INTERNATIONAL UNION
OF GEOLOGICAL SCIENCES

PUBLICATION NO. 25

THE CAMBRIAN SYSTEM ON THE EAST EUROPEAN PLATFORM

Correlation Chart and Explanatory Notes
by

Kaisa Mens
Institute of Geology of the Academy of Sciences
Estonian SSR, Tallinn

Jan Bergström
Geological Survey of Sweden, Lund

Kazimiera Lendzion
Geological Institute, Warsaw

Sponsored by the International Commission on Stratigraphy
Subcommission on Cambrian Stratigraphy,
Cambrian Correlations Working Group

Editors: J. H. Shergold
A. Yu. Rozanov
A. R. Palmer

June 1, 1990

International Union of Geological Sciences

The International Union of Geological Sciences (IUGS) was established in 1961 to promote and encourage the study of geological problems, especially those of world-wide significance. With a current membership of 96 countries, it is now one of the world's largest and most active nongovernmental scientific organizations. IUGS supports and facilitates international cooperation in the geological sciences and is the scientific sponsor of the quadrennial International Geological Congress. With UNESCO, it sponsors the International Geological Correlation Program, and it is a co-sponsor, with the International Union of Geodesy and Geophysics, of the International Lithosphere Program.

International Commission on Stratigraphy

International Subcommission on Cambrian Stratigraphy

FOREWORD

This correlation chart and explanatory notes is the fourth in a continuing series on the Cambrian System throughout the world.

The monograph reviews the stratigraphy and correlation of virtually all Cambrian units recognized on the East European Platform. A great deal of information has been accumulated for this correlation chart, which we hope will be of significant value to all workers on the Cambrian.

ISBN 0-930423-14-3

This publication is available from IUGS, P.O. Box 919, Herndon, VA 22070 (USA) and from the IUGS Secretariat, Geological Survey of Norway, P.O. Box 3006, N-7001 Trondheim, Norway.

THE CAMBRIAN SYSTEM ON THE EAST EUROPEAN PLATFORM

Correlation Chart and Explanatory Notes

by

Kaisa Mens
Institute of Geology of the Academy of Sciences
of the Estonian SSR, Tallinn

Jan Bergström
Geological Survey of Sweden, Lund

Kazimiera Lendzion
Geological Institute, Warsaw

Contents

Abstract

Cambrian lithostratigraphical units of the East European Platform are listed alphabetically. The present-day distribution area of Cambrian deposits is subdivided into 24 areas (columns on the correlation chart) having similar geological structure and the same stratigraphical nomenclature.

Correlation tables are correlated with the trilobite zonation of Scandinavia, as well as with the regional stages, established mainly according to the succession of acritarch assemblages.

PREFACE*

The present volume is one of the continuing series of regional summaries and correlation charts prepared by the Cambrian Correlation Working Group headed by J.H. Shergold, which operates within the framework of the IUGS Subcommission on Cambrian Stratigraphy.

This paper is not the first attempt at international cooperation to generalize the Cambrian stratigraphical materials of the East European Platform. Three monographs have been published within the framework of joint Polish-Soviet Research Programme on the Precambrian-Cambrian Boundary (IGCP Project No. 29). The first published results of the IGCP Project No. 86 "East European Platform" (south-west border) are also available. Authors of the present review have to some extent participated in both of these projects.

During the last decade new stratigraphical schemes have been compiled for Cambrian deposits in several countries situated on the Platform, among them a unified stratigraphical scheme for the Soviet part of the Platform.

All the above data, as well as abundant materials collected during a long period by numerous geologists working on the Cambrian stratigraphy of the Platform, have served as a basis for the present correlation chart and the first part of the monograph which gives a survey of Cambrian stratigraphy. Acritarch distributions and their assemblages in the Middle and Upper Cambrian sections are based on the data of N. Volkova from the Geological Institute of the USSR Academy of Sciences, the major part of which is still in press.

Descriptions of stratigraphical units constituting the second part of the present work, have been compiled for Sweden by J. Bergström, for Poland by K. Lendzion, and for the Soviet territory by K. Mens. In the last case, data have been revised and necessarily supplemented by P. Bukatchuk (Moldavia), Y. Dmitrovskaya (Kalinin, Yaroslavl', Vladimir, Kostroma and Moscow Regions), V. Goryansky (Leningrad and Pskov Regions), T. Jankauskas (Lithuania), V. Kirjanov (Ukraine) and L. Piskun (Byelorussia).

Only the most characteristic fossils are given in the descriptions of lithostratigraphical units. References are made to publications containing more complete lists.

In the present publication the stratigraphical terms differ somewhat from those used in the Soviet geological literature (see references): horizon is defined here as a regional stage, series as a group and suite as a formation. Groups and regional stages are not recognized in Scandinavia.

INTRODUCTION

Cambrian deposits are widely distributed on the East European Platform, especially in its western and central parts. On the surface they are exposed along the Baltic-Ladoga clint areas, and in the form of small isolated patches in the Oslo graben, in south and central Sweden, in the basin of the Dniestr River and along the northwestern border of the Platform, in the last case often allochthonous. In the major part of the present-day distribution area, Cambrian deposits are overlain by younger strata and have been studied by means of numerous boreholes. Thickness varies greatly reaching maxima (over 900 m) in the southwestern part of the Platform (Lvov-Lublin Slope) and in the Moscow Syneclise (about 500 m).

The Cambrian strata are lithologically variable, reflecting diversity of facies. Of the widest distribution are terrigenous formations, mostly represented by arenaceous and argillaceous rocks. Carbonate rocks and kerogen-bearing argillites are rare, and their role is noted only in the upper part of the Cambrian section in the northwestern part of the Platform.

Fossils are rather diverse: they are represented by sabelliditids, hyoliths, platysolenitids, hyolithelminthids, gastropods, *Mobergella, Volborthella*, agglutinated foraminiferids, inarticulate brachiopods, trilobites and other arthropods, conodonts, acritarchs and algae. There are also recorded numerous ichnites (see Martinsson, 1974; Lendzion, 1983; Palij et al. 1979). Due to different environments of deposition, the number of fossils and state of preservation varies greatly throughout the stratigraphic section, and also laterally. Trilobites and acritarchs, and for the upper part also conodonts, have been used most widely for biostratigraphical subdivision of the Cambrian sections of the Platform.

The stratigraphical completeness of the Cambrian section also varies greatly. The most widely distributed and the thickest are the deposits of the Lower Cambrian, less developed are the Middle Cambrian, and even more restricted are the Upper Cambrian formations.

RESEARCH HISTORY

Cambrian deposits of the East European Platform have been studied by a number of authors of different generations, and the history of geological studies can be divided into two periods.

The first period, covering the years up to the middle of the 20th century, is mainly characterized by the investigation of Cambrian deposits in the northwestern part of the Platform (Oslo graben, Sweden, Estonia, Leningrad District).

The first publications dealing with deposits now treated as Cambrian appeared at the end of the 18th century (Kalm, 1746; Linnaeus, 1745-1759; Fisher, 1781, etc.). On the whole, up to the middle of the 19th century, exploration was of a sporadic character and confined to the subdivision of sections by lithological characteristics. Of fossils, only some trilobites and inarticulate brachiopods were described, by C. Linnaeus, G. Wahlenberg, J.W. Dalman, E. Eichwald and others.

Systematic geological investigations, including the stratigraphy and palaeontology of Cambrian deposits, started in the middle of the last century and were connected with such names as N.P. Angelin, W.C. Brøgger, J.G. Linnarsson, J. Chr. Moberg, A.G. Nathorst,

S.A. Tullberg and F. Schmidt. By the end of the 19th century, the above mentioned, and many other well-known scientists of this time, had worked out rather detailed stratigraphical schemes for the Cambrian deposits of the outcrop areas: their depositional history and lithology were described, and also numerous fossils were characterized.

In the first half of the present century, these stratigraphical schemes were detailed and modified by B. Asatkin, J. Kiaer, L. Rukhin, A. Öpik, M. Yanishevsky and A. Westergård. As a result of the improvement of the biostratigraphical subdivision of sections and a detailed study of trilobites, the Cambrian zonal scheme was compiled for the northwestern area of the Platform where the lower part was subdivided into four zones, the middle part into three stages with nine zones, and the upper part into eight zones (Moberg, 1892a, b; Brøgger, 1886; Kiaer, 1916; Westergård, 1946, 1947).

Due to these studies the stratigraphical scheme for the Middle and Upper Cambrian deposits of Scandinavia, made on the basis of trilobite zones assumed almost the present-day form and nomenclature. In Estonia and the Leningrad area, the majority of the contemporary stratigraphical units were established and the geographical principle of the nomenclature was introduced at this time.

A new period in the geological investigation of the sedimentary cover of the East European Platform, including Cambrian deposits, began in the middle of the current century. This was greatly catalyzed by numerous deep borings which for the first time penetrated the Cambrian deposits of the subsurface. The first of them enabled the establishment of true thickness and lithological differentiation compared to previously known sections of the outcrop area. Considerably changed also were views on the stratigraphy of the deposits. Thus, the data obtained from the first borings enabled the detailing of the position of the lower boundary of the Cambrian System, leading to the distinction of the independent late Precambrian Vendian complex (Sokolov, 1952, 1953, etc.). In the 1960s, however, the first reviews were published on Cambrian deposits of the subsurface areas (Lendzion, 1961, 1962; Znosko, 1961; Tchernysheva, 1965, etc.). For the Soviet part of the Platform a unified stratigraphical scheme of Precambrian and Cambrian deposits was also worked out (Tikhij, 1965).

Of great significance for the elaboration of Cambrian stratigraphy, especially in arenaceous-argillaceous deposits, was the identification by Naumova (1949, 1960) of plant microfossils now known as acritarchs. Great contributions to the taxonomical study of acritarchs and their stratigraphical distribution in the Lower Cambrian sequences have been made by N. Volkova, V. Kirjanov and G. Vidal. Locally and/or in separate parts of the section Cambrian acritarchs have been studied by A. Fridrichsone, T. Jankauskas, L. Paškevičiene, L. Piskun, V. Timofeev, and R. Tynni (see References).

Palynological investigations have revealed that distinct acritarch assemblages characterize the established units in the Lower Cambrian and their succession in the section has a great importance for the biostratigraphical subdivision of terrigenous deposits which only occasionally yield sparse remains of shelly fauna or are totally lacking them (see Volkova et al., 1979). Study of acritarchs from the beds dated with reference to the established trilobite zones, has made correlation of such rocks possible.

Palaeontological, stratigraphical and partially lithological data on the Upper Precambrian and Lower Cambrian of the western part of the Platform (including the Scandinavian countries) are summarized in a three-volume monograph of the joint Polish-Soviet Research Programme on the Precambrian- Cambrian Boundary (Keller & Rozanov,

1979a, 1979b, 1980) which in part are now available also in English (Urbanek & Rozanov, 1983). A comprehensive account of the Cambrian of Norden has been published by Martinsson (1974), and this has now has been supplemented by new data on Lower Cambrian trilobites (Bergström 1981; Ahlberg et al., 1986) and acritarchs (Vidal, 1981a,b). A review compiled on the Polish part of the Platform has been made by Lendzion (1983), and by Bednarczyk (1984) on the northwestern part of this territory. On the basis of the results obtained through the study of Cambrian deposits within the Soviet part of the Platform, a new stratigraphical scheme for the Cambrian has been worked out (Spizharskij, 1986).

All the above-named publications, however, are concerned with only certain parts of the Platform or sequences, and a survey of the Cambrian over the whole Platform has until now been lacking.

CAMBRIAN STRATIGRAPHY

According to the recommendations of the Precambrian- Cambrian Boundary Working Group of the IUGS, "the Precambrian- Cambrian boundary should be placed as close as practicable to the base of the oldest stratigraphical unit to yield Tommotian (s.l.) fossil assemblages" (Cowie, 1985).

For facial reasons the Precambrian-Cambrian transition of the East European Platform contains too few shelly fossils for drawing the base of the Cambrian unambiguously. In general, there are two possible positions for drawing the lower boundary of the Cambrian: (1) at the base of the Baltic Group, and (2) within it, i.e. at the base of the Lontova Regional Stage. In accordance with stratigraphical concepts approved by the Stratigraphic Commission of the Soviet Union, this boundary is placed within the Baltic Group, i.e. at the level of the boundary between the Rovno and Lontova Regional Stages (Sokolov, 1984).

Two of the present authors (K.L. and K.M.), however, support the first alternative, as the detailed correlation between the East European Platform and the Siberian Platform is lacking, and the base of the Baltic Group presents the maximum number of possibilities for regional correlation.

The lower boundary of the Baltic Group in the major part of the area is distinct, and coincides with regional changes in the sedimentary conditions which led to the deposition of normal marine sediments. Beside the changes in hydrochemical parameters of environment, this level coincides with notable biotic changes. Thus, at the base of the Baltic Group (Rovno Regional Stage) *Sabellidites cambriensis* (Eichw.), morphologically advanced acritarchs and trace fossils of Palaeozoic aspect appear (Palij et al., 1979; Paškevičiene, 1980). Somewhat higher, but still within the deposits of the Rovno Regional Stage, there is an association with platysolenitids and pyritized casts of conical tube-shaped fossils (hyoliths?). In the Rovno/Lontova transitional beds the first gastropods appear (Lendzion, 1977), but acritarchs prove that this level is of Lontova age (Volkova, pers. comm.). In the overlying Lontova beds, in addition to the fossils listed, gastropod finds become more frequent, and the appearance of inarticulate brachiopods is noted (Mens & Pirrus, 1977). Thus, some groups of invertebrates developed the ability to form skeletons rather gradually during the Baltic age: various groups of them did not appear simultaneously but successively.

The upper boundary of the Cambrian System is traditionally placed at the base of the *Dictyonema flabelliforme* Zone. The dictyonemid graptolites are widespread in northwestern sections of the Platform, represented by black shales (= kerogen-bearing ar-

gillites) containing lenses of limestones. The definition of the Cambrian-Ordovician boundary outside the carbonate- argillite facies is complicated because graptolites are especially rare there. Data obtained recently on the ranges of conodonts, acritarchs and inarticulate brachiopods and their relationships with the graptolite zonation show that *Cordylodus andresi* Viira-Sergeyeva appears below the first occurrence of *D. flabelliforme sociale* which is found rarely together with *C. proavus* Müller (see further Borovko et al., 1980, 1981, 1984, 1985; Kaljo et al., 1986). In the carbonate-argillite facies, *C. andresi* is reported from land together with *Parabolina heres* Brøgger and these have been referred to the *Acerocare* Zone (Andres, 1981). In the Oslo Region, specimens of *D. flabelliforme sociale* occur above the base of the Tremadoc Series recognized by the appearance of *Boeckaspis hirsuta* (see Bruton et al., 1982).

On the basis of this evidence, the Cambrian-Ordovician boundary outside the argillite-carbonate succession roughly corresponds to the base of the *C. proavus* Zone, which has been taken for the upper limit of the Cambrian in the corresponding correlation chart.

In the Cambrian section of the East European Platform all the three Series, corresponding to the Lower, Middle and Upper Cambrian, have been distinguished on the basis of the trilobite succession.

The boundary between the Lower and Middle series is drawn at the base of the *Eccaparadoxides oelandicus* Stage (*Eccaparadoxides oelandicus* Superzone *sensu* Lendzion) coinciding with the appearance of paradoxidid trilobites. It is established in sections southwards from Öland with certainty. However, it should be noted that even in this area, despite relative completeness of the sections at the Lower/Middle Cambrian boundary, trilobites recorded from other zoogeographical provinces are unknown. The precise duration of this stratigraphical hiatus is, therefore, still somewhat uncertain. Bergström & Ahlberg (1981) have correlated it with the Hawke Bay Event as recognized by Palmer & James (1981) in North America. Therefore a gap has been left between the *Proampyx linnarssoni* and *Eccaparadoxides insularis* Zones on the correlation chart.

In the Soviet part of the Platform this boundary coincides with the base of the Kybartai Regional Stage defined on the basis of microphytological data in a relatively continuous lithological succession. For the upper part of the Kybartai Regional Stage *Ellipsocephalus puschi* Orłow., *E. polytomus* Linnars., *Strenuella (Comluella) samsonoviczi* Orłow., *S. (C.). insolita* N. Tchern. and *Lingulella ferruginea* Salter, and the acritarchs *Baltisphaeridium pseudofaveolatum* Fridr., *B. latviense* Volk., *Lophosphaeridium variabile* Volk., and *Pterospermopsis vitrea* Volk. have been recorded. These acritarchs appear only at the base of the Middle Cambrian and with the above mentioned trilobites they are indicative of the presence of the *Eccaparadoxides oelandicus* Stage. In the rest of the territory at this level a hiatus has been registered corresponding to the top of the Lower and to the base of the Middle Cambrian.

The base of the *Agnostus pisiformis* Zone is traditionally taken as a base for the Upper Cambrian in the Acado-Baltic area. This level is well established also in the northwestern sections of the East European Platform where the boundary beds are mostly represented by kerogen-bearing argillites with interbeds and lenses of carbonate rock containing trilobites and brachiopods (Westergård, 1944; Henningsmoen, 1957; Lendzion, 1983; Bednarczyk, 1984). Outside the carbonate- argillaceous facies, in sandy-silty sections, the Upper Cambrian is determined by acritarchs (appearance of *Veryhachium dumontii* Vang. and *Leiofusa stoumonensis* Palmer) and inarticulate brachiopods (occurrence of *Angulotreta postapicalis* Palmer and *Ungula inornata* (= *Obolus triangularis* Mickw.), refer-

ring to the occurrence of the *Olenus* and *Homagnostus obesus* Zone. The positive palaeontological evidence of the *Agnostus pisiformis* Zone is lacking (see Subdivisions of the Upper Cambrian) and for the definition of the Middle/Upper Cambrian boundary further investigations are needed in the sections of the sandy-silty facies.

Up to the present time, stages have not been included in the Cambrian stratigraphical standard scale for the East European Platform. The scale of stages accepted for the territory of the Soviet Union is compiled using the materials on the Siberian Platform and Kazakhstan (see Spiharskij et al., 1983) where the Cambrian sections are represented by carbonate rocks. The possibility and basis for the distinction of Cambrian stages on the East European Platform are treated in the above-mentioned work and their approximate position is given on the right in their correlation chart. Stage boundaries, which are insufficiently defined in the Cambrian succession of the East European Platform, are marked with a broken line.

SUBDIVISIONS OF THE LOWER CAMBRIAN

The Lower Cambrian rocks are widely distributed on the East European Platform, in places (southwestern part of the Platform) reaching a considerable thickness (over 500 m). The Lower Cambrian is mainly represented by terrigenous rocks, and only in southwestern Sweden and Norway, and in Lappland and Troms, have beds of limestone have been observed in the upper parts of sections.

The Lower Cambrian, extending from the base of the Baltic Group up to the lower boundary of the *Eccaparadoxides oelandicus* Stage is divided into seven biozones. In ascending order these are the : *Sabellidites cambriensis, Platysolenites antiquissimus, Rusophycus parallelum*, *Schmidtiellus mickwitzi* and *Mobergella*, *Holmia inusitata, Holmia kjerulfi* and *Proampyx linnarssoni* Zones. The base of each zone, except the *P.antiquissimus* Zone, can be defined by the first appearance of the index species or by the fossil assemblage characteristic of the zone. *Platysolenites antiquissimus* Eichw.* appears in the upper part of the *Sabellidites cambriensis* Zone. Therefore the boundary between these Zones is drawn by acritarch evidence and coincides with the boundary of the Rovno and Lontova Regional Stages. It should be noted here that in the Lower Cambrian of the Platform, the fossils, except *Sabellidites* and platysolenitids, are generally scarce, fossiliferous beds are ordinarily separated by barren beds, and the proposed biozones have no well-defined boundaries.

Simultaneously, on the basis of the succession of acritarch assemblages, the Lower Cambrian of the Platform can be subdivided into five regional stages (in Russian, horizons): in ascending order they are Rovno, Lontova, Dominopol', Vergale and Rausve.

The *Sabellidites cambriensis* Zone is the lowermost subdivision of the Baltic Group and corresponds to the Rovno Regional Stage. This zone, together with the Rovno Regional Stage, has been defined by Kirjanov (1969, p. 49).

The stratotype of the Rovno Regional Stage is the stratotype of the nominal formation. The rocks of the Rovno Regional Stage are represented by sand- and siltstones and

---

* The revision of platysolenitid taxonomy carried out by Rozanov permitted him to treat all forms of platysolenitids as the single species *P. antiquissimus* with several morphs. They are: *P. antiquissimus* morpha *normalis (= P. antiquissimus), P.a.*m. *minima (= Yanishewskyites petropolitanus), P.a.*m. *irregularis (= P. lontova), P.a.*m. *spiralis (= P. spiralis)*. In the present paper they are still considered as species.

clays which are widely distributed in the central and southwestern areas of the Platform (Keller & Rozanov, 1980).

The zonal assemblage of fossils, defining the range of the *Sabellidites cambriensis* Zone throughout the whole section, consists of *Sabellidites cambriensis* Jan., and other species of *Sabellidites, Sokoloviina* and *Paleolina*, which occur in the lower part together with *Tyrasotaenia podolica* Gnil., in the upper part with *Platysolenites* sp., and in the Lopiennik boring at the top of this Zone with *Aldanella* (see further Lendzion, 1977). The acritarch assemblages from the lower and upper parts of the *S. cambriensis* Zone differ considerably. The and characteristic acritarch species in the lower part are *Leiosphaeridia dehisca* Paŝkev., *Teophipolia lacerata* Kirjanov, *Retisphaeridium densum* Paŝkev., *Leiosphaerida pylomfera* Paŝkev., *Leiovalia striatella* Paŝkev., *Ceratophyton vernicosum* Kirjanov, and also the thread-like forms *Volyniella rudaminica* Paŝkev., and *V. ignatinica* Paŝkev. The acritarch assemblage of the upper part is characterized by the appearance of *Ceratophyton duplicum* Paŝkev., the predominance of *Leiosphaeridia parva* Aseeva and *C. vernicosum* Kirjanov, scarce *L. dehisca* Paŝkev., and the practical absence of *T. lacerata* Kirjanov and *R. densum* Paŝkev.

The *Platysolenites antiquissimus* Zone has been distinguished by Öpik (1929, p. 17) and was first named as the *Platysolenites-Hyolithus* Zone. It corresponds to the Lontova Regional Stage which is the uppermost stage of the pre-trilobite Cambrian on the East European Platform. The lower boundary of this zone coincides with the appearance of the genera *Granomarginata, Leiomarginata* and *Tasmanites tenellus* in the acritarch assemblage.

Fossils of the *P. antiquissimus* Zone are numerous, especially in clay intervals, and include skeletal remains of both animal and plant origin, as well as various trace-fossils. The stratigraphical range of fossils of this zone has been studied in detail in Estonia (Mens & Pirrus, 1977; Posti, 1978; Volkova et al., 1979; Mens & Paŝkevičiene, 1981; Mens & Posti, 1984). On the basis of these studies we conclude that the duration of various fossils in the sequence is variable. Thus *Platysolenites antiquissimus* Eichw., pyritized casts of hyoliths (?), *Granomarginata squamacea* Volk., *G. prima* Naum., and *Tasmanites tenellus* Volk. occur throughout the whole section, whereas the other taxa are distributed in a sequence which enables a four-fold subdivision of the Regional Stage (from base to top): 1) beds with *Sabellidites cambriensis* Yan., *Onuphionella agglutinata* Kirjanov and *Teophipolia* sp. n.; 2) beds with *Sabellidites* sp., *Platysolenites lontova* Öpik and horn-like chitinous sclerites; 3) beds with *P. lontova, Aldanella kunda* (Öpik) and horn-like chitinous sclerites; 4) beds with *P. spiralis* Posti, *Tasmanites bobrowskii* Waz. and *Synsphaeridium* sp.

For these units the rank of the Regional Stage has been proposed by Mardla et al. (1968, p. 22). The stratotype of the Lontova Formation has been taken for the stratotype of the Lontova Regional Stage.

The Lontova Regional Stage consists mostly of clayey rocks intercalated with sandstones and siltstones occurring in considerable amounts only in the basal part. Rocks of the Lontova Regional Stage are more widely distributed than those of the Rovno Regional Stage (Keller & Rozanov, 1980) and their absence has been proved only in the northwestern areas of the Platform (Mens & Pirrus, 1979; Bergström, 1981; Vidal, 1981, etc.) and in the eastern district of Tana, where *Spirosolenites spiralis* Glaessner (= *Platysolenites spiralis* Posti), now known only from the Lontova Regional Stage (Mens &

Pirrus, 1977, 1979; Posti, 1978; Mens & Posti, 1984), has been recorded from the Breivik Formation of the Dividal Group (Hamar, 1967; Føyn & Glaessner, 1979).

In the Polish part of the Platform the *Sabellidites* and *Platysolenites* Zones, together with the *Mobergella* Zone constitute the Klimontov Stage (see Lendzion, 1983).

The *Rusophycus parallelum* Zone was considered by Bergström (1981, p. 23) as the basal unit of the trilobitic Cambrian in order to separate it from the pre-trilobite beds. This part of the section has been established as an independent unit on the basis of trilobite traces. This is proved by the impressions of a trilobite found in the Hardeberga Sandstone (Ahlberg, Bergström & Johansson, 1986). The zone corresponds to the lower part of *Holmia* A *sensu* Vidal and to the Lower Dominopol' Regional Substage in the Cambrian stratigraphical scheme of the East European Platform in the USSR (Spizharskij, 1986).

Deposits of this zone are restricted in distribution, occurring only in the westernmost areas of the Platform. They are mostly represented by coarse grained sandy rocks intercalated with rare thin clayey rocks. Palaeontologically the *Rusophycus parallelum* Zone is poorly diagnosed. The deposits have yielded unidentifiable phosphatic fossil fragments, scarce remains of *Platysolenites* sp. and trace fossils, among which the prevailing forms are of the *Skolithos* type. Trilobite traces, including *Rusophycus parallelum* occur sporadically. Acritarchs are also rare, especially in the lowermost part of the zone, mostly represented by leiosphaerids and fragmentary specimens of the genera *Baltisphaeridium* and *Micrhystridium*. In the uppermost part of the zone the acritarch assemblage is more representative, comprising specimens of the genera *Granomarginata* and *Leiomarginata* but also *B.* cf. *cerinum* Volk., *B.* (?) *strigosum* Jank., *Tasmanites bobrowskii* Waz., and *Lophosphaeridium tentativum* Volk. (Volkova, 1973; Fridrichsone, 1974; Kirjanov, 1979; Vidal, 1981a; Brangulis et al., 1975; Areń et al., 1979); as well as leiosphaerids.

The *Schmidtiellus mickwitzi* and *Mobergella* Zone was previously known as the zone with *Kjerulfia (= Wanneria) lundgreni* and *Holmia torelli* (see Bergström, 1980; 1981; Ahlberg, 1984). It corresponds to the upper part of *Holmia* A (Vidal, 1981a), completely or partly to the *Mobergella* Zone of Lendzion (1983), and to the upper Dominopol' Regional Substage in the stratigraphical nomenclature accepted in the USSR (Spizharskij, 1986).

This zone is represented by frequently alternating clayey-silty-sandy rocks, in places enriched with glauconite and pebbles of phosphatized rock. The deposits of this zone are also distributed in the western part of the Platform, but their distribution area is considerably wider than that of the *Rusophycus parallelum* Zone, and on the southern slope of the Baltic Shield they unconformably overlie the Lontova Formation.

The fossil complex of the *Schmidtiellus mickwitzi* and *Mobergella* Zone is diverse, and in places abundant. Apart from the index species, trilobites are represented by *Schmidtiellus reetae, Holmia mobergi, H.* sp., *Kjerulfia? lundgreni, Wolynaspis unica* N. Tchern. and by forms, conditionally assigned to trilobites, *Livia convexa* Lendzion, *L. plana* Lendzion and *Cassubia infercambriensis* Lendzion. Of the genus *Mobergella, M. radiolata* Beng., *M. holsti* (Moberg), *M. turgida* Beng. and *M.* sp. have been described. It should be noted here that the geographical occurrence of *Mobergella* and trilobites (except representatives of *Livia* and *Cassubia)* is generally different, apparently due to ecological reasons.

As well as trilobites and *Mobergella*, the *Schmidtiellus mickwitzi* and *Mobergella* Zone contains *Platysolenites* sp., *Volborthella tenuis* Schm., *Torellella laevigata, T.* sp., *Mickwitzia monilifera* (Linnars.), agglutinated foraminifers and the so-called Lükati acritarch as-

semblage. The latter is mostly characterized by abundant species of the genus *Baltisphaeridium (B. cerinum, B. primarium, B. dubium, B. orbiculare, B. ornatum, B. papillosum* etc.), also by frequent *Tasmanites bobrowskii, T. volkovae, T. tenellus, Lophosphaeridium tentativum* and *Archaeodiscina umbonulata* (see Volkova et al., 1979).

In the present correlation chart the *Schmidtiellus mickwitzi* and *Mobergella* Zone includes also deposits of the regressive phase of the Liivian sedimentary cycle (see Mens, 1981) which are of a restricted distribution and distinguished as the Tiskre Formation. In this formation fossils are less frequent than in the underlying more clayey deposits, but *Scenella discinoides* Schm., *S. tuberculata* Schm., *Paterina rara* Gorj., *Mickwitzia formosa* Wiman, *M. concentrica* Gorj., and *Tasmanites piritaensis* Posti & Jank. additionally appear.

Deposits of the *Rusophycus parallelum* Zone and *Schmidtiellus mickwitzi* and *Mobergella* Zone in the Cambrian stratigraphical scheme of the East European Platform in the USSR (Spizharskij, 1986) are included in a single Regional Stage which has two substages. In consideration of priority , this has been named the Dominopol' Regional Stage, but is also known in previous works (Grigelis, 1978) as the Talsi Regional Stage. The Dominopol' Regional Stage has been defined by Kirjanov (1969, p. 55); its stratotype is the stratotype of the nominal formation. The deposits of the Dominopol' Regional Stage transgressively overlie various older formations down to the crystalline basement. On the whole, the Dominopol' Regional Stage is characterized by a distinct reorganisation of the fauna and flora in which trilobites, agglutinated foraminifers, *Volborthella*, bradoriids, and acritarchs of the genus *Baltisphaeridium* make their appearance.

The *Holmia inusitata* Zone (originally identified as *Callavia* sp.n.) has been established in the sections of the Mjøsa area (Bergström, 1981) where the Bråstad Shale (1aα) has yielded the only trilobite of this zone (Ahlberg, Bergström & Johansson, 1986). From its geological position in the section, and consideration of the acritarch data, this zone corresponds to the *Holmia* A-B Zones of Vidal (1981a), to the Lower Vergale Substage in the stratigraphical nomenclature of the USSR (Spizharskij, 1986) and to the Lyuboml' Regional Stage as treated by Kirjanov (1969).

The rocks of this zone are represented by light, sandy, coarse-grained siltstones and well-sorted sandstones with thin interclations and lenses of greenish-grey or brownish-grey clayey rocks. Due to the arenaceous composition of the rocks, the *Holmia inusitata* Zone is palaeontologically poorly characterized. Apart from the above-mentioned trilobite, occurring together with *Volborthella* (Bergström, 1981), only single valves of agglutinated foraminifers (Lieldiena & Fridrichsone, 1968) and fragments of inarticulate brachiopods (Mens, 1979) have been recorded.

