost part of the layer (up to 8.4 m thick) (72, 85).

According to paleontological data, the Sklavian Age / Stage of the Upper Silurian of Ukraine is comparable with the upper part of the Przhidolian Belt of the ISS.

In this way, biostratigraphy of the Silurian of Volyno-Podolia shows that the paleontological criterion for the division of rock sections makes it possible to divide the Silurian into three Epochs (Subsystems) - Early (Lower), Middle (Middle) and Late (Upper).

The Epochs (Subsystems) of the Silurian Period (System) are divided, according to our paleontological data, into Etapes (Belts), Etapes (Belts) - into Ages (Stages), Ages (Stages) - into Phases (Zones).

The most detailed (accurate to Stages and Zones) subdivision of deep-sea sediments containing the remains of graptolites and other planktonic organisms is possible.

But even by benthic groups, for example, by brachiopods, it is possible to divide the shelf deposits of the Silurian of Volyno-Podolia into Stages, if brachiopods (or another group of organisms) are represented in sections, for example, outcrops of the Dniester basin by numerous, systematically diverse and well-preserved remains.

Otherwise, according to the study of brachiopods, the subdivision of sections, for example, boreholes within the same Volyno-Podolia, is possible, as a rule, only with an accuracy to the Belt (due to the insufficiently good preservation and rare occurrence of remains).

Consequently, the different detail of the division of geological sections of outcrops and boreholes into different and even the same groups of organisms has long led stratigraphers to the objective need to distinguish two main subdivisions of paleontological substantiation - Belt and Stage (respectively, suprahorizon (or subsystem) and horizon).

From the stratigraphic scheme and paleontological characteristics of the above-described stratons, it is obvious that the Bolotinian, Furmanovian and Nevridian Horizons (Stages) of the Silurian of Volyno-

Podolia fully correspond in terms of stratigraphic volume and method of substantiation to the Telichian, Sheinwoodian and Gorstian stages of the stratotype area of the Silurian of Wales (Great Britain), and the Alizonian and the Paralatian Stages of the Silurian of Volyno-Podolia - the Homerian stage of Wales.

The Ludfordian “Stage” of the Silurian of Wales clearly needs a more detailed subdivision. However, there are currently no sufficient paleontological data for this for the upper part of the Ludlow Series in Wales.

Therefore, above the Gorstian Stage of the Tiritian Belt of the Middle Silurian, we recommend using in the Silurian ISS the following stages of the Silurian of Volyno-Podolia (from bottom to top): Konovian, Tagrian, Metonian, Stavanian and Sklavian.

This will increase the prestige of the Silurian ISS.

We recommend that the Silurian, as well as other geological systems of the Phanerozoic, be distinguished in the ISS as subdivisions of paleontological substantiation of such a rank as a Belt (Stage). For stratigraphic practice and science, subdivisions of the Belt rank are no less important than the Stage, since the Stage is less likely than the Belt to be established from the study of the remains of benthic groups of organisms and plants, which constitute the predominant part of paleontological objects in the sedimentary strata of the Earth.

The absence of a biostratigraphic subdivisions of the rank of a Belt (Etape) in the ISS gave rise in statigraphic practice and science to such concepts as “Regiostage”, “Suprahorizon” and “Subsystem”, which are understood and interpreted by “specialists” ambiguously, which leads to additional and unjustified errors in stratigraphic schemes (32) and research results.

It is also obvious that the further use in the ISS of the Silurian in an explicit or veiled form of litho-stratigraphic units of the Series and Formation types will not contribute to “... a common language in stratigraphy” (109, p. 87).

Separation of pelagic and hemipelagic deposits of the Silurian and lower Devonian Southwest EEP on graptolitic zones

It is known that the objectivity of the zonal division of the deposits of a particular area (region) depends on the completeness and reliability (quality) of paleontological data, as well as on the accuracy of the correlation of geological sections of wells both with each other and with outcrops of the Dniester reference section.

We compare sections of the Silurian according to taxa of the same name, both graptolites and other groups of organisms - brachiopods and chitinozoans.

Interlayers of volcanic ash (metabentonites) are also used, which in some cases have characteristic visual features (color, texture, thickness, etc.), as well as the known (established by us during the layer-by-layer study of outcrop and borehole sections) stratigraphic position of metabentonites in the Dniester reference section of the Silurian (89, 90).

The overall picture of the stratigraphic distribution of the graptolite taxa (genera and species) established by us in the geological sections of the outcrops and boreholes that uncovered the Silurian deposits of Ukraine is shown in Figures 5, 6, 10, 13.

Since a species is an elementary unit of systematic of the organic world and biostratigraphy, the intervals of geological sections, to which characteristic complexes of species are confined, are usually considered zones (36, 104). Taxa that have a wide geographical distribution and have long been used in the stratigraphy of the Silurian of Europe, Asia, North America, North Africa, and Australia have been chosen as index species of the graptolitic zones of the Silurian of Ukraine.

Depending on the completeness of zonal complexes and on what ratios of individual species or complexes are used - phylogenetic (related) or ecological (random, albeit causal) - in modern stratigraphy, two types of biotratigraphic zones are most often distinguished:

1) zones of distribution of taxa (biozones, phylozones, competitive-ranking zones, oppel zones, interval zones) and

2) complex zones (cenozones, ecozones).

Zones of the first type reflect predominantly related relationships of taxa, while those of the second type reflect the change of some ecological and facies settings by others.

In this work, depending on the specific distribution of graptolites along the section of a particular well or outcrop, only zones of species distribution, that is, zones of the first type, are distinguished.

In accordance with modern stratigraphic requirements (36), in our work, only the lower boundaries of the zones are substantiated by one of the following methods:

1) by the appearance in each specific geological section of a species-index of the zone, if a closely related (ancestral) species is established directly below its finds;

2) by the appearance of characteristic species of the given zone, if species closely related to them are found downstream;

3) by the disappearance from the sections of the characteristic species of the previous zone and the subsequent appearance of the characteristic species of this zone, despite the fact that closely related species have not been identified in adjacent complexes of this particular section.

The upper boundaries of the zones in the studied interval of the Silurian of Ukraine from the Upper Llandovery to the Lower Devonian inclusive are drawn along the base (along the bottom) of the overlying zones.

Early Epoch / Lower Subsystem

Bolotinian Age / Stage (see fig. 2)

In the southwest of the East European Platform (EEP), the Bolotino deposits occur transgressively and with a large stratigraphic hiatus on the Ordovician, Cambrian, or Vendian deposits (80).

Their stratigraphic completeness is not the same. On the Volyn-Podolsk plate, it includes the Teremtsovo erosion remnants (81), the lower parts of the Furmanovskaya, Suskaya and Shchedrogorskaya formations with a total thickness of 2-6.5 m (5, 82, 85). One brachiopod zone, *Visbyella visbyensis*, is distinguished here in the horizon.

On the Moldavian plate, the Morosheshtskaya, Step-Sochskaya and Chok-Maidanskaya formations with a total thickness of 21-32 m belong to the Bolotinsky horizon (see Fig. 32-2). Here, in addition to the above, three more brachiopod zones (bottom) are distinguished: *Stricklandia laevis*, *Pentamerus oblongus*, and *Costistricklandia lirata* (101).

In the pelagic formations of the Lvov-Kolomiya structural-facies region (83), one graptolitic zone *Monoclimacis crenulata* is distinguished. It includes the lower parts of the Dublyanskaya and Kladnevskaya suites up to 18.4 m thick (see Fig. 32-1, 32-2, 32-3).

The ***Monoclimacis crenulata*** Zone (Fig. 8, 9, 15, 20) is the oldest pelagic and hemipelagic Silurian deposits within Podolia. In the stratotype, it completes the Llandovery Series of Great Britain (182).

In the Dniester reference section, the zone is identified in the lower part of the Furmanovskaya Formation on the remains of *Monoclimacis crenulata* (Tornq.), *M. gracilis* (E. et W.), *Monograptus priodon* (Bronn), *M. parapriodon* Bouc. (84). The brachiopods *Plagiorhyncha analoga* (Wen.), *Eoplectodonta duvalii* (Dav.), *Glassia obovata* (Sow.) and other species of the *Visbyella visbyensis* Zone of the Bolotinsky Horizon were found together with them.

Some types of graptolites of the *Monoclimacis crenulata* zone were found on the Podolsk ledge of the basement in the wells Shidlovtsy-16902 (int. 296.6-298.5 m) and Yurkovtsy-16903 (int. 144-146.6 m).

On the Polessky (Kovelsky) basement ledge, the lower part of the Shchedrogorskaya Formation belongs to the *Monoclimacis crenulata* Zone (borehole Mosyr-5372, int. 370-376 m). In these sections of the Volyno-Podolsk plate, the zone is represented by marls with lenticular interlayers of clayey limestones containing the remains of various benthic organisms. The thickness of the zone here does not exceed 6 m.

In the Prut part of the Moldovian Plate, the *Monoclimacis crenulata* Zone is established based on the findings of *Monograptus parapriodon* Bouc. (borehole Bolotino-1, borehole 427-435 m, Korneshty-2, borehole 670-682 m). Its thickness is 8-12 m. The brachiopods *Costistricklandia lirata* (Sow.), *Atrypa hedei* Struve, and others occur together with graptolites (96).

In the Dobrudzhsky trough, the zone includes a sequence of interbedded black limestones and mudstones, in which *Monograptus praecedens* Bouc. was found (see Fig. 14). (well Kazaklia-1, int. 4072-4075 m).

Numerous graptolites of the *Monoclimacis crenulata* Zone were found in dark gray marls from the very bottom of the Kladnevskaya Formation in the western part of the Kovel uplift (Fig. 17, see Fig. 15). *Monoclimacis crenulata* (Tornq.), *Oktavites spiralis* (Gein.), *Streptograptus anguinus* (Prib.), *Retiolites angustidens* E. et W. 16, depth 372-375 m). Together with them, the brachiopods *Leangella segmentum* (Lindstr.), *Resserella sabrinae* Bass. and others. The thickness of the zone is 3-5.4 m.

In the Carpathian trough, this zone includes the lower part of the Dublyanskaya suite (83), which is represented by dense marls and mudstones (well Zagaipol-1, interval 2911-2913 m; Davideny-1, interval 2990-3001 m). The thickness of the zone is 11-12 m (see Fig. 8, 20).

Middle Epoch / Middle Subsystem

Kitaigorodian Etape / Belt (see fig. 2)

In the graptolitic facies of the Lvov-Kolomiya structural-facies region, the Kitaigorodian belt includes the upper large parts of the Kladnevskaya and Dublyanskaya suites with a total thickness of 43-?76 m (see Fig. 32), which conformably lie on the Llandoverian deposits.

According to the stratigraphic distribution of graptolites, which are very rare in the Kitaigorod belt, two zones are distinguished (bottom): *Uncinatograptus riccartonensis-Cyrtograptus murchisoni* and *Monograptus flemingii.* They are characterized by low rock thickness, monotonously polyfacial composition of sediments (interbedding of mudstones, marls and lenticular microgranular limestone layers) and rare finds of remains of benthic groups of organisms (most often brachiopods). This makes it possible to substantiate the correlation of graptolitic zones with horizons of the shelf facies of the Silurian of Ukraine.

From the Welsh, Czech and Lithuanian zones, individual sections of which the author was able to personally examine in the field, the coeval Wenlock zones of the Silurian of Ukraine are distinguished by a very rare occurrence of representatives of the genus *Cyrtograptus* Carr., 1867, as well as a significantly smaller number of graptolitic zones.

In the shelf (carbonate) facies of the Kovel-Kishinev structural-facies region, the Kitaigorodian belt (superhorizon) with a thickness of 42-91 m is divided into two horizons: Furmanovian and Alizonian (66, 94, 101). They are comparable, respectively, with the Sheinwoodian and the lower part of the Homerian (within the Whitewell chronozone) of Great Britain (110).

The ***Uncinatograptus riccartonensis - Cyrtograptus murchisoni*** Zone (Fig. 15, 17, 18) was established in the lower part of the Wenlockian deposits of North Wales (203). In the Dniester basin, it was identified by us in the right slope of the Ternava River opposite the village. Kitaigorod (outcrop Kitaigorod-29) based on findings of *Cyrtograptus murchisoni murchisoni* (Carr.), *C. murchisoni bohemicus* Bouc. This was of decisive importance for determining the Wenlock age of the predominant part of the Kitaigorod deposits in Ukraine (19, 84).

Remains of *Uncinatograptus riccartonensis* (Lapw.), *Pristiograptus praedubius* (Bouc.), etc. (see Fig. 18) were found in carbonate deposits of the Volyno-Podolsk plate (well Yurkovtsy-16903, depth 144-145 m; Olkhovtsy-16912, depth 201-214 m, Shidlovtsy-16902, depth 283.5 m, Kordovtsy-16916, depth 229.5 m, Koropets-1, depth 1272.8 m, Koropets-3, depth 1315-1319, 5 m; Podgaytsy-3, depth 1147.5 m; Mosyr-5372, depth 345 m). The installed capacity of the zone is 18 m.

Together with graptolites, the remains of brachiopods of the deep-water community *Dicoelosia - Skenidioides*, which is typical for the Furman horizon of the Kovel-Kishinev region, were collected (9).

The *riccartonensis-murchisoni* Zone is traced in the western part of the Kovel basement high in the lower part of the Kladnevskaya Formation (see Fig. 3). Its power is 23-? 29 m (borehole Kharsy-1873, borehole 418-441 m; Shiev-4109, borehole 524-? 553 m). The remains of brachiopods *Dicoelosia paralata* Bass., *Resserella sabrinae* Bass., *Meristina podolica* (Nikif.) and others were found together with graptolites (see Fig. 15, 17).

In the Cis-Carpathian trough, this zone includes the lower part of the Dublyanskaya (79) formation (borehole Davideny-1, int. 2985-2990 m).

In the Dobrudzhsky trough, the zone is composed of black pelitomorphic limestones with mudstone interbeds (well Kazaklia-1, depth 4060-4065.5 m). They contain *Uncinatograptus riccartonensis* (Lapw.), *Pristiograptus sardous* (Gort.), *Monograptus priodon* (Bronn). The total thickness of the zone in the Lvov, Carpathian and Dobrudzh troughs has not been established due to the interval recovery of core from deep wells (see Fig. 8, 12, 14, 16, 20, 22).

Paleontological data allow us to correlate the described Silurian zone of Ukraine with the lower part of the Shanewood Stage of Wales and the Silurian ISS. Characteristic graptolites of the upper part of the Sheinwoodian Stage have not yet been found within Volyno-Podolia.

The ***Monograptus flemingii*** Zone (Fig. 9, 15, 16, 18, 19, 28) is characterized by a very poor composition of graptolites and their relatively rare occurrence. The most representative section of it was found in int. 398-418 m well Kharsy-1873 in the western part of the Kovel uplift (see Fig. 15). It includes the middle part of the Kladnevskaya Formation (see Fig. 32), represented by dark gray marls with interlayers of pelitomorphic limestones.

The lower boundary of the zone is drawn by the appearance of *Monograptus flemingii* (Salt.), *Pristiograptus dubius* (Suess), *P. pseudodubius* (Bouc.), *P. praedubius* (Bouc.) in the sections. It is also determined by the disappearance of *Uncinatograptus riccartonensis* (Lapw.), *Monograptus priodon* (Bronn) from the sections (well Shiev-4109, depth 477-524 m; Pisha-16, depth 306-336 m). The thickness of the zone is 20-47 m. The brachiopods *Meristina podolica* (Nikif.), *M. bilobata* T. Modz., *Resserella sabrinae* Bass., *Dicoelosia paralata* Bass., *Pentlandina lewisii* (Dav.) and others are found in it.

Monoclimacis flumendosae (Gort.) was found in the submerged part of the Lvov trough in the layering of mudstones, siltstones and limestones (well Velikiye Mosty-30, depth 3974.6-3983.9 m). They may point to the *Monograptus flemingii* Zone, but in English sections this species is also found in the underlying *Uncinatograptus riccartonensis* Zone (110). The installed capacity of the zone is 48 m.

In the western part of the Kovel-Kishinev region, in limestone-marl deposits, together with *Monograptus flemingii* (Salt.), *Pristiograptus pseudodubius* (Bouc.), *P. praedubius* (Bouc.), the brachiopods *Dolerorthis rustica* (Sow.) , *Meristina bilobata* T. Modz. and others (borehole Koropets-1, borehole 1249-1271 m; Mosyr-5372, borehole 307-343.5 m, etc.) have been installed.

The thickness of the zone is 30-38 m.

According to the study of graptolites and brachiopods, the *Monograptus flemingii* Zone of Volyno-Podolia correlates with the upper part of the Sheinwoodian and lower part of the Homerian (within the Whitwellian chronozone) Stages of Wales and the Silurian ISS.

Tiritian Etape / Belt (see fig. 2)

The Tiritian deposits of Ukraine are deposited according to the Kitaigorodian one. Pelagic deposits of the belt are widely developed in the submerged part of the Lvov and in the Precarpathian trough. They are represented by mudstones with interlayers of marls and limestones (upper part of the Dublyanskaya Formation) and argillaceous limestones with interlayers and members of mudstones (Zheldetskaya Formation) with a total thickness of up to 135 m (83).

In the Dobrudzhsky trough, their age analogues were passed by only one well (Kazaklia-1) with a small-diameter core sampled by intervals. The remains of graptolites are rare, and therefore the upper part of the Tiritian deposits is not dissected.

Hemipelagic deposits are quite well studied in the western part of the Polessky uplift of the basement, where they are composed of compacted marls (the upper part of the Kladnevskaya suite) and marls with interlayers and units of clayey limestones (the Zabrodskaya suite) with a total thickness of 160–220 m (86).

In the Lvov trough (in the Ustilug-Rogatinsky flexure-fault zone), hemipelagic Tiritian deposits were penetrated only by some wells and with insignificant core removal, and therefore their biostratigraphy has not been sufficiently studied (including the division into graptolites).

Based on the described (87, 92) regularities of the historical development of graptolites, we propose to draw the lower boundary of the Tiritian belt of the MSS Silurian along the base of the *Ludensograptus ludensis-Gothograptus nassa* zone.

According to the stratigraphic distribution of graptolite species in the Tiritian pelagic and hemipelagic deposits of Ukraine, three zones are distinguished (from bottom to top): 1) *Ludensograptus ludensis-Gothograptus nassa,* 2) *Neodiversograptus nilssoni-Saetograptus chimaera,* 3) *Saetograptus leintwardinensis.*

To the east (across the strike of the Silurian deposits of Ukraine), the hemipelagic deposits are gradually replaced by facies shelf carbonate formations of the Tiritian superhorizon (belt), which, according to the study of brachiopods and chitinoids (94, 101), is subdivided into two horizons: Neuridian and Konovian (see Fig. 3).

In the geological sections of the western part of the Kovel-Kishinev structural-facies region, as well as the eastern part of the Lvov-Kolomiya region (83), remains of brachiopods, chitinozoans and graptolites are found together. They make it possible to correlate these horizons with graptolitic zones.

The ***Ludensograptus ludensis-Gothograptus nassa*** Zone (Fig. 9, 15, 16, 17, 18, 19, 20, 23, 24, 28) includes the upper part of the Kladnev Formation in the western region of the Kovel basement high. The most typical for Vopyno-Podolia is the section of the zone in the borehole Harsy-1873 (int. 377-398 m), where it is represented by marls with limestone interlayers (see Fig. 15).

Similar sections were discovered (Fig. 19) by wells Shiev-4109 (int. 467-477 m), Pishcha-16 (int. 284-307 m), Zaluzhye-27 (int. 443-452 m), Gushcha-4015 (int. 981-996 m). The remains of *Gothograptus nassa* (Holm), *Ludensograptus ludensis* (Murch.), *L. praedeubeli* (Jaeg.), *Pristiograptus* *pseudodubius* (Bouc.), *P. parvus* Ulst, *P. dubius* (Suess), etc. were found in them. The thickness of the zone is 9-23 m.

In the western part of the Brest depression, it is represented by marls with limestone interbeds in the upper part of the Lipnovskaya suite (61). In the well Brest-1 (int. 733-745 m) graptolites characteristic of the zone (86) were found in marls. They are confined to that part of the section, which was recently distinguished as "beds with *Leangella segmentum* (Lindatr.)" (40, p. 25).

In the Lvov trough, this zone includes the lower part of the Zheldetskaya Formation (5, 83). Black mudstones contain (see Fig. 16) *Gothograptus nassa* (Holm), *Ludensograptus ludensis* (Murch.), *Pristiograptus pseudodubius* (Bouc.), etc. (borehole Velikiye Mosty-30, int. 3929.4-3939.8 m).

In the Precarpathian trough, the zone includes the upper part of the Dublyanskaya suite (83). Mudstones contain remains (see Fig. 20) of species characteristic of the zone (borehole Zagaipol-1, depth 2871-2876 m). The total thickness of the zone in the Lvov, Precarpathian and Dobrudzhy troughs has not been established due to the interval recovery of deep well cores.

This graptolitic zone can also be traced in some wells in the western part of the Kovel-Kishinev region. Members of marlstones developed among lumpy limestones contain *Ludensograptus ludensis* (Murch.), *Pristiograptus dubius* (Suess), etc. (well Koropets-2, int. 1194-1227 m; Koropets-4, int. 71310-1340 m). The brachiopods *Striispirifer plicatelus* (L.), *Atrypa lapworthi* Alex. were found together with them.

In the marls of the upper part of the Shchedrogorskaya Formation (86) there are also (see Fig. 23, 24) the remains of the above graptolites (borehole Samoilichi-1859, borehole 462-472 m; Priluki-1844 borehole 535-541 m). In addition to the listed brachiopods, *Strophochonetes cingulatus* (Lindstr.), *Protochonetes minimus* (Sow.), *Cordatomyonia edgelliana* (Dav.), *Leangella segmentum* (Lindstr.) have been found here.

The given paleontological characterization of the zone described above within Volyno-Podolia allows us to confidently correlate it with the upper part of the Homerian stage of Wales and the Silurian ISS in the volume of the Gleedonian chronozone of the uppermost part of the Wenlock Series (110).

In terms of the scale of faunistic changes recorded by fossil organisms in its sediments, the Gleedonian chronozone is commensurate in stratigraphic volume, in our opinion, with the stages of the Jurassic system in the interpretation of A. Orbigny.

Therefore, we consider the Whitwellian and Glidonian chronozones of the Homerian Stage of the ISS (109) as Stages of the Middle Epoch (Middle Subsystem), also taking into account that the biostratigraphic boundary of the Kitaigorodian and Tiritian Belts of the Middle Silurian passes between these zones, that is, the boundary of a larger unit than the stage (see fig. 2).

The ***Neodiversograptus nilssoni-Saetograptus chimaera*** Zone (Figs. 8, 9, 14, 15, 17, 19, 20, 21, 23, 24) is represented in the western part of the Kovel basement high (86) by intercalation of limestones and marls from the lower part of the Zabrodskaya Formation (borehole Kharsy-1873, interval 340-377 m; Shiev-4109, interval 441.3-467 m; Zaluzhye-27, interval 430-443 m; Pischa-16, interval 260-284 m).

Its lower boundary is drawn both by the disappearance of graptolites from the sections of the previous zone, and by the mass appearance of its characteristic *Lobograptus progenitor* Urb., *Neodiversograptus nilssoni* (Barr.), *Bohemograptus bohemicus* (Barr.), *Saetograptus chimaera* (Barr.), *Colonograptus colonus* (Barr.), *Plectograptus macilentus* (Tornq.), *Spinograptus clathrospinosus* Eis. and others (see Fig. 15, 17, 19).

The section of the zone, typical for the southwest of the East European Platform, is taken to be deposits in int. 952-981 m well Guscha-4015. Its thickness is 29-37 m.

In the Brest depression, the zone is represented by similar deposits (well Brest-1, depth 695-733 m; Brest-10, depth 821-856.5 m) with a total thickness of 35-38 m. *Heisograptus micropoma* (Jaek.), *Pristiograptus dubius* (Suess), etc. Together with graptolites, remains of brachiopods *Howellella cuneata* Rub., *Aegiria grayi* (Dav.), *Atrypa sowerbyi* Alex., *Meristina obtusa* (Sow.) and other species, common in the Silurian of the Baltic States and Great Britain (67, 68).

In the Cis-Carpathian and Lvov troughs, this zone includes the lower part of the Zheldetskaya Formation (83), which is represented by black mudstones with limestone interlayers (well Davideny-1, int. 2936-2939 m; Zagaipol-1, int. 2870- 2871 m; Ivano-Frankivsk-1, interval 3532-3535 m; Dublyany-4, interval 4210-4215 m).

Similar deposits of the zone were uncovered in the Dobrudzhsky trough (well Kazaklia-1, int. 4006-4013 m). Remains of *Heisograptus micropoma* (Jaek.), *Uncinatograptus uncinatus* (Tullb.), *Lobograptus scanicus* (Tullb.), *Saetograptus chimaera* (Barr.), etc. characteristic of it, have been found (Fig. 20). The installed capacity of the zone in the Precarpathian and Lvov troughs is 32-50 m.

In the eastern part of the Kovel uplift, the *nilssoni-chimaera* zone includes the lower part of the Turskaya suite (82), which is represented by a sequence of interbedded limestones and marls (well Mosyr-5372, depth 266-295 m; Samoylichi-1859, depth 392-462 m). In these sections, limestones predominate, and therefore they belong to the Kovel-Kishinev facies region.

Marl beds contain remains of *Colonograptus colonus* (Barr.), *Bohemograptus bohemicus* (Barr.), *Pseudomonoclimacis tauragensis* (Pask.), *"Monograptus" huckei* Munch, and limestones contain remains of brachiopods *Atrypa sowerbyi* Alex., *Meristina obtusa* (Sow.), *Aegiria grayi* (Dav.) and others (see Fig. 24). The thickness of the zone reaches 70 m.

The paleontological characteristics of the *nilssoni-chimaera* Zone allow it to be correlated with the Gorstian Stage of Wales and the Silurian ISS.

In the stratotype of the Gorstian Stage, three zones have long been distinguished (from bottom): *Neodiversograptus nilssoni*, *Lobograptus scanicus*, *Pristiograptus tumescens*, which are an example of zones of the second type (coenozones, ecozones), which were discussed at the beginning of this chapter (section).

In Poland, the Baltic States (77), the Czech Republic and other countries, many zones are also distinguished in this stratigraphic interval, and in each country they are different, which indicates their local distribution (i.e., environmentally determined).

The ***Saetograptus leintwardinensis*** Zone (Figs. 8, 9, 14, 15, 16, 19, 20, 21, 23, 24) is represented in the western part of the Kovel basement ledge by interbedding marls and limestones of the upper part of the Zabrodskaya (86) formation (borehole Gushcha-4015, interval 923-952 m; Kladnev-5396, interval 410-430 m; Harsy-1873, interval 334-340 m).

Its lower boundary is drawn by the appearance in the sections *Saetograptus leintwardinensis* (Lapw.), *Cucullograptus hemiaversus* Urb., *Neolobograptus fragilis* Tseg., *Bohemograptus praecornutus* Urb., *Lobograptus invertus* Urb. (see Fig. 15, 19).
In addition to those listed in this zone, there are *Lobograptus progenitor* Urb., *L. exspectatus* Urb., *Saetograptus chimaera* (Barr.), *Colonograptus haupti* (Kuhne), *Pristiograptus vicinus* (Pern.), *Bohemograptus bohemicus tenuis* (Bouc.) appeared in the upper part of the zone. They move to the upper zone.

Differentiation of graptolites along the section makes it possible to divide the *leintwardinensis* zone into two subzones - lower and upper. The thickness of the zone in the western part of the Kovel ledge of the basement is 29 m.

In the western part of the Brest depression, this zone includes the upper part of the Franopolskaya Formation. The thickness of the zone increases to 133-144 m (well Brest-1, depth 562-695 m; Brest-10, depth 677-821m; Priluki-1844, depth 374-450 m). It is represented here by lumpy and platy limestones with marl interlayers, in which, in addition to the characteristic species (Fig. 21), *Pristiograptus tumescens* (Wood), *Saetograptus chimaera* (Barr.), *Lobograptus scanicus* (Tullb.) and others, are found brachiopods *Dayia navicula* (Sow.), *Aegiria grayi* (Dav.), *Septatrypa linguata* (Buch), *Cyrtia exporrecta* (Wahl.), etc.

In the Lvov and Carpathian troughs, this zone includes the upper part of the Zheldetskaya and the lower part of the Peremyshlyanskaya suite (83). They are represented, judging by individual core lifts, by black argillites or marls with limestone interbeds (well Velikiye Mosty-30, depth 3844-3855.4 m, 3867.3-3873.8 m, 3882.9-3873, 8 m; Dublyany-4, interval 4198-4205 m; Ivano-Frankivsk-1, interval 3455-3456 m; Zagaipol-1, interval 2802-2806 m; Davideny-1, interval 2932-2936 m). They contain *Saetograptus leintwardinensis* (Lapw.), *S. chimaera* (Barr.), *Cucullograptus hemiaversus* Urb., *Colonograptus colonus* (Barr.), *Bohemograptus bohemicus* (Barr.), *Pristiograptus vicinus* (Pern.), etc. (see Fig. 8, 14, 16, 20), brachiopods *Coelospira baltica* Rybn. The thickness of the zone in the Lvov trough is (approximately) 31-41 m, in the Cis-Carpathian trough - 35-79 m.

According to paleontological data, the *Saetograptus leintwardinensis* Zone of the Silurian of Volyno-Podolia correlates with the lower part of the Ludfordian Stage of Wales and the Silurian ISS.

It is indicative that in the stratigraphic interval of this zone in different countries usually no more than one zone is distinguished.

Outside of Europe, subspecies *Saetograptus fritschi linearis* (Czech Republic, Morocco) or *Saetograptus leintwardinensis primus* (Canada) are accepted as zonal.

We recommend that the deposits of this zone be identified in the ISS of the Silurian system under the name of the Konovian Stage (the stratotype of the stage is the section of the Konovsky horizon of the Dniester reference section of the Silurian).

Late Epoch / Upper Subsystem, Section

Ulichian Etape / Belt (see fig. 3)

The Late Silurian deposits of Ukraine are deposited according to the Middle Silurian. In the Dniester reference section, they are represented by various predominantly carbonate and carbonate-argillaceous rocks with numerous fossil remains of various benthic groups of organisms and remains of unclear plant (acritarchs) and animal (conodonts, chitinozoans) origin.

Shelf facies of Late Silurian carbonate-argillaceous deposits are traced by wells everywhere within the western and southwestern slopes of the Ukrainian crystalline shield. This is the Kovel-Kishinev structural-facies zone of Silurian sedimentation.

The beginning of the Ulichian Etape of development of benthic and planktonic (graptolites, acritarchs, conodonts, chitinozoans) groups of organisms was established in the boundary deposits of the Konovskaya and Tsviklevskaya suites of the Dniester reference section of the Silurian and their age analogues in other areas and regions of the South-West of the East European platform and, further, the Brest depression, Poland, the Baltic countries, Sweden (The author got acquainted with the outcrops of Silurian rocks and collected brachiopod shells during a field trip to the island of Gotland in August 1985).

As the ulichian shelf formations strike to the West and South-West, they were gradually facies replaced by deeper-water sediments with the remains of planktonic groups of organisms.

The brachiopods *Isorthis crassa* (Lindstr.), *Shaleriella delicata* Harp. et Bouc., *Protochonetes ludloviensis* Muir-Wood, *Microsphaeridiorhynchus nucula* (Sow.), trilobites, tabulates, heliolithoids, ostracods, cephalopods, conodonts, chitinozoans appeared in the geological record at this stratigraphic level.

At the same turn, a significant number of species and genera among various groups died out organisms that were characteristic of the Tiritian Etage in the development of the organic world (72).

Pelagic Ulichian deposits are distributed in the same areas as Tiritian deposits - in the submerged part of the Lvov and in the Precarpathian trough.

They are represented by the Peremyshlyanskaya suite, which is composed mainly of dark gray and black mudstones with single interlayers of clayey microgranular limestones (83) 120-198 m thick with numerous remains of graptolites.

A similar mudstone sequence in the Dobrudzhsky trough, judging by the rare rises of the core (only one well Kazaklia-1) of small diameter (1. 5-2. 5 cm), apparently does not contain graptolites, although the remains of chitinose in mudstones are found frequent.

Across the strike of the mudstones of the Peremyshlyanskaya suite (toward the East and Northeast), pelagic deposits are quickly replaced by facies carbonate neritic formations of the Tsviklevskaya and Rykhtovskaya formations of the eastern gentle slope of the Lvov trough with a total thickness of 64-86 m (83, 89), in which along with the remains of brachiopods, graptolites are sometimes found, which makes it possible to correlate the horizons of the Ulichian Belt in the southwest of the EEP - the Tagrian and Metonian (94) - with the graptolitic zones.

The hemipelagic formations of the Ulichian Belt were exposed with almost complete core recovery by many wells in the western part of the Kovel uplift of the basement, where they occur at relatively shallow depths (the top of the Belt is at depths of 400-600 m).

They are predominantly marl strata with a total thickness of 178–244 m with numerous remains of graptolites and individual lenticular interlayers and units of clayey lumpy and platy limestones, in which brachiopods are often found, which are used in this work to correlate horizons with graptolitic zones of the Ulichian Belt.

According to the lithological features of the rocks, the Ulichian hemipelagic deposits of the Kovel uplift are subdivided into (from below): the Oleshkovichskaya and Novinskaya formations, as well as the Lower Milovanskaya subformation (86). To the east (across the strike of the rocks), they are gradually replaced by the Gornikskaya (86) and Lugovskaya (10) formations with a total thickness of 74–115 m.

To the west, hemipelagic formations are also gradually facies replaced by miogeosynclinal flyschoid terrigenous deposits of the Lysogorsky anticlinorium of the Sventokrzysky Mountains (86).

Hemipelagic Ulichian deposits of the western part of the Kovel uplift are traced in the north-north-west direction to Poland and the South Baltic, where they are identified as a transitional facies zone between coeval carbonate (shelf) and terrigenous (pelagic) formations (58).

It is known that "the Upper Leintwardian Beds and the Witcliff Stage, which complete the section of the Marine Silurian of Great Britain, do not contain graptolites" (26, p. 73).

Three zones are distinguished in the interval from the *Saetograptus fritschi linearis* Zone to the *Monograptus ultimus* Zone in the upper part of the Kopanin Beds of the Czech Republic: *Pristiograptus longus, P. fecundus*, and *P. fragmentalis* (142, 180).

In the same interval of the section in Poland, five zones were identified (192, 209, 210).

In connection with such disagreements, the indicated interval of pelagic deposits on the territory of the former USSR was distinguished under the name of the *Neocucullograptinae* horizon, the biozonal division of which was absent until recently (60, Table 2).

The study of graptolites from the Silurian of Ukraine allowed us to divide it into two zones (from bottom): *Neocucullograptus kozlowskii unicornus* and *Uncinatograptus caudatus-Wolynograptus balticus* (85, 92). By decision of the Silurian subcommittee of the interdepartmental stratigraphic committee of the former USSR (Leningrad, 1987), these zones were named, respectively (Fig. 22), *Neocucullograptus kozlowskii-Neolobograptus auriculatus* and *Monograptus formosus-M. spineus* (24).

Separate characteristic species of these zones have recently been established in the Northern Balkhash region (25), the Baltic states (18, 58), the Czech Republic (142, 178, 179) and Poland (210). However, the Silurian ISS developed by the MCSS still lacks division of the *Neocucullograptinae* horizon into graptolitic zones (79, 129).

Thus, we propose to draw the lower boundary of the Ulichian Belt of the Silurian ISS in pelagic facies, taking into account the patterns of morphological changes in graptolites and their historical development described in the work, at the foot of the *Neocucullograptus kozlowskii-Neolobograptus auriculatus* zone.

Based on the stratigraphic distribution of graptolite species, the Ulichian pelagic and hemipelagic deposits of Ukraine are subdivided into two complex zones of the first type: *Neocucullograptus kozlowskii-Neolobograptus auriculatus*, *Formosograptus formosus-Bugograptus spineus.*

The ***Neocucullograptus kozlowskii-Neolobogpaptus auriculatus*** Zone (Fig. 7, 8, 9, 11, 16, 19, 20, 22, 23, 24) in the western part of the Kovel basement ledge is represented mainly by marl strata with limestone interlayers in its upper part (borehole Pulemets-1884, interval 747-783 m; Kusnishche-5394, interval 470-530 m). It includes the upper part of the Zabrodskaya, Oleshkovichskaya, and lower part of the Novinskaya Formations (86).

As a characteristic of the zone, a section in int. 820-923 m well Guscha-4015. Its lower boundary is drawn by the appearance of graptolites *Neolobograptus auriculatus* Urb., *Bohemograptus cornutus* Urb., *Polonograptus egregius* Urb., *Linograptus sp.* The zone is characterized by *Neocucullograptus kozlowskii kozlowskii* Urb., *N. kozlowskii unicornus* Urb., *Fterograptus torsivus* Tseg., *Pristiograptus kosoviensis* (Bouc.). The zone also includes *Lobograptus expestatus* Urb., *Bohemograptus bohemicus* (Barr.), *B. praecornutus* Urb., *Ludensograptus latilobus* (Tseg.), *Pseudomonoclimacis tauragensis* (Pask.), etc. (see Fig. 7, 11, 19). The thickness of the zone reaches 103 m.

In the eastern part of the Kovel basement ledge, this zone includes the upper part of the Turskaya suite and the lower most part of the Gornikskaya suite (86), which are represented by argillaceous limestones with marl interbeds (well Samoilichi-1859, int. 267-300 m). The latter contain remains of *Neolobograptus auriculatus* Urb., *N. longiseptum* Tseg., *Pseudomonoclimacis tauragensis* (Pask.), etc. and brachiopod *Dayia navicula* (Sow.) (Fig. 24).

In the marl-limestone sequence of the Brest depression (well Priluky-1844, depth 310-374 m; Brest-1, depth 7503-562 m; Brest-10, depth 635-677 m), installed *Neocucullograptus kozlowskii* Urb which characteristic of the Zone ., *Neolobograptus iniquus* Tseg., *N. longiseptum* Tseg., *N. evolvens* Tseg., *Pristiograptus kosoviensis* (Bouc.) and others (see Fig. 9, 21, 23). The brachiopods have also been found here *Dayia navicula* (Sow.), *Eomartiniopsis ludloviensis* Rybn., *Aegiria grayi* (Dav.), *Dicoelosia oklahomensis* Amsd. and others.

The thickness of the zone is 42-64 m.

In the Lvov and Carpathian troughs, this zone includes the lower part of the Peremyshlyanskaya suite (83). In the well Zagaipol-1 (int. 2799-2802 m) also includes the upper part of the Zheldetskaya suite, which indicates the metachronism of the boundary between these suites.

The zone is represented, judging by individual core lifts, by mudstones (less often marls) with limestone interlayers (well Velikie Mosty-30, depth 3740-3745.8 m, 3768.2-3774.4 m; Peremyshlyany-1, depth 2810.4-2817.6 m, 2861-2870.3 m; Dublyany-4, interval 4104-4110 m, 4130-4166.7 m; Ivano-Frankivsk-1, interval 3452-3455 m; Davideny- 1, interval 2856-2857 m).

Mudstones contain remains of *Neolobograptus auriculatus* Urb., *N. iniquus* Tseg., *Neocucullograptus inexspectatus* (Bouc.), *Bohemograptus urbaneki* Tseg., *Pseudomonoclimacis medius* Tseg. and others (see Fig. 8, 14, 20, 22).

The thickness of the zone in the Lvov trough is 73-124 m, in the Carpathian trough - 80-94 m.

According to the above paleontological data, the biostratigraphic volume of the pelagic formations of this zone and the Tagrian Stage of the Silurian of Ukraine is commensurate with the volume of the Horstian, Shanewoodian, Telichian and other stages of the Silurian of Wales and the ISS, adopted by the 27th session of the IGC in 1984. In this regard, we propose to single out the Tagrian Stage in the ISS of the Silurian system.

According to its stratigraphic position in the geological section above the *Saetograptus leintwardinensis* Zone, it may correspond to the middle part of the Ludfordian Stage of the Silurian of Wales, where graptolite remains are absent.

The Tagrian interval of the Silurian section in Poland is subdivided into five graptolitic zones (210), and in the Czech Republic – into three zones (180).

The ***Formosograptus formosus-Bugograptus spineus*** Zone (Fig. 7, 8, 11, 12, 14, 19, 20, 22, 25) was identified as the *Uncinatograptus caudatus-"Monograptus" balticus* Zone (92).

Later it was called the *formosus / balticus* (24), and the subcommittee of the ICSS of the former USSR on the stratigraphy of the Silurian system - the *formosus / spinus* zone (Leningrad, 1987) An oblique line between the index species of the last of the names separates the names of the boundary biohorizons (respectively, the lower and upper) limiting the biostratigraphic interval (*Interval*-Zones) of this zone (36).

In the western part of the Kovel ledge of the basement, the zone is represented in the lower part by the interbedding of limestones and marls, and in the upper part by a predominantly monotonous stratum of massive marls (well Pulemets-1884, int. 584-747 m; Selyakhi-1883, int. 352 ,7-404 m; Kusnishche-5394, interval 415-470 m). It includes the upper part of the Novinskaya and the lower parts of the Milovanskaya Formations (86).

The section in int. 694-820 m well Guscha-4015 is taken as the stratotype of the zone. Its lower boundary is drawn both by the disappearance of species characteristic of the underlying zone (see Fig. 7, 11, 19), and by the appearance in geological sections of outcrops and boreholes of *Uncinatograptus caudatus* Tseg., *Monograptus* (*Slovinograptus) balticus* (Tell.), *Serenograptus hamulosus* (Tseg.), *lstrograptus rarus* (Tell.), *Formosograptus formosus* (Bouc.), *F. uncatus* (Tseg.), *Bugograptus aculeatus* (Tseg.), *Wolynograptus acer* (Tseg.) and others.

Bohemograptus bohemicus tenuis (Bouc.), *Ludensograptus latilobus* (Tseg.), *Pristiograptus fragmentalis* (Bouc.) and others are also found in this zone.

The thickness of the zone varies from 125 to 163 m.

In the Lvov and Precarpathian troughs, this zone includes the upper part of the Peremyshlyanskaya suite (83), which is composed of black mudstones with lenticular limestone interlayers (well Glinyany-1, int. 2814-2820 m, 2845-2851 m; Litovezh-1, interval 2535.4-2537.4 m; Peremyshlyany-1, interval 2729.5-2739.9 m, 2757.2-2765.1 m; Dublyany-4, interval 4039-4048.8 m, 4084-4104 m; Zagaipol-1, interval 2650-2657 m, 2715-2722 m; Davideny-1, interval 2755-2761 m).

Argillites contain *Formosograptus formosus* (Bouc.), *Bugograptus spineus* (Tseg.), *B. aculeatus* (Tseg.), *Wolynograptus acer* (Tseg.), *Monograptus (Slovinograptus) balticus* (Tell.), *Serenograptus hamulosus* (Tseg.) , *Uncinatograptus caudatus* Tseg., *Istrograptus rarus* (Tell.) and others (see Fig. 8, 12, 14, 20, 22).

Pristiograptus fragmentalis (Bouc.), *P. longus* (Bouc.) and others have a slightly wider vertical distribution.

The thickness of the zone is 50-93 m.

In the western part of the Kovel-Kishinev region, in limestone-marl deposits, together with the remains of brachiopods *Levenea canaliculata* (Lindatr.), *Shaleriella delicata* Harp. et Bouc., *Protochonetes ludloviensis* Muir-Wood, etc. (borehole Zavadovka-6, depth 1317-1342 m; Brest-10, depth 579 m) occasionally found remnants graptolites *Bugograptus spineus* (Tseg.), *B. aculeatus* (Tseg .), *Pristiograptus fecundus* Prib. and others (Fig. 25).

Remains of *Uncinatograptus caudatus* Tseg. identified by the author at a depth of 1266.9 m from the Dubovskoye borehole (Kaliningrad region of Russia in the distant Baltic), and *Wolynograptus acer* (Tseg.) from the interval 1282.7–1288.8 m of the same borehole at the request of the Director of the Institute of Geology of Estonia D.L. Kalyo. Both species are characteristic of the *Formosograptus formosus-Bugograptus spineus* Zone, which indicates a wide geographical distribution of this zone (18).

The paleontological characteristics of this zone and the stratigraphic position in the geological section above the *Neocucullograptus kozlowskii-Neolobograptus auriculatus* Zone have no age analogues of the *Formosograptus formosus-Bugograptus spineus* Zone known to the author in other regions.

Therefore, we propose to distinguish the stratigraphic interval of the *Formosograptus formosus-Bugograptus spineus* complex zone of Volyno-Podolia under the name of the Metonian Stage in the ISS of the Silurian system.

Skalian (Przhidolian) Etape / Belt (see fig. 3)

Skalian shelf deposits of Ukraine occur conformably on the Ulichian Belt.

Pelagic formations are common in the submerged part of the Lvov and in the Predcarpathian trough, where they are represented mainly by dark gray and black mudstones with a total thickness of 140-350 m with numerous remains of graptolites.

Throughout the section (especially in the lower part of the belt) lenticular interlayers and members of black microgranular pelitomorphic limestones are developed.

According to the lithological features of the rocks, the Skalian pelagic deposits of Ukraine are divided into three formations (from below): Zadarovskaya, Glinyanskaya and Poltvinskaya (83).

In the eastern direction (across the strike), they are gradually replaced by the facies of the Markovichskaya, Darakhovskaya, and Zvenigorodskaya formations with a total thickness of 130–240 m, which are distributed in the western part of the eastern gentle slope of the Lvovsky trough (see Fig. 32).

Hemipelagic Skalian deposits were exposed by many boreholes in the western part of the Kovel uplift of the basement. They are represented mainly by argillite-marl strata with a thickness of 210-260 m with numerous remains of graptolites, which can be extracted by dissolving rocks in hydrofluoric acid.

Throughout the section, interbeds and members of microgranular limestones are developed, in which remains of benthic organisms (brachiopods, trilobites, ostracods, etc.) are found. According to the lithological features of the rocks of the Skalian deposits, the following are distinguished (from below): the Upper Milovanskaya subformation, the Guschinskaya and Tomashevskaya formations (86).

In the eastern part of the Kovel uplift, the basement deposits were destroyed by pre-Cretaceous erosion. In some places, only their erosional remnants remained, represented by the Markovichskaya suite (10) up to 6 m thick (borehole Glukhy-1874, int. 154-160 m).

The lower boundary of the Skalian (Pridolian) Belt in the stratotype section of Barrandiena (Czech Republic) was established by the disappearance of the conodonts *Ozarkodina crispa* (Wall.) from the sections and by the appearance in the geological record of the graptolites *Monograptus parultimus* Jaeg.

(142). This level coincided, as shown in this work, with the boundary of a cardinal change in the systematic composition of graptolites. Therefore, in the pelagic and hemipelagic facies of the Ukrainian Silurian, the lower boundary of the Skalian (Przhidolian) is drawn at the base of the *Istrograptus ultimus-Ludensograptus parultimus* Zone (92).

The issue of the lower boundary of the Skalian (Przhidolian) Belt in shelf carbonate facies remains debatable. The main reason is the impossibility of a direct paleontological correlation of its stratotype with the presumably coeval lagoonal-continental deposits of the Downton Series and the underlying rocks of the Ludlow Series of Great Britain (154).

In the first of them, the remains of normal-marine benthic organisms are absent, and in the second they have a completely different systematic composition, since they belong to the North Atlantic paleobiogeographic province, while the Silurian formations of Barrandiena belong to the Ural-Cordillera province (6).

It should also be taken into account that the upper part of the Ludlov Group of Great Britain (Whitcliff Beds) does not contain remains of graptolites, and therefore it cannot be compared with the Kopaninsky Beds of the Czech Republic and based on graptolites. However, it is confidently correlated by brachiopods and other benthic organisms with the Tsviklevskaya Formation of the Tagrian Horizon (Stage) of Ukraine, which forms the lower part of the Upper Silurian Ulichian Belt (72).

In the shelf facies of the Silurian of Ukraine, the lower boundary of the Przhidolsky Belt, which, as proved as a result of many years of research (72), is at the level of the lower boundary of the Skalian horizon (etage de Skala), is traditionally drawn at the contact of sediments with the Late Malinovetsky (Ulichian Belt) and Skalian (Pridolian) assemblages of brachiopods and other benthic groups of organisms (42, 45, 72, 152).

In the Dniester reference section, the boundary deposits of the Malinovetskaya and Rukshinskaya series are represented by dolomites (Upper Rykhtovskaya Subformation, 5–6 m thick) and dolomite marls with interlayers and dolomite units (Prigorodokskaya suite, 23–34 m thick), in which remains of both benthic and planktonic organisms are absent or extremely rare (in interlayers of calcareous dolomites or dolomitic limestones).

In this regard, until recently it was impossible to accurately indicate the level of the lower boundary of the Przhidolian belt in outcrops of the Dniester basin.

We obtained the paleontological characteristics of the age range of these lagoon-dolomite deposits by studying sections of wells drilled 90-110 km or more to the west and north-west of the Dniester outcrops in the facies zone, where the entire section of the Malinovetskaya and Rukshinskaya series of the local scheme is represented by normal marine carbonate (platy and lumpy limestones, marls) and carbonate-argillaceous (marls, mudstones) rocks with remains of benthic (brachiopods, trilobites, etc.) and planktonic (graptolites) organisms, respectively (boreholes Podgaitsy-1, 2; Koropets-1, 2, 3, 4; Zavadovka-1, 6; Lokachy-6, 10, 14; Zagaipol-1, etc.).

At the same time, the correlation of sections of outcrops and boreholes is based both on direct paleontological data from the Malinovetskaya Series and post-Prigorodoksky deposits of the Rukshinskaya Series (by brachiopods), and on tracing interlayers of volcanic ash (including six interlayers of metabentonites in the Prigorodokskaya Formation).

Thus, it was established that in the normal-marine sediments from the very bottom of the Rukshinskaya Series (including the age analogs of the Prigorodokskaya Formation), the brachiopods *Atrypa dzwinogrodensis* Kozl., *Protochonetes dniestrensis* (Kozl.), *Atrypoidea gigantus* Jones, *Coelospira pusilla* (His.), *Hemitoechia distincta crebra* T. Modz. et Nikif., *Delthyris ex gr. magnus* Kozl. and etc.

In the underlying Upper Malinovets deposits of the Ulichian belt, remains of closely related species, respectively, *Atrypa ex gr. sowerbyi* Alex., *Protochonetes ludloviensis* Muir-Wood, *Atrypoidea prunum* (Dalm), *Coelospira baltica* Rybn., *Microsphaeridiorhynchus nucula* (Sow.), *Delthyris sp.*

Major changes in the systematic composition of brachiopods have been established in the shelf facies of the Silurian of Ukraine between the boundary deposits of the Zvenigorodskaya (upper Silurian) and Khudykovetskaya (lower Devonian) formations.

Upper Silurian brachiopods *Isorthis ovalis* (Pask.), *Protochonetes dniestrensis* Kozl., *Atrypa dzwinogrodensis* Kozl., *Dayia bohemica* Bouc. and others disappeared from the geological record at this time level.

New Devonian genuses and species of brachiopods appeared at this level: *Isorthis szajnochai* Kozl., *Asymmetrochonetes proliferus* (Kozl.), *Atrypa tajnensis* Kozl., *Cyrtina praecedens* Kozl. and many others.

Trilobites, ostracods, crinoids, chitinozoans, and other groups of organisms also underwent cardinal changes in their systematic composition (45, 72).

It has been established that the level of change in the systematic composition of benthic groups of fauna in shelf facies coincided with the bottom of the *Tirassograptus uniformis* zone in graptolitic facies (45, 72, 167).

Such a large change in the systematic composition of ecologically different groups of organisms predetermined the choice of the boundary between the Silurian and Devonian systems at the base of the Borshchovsky horizon and its age counterparts in other regions of the world.

In our opinion, the boundaries of the change in the systematic composition of the organic world, similar to those indicated above, should be used, after their approbation by international working groups, as the boundaries of the ISS divisions.

An analysis of such boundaries from the point of view of their hierarchical subordination inevitably leads to a scientific, and not by agreement, solution of such complex stratigraphic problems as, for example, the Belt and Stage division of the Silurian system, as well as other systems of the Phanerozoic.

According to the stratigraphic distribution of graptolites, the Skalian (Przhidolian) pelagic and hemipelagic deposits of Ukraine are divided into three zones (from bottom): *Istrograptus ultimus-Ludensograptus parultimus, Skalograptus lochkovensis, Istrograptus transgrediens-Tirassograptus bouceki.*

The ***Istrograptus ultimus-Ludensograptus parultimus*** Zone (Fig. 7, 8, 11, 12, 14, 19, 21, 25) in the western part of the Kovel basement ledge is composed of massive marls of the upper part of the Milovanskaya Formation (82). It was re-drilled by the wells Gushcha-4015 (depth 640-694 m), Pulemets-1884 (depth 565-584 m), Kusnishche-5394 (depth 392-415 m).

The section of the zone in the first of these wells with a total thickness of 54 m was taken as typical for the South-West of the EEP. Its lower boundary is drawn by the appearance of *Istrograptus ultimus* (Pern.), *Ludensograptus parultimus* (Jaeg.), *Skalograptus vetus* Tseg. (see fig. 7, 11, 19). Approximately in the middle part of the zone, *Tirassograptus difficilis* Tseg., 1976 (= *Monograptus pridoliensis* Prib., 1981) appeared.

Istrograptus rarus (Tell.), *Pristiograptus longus* (Bouc.), *P. fragmentalis* (Bouc.), *Bohemograptus bohemicus tenuis* (Bouc.) occur in the lower part of the zone, which are also widespread in the underlying zone. The transit species for the described zone are *Pristiograptus fecundus* Prib., *Formosograptus formosus* (Bouc.).

The lower boundary of this zone is also established by the extinction of *Ludensograptus latilobus* (Tseg.), *Wolynograptus acer* (Tseg.), *Bugograptus spineus* (Tseg.), *B. aculeatus* (Tseg.), *"Monograptus" cf. lebanensis* (Tell.) and others. As a result of a significant renewal of the systematic composition of graptolites, the lower boundary of the zone and the Skalian (Przhidolian) Belt is usually easily established.

In the Brest depression, the *Istrograptus ultimus-Ludensograptus parultimus* zone includes the lower part of the Mukhavetskaya suite (at least 50 m), which is represented by lumpy limestones and marls (61). They contain *Skalograptus vetus* Tseg. (borehole Brest-10, depth 532.1-537.3 m).

In the Lvov and Carpathian troughs, this zone includes the Zadarovskaya and lower part of the Glinyanskaya Formation (83). The first of them is composed of interbedding limestones, marls and mudstones (well Glinyany-1, depth 2765-2769 m, 2793-2798 m; Litovezh-1, depth 2491.1-2495.9 m; Davideny-1, depth 2628-2636 m), the second - black mudstones with lenticular limestone interlayers (well Glinyany-1, depth 2728-2735 m; Dublyany-4, depth 3944.4-3946 m). Found in mudstones *Istrograptus ultimus* (Pern.), *I. rarus* (Tell.), *Ludensograptus parultimus* (Jaeg.), *Formosograptus formosus* (Bouc.), *Tirassograptus difficilis* Tseg., *Skalograptus vetus* Tseg. and others (see Fig. 8, 12, 14).

It is now difficult to establish the full thickness of the zone in the Lvov and Carpathian troughs due to the interval core recovery. Approximately it is equal to 50-70 m.

In the western part of the Kovel-Kishinev facies region, the *Istrograptus ultimus-Ludensograptus parultimus* Zone with a total thickness of up to 42 m is represented mainly by limestone-marl rocks (Fig. 26). In the lower part of the Darahovskaya (int. 1274-1284 m) and in the Zadarovskaya suite (int. 1284-1317 m) wells Zavadovka-6, together with the brachiopods of the Stavan Horizon *Atrypa dzwinogrodensis* Kozl., *Protochonetes dniestrensis* (Kozl.), *Atrypoidea gigantus* Jones, and others, graptolites *Istrograptus ultimus* (Pern.), *Ludensograptus parultimus* (Jaeg.), *Skalograptus vetus* Tseg. and others (see Fig. 25).

Graptolites *Tirassograptus ex gr. difficilis* Tseg., *Skalograptus sp*. installed on Zmeiny Island (in the Black Sea) in int. 459-470 m well Marine-1.

The ***Skalograptus lochkovensis*** Zone (Figs. 7, 8, 11, 19) was identified in the Přidodolian deposits of the Czech Republic long ago (72). It is described for the first time in the Upper Silurian of the southwest of the EEP. Its best section was discovered by the Kusnishche-5394 well in int. 365-392 m (see Fig. 11).

