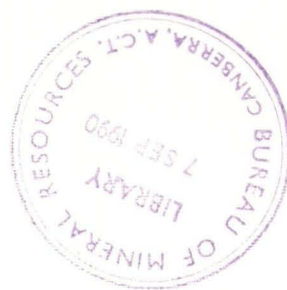


C.3.



Report 296

# Classification and review of the trilobite order Agnostida Salter, 1864: an Australian perspective



J.H. Shergold, J.R. Laurie & Sun Xiaowen

BMR PUBLICATIONS COMPACTUS  
(LENDING SECTION)

Bureau of Mineral Resources, Geology and Geophysics

BMR  
S 55(94)  
REP. 6  
C. 3

DEPARTMENT OF PRIMARY INDUSTRIES & ENERGY  
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Report No. 296

**CLASSIFICATION AND REVIEW OF  
THE TRILOBITE ORDER AGNOSTIDA Salter, 1864:  
AN AUSTRALIAN PERSPECTIVE**

by

J.H. Shergold<sup>1</sup>, J.R. Laurie<sup>1</sup> & Sun Xiaowen<sup>2</sup>

<sup>1</sup> Onshore Sedimentary and Petroleum Geology Branch, Bureau of Mineral Resources,  
Geology and Geophysics

<sup>2</sup> Nanjing Institute of Geology and Palaeontology, Nanjing, People's Republic of China

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE  
CANBERRA, 1990

© Commonwealth of Australia 1990

ISSN 0084-7100

ISBN 0 644 123 07 9

This work is copyright. Apart from any use as permitted under the *Copyright Act* 1968, no part may be reproduced by any process without written permission from the Director, Publishing & Marketing, AGPS. Inquiries should be directed to the Manager, AGPS Press, GPO Box 84, Canberra, ACT 2601.

Department of Primary Industries and Energy  
Minister for Resources: The Hon. Alan Griffiths, MP  
Secretary: G.L. Miller

Bureau of Mineral Resources, Geology and Geophysics  
Director: R.W.R. Rutland AO

Printed in Australia by J.S. McMillan Printing Group

# CONTENTS

|                                                                            | page |
|----------------------------------------------------------------------------|------|
| INTRODUCTION                                                               | 1    |
| ACKNOWLEDGEMENTS                                                           | 1    |
| BACKGROUND TO CLASSIFICATION                                               | 1    |
| PRESENT CLASSIFICATION                                                     | 3    |
| GLOSSARY OF TERMINOLOGY APPLIED TO AGNOSTIDA                               | 8    |
| TIMESCALES AND AUSTRALIAN AGNOSTOID BIOCHRONOLOGY                          | 23   |
| REPOSITORIES OF AGNOSTOID TYPE MATERIAL                                    | 26   |
| TAXONOMIC LISTING OF ORDER AGNOSTIDA                                       | 27   |
| SYSTEMATIC CLASSIFICATION OF AGNOSTIDA                                     | 32   |
| INDEX OF AGNOSTOID GENERA AND SUBGENERA                                    | 59   |
| REFERENCES                                                                 | 63   |
|                                                                            |      |
| FIGURES                                                                    |      |
| 1. Agnostoid terminology 1. General features                               | 17   |
| 2. Agnostoid terminology 2. External axial features                        | 18   |
| 3. Agnostoid terminology 3. Enrollment features                            | 19   |
| 4. Agnostoid terminology 4. Features of the thoracic segments              | 20   |
| 5. Agnostoid terminology 5. Features of the hypostome                      | 21   |
| 6. Agnostoid terminology 6. Internal axial features                        | 22   |
| 7. Correlation of regional biostratigraphic schemes                        | 24   |
| 8. Ranges of all known Middle and Late Cambrian Agnostida in Australia     | 25   |
| 9. Agnostinae                                                              | 73   |
| 10. Agnostinae, Glyptagnostinae, Ammagnostinae, Subfamiliae incertae sedis | 75   |
| 11. Ptychagnostidae                                                        | 77   |
| 12. Ptychagnostidae                                                        | 79   |
| 13. Spinagnostinae, Doryagnostinae                                         | 81   |
| 14. Peronopsidae, Diplagnostinae                                           | 83   |



**FIGURES (continued)**

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| 15. Diplagnostinae, Oidagnostinae, Pseudagnostinae                           | 85 |
| 16. Pseudagnostinae                                                          | 87 |
| 17. Clagnostinae, Aspidagnostinae, Metagnostidae                             | 89 |
| 18. Metagnostidae, Familiae incertae sedis                                   | 91 |
| 19. Familiae incertae sedis, Condylomygidae, Phalacromidae, Sphaeragnostidae | 93 |

## INTRODUCTION

The data presented in this Report is a classification of agnostoid trilobites which was originally prepared by J. H. Shergold and J. R. Laurie for revisions to volumes of the Treatise on Invertebrate Palaeontology, part 0, Arthropoda, 1. Since 35 (30%) of the 119 valid genera and subgenera of the Order Agnostida were first described from Australian material, and a further 8 original taxa now considered as synonymous with material earlier described elsewhere, the reassessment of this body of information has considerable significance for the taxonomic, biostratigraphic and palaeogeographic attributes of this group of trilobites as a whole. Additionally, a further 26 (22%) of valid agnostoid generic taxa originally described outside of Australia are represented here. Thus over 50% of all known valid taxa of Agnostida occur in Australian Stratigraphic Sequences. These form a very reliable basis for the correlation internationally of Cambrian rocks in particular.

The Treatise on Invertebrate Palaeontology, published by the University of Kansas and the Geological Society of America (see Eckel, 1982 for details of historical background), is an international compendium of all fossil groups classified down to the generic level. As such, in the contribution presented here, we place Australian agnostoids in their global classificatory context. The background and justification for this classification is outlined below. Documentation includes identification and location of type material where possible, status and designation of types, diagnoses from generic rank upwards, and geographic and stratigraphic range data. We also include a section on descriptive terminology, and another which attempts to demonstrate the biostratigraphic distribution of agnostoid trilobites in the Australian Cambrian.

## ACKNOWLEDGEMENTS

We are grateful to the following people for criticism and advice on the manuscript, and for assistance in obtaining information and illustrations of type material:

Adrian Rushton, British Geological Survey; Dick Robison, University of Kansas; Brian Pratt, University of Toronto; Harry Whittington, Sedgwick Museum, Cambridge; Richard Fortey, British Museum (Natural History); Jim Jago, South Australian Institute of Technology, Adelaide; David Bruton and Gunnar Henningsmoen, Palaeontological Museum, University of Oslo; Valdemar Poulsen, Department of Historical Geology and

Palaeontology, University of Copenhagen; Merete Bjerreskov, Geological Museum, University of Copenhagen; Rupert Reymont, Institute of Historical Geology and Palaeontology, Uppsala University; Solweig Stuenes, Palaeontological Museum, Uppsala University; Valdar Jaanusson, Swedish National Museum of Natural History, Stockholm; Yngve Grahn, Vivianne Berg-Madsen and Göran Kjellström, Swedish Geological Survey, Uppsala; Per Ahlberg, Department of Historical Geology and Palaeontology, University of Lund; Alan Thomas and P. J. Osborne, School of Earth Sciences, University of Birmingham; Wolfgang Struve, Senckenberg Museum, Frankfurt am Main; Hermann Jaeger, Museum for Natural Science, Humboldt University, Berlin; Klaus Sdzuy and Gerd Geyer, Institute for Palaeontology, University of Würzburg; Raimund Feist, University of Montpellier; Jiri Kriz, Geological Survey, Prague; Michal Mergl, Dept of Biology, Plzen; Françoise Debrenne, National Museum of Natural History, Paris; Gappar Ergaliev, K. I. Satpaev Institute of Geological Sciences, Alma-Ata; N. E. Chernysheva, VSEGEI, Leningrad; Xiang Liwen, Chinese Academy of Geological Sciences, Beijing; Zhang Wentang and Zhou Zhiyi, Academia Sinica, Institute of Geology and Palaeontology, Nanjing; Teiichi Kobayashi, University of Tokyo.

We acknowledge that there are many different views on the classification of the agnostoid trilobites. Since there is no consensus, the opinions and decision expressed here represent the state of the art for at least three agnostidologists.

This paper is dedicated to the memory of the late A. A. Öpik.

## BACKGROUND TO CLASSIFICATION

The first generic discrimination of agnostoids was made in 1846 by M'Coy, with the separation of *Trinodus* from *Agnostus*, and in 1847 by Hawle and Corda who recognised ten genera distributed between two higher taxonomic groups, Phalacromides and Battoides (see Kobayashi, 1939a, p.86-87). M'Coy (1849) regarded both of these groups as constituting his Subfamily Agnostinae, the first clear indication of a Linnean suprageneric classification for agnostoids. In spite of this, for up to 100 years after the introduction of the generic name *Agnostus* by Brongniart in 1822, most authorities throughout the world preferred to concentrate all agnostoid species under a single generic heading (eg. Beyrich, 1845; Angelin, 1851-1854; Barrande, 1852; Billings, 1860-1865; Hall, 1863; Salter, 1864; Linnarsson, 1869, 1879; Brögger, 1875, 1878; Tullberg, 1880; Matthew, 1896; Grönwall, 1902; Lake, 1906; Illing, 1916; Westergård, 1922), and accordingly

nineteenth and early twentieth century agnostoid classification maintained a status quo.

Although retaining the umbrella name *Agnostus*, Tullberg in 1880 produced the formative monograph which foreshadowed more contemporary style classifications of Agnostida. Tullberg divided agnostoid species into readily diagnosed morphologically related groups which could be recognised both within Scandinavia and elsewhere (eg. eastern North America, Matthew, 1896). Descriptive rather than Linnean terminology was applied to these groups (Longifrontes, Laevigati, Limbati, Parvifrontes) which became the basis of the classifications developed by Gürich (1907) and particularly Jaekel (1909). The latter successfully revived generic subdivision of *Agnostus* and applied the concept of families to house Tullberg's groups (Agnostidae, Metagnostidae, Paragnostidae and Leiagnostidae), and these form the basis of presently conceived familial taxa in the Middle Cambrian. Further groupings of genera were introduced by Raymond (1913) and Kobayashi (1935), but at subfamilial rank (Condylopyginae, Arthrorhachinae, Agnostinae, Phalacrominae), as divisions of Agnostidae. Howell (1935a, 1935b) by contrast introduced six new families (Spinagnostidae, Platagnostidae, Mallagnostidae, Geragnostidae, Micragnostidae, Trinodidae), two new subfamilies (Spinagnostinae, Quadragnostinae), and amended the existing families Phalacromidae Hawle & Corda, Agnostidae M'Coy and Leiagnostidae Jaekel. Subsequently (Howell, 1937), more new families and subfamilies were erected: Armagnostinae (of Spinagnostidae), Clavagnostidae (Clavagnostinae), Hastagnostidae (Hastagnostinae), Cyclopagnostidae (Cyclopagnostinae). Many of these taxa were based on inadequately preserved and diagnosable material and have little real use. Since their concepts are not sharply defined, many of these families are superfluous. Unfortunately, several of them have historical priority over subsequently proposed groupings which are generally acknowledged and would have preferred usage. Wherever possible in the classification proposed here, unnecessary names of this type are heavily restricted or synonymised. In the meantime, Whitehouse (1936) was also erecting new familial taxa on the basis of his pioneering research on Australian Middle Cambrian agnostoids. His contribution included recognition of Diplagnostidae and Pseudagnostidae, both still in use although somewhat modified in concept.

In 1939, Kobayashi (1939a, b) published the first definitive classification of agnostoid trilobites, uniting earlier classificatory schemes where possible. He recognised 42 genera and subgenera which he assigned to just four families

(Condylopygidae, Peronopsidae, Agnostidae and the new Sphaeragnostidae). However, he also applied fourteen subfamily names so that the majority of his suprageneric groups consisted of only two or three genera. In his classification of 1953-1955, Hupé presented 39 genera distributed among 15 families united into a single superfamily and ordered into five groups, resembling those of Tullberg (1880), based primarily on glabellar characteristics. This contribution was rapidly overtaken by the first edition of the Treatise on Invertebrate Paleontology (Howell in Moore, 1959) and Osnovy Paleontologii (Pokrovskaya, 1960).

The classifications offered in the two Treatises were quite different in scope. Howell (1959) classified 66 genera and subgenera into 12 families (subfamilies were not recognised), while Pokrovskaya (1960) validated only 29 genera assigned to 12 subfamilies all of which were regarded as divisions of the single family Agnostidae [Agnostoidea M'Coy]!

Öpik (1961, 1963) critically reviewed aspects of the profligate and overelaborate classification of Howell (1935a, b, 1937, 1959), and subsequently of Kobayashi (1962) who now required the recognition of six superfamilies and 13 families. Öpik suggested simplification by scoring off the acknowledged independent families like Condylopygidae and Clavagnostidae, the "appendix groups" like *Homagnostoides* [and Sphaeragnostidae], and the "artificial" polyphyletic Phalacromidae. Then the synonyms were discarded. Hastagnostidae was synonymised with Agnostidae, as were both Geragnostidae (now Metagnostidae) and Micragnostidae, and the priority of Glyptagnostidae (for what we now regard as Ptychagnostidae) over Hastagnostidae was demonstrated. More problematic was the rationalisation of Spinagnostidae. According to Öpik (1961b, p.53) *Spinagnostus* is the only agnostid with true genal spines, and he was thus able to suggest the restriction of Spinagnostidae to the nominal genus *Spinagnostus*, but this remains a controversial, and presently unaccepted statement. Cyclopagnostidae is a synonym of Spinagnostidae, and the latter as considered by Howell (1959) was at any event thought by Öpik to represent two families. Therefore, although *Quadragnostus* was thought to be a junior synonym of *Peronopsis*, Quadragnostidae Howell, 1935 was recognised as having priority over Peronopsidae Westergård (1936), and thus promoted to cover many genera previously classified as Spinagnostidae. Thus an objective rationalisation produced the basic classification of agnostoid trilobites which in slightly modified form is in current use.

The whole question of agnostoid classification was

discussed at great length subsequently (Öpik, 1967). In this paper Öpik attempted to rationalise the actual *modus operandi* of classification, of which the assessment of diagnostic characteristics is the nub. He pointed out, for instance, that up to 130 single characters could be used to diagnose a species of *Pseudagnostus*. To Öpik, both genera and families mostly could only be recognised on a diverse combination of characters. A tabular classification of agnostoids based on 112 genera and subgenera was therefore constructed on the basis of seven selected criteria ("morphological features variable in structure") and their structural variations which were considered to be the characters. Among the selected criteria were the condition of the acrolobes, the nature of the pygidial axis, and pygidial border and border furrow, the shape of the glabella, the type of pygidial/thoracic articulation, and the condition of the pygidial prosopon. It was found that most agnostoids could be classified within such a framework (into just 8 families and 11 subfamilies), although we now would accept a greater degree of overlap of some of the criteria (eg. the condition of the acrolobes, borders and border furrows). A criterion recognised by Öpik (criterion VIII on p.67), but not used by him, the position of the axial glabellar node, seems to us important. Less important to us, than Öpik, is the nature of the articulation of the pygidium and thorax.

Even more elaborate are the yet further discussions on agnostoid classification published by Öpik in 1979. In this, the basic characters as defined above are treated in detail: proportions of tagmata, spines and fulcral structures, homologous structures of the tergite, manifestations of appendages through analysis of presumed muscle scars, notulae and apodemes, positions of nodes, articulation, and suggestions of merocyclism. All this discussion leads towards a feeling for the functional morphology of the agnostoids, as a group. Much basic observation was later confirmed by Müller & Walossek (1987) who with the aid of phosphatised early growth stages of *Agnostus pisiformis* were able to demonstrate function and life style more successfully.

The general conclusion arrived at by Öpik was that due to the "combinative nature" of most taxa, "all agnostoids within their suborder are relatively close to each other, constituting a single superfamily, Agnostacea, with a restricted number of interrelated families" (1967, p.65). Öpik's classifications rely heavily on basic objective characteristics which permit intergrading morphologies to be independently diagnosed. This represents a significant advance in agnostoid discrimination.

Concurrent with the philosophy of agnostoid relationships and classification developed by Öpik, was the creation of a terminology appropriate to the classificatory requirements. Terms were coined for morphological features (Öpik, 1961a, 1961b, 1963, 1967, 1979) and their observed conditions, eg. constricted acrolobe, zonate border, retral spines, modified axiolobate pygidium, simplimarginate etc. This practice was continued by Robison (1982) for Middle Cambrian Ptychagnostidae and Shergold (1975, 1977, 1980, 1982) in his analysis of late Cambrian pseudagnostini with the ambition to be able to diagnose an agnostoid trilobite with the minimum of words, conditions like deliquiate, papilionate, en grand tenue, effaced etc. having quite definite descriptive meaning. Thus, the morphology of these organisms is married closely to classification through mostly (as yet) hypothetical function (until more material like that of Müller & Walossek (1987) is found), introducing a degree of subjectivity.

The classification presented here essentially follows many of the recent ideas developed in Australia and North America during the last 30 years. It is not presented in a cladistic fashion although everything needed to do so is made available. Because we agree with Öpik that only characteristics in combination can be used for sophisticated taxonomic discrimination, we have made use of extended diagnoses for both families and genera. We have also given more extended geographic occurrences and stratigraphic ranges than is normal in Treatise compilations. The former are given to state or province regions, and the latter are given to local biochronological stage and zone. First and last occurrences stratigraphically may occur in different zoogeographical provinces with different biofacies associations and biochronology, and so the appropriate scale for each is quoted.

Since the Linnean system of classification relies on the concept of the type specimen, we have also included what is known about the status of the type material, its repository and numbers. Parts of this data set are currently provisional. Several old collections are as yet unlocated; several taxa are based on cotype (syntype) material and require the designation of lectotypes; and in some cases types are known to be lost necessitating the search for topotype material and justification of neotypes.

## THE PRESENT CLASSIFICATION

In the present classification agnostoid and eodiscoid trilobites are considered as distinct groups separated at ordinal level in the taxonomic hierarchy. Thus we follow Rasetti (1945, 1948,

1952) in recognising the Order Agnostida Salter, 1864 which is exclusive of the eodiscoids, the latter being considered as a suborder of Ptychopariida. In so doing, we reject taxonomic concepts associated with Miomera Jaekel, 1909 in which agnostoids and eodiscoids have been traditionally united (eg. by Whitehouse, 1936; Öpik 1961b, 1967, 1975, 1979; Jell, 1970, 1975a). We agree with Öpik (1967) that the concept of Agnostida Kobayashi, 1935 is the same as that of Miomera since agnostoids and eodiscoids are also united in it (Kobayashi, 1939a, 1943, 1962; Moore, 1959; Rushton, 1966), as they are in the Superfamilies Eodiscidea of Richter (1932), Agnostidea of Richter & Richter (1941), Agnostacea of Henningsmoen (1951), Agnostoidae of Hupé (1953); and the Order Agnostida Salter, 1864 which Bergström (1973) thought equivalent to Miomera.

Agnostida used here is based on concepts of the Suborder Agnostina, traditionally attributed to Salter (1864) who recognised a Section Agnostini established for agnostoid trilobites alone. This is the Suborder Agnostina Salter, 1864 of Moore (1959), Rushton (1966) and Öpik (1961b, 1967, 1975, 1979), and as indicated above, Rasetti (1948, 1952) as an independent Order. Robison (1984) diagnosed an Order Agnostida in a similar way, but attributed it to Kobayashi, 1935 rather than Salter, 1864.

A total of 179 generic and subgeneric taxa assignable to the Order Agnostida Salter, 1864 have been assessed. Fifty-four (about 30%) of these taxa are synonyms. The remaining 125 valid taxa are assigned to the superfamilies Condylpygoidea Raymond, 1913, and Agnostoidea M'Coy, 1849, and superfamilies of uncertain affinity. Although the first is based on the single family Condylpygidae Raymond, 1913, itself containing only two genera, *Condylpyge* and *Pleuroctenium*, its concept is stable and goes back to the first attempted generic subdivision of *Agnostus* by Hawle & Corda (1847). At one taxonomic rank or another the constituent genera of Condylpygidae have retained independent status in all classifications. We follow Kobayashi (1962) in recognising them at superfamilial level, but the familial concept remains that advocated by Raymond (1913). The characteristic expansion of the anterior glabellar lobe, the apparent presence of occipital structures instead of the basal lobes, but retention of a cephalothoracic aperture (Rushton, 1979, p.45), and presence always of three segments in the anteroaxis of the pygidium serve to differentiate Condylpygoidea from Agnostoidea. This Superfamily is also prone to spinosity: an occipital spine may be developed and the elongate axial cephalic node may be an aggregation of small spines (see Rushton, op. cit.,

p.47, fig.2A). *Pleuroctenium* also displays spines developing from the axial nodes of the thoracic and anterior three pairs of pygidial segments. Fringing spines or crenulations occur on the pygidia of both genera. There is also a tendency, well illustrated by Westergård (1946, pl.2), for both cephalic and pygidial acrollobes to become transversely divided. Division occurs adjacent to the anterior glabellar furrow of the cephalon and the third, posteriormost (F3), transverse furrow of the pygidial axis. It is only among the Pseudagnostinae that such features are displayed among Agnostoidea. Condylpygoidea are therefore most distinctive members of the Agnostida.

The great bulk of agnostoid genera and subgenera, are assigned to the Superfamily Agnostoidea M'Coy, 1849, and distributed among 7 diagnosable families and 10 subfamilies. A significant number of genera, cannot be classified with confidence at the familial level, either because they are inadequately preserved, or are not diagnosable. Many of these genera are heavily effaced, and most in need of thorough revision. They are herein relegated to the "too hard basket".

Agnostoidean families recognised include Agnostidae M'Coy, 1849; Ptychagnostidae Kobayashi, 1939; Spinagnostidae Howell, 1935; Peronopsidae Westergård, 1936; Diplagnostidae Whitehouse, 1936; Clavagnostidae Howell, 1937 and Metagnostidae Jaekel, 1909.

Micragnostidae Howell, 1935, Glyptagnostidae Whitehouse, 1936, Hastagnostidae Howell, 1937 and Rudagnostidae Lermontova, 1951 are all considered synonyms of Agnostidae M'Coy, 1849. Agnostidae is presently considered to embrace three subfamilies, Agnostinae M'Coy, 1849 with 13 genera/subgenera, Ammagnostinae Öpik, 1967 with six, and Glyptagnostinae Whitehouse, 1936 with two genera. A further five genera cannot be placed in subfamilies, thus making Agnostidae the largest family of Agnostida. Agnostid genera can be divided in several ways, but the axial characteristics, particularly of the pygidium have been primarily used in the present classification. In Agnostinae the pygidium is simple and axiolobate; in Ammagnostidae the posterior lobe of the pygidial axis is invariably expanded and lengthened, and contains a well developed secondary axial node, while in Glyptagnostinae although the simple axiolobate situation is commonly obscured by scrobiculation, a secondary axial node is developed in association with a well defined transverse depression which occurs in the rear of the posterior lobe.

Full use of the subgeneric rank is made within Agnostinae to express end members of gradational

morphological series. Hence, *Homagnostus* is reinstated as a subgenus of *Agnostus*, representing morphs with a laterally expanded and extended pygidial axis. *Lotagnostus* (*Lotagnostus*), *L. (Eolotagnostus)* and *L. (Distagnostus)* represent recognisable degrees of effacement. In the revived genus *Oncagnostus* Whitehouse, 1936, the subgenus *Strictagnostus* is made available for short axis morphs with characteristically flared or tapered acrollobes and the subgenus *Kymagnostus* is used for long axis morphs without deliquiate border furrows. Ludvigsen, Westrop & Kindle (1989) have shown that *Trilobagnostus* should not be referred to *Lotagnostus*. It is here given generic status but could also be interpreted as a subgenus of *Oncagnostus*. The species referred to the genera and subgenera *Oncagnostus*, *Strictagnostus*, *Kymagnostus* and *Trilobagnostus* seemingly form a continuum in great need of revision. *Innitagnostus* and *Acutatagnostus* could also be regarded as subgenerically related. *Micragnostus*, following the suggestions of Fortey (1980, p.20), is restricted in specific composition but decidedly separated from *Geragnostus* (Metagnostidae) with which it has long been associated.

Glyptagnostinae is here regarded as a subfamily of Agnostidae rather than a family in its own right (Kobayashi, 1938, 1939a; Westergård, 1947; Henningsmoen, 1958; Öpik, 1961b; Shergold, 1982). It is restricted here to the genera *Glyptagnostus* and *Agnostardis*, as envisaged by Öpik (1963, p.38). The previously recognised subgenus *Lispagnostus* Öpik, 1967 is considered here synonymous with *Ammagnostus* Öpik, 1967. The highly scrobiculate and deuterolobate *Pseudoglyptagnostus* Lu, 1964 which has been associated with Glyptagnostinae is referred to Pseudagnostinae (Diplagnostidae) and regarded as an en grand tenue subgenus of *Agnostotes* Öpik, 1963. We prefer to regard Glyptagnostinae here as a subfamily of Agnostidae rather than Diplagnostidae as proposed by Öpik (1967), on the basis of cephalic axial similarity with genera such as *Innitagnostus* and pygidial axial similarity with *Agnostus* itself.

Ammagnostine genera form a readily recognisable cohesive group with the exception perhaps of the diminutive *Kormagnostella* Romanenko, 1967, as recognised by Öpik (1967). *Tentagnostus* is considered to be an en grande tenue subgenus of *Ammagnostus*. *Proagnostus* is revived following Robison's (1988) designation of a lectotype for *P. bulbosus*. *Agnostascus* Öpik, 1967 and *Agnostascus (Paragnostascus)* Peng, 1987 must now be regarded as synonyms of *Proagnostus*.

Of uncertain subfamilial classification, *Aistagnostus* Xiang & Zhang, 1985 is partially effaced and pygidially agnostine. Cephalically, it is less readily

accepted as an agnostine. The remaining unclassified genera have long and/or expanded posterior axial pygidial lobes. *Idolagnostus* is diminutive, could be deuterolobate, and even represent of genus of Pseudagnostinae. *Acmarhachis* has been similarly classified (Palmer, 1960, 1962), and *Connagnostus* has been regarded by Öpik (1967) as a diplagnostine. Until investigated in greater detail, however, we prefer to honour these genera with undefined status among Agnostidae.

The Family Ptychagnostidae is here considered to represent an independent family (fide Robison, 1984, p.10) rather than a subfamily of the Agnostidae as it was originally established (Kobayashi, 1939a, p.151) and has often been considered (Öpik, 1967, p.90; 1979, p.86; Ergaliev, 1980, p.67; Peng, 1987, p.82; Laurie, 1988, p.171). The members of this family, although sharing some features with members of the Agnostidae do not seem to be closely related to that family. Although there has been recent debate about the validity of many of the genera belonging to this family (Öpik, 1979; Robison, 1982; 1984; Laurie, 1988) there has been general agreement with regard to the association of species in the family. Also included in this family for the first time is *Tomagnostus*, the early species of which seem to be closely related to *Onymagnostus*. Tomagnostinae Kobayashi, 1939 therefore becomes a junior synonym of Ptychagnostidae Kobayashi, 1939 under the first reviser principle. It may be possible to subdivide the family into several subfamilies utilising some of the synonymous familial names (Triplagnostinae, Lejopyginae) but this has not been attempted herein.

Genera belonging to the Ptychagnostidae usually have a preglabellar median furrow, a relatively elongate anterior glabellar lobe, elongate basal lobes, a basic articulating device, well developed pygidial axial F1 and F2, an acuminate posterior pygidial axial lobe and a tendency toward spinosity.

The family Spinagnostidae was established by Howell (1935, p.218) to accommodate the subfamilies Spinagnostinae and Quadragnostinae, both of which were founded on only one genus, each containing one species. The types from which these species were described are very poorly preserved. For some time now the genus *Spinagnostus* has commonly been considered synonymous with *Hypagnostus* (see Westergård, 1946, p.44), despite Öpik's (1979, p.66) belief that it should be considered a separate genus. This synonymy is upheld herein, but does not invalidate the family name.

The types of the eponymous genus of the

subfamily Quadragnostinae are very poorly preserved and are largely uninterpretable. These names are therefore restricted to that type lot of specimens.

As understood herein, the family Spinagnostidae contains two subfamilies; i.e. Spinagnostinae Howell and Doryagnostinae subfam. nov.. All members of this family have nondeliquate border furrows, a nonspinose cephalon, small, triangular basal lobes, usually broadly rounded glabellar culmination and usually effaced pygidial axial F1 and F2. The former subfamily may be polyphyletic, however, all the members of this subfamily have a tendency to efface the anterior glabellar lobe, usually lack the preglabellar median furrow, have the glabellar node near the F2 furrows and lack a secondary axial node on the posterior lobe of the pygidial axis. The latter subfamily (Doryagnostinae) consists of only three genera which form a closely related monophyletic group. All possess a well developed anterior glabellar lobe, have the glabellar node from level with F1 to midway between F1 and F2 furrows and have a small secondary axial node located on the posterior pygidial axial lobe.

One genus (*Pseudoperonopsis* Harrington, 1938) is assigned to this family but cannot be placed in a subfamily. This is because the types have not been observed and have never been satisfactorily illustrated. Subsequent interpretations vary considerably.

There are probably well over a hundred species which have been assigned to *Peronopsis* and remain there despite the refinement in agnostid taxonomy over the last few decades. This genus has for a long time been the receptacle for almost any Early to Late Cambrian agnostoid with an axiolobate, simplimarginate pygidium with effaced pygidial axial F1 and F2, and a cephalon with a bilobate glabella and lacking a preglabellar median furrow. This has led to *Peronopsis* being, as it presently stands, probably the most morphologically diverse genus of the Agnostida.

Herein the genus is restricted to its type species and is associated with the rehabilitated genus *Diplorrhina* and with *Peronopsella* and *Gratagnostus* in the family Peronopsidae Westergård, 1936. This family is of uncertain relationships, but the included genera have a distinctive morphology. They all have well developed F1 and F2 furrows in the posterior glabellar lobe, a narrowly rounded glabellar culmination, simple trapezoidal basal lobes inset behind F1 and a long pygidial axis with a transverse depression in the anterior half of the posterior pygidial axial lobe.

The Family Diplagnostidae is essentially reserved for agnostoids which are commonly modified axiolobate (in the sense of Öpik, 1967), and frequently zonate. Thus the family includes the Subfamilies Diplagnostinae, Oidagnostinae and Pseudagnostinae. The Diplagnostinae have a characteristically zonate pygidium, in combination with an axiolobate or only slightly modified axiolobate condition, supported cephalically by the presence of an often sulcate and occasionally bilobate anterior glabellar lobe, and angulate glabellar culmination. Frequently, a transverse depression is developed behind the pygidial axial node in the anterior half of the posterior lobe. Such characteristics tend to unite the genera *Diplagnostus*, *Linguagnostus*, *Dolichagnostus*, *Tasagnostus* into a tight morphological group.

Öpik (1967, 1979) also included the genera *Baltagnostus* Lochman, 1944 and *Oedorhachis* Resser, 1938 in Diplagnostinae. In the case of the former, it is only the type species, *B. centerensis* (Resser), which is convincingly zonate. Other species assigned to this genus by subsequent workers are simplimarginate or have thickened posterior pygidial borders which are not really zonate in the sense of *Diplagnostus* or *Linguagnostus*: they are quasizonate, having a gentle doubling of the border. Similar are the species attributed by Öpik (1979) to *Pseudoperonopsis* Harrington, 1938, which form a well defined group stratigraphically, but will require generic reassessment when the type species, *Agnostus sallesi* Munier-Chalmas & Bergeron, 1899, is revised. As noted by Öpik (1967, p.69) specimens illustrated as *Peronopsis fallax* (Linnarsson) by Westergård (1946, pl.2, figs.18-24) also have an incipient zonation. All the above may, therefore, form a second group of taxa which lies intermediate between the basically non-zonate Peronopsidae and the typically zonate Diplagnostinae. All the forms noted have additionally a more angulate glabellar culmination.

Species assigned to *Oedorhachis* are generally acceptably zonate, but are also trispinose and have a variably laterally expanded posterior pygidial axial lobe, a combination of diplagnostid characteristics which sets them slightly apart from other Diplagnostinae.

The Subfamily Oidagnostinae also has a zonate pygidium, but there is a gap in the pygidial collar; the anteroaxis of the pygidium is composed of three segments, and the posterior lobe is subquadrate and extends to the pygidial collar; and a third marginal spine is situated sagittally. Thus Oidagnostinae have a strongly modified axiolobate condition. The morphologies of the constituent genera, *Oidagnostus*, and *Cristagnostus* are readily related to, and probably



derived from, Diplagnostinae. A major feature in their phylogeny is the separation of the anterior portion of the posterior lobe of the axis as seen in *Diplagnostus* as the third segment of the anteroaxis, and the manifestation of lateral bosses as appendages to this third segment (see Westergård, 1946, pl.9, fig.6 for extreme condition). These features seem to foreshadow the development of the accessory furrows and deuterolobe that characterise Pseudagnostinae.