Acritarchs, enabling us to determine the age of the deposits have been found in southern Sweden and the Mjøsa Region of Norway (Vidal, 1981a), from Estonia (Mens, 1979), from the Kaliningrad District (Nikashin et al., in press), and from the Ukraine (Kirjanov, 1979). The acritarch assemblage is of a mixed composition, including simultaneously occurring characteristic forms of the Lükati *(Baltisphaeridium dubium, Micrhystridium pallidum* and *Lophosphaeridium tentativum*), as well as those of the Vergale *(B. ciliosum, B. strigosum, B. varium*) assemblages.

Due to scarcity of palaeontological finds, the boundaries of the *Holmia inusitata* Zone are often defined on the basis of lithological criteria. The lower boundary is drawn at the base of light quartzose sandstones or coarse-grained siltstones, in places containing flat pebbles of greenish-grey and light-grey rocks, the surfaces of which are rarely phosphatized.

The Holmia kjerulfi Zone, established by Brøgger (1886), contains the index fauna (including trilobites) more often than the underlying zones. It corresponds to the upper part of the *Holmia* B Zone of Vidal (1981a) and to the upper Vergale Substage in the stratigraphical nomenclature of the USSR (Spizharskij, 1986).

This zone contains numerous and diverse fossils. The most typical, and of the greatest lateral distribution, are the trilobites *Holmia kjerulfi* Linnarsson and *Strenuaeva primaeva* (Brøgger). Following the revision of Bergström & Ahlberg (1981), other trilobites belonging mostly to the genera *Holmia, Ellipsocephalus* and *Proampyx* (see Bergström, 1973; Ahlberg & Bergström, 1978; Bergström & Ahlberg, 1981; Ahlberg, Bergström & Johansson, 1986; Lendzion, 1983) have been recorded and these are also found in the westernmost sections of Sweden and Poland.

Among inarticulate brachiopods occur *Acrothele bellapunctata* Walc., *A. prima* (Matthew), *A. genula* Matthew, *Westonia elongatus* Walc., *W. finlandensis* Walc., *Lingulella* sp. and other ill-preserved forms. *Volborthella,* agglutinated foraminifers, hyoliths and bradoriids have been also recorded, and the lower part has yielded a few specimens of platysolenitids, including *P. antiquissimus* Eichw.

The so-called Vergale acritarch assemblage is abundant and diverse. Its most characteristic forms are: *Baltisphaeridium ciliosum* Volk., *B. implicatum* Fridr., *B. varium* Volk., *B. insigne* (Fridr.), *Micrhystridium lanatum* Volk., *M. spinosum* Volk., *M. lubomlense* Kirjanov, *M. obscurum* Volk., *M. dissimilare* Volk., *M. parvum* Volk., *Estiastra minima* Volk., *Leiovalia tenera* Kirjanov, *Pterospermopsis solida* Volk., *Multiplicisphaeridium dendroideum* (Jank.), *Ovulum lanceolatum* Jank., *O. saccantum* Jank., *Aliumella baltica* Vand., *Granomarginata squamacea* Volk., *Tasmanites bobrowskii* Waz., *T. volkovae* Kirjanov and etc.

The *Holmia inusitata* Zone and *Holmia kjerulfi* Zone in the Cambrian stratigraphical scheme of the East European Platform in the USSR (Spizharskij, 1986) correspond to the Vergale Regional Stage. Previously the extent of the Vergale Regional Stage was limited to the *Holmia kjerulfi* Zone (Birkis et al., 1970, p. 910), now regarded as the upper Vergale Substage. The stratotype of the Vergale Regional Stage in this present work is the interval 1293-1336 m in the Vergale-46 borehole.

Deposits of this Regional Stage, especially of its upper substage, have the widest distribution of the trilobite-bearing Lower Cambrian deposits: at the present, it is only in the sections of the Moscow Syneclise that deposits of Vergale age have not been established. The rock composition of the Regional Stage is diverse. Over the whole distribution area its lower part consists mostly of light coarse-grained siltstones and fine-grained sandstones intercalated with thin beds of clay. The lithology of the upper substage is also variable laterally. In the north-westernmost sections it consists of sandy-clayey deposits with interbeds of carbonate rocks. Eastwards (Baltic Syneclise, Brest Depression, etc.), greenish-grey silty-argillaceous rocks with some interbeds of brown goethite oolites of variable thickness predominate. These sections are also characterized by bioturbation. Further eastwards, the whole section of the Vergale Regional Stage is represented by arenaceous-silty rocks.

The boundary between the Vergale and the Dominopol' Regional Stages has been drawn at a discontinuity surface (Keller & Rozanov, 1980). This boundary coincides, on the one hand, with the boundary between the Liivian and Aisciaian sedimentary stages

(Mens, 1981), and on the other, with the boundary between the *Holmia* A and B Zones in the two-member subdivision of the *Holmia* Zone (Vidal, 1981b).

The *Proampyx linnarssoni* Zone was established by Kiaer (1916) as the *Strenuaeva linnarssoni* Zone. It completes the Lower Cambrian section in Scandinavia (see Martinsson, 1974; Bergström & Ahlberg, 1981; Ahlberg, 1984) and corresponds to the lower part of the *Protolenus* Zone in the stratigraphical schemes of Poland, and to the Rausve Regional Stage, or at least to its lower part, in the Soviet stratigraphical nomenclature.

Lithologically, the deposits of this zone are genetically connected with the underlying formations of the *Holmia kjerulfi* Zone, and in local schemes they are often treated as one formation (see Gislöv, Tebra, Radzyń and Svityaz' Formations).

Trilobites have been recorded only from the westernmost sections in Scandinavia and Poland, and are represented, in addition to the index species by, *Ellipsocephalus lunatus, E. hoffi, E. gripi, Proampyx triangularis, Kingaspis (Kingaspis) borealis, Comluella (?) scanica, C. (?) lapponica, Protolenus* sp. and *Strenuaeva* sp. (see Bergström & Ahlberg, 1981; Ahlberg, 1984; Lendzion, 1983). Other fossils include inarticulate brachiopods, *Westonia bottnica*, *Lingulella (Lingulolepis) westergaardi* and *L. nathorsti,* torellellids, hyoliths, *Volborthella*, agglutinated foraminifers and acritarchs of the so-called Rausve assemblage (see below).

The Rausve Regional Stage has been diagnosed by Jankauskas (1972, p. 1187). The stratotype is represented by the interval 1220-1357 m in the Kybartai-22 section. It comprises mostly greenish-grey silty-argillaceous rocks with light violet patches, containing numerous trace-fossils, in places considerably bioturbated.

The lower boundary of the Rausve Regional Stage is lithologically transitional, drawn on the basis of microphytological data, primarily by the appearance of *Micrhystridium notatum* Volk., *M. oligum* Jank., *Deunffia dentifera* Volk., *Pterospermella vitrea* Volk. and *Synsphaeridium switjasium* Kirjanov. It must be noted that the Vergale and Rausve acritarch assemblages are successive, differing inconsiderably and only at the species level. On Soviet territory, deposits of the Rausve Regional Stage have not yielded trilobites and their correlation with the *Protolenus* Zone can only be made in the Radzyń section, where the trilobites *Kingaspis (Kingaspis) borealis* Lendzion and *Ellipsocephalus hoffi* (Schlotheim) occur with the Rausve acritarch assemblage.

The upper boundary of the Regional Stage with the deposits of the Kybartai Regional Stage is lithologically indistinct, showing what is considered to be continuous sedimentation at the Early to Middle Cambrian transition in the Baltic Syneclise.

SUBDIVISIONS OF THE MIDDLE CAMBRIAN

Middle Cambrian deposits are of relatively wide distribution on the Platform, on its western margin in places reaching a considerable thickness (over 300 m). In spite of this, their areal extent and total thickness are less than that of the Lower Cambrian. Only at some localities along the northwestern margin of the Platform, and at the crest of some local structures in the Baltic Syneclise, does the Middle Cambrian lie unconformably on crystalline basement.

Laterally the Middle Cambrian deposits form three main facies belts. In Scandinavia, from Bornholm in the south to the extreme north, excepting the Öland-Gotland and Östergötland area, almost the whole Middle Cambrian is represented by dark kerogen-bearing argillites and limestones - the so-called alum shales. Eastwards of this belt, and in

the western part of North Poland, a transitional belt is represented by alternating sandstones, siltstones, kerogen-bearing argillites and conglomerates. Over the rest of the Platform, the Middle Cambrian consists of terrigenous rocks, among which sand- and siltstones, containing different amounts of clayey deposits, and often represented by argillites, prevail.

On the basis of the trilobite succession, Westergård (1946) established three zonal groups which have served as a basis for the subdivision of the Middle Cambrian into three stages. In ascending order these are the *Eccaparadoxides oelandicus, Paradoxides paradoxissimus* and *P. forchhammeri* Stages, which are divided into nine zones based mostly on agnostoids and paradoxidids. A modified variant of this trilobite zonation is given on the left side of the correlation chart. In our version, emphasis is laid on trilobites considered as zonal indices in areas outside Scandinavia. Such subdivision is possible only in the transitional belt and in the sequences of the Oslo area where deposits have yielded a diverse and frequently abundant shelly fauna (see Martinsson, 1974; Lendzion, 1983; Bednarczyk, 1984; Berg-Madsen, 1985a, b). However, the contemporaneous Middle Cambrian of the arenaceous-silty facies belt in the eastern part of the region contains very few shelly faunas. Acritarchs have been studied from these arenaceous-silty sections, but in less detail than in the Lower and Upper Cambrian.

In the Soviet part of the Platform, on the basis of palaeontological data, the *Eccaparadoxides oelandicus* Stage is distinguished with the greatest certainty, especially its lower, *E. insularis* Zone, which is presumed to embrace the Kybartai Regional Stage.

The Kybartai Regional Stage has been defined by Areń et al. (1979, p. 58). The stratotype of this Regional Stage is the interval 1040.5-1077.8 m in the Vergale-50 boring. In the stratotype area, the Regional Stage is represented by mostly horizontally bedded glauconite-bearing sandstones and coarse- grained siltstones with layers of greenish-grey and dark clays.

The contact of the Kybartai Regional Stage with the underlying Lower Cambrian deposits is lithologically indistinct and is drawn at the appearance of *Baltisphaeridium latviense* Volk., *B. pseudofaveolatum* Fridr., *Liepaina plana* Jank. & Volk., *Lophosphaeridium variabile* and rare representatives of *Eliasum* and *Cristallinium* among the acritarchs. Among the inarticulate brachiopods, *Lingulella ferruginea* Salter occurs together with *Westonia finlandensis* Walc., *W. botnica* Wim., *W. balticus* Walc., *W.* sp. and *L.* sp. (see Korkutis, 1971). Their occurrence is more frequent in the lowermost part of the Regional Stage. In its upper parts trilobite remains have been recorded, including *Ellipsocephalus polytomus* (Linnars.), *Strenuella (Comluella) samsonowiczi* Orłow. and *S. (C.) insolita* N. Tchern. Although the index species of the *E. insularis* Zone is not recorded, the deposits of the Kybartai Regional Stage are supposed to belong to this zone on the basis of the continuous sedimentation in the boundary interval and the hereditary nature of the acritarch assemblage.

The Kybartai Regional Stage is overlain by light, well-sorted, quartzose, fine-grained sandstones and coarse-grained siltstones with thin interbeds of dark grey and brownish-grey, more rarely variegated, argillites. In the local stratigraphic columns these deposits are defined as the Deimena Superformation, the Ruhnu Beds, the Orlya Formation and their equivalents in the southwestern part of the Platform. Palaeontologically they are very poorly characterized. The argillaceous interbeds have yielded acritarchs, consisting mostly of long-ranging forms which, although impoverished, are similar to the Kybartai as-

semblage. No regional stage has been erected yet for this part of sequence in the Soviet Union.

The Deimena Superformation and its probable equivalents have been referred to the *Ptychagnostus praecurrens (E. pinus)* Zone, because of their intermediate position between the Kybartai Regional Stage and *Paradoxides paradoxissimus* Stage.

It should be noted here that the deposits of the *Eccaparadoxides oelandicus* Stage, i.e. of the Kybartai Regional Stage, and analogues of the Deimena Superformation are distributed only in the western areas of the Platform. In the central regions of the Moscow Syneclise there is no evidence for rocks of *Eccaparadoxides oelandicus* Zone age and, they probably were never deposited there.

In the younger Middle Cambrian deposits, commencing at the base of the *P. paradoxissimus* Stage, two acritarch assemblages have been noted in arenaceous-silty sections. The oldest assemblage differs from that of the *E. oelandicus* Stage by its lack of characteristic Lower Cambrian species and by the frequent occurrence of representative species of the genera *Eliasum* and *Crystallinium,* among them *C. cambriense* (Slav.) and *E. fombella.* On the whole, this acritarch assemblage has its own characteristic features, is well defined, and its appearance marks the beginning of a new stage in the evolution of acritarchs. At this time, deposits containing such acritarchs occur in a restricted area - in the sections of the southern part of the Baltic Syneclise. Due to the close connection of this acritarch community with assemblages established in the overlying Middle Cambrian deposits, this part of the section (the Veselovsk Formation and its stratigraphical equivalents) has been correlated with the lower half of the *P. paradoxissimus* Stage.

The overlying arenaceous-silty deposits, belonging to the *P. paradoxissimus* and *P. forchhammeri* Stages, are widely distributed in the southwest and central regions of the Platform. In these areas an indivisible acritarch assemblage, consisting mostly of representatives of the genera *Timofeevia (T. lancarae* (Cr. & Diez), *T. janischewski* (Vang.)), *Cristallinium (C. dubium* Volk., *C. ovillience* Cr. & Diez, *C. haslotianum* (Vang.)), and *Micrhystridium (M. lanceolatum* Vang., *M. confusum* (Jank.)), occurs.

Apart from acritarchs, these deposits contain valves of inarticulate brachiopods of the genera *Obolus* and *Lingulella*, a specimen of the bradoriid *Vojbocalina magnifera* Melnikova, and the upper part of the sequence has also yielded the trilobite *Agnostus subsulcatus* West. (see Dmitrovskaya, 1983; Kirjanov, 1979; Khazanovich et al., 1984). The last confirms the accepted correlation with the *P. forchhammeri* Stage, at least for the upper part of these silty-arenaceous deposits. The boundary of the Middle and Upper Cambrian in the Moscow Syneclise, in northwestern Poland, and in a considerable part of Sweden, is lithologically indistinct due to the continuous sedimentation.

SUBDIVISIONS OF THE UPPER CAMBRIAN

The trilobite zonal scale for the Upper Cambrian of the Acado-Baltic Faunal Province has been worked out by Westergård (1922) on the basis of the succession of olenids and agnostids. Six of the zones or zonal groups established by Westergård have been used as a correlation standard (see Correlation Chart).

The Upper Cambrian is palaeontologically recognized only in the northwestern and central areas of the Platform. The southern areas are devoid of Upper Cambrian rocks. In the northwestern areas of the Platform the Upper Cambrian is represented by black or dark brown kerogen-bearing argillites (the so-called alum shales), including lenses and in-

terbeds of carbonate rocks of a variable thickness, to various degrees enriched with kerogenous and clastic materials. The majority of fossils recorded from the Upper Cambrian deposits of this facies belt occur in the carbonate lenses and interbeds. The presence of all six standard zones has been documented with trilobites only in some sections on the Islands of Öland and Bornholm, on the Skåne Peninsula, and in the Oslo Region. In other parts of Sweden, the five lower zones are varyingly developed (see Martinsson, 1974). In North Poland only five zones have been recognized. Deposits of the *Leptoplastus* Zone and lower part of the *Peltura* Zones are missing, interpreted as breaks in the sequence (see Lendzion, 1983; Bednarczyk, 1984).

Outside the argillaceous-carbonate facies belt, the Upper Cambrian deposits are mostly represented by silty-arenaceous rocks. Argillaceous rocks are noticeably important only in the upper part of the section of the Moscow Syneclise (see Bugino and Pestovo Formations). In the rest of this facies belt, argillaceous rocks are represented only by thin bands and interbeds of greenish-grey clays (in the lower part of the sequence) and dark brown kerogen-bearing argillites (in the uppermost part). These deposits have yielded abundant inarticulate brachiopods, conodonts, hyolithelminthids and acritarchs (confined to the argillaceous intervals). Records of trilobites are very rare (see Balashova, 1963; Shestakova et al., 1976), and they can be used only for confirmation of the accepted correlation, established by other fossils, mostly by conodonts and acritarchs (Borovko & Sergeyeva, 1981, 1985; Volkova, 1980, 1982; pers. comm.; Volkova & Golub, 1985).

In the sections of the silty-arenaceous facies belt, stratigraphical equivalents of all trilobite zones have been established according to preliminary results of the study of conodont and acritarch assemblages, and also by the revision of the taxonomy and the vertical range of inarticulate brachiopods. However, correlation of local stratigraphical units of the silty-arenaceous facies belt with the zonal trilobite scale remains rather difficult. At the present state of the study it is only possible to establish the presence or absence of deposits of a certain zone in these sections. Definition of the boundaries of these zones is a task for the future.

To the *Agnostus pisiformis* Zone have been assigned the lowermost beds of the Petseri Formation of the western marginal areas of the Moscow Syneclise and the uppermost part of the Tolbukhino Formation of its central regions, containing numerous representatives of the acritarch genera *Timofeevia, Cristallinium* and *Vulcanisphaera* as well as *Pirea orbicularis* Volk., *Raphesphaera spinulifera* Volk. and *R. turbata* Martin. Other fossils from this part of the section have not been studied. The *Agnostus pisiformis* age of this interval is inferred by its stratigraphical position just above deposits of the *Lejopyge laevigata* Zone, occurring at least in the central areas of the Moscow Syneclise where *Agnostus subsulcatus* West, has been identified from the middle of the Tolbukhino Formation. On the other hand, this part of the sequence is overlain by the deposits containing acritarchs characteristic of the *Olenus* and *Agnostus* Zone.

Deposits containing an acritarch assemblage characterized by the presence of *Leiofusa stoumonensis* Vang. and *Veryhachium dumontii* Vang. and the absence of *Trunculumarinum revinum* (Vang.) are assigned to the *Olenus* and *Agnostus* Zone. They are more widely distributed than those of the *Agnostus pisiformis* Zone. Beside the Moscow Syneclise, their presence has been ascertained in the sections of the southern slope of the Baltic Shield (see Ülgase Formation) and of the eastern margin of the Baltic Syneclise (see Petseri Formation). Co-occurring with this acritarch assemblage are the conodonts *Phakelodus tenuis* (Müll.), *Furnishina furnishi* Müll. and *Westergaardodina bicuspidata*

Müll.; the inarticulate brachipods *Ungula inornata* (= *Obolus triangularis* Eichw.), *Angulotreta postapicalis* Palmer, *Ceratreta tanneri* (Metzger) and *Oepikites* sp. n.; torellellids, including *Torellella sulcata* Miss.; and phosphatic sclerites of an unknown taxonomic position which are found throughout the whole section.

The *Parabolina spinulosa* Zone includes deposits in which the acritarchs *Trunculumarinum revinium* (Vang.) and *Dasydiacrodium caudatum* Vang occur. Stratigraphical equivalents of the *Parabolina spinulosa* Zone have been established by acritarchs only on the southern slope of the Baltic Shield where they comprise the uppermost beds of the Ulgase Formation. The composition of the assemblages of inarticulate brachiopods and conodonts is reminiscent of those recorded from the underlying part of the Ulgase Formation. The Ladushkino Formation from the southeastern Baltic Syneclise has also been included in this zone. Its deposits have yielded *Orusia lenticularis* (Wahlenb.) and *Homagnostus* sp. (Kaplan et al., 1973).

The presence of the *Leptoplastus* Zone in the silty- arenaceous facies belt is not palaeontologically documented. Conditionally, this zone comprises parts of the Ladoga and parts of the Pestovo Formations.

The deposits of the *Peltura* Zone are recorded by conodonts, acritarchs and rare trilobite finds. Conodonts are represented by two complexes (see Borovko & Sergeyeva, 1981) which belong to the *Westergaardodina* conodont Zone and according to Viira (see Kaljo et al., 1986) to its two lower Subzones. The deposits ascribed to the *Peltura* Zone contain abundant and diverse acritarchs which are in general grouped into three assemblages (see Volkova & Golub, 1985 and N. Volkova pers. comm.). The lowermost one is characterized by the presence of *Impluviculus villosiusculus* Volk. and *Striatotheca loculifera* Volk., and comes from the lowermost part of the Bugino Formation included within the *Peltura* Zone on the basis of the co-occurrence of *Parabolina* sp., which, according to K. Lendzion, is similar to the representatives of this genus from the *Peltura* Zone. The other two assemblages of acritarchs have been established from the Ladoga Formation, the lower part of the Kallavere and the middle part of the Bugino Formations. They are characterized by the occurrence of *Acanthodiacrodium ubui* Martin, *Stelliferidium cortinulum* (Deunff), *Vulcanisphaera africana* Deunff and *Arbusculidium* sp. These acritarchs are known from the *Peltura* Zone on Random Island in eastern Newfoundland (see Martin, 1982). Besides conodonts and acritarchs, numerous shells of inarticulate brachiopods have been determined, among them *Ungula convexa* (= *Obolus convexus*), *Ungula ovata (?)* (= *Schmidtites ovatus*) and *Keyserlingia reversa*; and additionally hyolithelminthids of the genus *Torellella*; phosphatic fossils of the genera *Rukhinella*, *Hadimopanella*; and *Kaimenella* of an uncertain systematic position (see Borovko et al., 1980; Marss, 1987).

In the sections of the silty-arenaceous facies belt, parts of the Kallavere and parts of the Bugino Formation have been conditionally placed in the *Acerocare* Zone. That part of the Kallavere Formation correlative with the *Acerocare* Zone (up to the base of the *Cordylodus proavus* Zone) contains paracondonts, and also *Eoconodontus notchpeakensis* (Mill.) and *Cordylodus andresi* Viira & Sergeyeva, appearing successively in the section (Kaljo et al., 1986). Of the named euconodonts, *C. andresi* Viira & Sergeyeva has been recorded also from the *Acerocare* Zone of Öland with the trilobites of this Zone (see Andres, 1981). The acritarch assemblage established from this level (N. Volkova pers. comm.) is characterized by abundant diverse diacrodids, but *Acanthodiacrodium angustum* (Down.) and *Dicrodiacrodium ramusculum* are lacking, their first occurrence being recorded in the *Cordylodus proavus* Zone. A similar assemblage comes from the upper

part of the Bugino Formation. As well as conodonts and acritarchs, *Schmidtites celatus* (Volborth), *Oepikites obtusus* (Mickw.), *Ungula ingrica* (= *Obolus ingricus* Eichw.), *Keyserlingia buchii* (Verneuil), *Obolus eichwaldi* Mickw. and *Torellella* sp. have been identified from the *C. andresi* Zone of the Kallavere Formation.

The topmost Cambrian silty-arenaceous deposits with the above palaeontological characteristics are overlain by lithologically similar rocks containing *Cordylodus proavus* Müll. in the same formation. Higher up, argillite interbeds of this formation contain remains of the *Dictyonema* (= *Rhabdinopora) flabelliforme* group, considered to be index fossils of the Tremadoc Series (Ordovician).

CONCLUDING REMARKS

The appended correlation chart was compiled on the basis of the above stratigraphical review of the Cambrian of the East European Platform.

The zonal standard for the Lower Cambrian has been compiled in the presented form for the first time. The zones are not of equal duration and they have been established on different criteria. At present the most important task is to work out additional palaeontological evidence for the definition of the boundaries of these zones. Conventionally, the latter are considered coincidental with the boundaries of the local stratigraphical units.

The least founded of these boundaries is the stratigraphical position of the basal Cambrian beds in the areas where the Baltic Group is lacking, or at least its palaeontologically documented base. These basal beds (Żarnowiec Formation and Nexø Sandstone), owing to their continental origin, have not yielded fossils; accordingly, the age of the units is still uncertain and their zonal relationships require further study.

The correlation of the Middle and Upper Cambrian local stratigraphical units with the zonal standard is still approximate. This is due to their different facies causing lateral differentation of the shelly fauna, especially noticeable above the base of the *P. paradoxissimus* Stage. To improve the resolution of the Middle and Upper Cambrian correlation, acritarchs should be studied in the sections biostratigraphically characterized by zonal index fossils. Studies on Lower Cambrian acritarchs all over the East European Platform well demonstrate the correlative significance of this group.

ACKNOWLEDGEMENTS

The authors thank all colleagues and friends for their help and advice and for numerous discussions of Cambrian correlation problems on the East European Platform. We are grateful to Drs D. Kaljo and H. Nestor (Tallinn), A. Rozanov (Moscow) and B. Aren (Warsaw) for critical reading and offering helpful comments on this manuscript. We wish to thank Mrs. A. Noor for her linguistic help.

ALPHABETICAL LIST OF LITHOSTRATIGRAPHICAL UNITS

Several acronyms are used in the ensuing text in reference to geographical location: BSSR is an abbreviation of Byelorussian Soviet Socialist Republic (Byelorussia); MSSR is the abbreviation of Moldavian Soviet Socialist Republic (Moldavia); RSFSR is the abbreviation for Russian Soviet Federative Socialist Republic (Russia); and Ukr. SSR and Ukraine SSR are used for the Ukrainian Soviet Socialist Republic (the Ukraine).

Aisĉiai Group (8, 10, 11)

Introduced by Sakalauskas (1966, p. 47), the Aisĉiai Group is named after ancient Lithuanian-Latvian tribes (Sakalauskas, 1968), and is distributed in the western and central areas of the Soviet East Baltic.

The group includes the sediments deposited during the second Early Palaeozoic stage of transgression over the East European Platform (Mens, 1981) which consist of sandstones, siltstones and argillaceous rocks having different lithological characteristics and thickness over the depositional basin.

On the basis of palaeontological data deposits of this group belong to three Regional Stages (from below to top): Vergale, Rausve and Kybartai of which the first is subdivided into two substages. The Vergale and Rausve Stages are of Early Cambrian, and the Kybartai of Middle Cambrian age.

The Aisĉiai Group lies transgressively on deposits of different ages, but particularly on the crystalline basement, and is overlain either by the Middle Cambrian Deimena Superformation or by Lower Ordovician formations.

Alum Shale (1, 2, 3, 4, 5)

The Alum Shale is not formally recognized as a formation, and there is therefore no type locality.

The alum shales are more or less kerogenous, black fissile shales with lenses and beds of kerogenous limestone and stinkstone (Andersson et al., 1985), which contain a number of different trace elements. The faunas are strongly dominated by trilobites, particularly in the Upper Cambrian, where benthic faunas are virtually absent and the trilobites are mostly small olenids and agnostids. By contrast, the Middle Cambrian and Tremadocian alum shales contain much more varied faunas with large benthic trilobites, brachiopods, hyoliths etc. (e.g. Grönwall, 1902; Westergård, 1922, 1939, 1946, 1948, 1950, 1953; Henningsmoen, 1957, 1958). The alum shale was deposited as mud in a shallow sea, and commonly wedges into thin conglomerates in the direction of presumed shorelines, as on northern Öland. The thickness of the Cambrian part of the alum shale ranges up to more than 70 m in Scania (Westergård, 1944).

The alum shale sequence includes a number of units (possible future members or formations) with names of their own. The Acrothele Conglomerate, which may mark the beginning of the Paradoxissimus deposition, is particularly well developed on Öland, its type area. The Exsulans Limestone was originally named Coronatus Limestone by Nathorst (1877), but the name was modernized by Tullberg (1882). The type locality is Kiviks Esperöd, east Scania. Berg-Madsen (1981) has shown that the Kalby Clay of Bornholm is weathered Exsulans Limestone. The Paradoxissimus Siltstone has its type area in Öland and should probably not be included in the alum shale sequence. The Hyolithes Limes-

tone of Linnarsson (1883) occurs in direct contact with the overlying Andrarum Limestone of Nathorst (1877). The type locality for both units is Andrarum, Scania. The latter appears to pass laterally into the Exporrecta Conglomerate.

In Bornholm, the alum shale is divided into the lower and upper alum shale by the Hyolithes and Andrarum Limestones (Berg-Madsen, 1985a, b), and in central Sweden the alum shale is commonly divided by the "great stinkstone bed", which occupies a variable position around the Middle/Upper Cambrian boundary.

The alum shale sequence is underlain by Middle Cambrian Oelandicus beds or by Lower Cambrian strata and is usually overlain by Lower Ordovician strata.

Baltic Group (10, 11, 12, 13, 14, 15, 16,17, 19, 20, 22, 23, 23)

This was introduced by Sokolov (1952, p. 21), but has been revised for this volume more precisely after Kirjanov (1968). It is named after the Baltic Sea, and is distributed in the western and central areas of the East European Platform of the USSR. Thicknesses up to 300 m are reported.

The Baltic Group contains the so-called pre-trilobite Cambrian beds deposited during the first Early Cambrian transgression on to the East European Platform.

The lower boundary of the group is lithologically marked by the appearance of glauconite and often coincides with the base of interbedded sandstones, siltstones and clays. Palaeontologically it is drawn at the appearance of sabelliditids and the acritarchs *Leiosphaeridia dehisca* and *Teophipolia lacerata* Kirjanov. The group is represented by glauconite-bearing sandstones, siltstones and argillaceous rocks, the last predominant. A weathering crust divides the Baltic Group from the overlying Liivi Group.

Palaeontologically the Baltic Group belongs to two Regional Stages: the lower part to the Rovno and the upper to the Lontova Stages.

It disconformably overlies different Upper Vendian deposits or crystalline basement rocks, and is overlain by younger Cambrian or other deposits.

Berezhki Group (20, 22, 23)

This name was established by Shulga with formational status to separate the terrigenous post-Baltic part of the Cambrian succession. It was raised to the rank of Group and defined by Kirjanov (1969, p. 48), who also suggested its Early Cambrian age.

This group is named after Berezhki village in the Lyuboml' District of the Volynia Region. Its stratotype is the interval of 441.3-747 m in the western areas of the Ukrainian SSR where it has a thickness up to 350 m.

The Berezhki Group is represented by sandstones, siltstones and argillaceous rocks, one or another being prevalent in different parts of the section. The lower boundary of the group is distinct over the whole depositional area and is drawn at the base of a complex of light fine-grained quartzose sandstones containing pebbles and rolls of the underlying rocks in the basal part. Stratigraphical knowledge of this group is different in separate geostructures, but it has been most completely studied in Volynia. There, three formations have been distinguished within the group on lithological and palaeontological criteria (from below to top): Dominopol', Lyuboml' and Swityaz. In Podolia where denudation processes are deep, only the lowermost beds of the group are preserved, and defined as the Samets

Formation. In the region of the Palaeozoic Lvovi Downwarp these deposits are as yet little studied and the group is not subdivided into formations.

Over the whole depositional area, the group is underlain by the deposits of the Lontova Regional Stage, and overlain by deposits ranging from Middle Cambrian to the Upper Cretaceous.