It includes the upper part of the Milovanskaya and the lower part of the Gushchinskaya suite in the western part of the Kovel basement ledge (86). The first of them is represented by massive dark gray marls (well Kusnishche-5394, depth 380-392 m; Pulemets-1884, depth 546-565 m; Gushcha-4015, depth 626-640 m), the second - marls with limestone interbeds (well Kusnishche-5394, depth of 365-380 m; Pulemets-1884, depth of 520-546 m; Gushcha-4015, depth of 564-626 m). The total thickness of the zone in this geological-structural region is 27-76 m (see Fig. 7, 19).

Its lower boundary is drawn by the appearance of graptolites *Skalograptus lochkovensis* (Prib.), *Uncinatograptus prognatus* (Koren), *Dulebograptus trimorphus* Tseg., *Wolynograptus canaliculatus* (Tseg.).

In the lower part of the zone there are also *Skalograptus vetus* Tseg., *Ludensograptus parultimus* (Jaeg.), *Istrograptus ultimus* (Pern.), *Tirassograptus difficilis* Tseg., *Formosograptus formosus* (Bouc.), *Pristiograptus fecundus* (Prib.).

The remains of brachiopods *Dayia navicula* (Sow.), *Dnestrina gutta* Nikif. et T. Modz., Coelospira pusilla (His.) were found in the *Skalograptus lochkovensis* Zone in the western part of the Kovel ledge of the basement. The shells of the first species are also found in the Ulichian deposits, the second are typical for the entire Skalian (Przhidolian) Belt, the third - for the Stavan horizon of the Kovel-Kishinev structural-facies region.

Graptolites characteristic of the *Skalograptus lochkovensis* Zone have not been found in the submerged part of the Lvov trough, which can be explained by the low recovery of core samples from wells.

The remains of the index species of the zone were found (83) in the Precarpathian trough in the upper part of the Zadarovskaya Formation (borehole Davideny-1, int. 2628-2630 m). Further down the section, in the same borehole (int. 2634-2636 m), rhabdosomes of *Istrograptus ultimus* (Pern.) were found.

Consequently, in the interval of 2628-2636 m of this well, boundary deposits of the *ultimus-parultimus* and *lochkovensis* zones were raised.

The first (from bottom to top) finds of *Istrograptus transgrediens* (Pern.) in borehole Davidens-1 are dated for int. 2525-2532 m. From this we can conclude that the thickness of the *Skalograptus lochkovensis* zone in the Precarpathian trough reaches 98 m.

The paleontological characteristics of the Stavanian Stage and graptolitic zones of *Istrograptus ultimus-Ludensograptus parultimus, Skalograptus lochkovensis* of Volyno-Podillia allow us to correlate them with the lower part of the Przhidolian Belt of the Czech Republic.

This stratigraphic interval of the section, judging by the scale of changes in the systematic composition of brachiopods, graptolites, and chitinozoans, is commensurate with the volume of the Gorstian, Sheinwoodian, and Telichian Stages of Wales and the Silurian ISS, which were approved by the 27th IGC (Moskow, 1984).

Therefore, we propose to distinguish it under the name of the Stavanian Stage of the ISS of the Silurian System (see fig. 3).

The ***Istrograptus transgrediens-Tirassograptus bouceki*** Zone (Figs. 7, 8, 11, 12, 14, 20, 25, 26) is established for the first time in the Silurian deposits of the southwest of the EEP.

In North Africa, North America, Australia and some regions of Europe, the *Isrograptus transgrediens* and *Tirassograptus bouceki* zones are recognized as separate zones (26).

In some Czech sections of the Silurian, the index species of the *transgrediens* Zone occurs immediately above the *lochkovensis* Zone (179), and in the section of the Pozhary Formation in the Kosov Quarry (Czech Republic), its remains were found in the upper part of the *Istrograptus ultimus* Biozone (142).

In connection with such a wide stratigraphic distribution of *Istrograptus transgrediens* (Pern.), G. Jäger, following A. Przybl (174), identified two zones in the stratotype of the Przhidol belt above the *Skalograptus lochkovensis* Zone: *Monograptus bouceki* and *M. perneri*.

He called the section interval from the top of the latter to the base of the *Monograptus uniformis* Zone the *transgrediens* interzone (142).

In the southwest of the EEP, remains of *Istrograptus transgrediens* (Pern.) are often found just above the *Skalograptus lochkovensis* (Prib.) Zone.

Remains of *Tirassograptus bouceki* (Prib.), *T. perneri* (Bouc.) are less common, which can be explained, most likely, by interval, rather than continuous core recovery. Due to the insufficiently frequent finds of these taxa, it is premature, in our opinion, to distinguish independent zones of *Tirassograptus bouceki* and *T. perneri.*

That is why the section interval from the top of the underlying *Skalograptus lochkovensis* Zone to the foot of the Lower Devonian Tirassograptus uniformis Zone is called the *Istrograptus transgrediens-Tirassograptus bouceki* Zone.

The lower boundary of the described zone in the southwest of the EEP is drawn both by the disappearance from the sections of most of the species characteristic of the underlying zone, and by the appearance in the sections of *Istrograptus transgrediens* (Pern.), *Tirassograptus bouceki* (Prib.) (see Fig.

7, 11, 12, etc.). In its lower part there are *Skalograptus ex gr. lochkovensis* (Prib.), in the middle and upper - *Tirassograptus bouceki* (Prib.), *T. perneri* (Bouc.) (see Fig. 8, 20).

The remains of brachiopods *Protochonetes dniestrensis* (Kozl.), *Dnestrina gutta* Nikif. et T. Modz., Dayia navicula (Sow.), D. bohemica Bouc. were found in the *Istrograptus transgrediens-Tirassograptus bouceki* Zone.

In the western part of the Kovelsky ledge of the basement, it includes the upper part of the Gushchinskaya suite (well Pulemets-1884, depth 476-520 m; Kusnishche-5394, depth 302-365 m) and the Tomashevskaya suite (well Pulemets- 1884, interval 469-476 m; Kusnishche-5394, interval 282-302 m; Tomashevka-4116, interval 614-644 m).

A typical section of the zone in the South-West of the platform can be deposits penetrated by wells Kusnishche-5394, Tomashevka-4116 and Pulemets-1884 in the indicated intervals. The thickness of the zone reaches 161 m.

In the Lvov and Carpathian troughs, this zone includes the upper part of the Glinyanskaya and Poltvinskaya suites (83). The first of them is represented by black argillites with limestone interlayers, the second - mainly by argillites (Dublyany-4 well, interval 3737.5-3762 m, 3784-3790 m; Glinyany-1, interval 2622.4-2626.9 m, 2651-2656 m, 2694.8-2698 m, Zagaipol-1, interval 2162-2168 m, 2372-2379 m, 2504-2510 m, Davideny-1, interval 2227-2232 m, 2391-2397 m, 2525 -2532 m). Mudstones contain *Istrograptus transgrediens* (Pern.), *Linograptus sp*. (see fig. 8, 12, 14, 20). Occasionally, *Tirassograptus perneri* (Bouc.), *T. bouceki* (Prib.) are encountered (85). Remains of the brachiopod Dnestrina gutta Nikif. et T. Modz. were found in limestone interbeds.

The thickness of the zone in the submerged part of the Lvov trough, judging by individual core rises, is at least 150 m; in the Carpathian trough, it apparently reaches 300–400 m.

In the western part of the Kovel-Kishinev facies region, where the Skalian Belt is represented mainly by carbonate rocks, *Istrograptus transgrediens* (Pern.) is also sometimes found. They are confined to the marl interlayers of the upper part of the Darakhovskaya Formation (well Zavadovka-6, depth 1164-1224 m) and the lower part of the Zvenigorodskaya Formation (well Zavadovka-6, depth 1163 m; Podgaitsy-1, depth 1020-1025 m ; Podgaytsy-2, depth 992.8-1001.2 m).

Brachiopods *Dayia bohemica* Bouc., *Atrypa dzwinogrodensis* Kozl., *Dnestrina gutta* Nikif. et T. Modz. are installed in the same intervals of the indicated wells (see Fig. 25, 26). The first of the species is characteristic of the Sklavian Stage of the Kovel-Kishinev structural-facies region.

The paleontological characteristics of the zone described above make it possible to correlate it with the upper part of the Przhidolian Belt of the Czech Republic and with the Sklavian Stage of the shelf deposits of the Kovel-Kishinev structural-facies region of Ukraine.

We propose to distinguish this biostratigraphic interval of the section of Volyno-Podolia and other regions under the name of the Sklavian Stage of the International Scale of the Silurian System (see fig. 3).

The zonal division of the Silurian pelagic and hemipelagic deposits of Ukraine according to graptolites, as well as the correlation of the zones described above with deposits of the same age from different regions of the world, are shown in Fig. 27.

Devonian Period / System

After the third international symposium on the boundary between the Silurian and Devonian (Leningrad-Lvov, 1968), the Lower Devonian in the southwest of the EEP includes the Tiver and Dniester series of the Dniester reference section (45), which are traced along the strike into the Lvov Paleozoic trough, as well as the Yargara series (93) Southern Moldova and the North-Western Black Sea region (Odessa region of Ukraine).

Remains of graptolites are occasionally found only in the very bottom of the Tiverskaya Serie - in the Khudykovetskaya Formation of the Borshchovsky Horizon (20, 50, 85, 152).

Lochkovian Etape / Belt

The lower boundary of the Lochkian deposits of Ukraine is drawn according to the level of a cardinal change in the systematic composition of both benthic (brachiopods, trilobites, corals, etc.) and planktonic (graptolites, chitinozoans, conodonts, etc.) organisms. It coincided with the base of the *Tirassograptus uniformis* graptolite Zone (50, 72).

The ***Tirassograptus uniformis*** Zone (Fig. 22, 25, 26, 28) has long been known in the Czech Republic (180). In outcrops of the Dniester reference section, it is found at the base of the Khudykovetskaya Formation of the Tiverskaya Serie (20, 50, 85). Together with *Tirassograptus uniformis uniformis* (Prib.), *T. uniformis angustidens* (Prib.), there are numerous brachiopods *Howellella angustiplicata* (Kozl.), *Plectodonta maria* Kozl., *Asymmetrochonetes proliferus* (Kozl.), and many others are found.

Remains of rhabdosomes of these graptolites were found in a number of boreholes (Fig. 28), where the Khudykovetskaya Formation stands out (well Darakhov-1, depth 535-537 m; Zavadovka-6, depth 1103 m; Koropets-2, depth 780 m; Goroshovtsy-16, depth 465.5 m; Shishkovtsy-149, depth 138-139 m, etc.).

In the Lvov and Precarpathian troughs (see Fig. 22), remains of Early Devonian graptolites are rare (well Krekhov-1, depth 4120.2-4126.2 m; Peremyshlyany-1, depth 2463-2472.6 m). Sometimes they are accompanied by brachiopod shells of the Borshchovian horizon. The installed capacity of the zone is 57-76 m.

Within the southwest of the EEP, it has been established (see Fig. 26) that the vertical distribution of *Istrograptus transgrediens* (Pern.) and *Tirassograptus uniformis angustidens* (Prib.) overlaps within a 0.6 m interval (72).

It is known that the interval of possible finds of the second of them in Czech sections between the last finds of *Istrograptus transgrediens* (Pern.) and the first finds of *Tirassograptus uniformis* (Prib.) does not exceed 0.5 m (11). These data show the high accuracy achieved by paleontologists in determining the boundary between the Silurian and Devonian systems in various regions of the world.

It should be emphasized that this is the usual accuracy of subdivision and correlation of the Silurian and Lower Devonian deposits using graptolitic zones. In our opinion, at present, no other methods of periodization of the history of the Earth and correlation of the Lower-Middle Paleozoic deposits can achieve such high accuracy as the paleontological method.

The overlying Lower Devonian deposits of the Tiverskaya Serie in the southwest of the EEP do not contain, unfortunately, remains of graptolites from a younger zone than the *Tirassograptus uniformis* Zone (45).

Structural-tectonic plan of the territory of the Silurian and Early Devonian sedimentation on the southwestern edge of the East European Platform

An analysis of the above paleontological and stratigraphic materials shows that the Silurian and Lower Devonian deposits are common in the Dniester pericratonic trough (45), which was located in the Early Paleozoic to the west and southwest of the Ukrainian crystalline shield (Fig. 29).

The crystalline basement of the trough gradually subsided in the western and southwestern directions. Its pre-Baikalian (Archaean-Proterozoic) age has been established up to the Ustilug-Rogatinskaya fault zone within Volyno-Podolia and to the Tsygansko-Chadyr-Lungskaya fault zone in South Moldova and the Western Black Sea region (Odessa region of Ukraine).

Throughout the geological history, the Dniester trough was filled with Vendian (Mogilev-Podolskaya, Kanilovskaya and lower part of the Baltic series), Lower-Middle Cambrian (upper part of the Baltiyskaya and Berezhkovskaya series), Ordovician (Molodovskaya and Vyzhevskaya series), Silurian (Bolotinskaya, Yarugskaya, Malinovetskaya and Rukshynskaya series) and Lower Devonian (Tiverskaya and Dniesterskaya Series) deposits.

At the turn of the Early and Middle Devonian (Caledonian and Hercynian Paleotectonic Etape), the restructuring of the structural-tectonic plan of the southwest of the East European Platform ended, which led to the dying off of the Dniester pericraton and its division into separate Middle Paleozoic troughs: Lvovian and Pridobrudzhian.

We associate the beginning of this restructuring with the beginning of the early Devonian Borshchovian Etape (time) the beginning of the *Tirassograptus uniformis* chronozone). This is proved by the fact that the Lower Devonian Khudykovetskaya Formation does not inherit the submeridional plan of the Silurian sedimentation, but, according to our data, has a northwestern (almost Carpathian) strike.

The latter is characteristic of the entire Lower Devonian Tiverian Series (83). The eastern gently sloping side of the Lvov trough occupies most of the Volyno-Podolsk monoclinal (platform slope, slab). Shelf Silurian deposits are developed within its limits.

The western (submerged) part of the Lvov trough consists of several paleotectonic zones: 1) Litovezhsko-Veliko-Mostovskaya, 2) Rostochskaya, and 3) Rava-Russkaya (Fig. 1).

In the first of them, the Silurian deposits lie horizontally, as it is assumed, on the crystalline basement of the Archean-Proterozoic age.

The second zone is located between the Belz-Baluchinsky and Rava-Russian thrusts. Presumably, it is considered the earliest - Baikal - framing element of the margin of the Precambrian East European Platform (Rostochskaya zone of Baikalids).

Between the Lvov trough and the Bilche-Volitskaya (outer) zone of the Predcarpathian trough, the Rava-Russkaya folded zone of the Caledonides of the West European Platform is distinguished, which is a mosaic of blocks of the pre-Hercynian or Hercynian crystalline basement.

The Rava-Russian zone is composed of Silurian and Lower Devonian sandy-argillaceous deposits. which underwent folding during the Caledonian and Hercynian tectonic stages of development of this territory.

To the north of the Lvovian Middle Paleozoic trough, the Polessky (Kovelsky, Volynsky) uplift of the crystalline basement is located. In its eastern part - on the Kovel-Ratnensky ledge - shelf deposits of lagoonal, shallow and open-shelf facies zones are developed.

In the western part of the Polessky uplift, numerous boreholes studied by us uncovered the Silurian limestone-marl sequence with remains of graptolites and, less commonly, brachiopods, trilobites, which, in our opinion, lived in the paleogeographic conditions of the platform slope.

Their study showed that the conditions of the Silurian sedimentation on the Polessky uplift differed significantly from the conditions of sedimentation both within the Lvov trough and on the western slope of the Ukrainian shield.

The Moldavian plate (monocline) is adjoined from the south by the Kiliya zone of the Baikalids (?) and the Prut ledge, composed of folded Lower Paleozoic deposits.

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Paleontological tables and explanations to them

Table 1

Fig.1, 2. *Monograptus flemingii* (Salter) ....… p. 13

I - proximal part of the rhabdosome (symmetrical lateral tubular outgrowths are well developed near the curved parts of the theca), no. 2275/152, x 22, well. Cordovians-16916, ch. 261 m, Ternava Formation of Podopia, *flemingii* Zone; 2 - a distal fragment with short wide lateral outgrowths near the curved parts of the theca, no. 2275/156, x 22, location and age are the same.

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3 - rhabdosome proximal, no. 2275/172, x 20, well Shiev-4109, int. 524-526 m, Kladnevskaya Formation of Volyn, *riccartonensis-murchisoni* Zone; 4 - distal fragment, no. 2275/175, x 20, same location and age.

Fig. 5, 6. *Uncinatograptus caudatus* Tsegelnjuk …………………………………..p. 18

5 - the initial part of the rhabdosome with a characteristic proximal bend, no. 275/184, x 22, well. Guscha-4015, int. 758.5-763.5 m, lower part of the Milovan Formation, *formosus-spineus* zone; 6 - a fragment of the distal part of the rhabdosome with a characteristic uncinatal type of endings, no. 2275/183, x 22, location and age are the same.

Fig. 7. *Skalograptus vetus* Tsegelnjuk …………………………………….……..p. 24

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Proximal rhabdosome with well-developed large lateral lobes at the mouths of the theca, no. 2275/196, x 40, well. Guscha-4015, int. 626.8-640 m, upper Milovanskaya suite, *lochkovensis* zone.

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Proximal rhabdosome with symmetrical lateral elevations of the orifices of the first four thecae (the fifth and subsequent thecae have smooth margins of the orifices), no. 2275/90, x 20, well. Zaluzhye-27, depth. 445 m, upper part of the Kladnevskaya Formation, *ludensis-nassa* zone.

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A proximal fragment with symmetrical lateral elevations of the margins of the mouths of all the thecae, no. 2275/101, x 20, borehole Guscha-4015, int. 748.8-753.5 m, Lower Milovanskaya Subformation, *formosus-spineus* Zone.

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Table V1

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Fig. 8. *Monoclimacis linnarsoni* (Tullberg) ....p. 70

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Table VII

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Proximal rhabdosome with dorsal lobes above the mouths of the thec, no. 2275/217, x 22, well Brest-1, ch. 805.6 m, Zelvyanskaya Formation, c*renulata* Zone.

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Proximal rhabdosome without dorsal lobes above the mouths of the thec, No. 2275/230, x 20, well Brest-1, ch. 817, Zelvyanskaya Formation, c*renulata* Zone.

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6 - extreme proximal, no. 2275/359, x 18, well Guscha-4015, int. 758.5-763.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 7 - a fragment of the distal with the characteristic structure of the aperture device tech, no. 2275/357, x 19, location and age are the same.

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8 - extreme proximal rhabdosome, no. 2275/377, x 38, well. Guscha-4015, int. 799.9-804.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 9 - fragment of the distal with curved dorsal-lateral lobes, no. 2275/378, x 37, same location and area.

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4 - extreme proximal with gently sloping lateral elevations of the mouth of the tech, no. 2275/438, x 19, well. Brest-1, ch. 557.8 m, lower Rusilovskaya suite, *kozlowskii-auriculatus zone*; 5 - the initial part of the rhabdosome, no. 2275/440, x 22, the same borehole, ch. 547 m, lower part of the Rusilov Formation, same zone, 6 - distal fragment with lateral elevations of the estuaries, no. 2275/444, x 22, same borehole, ch. 544 m, location and zone are the same.

Fig. 7-9. *Lobograptus progenitor* Urbanek ....…p. 104

7 - dorsally curved extreme proximal, no. 2275/482, x 19, well. Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the leintwardinensis zone; 8 - fragment of a dorsally curved proximal, no. 2275/478, x 19, borehole Brest-1, depth 732 m, lower part of the Francopol Formation, *nilssoni-chimaera* zone; 9 - distal fragment, no. 2275/479, x 19, same location and age.

Table IX

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Distal part of an adult rhabdosome with symmetrical lateral lobes at the mouths of the theca, no.

2275/485, x 19, well Shiev-4109, int. 443.7-445.6 m, Zabrodskaya suite, *nilssoni-chimaera* zone.

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2 - sicula, first theca (with distinct lateral lobes) and part of the leak of the second theca, no. 2275/491, x 40, borehole Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone; 3 - a fragment of the middle part of the rhabdosome with lateral lobes (the right lobes are larger than the left ones), no. 2275/494, x 38, same location and age.

Fig. 5-7. *Cucullograptus hemiaversus* Urbanek ....…p. 111

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1 - distal rhabdosome with larger right lateral lobes of the mouths of the tech, no. 2275/500, x 40, well. Guscha-4015, interval 941.8-952.6 m, Zabrodskaya Formation, lower parts of the *leintwardinensis* zone; 2 - extreme proximal with a larger right lobe of the mouth of the first theca, no. 2275/495, x 40, location and age are the same.

Fig. 3, 4. *Bohemograptus praecornutus* Urbanek ....…p. 118

3 - proximal rhabdosome with lateral elevations at the mouths of the theca, no. 2275/552, x 20, well. Brest-1, depth 550.3 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 4 - a distal fragment of an adult rhabdosome with symmetrical lateral elevations of the theca mouths, no. 2275/559, x 30, the same borehole, depth 557.8 m, section interval and zone are the same.

Fig. 5, 6. *Bohemograptus cornutus* Urbanek ....…p. 120

5 - proximal rhabdosome with ribbon-like and circular formations of microfuseluses on the mouths of the theca, sicula and on the virgella, no. 2275/568, x 27, well. Guscha-4015, int. 902.4-906.4 m, lower part of the Oleshkovichi Formation, *kozlowskii-auriculatus* zone; 6 - distal fragment with ventral-lateral elevations, no. 2275/489, x 21, same borehole, int. 920-923 m, lower part of the *kozlowskii-auriculatus* zone.

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Fig. 4, 5. *Neocucullograptus kozlowskii kozlowskii* Urbanek ……………………………p. 124

4 - extreme proximal, no. 2275/510, x 39, well. Brest-1, depth 518.5 m, Rusilovskaya Formation, *kozlowskii-auriculatus* Zone; 5 - distal rhabdosome (left lateral lobes overlap the mouths of the theca, right lobes hang down along the ventral side of the rhabdosome, the lateral process of the right lobe and the rostral process of the left lobe are visible), no. 2275/523, x 39, well. Guscha-4015, int. 906.4-911.3 m,

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1 - a fragment of a large fragment of rhabdosome on the surface of marl, no. 2275/598, x 20, well. Harsy-1873, ch. 346.5 m, Zabrodskaya Formation, upper part of the *nilssoni-chimaera* zone; 2 - sicula, first theca and beginning of the second theca (broken off dorsal spine of the sicula is located on the right cavity), no. 2275/476, x 39, borehole Guscha-4015, depth 967.2-971.6 m, lower part of the Zabrodskaya suite, *nilssoni-chimaera* zone.

Fig. 3. *Neocucullograptus kozlowakii kozlowskii* Urbanek …………………………… p. 124
Fragment of the middle part of the rhabdosome, no. 2275/512, x 39, borehole Guscha-4015, int. 860-863.4 m, upper Oleshkovichi Formation, *kozlowskii-auriculatus* Zone.

Fig. 4. *Neocucullograptus kozlowskii unicornus* Urbanek…………… ………………p. 126
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5 - a fragment of the distal rhabdosome (the mouths of the tech are blocked by dorsal lobes), no. 2275/403, x 37, well. Shiev-4109, int. 443.7-445.6 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 6 - a fragment of the middle part of the rhabdosome, no. 2275/404, x 40, the same borehole, int. 442.7-443.7 m, formation and zone are the same.

Table XIII

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1 - a fragment of the distal rhabdosome (the dorsal walls of the theca are bent in the direction of their growth), no. 2275/338, x 20, well. Guscha-4015, depth 794.9-799.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 2 - the extreme proximal of the rhabdosome (the dorsal lobe of the first theca is bent along its middle), no. 2275/327, x 40, location and zone are the same.

Fig. 3, 4. *Neodiversograptus beklemishevi* Urbanek ……………………………………p. 130
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Fig. 5, 6. *Serenograptus hamulosus* (Tsegelnjuk) ....p. 95
5 a, b - extreme proximal rhabdosome (a - view from the right side,
6 - left view), no. 2275/280, x 58, borehole Guscha-4015, int. 811.9-816.4 m, upper part of the Novinsky Formation, lower part of the *formosus-spineus* zone; 6 - a fragment of the distal (the mouths of the theca are blocked by subtriangular dorsal lobes), no. 2275/291, x 20, location and age are the same.

Table XIV

Fig. 1-3. *"Monograptus" operculatus* Munch ....….p. 131
1 - distal part of the rhabdosome (the orifices of the theca are covered by subtriangular dorsal lobes), no. 2275/413, x 38, well. Guscha-4015, int. 799.9-804.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 2 - sicula and incomplete first theca, no. 2275/411, x 40, location and age are the same, 3 - fragment of the middle part of the rhabdosoma (the mouth of the theca is blocked by a subtriangular dorsal lobe), no. 2275/412, x 38, location and the same age.

Fig. 4. *Neocucullograptus kozlowskii unicornus* Urbanek ………………………………. p. 126
4 - The middle part of the rhabdosome, no. 2275/525, x 40, well Guscha-4015, int. 894.2-895.8 m, lower part of the Oleshkovichskaya Formation, *kozlowskii-auriculatus* zone.

Fig. 5-7. *Polonograptus egregius* Urbanek ....…p. 102
5 - sicula and part of the leak of the first theca, no. 2275/422, x 20, borehole Guscha-4015, int. 860-863.4 m, upper Oleshkovichi Formation, *kozlowskii-auriculatus* Zone; 6 - proximal part of the rhabdosome (unusually long ventrally curved thecae), no. 2275/417, x 22, well. Brest-1, depth 500.7 m, Lesnyanskaya suite, zone ? *kozlowskii-auriculatus*; 7 - distal fragment, no. 2275/420, x 20, same location and age.

Table XV

Fig. 1-3, 10. *Monograptus flemingii* (Salter) ....…… p. 13
1, 2 - semi-volumetric proximal parts of adult rhabdosomes, respectively, No. 2275/152 and No. 2275/153, x 15, well. Cordovtsy-16916, depth 261 m, Ternav Formation of Podolia, *flemingii* Zone; 3 - distal fragment, no. 2275/156, x 15, ibid., 10 - large distal part of the rhabdosome on the marl surface, no. 2275/1, x 3, well Sukachi-1903, depth. 381 m, the Shchedrogorsk Formation of Volyn, the same zone.

Fig. 4-9. *Uncinatograptus riccartonensis* (Lapworth) ……………………………………p. 16
4-6 - semi-volume proximal rhabdosomes, respectively, No. 2275/174, No. 2275/172, No. 2275/173, all x 22, well. Shiev-4109, int. 524-526 m, Kladnevskaya Formation of Volyn, *riccartonensis-murchisoni* Zone; 7, 8 - fragments of semi-volumetric distal parts, no. 2275/176, no. 2275/175, both x 22, ibid., 9 - large distal fragment on the marl surface, no. Harsy-1873, ch. 440.3 m, the lower part of the Kladnevskaya suite, the same zone.

Fig. 11. *Uncinatograptus caudatus* Tsegelnjuk ....…p. 18
Semi-volumetric proximal rhabdosome, no. 2275/186, x 15, well Guscha-4015, int. 763.5-768.5 m, lower part of the Milovan Formation of Volhynia, *formosus-spineus* zone.

Table XVI

Fig. 1-8. *Uncinatograptus caudatus* Tsegelnjuk ....…p. 18
1, 2, 6 - proximal parts of rhabdosomes, respectively, No. 2275/178, No. 2275/177, No. 2275/184, all x 15, well Guscha-4015, int. 763.5-768.5 m, Lower Milovanian subformation, *formosus-spineus* zone, 5 - extreme proximal, no. 2275/454, x 15, same borehole, int. 789.9-794.9 m, tops of the Novinsky Formation, same zone, 3, 4 - large fragments of distals, no. 2275/183, no. 2275/179, both x 15, same borehole, int. 763.5-768.5 m, 773.5-778.5 m, Lower Milovanskaya Subformation, same zone, 7 - rhabdosome proximal on limestone surface, No. 2275/607, x 8, well Pulemets-1884, ch. 671 m, lower part of the Milovanskaya Formation, same zone, 8 - large distal fragment on the marl surface, no. 2275/6, x 5, same borehole, ch. 697 m, lower part of the Milovanskaya Formation, same zone.

Fig. 9, 10. *Uncinatograptus prognatus* Koren ....….. ..p. 20
9 - the initial part of the rhabdosome on the limestone surface, no. 2275/10, x 7, well Pulemets-1884, int. 562-563 m, upper subformation of the Milovanskaya Formation, *ultimus-parultimus* zone; 10 - extreme proximal rhabdosome, no. 1980/5, x 35, well. G'uscha-4015, int. 626.8-640 m, Upper Milovanian Subformation, lower part of the *lochkovensis* Zone.

Table XVII

Fig. 1-4. *Uncinatograptus prognatus* Koren ....p. 20
1, 2, 4 - proximal parts of rhabdosomes, respectively, No. 2275/191, No. 2275/194, No. 2275/190, the first two x 22, the third - x 29, well Guscha-4015, int. 622.4-626.8 m, 626.8-640 m, upper Milovanskaya and lower Guschinskaya Formation of Volhynia, *lochkovensis* zone; 5 - fragment of the distal (view from the

ventral side, free dorsal walls of the tech are visible), no. 2275/193, x 22, the same borehole, int. 626.8-640 m, the upper part of the Milovan Formation, the same zone.

Fig. 5-7. *Dulebograptus trimorphus* Tsegelnjuk ....p. 22
5 - proximal part of the rhabdosome, no. 2275/195, x 15, well. Guscha-4015, int. 626.8-640 m, upper Milovanskaya Formation, *lochkovensis* zone; 6 - the proximal part of the rhabdosome, which shows that the hood-like end of the lower theca is not yet divided into two lateral lobes, but the end of the subsequent theca is provided with two symmetrical lateral lobes, no. 1980/7, x 40, the same borehole, int. 622.4-626.8 m, lower Gushchi Formation, *lochkovensis* zone; 7 - the middle part of the rhabdosome, on the mouths of which the lateral lobes are developed, decreasing in the distal direction, no. 2275/204, x 15, location and age are the same.

Fig. 8-10. *Skalograptus vetus* Tsegelnjuk ....p. 24
8, 9 - proximal parts of rhabdosomes with long symmetrical lateral lobes, which are developed at the mouths of the theca, respectively, no. 2275/198, no. 2275/199, x 15, well. Guscha-4015, int. 626.8-640 m, 602.9-606.3 m, lower part of the Gushchinskaya Formation and upper part of the Milovanskaya Formation, *lochkovensis* zone; 10 - a fragment of the middle part of the rhabdosome with relatively long lateral lobes, no. 2275/202, x 15, well. Guscha-4015, int. 602.9-606.3 m, the lower part of the Gushchi Formation, the same zone.

Table XVIII

Fig. 1-5. *Skalograptus vetus* Tsegelnjuk ....p. 24
1 - prosicle, metasicule and proteca with gently sloping lateral elevations, no. 2275/207, x 22, borehole Guscha-4015, int. 591.4-595.9 m, lower part of the Gushchi Formation, *lochkovensis* zone; 2 - sicula, proteca and beginning of the metatheca with steep lateral elevations, no. 2275/208, x 22, location and age are the same, 3-5 - extreme proximal rhabdosomes, no. 2275/206, x 15, no. 2275/196, x 15, no. 2275/205, x 22, well Gushcha-4015, intervals, respectively, 622.4-626.8 m, 626.8-640 m, 615.1-620.5 m, the upper part of the Milovanskaya suite and the lower part of the Guschinskaya suite of Volyn, the same zone.

Fig. 6-9. *Skalograptus lochkovensis* (Pribyl) ....c. 27
Proximal and middle parts of rhabdosomes on the surface of clayey limestones, respectively, no. 2275/47, x 12, no. 2275/45, x 7, no. 2275/46, x 6, no. well Pulemets-1884, ch. 551 m, 554 m, 552 m, lochkovensis zone.

Fig. 10-12. *Pristiograptus dubius* (Suess) ....p. 30
10 - proximal rhabdosome (view from the ventral side, the plane of the mouth of the first theca is strongly inclined downwards), no. 2275/20, x 15, well. Guscha-4015, int. 681.1-685.6 m, Upper Milovanskaya subformation, *ultimus-parultimus* zone; 11 - proximal, no. 2275/26, x 15, same borehole, ch. 844.5-847 m, Novinskaya Formation of Volyn, *kozlowskii-auriculatus* Zone; 12 - a fragment of the distal part of the rhabdosome, no. 2275/25, x 15, location and age are the same.

Table XIX

Fig. 1-3. *Pristiograptus gotlandicus* (Perner) ....p. 32
1 - large bulk fragment of the initial part of the rhabdosome, no. 2275/80, x 10, 2 - bulk fragment of the extreme proximal, no. 2275/23, x 15; 3 is a fragment of the middle part of an adult rhabdosome, as in FIG. 1, no. 2275/80, x 15. Both rhabdosomes from an outcrop in the Prongowiec ravine (village of Bardo), *gotlandicus zone* of the Świętokrzysky mountains (Poland).

Fig. 4-7. *Pristiograptus tumescens* (Wood) ....p. 36
4 - prosicle, metasicle and the beginning of the leak of the first theca, no. 2275/9, x 22, well. Guscha-4015, int. 844.5-847 m, Novinka Formation of Volyn, *kozlowskii-auriculatus* Zone; 5 - volumetric

fragment of the extreme proximal, no. 2275/30, x 22, well. Brest-1, ch. 586.5 m, the Franopol Formation of the Brest Depression, *leintwardinensis* Zone; 6 - a large fragment of the initial part of the rhabdosome, no. 2275/31, x 10, the location and age are the same, 7 - the proximal of the rhabdosome shown in Fig. 6, x 15.

Fig. 8, 9. *Pristiograptus vicinus* (Perner) ....………p. 34
8 - rhabdosome proximal (fuselage structure of the periderm is visible), no. 2275/5, x 15, well. Guscha-4015, int. 717.5-722.5 m, lower part of the Milovanskaya Formation, *formosus-spineus* zone; 9 - fragment of the distal part of the rhabdosome, no. 2275/18, x 15, well Brest-1, ch. 550.3 m, Rusilovskaya Formation, *kozlowskii-auriculatus* Zone.

Table XX

Fig. 1, 2. *Pristiograptus vicinus* (Perner) ....……p. 34
1 - proximal part of the rhabdosome, no. 2275/24, x 15, well. Guscha-4015, int. 844.5-847 m, Novinskaya Formation, *kozlowskii-auriculatus* Zone; 2 - fragment of the distal part, no. 2275/4, x 22, borehole Guscha-4015, int. 717.5-722.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone.

Fig. 3, 4. *Pristiograptus tumescens* (Wood) .....…………………………………….……p. 36
3 - proximal, no. 2275/19, x 10, well Guscha-4015, int. 681.1-685.6 m, Milovanskaya Formation, lower part of the *ultimus-parultimus* zone; 4 - large fragment of the distal part of the rhabdosome, no. 2275/28, x 15, well Brest-1, Ch. 586.5 m, Franopil Formation, *leintwardinensis* Zone.

Fig. 5-7. *Ludensograptus ludensis* (Murchison)..p. 38
5, 6 - proximal parts of bulk rhabdosomes, respectively, no. 2275/79, x 15, no. 2275/78, x 15, from an outcrop in the Prongowiec ravine (village of Bardo), ludensis zone of the Świętokrzysky Mountains (Poland), 7 - proximal part rhabdosomes, no. 2275/87, x 15, well Brest-1, ch. 742 m, Lipnovskaya Formation of the Brest Depression, *ludensis-nassa* zone.

Fig. 8, 9. *Ludensograptus praedeubeli* (Jaeger) ....…p. 41
8 - proximal part of the rhabdosome, no. 2275/2, x 6, well Harsy-1873, ch. 391.3 m, upper part of the Kladnevskaya Formation of Volhynia, *ludensis-nassa* zone; 9 - large fragment of the proximal part of the rhabdosome, no. 2275/90, x 15, well Zaluzhye-27, Ch. 445 m, upper part of the Kladnevskaya Formation, *ludensis-nassa* zone.

Table XXI

Fig. 1. *Ludensograptus praedeubeli* (Jaeger) ....…….p. 41
Proximal rhabdosome with well-developed elevations at the mouths of the first two theca, no. 2275/91, x 22, borehole no. Brest-1, ch. 739 m, Lipnovskaya Formation of the Brest Depression, *ludensis-nassa* zone.

Fig. 2-9. *Ludensograptus latilobus* (Tsegelnjuk) ....…p. 43
2, 3 - prosicle, metasicule and the beginning of the leak of the first theca with smooth lateral and ventral edges of the mouths, no. 2275/106, no. 2275/99, both rhabdosomes x 22, well. Guscha-4015, int. 748.5-753.5 m, 735.5-743.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 4, 5, 7 - proximal parts of rhabdosomes with well-defined lateral elevations of the orifices of all theca, respectively, no. 2275/101, x 15, no. 2275/105, x 15, no. Guscha-4015, int. 703.3-708.6 m, 748.8-753.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 6 - proximal, no. 2275/98, x 15, well Guscha-4015, int. 860-863.4 m, upper Oleshkovichi Formation, *kozlowskii-auriculatus* Zone; 8 – fragment of the distal part of the rhabdosome with well-developed lateral elevations, no. 2275/104, x 15, borehole no. Guscha-4015, int. 743.5-748.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 9 - distal fragment, no. 1980/2, x 17, same borehole, int. 800-804 m, tops of the Novinsky Formation, same zone.

Table XXII

Fig. 1-4. *Ludensograptus parultimus* (Jaeger) ....…………………………………….……p. 45
1-3 - proximal rhabdosomes with well-developed lateral elevations at the mouths of all theca, nos. 2275/125, 2275/126, 2275/127, all x 15, well Guscha-4015, .int. 667.2-672.2 m, Upper Milovanskaya subformation, *ultimus-parultimus* zone; 4 - a large fragment of the initial part of the rhabdosome (lateral elevations are visible at the mouths of all the thecae), no. 2275/124, x 15, the same borehole, int. 654.5-659 m, same area.

Fig. 5-8. *Colonograptus colonus* (Barrande) ....….p. 47
5 - proximal rhabdosome, no. 2275/65, x 15, well. Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation of Volhynia, lower parts of the *leintwardinensis* zone; 6 - proximal (.all lateral lobes end in spines), no. 2275/68, x 15, well. Shiev-4109, int. 449.8-450.8 m, Zabrodskaya suite, *nilssoni-chimaera* zone; 7 - proximal with well-developed short lateral subtriangular lobes at the mouths of the first eight theca, no. 2275/35, x 15, borehole Brest-1, ch. 639 m, Franopil Formation, *leintwardinensis* Zone; 8 - proximal rhabdosome with lateral lobes in the first five theca, no. 2275/34, x 15, well. Guscha-4015, int. 933.4-936.9 m, Zabrodskaya Formation, *leintwardinensis* zone.

Table XXIII

Fig. 1-3. *Colonograptus colonus* (Barrande) ...……………………………………..……p. 47
1 - extreme proximal, no. 2275/69, x 15, well Shiev-4109, int. 449.8-450.8 m, Zabrodskaya suite, *nilssoni-chimaera* zone; 2, 3 - proximal fragments of rhabdosomes, respectively, no. 2275/71, no. 2275/74, x 15, borehole Guscha-4015, int. 937-942 m, Zabrodskaya Formation, *leintwardinensis* Zone.

Fig. 4-9. *Saetograptus chimaera* (Barrande) ……………………………………......…p. 00
4 - extreme proximal of the rhabdosome with a characteristic outline of the mouth of the sicula, no. 2275/48, x 22, well. Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone; 5 - a large fragment of a rhabdosome with a characteristic location of massive spines on the lateral edges of the mouths of numerous theca, no. 2275/75, x 15, location and age are the same, 6, 7 - proximal to the rhabdosome, no. 2275/57, x 22, no. 2275/40 , x 15, well Guscha-4015, int. 962.5-967.2 m, 971.6-976 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 8 - a fragment of the distal part of the rhabdosome with characteristic subtriangular "bases" for spines within the lateral margins of the mouths of the theca, no. 2275/36, x 15, well. Brest-1, ch. 639 m, Franopil Formation, *leintwardinensis* Zone; 9 - proximal fragment, no. 2275/52, x15, borehole Brest-1, ch. 640 m, Frranopol Formation, same zone.

Fig.10. *Saetograptus leintwardinensis leintwardinensis* (Lapworbh) ……………………...p. 53
Fragment of the proximal with a characteristic location of the spines within the lateral-dorsal margins of the mouths of the theca, no. 2275/42, x 15, borehole Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone.

Table XXIV

Fig. 1-9. *Saetograptus leintwardinensis leintwardinensis* (Lapworth) ……………….……53
1 - rhabdosome proximal, no. 2275/50, x 22, well Guscha-4015, int. 933.4-956.9 m, Zabrodskaya Formation, *leintwardinensis* Zone; 2, 3 - extreme proximal rhabdosomes with a dorsal spine of the sicle, no. 2275/41, x 22, no. 2275/39, x 22, the same borehole, int. 941.8-952.6 m, location and zone are the same; 4-6 - initial parts of rhabdosomes with a characteristic location of spines on the edges of the theca mouths near interthecal septa, no. 2275/45, x 22, no. 2275/43, x 22, no. 2275/54, x 22, borehole Guscha-4015, int. 933.4-936.9 m, 941.8-952.6 m, location and zone are the same; 7, 8 - extreme proximals with dorsal spine of sicula, no. 2275/51, x 22, no. 2275/62, x 22, borehole Guscha-4015, int. 933.4-936.9 m,

Zabrodskaya Formation, same zone; 9 - a large fragment of an adult rhabdosome on the surface of marl, no. 2275/32, x 7, location and age are the same.

Table XXV

Fig. 1.2. *Saetograptus leintwardiensis leintwardiensis* (Lapworth) .... p. 53

Fragments of the middle and distal parts of rhabdosomes (their spines or subtriangular bases are located near interthecal septa), no. 2275/47, x 15, no. 2275/44, x 15, borehole Guscha-4015, int. 941.8-952.6 m, 937-942 m, Zabrodskaya Formation, *leintwardinensis* Zone.

Fig. 3-9. *lstrograptus rarus* (Teller) .... p. 56

3 - proximal rhabdosome, no. 2275/110, x 15, well. Guscha-4015, int. 703.3-708.6 m, Lower Milovanian Subformation, upper *formosus-spineus* Zone; 4 - distal part of the rhabdosome with ventral-lateral elevations of the mouths of the theca, no. 2275/117, x 15, well. same, int. 717.5-722.5 m, location and zone are the same, 5, 6 - proximal parts of rhabdosomes with well-developed ventral-lateral lobes at the mouths of the first thecae and ventral-lateral elevations at the mouths of the second and all subsequent thecae, no. 2275 /114, x 22, No. 2275/109, x 15, well same, int. 703.7-708.6 m, upper part of the Lower Milovan Subformation, same locality and zone, 7 - middle part of the rhabdosome with ventral-lateral elevations at the mouths of the theca, no. 2275/118, x 15, borehole Zgoryany-409, ch. 277.1 m, Lower Milovanskaya Subformation, same zone, 8 - distal part, no. 2275/111, x 15, borehole Guscha-4015, int. 703.3-708.6 m, location and zone are the same, 9 - the extreme proximal of the rhabdosome with well-developed ventral-lateral lobes at the mouth of the first theca and ventral-lateral elevations at the mouth of the second theca, no. 2275/ 121, x 22, well same, int. 820.8-821.7 m, Novinskaya Formation, lower part of the *formosus-spineus* zone.

Fig. 10. *Istrograptus ultimus* (Perner) ....p. 58

Proximal rhabdosome with ventral-lateral lobes on the mouths of the first two thecae), mouth of the second thecae almost straight), No. 2275/141, x 22, well. Guscha-4015, int. 663.4-667.8 m, Upper Milovanskaya subformation, *ultimus-parultimus* zone.

Table XXVI

Fig. 1. *Istrograptus rarus* (Teller) ....p. 56

Large fragment of the initial part of the rhabdosome with small ventral-lateral lobes at the mouth of the first theca and distinct ventral-lateral elevations at the mouths of the second and all subsequent theca, no. 2275/122, x 15, borehole no. Zgoryany-409, Ch. 277.1 m, Lower Milovanian Subformation, *formosus-spineus* Zone.

Fig. 2-11. *Istrograptus ultimus* (Perner) ....p. 58

2, 4 - proximal rhabdosomes with ventral-lateral lobes at the mouths of the thecae (lobes of the first one or two thecae are slightly curved downwards), no. 2275/134, x 22, no. 2275/144, x 15, well. Guscha-4015, int. 691-693.6 m, 659-662 m, lower part of the Upper Milovanian Subformation, *ultimus-parultimus* zone; 3 - sicula and the beginning of the leak of the first theca with smooth lateral edges, no. 2275/140, x 22, the same borehole, int. 663.4-667.8 m, location and zone are the same, 5 - a fragment of the distal part of the rhabdosome with well-developed lobes, no. 2275/145, x 15, the borehole is the same, int. 659-662 m, location and zone are the same; 6-11 - proximal rhabdosomes with ventral-lateral lobes, no. 2275/139, x 22, no. 2275/142, x 15, no. 2275/135, x15, 2275/143, x 15, no. 15, No. 2275/128, x 15, the well is the same, the interval is 663.4-667.8 m, 643.5-644.5 m, 659-662 m, respectively, the location and zone are the same.

Table XXVII

Fig. 1. *Istrograptus ultimus* (Perner) ....p. 58
Proximal rhabdosome with ventral-lateral lobes at the mouths of the first two thecae and elevations at the mouths of the subsequent thecae, no. 2275/133, x 15, well. Guscha-4015, int. 662.4-663.4 m, Upper Milovanskaya subformation, *ultimus-parultimus* zone.

Fig. 2-11. *Istrograptus transgrediens* (Perner) ....p. 62
2 - proximal rhabdosome with ventral-lateral lobes at the mouths of the first three thecae and ventral-lateral elevations at the mouths of subsequent thecae, no. 2275/151, x 15, well. Tomashevka-4116, int. 614.5-616.2 m, Tomashev Formation of the western part of the Volyn uplift of the basement, *transgrediens-bouceki* zone; 4, 5 - proximal rhabdosomes with lobes at the mouths of the first two theca, no. 2275/147, x 22, no. 2275/146, x 22, same borehole, int. 641.5-643.5 m, location and zone are the same, 3, 7 - fragments of the initial parts of rhabdosomes with ventral-lateral lobes at the mouths of the theca, no. 2275/148, x 15, no. 2275/150, x 15, location and age are the same, 6 - a fragment of the middle part of the rhabdosome with ventral-lateral elevations at the mouths of the lower theca and smooth aperture edges at the upper theca, no. 2275/149, x 15, location and age are the same; 8, 9, 10 - large fragments of rhabdosomes with lobes at the mouths of the first theca, which are replaced up the rhabdosomes by ventral-lateral elevations and then by smooth edges of the mouths of the theca, no. 2275/581, x 6.5; No. 2275/580, x 6.5; No. 2275/582, x 6.5, well Tomashevka-4116, int. 641.5-643.5 m, 639.8-641.5 m, formation and zone are the same; 11 - a large fragment of the initial part of the rhabdosome with lobes at the mouths of the first four thecae, with elevations at the mouths of the fifth, sixth, and seventh thecae, and with smooth edges of the mouths of all subsequent thecae, no. 2275/583, x 6.5, borehole Pulemets-1884, ch. 539 m, Gushchinskaya Formation, *transgrediens-bouceki* zone.

Fig. 12-15. *Heisograpbus micropoma* (Jaekel) ....p. 66
12 - proximal part of the rhabdosome (ventral view), no. 2275/274, x 15, well Guscha-4015, int. 953.7-962.5 m, Zabrodskaya suite, *nilssoni-chimaera* zone; 13 - the middle part of the rhabdosome, no. 2275/279, x 15, the same borehole, int. 962.7-967.2 m, location and zone are the same; 14, 15 - distal fragments of rhabdosomes with short dorsal lobes hanging over the mouths of the theca, no. 2275/277, no. 2275/278, both x 15, borehole Shiev-4109, int. 449.8-450.8 m, Zabrodskaya suite, *nilssoni-chimaera* zone.

Table XXVIII

Fig. 1-3. *Heisograptus micropoma* (Jaekel) ....p. 66
1 - adult rhabdosome with well-developed dorsal visors hanging over the mouths of the theca, no. 2275/576, x 6, well. Harsy-1873, int. 348.5-349 m, Zabrodskaya suite, *nilssoni-chimaera* zone; 2, 3 - fragments of the proximal and distal parts of rhabdosomes, no. 2275/276, x 22, no. 2275/275, o 22, borehole Shiev-4109, int. 449.8-450.8 m, 443.7-445.6 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone.

Fig. 4-15. *Wolynograptus acer* (Tsegelnjuk) ....p. 78
4-7, 10-13 - proximal parts of rhabdosomes with well-developed siculae and dorsal-lateral lobes of the mouths of the first theca, no. 2275/320, x 15, no. 2275/316, x 15, no. 2275/311, x 15, no. 2275 /321, x 15, No. 2275/322, x 15, No. 2275/310, x 15, No. 2275/319, x 22, No. 2275/314, x 22, well Guscha-4015, int. 763.5-768.5 m, 768.5-773.5 m, 773.5-778.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 8, 9, 14 - middle and distal parts of rhabdosomes with large dorsal-lateral visors hanging over the mouths of all the thecae, no. 2275/317, no. 2275/318, no. 768.5-773.5 m, location and zone are the same, 15 - adult rhabdosome with large peaks over the mouths of all theca, no. 2275/577, x 5, well. Pulemets-1884, ch. 702 m, lower part of the Milovanskaya Formation, *formosus-spineus* zone.

Table XXIX

Fig. 1. *Wolynograptus acer* (Tsegelnjuk) ....…………………………………….…p. 78
Rhabdosome proximal, no. 2275/313, x 15, well Guscha-4015, int. 773.5-778.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone.

Fig. 2-14. *Tirassograptus difficilis* (Tsegelnjuk) ....….p. 86
7 - prosicule, metasicle and the beginning of the leak of the first theca with smooth lateral edges, no. 2275/307, x 22, well. Guscha-4015, int. 622.4-626.8 m, lower Gushchi Formation, *lochkovensis* zone; 2, 3, 8, 10, 11 - proximal parts of rhabdosomes with dorsal-lateral lobes that hang over the mouths of the theca, no. 2275/295, no. 2275/308, no. 2275/298, no. 2275/296, no. all x 15, same location and age; 4 - rhabdosome proximal (fuselage structure of the dorsal-lateral lobes is visible), no. 2275/305, x 22, same borehole, int. 615.1-620.5 m, location and zone are the same; 5, 6, 9, 12 - fragments of the middle and distal parts of the rhabdosome with well-developed dorsal lobes hanging over the mouths of the theca, no. 2275/309, no. 2275/304, no. 2275/306, no. 2275/303, all x 15, same well, int. 615.1-620.5 m, 622.4-626.8 m, zone and location are the same; 13 - proximal rhabdosome on the surface of limestone, no. 2275/578, x 8, borehole Pulemets-1884, ch. 561 m, Upper Milovanian Subformation, same zone; 14 - adult rhabdosome, no. 2275/579, x 6, location and age are the same.

Fig. 15. *Bugograptus spineus* (Tsegelnjuk) ....….p. 81
The initial part of the rhabdosome with well-developed dorsal-lateral lobes at the mouths of the theca and symmetrical spines, no. 2275/446 (view from the right side), x 15, borehole Guscha-4015, int. 732.6-737.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone.

Table XXX

Fig. 1-10. *Bugograptus spineus* (Tsegelnjuk) ....…p. 81
1-4, 8 - proximal parts of rhabdosomes with dorsal-lateral lobes, which are equipped with symmetrical spines, no. 2275/446 (left side view), x 15; No. 2275/447 (view from the right side), x 22; No. 2275/447 (view from the left side), x 22; No. 2275/450, x 22; No. 2275/452, x 15, well Guscha-4015, int. 732.6-737.5 m, 743.5-748.5 m, Lower Milovan Subformation, *formosus-spineus* Zone; 7 - sicula and first theca proximal with observed fuselage structure of the periderm, no. 2275/448, x 22, same borehole, int. 732.6-737.5 m, location and zone are the same, 5, 6 - distal parts of rhabdosomes with dorsal-lateral lobes hanging over the mouths of the theca, and symmetrical spines in the distal parts of the lobes, no. 2275/451, no. 2275 /453, both x 22, location and age are the same, 9 - distal fragment of an adult rhabdosome, no. 2275/585, x 6.5, well. Selyakhi-1883, ch. 382 m, Novinskaya suite, the same zone, 10 - the initial part of an adult rhabdosome on the surface of clayey limestone, No. 2275/584, x 6.5, location and age are the same.

Fig. 11, 12. *Bugograptus aculeatus* (Tsegelnjuk) ………………………………….…p. 82
11 - sikula and the first theca, no. 2275/457, x 22, borehole Guscha-4015, int. 820.8-821.7 m, Novinskaya Formation, lower part of the *formosus-spineus* zone; 12 - a fragment of the distal part of the rhabdosome with hook-shaped metathecae in their upper parts and with large dorsal-lateral lobes hanging over the mouths of the thecae, no. 2275/461, x 22, the same borehole, int. 717.5-722.5 m, Lower Milovanskaya Subformation, same zone.

Table XXXI

Fig. 1-6. *Bugograptus aculeatus* (Tsegelnjuk) ....……p. 82
1, 2 - dorsally curved distal fragments of rhabdosomes, respectively, no. 2275/460, no. 2275/455, both x 15, well. Guscha-4015, int. 820.8-821.7 m, 789.9-794.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 3, 4 - dorsally curved proximal parts, no. 2275/456, no. 2275/459, both x 15, borehole the same, int. 820.8-821.7 m, location and zone are the same; 5 - dorsally curved adult

rhabdosome, no. 2275/586, x 6, same well, int. 783-785.5 m, Lower Milovanskaya Subformation, same zone; 6 - a large distal fragment of an adult rhabdosome, no. 2275/587, x 6.5, well. Pulemets-1884, ch. 725 m, Novinskaya suite, same zone.

Fig. 7-13. *Bugograptus protospineus* (Urbanek)..…p. 83

7-9 - proximal parts of rhabdosomes with hook-shaped metathecus and large dorsal-lateral lobes hanging over the mouths of the thecae. The lobes in their distal part are equipped with wide outgrowths of the periderm (lobes) pulled downwards, no. 2275/462, x 15, no. 2275/467, x 22, no. Guscha-4015, int. 785.9-788.9 m, 758.5-763 m, Lower Milovanian subformation, *formosus-spineus* zone; 10, 12 - distal fragments of rhabdosomes, no. 2275/466, no. 2275/465, both x 15, same borehole, int. 758.5-763 m, subformation and zone are the same, 11 - dorsally curved middle part of the rhabdosome (hook-shaped metatheca have large dorsal-lateral lobes, which are equipped in their distal part with outgrowths drawn downwards - lobes), No. 2275/464, x 15, location and zone the same, 13 - dorsally curved fragment of an adult rhabdosome, no. 2275/588, x 6.5, well Selyakhi-1883, ch. 402.5 m, Novinskaya suite, same zone.

Fig. 14, 15. *Monoclimacis crenulata* (Tornquist) ....….p. 68

14 - extreme proximal rhabdosome with dorsal lobe, which hangs over the mouth of the first theca, no. 2275/209, x 22, well. Brest-1, ch. 805.6 m, Zelvyanskaya Formation of the Brest Depression, *crenulata* Zone; 15 - a fragment of the proximal part of the rhabdosome with small dorsal lobes above the mouths of the theca, no. 2275/218, x 22, location and age are the same.

Table XXXII

Fig. 1-11. *Monoclimacis crenulata* (Tornquist) ……………………………………..………p. 00

3, 11 - proximal rhabdosomes with dorsal lobes above the mouths of the first theca, nos. 2275/215, nos. 2275/213, both x 22, borehole Brest-1, ch. 805.6 m, Zelvyanskaya Formation, *crenulata* Zone; 2 - slightly dorsally curved proximal, no. 2275/217, x 15, same location and age, 4 - middle part of the rhabdosome, no. 2275/216, x 15, same location and age, 1, 5 , 6, 8, 9 - fragments of the initial parts of rhabdosomes with well-developed dorsal lobes of the theca mouths, no. 2275/220, no. 2275/210, no. 2275/214, no. 2275/219, no. location and age are the same; 7, 10 - fragments of distal rhabdosomes, the orifices of which are devoid of dorsal lobes, no. 2275/212, no. 2275/221, both x 15, location and age are the same.

Fig. 12-15. *Monoclimacis linnarsoni* (Tullberg) ..……………………………………..…p. 70

12, 13 - proximal parts of rhabdosomes (theca excavations lack dorsal lobes), no. 2275/229, x 22, no. 2275/227, x 15, well. Brest-1, Ch. 817 m, 808 m, Zelvyanskaya Formation, *crenulata* Zone; 14, 15 - fragments of middle parts of rhabdosomes, no. 2275/223, x 22, no. 2275/224, x 15, same borehole, int. 808 m, suite and zone are the same.