The Pseudagnostinae are usually simplimarginate diplagnostoids which develop a deuterolobe proper and accessory furrows, and which are linked to other groups of Diplagnostidae by the occasional presence of a third pygidial spine, as in *Pseudagnostus* (*Sulcatagnostus*), and triannulate anteroaxis, as in *Xestagnostus*. The Pseudagnostinae are a large group of genera which exhibit a wide range of deuterolobe morphology and degrees of effacement. Genera are linked by the situation of the axial glabellar node and its relationship to the F2 and F3 furrows (Shergold, 1975, 1977, 1980), falling essentially into pseudagnostoid, neoagnostoid, and rhaptagnostoid groups. Degree of effacement varies from near total in *Litagnostus* to extreme scobication in *Neoagnostus* (*Machairagnostus*). *Agnostotes* (*Agnostotes*) Öpik, 1963 and *A. (Pseudoglyptagnostus)* with its synonym *Glyptagnostotes* Lazarenko, 1966, generally associated with Glyptagnostinae, eg. Xiang & Zhang (1985), are here classified among the Pseudagnostinae because their pygidia seem to be typically deuterolobate (see particularly Lazarenko, 1966, pl.2 figs.1, 2, 5, 6, 8, 10-12). Cephalically, it is acknowledged that glyptagnostine characteristics, like the elaborate development of the lateral glabellar lobes and division of the anterior lobe by a median sulcus, are apparent in the scrobiculate subgenus *Pseudoglyptagnostus*, but much less marked in the more effaced *Agnostotes*. Neither subgenus possesses the typical glyptagnostine posterior axial lobe with its secondary axial node and associated transverse depression. Öpik (1963, 1967) has explored alternative possibilities for the classification of *Agnostotes* within the Diplagnostidae.

The definition of a deuterolobe is not always clear. It is a composite posterior pygidial lobe which comprises both axial and pleural elements and which extends therefore to the posterior border furrow, and is anterolaterally at least circumscribed by accessory furrows. Possibly then, genera like *Oxyagnostus* should be excluded from Pseudagnostinae and forms like *Idolagnostus* included. Some others, like *Formosagnostus*, judging from its relationship with the *bulgosus* species group of *Pseudagnostus* (Shergold, 1977) seem to indicate derivation from Agnostidae and

suggests that the Subfamily Pseudagnostinae could be polyphyletic, but further revision is required to solve such issues. Fortey (1980, p.28) has regarded the Pseudagnostinae as somehow related to the Metagnostidae because some of them possess what might be taken to be an intranotular axis behind the defined extent of the pygidial axis; the glabellar furrow patterns; the deliquiation of the border furrows; common pygidial articulating device; and sometimes common prosopon. However, many morphological trends found among agnostoids are subsequently reiterated in apparently unrelated groups. Pseudagnostine features are found in Middle Cambrian Oidagnostinae (Diplagnostidae), and in Glyptagnostinae (Agnostidae). The transverse division of the cephalic acrolobe of the latest Cambrian genus *Trisulcagnostus* may be observed also in Condylropygidae.

Clavagnostidae has been long recognised as an independent family, like Condylropygidae, of unknown origin and with unknown descendants. It has been discussed at length by Öpik (1967) whose subfamilial division into Clavagnostinae and Aspidagnostinae is followed here. Clavagnostidae are distinguished by the fused anterior and posterior glabellar lobes and generally shortened glabella. Clavagnostinae have a relatively simple pygidium characterised by an acuminate axis posteriorly bisected by a transverse furrow somewhat similar to Glyptagnostinae. In Aspidagnostinae the pygidial axis has both F1 and F2 furrows, plus the posterior transverse one, and a secondary axial node, also rather reminiscent of Glyptagnostinae. The posterior border of constituents of this subfamily is, however, zonate, and there is a gap in the collar, as in *Oidagnostus*. A hint of a third marginal pygidial spine in Aspidagnostinae is also oidagnostine. *Utagnostus* is temporarily lodged among Clavagnostidae by virtue of its trispinose pygidium and nature of its cephalic spines.

The family name Metagnostidae Jaekel, 1909 was revived by Fortey (1980, p.24) to embrace some of the genera in the past most commonly referred to Geragnostidae Howell, 1935 (see Howell, 1959, p.O176). Fortey (1980, p.27) also included the genera *Segmentagnostus* and *Corrugatagnostus*; i.e. those genera with a chevronate furrow separating the two main glabellar lobes. This taxonomic scheme is followed herein with modifications, notably some of those introduced by Zhou (1987).

Two long accepted families, Phalacromidae Hawle & Corda, 1847 and Sphaeragnostidae Kobayashi, 1939, are unclassified at superfamilial rank. The former is based on the genera, *Phalacroma*, *Lisogoragnostus* and *Dignagnostus*, and the latter on *Sphaeragnostus* alone.

Phalacromidae, concept and composition, has been discussed at some length by Öpik (1961b) and Jago (1976). It has been considered as polyphyletic (Öpik, 1967, p.82). We follow Öpik (1961b, p.54) in recognising the validity of Family Phalacromidae Hawle & Corda, 1847, but restricted to the genera noted above. All other genera previously associated with Phalacromidae (*Phalagnostus*, *Grandagnostus*, *Valenagnostus*, *Phoidagnostus*) are classified elsewhere. The inclusion here of *Dignagnostus* Hairullina, 1975 is based on pygidial characteristics and there is no certainty that associated cephalia illustrated by this author are correctly assigned. If *Dignagnostus* is a phalacromid, then the cephalia must be discarded. If the association of cephalia and pygidia illustrated by Hairullina is correct, then *Dignagnostus* must be rejected from Phalacromidae which would then be restricted to *Phalacroma* as indicated by Öpik (1967). Pygidia of *Dignagnostus grandis* and *Phalacroma bibullatum* are unified by the long (sag.), wide (tr.) and laterally expanded axis, effacement of transverse furrows, shape and position of the axial node, and retention of a transverse depression behind the axial node, a characteristic feature of *Peronopsis* and *Diplagnostus*, which may indicate the derivation of Phalacromidae. Cephalia assigned to *Dignagnostus* ignored, species of Phalacromidae are relatively large and mostly effaced.

Effacement also is responsible for the isolation of Sphaeragnostidae. The genus *Sphaeragnostus* is widely distributed during the Ordovician, and quite characteristic. The cephalon is completely effaced and the pygidial axis an unfurrowed sphaeroidal structure of substantial width (tr.). Thoracic axial structures are also very wide (tr.) limiting the extent of the pleurae. There is no guarantee that Sphaeragnostidae, or Phalacromidae, are true Agnostida, as the presence of a cephalothoracic aperture is not confirmed in either group.

Twenty two genera are left unclassified at familial level. Mostly this is because their type specimens are not readily interpreted through effacement of diagnostic morphology (*Agnostogonus*, *Delagnostus*, *Leiagnostus*, *Monaxagnostus*, *Phoidagnostus*, *Glaberagnostus*, *Grandagnostus*, *Skryjagnostus* and *Valenagnostus*) or adverse preservation (*Archaeagnostus*, *Armagnostus*, *Blystagnostus*, *Hastagnostus* and *Quadragnostus*), or both (*Ciceragnostus* and *Gallagnostus*). *Plurinodus* is a diminutive genus which may prove supragenerically classifiable when more material becomes available. *Acadagnostus* may also prove to be classifiable when its types are located, and *Phaldagnostus* when it is properly illustrated. *Homagnostoides* has features which are similar to Condylopygoidea! Pratt (in press) has recently erected a Family Phalagnostidae for the effaced genus *Phalagnostus*

whose relationships with other agnostoids, particularly *Grandagnostus* and *Valenagnostus*, have not been thoroughly explored. Jago (1976) regards all three genera as Agnostidae (Quadragnostinae). If eventually proved acceptable, a rejuvenated Quadragnostidae would take precedence over Phalagnostidae.

Five genera are rejected from Agnostida Salter, 1864. Two of them, *Discagnostus* Öpik, 1963, the sole representative of the Family Discagnostidae Öpik, 1963, and *Mallagnostus* Howell, 1935, on which Mallagnostidae Howell, 1935 is based, are considered better classified among Eodiscina (Ptychopariida). *Gallagnostoides*, founded by Kobayashi (1939b, p.580) on *Aeglina boia* Hicks (1875, p.185, pl.10, figs 9, 9a) is a mid Arenig species of the cyclopygid subgenus *Microparia* (*Microparia*) Hawle & Corda according to Fortey & Owens (1989, p.172). *Pseudotrinosus* Kobayashi & Hamada, 1971, from the Devonian of western Malaysia, is referred to Aulacopleurinae by Thomas & Owens (1978, p.74).

## GLOSSARY OF TERMINOLOGY APPLIED TO AGNOSTIDA

This glossary contains terminology which has been applied to agnostoid trilobites, exclusive of eodiscoids (Figs. 1 - 6). It is both descriptive and interpretive, and is intended to reinforce the list of "Morphological terms applied to Trilobita" which is in preparation for the revised trilobite volumes of the "Treatise on Invertebrate Paleontology". Other terminology, of a zoological aspect, applied to the phosphatised ventral appendages and internal structures recently described (Müller & Walossek, 1987) for *Agnostus pisiformis*, is not included here.

### ACCESSORY FURROWS

A pair of diagonal pygidial furrows which in the Pseudagnostinae arise at the posterolateral corners of the second segment of the axial lobe and are directed abaxially and rearward, often encompassing the deuterolobe; interpreted not as axial furrows but as major scrobicules (parietal septa of pygidial alimentary glands) (Öpik, 1963).

### ACROLOBE

The acrolobe is the convex (sag., tr.) body of either cephalon or pygidium which is surrounded by peripheral marginal furrows (Öpik, 1967).

### ANTERIOR BASAL LOBE

The basal lobes of some agnostoid species are divided into an anterior basal lobe and a posterior basal lobe (Öpik, 1979).

**ANTERIOR FURROW**

See TRANSLABELLAR FURROW

**ANTERIOR LATERAL FURROW**

Furrow separating anterior pygidial axial segment from middle segment (Robison, 1964).

**ANTERIOR LOBE, ANTERIOR GLABELLAR LOBE**

The foremost lobe of the glabella, usually separated from the anterolateral lobes by transglabellar or anterolateral furrows. In some species, where the anterolateral furrows are obliterated, the anterior and anterolateral lobes may appear fused.

**ANTERIOR PLEURAL BAND**

In the anterior thoracic segment the pleural furrow separates the anterior pleural band from the posterior pleural band (Robison, 1964).

**ANTERIOR SEGMENT**

The anterior pygidial axial subdivision (Robison, 1964).

**ANTEROAXIS**

Anterior part of pygidial axis that includes the first two segments (M1 and M2) and the anterior lateral furrow which separates them (Robison, 1982).

**ANTEROGLABELLA**

Anterior part of glabella that is bounded by the axial and transglabellar (F3) furrows; external evidence of segmentation is absent (Robison, 1982). This term has previously been applied by Öpik (1961b) to the frontal lobe plus associated lobes L2-L4 of *Centropheura*.

**ANTEROLATERAL FURROWS**

In papilionate species, the transglabellar furrow is often interrupted sagittally and divided into two parts at an obtuse angle to each other. These parts are referred to as anterolateral furrows (Shergold, 1975).

**ANTEROLATERAL LOBES**

External low swellings at the anterolateral corners of the posterior glabellar lobe are termed anterolateral lobes. They are separated from the anterior lobe by transglabellar or anterolateral furrows, and from the remainder of the posterior lobe generally by weak median lateral furrows. On internal moulds the anterolateral lobes are seen to be defined by raised rims enclosing areas of muscle attachment (Shergold, 1975).

**ANTEROLATERAL SCARS**

On the internal mould these lie in the position occupied by the anterolateral glabellar lobes of the external surface. They are the largest muscle scars

of the cephalon (Shergold, 1975).

**APICAL BOSS (of HYPOSTOME)**

Prominent, anteriorly situated hood-like convexity (Robison, 1972).

**APODEMAL PITS**

These are depressions on the dorsal carapace caused by the adventral invagination of the test to produce apodemes. The impression of an apodeme on the internal mould is called a notula.

**ARTICULATING DEVICE**

The articulating device of the agnostoid pygidium when complete consists of the articulating half-ring, the articulating furrow, and the recess in front of the axial lobe. Four kinds are known: (1) the basic, in Spinagnostidae and Ptychnagnostidae, (2) the agnostoid, in Agnostinae and Clavagnostinae, (3) the glyptagnostoid, in the Glyptagnostinae, Pseudagnostinae and Diplagnostinae; and (4) a simple plate in *Xestagnostus* (Öpik, 1963, 1967). See also CONCAVE FACETS.

**ARTICULATING FACETS**

See CONCAVE FACETS

**ARTICULATING FURROW**

See ARTICULATING DEVICE

**ARTICULATING HALF-RING**

A narrow, transverse, arched ridge, a segment of a circle or ellipse, separated from the first axial segment of the pygidium by an articulating furrow and axial bar (Öpik, 1963).

**AXIAL BAR**

The convex floor of the articulating furrow in the form of a median segment of a cylinder, between the muscle spots. It is in line with the axial node and the intranotular axis (Öpik, 1963).

**AXIAL FURROWS**

Denotes the primary and fundamental furrows dividing the trilobite body into an axial lobe and a pair of pleural lobes.

**AXIAL GLABELLAR CARINAE**

A pair of narrow (tr.) elevated ridges - axial glabellar carinae - flanks the axial glabellar sulcus on the internal cephalic mould of Pseudagnostinae. Anteriorly they merge into the axial glabellar node, where they also join the oblique lateral ridges. The carinae define the adaxial limits of the major and minor posterior scars. The carinae run the length of the glabella between the axial and terminal nodes. They are analogous to the intranotular ridges of the pygidium (Shergold, 1975).

**AXIAL GLABELLAR NODE, GLABELLAR NODE**

An elongate node lying near the mid-length of the glabella, either between or behind the anterolateral glabellar lobes. Frequently it has a posterior cleft and a marked sagittal ridge. Occasionally an axial glabellar carina runs backwards from the rear of the node along the sagittal line to the terminal glabellar node (Robison, 1964; Shergold, 1975).  
Synonym **MEDIAN NODE** (Robison, 1982)

**AXIAL GLABELLAR SULCUS**

This is a narrow groove which runs along the sagittal line of the cephalic internal mould from the terminal glabellar node to the axial glabellar node. It runs into the cleft in the rear of the latter. The sulcus is widest (tr.) between the major and minor posterior scars (Shergold, 1975).

**AXIAL PYGIDIAL NODE, AXIAL NODE**

An external convexity lying sagittally on one or more of the pygidial segments. May develop into a tubercle or a spine (Öpik, 1979; Robison, 1982).

**AXIAL PYGIDIAL SCARS**

A general term for the paired muscle scars of the pygidial axis.

**AXIAL NODE**

See **AXIAL PYGIDIAL NODE**

**AXIAL SEGMENTS**

Metameric divisions of the pygidial or thoracic axis.

**AXIAL SPINES**

Spines arising from the midline of the sclerites (Öpik, 1979).

**AXIOLOBATE**

Term describing agnostoids with the basic unmodified pygidial axial lobe (Öpik, 1967). See also **MODIFIED AXIOLOBATE** and **DEUTEROLOBATE**.

**BASAL GLABELLAR LOBES**

See **BASAL LOBES**.

**BASAL LOBES**

Lateral lobe adjacent to posterolateral extremity of glabella, separated from it by basal furrows. Of variable shape, they may be simple or elongate, entire or divided (double) and are linked behind by the connective band (Shergold, 1975; Robison, 1982).

**BASAL FURROWS**

Furrows separating posterior glabellar lobe from basal lobes (Robison, 1982).

**BASE (of HYPOSTOME)**

Triangular area at centre of hypostome lying between apical boss and fenestrules (Robison, 1972).

**BLADE**

Posterior paired keels of hypostome, probably sites for muscle insertion (Robison, 1972).

**BORDER**

The border is the outer dorsal flange of the cephalon and pygidium, separated from the acrolobe by the border furrow.

**BORDER FURROW**

See **MARGINAL FURROW**

**CAECA (-UM)**

Ramified, blind, lateral extensions of the alimentary canal, interpreted to have functioned as hepatic glands facilitating the digestion of food (Öpik, 1959, 1961a, 1963).

**CAECA, GENAL**

Caeca located in the pleural and preglabellar regions of agnostoids and other trilobites (Öpik, 1959, 1961a).

**CAECA, RETICULATE**

Reticulation of caeca is indicated by confluent external rugae and short disconnected scrobicules (Öpik, 1963).

**CAECA, TERMINAL**

Terminal scrobicules and rugae which may cross the marginal furrow and extend to the pygidial margin (Öpik, 1967).

**CEPHALIC RECESS**

The upward arched recess in the rear of the cephalon, covered in some agnostids by the occipital collar (Robison, 1964). See **CEPHALOTHORACIC APERTURE**.

**CEPHALOTHORACIC APERTURE**

The aperture is formed by the cephalic and the thoracic recesses at the articulating junction of the cephalon with the thorax; the function of the aperture is unknown (Robison, 1964).

**CLAVAGNOSTID PITS**

A pair of short, subparallel, elongate pits situated exsagittally behind the axial pygidial node in many clavagnostids, often terminating at a node (Öpik, 1967).

**CONCAVE FACETS**

The pleural facets of trilobites are presumed to be flat, but their structure has not been studied as yet in detail. In the majority of the Spinagnostidae and Ptychagnostidae which possess the basic form of

the articulating device the pygidial facets are flat and the fulcra are geniculate but not pointed; still, moderately concave facets occur sporadically in their subfamilies. In several of the Agnostinae and Diplagnostinae, however, and in the Pseudagnostinae, the facets are concave and combined with pointed fulcra. In the Glyptagnostinae the facets are flat and the fulcra angulate but not pointed. The concavity of the facets indicates a complication of the mechanics of articulation (Öpik, 1967). **Synonym ARTICULATING FACETS** (Shergold, 1975).

#### CONNECTIVE BAND

A narrow (sag.) band connecting the basal lobes across the back of the posterior glabellar lobe (Öpik, 1963). **Synonym OCCIPITAL BAND** (Robison, 1964).

#### CONSTRICTED, UNCONSTRICTED ACROLOBES

The acrolobe is described as constricted when its lateral margins curve slightly inwards. When the lateral margins maintain a constant curvature the acrolobe is unconstricted (Öpik, 1967).

#### DELIQUIATE

The condition in which the border furrow is deeply grooved or channel-like (See **MARGINAL GUTTER**), as distinct from the non-deliquiate condition in which the marginal furrow is merely represented by a break in convexity (Shergold, 1975).

#### DELTOID AREA/DEPRESSION

A triangular depression formed by expansion of the anterior border furrow at its junction with the preglabellar median furrow. It is prominent in species of *Doryagnostus* (Robison, 1978). Note that **DELTOID AREAS** were previously defined as part of the musculature in Pseudagnostinae.

#### DELTOID AREAS

These are triangular depressions lying between the oblique lateral ridges and the axial carina. They are morphologically distinct from the major posterior muscle scars which enclose them rearwards (Shergold, 1975).

#### DEUTEROLOBE (n), DEUTEROLOBATE (adj)

The deuterolobe is a composite pygidial lobe consisting of confluent pleural and axial elements; generally a tumid convexity lying between that part of the pygidial axis defined by the axial furrows and the posterior marginal furrow. Laterally it is defined by accessory furrows. Degree of convexity, and thus definition varies greatly. The deuterolobe may be encircled by accessory furrows posteriorly where they merge with the posterior marginal furrow to give a plethoid condition. Deuterolobe

replaces **ENDLOBE** and **PSEUDOLOBE** as a recommended term. An agnostoid in which the deuterolobe is well defined is described as deuterolobate (Öpik, 1963).

#### DIVERTICULAR DUCT

A major intestinal appendage, or a duct leading from or into an ingluvial sac. It may be represented externally as a ruga or as an interruption of a furrow (scrobicule) (Öpik, 1959, 1961a, 1963).

#### EFFACED

An effaced condition is one in which furrows and lobes are obliterated to give a smooth or near-smooth surface. All conditions of partial effacement exist, from highly effaced to en grande tenue (Öpik, 1967).

#### EN GRANDE TENUE

A condition described as "in full dress"; refers to agnostids displaying all their lobes and furrows as distinct from effaced agnostoids.

#### ENDLOBE

Jaekel (1909) applied the term "Endlobus" in the diagnosis of his new genus *Pseudagnostus*; for the same structure Kobayashi (1939a) suggested the word pseudolobe. See **DEUTEROLOBE**.

#### EXTRANOTULAR AXIS

The two longitudinal parts of the axial lobe situated between the axial furrows and the notular lines. In the absence of axial furrows the extranotular parts of the axial lobe may be mistaken for parts of the pleural lobes, and the notular lines regarded as the "true axial furrows" (Öpik, 1963).

#### F1, F2, F3

Designations of lateral axial furrows (F) of glabella or pygidial axis counting from either posterior of glabella or anterior of pygidium (Robison, 1982).

#### FACET

See **CONCAVE FACETS**

#### FENESTRULES

A pair of triangular perforations in the posterior part of the base of the hypostome (Robison, 1972).

#### FIBULAR FURROW

When an agnostoid is enrolled, the inner edge of the cephalic doublure fits into a groove along the doublure of the pygidium. This groove is analogous to the vincular furrow of polymerid trilobites (Robison, 1964).

#### FRINGE

Very small exsagittally directed spinose crenulations on the posterior margin of some

condylopygids (Rushton, 1979). Could also be applied to the comb of larger spines on the lateral margins of the pygidium of *Pleuroctenium*.

#### FRONTAL SULCUS

Short sagittal furrow, a posterior continuation of the preglabellar median furrow, which bifurcates in part or in toto the anterior glabellar lobe in some agnostoid genera; interpreted as mesenteric (Öpik, 1961a).

#### FULCRAL LINE

An exsagittal line through each fulcral point, being a line of geniculation (Öpik, 1967).

#### FULCRAL POINTS, PRONGS

Prongs are short paired spines (points) on the left and right fulcral hinges which lie at the adaxial culmination of the concave facets (Öpik, 1979).

#### FULCRAL SPINES

Extreme development of PRONGS (Öpik, 1979).

#### GENAL ANGLE

The rearward-pointing process derived from the posterior cephalic margin at the posterolateral corner of the cephalon is referred to as the genal angle.

#### GLABELLA

Cephalic axis excluding basal lobes (Robison, 1982).

#### GLABELLAR CULMINATION

Posterior extremity of posterior glabellar lobe (Öpik, 1979).

#### GLABELLAR NODE

See AXIAL GLABELLAR NODE

#### HYPOSTOME

Exoskeleton of the labrum, detached in agnostoids from a rostral plate, if it exists (Whittington, 1988).  
Synonym HYPOSTOMA.

#### INTRANOTULAR AXIS

The main, median part of the pygidial axial lobe between the notular lines, or between the two lines of notulae (muscle scars or muscle spots). The notular lines and the extranotular axis belong also to the axial lobe (Öpik, 1963). Other terms are "elliptical ring" (Troedsson, 1937) and "lancetoid field" (Ivshin, 1956; Rosova, 1960).

#### INTRANOTULAR RIDGE

Narrow (tr.) ridges lying on either side of the intranotular sulcus, and anteriorly merging with the pygidial axial node. These ridges are complex structures, knotted in appearance, and apparently formed by coalescence of small swellings lying between the paired muscle scars and the

intranotular sulcus (Shergold, 1975).

#### INTRANOTULAR SULCUS

A sagittal groove, widening (tr.) anteriorly and posteriorly, running between the terminal pygidial node and the axial pygidial node. The sulcus runs into the latter node and cleaves it sagittally (Shergold, 1975).

#### LABRUM

Part of the ventral cephalic structure covering the mouth that has commonly been called the hypostome (Robison, 1982). However, according to Moore (1969) the labrum is an "unpaired outgrowth arising just in front of the mouth and more or less covering it", and is itself covered by the hypostome according to Bergstrom (1973).

#### LATERAL AXIAL LOBES

Rounded lobes occupying the anterolateral portions of the axis in each of the thoracic segments (Robison, 1964).

#### LATERAL GLABELLAR FURROWS

See MEDIAN LATERAL FURROWS.

#### LATERAL GLABELLAR PITS

Pits lying in the position of the median lateral furrows on either side of the midmost glabella (Öpik, 1979).

#### LATERAL NOTCH

See MEDIAN LATERAL FURROWS.

#### M1, M2, M3

Designations of transverse axial divisions of the glabella or pygidial axis, perhaps corresponding to internal segmentation, counting from either posterior of glabella or anterior of pygidium (Robison, 1982).

#### MAJOR POSTERIOR SCARS OF THE POSTERIOR LOBE

A pair of large circular depressed areas lying across the rear of the posterior glabellar lobe, on a transverse line across the maximum width of that lobe. The two scars are separated from each other on either side of the sagittal line by the axial glabellar carinae and sulcus, and from the oblique lateral scars by the oblique lateral ridges (Shergold, 1975).

#### MARGIN

The outer periphery of the shield, lying between the marginal furrows and the edge of the carapace. Synonyms, RIM, BORDER.

#### MARGINAL FURROW

A furrow lying at the break in convexity between the acrolobe and the rim. Synonym BORDER FURROW.

**MARGINAL GUTTER**

The broad, overdeepened marginal furrow of either the cephalon or pygidium. The term border gutter is used for the same feature (Shergold, 1972).

**MEDIAN AXIAL LOBE**

Median portion of axial lobe of thoracic segments (Robison, 1964).

**MEDIAN GAP**

See ZONATE.

**MEDIAN LATERAL FURROWS**

Generally weakly defined, these furrows separate the anterolateral glabellar lobes from the remainder of the posterior lobe (Shergold, 1975). Öpik (1963) referred to them as lateral glabellar furrows and Robison (1982) called them lateral notches or F2 furrows but here they are termed median lateral furrows, to distinguish them from anterolateral furrows.

**MEDIAN NODE**

See AXIAL GLABELLAR NODE.

**MEDIAN PREGLABELLAR FURROW**

This term has been used as a synonym of longitudinal preglabellar furrow as defined by Harrington and others (1959). It has priority of usage but has been superseded by the more popular term preglabellar median furrow. See PREGLABELLAR MEDIAN FURROW

**MID-CHEEK FURROWS**

A pair of furrows extending obliquely from the axial furrows adjacent to the anterolateral glabellar lobes to the marginal furrow (Ergaliev, 1980).

**MIDDLE SEGMENT**

Segment of pygidial axis second from anterior margin (Robison, 1964). See M1, M2, M3.

**MIDMOST GLABELLA**

In *Goniagnostus*, the median portion of the posterior glabellar lobe which is separated from the flanks of the lobe by a distinct change in slope or by delicate exsagittal furrows (Öpik, 1979).

**MINOR AXIAL SCARS**

Two small scars lying on the sagittal line of the glabella intermediate between the major and minor posterior scars within the axial glabellar sulcus (Shergold, 1975).

**MINOR POSTERIOR SCARS OF THE POSTERIOR LOBE**

A pair of small ovoid impressions lying to the rear of the major posterior scars, but just anterior to the terminal glabellar node, are visible on some specimens of *Pseudagnostus* (Shergold, 1975).

**MODIFIED AXIOLOBATE PYGIDIUM**

Modifications of the posterior axial lobe of the pygidium are rather frequent in the Diplagnostidae and Clavagnostidae; in *Oidagnostus* the rear axial lobe is expanded, and trapeziform; in *Aspidagnostus* the posterior lobe has a well developed transverse depression; and the Pseudagnostinae are deutero lobate (Öpik, 1967).

**MUSCLE SCARS**

Relatively large, but shallow, parietal depressions in the trilobite test that served as muscle attachments (Öpik, 1963).

**NOTULA, (-AE)**

Small circular or subcircular pits, most obvious on the internal mould and lying within areas defined by muscle scars, have been termed notulae by Öpik (1963, p.32). Generally a pair of notulae is associated with each muscle scar. Notulae also occur in the cephalon, in some species being present in the floor of the oblique lateral scars of the posterior lobe (Shergold, 1975).

**NOTULAR FURROWS**

The longitudinal ("axial") furrows developed between the notulae; or, in the absence of external manifestation of the notulae, occupying the position of notular lines. These furrows, or the notular lines, are intra-axial and divide the axial lobe into a median (intranotular) and a pair of extranotular parts (Öpik, 1963).

**NOTULAR LINES**

The two longitudinal lines of notulae converging at the terminal node in the pygidial axial lobe. The notular lines, the notulae, and the notular furrows lie within the axial lobe and cannot be regarded as the limits of that lobe; the limits are the axial furrows (Öpik, 1963).

**OBLIQUE LATERAL RIDGES**

A pair of ridges adaxially flanks the oblique lateral muscle scars and also defines the abaxial limits of the major posterior scars. Anteriorly they merge with the axial carinae or become indistinct in the area between the anterolateral scars of the posterior lobe and the axial glabellar node, depending on the position of this node with relation to the anterolateral scars. Posteriorly these oblique lateral ridges merge into an indefinable area which separates the minor and major posterior scars (Shergold, 1975).

**OBLIQUE LATERAL SCARS OF THE POSTERIOR LOBE**

Grooves, interpreted as muscle scars, running obliquely and arcuately from the abaxially flanks of the axial glabellar node to the front of the basal lobes. These scars are complex and apparently connected anterosagittally with the anterolateral

scars. A series of pits, interpretable as notulae, lies in the floor of these scars in some species (Shergold, 1975).

#### OCCIPITAL BAND

See CONNECTIVE BAND.

#### OCCIPITAL COLLAR

In several agnostids a semi-cylindrical projection (the collar) extends from the rear of the cephalon as a cover of the cephalic recess and of the thoracic recess, somewhat protecting from above the apparently exposed viscera which pass from the cephalon into the thorax (Öpik, 1967).

#### OCCIPITAL DENTS

A pair of indentations occurs in the front of the occipital lobe, of unknown function and incidental in several superfamilies (Öpik, 1967).

#### OCCIPITAL SPINE

The spine extending rearwards from the culmination of the posterior glabellar lobe. This feature is common in species of *Goniagnostus* (Öpik, 1979).

#### OUTER GLABELLA

In *Goniagnostus*, the flanks of the posterior glabellar lobe, separated from the MIDMOST GLABELLA by a distinct change in slope or by delicate exsagittal furrows (Öpik, 1979)

#### PAPILIONATE

Agnostids in which the axial glabellar node lies between the anterolateral lobes are termed papilionate (Shergold, 1975).

#### PERIPHERAL PLEURAL LOBE

That part of the pygidial pleural lobe flanking or even enclosing the deuterolobe in *Pseudagnostus*.

#### PLETHOID

Species of Pseudagnostinae with accessory furrows defining the deuterolobe clearly and continuing to the posterior marginal furrow are termed plethoid. Such species are invariably preserved en grande tenue (Shergold, 1972).

#### PLEURAL FIELD

The extra-axial acrolobe of the pygidium (Robison, 1964).

#### PLEURAL FURROW

Generally transverse furrow separating the anterior and posterior pleural bands from each other on the pleural lobes of the anterior thoracic segment (Robison, 1964). This term is also used for the furrow separating the pleural stop from the remainder of the pleural lobe on the posterior thoracic segment (Öpik, 1979).

#### PLEURAL STOP

Low ridge separating the facet from the pleural furrow in the posterior thoracic segment (Öpik, 1979).

#### POSTAXIAL MEDIAN FURROW

Longitudinal groove behind the pygidial axis, which extends from the axial furrow to the border furrow (Robison, 1982).

#### POSTERIOR APPENDIFERAL PITS

Apodemal pits located in front of the basal lobes, common in species of *Goniagnostus* (Öpik, 1979).

#### POSTERIOR BASAL LOBE

Posteriormost lobe of divided basal lobe (Öpik, 1979). See also ANTERIOR BASAL LOBE.

#### POSTERIOR LATERAL FURROW

The transverse furrow separating the second pygidial axial segment from the third and/or posterior segment (Robison, 1964).

#### POSTERIOR LOBE

The main body of the glabella between the connective band of the basal lobes and the anterior or anterolateral glabellar furrow (Robison, 1964).

#### POSTERIOR PLEURAL BAND

Posterior division of thoracic pleural region (Robison, 1964). See also ANTERIOR PLEURAL BAND.

#### POSTERIOR SEGMENT

See POSTEROAXIS.

#### POSTEROAXIS

That part of the pygidial axis behind F2; except for rare muscle scars, external evidence of segmentation is lacking (Robison, 1982).

#### POSTEROGLABELLA

Posterior part of glabella behind the transglabellar (F3) furrow (Robison, 1982). This term has previously been applied by Öpik (1961b) to the combined occipital and preoccipital glabellar lobes of *Centropleura*.

#### POSTEROLATERAL SPINES

These are sited on the posterolateral margins of the pygidium, but are varyingly situated with respect to the rear of the axis or the deuterolobe. The spines vary in size from mere denticles to stout spines. They may be deflected outwards from the lines of the pygidial margins or lie in line with them. They may be straight, curved or hooked, and are frequently oriented adventrally.

#### PREGLABELLAR MEDIAN FURROW

A sagittal furrow which runs from the axial furrow encircling the front of the glabella to the anterior cephalic marginal furrow, thus dividing the



acrolobe anteriorly (Robison, 1982). Synonyms, MEDIAN PREGLABELLAR FURROW, LONGITUDINAL PREGLABELLAR FURROW, PREGLABELLAR FURROW.

#### PRONGS

Short paired spines (points) on the left and right fulcral hinges (Öpik, 1979).

#### PSEUDOFURROWS

See ACCESSORY FURROWS

#### PSEUDOLOBE

See DEUTEROLOBE

#### PYGIDIAL COLLAR

See ZONATE.

#### PYGIDIAL FULCRA

Geniculation at medial extremity of facets. May be rounded, pointed or with small spine (Öpik, 1967).

#### RHAPTOID

A term applied to species of Pseudagnostinae, referring to the presence of notular lines on the pygidial axis. Effaced Pseudagnostinae are frequently rhapsoid (Shergold, 1972).