Białogóra Formation (6)

This formation was established by Bednarczyk & Turnau-Morawska (1975, pp. 556-557). It is named after Białogóra village in North Poland where the stratotype is the interval 2715.7-2719.5 m in Białogóra-1 boring. It is distributed in the western areas of North Poland, and has a thickness not exceeding 4 m.

The Białogóra Formation is composed of light grey quartzose-glauconitic sandstones with carbonate cement. The sandstones contain pebbles of darker grey sandstone and argillite, as well as phosphorite nodules.

The fauna includes *Lejopyge laevigata* (Dalman) and *Billingsella exporrecta* (Linnarsson) allowing the formation to be referred to the *Solenopleura brachymetopa* and *Lejopyge laevigata* Zones.

It is underlain by the Middle Cambrian Osieki Formation, and overlain by the Upper Cambrian Słowinski Formation.

Bug Formation (19)

This was introduced by Bessonova & Piskun (1977, p. 33), but its concept has been considerably revised herein to comprise only the deposits of the Lower Bug Subformation (see Makhnach et al., 1981).

The formation is named after the Bug River (Bessonova & Piskun, 1978). Its stratotype is the interval 1046-1110 m in the boring Brest 29-K, located in Novoselki village, Brest Region, BSSR (see Bessonova & Piskun, 1978; Makhnach et al., 1981).

The Bug Formation is distributed in the western areas of Brest Region, BSSR, where it usually has a thickness of 40-45 m, rarely up to 58 m, and is represented by greenish- and dark- grey silty-argillaceous rocks and coarse-grained siltstones. In the lower part of the formation light grey fine-grained quartzose sandstones with silt and clay interbeds prevail. The rocks are characterized by the presence of siderite, iron ooliths, kaolinite and numerous trace fossils often causing the formation to be bioturbated.

The formation has yielded diverse body fossils including *Volborthella tenuis* Schm., inarticulate brachiopods of the genera *Lingulella* and *Westonia*, agglutinated foraminifers and *Platysolenites antiquissimus* Eichw. The acritarch assemblage includes *Baltisphaeridium ciliosum* Volk., *B. varium* Volk., *B. compressum* Volk., *Micrhystridium lanatum* Volk., *Tasmanites volkovae* Kirjanov, etc., on the basis of which the Bug Formation is attributed to the Vergale Regional Stage (Bessonova & Piskun, 1977, 1978, 1979; Makhnach et al., 1981).

The lower and upper boundaries are drawn on the basis of lithological features. Underlying are the deposits of the Spanovka Formation, and overlying is the Velichkovichi Formation of the Rausve Regional Stage.

Bugino Formation (17)

This formation was established by Rybnikova & Strikovskaya (1984, p. 46), and named after the village of Bugino, Yaroslavl' Region, RSFSR, where the stratotype is the interval of 2060- 2145 m in Urdomskaya-1 boring.

The Bugino Formation occurs in the western areas of the Moscow Syneclise. Thickness increases from the west to the east being greatest (up to 90 m) in the stratotype area.

The lowermost part of the formation consists of light grey and greenish-grey silty-sandy rocks with clay-carbonate cement. The major part of the formation is represented by dark grey and brownish silty argillites and argillite-like clays with thin silt and sandstone interbeds. In places the deposits contain accumulations of glauconite and fine-grained carbonate. At the base of the formation a thin conglomeratic interbed containing flat pebbles of phosphatized rocks often occurs.

The most frequent macrofauna includes the inarticulate brachiopod genera *Obolus, Lingulella, Westonia* and *Acrotreta* and occasional trilobites. From the Tolbukhinskaya-1 section (2080.2-2088.4 m), *Parabolina jaroslavica* Suv. has been identified, and the Rybinskaya-1 section (1840-1942.6 m) has yielded *Parabolina* sp.

Among the deposits of the formation three acritarch assemblages have been recorded (N. Volkova pers. comm.), the second of which, on the basis of the occurrence of species of the genus *Arbusculidium*, permits stratigraphical correlation with the *Peltura* Zone. The upper assemblage, however, containing *Acanthodiacrodium angustum* and *Dicrodiacrodium ramusculum,* shows that the deposits may continue into the *Acerocare* Zone.

The Bugino Formation is underlain by the Upper Cambrian Pestovo Formation, and overlain by terrigenous rocks of the Tremadoc Series.

Bui Formation (17)

The Bui Formation (Dmitrovskaya et al., 1983, p. 73) corresponds to the Danilovo and Rusanovo Beds of Kirsanov (1974), and is named after the town of Bui near which the stratotype section is located over the interval 2735-2810 m in the Bui boring.

The formation is distributed in the central regions of the RSFSR where its thickness varies from 20-75 m being greatest in the Galich Depression.

Represented by variegated and greenish-grey arenaceous- silty-argillaceous deposits, the formation is divided into two by a band of sand or siltstone. At the base, in western sections, there occurs an interbed of gravelly feldspar-quartz sandstone containing dark flat phosphatized pebbles. The lower part of the formation is enriched in glauconite which is rare in the upper half.

The formation has yielded sabelliditids and scarce platysolenitids (only in the upper part). Different acritarch assemblages occur in the lower and upper parts. That of the lower includes *Leiosphaerida* together with *Teophipolia laccerata* Kirjan., *Ceratophyton vernicosum* Kirjan. and *Leiovalia striatella* Paškev., whereas in the upper half representatives of the genera *Teophipolia* and *Retisphaeridium* have not been recorded. A complete list of acritarchs is given by Paškevičiene (1981). By acritarchs the Bui Formation is correlated with the Rovno Regional Stage.

The Bui Formation is underlain by the Upper Vendian Reschma Formation, and is overlain by the Lezha Formation of the Lontova Regional Stage.

Buiki Formation (13)

This formation was established during the compilation of Cambrian stratigraphical scheme of Byelorussia by Makhnach et al. (1981), and named after Buiki village. The stratotype occurs in the interval 281-290 m of the Postavskaya boring located at Buiki village (Zinovenko & Piskun, 1981).

The Buiki Formation is distributed in northwestern Byelorussia, where it reaches a thickness up to 17 m, and is represented by light grey to white fine-grained quartzose sandstones with the interbeds of kaolinitized clays. The rocks contain abundant pyrite nodules and grains.

Palaeontologically the formation is poorly characterized. Clay interbeds have yielded single ichnites of the *Skolithos* type and a scarce acritarch assemblage. The presence of *Timofeevia phosphoritica* Vang., *T. lancarae* Vang. and *Cristallinum cambriensis* Vang. among the acritarchs enables the Buiki Formation to be dated as Middle Cambrian, but not earlier than the *Paradoxides paradoxissimus* Stage.

The Buiki Formation rests disconformably on the weathering crust of the Lontova Regional Stage and is overlain by glauconite-bearing rocks of the Lower Ordovician Latorp Regional Stage.

Cirma Superformation (12)

This stratigraphical unit was introduced by a group of authors (Brangulis et al., 1975, p. 108), and named after Lake Cirma in eastern Latvia. The stratotype is the interval 874-925 m in Tsirulishi boring (Brangulis et al., 1976, p. 32). It is distributed in eastern and central Latvia where its thickness varies greatly according to completeness of the section, mostly being between 14-73 m.

This unit comprises four members which, except for the upper one, thin eastwards. The lowest member consists of quartzose sandstones and siltstones with interbeds of greenish- grey clays, and rarely gravellites; the second member is represented by alternating quartzose sandstones, siltstones and dark grey clays; the third contains quartzose sandstones with interbeds of greenish-grey clays; and the uppermost member is formed of quartzose sand and siltstones with rare interlayers and lenses of kaolinitized clays.

The first member and the lowermost part of the second member have yielded an impoverished Vergale acritarch assemblage. In the uppermost part of the second member and the lowermost part of the third, the Rausve acritarch assemblage has been recorded. The uppermost beds of the third and fourth members contain Middle Cambrian acritarchs of the *Paradoxides paradoxissimus* and *P. forchhammeri* Stages. Judging by acritarchs, the Cirma Superformation comprises deposits ranging from the Vergale Regional Stage up to the uppermost Middle Cambrian. Lists of acritarchs have been published in works by Brangulis et al. (1975) and Volkova (1983).

The Cirma Superformation rests transgressively either on the weathered crust of the Lontova Regional Stage or on the crystalline basement, and is overlain by the Upper Cambrian Petseri Formation with evidence of a sedimentary break, or by Lower Ordovician glauconite-bearing sandstones.

Dark grey, almost black, micaceous siltstones (21, 22)

This informal unit has been established only recently (Kirjanov, 1977, p. 67; 1979, pp. 66-67) and its rank is uncertain. It is best exposed in the interval 3046-3243 m of the Peremyshlyany-1 boring.

The unit is distributed in the westernmost areas of the Ukraine and eastern Poland where it has a thickness of about 200 m, and consists of dark grey, almost micaceous siltstones with interbeds of light quartzite-like sandstones with abundant pyrite nodules.

The unit contains inarticulate brachiopods, among which *Lingulella* cf. *desiderata* (Walcott) and *L. lepis* Salter have been identified, and also trilobites (see Lendzion, 1983), allowing a correlation with the deposits of the *Paradoxides paradoxissimus* Stage.

It rests on light grey and variegated Middle Cambrian sandstones (western Ukraine) or on the Kostrzyn Formation of the *Eccaparadoxides oelandicus* Stage (eastern Poland), and is overlain by Ordovician deposits.

Dębki Formation (6)

This was established by Bednarczyk & Turnau-Morawska (1975, pp. 550-555), and named after Dębki village, in northern Poland, where the stratotype is the interval 2700-2709.5 m in Dębki-3 boring. It is distributed in the western areas of North Poland where a maximum thickness up to 80 m is recorded.

The unit is composed of fine to medium-grained quartzose sandstones intercalated with dark grey argillites. Its fauna contains *Paradoxides paradoxissimus* (Wahlenberg), *Ellipsocephalus lejostracus* (Angelin), *Triplagnostus gibbus* (Linnarsson), *Peronopsis pusilla* Tullberg, *P. fallax* (Linnarsson) *interalia,* as well as inarticulate brachiopods (see Bednarczyk, 1984).

Trilobites indicate that the formation belongs to the *Ptychagnostus gibbus* and *P. atavus* Zones, and possibly also to the *P. punctuosus* Zone.

It is underlain by the Middle Cambrian Sarbsko Formation, and overlain by the Middle Cambrian Osieki Formation.

Deimena Superformation (8, 9)

This stratigraphic unit was introduced by Sakalauskas (1966, p. 47). It is named after the Deimena River of the Kaliningrad Region where its stratotype is the interval 1852.4-1936 m in Pravdinsk-1 boring (Grigelis et al., 1971). The superformation is distributed in the western and southwestern areas of the Soviet East Baltic. Its thickness is greatest in the southwest, reaching 120 m.

The Deimena Superformation consists of light quartzose sandstones and coarse-grained siltstones with thin interbeds of dark grey argillaceous rocks with brownish shades, and rare interbeds of greenish-grey argillaceous rocks. Single grains of glauconite have been recorded in the lowermost part of the formation.

Palaeontologically the unit is poorly characterized: only rare fragments of inarticulate brachiopods and an impoverished acritarch assemblage mostly composed of forms of the genera *Baltisphaeridium, Micrhystridium* and *Leiosphaeridia* occur, which do not define an exact age. By its position in the section, the Deimena Superformation is conditionally attributed to the lowermost Middle Cambrian-to the *Ptychagnostus praecurrens (Eccaparadoxides pinus)* Zone.

It lies transgressively on various Cambrian deposits, over local structures, but most often however, on rocks of the crystalline basement, and is overlain by Middle Cambrian to Lower Ordovician deposits.

Dominopol' Formation (20)

This formation was introduced by Kirjanov (1969, p. 52), who named it after Dominopol' village in the Vladimir-Volynia District of the Volynia Region.

Its stratotype is the interval 617.2-747 m in the Berezhki-2944 boring, and it is distributed in the western areas of the Ukrainian SSR, where its thickness is up to 160 m.

On the basis of lithological features the formation is subdivided into two gradually transitional subformations.

The Lower Dominopol' Subformation, with a thickness of up to 135 m, is represented by light grey (with a spotted greenish or pinkish colouring) fine-grained quartzose sandstones with rare thin interbeds of greenish-grey and reddish-brown argillaceous siltstones, micaceous on some bedding planes. Fossils are lacking.

The Upper Dominopol' Subformation consists of interbedded arenaceous, silty and argillaceous rocks of a darker colouring. This is due to a considerable amount of clay. The uppermost part of this subformation is in places variegated, with evidence of subaerial weathering.

It contains the trilobites *Wolynaspis unica* N. Tchern and *Schmidtiellus* sp., fragments of *Mickwitzia* sp.; and *Volborthella tenuis* Schm. Acritarchs are numerous, being represented by the Lukati assemblage. These are listed by Kirjanov in several papers (see Kirjanov & Tchernysheva, 1967; Kirjanov, 1979, pp. 160, 161). On the basis of palaeontological data and the transitional character of the boundary between the subformations, the whole Dominopol' Formation is attributed to the Dominopol' Regional Stage.

It is underlain by the Stokhod Formation of the Lontova Regional Stage, and overlain by the Lyuboml' Formation of the Vergale Regional Stage.

File Haidar Formation (4, 5)

This formation was named by Bergström & Gee (1986) for the Lower Cambrian of the Baltic and adjoining parts of Sweden. The type sequence was described by Thorslund & Westergård (1938) from the File Haidar bore, Götland.

The Kalmarsund Sandstone is considered to be a local facies, a member if so preferred. Two tongues of the File Haidar Formation are found as outliers in Västergötland, Östergötland and Närke; these are known as the Mickwitzia and Lingulid Sandstones. The thickness of the formation ranges from a minimum of about 20 m in central Sweden to 157 m at File Haidar. The rocks are dominantly fine grained sandstones and siltstones with clay (Westergård, 1929, 1940; Thorslund & Westergård, 1938; Hessland, 1955; Martinsson, 1974; Bergström & Gee, 1986). Body fossils are dominated by various shells and tubes such as *Volborthella tenuis, Mobergella* spp., *Mickwitzia monilifera, Tommotia* sp. and *Torellella laevigata*. Trilobites include *Holmiella* sp. and "*Strenuella*" *obscura*, and a number of undetermined olenellid fragments are known from the Gävle area (Wiman, 1903). Other arthropods include the early xiphosuran *Eolimulus* and the probable trilobitomorph *Paleomerus*. Trace fossils are much more numerous than body fossils. Acritarchs throughout the sequence indicate the "*Holmia* stage" (Vidal, 1981a, b).

The File Haidar Formation generally rests on Proterozoic basement rocks. It is overlain by Middle Cambrian strata, but at least on land there is a large hiatus corresponding to the Hawke Bay Event separating these sequences.

Filipeny Formation (24)

Bukachuk et al. (1968, pp. 125-126) established this unit which was named after Filipeny village in the Leovo Region, MSSR. Its stratotype is the interval 1102-1189 m in the P-111 boring located at Yargara village. The formation has a restricted distribution in southwestern Moldavia, where its greatest thickness is 86 m.

It is represented by light and pinkish-grey, almost white quartzite-like fine-grained quartzose sandstones with interbeds of dark grey fine-grained silt and claystones.

Palaeontologically it is uncharacterized. On the basis of similar lithological features with the Zbruch Formation of Podolia, and by its position in the section, the Filipeny Formation is conditionally attributed to the Lontova Regional Stage.

It is underlain by the Tigech Formation of the Rovno Regional Stage, and overlain by the Upper Caradoc Pleshen Formation.

Galich Formation (17)

This was introduced by Dmitrovskaya et al. (1983), and corresponds to the Glebovo Beds of Kirsanov (1974).

It is named after the town of Galich near which the stratotype section is located in the interval 2550-2650 m of the Galich-1 boring. The formation is distributed in the eastern part of the central regions of the RSFSR (Gryazov and Galich Depressions). Thicknesses increase from the southwest to the northwest, being greatest (about 100 m) in the stratotype area.

Light green and greenish-grey argillaceous rocks with rare interbeds and lenses of quartzose siltstones and feldspathic-quartzose glauconite-bearing sandstones characterize the formation, the lower part of which is more coarse-grained compared to the upper. Numerous pyritized trace fossils occur on clayey bedding planes. At the top of the formation the rocks are variegated and kaolinitic, constituting a weathering crust.

The only fossils recorded are sabelliditids, platysolenitids and acritarchs, including *Granomarginata squamacea* Volk., *G.* cf. *prima* Naum., *Micrhystridium tornatum* Volk., and *Tasmanites* cf. *tenellus* Volk. (see Kirsanov, 1974; Dmitrovskaya et al., 1983). On the basis of these, the deposits are attributed to the Lontova Regional Stage.

The Galich Formation lies conformably on the Lezha Formation of the Lontova Regional Stage, and is overlain transgressively by the Middle Cambrian Urdom Formation.

Gege Formation (8)

The lower part (18 m) of the formation consists of quartzose sandstones with thin interbeds of siltstones and greenish-grey argillaceous rocks. At the base, an interbed of unsorted sandstone with gravel occurs. The upper part (15 m) is represented by frequently interbedded micaceous-feldspathic- quartzose sandstones and argillaceous rocks, including interlayers of brown iron oolites. This part is also characterized by the wide development of bioturbation structures of the "kraksten" type.

The Gege Formation contains *Germaropyge* (?) *mendosa*. Tchern., *Volborthella tenuis* Schm., and the Vergale acritarch assemblage, lists of which are given by Jankauskas (1972, 1974).

It is underlain by crystalline basement (Proterozoic Neivirzhe Formation) and overlain by the Virbalis Formation of the Rausve Regional Stage.

Gislöv Formation (3)

The top of the lower Cambrian in Scania was distinguished by Bergström & Ahlberg (1981) as the Gislöv Formation. The type locality is situated on the shore 1 km SW of Brantevik, southeastern Scania.

Exposed sections in Scania indicate that the formation is less than 2 m, and commonly less than 1 m thick. However, uncored drillings have penetrated what seems to be around 10 m of Gislöv Formation in eastern Scania. Corresponding strata at Slagelse in Sealand may measure 22 m (Chr. Poulsen, 1969). No corresponding strata are developed in Bornholm. At Slagelse the sediments are described as hard, grey shale. In Scania there is typically a basal part with quartz grains reworked from the underlying Rispebjerg Sandstone. There is commonly a gradual transition over a middle claystone or marly siltstone to an upper grey to almost black limestone. There is a varied fauna, including *Holmia sulcata* (formerly identified as *H. kjerulfi*), species of *Proampyx*, *Ellipsocephalus* and *Comluella*, *Calodiscus lobatus*, and various brachiopods and hyoliths. Trilobites at Slagelse include *Kjerulfia selandica* and a *Holmia*. Based on this fauna, the Gislöv Formation corresponds to the zones with *Holmia kjerulfi* and *Proampyx linnarssoni* and can be correlated with the Holmia Shale and Evjevik Limestone of the Mjøsa area, with the upper siltstone member at Torneträsk, and with the Lingulid Sandstone Member of central Sweden.

In Scania the formation is underlain by the Rispebjerg Sandstone and overlain by Middle Cambrian Paradoxissimus beds.

Hardeberga Sandstone (3)

The stratigraphic term Hardeberga Sandstone was originally introduced by Angelin in 1877 to cover the whole sequence of Lower Cambrian arenites in Scania. Hadding (1929) restricted the use of the term to the "unfossiliferous" strata below the trilobite-bearing Noretorp Formation (by then unnamed), and Regnéll (1960) referred to the "unfossiliferous" strata as the Hardeberga Sandstone *sensu stricto*. In southeastern Scania this sequence was subdivided by Lindström & Staude (1971) into discrete formations: from below the Lunkaberg, Vik, Brantevik and Hardeberga Formations. As this subdivision cannot be extended to other parts of Scania, or to Bornholm, it seems most convenient to retain the definition of the Hardeberga Sandstone of Hadding and Regnéll, and to use the units of Lindström & Staude as local members (Bergström 1982, pp. 11-12; Bergström & Gee, 1986). The Balka Sandstone of Bornholm corresponds to the Hardeberga Sandstone, and the two names must be regarded as synonymous. A quartzarenite which is possibly Hardeberga Sandstone is also found below *Holmia*-bearing beds in the boring at Slagelse, Sealand (Sorgenfrei & Buch, 1964; Poulsen, 1969).

The Hardeberga Sandstone ranges in thickness from some 60 m on Bornholm to more than 100 m in Scania (e.g. around 115 m at Simrishamn according to Lindström & Staude, 1971). The lithology is typically a quartz-cemented quartzarenite, more or less white in colour. Occasionally there are silty and clayey intercalations (particularly in the Lunkaberg

Member). The Brantevik Glauconitic Sandstone is a thin member (3 m thick) with thin-bedded glauconitic and phosphoritic siltstone of comparatively dark colour. Fossils are dominated by trace fossils such as *Syringomorpha, Diplocraterion, Skolithos, Psammichnites* and *Rusophycus* (Hadding, 1929; Chr. Poulsen, 1969; Bergström, 1970). Body fossils are rare and include hyoliths and a single impression of a trilobite, which may be a *Holmia*. Acritarchs indicate a *Holmia* Stage level (Vidal, 1981a, b).

The Hardeberga Sandstone is a marine, nearshore sandstone which rests on Proterozoic basement rocks except in Bornholm, where it rests on the continental Nexø Sandstone. It is overlain by upper Lower Cambrian sediments.

Irbeni Formation (10)

This name was first introduced in the Cambrian stratigraphical scheme for the East Baltic (Grigelis, 1978), but was previously called the Kurzeme Formation (Kala, 1972; Mens & Pirrus, 1972; Areń et al., 1979), an already occupied name (see Kala et al., 1984).

The name comes from the Irbeni Gulf between Saaremaa Island and Kurzeme Peninsula. The stratotype of this formation is the stratotype of the Kurzeme Formation represented by the interval 1329-1387 m in the Pavilosta boring, western Latvia (Lieldiena & Fridrichsone, 1968).

It occurs in Latvia and western Estonia where the maximum thickness reaches 50 m, and where it is represented by frequently interbedded argillaceous and silty rocks including some interlayers of brown goethite oolites. Argillaceous rocks of the lower part of the formation are greenish-grey, but in the upper part they are dark grey, with a brownish shade. Characteristic are abundant ichnites in clay intervals forming a bioturbation structure of the "kraksten" type. Agglutinated foraminifers, *Volborthella*, fragments of inarticulate brachiopods, trilobites and numerous ichnites occur. The acritarch assemblage has yielded *Baltisphaeridium ciliosum* Volk., *B. compressum* Volk., *B. implicatum* Fridr., *B. insigne* (Fridr.), *B. varium* Volk., *B. primarium* Jank., *B. strigosum* Jank., *B. orbiculare* Volk., *Micrhystridium lanatum* Volk., *M. tornatum* Volk., *Tasmanites volkovae* Kirjanov, T. *bobrowskii* Waz., *Dictyotidium priscum* Kirjanov & Volk., *Pterospermella solida* (Volk.), *Leiovalia tenera* Kirjanov, *Lophosphaeridium truncatum* Volk., *Alliumella baltica* Vanderflit, Gran*omarginata squamacea* Volk., *Leiomarginata simplex* Naum., *Leiosphaeridia bicrura* Jank., *L.* sp., *Cymatiosphaera* sp., and *Ovulum* sp.

The Irbeni Formation rests on the Soela Formation of the Lower Vergale Substage. It is overlain either by the Middle Cambrian Ruhnu Beds or arenaceous rocks of the Lower Ordovician Pakerort Stage. In places, overlying deposits are carbonates of the Latorp Stage.

Kallavere Formation (14)

Under this name, and with the rank of formation, this unit was first published by Ulst & Gailite (1976, p. 56), but the name itself was originally proposed by R. Männil and A. Rõõmusoks during the compilation of the stratigraphical schemes for the East Baltic area (Grigelis, 1978; Männil & Rõõmusoks, 1984).

The present concept of the formation is condensed compared to that given in the above works: the Ülgase Member has been excluded as it is now treated as an independent formation. Presently the formation corresponds to the upper part of the Obolus Sandstone (= Ungulitensand) of Schmidt (1881), zones, $A_{2\beta}$ and $A_{2\gamma}$ of Öpik (1929), Maardu Mem-

ber of Mŭŭrisepp (1958), Maardu and Suurjogi Members of Loog (1964) and to the Maardu, Suurjõgi, Katela, Rannu and Orasoja Members of Heinsalu (1986).

The name of the formation derives from Kallavere village, North Estonia, where a stratotype section is defined in the clint near a shaft of an ancient mine at the eastern margin of Ülgase village, 4 km to the northeast of Kallavere. The formation, as occurring in Estonias has a thickness up to 20 m, but most often is 4-6 m.

Lithological composition is diverse vertically, as well as laterally. The lower part is mostly characterized by light quartzose, weakly cemented, fine-grained sandstones, and coarse-grained siltstones with lens-shaped shelly brachiopod coquinas - the so-called Obolus Conglomerate. The upper part of the formation consists of darker fine to medium-grained cross-bedded detrital sandstones. Throughout the whole section of the formation there occur interbeds (up to a few cm) of dark brown kerogen-bearing argillites, and in the lower part there are also greenish-grey clays.

The fossil complex is represented by inarticulate brachiopods (according to the revision by L. Popov) *Schmidtites celatus* (Volborth), *Oepikites obtusus* (Mickwitz), *Ungula ingrica* (Eichw.), *Keyserlingia buchii* (Verneuil), *Obolus eichwaldi* Mickwitz; conodonts characteristic of the *Westergaardodina* Zone up to the *Cordylodus rotundatus - C. angulatus* Zone (incl.), and graptolites of the genus *Dictyonema (= Rhabdinopora)*, of which *D. f. sociale* appears in the *Cordylodus proavus* Zone (see Kaljo et al., 1986). On the basis of these palaeontological data the formation is dated as Late Cambrian (*Peltura* Zone) to Tremadocian.

It lies transgressively on various deposits, from the Lower Cambrian Tiskre Formation up to the Upper Cambrian Ülgase Formation, and is overlain by the Lower Ordovician Türiasalu Formation.

Kaplonosy Formation (18, 21)

Established by Lendzion (1962, p. 522), this formation was named after Kaplonosy village, eastern Poland. The stratotype is the interval 1067-1215 m in Kaplonosy IG-1 boring. The formation occurs in southeastern Poland where a maximum thickness of 280 m has been recorded. It is composed of grey and variegated sandstones with rare interbeds of reddish-brown siltstone.

Shelly fauna has not been found, but there are trace fossils, such as *Psammichnites gigas* Torell, *Bifungites* sp., *Diplocraterion* sp. and *Rusophycus* sp. Acritarchs are represented by *Micrhystridium tornatum* Volk., *M. lanatum* Volk., *Granomarginata squamacea* Volk., *Baltisphaeridium compressum* Volk., *Archaeodiscina umbonulata* Volk., and *Tasmanites bobrowskii* Waz.

All these are long-ranging forms and on the basis of stratigraphical position the formation is conditionally referred to the *Rusophycus parallelum* to *Holmia inusitata* Zones inclusive.

The Kaplonosy Formation is underlain by the Zawiszyn Formation in the Podliassian-Brest Depression and by the Mazowsze Formation in the Lublin Slope and is overlain by the Lower Cambrian Radzyń Formation.

Khmelnitskiy Formation (23)

This was introduced by Kirjanov (1969, p. 49), previously with the rank of beds (Kirjanov, 1965) or as the Rovno Beds (Kirjanov, 1968).

It is named after the town of Khmelnitskiy, where the stratotype interval is between 317.7-377.7 m in the Darabadny- 1372 boring.

The formation occurs in the southern part of the Ukrainian SSR as a narrow belt between the upper reaches of the South Bug River and the middle reaches of the Dnestr River, being exposed near Kitaigorod and Subochi villages. Eastwards it grades laterally into the Zbruch Formation. Thicknesses vary from 36- 60 m.

Lithologies consist of alternating sand and siltstones and argillaceous rocks. In a number of sections, according to the ratio of rock types, the formation is subdivided into two parts. In the lower part (0.1-30 m) light greenish-grey glauconitic-quartzose sandstones with pebbles of various rock types including brown phosphorites prevail. Layers of siltstone and argillaceous rocks are dark grey and usually of insignificant thickness. In the upper part of the formation siltstones of a dark grey to black colour predominate.

The formation has yielded abundant sabelliditids among which have been identified *Sabellidites cambriensis* Yan., *Sokoloviina costata* Kirjanov and *Paleolina* sp. have been identified. The acritarchs are restricted, differing from the typical Rovno assemblage by the abundance of coarse leiospherid forms and an inconsiderable number of *Teophipolia lacerata* Kirjanov. On the basis of these data the formation is attributed to the Rovno Regional Stage. However, it is possible that its uppermost part, where fossils are lacking, belongs already to the Lontova Stage.

The Khmelnitskiy Formation is underlain by the Okunets Formation of the Rovno Regional Stage. The uppermost beds grade into the Zbruch Formation of the Lontova Regional Stage, and in the east, due to denudation, is overlain by the Ordovician Molodovo Regional Stage.

Kluki Formation (6)

This was established by Bednarczyk & Turnau-Morawska (1975, pp. 540-544) and named after Kluki village, in northern Poland, where a stratotype interval 3135-3330 m occurs in Smoldzino-1 boring. The Kluki Formation occurs mainly in the western areas of northern Poland. Thickness is greatest in the stratotype area, but does not exceed 200 m.

Lithologically the formation is not homogeneous. Its lower part is mostly represented by grey sandstones with greenish- grey, pink and reddish-brown stripes and patches. The upper part consists of light grey horizontally-bedded quartzose siltstones.

Hyoliths, *Mobergella,* acritarchs, etc. have been described (see Lendzion, 1983; Bednarczyk, 1984), allowing the formation to assigned to the *Mobergella* and *Schmidtiellus mickwitzi* Zone.

The lower boundary of the formation is lithologically transitional. It is underlain by the Lower Cambrian - Upper Vendian, Zarnowiez Formation and overlain by the Lower-Middle Cambrian Lebsko Formation.

Kobozha Group (17)

This unit was established during the compilation of the Cambrian stratigraphical scheme for the Soviet part of the East European Platfrom (Spizharskij, 1986) with the rank of group. It is named after the Kobozha River of the Novgorod Region. Previously it has been regarded as a formation by Dmitrovskaya et al. (1983). The stratotype is the interval 1225.5-1312 m in the Pestovo boring.

This group is distributed in the central regions of the RSFSR, especially in the western part where its thickness in stratigraphically complete sections is up to 90 m.

The group comprises the deposits of the second post-Baltian sedimentary stage which was deposited during the Late Cambrian in the Moscow Syneclise. The lower boundary is lithologicaly distinct, marked by alternating rock types, and in places by basal gravellites. The upper boundary is lithologically markedly different, and is considered palaeontologically distinct.

The Kobozha Group contains an alternation of sandstones, siltstones and argillaceous rocks. In the lower part there are predominantly sandstones, but in the upper part argillaceous rocks prevail. On the basis of the ratio of rock types the group is subdivided into three formations. The lower-arenaceous part is defined as the Nikolskoye Formation, the middle, more argillaceous one, as the Pestovo Formation, and the upper, the most argillaceous, as the Bugino Formation.