Table XXXXIII

Fig. 1-4. *Monoclimacis linnarsoni* (Tullberg) ...…………………………………….…p. 70

1 - a fragment of the distal adult rhabdosome, no. 2275/225, x 15, well. Brest-1, ch. 808 m, Zelvyanskaya Formation, *crenulata* Zone; 2 - fragment of the middle part of the rhabdosome, no. 2275/228, x 15, location and age are the same, 3 - extreme proximal, no. 2275/230, x 15, same borehole, ch. 817 m, same formation and zone, 4 - proximal fragment, no. 2275/226, x 15, same borehole, ch. 808 m, suite and zone are the same.

Fig. 5-10, 12. *Pseudomonoclimacis haupti* (Kuhne) …………………………………..p. 72

5, 6, 8 - proximal parts of rhabdosomes, no. 2275/238, x 15, no. 2275/235, x 22, no. 2275/239, x 15, well. Brest-1, ch. 561.8 m, 532.3 m, 544 m, Rusilov Formation of the Brest Depression, *kozlowskii-auriculatus* Zone; 7, 9 - proximal with rhabdosom, no. 2275/231, no. 2275/7, both x 22, well Guscha-4015, int. 933.4-936.9 m, 727.5-732.5 m, Zabrodskaya Formation and Lower Milovanskaya Subformation, *leintwardinensis* and *formosus-spineus* zones, respectively; 10 - distal fragment, no. 2275/232, x 15, well Guscha-4015, int. 933.4-936.9 m, Zabrodskaya Formation, *leintwardinensis* zone; 12 - fragment of the distal part, no. 2275/237, x 15, borehole Brest-1, ch. 532.3 m, Rusilovka Formation, *kozlowskii-auriculatus* Zone.

Fig. 11, 13, 14. *Pseudomonoclimacis tauragensis* (Paskevicius.) ……………………p. 74

11, 14 - large fragments of proximals, no. 2275/260, no. 2275/257, both x 15, borehole Brest-1, ch. 550.3 m, lower Rusilovskaya suite of the Brest depression, *kozlowskii-auriculatus* zone; 13 - prosicle, metasicle and the beginning of the leak of the first rhabdosome theca, no. 2275/267, x 22, location and age are the same.

Table XXXIV

Fig. l-7. *Pseudomonoclimacis tauragensis* (Paskevicius)… ……………………p. 74

1 - the initial part of the adult rhabdosome, no. 2275/258, x 10, well. Brest-1, ch. 550.3 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 2-5 - large fragments of proximal adult rhabdosomes with normal excavations of the ventral margin, no. 2275/256, no. 2275/263, no. 2275/264, no. 548 m, 550.3 m, formation and zone are the same; 6 - distal fragment of an adult rhabdosome with characteristic thecae endings, no. 2275/266, x 15, same borehole, ch. 550.3 m, same area; 7 - a large fragment of an adult rhabdosome, no. 2275/589, x 6.5, well. Harsy-1873, ch. 340 m, Zabrodskaya Formation, *leintwardinensis* Zone.

Fig. 8, 9. *Formosograptus formosus* (Boucek) ....p. 88

8 - extreme proximal rhabdosome, no. 2275/366, x 15, well. Guscha-4015, int. 753.5-758.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 9 - a fragment of the distal part of the rhabdosome (dorsal lobes almost covering the mouths of the theca and open funnel-shaped outgrowths in the dorsal-lateral parts of the mouths of the theca are visible), no. 2275/356, x 22, location and age are the same.

Table XXXV

Fig. 1-10. *Formosograptus formosus* (Boucek) ………………………………….…p. 88

2-6 - extreme proximals of rhabdosomes (strongly curved dorsal cavities hang over the mouths of the first thecae, open funnel-shaped outgrowths are developed in the dorsal-lateral parts of the mouths), no. 2275/368, no. 2275/364, no. 2275/363, no. 2275/359, all x 22, well Guscha-4015, int. 753.5-758.5 m, 758.5-763.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 1 - a fragment of the middle part of the rhabdosome, no. 2275/354, x 15, the same borehole, int. 753.5-758.5 m, subformation and zone are the same; 7, 8 - fragments of distal parts of adult rhabdosomes, no. 2275/358, no. 2275/357, both x 15, same borehole, int. 758.5-763.5 m, same zone, 9 - fragment of the initial part of the rhabdosome, no. 2275/590, x 6.5, well Selyakhi-1883, ch. 393 m, Novinskaya Formation, same zone; 10 - large distal fragment of an adult rhabdosome, no. 2275/591, x 4, same borehole, ch. 390.7 m, suite and zone are the same.

Table XXXVI

Fig. 1, 2. *Formosograptus formosus* (Boucek) ....…p. 88

1 - extreme proximal rhabdosome, no. 2275/367, x 22, well. Guscha-4015, int. 753.5-758.5 m, Lower Milovanian Subformation, *formosus-spineus* Zone; 2 - a fragment of the distal part, in the dorsal-lateral parts of the mouths of the theca there are open funnel-shaped outgrowths of the periderm, no. 2275/355, x 22, location and age are the same.

Fig. 3-12. *Formosograptus uncatus* (Tsegelnjuk) ……………………………………..p. 90

3 - the extreme proximal of the rhabdosome with a sicle, the dorsal lobe of the first theca is strongly

curved downwards, open funnel-shaped outgrowths are developed in the dorsal-lateral parts of the orifice, no. 2275/377, x 22, well. Guscha-4015, int. 799.9-804.9 m, upper part of the Novinskaya Formation, *formosus-spineus* zone; 4-8 - fragments of the middle parts of rhabdosomes, respectively, no. 2275/378, no. 2275/375, no. 2275/379, no. 2275/376, no. 9 - distal fragment, no. 2275/382, x 22, same borehole, int. 804.9-809.4 m, formation and zone are the same; 10 - characteristic dorsal bend of an adult rhabdosome, no. 2275/592, x 4, well. Pulemets-1884, ch. 734 m, Novinskaya Formation, same zone, 11 - distal fragment, no. 2275/593, x 4, same location and age; 12 - a fragment of the distal adult rhabdosome, no. 2275/594, x 6.5, the same borehole, int. 730 m, suite and zone are the same.

Fig. 13. *Neolobograptus auriculatus* Urbanek ....…p. 98

Sikula, the first theca and the proteca of the second theca, no. 2275/425, x 15, borehole Guscha-4015, int. 911.3-915.7 m, lower part of the Oleshkovicho Formation of Volhynia, lower part of the *kozlowskii-auriculatus* zone.

Table XXXVII

Fig. 1-7. *Neolobograptus auriculatus* Urbanek ....…p. 98

1 - a fragment of the distal part of the rhabdosome with ventral-lateral elevations at the mouths of the theca, no. 2275/445, x 15, well. Brest-1, ch. 544 m, Rusilovskaya Formation, *kozlowskii-auriculatus* Zone; 2 - distal fragment, no. 2275/431, x 22, well Guscha-4015, int. 920-923 m, upper part of the Zabrod Formation, lower part of the *kozlowskii-auriculatus* zone; 3-5 - fragments of the initial parts of rhabdosomes with elevations at the mouth of the tech, no. 2275/427, no. 2275/426, no. 911.3-915.7 m, lower Oleshkovichskaya Formation, same zone, 6 - extreme proximal rhabdosome, no. 2275/437, x 15, well Brest-1, ch. 543.5 m, Rusilovskaya suite, same zone, 7 - proximal part, no. 2275/432, x 22, borehole Guscha-4015, int. 897.4-902.4 m, lower part of the Oleshkovichi Formation, same zone.

Fig. 8-15. *Neolobograptus fragilis* Tsegelnjuk …………………………………………....p. 100

8 - extreme proximal rhabdosome, no. 2275/438, x 15, well. Brest-1, ch. 557.8 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 10, 11 - fragments of the middle parts of rhabdosomes, respectively, no. 2275/436, no. 2275/435, both x 15, borehole Guscha-4015, int. 941.8-952.6 m, 920.3-923 m, upper part of the Zabrodskaya suite, leintwardinensis zone; 13 - fragment of the middle part of the rhabdosome, no. 2275/441, x 15, well. Brest-1, ch. 547 m, lower Rusilovskaya Formation, *kozlowskii-auriculatus* Zone; 14 - extreme proximal rhabdosome, in which the first four thecae are developed, no. 2275/440, x 15, location and zone are the same; 9, 12, 15 - fragments of distal parts of rhabdosomes, no. 2275/444, no. 2275/439, no. 2275/443, all x 15, borehole Brest-1, ch. 544 m, 549.5 m, lower Rusilovskaya suite, same zone.

Table XXXVIII

Fig. 1-14. *Lobograptus progenitor* Urbanek ....p. 104

1 - proximal part of the ventrally curved rhabdosome no. 2275/479, x 10, well. Brest-1, ch. 732.4 m, Franopil Formation, *nilssoni-chimaera* Zone; 8 - the same copy, x 15; 2 - fragment of a dorsally curved proximal, no. 2275/478, x 15, same location and age; 4, 9 - dorsally curved extreme proximals, no. 2275/482, no. 2275/428, both x 15, well. Guscha-4015, int. 941.8-952.6 m, 911.3-915.7 m, Zabrodskaya and lower Oleshkovichskaya Formation, lower *kozlowskii-auriculatus* Zone and *leintwardinensis* Zone; 10 - dorsally curved proximal, no. 2275/477, x 22, well. Brest-1, ch. 732.4 m, lower part of the Francopol Formation, *nilssoni-chimaera* zone; 11, 12 – proximal rhabdosomes, respectively, no. 2275/433, no. 2275/482, both x 22, well. Guscha-4015, int. 920-923 m, 941.8-952.6 m, Zabrodskaya Formation, lower parts of the *kozlowskii-auriculatus* Zone and the leintwardinensis Zone; 3, 5 – fragments of the middle parts of rhabdosomes with distinct elevations of the lateral margins of the theca, no. 2275/484, no.

2275/483, both x 15, borehole Shiev-4109, ch. 446.6-447.6 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 6 - fragment of the middle part of the rhabdosome, no. 2275/483, x 22, same location and age; Brest-1, ch. 752.4 m, lower part of the Francopol Formation, *nilssoni-chimaera* zone; 13 - adult rhabdosome on the surface of clayey limestone, no. 2275/595, x 5, well Harsy-1873, ch. 341 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 14 is a distal fragment of the rhabdosome shown in Fig. 13, No. 2275/595, x 6.5.

Table XXXIX

Fig. 1-6. *Lobograptus simplex* Urbanek ....p. 106
1 - distal fragment with symmetrical lateral lobes at the mouths of the theca, no. 2275/485, x 15, borehole Shiev-4109, int. 443.7-445.6 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 2, 3 - middle parts of rhabdosomes (lateral lobes are visible), no. 2275/488, no. 2275/486, both x 15, well. Guscha-4015, int. 953.7-962.5 m, 941.8-952.6 m, Zabrodskaya Formation, *nilssoni-chimaera*, *leintwardinensis* zones; 4 - distal fragment, no. 2275/487, x 15, same borehole, int. 941.8-952.6 m, same suite, *leintwardinensis* zone; 5 - proximal rhabdosome with symmetrical lateral lobes at the mouths of the theca, no. 2275/492, x 15, location and age are the same; 6 - distal fragment of an adult rhabdosome, no. 2275/596, x 5, well. Harsy-1873, int. 346.5-346.8 m, *nilssoni-chimaera* zone.

Fig. 7-11. *Lobograptus scanicus scanicus* (Tullberg) ……………………………...p. 107
7 - sicula and first theca with lateral elevations, no. 2275/491, x 15, borehole Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone; 8 - fragment of the proximal part, no. 2275/496, x 15, location and age are the same, 9, 10 - ventrally curved fragments of the middle parts of rhabdosomes, no. 2275/499, no. 2275/493, both x 15, location and age the same, 11 - distal fragment, no. 2275/494, x 15, same location and age.

Fig. 12-14. *Lobograptus invertus* Urbanek ....……p. 109
12 - proximal rhabdosome with lateral lobes at the mouths of the first theca, no. 2275/495, x 15, well. Guscha-4015, int. 941.8 -952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone; 13 - proximal fragment, no. 2275/501, x 22, location and zone are the same; 14 - a fragment of the middle part of the rhabdosome, no. 2275/500, x 15, location and age are the same.

Table XL

Fig. 1, 2. *Lobograptus invertus* Urbanek ....…c. 109
1 - distal of the rhabdosome, the right lobes of the orifices were larger than the left ones, no. 2275/498, x 22, well. Guscha-4015, int. 941.8-952.6 m, Zabrodskaya Formation, lower part of the *leintwardinensis* zone; 2 - fragment of the middle part of the rhabdosome, no. 2275/497, x 15, location and age are the same.

Fig. 3-10. *Cucullograptus hemiaversus* Urbanek ....…c. 111
3 - extreme proximal (sicula, first and beginning of the second theca), no. 2275/502, x 22, well. Guscha-4015, int. 936.9-941.8 m, upper part of the Zabrodskaya Formation, *leintwardinensis* zone; 4-6 - fragments of proximal rhabdosomes with well-developed lateral lobes on the mouths of the theca, no. 2275/504, x 15, no. 2275/505, x 15, no. 2275/503, x 22, well Guscha-4015, int. 928.2-931.1 m, 936.9-941.8 m, 933.4-936.9 m, section interval and zone are the same; 7-9 - fragments of distals with well-developed left lateral lobes on the mouths of the theca that overlap the mouths and right lobes, no. 2275/508, x 15, no. 2275/506, x 22, no. 2275/507, x 15, well . Guscha-4015, int. 933.4-936.9 m, section interval and zone are the same; 10 - a large distal fragment of an adult rhabdosome, no. 2275/597, x 6.5, well. Gushcha-4015, int. 936.9-941.8 m, formation and zone are the same.

Fig. 11-13. *Bohemograptus bohemicus bohemicus* (Barrande) …………………….. p. 113

11 - extreme proximal rhabdosome, no. 2275/535, x 15, well. Guscha-4015, int. 891.3-894.2 m, lower part of the Oleshkovichi Formation, *kozlowskii-auriculatus* zone; 12 - proximal, no. 2275/531, x 15, well Brest-1, ch. 559.7 m, lower Rusilovskaya Formation, *kozlowskii-auriculatus* zone; 13 - distal fragment, no. 2275/540, x 15, borehole Guscha-4015, int. 920-923 m, upper part of the Zabrod Formation, lower part of the *kozlowskii-auriculatus* zone.

Table XLI

Fig. 1-5. *Bohemograptus bohemicus bohemicus* (Barrande) ……………………..…… p. 113

1 - fragment of the initial part of the rhabdosome, no. 2275/541, x 15, well. Gushcha-4015, int. 860-863.4 m, upper Oleshkovichskaya Formation, *kozlowskii-auriculatus* Zone; 2-4 - proximal parts of rhabdosomes, no. 2275/554, x 22, no. 2275/533, x 15, no. 2275/553, x 15, well. Brest-1, ch. 550.3 m, 557.8 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 5 - distal fragment, no. 2275/534, x 15, same borehole, ch. 534.3 m, Rusilovskaya suite, same zone.

Fig. 6, 7. *Bohemograptus bohemicus tenuis* (Boucek)…………………..……….p. 116

6 - distal fragment, no. 2275/481, x 15, borehole Guscha-4015, depth 953.7-962.5 m, Zabrodskaya suite, *nilssoni-chimaera* zone; 7 - proximal, no. 2275/550, x 15, well Brest-1, ch. 516.2 m, Rusilovskaya Formation, *kozlowskii-auriculatus* Zone.

Table XLII

Fig. 1-6. *Bohemograptus bohemicus tenuis* (Boucek)……………………………….p. 116

1 - a fragment of the distal part, no. 2275/537, x 15. well..Gushcha-4015, int. 891.3-894.2 m, lower part of the Oleshkovichi Formation, *kozlowskii-auriculatus* zone; 2 - extreme proximal, no. 2275/555, x 22, the same borehole, int. 860-863.4 m, location and zone are the same; 3, 5 - proximal with rhabdosome, no. 2275/549, no. 2275/548, both x 15, well. Brest-1, ch. 559.7 m, 499.7 m, lower Rusilovskaya and Lesnyanskaya suites, same zone; 4 - proximal rhabdosome with microfuselage structures within the virgella and the mouth of the second theca, no. 2275/539, x 15, well. Guscha-4015, int. 906.4-911.3 m, bottoms of the Oleshkovichskaya suite, the same zone; 6 - a fragment of the middle part of the rhabdosome, no. 2275/536, x 15, the same borehole, int. 891.3-894.2 m, section interval and zone are the same.

Fig. 7-13. *Bohemograptus cornutus* Urbanek ....….p. 120

7 - the extreme proximal of the rhabdosome with microfuselage formations within the virgella and the mouth of the first theca, no. 2275/573, x 22, well. Guscha-4015, int. 906-911 m, lower Oleshkovichi Formation, *kozlowskii-auriculatus* Zone; 8, 9, 11 - distal to rhabdosomes with ventral lobes at the mouths of the theca, no. 2275/571, no. 2275/489, no. 2275/570, all x 15, borehole Guscha-4015, int. 902.4-906.4 m, 920-923 m, upper Zabrodskaya and lower Oleshkovichskaya formations, the same zone; 10, 12, 13 - fragments of the middle parts of rhabdosomes, respectively, no. 2275/574, no. 2275/569, no. 891.3-894.2 m, 902.4-906.4 m, the lower part of the Oleshkovichi suite, the same zone.

Table XLIII

Fig. 1-3. *Bohemograptus cornutus* Urbanek …………………………………………p. 120

1 - a fragment of the middle part of the rhabdosome with ventral-lateral elevations at the mouths of the theca, no. 2275/575, x 15, well. Guscha-4015, int. 891.3-894.2 m, lower part of the Oleshkovichi Formation, *kozlowskii-auriculatus* zone; 2 - a fragment of the distal with high ventral-lateral elevations of the mouths of the thek, no. 2275/490, x 15, the same borehole, int. 920-923 m, upper part of the Zabrodskaya Formation, same zone; 3 - a fragment of the proximal part of the rhabdosome with microfuselage formations on the mouths of the theca, sicula and on the virgella, no. 2275/568, x 15, the

same borehole, int. 902.4-906.4 m, lower Oleshkovichi Formation, *kozlowskii-auriculatus* zone.

Fig. 4-12. *Bohemograptus praecornutus* Urbanek. ……………………………….p. 118

4 - the proximal part of the rhabdosome with gently sloping lateral elevations of the mouths of the tech, no. 2275/552, x 15, well. Brest-1, ch. 550.3 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 5-8 - proximal rhabdosomes, respectively, No. 2275/556, No. 2275/563, No. 2275/565, No. 2275/564, all x 15, well. Guscha-4015, int. 860-863.4 m, 920-923 m, 941.8-952.6 m, Zabrodskaya and Oleshkovichskaya formations, *kozlowskii-auriculatus* zone; 9 - fragment of the middle part of the rhabdosome, no. 2275/558, x 15, borehole Brest-1, ch. 557.8 m, lower Rusilovskaya suite, *kozlowskii-auriculatus* zone; 10 - fragment of the middle part of the rhabdosome with high lateral elevations of the mouths of the tech, no. 2275/557, x 15, borehole Guscha-4015, int. 860-863.4 m, upper Oleshkovichskaya Formation, same zone; 11, 12 - fragments of distal rhabdosomes with high lateral elevations of the theca mouths, no. 2275/559, no. 2275/560, both x 15, borehole Brest-1, ch. 557.8 m, lower Rusilovskaya suite, the same zone.

Table XLIV

Fig. 1-11 *Neocucullograptus inexspectatus inexspectatus* (Bouc) …………………p. 122

1, 8 - fragments of the middle part of rhabdosomes, respectively, no. 2275/518, no. 2275/520, both x 15, borehole Guscha-4015, int. 886.6-891.3 m, Oleshkovich Formation, *kozlowskii-auriculatus* Zone; 2 - proximal rhabdosome (first and second theca), no. 2275/515, x 22, same borehole, int. 902.4-906.4 m, lower part of the Oleshkovichi Formation, same zone; 3-5 - extreme proximal, no. 2275/514, no. 2275/513, no. 2275/521, all x 22, the well is the same, int. 902.4-906.4 m, 911.3-915.7 m, 906.4-911.1 m, section interval and zone are the same; 6, 7 - proximal parts of rhabdosomes, no. 2275/517, no. 2275/516, both x 15, same borehole, int. 886.6-891.3 m, 895.8-897.4 m, Oleshkovichskaya suite, same zone; 9 - a fragment of the middle part of the rhabdosome, no. 2275/522, x 15, the same borehole, int. 906.4-911.1 m, lower part of the Oleshkovichi Formation, same zone; 10 - a fragment of the distal rhabdosome (large left lobes overlap the mouths of the theca and hang over their ventral edges), no. 2275/519, x 15, the borehole is the same; int. 886.6-891.3 m, Oleshkovichskaya suite, same zone; 11 - adult rhabdosome on the limestone surface, no. 1788/121, x 4, well Brest-1, depth 534.3 m, Rusilovskaya suite, same zone.

Fig. 12-14. *Neocucullograptus kozlowskii unicornus* Urbanek……………………. p. 126

12 - sicula with microfuselage vanes on the lateral margins and the first theca, no. 2275/530, x 22, borehole Guscha-4015, int. 894.2-895.8 m, Oleshkovichskaya Formation, *kozlowskii-auriculatus* Zone; 13 - proximal rhabdosome, no. 2275/527, x 22, location and age are the same; 14 - proximal rhabdosome, no. 2275/529, x 22, location and age are the same.

Table XLV

Fig. 1-4. *Neocucullograptus kozlowskii kozlowskii* Urbanek ……………………...p. 124

1, 2 - fragments of the middle parts of rhabdosomes, no. 2275/512, no. 2275/511, both x 15, borehole Guscha-4015, int. 860-863.4 m, 842.5-844.5 m, upper part of the Oleshkovichskaya and lower part of the Novinskaya suite, *kozlowskii-auriculatus* zone; 3 - extreme proximal rhabdosome, no. 2275/510, x 15, well. Brest-1, ch. 518.5 m, Rusilovskaya suite, same zone, 4 - distal rhabdosome, no. 2275/523, x 22, well Guscha-4015, int. 906.4-911.3 m, lower part of the Oleshkovichskaya Formation, same zone.

Fig. 5-8. *Neocucullograptus kozlowskii unicornus* Urbanek ………………………..p. 126

5 - large fragment of the extreme proximal, no. 2275/524, x 15, borehole Guscha-4015, int. 894.2-895.8 m, Oleshkovichskaya Formation, *kozlowskii-auriculatus* Zone; 6 - proximal part of the rhabdosome, no. 2275/528, x 22, same location and age; 7 - middle part of the rhabdosome, no. 2275/525, x 15, same location and zone; 8 a, b - distal part of the rhabdosome (a - view from the right side, b - view from the left, lateral outgrowths of the right lobes of the theca are visible), no. 2275/526, x 15, location and age are

the same.

Fig. 9-12. *Neodiversograptus nilssoni* (Barrande) …………………………………...p. 128
9 - sicula and first rhabdosome theca (broken dorsal spine of sicula located on the right lobe), no. 2275/476, x 22, well Guscha-4015, int. 967.2-971.6 m, lower part of the Zabrodskaya suite, *nilssoni-chimaera* zone; 10 - deformed extreme proximal of the rhabdosome (the dorsal spine of the sicula is located on the left lobe), no. 2275/475, x 22, well. Brest-1, ch. 721.5 m, lower part of the Francopol Formation, same zone; 11 - the middle part of the rhabdosoma, no. 2275/599, x 6, the same borehole, ch. 681 m, Franopol Formation, lower part of the *leintwardinensis* Zone; 12 - fragment of a large fragment of the middle part of the rhabdosome, no. 2275/598, x 6, borehole Harsy-1873, ch. 346.5 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone.

Fig. 13, 14. *Neodiversograptus beklemishevi* Urbanek …………………………p. 130
13 - the extreme proximal of the rhabdosome (the mouth of the siculum is broken off), no. 2275/474, x 22, well. Guscha-4015, int. 894.2-895.8 m, lower part of the Oleshkovichi Formation, *kozlowskii-auriculatus* zone; 14 - a fragment of a large fragment of rhabdosome (more than 19 mm long), no. 2275/600, x 6.5, well. Harsy-1873, ch. 340 m, Zabrodskaya Formation, *leintwardinensis* Zone.

Table XLVI

Fig. 1-14. *Monograptus (Slovinograptus) balticus* (Teller) ………………………p. 92
1, 3 - fragments of the middle parts of rhabdosomes, no. 2275/337, no. 2275/345, both x 15, borehole Guscha-4015, int. 794.9-799.9 m, 732-737.5 m, tops of the Novinsky Formation and Lower Milovanskaya Subformation, *formosus-spineus* zone; 4 - a fragment of the distal rhabdosome, no. 2275/339, x 15, the same borehole, int. 794.9-799.9 m, tops of the Novinskaya Formation, same zone; 2, 5, 6, 7 - fragments of proximal rhabdosomes, no. 2275/329, no. 2275/343, no. 2275/341, no. subformation, same zone; 8 - proximal fragment, no. 2275/328, x 22, location and zone are the same; 9, 10 - extreme proximal rhabdosomes, no. 2275/554, no. 2275/551, both x 22, same borehole, int. 799.9-804.9 m, 752-757.5 m, the tops of the Novinsky Formation and the Lower Milovanskaya Subformation, the same zone; 11-14 - extreme proximal rhabdosomes, no. 2275/540, no. 2275/555, no. 2275/327, 2275/332, all x 15, location and zone are the same.

Table XLVII

Fig. 1-6. *Monograptus (Slovinograptus) balticus* (Teller) ………………………p. 92
1, 2 - fragments of distal rhabdosomes (the dorsal walls of the thecae are bent in the direction of their growth), no. 2275/344, no. 2275/338, both x 15, borehole Gushcha-4015, int. 732-737.5 m, 794.9-799.9 m, upper Novinskaya Formation and Lower Milovanskaya Subformation, *formosus-spineus* zone; 3 - sicula and first theca of rhabdosome, no. 2275/330, x 22, same well, int. 732-737.5 m, Lower Milovanskaya Subformation, same zone; 4 - the initial part of the rhabdosome on the limestone surface, no. 2275/601, x 6.5, well. Pulemets-1884, ch. 732 m, Novinskaya suite, the same zone, 5 - a large fragment of the initial part of the rhabdosome on the surface of clayey limestone, no. 2275/604, x 6.5, the same borehole, ch. 721 m, formation and zone are the same; 6 a - a large fragment of an adult rhabdosome on the surface of clayey limestone, no. 2275/603, x 4 - the same location and zone, 6 b - the distal part of the same specimen, x 6.5.

Fig. 7-11. *Serenograptus hamulosus* (Tsegelnjuk) …………………………………...p. 95
7 - the initial part of the rhabdosome on the surface of clayey limestone, no. 2275/605, x 6.5, well. Pulemets-1884, ch. 721 m, Novinskaya Formation, *formosus-spineus* zone; 8 - adult rhabdosome on the surface of clayey limestone, no. 2275/606, x 3.6, the same borehole, ch. 747 m, lower part of the Novinskaya Formation, same zone; 9 - extreme proximal rhabdosome (dorsal lobe overhangs

above the mouth of the first theca), No. 2275/284, x 22, well Gushcha-4015, int. 811.9-816.4 m, Novinskaya Formation, lower part of this zone; 10, 11 - proximal with rhabdosom, no. 2275/353, no. 2275/281, both x 15, same borehole, int. 816.8-820.8 m, 811.9-816.4 m, section interval and zone are the same.

Table XLVIII

Fig. 1-13. *Serenograptus hamulosus* (Tsegelnjuk ……………………………p. 95

1, 3 - proximal rhabdosomes, respectively, No. 2275/293, No. 2275/350, both x 15, well. Guscha-4015, int. 816.8-820.8 m, 799.9-804.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 2, 4-6 - extreme proximal rhabdosomes, no. 2275/283, no. 2275/285, no. 2275/280, 2275/282, x 22, same borehole, int. 811.9-816.4 m, section interval and zone are the same; 7-9 - fragments of the proximal parts of rhabdo-somes, no. 2275/287, no. 2275/286, no. 2275/288, all x 15, location and zone are the same; 10-12 - fragments of the middle parts of rhabdosomes, no. 2275/289, no. 2275/347, no. 2275/348, all x 15, the same borehole, int. 811.9-816.4 m, 799.9-804.9 m, formation and zone are the same, 13 - a fragment of the distal rhabdosome, no. 2275/291, x 15, the same borehole, int. 811.9-816.4 m, formation and zone are the same.

Table XLIX

Fig. 1-4. *Serenograptus hamulosus* (Tsegelnjuk) ………………………………...p. 95

I - fragment of the middle part of the rhabdosome, no. 2275/352, x 15, well Gushcha-4015, int. 816.8-820.8 m, upper part of the Novinskaya Formation, lower part of the *formosus-spineus* zone; 2 - extreme proximal rhabdosome, no. 2275/292, x 15, location and zone are the same; 3 - distal fragment, no. 2275/290, x 15, same borehole, int. 811.9-816.4 m, location and zone are the same; 4 - extreme proximal rhabdosome (dorsal lobe hanging over the mouth of the first theca), no. 2275/408, x 22, location and zone are the same.

Fig. 5-9. *"Monograptus" huckei* Munch ……………………………………………p. 132

5 - a fragment of the proximal part of the rhabdosome (the dorsal lobe hangs over the mouth of the theca), no. 2275/405, x 22, well. Shiev-4109, int. 442.7-443.7 m, Zabrodskaya Formation, *nilssoni-chimaera* Zone; 6, 7 - fragments of the distal parts of rhabdosomes (dorsal lobes hanging over the mouths of the thecae), no. 2275/406, no. 2275/404, both x 15, borehole Shiev-4109, int. 446.6-447.6 m, 442.7-443.7 m, formation and zone are the same; 8 - a fragment of the middle part of the rhabdosome, no. 2275/403, x 22, the same borehole, int. 443.7-445.6 m, formation and zone are the same; 9 - fragment of the middle part of the rhabdosome, no. 2275/407, x 22, well. Brest-1, Ch. 732.4 m, lower part of the Francopol Formation, same zone.

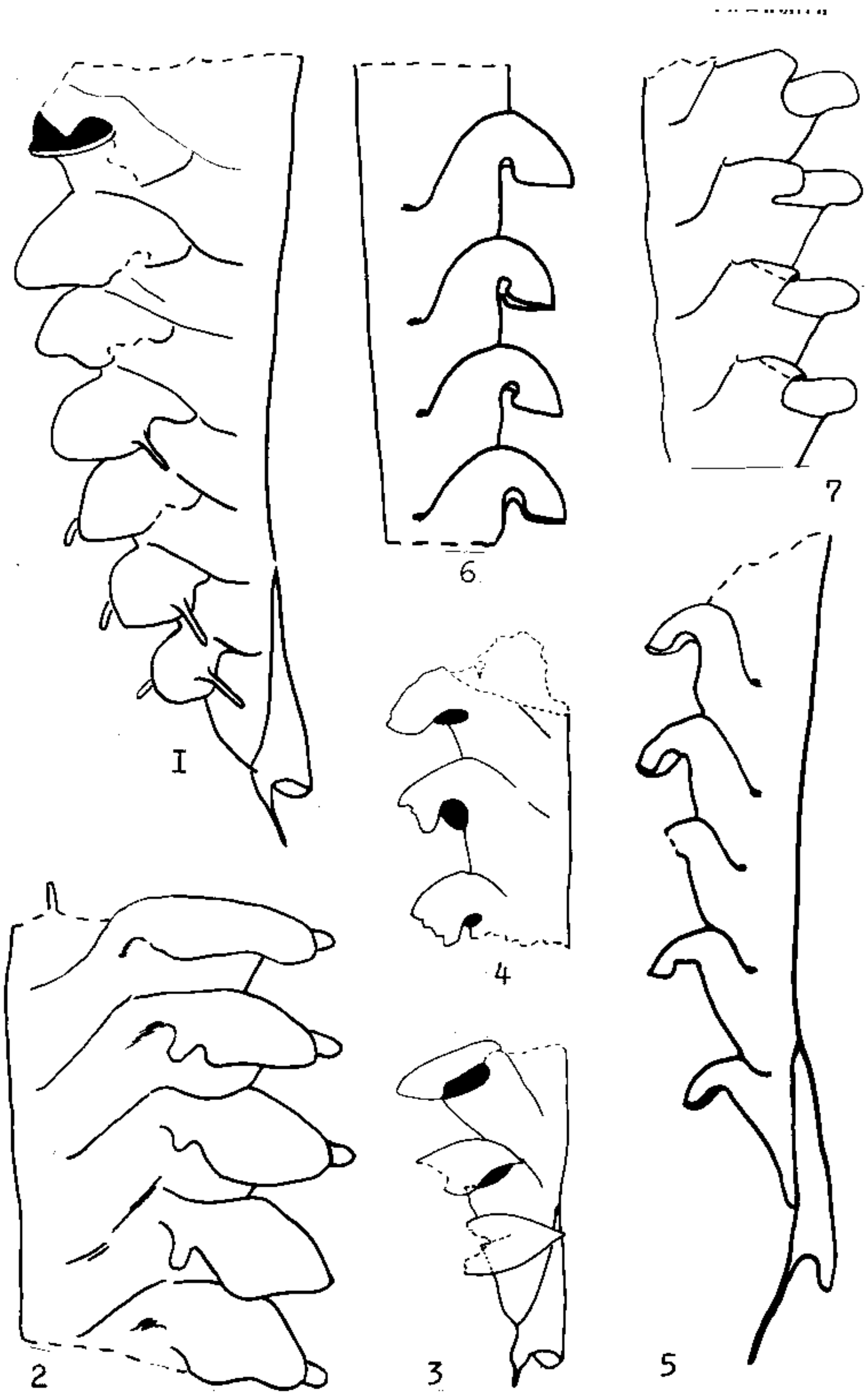
Fig. 10-14. *"Monograptus" operculatus* Munch ………………………………......p. 131

10 - sicula and the beginning of the leak of the first theca, no. 2275/411, x 22, well Guscha-4015, int. 799.9-804.9 m, upper part of the Novinsky Formation, *formosus-spineus* zone; 11 - distal part of rhabdosome, no. 2275/409, x 15, same well, int. 780.6-783 m, lower part of the Milovanskaya Formation, same zone; 12 - proximal fragment, no. 2275/412, x 22, same borehole, int. 799.9-804.9 m, upper part of the Novinskaya Formation, same zone; 13 - fragment of the middle part of the rhabdosome, no. 2275/410, x 15, location and zone are the same; 14 - fragment of the middle part of the rhabdo-soma, no. 2275/413, x 22, location and zone are the same.

Table L

Fig. 1-10. *Polonograptus egregius* Urbanek ……………………………………...p. 102

I - proximal rhabdosome, consisting of ventrally curved thin long thecae with lateral elevations at their mouths, no. 2275/417, x 15, well. Brest-1, ch. 500.7 m, Lesnyanskaya suite, zone *? kozlowskii-auriculatus*; 2 - a fragment of the middle part of the rhabdosome (high lateral elevations at the mouths of the theca), no. 2275/421, x 15, location and zone are the same; 3 - sicula and the beginning of a very long leak of the first theca, no. 2275/422, x 22, well. Gushcha-4015, int. 860-863.4 m, upper Oleshkovichi Formation, same zone; 4 - proximal rhabdosome showing the fuselage structure of the protecus, metathecus and lateral elevations, no. 275/423, x 22, location and age are the same; 5 - sicula and flow of the first theca, in which the fuselage structure is visible, no. 2275/414, x 22, well. Brest-1, ch. 500.7 m, Lesnyanskaya suite, same zone, 6 - proximal fragment, no. 2275/424, x 15, borehole Gushcha-4015, int. 860-863.4 m, tops of the Oleshkovichi Formation, same zone; 7, 10 - fragments of distal rhabdosomes showing the fuselage structure of the proteca, metatheca, and lateral elevations of the theca mouths, no. 2275/420, no. 2275/419, both x 15, borehole Brest-1, ch. 500.7 m, Lesnyanskaya Formation, same zone; 8 - a fragment of the proximal rhabdosome, no. 2275/416, x 22, location and age are the same; 9 - proximal fragment, no. 2275/418, x 15, location and zone are the same.



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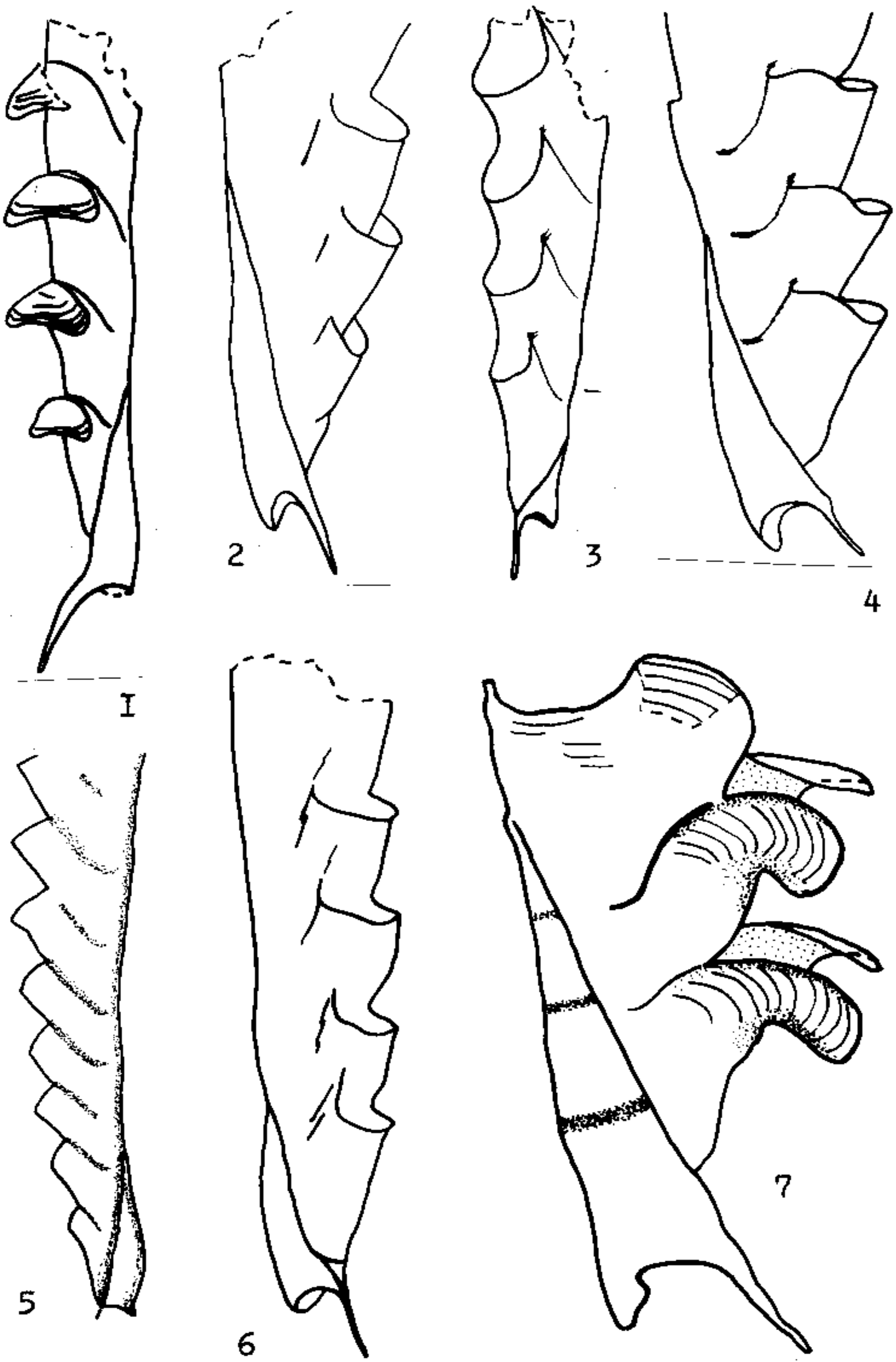

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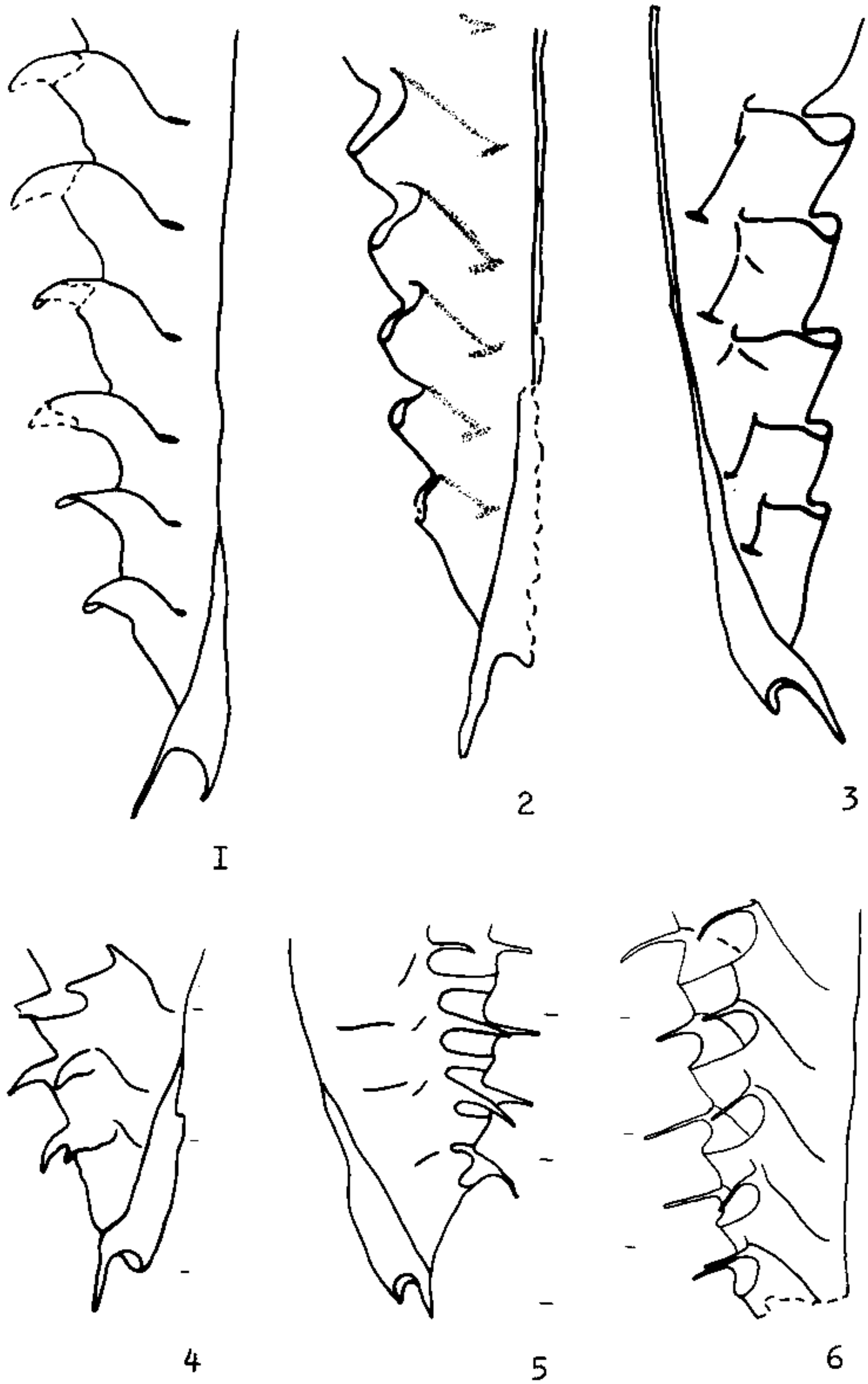

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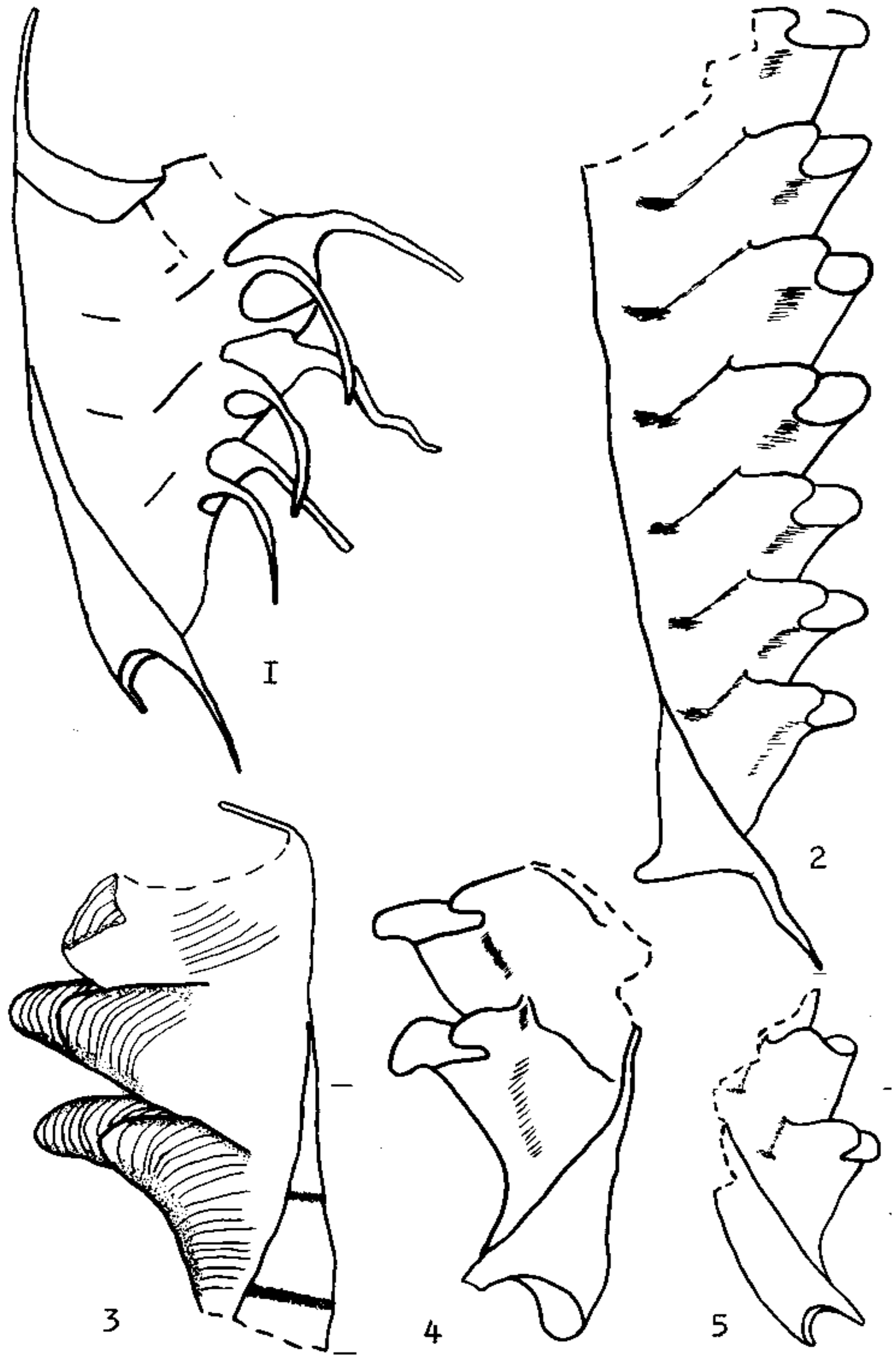

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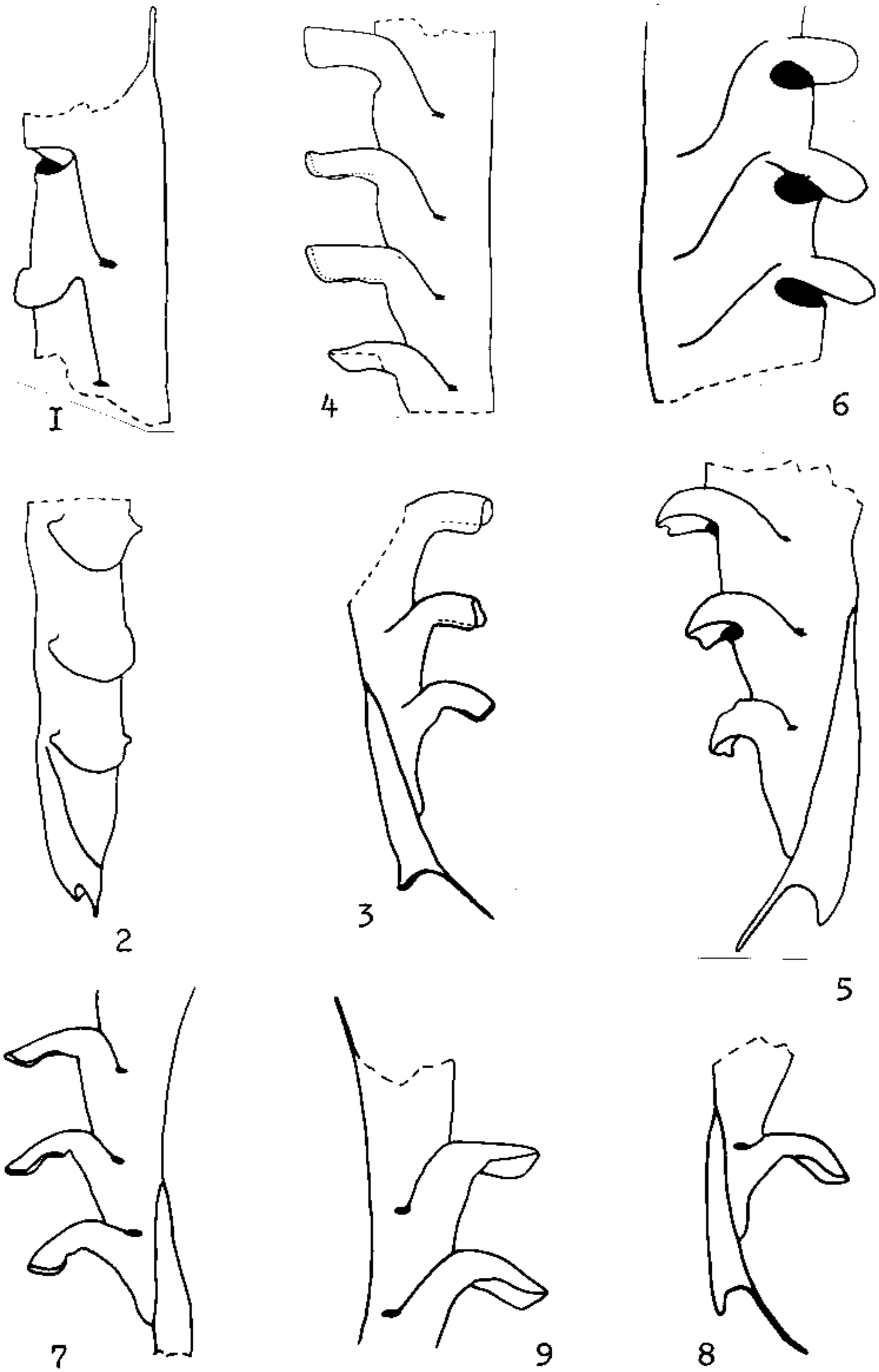

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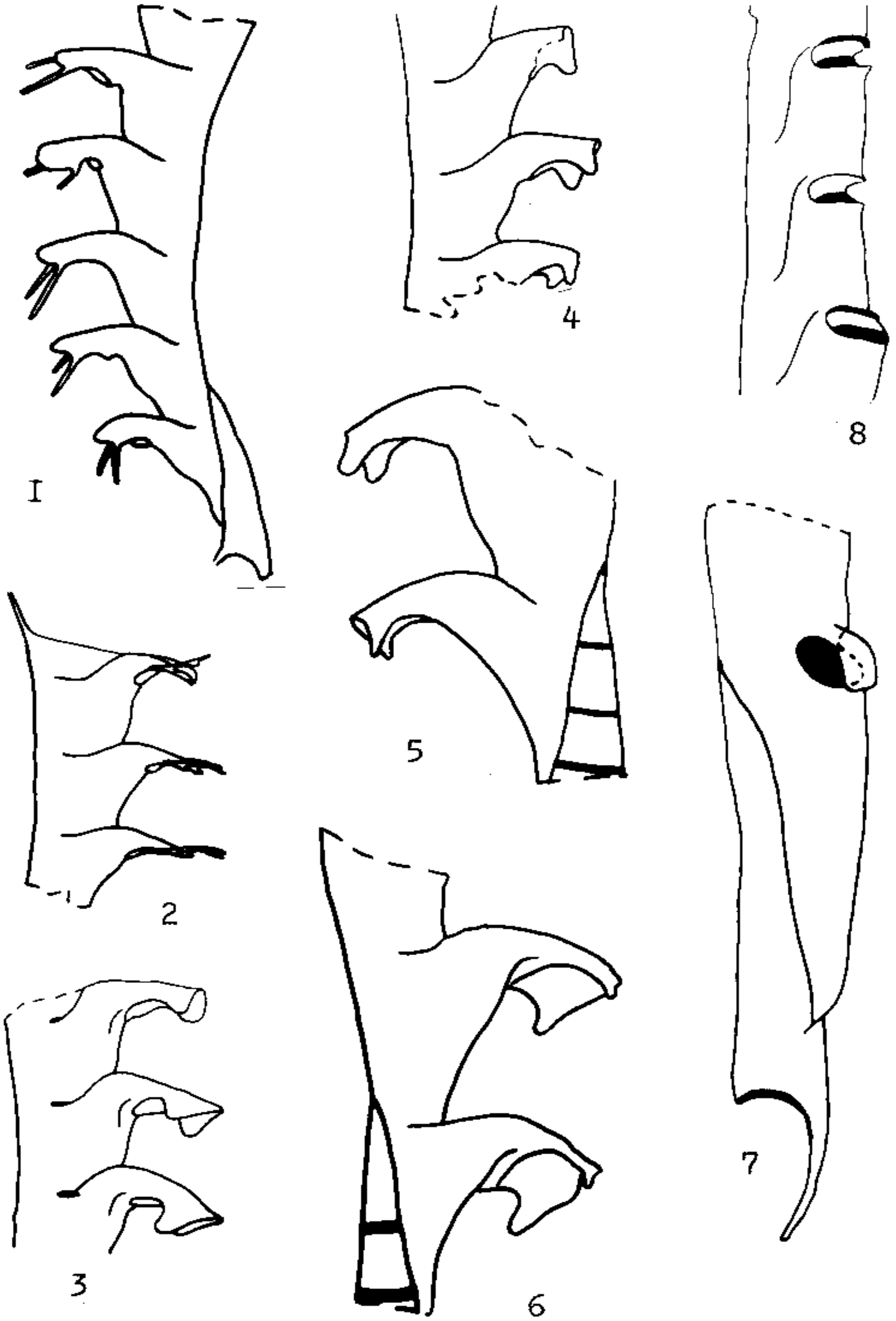