#### RIM

Outermost portion of border of cephalon or pygidium, separated from acrolobe by marginal furrow (Öpik, 1967). Synonym BORDER

#### ROSETTE, ROSETTE & KNOB

Transverse depression in posterior half of posterior lobe of pygidial axis, commonly with a central node (knob) (Öpik, 1979).

#### RUGA, (-AE)

Ridges separating scrobicules from one another, often palmate and ramified, and thought to represent a symmetrical pair of alimentary glands (Öpik, 1959; 1961a).

#### SCARS OF BASAL LOBES

Teardrop-shaped scars lie at the adaxial tips of the basal lobes. They are small and not often readily discernible (Shergold, 1975).

#### SCROBICULA, (-AE)

Externally radiating grooves or furrows between rugae, mostly confined to genae, but rarely in pygidial axis. Connected to alimentary canal by short diverticular ducts. Thought to represent internal parietal septa bearing mesenteries associated with the positioning of glands (Öpik, 1959; 1961a). Synonym SCROBICULES.

#### SCROBICULATE

The condition of bearing scrobiculae.

#### SECONDARY MEDIAN NODE

Small swelling situated at different positions along the midline of the posteroaxis (Robison, 1982).

#### SHOULDER FURROWS

Furrows separating the shoulders from the rest of the pleural lobes in an agnostid pygidium. They are possibly, but not certainly, homologous to the anterior pygidial pleural furrows in other trilobites. In most agnostids the shoulder furrows form a unit with the marginal furrow, but in some they extend straight to the margin. They are never effaced (Öpik, 1963).

#### SHOULDERS

In the agnostid pygidium the anterior border of the pleural lobes, separated by the shoulder or anteromarginal furrows, and geniculated at the fulcral points (Öpik, 1963).

#### SIMPLIMARGINATE

Term describing pygidia with the basic, unmodified rim; in this respect they are distinct from the zonate pygidium (Öpik, 1967). Synonym SIMPLICIMARGINATE.

#### SPECTACULATE

Term describing pseudagnosti in which the axial glabellar node lies to the rear of the anterolateral glabellar lobes, and is therefore also to the rear of the anterior glabellar furrow (Shergold, 1975).

#### TERMINAL GLABELLAR NODE

A small node lying at the posterior extremity of the posterior glabellar lobe (Öpik, 1967; Shergold, 1975).

#### TERMINAL NODE OF GLABELLA

See TERMINAL GLABELLAR NODE.

#### TERMINAL PYGIDIAL NODE

A small node, lying at the posterior culmination of the intranotular axis, marking the rear extremity of the axial lobe and the axial viscera; the displaced position of the node is assumed to indicate subsequent anatomical modifications in distribution of the viscera (Öpik, 1967; Shergold, 1975).

#### TERMINAL NODE OF THE PYGIDIAL AXIS

See TERMINAL PYGIDIAL NODE.

#### TERMINAL CAECA

See CAECA, TERMINAL.

#### THORACIC RECESS

Median, semicircular indentation in the front margin of the first thoracic segment (Robison, 1964). See CEPHALOTHORACIC APERTURE.

**TRANSAXIAL FURROWS**

Furrows separating axial segments of the pygidium.

**TRANSGLABELLAR FURROW**

Transverse furrow separating the anterior glabellar lobe from the posterior lobe (Robison, 1964).

Synonyms **TRANSVERSE GLABELLAR FURROW** (Westergard, 1946), **ANTERIOR FURROW** (Shergold, 1975).

**TRANSVERSE FURROW (of HYPOSTOME)**

Shallow transverse depression separating apical boss from base in anterior part of hypostome (Robison, 1972).

**TRANSVERSE FURROWS or TRANSVERSE ARTICULATING FURROWS**

Transverse furrows separating the segments of the pygidial axis. They are interrupted sagittally by the pygidial axial node, and terminate adaxially in apodemal pits. Often they are partly effaced (Shergold, 1975). Synonym **ARTICULATING FURROW** (Öpik, 1961a).

**TRANSVERSE GLABELLAR FURROW**

See **TRANSGLABELLAR FURROW**.

**TRUE AXIAL FURROWS, AXIAL LOBE, AXIS**

The designation "true" has been used in the literature to emphasise the distinction from the "false" pseudofurrows and pseudolobe; it is less needed if the "pseudo" terms are replaced by accessory furrows and deuterolobe (Öpik, 1963).

**WINGS (of HYPOSTOME)**

Anterior and posterior, addorsally oriented, forked structures analogous to the anterior and posterior wings of non-agnostoid trilobites (Robison, 1972).

**WING FURROWS (of HYPOSTOME)**

Narrow furrows which mark the inner margin of each wing (Robison, 1972).

**ZONATE**

A condition of the posterior border of the pygidium (between the marginal spines) in which the rim is duplicated by the pygidial collar - a ridge on the rim or even a fold of the margin of the acrolobe; in the *Diplagnostinae*, *Tomagnostinae*, and *Triadaspis* the pygidial collar is continuous; in *Oidagnostus* and *Aspidagnostus* it is divided by a median gap (Öpik, 1967).

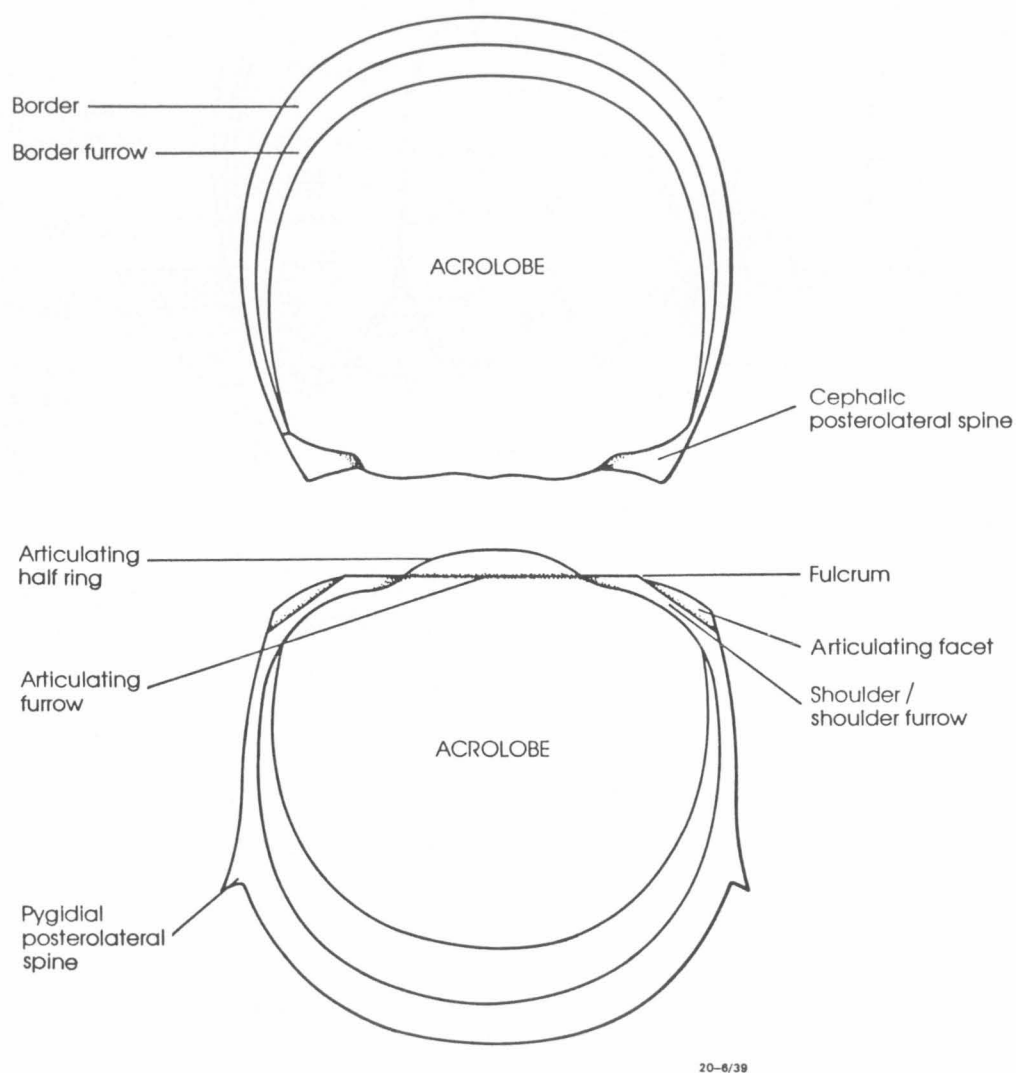


FIGURE 1. Agnostoid terminology 1. General features.

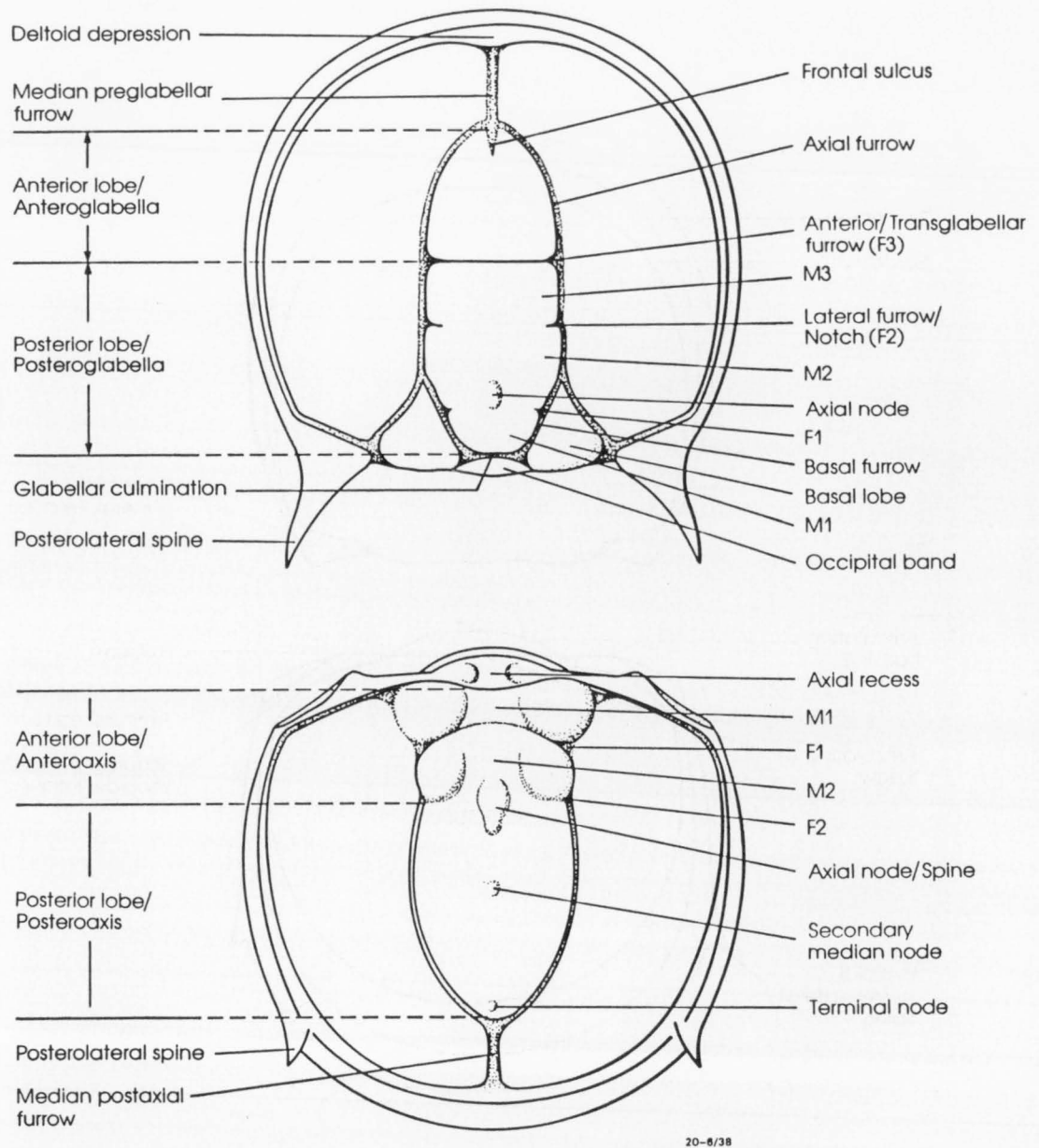
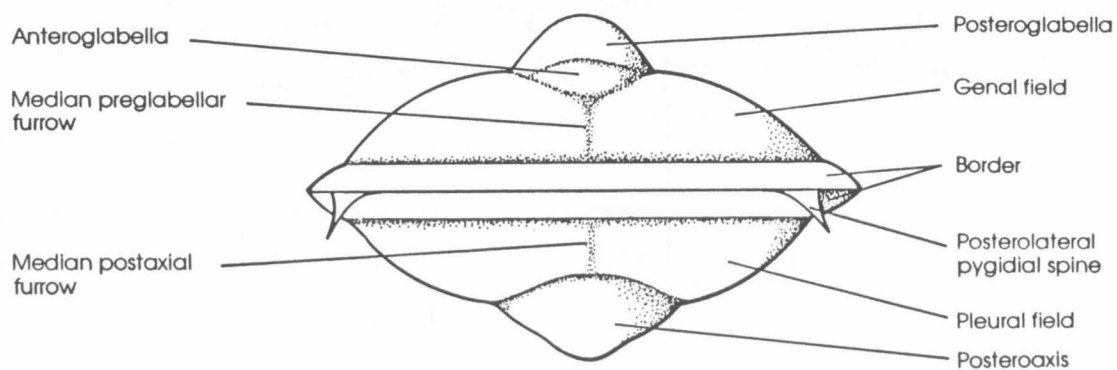
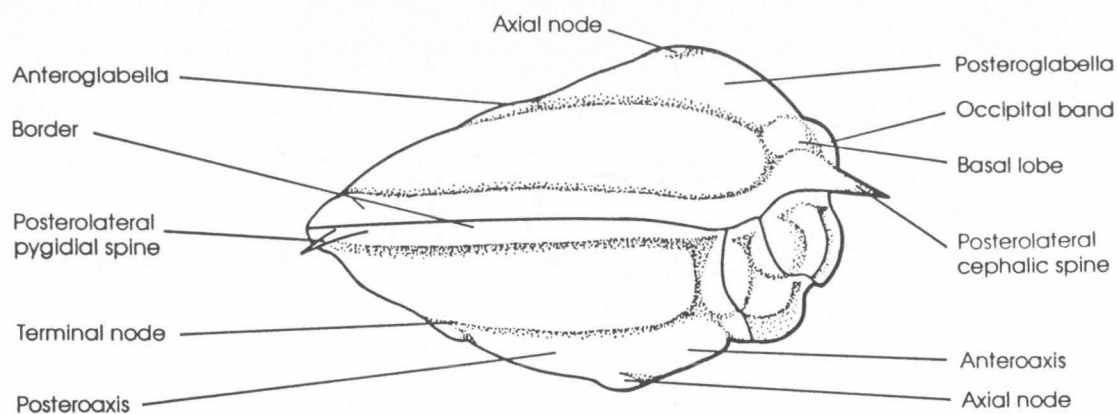
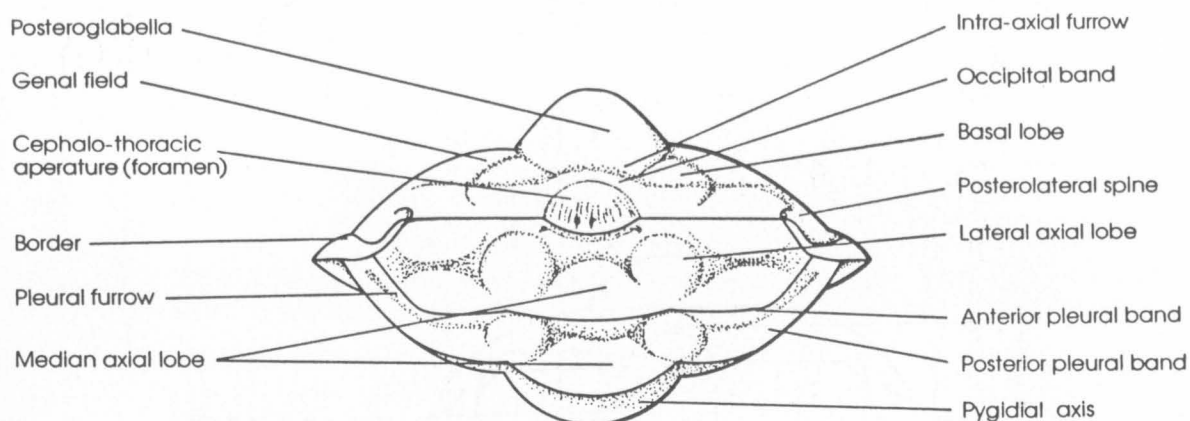
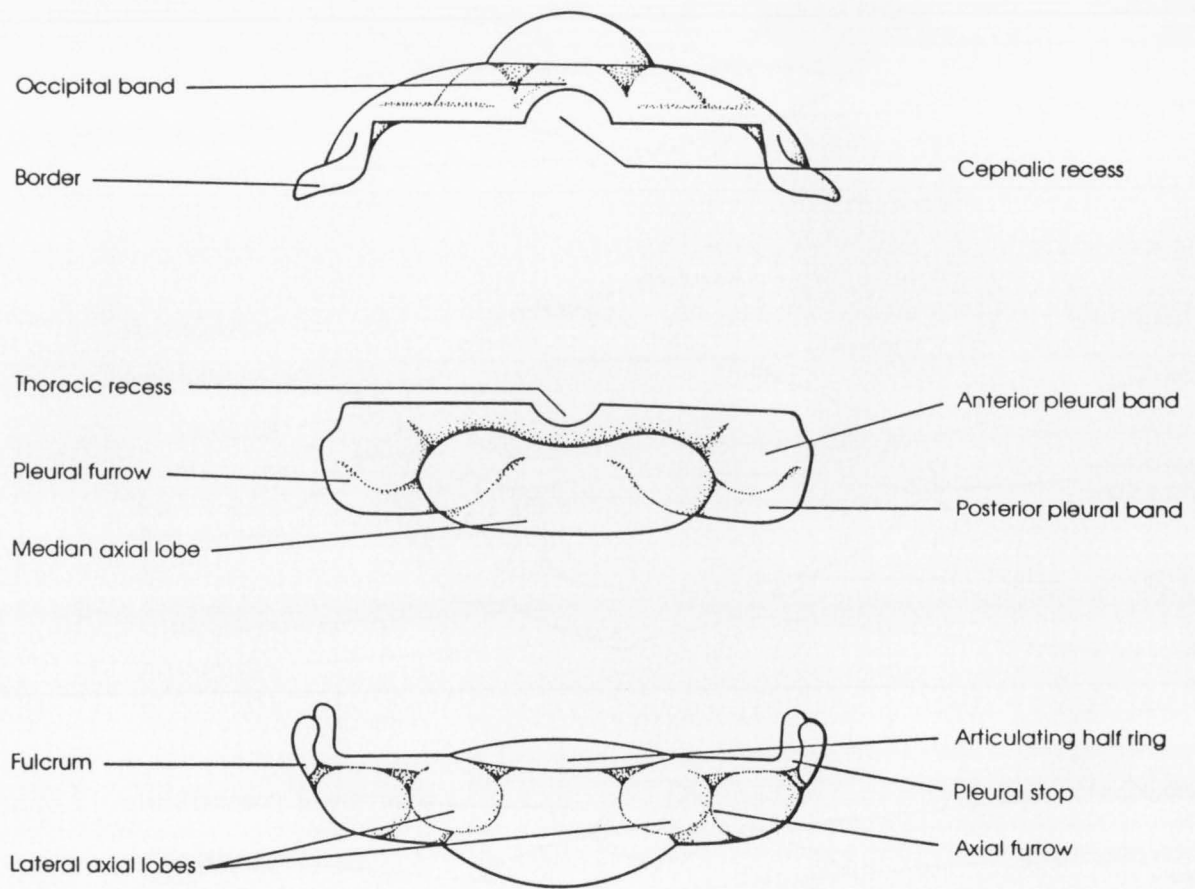


FIGURE 2. Agnostoid terminology 2. External axial features.



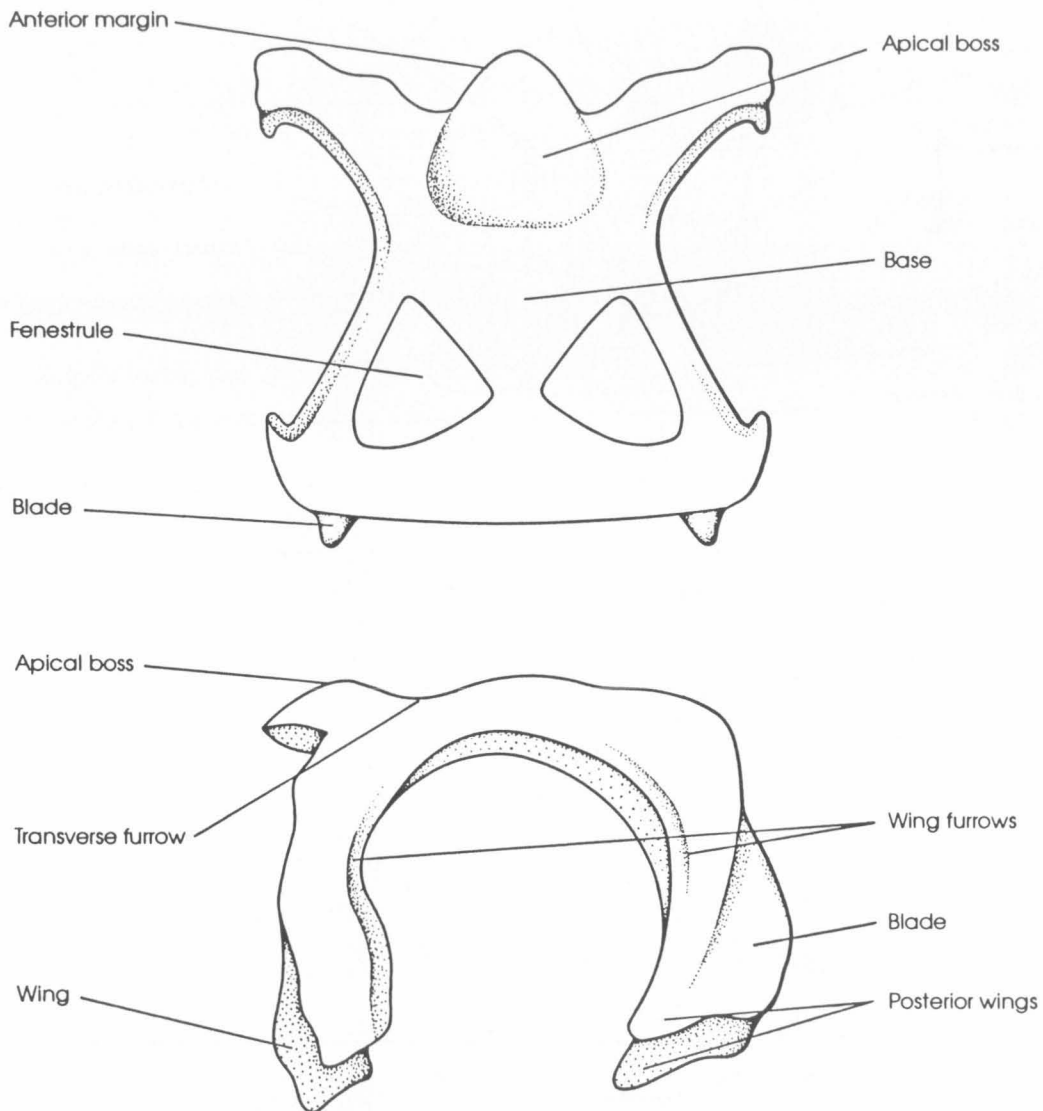
20-6/40

FIGURE 3. Agnostoid terminology 3. Enrollment features.



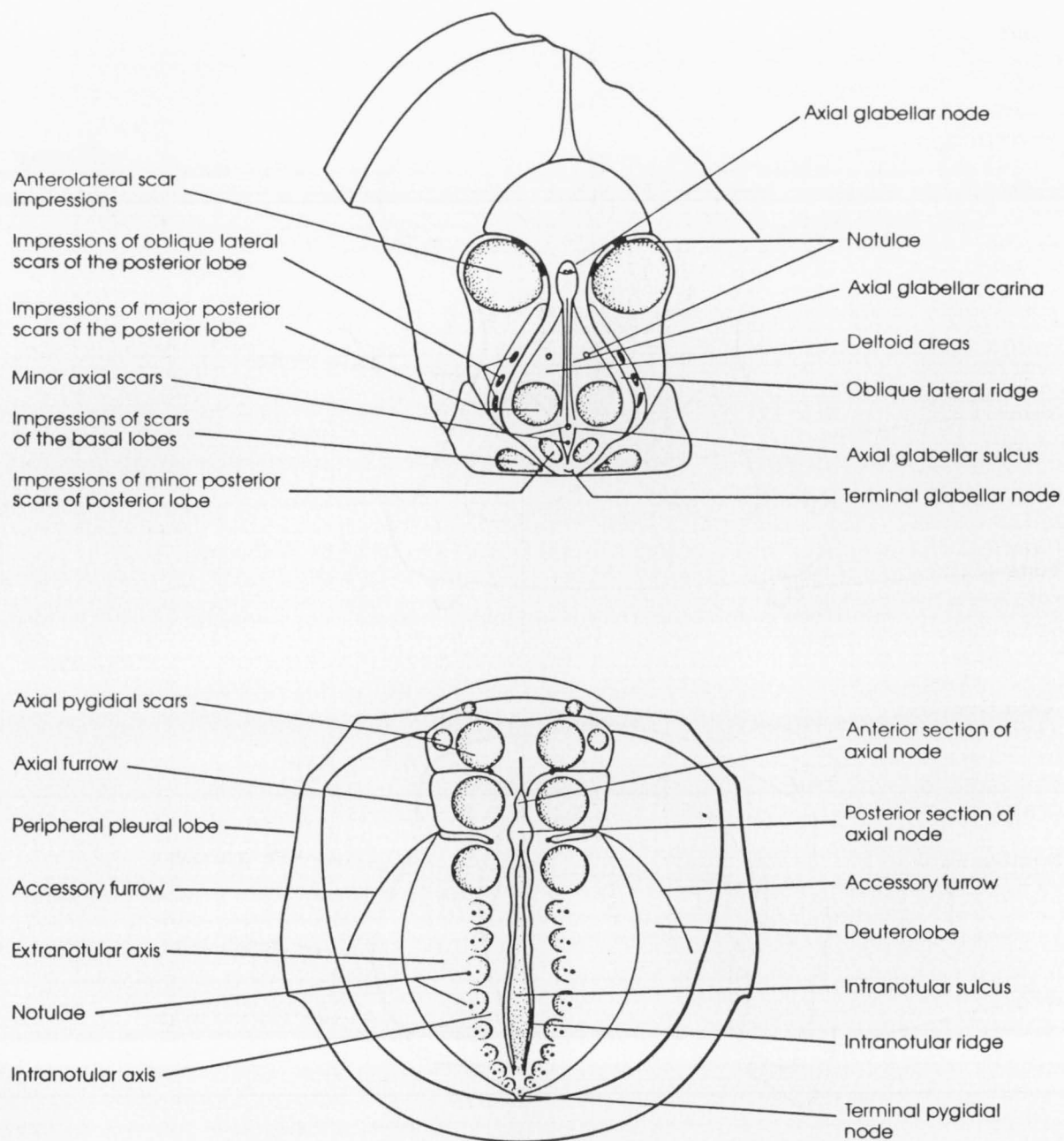
20-8/41

FIGURE 4. Agnostoid terminology 4. Features of the thoracic segments.



20-8/43

FIGURE 5. Agnostoid terminology 5. Features of the hypostome.



20-8/42

FIGURE 6. Agnostoid terminology 6. Internal axial features.



## TIMESCALES AND AUSTRALIAN AGNOSTOID BIOCHRONOLOGY

Biochronological divisions of the Cambrian Period are currently being assessed by the International Commission on Stratigraphy (ICS), Subcommission on Cambrian Stratigraphy through the agency of the Cambrian Correlations Working Group. Other Working Groups have been established to make decisions on the duration and definition of the Period. Biochronological divisions in use now are essentially regionally based. Although there is no international agreement on the correlation of these regional stratigraphies, bioevents of global distribution permit the recognition of a limited number of data points about which there is little, if any, disagreement (e.g. Robison et al., 1976), and these are used here as a basis for the subdivisions and preliminary correlation adopted on Figure 7.

Within these divisions, intensively studied regional biostratigraphic schemes act as interim standards, e.g. the archaeocyathan based Early Cambrian of the Siberian Platform, which appears to be applicable in other regions of extensive shelf carbonate deposition; and the Late Cambrian carbonate sequences of the Laurentian Platform. The agnostoid trilobite based Middle Cambrian of the Baltic Platform, associated with widespread oceanic anoxia and global sea level fluctuations, is widely recognisable; and similarly the outer shelf olenoid based biostratigraphy of the same region, although with more limited spatial distribution. In between these "standards" are the Middle and Late Cambrian shelf sequences of the Australo-Sinian Platform and southern Kazakhstan (Fig. 7).

During the Cambrian, from approximately late in the Olenellus Zone of North America (latest Early Cambrian), agnostoid trilobites evolved rapidly, and by the beginning of the Middle Cambrian had diversified into virtually all marine environments. These facts make them ideal index fossils, especially for the Middle Cambrian, when they attain the same importance as the graptolites during the Ordovician, and ammonites during the Jurassic among other macrofossil groups. Hence, the stratigraphic distribution of Cambrian agnostoid genera classified here is highly resolved and can be documented at local zonal and regional stadial levels. The chron represented by a Cambrian agnostoid zone may be very brief: according to Kobayashi (1949), the *Glyptagnostus*

*reticulatus* Zone represents a "world instant". While agnostoid trilobites do cross the Cambrian-Ordovician boundary, and are represented throughout the Ordovician, their evolutionary rate has apparently diminished and their distribution is significantly more circumscribed. Some 19 Ordovician agnostoids are recognised in this report. Although they frequently range through long intervals, and many have an extremely wide geographical distribution, they can be quite localised both spatially and temporally. Thus, *Corrugatagnostus* occurs in the latest Cambrian-early Tremadoc in such disparate places as Argentina, the Altai mountains of southern Siberia, and Zhejiang Province of eastern China. It also occurs during Arenig-Llanvirn time in England and France, but during the subsequent Ordovician (Llanvirn - Ashgill) extends its geographic range to include Ireland, Scotland, Poland, Czechoslovakia, Uzbekistan, Kazakhstan and Jiangsu Province of China. Such intermittency mitigates against the wide use of agnostoids in Ordovician biostratigraphic schemes, and the Ordovician Period is significantly less highly resolved in terms of agnostoid biochronology. Accordingly, we have documented Ordovician agnostoid genera only to local stadial level, but have used the classical British Series divisions of the Ordovician as global standards. For correlation of this scheme with North American and Australian stratigraphic nomenclature we follow Webby & Nicoll (1989).

Since such a relatively large proportion of known agnostoid genera occur in the Cambrian sedimentary sequences of Australia they have been utilised biostratigraphically wherever possible to provide the basis of biochronology (Figure 8). They are extremely important in the Middle Cambrian and Early Late Cambrian, when their stratigraphic distributions can be keenly related to Scandinavia (Öpik, 1968, 1979) and elsewhere. Their distribution in the Late Cambrian of northern Australia has been previously indicated (Shergold, 1977) and it is possible to recognise a sequence of assemblage-zones characterised by Pseudagnostinae in particular in the Georgina Basin which has been replicated in southern Kazakhstan (Ergaliev, 1980; 1983). In Figure 8 the ranges of all known Middle and Late Cambrian genera are plotted following Shergold (1989). Australian Ordovician occurrences are limited to just two genera.