Kostrzyń Formation (18, 21)

Established by Lendzion (1962, p. 523), and named after the Kostrzyń River, eastern Poland, the stratotype - interval is 3636.6-3886.7 m in the Okuniew IG-1 boring.

The Kostrzyń Formation occurs in the southeastern areas of Poland, where a maximum thickness of 250 m is recorded. This formation is composed of quartzose sandstones cemented mostly by silica of the regeneration type, and containing single interbeds of silty argillite.

Fossil remains are rare, *Ellipsocephalus polytomus* Linnarsson, *Eccaparadoxides pinus* Holm, *Paradoxides* sp., *Solenopleura* sp. and *Lingulella ferruginea* Salter occurring. On the basis of these fossils, the formation is assigned to the *Eccaparadoxides oelandicus* Stage. Its upper part, however, may be a stratigraphical equivalent of the lower zone of the *P. paradoxissimus* Stage.

The formation is underlain by the Lower Cambrian Radzyń Formation. Overlying units are either Middle Cambrian (on the Lublin Slope of the Platform) or Lower Ordovician formations, and in places even younger ones.

Kybartai Formation (8)

The Kybartai Formation (Sakalauskas, 1966, p. 47) was named after the town of Kybartai, in Lithuania. The stratotype interval is 2020-2032 m in the Stonishkyai boring (Grigelis et al., 1971), and the formation occurs in the Kaliningrad Region of western Lithuania and western Latvia. In western Latvia, it is treated as a member within the Tebra Formation. Its thickness attains 32 m.

The formation comprises alternating horizontally-bedded quartzose-glauconitic sandstones, siltstones and dark grey or greenish grey argillaceous rocks. In places the sandstones contain pebbles of phosphatized rocks. Often in the sandstones, and more rarely in the siltstones, bedding planes are covered with grains of glauconite, and the valves and detritus of inarticulate brachiopods. The uppermost part of the formation is frequently pyritized.

Numerous inarticulate brachiopods, mostly of the genera *Westonia* and *Lingulella*, but also *L.* cf. *ferruginea* Salter occur (Korkutis, 1968), and the Kybartai acritarch assemblage *interalia* includes *Baltisphaeridium pseudofaveolatum* Fridr., *Liepaina plana* Jank. & Volk.

and *Lophosphaeridium variabile* Volk. A complete list of acritarchs is given by Jankauskas (1982).

This unit serves as the nominal formation for the Kybartai Regional Stage. It is underlain by the Virbalis Formation of the Rausve Regional Stage, in places the contact bearing traces of a sedimentary break, and is overlain by the Deimena Superformation.

Ladoga Formation (15, 16)

Rukhin (1939, p. 152) introduced this formation, but the composition and grounds for the Upper Cambrian age are given in the papers by Borovko et al. (1980, 1984). It is named after Lake Ladoga. The lectostratotype is an outcrop on the left bank of the Izhora River, 8 km to the northeast of the town of Pavlovsk.

The formation crops out in the northwestern areas of the RSFSR where its thickness is up to 10 m, but only 1.4 m in the stratotype area.

The Lodoga Formation contains light grey inequigranular and weakly cemented quartzose sandstones with an admixture of glauconitic nodules, quartz gravel and phosphatic pebbles. It contains thin interbeds of light grey and brown compact clays and siltstones. At the base, lenses of ferruginized pisolitic nodules occur in some places. Sedimentary structures include cross- and horizontal bedding alternating according to different gradation in grain size or in detritus content.

Fossils are represented by two conodont and acritarch assemblages, inarticulate brachiopods of the genera *Ungula, Oepikites* and *Keyserlingia* and remains of *Torellella* and *Rukhinella*. A complete list is given by Borovko et al. (1984).

Considering the composition of the conodont and acritarch assemblages, the Ladoga Formation is considered to have a late Upper Cambrian age (*Leptoplastus* and *Peltura* Zones).

It is underlain by the Middle Cambrian Sablinka Formation and overlain by the Tosno Formation of the Lower Ordovician (Tremadoc Series).

Ladushkino Formation (8)

This was established as a formation by Nikashin et al. (in press) but the Late Cambrian age and lithology were defined earlier (see Kaplan et al., 1973). It is named after Ladushkino village in the Mamonovski District of Kaliningrad Region. No stratotype has been determined, but the formation is characterized by sections in the borings Ladushkino-1 (2451.8-2494 m), Veselovsk-5 (2492.35-2494 m) and Veselovsk-8 (2463-2463.5 m).

The Ladushkino Formation occurs in the southwestern part of Kaliningrad Region. Its thickness is inconsiderable, varying from 0.2 to 1.65 m. It consists of terrigenous-carbonate rocks, the most characteristic being light grey organogenic-detrital dolomitized limestones, quartzose sandstones with abundant carbonate cement, and dark grey, almost black, kerogen-bearing argillites. The rocks of the formation are, as a rule, strongly fractured, the fractures being filled with a white crystalline calcite. The formation has yielded *Homagnostus* sp., *Orusia lenticularis* (Wahlenb.) and *Acrothele* (?) (Kaplan et al., 1973), indicating that the deposits are Upper Cambrian, probably ranging in age over the *Olenus* and *Agnostus* and *Parabolina spinulosa* Zones combined.

The Ladushkino Formation lies disconformably on Middle Cambrian deposits of various age, and is overlain by glauconitic sandstones of the Ordovician Arenig Series.

Lakai Formation (13)

Jankauskas (in Jankauskas & Paškevičience, 1973, p. 14) named this formation after Lakai Lake, in eastern Lithuania where a stratotype is the interval 526-559 m in the Lyaljai-284 boring. The Lakai Formation occurs in the eastern and central areas of Lithuania and has a maximum thickness of 50 m in the vicinity of Tauchonis village.

It consists of light fine-grained quartzose sandstones and coarse-grained siltstones with thin interbeds of greenish-grey and argillaceous rocks.

Fossils are represented by acritarchs. An assemblage from the lower part of the formation correlates with the Vergale Regional Series, but those of the upper part are considered to indicate a Middle Cambrian age. A complete list of acritarchs is given by Jankauskas (1982).

In the east, the formation is underlain by the weathered crust of the Lontova Regional Stage, and in the west by rocks of the crystalline basement. Usually it is overlain by carbonate rocks of the Lower Ordovician Arenig Stage, but also in places, by a thin member of the so-called Obolus Sandstone, of Tremadoc age.

Łebsko Formation (6)

Established by Bednarczyk & Turnau-Morawska (1975, pp. 544-548), the Lebsko Formation, named after Lake Łebsko, North Poland, has a stratotype interval between 3003-3184.4 m in the Leba-8 boring. It occurs in the western areas of northern Poland where its maximum thickness is 185 m.

This formation is composed of quartzose-glauconitic sandstones with phosphate nodules and interbeds of quartzose- glauconitic siltstone.

The fauna is not diverse, especially in the lower and middle parts, and is represented by *Orthotheca hermelini* (Holm), *Acrothele prima* (Matthew), *Acrotreta gemmula* Matthew, *Eccaparadoxides* ex. gr. *oelandicus* (Sjögren), *E. insularis* (Westergård), *Bailiella emarginata* (Linnarsson), and *Hipponicharion eos* Matthew (see also Lendzion, 1983; Bednarczyk, 1984).

On the basis of faunal and lithological characteristics the deposits of this formation are considered to represent the zones from *Holmia inusitata* to *Eccaparadoxides insularis* inclusive.

The Łebsko Formation is underlain by the Lower Cambrian Kluki Formation and overlain by the Middle Cambrian Sarbsko Formation.

Lezha Formation (17)

The Lezha Formation (Kirsanov, 1974, p. 17) corresponds to the Rostov Formation of Dmitrovskaya et al. (1983), and is named after the Lezha River.

A stratotype interval is 1869-1977 m in the Vologda boring. The formation is distributed in the central regions of the RSFSR, where its thickness varies from 25-170 m, increasing southeastwards towards the Galich Depression.

It consists of greenish-grey, red-brown and brownish argillaceous rocks with rare interbeds of quartzose silty sandstone which include nodules and small lenses of glauconite. The lower part is coarser-grained than the upper. Characteristic are abundant pyritized trace fossils. In western sections, i.e. outside the distribution area of the Galich Forma-

tion, rocks of the uppermost part of the Lezha Formation are variegated and kaolinitized, constituting a weathering crust.

Sabelliditids, platysolenitids and acritarchs, including species of *Leiosphaerida* with *Granomarginata squamacea* Volk., *G. prima* Naum., *Leiomarginata simplex* Naum., *Micrhystridium tornatum* Volk., and *Tasmanites tenellus* Volk., which enable correlation with the deposits of the Lontova Regional Stage occur.

The Lezha Formation lies without noticeable traces of a hiatus on the Bui Formation of the Rovno Regional Stage, and is overlain by the Galich Formation of the Lontova Regional Stage.

Light grey and multicoloured sandstones (20, 22)

This informal lithofacies was introduced by Kirjanov (1969, p. 61) for the interval 358.9-441.3 m in the Berezhki-2944 boring, which was suggested as a type section of this unit. It occurs in the western areas of the Ukraine, where its thickness is about 120 m.

Sandstones are light grey with bands (up to 10 m) of multicoloured sandstone and grey siltstone with brownish shades. Sandstones are mostly fine-grained and quartzose, and in the uppermost part of this stratigraphical unit hard with carbonate basal cement.

Fossils are represented only by poorly preserved acritarchs which do not allow an accurate dating of the rocks. On the basis of lithological similarities of these deposits with the Kostrzyn Formation of eastern Poland, containing early Middle Cambrian trilobites (Lendzion, 1969), they are conditionally attributed to the *Eccaparadoxides oelandicus* Stage (Kirjanov, 1979).

Underlying are the deposits of the Berezhki Group. In the area of maximum development, the formation is overlain by Carboniferous or Upper Cretaceous deposits, and in western sections of the Lvov Palaeozoic Downwarp by deposits of the *Paradoxides paradoxissimus* Stage.

Liivi Group (10, 14, 15)

This group was established during the compilation of the Cambrian stratigraphical scheme for the East Baltic (Grigelis, 1978) on the basis of the characteristics given by Mens (1981). It is named after the Livonian tribe, and distributed in the western and northern areas of the Soviet East Baltic where its thickness is up to 80 m.

The group connects the deposits of the first Early Palaeozoic sedimentary stage of the western transgression on the East European Platform. It mostly contains arenaceous- silty rocks, but in the central part of its type area also includes argillaceous rocks.

The Liivi Group corresponds to the Dominopol' Regional Stage which is subdivided into two substages. The lower substage corresponding to the lower part of the group, the upper one to its middle and upper parts.

It lies transgressively on the rocks of either the Baltic Group or the crystalline basement, and is overlain by Cambrian or Lower Ordovician deposits of varying age.

Lomonosov Formation (15, 16)

Männil (1958, p. 351) proposed this as a formal name for the post-Laminarites Sandstones of Asatkin (1937). It was regarded as a formation by Tikhij (1965) and Yanovski (1971). It is named after the town of Lomonosov, in the Leningrad Region, and its

stratotype is found in outcrops near that town. The formation is distributed in the northwestern areas of the RSFSR, where a maximum thickness of 30 m occurs.

The Lomonsov Formation consists mostly of clayrocks, including interbeds and lenses of glauconite-bearing sandstones and siltstones of variable thickness. Their number and thickness increase to the east and southeast as does the thickness of the formation itself. Rocks are of a greenish- grey colour, with rare violet and red-brown patches and stripes. In places, sandstones contain flat pebbles of phosphatized rocks.

Sabelliditids, platysolenitids and various ichnites, some pyritized, occur. In the lower parts of the formation in eastern sections, acritarchs are represented by the Rovno assemblage, and in the upper part, and in the west throughout the whole section, by the Lontova assemblage (Volkova et al. 1979; Paškevičiene, 1980). Considering the palaeontological data, the formation is assigned to the Rovno and Lontova Regional Stages.

The Lomonosov Formation is underlain by the Upper Vendian Kotlin Formation, and it grades gradually into the Siverskaya Formation of the Lontova Regional Stage.

Lontova Formation (11, 12, 13, 14)

Männil (1958, p. 351) regarded this unit as a formation, following Öpik (1933, p. 5, 6) who named it after Lontova village, located eastwards from Kunda quarry, northern Estonia. It corresponds to the upper part of blue clays of Schmidt (1881); the upper part of blue clays (A_{1b}) of Mickwitz (1911); the *Hyolithus* Zone and the lower part of blue clays of Öpik (1926); and to the Lontova Beds of Öpik (1933).

The type section is in Kunda quarry and the interval 14- 88.3 m in Kunda (Lontova) boring (see Mens & Pirrus, 1977).

The formation occurs in northern and eastern Estonia, in eastern Latvia, eastern Lithuania and northwestern Byelorussia. From borehole data, the thickness of the formation attains 120 m.

It contains greenish-grey or variegated argillaceous rocks with glauconite-bearing interbeds of sandstones and siltstones, and has been subdivided lithologically into the Sämi, Mahu, Kestla and Tammneeme Members (Kala et al., 1970; Mens & Pirrus, 1977). In the northwest of the region, the Lontova Formation is replaced laterally by the Voosi Formation.

Sabellidites, Platysolenites, gastropods, hyoliths, numerous pyritized ichnites and the Lontova assemblage of acritarchs, including among others representatives of the genera *Tasmanites*, *Granomarginata* and *Leiomarginata* occur (Volkova, 1968; Volkova et al., 1979; Paškevičiene, 1980).

The formation lies transgressively on formations of the Lower Cambrian Rovno Regional Stage and rocks of the crystalline basement, and is overlain disconformably by various Cambrian or younger deposits, often marked by a weathering crust in the uppermost part of the formation.

Lükati Formation (10, 14, 15)

This was established as a formation by Mens & Pirrus (1977). In earlier papers it corresponds to the Lükati Member of the Pirita Formation of Männil (1958, 1960). Mardla, Mens, Kala, Kajak & Erisalu (1968) ranked it as a regional stage. It is named after the Lükati locality at the eastern outskirts of Tallinn, and its stratotype is the outcrop on the

left bank of the Pirita River 400 m upstream from Lükati bridge. The lower boundary of the formation (see Mens & Pirrus, 1977) occurs also in a borehole there. The formation occurs in western and northern Estonia, and in the western areas of Leningrad Region where its thickness is up to 20 m.

It consists of interbedded greenish-grey silty argillaceous rocks and light grey pelitic siltstones. In western sections the middle part contains sandstone interlayers. Rocks are often enriched with glauconite, especially in the lower part of the formation.

Volborthella tenuis Schm., *V. conica* Schindewolf, *Schmidtiellus mickwitzi* (Schm.), *Mickwitzia monilifera* (Linnars.), torellellids, hyoliths, and agglutinated foraminifers occur, and in the west, the lower half of the formation has yielded *Platysolenites antiquissimus* Eichw. Among acritarchs the most characteristic are *Baltisphaeridium cerinum* Volk., *B. dubium* Volk., B. or*biculare* Volk., *B. ornatum* Volk., *B. papillosum* Volk., *Micrhystridium pallidum* Volk., *M. tornatum* Volk., *Archaeodiscina umbonulata* Volk., *Tasmanites bobrowskii* Waz., and *T. volkovae* Kirjanov. A complete list of the acritarch assemblage is given by Volkova (1968), Jankauskas & Posti (1973), Mens & Pirrus (1977, 1979).

The formation lies transgressively on the deposits of the Soru Formation, or of the Lontova Formation, and is often separated from the underlying units by a conglomerate interbed. It is overlain by the Tiskre Formation or by the units of the Aisčiai Group. In the last case the top of the formation is frequently weathered.

Łyna Formation (7)

Established by Lendzion (1986, in press) and named after the Łyna River, northern Poland, the stratotype is the interval 1890.5-2021.2 m in Bartoszyce IG-1 boring. The formation occurs in the eastern areas of North Poland where its thickness does not exceed 140 m.

Fine and varigrained weakly cemented sandstones with rare carbonate nodules and interbeds of argillaceous siltstone comprise the Łyna Formation.

Fossils are scarce, represented by *Ellipsocephalus* cf. *polytomus* Linnarsson, *E.* sp. (cf. *E. jugoseovi* Orłowski), *Lingulella* sp.; *Skolithos* sp., and *Berganevia* sp.

The formation belongs to the lower half of the Middle Cambrian, from the *Eccaparadoxides insularis* Zone to the *Ptychagnostus atavus* Zone.

It lies on the Lower-Middle Cambrian, Prabuty Formation and is overlain disconformably by the Upper Cambrian Młynary Formation.

Lyuboml' Formation (20)

Established by Kirjanov (1969, p. 55), and named after the town of Lyuboml' in the Volynia Region, this formation has a stratotype in the interval 543.3-617.2 m in the Berezhki-2944 boring. It is distributed in the western areas of the Ukrainian SSR, where a thickness up to 80 m is present.

The formation is represented by light grey, almost white quartzose sandstones with lenses and thin interbeds of ash-grey kaolinitic clay. At the base, in places, there occurs an interbed of conglomerate-like rock including weakly rounded pebbles of greenish-grey siltstone. The upper part is rarely intercalated with dark grey argillaceous siltstones.

Fossils are extraordinarily scarce. Only one section, the boring B-26 located in Korytnica village, has yielded acritarchs. The specific composition of this assemblage is peculiar:

there are typical forms of the Lükati assemblage, e.g. *Baltisphaeridium cerinum* Volk., on the one hand, and e.g. *B. ciliosum* Volk., on the other. Considering the latter, the deposits of the Lyuboml' Formation can be attributed to the Vergale Regional Stage. A complete list of this assemblage is given in Kirjanov (1979, p. 163).

The Lyuboml' Formation is underlain by the Dominopol' Regional stage, and overlain by the Svityaz' Formation of the Vergale Regional Stage and in local uplifts it underlies Upper Cretaceous deposits.

Mazowsze Formation (18, 21)

Lendzion (1962, p. 522) established this formation, which, according to the Stratigraphic Nomenclature of Poland, includes the Wlodawa Subformation, description of which is given separately. It is named after the Mazowsze Region, situated in the central part of eastern Poland, where a stratotype is the interval 1464.3-1593.7 m in the Radzyń IG-1 boring. A thickness of up to 160 m occurs in the southern areas of East Poland.

The formation includes silty argillites intercalated with quartzose-glauconitic sandstones containing phosphatic nodules. The fauna (except the Wlodawa Subformation) has yielded *Platysolenites antiquissimus* Eichw., *Onuphionella agglutinata* Kirjanov, *Coleolella differo* Lendzion, *C. billingsi* Syssoiev, and *Torellella* cf. *laevigata* (Linnarsson). Acritarchs are dominated by *Granomarginata squamacea* Volk., *G. prima* Naumova, *Micrhystridium tornatum* Volk., *Leiosphaeridia* sp. nov., *Leiomarginata simplex* Naumova, *Tasmanites* cf. *tenellus* Volk., and *T. tenellus* Volk. Trace fossils include *Teiichnus* cf. *rectus* Seilacher, *Curvolithus* sp., *Treptichnus* cf. *bitureus* Seilacher, *Rusophycus?* sp., and *Berganevia* sp. On the basis of these palaeontological data, the formation corresponds to the *Platysolenites antiquissimus* Zone or to the Lontova Regional Stage.

It is underlain by Upper Vendian deposits, and the lower part of the formation is usually represented by the Wlodawa Subformation. Trilobite-bearing Lower Cambrian rocks overlie the Mazowsze Formation.

Młynary Formation (7)

Lendzion (1986, in press) named this formation after Młynary village in northern Poland. Its stratotype is the interval 2792-2792.5 m in the Młynary-1 boring, and the formation is distributed in the eastern areas of northern Poland, where its thickness is inconsiderable, not exceeding 1 m.

This formation is composed of fine-grained calcareous sandstones and fine-crystalline limestones. Its fauna is represented by *Agnostus pisiformis* (Linnarsson), *Olenus* cf. *truncatus* (Brünnich), *Homagnostus obesus* (Belt) and *Orusia lenticularis* (Wahlenberg), allowing correlation of the deposits with the *Agnostus pisiformis*, *Olenus* and *Agnostus* and *Parabolina spinulosa* Zones.

It is underlain by the Middle Cambrian Łyna Formation, and disconformably overlain by rocks of the Tremadoc or Arenig Series.

Mologa Group (17)

Ranked as a group in the present volume, this unit was established during the compilation of a Cambrian stratigraphical scheme for the Soviet part of the East European Platform (Spizharskij, 1986). It is named after the Mologa River of the Novgorod Region. This name was proposed by Dmitrovskaya for a unit of the same concept, but ranked as a for-

mation (Dmitrovskaya et al., 1983). The stratotype is the interval 1321-1360 m in the Pestovo boring.

The group occurs in the central regions of the RSFSR, geostructurally constituting the Moscow Syneclise. Its thickness is up to 90 m.

The Mologa Group connects deposits of the first post- Baltian Cambrian sedimentary stage taking place in the Middle and at the beginning of the Late Cambrian in the Moscow Syneclise.

The lower boundary is distinct: rocks of the Mologa Group lie on the weathered surface of the deposits of the Lontova Regional Stage. At the base of the group a gravellite interbed often occurs. The upper boundary is less distinct and coincides with an alternation of rock types.

Represented by sandstones, siltstones and argillaceous rocks, the Mologa Group is divided into two members: in the lower part sandstones predominate, but in the upper part, the amount of arenaceous and argillaceous rocks is almost equal. Considered lithologically, two formations have been distinguished within the group: the Urdom (lower) and Tolbukhino (upper) Formations.

Nexø Sandstone(3)

This formation is restricted to Bornholm, and was first distinguished by Johnstrup (1874). The type area is at the town of Nexø, specifically the Frederik Quarry.

The Nexø Sandstone is typically a subarkosic reddish sandstone measuring more than 100 m. It was formed as a continental outwash plain, and fossils useful for correlation therefore are absent. There is no reason to refer the formation to the Precambrian, as has been commonly done (e.g. Martinsson, 1974, p. 213). The formation was described i.a. by Hansen (1936).

The Nexø Sandstone rests on Proterozoic basement and is overlain by the Lower Cambrian Hardeberga (Balka) Sandstone, which was originally included in the Nexø Sandstone on Bornholm.

Nikolskoye Formation (17)

Established during the compilation of the Cambrian stratigraphical scheme for the Soviet part of the East European Platform (Spizharskij, 1986), this formation corresponds to the third member, or to the lower half, of the Pestovo Formation in the stratigraphical classification used by Shestakova et al. (1976), or to the lower half of the Kobozha Formation of Dmitrovskaya et al. (1983).

It is named after Nikolskoye village, Yaroslavl' Region, where its stratotype is the interval 2120-2090 m in the Urdom-2 boring.

This formation occurs in the central regions of the RSFSR. The thickness of the formation in the west of the distribution area varies from 30-50 m, gradually decreasing eastwards as a result of pre-Ordovician erosion.

It consists of weakly cemented light grey fine to coarse- grained quartzose sandstones with numerous interbeds of dark grey argillaceous rocks. In the upper part of the section, micaceous silty-argillaceous rocks with thin horizontal lamination predominate.

The Nikolskoye Formation is palaeontologically barren, but it is referred as the Upper Cambrian on account of its stratigraphical context.

It is underlain by the Middle Cambrian Tolbukhino Formation and overlain by the Upper Cambrian Pestovo Formation.

Norretorp Formation and "green siltstones" (3)

This unit has long been known from Bornholm as the "Green Shales" (Forchhammer, 1835), with exposures along the Lilleaa and Laesaa rivulets. In Scania it was ultimately named by Bergström (1970) as the Norretorp Sandstone, the type locality being the Hardeberga quarry at Norretorp, east of Lund.

The thickness reaches a maximum of about 60 m in Bornholm, whereas in Scania it appears to range between approximately 4- 25 m. The lithology is basically silty, in Scania also sandy, and there is a fair amount of glauconite and phosphorite which give the rocks a greenish to dark grey colour. The fauna is not large but interesting because of its correlative potential. It includes the oldest known trilobites of Norden: *Holmia mobergi, Schmidtiellus mickwitzi torelli*, and *Wanneria*? *lundgreni* (Bergström, 1973), and the trilobite-type trace fossil *Rusophycus dispar*. This means that the formation can be correlated with the Brennseter Formation ($1a\alpha_1$, thus a level below the *Mobergella*-bearing $1a\alpha_2$) in the Mjøsa area, the Mickwitzia Sandstone (with *Mobergella*) in central Sweden, part of the Duolbasgaissa Formation in Finmark, and the Lükati Sandstone in Estonia (Bergström, 1981). Other fossils include *Volborthella tenuis*, *Magnicanalis mobergi* and hyoliths. Phosphate nodules in Bornholm have yielded a rich microfauna including species of *Fordilla, Prosinuites, Circotheca, Orthotheca, Hyolithes, Halkieria*, *Hyolithellus*, and *Coleoloides* etc. (Chr. Poulsen, 1967).

The Norretorp Formation (green siltstones) rests on the Hardeberga (Balka) Sandstone and is overlain by the Lower Cambrian Rispebjerg Sandstone.

Okunets Formation (23)

Previously this part of the section was treated within the Komarovo Beds of the Upper Vendian Kanilovka Formation (Velikanov, 1979, pp. 146-151).

Kirjanov (1985, pp. 43-47) named this formation after the Okunets Stream - the right tributary of the Ternava River, and designated a stratotype at outcrop No 218 at Kitaigorod village.

The Okunets Formation occurs in a narrow belt in the southern areas of the Ukrainian SSR between the upper reaches of the South Bug River and the middle reaches of the Dnestr River. Its thickness is up to 17 m.

The formation contains dark greenish-grey argillaceous siltstones with some interbeds of coarse-grained siltstone or fine-grained sandstone with thicknesses of 1-40 cm. The lower surface of these siltstone layers is covered with various ichnites filled with silty material. The rocks contain single glauconite grains. Bedding planes are covered by micas, and sometimes also flat pebbles of phosphatized argillaceous rocks.

Besides ichnites, sabelliditids, films of algae, among them *Tyrasotaenia podolica* Gnil. and *T. tungusica* Gnil., occur. Acritarchs are represented by *Leiosphaeridia div.* sp., *L. dehisca* Paskev., *L. parva* Aseeva, and *Teophipolia lacerata* Kirjanov etc. On the basis of these data the formation is attributed to the Rovno Regional Stage.

The formation is underlain by the Studenitsa Formation of the Upper Vendian Kanilovka Group and overlain by the Khmelnitskiy Formation of the Rovno Regional Stage.

Orlya Formation (19)

Bessonova & Piskun (1977, p. 32) named this formation after Orlya village in the Brest Region. It corresponds to the Middle Cambrian sandstone member of Zinovenko & Makhnach (1972). Its stratotype is the interval 1120-1156 m in Brest 28-K boring, located in Orlya village, Brest Region (Bessonova & Piskun, 1978).

Deposits of this formation have been recorded in the most westerly areas of the Brest Region, BSSR (Bessonova & Piskun, 1979) with thicknesses reaching 75 m (Makhnach et al., 1981).

The formation is represented by light fine-grained quartzose sandstones with the interbeds of light grey silty and brownish-grey argillaceous rocks in its middle part.

Argillaceous rocks have yielded scarce acritarchs of the genera *Tasmanites, Leiosphaeridia* and *Micrhystridium* which do not enable the exact age of the formation to be defined.

Underlain by glauconite-bearing deposits of the Stavy Formation treated as a part of the Kybartai Regional Stage, the formation is overlain by glauconitic sandstones of the lower Ordovician Latorp Regional Stage.

Osieki Formation (6)

This was established by Bednarczyk & Turnau-Morawska (1975, pp. 555-556), and named after Osieki village, in northern Poland, where a stratotype is the interval 2691-2709.5 m in Dębki-3 boring.

It is distributed in the western areas of northern Poland over a small areal extent. Its thickness is up to 31 m.

Mostly composed of light quartzose siltstones with carbonate cement, in places siltstones grade into sandstones with lenses of carbonaceous rocks and dark grey argillite interbeds.

Fauna is lacking. On the correlation chart the formation is conditionally assigned to the *P. paradoxissimus* Stage, as it occurs between the Dębki (below) and Białogóra Formations (above).

Ovishi Formation (9)

Brangulis, Volkova, Karpitskaya & Rozanov (1975, p. 58) established this formation, and named it after Ovishi village on Kurzeme Peninsula, Latvia. Its stratotype is the interval 962-1022 m in the Ovishi-94 boring. The formation occurs in northwestern Latvia where its thickness is up to 60 m.

It consists of grey to variegated quartzose siltstones and sandstones with intercalations of argillaceous siltstones, clays and gravellites. The upper part of the formation is more homogeneous and represented by light coarse-grained siltstones with numerous thin interbeds of greenish-grey argillaceous rocks. The horizontal lamination is often disturbed by bioturbation. This part of the formation has been distinguished as the Durbe Member (Birkis et al., 1970, p. 907).

Palaeontologically the formation is weakly characterized. Beside ichnites, mostly represented by forms of *Skolithos*, it has yielded a single *Platysolenites* sp. and rare acritarchs (Brangulis et al., 1975). The occurrence of *Baltisphaeridium cerinum* Volk. and *Micrhystridium pallidum* Volk. allows the Ovishi Formation to be assigned to the Lower Dominopol' Substage.

It lies on the crystalline basement or on the Zura Beds of the Upper Proterozoic and is overlain by the Ventava Formation.

Paala Beds (11)

These beds were first introduced as an independent unit in the Cambrian stratigraphical scheme for the East Baltic Platform by Grigelis (1978). The basis for their distinction and characteristics are given by Mens, Pirrus & Brangulis (1984). They are named after the Paala River of Estonia. A stratotype has not been established. The most typical sections are represented by the interval 410-439 m in the Viljandi boring and 409-442 m in the Elva boring.

The Paala Beds occur in central and southeastern Estonia where thicknesses up to 40 m occur.

The beds comprise light quartzose, non-glauconitic coarse- grained siltstones and fine-grained sandstones with pellets of white kaolinitic clay. According to the degree of maturity of the clastic material and the association of the heavy minerals, the Paala Beds are subdivided into the Elva (lower) and Raudna (upper) layers (see Mens et al., 1984). Palaeontologically they are not characterized. Southwards, they grade laterally into the upper member of the Cirma Superformation which has yielded Middle Cambrian acritarchs (Volkova, 1983).

They rest transgressively on various Lower Cambrian deposits, and are overlain by Upper Cambrian or Lower Ordovician deposits.

Paneriai Formation (13)

This formation was recognized and named by Jankauskas (1982, p. 40) after Aukshtei-Paneriai representing a quarter of the town of Vilnius. Its stratotype is the interval 356-371 m in the Aukshtei-Paneriai boring, and it is distributed in the southeastern areas of Lithuania, having a thickness of up to 20 m.

It consists of light fine-grained quartzose sandstones with numerous interbeds of greenish-grey and dark grey argillaceous rocks which in places take up a half of the whole section.

Numerous specimens of acritarchs, among them *Timofeevia lancarae* (Cr. et D.), *Cristallinium cambriense* (Slav.), *Eliasum llaniscum* Fomb., and *Micrhystridium confusum* (Jank.), allow the formation to be referred to the *Paradoxides paradoxissimus* Stage.