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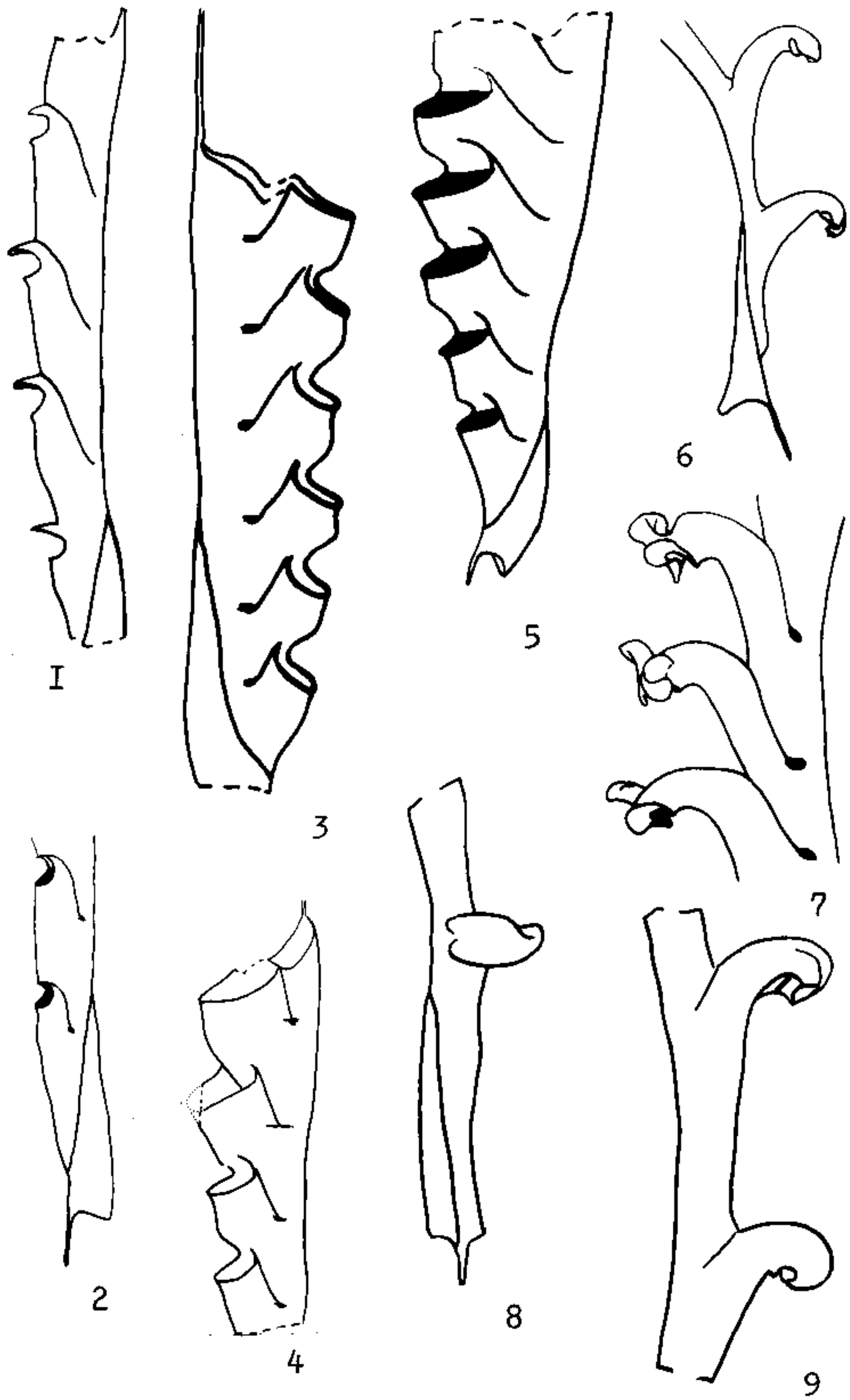

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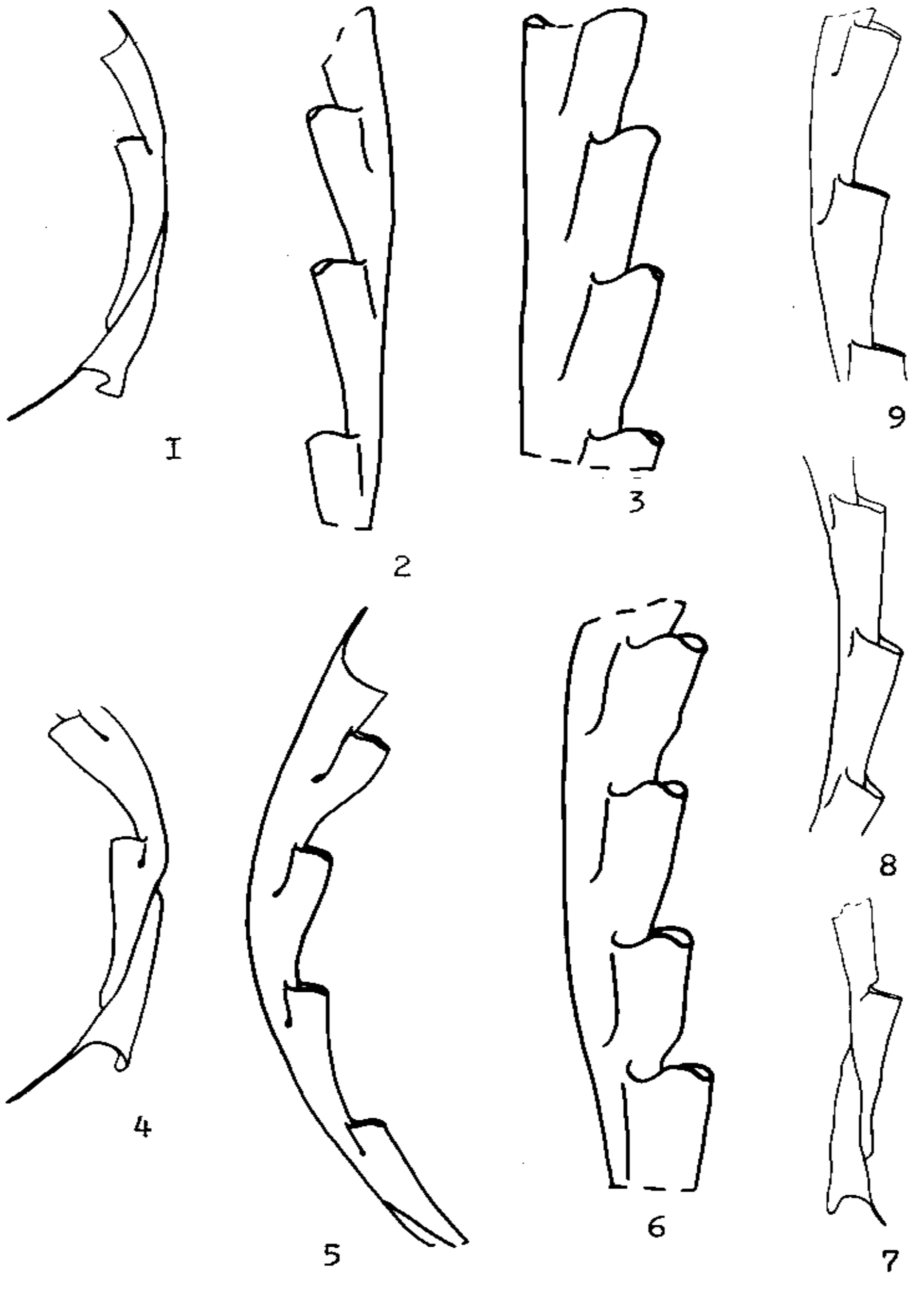

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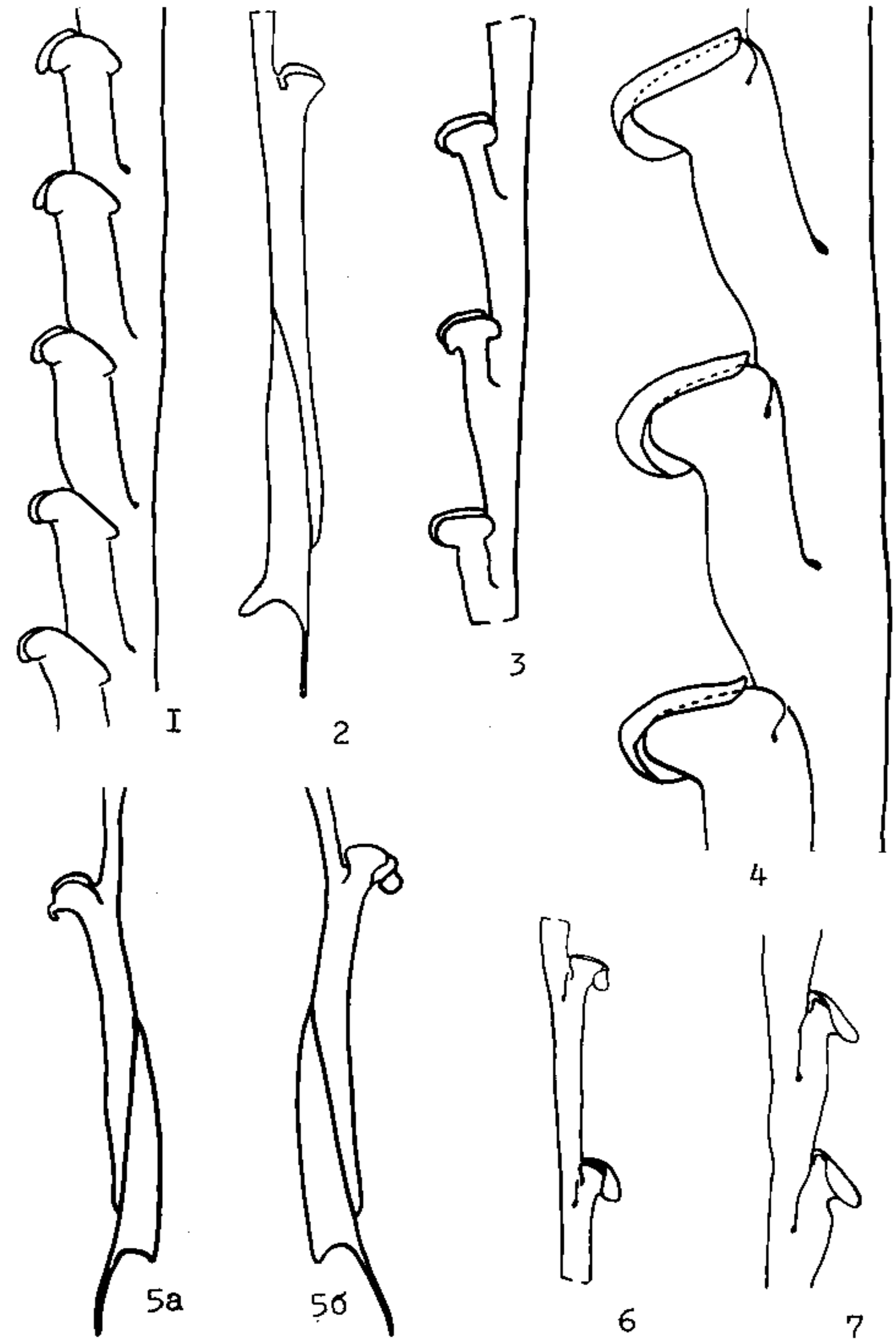

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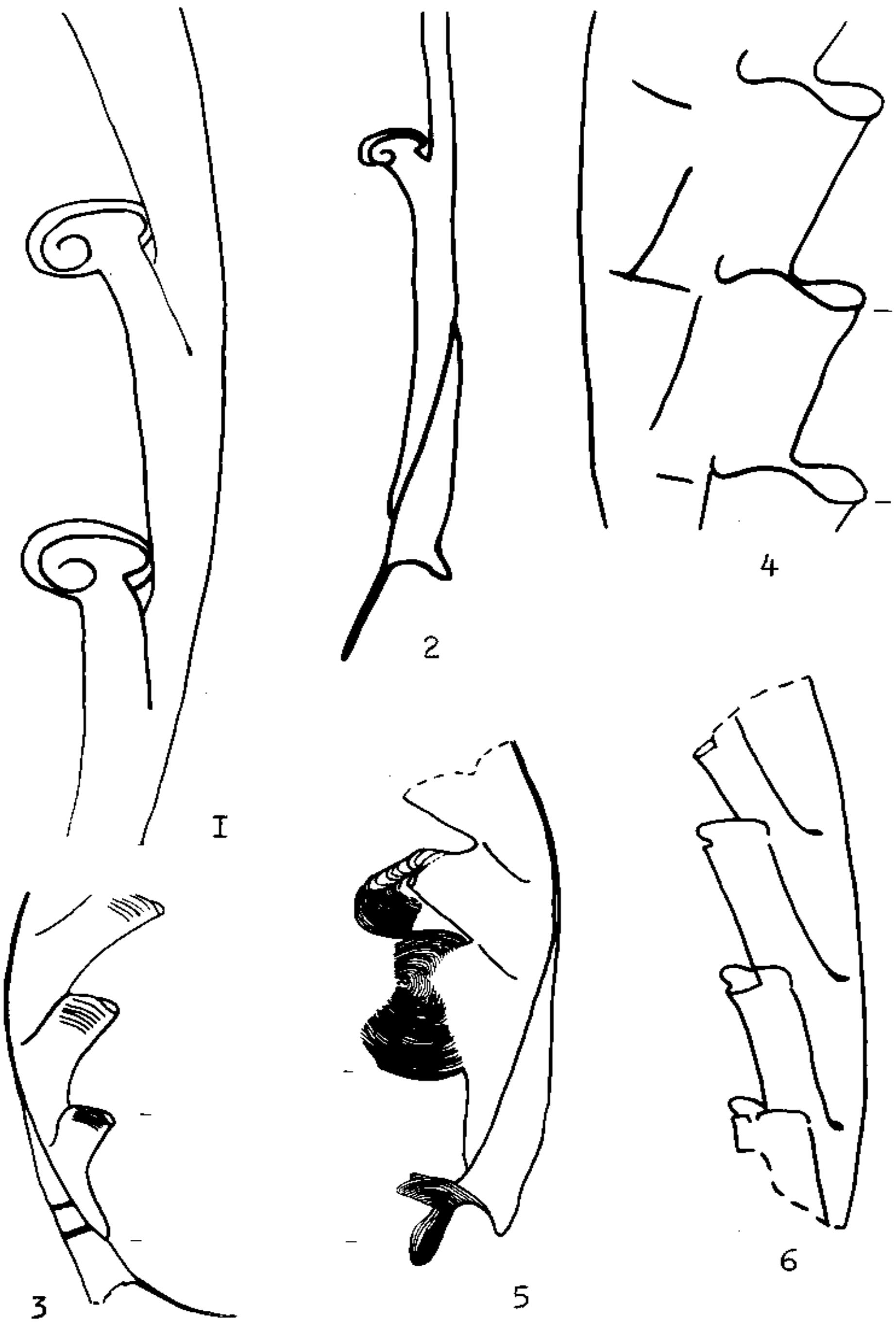

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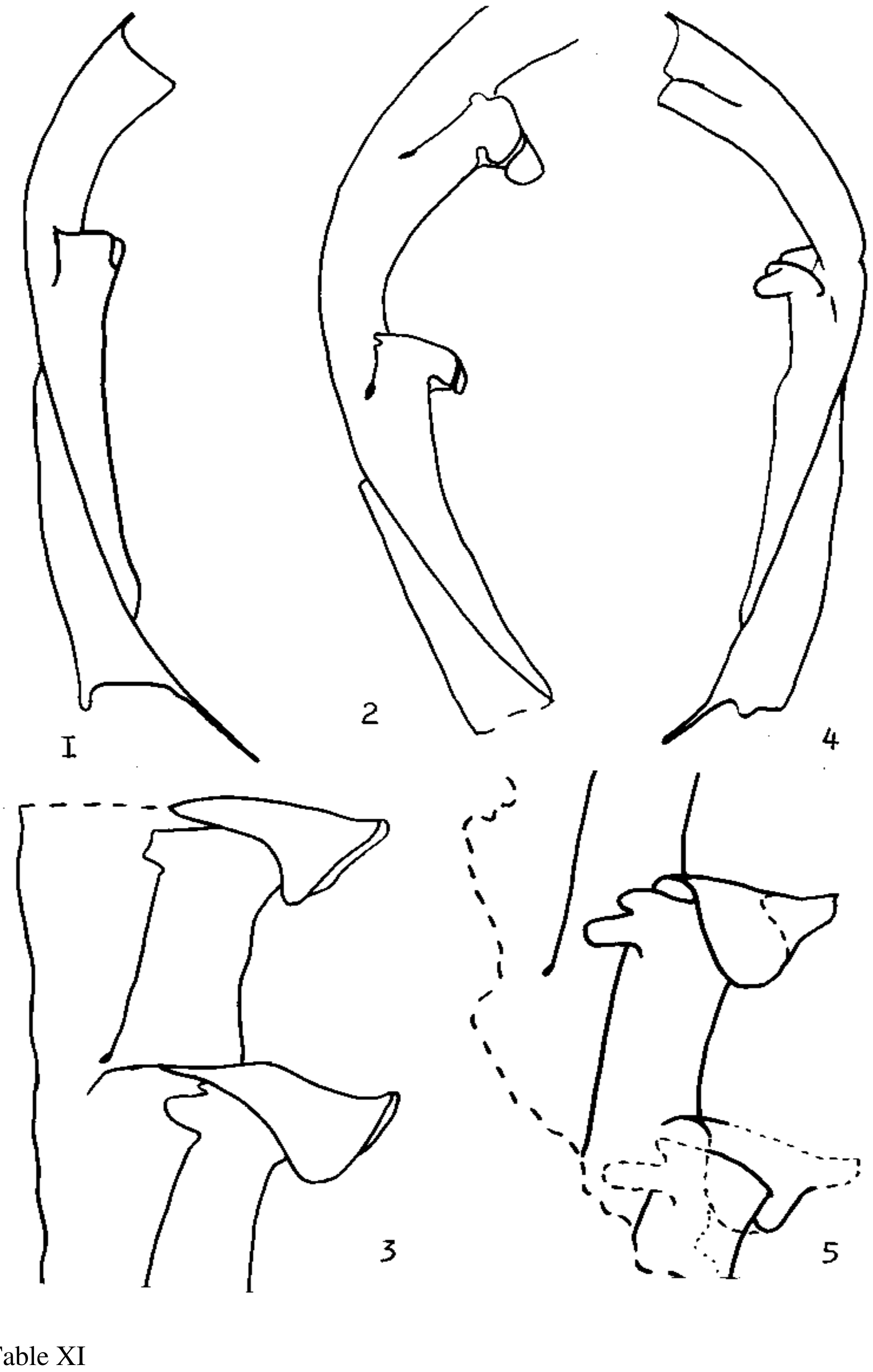
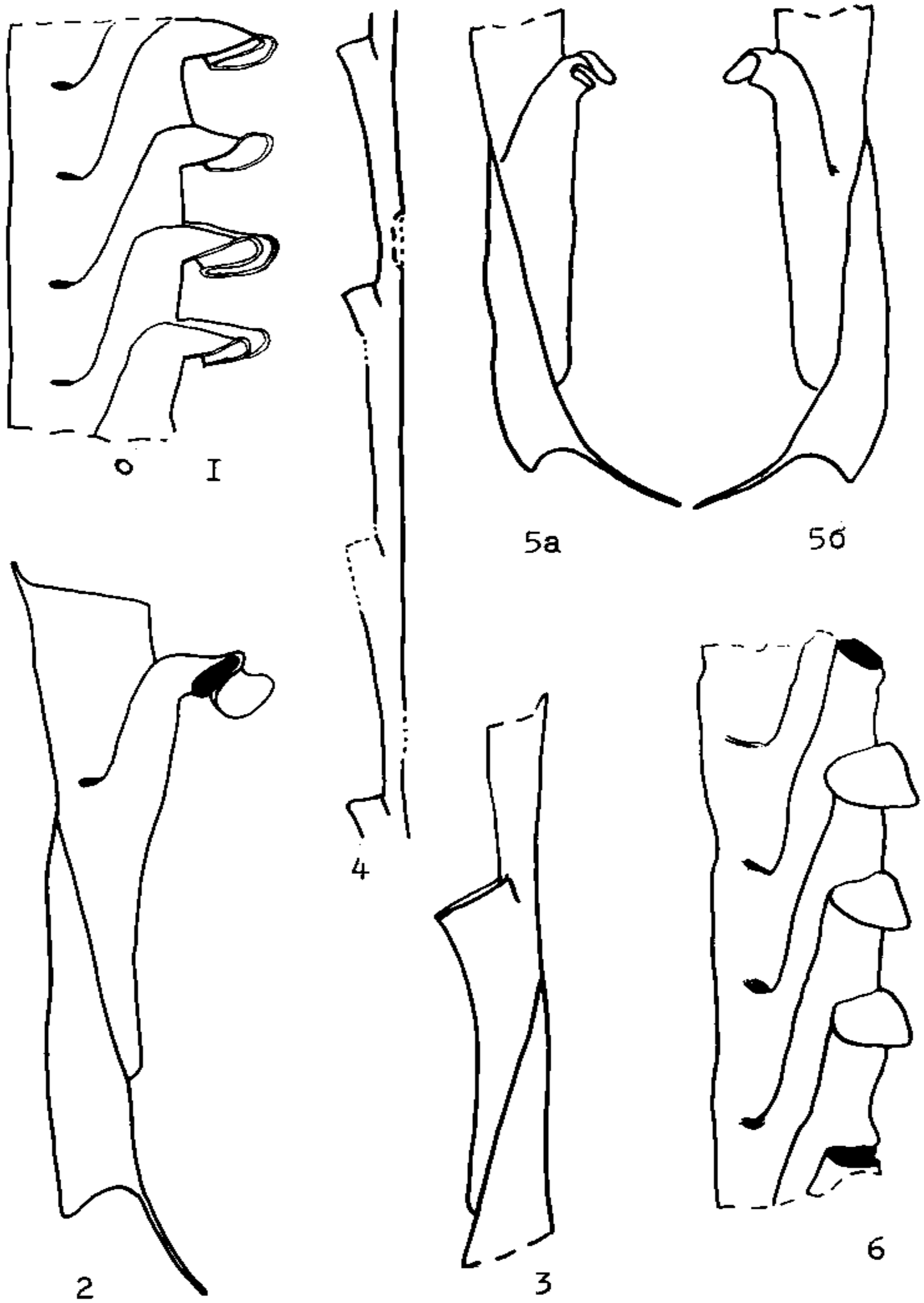


Table XI

Table XII



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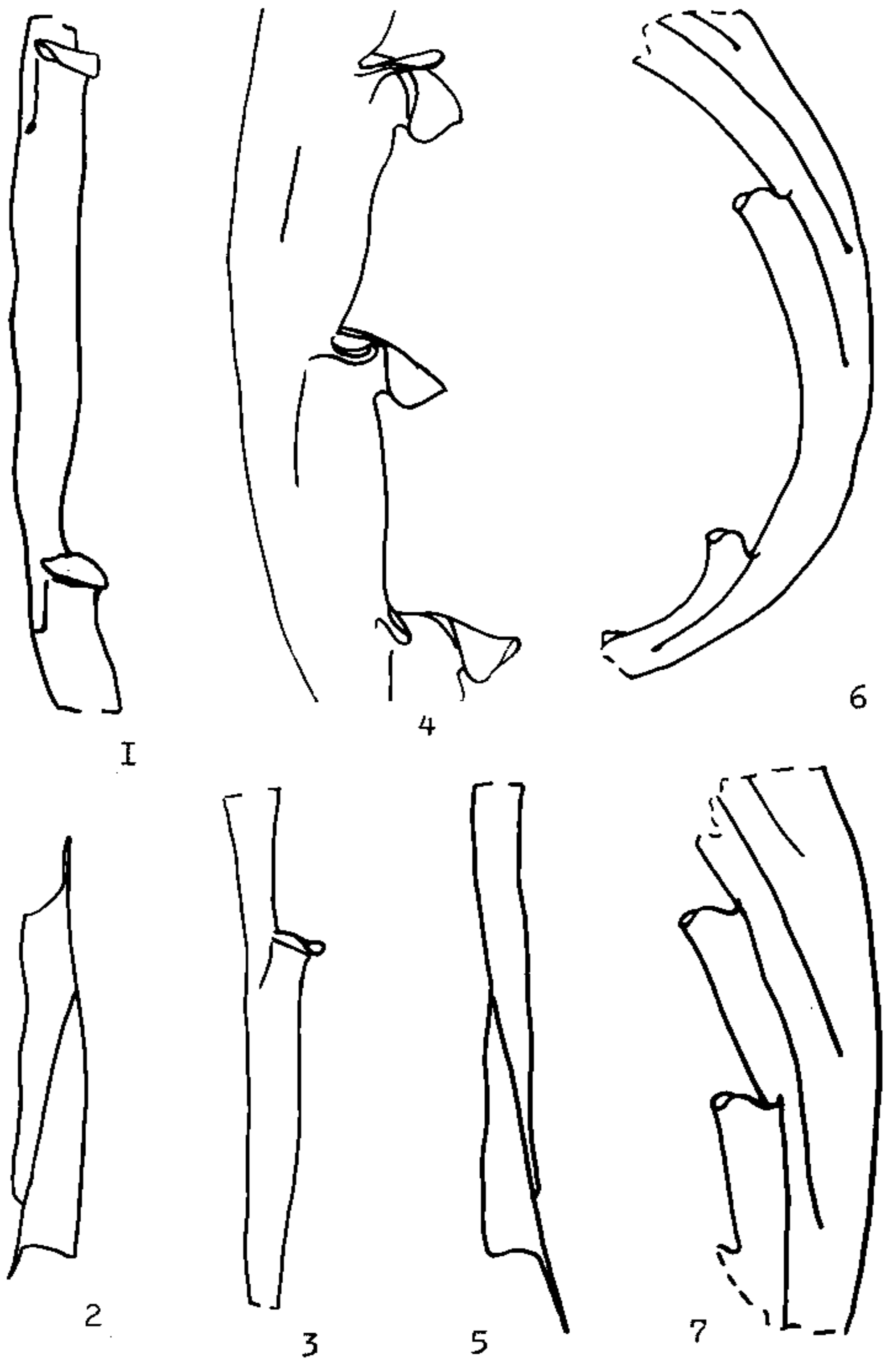

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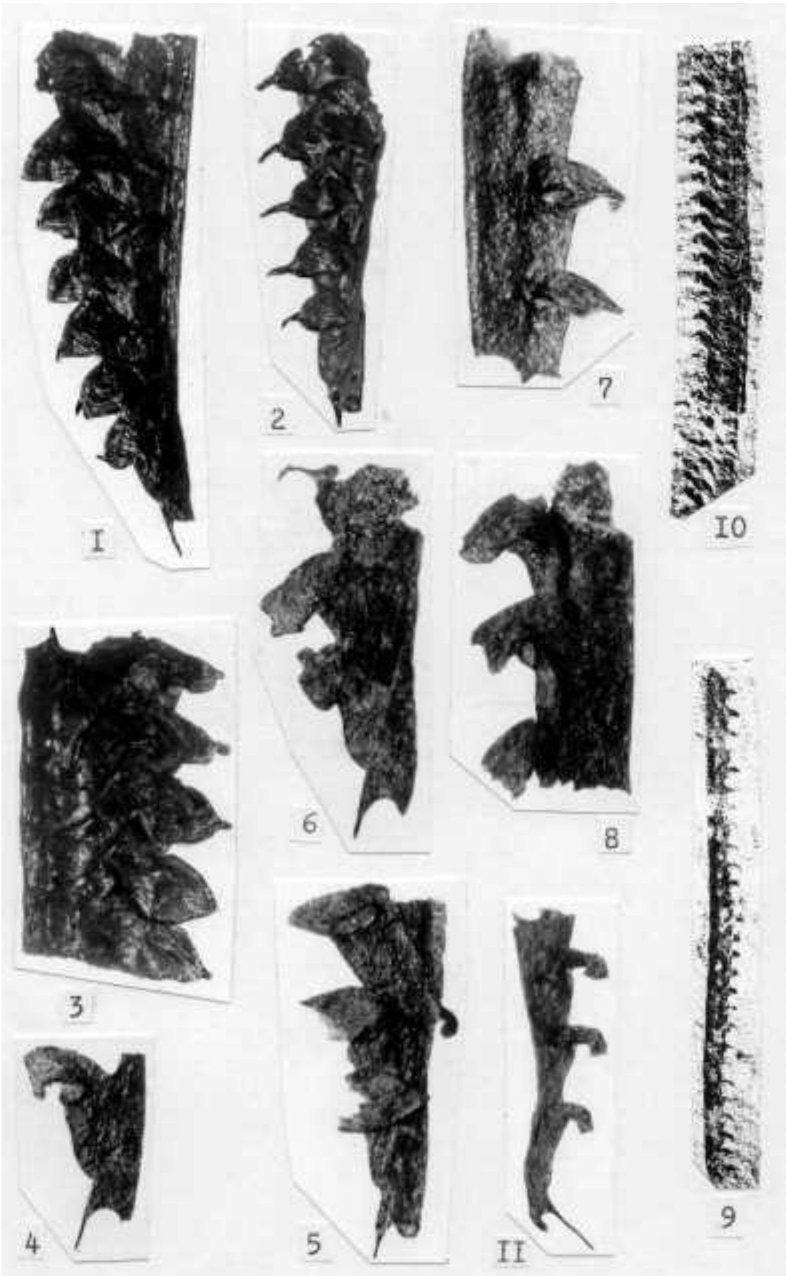

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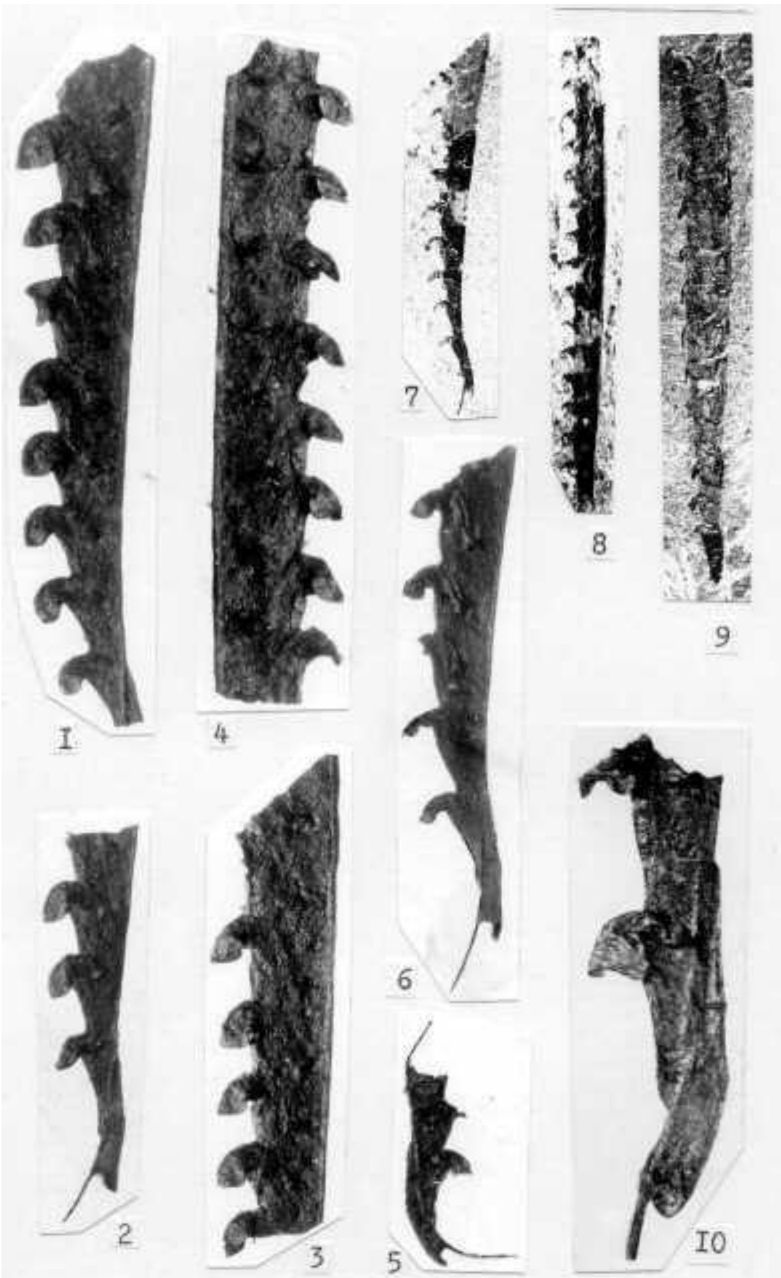

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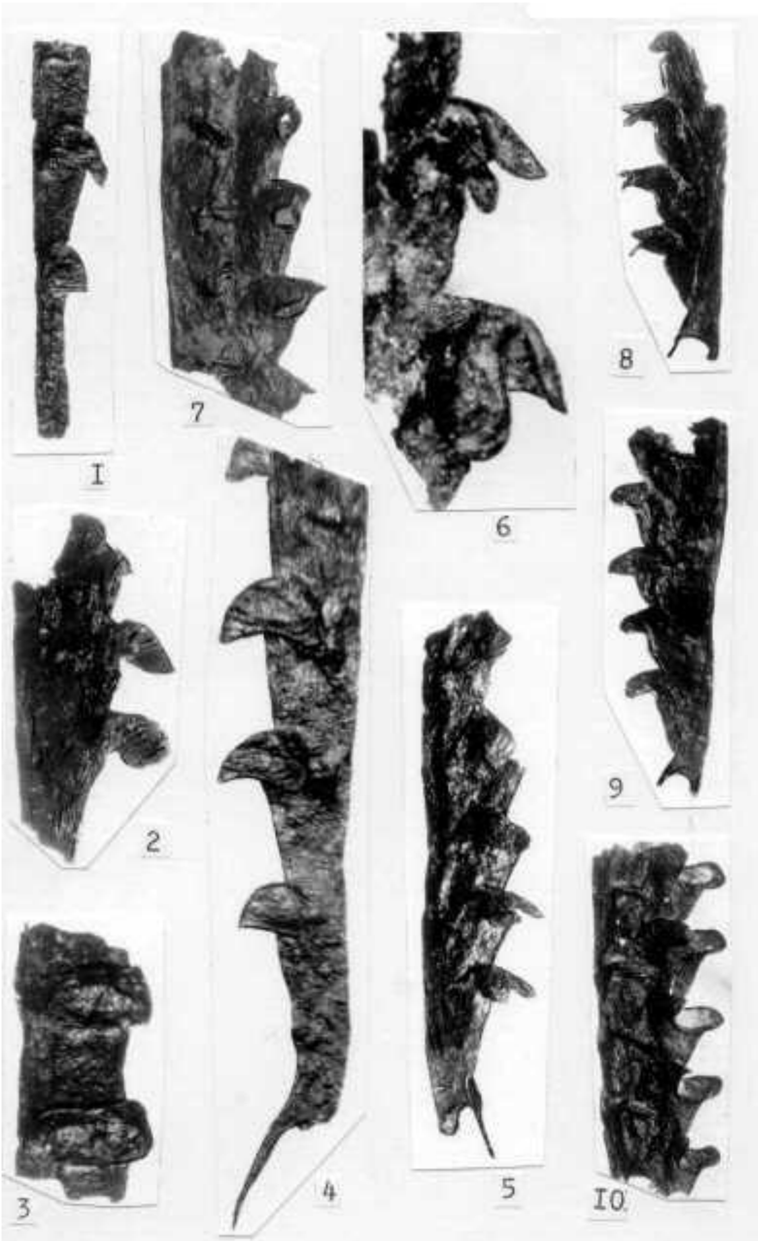

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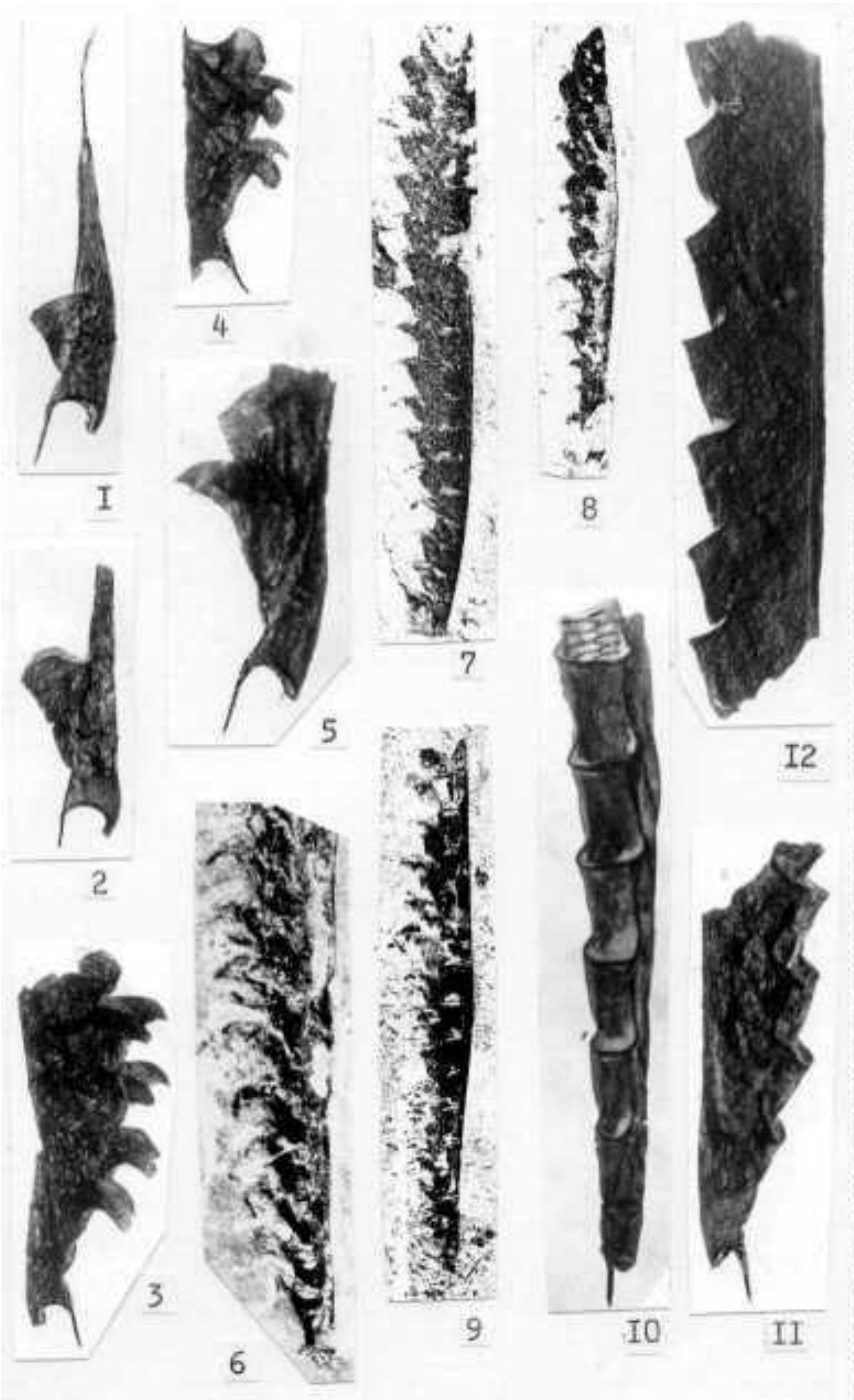

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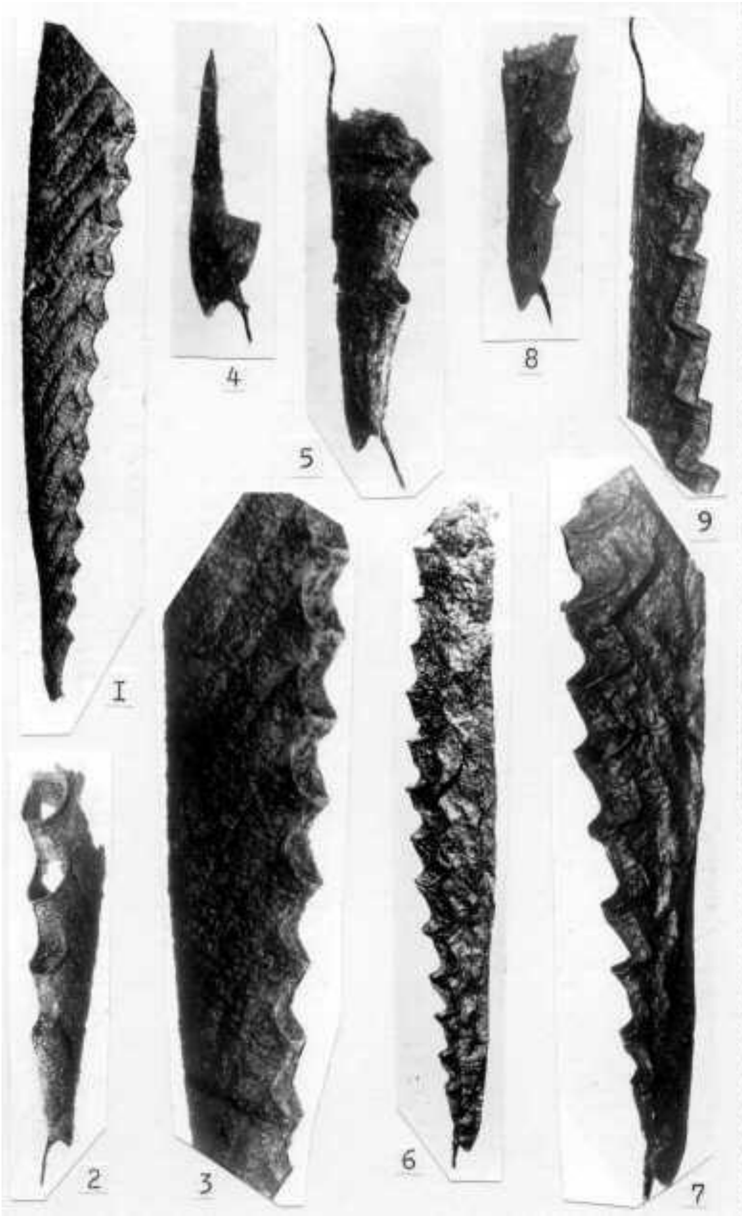

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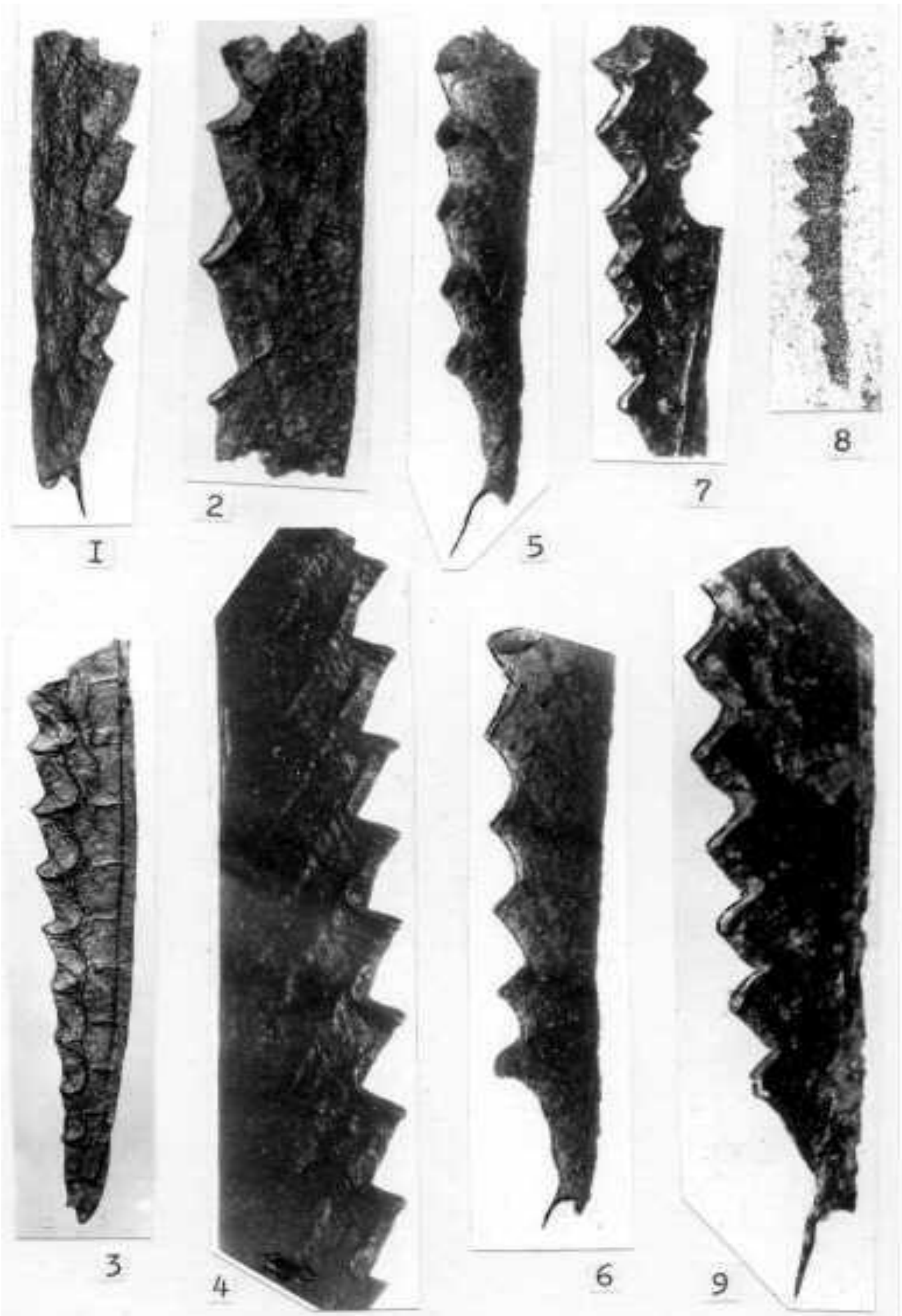

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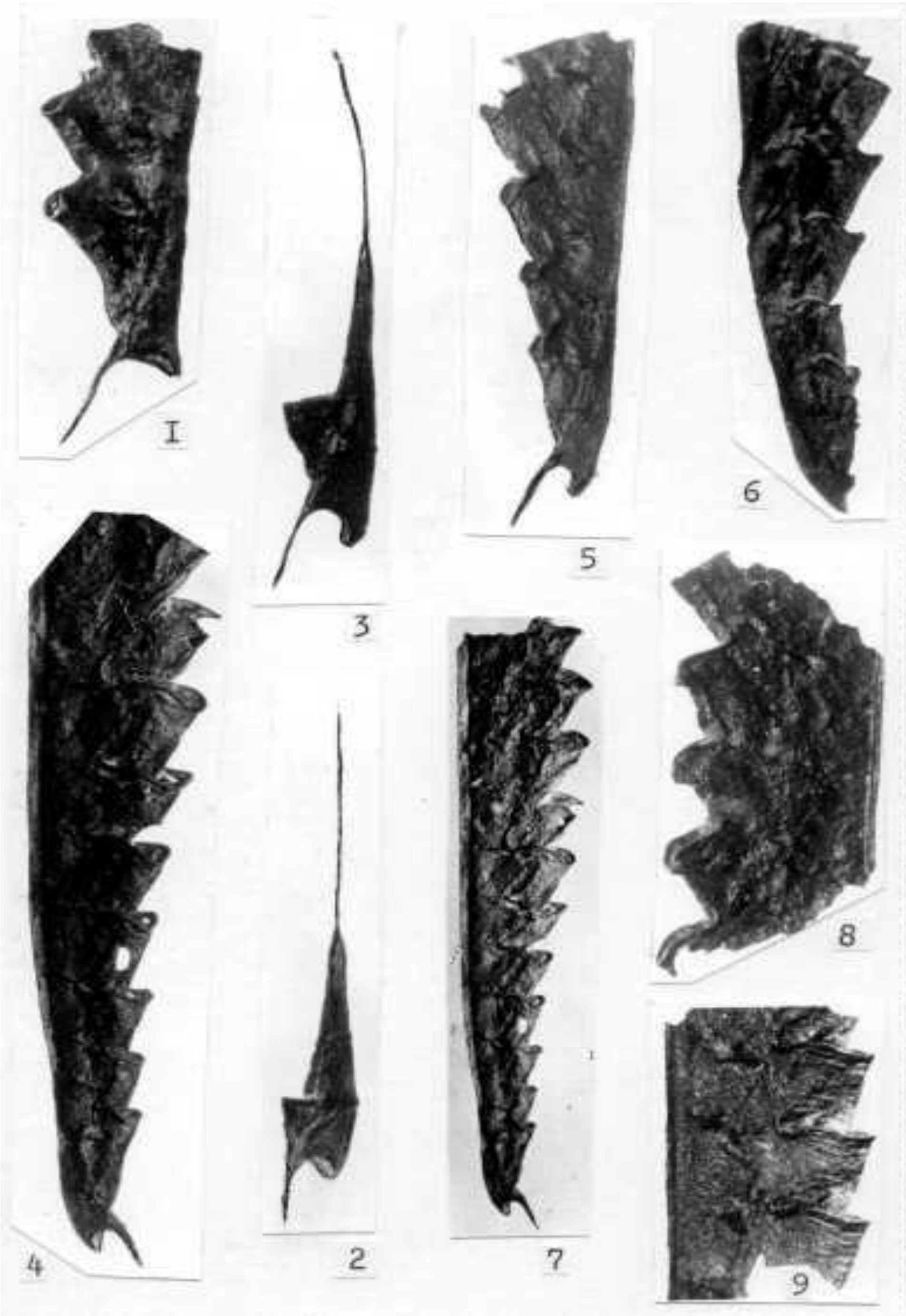

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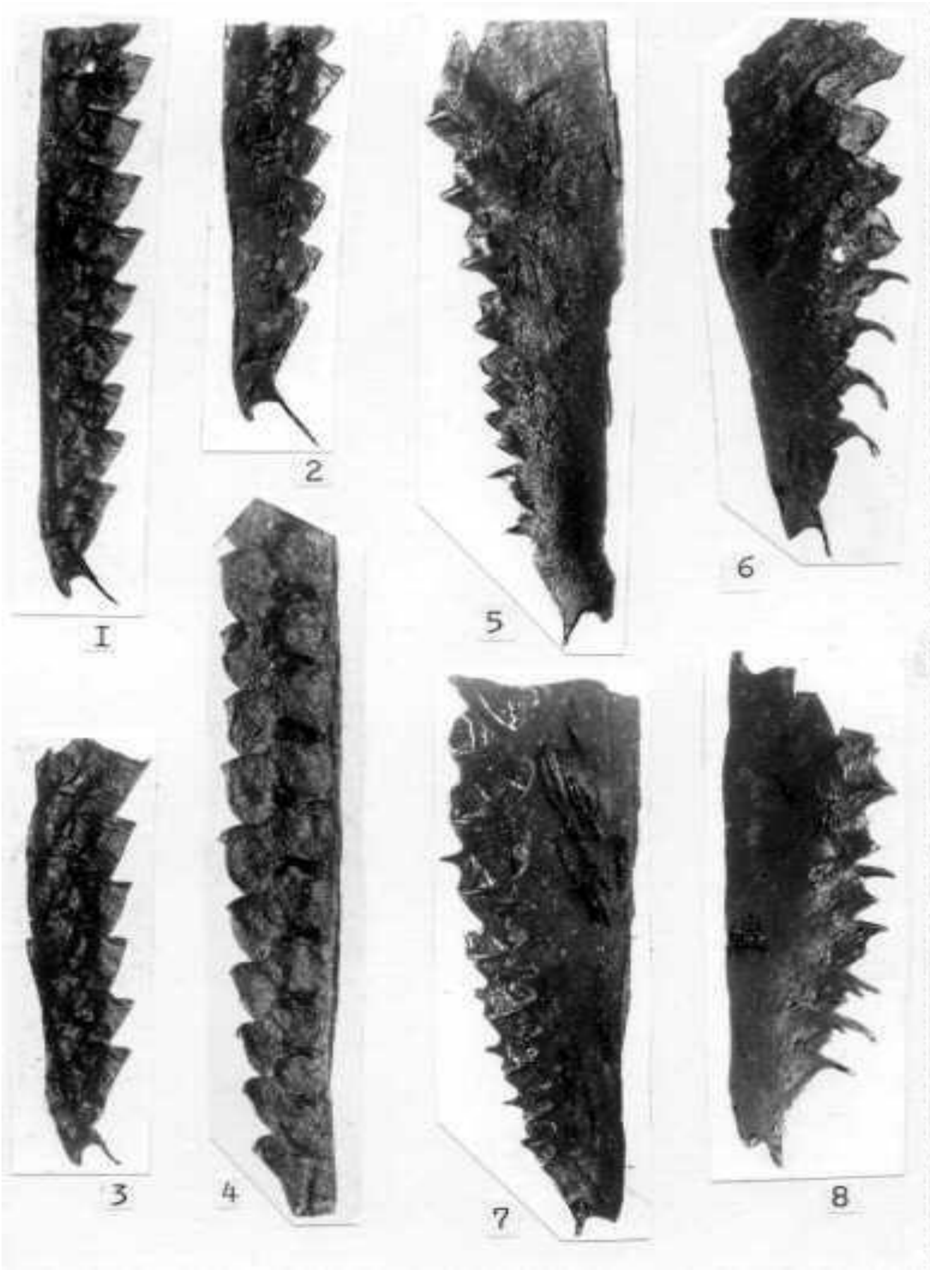

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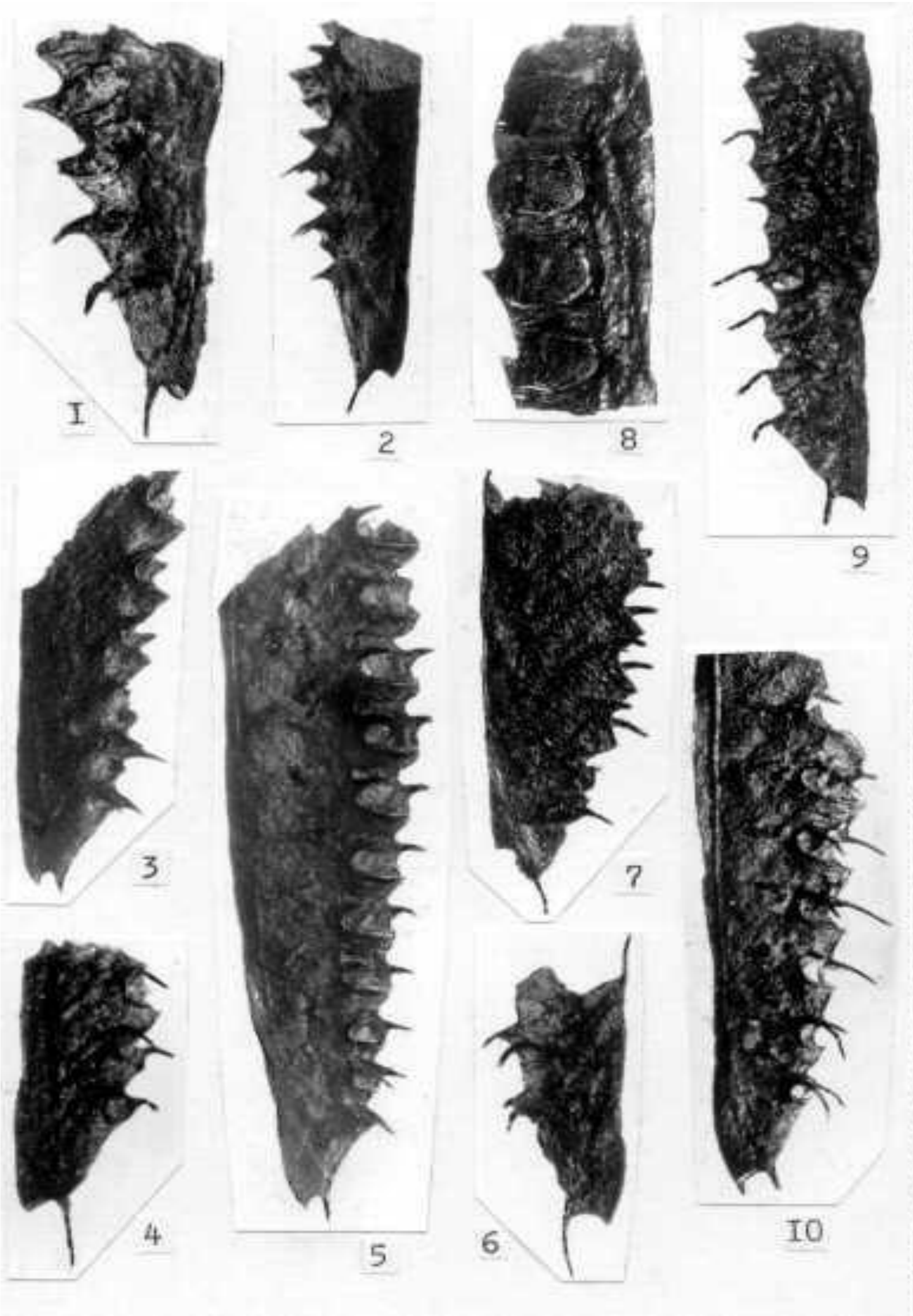