20-6/44

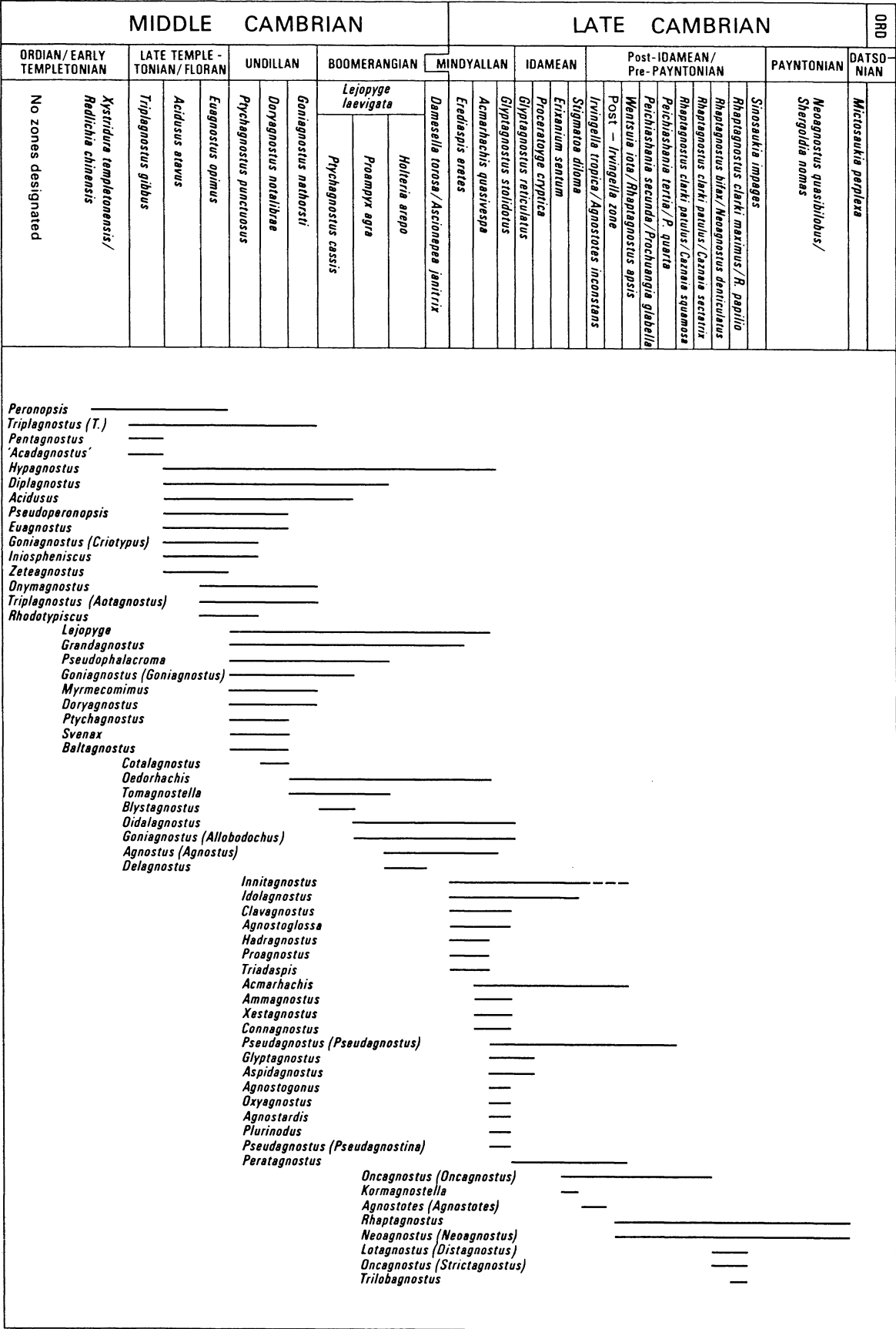


FIGURE 8. Ranges of all known Middle and Late Cambrian Agnostida in Australia

# **REPOSITORIES CONTAINING TYPE MATERIAL OF AGNOSTIDA**

AM - Australian Museum, Sydney, Australia

BMNH - British Museum (Natural History), London, U.K.

BMR - Bureau of Mineral Resources, Canberra, ACT, Australia

BU - Department of Geology, Birmingham University, Birmingham, U.K.

CAGC - Chinese Academy of Geological Sciences, Beijing, China

CNIGR - Central Scientific Research Geological Exploration Museum (Chernyshev Museum), Leningrad, USSR

GIN - Geological Institute, USSR Academy of Sciences, Moscow, USSR

GMAN - Geological Museum, Geological Institute, Kazakhstan Academy of Sciences, Alma Ata, Kazakhstan

GMI - Geological Institute Museum, Department of Historical Geology, University of Lund, Lund, Sweden

GSC - Geological Survey of Canada, Ottawa, Canada

GSM - Geological Survey Museum, London, U.K.

HBG - Hunan Provincial Bureau of Geology, Changsha, Hunan, China

HMB - Museum for Natural Science, Humboldt-University, Berlin, DDR

IGiG - Institute of Geology and Geophysics, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan, USSR

KazIMS - Kazakhstan Scientific Research Institute of Mineral Resources, Alma Ata, Kazakhstan, USSR

LGSB - Laboratory of Geology, Sorbonne, Paris, France

LU - Department of Geology and Mineralogy, Laval University, Quebec, Canada

MCZ - Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA

MMG - Museum of the Ministry of Geology,

Tashkent, Uzbekistan, USSR

MMK - Geological Museum, Copenhagen University, Copenhagen, Denmark

MR - Regional Museum of B. Horák, Rokycany, Czechoslovakia

NIGP - Nanjing Institute of Geology and Palaeontology, Academia Sinica, Nanjing, China

NMI - National Museum of Ireland, Dublin, Eire

PMO - Palaeontological Museum, University of Oslo, Oslo, Norway

PMU - Palaeontological Museum, Uppsala University, Uppsala, Sweden

PU - Department of Geology, Princeton University, New Jersey, USA

RM - Swedish Museum of Natural History, Stockholm, Sweden

SBNM - National Museum of Natural History, National Museum, Prague, CSSR

SGU - Swedish Geological Survey, Uppsala, Sweden

SM - Sedgwick Museum, Department of Earth Sciences, University of Cambridge, Cambridge, U.K.

SMF - Senckenberg Museum, Frankfurt-a-M., DBR

TsGM - Central Scientific and Geological Museum, Novosibirsk, USSR

UBA - Department of Geology, University of Buenos Aires, Buenos Aires, Argentina

UM - Department of Geology, University of Montpellier, Montpellier, France

UMC - University of Missouri-Columbia, Columbia, Missouri, USA

UQ - Department of Geology, University of Queensland, Brisbane, Australia

USNM - U.S. National Museum, Washington, D.C., USA

UTGD - Department of Geology, University of Tasmania, Hobart, Australia

XIGMR - Xinjiang Institute of Geology and Mineral Resources, Xinjiang Uygur Autonomous

Region, Urumqi/Chinese Academy of Geological  
Sciences, Beijing, China

ZSGU - West Siberian Research Institute for  
Geology, Geography and Mineral Resources,  
Novokuznetsk, USSR

## TAXONOMIC LISTING OF ORDER AGNOSTIDA

### ORDER AGNOSTIDA Salter, 1864

#### SUPERFAMILY AGNOSTOIDEA M'Coy, 1849

##### AGNOSTIDAE M'Coy, 1849

- = Micragnostidae Howell, 1935
- = Glyptagnostidae Whitehouse, 1936
- = Hastagnostidae Howell, 1937
- = Rudagnostidae Lermontova, 1951

##### AGNOSTINAE M'Coy, 1849

- AGNOSTUS Brongniart, 1822
- AGNOSTUS (AGNOSTUS) Brongniart, 1822
- = Battus Dalman, 1827
- AGNOSTUS (HOMAGNOSTUS) Howell, 1935
- ACUTATAGNOSTUS Ergaliev, 1980
- ?GYMNAGNOSTUS Robison & Pantoja-Alor, 1968
- INNITAGNOSTUS Öpik, 1967
- ?IVSHINAGNOSTUS Ergaliev, 1980
- LOTAGNOSTUS Whitehouse, 1936
- LOTAGNOSTUS (LOTAGNOSTUS) Whitehouse, 1936
- LOTAGNOSTUS (EOLOTAGNOSTUS) Zhou, 1982
- LOTAGNOSTUS (DISTAGNOSTUS) Shergold, 1972
- MICRAGNOSTUS Howell, 1935
- ONCAGNOSTUS Whitehouse, 1936
- ONCAGNOSTUS (ONCAGNOSTUS) Whitehouse, 1936
- = Eurudagnostus Lermontova, 1951
- ONCAGNOSTUS (STRICTAGNOSTUS) Shergold, 1975
- ONCAGNOSTUS (KYMAGNOSTUS) Hohensee, 1989
- TRILOBAGNOSTUS Harrington, 1938
- = Rudagnostus Lermontova, 1951

##### AMMAGNOSTINAE Öpik, 1967

- AMMAGNOSTUS Öpik, 1967
- AMMAGNOSTUS (AMMAGNOSTUS) Öpik, 1967
- = Glyptagnostus (Lispagnostus) Öpik, 1967
- = Agnostoglossa Öpik, 1967
- AMMAGNOSTUS (TENTAGNOSTUS) Sun X.-W., 1989
- FORMOSAGNOSTUS Ergaliev, 1980
- = Kunshanagnostus Qian & Zhou, 1984
- HADRAGNOSTUS Öpik, 1967
- ?KORMAGNOSTELLA Romanenko, 1967
- = Litagnostoides Schrank, 1975
- KORMAGNOSTUS Resser, 1938
- PROAGNOSTUS Butts, 1926
- = Agnostascus Öpik, 1967
- = Agnotascus (Paragnostascus) Peng, 1987

##### GLYPTAGNOSTINAE Whitehouse, 1936

- GLYPTAGNOSTUS Whitehouse, 1936
- = Barrandagnostus Ivshin, 1960
- AGNOSTARDIS Öpik, 1963

##### SUBFAMILIAE INCERTAE SEDIS

- ACMARHACHIS Resser, 1938
- = Cyclagnostus Lermontova, 1940
- = Wanagnostus Qiu, 1983

AISTAGNOSTUS Xiang & Zhang, 1985  
 CONNAGNOSTUS Öpik, 1967  
 ?IDOLAGNOSTUS Öpik, 1967  
 QUADRAHOMAGNOSTUS Chu, 1959

PTYCHAGNOSTIDAE Kobayashi, 1939  
 = Triplagnostinae Kobayashi, 1939  
 = Lejopyginae Harrington in Kobayashi, 1939  
 = Tomagnostinae Kobayashi, 1939  
 = Canotagnostidae Rusconi, 1951  
   PTYCHAGNOSTUS Jaekel, 1909  
   ACIDUSUS Öpik, 1979  
     =?Canotagnostus, Rusconi, 1951  
   GONIAGNOSTUS Howell, 1935  
     =Huaragnostus Rusconi, 1950  
   GONIAGNOSTUS (GONIAGNOSTUS) Howell, 1935  
   GONIAGNOSTUS (ALLOBODOCHUS) Öpik, 1979  
   GONIAGNOSTUS (CRIOTYPUS) Öpik, 1979  
   LEJOPYGE Hawle & Corda, 1847  
     =Miagnostus Jaekel, 1909  
     =Pseudophalacroma Pokrovskaya, 1958  
   MYRMECOMIMUS Öpik, 1979  
   ONYMAGNOSTUS Öpik, 1979  
     =Onymagnostus (Agnostonymus) Öpik, 1979  
   PENTAGNOSTUS Lermontova, 1940  
   TOMAGNOSTUS Howell, 1935  
   TRIPLAGNOSTUS Howell, 1935  
   TRIPLAGNOSTUS (TRIPLAGNOSTUS) Howell, 1935  
     =Solenagnostus, Whitehouse, 1936  
   TRIPLAGNOSTUS (AOTAGNOSTUS) Öpik, 1979  
   ZETEAGNOSTUS Öpik, 1979

SPINAGNOSTIDAE Howell, 1935  
 = Quadragnostidae Howell, 1935, sensu Öpik, 1961  
 = Cyclopagnostidae Howell, 1937  
   SPINAGNOSTINAE Howell, 1935  
     =Cyclopagnostinae Howell, 1937  
     =Hypagnostinae Ivshin, 1953  
     =Euagnostinae Öpik, 1979  
       HYPAGNOSTUS Jaekel, 1909  
       =Spinagnostus Howell, 1935  
       =Cyclopagnostus Howell, 1937  
       =Hypagnostus (Breviagnostus) Liu, 1982  
       =Hypagnostus (Metahypagnostus) Qiu, 1983  
       COTALAGNOSTUS Whitehouse, 1936  
       EOAGNOSTUS Resser & Howell, 1938  
       EUAGNOSTUS Whitehouse, 1936  
       MICAGNOSTUS Hairullina, 1975  
       PERATAGNOSTUS Öpik, 1967  
       RARAGNOSTUS Hairullina, 1975  
       SVENAX Öpik, 1979  
       TOMAGNOSTELLA Kobayashi, 1939  
   DORYAGNOSTINAE Nov.  
     DORYAGNOSTUS Kobayashi, 1939  
     =Ceratagnostus Whitehouse, 1939  
     ITAGNOSTUS Öpik, 1979  
     RHODOTYPISCUS Öpik, 1979  
 SUBFAMILY INCERTAE SEDIS  
   PSEUDOPERONOPSIS Harrington, 1938

PERONOPSIDAE Westergård, 1936

- PERONOPSIS Hawle & Corda, 1847  
 = Mesospheniscus Hawle & Corda, 1847  
 = Mesagnostus Jaekel, 1909  
 DIPLORRHINA Hawle & Corda, 1847  
 GRATAGNOSTUS Hairullina, 1975  
 PERONOPSELLA Sdzuy, 1967
- DIPLAGNOSTIDAE Whitehouse, 1936  
 DIPLAGNOSTINAE Whitehouse, 1936  
 DIPLAGNOSTUS Jaekel, 1909  
 = Enetagnostus Whitehouse, 1936  
 BALTAGNOSTUS Lochman, 1944  
 DOLICHAGNOSTUS Pokrovskaya, 1958  
 ?INIOSPHENISCUS Öpik, 1979  
 LINGUAGNOSTUS Kobayashi, 1939  
 OEDORHACHIS Resser, 1938  
 TASAGNOSTUS Jago, 1976  
 OIDALAGNOSTINAE Öpik, 1967  
 OIDALAGNOSTUS Westergård, 1946  
 = Ovalagnostus Lu, 1974  
 CRISTAGNOSTUS Rushton, 1978  
 PSEUDAGNOSTINAE Whitehouse, 1936  
 PSEUDAGNOSTUS Jaekel, 1909  
 = Plethagnostus Clark, 1923  
 PSEUDAGNOSTUS (PSEUDAGNOSTUS) Jaekel, 1909  
 PSEUDAGNOSTUS (PSEUDAGNOSTINA) Palmer, 1962  
 PSEUDAGNOSTUS (SULCATAGNOSTUS) Kobayashi, 1937  
 ?AGNOSTOTES Öpik, 1963  
 AGNOSTOTES (AGNOSTOTES) Öpik, 1963  
 AGNOSTOTES (PSEUDOGLYPTAGNOSTUS) Lu, 1964  
 = Glyptagnostotes Lazarenko, 1966  
 DENAGNOSTUS Jago, 1987  
 LITAGNOSTUS Rasetti, 1944  
 NEOAGNOSTUS Kobayashi, 1955  
 NEOAGNOSTUS (NEOAGNOSTUS) Kobayashi, 1955  
 = Pseudorhaptagnostus Lermontova, 1940  
 = Euplethagnostus Lermontova, 1940  
 = Hyperagnostus Kobayashi, 1955  
 = Tarayagnostus Suarez-Soruco, 1975  
 = Calagnostus Zhang & Wang, 1985  
 NEOAGNOSTUS (MACHAIRAGNOSTUS) Harrington & Leanza, 1957  
 OXYAGNOSTUS Öpik, 1967  
 RHAPTAGNOSTUS Whitehouse, 1936  
 TRISULCAGNOSTUS Ergaliev, 1980  
 = Pseudagnostus (Tririmagnostus) Qiu, 1983  
 XESTAGNOSTUS Öpik, 1967
- CLAVAGNOSTIDAE Howell, 1937  
 = Acanthagnostidae Qian, 1982  
 CLAVAGNOSTINAE Howell, 1937  
 CLAVAGNOSTUS Howell, 1937  
 = Tomorhachis Resser, 1938  
 = Culipagnostus Rusconi, 1952  
 = Stigmagnostus Poulsen, 1960  
 = Acanthagnostus Qian, 1982  
 ASPIDAGNOSTINAE Pokrovskaya, 1960  
 ASPIDAGNOSTUS Whitehouse, 1936  
 = Biragnostus Pokrovskaya, 1960  
 TRIADASPIS Öpik, 1967  
 SUBFAMILIAE INCERTAE SEDIS  
 UTAGNOSTUS Robison, 1964

## METAGNOSTIDAE Jaekel, 1909

=Trinodidae Howell, 1935

=Geragnostidae Howell, 1935

=Arthrorhachidae Raymond, 1913

ARTHRORHACHIS Hawle &amp; Corda, 1847

=Metagnostus Jaekel, 1909

=Girvanagnostus Kobayashi, 1939

ANGLAGNOSTUS Howell, 1935

CHATKALAGNOSTUS Hairullina &amp; Abdullaev, 1970

=Oculagnostus Ahlberg, 1988

CORRUGATAGNOSTUS Kobayashi, 1939

=Segmentagnostus Pek, 1977

=Granulatagnostus Kolobova, 1981

DIVIDUAGNOSTUS Koroleva, 1982

=Peziziopsis Ju, 1983

GALBAGNOSTUS Whittington, 1965

GERAGNOSTELLA Kobayashi, 1939

GERAGNOSTUS Howell, 1935

=Geratrinodus Kobayashi &amp; Hamada, 1978

=Neptunagnostella Pek, 1977

GRANULOAGNOSTUS Pek, 1970

TRINODUS M'Coy, 1846

## FAMILIAE INCERTAE SEDIS

ACADAGNOSTUS Kobayashi, 1939

AGNOSTOGONUS Öpik, 1967

ARCHAEAGNOSTUS Kobayashi, 1939

ARMAGNOSTUS Howell, 1937

BLYSTAGNOSTUS Öpik, 1961

CICERAGNOSTUS Kobayashi, 1937

DELAGNOSTUS Öpik, 1961

GALLAGNOSTUS Howell, 1935

GLABERAGNOSTUS Romanenko, 1985

GRANDAGNOSTUS Howell, 1935

HASTAGNOSTUS Howell, 1937

HOMAGNOSTOIDES Kobayashi, 1939

LEIAGNOSTUS Jaekel, 1910

=Phoidagnostoides Pillet, 1978

MONAXAGNOSTUS Liu, 1982

PHALAGNOSTUS Howell, 1955

=Phalacromina Kobayashi, 1962

PHALDAGNOSTUS Ivshin, 1960

PHOIDAGNOSTUS Whitehouse, 1936

PLURINODUS Öpik, 1967

QUADRAGNOSTUS Howell, 1935

SKRYJAGNOSTUS Snajdr, 1957

TORAGNOSTUS Robison, 1988

VALENAGNOSTUS Jago, 1976

## SUPERFAMILY CONDYLOPYGOIDEA Raymond, 1913

CONDYLOPYGIDAE Raymond, 1913

CONDYLOPYGE Hawle &amp; Corda, 1847

=Paragnostus Jaekel, 1909

=Fallagnostus Howell, 1935

PLEUROCTENIUM Hawle &amp; Corda, 1847

=Dichagnostus Jaekel, 1909

## SUPERFAMILIAE INCERTAE SEDIS

PHALACROMIDAE Hawle &amp; Corda 1847

=Platagnostidae Howell, 1935



PHALACROMA Hawle & Corda, 1847

=Platagnostus Howell, 1935

DIGNAGNOSTUS Hairullina, 1975

LISOGORAGNOSTUS Rozova, 1988

SPHAERAGNOSTIDAE Kobayashi, 1939

SPHAERAGNOSTUS Howell & Resser, 1936

#### NOMINA NUDA

KITATAGNOSTUS Petrunina, 1966

PARAPSEUDAGNOSTUS Petrunina, 1966

PSEUDAGNOSTELLA Koroleva, 1982

#### REJECTED GENERA

DISCAGNOSTUS Öpik, 1963 {Eodiscida}

GALLAGNOSTOIDES Kobayashi, 1939

MALLAGNOSTUS Howell, 1935 {Eodiscida}

PSEUDOTRINODUS Kobayashi & Hamada, 1971

## SYSTEMATIC CLASSIFICATION OF AGNOSTIDA

In the following, genera found in Australia are in the larger of the two type faces.

**Order AGNOSTIDA** Salter, 1864  
[nom. correct. pro Agnostini Salter, 1864]

[= Superfamily Agnostacea M'Coy, 1849; Superfamily Eodiscidea Richter, 1932 (partim); Suborder Agnostida Whitehouse, 1936; Subclass Agnostia (Crustacea) Resser, 1938; Superfamily Agnostidea Richter & Richter, 1941 (partim); Superfamily Agnostidea Westergård, 1946 (partim); Order Agnostida Rasetti, 1948; Superfamily Agnostacea Henningsmoen, 1951 (partim); Superfamily Agnostoidae Hupé, 1953; Suborder Agnostina Moore in Harrington et al., 1959; Superfamily Agnostacea Bergström, 1973; Order Agnostida Robison, 1984]

[Type: *Agnostus* Brongniart, 1822]

Diminutive, eyeless, lacking facial suture, isopygous trilobites having two thoracic segments, 2-3 segments in the pygidial anteroaxis, 3-8 additionally in fused complex posteroaxis of variable geometry and constitution; unsegmented cephalic and pygidial acrolobes; cephalon and thorax articulating without overlap, lacking articulating half-ring on anterior thoracic segment, commonly possessing cephalothoracic aperture; cephalothoracic articulation by way of hingeing on the pleural fulcra and the geniculation point, lacking cephalic genal spines; hypostome detached, having long, addorsally directed anterior and posterior wings.

Early Cambrian - Late Ordovician

**Superfamily AGNOSTOIDEA** M'Coy, 1849  
[nom. transl. herein = subfam. Agnostinae M'Coy, 1849]

Agnostida possessing basal glabellar lobes repeated in the lateral axial lobe of each thoracic segment.

Early Cambrian - Late Ordovician

**Family AGNOSTIDAE** M'Coy, 1849  
[= Micragnostidae Howell, 1935; Glyptagnostidae Whitehouse, 1936; Hastagnostidae Howell, 1937; Rudagnostidae Lermontova, 1951]

En grande tenue to effaced, with nondeliquiate to deliquiate border furrows, a narrow cephalic

border and pygidial border of variable width; acrolobes usually unconstricted; preglabellar median furrow absent to well developed. Glabella with variably shaped anterior lobe; F3 straight or curved; F2 absent to well developed, glabellar culmination rounded, subquadrate or obtusely angular; glabellar node from midway between F1 and F2 to in front of F2; basal lobes variable in size, usually simple, occasionally incorporating lateral portions of M2 lobe. Pygidium with agnostoid, glyptagnostoid or basic articulating device; usually long axis, commonly reaching border furrow, commonly constricted across M2; F1 variably impressed or effaced; M1 usually trilobate; F2 variably impressed or effaced; posterior lobe usually long, semioval, ogival, semicircular or bulbous, commonly with either secondary axial node in posterior half, or with terminal node.

Middle Cambrian - Early Ordovician.

**Subfamily AGNOSTINAE** M'Coy, 1849

En grande tenue to largely effaced, nondeliquiate to deliquiate border furrows; acrolobes usually unconstricted; preglabellar median furrow absent to well developed. Glabella with large ogival, semioval, subpentagonal, subquadrate or trapeziform anterior lobe; F3 straight to concave forward; F2 absent to well developed; glabellar culmination variably rounded, subquadrate or obtusely angular; glabellar node from midway between F1 and F2 to level with F2; basal lobes variable in size, usually simple, occasionally incorporating lateral portions of M2 lobe. Pygidium bispinose or nonspinoso, with agnostoid or basic articulating device; axis usually long, not reaching border furrow, with a slight constriction across M2; F1 variably impressed, rarely effaced; M1 usually trilobate; F2 variably impressed, rarely effaced; posterior lobe usually long, semioval, ogival, semicircular or bulbous, with or without terminal node.

Middle Cambrian - Early Ordovician (*L. laevigata* - *Didymograptus bifidus* Zones).

**AGNOSTUS** Brongniart, 1822

*Entomostracites pisiformis* Wahlenberg, 1818, p.42, SD Jaekel, 1909, p.399.  
Lectotype, selected herein, cephalon (Wahlenberg, 1818, pl.1, fig.5), Vg 819, PMU, Uppsala.

En grande tenue; generally with relatively narrow borders and deliquiate to nondeliquiate border furrows; unconstricted or weakly constricted acrolobes. Cephalon with median preglabellar furrow; ogival or rounded anterior glabellar lobe;

posterior lobe tapering forward; axial node level with or slightly behind variably developed F2; basal lobes variable in size. Pygidium with long (sag.), variably wide (tr.) and tumid axis, usually not reaching border furrow, F1 and F2 well developed or effaced, lacking postaxial median furrow; marginal spines present.

Late Middle Cambrian - early Late Cambrian (*L. laevigata* - *O. cataractes* Zones). Cosmopolitan.

**AGNOSTUS (AGNOSTUS)** Brongniart, 1822 (fig. 9.1a,b)  
[=*Battus* Dalman, 1828]

With deliquate or subdeliquate border furrows in both shields. Cephalon with ogival anterior glabellar lobe, basal lobes of moderate to large size. Pygidium with long (sag.), relatively narrow (tr.), posteriorly pointed or narrowly rounded axis; F1 and F2 very weak or effaced.

Late Middle Cambrian - early Late Cambrian. Sweden, Norway, Denmark, England, Wales & Canada (New Brunswick, Newfoundland), *L. laevigata* - *A. pisiformis* Zones; Australia (Queensland), *E. eretes* Zone; Argentina, late Middle Cambrian.

**AGNOSTUS (HOMAGNOSTUS)** Howell, 1935 (fig. 9.2)

*Agnostus pisiformis* Linnaeus var. *obesus* Belt, 1867, p.294, OD Howell, 1935

Lectotype (SD Rushton in Allen et al., 1981, pl.16, fig.2), I.7646 (Belt, 1867, pl.12, fig.4a), BMNH, London.

With nondeliquate to subdeliquate border furrows in both shields. Cephalon with ogival or rounded anterior glabellar lobe; basal lobes of moderate size. Pygidium with broad (tr.), posteriorly broadly rounded axis extending nearly to posterior border furrow. Axis constricted across M2 with posterior lobe variably but always laterally expanded. F2 well developed, F1 always impressed laterally and only occasionally impressed medially; M1 variably tripartite.

Late Cambrian. England & Wales, *O. gibbosus* - *O. cataractes* Subzones; Sweden, Norway, Denmark, *Olenus* Zone; USSR (Novaya Zemlya, Yakutia, Altay Mts, Kazakhstan), *Pedinocephalina/Toxotis* - *Irvingella* Zones; China (Shandong, Liaoning) & S. Korea, *Chuangia* Zone; Australia (Queensland), *G. reticulatus* Zone; USA (Alaska, Texas, Nevada, Wyoming), *Aphelaspis* - *Elvinia* Zones; Canada (Newfoundland), *Olenus* Zone.

**ACUTATAGNOSTUS** Ergaliev, 1980

*Acutatagnostus acutatus* Ergaliev, 1980, p.91, OD.

Holotype (Ergaliev, 1980, pl.11, fig.16), No.1950/184, GMAN, KazSSR, Alma-Ata.

Like *Innitagnostus* but with preglabellar median furrow only evident proximally; long, ogival anterior glabellar lobe, well developed F2 but weak F1. Pygidium with retrally located spines; long axis extending almost to posterior border furrow; M1 and M2 clearly trilobate; F1 only laterally impressed.

Late Cambrian (Sakskian). USSR (Kazakhstan), *H. longiformis* & *P. curtare* Zones.

?**GYMNAGNOSTUS** Robison & Pantoja-Alor, 1968 (fig. 9.6a,b)

*Gymnagnostus gongros* Robison & Pantoja-Alor, 1968, p.776, OD.

Holotype (Robison & Pantoja-Alor, 1968, pl.97, fig.29), No.158892, USNM, Washington.

Almost effaced, but cephalon has retained very narrow borders, a faint axial glabellar node and partly outlined basal lobes; pygidium with broader border, faintly constricted acrolobe, weakly defined axial furrows and terminal node indicative of short axis, prominent axial node, advanced posterolateral spines.

Early Ordovician. Mexico, *Cordylodus proavus* Zone (Tremadoc).

**INNITAGNOSTUS** Öpik, 1967 (fig. 9.3a,b)

*Innitagnostus innitens* Öpik, 1967, p.98, OD.

Holotype (Öpik, 1967, pl.58, fig.2), CPC 5853, BMR, Canberra.

En grande tenue, usually nonscrobiculate, with nondeliquate border furrows, narrow borders and unconstricted acrolobes. Preglabellar median furrow variably developed. Glabella with broad, trapeziform anterior lobe; F3 well impressed, nearly straight; posterior lobe with well developed F1 and F2; lateral portions of M2 commonly separated from midmost glabella by weak longitudinal (exsag.) furrows; glabellar node located from midway between F1 and F2 to level with F2. Basal lobes of moderate size, trapezoidal. Pygidial axis of moderate length, constricted across M2; M1 trilobate; F1 well impressed, bent forward; F2 straight laterally, bent rearward by strong axial node. Posterior lobe ogival to semioval, usually narrowly rounded posteriorly, not reaching border furrow. Postaxial median furrow absent.

Late Cambrian (Mindyallan - Idamean). Australia (Queensland), *E. eretes* - *S. diloma* Zones; China (Guizhou, Hunan), Late Cambrian; USSR (Kazakhstan, Siberia), *G. stolidotus* - *P. curtare* Zones.

?**IVSHINAGNOSTUS** Ergaliev, 1980

*Ivshinagnostus ivshini* Ergaliev, 1980, p.65, OD.

Holotype (Ergaliev, 1980, pl.13, fig.2), No.1950/204, GMAN, Alma-Ata.

En grande tenue, nonscrobiculate, with deliquate border furrows and narrow borders, unconstricted acrollobes, anteriorly expanding cephalon and posteriorly expanding pygidium; preglabellar median furrow absent. Glabella strongly tapered, with small, rounded anterior lobe; posterior lobe with F2 furrows very weak, F1 furrows weak, basal furrows weak; glabellar node a short distance behind F2 furrows; basal lobes indistinct. Pygidium bispinose; axis tapered, unconstricted, short; F1 weak; M1 weakly trilobate; F2 very weak.

Late Cambrian (Sakskian). USSR (Kazakhstan), *I. ivshini* Zone.

#### LOTAGNOSTUS Whitehouse, 1936

*Agnostus trisectus* Salter, 1864b, p.10, OD Whitehouse, 1936, p.101.

Holotype by monotypy, No.8768 (Salter, 1864b, pl.1, fig.11), GSM, London.

Variably effaced, with usually nondeliquate border furrows and unconstricted acrollobes, with or without a preglabellar median furrow. Glabella with long (sag.), semiovalate, ogival or subpentagonal anterior lobe; F3 furrow straight or bent backward; posterior lobe with well developed F2 furrows; glabellar node located from midway between F1 and F2 furrows to level with F2 furrow. Basal lobes large, triangular, in some species incorporating the narrow (tr.) portions of the M2 lobe. Pygidium bispinose, axis long (sag.), variably constricted across M2; M1 trilobate, F1 impressed at least laterally, M2 trilobate, F2 always impressed. Posterior lobe elongate, semiovalate to ogival with well developed terminal node.

Late Cambrian.

LOTAGNOSTUS (LOTAGNOSTUS) Whitehouse, 1936 (fig. 9.7a,b)

En grande tenue, commonly scrobiculate, variably deliquate. Preglabellar median furrow present. Glabella with long (sag.) subpentagonal anterior lobe; posterior lobe with F2 furrow well developed, in some species curving forward to intersect F3 furrow, isolating anterolateral lobes; glabellar node located midway between F1 and F2 furrows. Basal lobes large, triangular, in some species incorporating the narrow lateral portions of the M2 lobe. Pygidial axis weakly constricted across M2, F1 and F2 clearly impressed.

Latest Cambrian. England, Wales, *P. minor* Zone; Sweden, *P. minor* - *P. scarabaeoides* Zones; Canada (Nova Scotia, Quebec), *Peltura* Zone, (Newfoundland) Sunwaptan; China (Xinjiang, Zhejiang, Hunan, Anhui, Guizhou), *L.(L.) punctatus*, *H. regalis* Zones & correlatives; USSR (Kazakhstan), *E. scrobicularis* Zone ; USA (Vermont, Maryland); Argentina.

#### LOTAGNOSTUS (EOLOTAGNOSTUS) Zhou, 1982

*Eolotagnostus gansuensis* Zhou, 1982, p.217, OD.

Holotype (Zhou, 1982, pl.57, fig.10), Tr 008, XIGMR, Xian.

En grande tenue, cephalon weakly scrobiculate and pygidium nonscrobiculate, nondeliquate border furrows. Preglabellar median furrow absent or weakly developed. Glabella with

long (sag.) semiovalate to ogival anterior lobe; posterior lobe with F2 furrows angled slightly forward; glabellar node located midway between F1 and F2 furrows. Basal lobes large, triangular. Pygidial axis variably constricted across M2; with F1 impressed laterally, medially effaced, F2 clearly impressed.

Latest Cambrian. China (Gansu, Xinjiang, Zhejiang), *L. punctatus* - *Hedinaspis* Zone; USSR (Kazakhstan), *E. scrobicularis* Zone.

#### LOTAGNOSTUS (DISTAGNOSTUS) Shergold, 1972 (fig. 10.1a,b)

*Distagnostus ergodes* Shergold, 1972, p.17, OD.

Holotype (Shergold, 1972, pl.4, fig. 3), CPC 9667, BMR, Canberra.

Exoskeleton largely effaced with only traces of axial furrows in both cephalon and pygidium; nondeliquate border furrows; glabellar node level with F2 furrow. Pygidial axis weakly constricted across M2; F1 and F2 weakly impressed.

Latest Cambrian. Argentina; Australia (Queensland), *R. clarki maximus*/*R. papilio* - *R. bifax*/*N. denticulatus* Zones; USA (Nevada), *S. pyrene* Zone; Canada (Quebec).

#### MICRAGNOSTUS Howell, 1935

*Agnostus calvus* Lake, 1906, p.23, OD Howell, 1935b, p.233. Lectotype (SD Fortey, 1980, p.23), A548 (Lake, 1906, pl.2, fig.18), SM, Cambridge.

En grande tenue, nonscrobiculate, nondeliquate border furrows unconstricted acrollobes. Preglabellar furrow absent. Glabella with semiovalate anterior lobe, F3 straight; posterior lobe parallel-sided with F2 weakly developed or absent, glabellar culmination broadly rounded, glabellar node level with or slightly behind F2. Basal lobes small. Pygidium minutely bispinose, axis relatively short, unconstricted or weakly constricted over M2; M1 trilobate; F1 traversing axis; F2 well impressed, slightly deflected by axial node. Posterior lobe semiovalate. Postaxial median furrow absent.