The Paneriai Formation is underlain by rocks of the Lakai or Lontova Formations and overlain by deposits of the Lower Ordovician Arenig Series.

Pestovo Formation (17)

This corresponds to the fourth member, or to the upper half, of the Pestovo Formation in the stratigraphical classification used by Shestakova et al. (1976), or to the upper half of the Kobozha Formation of Dmitrovskaya et al. (1983). Khazanovich (1969, p. 11) first named it after the town of Pestovo, in the Novgorod Region. Its stratotype is the in-

terval 1225.5-1262.5 m in the Pestovo boring, the description of which is given by Khazanovich (1982).

The Pestovo Formation occurs in the central regions of the RSFSR. The thickness varies considerably, being greatest (about 40 m) in the stratotype area.

It consists of greenish-grey argillaceous rocks, including rare interbeds of light grey quartzose arenaceous siltstones with horizontal lamination. The presence of siderite nodules and the sideritic matrix in silty-arenaceous rocks is common in this formation.

The formation has yielded the trilobites *Parabolina lobata rossica* Bal., and *P. pestovensis* Bal., inarticulate brachiopods of the genera "*Westonia*" and *Lingulella*, and an acritarch assemblage. A list of the last is given by Volkova (1980).

By trilobites the Pestovo Formation is assigned to the upper half of the Upper Cambrian. A Late Cambrian age is also in accordance with the acritarch data.

It is underlain by the Upper Cambrian Nikolskoye Formation and overlain by the Upper Cambrian Bugino Formation.

Petseri Formation (11, 12, 16)

Introduced by Kajak (1967), detailed characteristics and grounds for the Late Cambrian age are given by Volkova et al. (1981). The formation is named after the boring Petseri-330, located on the right bank of the Piusa River, northwards from the town of Petseri. A stratotype, the interval 446.6-457.3 m, is in the Petseri-330 boring.

The Petseri Formation occurs in southeastern Estonia, northeastern Latvia and in the northern areas of the Pskov Region. Its thickness is up to 11 m.

The formation consists of inequigranular arenaceous and argillaceous rocks. The first are usually weakly cemented. Where the section is complete, three members are recognized (from below to top), based on the predominance of sandstone, clay and sandstone (Volkova et al., 1981).

In the central argillaceous part of the section numerous shells of inarticulate brachiopods of the genera *Ungula, Oepikites*, and *Angulotreta* occur, and an acritarch assemblage containing *Timofeevia lancarae* Vang., and *T. phosphoritica* Vang., together with forms of the genera *Cymatiogalea, Veryhachium* and *Vulcanisphaera*, permit the Petseri Formation to be assigned to the lower part of the Upper Cambrian.

The lower and upper boundaries of the formation are distinctly marked by breaks in sedimentation. Underlying are the deposits of the Middle Cambrian Sablinka, Paala and Cirma units, and overlying are the Lower Ordovician units of the Tremadoc, and, more rarely, Arenig Series.

Piaśnica Formation (6)

Named after Piaśnica village, in northern Poland, Bednarczyk & Turnau-Morawska (1975, pp. 559-560) established a stratotype within the interval 2660.3-2661.3 m in Dębki-2 boring. The formation is distributed in northern Poland, especially in its western areas where its thickness is up to 6 m.

It is composed by black kerogen-bearing argillites with interbeds and lenses of biodetritic and coarse-crystalline limestone.

The fauna is represented by the trilobites *Peltura acutidens* Brøgger, *P. s. scarabaeoides* (Wahlenberg), *Sphaerophthalmus alatus* (Boeck), *S. humilis* (Phillips), *Parabolina l. lobata* (Brogger), P. l. *praecurrens* Westergård, *P. acanthura* (Angelin), and *P. h. heres* Brögger; the conodonts *Prooneotodus tenuis* (Müller), *Sagittodontus dahlmani* Müller, *Prooneotodus gallatini* Müller, *Cordylodus* aff. *intermedius* Furnish, and *C.* aff. *rotundatus* Pander. According to these data the formation belongs to the *Peltura, Acerocare* and younger Ordovician Zones.

It is disconformably underlain by the Upper Cambrian Słowinski Formation and overlain by the Tremadoc or Arenig Series.

Prabuty Formation (7)

Established by Lendzion (1986), and named after the town of Prabuty, in northern Poland, a stratotype is designated as the interval 2641.3-2700.1 m in the Olsztyn IG-2 boring.

The formation is distributed in the eastern areas of North Poland where its maximum thickness is 80 m. It consists of quartzose-glauconitic sandstones alternating with siltstones and silty argillites. In places phosphate nodules occur.

Fossils are represented by *Ellipsocephalus* cf. *hoffi* (Schlotheim), *Westonia bottnica* (Wiman), *Lingulella westergaardi* Kautsky, *L.* cf. *nathorsti* Linnarsson, *Mickwitzia* cf. *monilifera* (Linnarsson), *Torellella laevigata* Linnarsson, *T. holmi* Kiaer, *Hyolithes* sp., *Bergaueria* major Palij, *B. perata* Palij, *Planolites beverleyensis* (Billings), *P. montanus* Richter, *Teichichnus vec*tus Seilacher, *Bilinichnus simplex* Fedonkin & Palij, *Granomarginata squamacea* Volk., *Micrhystridium obscurum* Volk., *M. spinosum* Volk., *Baltisphaeridium ciliosum* Volk., *B. varium* Volk., and *Deunffia dentifera* Volk.

Palaeontologically the formation definitely belongs to the *Proampyx linnarssoni* (*Protolenus*) and *Eccaparadoxides insularis* Zones. Its lowermost part, however, may correlate also with the *Holmia kjerulfi* Zone.

It is underlain by the Lower Cambrian Suwałki Formation and overlain by the Middle Cambrian Łyna Formation.

Radzyń Formation (18, 21)

This formation was named by Lendzion (1962, p. 533) after the town of Radzyń-Podlaski, southeastern Poland. Its stratotype is the interval 1067.8-1281.2 m in the Radzyń IG-1 boring. It is confined to southeastern Poland where its maximum thickness is about 260 m.

The Radzyń Formation is composed of intercalated sandstone, siltstone and claystone beds with abundant glauconite and rare phosphatic nodules.

Shelly fauna is dominated by trilobites, inarticulate brachiopods, ostracodes and hyoliths. Additionally, trace fossils and acritarchs have been reported (see Lendzion, 1983). The occurrence of *Holmia kjerulfi* Linnarsson, *Strenuaeva primaeva* (Brøgger), *Ellipsocephalus* cf. *gripi* (Kautsky) and *Kingaspis (K.) borealis* Lendzion indicates the *Holmia kjerulfi* and *Proampyx linnarssoni* Zones.

It is underlain by the Lower Cambrian Kaplonosy Formation and overlain by the Middle Cambrian Kostrzyń Formation.

Rispebjerg Sandstone (3)

The Rispebjerg Sandstone has long been recognized on Bornholm as a distinct type of rock (e.g. Johnstrup, 1874; Deecke, 1897; Grönwall, 1899, 1902). The type areas are the Øleaa and Laesaa rivulets, and it is named from the Rispebjerg hill near Øleaa. It is known from southeast Bornholm and Scania.

The Rispebjerg Sandstone is only about 1-3 m thick, but the unique lithology merits formation status (Hansen, 1936; de Marino, 1980). The sand grains are typically large and well rounded. Particularly in some layers there is a large amount of phosphorite, which seems to have been formed through phosphorization of calcareous mud. Also glauconitization, chertification, calcification, chloritization and pyritization altered the sediment and obscured original features. Identifiable fossils are extremely rare. Chr. Poulsen (1967) reported the trace fossil *Cruziana dispar* and *Hyolithellus micans.*

The Rispebjerg Sandstone overlies the Norretorp Formation (siltstones). In Scania it is overlain by the Lower Cambrian Gislöv Formation, and in Bornholm by Middle Cambrian strata.

Rovno Formation (20, 22)

This was established by Kirjanov (1969, p. 49) as a formation, but previously had been treated as beds (see further Kirjanov, 1976). The formation is named after the town of Rovno, and a stratotype, the interval of 100-152.7 m in boring No 4 is located in the town of Klevan, Rovno Region.

It is distributed in the western areas of the Ukrainian SSR and has a thickness of 28.9-52.7 m.

The formation comprises two members: the lower one is represented by greenish-grey glauconitic-quartzose sandstone, at the base rarely containing interbeds of gravellite rocks with pebbles of phosphatized siltstones and sandstones. The upper member consists of alternating siltstones and sandstones and argillaceous rocks. The amount of silty and arenaceous material increases regularly from east to west.

Palaeontologically the formation is characterized by the appearance and a wide distribution of sabelliditids, including *Sabellidites cambriensis* Yan. and *Sokoloviina costata* Kirjan, and by the occurrence of the Rovno acritarch assemblage which, besides the thick-walled leiosphaerids, also contains *Teophipolia lacerata* Kirjan. A complete list of acritarchs is given by Kirjanov (1976; p. 14; 1979, p. 156).

The Rovno Formation is underlain by the Studenitsa Formation of the Upper Vendian Kanilovka Group. Over most of its distribution area it is overlain by the Stokhod Formation of the Lontova Regional Stage. In eastern sections, however, due to denudation, it is overlain by Ordovician or even Upper Cretaceous deposits.

Rudamina Formation (13)

Jankauskas (1974, p. 23) introduced this formation which is named after Rudamina village in southeastern Lithuania. Its stratotype is the interval 332-356 m in the Vilkishkyai boring (Jankauskas, 1975). It occurs in eastern Lithuania and northwestern Byelorussia, in places attaining a thickness of over 40 m.

The lowermost part of the formation is represented by a complicated alternation of claystones, siltstones and sandstones. The mineral composition of rocks includes

glauconite, sometimes accumulated on bedding planes. Rocks are of greenish-grey colouring with red-brown and violet patches. At the top of the formation variegated ferruginized micaceous argillaceous rocks giving evidence of subaerial weathering often occur. The Rudamina Formation contains *sabelliditids* together with *Leiosphaeridia dehisca* Paškev., *Teophipolia lacerata* Kirjan, and *Leiovalia striatella* Paškev. among the acritarchs, showing the Rovno age of the deposits. A complete list of acritarchs is given Paškevičiene (1980).

Underlying are either Upper Vendian deposits or Lower Proterozoic and Archaean crystalline rocks, and the formation is overlain by the Lontova Formation.

Ruhnu Beds (10)

First established as an independent unit in the Cambrian stratigraphical scheme for the East Baltic (Grigelis, 1978), the basis for the distinction and characteristics of these beds is given by Kala, Mens & Pirrus (1984). They are named after Ruhnu Island in Riga Bay, but a stratotype has not been designated. The best presently known section embraces the interval 706.8-728 m in the Ruhnu boring.

The Ruhnu Beds occur in southwestern Estonia. Their thickness increases southwards, in the Ruhnu boring being in excess of 20 m.

They consist of light quartzose coarse-grained siltstones and fine-grained sandstones with gravel grains. Glauconite is lacking, and the clayey component of the rock is rich in kaolinite. Palaeontologically these beds are not characterized.

Southwards they grade laterally into the Middle Cambrian Deimena Superformation, and are underlain by various deposits of the Aisčiai Group and overlain by the Lower Ordovician rocks, mostly of the Arenig Series.

Ryta Formation (19)

The Ryta Formation, defined by Bessonova & Piskun (1977, p. 32), is named after the Ryta River (Bessonova & Piskun, 1978), and is distributed in southwestern Byelorussia. It has a thickness up to 20 m, and a stratotype has been selected over the interval 802-814 m in the boring Brest 17-K (Stradech).

The formation consists of greenish-grey, thin-bedded silty- argillaceous and argillaceous-silty rocks with interbeds of fine-grained quartzose-feldspathic sandstones and micaceous siltstones. Two units are recognized, the bases of which contain sandstones, alternating upwards with siltstones and clays. At the top of the formation variegated ferruginized micaceous argillaceous rocks thought to be a weathering crust occur (Bessonova & Piskun, 1978).

Siltstones and argillaceous rocks contain acritarchs and vendotaenids, the latter being represented by *Tyrasotaenia podolica* Gnil., and *Dvinia fibrosa* Gnil. Two acritarch assemblages have been recorded. The lower part is characterized by the presence of *Teophipolia lacerata* Kirjan, *Leiosphaeridia dehisca* Paškev. and a single specimen of *Tasmanites plicatus* Piskun. In the upper part thick-walled leiosphaerids prevail, and *Leiovalia striatella* Paškev. makes its appearance. The formation has sporadically yielded remains of *Sabellidites cambriensis* Yan.

The Ryta Formation is underlain by the Upper Vendian Kotlin Formation and overlain by the Stradech Formation of the Lontova Regional Stage.

Sablinka Formation (15, 16)

Established by Rukhin (1939, p. 15), this corresponds (especially in eastern sections) to the lower part of the Izhora Sandstone of Nekrasov (1938). It is named after the Sablinka Stream, the left tributary of the Tosno River. Its stratotype is an outcrop at the mouth of the Sablinka Stream (Borovko et al., 1984). The formation is distributed in the northwestern areas of the RSFSR where its thickness varies from a few metres to 20 m, increasing eastwards.

It is represented by light, well-sorted, fine-grained quartzose sandstones with thin (less than 10 cm) interbeds of grey, dark grey or light-varicoloured clays and siltstones which in the lower part of the formation are most abundant. At the base, in places, interbeds of gravelly sandstone occur. The uppermost part bears traces of weathering sometimes represented by a ferruginous crust with the thickness of a few centimetres.

The formation contains inarticulate brachiopods of the genera *Obolus* and *Oepikites* (Popov et al., 1984), bradoriids *Vojbocalina magnifera* Melnikova, and acritarchs. The acritarch assemblage is of a peculiar composition including numerous representatives of the genera *Lophomarginata* and *Leiosphaeridia*. A complete list of acritarchs is given by Borovko et al. (1984).

Over a considerable territory this formation lies on a weathering crust of the Lontova Regional Stage; in western sections on the Lükati or Tiskre Formations of the Dominopol' Regional Stage. It is overlain by the Upper Cambrian Ladoga or Petseri Formations, or the Lower Ordovician Tremadoc Series.

Samets Formation (23)

The Samets Formation was introduced by Kirjanov (1985, pp. 47-51). Earlier this stratigraphic interval had been treated as a part of the undivided Berezhki Group (Kirjanov, 1979, pp. 191-173). It is named after the Samets River, and a stratotype is defined as the interval 366.7-449.4 m in the Kamenki-3650 boring.

The formation occurs in the most southwestern areas of the Ukrainian SSR, on the territory between the upper reaches of the South Bug River and the middle reaches of the Dnestr River. Its thickness is about 83 m.

It consists mostly or light grey medium to fine-grained sandstones. In places, dark grey, almost black siltstones interbedded with light sandstones occur. At the base of the formation there are conglomerate or gravellite interlayers composed of weakly rounded quartz pebbles and fragments of greenish-grey argillaceous siltstone.

Palaeontologically little is diagnostic. The upper part has yielded hyoliths of the Families Allathecidae and Sulcavitidae. However, the acritarchs *Baltisphaeridium orbiculare* Volk., *B. ornatum* Volk., *B. compressum* Volk., *Cymatiosphaera* (?) (*Skiagia*) *membracea* Kirjanov, *Tasmanites bobrowskii* Waz., *Pterospermopsimorpha wolynica* Kirjanov, *Pseudotasmanites parvulus* Kirjanov and *Archaeodiscina* aff. *umbonulata* Volk. occur, permitting correlation of the Samets Formation with the Dominopol' Regional Stage.

This formation is underlain by the Zbruch Formation of the Lontova Regional Stage and overlain either by Ordovician or Silurian carbonate rocks.

Sarbsko Formation (6)

Bednarczyk & Turnau-Morawska (1975, pp. 549-550) established this formation which is named after Lake Sarbsko, in northern Poland. The stratotype of the formation is the interval 2793-3003 m in Leba-8 boring. It is distributed in the western areas of North Poland, where a maximum thickness of 210 m is recorded.

It consists of alternating grey quartzose siltstones and black or dark grey kerogen-bearing argillites; in places siltstones are replaced by sandstones.

The fauna is diverse and numerous, represented by *Eccaparadoxides oelandicus* (Sjögren), *E. pinus* (Holm), *E. torelli* (Holm), *E. pomeranicus* (Bednarczyk), *Triplagnostus praecurrens* (Westergård), *Peronopsis fallax* (Linnarsson), *Hyolithes oelandicus* Holm, *Globorilus globiger* (Saito), *Redlichella granulata* (Linnarsson), and *Acrotreta socialis* Seebach. A complete list of fauna is given by Bednarczyk (1984). According to this palaeontological data the formation belongs mainly to the *Ptychagnostus praecurrens* Zone, in places extending into the *P. gibbus* Zone.

The formation is underlain by the Lower-Middle Cambrian Łebsko Formation and overlain by the Middle Cambrian Dębki Formation.

Siverskaya Formation (15, 16)

First introduced in the Cambrian stratigraphical scheme for the Soviet part of the East European Platform, the Siverskaya Formation corresponds to the upper, clayey parts, of the Baltic Group, previously regarded as the Lontova Formation (Tikhij, 1965). It is named after the boring of the same name located not far from Siverskaya railway station, in which a stratotype section is the interval 158.8-269.1 m in the Siverskaya boring (Yanovsky, 1971).

The formation occurs in the northwestern areas of the RSFSR where its greatest thickness of over 120 m occurs in the Leningrad District.

This formation contains variegated silty-argillaceous and argillaceous rocks. Predominant are greenish-grey rocks with interbeds and patches of reddish-brown and violet-red ones. The top of the formation contains ferruginized multicoloured to white kaolinitic clays constituting a weathering crust over a considerable area.

Sabelliditids (in the lower part), platysolenitids and pyritized casts of hyoliths occur. Acritarchs are represented by the Lontova assemblage (Volkova et al., 1979; Paškevičiene, 1980). Characteristic are various and often numerous pyritized trace fossils belonging to the Lontova Regional Stage.

The formation lies conformably, with gradual transgressions expressed by the predominance of claystones, on the Lomonosov Formation. It is overlain, with evident marks of sedimentary breaks, in the west by the Lükati Formation of the Dominopol' Regional Stage, and over the rest of the Platform by the Middle Cambrian Sablinka Formation.

Słowinski Formation (6)

The Słowinska Formation (Bednarczyk & Turnau-Morawska, 1975, pp. 557-559) was named after the Słowinski coast, northern Poland, where a stratotype is defined as the interval 2704.5-2715.7 m in Białogóra-1 boring. It is distributed in the western areas of North Poland, and has a thickness not in excess of 12 m.

The formation is composed of black kerogen-bearing argillites with organic-rich limestone interbeds and lenses.

Trilobites and conodonts occur: *Agnostus pisiformis* (Linnaeus), *Homagnostus obesus* (Belt), *Olenus wahlenbergi* Westergård, *O. truncatus* (Brünnich), *Parabolina spinulosa* (Wahlenberg), *Orusia lenticularis* (Wahlenberg), *Cyclotron nadomarginatum* Schrank, *Hesslandona necopina* Müller, *Furnishina alata* Szaniawski, *F. polonica* Szaniawski, *F. longibasis* Bednarczyk, *F. pomeranica* Bednarczyk, *F. quadrata* Müller, *F. furnishi* Müller, *F. asymmetrica* Müller, *Westergaardodina tricuspidata* Müller, *W. wimani* Szaniawski, *W. bohlini* Müller, *W. klewa* Müller and others.

On the basis of trilobite data the formation belongs to the Zones of *Agnostus pisiformis, Olenus* and *Agnostus* and *Parabolina spinulosa*.

It is underlain by the Middle Cambrian Białogóra Formation. The upper boundary is erosional, overlain by the deposits of the Upper Cambrian Piaśnica Formation.

Soela Formation (10)

Following the suggestion of Mens & Pirrus, 1976; and Mens, 1979), Kala et al. (1984, p. 25) regarded this as an independent unit, but previously, the deposits of the Soela Formation had been treated either, as the upper part of the Tiskre Formation (Kala, 1972; Areń et al., 1979) or as the lower part of the Kurzeme (now Irbeni) Formation (Mens & Pirrus, 1972).

The Soela Formation is named after the Gulf of Soela, located between Hiiumaa and Saaremaa Islands. Its stratotype is the interval of 230.7-263.7 m in the Emmaste boring on Hiiumaa Island. It also occurs in western Estonia where its thickness varies from 2.5-33 m, increasing from north to south.

It contains weakly cemented coarse-grained oligomictic siltstones containing up to 10% of sand and gravel grains. In the lowermost part of the section interbeds of greenish-grey pelitic siltstones, more rarely of silty clays occur. Characteristically (especially of the lower part) there are pebbles of greenish-grey clay and cross-bedding marked by mica scales and glauconite grains.

Valves of agglutinated foraminifers, *Volborthella* and semi- rounded fragments of inarticulate brachiopods occur sparsely, and the acritarchs *Baltisphaeridium dubium* Volk., *B. implicatum* Fridr., *B. ciliosum* Volk., *B. strigosum* Volk., *B.* aff. *compressum* Volk., *B. varium* Volk., *Micrhystridium pallidum* Volk., *M. lanatum* Volk., *M. tornatum* Volk., *Lophosphaeridium* aff. *tentativum* Volk., *L. truncatum* Volk., *Tasmanites bobrowskii* Waz., *Alliumella baltica* Vand., *Granomarginata squamacea* Volk., *Leiosphaeridia bicrura* Jank., etc also occur. This assemblage allows the inclusion of the Soela Formation within the lower substage of the Vergale Regional Stage. Single ichnites containing *Skolithos*, or more rarely *Planolites*, occur in the more clayey interbeds.

Deposits of the formation rest transgressively on various older formations: on the Tiskre deposits, the weathering crust of the Lükati and Lontova Formations and on the rocks of the crystalline basement, and are conformably overlain by the Irbeni Formation.

Söru Formation (10)

This was introduced in 1971 by Kala (see Grigelis, 1978; Aren et al., 1979, pp. 33-52), and grounds for the distinction and characteristics of the formation have been given by Kala, Mens & Pirrus (1984). The formation is named after Söru village, on Hiiumaa Is-

land, Estonia. The stratotype occurs in the interval 100.5-147 m in the Tahkuna boring on Hiiumaa Island. The Söru Formation occurs in the northwestern part of the Estonian mainland, and on Saaremaa, Hiiumaa, Muhu and Vormsi Islands. Its thickness is up to 50 m.

The lower part of the formation consists mostly of massive coarse-grained quartzose-feldspathic siltstones with thin clay interbeds and films. The upper part is represented by a complex of interbedded argillaceous rocks and siltstones. In both parts, rocks are light grey with greenish-shades, but red and violet-red patches occur as well. The formation is palaeontologically weakly characterized, yielding rare shells of agglutinated foraminifers and fine phosphate-bearing detritus of inarticulate brachiopods. The acritarchs *Tasmanites bobrowskii* Waz., *Micrhystridium pallidum* Volk., *Baltisphaeridium* sp., *Leiosphaeridia* sp., and numerous ichnites, especially in the upper part, occur.

The presence of agglutinated foraminifers and representatives of the genus *Baltisphaeridium* enable the deposits to be correlated with the lower substage of the Dominopol' Regional Stage.

The Söru Formation rests transgressively either on the deposits of the Lontova Formation or on crystalline basement rocks and is overlain by the deposits of the Lükati Formation from which it is frequently separated by a conglomerate interlayer.

Spanovka Formation (19)

Bessonova & Piskun (1977, p. 33) introduced the Spanovka Formation which is named after the Spanovka River of the Brest Region, BSSR (Bessonova & Piskun, 1978). It corresponds to the fourth member in the stratigraphical classification of Zinovenko & Makhnach (1972) and to the Spanovka Formation together with the regressive part of the Baltic Group sensu Bessonova & Piskun (1977, 1978). The stratotype of the formation as conceived here is the interval 540-689 m in the Brest 17-K borehole, located in Stradech village, Brest Region, BSSR (Makhnach et al., 1981). The formation occurs in the western areas of the Brest Region, BSSR, where a maximum thickness of 155 m is recorded (Makhnach et al., 1981).

It contains light grey quartzose and feldspathic-quartzose sandstones, of brownish, pinkish and greenish shades, together with greenish-grey and violet clay interbeds.

Only in one section (boring Brest 29-K) have these deposits yielded fossils; an acritarch assemblage which includes *Baltisphaeridium cerinum* Volk., *B. dubium* Volk., *B. compressum* Volk., *Tasmanites bobrowskii* Waz., and *Micrhystridium tornatum* Volk. In the upper part of this section *B. ciliosum* Volk. also occurs. These acritarchs clearly reveal the post-Baltian age of the deposits but they do not determine the exact stratigraphical position of the formation within the Dominopol' Regional Stage as conceived to date (Bessonova & Piskun, 1977, 1978, 1979; Makhnach et al., 1981). However, on the basis of acritarchs, the Spanovka deposits, or at least their uppermost part, can be attributed to the Lower Vergale Substage.

The formation is underlain by the deposits of the Stradech Formation of the Lontova Regional Stage, and is conformably overlain by the Bug Formation of the Vergale Regional Stage.

Stavy Formation (19)

Established by Bessonova & Piskun (1977, p. 33), and named after Stavy village, Brest Region, BSSR, this formation corresponds to the upper part of the fifth member accord-

ing to the classification of Zinovenko & Makhnach (1972) and/or to the Upper Stavy Subformation in the Cambrian stratigraphical scheme for Byelorussia (Makhnach et al., 1981). The stratotype is the interval 944-998 m in the boring Brest 29-K borehole which is located in Novoselki village, Brest Region, BSSR (Besonova & Piskun, 1978). The formation occurs in the western areas of the Brest Region, BSSR, where it has a maximum thickness of 53 m (Bessonova & Piskun, 1979).

Numerous ichnites and an acritarch assemblage which includes *Micrhystridium notatum* Volk., *M. obscurum* Volk., *Tasmanites convolutus* Volk. & Piskun and *Synsphaeridium svithasium* Kirjan occur (Bessonova & Piskun, 1977, 1978, 1979; Makhnach et al., 1981). Shells of inarticulate brachiopods, among them *Lingulella* cf. *ferruginea* Salter, also occur frequently.

Considering the palaeontolgical data and lithological criteria, the Stavy Formation belongs to the Kybartai Regional Stage. It is underlain by the Velichkovichi Formation of the Rausve Regional Stage, and is overlain by the Middle Cabmrian Orlya Formation.

Stokhod Formation (20, 22)

Kirjanov (1969, p. 49) redefined the Stokhod Beds (see Kirjanov, 1966, p. 17) as a formation. It is named after the Stokhod River, and a stratotype is designated as the interval 138.3-247.6 m in boring N-5 located near Welikiy Obzyr village, Volynia Region. It is distributed in the western areas of the Ukrainian SSR where its thickness is 71.4-109.3 m.

The Stokhod Formation consists of dark grey and greenish argillaceous rocks with rare thin sandstone interbeds which increase in number and thickness westwards. At the base of the formation an interbed of conglomerate-like rock containing flat fragments of argillites, siltstones, phosphorites and quartz occurs. At the top of the formation there is a variegated member bearing marks of subaerial weathering.

It contains *Platysolenites antiquissimus* Eichw., *Onuphionella agglutinata* Kirjanov, sabelliditids (mostly in the lower part) and the Lontova acritarch assemblage listed by Kirjanov (see Kirjanov, 1966, p. 16, 17; 1979, p. 157).

The formation is underlain by the Lower Cambrian Rovno Formation, and overlain by various deposits ranging from the Lower Cambrian to the Upper Cretaceous.

Stradech Formation (19)

Bessonova & Piskun (1977, p. 32), named this formation after Stradech village in the Brest Region (Bessonova & Piskun, 1978) where it corresponds to the second argillaceous member of Zinovenko & Makhnach (1972). The stratotype is the interval 689-802 m in the Brest 17-K borehole (Stradech boring). The formation occurs in southwestern Byelorussia, where its greatest recorded thickness is 22 m (Makhnach et al., 1981).

The Stradech Formation consists of greenish-grey silty argillaceous rocks with glauconitic-quartzose siltstone and sandstone interbeds. An interbed of unsorted glauconitic- quartzose sandstone containing pebbles of phosphorite-bearing rocks occurs at the base and a band of variegated argillaceous rocks considered to be a weathering crust occurs at the top.

The formation contains numerous ichnites, the Lontova acritarch assemblage, vendotaenids of the genus *Dvinia*, the filamentous alga *Leiothrichoides typicus* Herman and plant tissue, permitting the correlation of these deposits with the Lontova Regional Stage (Bessonova & Piskun, 1977, 1978; Makhnach et al., 1981).

The lower and the upper boundaries of the formation coincide with sedimentary breaks marked by weathering crusts. Underlying are the rocks of the Ryta Formation of the Rovno Regional Stage, and overlying are those of the Spanovka Formation.

Suwałki Formation (7)

Under this name, but with the rank of group, this unit was established by Znosko (1961, pp. 476-479) for deposits previously considered as Upper Proterozoic (Znosko, 1961, 1975), but now proved to be of Early Cambrian age. It is named after the town of Suwałki, in northeastern Poland where a stratotype, the interval 2064.8-2122 m is defined in Bartoszyce IG-1 boring. The formation occurs in the eastern areas of North Poland. Its thickness is up to 80 m.

Brown to grey fine to vari-grained sandstones, siltstones and argillaceous siltstones intercalated with iron oolites or siderite nodules are characteristic.

A diverse fauna has yielded *Holmia kjerulfi* Linnarsson, *Strenuaeva primaeva* (Brøgger), *Lingulella* cf. *nathorsti* Linnarsson, *Luekatiella* sp., and *Hyolithellus* sp. The trace fossils *Planolites beverleyensis* (Billings), *P. montanus* Richter, *Teichichnus vectus* Seilacher, *Phycodes pedum* Seilacher, and *Rusophycus* sp. occur, together with acritarchs represented by *Granomarginata squamacea* Volk., *Micrhystridium dissimilare* Volk., *M. obscurum* Volk., *M. parvum* Volk., *M. spinosum* Volk., *Baltisphaeridium ciliosum* Volk., *B. compressum* Volk., *B. varium* Volk., *B. insigne* (Fridr.), and *Estiastra minima* Volk.

The formation lies on the crystalline basement, and is overlain by the Prabuty Formation of Early Middle Cambrian age.

Svityaz' Formation (20)

The Svityaz' Formation was introduced by Kirjanov (1969, p. 58) and named after Lake Svityaz', located in the Lyuboml' District of the Volynia Region. The stratotype is the interval 288.9-365 m in Podmanevo-8 boring. It is distributed in the southern areas of the Ukrainian SSR, where its thickness is 100-112 m.

This formation is represented by alternating sandstone and argillaceous siltstone interbeds of variable thickness. In the lower part of the formation siltstones are usually greenish- grey, at the base variegated, and in the upper part, grey with slight brownish shades. Near the town of Vladimir-Volynski interbeds of brown iron oölites are exposed in the lower part. Besides quartz, the mineral composition of the rocks includes a considerable amount of feldspar, glauconite, siderite and pyrite.