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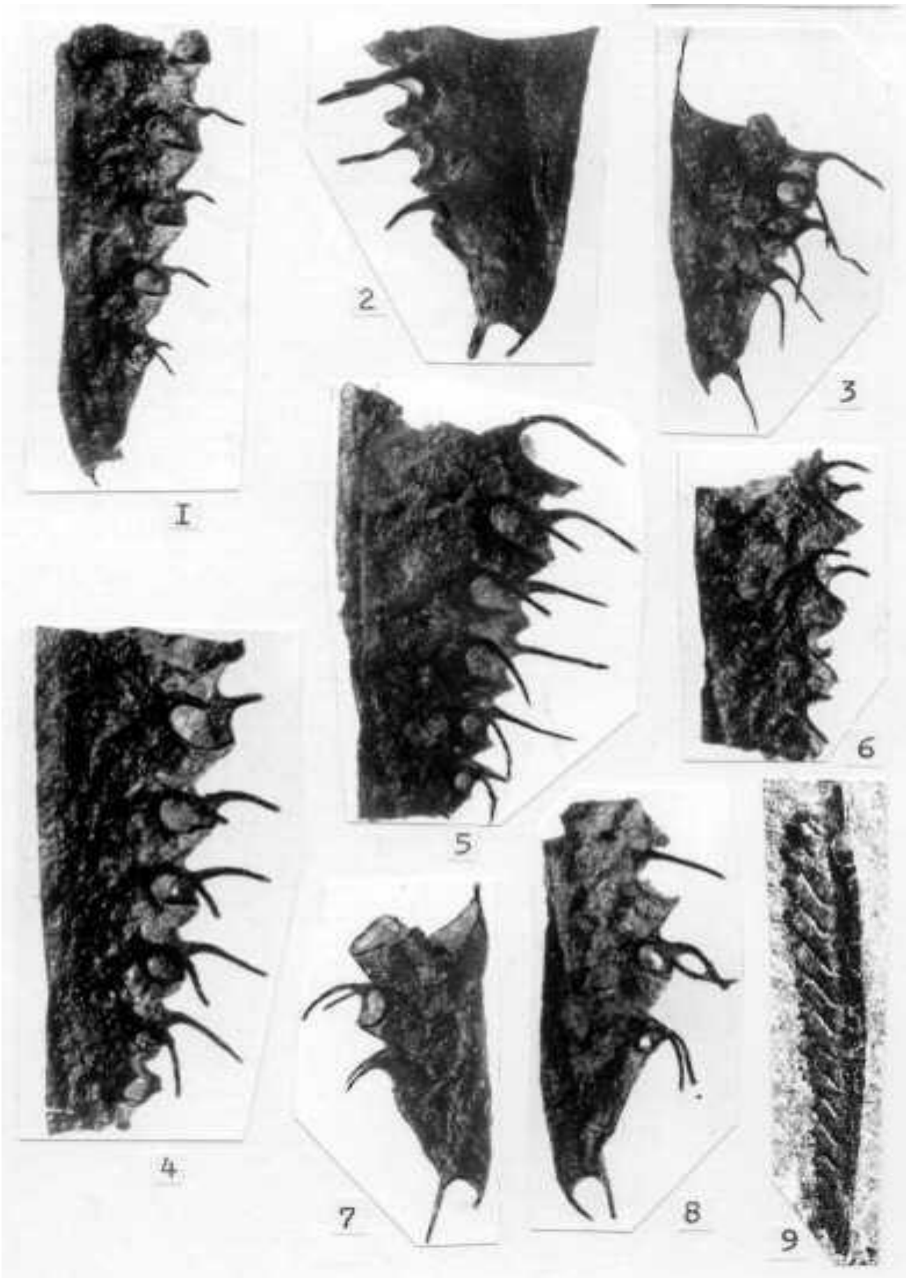

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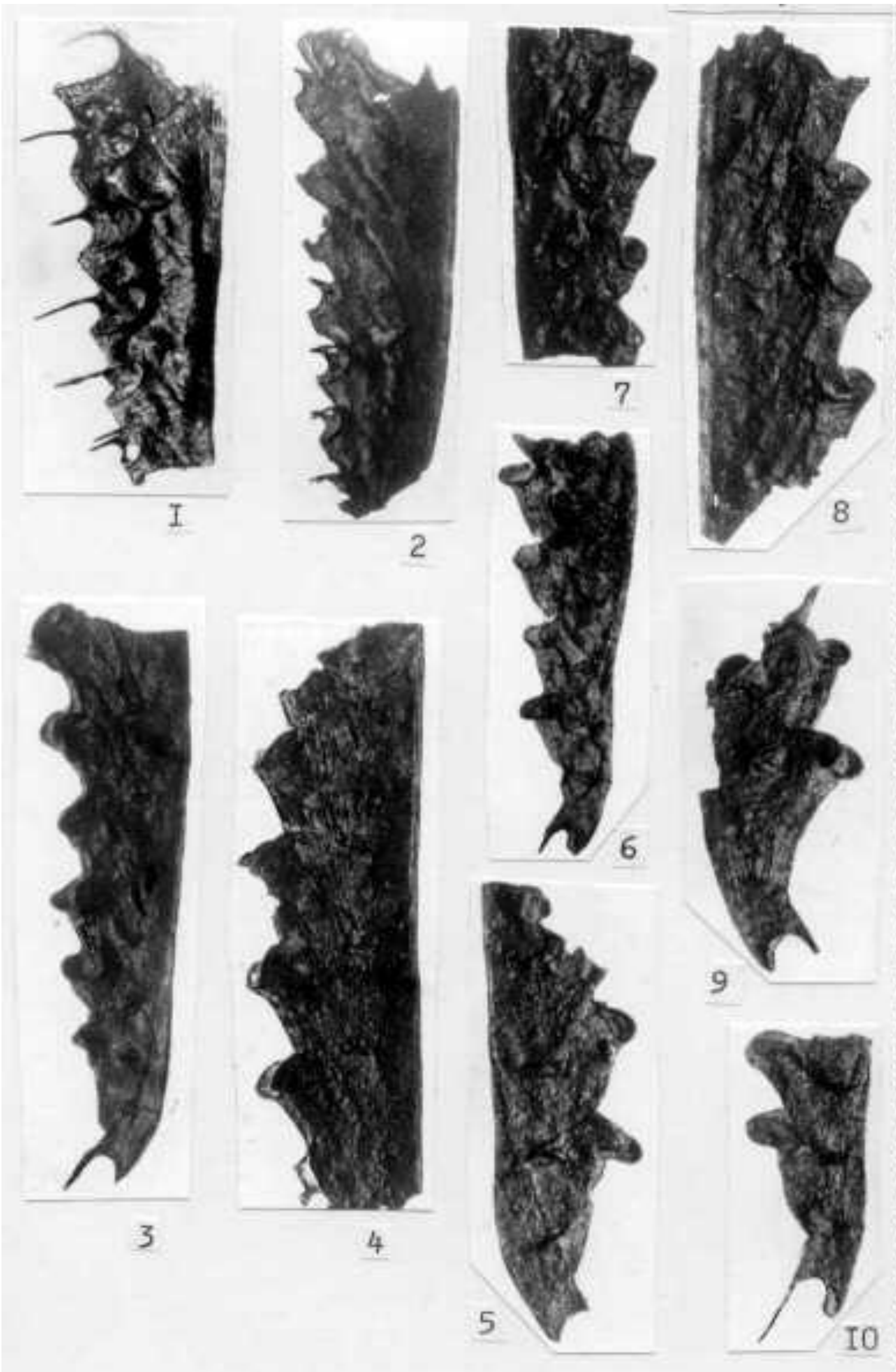

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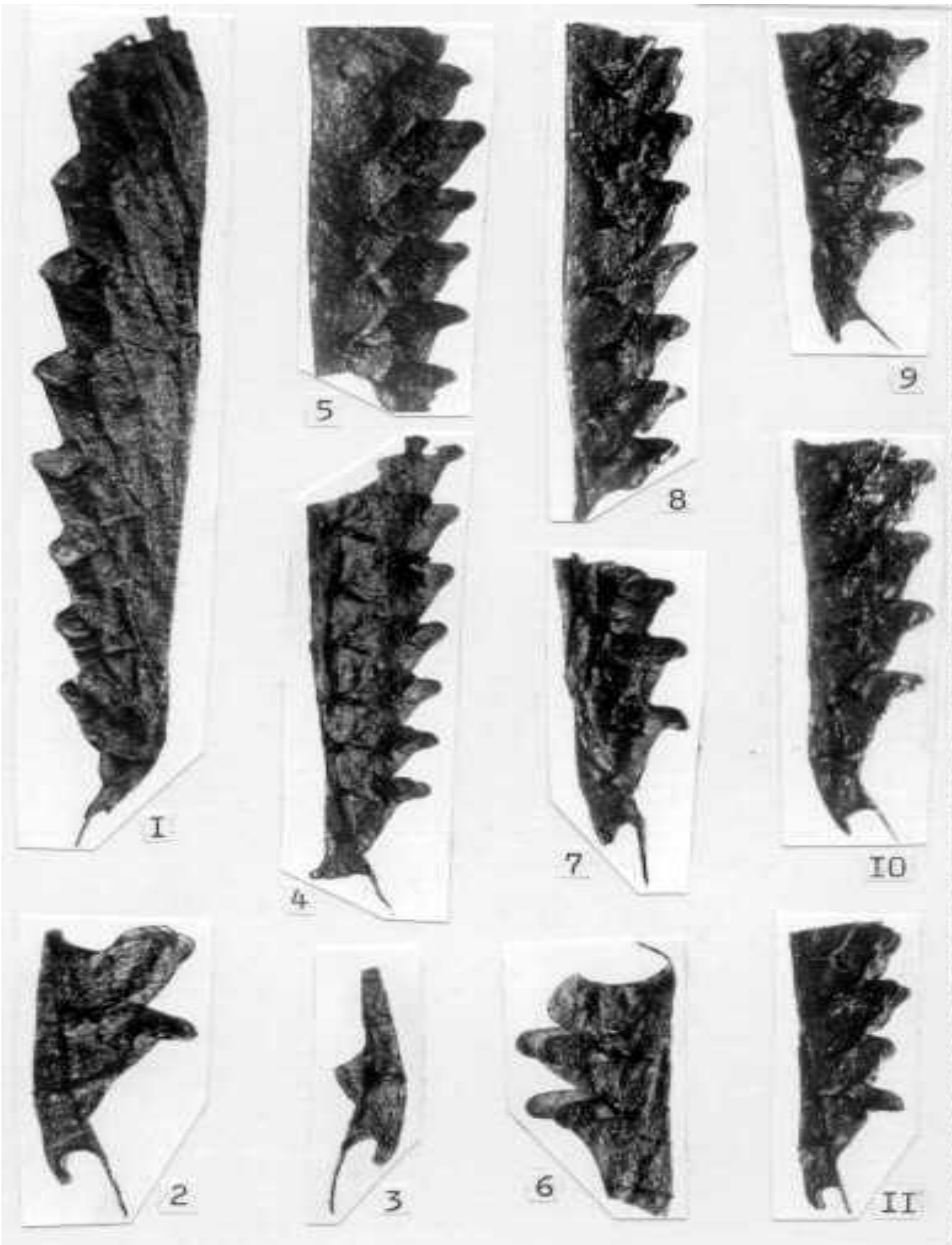
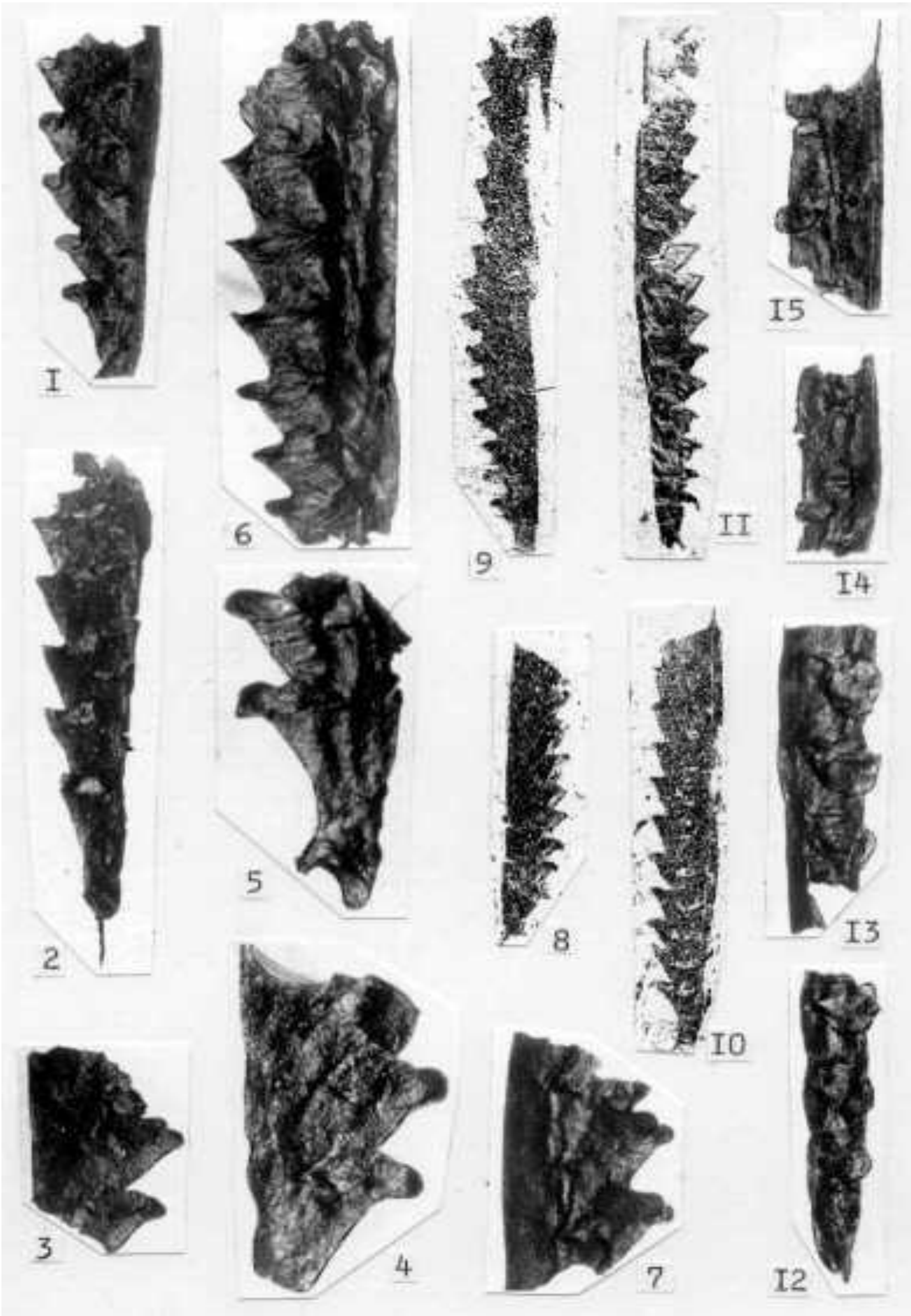


Table XXVI



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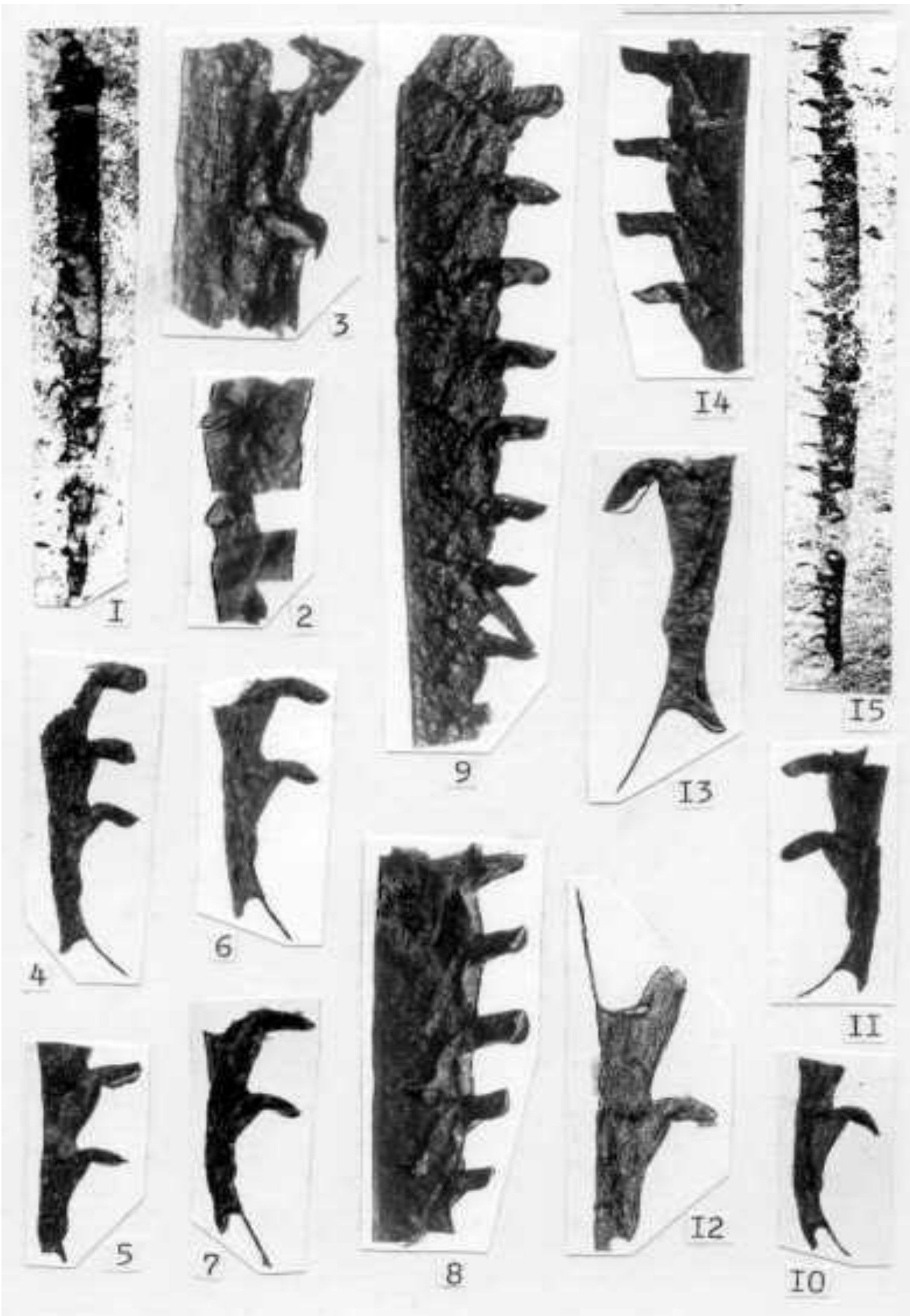

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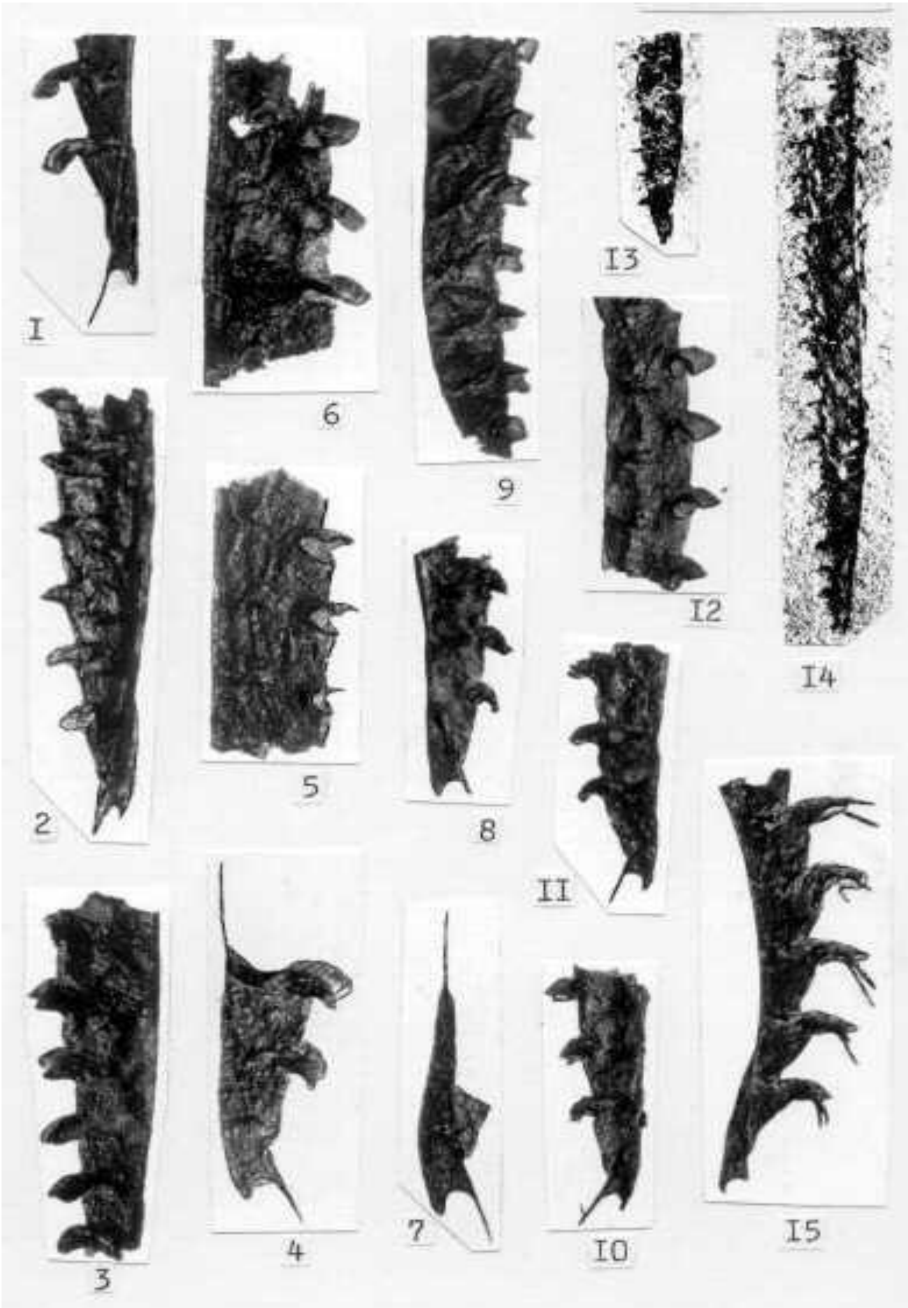

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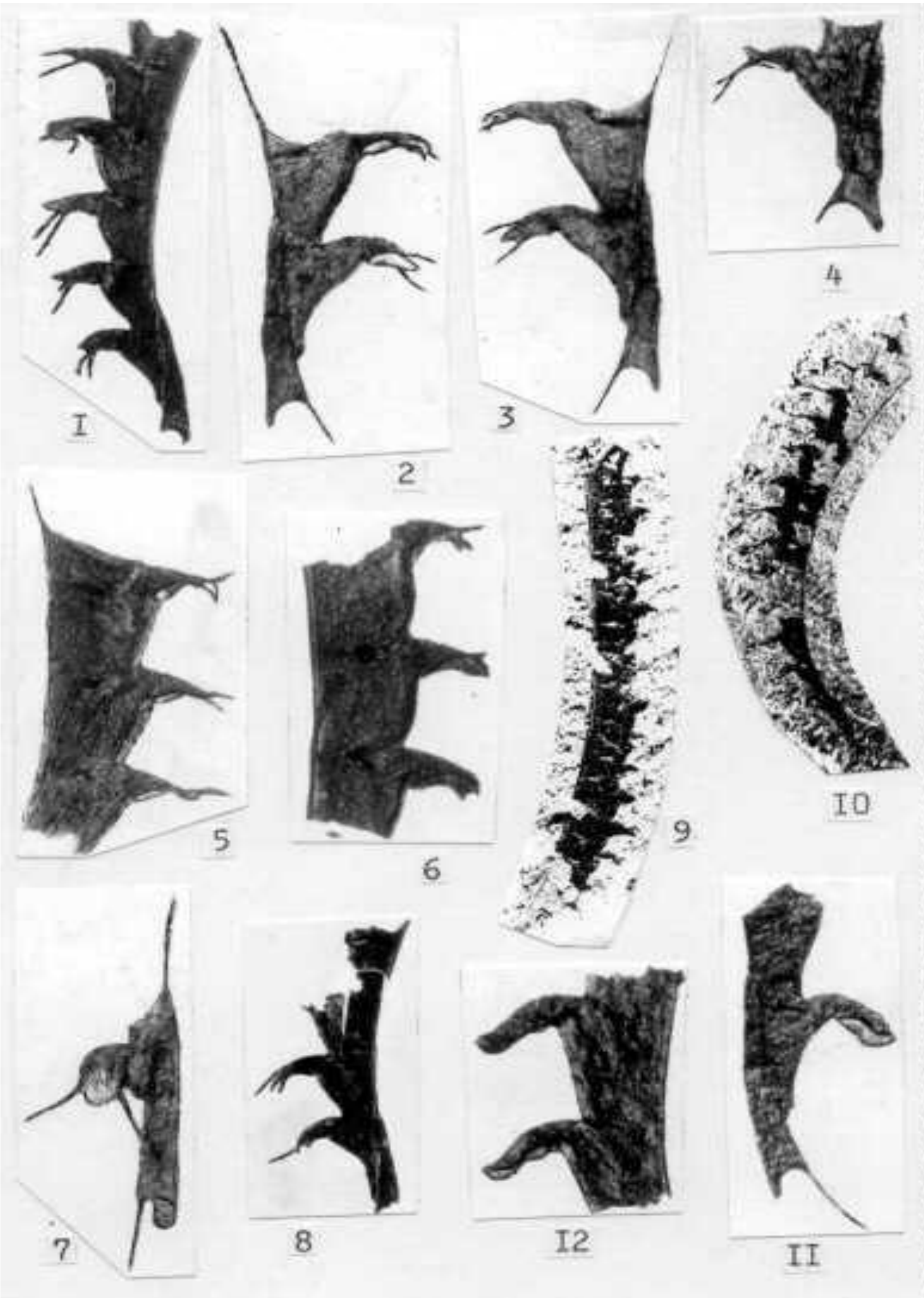

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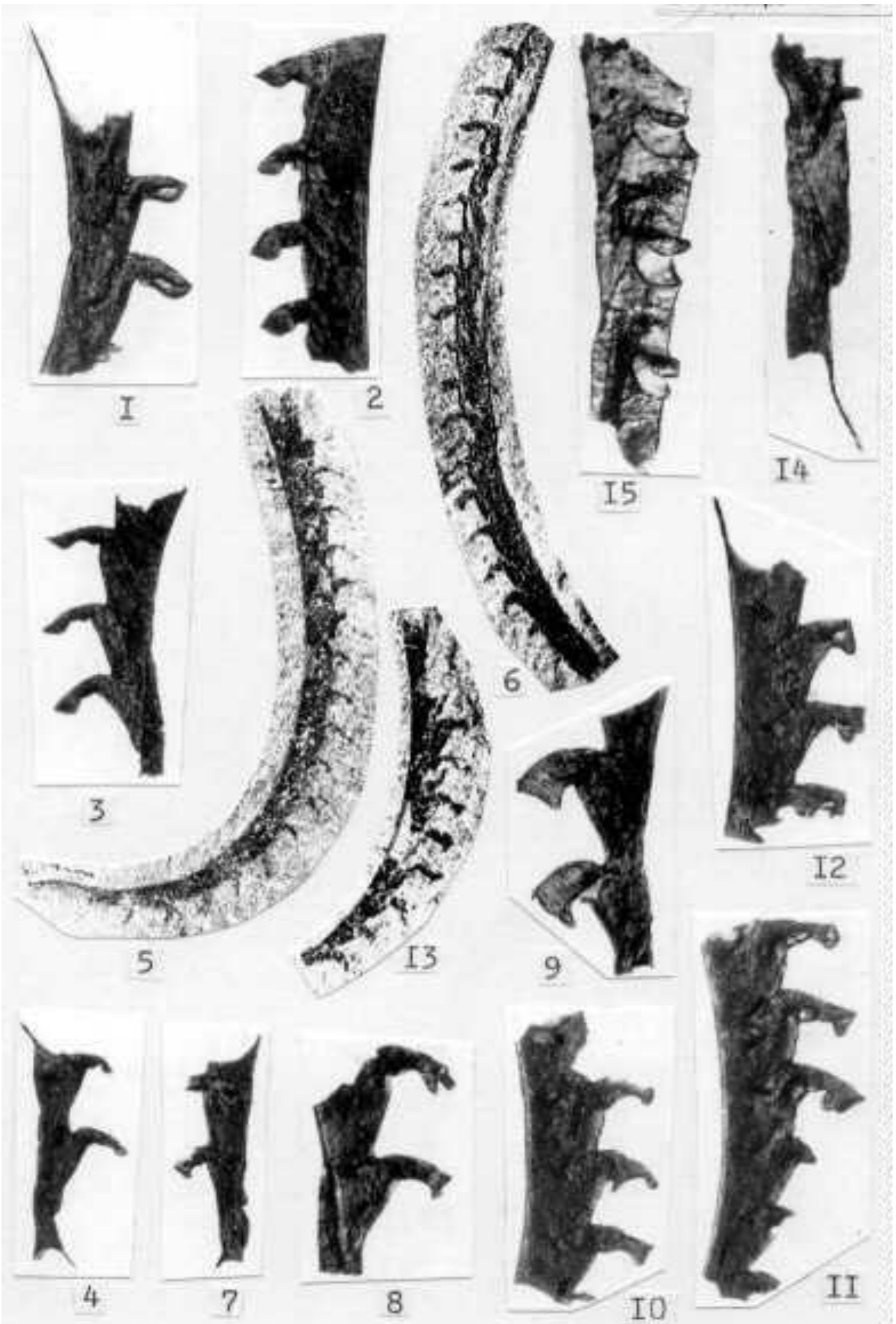
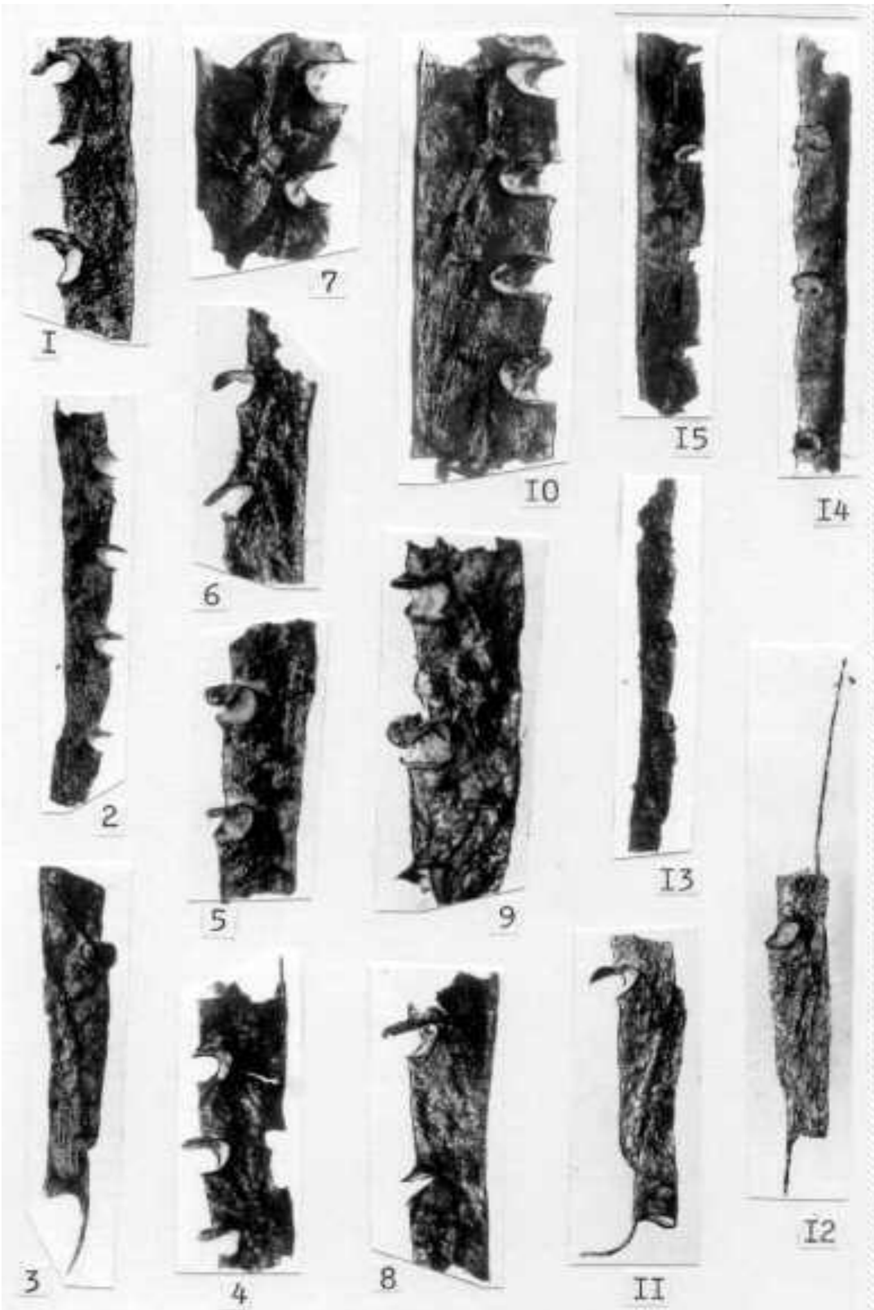


Table XXXI



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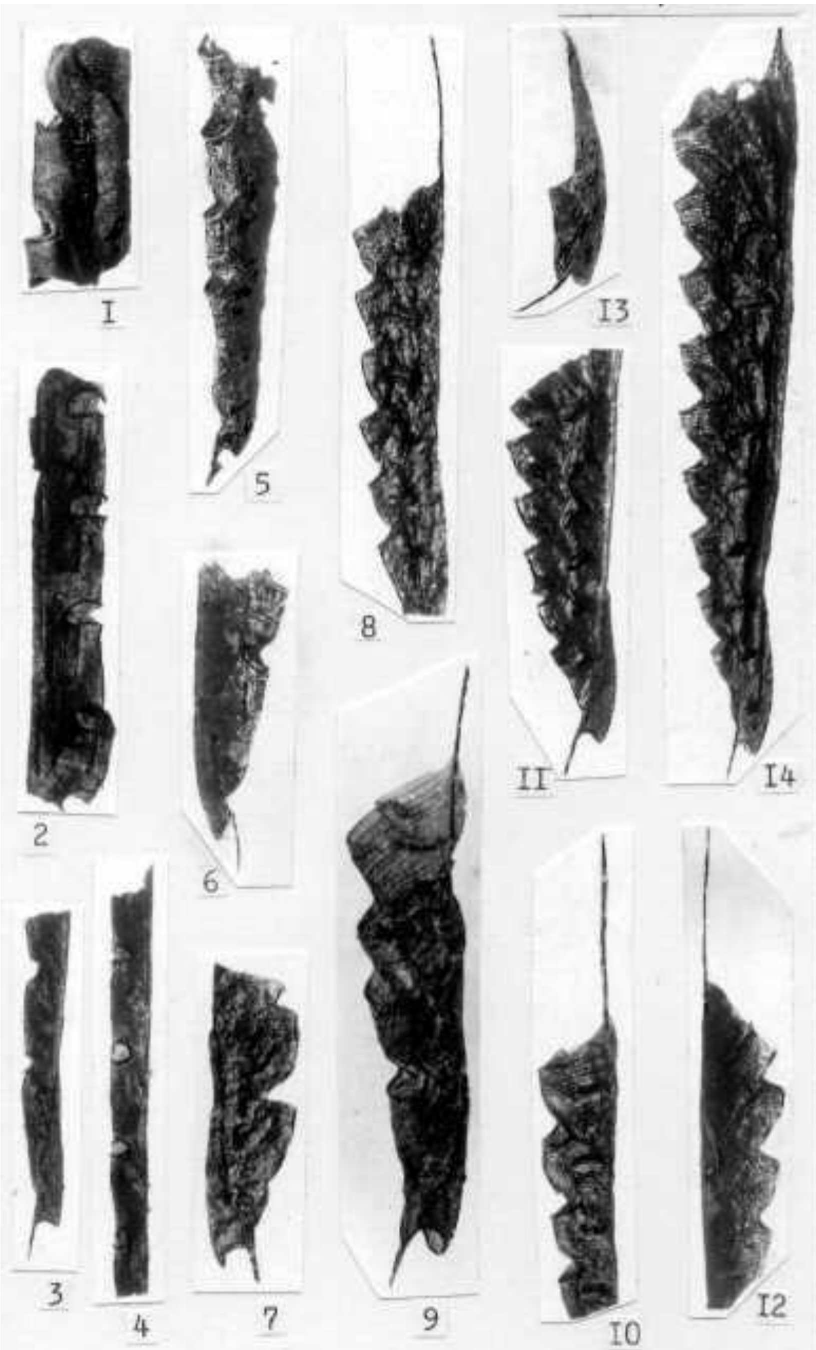

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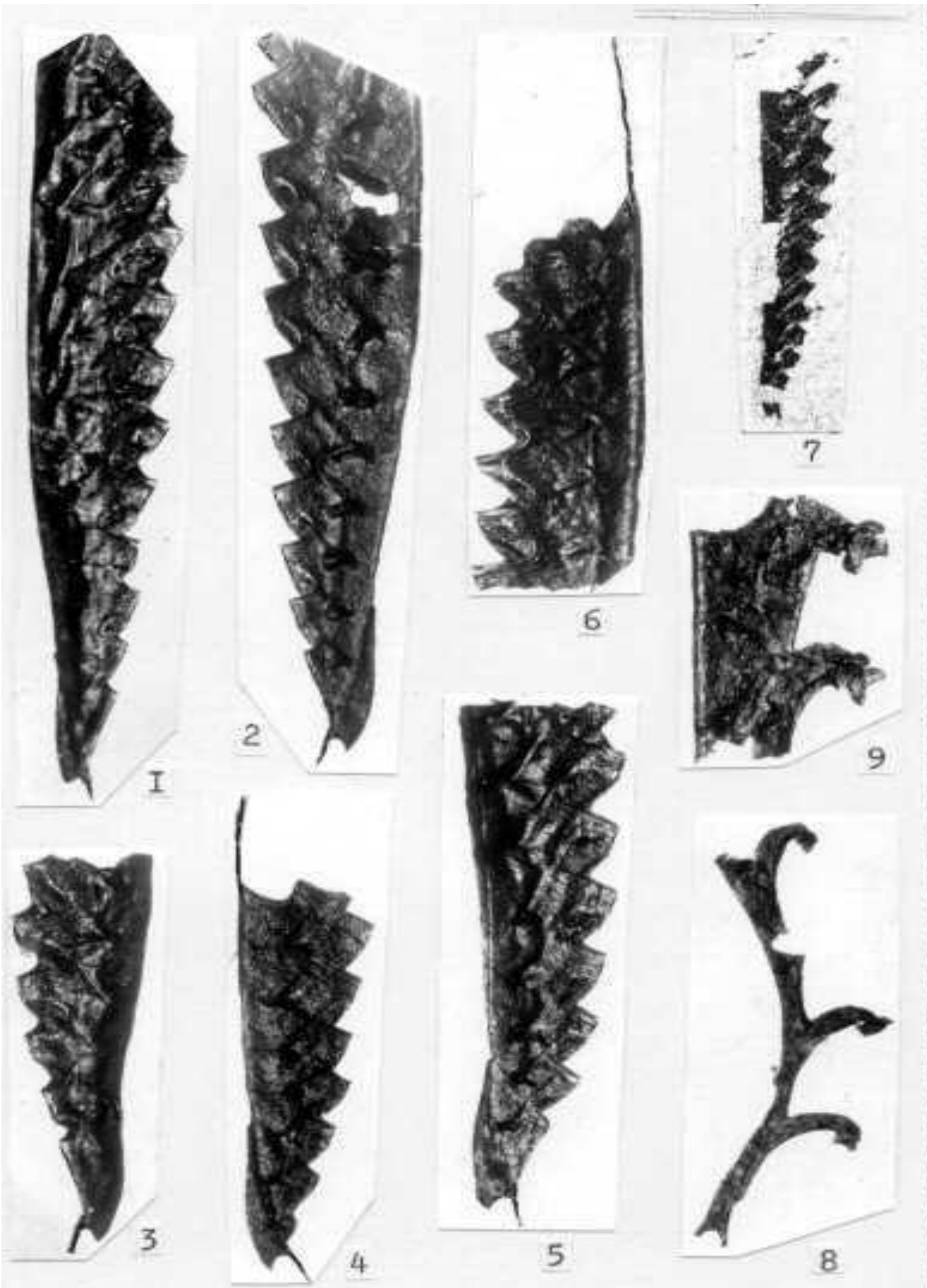

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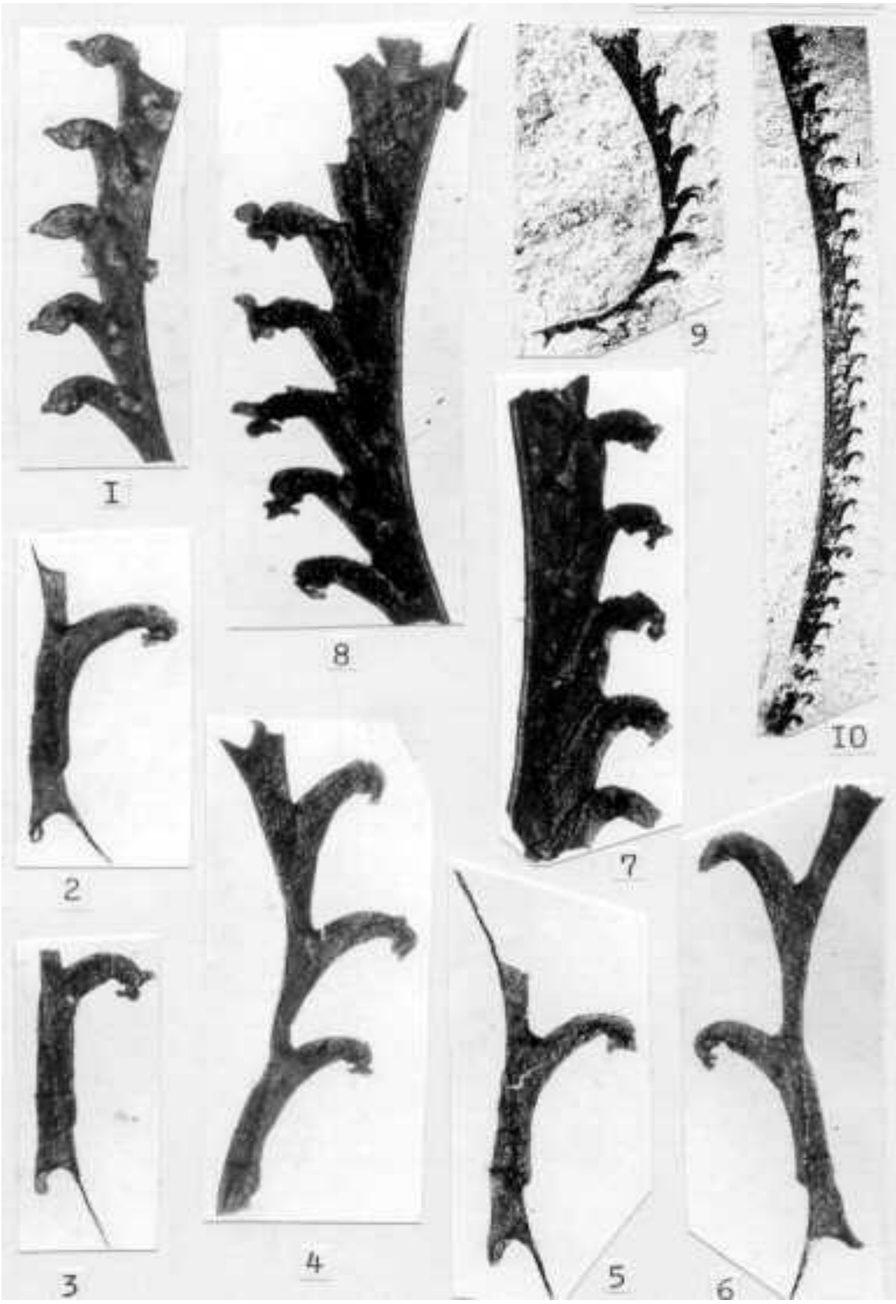

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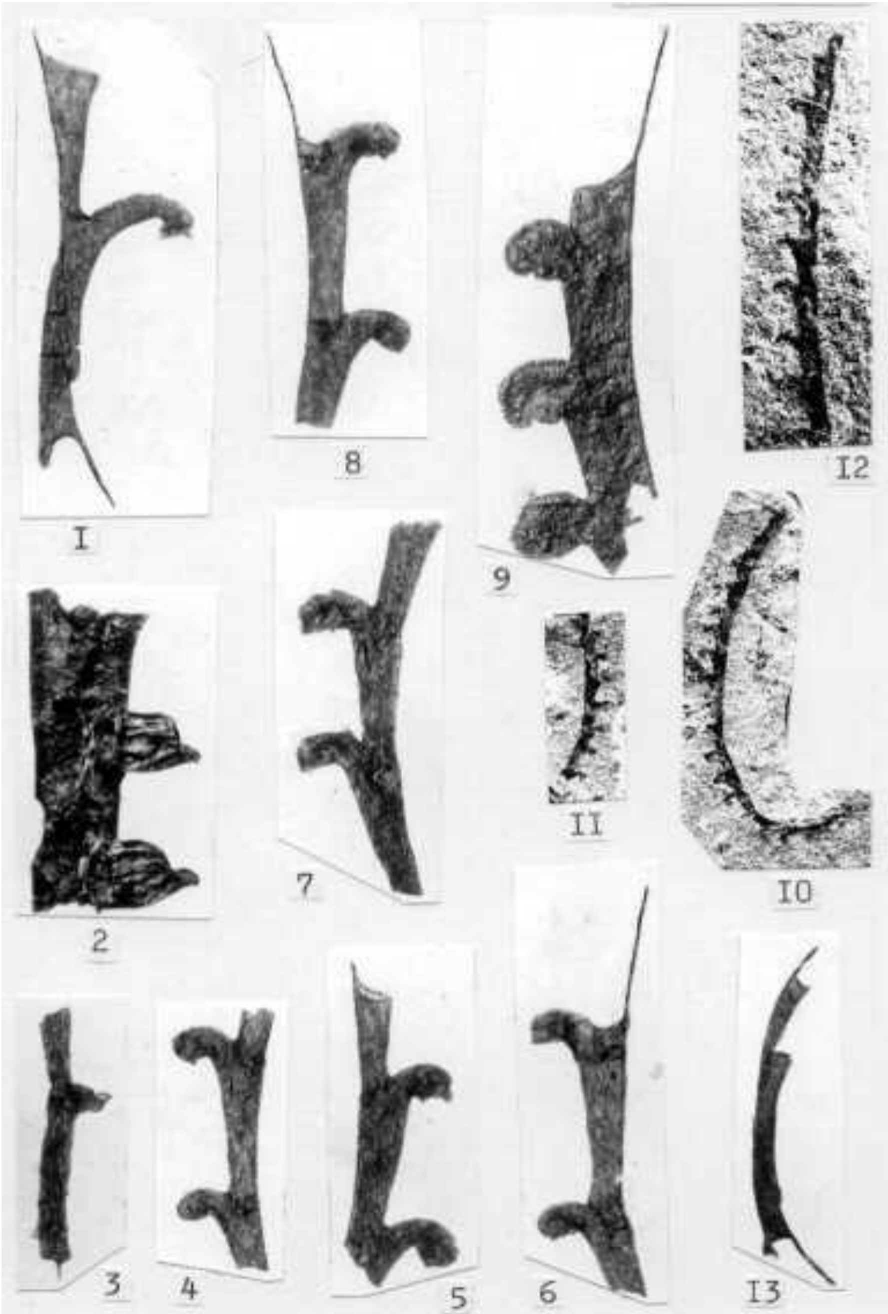

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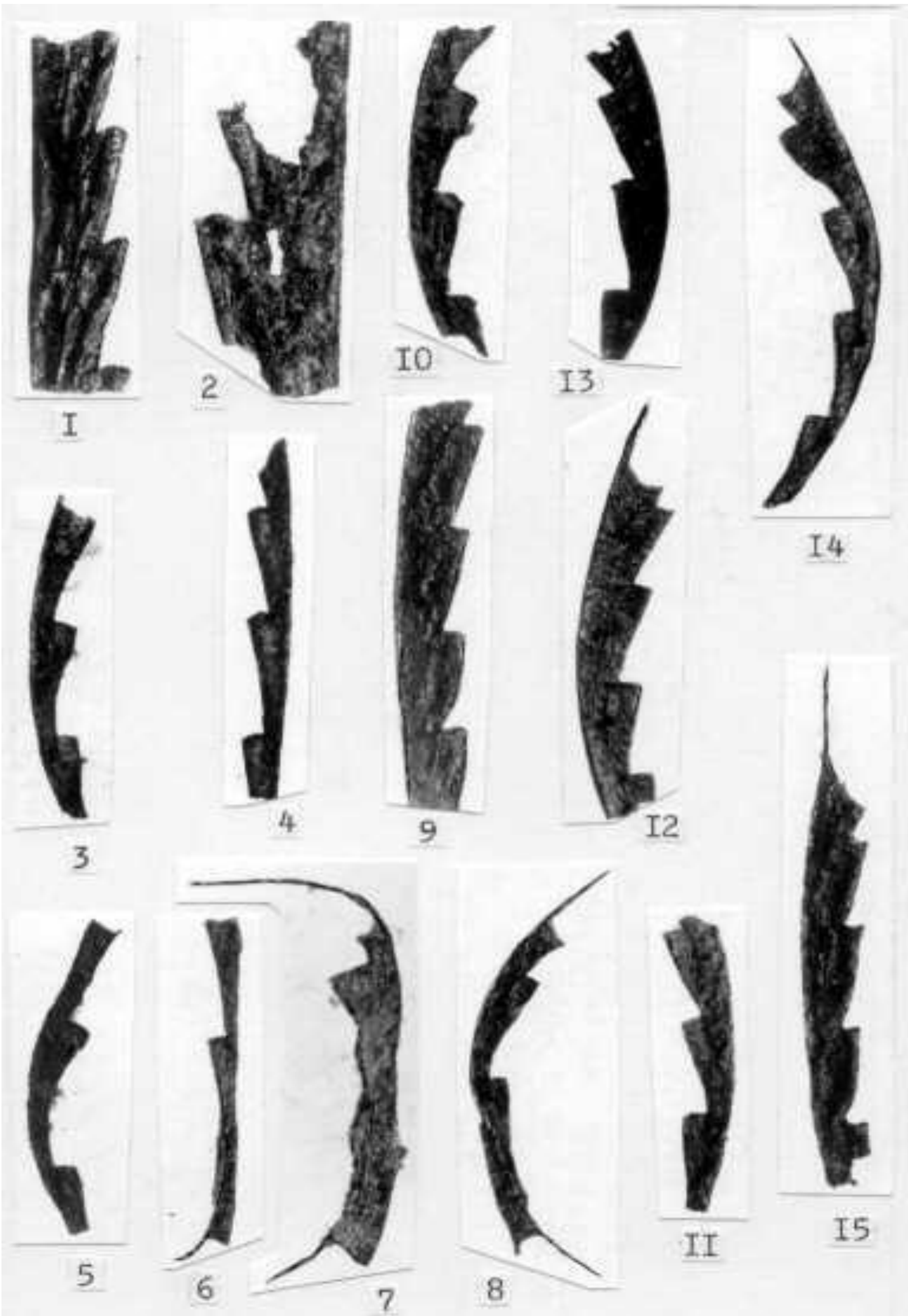

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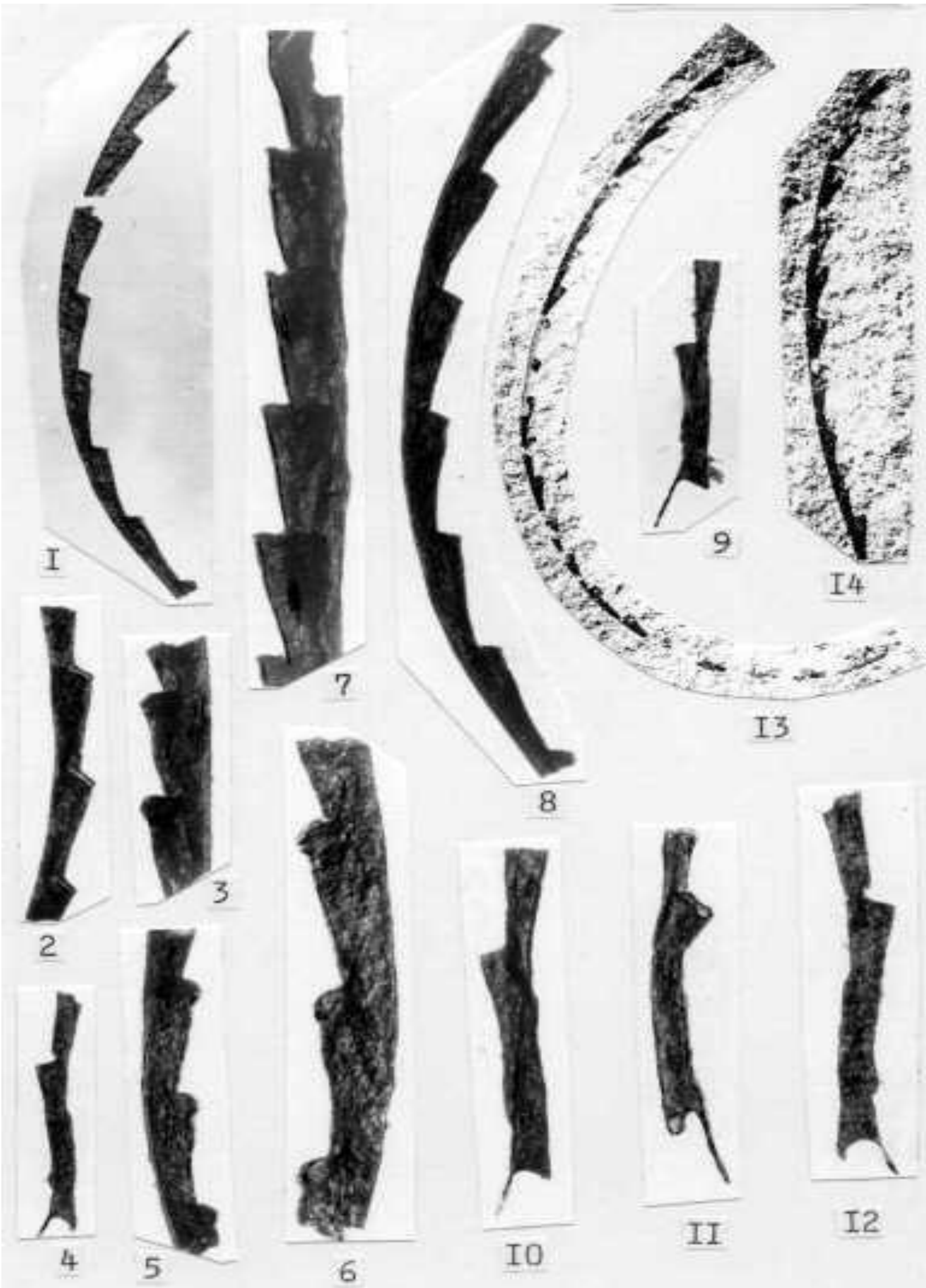