Early Ordovician (Tremadoc - Arenig). Wales, Spitsbergen, *Asaphellus* - *D. bifidus* Zones; Argentina, *N. argentina* - *K. meridionalis* Zones.

#### ONCAGNOSTUS Whitehouse, 1936

*Agnostus hoi* Sun, 1924, p.28; OD Whitehouse, 1936, p.84

Lectotype (SD Sun X.-W., 1989, p.70), GSCH 515 (Sun, 1924, pl.2, fig.2c), NIGP, Nanjing.

En grande tenue, nonscrobiculate, usually with deliquate border furrows in both shields. Median preglabellar furrow absent. Glabella with semiovalate, subpentagonal or subquadrate anterior lobe; F3 straight; usually short posterior lobe with F2 variably developed; axial node level with or slightly behind F2. Pygidium bispinose with long, broad, nearly parallel-sided axis, posteriorly broadly rounded; M1 trilobate; F1 only impressed laterally, curving forwards to articulating furrow to isolate subtriangular to ovate anterolateral lobes;

F2 well developed; posterior lobe relatively short, broad, semioval to semicircular.

Late Cambrian - Early Ordovician (*G. reticulatus* - *K. meridionalis* Zones)

### ONCAGNOSTUS (ONCAGNOSTUS)

Whitehouse, 1936 (fig. 9.4a,b)

[= *Eurudagnostus* Lermontova, 1951]

Deliquate border furrows in both shields. Pygidial axis long (sag.), broad (tr.), nearly parallel-sided, posteriorly broadly rounded; posterior lobe relatively broad.

Late Cambrian (*Glyptagnostus reticulatus* - *Peltura scarabaeoides*). Sweden, *P. aciculata* Zone; USSR (Siberia, Kazakhstan), *P. pseudangustilobus* - *T. trisulcus* Zones; China (Hebei, Hunan, Liaoning), *Chuangia* - *L. bella*/*A. sinensis* Zones; S. Korea, *Chuangia* - *Eochuangia* Zones; Australia (Queensland), *S. diloma* - *R. maximus*/*R. papilio* Zones; Antarctica (N. Victoria Land), *Dunderbergia* Zone; USA (Alaska, Montana, Wyoming, Nevada, Texas), *Aphelaspis* - *Elvinia* Zones; Canada (Newfoundland), Sunwaptan.

### ONCAGNOSTUS (STRICTAGNOSTUS)

Shergold, 1975 (fig. 9.5a,b)

*Geragnostus* (*Strictagnostus*) *chronius* Shergold, 1975, p.54, OD.

Holotype (Shergold, 1975, pl.13, fig.5), CPC 11732, BMR, Canberra.

Deliquate border furrows in both shields. Cephalon anteriorly expanding, with anteriorly tapering acrolobe. Pygidium posteriorly flared with posteriorly tapering, gently constricted acrolobe; short (sag.), posteriorly tapering pygidial axis, posteriorly rounded, commonly slightly constricted at M2; short, semioval posterior lobe terminating well in advance of posterolateral spine bases.

Late Cambrian - Early Ordovician (*R. bifax*/*N. denticulatus* - *K. meridionalis* Zones). Australia (Queensland), *R. bifax*/*N. denticulatus* - *R. maximus*/*R. papilio* Zones; Argentina, Bolivia, *K. meridionalis* Zone; USA (Texas), *M. typicalis* Zone; S. Korea, *Asaphellus* Zone; China (Anhui), Late Cambrian; Afghanistan, Tremadoc; USSR (Kazakhstan), *T. trisulcus* Zone.

### ONCAGNOSTUS (KYMAGNOSTUS) Hohensee, 1989

*Kymagnostus harti* Hohensee, in Hohensee & Stitt, 1989, p.861, OD.

Holotype (Hohensee & Stitt, 1989, fig.3-1), No. 16666a, UMC, Columbia.

With nondeliquate border furrows in both shields; cephalic

border narrow; pygidial border wide, flattened. Pygidial axis long (sag.), broad (tr.), nearly parallel-sided or expanding posteriorly, axial furrows commonly effaced around posterior lobe.

Late Cambrian (*Elvinia* Zone). USA (Arkansas, Texas)

### TRILOBAGNOSTUS Harrington, 1938

*Agnostus innocens* Clark, 1923, p.122, OD Harrington, 1938, p.148.

Holotype (Ludvigsen, Westrop & Kindle, 1989, pl.1, fig.25), No. 1697, MCZ, Cambridge

[= *Rudagnostus* Lermontova, 1951]

Nonscrobiculate, variably deliquate; unconstricted acrolobes; median preglabellar furrow generally absent. Glabella with straight or gently posteriorly curved F3; short posterior lobe with F2 usually absent; glabellar node level with F2 furrows. Pygidium with axis of variable length (sag.), widest at M1; F1 generally only impressed laterally, curving forward to isolate lateral lobes; posterior lobe relatively long (sag.); posterolateral spines retral.

Late Cambrian to Early Ordovician (*P. minor* - *Yosimuraspis* Zones). Wales, Sweden, Germany, Czechoslovakia, Poland, *P. acutidens* Zone - early Tremadoc; Turkey, early Tremadoc; China (Anhui, Guizhou, Hebei, Shanxi, Liaoning, Jilin, Zhejiang), *L. punctatus* - *Yosimuraspis* Zones; S. Korea, "*Dictyites*" Zone; Australia (Queensland), *R. maximus*/*R. papilio* Zone; Argentina, Bolivia, Colombia, *N. argentina* Zone; Mexico, *C. proavus* Zone; USA (Alaska, Montana, Nevada, Texas, Oklahoma, Vermont), *Saratogia*/*Drumaspis* - *C. proavus* Zones; Canada (Quebec, Newfoundland), Sunwaptan.

### Subfamily AMMAGNOSTINAE Öpik, 1967

Usually en grande tenue, nonscrobiculate with nondeliquate to deliquate border furrows, a narrow cephalic border and a broad, flattened pygidial border, acrolobes usually unconstricted, preglabellar median furrow absent or well developed. Glabella with subtriangular, ogival, subpentagonal or subquadrate anterior lobe, F3 straight or curved, posterior lobe with F2 absent or well developed, glabellar culmination broadly rounded to very obtusely angular, glabellar node from immediately behind to in front of F2, basal lobes small to moderate size. Pygidium usually bispinose, axis long, broad, reaching border furrow, broadly rounded posteriorly, usually with slight constriction over M2. F1 effaced or weakly impressed laterally, curving forward to intersect articulating furrow, isolating anterolateral lobes; F2 variably impressed, deflected by well developed

axial node; posterior lobe long, broad, semioval, with well developed secondary axial node in posterior half.

Late Middle to early Late Cambrian (*P. punctuosus* - *G. reticulatus* Zones).

#### AMMAGNOSTUS Öpik, 1967

*Ammagnostus psammius* Öpik, 1967, p.137, OD  
Holotype (Öpik, 1967, pl.66, fig.3), CPC 5937, BMR, Canberra.

En grande tenue or with pygidial axial furrows effaced posteriorly. Preglabellar median furrow absent. Glabella with ogival to subpentagonal anterior lobe; F3 straight or concave forward; a broad, anteriorly tapering posterior lobe with variably developed F2 furrow and broadly rounded glabellar culmination; glabellar node immediately behind F2 furrows. Pygidial axis with variable constriction over M2; F1 effaced or weakly impressed.

Early Late Cambrian.

#### AMMAGNOSTUS (AMMAGNOSTUS) Öpik, 1967 (fig. 10.4a,b)

[=*Glyptagnostus* (*Lispagnostus*) Öpik, 1967; =*Agnostoglossa* Öpik, 1967]

Pygidial axis usually weakly constricted across M2 and with F2 effaced or weakly impressed.

Early Late Cambrian. Australia (Queensland), *E. eretes* - *G. stolidotus* Zones; USSR (Kazakhstan), *K. simplex* - *G. stolidotus* Zones; China (Liaoning), *K. quadriceps* fauna; ?USA (Montana), *Cedaria* Zone; ?Antarctica, *Aphelaspis* Zone.

AMMAGNOSTUS (TENTAGNOSTUS) Sun X.-W., 1989  
*Pseudagnostus adchinensis* Schrank, 1975, p.595, OD, Sun X.-W., 1989, p.75.  
Holotype (Schrank, 1975, pl.2, fig.1), T934.1, HMB, Berlin.

Pygidial axis strongly constricted across M2 and with F2 strongly impressed.

Early Late Cambrian. China (Liaoning), *K. quadriceps* fauna

#### FORMOSAGNOSTUS Ergaliev, 1980

*Formosagnostus formosus* Ergaliev, 1980, p.92, OD.

Holotype (Ergaliev, 1980, pl.5, fig.11), 1950/92, GMAN, KazSSR, Alma-Ata.

[=*Kunshanagnostus* Qian & Zhou, 1984]

En grande tenue, with deliquiate or subdeliquiate border furrow and narrow border in cephalon, and poorly defined deliquiate border furrow and broad,

flattened border in pygidium, unconstricted acrolobes. Preglabellar median furrow clearly developed. Glabella with anterior lobe ogival to subpentagonal; F3 bent backward; posterior lobe with well developed F2 furrows, F1 furrows absent or weakly developed, broadly rounded glabellar culmination; glabellar node immediately behind F2 furrows. Pygidial axis with slight constriction over M2; F1 only impressed laterally, curving forward to intersect articulating furrow and isolating small, subtriangular anterolateral lobes; F2 clearly impressed, deflected strongly backward by long, low axial node.

Early Late Cambrian. USSR (Kazakhstan), *K. simplex* - *G. reticulatus* Zones; Australia (Queensland), *E. eretes* Zone; China (Jiangsu).

#### HADRAGNOSTUS Öpik, 1967 (fig. 10.6)

*Hadragnostus las* Öpik, 1967, p.102, OD.

Holotype (Öpik, 1967, pl.58, fig.8), CPC 5861, BMR, Canberra.

Cephalon and pygidium transverse; en grande tenue with subdeliquiate border furrows and narrow border on cephalon and moderately wide border on pygidium; unconstricted acrolobes. Preglabellar median furrow broad, short. Glabella relatively long with short (sag.) subtriangular to ogival anterior lobe; F3 straight; posterior lobe with weakly developed F2, broadly rounded glabellar culmination; glabellar node absent. Pygidial axis tapering forward from middle of posterior lobe with constriction across M2 weak or absent; F1 and F2 furrows effaced.

Earliest Late Cambrian. Australia (Queensland), *E. eretes* - *A. quasivespa* Zones; Iran, *Drepanura* Zone; USA (Montana), *Crepicephalus* Zone.

#### ?KORMAGNOSTELLA Romanenko, 1967

*Kormagnostella glabrata* E. Romanenko, 1967, p.75, OD.

Holotype (E. Romanenko in Romanenko, E. & Romanenko, M., 1967, pl.1, fig.22), No.152/166, ZSGU, Novokuznetsk.

[=*Litagnostoides* Schrank, 1975]

Diminutive, partly effaced, with deliquiate border furrow and narrow border in cephalon and subdeliquiate border furrow and wide, flat border in pygidium; acrolobes unconstricted. Preglabellar median furrow absent. Glabella with anterior lobe effaced; F3 curved forward; posterior lobe with F1 and F2 furrows absent; glabellar culmination broadly rounded to obtusely angular; glabellar node posteriorly located. Pygidium nonspinose, axial furrows only impressed anteriorly, adjacent to M1 and anterior portion of M2. Axial node of

moderate size. Weakly developed terminal node located adjacent to border furrow.

Late Cambrian. USSR (Altay Mts, S. Siberia), Saksikian-Ajusokkanian; China (Liaoning), *Kaolishania quadriceps* fauna; Australia (Queensland), *S. diloma* Zone.

#### **KORMAGNOSTUS** Resser, 1938

*Kormagnostus simplex* Resser, 1938, p.49, OD.  
Cotypes (Resser, 1938, pl.9, figs 11-13), No. 94842, USNM, Washington.

En grande tenue except for effacement of the anterior glabellar lobe, with deliquiate border furrow in cephalon and with poorly defined deliquiate border furrow and broad, flattened border in pygidium. Preglabellar median furrow absent. Glabella with straight F3; a broad anteriorly tapering posterior lobe with weakly developed F2 furrows, a broadly rounded glabellar culmination; glabellar node immediately behind F2 furrows. Pygidial axis usually widest across posterior lobe with very slight constriction over M2; F1 and F2 effaced.

Latest Middle - Early Late Cambrian. USA (Alabama, Georgia, Missouri, Nevada, Tennessee, Texas, Utah, Wyoming), *Bolaspidea* - *Crepicephalus* Zones; Canada (Quebec) & Argentina, *Bolaspidea* Zone; Australia (Queensland), *E. eretes* Zone, (Tasmania) *P. punctuosus* - *G. nathorsti* Zones; China (Hunan, Guizhou), *P. jimaensis/Cyclolorenzella* Zone; USSR (Kazakhstan), *K. simplex* Zone.

#### **PROAGNOSTUS** Butts, 1926 (fig. 10.7a,b,c)

*Proagnostus bulbosus* Butts, 1926, p.76.  
Lectotype (SD Robison, 1988, p.41, fig.8.12), No. 94867 (Butts, 1926, pl.9, fig.12), USNM, Washington.  
[=*Agnostus* Öpik, 1967; =*Agnostus* (*Paragnostus*) Peng, 1987]

Cephalon narrow, trapeziform or semioval; with nondeliquiate border furrows and with a narrow border in the cephalon and a wider, flattened border in the pygidium; acrolobes unconstricted. Preglabellar median furrow well developed. Glabella with anterior lobe subquadrate to semioval; F3 straight or bent strongly forward; posterior lobe with well developed F2 furrows; glabellar culmination broadly rounded to obtusely angular; glabellar node in front of F2 furrows. Pygidium bispinose, with spines retral or advanced; axis with well developed constriction across M2; F1 weakly impressed or effaced; F2 weakly impressed or absent, deflected posteriorly by strong axial node.

Late Middle Cambrian - early Late Cambrian.  
USA (Alabama), *Cedaria* Zone; Canada (Northwest Territories), *Cedaria minor* Zone; Australia (Queensland), *E. eretes* Zone, (Tasmania), *L. laevigata* Zone; China (Hunan, Guizhou), *Paradamesops jimaensis-Cyclolorenzella tuma* Zone, (Xinjiang) *Agnostus orientalis* (= *Proagnostus orientalis*) Zone; USSR (Kazakhstan, Siberia), *L. laevigata-G. stolidotus* Zones.

#### **Subfamily GLYPTAGNOSTINAE** Whitehouse, 1936

En grande tenue, with nondeliquiate border furrows, narrow borders and unconstricted acrolobes. Preglabellar median furrow well developed. Glabella with anterior lobe ogival, subpentagonal or subquadrate, posterior lobe with well developed F2 furrow and broadly rounded glabellar culmination; glabellar node located from midway between F1 and F2 to level with F2. Basal lobes of moderate to large size. Pygidium has glyptagnostoid articulating device, axis of moderate length, broadest across M1. Posterior lobe narrowly ogival to subtriangular with secondary axial node and associated well developed transverse depression usually in posterior half. Postaxial median furrow well developed.

Late Middle Cambrian - early Late Cambrian.

#### **GLYPTAGNOSTUS** Whitehouse, 1936 (fig. 10.2a,b)

*Glyptagnostus toreuma* Whitehouse, 1936, p.101, OD [= *Agnostus reticulatus* Angelin, 1851, p.8].  
Lectotype (SD Westergård, 1947, pl.1, fig.2), Ar 9794, RM, Stockholm  
[=*Barrandagnostus* Ivshin in Khalfin (ed.), 1960]

Of low convexity, both cephalon and pygidium strongly scrobiculate. Glabella with anterior lobe subpentagonal to subquadrate, commonly with median sulcus, F3 straight or bent forwards. Posterior lobe with very well developed F1 furrow, with lateral portions of M2 separated from the midmost glabella by longitudinal (exsag.) furrows. Glabellar node located from midway between F1 and F2 to level with F2. Basal lobes large, triangular. Pygidial axis constricted across M2, M1 trilobate, F1 bent forward, M2 trilobate, axial node extending well on to posterior lobe. Posterior lobe narrowly ogival to subtriangular.

Early Late Cambrian (late Mindyallan - early Idamean). Cosmopolitan.

**AGNOSTARDIS** Öpik, 1963 (fig. 10.3a,b)

*Agnostardis amplinatis* Öpik, 1963, p.39, OD.

Holotype (Öpik, 1963, pl.3, fig.8), CPC 4270, BMR, Canberra.

Nonscrobiculate or faintly scrobiculate. Glabella with anterior lobe ogival to subpentagonal, F3 straight or bent backward, posterior lobe lacking F1, with glabellar node located midway between F1 and F2. Basal lobes of moderate size. Pygidial axis tapering posteriorly, F1 and F2 effaced, axial node moderately large. Posterior lobe subtriangular.

Late Middle Cambrian - early Late Cambrian. Australia (Queensland), *G. stolidotus* Zone; China (Gansu, Guizhou), *L. laevigata* Zone.

### Subfamiliae Incertae Sedis

**ACMARHACHIS** Resser, 1938

*Acmarhachis typicalis* Resser, 1938, p.47, OD.

Holotype (Resser, 1938, pl.10, fig.5), No. 94858, USNM, Washington.

[= *Cyclagnostus* Lermontova in Vologdin et al., 1940; = *Wanagnostus* Qiu, 1983]

En grande tenue, nonscrobiculate with nondeliquiate border furrows and unstricted acrolobes; preglabellar median furrow weak or absent. Glabella with long ogival to subquadrate anterior lobe; F3 straight; posterior lobe with forwardly directed F2 furrows, occasionally joining to form chevronate furrow; glabellar node located from well behind F2 furrows to near apex of chevronate furrow; glabellar culmination variably rounded to obtusely angular; basal lobes of moderate to large size, triangular. Pygidium with agnostoid articulating device, long (sag.) axis reaching border furrow, strongly constricted across M2; broad, tumid posterior lobe bears terminal node and sometimes intranotular axis.

Late Cambrian. USA (Alabama, Nevada, Maryland, Vermont), *Crepicephalus* - *Aphelaspis* Zones; Canada (British Columbia), *Parabolinella* Limestone; Australia (Queensland), *D. torosa*/*A. janitrix* - *W. iota*/*R. apsis* Zones; USSR (Kharaulakh, Kazakhstan), *L. laevigata* - *P. pseudangustilobus* Zones; China (Anhui).

**AISTAGNOSTUS** Xiang & Zhang, 1985

*Aistagnostus laevigatus* Xiang & Zhang, 1985

Holotype (Xiang & Zhang, 1985, pl.6, figs 1a,b), T1415, CAGC, Beijing.

Small, en grande tenue with axial furrows weakly impressed, nondeliquiate border furrows. Anterior glabellar lobe short, broad, subpentagonal; posterior glabellar lobe short, broad with median node at midlength. Basal lobes simple.

Preglabellar median furrow absent. Pygidial axis short, broad, posteriorly rounded, tripartite with transverse furrows weakly impressed. Postaxial median furrow absent. Pygidial marginal spines small.

Late Cambrian. China (Xinjiang), *Agnostotes tianshanicus* Zone.

**CONNAGNOSTUS** Öpik, 1967 (fig. 10.8a,b)

*Connagnostus venerabilis* Öpik, 1967, p.128, OD.

Holotype (Öpik, 1967, pl.54, fig.11a,b), CPC 5809, BMR, Canberra.

Nonscrobiculate with nondeliquiate to deliquiate border furrow and narrow border in cephalon; deliquiate border furrow and broad flattened border in pygidium; unstricted cephalic acrolobe and unstricted to weakly constricted pygidial acrolobe; preglabellar median furrow absent. Glabella with semicircular to semioval anterior lobe; F3 bent slightly forward; F2 weakly developed; glabellar culmination rounded; glabellar node elongate, keel-like, extending from level with F2 nearly to F3; basal lobes of moderate size. Pygidial axis long, broad, extending to or nearly to border furrow, with very weak constriction over M2; F1 clearly impressed, deflected forward by anterior end of axial node; F2 nearly straight, deflected by axial node. Axial node well defined, elongate, ovate.

Early Late Cambrian. Australia (Queensland), *A. quasivespa* - *G. stolidotus* Zones; USA (Alabama), *G. stolidotus* Zone; ?USSR (S. Siberia).

**IDOLAGNOSTUS** Öpik, 1967 (fig. 10.5a,b)

*Idolagnostus agrestis* Öpik, 1967, p.104, OD.

Holotype (Öpik, 1967, pl.60, fig.8), CPC 5766, BMR, Canberra.

Small, nonscrobiculate, nondeliquiate to deliquiate border furrows with borders narrow; unstricted acrolobes; preglabellar median furrow well developed to absent. Glabella with small triangular to ogival anterior lobe; F3 well developed and nearly straight; F2 usually well developed as transglabellar furrow, straight or curved forward; glabellar node a short distance behind F2 furrow; glabellar culmination broadly rounded to obtusely angular; basal lobes of moderate size. Pygidium nonpinose; axis long, strongly constricted across M2; F1 clearly impressed, curved forward; F2 clearly impressed, deflected rearward by axial node; posterior lobe expanded, subcircular, extending to or nearly to border furrow; with or without small terminal node.

Late Cambrian (Mindyallan - Idamean), Australia (Queensland), *E. eretes* - *S. diloma* Zones; China (Qinghai), early Upper Cambrian.



**QUADRAHOMAGNOSTUS** Zhu, 1959

*Homagnostus* (*Quadrhomagnostus*) *subquadratus* Zhu, 1959, p.91, OD.

Holotype (Zhu, 1959, pl.1, fig. 21), No. 9429, NIGP, Nanjing.

Nonscrobiculate, with deliquate border furrows, moderately wide borders and unconstricted acrollobes; preglabellar median furrow very weak to absent. Glabella with small to moderate sized subrhombic to subcircular anterior lobe; F3 curved strongly rearward; F2 effaced or weakly impressed, crossing glabella, curved forward; glabellar node immediately behind F2 furrow; glabellar culmination narrowly rounded to angular; basal lobes of moderate to large size. Pygidial axis long, parallel sided or expanding slightly rearwards; F1 clearly impressed, straight or curved slightly forward; F2 clearly impressed, deflected slightly by moderately sized axial node. Posterior lobe long, semioval, nearly reaching border furrow.

Early Late Cambrian. China (Henan, Liaoning), *B. paronai* - *D. premesnili* Zones.

**Family PTYCHAGNOSTIDAE** Kobayashi, 1939

[=Triplagnostinae Kobayashi, 1939; =Lejopyginae Harrington in Kobayashi, 1939; =Tomagnostinae Kobayashi, 1939; =Canotagnostidae Rusconi, 1951]

Agnostacea with basic articulating device; usually en grande tenue with non-deliquate border furrows and unconstricted acrollobes; usually with a median preglabellar furrow and elongate basal lobes. Axial glabellar node variable in position. Pygidium usually simplimarginate, rarely weakly zonate, nonspinose or bispinose; axiolobate with F1 furrow well developed, F2 furrow rarely absent; posterior axial lobe usually long, acuminate or rounded posteriorly, occasionally with a transverse depression in anterior half. Median postaxial furrow usually present.

Middle Cambrian - early Late Cambrian.

**PTYCHAGNOSTUS** Jaekel, 1909 (fig. 11.1a,b)

*Agnostus punctuosus* Angelin, 1851, p.8; OD Jaekel, 1909, p.401 [the first paragraph of p.401 is misplaced and should appear at the top of p.400]. Lectotype (SD Westergård, 1946, p.78, pl.12, figs 3a,b), Ar 9539, RM, Stockholm.

En grande tenue, scrobiculate; prosopon finely granulose or pustulose; nonspinose. Median preglabellar furrow present. Anterior glabellar lobe semioval; posterior glabellar lobe evenly convex, with F2 furrows well developed, glabellar node slightly behind to slightly in front of F2 furrow; basal lobes elongate, divided or entire. Pygidial axis with small node on M2; long posterior lobe narrowly rounded to acuminate posteriorly. Median postaxial furrow present.

Middle Cambrian. Sweden, Denmark & Norway, latest *H. parvifrons* Zone - *P. punctuosus* Zone; Australia (Queensland), *P. punctuosus* Zone - *D.*

*notalibrae* Zone; USSR (Kazakhstan), *P. punctuosus* Zone, (Siberian Platform) *A. henrici* Zone; England, Canada (Newfoundland), *P. davidis* Zone; USA (Utah & Nevada), *A. atavus* - *P. punctuosus* Zone, (New York) *Bolaspidella* Zone; Argentina, China (Liaoning), Middle Cambrian.

**ACIDUSUS** Öpik, 1979 (fig. 11.2)

*Ptychagnostus* (*Acidusus*) *acidusus* Öpik, 1979, p.100, OD.

Holotype (Öpik, 1979, pl.46, figs 2,3), CPC 14248, BMR, Canberra.

[?=Canotagnostus Rusconi, 1951]

En grande tenue with axial furrows strongly impressed and median preglabellar furrow well developed, commonly scrobiculate; prosopon smooth or pustulose, nonspinose or with cephalic spines, axial spine on posterior thoracic segment and pygidial marginal spines. Anterior glabellar lobe oval, semioval or trapeziform; posterior glabellar lobe tapering strongly anteriorly, evenly convex to slightly posteriorly inflated with F2 furrows well developed; glabellar node located slightly in front of F1 furrows; basal lobes elongate, divided or entire. Pygidial axis with moderate to large, elongate node on M2 strongly deflecting F2 furrow. Posterior lobe long, narrowly rounded to acuminate posteriorly, with or without small terminal tubercle. Median postaxial furrow occasionally absent.

Middle Cambrian. Sweden, *T. fissus*/*A. atavus* Zone; Sweden, Norway & Denmark, *S. brachymetopa* Zone; Australia (Queensland), *A. atavus* - *A. cassis* Zones, (Tasmania) *A. cassis* or *P. agra* Zone; USSR (Kazakhstan), *A. atavus* Zone, beds with *Pianaspis recta*; (Siberian Platform) *T. fissus*, *A. henrici*, *L. allachjunensis* Zones; (Altay-Sayan) *A. limbataeformis* Zone; USA (Alaska), *Bolaspidella* Zone, (Utah) *B. fimbriatus* - *B. contracta* Subzones; China (Hunan, Guizhou), Middle Cambrian.

**GONIAGNOSTUS** Howell, 1935

*Agnostus nathorsti* Brögger, 1878, p.68, OD Howell, 1935c, p.13.

Holotype not yet identified (Brögger, 1878, pl.5, fig.1), PMO, Oslo

[=Huaragnostus Rusconi, 1950]

En grande tenue with axial furrows strongly impressed and median preglabellar furrow well developed, usually scrobiculate; spinose, with or without cephalic spines and an occipital spine, with an axial spine and fulcral spines on the posterior thoracic segment and a pair of pygidial marginal spines. Anterior glabellar lobe low, subtriangular;

posterior glabellar lobe broad, very strongly convex in posterior half, with F2 furrows very well developed, axial glabellar node located behind F1 furrows; basal lobes elongate, divided or entire, anterior extremities indistinct, associated with a well developed apodemal pit. Pygidial axis long with spine on middle lobe strongly deflecting F2 furrow rearward; posterior lobe long, pyriform with strong tubercle near midlength, centred on a variably developed rosette. Postaxial median furrow well developed.

Middle Cambrian - early Late Cambrian.

**GONIAGNOSTUS (GONIAGNOSTUS)** Howell, 1935 (fig. 11.6)

Cephalon without arcuate scrobicules. Posterior lobe of pygidial axis with rosette weakly developed or absent.

Late Middle Cambrian. Sweden, Norway, Denmark, *L. lundgreni*/*G. nathorsti* - *S. brachymetopa* Zones; Australia (Northern Territory & Queensland), *P. punctuosus* - *G. nathorsti* Zones; England, ?late *P. davidis* Zone; Canada (New Brunswick & Newfoundland), *P. hicksi* Zone; USSR (Turkistan), *H. brevifrons* beds, (Siberian Platform) *A. henrici* - *L. laevigata*/*A. truncata* Zones; Middle Cambrian, China (Qinghai) and Argentina.

**GONIAGNOSTUS (ALLOBODOCHUS)** Öpik, 1979 (fig. 11.3a,b,c)

*Goniagnostus (Allobodochus) fumicola* Öpik, 1961, OD Öpik, 1979, p.144.  
Holotype (Öpik, 1961, pl.20, figs 14a, b), CPC 3598, BMR, Canberra.

Cephalon without arcuate scrobicules. Glabella with very strongly developed F1 and F2 furrows, commonly with the midmost glabella separated from the outer glabella by weak longitudinal (exsag.) furrows. Posterior pygidial axial lobe with very well developed rosette.

Late Middle Cambrian to early Late Cambrian. Sweden, England, *L. laevigata* Zone; Australia (Queensland & Tasmania), *A. cassis* - *E. eretes* Zones; USSR (Lesser Karatau), ?*G. nathorsti* Zone, ?*L. armata* Zone, late *L. laevigata* Zone, early *K. simplex* Zone; China (Hunan & Guizhou), *P. jimaensis*/*C. tuma* Zone, (Zhejiang) *L. laevigata* Zone.

**GONIAGNOSTUS (CRIOTYPUS)** Öpik, 1979 (fig. 11.4a,b)

*Goniagnostus (Criotypus) oxytorus* Öpik, 1979,

p.144, OD.

Holotype (Öpik, 1979, pl.57, figs 1, 2), CPC 14309, BMR, Canberra.

Cephalon with well developed arcuate scrobicules. Posterior lobe of pygidial axis with rosette usually absent, rarely weakly developed.

Middle Cambrian. Australia (Queensland), *A. atavus* - *E. optimus* Zones.

**LEJOPYGE** Hawle & Corda, 1847 (fig. 11.5a,b)  
*Battus laevigatus* Dalman, 1828, p.136, OD Hawle & Corda, 1847, p.51.

Lectotype (SD Westergård, 1946, p.134, pl.13, fig.21a,b), No.Ar287b, RM, Stockholm.

[=*Miagnostus* Jaekel, 1909; =*Pseudophalacroma* Pokrovskaya, 1958]

Strongly convex with very narrow cephalic border, en grande tenue to largely effaced, uncommonly scrobiculate; prosopon smooth, nonspinose or with cephalic spines and pygidial marginal spines. Anterior glabellar lobe narrow, subtriangular; posterior glabellar lobe with F2 furrows usually absent, glabellar node midway between F1 and F2; basal lobes short, simple. Pygidial axis with small node on middle lobe, slightly deflecting F2 furrow rearward; posterior lobe long, acuminate or narrowly rounded posteriorly.

Late Middle Cambrian. Sweden, Norway, Denmark, *P. punctuosus* - *L. laevigata* Zones; Australia (Queensland & Tasmania), *P. punctuosus* - *C. quasivespa* Zones; England, *P. forchhammeri* Zone; USSR (Kazakhstan & Uzbekistan), *L. armata* - *L. laevigata* Zones, *H. brevifrons* beds, (Siberian Platform) *L. lundgreni* Subzone - *L. laevigata*/*A. truncata* Zone; China (Zhejiang, Hunan, Guizhou), *L. laevigata* Zone, (Hunan) *Paramphoton* Zone; USA (New York), *Bolaspidella* Zone, (Utah, Nevada) *P. punctuosus* - *L. laevigata* Zones; Greenland, *L. laevigata* Zone; Middle Cambrian of Canada (Newfoundland), Alaska & China (Qinghai); ?Argentina.

**MYRMECOMIMUS** Öpik, 1979 (fig. 12.1)

*Myrmecomimus tribulis* Öpik, 1979, p.136, OD.

Holotype (Öpik, 1979, pl.36, figs 1, 1a, 2), CPC 14179, BMR, Canberra.

Small, strongly convex, en grande tenue or with anterior glabellar glabellar lobe, preglabellar median furrow and postaxial median furrow effaced, nonscrobiculate, nonspinose or with short cephalic spines. Posterior glabellar lobe very strongly convex, subhexagonal or subcircular, lateral glabellar furrows absent; basal lobes elongate, entire. Thorax nonspinose. Pygidial axis

with very strongly inflated M2 and posterior lobes, with node of moderate size on M2, posterior lobe semiovalate to semicircular, F2 furrow well developed to effaced.

Middle Cambrian. Australia (Queensland), *P. punctuosus* - *D. notalibrae* Zones; USSR (Siberian Platform), *Pseudanomocarina* Zone.

**ONYMAGNOSTUS** Öpik, 1979 (fig. 12.2a,b)

*Onymagnostus angulatus* Öpik, 1979, p.108 [= *O. hybridus* (Brögger, 1878)] OD.

Location of types unknown.

[= *Onymagnostus (Agnostonymus)* Öpik, 1979]

Usually en grande tenue, very strongly convex, particularly in the pygidium, borders in both shields of moderate width, axial furrows variably impressed, narrow; preglabellar median furrow well developed, postaxial median furrow absent; uncommonly scrobiculate; nonspinose or with small pygidial marginal spines. Anterior glabellar lobe low, semiovalate; posterior glabellar lobe evenly convex with F2 furrows weak to well developed, glabellar node a short distance behind F2 furrows; basal lobes short to slightly elongate, entire, commonly indistinct anteriorly. Pygidial axis very long with large node on middle lobe strongly deflecting F2 furrow; posterior lobe very long, semiovalate to subtriangular, narrowly rounded posteriorly.