The formation has yielded three acritarchs assemblages (Kirjanov, 1979, pp. 165-167). The lowermost one is represented by the Vergale acritarch assemblage which occurs with *Strenuaeva primaeva* (Brøgg.), *Lingulella* sp., *Glyptias* sp., *Westonia finlandensis* Walc., agglutinated foraminifers and numerous ichnites.

The second assemblages, recognized by the appearance and wide distribution of *Deunffia dentifera* Volk., and *Synsphaeridium switjasium* Kirjan. is very distinct and defines the Rausve age of the deposits. In the upper acritarch assemblage the species are less diverse and numerically impoverished. No new acritarchs appear, and so the exact age of these deposits cannot be established, and the whole of the upper part of the Svityaz' Formation is attributed to the Rausve Regional Stage (Kirjanov, 1969; 1979, p. 167-168).

The formation is underlain by the Lower Cambrian Lyuboml' Formation, and overlain by various deposits ranging in age from Middle Cambrian to Late Cretaceous.

Tebra Formation (9)

Brangulis et al. (1975, p. 62) established this formation for a unit previously called the Kursas Formation (Birkis et al., 1970, p. 908). It is named after the Tebra River in western Latvia. its stratotype is the interval 1232.2-1309.8 m in Vergale-46 boring.

This formation corresponds to the middle and upper parts of the Kurzeme and Kybartai Formations according to the stratigraphic nomenclature used by Lieldiena & Fridrichsone (1968). It is distributed in western Latvia with maximum thickness (84 m) occurring in the southwesternmost part of this territory.

The formation comprises a complicated interbedding of argillaceous, silty and arenaceous rocks with oolitic iron ore interlayers. Bioturbation structures of the "kraksten" type are widely developed. On the basis of the ratio of rock types in the most complete sections the formation is subdivided into four members (Birkis et al., 1970; Brangulis et al., 1976). The lower member (the so-called oölitic iron ore member) is characterized by the presence of some goethite oolitic interbeds among clays and siltstones. Above this is a member containing compact dark grey, grey and violet-grey silty clays with thin interbeds and lenses of light grey siltstones. Next succeeds a member with light grey and white sandstones and coarse-grained siltstones with greenish-grey clay interbeds and lenses. This part of the section is characterized by the wide occurrence of glauconite and detritus of inarticulate brachiopod shells accumulated on bedding planes and by the restricted development of bioturbation. The uppermost member is represented by grey and dark grey clayey rocks with single thin interbeds of light sandstones and coarse-grained siltstones. The two upper members are equivalent to the Kybartai Formation in the stratigraphic nomenclature by Lieldiena & Fridrichsone (1968).

Palaeontologically the members are distinct (Lieldiena & Fridrichsone, 1968; Birkis et al., 1970; Brangulis et al., 1976). The lower member has yielded *Volborthella*, platysolenitids, hyoliths, agglutinated foraminifers and inarticulate brachiopods, the trilobite *Ellipsocephalus* sp., and an acritarch assemblage which allows correlation of the lowermost part of the Tebra Formation with the Vergale Regional Stage. In the second member no trilobites or platysolenitids have been recorded. The acritarch asemblage establishes the Rausve age for these rocks. The deposits of the third and fourth members lack *Volborthella* and agglutinated foraminifers, and the acritarch composition changes. However, due to the presence of the trilobites *Ellipsocephalus* cf. *pusci* Orlow., *E. polytomus* Linnars., *Strenuella* (*Comluella*) aff. *samsonowiczi* Orł., *S. (C.) insolita* N. Tchern., and the inarticulate brachiopod *Lingulella* cf. *ferruginea* Salter, this part of the section correlates with the Kybartai Regional Stage, considered to represent the Middle Cambrian *Eccaparadoxides insularis* Stage.

Underlying rocks over the whole development area are the deposits of the upper part of the Ventava Formation, and the Middle Cambrian Deimena Superformation overlies.

Tigech Formation (24)

Bukachuk et al. (1969, p. 124), established this formation which is named after Tigech village of the Leon District, Moldavian SSR, with a stratotype in the interval 1206-1392 m in the P-110 boring located at Yargara village. It occurs in a restricted area of southwestern Moldavia with a thickness up to 200 m.

On lithological criteria, the formation is subdivided into three subformations (Bukachuk et al., 1969). The lower parts of these subformations consist mostly of fine-

grained light grey sandstones with siltstone interbeds alternating upwards with silty argillaceous rocks and siltstones of a dirty-grey to dark grey and greenish-colouring. At the base of the Lower Tigech Subformation a bed, 10 m thick, contains very hard coarse and inequigranular sandstones and gravellites with quartzite fragments. Sandstones and siltstones are mainly feldspathic-quartzose, with rare glauconite grains. The structure is horizontal to current-bedded.

The formation has yielded sabelliditids, vendotaenids of the genus *Tyrasotaenia* and acritarchs which include *Teophipolia lacerata* Kirjanov (Bukachuk, 1983, p. 22). On the basis of these fossils the Tigech Formation is assigned to the Rovno Regional Stage.

It is underlain by the Ferapontyev Formation of the Vendian Avdarmin Group, and is overlain by the Filipeny Formation, conditionally assigned to the Lontova Regional Stage.

Tiskre Formation (10, 14, 15)

This unit was introduced with the rank of formation by Männil (1958, p. 351), but its present concept is that of Mens & Pirrus (1977). The term "Tiskre" was originally introduced by Öpik (1933) for the upper member of the formation which is the major part of the formation as now understood (see Mens & Pirrus, 1977).

It corresponds to the "Fucoid Sandstone" and the upper part of the "Eophyton Sandstone" of Schmidt (1886) and Mickwitz (1911), the Tiskre Sandstone (= sandstone with *Diplocraterion*), and the Kakumägi Beds with "Mickwitzia conglomerate" (= *Scenella* Zone) of Öpik (1933, 1956). The name comes from Tiskre village, northern Estonia. The stratotype is the exposure at the southern end of Rannamõisa Cliff (Mens & Pirrus, 1977).

This formation occurs in northern and northwestern Estonia, and in the western areas of the Leningrad Region. Its thickness is greatest in the stratotype areas, reaching 20 m.

It is mostly represented by light coarse-grained siltstone throughout the section, and contains interbeds of greenish-grey argillaceous rocks, in the lowermost part also beds in inequigranular sandstone and conglomerate lenses (the so-called "Mickwitzia conglomerate"). It is divided into the Kakumägi (lower) and Rannamoisa (upper) Members. In the Kakumägi Member *Mickwitzia monilifera* (Linnars.), *M. formosa* Wiman, *M. concentrica* Gorjansky, *Paterina rara* Gorjansky, *Scenella discinoides* Schm., *S. tuberculata* Schm., fragments of *Schmidtiellus mickwitzi* (Schm.), and ostracodes of the family Bradoriidae occur. The Rannamoisa Member has yielded the ichnites *Skolithos linearis* Hald., *Diplocraterion parallelum* Torell., and *D. helmerseni* Öpik, and fragments of inarticulate brachiopods. Acritarchs mostly characterize the Kakumägi Member: in the Rannamoisa Member they are known from one borehole section only where they are represented by *Tasmanites bobrowskii* Waz., *T. volkovae* Kirjanov, *T. piritaensis* Posti & Jank., *Baltisphaeridium compressum* Volk., *B. cerinum* Volk., *Micrhystridium tornatum* Volk., *Leiomarginata simplex* Naum., and *Granomarginata squamacea* Volk.

The Tiskre Formation lies conformably, often with a break in sedimentation, on the Lükati Formation, and is overlain by various Cambrian or Lower Ordovician deposits.

Tolbukhino Formation (17)

Kuzmenko (1984, p. 33) introduced this formation which corresponds to the second member, or upper half of the Sablinka Formation, in the stratigraphical classification used

by Shestakova et al. (1976), or to the upper part of the Mologa Formation of Dmitrovskaya et al (1983). It is named after Tolkubkhino village, Yaroslavl Region. A stratotype is located in the interval 2194-2152 m in the Tolbukhino-1 boring.

This formation is distributed in the central regions of the RSFSR where its thickness varies from 15-50 m, decreasing eastwards due to pre-Ordovician denudation.

It is represented by alternating light grey fine-grained quartzose sandstones, dark grey or greenish-grey argillaceous siltstones and dark grey, sometimes brownish, argillites. In places numerous vertical traces of mud-eaters form a bioturbation structure of the "kraksten" type.

The trilobite *Agnostus subsulcatus* West., inarticulate brachiopods of the genera *Paldiskia* and *Westonia*, and two acritarch assemblages have been recorded. The lower one (up to 2173.4 m) includes representatives of the genera *Dictyotidium, Multiplicisphaeridium, Aranidium, Ovulum, Baltisphaeridium, Micrhystridium* and *Tasmanites*. In the upper assemblage (2173.4-2152 m), there are additionally representatives of the genera *Vulcanisphaera* and *Cymatiogalea*. On the basis of the named fossils the deposits are considered to have a Middle and early Late Cambrian age.

The Tolbukhino Formation is underlain by the Middle Cambrian Urdom Formation, and overlain by the Upper Cambrian Nikolskoye Formation.

"Torneträsk Formation" (1)

This "formation", which includes Precambrian and Cambrian strata separated by a large hiatus, was introduced by Thelander (1982). The type locality is the Luopakte section on the southern side of Lake Torneträsk (Moberg, 1908).

The "formation" corresponds to units A-I of Kulling (1965) and A-F of Vogt (1967). Of these units, A, B and most of C form a Vendian sedimentation unit, dated by acritarchs and the medusa *Kullingia concentrica*. The uppermost part of unit C is already well within the Lower Cambrian and contains the first Cambrian type trace fossils, such as *Skolithos*. At Luopakte, the Cambrian part of the "formation" is almost 90 m thick. It consists of 2 m of unit C ("middle sandstone"), which in effect is sandstone/siltstone, a conglomerate tongue of the Vakkejokk Breccia, and a thin dolomite layer. Unit D is the "middle shale" or "red and green siltstone", some 19 m thick, and reported to have (at various localities) *Platysolenites lontova* and *P. antiquissimus, Volborthella* sp. and hyoliths. The "upper sandstone" is around 50 m thick. Channels and other structures indicate that it was deposited in very shallow water, beach and possibly tidal environments. Body fossils have not been found, but there are trace fossils such as *Scolicia, Spirodesmos* and *Gyrolithes*?. The "upper siltstone" ("upper shale") measures some 18 m. At its base and top are calcareous beds with trilobites of the genera *Ellipsocephalus, Proampyx, Strenuaeva* and *Comluella* (Ahlberg, 1985). These strata thus correlate with the Gislöv Formation, the *Holmia*/Evjevik units at Mjøsa, and the Lingulid Sandstone.

The Cambrian part of the "Torneträsk Formation" is underlain by Vendian parts of the same "formation" and overlain by undated alum shale.

Ülgase Formation (14)

Khazanovich & Missarzhevsky (1982, p. 7) suggested the establishment of this unit as a formation. The corresponding part of the section was first treated as an independent subdivision by Öpik (1929) when he defined the zone with *Acrotreta-Lingulella*. The geographi-

cal name was given by Müürisepp (1958) after Ülgase village, located eastwards from Tallinn.

The stratotype is the Ülgase outcrop near a ditch for the draining of an ancient mine.

The formation occurs in northern Estonia. At outcrop its thickness is less than 10 m, but in borings it may reach 14 m.

It comprises light coarse-grained siltstones and fine- grained sandstones with interbeds of greenish-grey (below) and brownish-grey (above) argillaceous rocks. Mineralogical and granulometrical characteristics of the rocks in the stratotype area are given by Mens (1984).

The formation contains numerous inarticulate brachiopods of the genera *Ungula, Oepikites, Angulotreta* and *Ceratreta,* and also conodonts of the genera *Phakelodus* (= *Prooneotodus*) and *Furnishina* (see Rõõmusoks et al., 1975; Borovko et al., 1984). Abundant is *Torellella sulcata* Missarzhevsky, and greenish grey clay interbeds have yielded acritarchs of the genera *Aranidium, Cymatiogalea, Leiofusa, Stelliferidium, Veryhachium, Vulcanisphaera, Timofeevia,* and etc. A complete list of acritarchs is given by Volkova (1982). On the basis of palaeontological data the Ülgase Formation is assigned to the lowermost Upper Cambrian.

The formation is disconformably underlain by the Tiskre Formation of the Dominopol' Regional Stage, and is overlain with break in sedimentation by the youngest Upper Cambrian and Lower Ordovician sandstones.

Urdom Formation (17)

Introduced by Kuzmenko (1984, p. 31), this corresponds to the first member, or to the lower half of the Sablinka Formation, in the stratigraphical classification used by Shestakova et al. (1976), or to the lower half of the Mologa Formation of Dmitrovskaya et al. (1983). It is named after the Urdom River, Yaroslavl' Region, RSFSR; its stratotype is the interval 2152-2200 m in the Urdom-1 boring; and it is distributed in the central regions of the RSFSR where it has a thickness varying from 18-40 m

The Urdom Formation contains weakly cemented white and light grey sandstones with rare thin lenses and interbeds of argillaceous rocks. Sandstones have variable grain size with gravelly admixture, especially in the lower part of the formation. The structure is cross-bedded and horizontally- bedded, marked by alternating beds of a different grains size. The cement is clayey, usually of kaolinitic composition.

Acritarchs have been recorded, including representatives of the genera *Dictytidium* and *Multiplicisphaeridium,* enabling correlation of the formation with the *Paradoxides paradoxissimus* and *P. forchhammeri* Stages. A complete list of acritarchs is given by Volkova (1980).

The formation is underlain by a weathering crust on the Lontova Regional Stage and overlain by the Middle-Upper Cambrian Tolbukhino Formation.

Vaki Formation (11)

This formation was established during the compilation of the Cambrian stratigraphical scheme for the Soviet part of the East European Platform (Spizharskij, 1986) but the unit had been recognized and named earlier under the rank of Beds (Grigelis, 1978; Mens

et al., 1984). It is named after Vaki village in central Estonia where the stratotype is the interval 284.4-322 m in the Vaki-67 boring.

This formation is distributed in central and eastern Estonia where it is the shallow-water equivalent of the Soela and Irbeni Formations. It is up to 35 m thick.

The formation consists of light coarse-grained siltstones with rare thin interbeds of greenish-grey and bleach-violet argillaceous rocks. The latter are often enriched with mica and trace fossils of the *Skolithos* type filled with silty material. Besides ichnites, the formation contains scarce detritus of inarticulate brachiopods.

It rests transgressively on deposits of various age, from the Tiskre Formation of the Dominopol' Regional Stage down to the rocks of the crystalline basement, and is overlain by the Middle Cambrian Paala Beds, or Lower Ordovician deposits of various age.

Velichkovichi Formation (19)

This was established in 1983 during the compilation of a Cambrian stratigraphical scheme for the Soviet part of the East European Platform, and is named after Velichkovichi village. It corresponds to the lower half of the fifth member of Zinovenko & Makhnach (1972), to the Upper Bug Subformation of Bessonova & Piskun (1977, 1978, 1979), and/or to the Lower Stavy Subformation in the Cambrian stratigraphical classification for Byelorussia (Makhnach et al., 1981). The stratotype occurs in the interval 998-1046 m in the Brest 29-K borehole, located in Novoselki village of the Brest Region, BSSR (Bessonova & Piskun, 1978). It is distributed in the western areas of Brest Region, BSSR, where in places, the thickness reaches 44 m (Bessonova & Piskun, 1979).

The formation consists of light grey arenaceous-silty and greenish-dark grey argillaceous rocks. At the base light grey to white fine-grained sandstones with dolomitic-clay cement, pyrite and scarce galuconite nodules occur.

The deposits have yielded *Volborthella tenuis* Schm., *Lingullella* sp., agglutinated foraminifers and acritarchs represented by *Tasmanites volkovae* Kirjan., *Baltisphaeridium strigosum* Jank., *B. bresticum* Piskun, *B. ciliosum* Volk., *B. microconicum* Piskun, *B. zinovenkivae* Piskun, *B. compressum* Volk., *Micrhystridium spinosum* Volk., *M. lanatum* Volk. and *Cymatiosphaera* sp.

On the basis of lithological features and the position of the formation in the section, it is considered to belong to the Rausve Regional Stage.

It is underlain by the Bug Formation of the Vergale Regional Stage, and overlain by deposits of the Stavy Formation of the Kybartai Regional Stage.

Ventava Formation (9)

This formation was established by a group of authors (Birkis et al., 1970, p. 907) and named after the ancient ethnic province of Ventava in western Latvia where a stratotype has been designated as the interval 1309.8-1360 m in the Vergale-46 boring.

It occurs in western Latvia where its maximum thickness is in the southwest, reaching 62 m (Brangulis, 1979).

The formation comprises three members (from below to top): pre-Saka, Saka and post-Saka (Brangulis et al., 1976). The pre-Saka Member, with a thickness of up to 27 m, consists of greenish-grey, and at the top variegated, argillaceous rocks with interbeds and lenses of siltstones, sandstones and gravellites containing *Volborthella tenuis* Schm.,

Platysolenites antiquissimus Eichw., *Torellella* cf. *laevigata* (Linnars.), agglutinated foraminifers and the so-called Lükati acritarch assemblage (Birkis et al., 1970; Brangulis, 1979).

The Saka Member has a thickness up to 35.5 m and is represented by white, coarse-grained siltstones and fine- grained sandstones with thin clay interbeds. At the base, in places, gravellites and conglomerates occur. Single acritarchs and shells of agglutinated foraminifers have been recorded.

The post-Saka Member has a maximum thickness of 15 m and contains alternating argillaceous and silty rocks with sandstone interbeds. It has yielded *Strenuaeva primaeva* (Brøgger), *Volborthella tenuis* Schm., rare *Platysolenites antiquissimus* Eichw., shells of agglutinated foraminifers, valves of inarticulate brachiopods and the Vergale acritarch assemblage (Birkis et al., 1970; Brangulis, 1979). According to palaeontological data the post-Saka Member is assigned to the Vergale Regional Stage and the pre-Saka Member belongs to the Dominopol' Regional Stage. The stratigraphical position of the Saka Member is uncertain (see Grigelis, 1978; Mens, 1981).

Underlying rocks are either the crystalline basement or deposits of the Ovishi Formation of the Dominopol' Regional Stage, and those overlying belong to the Tebra Formation of the Vergale Regional Stage.

Veselovsk Formation (8)

This formation was introduced by Nikashin et al. (in press). It is named after Veselovsk village where its stratotype is the interval 2463.6-2468.4 m in the Veselovskaya-8 boring. This formation occurs in the southwestern areas of the Kaliningrad Region where it consists of interbedded dark grey argillaceous and light grey arenaceous-silty rocks. Arenaceous rocks are often strongly cemented with carbonate and they are characterized by beds containing numerous pyrite nodules. They are cross-bedded or horizontally-bedded and have a thickness up to 5 m.

The formation has yielded numerous acritarchs including, besides forms of the genera *Balt*isphaeridium and *Micrhystridium, Eliasum llaniscum* Fombella, *Cristallinium cambriense* Vang. and *Timofeevia phosphoritica* Vang. which appear in the Cambrian section at the base of the *Paradoxides paradoxissimus* Stage (Martin & Dean, 1981). A complete list of acritarchs is given by Nikashin et al. (in press). Deposits of this formation lie disconformably on the Deimena Superformation, and they are overlain by glauconitic sandstones of the Ordovician Arenig Series, or more rarely, by deposits of the Upper Cambrian Ladushkino Formation.

Virbalis Formation (8)

Established by Sakalauskas (1966, p. 47), and named after the town of Virbalis, a stratotype occurs in the interval 2032- 2080 m in the Stonishkyai boring (Grigelis et al., 1971).

The Virbalis Formation occurs in western Lithuania and the Kaliningrad Region. Its thickness is greater in the west, in places reaching 42 m, where it consists of alternating quartzose-glauconitic and quartzose sandstones, siltstones and greenish and dark grey argillaceous rocks. Bioturbation structures of the "kraksten" type are widely developed.

Fossils are represented by trilobite fragments of the genus *Ellipsocephalus,* valves of inarticulate brachiopods of the genera *Lingulella* and *Westonia,* hyolithelminthes shells

(Korkutis, 1971) and the Rausve acritarch assemblage, a complete list of which is given by Jankauskas (1974, 1982).

It is underlain by the Gege Formation of the Vergale Regional Stage and overlain by the Kybartai Formation of the Kybartai Regional Stage.

Voosi Formation (10)

Established by Kala, Kajak, Mens & Pirrus (1981, p. 130), the detailed characteristics of the formation are given by Kala, Mens & Pirrus (1984). Previously these rocks were thought to be shallow-water equivalents of the Lontova Formation (Tikhij, 1978; Areń et al., 1979).

The formation is named after the Gulf of Voosi, between the Noarootsi Peninsula and Vormsi Island, western Estonia, where a stratotype is defined as the interval 237.5-300 m in the Haapsalu-3 boring. It occurs in western Estonia and has a thickness up to 90 m.

The lower part of the formation is mostly composed of sandstones, its upper half containing a considerable amount of glauconite. The upper part consists of interbedded argillaceous rocks and siltstones. The formation comprises three members (from below to top): Taebla, Kasari and Paralepa (Kala et al., 1981). *Sabellidites cambriensis* Yan., *S.* sp., *Platysolenites antiquissimus* Eichw., *P. lontova* Öpik, *P. spiralis* Posti, *Aldanella kunda* (Öpik) and casts of hyoliths have been recorded. Among the acritarchs *Granomarginata prima* Naum., *G. squamacea* Volk., *Leiomarginata simplex* Naum., *Tasmanites tenellus* Volk., *T. bobrowskii* Waz. (only in the upper part), *Micrhystridium tornatum* Volk., *Leiosphaeridia culta* (Andr.), *L. pelucida* (Schep.), and *L. dehisca* Paŝkev. have been identified. Also occuring are the filiform algae *Leiotrichoides typicus* Herman, and *Oscillatorites wernadskii* Schep. Numerous ichnites, often pyritized, especially in clay interbeds, are present.

The formation rests on the rocks of the Upper Vendian or on the crystalline basement and is overlain by the Söru or Lükati Formations of the Dominopol' Regional Stage.

Włodawa Subformation (18, 21)

This unit was established by Lendzion (1978, p. 18), but with the rank of group. It is presently considered (Lendzion, 1983, p. 9) to belong to the Mazowsze Formation.

Named after the town of Włodawa, in eastern Poland, where a stratotype occurs over the interval 3330-3401 m in the Krowie Bagno IG-1 boring, it is locally distributed in southeastern Poland, having a maximum thickness of 101 m.

Fossils are represented by *Sabellidites cambriensis* Yanishevsky, *Platysolenites antiquissimus* Eichw. (= *Yanishevskytes petropolitanus* (Yanishevsky)), *Onuphionella agglutinata* Kirjanov, *Aldanella polonica* Lendzion, *Tyrasotaenia* Gnilovskaya, *T. tungusica* Gnilovskaya, and by acritarchs. According to the acritarchs, the main part of the subformation belongs to the *Sabellidites cambriensis* Zone. Its uppermost part, in places, is assigned to the *Platysolenites antiquissimus* Zone, as it contains the Lontova acritarch assemblage.

This formation is underlain by Upper Vendian deposits. High in the section it is gradually replaced by the upper part of the Mazowsze Formation.

Wysokoe Group (19)

Bessonova & Piskun (1977, p. 31) named this group after Wysokoe village in the Brest Region of the BSSR, where a thickness up to 220 m is recorded.

The lower boundary of the group is fixed by a sedimentary break represented by a weathering crust in the uppermost part of the underlying Lontova Regional Stage. At the base of the group lenses of coarse-grained rocks sometimes occur. The upper boundary is lithologically distinct, because the overlying rocks are the non-glauconitic homogeneous sandstones of the Orlya Formation.

The Wysokoe Group contains the arenaceous, silty and argillaceous rocks of the Spanovka, Bug, Velichkovichi and Stavy Formations.

It is attributed to the Dominopol', Vergale, Rausve and Kybartai Regional Stages on the basis of palaeontological data.

Yagodnyi Formation (8)

This formation was established by Nikashin et al. (in press) after Yagodnyi village in the northwestern areas of Kaliningrad Region, where a stratotype occurs in the interval 2921-2953 m in the Yagodnyi-1 boring.

It consists of light, strongly cemented, fine-grained and medium-grained quartzose sandstones and includes in the middle part of the formation, a band of dark grey argillaceous rocks. The thickness varies from 0.3-34 m, increasing regularly from east to west.

Rare acritarchs and ichnites occur. The latter are more characteristic of the middle argillaceous part of the formation, being represented by pyritized forms, as well as by those filled with arenaceous material. The acritarch assemblage has yielded abundant leiosphaerids, and representatives of the genera *Baltisphaeridium*, *Micrhystridium* and *Cymatiosphaera*. *B. ciliosum* Volk., *M. dissimilare* Volk., and *C. postii* Jank. suggest a post-Dominopol' age for these deposits.

The Yagodnyi Formation lies transgressively on the crystalline basement and is conformably overlain by the deposits of the Gege Formation of the Vergale Regional Stage.

Żarnowiec Formation (6)

Named after the town of Żarnowiec, northern Poland, Lendzion (1970, p. 343) established this formation, which has a stratotype in the interval 3201.1-3236.5 m in Żarnowiec IG-1 boring. It occurs in the western areas of northern Poland and has a thickness of up to 150 m.

The Żarnowiec Formation is composed of vari-grained sandstones. Usually in the lowermost part these sandstones are poorly sorted, and indistinctly bedded. Higher in the section they become mor esorted and fine-grained; prevalent are pinkish-grey and light grey rocks. In this part of the sequence the rocks are horizontally laminated or cross-bedded. The top of the formation is usually horizontally-bedded, and contains intercalations of greenish-grey siltstones.

Fossils are lacking. The formation is conditionally assigned to the uppermost Vendian and Lower Cambrian.

It is underlain by the crystalline basement and overlain by the Lower Cambrian Kluki Formation.

Zawiszyn Formation (18)

This formation was established by Lendzion (Areń & Lendzion, 1974, p. 34). It is named after Zawiszyn village, in central Poland, where a stratotype interval occurs between 2367.1-2397 m in Tłuszcz IG 1 boring.

The Zawiszyn Formation occurs in central Poland in the western sections of the Podlyas-Brest Depression where it has a thickness up to 48 m.

It is represented by fine-grained and medium-grained quartzose-glauconitic sandstones with rare interbeds of silty argillites.

The formation contains *Mobergella holsti* (Moberg), *M. radiolata* Bengtson, *M. turgida* Bengtson, *Livia plana* Lendzion, *L. convexa* Lendzion, *Cassubia infercambriensis* Lendzion; *Granomarginata squamacea* Volk., *Micrhystridium lanatum* Volk., *M. tornatum* Volk., *M.* cf. *pallidum* Volk., *Rudaminia alata* Jank., *Baltisphaeridium cerinum* Volk., *B. dubium* Volk., and *B. strigosum* Jank.

On the basis of these fossils the formation is assigned to the *Schmidtiellus mickwitzi* and *Mobergella* Zone. Its lower barren part, however, may be the stratigraphical equivalent of the *Rusophycus parallellum* Zone.

The Zawiszyn Formation rests on the Lower Cambrian Mazowsze Formation or on the crystalline basement, and it is overlain by the Lower Cambrian Kaplonosy Formation.

Zbruch Formation (23)

Introduced by Kirjanov (1969, p. 49) with the rank of formation, this part of the section had previously been treated as beds with the same name (Kirjanov, 1965, 1968). It is named after the Zbruch River, Ukrainian SSR, and its stratotype is the interval 246.8-291.1 m in boring N. 12607, located at Ivanovka village.

It occurs in the most southwestern areas of the Ukraine SSR as a narrow belt between the upper reaches of the South Bug River and the middle reaches of the Dnestr River, where its thickness varies from 13-44 m.

The formation contains light grey fine-grained quartzose sandstones with numerous interbeds of greenish-grey or reddish- brown silt stones. Throughout the section interbeds of conglomeratic rocks, the so-called "autochtonous conglomerates", and traces of bioturbation, occur. Ripple marks and mud cracks rarely occur.

Palaeontologically, only single acritarchs, represented by *Tasmanites tenellus* Volk., and the ichnite *Treptichnus triplex* Palij have been recorded. On the basis of these finds and by the presence of facial transgressions into the Khmelnitskiy Formation, this unit is attributed to the Lontova Regional Stage.

It is underlain by the Khmelnitskiy Formation and in most cases overlain by the Ordovician Molodovo Regional Stage. Only in the stratotype area is this formation overlain by the Samets Formation of the Dominopol' Regional Stage.

REFERENCES

(Those in Russian are asterisked)

Ahlberg, P., 1984. Lower Cambrian trilobites and biostratigraphy of Scandinavia. *Lund Publications in Geology*, 22, 37 pp.

Ahlberg, P., 1985. Lower Cambrian trilobites faunas from the Scandinavian Caledonides - a review. *In The Caledonide Orogen-Scandinavia and related areas* (Ed. D.G. Gee & B.A. Sturt), pp. 339-346. John Wiley & Sons Ltd.

Ahlberg, P. & Bergström J., 1978. Lower Cambrian ptychopariid trilobites from Scandinavia. *Sveriges Geologiska Undersökning*, Ca, 49, 41 pp, 4 pls.

Ahlberg, P., Bergström, J. & Johansson, J., 1986. Lower Cambrian olenellid trilobites from the Baltic Faunal Province. *Geologiska Föreningens Stockholm Förhandlinger*, 108, 39-56.

Angelin, N.P., 1877. *Geologisk öfversigtskarts öfver Skåne med åtfljande text, på uppdrag af Malmöhus och Christianstads läns Kongl. Hushållnings Sällskaputarbetad* (Ed. B. Lundgren).. 83 pp. Lund.

Andersson, A., Dahlman, B., Gee, D.G. & Snäll, S., 1985. The Scandinavian Alum Shales *Sveriges Geologiska Undersökning,* Ca, 56, 50 pp.

Andres, D., 1981. Beziechungen zwischen kambrischen Conodonten und Euconodonten. *Berliner Geowissenschahten Abhandlung,* A, 19-31.

Aren, B., Brangulis, A.P., Volkova, N.A., Lendzion, K., Mens, K.A., Michniak, R.K., Paskeviciene, L.T., Pirrus, E.A., Rozanov, A.Yu., & Jankauskas, T.V., 1979. The Baltic Syneclise. *In Upper Precambrian and Cambrian stratigraphy of the western part* of *the East European Platform* (Ed. Keller, B.M., & Rozanov, A. Yu), pp. 42-68. Nauka, Moscow.

*Aren, B. & Lendzion, K., 1974. Distribution and stratigraphy of the Lower Cambrian Klimontov Stage in the platform area of Poland. *In Biostratygrafiya i paleontologiya nizhnego kembriya Evropy i Severnoy Azii*, pp. 30-35. Nauka, Moscow.

Aren, B. & Lendzion, K., 1978. Charakterystyka stratygraficzo- litologiczna wendu i kambru dolnego. *Prace Instytutu Geologicznego*, 7-49.

Asatkin, B.P., 1937. Precambrian, Cambrian and Lower Silurian deposits in the Leningrad region. *Trudy Leningradskogo geologicheskogo tresta*, 15, 5-8

*Balashova, E.A., 1963. The first trilobite finding from the Upper Cambrian of the Russian Platform. *Vestnik Leningradskogo Universiteta, Seriya Geologiya i Geografiia*, 2, 126-128.