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Table XXXIX

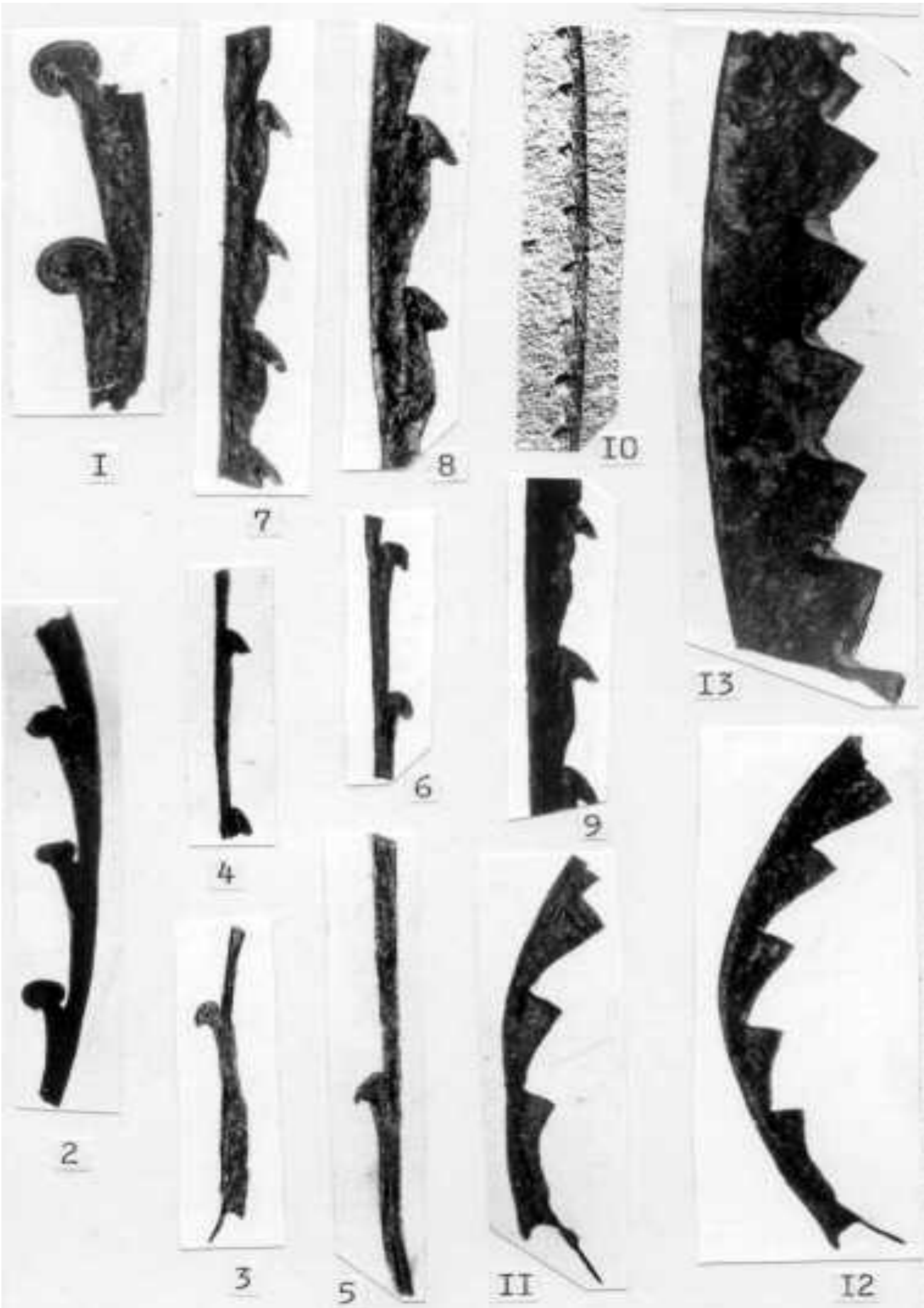
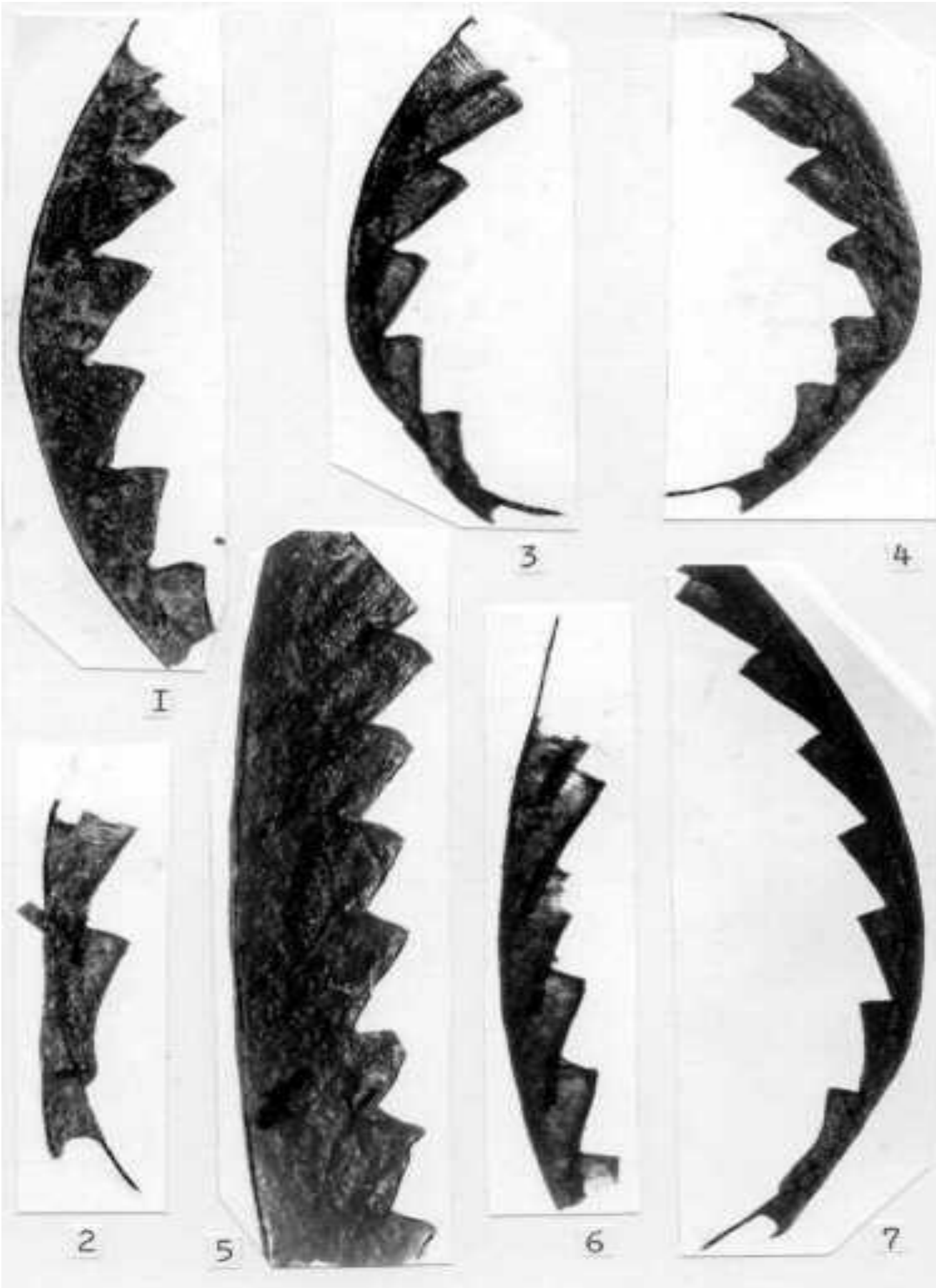


Table XL



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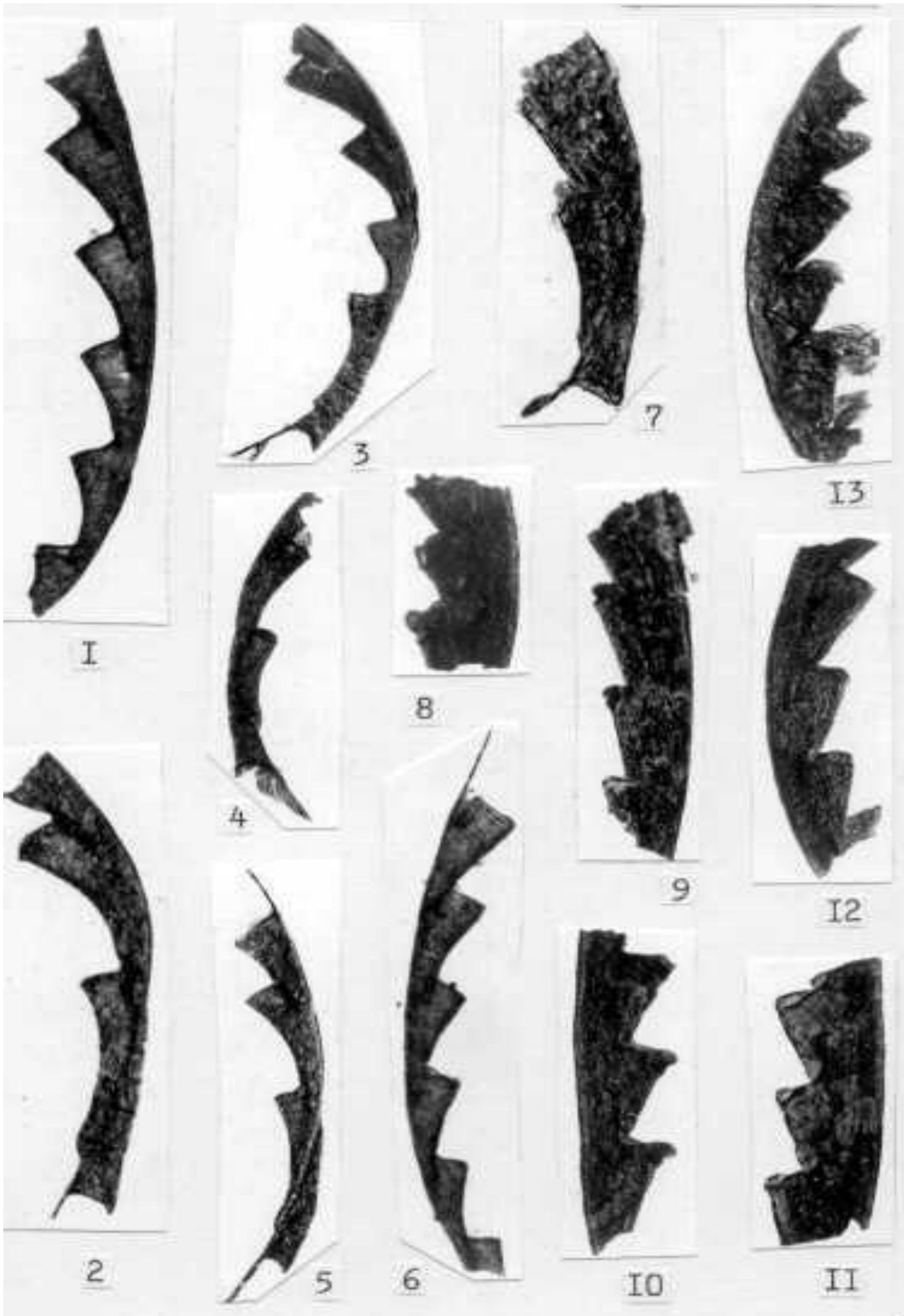

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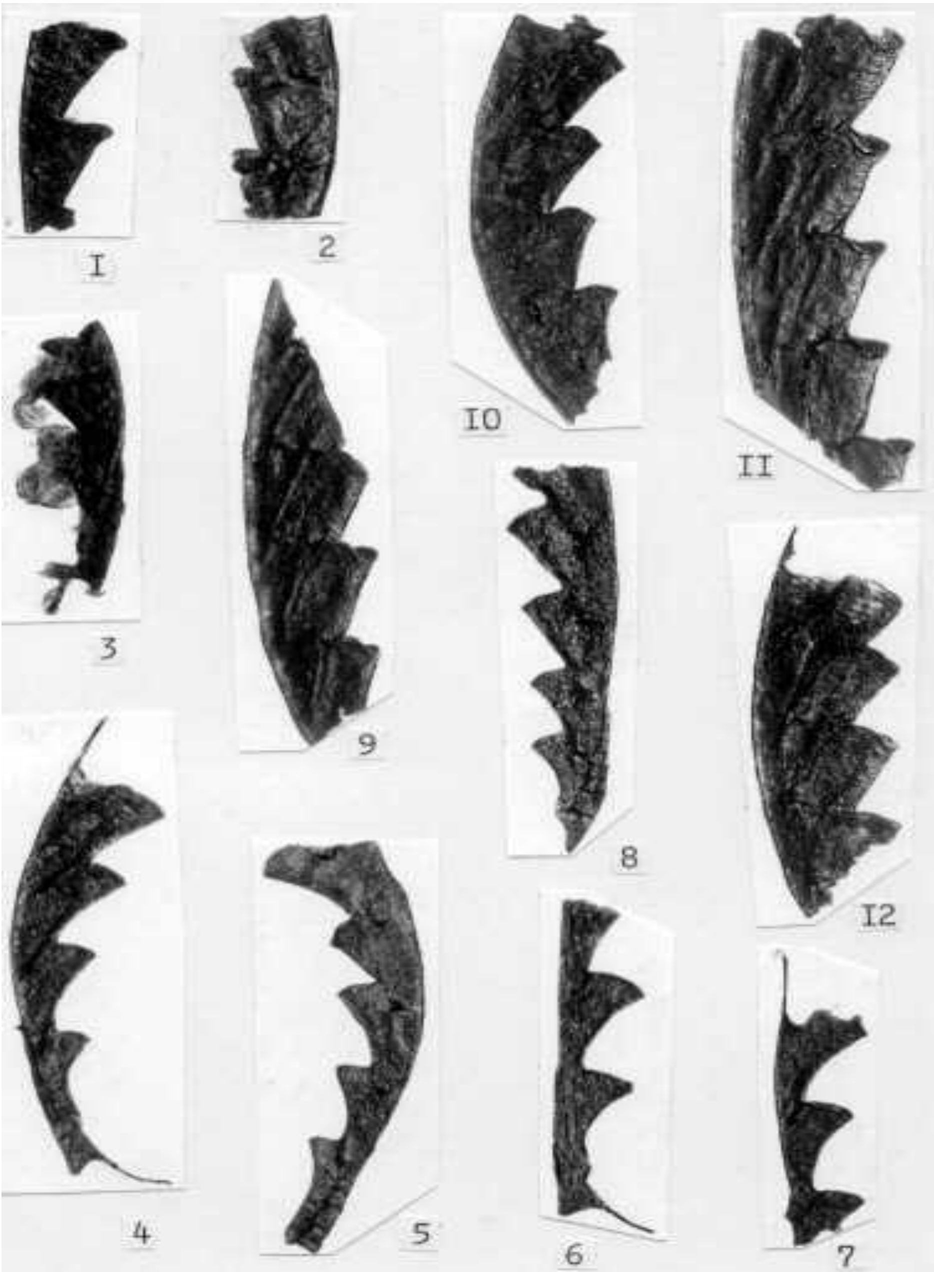

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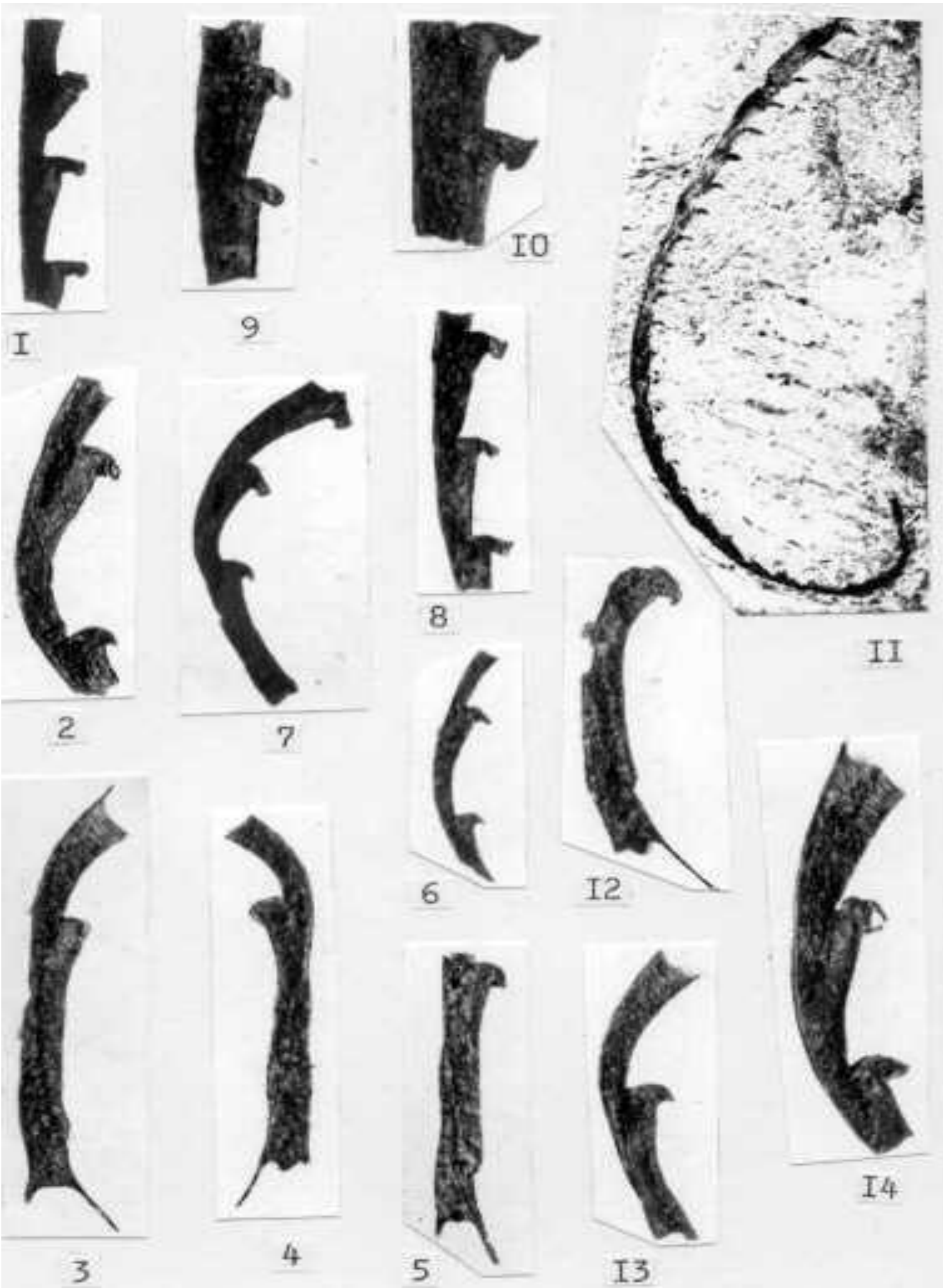

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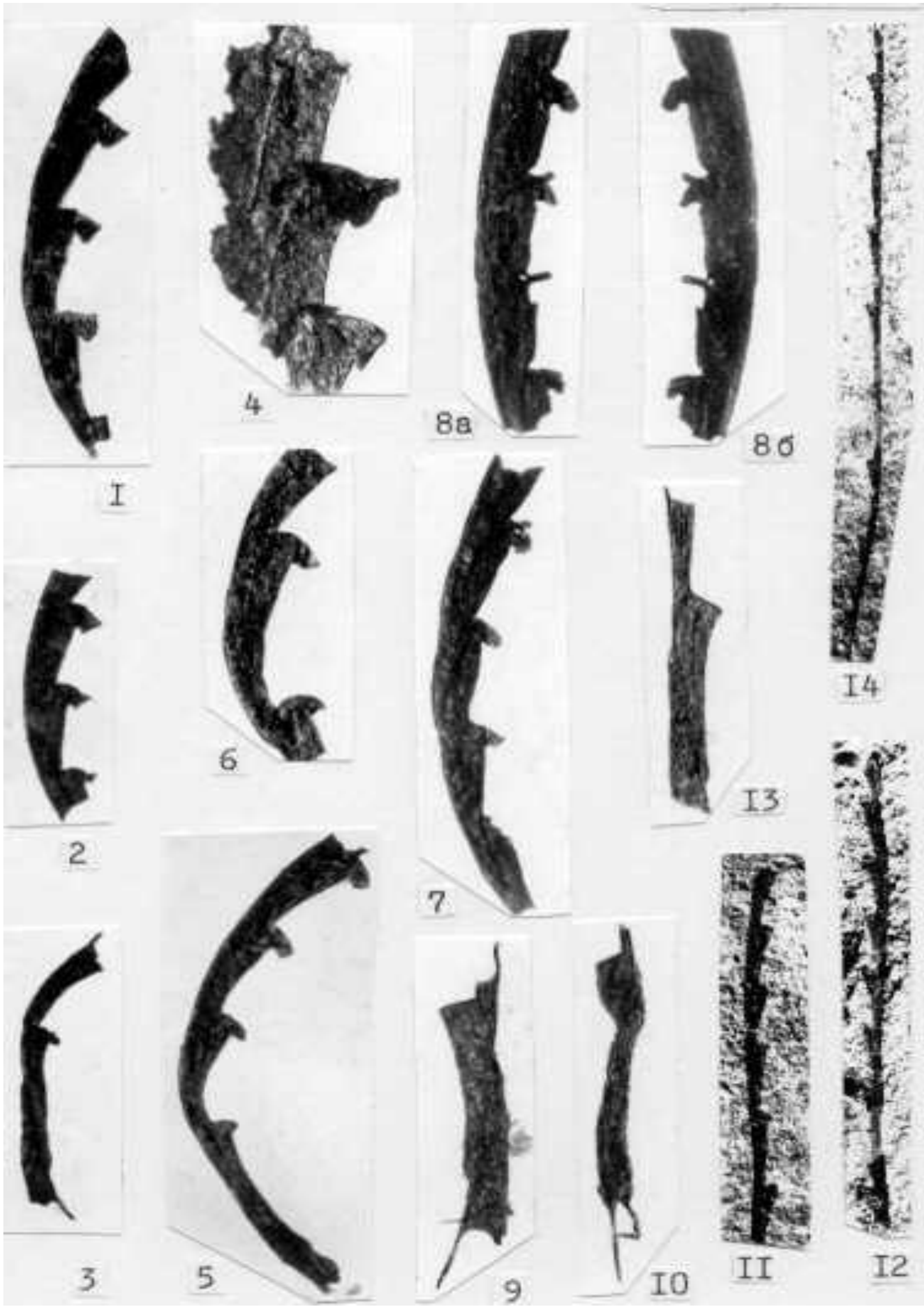

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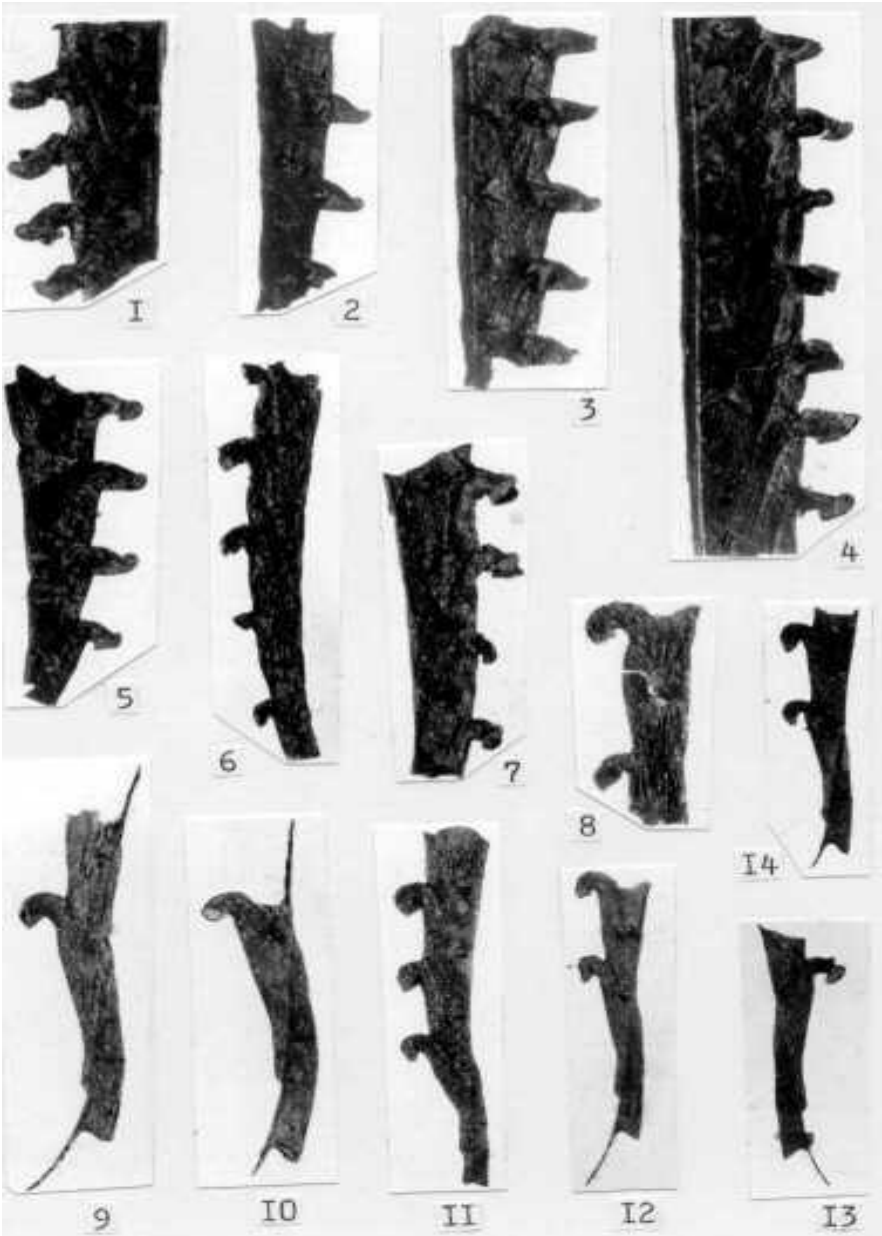

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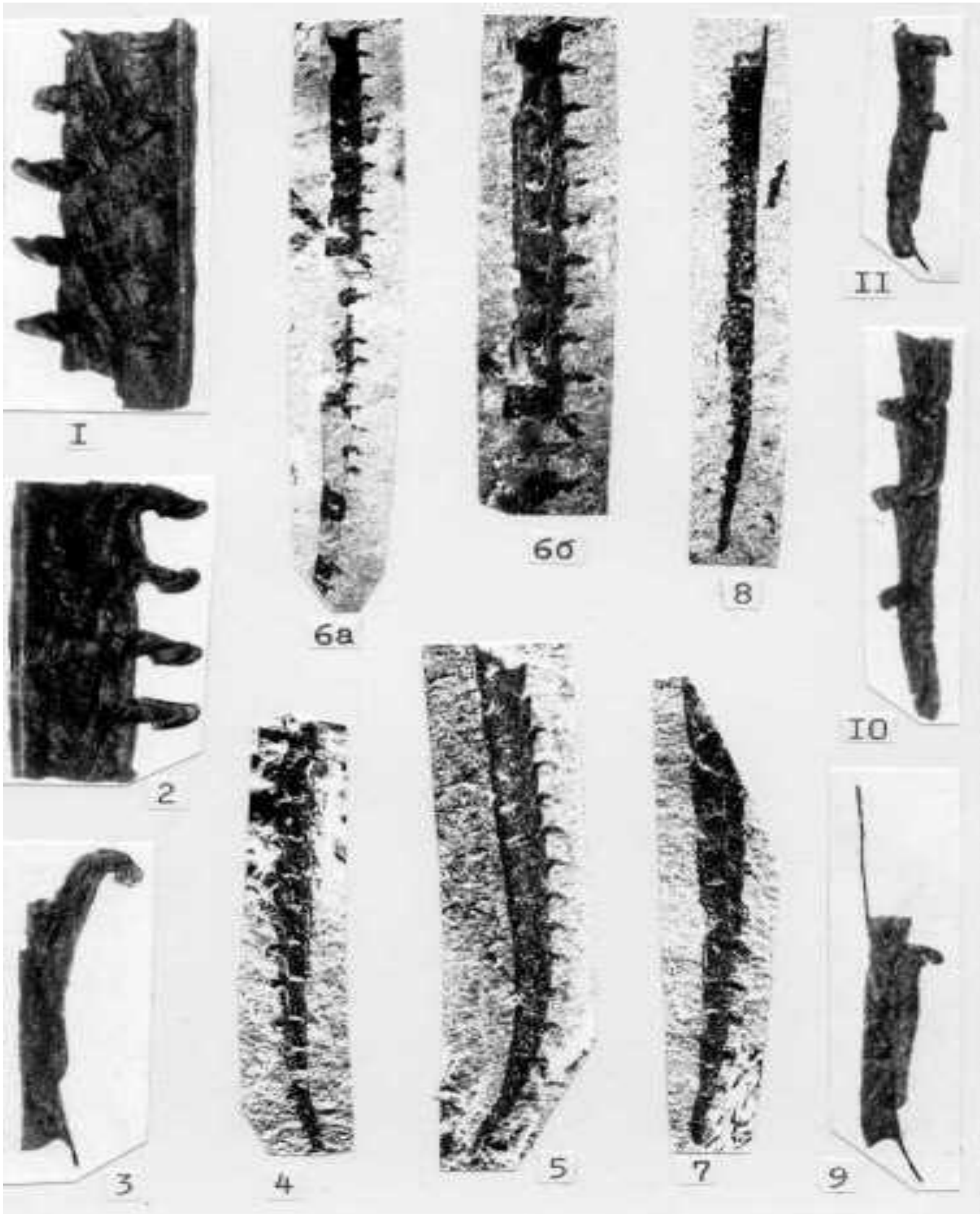

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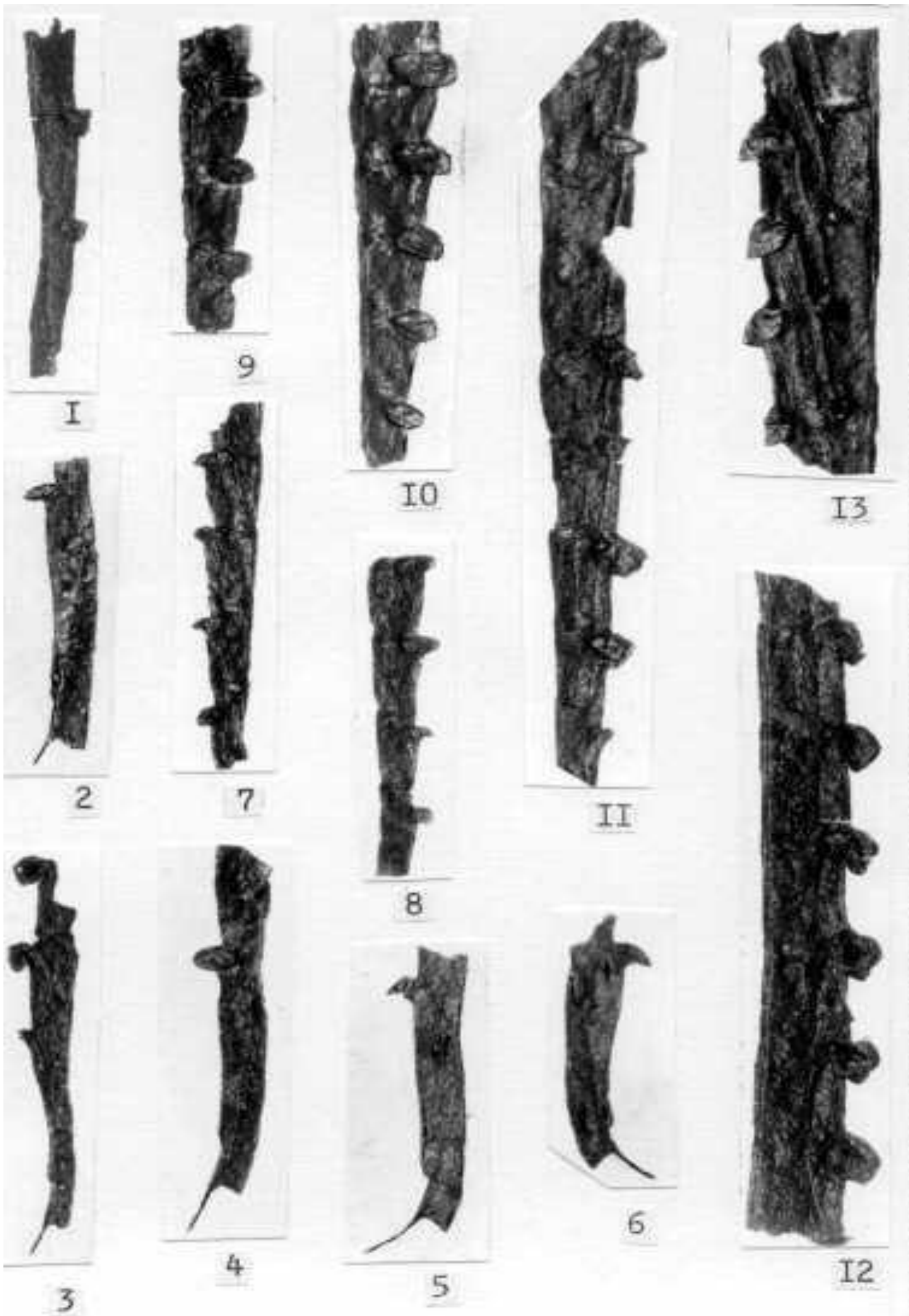

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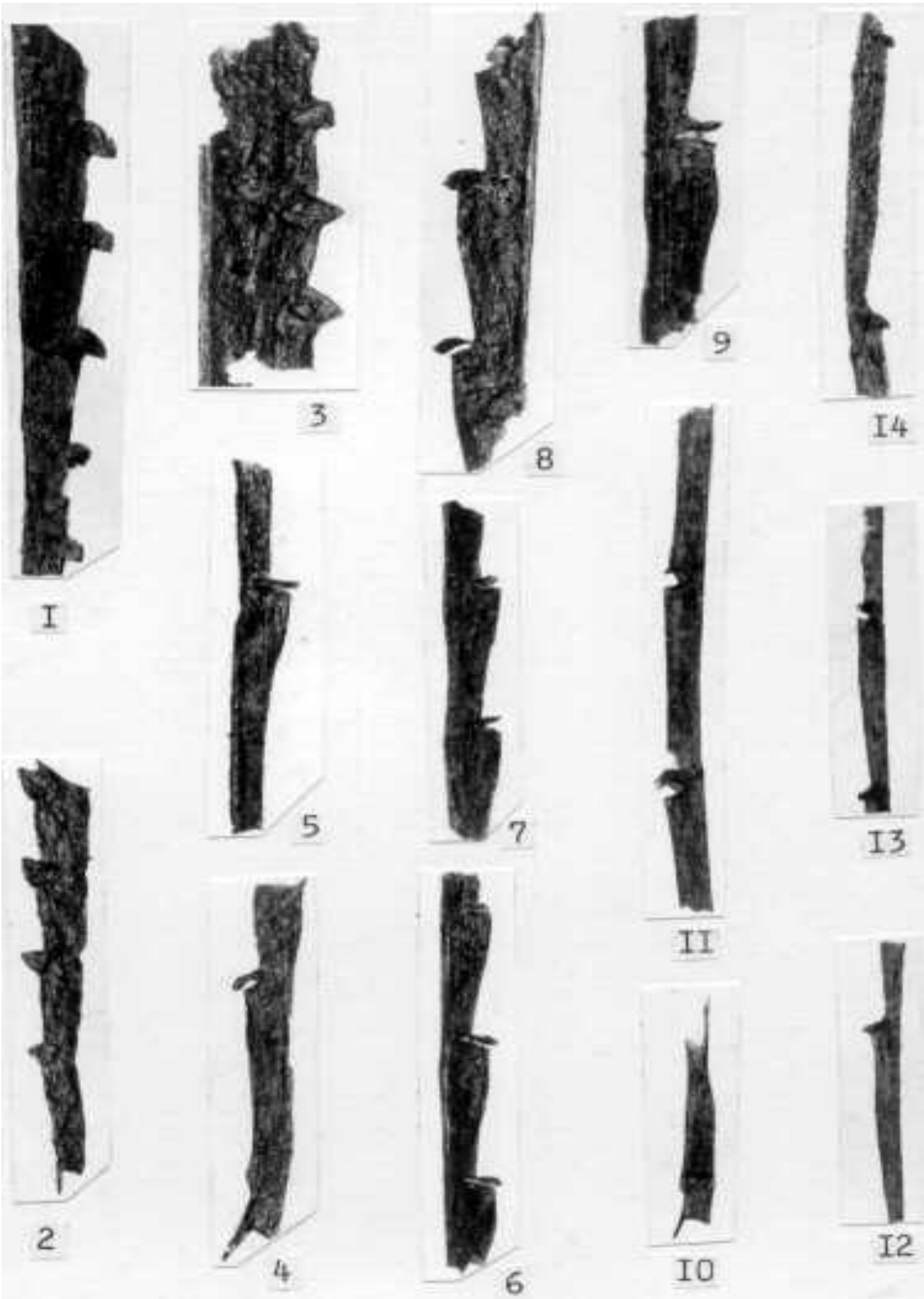

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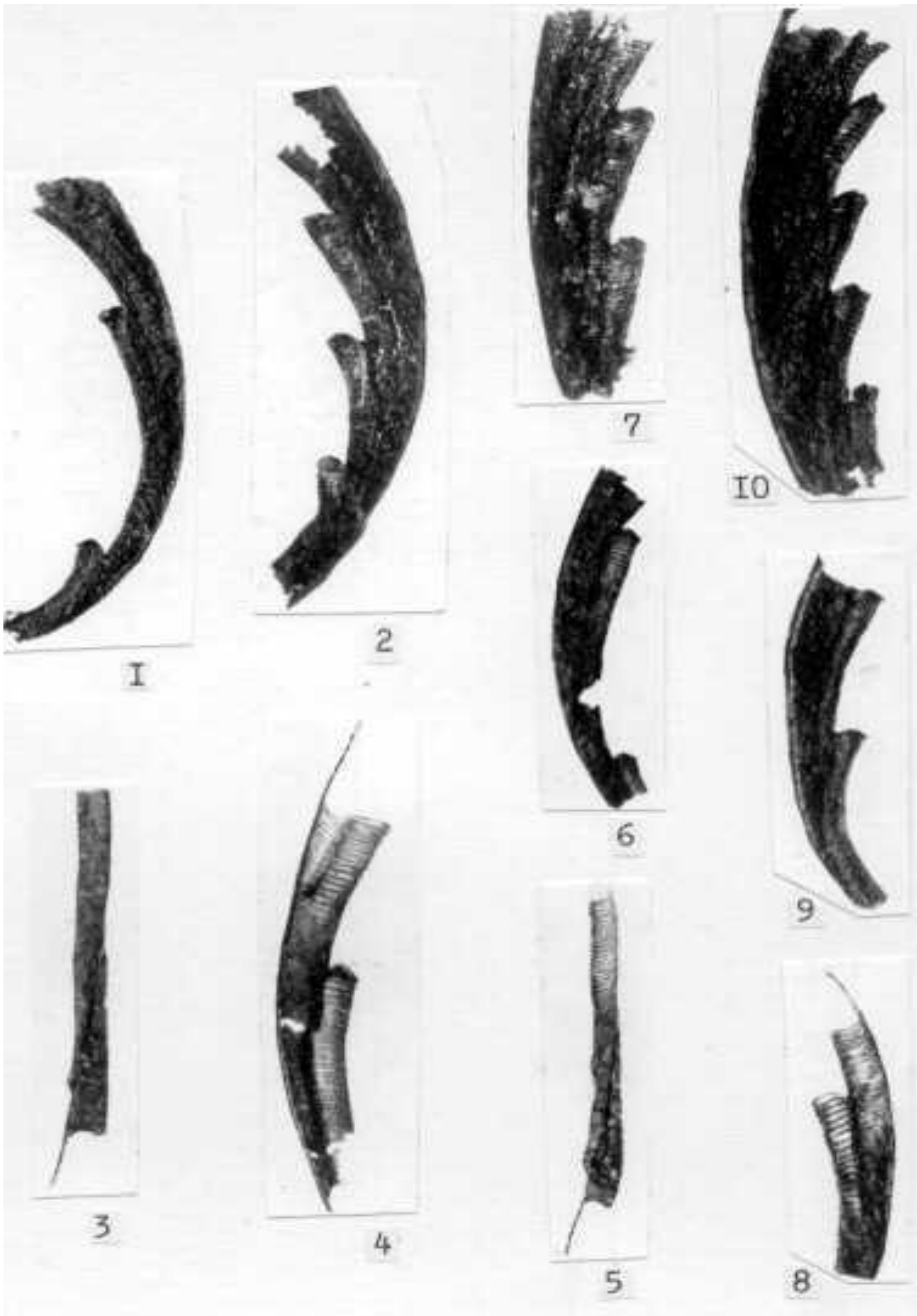

Table L

Illustrations for the stratigraphy of the Silurian of Ukraine and explanations for the figures

Fig. 1. Scheme of facies zoning of the Silurian deposits in the southwest of the East European Platform (EEP) and the location of outcrops and boreholes studied by the author.

Explanations for the figure: I - I - shelf (carbonate) deposits of the Kovel-Kishinev structural-facies region, II - II - Pelagian (clay, carbonate-argillaceous in the eastern zone of development) deposits of the Lvov-Kolomya structural-facies region.

Wells that uncovered sediments with remains: A - graptolites, B - brachiopods and other benthic organisms, C - planktonic and benthic organisms.

Facies areas and sub-areas: Kovel basement uplift: 1 - western part, 2 - eastern part.

Lvov trough: 3 - submerged part, 4 - western part of the eastern slope, 5 – north-eastern part of the slope.

Western slope of the Ukrainian shield: 6 - Volyn part, 7 - northern slope of the Podolian ledge, 8 - Podolsk ledge of the foundation.

South-western slope of the shield: 9 - Priprut part, 10 - lower Transnistria.

Boundaries: 11 - between the pelagic and neritic areas of sedimentation, 12 - the north-eastern boundary of the Silurian, 13 - the eastern boundary of the Lvov trough, 14 - the north-eastern boundary of the Precarpathian trough, 15 - the boundary of the thrust of the flysch Carpathians, 16 - the northern boundary of the Dobrudzha trough, 17 - crystalline rocks of the Ukrainian shield.

Fig. 2. The stratigraphic charts of the Lower and Middle Silurian in the Southwest of the East European Platform.

Fig. 3. Scheme of stratigraphy of the Upper Silurian deposits in the southwest of the EEP.

Fig. 4. Stratigraphic charts of the Silurian deposits of the southwest of the East European Platform (The stratigraphic charts of the Silurian System).

Fig. 5. Stratigraphic distribution of graptolite genera in the Silurian and Lower Devonian deposits of the southwest of the EEP.

Fig. 6. Stratigraphic distribution of *Monograptinae, Uncinatograptinae, Pristiograptinae*, *Neolobograptinae* species in the Silurian and Lower Devonian deposits of Ukraine.

Fig. 7. Distribution of graptolites and brachiopods in the boreholes Pulemets-1884 and Selyakhi-1883.

Fig. 8. Distribution of graptolites and brachiopods in borehole Davidens-1.

Fig. 9. Distribution of graptolites and brachiopods in borehole Brest-1.

Fig. 10. Stratigraphic distribution of *Heisograptinae, Pristiograptinae, Neolobograptinae* and other groups of graptolites in the Silurian deposits of Ukraine.

Fig.11. Distribution of graptolites and brachiopods in boreholes Kusnishche-5394 and Tomashevka-4116.

Fig. 12. Distribution of graptolites and brachiopods in the Glinyany-1 and Litovezh-1 boreholes.

Fig. 13. Stratigraphic distribution of *Linograptinae, Cyrtograptinae, Cucullograptinae, Neocucullograptinae*, *Retiolitinae, Plectograptinae* and other groups of graptolites in the Silurian deposits of Ukraine.

Fig. 14. Distribution of graptolites and brachiopods in the boreholes Dublyany-4, Ivano-Frankivska-1 and Kazaklia-1.

Fig. 15. Distribution of graptolites and brachiopods in the wells Kharsy-1873 and Kladnev-5396.

Fig. 16. Distribution of graptolites and brachiopods in borehole Great Bridges-30.

Fig. 17. Distribution of graptolites and brachiopods in wells Shiev-4109, Zaluzhye-27 and Pishka-16.

Fig. 18. Distribution of graptolites and brachiopods in boreholes Koropets-4 and Koropets-3.

Fig. 19. Distribution of graptolites and brachiopods in borehole Guscha-4015.

Fig. 20. Distribution of graptolites and brachiopods in the borehole. Zagaipol-1.

Fig. 21. Distribution of graptolites and brachiopods in borehole Brest-10.

Fig. 22. Distribution of graptolites and brachiopods in borehole Przemyshlyany-1.

Fig. 23. Distribution of graptolites and brachiopods in borehole Priluki-1844.

Fig. 24. Distribution of graptolites and brachiopods in borehole Samoilichi-1859.

Fig. 25. Distribution of graptolites and brachiopods in the boreholes Zavadovka-6 and Lokachi-14.

Fig. 26. Distribution of graptolites and brachiopods in boreholes Podgaytsy-1 and Podgaytsy-2.

Fig. 27. Comparison of schemes of zonal division of the Silurian system of various regions of the Earth according to graptolites.

Fig. 28. Distribution of graptolites and brachiopods in boreholes Koropets-1 and Koropets-2.

Fig. 29. Structural-tectonic plan of the territory of the Silurian and Early Devonian sedimentation.

Fig. 30. Distribution of thicknesses of the upper Silurian Ulichian belt in the southwest of the East European Platform.

Fig. 31. Comparison of ideas about the General Stratigraphic Scheme of the Silurian system (=

International Stratigraphic Scale of the Silurian).

Fig. 32-1. Correlation of local stratigraphic schemes of the Silurian in various structural-facilic regions of the South-West of the EEP.

Fig. 32-2. Continuation: Correlation of local stratigraphic schemes of the Silurian in various structural-facilic regions of the South-West of the EEP.

Fig. 32-3. Continuation: Correlation of local stratigraphic schemes of the Silurian in various structural-facilic regions of the South-West of the EEP.

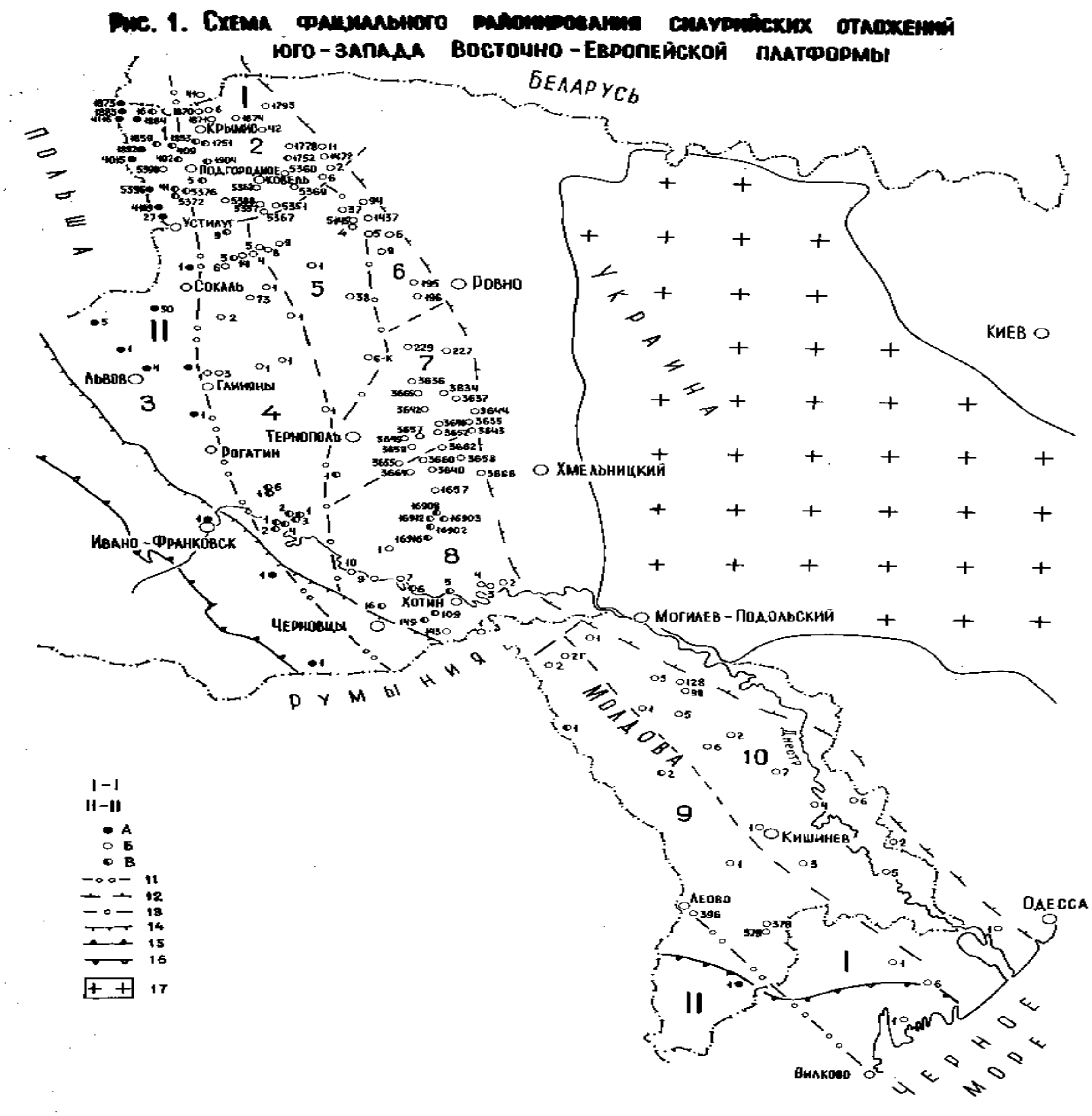

Fig. 1. Facies zoning of deposits and location of outcrops studied by the author in the basin of the river. Dniester and wells in the South-West of the

GSC			Stratigraphy of the South-West of EEP							
			Chronostratigraphy					Lithostratigraphy		
System	Series	Stage	System	Section	Belt	Stage	Graptolites	Series	Suite	Subsuite
Silurian	Ludlow	Ludfordian	Silurian	Middle	Tiritian	Konovian	S. leintwardi-nensis, C. hemiaversus, B. praecornutus, N. fragilis, L. exspectatus	Malinov-tsy	Konovka	Shutnovtsy
										Goloskov
								Yaruga	Bagovitsa	
		Gorstian				Nevridian	N. nilssoni, S. chimaera, C. colonus, U. uncinatus, L.simplex, S. spinosus, H. balticus			Ustja
										Muksha
	Wenlock	Gleedonian (Homerian)				Paralatian	L. ludensis, L. praed-eubeli, G. nassa, P. par-vus, P. jaegeri		Ternava	
										Sursha
		Whitwellian (Homerian)			Kitaigorodian	Alizonian	M. flemingii, M. flumendosae, P. praedubius, P. pseudodubius			Vrublivtsy
		Sheinwoodian				Furmanovian	U. riccartonensis, C. murshisoni		Furmanovka	Demshin
										Restevo
	Llandovery	Telychian		Lower		Bolotynian	M. crenulata, O. spiralis, R. angustidens, S. anguinus, M. parapriodon	Bolotyn	Step-Soch	
									Morosheshty	

Fig. 2. Scheme of stratigraphy of the Lower and Middle Silurian deposits of the southwest of the East European Platform

Global Stratigr. Chart			Stratigraphy of the South-West of EEP							
			Chronostratigraphy					Lithostratigraphy		
System	Series	Stage	System	Section	Belt	Stage	Graptolites	Series	Suite	Subsuite
Devonian	Lower	Lochkovian	Devonian	Lower	Lochkovian	Borshchovian	T. uniformis, T. uniformis angustidens	Rukshyn	Mitkov	
									Khudykovtsy	
Silurian	Pridoli		Silurian	Upper	Skalian	Sklavian	T. uniformis angustidens, I. transgrediens, U. perneri		Zvenigorod	
									Trubchin	
						Stavanian	S. lochkovensis, S. vetus, I. ultimus, L. parultimus, D. trimorphus, H. hornyi		Varnitsa	
									Prigorodok	
	Ludlow	Ludfordian			Ulichian	Metonian	B. spineus, B. aculeatus, S. balticus, S. hamulosus, U. acer, D. bresticus	Malinotsy	Ryknta	Isakivtsy
										Grinchuk
						Tegrian	N.kozlowskii, N.auriculatus, B. urbaneki, M. egregius		Tsviklivtsy	Bernovo
										Sokil
				Middle	Tiritian	Konovian	S. leintwardinensis, C. hemiaversus, B. praecornutus, D. bellus, N. fragilis		Konovka	Shutnovtsy
										Goloskov
								Yaruga	Bag.	Ustja

Fig. 3. Scheme of stratigraphy of the Upper Silurian deposits of the Southwest of the East European Platform.

The stratigraphic charts of the Silurian System

Standard stratigraphical divisions				Stratigraphy of the South-Western part of the EEP						
				Chronostratigraphy				Lithostratigraphy		
System	Subsystem	Series	Stage	Section	Belt	Stage	Graptolites	Series	Suite	Subsuite
Silurian	Upper	Pridoli		Upper	Skalian	Sklavian	I.transgrediens, U. perneri, T.uniformis angustidens	Rukshin		Zvenigorod Trubchin Varnitsa
Silurian	Upper	Pridoli		Upper	Skalian	Stavanian	S.lochkovensis, S. vetus, I.ultimus, L. parultimus, D.trimorphus, H.difficilis	Rukshin		Prigorodok
Silurian	Upper	Ludlow	Ludfordian	Upper	Ulichian	Metonian	B.spineus, B.aculeatus, S.balticus, S. hamulosus, U.acer, D. bresticus, F.formosus, I.rarus	Malinovtsy	Rykhta	Isakivtsy Grinchuk
Silurian	Upper	Ludlow	Ludfordian	Upper	Ulichian	Tagrian	N.kozlowskii, N.kozlowskii unicornus, N.auriculatus, B.urbaneki, M.egregius	Malinovtsy	Tsviklivtsy	Bernovo Sokil
Silurian	Upper	Ludlow	Ludfordian	Middle	Tiritian	Konovian	S.leintwardinensis, C.hemiaversus, B.praecornutus, N.fragilis, D.bellus, L.expectatus	Malinovtsy	Konovka	Shutnivtsy Goloskov
Silurian	Upper	Ludlow	Gorstian	Middle	Tiritian	Nevridian	N.nilssoni, S.shimaera, C.colonus, U. uncinatus, L.simplex	Yaruga	Bagovitsa	Ustja Muksha
Silurian	Lower	Wenlock	Homerian (Gledon)	Middle	Tiritian	Paralatian	G.nassa, L.ludensis, P.parvus	Yaruga	Ternava	Sursha
Silurian	Lower	Wenlock	Homerian (Whitwel)	Middle	Kitaogorodian	Alizonian	M.flemingii, M.flumendosae	Yaruga	Ternava	Vrublevtsy
Silurian	Lower	Wenlock	Sheinwoodian	Middle	Kitaogorodian	Furmanovian	P.sardous, U.riccartonensis, C.murchisoni, M.priodon	Yaruga	Furmanovka	Demshin Restevo
Silurian	Lower	Llandovery	Telychian	Lower		Bolotynian	M.crenulata, M.griestoniensis, M.paraprіodon, O.spiralis, R. angustidens	Bolotyn		Step-Soch Morosheshty

Fig. 4. Scheme of stratigraphy of the Silurian deposits of the Southwest of the East European Platform (The stratigraphic charts of the Silurian System).

Рис. 5. Распространение родов граптолитов в силуре и раннем девоне на юго-западе платформы

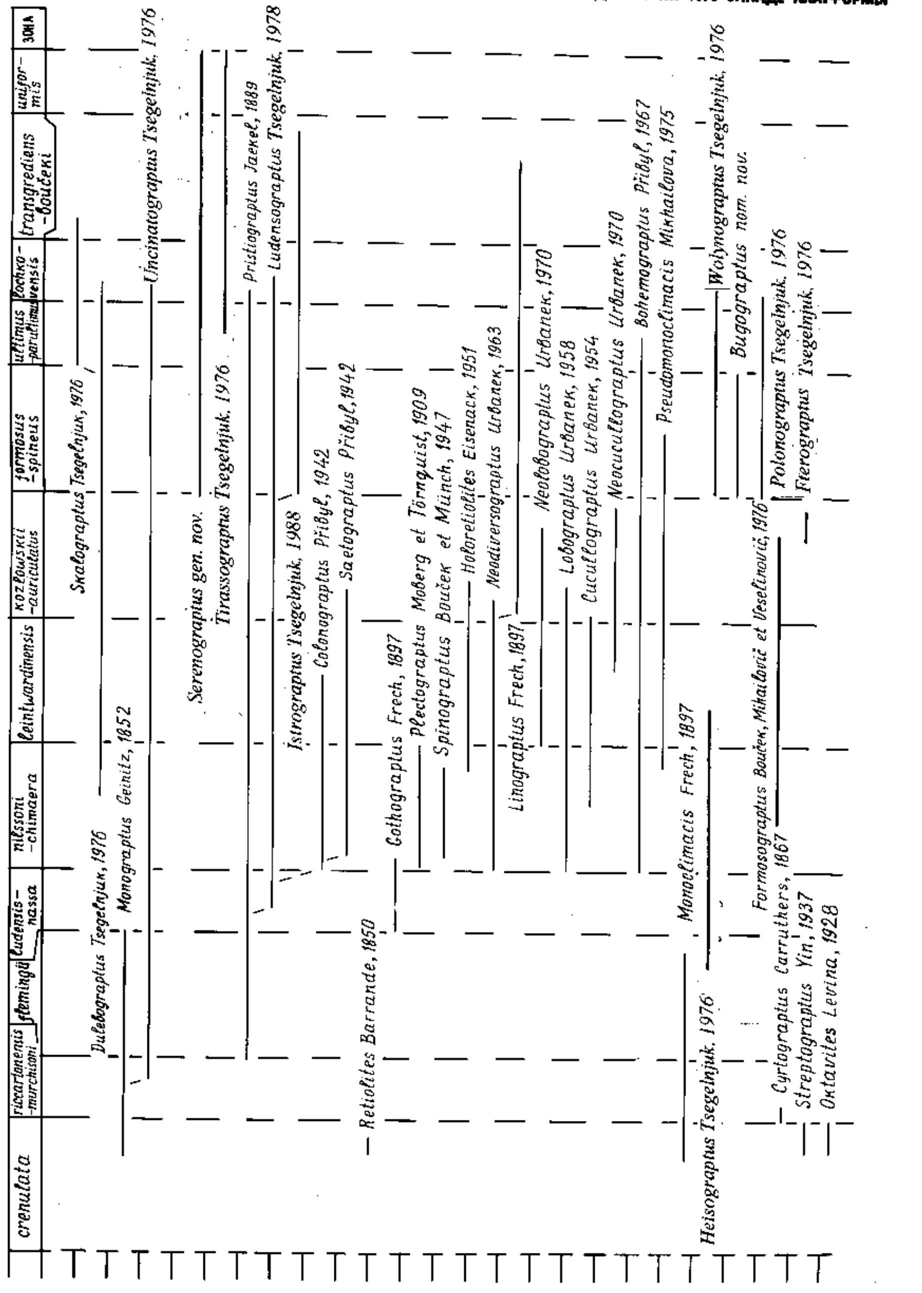

Fig. 5. Stratigraphic distribution of graptolite genera in the Silurian and Lower Devonian deposits of the southwest of the EEP.