Middle Cambrian. Sweden, Norway, Denmark, *T. fissus*/*A. atavus* - *L. lundgreni*/*G. nathorsti* Zones; Australia (Queensland, Northern Territory), late *T. gibbus* - *G. nathorsti* Zones, (Tasmania) *P. punctuosus* or *G. nathorsti* Zone; England, Wales, *P. aurora* - early *P. davidis* Zone; Canada (Newfoundland, New Brunswick), *P. hicksi* - *P. forchhammeri* Zones; USSR (Siberian Platform), ?*Kounamkites* Zone, *T. fissus*/*P. hicksi* - *A. limbataeformis* Zones, (Kazakhstan & Uzbekistan) *Pseudanomocarina* Zone; Czechoslovakia, *E. pusillus* Zone; USA (Utah), *T. gibbus* Zone, *B. contracta* Subzone.

**PENTAGNOSTUS** Lermontova, 1940 (fig. 12.7a,b)

*Pentagnostus anabarensis* Lermontova in Vologdin et al., 1940, p.127, OD.

Lectotype (SD, Laurie, in prep.), No. 56/9182 (Lermontova in Vologdin et al., 1940, pl.35, fig.10c), CNIGR, Leningrad.

En grande tenue, preglabellar median furrow weakly to moderately well developed, postaxial median furrow weak to absent, rarely scrobiculate, nonspinose or with small pygidial marginal spines. Anterior glabellar lobe semiovalate; posterior glabellar lobe with subparallel sides, evenly convex

or slightly inflated posteriorly with F2 furrows weakly to moderately well developed and axial glabellar node located midway between F1 and F2 furrows; basal lobes short to slightly elongate, entire. Pygidial axis with small node on middle lobe slightly deflecting F2 furrow; posterior lobe subtriangular to semiovalate.

Early Middle Cambrian; Sweden, Norway, *P. insularis* - *T. gibbus* Zone; England, *P. pinus* Zone; Australia (Northern Territory & New South Wales), *T. gibbus* Zone; USSR (Siberian Platform), *Kounamkites* - *T. fissus* Zones, (Altay-Sayan) early Middle Cambrian; Canada (British Columbia), *Bathyriscus*/*Elrathina* zone; Antarctica (Shackleton Range), early Middle Cambrian.

**TOMAGNOSTUS** Howell, 1935 (fig. 12.6a,b)

*Agnostus fissus* Lundgren in Linnarsson, 1879, p.23, OD Howell, 1935c, p.15.

Neotype (SD Westergård, 1946, p.58, pl.7, fig.22), No.4840, SGU, Uppsala.

En grande tenue, usually scrobiculate; borders of moderate width, nonspinose or with small pygidial marginal spines. Preglabellar median furrow commonly weakly developed. Anterior glabellar lobe subquadrate to semiovalate, usually sulcate; posterior glabellar lobe parallel-sided or anteriorly tapering, usually with well developed F2 furrows. Axial glabellar node elongate, from a short distance behind to in front of F2 furrows; basal lobes slightly elongate, commonly indistinct anteriorly. Pygidial axis with well developed F1 and F2 furrows, moderate to small node on M2; posterior lobe long, acuminate or narrowly rounded posteriorly with well developed transverse depression near midlength. Postaxial median furrow rarely present. Weak, narrow (sag.) pygidial collar present in some specimens.

Middle Cambrian. Sweden, Denmark, England, *T. gibbus* - *H. parvifrons* Zones; USSR (Siberia), *Kounamkites*, *Pseudanomocarina*, *T. fissus*-*P. hicksi* - *A. henrici* Zones; Canada (Newfoundland), *P. hicksi* - *P. davidis* Zones; Czechoslovakia, *E. pusillus* Zone; Australia (Northern Territory), ?*A. atavus* Zone.

**TRIPLAGNOSTUS** Howell, 1935

*Agnostus gibbus* Linnarsson, 1869, p.81, OD Howell, 1935, p.14.

Types not identified, current concept based on Westergård (1946).

En grande tenue, rarely scrobiculate; spinose. Anterior glabellar lobe subtriangular, semiovalate or subpentagonal. Posterior glabellar lobe strongly

convex in entirety or only in in posterior half, with axial glabellar node located level with F1 furrows; basal lobes elongate, divided or entire. Pygidial axis with spine or large node on M2 deflecting F2 furrow rearward. Preglabellar median furrow well developed, postaxial median furrow well developed to absent.

Middle Cambrian.

**TRIPLAGNOSTUS (TRIPLAGNOSTUS)** Howell, 1935 (fig. 12.5a,b)

[=*Solenagnostus* Whitehouse, 1936]

Anterior glabellar lobe low, subtriangular to semiovalate; posterior glabellar lobe very strongly convex in posterior half, F2 furrows strongly developed to weak. Pygidial axis with spine or large node on M2 strongly deflecting F2 furrow rearward; posterior axial lobe long, semiovalate to subtriangular, usually with small median tubercle near midlength. Postaxial median furrow well developed to absent.

Middle Cambrian. Sweden, Norway, Denmark, *T. gibbus* - *T. fissus*/*A. atavus* Zones; Australia (Queensland), *T. gibbus* - *G. nathorsti* Zones; USSR (Siberian Platform), late *Kounamkites*, *T. gibbus*, *T. fissus*, *Pseudanomocarina* Zones, (Kazakhstan) early *A. atavus* Zone; USA (New York), *Bathyriscus*/*Elrathina* Zone, (Utah & Nevada) *T. gibbus* Zone; England, Poland, Antarctica, Middle Cambrian.

**TRIPLAGNOSTUS (AOTAGNOSTUS)** Öpik, 1979 (fig. 12.3)

*Aotagnostus culminosus* Öpik, 1979, p.133, OD. Holotype (Öpik, 1979, pl.34, fig.1.), CPC 14166, BMR, Canberra.

Anterior glabellar lobe slightly to strongly inflated, subtriangular to subpyriform; posterior glabellar lobe short, tapering forward, very strongly convex with F2 furrows very weak to absent. Pygidial axis with large spine or node on gibbous M2, strongly deflecting F2 furrow; posterior lobe of short or moderate length, semiovalate. Postaxial median furrow well developed.

Late Middle Cambrian. Australia (Queensland), *E. opimus* - *G. nathorsti* Zones.

**ZETEAGNOSTUS** Öpik, 1979 (fig. 12.4a,b)

*Zeteagnostus incautus* Öpik, 1979, p.105; OD.

Holotype (Öpik, 1979, pl.45, fig.1), CPC 14242, BMR, Canberra.

Commonly scrobiculate. Anterior glabellar lobe subtriangular; posterior glabellar lobe evenly convex with F2 furrows weakly developed or

absent, with axial glabellar node from a short distance in front of F1 furrow to a short distance behind F2 furrow; basal lobes elongate, divided or entire, variably indistinct. Pygidial axis with F2 furrow straight or slightly deflected rearward. Postaxial median furrow present.

Middle Cambrian. Australia (Queensland), *A. atavus* - *E. opimus* Zones; ?Sweden, *T. fissus*/*A. atavus* Zone; USSR (Kazakhstan), *Z. intermedius* Zone (*sensu* Robison, 1984, p.20); USA (Utah), *T. gibbus* Zone; China (Liaoning), early Middle Cambrian.

**Family SPINAGNOSTIDAE** Howell, 1935

[=*Quadragnostidae* Howell, 1935 *sensu* Öpik, 1961; *Cyclopagnostidae* Howell, 1937]

En grande tenue or with anterior glabellar lobe variably effaced; usually nonscrobiculate; with nondeliquate border furrows and narrow to moderately wide borders; unconstricted acrollobes; cephalon nonspinose; preglabellar median furrow well developed to absent. Glabella with ogival, semiovalate, subpentagonal or effaced anterior lobe; F3 straight, variably bent forward or effaced; posterior lobe with F2 usually developed; glabellar culmination usually broadly rounded; glabellar node from level with F1 to slightly in front of F2; basal lobes small, simple. Pygidium nonspinose or bispinose, with axis usually long, not reaching border furrow, ogival and constricted across M2; F1 and F2 usually effaced; axial node of moderate size; postaxial median furrow usually present

Late Early Cambrian - middle Late Cambrian.

**Subfamily SPINAGNOSTINAE** Howell, 1935

[=*Cyclopagnostinae* Howell, 1937; *Hypagnostinae* Ivshin, 1953; *Euagnostinae* Öpik, 1979]

Commonly nonscrobiculate, with most species variably effacing the anterior glabellar lobe and some also effacing F3; cephalic border usually narrow; pygidial border wider; preglabellar median furrow usually absent, rarely weakly developed. Glabella with anterior lobe semiovalate, subpentagonal or more commonly effaced; F3 straight, bent forward or effaced; posterior lobe with F2 weak or absent; glabellar culmination usually broadly rounded; glabellar node located from a short distance behind F2 to a short distance in front of F2. Pygidium nonspinose or bispinose; axis usually long, ogival, with a constriction across M2; F1 and F2 usually effaced. Median postaxial furrow usually present.

Late Early Cambrian - middle Late Cambrian.

**HYPAGNOSTUS** Jaekel, 1909 (fig. 13.1a,b)

*Agnostus parvifrons* Linnarsson, 1869, p.82, OD  
Jaekel, 1909, p.399.

Lectotype (SD Westergård, 1946, p.116),  
09302/Tr15 (Linnarsson, 1869, pl.2, fig.56), SGU,  
Uppsala.

[=*Spinagnostus* Howell, 1935; *Cyclopagnostus*  
Howell, 1937; *Hypagnostus (Breviagnostus)* Liu,  
1982; *Hypagnostus (Metahypagnostus)* Qiu, 1983]

Commonly weakly scrobiculate; narrow cephalic  
border and wider pygidial border; preglabellar  
median furrow absent. Glabella with anterior lobe  
effaced; F3 bent forward, rounded or chevronate;  
posterior lobe short, variably ovate with F2 weak  
or absent; glabellar culmination broadly rounded;  
glabellar node level with or slightly in front of F2  
furrows. Pygidium usually nonspiny, axis usually  
long, broadly ogival or less commonly short and  
posteriorly rounded, with weak constriction across  
M2; F1 and F2 effaced; postaxial median furrow  
usually developed.

Middle Cambrian - early Late Cambrian. Sweden,  
Wales, *H. parvifrons* - *L. laevigata* Zones; England,  
*H. parvifrons* - *A. pisiformis* Zones; Norway, *P.*  
*tessini* - *P. forchhammeri* Zones; Denmark, *P.*  
*tessini* Zone; Czechoslovakia, *P. (P.) gracilis* Zone;  
USA (Vermont, New York), *Bolaspidea* Zone,  
(Alaska) late Dresbachian; Canada  
(Newfoundland, New Brunswick, Quebec), *H.*  
*parvifrons* Zone; Australia (Queensland,  
Tasmania), *P. atavus* - *E. eretes* Zones; China,  
*H. parvifrons* - *G. stolidotus* Zones; USSR  
(Turkistan, Salair, Altay, SE Siberia, Kazakhstan),  
*T. fissus*/*P. hicksi* - *L. laevigata*/*A. truncata* Zones,  
(Kazakhstan) *K. simplex* - *G. reticulatus* Zones;  
Argentina.

**COTALAGNOSTUS** Whitehouse, 1936

*Agnostus lens* Grönwall, 1902, p.65, OD  
Whitehouse, 1936, p.92.

Syntypes (Grönwall, 1902, pl.1, figs 8,9), numbers  
unknown, MMK, Copenhagen.

Like *Hypagnostus* but with F3 effaced and  
commonly with axial furrows surrounding posterior  
lobe of pygidial axis effaced.

Middle Cambrian. Sweden, *P. atavus* - *P.*  
*forchhammeri* Zones; Denmark, *P. davidis* Zone;  
Norway, *P. paradoxissimus* - *P. forchhammeri*  
Zones; England, Wales, *H. parvifrons* - *P.*  
*punctuosus* Zones; Canada (Newfoundland, Nova  
Scotia), late *P. hicksi* - early *P. davidis* Zones;  
USA (Utah, Alaska), *B. contracta* Subzone;  
Australia (Queensland), *D. notalibrae* Zone; USSR  
(SE Siberia), *T. fissus*/*P. hicksi* to late *P. davidis*  
Zones, (Salair) *P. forchhammeri* Zone; Argentina;  
China (Hunan, Guizhou).

**EOAGNOSTUS** Resser & Howell, 1938 (fig. 13.2a,b)

*Eoagnostus rodnyi* Resser & Howell, 1938, p.216, OD.

Holotype (Resser & Howell, 1938, pl.3, fig.4), No.90796,  
USNM, Washington.

Small, nonscrobiculate; with moderately wide borders;  
preglabellar median furrow absent. Glabella with anterior  
lobe very faintly outlined or effaced, semioval; F3 straight;  
posterior lobe strongly inflated posteriorly, overhanging  
occipital band; glabellar node absent; glabellar culmination  
rounded or obtusely angular. Pygidium nonspiny, axis of  
moderate length, strongly convex, semioval, narrowly  
rounded posteriorly; F1 and F2 effaced; axial node indistinct;  
postaxial median furrow weakly developed.

Late Early Cambrian. USA (Pennsylvania, Vermont, New  
York), *Olenellus* - *Paedumias-Bonnia* faunas.

**EUAGNOSTUS** Whitehouse, 1936 (fig. 13.5)

*Euagnostus opimus* Whitehouse, 1936, p.87, OD.

Holotype (Whitehouse, 1936, pl.8, fig.11), UQF  
3195, UQ, Brisbane.

Nonscrobiculate, with narrow cephalic border and  
wider pygidial border; preglabellar median furrow  
absent. Glabella with anterior lobe broadly  
semioval or variably effaced; F3 straight;  
posterior lobe broad with F2 weak to absent;  
glabellar culmination broadly rounded; glabellar  
node a short distance behind F2; Pygidium  
nonspiny or bispiny; axis long, ogival, nearly  
reaching border furrow, slightly constricted across  
M2; F1 and F2 effaced; postaxial median furrow  
well developed.

Middle Cambrian. Australia (Queensland), *E.*  
*opimus* - *D. notalibrae* Zones; USA (Utah,  
Nevada), early *T. gibbus* - *P. punctuosus* Zones.

**MICAGNOSTUS** Hairullina, 1975

*Micagnostus rectus* Hairullina (in Repina et al., 1975, p.115),  
OD.

Holotype (Hairullina, 1975, pl.11, figs 13-14), No.483/179,  
MMG, Uz.SSR, Tashkent.

Only known from cephalon: Small, nonscrobiculate, with  
moderately wide border; preglabellar median furrow absent.  
Glabella short, broad, with anterior lobe weakly outlined,  
semicircular to semioval; F3 straight; posterior lobe short,  
broad; F2 absent; glabellar node indistinct; glabellar  
culmination broadly rounded.

Middle Cambrian. USSR (Uzbekistan), *Pseudanomocarina*  
Zone.

**PERATAGNOSTUS** Öpik, 1967 (fig. 13.3a,b)

*Peratagnostus nobilis* Öpik, 1967, p.86, OD.

Holotype (Öpik, 1967, pl.52, figs 11a-c), CPC 5787,  
BMR, Canberra.

Almost completely effaced; nonscrobiculate or  
weakly scrobiculate; cephalic border absent or very  
narrow; pygidial border wider, always present;  
preglabellar median furrow absent. Glabella with  
vestigial axial furrows defining rear; glabellar node

advanced; glabellar culmination broadly rounded. Pygidium nonspino-se, retaining traces of axial furrows defining a narrowly tapering axis which does not reach posterior border furrow; postaxial median furrow effaced.

Late Cambrian. Australia (Queensland), *E. sentum* - *R. apsis*/*W. iota* Zones; S. Korea, *Eochuangia* Zone; USSR (Kazakhstan), *G. stolidotus* - *H. longiformis* Zones, (Yakutia) *Irvingella*/*C. felix* Zone; USA (Nevada), *Dunderbergia* Zone, (Alaska) Franconian; China (Hunan, Guizhou).

#### **RARAGNOSTUS** Hairullina, 1975

*Raragnostus mirus* Hairullina (in Repina et al., 1975, p.117), OD.

Holotype (Hairullina, 1975, pl.12, figs 17,18), 483/190b, MMG, Uz.SSR, Tashkent.

Small, nonscrobiculate, with narrow cephalic border and wide, flat pygidial border; preglabellar median furrow absent. Glabella with effaced anterior lobe and with F3 effaced or weakly impressed, bent forward; posterior lobe short with F2 weak to absent; glabellar culmination broadly rounded; glabellar node a short distance behind F2 furrow. Pygidium nonspino-se, axis very broad, long, posteriorly broadly rounded and in contact with border furrow across entire posterior margin; F1 and F2 effaced; axial node indistinct.

Middle Cambrian. USSR (Uzbekistan), Amgan - Mayan; Australia (Queensland), *G. nathorsti* Zone; Sweden, *P. forchhammeri* Stage.

#### **SVENAX** Öpik, 1979 (fig. 13.8)

*Agnostus pusillus* Tullberg, 1880, p. 36, OD Öpik, 1979, p.64.

Holotype (Tullberg, 1880, pl.2, fig.30), not yet identified, GMI, Lund.

En grande tenue; weakly scrobiculate; with narrow cephalic border and slightly wider pygidial border; preglabellar median furrow absent. Glabella with semio-vate to subpentagonal anterior lobe with adjacent axial furrows weakly impressed; F3 straight or bent slightly forward; posterior lobe with F2 weak; glabellar culmination broadly rounded; glabellar node level with or slightly in front of F2. Pygidium nonspino-se, axis short, broadly ogival, with well developed constriction across M2; F1 and F2 effaced; postaxial median furrow clearly developed.

Middle Cambrian. Sweden, Denmark, Norway, *P. punctuosus* Zone; Australia (Queensland), *P. punctuosus* - *D. notalibrae* Zones.

**TOMAGNOSTELLA** Kobayashi, 1939 (fig. 13.4a,b) *Agnostus exsculptus* Angelin, 1851, p.7, OD Kobayashi, 1939, p.150.

Lectotype (SD Westergård, 1946, p.118), Ar 2007 (Tullberg, 1880, pl.1, fig.10), RM, Stockholm.

Commonly weakly scrobiculate; narrow cephalic border and slightly wider pygidial border; preglabellar median furrow occasionally weakly developed, usually absent. Glabella with F3 straight, bent forward, chevronate or rarely effaced; posterior lobe with F2 commonly developed; glabellar culmination broadly rounded; glabellar node from slightly behind to slightly in front of F2 furrows. Pygidium usually nonspino-se, axis long, commonly reaching border furrow or connected to it by postaxial median furrow; usually strongly constricted across M2; F1 clearly developed, bent forward; F2 variably developed, nearly straight with a slight median deflection around axial node.

Middle Cambrian. Sweden, *H. parvifrons* - *L. laevigata* Zones; Norway, England, *L. laevigata* Zone; USSR (Siberia, Turkestan), late *P. davidis* - *L. laevigata* Zones; Australia (Queensland), *G. nathorsti* Zone; China (Hunan, Guizhou), late Middle Cambrian.

#### **Subfamily DORYAGNOSTINAE** subfam. nov.

Nonscrobiculate, en grande tenue with borders of moderate width; preglabellar median furrow absent to well developed. Glabella with ogival to semio-vate anterior lobe; F3 clear, straight or with slight median forward deflection; posterior lobe with F2 furrows present; glabellar culmination broadly rounded; glabellar node located from level with F1 to midway between F1 and F2. Pygidium nonspino-se to bispino-se; axis long, not reaching border furrow, acuminate to narrowly rounded posteriorly; constricted across M2; F1 and F2 effaced; posterior lobe long, ogival to semio-vate with small secondary axial node, commonly associated with a transverse depression in posterior half; postaxial median furrow usually present.

Middle Cambrian.

#### **DORYAGNOSTUS** Kobayashi, 1939 (fig. 13.7a,b)

*Agnostus incertus* Brögger, 1878, p.70; OD Kobayashi, 1939a, p.148.

Lectotype (Nikolaisen & Henningsmoen, 1989, fig.2a), No. 28200, PMO, Oslo  
[= *Ceratagnostus* Whitehouse, 1939]

Preglabellar median furrow well developed, usually expanding into deltoid area anteriorly. Glabella with ogival anterior lobe; F3 straight or with slight

median forward deflection; posterior lobe with weak F2 furrows; glabellar node midway between F1 and F2 furrows. Pygidium bispinose, axis ogival, acuminate posteriorly; posterior lobe ogival, commonly with transverse depression.

Late Middle Cambrian. Norway, Denmark, *P. tessini* Zone; Sweden, *P. punctuosus* Zone; Canada (Newfoundland), *P. davidis* Zone; Australia (Queensland), *E. opimus* - *G. nathorsti* Zones; USSR (SE Siberia), late *P. davidis* - *P. forchhammeri* Zones; China (Xinjiang), *G. nathorsti*/*P. punctuosus* Zone; Denmark, England, China (Hunan & Guizhou).

#### ITAGNOSTUS Öpik, 1979 (fig. 13.6)

*Agnostus elkedraensis* Etheridge Jr, 1902, OD Öpik, 1979, p.60.

Lectotype (SD Whitehouse, 1936, p.89, pl.9, fig.3), F9138, AM, Sydney.

Preglabellar median furrow absent. Glabella with semioval anterior lobe; F3 straight; posterior lobe with F2 furrows weak or absent; glabellar node level with or a short distance in front of F1 furrows. Pygidium nonspinose or bispinose, axis broad, long, narrowly rounded posteriorly; posterior lobe semioval, lacking transverse depression; postaxial median furrow absent.

Early Middle Cambrian. Australia (Northern Territory), *T. gibbus* Zone; USSR (Siberian Platform), *Oryctocara* - *Kounamkites* Zones; Canada (British Columbia), *Bathyriscus*/*Etrathina* Zone; ?Germany, *P. insularis* Zone; China (Guizhou), Middle Cambrian.

#### RHODOTYPISCUS Öpik, 1979 (fig. 13.9)

*Rhodotypiscus nasonis* Öpik, 1979, p.79, OD.

Holotype (Öpik, 1979, pl.16, fig.1), CPC 14072, BMR, Canberra.

Preglabellar median furrow usually weakly developed or absent. Glabella with semioval anterior lobe; F3 straight; posterior lobe with well developed F2 furrows; glabellar culmination strongly inflated; glabellar node level with or a short distance in front of F1 furrow. Pygidium bispinose, axis elongate ogival, acuminate posteriorly; posterior lobe ogival, commonly with well developed transverse depression.

Middle Cambrian. Australia (Queensland), *E. opimus* Zone; U.S.A. (Utah), *T. gibbus* - early *P. punctuosus* Zones, (Alaska) Middle Cambrian; ?USSR (Siberia), *T. fissus* Zone. China (Xinjiang), *G. nathorsti*/*P. punctuosus* Zone; Canada (Quebec)

#### Subfamiliae Incertae Sedis

##### PSEUDOPERONOPSIS Harrington, 1938

*Agnostus sallesi* Munier-Chalmas & Bergeron in Bergeron, 1889, p.337; SD Öpik, 1979, p.43.

Holotype (Munier-Chalmas & Bergeron in Bergeron, 1889, pl.3, fig.5), not yet identified, LGSB, Paris.

With tendency to efface F1 and F2 furrows of pygidial axis; deliquiate border furrows; unconstricted acrollobes. Cephalon with vestigial median prelabellar furrow; axial glabellar node at posterior lobe midlength. Pygidium simplimarginate or narrowly (sag.) zonate; generally with short (sag.), pointed axis; with or without median postaxial furrow; with posterolateral spines.

Middle Cambrian. France, *Paradoxides* Beds; Spain, *Badulesia* - *Solenopleuropsis* Zones; USA (Utah), *B. contracta* Subzone; Australia (Queensland), *A. atavus* - *D. notalibrae* Zones; China (Liaoning, Shandong), *Crepicephalina* Zone.

#### Family PERONOPSIDAE Westergård, 1936

Usually en grande tenue, commonly scrobiculate, with nondeliquiate border furrows and unconstricted acrollobes; cephalon nonspinose; prelabellar median furrow usually absent, occasionally weakly developed. Glabella with subrectangular, trapeziform, semicircular or semioval anterior lobe; F3 straight or bent rearward; posterior lobe with F1 and F2 well developed; glabellar culmination narrowly rounded; glabellar node from a short distance behind F2 to a short distance in front of F2; basal lobes simple, inset behind a well developed F1 furrow. Pygidium simplimarginate, nonspinose or bispinose, axis long, nearly reaching border furrow, ogival to subtriangular, variably constricted across M2; F1 well developed to effaced; F2 well developed to effaced, straight or deflected around axial node; posterior lobe semioval to ogival with a usually well developed transverse depression at about midlength or in anterior half.

Middle Cambrian.

##### PERONOPSIS Hawle et Corda, 1847 (fig. 14.1a,b)

*Battus integer* Beyrich, 1845, p.44, OD Hawle & Corda, 1847, p.231.

Lectotype (SD Pek & Vanek, 1971, p.270, pl.1, fig.6), Beyrich Collection 68(530), HMB, Berlin.

[=*Mesospheniscus* Hawle & Corda, 1847; *Mesagnostus* Jaekel,

1909]

En grande tenue, nonscrobiculate; narrow border in cephalon and wide, flat border in pygidium; preglabellar median furrow absent. Glabella with subquadrate to semioval anterior lobe; F3 straight; posterior lobe with glabellar node a short distance behind F2. Pygidium nonspinose or bispinose; axis strongly convex, broadly oval; F1 weak; F2 weak or absent, straight; posterior lobe broadly oval, narrowly rounded to acuminate posteriorly, with a weakly developed transverse depression at about midlength.

Middle Cambrian. Czechoslovakia, *P.(P.) gracilis* Zone; ?Sweden.

**DIPLORRHINA** Hawle et Corda, 1847 (fig. 14.2)

*Diplorrhina triplicata* Hawle et Corda, 1847, p.47, SD Pek & Vanek, 1971, p.271.

Lectotype (SD Šnajdr, 1958, pl.4, fig.9), Hawle Collection 745/66, SBNM, Prague.

En grande tenue, with moderately wide border in cephalon and wider border in pygidium; commonly scrobiculate; preglabellar median furrow absent or weakly developed. Glabella with subrectangular, trapeziform or semicircular anterior lobe; F3 bent rearward, rounded or chevronate; posterior lobe with glabellar node from a short distance behind to slightly in front of F2 furrows. Pygidium bispinose; axis of low convexity, oval to subtriangular; F1 well developed to effaced, bent forward; F2 well developed or effaced, straight, posterior lobe acuminate posteriorly with a well developed transverse depression in anterior half.

Middle Cambrian. Czechoslovakia, *P.(E.) pusillus* - *P.(P.) gracilis* Zones; Sweden, *H. parvifrons* - *S. brachymetopa* Zones; England, Canada (Newfoundland), late *P. hicksi* - early *P. davidis* Zone.

**GRATAGNOSTUS** Hairullina, 1975 (fig. 14.3a,b)

*Gratagnostus latus* Hairullina (in Repina et al., 1975, p.113), OD.

Holotype (Hairullina, 1975, pl.11, fig.10), No.483/189, MMG, Uz.SSR, Tashkent.

En grande tenue, nonscrobiculate; narrow to moderately wide border in cephalon and wider border in pygidium; median preglabellar furrow absent. Glabella with trapeziform to semicircular anterior lobe; F3 straight; posterior lobe with glabellar node midway between F1 and F2. Pygidium bispinose; axis broad, oval; F1 well developed; F2 well developed, deflected around axial node; posterior lobe narrowly rounded posteriorly with a well developed transverse depression in anterior half.

Middle Cambrian. USSR (Uzbekistan), *Pseudanomocarina* Beds; England, *P. aurora* - *T. fissus* Zones; Sweden, *T. fissus*/*A. atavus* Zone; Canada (Newfoundland), *P. bennetti* Zone.

**PERONOPSELLA** Szűy, 1967 (fig. 14.4a,b)

*Peronopsella pokrovskajae* Szűy, 1967, p.88, OD.

Holotype (Szűy, 1967, pl.1, fig.1), No. 24000, SMF, Frankfurt.

Similar to *Peronopsis* except that in the cephalon, F3 and F2 furrows and axial furrows surrounding anterior half of glabella are effaced. In the pygidium F1, F2 and usually axial furrows surrounding the posterior axial lobe are effaced.

Middle Cambrian. Spain (Asturias), *C. ovata* beds, *Acadolenus* - *Badulesia* Zones, (Zaragoza) *Badulesia* - *Pardailhanian* Zones; Germany, *Paradoxissimus* beds, *T. gibbus* - *P. atavus* Zones; England, early *T. fissus* Zone; Canada (Newfoundland), *P. bennetti* Zone.

## Family DIPLAGNOSTIDAE Whitehouse, 1936

En grande tenue to largely effaced, commonly scrobiculate, usually with deliquate border furrows, with pygidial border simplimarginate or variably zonate; cephalon nonspinose; cephalic acrolobe usually unconstricted; pygidial acrolobe commonly constricted; preglabellar median furrow well developed to absent. Glabella with anterior lobe variable in shape; F3 variably impressed, straight to V-shaped; posterior lobe with glabellar culmination variably rounded to angular; glabellar node from slightly behind F2 to near F3; basal lobes of moderate to large size, simple. Pygidium with basic or glyptagnostoid articulating device, bispinose, occasionally posteriorly angulate or trispinose; axis of variable length, commonly deuterolobate; F1 variably impressed or effaced; M1 commonly trilobate; F2 usually impressed, deflected by axial node; in axiolobate forms, posterior lobe with transverse depression; deuterolobate forms with well developed terminal node.

Middle Cambrian - Early Ordovician.

## Subfamily DIPLAGNOSTINAE Whitehouse, 1936

En grande tenue, usually nonscrobiculate, with a variably zonate pygidial border; cephalic acrolobe unconstricted. Glabella with subquadrate to semicircular anterior lobe; F3 variably impressed, straight; posterior lobe with variably developed F2 and F1; glabellar culmination narrowly rounded to angular; glabellar node from slightly behind to slightly in front of F2 furrows. Pygidium usually bispinose, occasionally posteriorly angulate or trispinose; axis of variable length, usually slightly constricted over M2; F1 well developed to effaced; M1 commonly trilobate; F2 well developed to effaced; posterior lobe variable in shape, usually with transverse depression; pygidial collar usually present, incipient, arcuate or sinuous.

Middle Cambrian - early Late Cambrian (*T. gibbus* - *G. stolidotus* Zones).

**DIPLAGNOSTUS** Jaekel, 1909 (fig. 14.5a,b)

*Agnostus planicauda* Angelin, 1851, p.7, OD Jaekel, 1909, p.396.

Location of types unknown [Topotypes illustrated by Westergård, 1946, pl.8, figs 22-24.] [= *Enetagnostus* Whitehouse, 1936]

Cephalon commonly scrobiculate; deliquate to subdeliquate border furrows with narrow border in cephalon and zonate border in pygidium;



unconstricted acrolobes; preglabellar furrow well developed to absent. Glabella with trapeziform to subrectangular anterior lobe, commonly with median sulcus; F3 clearly impressed; F2 well developed or absent; glabellar culmination narrowly rounded; glabellar node level with or slightly in front of F2 furrows. Pygidium bispinose; axis long, broad, ogival, commonly extending to border furrow or connected to it by postaxial median furrow; F1 clearly impressed laterally; F2 clearly impressed; posterior lobe ogival to subtriangular, commonly with poorly defined transverse depression at about midlength; pygidial collar always well defined, extending across entire posterior margin between pygidial marginal spines, but not extending onto acrolobe.

Middle Cambrian. Sweden, *P. punctuosus* - *L. laevigata* Zones; Denmark, Norway, *L. laevigata* Zone; England, *P. aurora* - *T. fissus* Zones; France, *Paradoxides* Beds; Canada (Newfoundland), *P. davidis* Zone; USSR (Turkestan, Tien-Shan), Amgan, (SE Siberia) *T. fissus* - *L. laevigata* Zones; China (Zhejiang), *L. armata* Zone, (Hunan, Guizhou, Qinghai) late Middle Cambrian; Australia (Queensland, Tasmania), *P. atavus* - *L. laevigata* Zones; Argentina.

#### **BALTAGNOSTUS** Lochman, 1944

*Proagnostus? centerensis* Resser, 1938, p.48, SD Lochman, 1944, p.132.  
Holotype (Resser, 1938, pl.10, fig.18), No.94868, USNM, Washington.

Nonscrobiculate, with deliquiate border furrows, unconstricted acrolobes; preglabellar median furrow absent. Glabella with subquadrate to subpentagonal anterior lobe; F3 clear; posterior lobe with weak F2 furrows; glabellar culmination narrowly rounded to angular; glabellar node about level with F2 furrows. Pygidium bispinose; axis long, reaching border furrow, slightly constricted across M2; F1, F2 effaced; posterior lobe semiovate, broadly rounded posteriorly; pygidial collar arcuate, short (tr.), indistinct.

Middle Cambrian. USA (Alabama, Montana, Nevada, New York, Tennessee, Texas, Utah), *Bolaspidella* Zone; Canada (Quebec), China (Liaoning), late Middle Cambrian; S. Korea, *Tonkinella* Zone; Australia (Queensland), *E. opimus* - *D. notalibrae* Zones.

#### **DOLICHAGNOSTUS** Pokrovskaya, 1958

*Dolichagnostus admirabilis* Pokrovskaya, 1958, p.36, OD.

Holotype (Pokrovskaya, 1958, pl.3, fig.1), 3534/3, GIN, Moscow.