Bednarczyk, W., 1984. Biostratigraphy of the Cambrian deposits in the Leba area. *Acta Geologica Polonica*, 34, 1-2, 95- 109.

Bednarczyk, W. & Turnau-Morawska, M., 1975. Lithostratygrafia osadow kambru i wendu w rejonie Leby. *Acta Geologica Polonica*, 25, 4, 537-566.

Berg-Madsen, V., 1981. The Middle Cambrian Kalby and Borregård Members of Bornholm, Denmark. *Geologiska Föreningens i Stockholm Förhandlingar*, 103, 2, 215-231.

Berg-Madsen, V., 1985a. The Middle Cambrian of Bornholm, Denmark: A stratigraphical revision of the lower alum shale and associated anthraconites. *Geologiska Föreningens i Stockholm Förhandlingar*, 106, 4, 357-376.

Berg-Madsen, V., 1985b. A review of the Andrarum Limestone and the upper alum shale (Middle Cambrian) of Bornholm, Denmark. *Bulletin Geological Society of Denmark*, 34, 3-4, 133-143.

Bergström, J., 1970. *Rusophycus* as an indication of early Cambrian age. *In Trace Fossils Crimes*, (Eds. T.P. & Harper, J.C.), pp. 35-42, *Geological Journal Special Issue*, 3.

Bergström, J., 1973. Classification of olenellid trilobites and some Balto-Scandian species. *Norsk Geologisk Tidsskrift*, 53, 283-314.

Bergström, J., 1976. Lower Palaeozoic trace fossils from eastern Newfoundland. *Canadian Journal of Earth Science*, 13, 1613-1633.

Bergström, J., 1980. Middle and Upper Cambrian biostratigraphy and sedimentation in south central Jämtland, Sweden. *Geologiska Föreningens Stockholm Förhandlingar*, 102 (4), 373-376.

Bergström, J., 1981. Lower Cambrian shelly faunas and biostratigraphy in Scandinavia. In Short Papers for the Second International Symposium on the Cambrian System 1981 (Ed. M.E. Taylor). *U.S. Geological Survey, Open-File Report* 81-743, 22-25.

Bergström, J., 1982. Outline of the geology of Scania. In J. Bergström, B. Holland, K. Larsson, E. Norling & U. Sivhed (Contributors), Guide to excursions in Scania. *Sveriges Geologiska Undersökning*, Ca, 54, 7-20.

Bergström, J. & Ahlberg, P., 1981. Uppermost Lower Cambrian biostratigraphy in Scania. *Geologiska Föreningens Stockholm Förhandlingar*, 103, 193-214.

Bergström, J. & Gee, D.G., 1985. The Cambrian in Scandinavia. *In The Caledonide Orogen - Scandinavia and Related Areas*. (Eds D.G. Gee & B.A. Sturt), pp. 247-271. John Wiley & Sons Ltd.

*Bessonova, V.Ya. & Piskun, L.V., 1977. Correlation of the Byelorusian Cambrian deposits with other areas. *In Novye dannye po geologii BSSR*, pp. 29-34. Belorusskiy naucho-issledovatel'skiy geologorazvedochnyi institut, Minsk.

*Bessonova, V.Ya. & Piskun, L.V., 1978. Stratotypes of the Cambrian Formations of the eastern part of the Podlyas- Brest depression. *In Sovremennye problemy geologii BSSR*, pp. 34-45. Belorusskiy naucho-issledovatel'skiy geologorazvedochnyi institut, Minsk.

*Bessonova, V.Ya. & Piskun, L.V., 1979. Eastern part of the Podlyas-Brest depression. *In Stratigraphiya verkhnedokembriyskikh i kembriyskikh otlozheniy zapada Vostochno*-Evropeyskoy *platformy*, pp. 97-118. Nauka, Moscow.

*Birkis, A.P., Brangulis, A.P., Volkova, N.A. & Rozanov, A.Yu., 1970. New data on the Cambrian stratigraphy of western Latvia. *Doklady Akademii Nauk SSSR*, 195 (4), 907-910.

*Borovko, N.G., Popov, L.E., Sergeyeva, S.P. & Khazanovich, K.K., 1980. New faunal complex from the lower part of Obolus Sandstone in section of the Izhora River. *Doklady Akademii Nauk SSSR*, 254 (5), 1192-1194.

*Borovko, N.G. & Sergeyeva, S.P., 1981. Late Cambrian and Early Ordovician conodonts from the Izhora River Basin. *Doklady Akademii Nauk SSSR*, 261 (1), 149-151.

*Borovko, N. & Sergeyeva, S., 1985. Upper Cambrian conodonts of the Balto-Ladoga clint. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 34 (4), 125-129.

*Borovko, N.G., Sergeyeva, S.P., Volkova, N.A., Golub, I.N., Goryansky, N.Yu., Popov, L.E. & Khazanovich, K.K., 1984. Key-section of the Cambrian-Ordovician boundary beds in the north-western part of Russian Plate (the Izhora River). *Izvestiya Akademiia Nauk SSSR, Seriya Geologicheskaya*, 7, 54-63.

*Brangulis, A.P., 1979. The Cambrian of Latvia. *In Geologicheskoye stroyenie i poleznye iskopaemye Latvii*, pp. 18-38. Zinatne, Riga.

*Brangulis, A.P., Volkova, N.A., Karpitskaya, L.P., Murnieks, A.E. & Rozanov, A.Yu., 1975. On the stratigraphy of the Cambrian old deposits in the transition belt between Baltic and Moscow Syneclises. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 12, 103-109.

*Brangulis, A., Volkova, N., Karpitskaya, L. & Rozanov, A., 1975. On the composition of the Old series in the North of Kurzeme Peninsula. *In Geologiya kristallicheskogo fundamenta i osadochnogo chekhla Pribaltiki*, pp. 58-63. Zinatne, Riga.

*Brangulis, A.P., Murnieks, A.E. & Fridrichsone, A.I., 1976. The Cambrian of Latvia. *In Stratigraficheskie skhemy Latviiskoy SSR*, pp. 23-35. Zinatne, Riga.

Brøgger, W.C., 1886. Om alderen af Olenelluszone i Nordamerika. *Geologiska Föreningens Stockholm Förhandlingar,* 8, 182-213.

Bruton, D.L., Erdtmann, B.D., & Koch, L., 1982. The Naersnes Section, Oslo Region, Norway: a candidate for the Cambrian- Ordovician boundary stratotype at the base of the Tremadoc Series. *In The Cambrian-Ordovician Boundary: sections, fossil distributions and correlations* (Eds Bassett M.G. & Dean W.T.), pp. 61-69. National Museum of Wales, Geological Series 3, Cardiff.

*Bukatchuk, P.D., 1983. The Vendian of Moldavia and Podolian Dniester Region. *In Geologicheskoe stroyenie i poleznye iskopaemye Moldavskoi SST,* pp. 19-22. Kishinev.

*Bukatchuk, P.D., Kol'tsova, E.M. & Polukhtovich, B.M., 1969. The Cambrian deposits of Moldavia. *Sovetskaya Geologiya*, 8, 125-127.

*Bukatchuk, P.D. & Edelshtein, A.Y. 1964. Presilurian deposits. *In Stratigrafiya osadochnykh obrazovaniy Moldavii.* Kartya Moldovenyaskeh, Kishinev.

Cowie, J.W., 1985. Continuing work on the Precambrian - Cambrian Boundary. *Episodes*, 8(2), 93-97.

de Marino, A., 1980. Sandstones and phosphatized calcareous sediments of the Lower Cambrian Rispebjerg Sandstone. Bornholm, Denmark. *Danmarks Geologiske Undersøgelse*, 2R, 113, 39 pp.

Deecke, W., 1897. Die phosphoritführenden Schichten Bornholms. *Mittheilungen des naturwissenschaftlichen Vereins für Neuvorpommeren und Rügen*, 29, 1-15.

*Dmitrovskaya, Yu. E., Nikashin, E.S. & Usanov, N.A., 1983. Stratigraphic subdivision of Cambrian sediments in the Moscow Syneclise. *Sovetskaya Geologiya*, 22, 72-77.

Erdtmann, B.D., 1982. Palaeobiogeography and environments of plantic dictyonemid graptolites during the earliest Ordovician. *In The Cambrian-Ordovician Boundary: sections, fossil distributions and correlations* (Eds Bassett M.G. & Dean W.T.), pp. 9-27. National Museum of Wales, Geological Series 3, Cardiff.

Fedonkin, M.A., 1977. Precambrian-Cambrian ichnocoenoses of the East European platform. *In Trace Fossils* 2 (Eds T.P. Crimes & J.C. Harper), pp. 183-194. Geological Journal Special Issue, 9.

Fisher, J., 1791. *Versuch einer Naturgeschichte von Livland*. 2nd. Edns. 826 pp. Königsburg.

Forchhammer, G., 1835. *Danmarks geognostiske Forhold. Inbydelseskrift Reformationsfesten der 14de Novbr 1835*. 112 pp. Copenhagen.

Føyn, S. & Glaessner, M.F., 1979. *Platysolenites*, other animal fossils, and the Precambrian-Cambrian transition in Norway. *Norsk Geologisk Tidsskrift, 59, 25-46.*

*Fridrichsone, A.I., 1974. Supplementary stratigraphic subdivision of Cambrian in Latvia. *In Regionalnaya geologiya Pribaltiki*, pp. 3-15. Zinatne, Riga.

Grigelis, A.A. (Ed.), 1978. Decisions of the Interdepartmental regional stratigraphical conference on the unified area (1976). Interdepartmental Stratigraphic Committee of the USSR, Leningrad. 66 pp., correlation charts.

*Grigelis, A.A., Ignatavicius, N.I. & Saladzhius, N.Yu., 1971. *Stratigraphical schemes and legend to geological and hydrological maps of Lithuania*, 255 pp. Periodika, Vilnius.

Grönwall, K.A., 1899. Bemerkningen om de sedimentaere Dannelser paa Bornholm og deres tektoniske Forhold. *Danmarks Geologiske Undersøgelse*, 2R, 10, 52 pp.

Grönwall, K.A., 1902. Bornholms Paradoxideslag og deres Fauna. *Danmarks Geologiske Undersøgelse*, 2R, 13, 230 pp.

Hadding, A., 1929. The Pre-Quaternary sedimentary rocks of Sweden, III. *Lunds Universitets Årsskrift, N.F. Avd* 2, 25 (3), 287 pp.

Hamar, G., 1967. *Platysolenites antiquissimus* Eichw. (Vermes) from the Lower Cambrian of northern Norway. *Norges Geologiske Undersøkelse*, 249 (II), 89-94.

Hansen, K., 1936. Die Gesteine des Unterkambriums von Bornholm nebst einigen Bemerkungen über die tektonischen Verhaltnisse von Bornholm. *Danmarks Geologiske Undersøgelse*, 2R, 62, 194 pp.

*Heinsalu, H.N., 1986. Lithostratigraphical subdivision of Tremadoc deposits of North Estonia. *Proceedings of the Estonian SSR Academy of Science, Geology*, 36 (2), 66-78.

Henningsmoen, G., 1957. The trilobite family Olenidae, with description of Norwegian material and remarks on the Olenid and Tremadocian Series. *Skrifter utgilt av det Norske Videnskaps-Akademie Oslo*, 1, *Mat-naturv. Klasse, 1957*, 1, 303 pp.

Henningsmoen, G., 1958. The Upper Cambrian faunas of Norway with descriptions of non-olenid invertebrate fossils. *Norsk Geologisk Tidsskrift*, 38, 179-196.

Hessland, I., 1955. Studies on the lithogenesis of the Cambrian and basal Ordovician of the Böda Hamn sequence of strata. *Bulletin of the Geological Institute, University of Uppsala*, 35, 35-109.

*Jankauskas, T.V., 1972., Biostratigraphy of the Lower Cambrian of Lithuania. *Doklady Akademii Nauk SSSR*, 205 (5), 1186- 1189.

*Jankauskas, T.V., 1974. Correlation of the Cambrian deposits of Lithuania. *In Biostratigrafiya i paleontologiya nizhnego kembriya Evropy i severnoy Azii*, pp. 22-29. Nauka, Moscow.

*Jankauskas, T.V., 1975a. New Lower Cambrian acritarchs of the Baltic region. *Paleontologicheskiy Zhurnal*, 1975(1), 94-104.

*Jankauskas, T.V., 1975b. New evidence to the geological evolution of East-Baltic regions in Cambrian time. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1975(1), 112-118.

*Jankauskas, T.V., 1982. Upper Precambrian and Cambrian floral microfossils of European part of the SSSR and their stratigraphical significance. Avtoreferat doktoskoy dissertatsii, , 52 pp. Moscow

*Jankauskas, T.V. & Paskeviciene, L.T., 1973. New evidence to the Cambrian stratigraphy of the east areas of Lithuania. *In Materialy III nauchnoy konferentsii geologov Litovskoy SSSR*, pp. 12-14. Periodika, Vilnius.

*Jankauskas, T.V., & Posti, E.A., 1973. Micropalaeontological characteristic of the stratotype sections of the Estonian Lower Cambrian. *Izvestiya Akademii Nauk Estonskoy SSR*, 25, *Khimiya Geologiya,* 1973, pp. 143-148.

Johnstrup, F., 1874. Oversigt over de palaeozoiske Dannelser paa Bornholm, Beretning 11 skand. *Naturforskermøde,* pp. 299- 308. Copenhagen.

*Kajak, K.F., 1967. Main features of the geological structure. *In Mineral'no-syr'evaya baza SSSR, XVI, ESSR*, pp. 24-30. Moscow.

*Kala, E., 1972. On the age of the Tiskre beds in the Isle of Hiiumaa. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 21 (3), 276-278.

*Kala, E., Mardla, A., & Kajak, K., 1970. Lithostratigraphic characterization of the Vendian and Lower Cambrian deposits in Estonia. *In Tezisy dokladov VII nauchnoy konferentsii geologov Pribaltiki i Belorussii*, pp. 65-68. Tallinn.

*Kala, E., Kajak, K., Mens, K. & Pirrus, E., 1981. Lithostratigraphy and facies of the Lontova Stage in Estonia. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 21 (3), 276-278.

*Kala, E.A., Mens, K.A. & Pirrus, E.A., 1984. On the stratigraphy of the Cambrian in West Estonia. *In Stratigrafiya drevnepaleozoyskikh otlozheniy Pribaltiki*, pp. 18-37. Tallinn.

Kaljo, D., Borovko, N., Heinsalu, H., Khazanovich, K., Mens, K., Popov, L., Sergeyeva, S., Sobolevskaya, R. & Viira, V., 1986. The Cambrian-Ordovician boundary in the Baltic-Ladoga clint area (North Estonia and Leningrad Region, USSR). *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 35 (3), 97-108.

Kalm, P., 1746. *Pehr Kalm, Västgöta och Bohuslänska resa förrättad År 1742* (Ed. Claes Kranz). 265 p. Wahlström and Widstrand, Stockholm.

*Kaplan, A.A., Andreyva, O.N., Tchernysheva, N.E. & Goryansky, V.Yu., 1973. The first discovered, palaeontologically characterized Upper Cambrian deposits in the eastern part of the South Baltic. *Doklady Akademii Nauk SSSR*, 209 (6), 1393-1394.

Keller, B.M. & Rozanov, A.Yu. (Eds.), 1979a. *Upper Precambrian and Cambrian Palaeontology of the Eastern European Platform*, 212 pp., 83 pls. Nauka, Moscow.

Keller, B.M. & Rozanov, A.Yu. (Eds.), 1979b. *Upper Precambrian and Cambrian Stratigraphy of the western part of the East European Platform*, 236 pp. Nauka, Moscow.

Keller, B.M. & Rozanov, A.Yu. (Eds.), 1980. *Paleogeography and lithology of the Vendian and Cambrian of the western part of the East European Platform*, 119 pp. Nauka, Moscow.

*Khazanovich, K.K., 1969. Stratigraphy and development of the Cambrian-Ordovician boundary beds in the Leningrad Region and adjacent areas. Avtoreferat kandidatskoy dissertatsii, Tallinn, 25 pp.

*Khazanovich, K.K., 1982. On the Pestovo Formation (Upper Cambrian) in the North-West of the East European Platform. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 31 (3), 94-99.

*Khazanovich, K. & Missarzhevsky, V., 1982. On the stratigraphy of the Zlgase Beds in Estonia with the description of a new representative of hyolithelminthes. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology,* 31 (1), 7-11.

*Khazanovich, K.K., Popov, L.E. & Melnikova, L.M., 1984. Inarticulate brachiopods, ostracods and hyolithelminthes of the Sablinka Formation in the Leningrad Region. *Paleontologicheskiy Zhurnal*, 1984(4), 33-47.

Kiaer, J., 1916. The Lower Cambrian Holmia fauna at Tømten in Norway. *Skrifter utgilt av det Norske Videnskaps-Akademie Oslo,* 1. *Mat-naturv*. Klasse, 10, 140 pp.

*Kirjanov, V.V., 1965. On the Cambrian deposits in the Dniester Region of Podolia. *In Geologiya i geokhimiya neftyanykh i gazovykh mestorozhdeniy* 2. Naukova Dumka, Kiev.

*Kirjanov, V.V., 1968. Paleontological remains and stratigraphy of the Baltic Group of Volynia-Podolia. *In Paleontologiya i stratigrafiya nizhnego paleozoya Volyno-Podolii*, pp. 5-25. Naukova Dumka, Kiev.

*Kirjankov, V.V., 1969. Cambrian stratigraphic scheme of Volyn, *Geologicheskiy Zhurnal*, 29 (5), 48-82.

*Kirjanov, V.V., 1976. Some notes on the Obzyrian layers (Suite) of the Lower Cambrian in Volyn'. *Geologicheskiy Zhurnal*, 36 (3), 97-103.

*Kirjanov, V.V., 1979a. The Cambrian. *In Upper Precambrian and Cambrian Stratigraphy of the western part of the East European Platform* (Eds Keller, B.M. & Rozanov, A.Yu.), pp. 151-177. Nauka, Moscow.

*Kirjanov, V.V., 1979b. Correlation of the Upper Vendian and Cambrian strata between Poland and Volyn'. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1979(2), 61-68.

*Kirjanov, V.V., 1985. New stratigraphical units in the Precambrian-Cambrian boundary interval of the Podolian Slope of the Ukraine Shield. *In Novye dannye po stratigrafii Venda i nizhnego paleozoya Volyno-Podolii*. Institut Geologicheskikh Nauk Kiev, Akademii Nauk USSR, 41-49.

*Kirjanov, V.V. & Chernysheva, N.E., 1967. On the Lower Cambrian of north-western Volynia and on the finding of the oldest trilobite. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1967(7), 119-125.

*Kirsanov, V.V., 1974. On the stratigraphy of the Vendian- Cambrian boundary beds in the central regions of the East European Platform. *In Biostratigrafiya i paleontologiya nizhnego kembriya Evropy i Severnoy Azii*, pp. 5-12. Nauka, Moscow.

*Kopeliovich, A.V., 1965. Epigenesis of the Old Strata in the south-western part of the Russian Platform. *Trudy Geologicheskogo Instituta, Akademii Nauk SSSR*, 121, 312 pp.

*Korkutis, V.A., 1968. Stratigraphy of Cambrian sediments of the southern Pribaltic. *In Stratigrafiya nizhnego paleozoya Pribaltiki i korrelyatsiya s drugimi regionamy,* pp. 53-68. Mintis, Vilnius.

*Korkutis, V.A., 1971. Cambrian deposits of the Baltic Basin. *Trudy Litovskogo Nauchno Issledovatel' skogo Geologorazvedochnogo Instituta*, 12, 176 pp, Mintis, Vilnius.

Kulling, O., 1964. Översikt ver norra Norrbottensfjällens kaledonberggrund. *Sveriges Geologiska Undersøkning*, Ba, 19, 166 pp.

*Kuzmenko, Yu. T., 1984. On the correlation of the Cambrian- Ordovician Boundary Beds in the Moscow syneclise. *Geologiya i razvedka*, 1984(1), 29-36.

Lendzion, K., 1961. Zagadnicnia stratygrafii kambru na pograniczu Polski i ZSRR. *Przeglad Geologiczny*, 9(4), 219- 221.

Lendzion, K., 1962. Paleozoik na anteklizie Slawatycz w swietie nowych wiercen. *Kwartalnik Geologiczny*, 6 (4), 513-525.

Lendzion, K., 1969. O stratygrafii kambru platformowego w Polsce. *Kwartalnik Geologiczny*, 13 (3), 501-509.

Lendzion, K., 1970. Eokambri i kambr w otworze Zarnowiec IG-1. *Przeglad Geologiczny*, 18 (7), 303-344.

Lendzion, K., 1972. Kambr subholmiowy w polnocno-wachodniej Polsce. *Kwartalnik Geologiczny*, 16 (3), 557-566.

Lendzion, K., 1974. Kambr Profile glebokich otworow wiertniczych Institut Geologiczny Warszawa (14. Bartoczyce IG-1, Goldap IG-1).

Lendzion, K., 1975. Fauna of the Mobergella Zone in the Polish Lower Cambrian. *Kwartalnik Geologiczny*, 19 (2), 237-242.

Lendzion, K., 1977. First gastropod fauna from the Klimontow Stage (Lower Cambrian) of south-eastern Poland. *Kwartalnik Geologiczny*, 21 (2), 240-243.

Lendzion, K., 1983a. Rozwoj kambry osadow platformowych Polski. *Prace Instytuta Geologicznego*, 1-55.

Lendzion, K., 1983b. Biostratygrafia osadow kambru w polskiej czesci platformy wschodnioeuropejskiej. *Kwartalnik Geologiczny*, 27 (4), 669-694.

Lendzion, K., 1986. Sedimentation of the Vendian-Cambrian marine sequence, Poland. *Geological Magazine*, 123 (4), 361- 365.

*Lieldiena, E.K. & Fridrichsone, A.I., 1968. On the stratigraphy of the Cambrian deposits in the western part of Latvia. *In Stratigrafiya nizhnego paleozoya Pribaltiki i korrelyatsiya s drugimi regionalmi*, pp. 33-51. Mintis, Vilnius.

Lindström, M. & Staude, H., 1971. Beitrag zur Stratigraphie der unterkambrischen Sandstein des südlichsten Skandinaviens. *Geologica et Palaeontologica*, 5, 1-7.

Linnaeus, C., 1745. *Öländiska och Gothländska Resa, på Riksens Högloflige Ständers be fallning förrättad åhr 1741.* (Carl Linnaei journey to Öland and Gotland, carried out in 1741). xii + 1-344 + 30 pp. Stockholm & Uppsala. (Many later editions).

Linnaeus, C., 1759. Petrificatet Entomolithus paradoxus, sådant, som det finnes uti Hans Excellence, Riks-Rådets Högvälborne Herr Grefve C.G. Tessins sampling. (The petrification Entomolithus paradoxus as it is represented in the collection of His Ex-

cellency, etc., C.G. Tessin) *Acta regiae academiae scientarium holmiae*, 19, Holmiae (Stockholm).

Linnarsson, J.G.O., 1883. De undre Paradoxideslagren vid Andrarum. *Sveriges Geologiska Undersökning*, C, 54, 47 pp., 4 pls.

Loog, A., 1964. Pakerordi lademe lithostratigraafilisest liigestusest avamusel. VII Eesti Looduseuurijate päeva ettekannete teesid, pp. 82-84. Tartu.

*Lyutkevich, E.M. & Pejsik, M.I., 1957. The north-western part of the Russian Platform. In Ocherki po geologii SSSR101pp. *Trudy Vsesoyuznogo Neftyanoy Nauchno-issledovatelskogo. Geologorazvedochnogo Instituta.*

*Makhnach, A.S., Zinovenko, G.V., Bessonova, V.Ya., Il'kevich, G.I., Piskun, L.V., Pushkin, V.I. & Shkuratov, V.I., 1981. Cambrian stratigraphical scheme for Byelorussia. *In Materialy po stratigrafii Belorussii*, pp. 30-34. Nauka i tekhnika, Minsk.

*Mardla, A.K., Mens, K.A., Kala, E.A., Kajak, K.F. & Erisalu, E.K., 1968. On the stratigraphy of the Cambrian strata of Estonia. *In Stratigrafiya nizhnego paleozoya Pribaltiki i korrelyatsiya s drugimi regionami*, pp. 22-32. Mintis, Vilnius.

Martin, F., 1982. Some aspects of late Cambrian and early Ordovician acritarchs. *In The Cambrian-Ordovician boundary: sections, fossil distributions, and correlations* (Ed. Basset M.G. & Dean W.T.), pp. 29-40. National Museum of Wales, Geological Series 3, Cardiff.

Martin, F. & Dean, W.T., 1981. Middle and Upper Cambrian and Lower Ordovician acritarchs from Random Island, Eastern Newfoundland. *Geological Survey of Canada, Bulletin*, 343, 32 pp.

Martinsson, A., 1974. Cambrian of Norden. *In Lower Palaeozoic rocks of the World, 2. Cambrian of the British Isles, Norden and Spitzbergen*, (Ed. C.H. Holland), pp. 185-283. John Wiley & Sons, London.

*Männil, R., 1958. On the nomenclature of the Cambrian deposits in the East Baltic area. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology* 8 (4), 350-352.

*Männil, R., 1960. The Cambrian System. *In Geologiya SSSR*, XXVIII, pp. 40-54. Moscow.

*Männil, R. & Roomusoks, A., 1984. A revision of lithostratigraphic subdivision of the Ordovician of North Estonia. *In Stratigrafiya drevnepaleozoyskikh otlozheniy Pribaltiki* pp. 52-62. Tallinn.

Märss, T., (in press). Hadimopanellids from the Cambrian of Estonia and Kirgisia (East Baltic and Central Asia, USSR). *Proceedings of the Academy of Sciences of the Estonian SSR, Geology.*

*Mens, K., 1979. Mineralogical and palaeontological characteristica of the Soela Formation. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology* 28 (4), 125-132.

*Mens, K.A., 1981. On Early Cambrian sedimentation stages in the East Baltic area. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1981(3), 83-90.

*Mens, K., 1984. On the mineralogy of the Ülgase Beds in Maardu district. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 33 (3/4), 96-103.

*Mens, K. & Paskevicene, L., 1981. Environmental control of the distribution of acritarchs in the Lontova Stage of Estonia. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology* 30 (4), 148-155.

*Mens, K.A. & Pirrus, E.A., 1972. New data on the age of Tiskre Beds in the NW of Estonia. *Proceedings of the Academy of Sciences of the Estonian SSR, Chemistry and Geology*, 21 (3), 278-281.

*Mens, K.A. & Pirrus, E.A., 1976. On lithologic-mineralogic criteria for the subdivision of the Vendian and Cambrian terrigenous rocks of the East Baltic area. *In Materialy po stratigrafii Pribaltiki*, pp. 27-28. Vilnius.

*Mens, K. & Pirrus, E., 1977. *Stratotypes of the Cambrian Formations of Estonia*, 68 pp. Valgus, Tallin.

*Mens, K.A. & Pirrus, E.A., 1979. Southern slope of the Baltic Shields. *In Upper Precambrian and Cambrian Stratigraphy of the western part of the East European Platform* (Eds Keller, B.M. & Rozanov, A.Yu.), pp. 7-41. Nauka, Moscow.

*Mens, K.A. & Pirrus, E.A., 1984. Lithological summary of the Precambrian-Cambrian transition-beds on the East European platform. *27th Session, International Geological Congress, Moscow, Abstracts* 1, 120-121.

*Mens, K., Pirrus, E. & Brangulis, A., 1984. Structure and stratigraphy of the upper part of the Cambrian sequence in the eastern part of the East Baltic area. *In Stratigrafiya drevnepaleozoyskikh otlozheniy Pribaltiki*, pp. 38-51. Tallinn.

*Mens, K. & Posti, E., 1984. Distribution and correlation significance of organic remains in the Baltic Series of Estonia. *In Stratigrafiya drevnepaleozoyskikh otlozheniy Pribaltiki*, pp. 5-17. Tallinn.

Mickwitz, A., 1911. Archaikum, Kambrium, Silur. *In Baltische Landeskunde*, pp. 138-174. Verlag von G. Löffler, Riga.

Moberg, J. Chr., 1892a. Om en nyupptäckt fauna i block af dr N.O. Holst. *Geologiska Föreningens Stockholm Förhandlingar*, 14, 103-120.

Moberg, J. Chr., 1892b. Om Olenellusledet i sydliga Skandinavien. *Det Skandinaviske Naturforskermøde*, 14, 434-439.

Moberg, J. Chr., 1908. Bidrag till kännedomen om de kambriska lagren vid Torneträsk. (Contribution to the knowledge of the Cambrian strata at Lake Torneträsk, northern Swedish Lappland). *Sveriges Geologiska Undersökning*, C, 212, *Årsbok* 2 (4), 30 pp., 1 pl.

*Müürisepp, K., 1958. Lower boundary of the Pakerort Stage from Pakerort to the Syas River. *Trudy Instituta Geologii Akademii Nauk ESSR*, 3, 55-79.

Nathorst, A.G., 1877. Om de kambriska och siluriskalagren vid Kiviks Esperöd i Skåne, jemte anmärkningar om primordial faunans lager vid Andrarum. *Geologiska Föreningens Stockholm Förhandlingar*, 3, 263-272.

*Naumova, S.N., 1949. Lower Cambrian spores. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1949(4), 49- 56.

*Naumova, S.N., 1960. Spore and pollen assemblages of the Riphean and Lower Cambrian of the USSR. *In Mezhdunarodnyi geologicheskiy kongress, XXI sessiya. Doklady sovetskikh geologov. Problema* 8, 109-117.

*Nekrasov, B.A., 1938. Eophyton, Izhora (Fucoid) and Obolus Sandstones in the Leningrad Region. *Byulleten' Moskovskogo obshchestvo ispytatelii prirody, seriya geologicheskaya*, 16 (2), 161-177.

*Nikashin, E.S., Bryzgalova, E.G., Gorbachev, V.I., Desyatkov, V.M., Shamraj, T.I., Shekhodanov, V.A. & Chagaev, A. Ya., (in press). New information on the Cambrian stratigraphy of the southwestern part of the Baltic Syneclise. *In Fatsii i stratigrafiya venda i kembriya zapada Vostochno-Evropeyskoy platformy*. Tallin.

Öpik, A., 1925. Beitrag zur Stratigraphie und Fauna das estnischen Unter-Kambriums (*Eophyton*-Sandstein). *Tartu Ülikooli Geoloogia Instituudi Toimetused*, 3, 1-20, pls 1-3.

Öpik, A., 1926. Über den estländischen Blauen Ton. *Tartu Ülikooli Geoloogia Instituudi Toimetused*, 6, 39-47.

Öpik, A., 1929. Studien Über des estnische Unterkambrium (Estonium). *Tartu Ülikooli Geoloogia Instituudi Toimetused*, 15, 1-56.

Öpik, A., 1933, Über *Scolithos* aus Estland. *Tartu Ülikooli Geoloogia Instituudi Toimetused*, 29, 1-12.