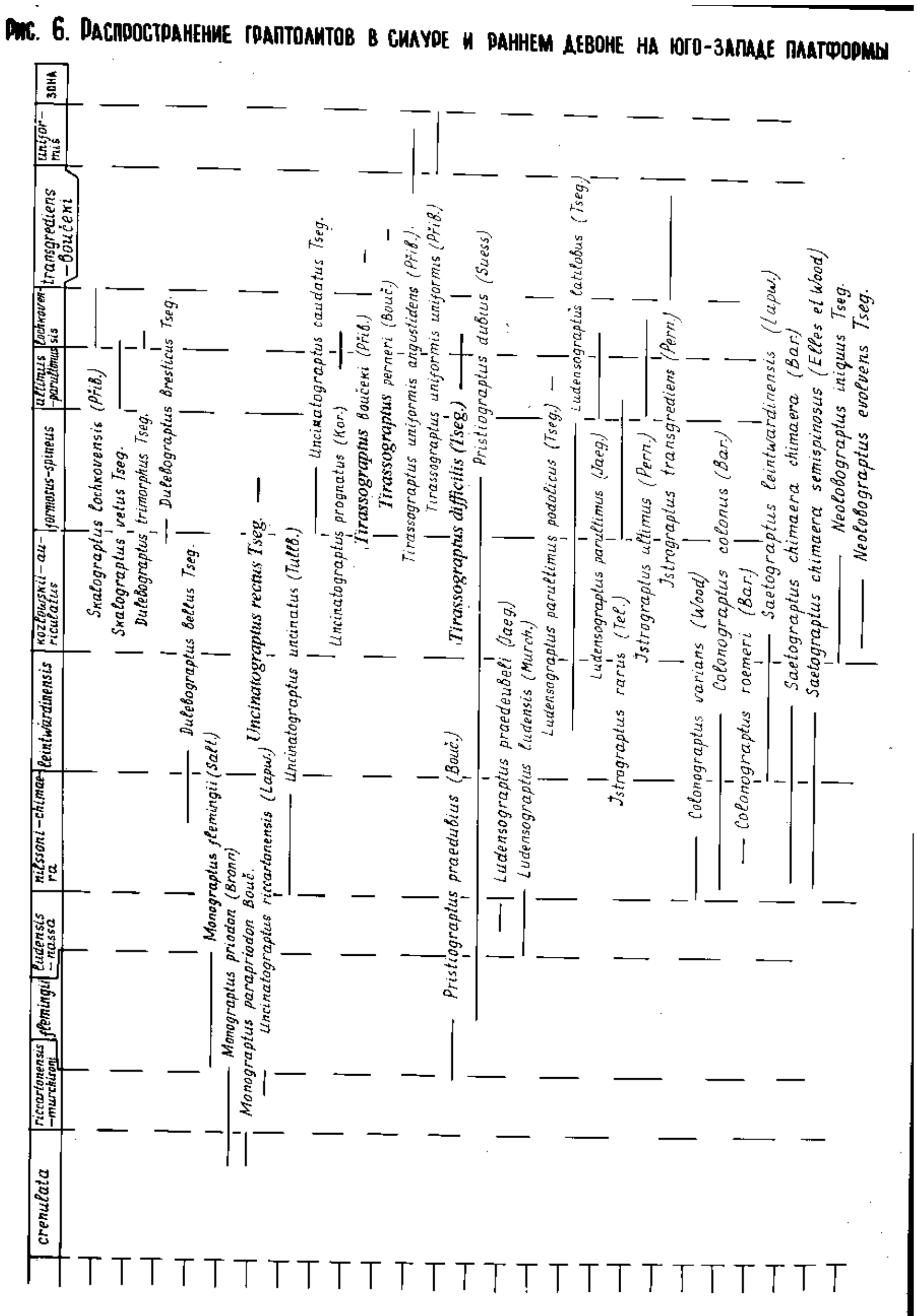

Fig. 6. Stratigraphic distribution of the species Monograptinae, Uncinatograptinae, Pristiograptinae, Neolobograptinae in the Spiritual and Lower Devonian deposits of Ukraine.

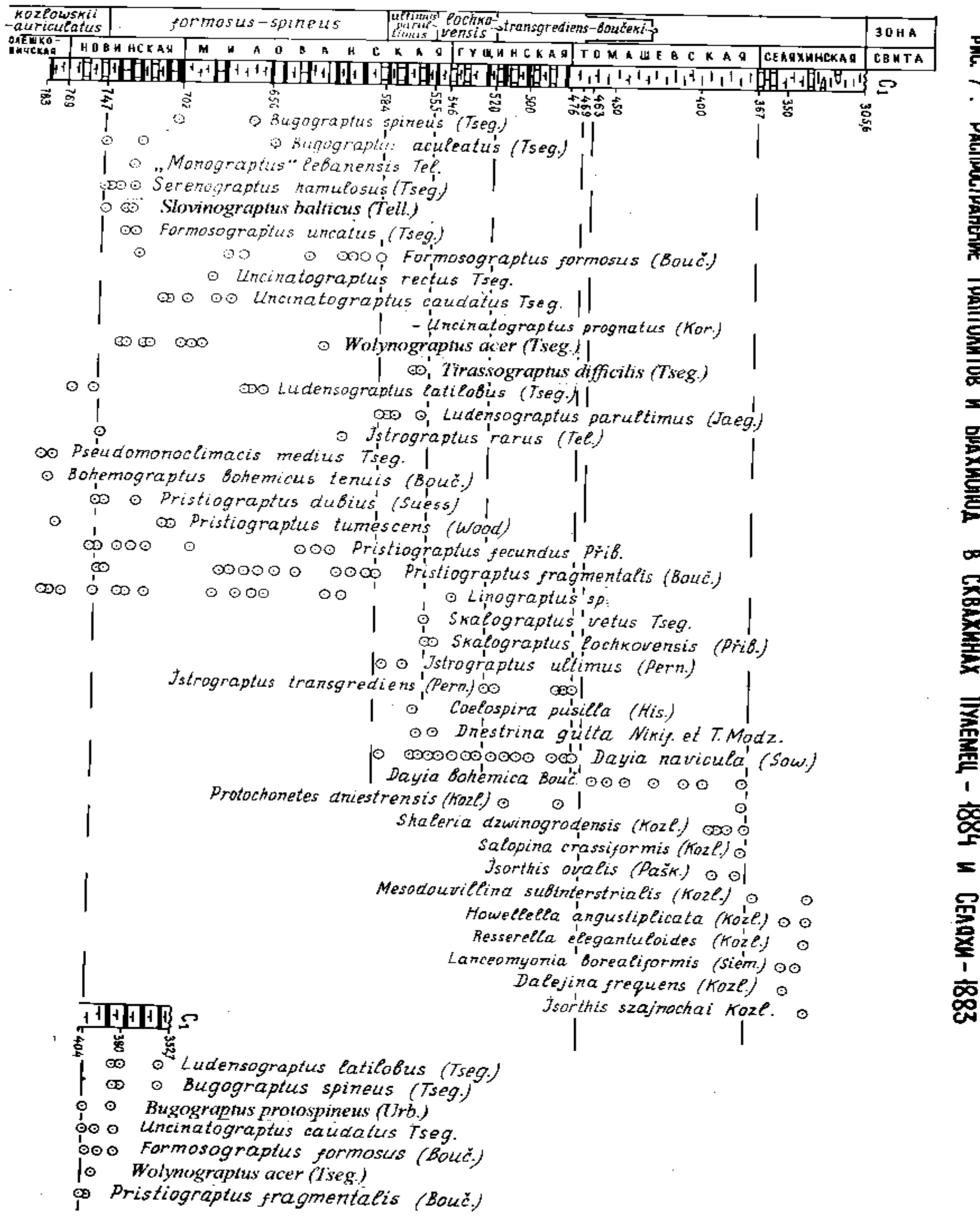

Fig. 7. Distribution of graptolites and brachiopods in the boreholes Pulemets-1884 and Selyakhi-1883.

Рис. 8. Распространение граптолитов и брахиопод в скв. Давидены-1

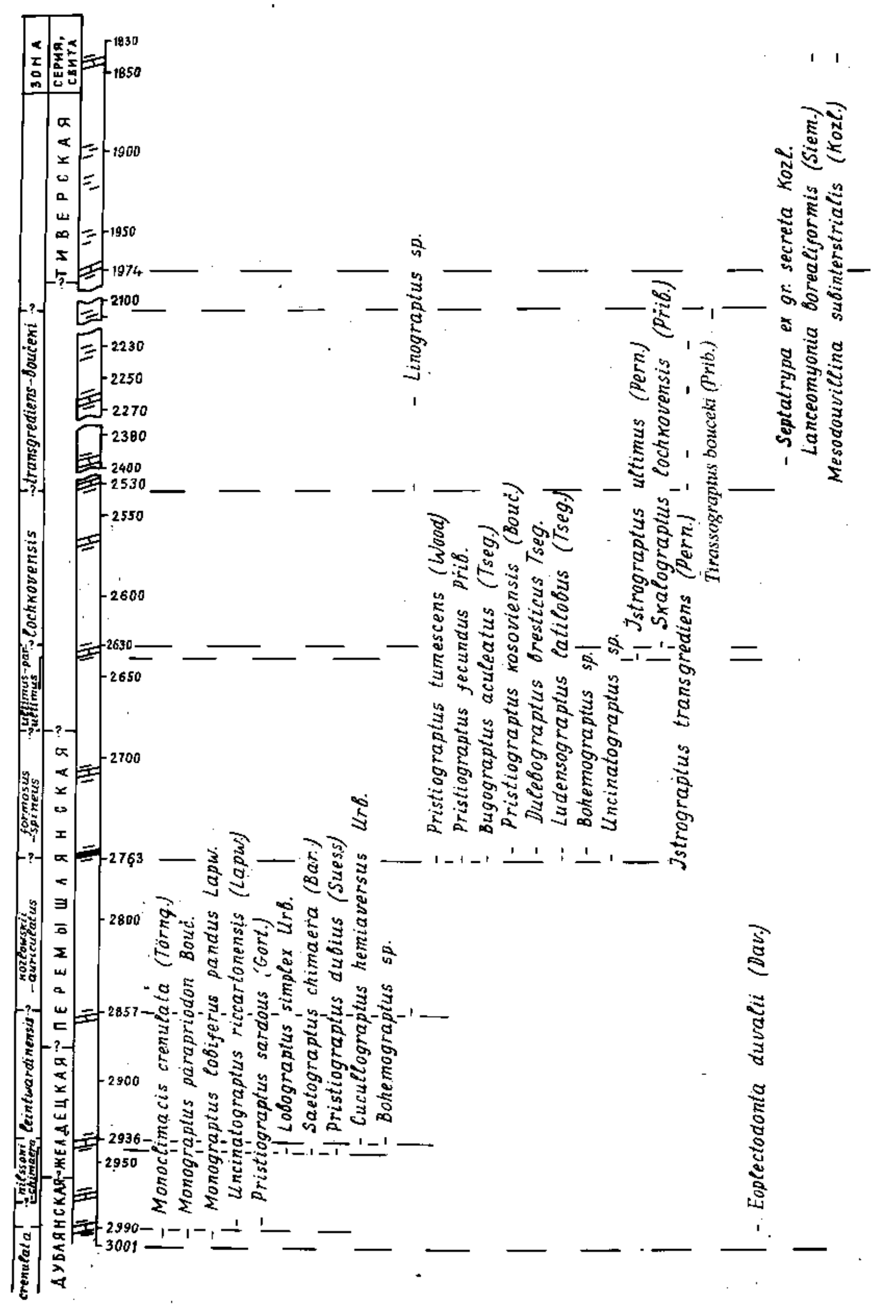

Fig. 8. Distribution of graptolites and brachiopods in boreholes Davideny-1.

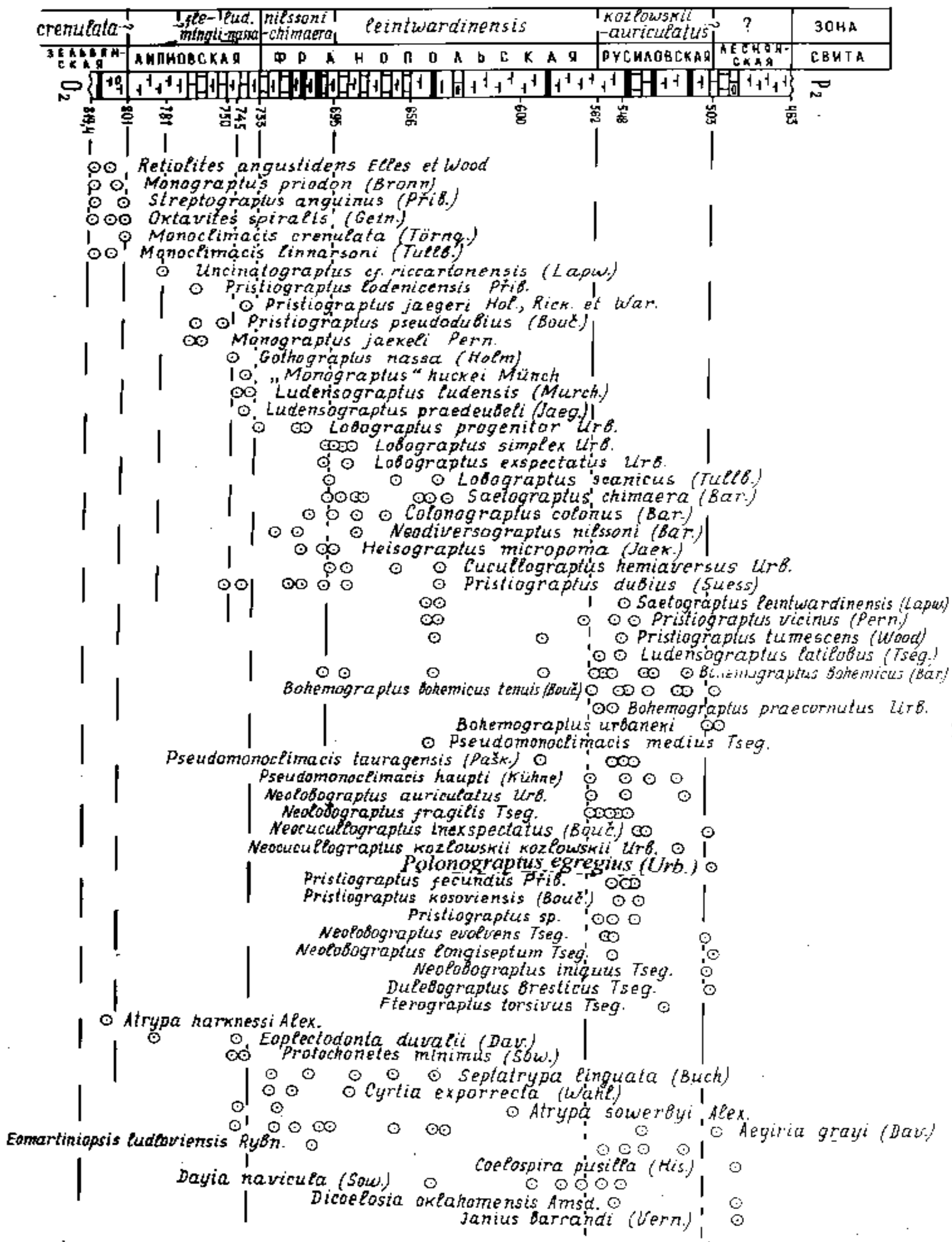

Fig. 9. Distribution of graptolites and brachiopods in borehole Brest-1.

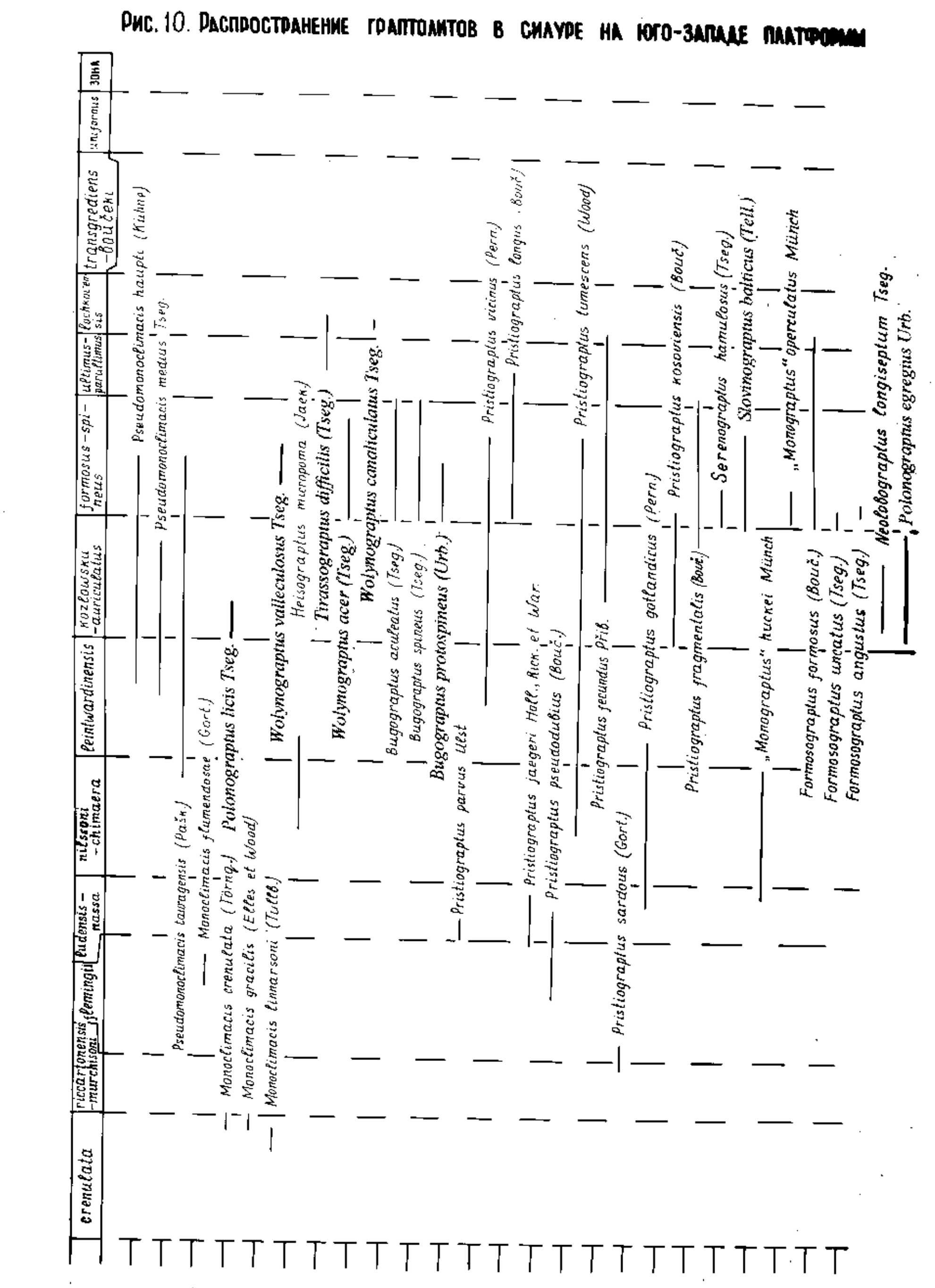

Fig. 10. Stratigraphic distribution of Heisograptinae, Pristiograptinae, Neolobograptinae and other groups of graptolites.

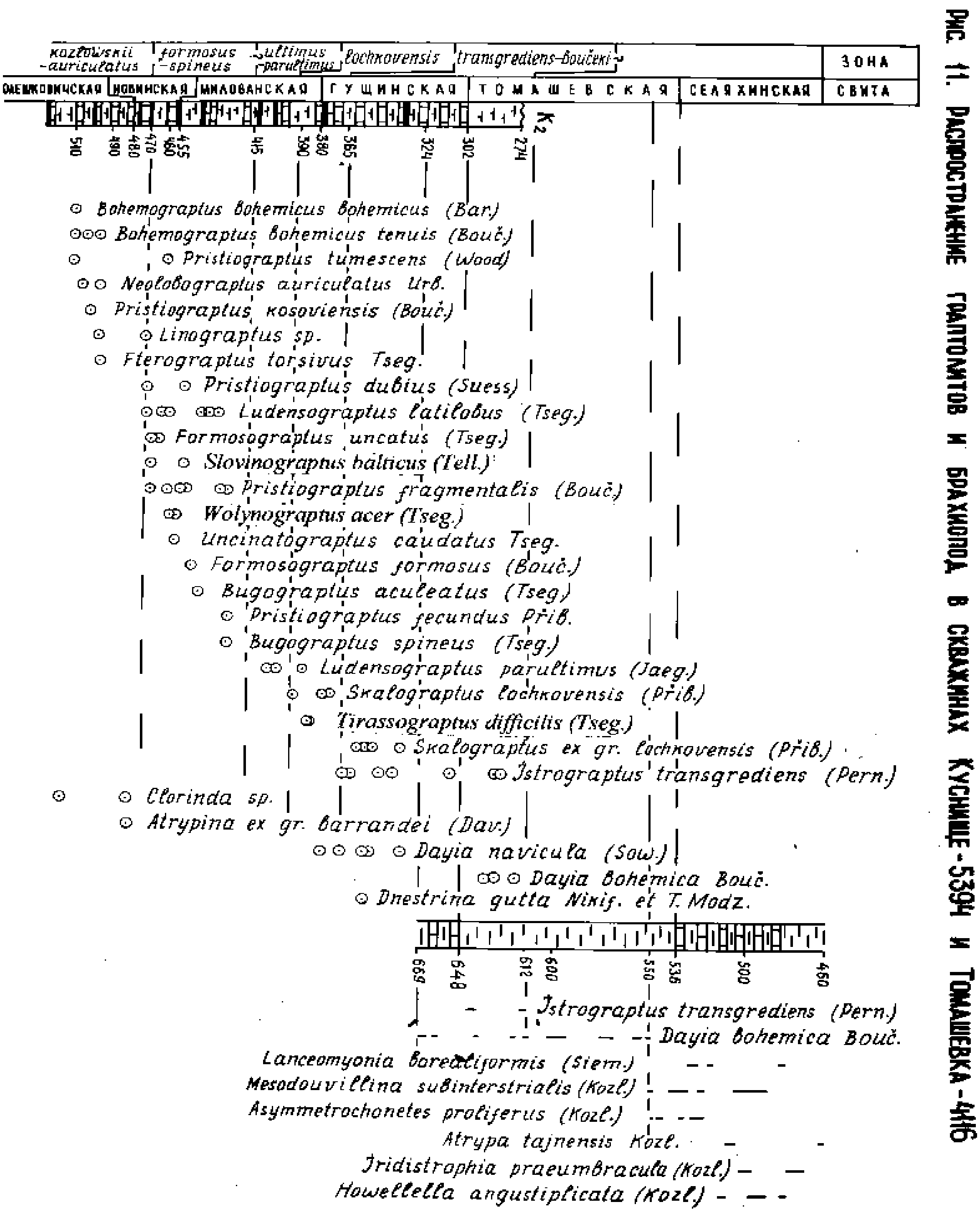

Fig.11. Distribution of graptolites and brachiopods in boreholes Kusnishche-5394 and Tomashevka-4116.

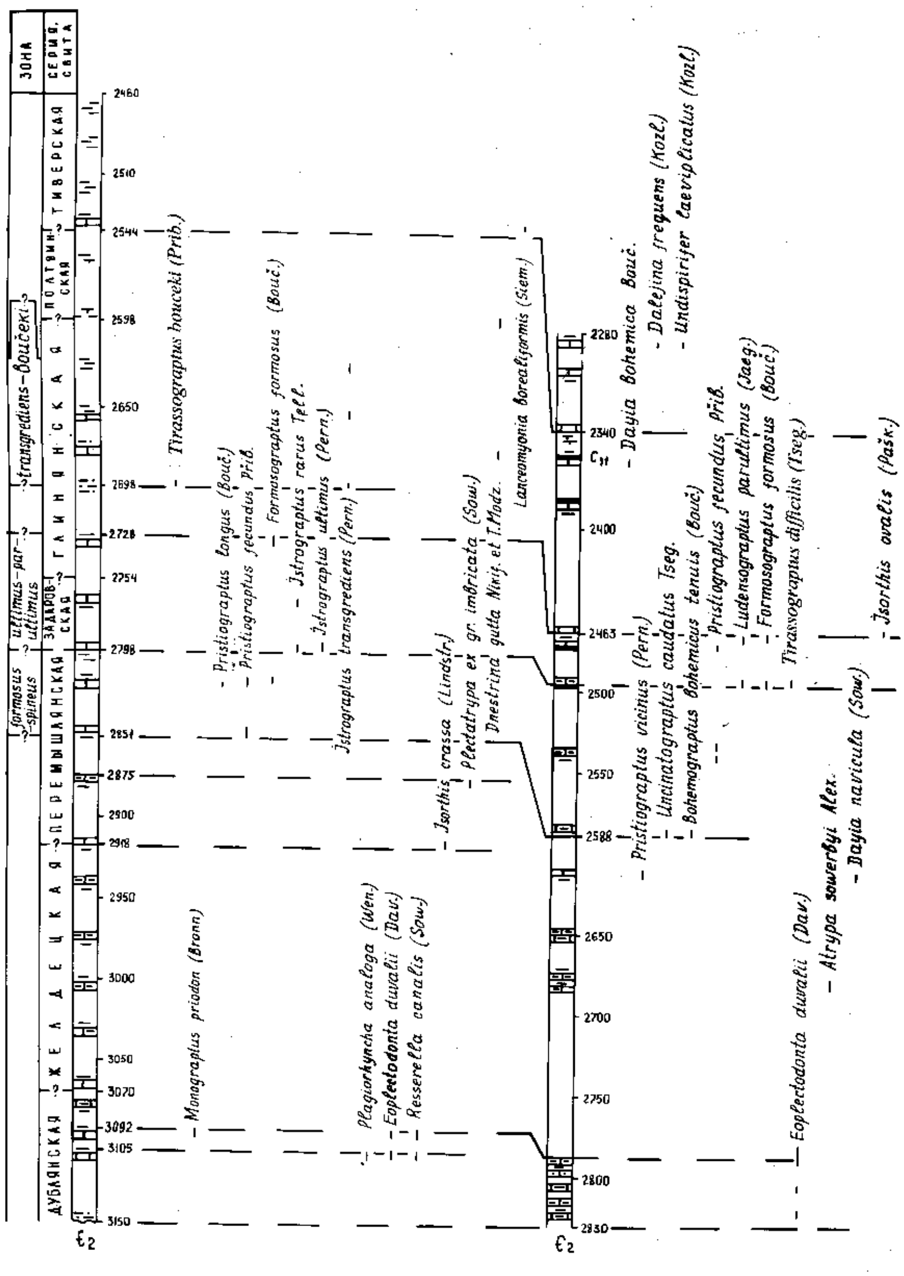

РИС. 12. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВАЖИНАХ ГЛИНЯНЫ-1 И ЛИТОВЕЖ-1

Fig. 12. Distribution of graptolites and brachiopods in the Glinyany-1 and Litovezh-1 boreholes.

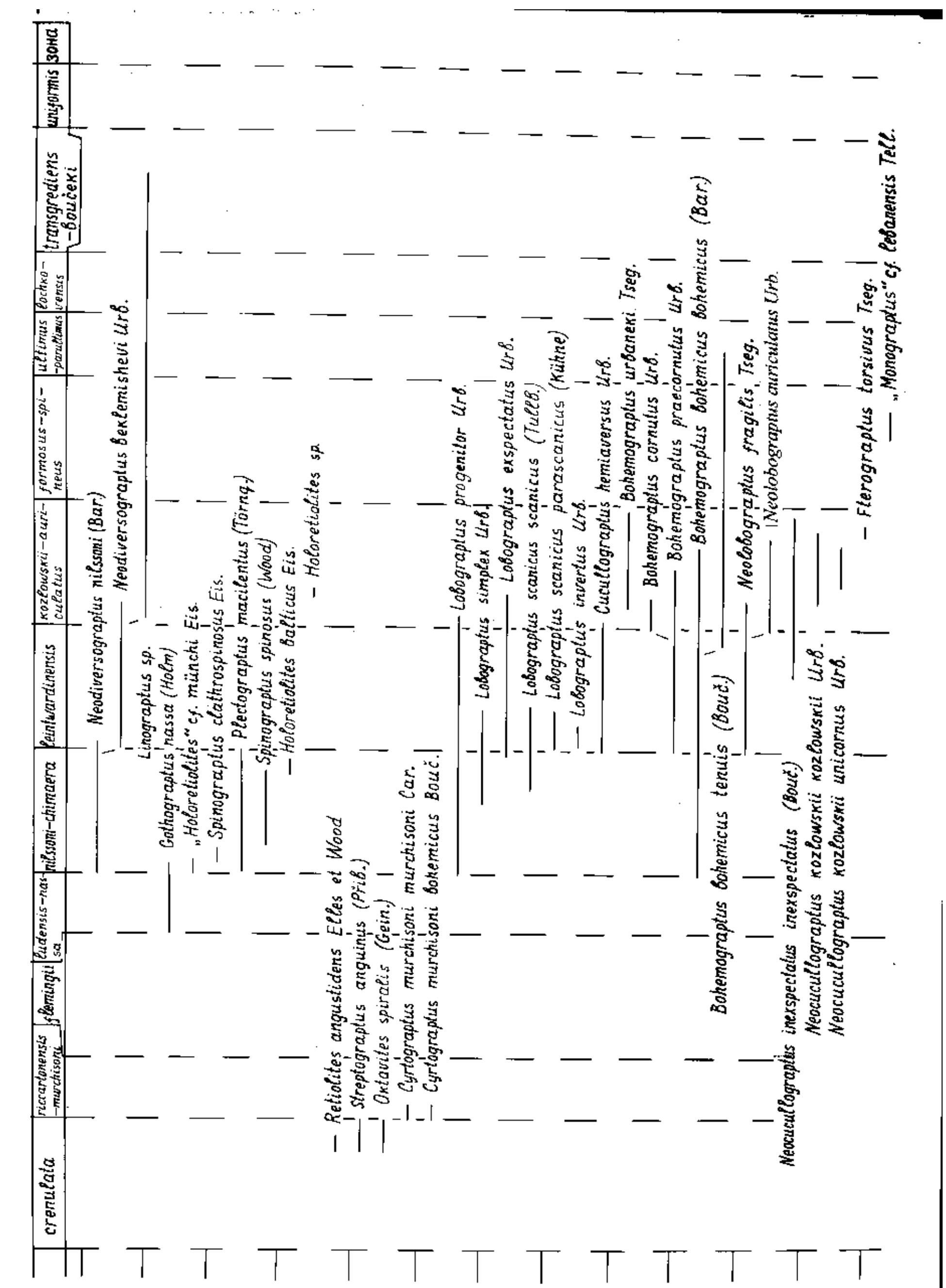

РИС. 13. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ В СИЛУРЕ ЮГО-ЗАПАДА ПЛАТФОРМЫ

Fig. 13. Stratigraphic distribution of species of Linograptinae, Cyrtograptinae, Cucullograptinae, Neocucullograptinae, Retiolitinae, Plectograptinae and other groups of graptolites.

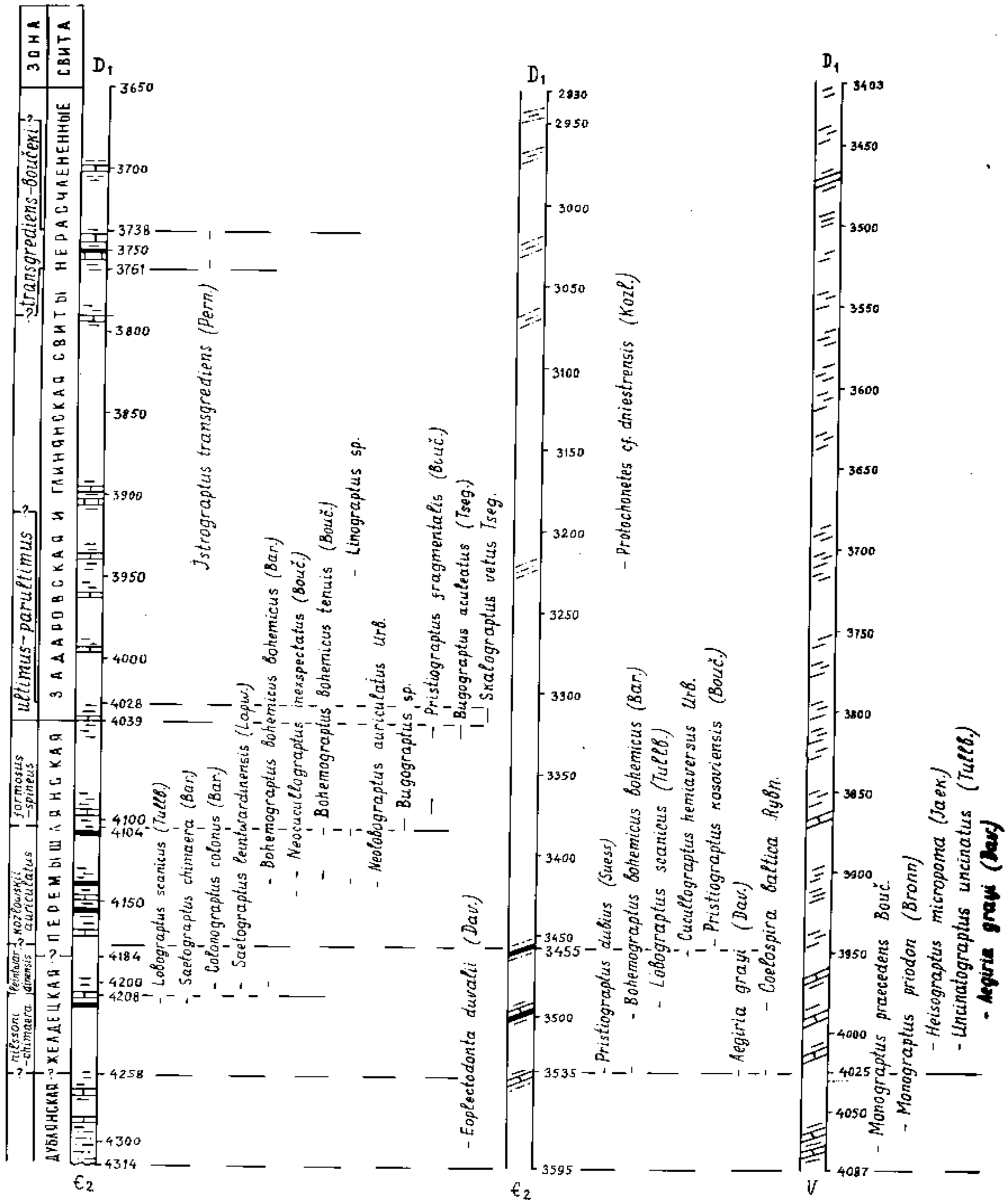

РИС.14. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВАЖИНАХ ДУБЛЯНЫ-4, ИВАНО-ФРАНКОВСКАЯ-1 И КАЗАКЛИЯ-1

Fig. 14. Distribution of graptolites and brachiopods in boreholes Dublyany-4, Ivano-Frankivska-1 and Kazaklia-1.

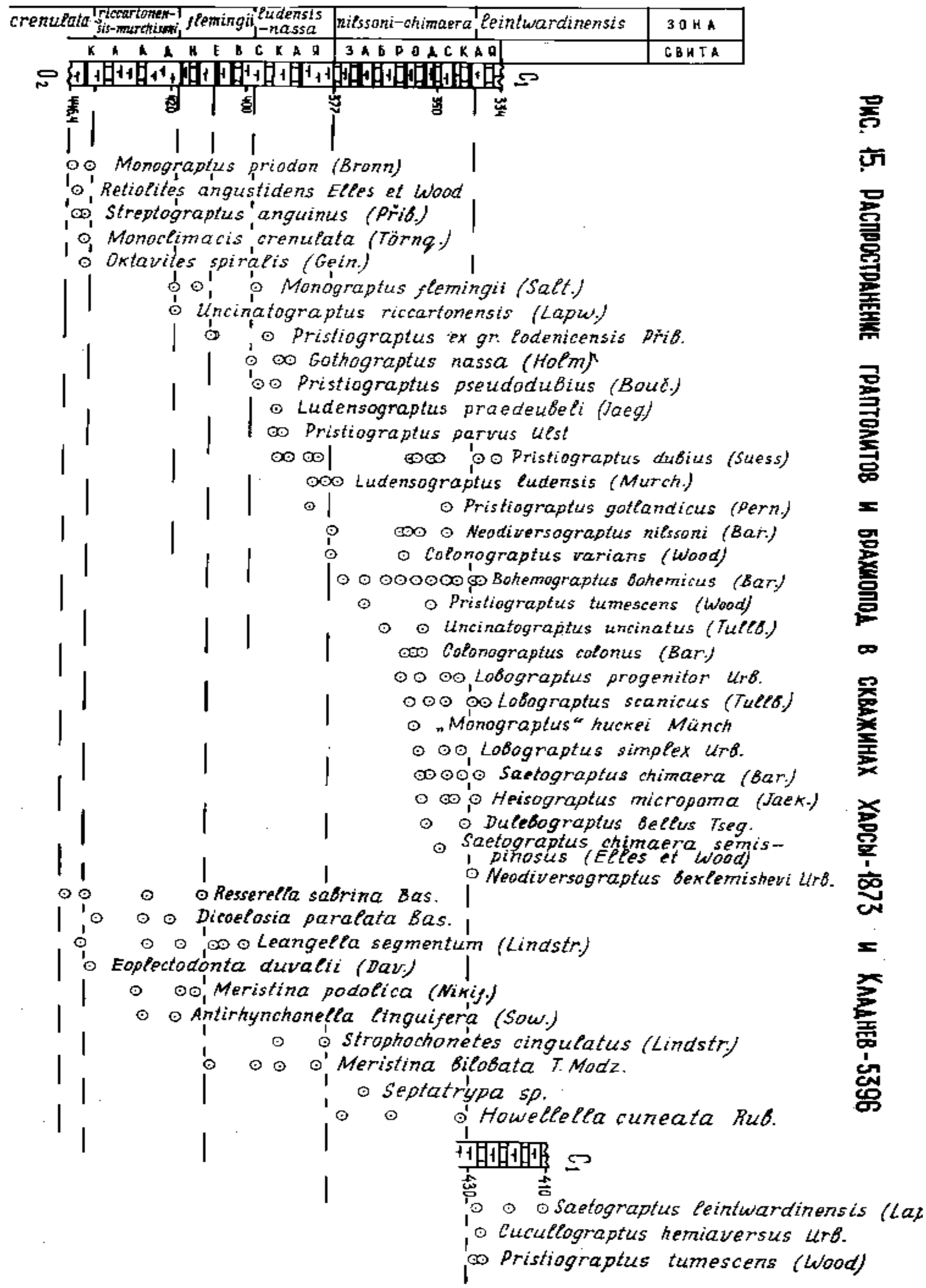

Fig. 15. Distribution of graptolites and brachiopods in the wells Kharsy-1873 and Kladnev-5396.

Рис. 16. Распространение граптолитов и брахиопод в скв. Великие Мосты – 30

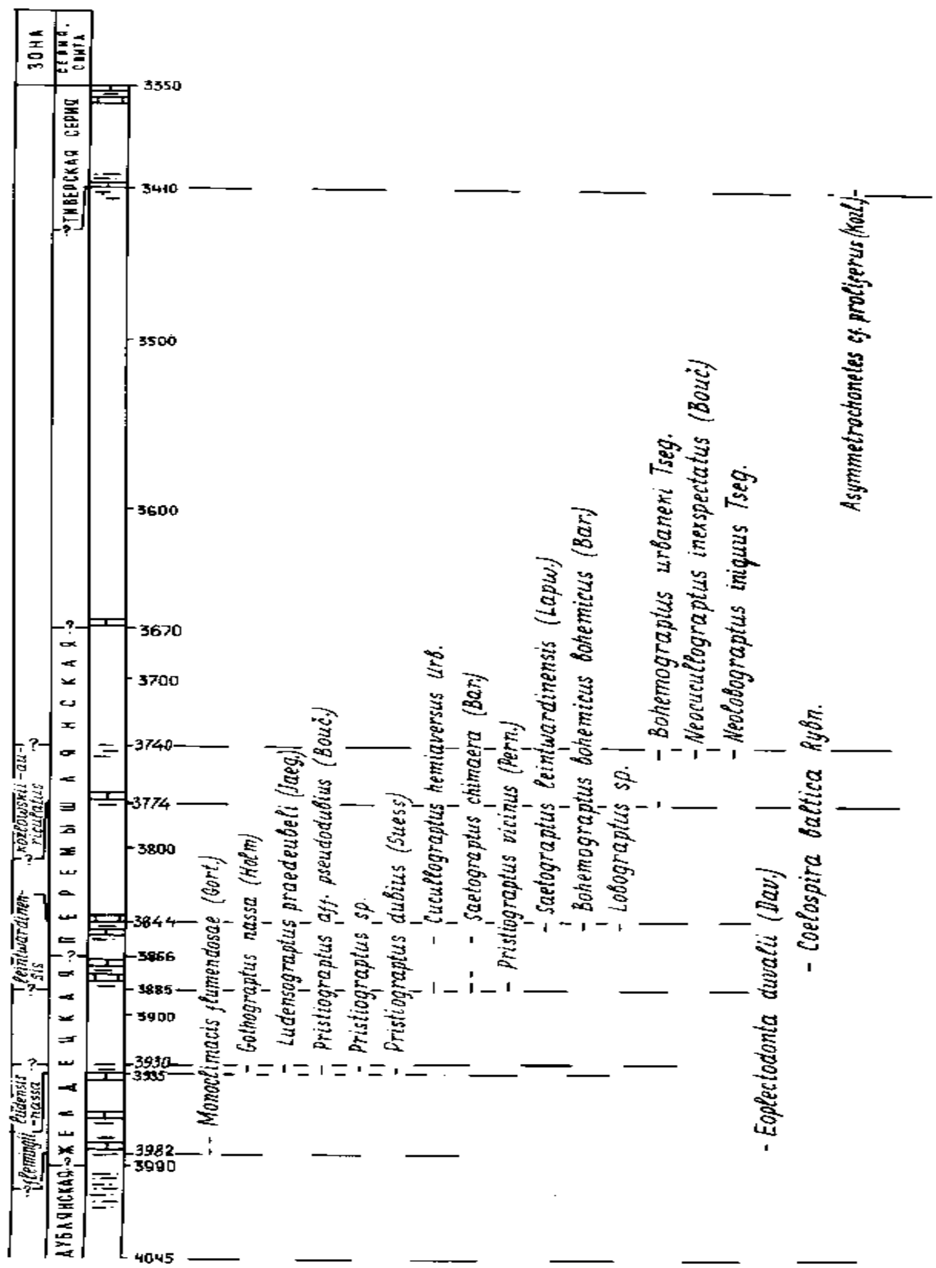

Fig.. 16. Distribution of graptolites and brachiopods in borehole Velikye Mosty (Great Bridges) - 30.

РИС. 17. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВАЖИНАХ ШИЕВ-4109, ЗАЛУЖЬЕ-27 И ПИШКА-16

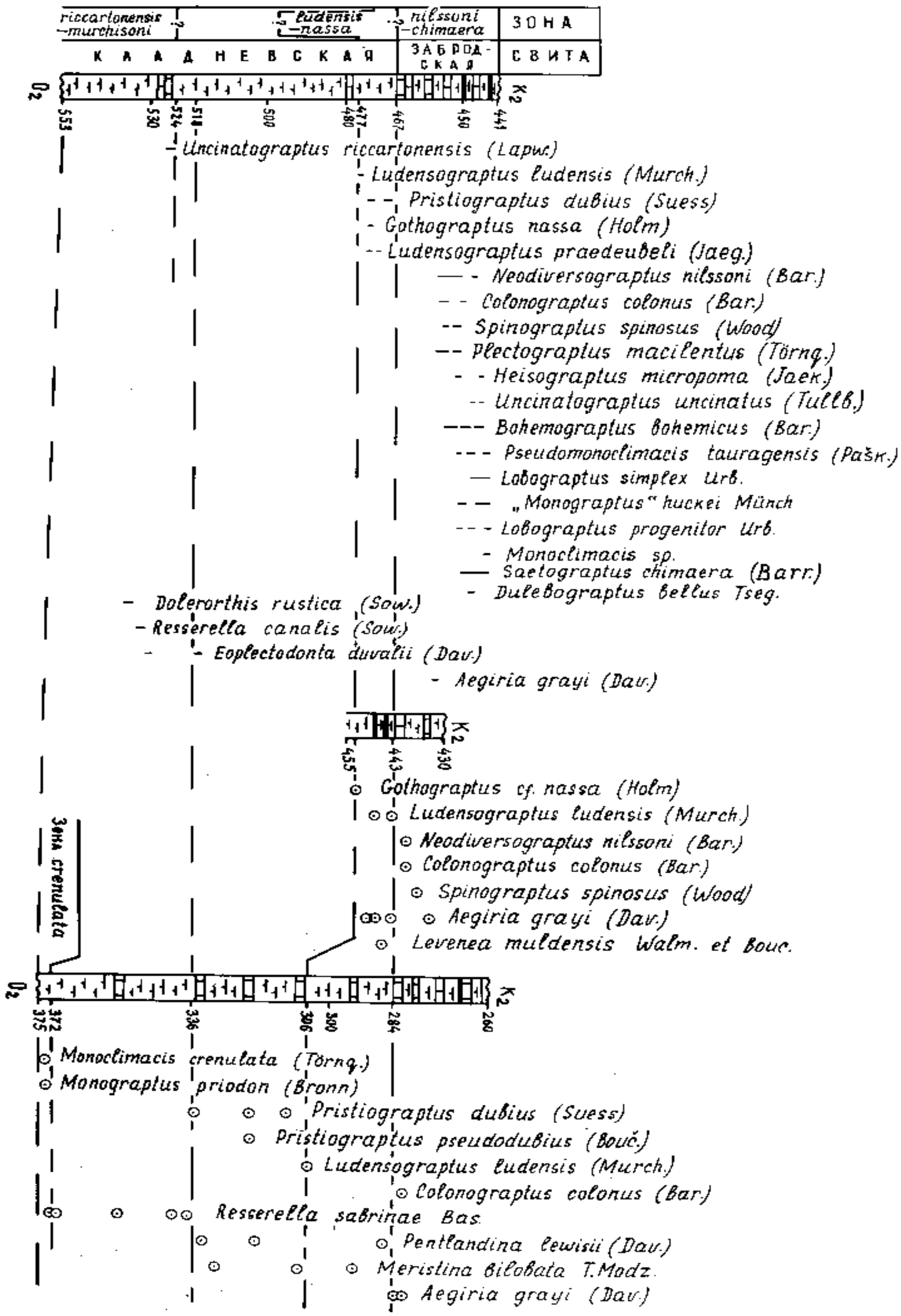

Fig. 17. Distribution of graptolites and brachiopods in wells Shiev-4109, Zaluzhye-27 and Pishka-16.

Рис. 18. Распространение граптолитов и брахиопод в скважинах Коропец-4 и Коропец-3

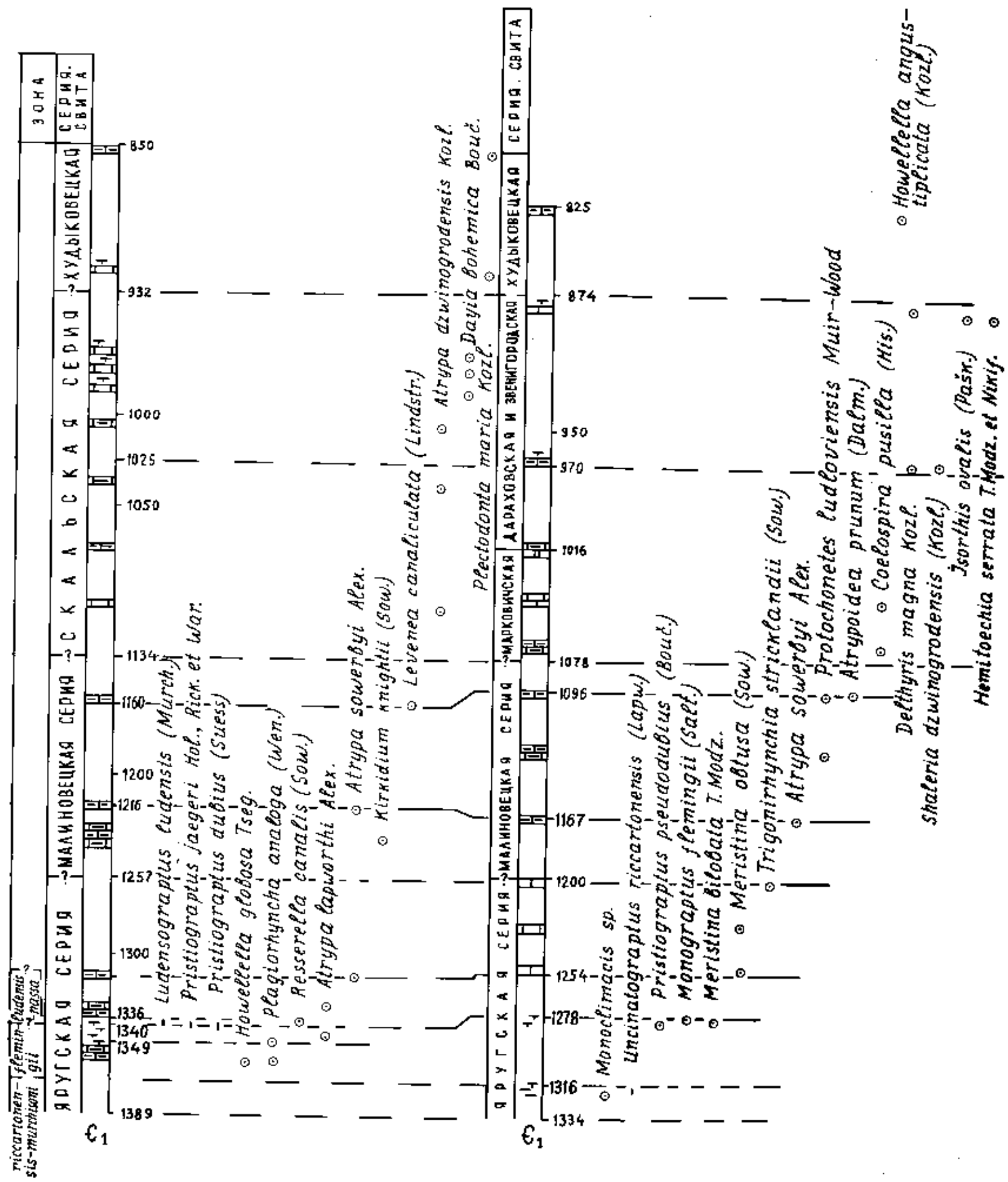

Fig. 18. Distribution of graptolites and brachiopods in boreholes Koropets-4 and Koropets-3.

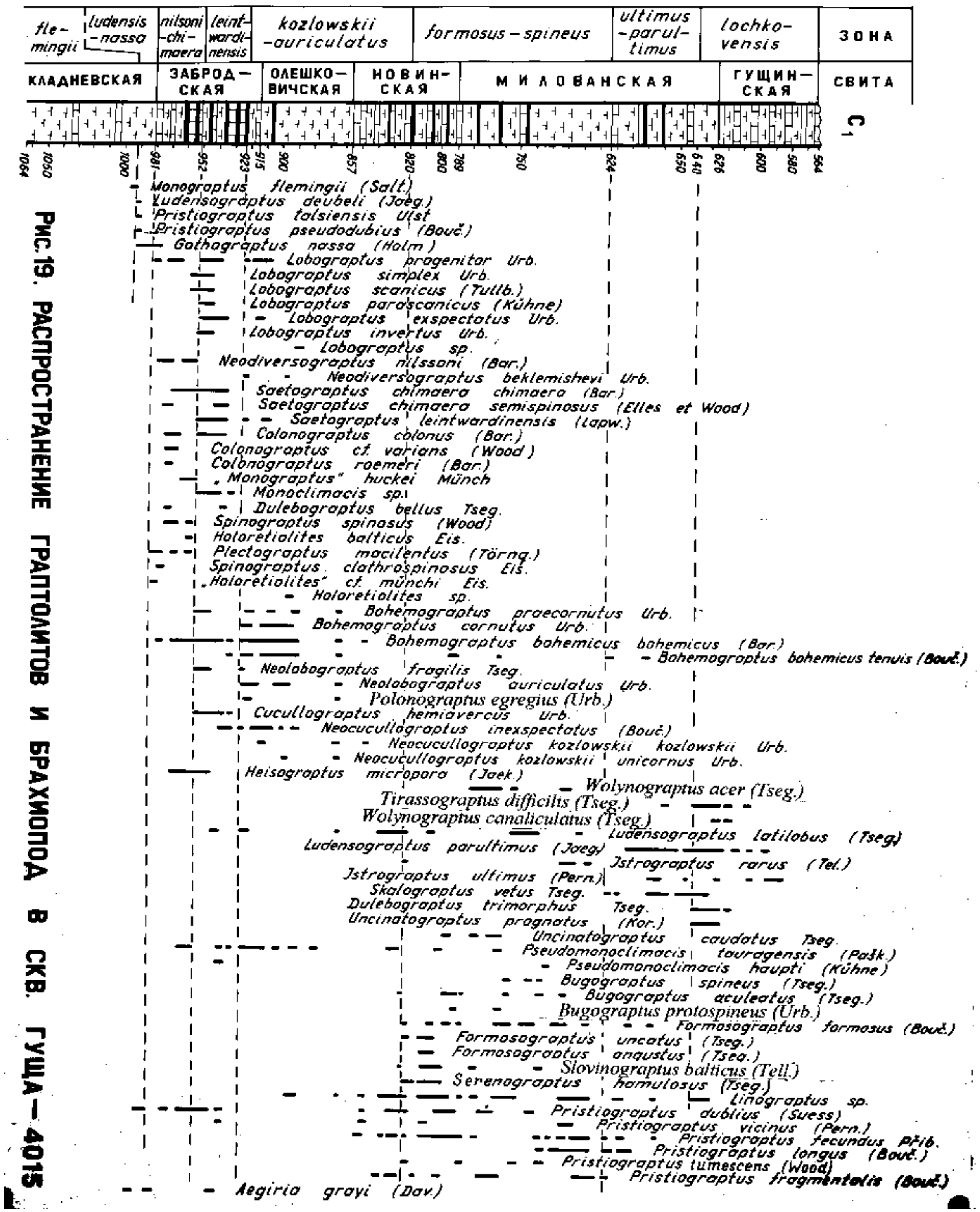

Fig.. 19. Distribution of graptolites and brachiopods in borehole Guscha-4015.