[=*Dolichagnostus* Öpik, 1967]

Nonscrobiculate, with broad, deliquiate border furrows; cephalic acrolobe unconstricted; pygidial acrolobe commonly constricted; preglabellar median furrow commonly well developed. Glabella with trapeziform anterior lobe; F3 weak; posterior lobe with F2 weak or absent; glabellar culmination narrowly rounded to angular; glabellar node about level with F2 furrows. Pygidium bispinose and angulate posteriorly; axis long, extending to pygidial collar, broadly rounded posteriorly, slightly constricted across M2; F1, F2 effaced; posterior lobe long, with transverse furrow in anterior half; pygidial collar sinuous, extending onto acrolobe.

Late Middle Cambrian. USSR (Siberia), Mayan; Australia (Queensland), *L. laevigata* Zone.

#### **?INIOSPHENISCUS** Öpik, 1979 (fig. 15.1a,b)

*Iniospheniscus talis* Öpik, 1979, p.50, OD.

Holotype (Öpik, 1979, pl.9, fig.1), CPC 14021, BMR, Canberra.

En grande tenue, nonscrobiculate with subdeliquiate to deliquiate border furrows; pygidial border commonly incipiently zonate; acrolobes unconstricted; preglabellar median furrow absent. Glabella with subrectangular anterior lobe; F3 well developed; posterior lobe with weak F2 furrows; glabellar culmination variably rounded; glabellar node about level with F2 furrows. Pygidium bispinose; axis long, reaching border furrow, expanding rearwards, with slight constriction across M2; F1, F2 impressed laterally; posterior lobe very broad, semiovate, rounded posteriorly, lacking transverse depression; pygidial collar absent or very short (tr.), indistinct.

Middle Cambrian. Australia (Queensland), *A. atavus* - *P. punctuosus* Zones; China (Shandong), *Amphoton* Zone.

#### **LINGUAGNOSTUS** Kobayashi, 1939 (fig. 14.6a,b)

*Agnostus kjerulfi* Brögger, 1878, p.65, OD Kobayashi, 1939a, p.142.

Lectotype (SD Westergård, 1946, p.124, pl.8, fig.32), No.28684, PMO, Oslo.

Nonscrobiculate; deliquiate border furrows; zonate border in pygidium; cephalic acrolobe unconstricted; pygidial acrolobe commonly constricted; preglabellar median furrow absent. Glabella with trapeziform to sunrectangular anterior lobe, commonly with median sulcus; F3 clearly impressed; F2 weakly developed or absent; glabellar culmination narrowly rounded to angular; glabellar node about level with F2 furrows. Pygidium bispinose or trispinose, commonly with postaxial notch on margin; axis short, broadly ogival, unconstricted or slightly constricted across

M2; F1 effaced to clearly impressed laterally; F2 effaced to clearly impressed; posterior lobe short, broad, subtriangular with transverse depression at about midlength. Pygidial collar sinuous, extending onto acrolobe.

Late Middle Cambrian. Sweden, England, *P. punctuosus* Zone; Denmark, *P. davidis* Zone; Norway, *P. forchhammeri* Zone; Wales, *P. paradoxissimus* Zone; USSR (Siberia, Tuva, Turkestan, Kazakhstan), *L. laevigata*, *Anopolenus*, *L. allachjunensis* Zones; China (Hunan, Guizhou, Qinghai, Zhejiang), *L. armata* Zone; Australia (Queensland, Northern Territory), *T. gibbus* - *L. laevigata* Zones.

**OEDORHACHIS** Resser, 1938 (fig. 15.4a,b)  
*Oedorhachis typicalis* Resser, 1938, p.50, OD.  
Holotype (Resser, 1938, pl.10, figs 16, 22, 28), No.94866, USNM, Washington.  
[=*Acmarhachis* Resser (pars), fide Palmer, 1962, p.19]

Similar to *Tasagnostus* but with only incipient zonation and lacking the transverse furrow in the posterior pygidial axial lobe.

Late Middle Cambrian - early Late Cambrian. Australia (Queensland), *G. nathorsti* - *A. quasivespa* Zones; Argentina, *Bolaspidella* Zone; USA (Alabama, Tennessee), *G. stolidotus* Zone; China (Liaoning, Qinghai); ?Sweden.

**TASAGNOSTUS** Jago, 1976 (fig. 14.7a,b)  
*Tasagnostus debori* Jago, 1976, p.161, OD.  
Holotype (Jago, 1976, pl.26, fig.1), No. 86869e, UTGD, Hobart.

Nonscrobiculate, with broad, deliquate border furrows; zonate pygidial border; acrolobes unconstricted; preglabellar median furrow weak. Glabella with trapeziform to subpentagonal anterior lobe; F3 weak; posterior lobe with F2 weak or absent; glabellar culmination acutely angular; glabellar node about level with F2 furrows. Pygidium bispinose; axis long, constricted across M2; F1, F2 effaced; posterior lobe slightly bulbous, broadly rounded posteriorly, extending to pygidial collar, with well developed transverse furrow in anterior half; pygidial collar extending across entire posterior margin between pygidial spines, but not extending on to acrolobe.

Late Middle Cambrian. Australia (Tasmania), *L. laevigata* Zone - ?*D. torosa*/*A. janitrix* Zone.

## Subfamily OIDALAGNOSTINAE Öpik, 1967

En grande tenue, scrobiculate, with deliquate border furrows; zonate pygidial border; unconstricted cephalic acrolobe; commonly constricted pygidial acrolobe; preglabellar median furrow usually weak. Glabella with trapeziform to subrectangular anterior lobe; F3 well developed, straight; posterior lobe with variably developed F2; glabellar culmination narrowly rounded; glabellar node about level with F2 furrows. Pygidium trispinose; axis long, extending to pygidial collar or posteriorly effaced; F1 variably impressed; M1 trilobate; F2 variably impressed, deflected by axial node; posterior lobe variably quadrate with deep transverse depression in anterior half, posterior portion subrectangular, tumid or effaced.

Late Middle Cambrian - early Late Cambrian (*L. laevigata* - *G. stolidotus* Zones).

**OIDALAGNOSTUS** Westergård, 1946 (fig. 15.3a,b)  
*Oidalagnostus trispinifer* Westergård, 1946, p.65, OD.

Holotype (Westergård, 1946, pl.9, fig.6), No. 08313/22, SGU, Uppsala.  
[=*Ovalagnostus* Lu, 1974]

Preglabellar median furrow weakly developed. Pygidial axis long, extending to pygidial collar; F1, F2 variably impressed; posterior lobe divided into subtrapeziform anterior portion and tumid, subrectangular posterior portion by deep transverse depression; posterior portion commonly separated from pleural field by paired bosses and weak accessory furrows; pygidial collar arcuate, with median depression.

Latest Middle Cambrian - early Late Cambrian. Sweden, *L. laevigata* Zone; Australia (Queensland, Tasmania), *L. laevigata*, *C. quasivespa*, *G. stolidotus* Zones; Canada (Newfoundland), *A. pisiformis* Zone; USSR (NW Siberia), *Pedinocephalus/Toxotis* Zone, (S. Siberia), *L. laevigata* Zone; China (Hunan), *L. laevigata* Zone.

**CRISTAGNOSTUS** Rushton, 1978 (fig. 15.2)  
*Cristagnostus papilio* Rushton, 1978, p.262, OD.  
Holotype (Rushton, 1978, pl.26, fig.5), BDA 1320-1321, GSM, London.

Very weakly scrobiculate; preglabellar median furrow variably developed. Pygidial axis with F1 well developed; F2 weak; posterior lobe with only anterior portion defined by axial furrow and transverse depression; axial furrow effaced behind transverse depression; pygidial collar sinuous, extending onto acrolobe.

Latest Middle Cambrian - earliest Late Cambrian. England, Canada (Newfoundland), *A. pisiformis* Zone; USSR (?N. Siberia, SW Siberia), latest Middle Cambrian, (SW Siberia) earliest Late Cambrian.

**Subfamily PSEUDAGNOSTINAE** Whitehouse, 1936

En grande tenue to largely effaced, commonly scrobiculate, usually with deliquiate border furrows and wide borders; pygidial border usually simplimarginate; cephalic acrolobe usually unconstricted; pygidial acrolobe commonly constricted; preglabellar median furrow well developed to absent. Glabella with anterior lobe variable in shape; F3 variably impressed, straight to V-shaped, rarely bent forward; posterior lobe with glabellar node from a short distance behind F2 to near F3. Pygidium bispinose, rarely trispinose; axis long, deuterolobate; F1 usually effaced or weak; F2 usually impressed; deuterolobe often effaced, with terminal node.

Late Cambrian - Early Ordovician (*Erediaspis eretes* - *Cordylodus proavus* Zones).

**PSEUDAGNOSTUS** Jaekel, 1909

*Agnostus cyclopyge* Tullberg, 1880, p.26, OD Jaekel, 1909, p.400.

Types not identified, based on Lo 3066t, Lo 3067t (Westergård, 1922, pl.1, figs 7, 8), GMI, Lund. [= *Plethagnostus* Clark, 1923]

Variably convex, spectaculate pseudagnostines, partly effaced to en grande tenue, generally with wide borders, variably deliquiate border furrows; long (sag.) anteriorly rounded or pointed anterior glabellar lobe, simple terminally angulate posterior lobe, and prominent triangular basal lobes, lateral lobes not well developed; pygidium weakly to strongly deuterolobate, occasionally trispinose with up to 8 late holaspide metameres.

Late Cambrian.

**PSEUDAGNOSTUS (PSEUDAGNOSTUS)** Jaekel, 1909 (fig. 15.5a,b)

Partly effaced and en grande tenue pseudagnostines, generally with deliquiate border furrows; preglabellar median furrow usually present; pygidium with single pair of marginal spines in advance of rear of deuterolobe.

Late Cambrian. Sweden, England, *Olenus/Leptoplastus* - *O. cataractes/L. raphidophorus* Zones; USA (Alaska, Montana, Wyoming, Nevada, Utah, Idaho, Texas, Oklahoma, Tennessee, Virginia, Maryland, Wisconsin), Canada (British Columbia, Alberta, Quebec), *Cedaria* - *Ptychaspis/Prosaugia* Zones, (Newfoundland) Sunwaptan; Australia (Queensland, Tasmania), *E. eretes* - *P. tertia/P. quarta* Zones; S. Korea, *Eochuangia* Zone; USSR

(Kazakhstan, NW Siberia, Yakutia), *A. pisiformis* - *A. scrobicularis* Zones; Argentina; Antarctica; Vietnam; Afghanistan; Turkey.

**PSEUDAGNOSTUS (PSEUDAGNOSTINA)**

Palmer, 1962 (fig. 15.6a,b)

*Pseudagnostina contracta* Palmer, 1962, p.21, OD. Holotype (Palmer, 1962, pl.2, fig.23), No.143150, USNM, Washington.

Effaced or partly effaced, strongly spectaculate pseudagnostines with subdeliquiate border furrows, lacking preglabellar median furrow, unconstricted acrollobes, clearly incised transverse anterior glabellar furrow; pygidium weakly deuterolobate; F1, F2 furrows effaced, posterolateral spines generally close to rear of deuterolobe.

Late Cambrian. USA (Alabama, Nevada), Australia (Queensland), USSR (Kazakhstan), *G. stolidotus* Zone; S. Korea, *Drepanura-Stephanocare* Zone; China (Hunan, Liaoning, Shandong), Kushanian.

**PSEUDAGNOSTUS (SULCATAGNOSTUS)** Kobayashi, 1937 (fig. 15.7)

*Agnostus securiger* Lake, 1906, p.20, OD Kobayashi, 1937, p.451.

Holotype (Lake, 1906, pl.2, fig.11), No.57650, GSM, London.

En grande tenue pseudagnostines with deliquiate border furrows and strongly constricted acrollobes, possessing preglabellar median furrow; pygidium trispinose.

Late Cambrian. England, *O. cataractes* Subzone; ?China (Xinjiang, Hunan).

**?AGNOSTOTES** Öpik, 1963

*Agnostotes inconstans* Öpik, 1963, p.43, OD.

Holotype (Öpik, 1963, pl.3, fig.11), CPC 4272, BMR, Canberra.

Large, variably en grande tenue, variably scrobiculate, with nondeliquiate border furrows, narrow borders and unconstricted acrollobes. Preglabellar median furrow well developed. Glabella with broad anterior lobe; F3 bent forward; posterior lobe with well developed forwardly directed F2 furrows and broadly rounded glabellar culmination; F1 well developed to absent; glabellar node located level with or slightly in front of F2 furrows. Pygidium bispinose; F1 effaced or impressed laterally, F2 variably impressed; deuterolobe subcircular to subpyriform, with well developed terminal node; notular lines usually developed.

Late Cambrian (Changshanian).

**AGNOSTOTES (AGNOSTOTES)** Öpik, 1963 (Fig. 16.5a,b)

Scrobiculate, axial furrows weakly impressed. Preglabellar median furrow well developed. Glabella with anterior lobe broad (tr.) and subpentagonal; F3 slightly convex forward; posterior lobe with clearly developed F2; glabellar node level with or slightly in front of F2 furrows. Pygidial axis with F1 effaced and F2 weakly impressed; accessory furrows weakly impressed; axial node extending slightly onto deuterolobe. Deuterolobe subcircular with notular lines erratically developed.

Late Cambrian. Australia (Queensland), *I. tropica* Zone; China (Qinghai).

**AGNOSTOTES (PSEUDOGLYPTAGNOSTUS)** Lu, 1964  
*Pseudoglyptagnostus clavatus* Lu in Wang, 1964, p.32, OD.  
Holotype (Lu in Wang, 1964, pl.4, fig.7), 23719, NIGP, Nanjing  
[=*Glyptagnostotes* Lazarenko, 1966]

Both shields strongly scrobiculate. Glabella with anterior lobe broad and trapeziform, with variably developed median sulcus; F3 bent strongly forward; posterior lobe with well developed F2 and F1; lateral portions of M2 commonly separated from midmost glabella by longitudinal (exsag.) furrows; glabellar node is located in front of F2 furrow. Pygidial axis with F1 impressed laterally and F2 clearly impressed; axial node extending well onto deuterolobe. Accessory furrows clearly impressed; deuterolobe subpyriform, with notular lines well developed, containing 7 or 8 pairs of notulae.

Late Cambrian. China (Hunan, Zhejiang); USSR (Kazakhstan), *P. curtare* - *Irvingella/C. felix* Zones.

**DENAGNOSTUS** Jago, 1987

*Denagnostus corbetti* Jago, 1987, p.213, OD.  
Holotype (Jago, 1987, pl.24, fig.13), No. 88463, UTGD, Hobart.

Subovoid or subcircular cephalon and pygidium, almost effaced, with nondeliquiate border furrows; wide anterior cephalic border narrows posteriorly and disappears at about cephalic midlength. Glabella faintly outlined, spectaculate with effaced preglabellar median furrow. Pygidium with very weakly outlined axis, acrolobe slightly constricted, marginal spines small, well in advance of rear of deuterolobe. Pygidial border broad, faintly zonate.

Early Late Cambrian. Australia (Tasmania), Idamean.

**LITAGNOSTUS** Rasetti, 1944

*Litagnostus levisensis* Rasetti, 1944, p.235, OD.  
Syntypes (Rasetti, 1944, pl.36, figs 5, 6), ex Laval Univ., LU1103a,b, BMNH, London.

Cephalon and pygidium totally effaced with exception of narrow borders and pygidial axial node; internal moulds

typically rhapsagnostoid.

Late Cambrian. Canada (Alberta), *Taenicephalus* Zone - *?Ellipsocephaloides silvestris* Subzone, (Newfoundland) Sunwaptan, (Quebec); USA (Minnesota, Wisconsin, Texas).

**NEOAGNOSTUS** Kobayashi, 1955

*Neoagnostus aspidoides* Kobayashi, 1955, p.473, OD.

Holotype (Kobayashi, 1955, pl.7, fig.5), No.12745, GSC, Ottawa.

Spectaculate, partially effaced to en grande tenue Pseudagnostinae, with generally wide borders and subdeliquiate to deliquiate border furrows; weakly constricted acrolobes; cephalon and pygidium frequently subquadrate; cephalon with variably developed preglabellar median furrow, generally small rhomboid anterior lobe, variably defined V-shaped F3 furrow; chevronate F2 furrow behind anterolateral lobes of posterior glabellar lobe, anterolateral lobes close together or meeting sagittally; pygidium incorporates third segment in anteroaxis, weakly to strongly deuterolobate, retral posterolateral spines, up to 8 late holaspide metameres.

Late Cambrian - Early Ordovician.

**NEOAGNOSTUS (NEOAGNOSTUS)** Kobayashi, 1955 (Fig. 16.1a,b,c)

[=*Pseudorhaptagnostus* Lermontova in Vologdin et al., 1940; =*Euplethagnostus* Lermontova in Vologdin et al., 1940; =*Hyperagnostus* Kobayashi, 1955; =*Tarayagnostus* Suarez-Soruco, 1975; =*Calagnostus* Zhang & Wang, 1985]

En grande tenue to partly effaced, cephalon non-scrbiculate; glabella proportionately long; preglabellar median furrow variably developed; variably deuterolobate.

Late Cambrian - Early Ordovician. Canada (British Columbia, Newfoundland, Quebec), *Elvinia* - *Missisquoia* Zones; USA (Alaska, Vermont), Franconian - Trempealeauan; Mexico, *?Cordylodus proavus* Zone; Australia (Queensland), *W. iota/R. apsis* - *N.quasibilobus/T. nomas* Zones; China (Anhui, Guizhou, Hunan, Shanxi, Zhejiang, Xinjiang, Yunnan), *L. punctatus* - *M. perpetis* Zones, (Shandong) *Kaolishania* Zone; S. Korea, *Kaolishania* Zone; USSR (Kazakhstan, Altay-Sayan, Kuznetsk Alatau, Yakutia), *Irvingella* - *M. mutabilis* Zones; Wales, Tremadocian; ?Argentina, early Tremadocian.

**NEOAGNOSTUS (MACHAIRAGNOSTUS)** Harrington & Leanza, 1957

*Machairagnostus tmetus* Harrington & Leanza, 1957, p.64, OD.

Holotype (Harrington & Leanza, 1957, fig.7.4), No.1297, UBA, Buenos Aires.

En grande tenue but with partially effaced glabellar furrows; cephalon scrobiculate, possessing preglabellar median furrow and proportionately short glabella; pygidium non-scrobiculate, weakly deuterolobate, preserving intranotular axis.

Latest Cambrian - earliest Ordovician. Argentina, *N. argentina* Zone; USSR (Kazakhstan), *E. scrobicularis* - *P. asiatica* Zones.

### **OXYAGNOSTUS** Öpik, 1967 (Fig. 16.2a,b)

*Oxyagnostus apicula* Öpik, 1967, p.159, OD.

Holotype (Öpik, 1967, pl.63, fig.6), CPC 5916, BMR, Canberra.

Both cephalon and pygidium with constricted acrolobes, relatively narrow borders and deliquiate border furrows; cephalon lacking preglabellar median furrow, glabellar rear angulate, glabellar node advanced; no side lobes developed apart from triangular basal lobes; pygidium with axis constricted at M2, and long, subpentagonal, laterally expanded posterior lobe, deuterolobe not obvious externally, posterolateral spines slightly in advance of terminal axial node.

Late Cambrian. Australia (Queensland), *G. stolidotus* Zone; USA (Alabama), *Crepicephalus* Zone.

### **RHAPTAGNOSTUS** Whitehouse, 1936 (Fig. 16.3a,b)

*Agnostus cyclopygeformis* Sun, 1924, p.26, OD Whitehouse, 1936, p.97.

Lectotype (SD Sun X.-W., 1989, p.108), GSCH 503 (Sun, 1924, pl.2, figs 1c), NIGP, Nanjing.

Characteristically with subovoid to subcircular cephalon and pygidium, effaced to partly effaced, with non-deliquiate border furrows; cephalon papilionate with effaced preglabellar median furrow; pygidium variably deuterolobate, with weakly constricted acrolobe, marginal spines well in advance of rear of deuterolobe, and 9 or 10 late holaspide metameres.

Late Cambrian. Australia (Queensland), *W. iota*/*R. aphis* - *N. quasibilobus*/*T. nomas* Zones; China (Anhui, Hebei, Zhejiang, Liaoning, Shandong, Yunnan, Qinghai, Xinjiang), *Kaolishania*-*Tsinania* Zones; N. & S. Korea, Fengshanian, *Tsinania* - *Eoorthis* Zones; USSR (Kazakhstan), *E. scrobicularis* - *T. trisulcus* Zones, (Yakutia) *P. perlata* Zone; Canada (Northwest Territories, Newfoundland), *Yukonaspis* Zone; USA (Alaska, Montana, Nevada, Vermont), *S. pyrene* - *S. serotina* Zones; Mexico, pre-*Cordylodus proavus*.

### **TRISULCAGNOSTUS** Ergaliev, 1980

*Trisulcagnostus trisulcus* Ergaliev, 1980, p.116, OD.

Holotype (Ergaliev, 1980, pl.18, fig.13), No.1950/289, GMAN, KazSSR, Alma-Ata.

[= *Pseudagnostus* (*Tririmagnostus*) Qiu, 1983]

Rhaptagnostoid pseudagnostines with narrow borders and non-deliquiate border furrows, well defined preglabellar median furrow and additionally a pair of transverse furrows crossing cephalic acrolobe from axial furrow to border furrow at level of anterolateral lobes of posterior glabellar lobe; pointed anterior lobe, papilionate; pygidium unknown.

Late Cambrian. USSR (Kazakhstan), *E. scrobicularis* - *T. trisulcus* Zones; China, (Anhui, Hunan).

### **XESTAGNOSTUS** Öpik, 1967 (Fig. 16.4a,b,c)

*Xestagnostus legirupa* Öpik, 1967, p.161, OD.

Holotype (Öpik, 1967, pl.64, fig.1), CPC 5922, BMR, Canberra.

Moderately large, relatively flat, externally effaced pseudagnostines; cephalon lacking preglabellar median furrow, spectaculate, large triangular basal lobes, glabellar culmination angulate, unconstricted acrolobe; scrobiculate on internal mould; pygidium with constricted acrolobe, internally scrobiculate pleural lobes, rectangular anteroaxis, effaced accessory furrows, weakly deuterolobate, concave articulating facets, fulcral spines, simple articulating device represented by elliptical depressed plate, advanced posterolateral spines, 9 holaspide metameres.

Late Cambrian. Australia (Queensland), *A. quasivespa* - *G. stolidotus* Zones.

### **Family CLAVAGNOSTIDAE** Howell, 1937

[= *Acanthagnostidae* Qian, 1982]

En grande tenue, commonly scrobiculate with nondeliquiate to deliquiate border furrow in cephalon, and a nondeliquiate border furrow and commonly zonate border in pygidium, unconstricted acrolobes and well developed cephalic spines. Preglabellar median furrow well developed to absent. Glabella acuminate, rounded or obtusely angular anteriorly, usually with anterior and posterior lobes fused; F2 absent or weakly developed; glabellar culmination variably rounded or angular; glabellar node elongate, located near midlength or in anterior half of glabella; basal lobes of small to moderate size, simple. Pygidium bispinose or trispinose with long, usually ogival to subtriangular axis; constricted across M2; F1 effaced or clearly impressed, curving forward to articulating furrow to isolate anterolateral lobes; F2 effaced or clearly impressed, strongly deflected by long axial node; posterior axial lobe long, usually ogival, subtriangular or subpyriform, commonly extending to border furrow, with a

transverse depression commonly associated with a pair of longitudinal (exsag.) pits at about lobe midlength.

Late Middle Cambrian - early Late Cambrian (*Paradoxides forchhammeri*/*Lejopyge laevigata* - *Glyptagnostus reticulatus* Zone).

#### Subfamily CLAVAGNOSTINAE Howell, 1937

Pygidium simplimarginate; axis with F1 and F2 effaced.

Late Middle Cambrian - early Late Cambrian (*Paradoxides forchhammeri*/*Lejopyge laevigata* - *Glyptagnostus stolidotus* Zone).

#### CLAVAGNOSTUS Howell, 1937 (Fig. 17.1a,b)

*Aagnostus repandus* Westergård, 1930, p.13; OD Howell, 1937, p.1164.

Lectotype (SD Westergård, 1946, pl.4, fig.19), Number unknown, GMI, Lund.

[= *Tomorhachis* Resser, 1938; = *Culipagnostus* Rusconi, 1952; = *Stigmagnostus* Poulsen, 1960; = *Acanthagnostus* Qian, 1982]

Nonscrobiculate with nondeliquiate border furrows; preglabellar median furrow absent to well developed. Glabella with anterior and posterior lobes fused, acuminate, rounded or obtusely angular anteriorly; glabellar culmination variably rounded or angular; F2 absent; glabellar node elongate, located in anterior half of glabella. Pygidium bispinose or trispinose with long, narrowly ogival to subtriangular axis; posterior lobe subtriangular to narrowly ogival, commonly reaching border furrow or connected to it by postaxial median furrow, with a broad transverse depression associated with a pair of longitudinal (exsag.) pits at about lobe midlength.

Late Middle Cambrian - Early Late Cambrian. Sweden, *L. laevigata* Zone; USSR (Bennett Island), *P. forchhammeri* Zone, (SW Siberia, Altay Mts, Salair, Turkestan) *L. laevigata* Zone, (NW Siberia) *L. armata*-*M. mirabilis* Zone, (SE Siberia) *Solenoparia* Zone, (Kazakhstan) *L. armata*-*K. simplex* Zone; Australia (Tasmania), *L. laevigata* Zone, (Queensland) *E. eretes* - *G. stolidotus* Zones; USA (Vermont, Alabama); Argentina; Germany; China (Shandong) *Drepanura* Zone, (Anhui, Hunan, Qinghai).

#### Subfamily ASPIDAGNOSTINAE Pokrovskaya, 1960

Pygidium trispinose, zonate; F1 impressed laterally,

curving forward to articulating furrow to isolate subtriangular anterolateral lobes; F2 strongly deflected by long axial node which extends nearly to midlength of posterior axial lobe.

Early Late Cambrian (*A. pisiformis* - *G. reticulatus* Zones).

#### ASPIDAGNOSTUS Whitehouse, 1936 (Fig. 17.2a,b)

*Aspidagnostus parmatius* Whitehouse, 1936, p.104, OD.

Holotype (Whitehouse, 1936, pl.9, fig.5), UQF 3213, UQ, Brisbane.

[= *Biragnostus* Pokrovskaya in Khalfin (ed.), 1960]

Commonly scrobiculate, with nondeliquiate to deliquiate border furrow and anteriorly angulate border in cephalon; pygidium with nondeliquiate border furrow and zonate border with collar crossed by deep median gap, commonly flanked by a pair of knobs. Preglabellar median furrow well developed. Glabella acuminate or narrowly rounded anteriorly; glabellar culmination narrowly rounded to angular; glabellar node elongate, located at or in front of glabellar midlength; basal lobes small to moderate size, commonly divided. Pygidial axis long, acuminate; posterior lobe long, subtriangular to subpyriform, extending to border furrow, with deep transverse depression at about midlength, commonly associated with a pair of small longitudinal (exsag.) pits and a weak to well developed secondary axial node.

Early Late Cambrian. Australia (Queensland, Tasmania), *G. stolidotus* - *G. reticulatus* Zones; USSR (S Siberia, Kazakhstan), *G. reticulatus* Zone; England, *A. pisiformis* Zone; USA (Nevada), late *Crepicephalus* Zone, (Alabama, Nevada) *G. reticulatus* Zone.

#### TRIADASPIS Öpik, 1967

*Triadaspis bigeneris* Öpik, 1967, p.125, OD.

Holotype (Öpik, 1967, pl.54, fig.6), CPC 5804, BMR, Canberra.

Only poorly preserved pygidium known; with nondeliquiate border furrow, zonate border lacking a gap in the collar; axis long, acuminate, relatively broad, reaching border furrow; posterior lobe ogival to subpyriform with transverse depression and a pair of associated longitudinal (exsag.) pits in anterior half.

Early Late Cambrian. Australia (Queensland), *E. eretes* Zone.

## Subfamiliae Incertae Sedis

### UTAGNOSTUS Robison, 1964

*Utagnostus trispinulus* Robison, 1964, p.533, OD. Holotype (Robison, 1964, pl.82, fig.25), No. 141226, USNM, Washington.

Small, en grande tenue, nonscrobiculate with nondeliquate border furrows; narrow cephalic and broad pygidial border; cephalic spines well developed; preglabellar furrow absent. Glabella with small, low, semioval anterior lobe; F3 weakly impressed, nearly straight; glabellar culmination narrowly rounded or obtusely angular; glabellar node about level with F2 furrows; basal lobes very small, simple. Pygidium trispinose; axis long, broad, reaching border furrow; F1 effaced; F2 clearly impressed, strongly deflected by elongate axial node; posterior lobe semioval, broadly rounded posteriorly, of low convexity.

Late Middle - early Late Cambrian. USA (Utah), late *P. punctuosus* - early *L. laevigata* Zones; Australia (New South Wales), ?*P. punctuosus* Zone.

### Family METAGNOSTIDAE Jaekel, 1909

[=Trinodidae Howell, 1935; Geragnostidae Howell, 1935; Arthrorhachidae Raymond, 1913]

Usually en grande tenue, usually nonscrobiculate, usually with nondeliquate border furrows; unconstricted acrolites; cephalon nonspinose; preglabellar median furrow usually absent. Glabella usually with semioval, semicircular or subcircular anterior lobe; F3 effaced, variably chevronate or concave forward; posterior lobe with F2 furrows absent or chevronate; glabellar culmination broadly rounded or obtusely angular; glabellar node on or near F3 furrow; basal lobes of small to moderate size, simple. Pygidium with agnostoid articulating device, usually bispinose; axis usually short, not reaching border furrow; F1 impressed laterally, curving forward to articulating furrow, isolating anterolateral lobes; F2 impressed, straight or deflected by axial node; posterior lobe variable in length, trapeziform, subrectangular, semioval or subtriangular, commonly with terminal node; postaxial median furrow absent.

?Late Cambrian - Ordovician.

### ARTHRORHACHIS Hawle & Corda, 1847 (Fig. 17.5a,b)

*Battus tardus* Barrande, 1846, p.35, by monotypy. Lectotype (SD Pribyl in Horný & Bastl, 1970, p.308), CD 1812 (Barrande, 1852, pl.49, figs 1-4) SBNM, Prague. [=Metagnostus Jaekel, 1909; =Girvanagnostus Kobayashi, 1939]

Nonscrobiculate; nondeliquate border furrows; preglabellar median furrow absent. Glabellar F3 effaced or with straight medial portion, lateral portions curving forward and outward; posterior lobe with F2 furrows weak; glabellar node immediately behind F3 furrow. Pygidium bispinose, axis very short, tapering rearward; posterior lobe transverse, subrectangular, trapeziform or subtriangular; commonly with weak terminal node.

Ordovician. Czechoslovakia, Late Caradoc - Ashgill; Poland, England, Ireland, USSR (Uzbekistan), Norway, Denmark, Ashgill; Scotland, Caradoc; USSR (Kazakhstan), Tremadoc - Ashgill; Argentina, late Tremadoc; eastern USA, early Middle Ordovician; Turkey, late Arenig; France, early Arenig; Sweden, late Tremadoc to early Caradoc; Spitsbergen, late Canadian; China (Shaanxi), late Middle Ordovician; Germany, Middle Ordovician.

### ANGLAGNOSTUS Howell, 1935 (Fig. 17.6)

*Agnostus dux* Callaway, 1877, p.665, OD Howell, 1935b, p.233. Holotype by monotypy (Callaway, 1877, pl.24, fig.3), No.693, BU, Birmingham.

Type species known from one poorly preserved articulated specimen. En grande tenue, nonscrobiculate with nondeliquate border furrows; preglabellar median furrow absent. Glabella short with semioval anterior lobe; F3 clearly impressed, weakly concave forward; posterior lobe with F2 furrows absent; glabellar culmination broadly rounded; glabellar node not preserved; basal lobes small, transverse. Pygidium minutely bispinose; axis very short, quadrate; posterior lobe transverse, subrectangular with terminal node; F1 and F2 impressed, poorly preserved.

Early Ordovician. England, ?France, Tremadoc.

### CHATKALAGNOSTUS Hairullina & Abdullaev, 1970 (Fig. 17.4a,b)

*Chatkalagnostus mirus* Hairullina & Abdullaev in Abdullaev & Khaletskaia, 1970, p.20, OD. Holotype (Hairullina & Abdullaev in Abdullaev & Khaletskaia, 1970, pl.1, fig.1), No.4/3, IGI, Tashkent. [=Oculagnostus Ahlberg, 1988]

Large, en grande tenue, usually scrobiculate, with wide, deliquate border furrows; preglabellar median furrow absent. Glabella broad, with large subquadrate anterior lobe; F3 nearly straight, curving rearward laterally; posterior lobe with F2 furrows well developed, chevronate; glabellar node immediately behind F3 furrow. Pygidium bispinose; axis short, slightly constricted across M2; posterior lobe transverse, subrectangular.

Late Early Ordovician. Czechoslovakia, Llanvirn - early Llandeilo; USSR (Uzbekistan), ?Llandeilo; Sweden, ?Arenig - Llanvirn.

### CORRUGATAGNOSTUS Kobayashi, 1939 (Fig. 17.7)

*Agnostus perrugatus* Barrande, 1872, p.143; OD Kobayashi, 1939a, p.173 [=A. morea Salter, 1864b, p.7]. Holotype by monotypy (Salter, 1864b, pl.1, fig.13), No.8699, GSM, London. [=Segmentagnostus Pek, 1977; =Granulatagnostus Kolobova, 1981]

En grande tenue, usually scrobiculate, with nondeliquate border furrows; preglabellar median furrow present in more strongly scrobiculate forms. Glabella with semioval to semicircular anterior lobe; F3 chevronate; posterior lobe with F2 variably developed, chevronate; glabellar node from immediately behind F3 to well on to anterior glabellar lobe. Pygidium bispinose; axis very short, tapering rearward or with slight constriction across M2; posterior lobe transverse, subrectangular to trapeziform, usually with weak terminal

node.