Öpik, A., 1956. Cambrian (Lower Cambrian) of Estonia. *In El Sistema Cambrico su Paleogeografia y el Problema du su Base*, 1, 97-126. 20th Session International Geological Congress, Mexico.

Palij, V.M., Posti, E.A. & Fedonkin, M.A., 1979. Soft-bodied Metazoa and trace fossils in the Vendian and Early Cambrian. *In Upper Precambrian and Cambrian Palaeontology of the East European Platform* (Eds Keller, B.M., & Rozanov, A.Yu.), pp. 49-82. Nauka , Moscow.

Palmer, A.R., & James, N.P., 1980. The Hawke Bay Event: a circum-Iapetus regression near the lower Middle Cambrian boundary. *In Proceedings "the Caledonides in* the *USA", IGCP Project 27: Caledonide orogen 1979 meeting, Blacksburg Virginia* (Ed. D.R. Wones), pp. 15-18. Department of Geological Science, Virginia Polytechnic Institute and State University, Memoir 2.

*Paskeviciene, L.T., 1980. *Acritarchs in the Vendian-Cambrian boundary beds of the western part of the East European platform*. 75 pp, Nauka, Moscow.

*Paskeviciene, L.T., 1981. New data on the stratigraphy of the Rovno Stage of the East Baltic area. *In Dostizheniya i zadachi issledovaniy po geologii Litovskoy SSR*, pp. 55-56, Vilnius.

*Paskevicius, J., 1959. Cambrian and Ordovician. *In Kratkiy ocherk geologii Litovskoy SSR*, pp. 1-16. Vilnius.

*Popov, L.E. & Khazanovich, K.K., 1985. New data on the stratigraphy of the Cambrian-Ordovician phosphatic-bearing deposits in the northwestern part of the Russian Plate. *In Problemy razvitiya i ratsional'nogo ispol'zovaniya resursov Pribaltiyskogo fosforitonosnogo basseyna. Trudy Gosudarstvenogo nauchno-issledovatel'skogo Instituta Gornokhimicheskogo Seriya*, 63, 38-47. Moscow.

*Posti, E., 1978. New finds of platysolenitids and gastropods from the Lontova Stage of Estonia. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology* 27 (3), 103-107.

Poulsen, Chr., 1967. Fossils from the Lower Cambrian of Bornholm. *Det Kongelige Danske Videnskabernes Selskab, Matematisk-fysiske Meddelelser*, 36 (2), 1-48.

Poulsen, Chr., 1969. The Lower Cambrian from Slagelse no. 1, western Seeland. *Danmarks Geologiske Undersøgelse*, 2R, 93, 27 pp., 1 pl.

Regnell, G., 1960. The Lower Palaeozoic of Scania. In The Lower Palaeozoic of Scania. The Silurian of Gøtland (Eds G. Regnell & J.E. Hede), pp. 3-43. *21st Session International Geological Congress, Norden, Guide to Excursions A22 and C17.*

*Rozanov, A. Yu., 1973. *Regularities in the morphological evolution of regular archaeocyathean and the problems of the Lower Cambrian stage division*. 164 pp. Nauka, Moscow.

*Rozanov, A. Yu., 1979. *Platysolenites*. pp. 83-87. *In Upper Precambrian and Cambrian Palaeontology of the East European Platform* (Eds Keller, B.M. & Rozanov, A. Yu.), pp. 83-87. Nauka, Moscow.

*Rukhin, L.B., 1939. Cambrian-Silurian arenaceous strata in the Leningrad Region. *Uchenye zapiski Leningradskogo gosudarstvennogo universiteta, Seriya geology-pochvennykh nauk*, 4, 175 pp. Trudy Sablinskoy stantsii, Leningrad.

*Rybnikoba, M.V. & Strikovskaya, E.M., 1984. Subdivision of the Lower Ordovician terrigenous rocks in the Moscow Syneclise. *Sovetskaya Geologiya*, 1984(4), 45-51.

*Sakalauskas, V.F., 1966. New data of the Cambrian stratigraphy of the southern part of the East Baltic. *In Tezisy dokladov XIX nauchnoy studencheskoy konferentsii Vilnyusskiy gosudarstvenniy universitet imeni Kapsukasa*, pp. 44-47. Vilnius.

*Sakalauskas, V.F., 1968. New Cambrian stratigraphical scheme of the southern part of the East Baltic. *In Materialy V nauchnoy konferentsii geologov Pribaltiki i Belorussii*, pp. 161-171. Periodika, Vilnius.

*Schmidt, F., 1886. On the correlation of Russian Cambrian deposits with Swedish ones. *Trudy S.-Petersburgskogo obshchestva estestvoispytateliy,* 18 (1),*19-21.*

*Schmidt, F., 1888. Über eine neuentdeckte Untercambrische Fauna in Estland. *Memoires de l'Academie des Science, St Petersburg, Serie* 7, 1-27.

*Shestakova, M.D., Klevtsova, A.A. & Suvorova, N.P., 1976. On the Cambrian stratigraphy of the Moscow Syneclise. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1976(12), 58-66.

*Shulga, P.L., 1964. Detailing of the stratigraphic subdivision of the Upper Precambrian and Palaeozoic deposits in Volyn- Podolia. *Geologicheskiy Zhurnal*, 24 (6), 104-106.

*Sokolov, B.S., 1952. On the age of the old sedimentary cover of the Russian Platform. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1952(5), 21-31.

*Sokolov, B.S., 1953. Stratigraphical scheme of the Lower Paleozoic (pre-Devonian) deposits of northwestern part of the Russian Platform. *In Devon Russkoy platformy*, pp. 16-38. Gostoptekhizdat, Leningrad-Moscow.

*Sokolov, B.S., 1984. Vendian System: its position in the stratigraphic column. *In Stratigrafiya. Doklady k 27-omu Mezhdunarodnomu geologicheskomu kongressu.* Nauka, Moscow. pp. 111-127.

Sorgenfrei, T. & Buch, A., 1964. Deep tests in Denmark 1935- 1939. *Danmarks Geologiske Undersøgelse*, 3R, 36, 146 pp.

Spizharskij, T.N. (Ed.), 1986. Divisions of the Interdepartmental Regional Stratigraphical Conference on the Cambrian of the Russian Platform (Vilnius, 1983). Interdepartmental Stratigraphic Committee of the USSR, Leningrad.

*Spizharskij, T.N., Ergaliev, G.Kh., Zhuravleva, I.T., Repina, L.N., Rozanov, A.Yu. & Chernysheva, N.E., 1983. Cambrian stage scale. *Sovetskaya Geologiya*, 1983(8), 57-72.

Thelander, T., 1982. The Torneträsk Formation of the Dividal Group, northern Swedish Caledonides. *Sveriges Geologiska Undersökning*, C, 789, 41 pp.

Thorslund, P. & Westergård, A.H., 1938. Deep boring through the Cambro-Silurian at File Haidar, Gotland. *Sveriges Geologiska Undersökning*, C, 415, 57 pp.

Tikhij, N.N. (Ed.), 1965. Decisions of the Interdepartmental conference on the unified stratigraphical schemes of the Upper Precambrian and Paleozoic of the Russian Platform (1962). Interdepartmental stratigraphic Committee of the USSR, Leningrad, 79 pp., correlation charts.

Tullberg, S.A., 1882. Beskrifning till kartbladet Öfvedskloster. *Sveriges Geologiska Undersökning*, Aa, 86, 50 pp.

*Ulst, R. Zh. & Gailite, L.K., 1976. Ordovician System. *In Stratigraficheskie skhemy Latviyskoy SSR*, pp. 36-63. Zinatne, Riga.

Urbanek, A. & Rozanov, A. Yu. (Eds.), 1983. *Upper Precambrian and Cambrian Palaeontology of the East European Platform*. pp. 1-158, Publishing House Wydawnictwa Geologiczne, Warszawa.

Velikanov, V.A. 1979. The Vendian of the Podolian region. *In Upper Precambrian and Cambrian Stratigraphy of the western part of the East European Platform* (Eds Keller, B.M. & Rozanov, A.Yu), pp. 131-151. Nauka, Moscow.

Vidal, G., 1976. Late Precambrian microfossils from the Visings ö Beds in southern Sweden. *Fossils & Strata*, 9, 57 pp.

Vidal, G., 1981a. Micropalaeontology and biostratigraphy of the Lower Cambrian sequence in Scandinavia. *In Short Papers for the Second International Symposium on the Cambrian System 1981* (Ed. M.E. Taylor), pp. 232-235. Open-File Report 81-743, U.S. Geological Survey.

Vidal, G., 1981b. Lower Cambrian acritarch stratigraphy in Scandinavia. *Geologiska Föreningens Stockholm Förhandlingar*, 103, 183-192.

Vogt, T., 1967. Fjellkjedestudier i den østlige del av Troms. *Norges Geologiske Undersøkelse*, 248, 60 pp.

*Volkova, N.A., 1968. Acritarchs from Precambrian and Lower Cambrian deposits of Estonia. *In Problematika pogranichnykh sloyov rifeya i kembriya Russkoy platformy, Urala i Kazakhstana*, pp. 8-36. Nauka, Moscow.

*Volkova, N.A., 1973. Acritarchs and correlation of the Vendian and Cambrian deposits in the western part of the Russian Platform. *Sovetskaya Geologiya*, 1973(4), 48-62.

*Volkova, N.A., 1980. Acritarchs from the Middle and Upper Cambrian of the Moscow Syneclise. *Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya*, 1980(12), 49-57.

*Volkova, N.A., 1982. The age of the Ülgase Beds at the Cambrian-Ordovician contact of Estonia. *Sovetskaya Geologiya*, 1982(9), 85-88.

*Volkova, N.A., 1983. Acritarchs from the Middle and Upper Cambrian in the northwestern part of the East European platform. *In Stratigrafiya i korrelyatsiya osadkov metodami palinologii, materialy IV Vsesoyuznoy palinologicheskoy Konferentsii* (Ed.

G.N. Paulov), pp. 13-17, 2 pls. Akademiya Nauk SSSR, Uralskii Nauchnyi Tsentr Sverdlovsk.

*Volkova, N.A. & Golub, U.N., 1985. New acritarchs from Upper Cambrian of Leningrad Region (Ladoga Formation). *Paleontologicheskiy Zhurnal*, 1985(4), 90-98.

*Volkova, N.A., Kajak, K., Mens, K. & Pirrus, E., 1981. New data on Cambrian-Ordovician transitional beds in the eastern part of the East Baltic. *Proceedings of the Academy of Sciences of the Estonian SSR, Geology*, 30 (2), 51-55.

*Volkova, N.A., Kirjanov, V.V., Piskun, L.V., Pashkyavichene, & Jankauskas, T.V., 1979. Microflora. In *Upper Precambrian and Cambrian Palaeontology of the East European Platform* (Eds Keller, B.M., & Rozanov, A.Yu.), pp. 4-38. Nauka, Moscow.

Westergård, A.H., 1922. Sveriges Olenidskiffer. *Sveriges Geologiska Undersökning*, Ca, 18, 1-188 (in Swedish), 189- 205 (English).

Westergård, A.H., 1929. A deep boring through Middle and Lower Cambrian strata at Bornholm, Isle of Öland. *Sveriges Geologiska Undersökning*, C, 355, *Årsbok* 22 (5), 19 pp.

Westergård, A.H., 1939. On Swedish Cambrian Asphidae. *Sveriges Geologiska Undersökning*, C, 421, *Årsbok* 33 (1), 16 pp., 3 pls.

Westergård, A.H., 1940. Nya djupborrningar genom äldsta ordovicium och kambrium i Östergötland och Närke. *Sveriges Geologiska Undersökning*, C, 437, *Årsbok* 34 (7), 72 pp.

Westergård, A.H., 1944. Borrningar genom Skånes alunskiffer 1941-1942. *Sveriges Geologiska Undersökning*, C, 459, *Årsbok* 38 (1), 45 pp., 3 pls.

Westergård, A.H., 1946. Agnostidea of the Middle Cambrian of Sweden. *Sveriges Geologiska Undersökning*, C, 477, *Årsbok* 40 (1), 140 pp., 16 pls.

Westergård, A.H., 1947. Supplementary notes on the Upper Cambrian trilobites of Sweden. *Sveriges Geologiska Undersökning*, C, 489, *Årsbok* 41 (8), 34 pp., 3 pls.

Westergård, A.H., 1948. Non-agnostidean trilobites of the Middle Cambrian of Sweden. I. *Sveriges Geologiska Undersökning*, C, 498, *Årsbok* 42 (7), 32 pp., 4 pls.

Westergård, A.H., 1950. Non-agnostidean trilobites of the Middle Cambrian of Sweden. II. *Sveriges Geologiska Undersökning*, C, 511, *Årsbok* 43 (9), 56 pp., 8 pls.

Westergård, A.H., 1953. Non-agnostidean trilobites of the Middle Cambrian of Sweden. III. *Sveriges Geologiska Undersökning*, *Årsbok* 46 (2), 59 pp., 8 pls.

Wiman, C., 1903. Studien ber Nordbaltische Silurgebiet. I. Olenellus-sandstein, Obolus-sandstein und Ceratopygeschiefer. *Bulletin of the Geological Institution Uppsala*, 6, 12-76.

*Yanishevsky, M.E., 1926. On the remains of tubicolous worms from Cambrian blue clays. *Ezhegodnik Russkogo paleontologicheskogo obshchestva*, 4, 99-113, Leningrad.

*Yanishevsky, M.E., 1927. Ueber Trilobitenreste (*Schmidtiellus mickwitzi* F. Schm.) aus dem kambrischen blauen ton. *Ezhegodnik Russkogo paleontologicheskogo obshchestva*, 6, 25-50, Leningrad.

*Yanishevsky, M.E., 1939. Cambrian deposits in Leningrad Region. *Uchenye zapiski Leningradskogo gosudarstvennogo universiteta, Seriya Geologicheskaya*, 25 (1), 3-30. Leningrad.

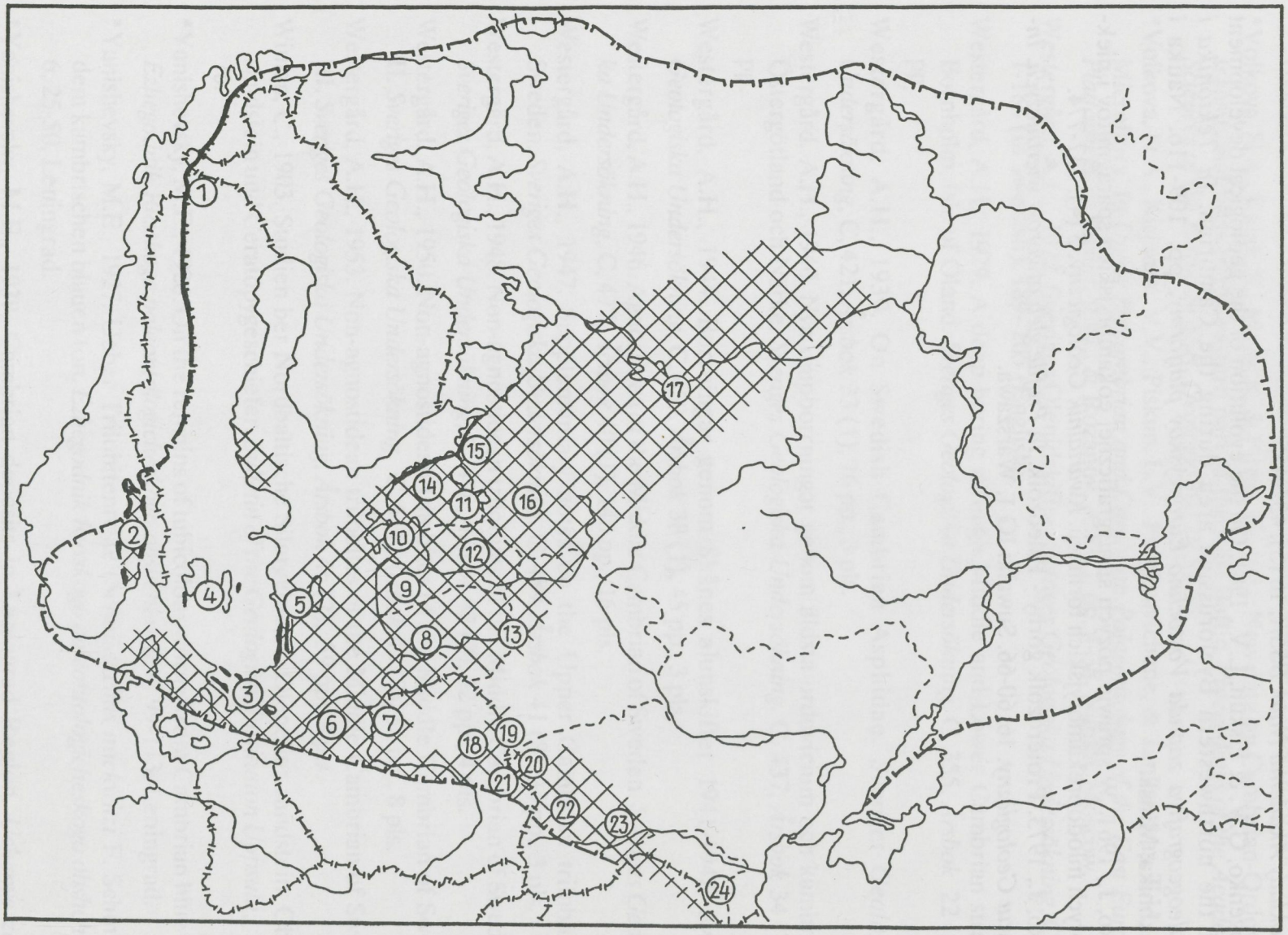
*Yanovsky, A.S., 1971. Cambrian System. *In Geologiya SSSR, I (Leningradskaya, Pskovskaya i Novgorodskaya oblasti)*, pp. 114-127. Nauka, Moscow.

*Zinovenko, G.V. & Makhnach, A.S., 1972. Cambrian stratigraphy of the Brest depression. *Doklady Akademii Nauk BSSR*, 16 (5), 452-455.

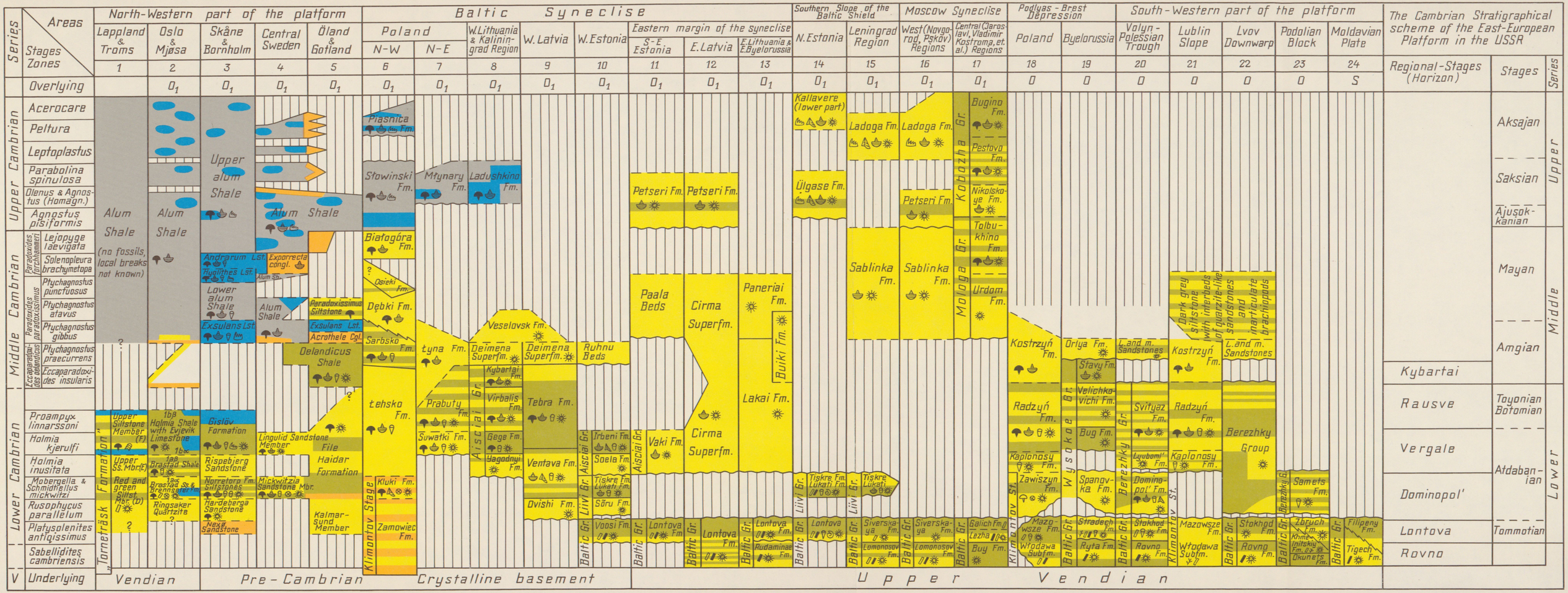
*Zinovenko, G.V. & Piskun, L.V., 1981. On the evolution of the geological development of the northwestern Byelorussian area during the Cambrian. *In Tektonika i paleogeografiya zapada Vostochno-Europeyskoy platformy*, pp. 109-116. Nauka i tekhnika, Minsk.

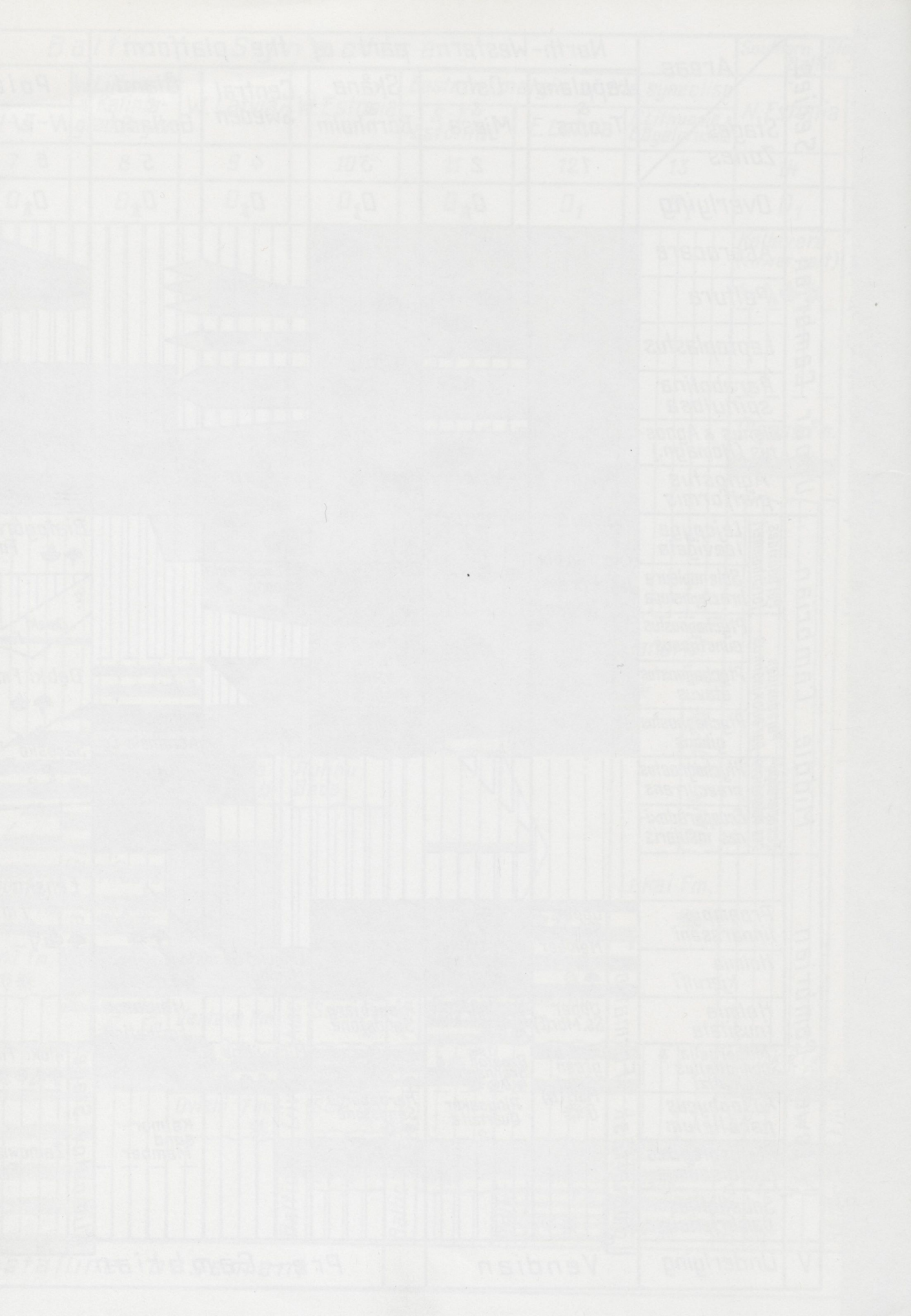
Znosko, J., 1961. W sprawie pozycti stratygraficznej eokambryjskich sparagmitov i niektorych mlodoprekambryjskich formacji. *Kwartalnik Geologiczny*, 5 (4), 737-774.

Znosko, J., 1973. Proterozoik gorny - Paleozoik. *In Profile gleb otworow wiertniczych. Instytut Geologiczny*, 16, 60-66. Suwalki IG 1, Warszawa.



Map of the present-day distribution of Cambrian deposits on the East European Platform,
with locations of stratigraphical columns discussed in the text.
Outcrop area: black Subsurface area: cross-hatching


Series
Areas
Stages
Zones
North-Western part of the platform
Lappland & Troms
Oslo & Mjøsa
Skåne & Bornholm
Central Sweden
Öland & Gotland
Baltic Syneclise
Poland
N-W
N-E
W.Lithuania & Kaliningrad Region
W. Latvia
W. Estonia
Eastern margin of the syneclise
S-E Estonia
E.Latvia
E.Lithuania & E.Byelorussia
Southern Slope of the Baltic Shield
N. Estonia
Moscow Syneclise
Leningrad Region
West (Novgorod, Pskov) Regions
Central (Yaroslavl, Vladimir, Kostroma, et al.) Regions
Podlyas - Brest Depression
Poland
Byelorussia
South-Western part of the platform
Volyn - Polessian Trough
Lublin Slope
Lvov Downwarp
Podolian Block
Moldavian Plate
The Cambrian Stratigraphical scheme of the East-European Platform in the USSR
Regional-Stages (Horizon)
Stages
Series
Upper Cambrian
Middle Cambrian
Lower Cambrian
Acerocare
Peltura
Leptoplastus
Parabolina spinulosa
Olenus & Agnostus (Homagn.)
Agnostus pisiformis
Lejopyge laevigata
Solenopleura brachymetopa
Ptychagnostus punctuosus
Ptychagnostus atavus
Ptychagnostus gibbus
Ptychagnostus praecurrens
Eccaparadoxides insularis
Proampyx linnarssoni
Holmia kjerulfi
Holmia inusitata
Mobergella & Schmidtiellus mickwitzi
Rusophycus parallelum
Platysolenites antiquissimus
Sabellidites cambriensis
Underlying
Aksajan
Saksian
Ajusokkanian
Mayan
Amgian
Kybartai
Rausve
Vergale
Dominopol'
Lontova
Rovno
Toyonian
Botomian
Atdabanian
Tommotian
Alum Shale
(no fossils, local breaks not known)
Upper alum Shale
Lower alum Shale
Exsulans Lst.
Andrarum Lst.
Hyolithes Lst.
Exporrecta congl.
Alum Sh.
Paradoxissimus Siltstone
Acrothele Cgl.
Delandicus Shale
Lingulid Sandstone Member
Mickwitzia Sandstone Mbr.
Kalmarsund Member
File
Haidar Formation
Upper Siltstone Member (?)
Upper Ss. Mbr.(?)
Red and green Siltst. Mbr. (D)
Holmia Shale with Evjevik Limestone
Brastad Shale
Ringsaker Quartzite
Torneträsk Formation
Cislöv Formation
Rispebjerg Sandstone
Norretorp Fm. Siltstones
Hardeberga Sandstone
Nexø Sandstone
Prasnica Fm.
Stowinski Fm.
Mtynary Fm.
Ladushkino Fm.
Białogóra Fm.
Osieki Fm.
Dębki Fm.
Sarbsko Fm.
Łeba Fm.
Prabuty Fm.
Suwałki Fm.
Kluki Fm.
Zamowiec Fm.
Klimontov Stage
Veselovsk Fm.
Deimena Superfm.
Kybartai Fm.
Virbalis Fm.
Gege Fm.
Vagodnyi Fm.
Aisciai Gr.
Tebra Fm.
Ventava Fm.
Dvishi Fm.
Ruhnu Beds
Irbeni Fm.
Soela Fm.
Tiskre Fm.
Lukati Fm.
Sõru Fm.
Voosi Fm.
Baltic Gr.
Liivi Gr.
Petseri Fm.
Paala Beds
Vaki Fm.
Cirma Superfm.
Paneriai Fm.
Burki Fm.
Lakai Fm.
Kallavere (lower part)
Ülgase Fm.
Lontova Fm.
Tiskre Fm.
Lukati Fm.
Ladoga Fm.
Sablinka Fm.
Siverskaya Fm.
Lomonosov Fm.
Kobozha Gr.
Bugino Fm.
Pestovo Fm.
Nikolskaye Fm.
Mologa Gr.
Tolbukhino Fm.
Urdom Fm.
Galich Fm.
Lezha
Buy Fm.
Kostrzyń Fm.
Radzyń Fm.
Kaplonosy Fm.
Zawiszyn Fm.
Mazowsze Fm.
Włodawa Subfm.
Klimontov St.
Wysokoe Gr.
Oriya Fm.
Stavy Fm.
Velichkovichi Fm.
Bug Fm.
Spanovka Fm.
Stradech Fm.
Ryta Fm.
Berezhky Gr.
Land m. Sandstones
Svityaz Fm.
Lyuboml' Fm.
Dominopol' Fm.
Stakhod Fm.
Rovno Fm.
Dark grey Siltstone with interbeds of quartzite-like sandstones and inarticulate brachiopods
Berezhky Group
Zbruch Fm.
Khmelnitskiy Fm.
Okunets Fm.
Berezhky G.
Samets Fm.
Filipeny Fm.
Tigech Fm.
Vendian
Pre-Cambrian Crystalline basement
Upper Vendian



E. Pirras

E Pirrus

INTERNATIONAL UNION
OF GEOLOGICAL SCIENCES

PUBLICATION NO. 25

THE CAMBRIAN SYSTEM ON THE EAST EUROPEAN PLATFORM

Correlation Chart and Explanatory Notes

by

Kaisa Mens
Institute of Geology of the Academy of Sciences
Estonian SSR, Tallinn

Jan Bergström
Geological Survey of Sweden, Lund

Kazimiera Lendzion
Geological Institute, Warsaw

Sponsored by the International Commission on Stratigraphy
Subcommission on Cambrian Stratigraphy,
Cambrian Correlations Working Group

Editors: J. H. Shergold
A. Yu. Rozanov
A. R. Palmer

June 1, 1990