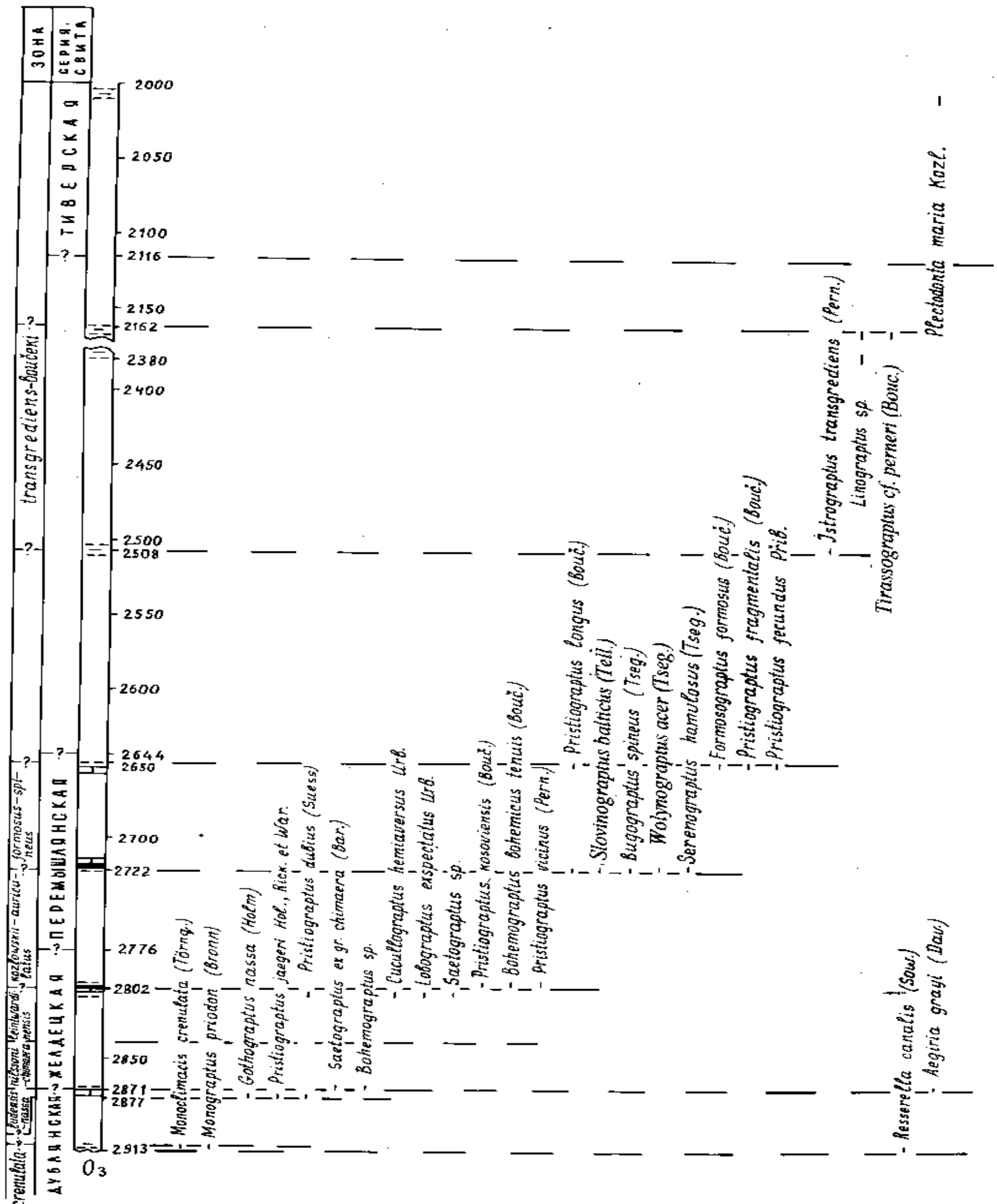

РИС. 20. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВ. ЗАГАЙПОЛЬ-1

Fig 20. Distribution of graptolites and brachiopods in the borehole. Zagaipol-1.

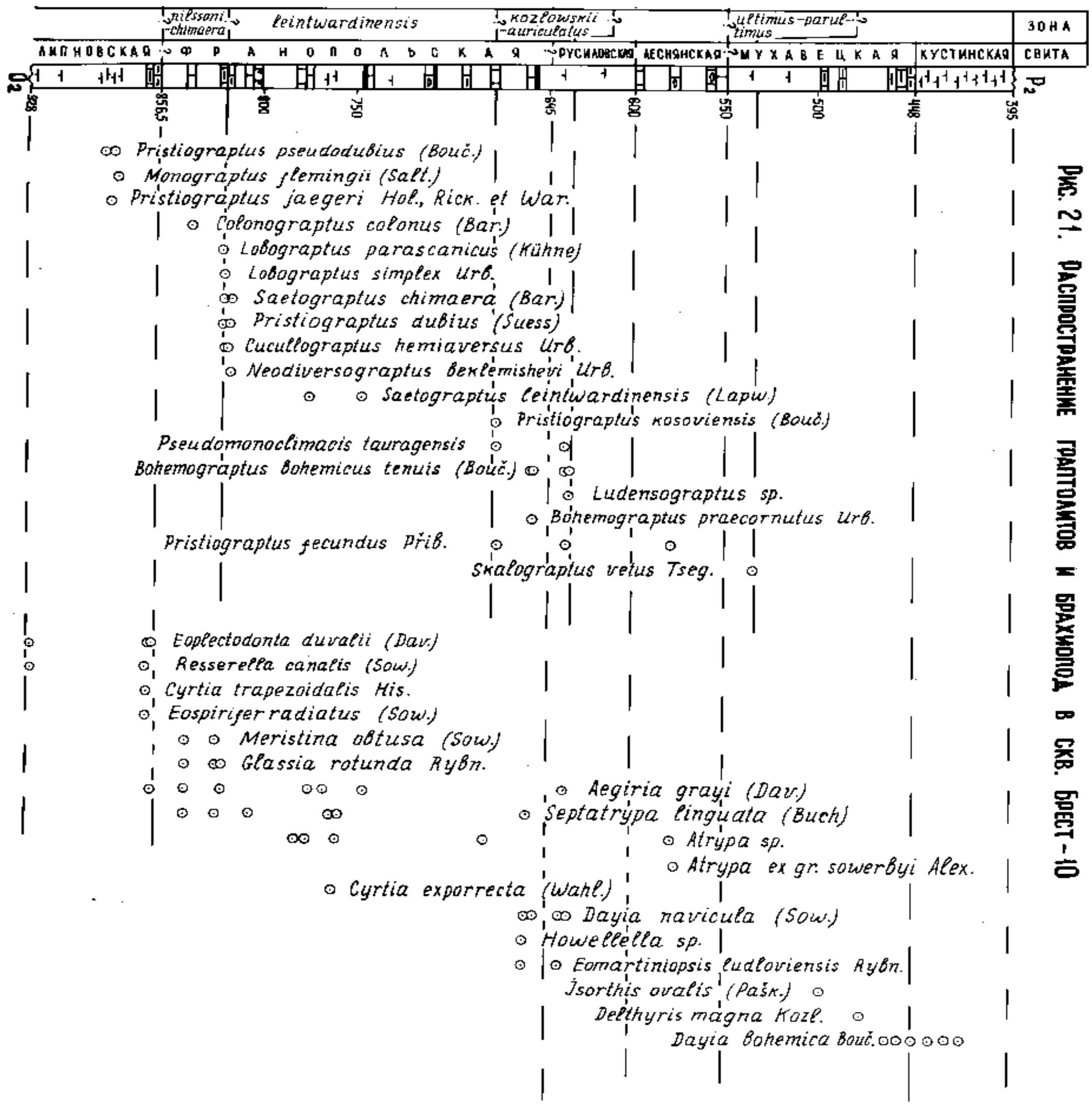

Fig. 21. Distribution of graptolites and brachiopods in borehole Brest-10.

Рис. 22. Распространение граптолитов и брахиопод в скв. Перемышляны-1

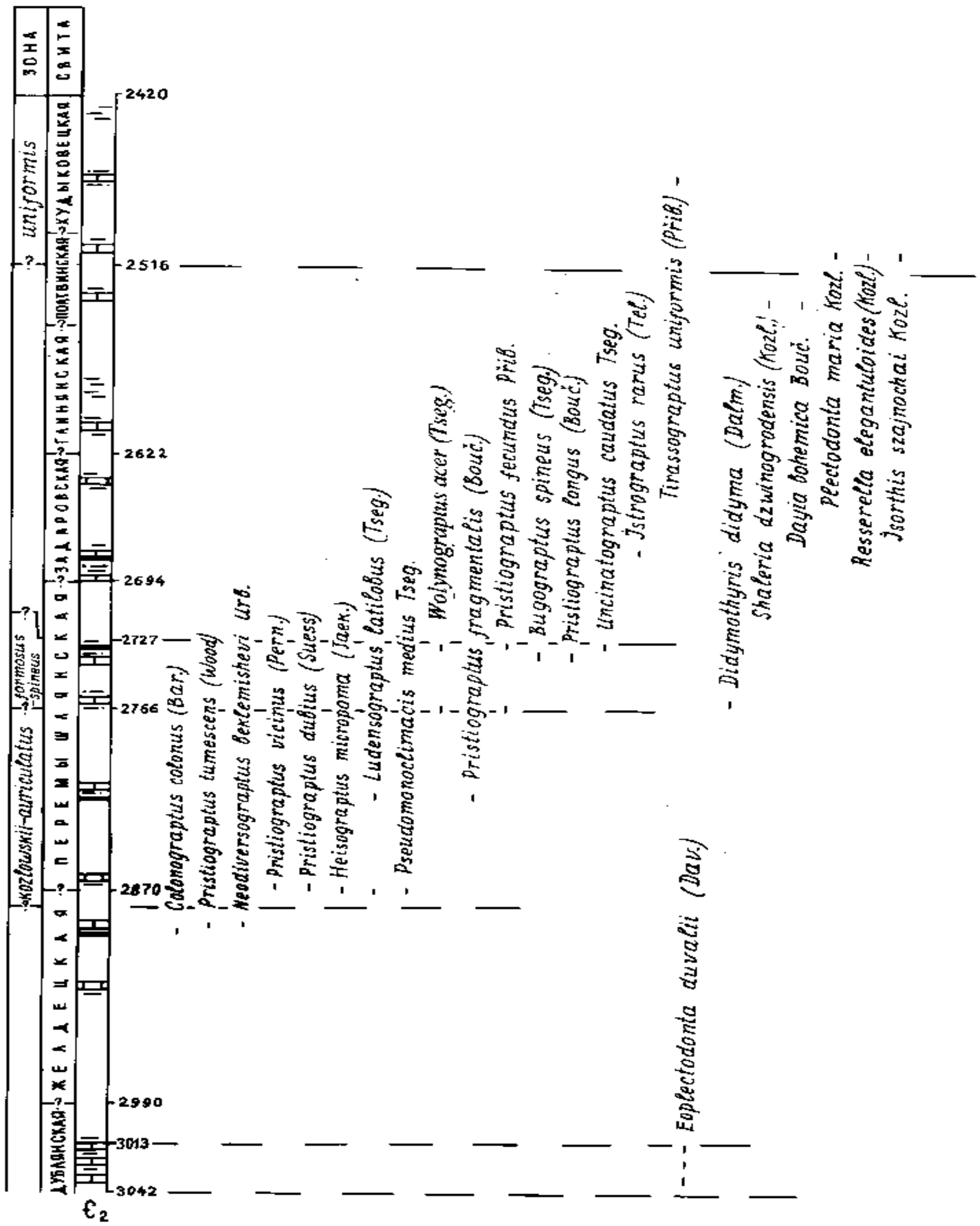

Fig. 22. Distribution of graptolites and brachiopods in borehole Peremyslyany-1.

РИС. 23. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВ. ПРИЛУКИ - 1844

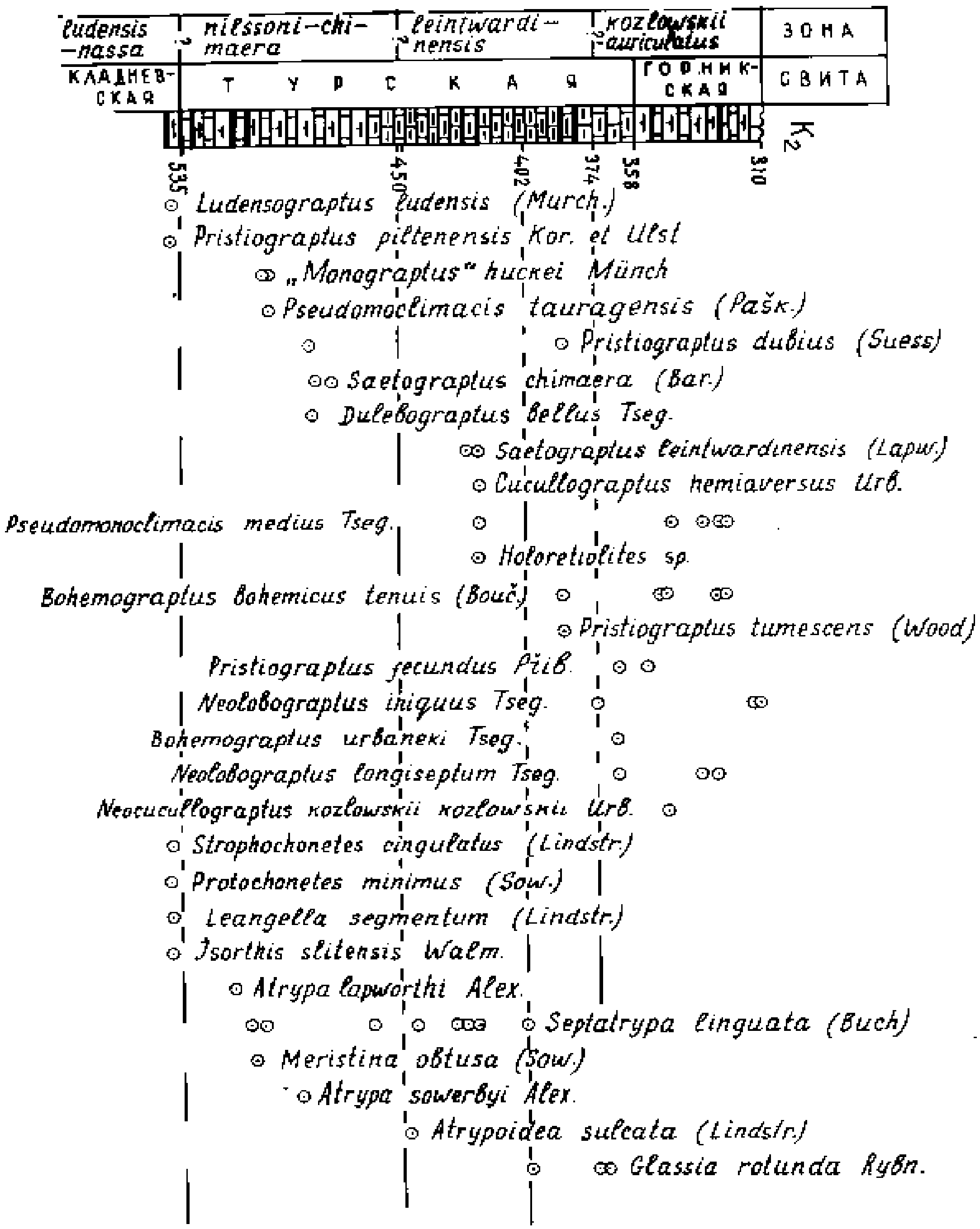

Fig. 23. Distribution of graptolites and brachiopods in borehole Priluki-1844.

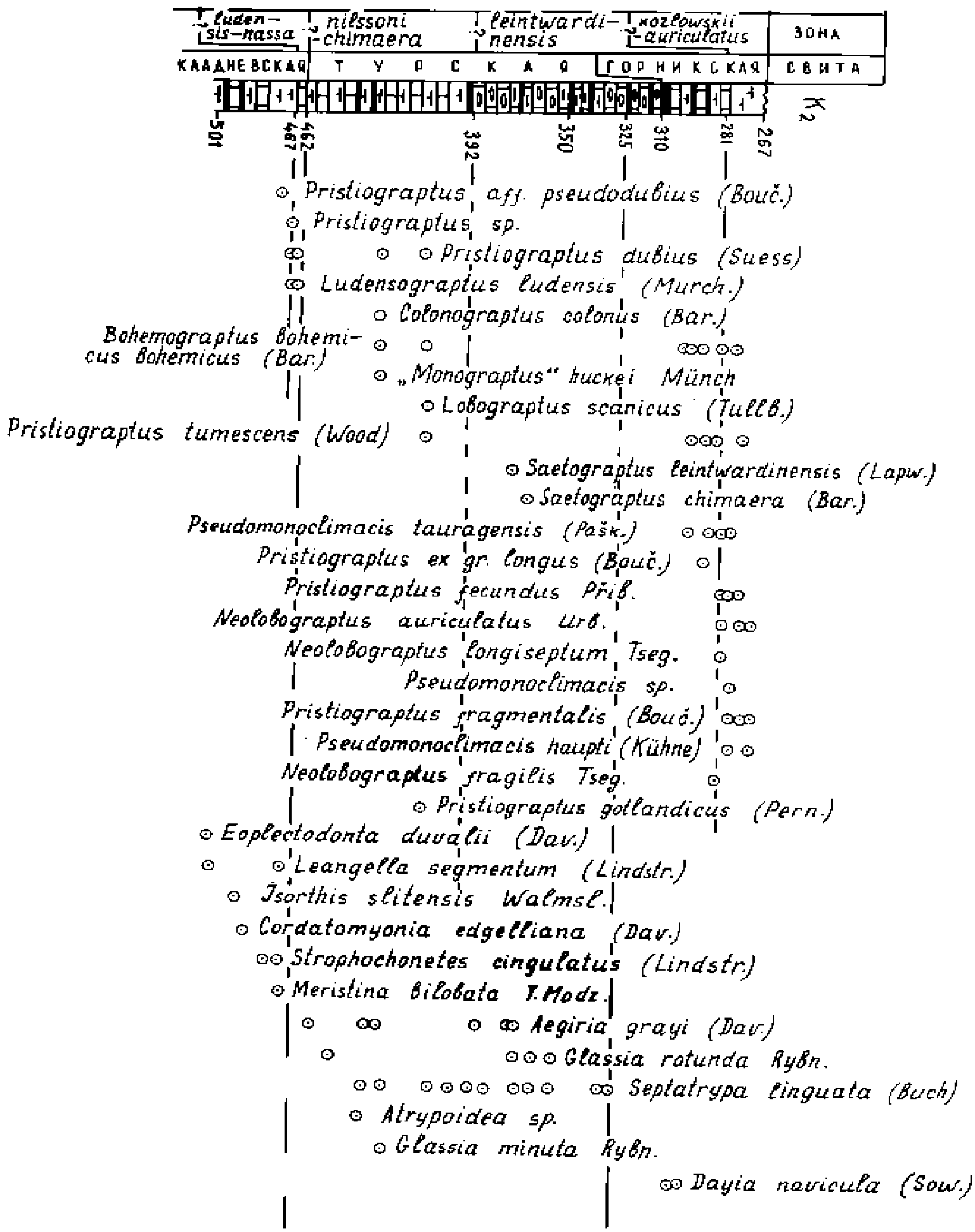

Рис. 24. Распространение граптолитов и брахиопод в скв. Самойличи-1859

Fig. 24. Distribution of graptolites and brachiopods in borehole Samoilichi-1859.

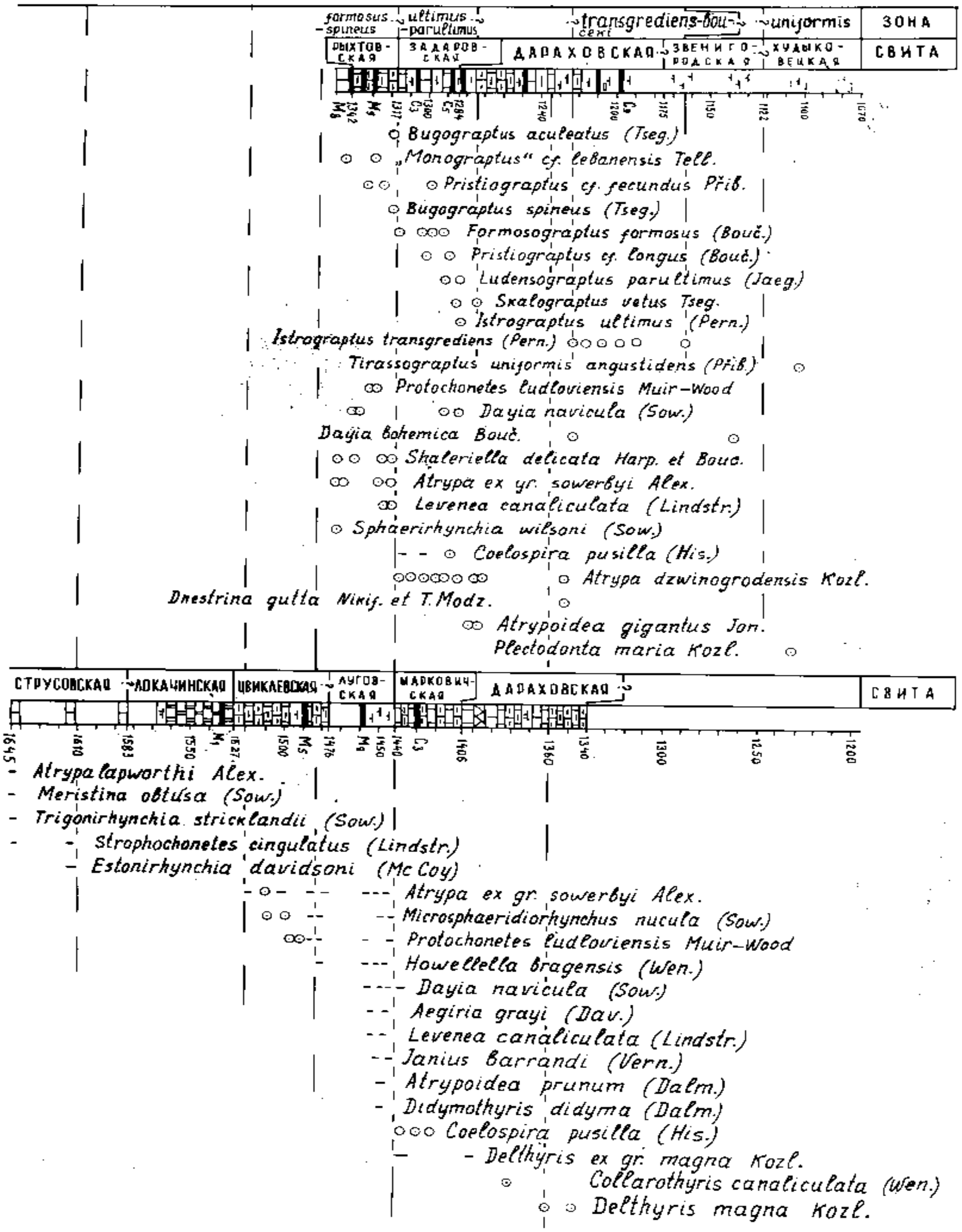

Рис.25. Распространение граптолитов и брахиопод в скважинах Заводовка-6 и Локачи-14

Fig. 25. Distribution of graptolites and brachiopods in the boreholes Zavadovka-6 and Lokachi - 14

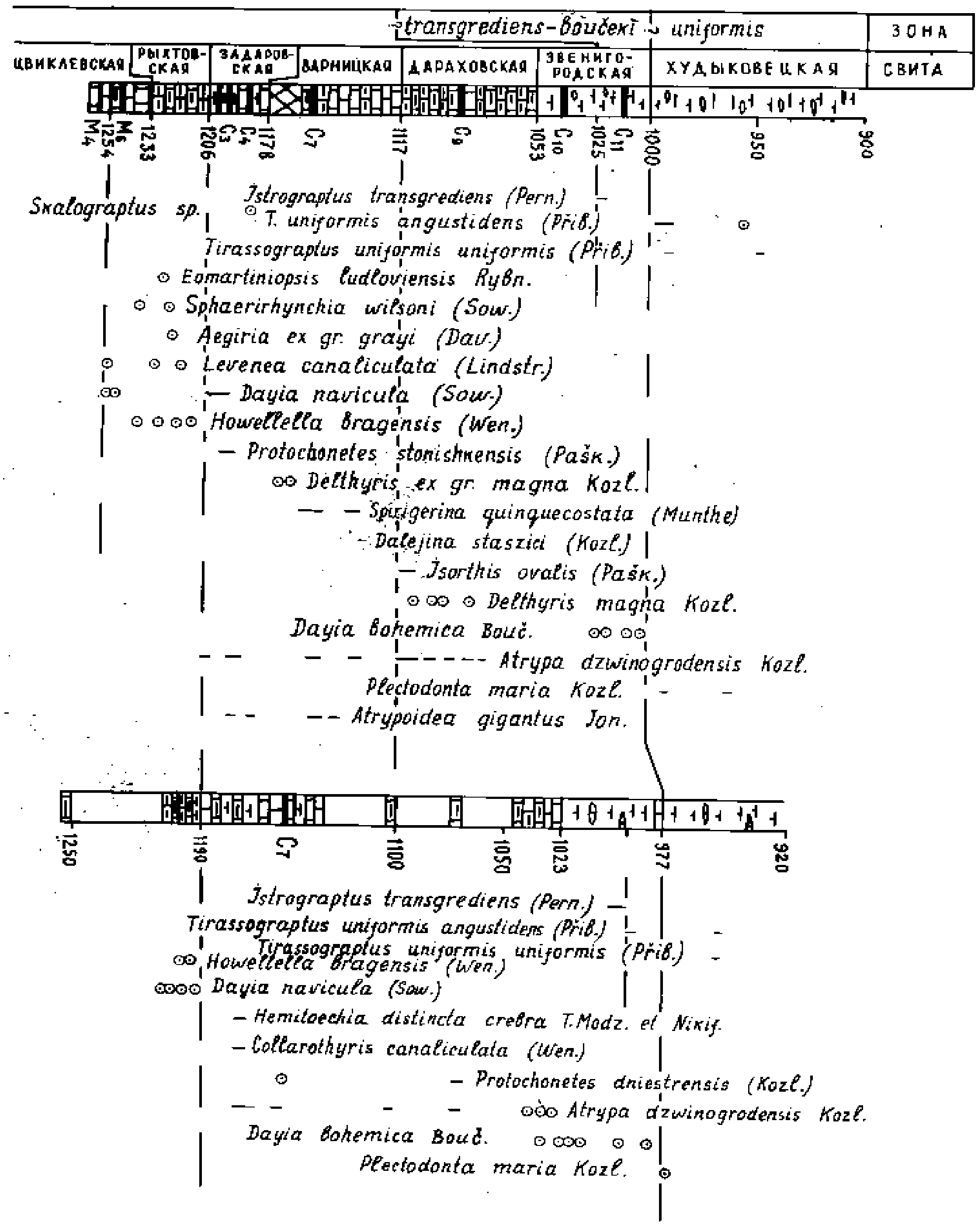

РИС. 26. РАСПРОСТРАНЕНИЕ ГРАПТОЛИТОВ И БРАХИОПОД В СКВАЖИНАХ ПОДГАЙЦЫ-1 И ПОДГАЙЦЫ-2

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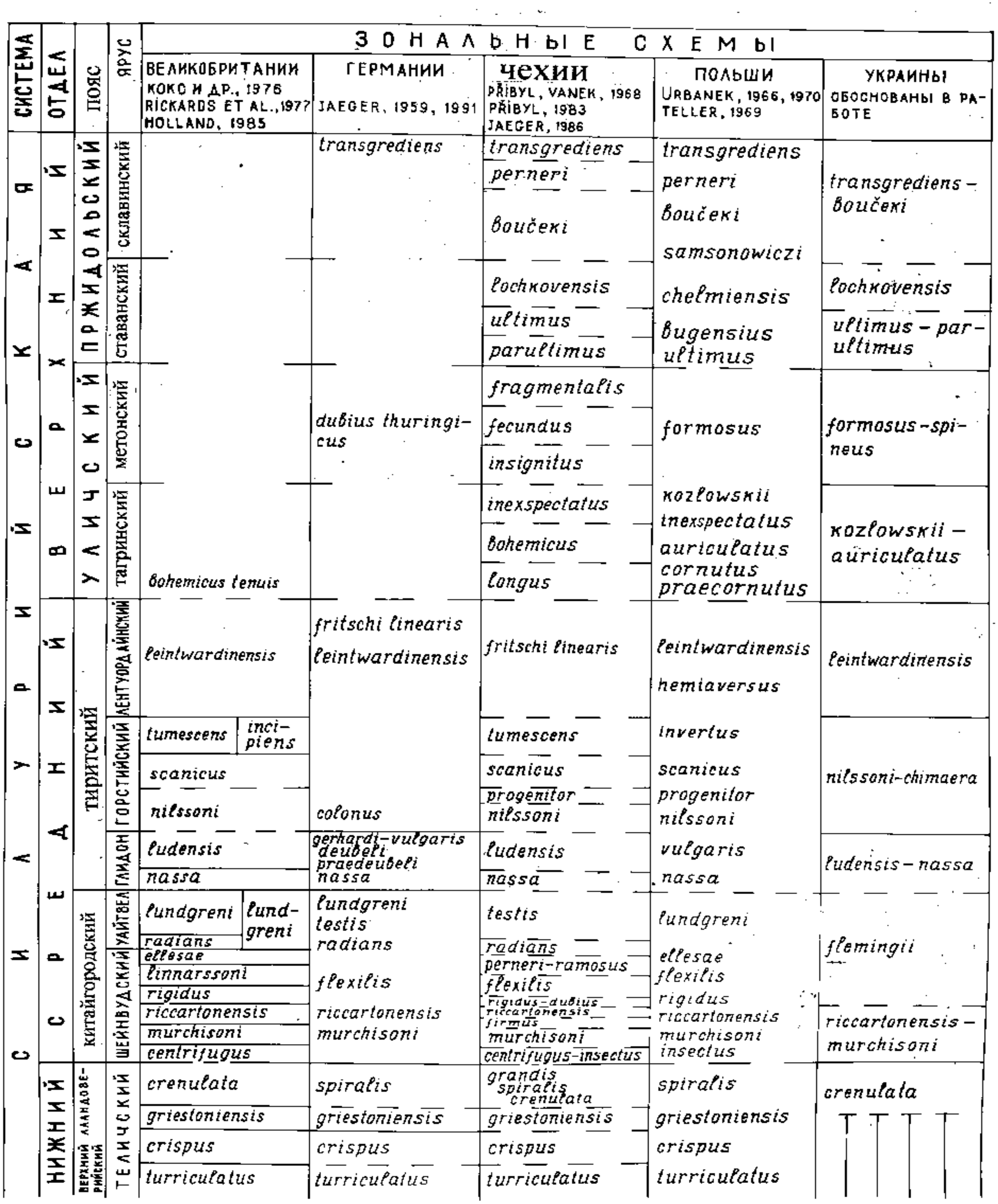

Fig. 27. Comparison of schemes of zonal subdivision of Silian deposits according to graptolites.

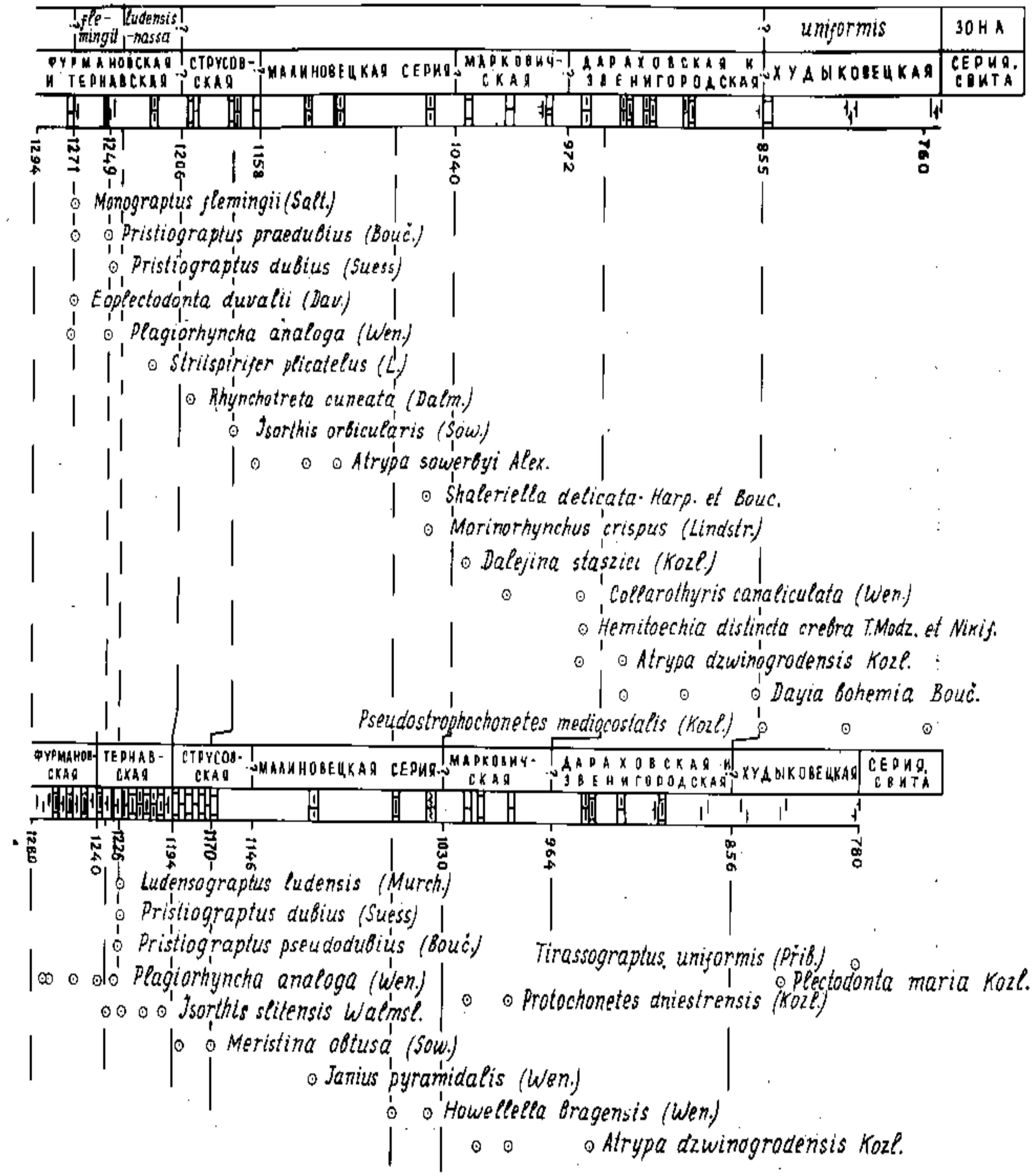

Рис. 28. Распространение граптолитов и брахиопод в скважинах Коропец-1 и Коропец-2

Fig. 28. Распространение граптолитов и брахиопод в скважинах Коропец-1 и Коропец-2.

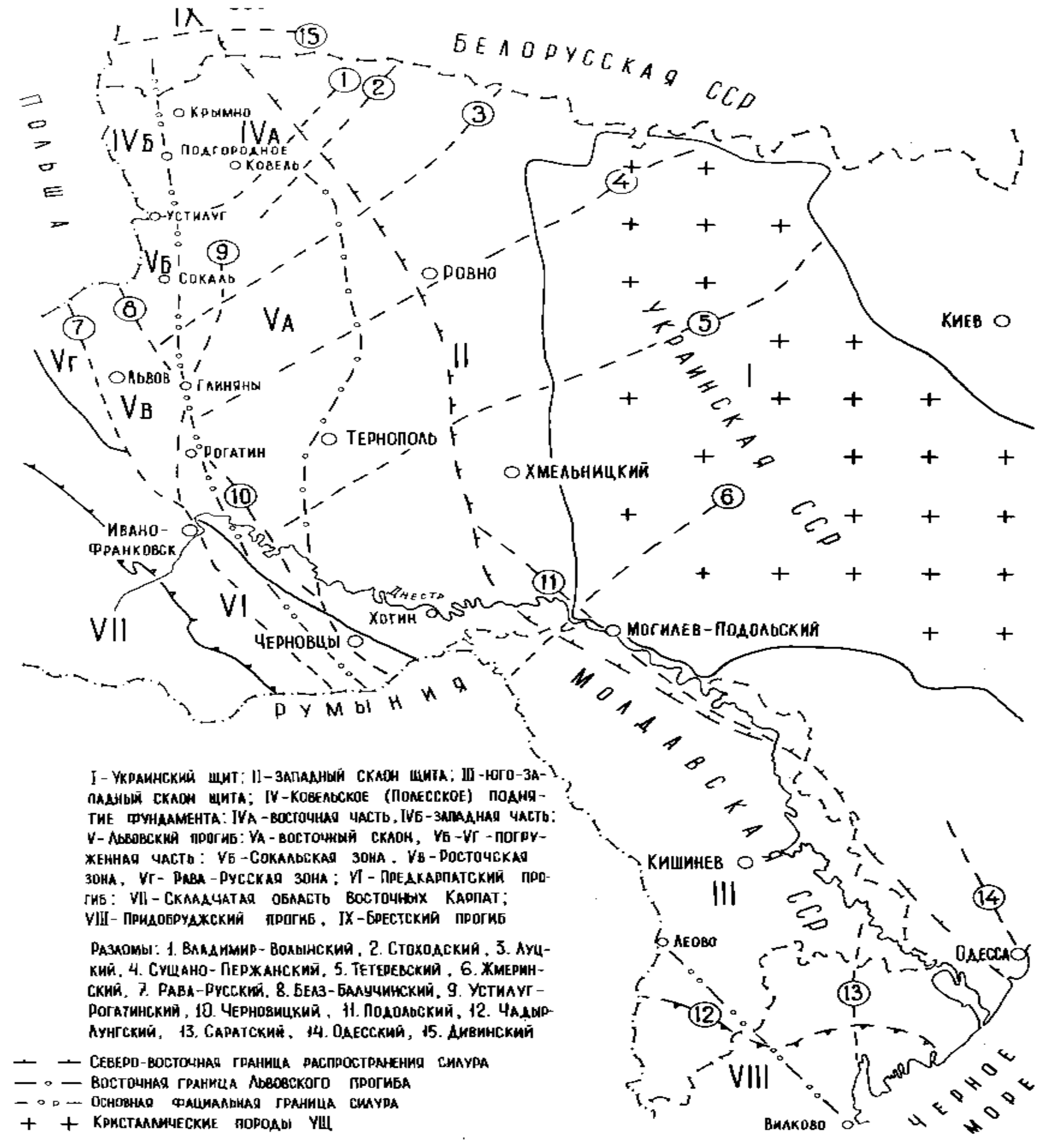

Fig. 29. Structural-tectonic plan of the territory of the Silurian and Early Devonian sedimentation

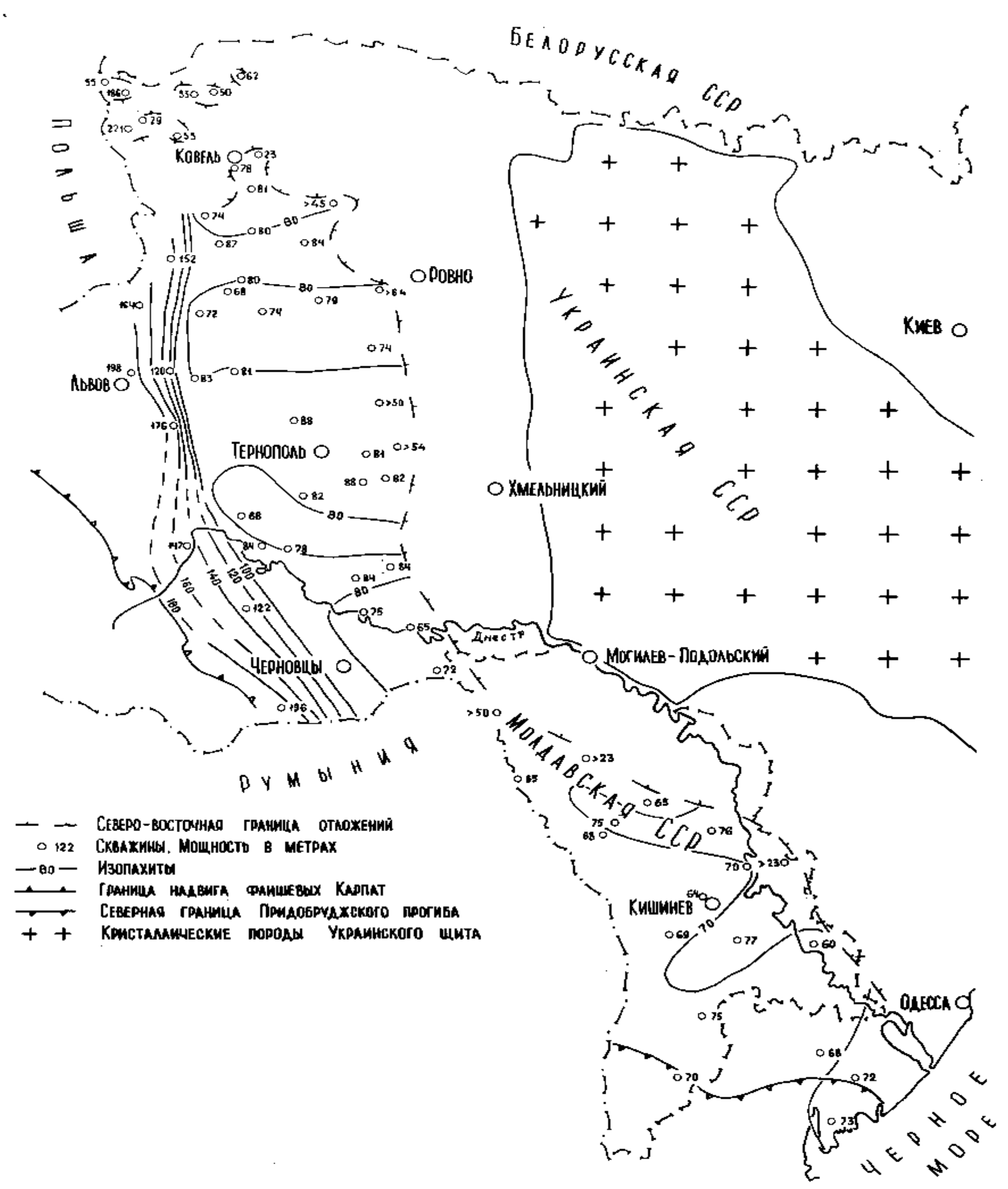

Fig. 30. Distribution of thicknesses of the Ulichian belt deposits in the southwest of the East European platform.

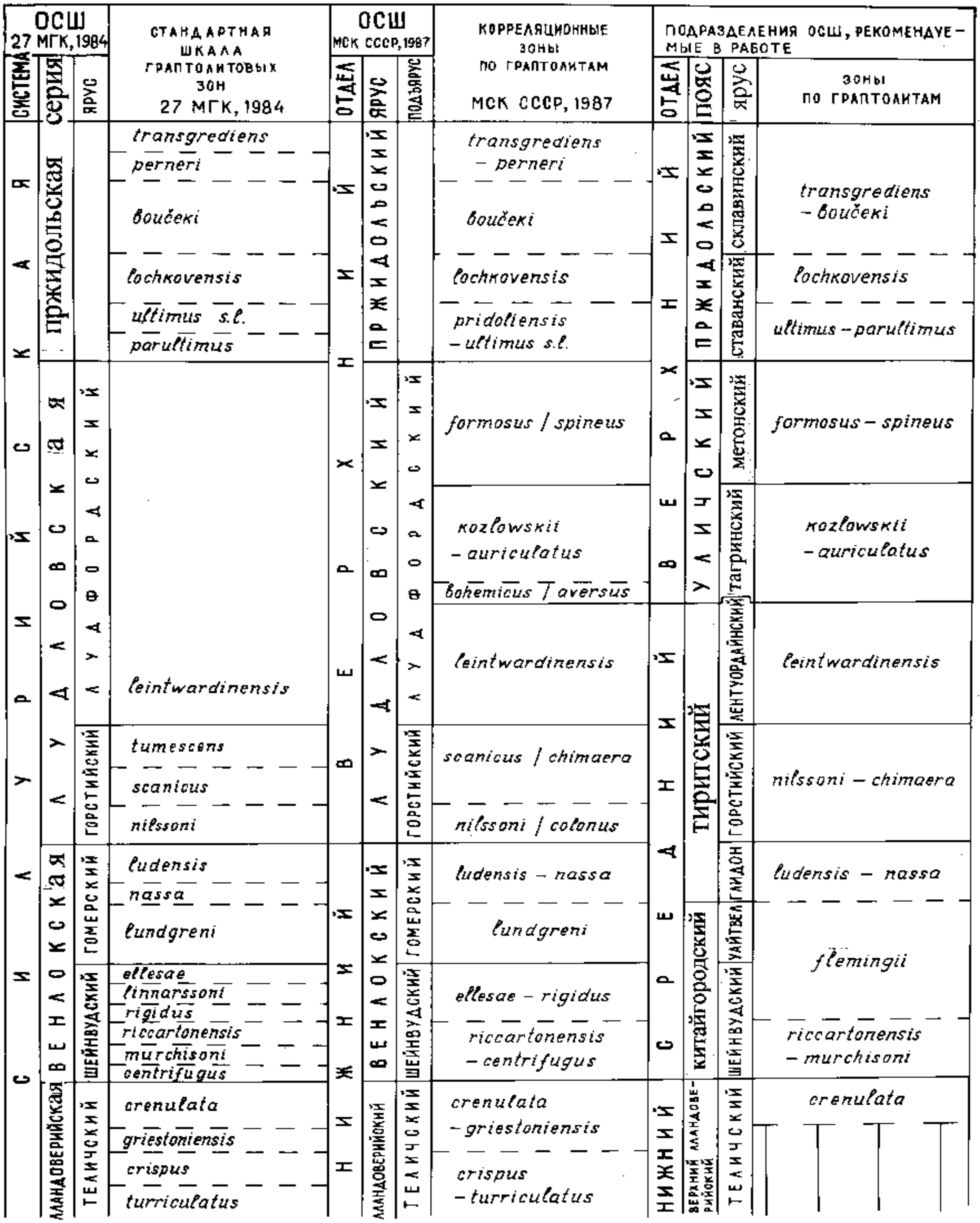

Fig. 31. Comparison of ideas about the International Stratigraphic Scale of the Silurian

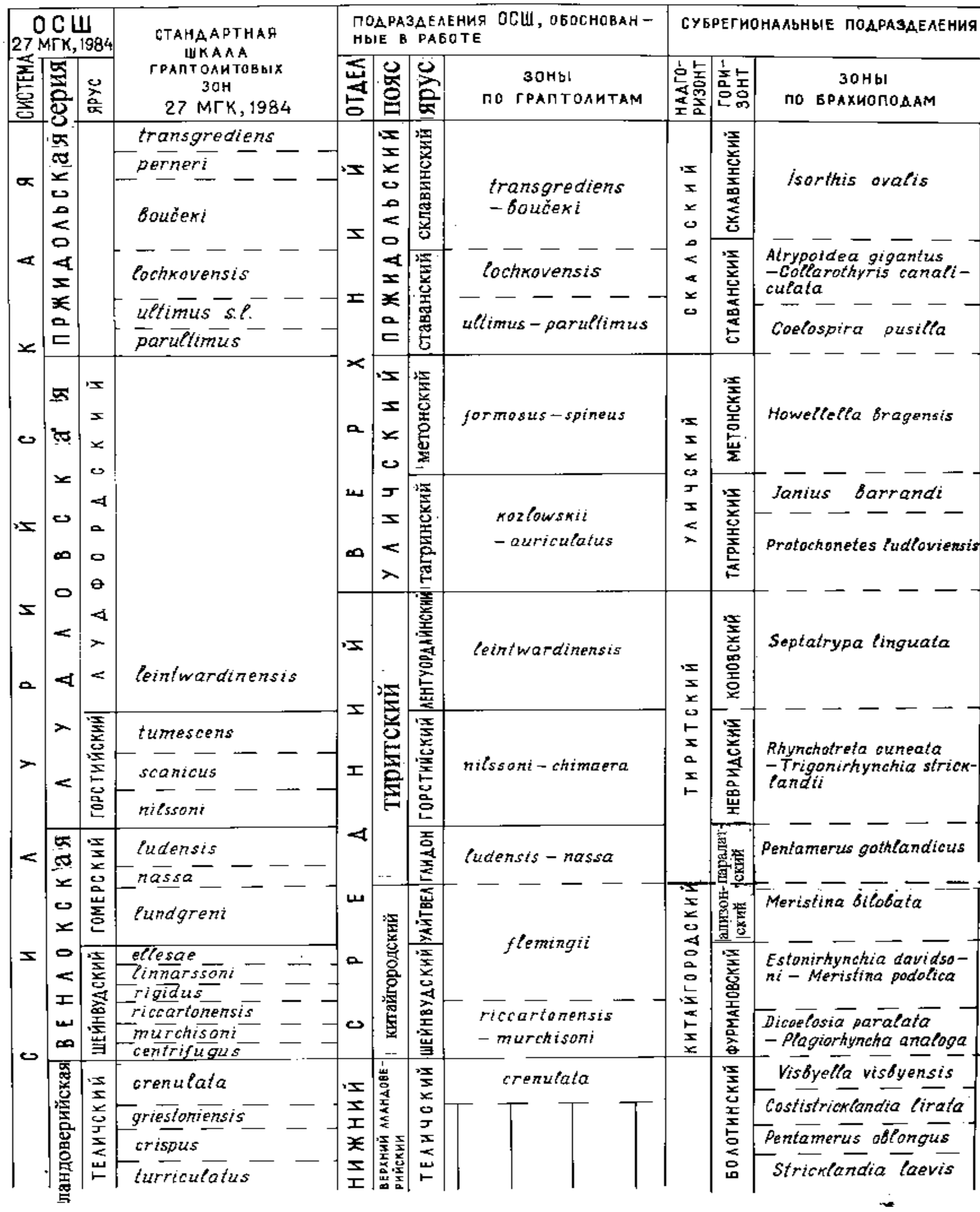

Fig. 32-1. Correlation of local stratigraphic schemes of the Silurian in the southwest of the EEP.

Рис. 3 ПРОДОЛЖЕНИЕ

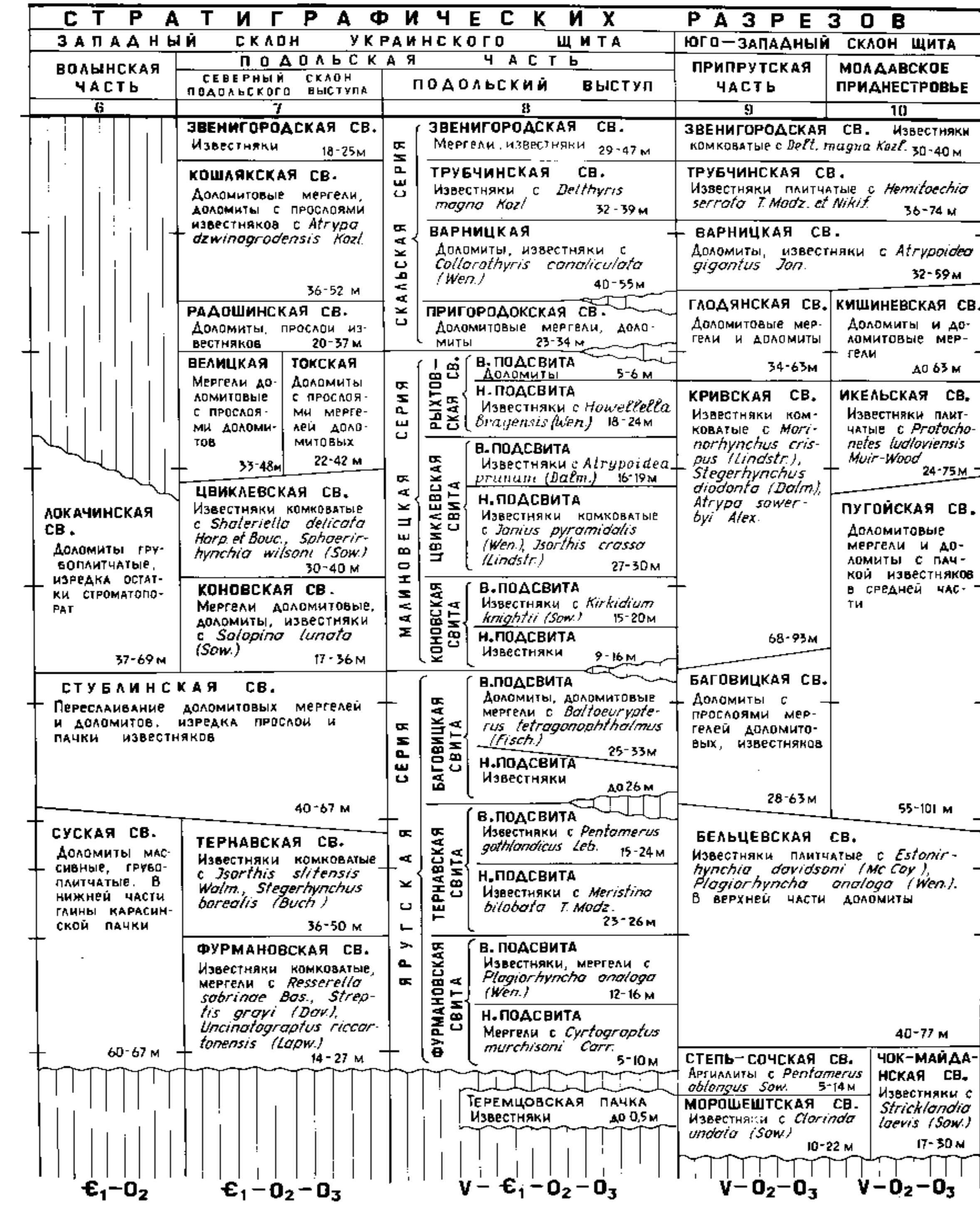

Fig. 32-2. Continued: Correlation of local stratigraphic schemes of the EEP Silurian.

Рис. 3 ПРОДОЛЖЕНИЕ

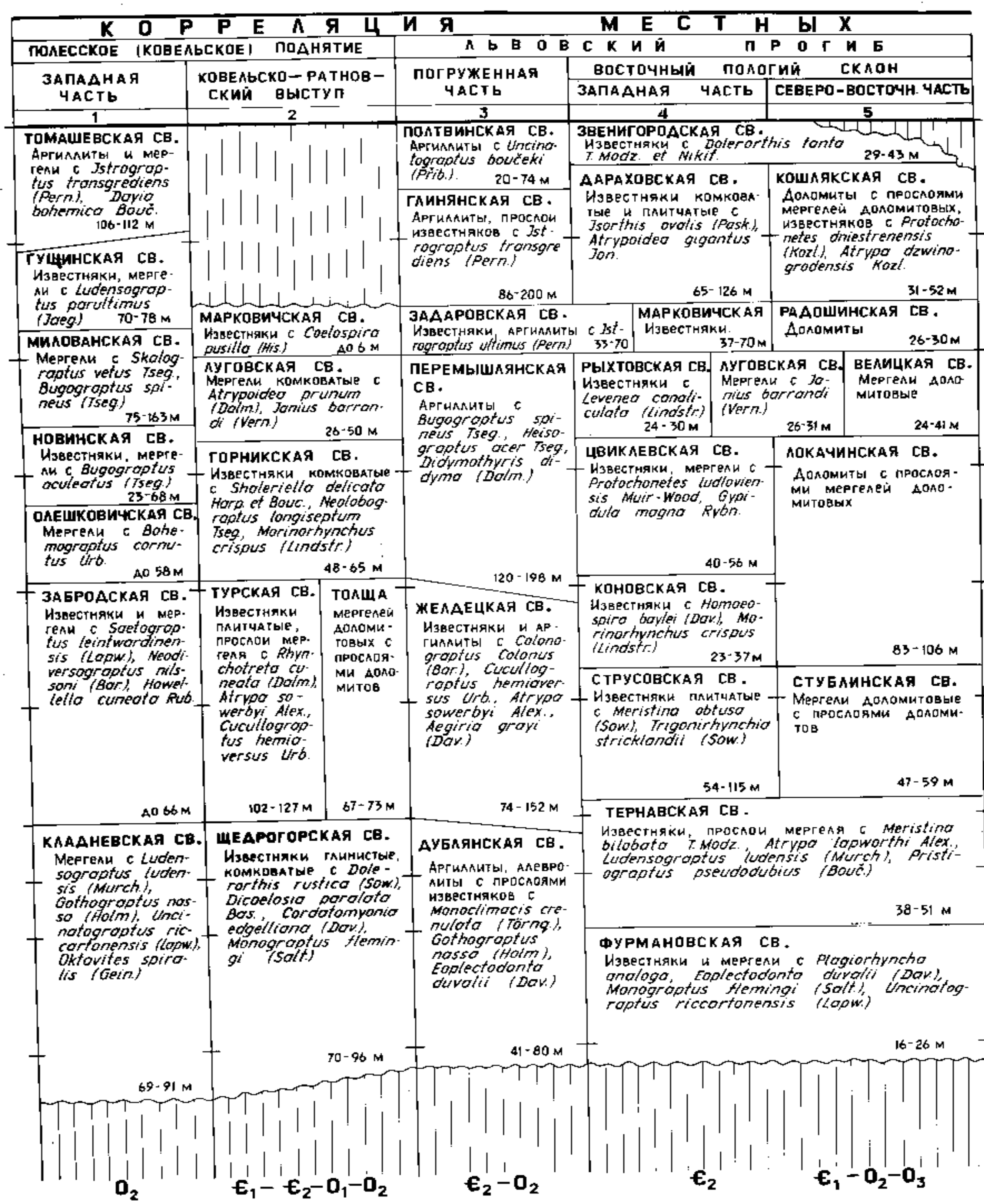

Fig. 32-3. Continued: Correlation of local stratigraphic schemes of the EEP Silurian.

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