?Late Cambrian - Late Ordovician. Czechoslovakia, Llanvirn - early Caradoc; England, Arenig - early Llanvirn; Scotland, late Caradoc - Ashgill; Ireland, Ashgill; France, ?early Arenig; ?Argentina, early Tremadoc; USSR (Altay Mts), ?Late Cambrian, (Kazakhstan) middle - late Caradoc, (Uzbekistan) Ashgill; China (Zhejiang), ?Tremadoc, late Caradoc - Ashgill, (Jiangsu) late Caradoc; USA (Texas), Early Ordovician; Poland, Ashgill.

**DIVIDUAGNOSTUS** Koroleva, 1982 (Fig. 17.8)  
*Dividuagnostus minus* Koroleva, 1982, p.21, OD.  
Holotype (Koroleva, 1982, pl.1, fig.5), No. 1-358, KazIMS, Alma-Ata.  
[=*Pezizopsis* Ju in Qiu et al., 1983]

En grande tenue, nonscrobiculate, with nondeliquate border furrows, preglabellar median furrow absent. Glabella with bulbous, subcircular anterior lobe; F3 strong, chevronate; posterior lobe subcircular with F2 absent; glabellar node from a short distance behind to immediately behind F3 furrow. Pygidium bispinose, axis short, with well developed constriction across M2; posterior lobe nearly equidimensional, semiovalate to subrectangular, without terminal node.

Early - Late Ordovician. USSR (Kazakhstan), Middle Ordovician; China (Zhejiang), ?Tremadoc, early Ashgill, (Gansu) Caradoc - Ashgill, (Jiangxi) late Caradoc; Wales, middle Arenig, Llandeilo - early Caradoc; England, early Llandeilo; Australia (New South Wales), late Gisbornian - early Eastonian; ?Canada (Newfoundland), Tremadoc.

**GALBAGNOSTUS** Whittington, 1965 (Fig. 18.1a,b)  
*Agnostus galba* Billings, 1865, p.297, OD  
Whittington, 1965, p.304.  
Lectotype (SD Whittington, 1965, p.305, pl.3, figs 1, 2, 4), No.689b, GSC, Ottawa.

En grande tenue, nonscrobiculate, with nondeliquate border furrows; preglabellar median furrow absent. Glabella short, broad; F3 effaced; F2 weak; glabellar node very advanced, near anterior margin of glabella. Pygidium bispinose; axis very short, tapering rearwards; posterior lobe transverse, trapeziform with indistinct median ridge and deepening of axial furrow behind this ridge.

Early Ordovician - Middle Ordovician. Canada (Newfoundland), Whiterock; ?Sweden, middle Arenig; ?Australia, middle Arenig.

**GERAGNOSTELLA** Kobayashi, 1939 (Fig. 17.3)  
*Agnostus tullbergi* Novak, 1883, p.59, OD Kobayashi, 1939a, p.171.  
Neotype (Pek, 1977, p.13, pl.3, fig.6), MR-1-356, MR,

Rokycany.

Mostly en grande tenue with tendency to efface the axial furrows surrounding the posterior pygidial axial lobe, nonscrobiculate, with nondeliquate border furrows; preglabellar median furrow absent. Glabella with F3 usually effaced or with straight median portion impressed; F2 weak; glabellar node immediately behind F3 furrow. Pygidium bispinose, axis of moderate length, tapering rearward; posterior lobe semiovalate, variably effaced, with strong terminal node.

Middle - late Early Ordovician. Czechoslovakia, Llanvirn; Spain, early Llanvirn; Sweden, early Arenig; Turkey, early - late Arenig.

**GERAGNOSTUS** Howell, 1935  
*Agnostus sidenbladhi* Linnarsson, 1869, p.82, OD Howell, 1935b, p.231.  
Cotypes (Linnarsson, 1869, pl.2, figs 60, 61), Nos. 08251/1, 3, SGU, Uppsala.  
[=*Geratrinodus* Kobayashi & Hamada, 1978; =*Neptunagnostella* Pek, 1977]

En grande tenue to nearly entirely effaced, nonscrobiculate, with nondeliquate border furrows; preglabellar median furrow absent. Glabella with semiovalate anterior lobe; F3 effaced or with straight medial portion, lateral portions curving forward and outward; posterior lobe with weak F2 furrows; glabellar node immediately behind F3 furrow. Pygidium usually bispinose, axis of moderate length, commonly constricted across M2; posterior lobe nearly equidimensional, semiovalate to subrectangular, commonly with weak terminal node.

Ordovician. Sweden, late Tremadoc - Llanvirn; Norway, late Tremadoc; France, late Tremadoc - early Arenig; Czechoslovakia, Arenig - Llanvirn; Scotland, Llandeilo; Canada (Newfoundland), Whiterock; Argentina, Tremadoc; Turkey, Arenig; USSR (Tadzhikistan), Arenig, (Uzbekistan) Ashgill; China (Hubei), Tremadoc - Llanvirn; USA (Nevada), ?Early Ordovician; Malaysia, ?Middle Ordovician.

**GRANULOAGNOSTUS** Pek, 1970  
*Agnostus dusli* Novak, 1883, p.58, OD Pek, 1970, p.129.  
Holotype by monotypy (Novak, 1883, pl.1, figs 12a-d), CD 314, SBNM, Prague.

Known only from a pygidium which is similar to that of *Galbagnostus* but has a coarsely pustulose prosopon.

Czechoslovakia, Llanvirn.

**TRINODUS** M'Coy, 1846  
*Trinodus agnostiformis* M'Coy, 1846, p.56, by monotypy.  
Holotype by monotypy (M'Coy, 1846, pl.4, fig. 3), No.IV-3, NMI, Dublin.

Known only from an incomplete and distorted internal mould of a cephalon. The generic name was restricted to this type specimen by Fortey (1980, p.27).

Early Middle Ordovician. Ireland, Llandeilo.

## Familiae Incertae Sedis

**ACADAGNOSTUS** Kobayashi, 1939  
*Agnostus acadicus* Hartt (in Dawson, 1868, p.655), OD Kobayashi, 1939a, p.113.  
Holotype by monotypy (fide Öpik, 1979, p.62), location



unknown.

The type species of this genus has never been satisfactorily illustrated and the whereabouts of the type is unknown

Cambrian. Canada (New Brunswick)

**AGNOSTOGONUS** Öpik, 1967 (Fig. 18.9a,b)  
*Agnostogonus incognitus* Öpik, 1967, p.94, OD.  
 Holotype (Öpik, 1967, pl.57, fig.8), CPC 5846, BMR, Canberra.

Effaced cephalon and pygidium retaining narrow borders and faint indications of basal lobes and furrows, posterior margin of glabella, axial furrows of pygidial anteroaxis and axial nodes of each shield. May belong to either Ptychagnostinae or Spinagnostidae.

Early Late Cambrian. Australia (Queensland), *G. stolidotus* Zone.

**ARCHAEAGNOSTUS** Kobayashi, 1939  
*Archaeagnostus primigenus* Kobayashi, 1939a, p.112, OD  
 Lectotype (SD Rasetti & Theokritoff, 1967, p.195, pl.20, fig.20), No. 18328, USNM, Washington.

Small, nonscrobiculate with nondeliquiate border furrows; cephalon ?nonspinose; preglabellar furrow absent. Glabella parallel-sided, with elongate, subquadrate anterior glabellar lobe; F3 deep, straight; posterior lobe strongly inflated posteriorly lacking F1 and F2; glabellar node posteriorly located; glabellar culmination narrowly rounded or angular; basal lobes small, simple. Pygidium nonspinose; axis of moderate length, broad, rounded posteriorly, not reaching border furrow; F1, F2 effaced; postaxial median furrow absent.

Late Early Cambrian. USA (New York).

**ARMAGNOSTUS** Howell, 1937  
*Armagnostus megalaxis* Howell, 1937, p.1162, OD.  
 Holotype (Howell, 1937, pl.2, fig.15), No. 9786, PU, Princeton.

The type species of this genus is based on a poorly preserved, distorted holotype pygidium and eleven paratypes, two of which (one cephalon and one pygidium) were illustrated by Howell (1937, pl.2, figs 12, 16). These are equally poorly preserved, making this species and hence the genus very difficult to interpret.

Late Middle Cambrian. USA (Vermont), *Centroleura vermontensis* fauna; Canada (New Brunswick).

**BLYSTAGNOSTUS** Öpik, 1961 (Fig. 18.2)  
*Blystagnostus laciniatus* Öpik, 1961, p.95, OD.  
 Holotype (Öpik, 1961, pl.23, fig.5), CPC 3628, BMR, Canberra.

Agnostoid with short, semiglobose pygidial anteroaxis, frill-like border and granulose prosopon.

Middle Cambrian. Australia (Queensland), *P. cassis* Zone.

**CICERAGNOSTUS** Kobayashi, 1937

*Agnostus barlowi* Belt, 1868, p.11, OD Kobayashi, 1937, p.442.  
 Lectotype (inferred from Lake, 1906, p.17), No.58498, BMNH, London.

Largely effaced but preserving faint indication of glabella and anteroaxis of pygidium, cephalic border very narrow, pygidial border wider, possibly deuterolobate. Probably referable to an effaced pseudagnostinid genus. All other species Middle Cambrian and variously assigned.

?Early Ordovician. Wales, ?Tremadoc.

**DELAGNOSTUS** Öpik, 1961 (Fig. 18.4)  
*Delagnostus dilemma* Öpik, 1961, p.88, OD.  
 Holotype (Öpik, 1961, pl.23, fig.9), CPC 3633, BMR, Canberra.

Pygidium largely effaced, without border or border furrows except anterolaterally; axial furrows only preserved anteriorly; vestigial axial node and faintly acuminate axis not reaching margin may be apparent; non-spinose; smooth.

Late Middle Cambrian. Australia (Queensland, Northern Territory), late *L. laevigata* Zone.

**GALLAGNOSTUS** Howell, 1935 (Fig. 18.8)  
*Gallagnostus geminus* Howell, 1935b, p.227, OD.  
 Holotype (Howell, 1935b, pl.22, fig.21), Miquel Colln, H 13, UM, Montpellier.

Holotype of type species is a distorted, poorly preserved complete exoskeleton. Apparently totally effaced, apart from cephalic and pygidial border furrows; narrow but distinct borders.

Middle Cambrian. France, *Paradoxides* Beds.

**GLABERAGNOSTUS** Romanenko, 1985  
*Glaberagnostus altaicus* Romanenko, 1985, p.57, OD.  
 Holotype (Romanenko, 1985, pl.5, fig.5), No. 1160/4, ZSGU, Novokuznetsk.

Cephalon smooth, lacking a border, mostly effaced, with glabella defined only posteriorly; basal lobes small. Pygidium smooth, smaller than cephalon, with well developed border and wide border furrow; axis defined laterally, posteriorly indistinct, axial node indistinct; marginal spines small or absent.

Early Late Cambrian. USSR (Altai Mts), *G. reticulatus* Zone.

**GRANDAGNOSTUS** Howell, 1935 (Fig. 18.10)  
*Grandagnostus vermontensis* Howell, 1935a, p.221, OD.  
 Holotype (Howell, 1935a, pl.22, fig.8), No.9736, PU, Princeton.

Generic name confined to the very poorly preserved holotype cephalon of the type species by Robison (1988). Almost completely effaced; cephalic border extremely narrow (sag.) or absent; glabellar node advanced.

Late Middle Cambrian. USA (Vermont).

**HASTAGNOSTUS** Howell, 1937  
*Hastagnostus angustus* Howell, 1937, p.1165, OD.

Holotype (Howell, 1937, pl.3, fig.4), No. 9795, PU, Princeton.

The type species of this genus is based on a very poorly preserved complete exoskeleton which is difficult to interpret.

Late Middle Cambrian. USA (Vermont), *Centroleura vermontensis* beds.

#### **HOMAGNOSTOIDES** Kobayashi, 1939

*Agnostus ferralsensis* Munier-Chalmas & Bergeron, 1889, p.342, OD Kobayashi, 1939a, p.178.

Syntypes (Munier-Chalmas & Bergeron, 1889, pl.4, figs 8,9) not yet located.

Pygidium with short (sag.) laterally expanded, flask-like posterior axial lobe, posteriorly truncate, long axial node extending across entire anteroaxis, constricted acrolobe lacking median postaxial furrow, wide borders, nondeliquate border furrows, retral spines. Cephalon ascribed may not belong.

Early Ordovician. France, early Tremadoc.

#### **LEIAGNOSTUS** Jaekel, 1910

*Lieagnostus erraticus* Jaekel, 1910, p.401, OD.

Holotype (Jaekel, 1910, fig. 23), K258, HMB, Berlin.

[=*Phoidagnostoides* Pillet in Capera et al., 1978]

Cephalon and pygidium ovoid, effaced; cephalon lacking border, totally effaced except for advanced glabellar node; pygidium nonspinose, with relatively broad, flat border with nondeliquate border furrow, and a weak axial node.

?Late Late Cambrian - Early Ordovician. Germany, Tremadoc - Arenig; Czechoslovakia, Tremadoc - Llanvirn; France, Tremadoc; Wales, Tremadoc; Sweden, early Arenig; Argentina, Tremadoc (*P. argentina* Zone); China, ?latest Cambrian - early Llanvirn (Guizhou, ?Hunan, Gansu, Xinjiang); ?USSR (Kazakhstan), *Rhadinopleura pyriforme* Zone.

#### **MONAXAGNOSTUS** Liu, 1982

*Monaxagnostus yongshunensis* Liu, 1982, p.293, OD.

Holotype (Liu, 1982, pl.209, fig.8), HT 8123, HBG, Changsha

Effaced exoskeleton; cephalon totally effaced except for traces of basal lobes, lacking border and border furrow; pygidium retains indistinct axial node and rather broad border with non-deliquate border furrow.

Late Cambrian. China (Hunan).

#### **PHALAGNOSTUS** Howell, 1955

*Batus nudus* Beyrich, 1845, p.46, OD Howell, 1955, p.925.

Neotype (SD Šnajdr, 1958, p.78), cc229, No.1017 (Barrande, 1852, pl.49, fig.6), SBNM, Prague.

[=*Phalacromina* Kobayashi, 1962]

Almost totally effaced. Only glabellar culmination and small basal lobes weakly defined; otherwise cephalon totally effaced. Pygidial axis circular or ovate, defined by deep axial furrows; pygidial acrolobe undivided postaxially forming posteriorly elongate pseudoborder with ventrally directed true border (?); anterolateral border furrow crosses pseudoborder and separates almost horizontal articulating facets; vestigial elongate axial node present.

Middle Cambrian. Sweden, *P. punctuosus* Zone; Denmark, *P. tessini* Zone; Wales, England, *H. parvifrons* Zone; France, *Paradoxides* Beds; Czechoslovakia, *E. pusillus* Zone; USSR (Bennett I., Yakutia) & Canada (Newfoundland), *P. davidis* Zone; ?USA (Vermont).

#### **PHALDAGNOSTUS** Ivshin, 1960

*Phaldagnostus orbiformis* Ivshin in Khalfin (ed.), 1960, p.167, OD.

Holotype (Ivshin in Khalfin (ed.), 1960, p.168, text-fig.48), Por-1, ZSGU, Novokuznetsk.

Ivshin's type specimen has never been satisfactorily illustrated. The description does not permit distinction between this and other effaced genera.

Late Cambrian. USSR (Maly Karatau, Altai Mts, Kazakhstan), *G. reticulatus* - *P. curtare* Zones.

#### **PHOIDAGNOSTUS** Whitehouse, 1936 (Fig. 18.5)

*Phoidagnostus limbatus* Whitehouse, 1936, p.93, OD.

Holotype (Whitehouse, 1936, pl.9, fig.10), UQF 3207, UQ, Brisbane.

Only cephalon known; acrolobe moderately convex, unconstricted, scrobiculate; border narrow, border furrow nondeliquate; axial furrows anteriorly effaced, weakly developed posteriorly; preglabellar median furrow clearly developed; glabellar culmination rounded; elongate axial node at about cephalic midlength, flanked by subtriangular depressions; basal lobes short, transverse, tumid; prosopon smooth.

Late Middle Cambrian. Australia (Queensland), *P. cassis* Zone.

#### **PLURINODUS** Öpik, 1967 (Fig. 18.3)

*Plurinodus discretus* Öpik, 1967, p.170, OD.

Holotype (Öpik, 1967, pl.60, fig.17), CPC5889, BMR, Canberra.

Diminutive pygidia with broad borders, deliquate border furrows, and unconstricted acrolobe; anteroaxis tapers rearward, defined by deep and wide axial furrows; F1, F2 effaced; completely effaced posterior lobe, terminal node situated at border furrow; retral marginal spines, agnostoid articulating device. Cephalon with depressed or effaced anterior glabellar lobe may be associated. May belong to Pseudagnostinae.

Early Late Cambrian. Australia (Queensland), *G. stolidotus* Zone.

#### **QUADRAGNOSTUS** Howell, 1935

*Quadragnostus solus* Howell, 1935a, p.219, OD.

Holotype (Howell, 1935a, pl.22, fig.6), No. 9793, PU, Princeton.

The type species of this genus is based on a very poorly preserved holotype pygidium and an equally poorly preserved, fragmentary paratype cephalon, both of which are difficult to interpret.

Late Middle Cambrian. USA (Vermont), *Centroleura vermontensis* beds.

#### **SKRYJAGNOSTUS** Šnajdr, 1957 (Fig. 19.1)

*Skryjagnostus pompeckji* Šnajdr, 1957, p.236, OD.

Holotype (Šnajdr, 1958, pl.6, fig.4), Šnajdr Colln Br-191, SBNM, Prague.

Exoskeleton almost totally effaced except for a hint of axial furrows around the rear of the basal glabellar lobes, and the presence of an extremely narrow (sag.) border in both cephalon and pygidium.

Middle Cambrian. Czechoslovakia, *E. pusillus* Zone; USSR (NW Siberia), *Pedinocephalus/Toxotis* Zone.

**TORAGNOSTUS** Robison, 1988 (Fig. 18.7a,b)  
*Agnostus bituberculatus* Angelin, 1851, p.6, OD.  
Lectotype (Rozova, 1964, p.19), number unknown, RM, Stockholm.

Almost completely effaced, lacking cephalic border and with wide pygidial border. Cephalon strongly convex; glabella outlined posteriorly, narrow, tapering forward, with broadly rounded or obtusely angular culmination; glabellar node elongate, well in front of cephalic midlength; basal lobes simple, bulbous, strongly transverse. Pygidial axis very broad, with M1 bounded by axial furrow; axial node weak, elongate

Late Middle Cambrian. Sweden, *S. brachymetopa* Zone; USSR (Siberian Platform), *C. oriens* Zone, *A. henrici* Zone, (Tyan-Shan) Mayan Stage, (Bennett Island); North Greenland, *L. laevigata* Zone; USA (Alaska); Denmark; China (Hunan).

**VALENAGNOSTUS** Jago, 1976 (Fig. 18.6a,b)  
*Agnostus nudus* Beyrich var. *marginata* Brögger, 1878, p.73, OD Jago, 1976, p.144.  
Holotype not identified (Brögger, 1878, pl.6, fig.3), PMO, Oslo.

Exoskeleton almost completely effaced; cephalic border and border furrow extremely narrow (sag.); pygidium with wide border, especially posteriorly, and deliquate to subdeliquate border furrow; unconstricted acrolobes. Cephalic axial furrows effaced, but axial glabellar node may be present retrally. Vestigial pygidial axial furrows may define long (sag.) axis extending to border furrow bearing terminal node; axial node almost totally effaced; nonspinoe; smooth.

Late Middle - early Late Cambrian. Norway, *P. rugulosus* Zone; Sweden, *Hyolithes* Limestone; Denmark, *P. davidis* Zone; Australia (Tasmania), *L. laevigata* Zone, (Queensland) *D. notalibae* - *E. eretes* Zones.

### Superfamily CONDYLOPYGOIDEA Raymond, 1913

[nom. transl. herein, ex Condylropygenae Raymond, 1913 (partim)]

Agnostida possessing very narrow (exsag) transverse basal lobes forming a continuous occipital ring, bearing a median tubercle or spine.

Early - Middle Cambrian

### Family CONDYLOPYGIDAE Raymond, 1913

Agnostida with constricted cephalic and pygidial acrolobes; cephalic axis with laterally expanded anterior glabellar lobe, posterior lobe with truncate culmination, short (exsag.) basal lobes forming continuous occipital ring, bearing median tubercle or spine, also present on thoracic segments; pygidial axis with triannulate anteroaxis and laterally expanded, posteriorly rounded posteroaxis.

Early - Middle Cambrian.

**CONDYLOPYGE** Hawle & Corda, 1847 (Fig. 19.2)  
*Battus rex* Barrande, 1846, p.17; OD Hawle & Corda, 1847, p.166.  
Lectotype (SD Šnajdr, 1958, p.52), GC 237 (Barrande, 1852, pl.49, fig.5), SBNM, Prague.  
[= *Paragnostus* Jaekel, 1909; = *Fallagnostus* Howell, 1935]

En grande tenue; cephalon and pygidium with strongly deliquate border furrows and constricted acrolobes; anterior glabellar lobe very large, approximately semicircular, posterior lobe cylindrical, with retral axial node; pygidial axis bearing elongate keel formed by fusion of axial nodes anteriorly; spines, where developed, are short, prosopon smooth.

Late Early - Middle Cambrian (*Protolenus* Zone - *P. paradoxissimus* Stage). Czechoslovakia, *E. pusilla* Zone; England, *Protolenus* - *P. atavus/T. fissus* Zones; Wales, *P. oelandicus* Zone; Sweden, *P. insularis* - *P. punctuosus* Zones; France, *Paradoxides* beds; Germany, *P. insularis* - *P. paradoxissimus* Zones; Spain, *P. paradoxissimus* Zone; Canada (Newfoundland, New Brunswick), *P. hicksi* - *P. davidis* Zones; USA (Massachusetts); USSR (N. Siberia), Amgan Stage, *Oryctocara* - *Kounamkites* Zones, (SE. Siberia) Mayan Stage, *T. fissus* Zone.

**PLEUROCTENIUM** Hawle & Corda, 1847 (Fig. 19.3a,b)  
*Battus granulatus* Barrande, 1846, p.15; SD Vogdes, 1925, p.110.  
Lectotype (SD Šnajdr, 1958, p.56), GC 250 (Barrande, 1852, pl.49, figs 5-7), SBNM, Prague.  
[= *Dichagnostus* Jaekel, 1909]

En grande tenue; cephalon and pygidium with narrow borders and border furrows and weakly constricted acrolobes; anterior glabellar lobe crescentic, wrapped around posterior glabellar lobe; long cephalic and posterolateral pygidial spines commonly developed, discrete spines developed from axial pygidial nodes, and lateral and posterior margins frequently bear a fringe of small spines; prosopon granular.

Middle Cambrian (*P. oelandicus* - *P. paradoxissimus* Stages). Czechoslovakia, *E. pusilla* Zone; England, *P. aurora* - *P. punctuosus* Zones; Wales, Sweden, *H. parvifrons* Zone; France, *Paradoxides* beds; Canada (Newfoundland, New Brunswick), *P. hicksi* - *P. davidis* Zones.

### Superfamiliae Incertae Sedis

**Family PHALACROMIDAE** Hawle & Corda, 1847  
[= *Platagnostidae* Howell, 1935]

Cephalon variably effaced; pygidium with long (sag.) and laterally expanded axis, pygidial axial

node close to middle of axis, elongate; transverse groove or furrow present immediately behind axial node; variable border morphology and spinosity.

Middle Cambrian.

**PHALACROMA** Hawle & Corda, 1847 (Fig. 19.4)  
*Battus bibullatus* Barrande, 1846, p.14, OD Hawle & Corda, 1847, p.43.  
Lectotype (SD Šnajdr, 1958, p.74), cc244, No.1027 (Barrande, 1852, pl.49, fig.6), SBNM, Prague.  
[=*Platagnostus* Howell, 1935]

Cephalon almost totally effaced, having a barely perceptible border and axial furrows which are defined only posteriorly, basal lobes effaced. Pygidium with very wide (tr.) axis extending to narrow (sag.) posterior border; nonspinose.

Middle Cambrian. Czechoslovakia, *E. pusillus* Zone; France, *Paradoxides* Beds; USSR, *T. fissus*/*P. hicksi* - late *P. davidis* Zones.

**?DIGNAGNOSTUS** Hairullina, 1975  
*Dignagnostus grandis* Hairullina, 1975, p.111, OD.  
Holotype (Hairullina in Repina et al., 1975, pl.12, figs 7-8), 483/218b, MMG, Tashkent.

With tendency to efface pygidial F1 and F2 furrows while retaining axial and border furrows. Pygidial axis pyriform, transversely expanded, long (sag.) reaching posterior border furrow; acrolobe unconstricted, pleural fields very narrow (tr.); borders of significant width, posterolaterally spinose. Cephalon with advanced glabellar node and vestigial median preglabellar furrow

Middle Cambrian. USSR (Uzbekistan), *Sdzuyella-Aegunaspis* beds.

**LISOGORAGNOSTUS** Rozova, 1988

*Lisogoragnostus kalisae* Rozova, 1988, p.64, OD.  
Holotype (Rozova in Lisogor et al., 1988, pl.5, fig.9), 848/36, TsSGM, Novosibirsk.

Cephalon partly effaced, with vestigial basal lobes and glabellar culmination; well defined border furrows; pygidium apparently lacking border or border furrows, with wide (tr.), short (sag.), axis which bears a low axial node anteriorly and lacks F1 and F2 furrows.

Middle Cambrian. USSR (southern Kazakhstan, Siberian Platform), beds with *Peronopsis fallax* and *Tomagnostus fissus*.

## Family SPHAERAGNOSTIDAE Kobayashi, 1939

Agnostida with totally effaced cephalon, but retaining pygidial border, and short (sag.), convex, subcircular pygidial axis.  
Ordovician.

**SPHAERAGNOSTUS** Howell & Resser, 1936 (Fig. 19.5)  
*Agnostus similis* Barrande, 1972, p.144, OD Howell & Resser in Cooper & Kindle, 1936, p.361.  
Holotype (Barrande, 1872, pl.14, figs 17, 18), CD 489 (see Pek, 1977, pl.7, fig.6), SBNM, Prague.

Cephalon totally effaced, lacking traces of border furrows, axial furrows and glabellar node externally; pygidium has well defined, non-deliquate border furrows, narrow border, and axial furrows defining short (sag.), broad (tr.), convex (tr., sag.), subcircular, unfurrowed axis which bears both axial and terminal nodes; acrolobe unconstricted, convex, lacking median postaxial furrow, posterolateral spines minute or absent; pleural regions of thoracic segments extremely restricted (tr.), axial portions short (sag.), very wide (tr.).

Ordovician. Czechoslovakia, Llandeilo; Wales, Llandeilo - Ashgill; Denmark, Sweden, Poland, Ashgill; Ireland, early Ashgill; USSR (Kazakhstan), Caradoc, (Kendykhtas) late Tremadoc, (Turkestan) Ashgill; China (Jiangxi, Zhejiang, Nei Mongol), Ashgill, (Hunan) Llandeilo; Canada (Quebec), middle Ashgill.

## NOMINA NUDA

**KITATAGNOSTUS** Petrunina, 1966

**PARAPSEUDAGNOSTUS** Petrunina, 1966

**PSEUDAGNOSTELLA** Koroleva, 1982

## REJECTED GENERA

**DISCAGNOSTUS** Öpik, 1963 [Eodiscida; herein]

**GALLAGNOSTOIDES** Kobayashi, 1939 [= *Microparia* (*Microparia*) Hawle & Corda, 1847; *fide* Fortey & Owens, 1987, p.172.]

**MALLAGNOSTUS** Howell, 1935 [Eodiscida; *fide* Rushton, 1966, p.10; Rasetti & Theokritoff, 1967, p.190.]

**PSEUDOTRINODUS** Kobayashi & Hamada, 1971 [Aulacopleurinae; *fide* Thomas & Owens, 1978, p.74.]

# INDEX OF AGNOSTOID GENERA AND SUBGENERA

## GENUS/SUBGENUS

Acadagnostus Kobayashi, 1939  
Acanthagnostus Qian, 1982  
Acidusus Öpik, 1979  
Acmahachis Resser, 1938  
Acutatagnostus Ergaliev, 1980  
Agnostardis Öpik, 1963  
Agnostascus Öpik, 1967  
Agnostascus (Paragnostascus) Peng, 1987  
Agnostoglossa Öpik, 1967  
Agnostogonus Öpik, 1967  
Agnostonymus Öpik, 1979  
Agnostotes (Agnostotes) Öpik, 1967  
Agnostotes (Pseudoglyptagnostus) Lu, 1964  
Agnostus (Agnostus) Brongniart, 1822  
Agnostus (Homagnostus) Howell, 1935  
Aistagnostus Xiang & Wang, 1985  
Allobodochus Öpik, 1979  
Ammagnostus (Ammagnostus) Öpik, 1967  
Ammagnostus (Tentagnostus) Sun X.-W., 1989  
Anglagnostus Howell, 1935  
Aotagnostus Öpik, 1979  
Archaeagnostus Kobayashi, 1939  
Armagnostus Howell, 1937  
Arthrorhachis Hawle & Corda, 1847  
Aspidagnostus Whitehouse, 1936

Baltagnostus Lochman, 1944  
Barrandagnostus Ivshin, 1960  
Battus Dalman, 1828  
Biragnostus Pokrovskaya, 1960  
Blystagnostus Öpik, 1961

Calagnostus Zhang & Wang, 1985  
Canotagnostus Rusconi, 1951  
Ceratagnostus Whitehouse, 1939  
Chatkalagnostus Hairullina & Abdullaev, 1970  
Ciceragnostus Kobayashi, 1937  
Clavagnostus Howell, 1937  
Condylopyge Hawle & Corda, 1847  
Connagnostus Öpik, 1967  
Corrugatagnostus Kobayashi, 1939  
Cotalagnostus Whitehouse, 1936  
Criotypus Öpik, 1979  
Cristagnostus Rushton, 1978  
Culipagnostus Rusconi, 1952  
Cyclagnostus Lermontova, 1940  
Cyclopagnostus Howell, 1937

Delagnostus Öpik, 1961  
Denagnostus Jago, 1987  
Dichagnostus Jaekel, 1909  
Dignagnostus Hairullina, 1975  
Diplagnostus Jaekel, 1909  
Diplorrhina Hawle & Corda, 1847  
Discagnostus Öpik, 1963  
Distagnostus Shergold, 1972  
Dividuagnostus Koroleva, 1982

## CLASSIFICATION

Family uncertain  
[= Clavagnostus Howell, 1937]  
Ptychagnostidae  
Agnostidae, Subfamily uncertain  
Agnostidae, Agnostinae  
Agnostidae, Glyptagnostinae  
[= Proagnostus Butts, 1926]  
[= Proagnostus Butts, 1926]  
[= Ammagnostus Öpik, 1967]  
Family uncertain  
[= Onymagnostus Öpik, 1979]  
Diplagnostidae, Pseudagnostinae  
Diplagnostidae, Pseudagnostinae  
Agnostidae, Agnostinae  
Agnostidae, Agnostinae  
Agnostidae, Subfamily uncertain  
[= Goniagnostus (Allobodochus) Öpik, 1979]  
Agnostidae, Ammagnostinae  
Agnostidae, Ammagnostinae  
Metagnostidae  
[= Triplagnostus (Aotagnostus) Öpik, 1979]  
Family uncertain  
Family uncertain  
Metagnostidae  
Clavagnostidae, Aspidagnostinae

Diplagnostidae, Diplagnostinae  
[= Glyptagnostus Whitehouse, 1936]  
[= Agnostus (Agnostus) Brongniart, 1822]  
[= Aspidagnostus Whitehouse, 1936]  
Family uncertain

[= Neoagnostus (N.) Kobayashi, 1955]  
[? = Acidusus Öpik, 1979]  
[= Doryagnostus Kobayashi, 1939]  
Metagnostidae  
Family uncertain  
Clavagnostidae, Clavagnostinae  
Condylopygidae  
Agnostidae, Subfamily uncertain  
Metagnostidae  
Spinagnostidae, Spinagnostinae  
[= Goniagnostus (Criotypus) Öpik, 1979]  
Diplagnostidae, Oidagnostinae  
[= Clavagnostus Howell, 1937]  
[= Acmahachis Resser, 1938]  
[= Hypagnostus Jaekel, 1909]

Family uncertain  
Diplagnostidae, Pseudagnostinae  
[= Pleuroctenium Hawle & Corda, 1847]  
Phalacromidae  
Diplagnostidae, Diplagnostinae  
Peronopsidae  
[rejected from Agnostida]  
[= Lotagnostus (Distagnostus) Shergold, 1972]  
Metagnostidae

Dolichagnostus Pokrovskaya, 1958  
Doryagnostus Kobayashi, 1939

Enetagnostus Whitehouse, 1936  
Eoagnostus Resser & Howell, 1938  
Eolotagnostus Zhou, 1982  
Euagnostus Whitehouse, 1936  
Euplethagnostus Lermontova, 1940  
Eurudagnostus Lermontova, 1951

Fallagnostus Howell, 1935  
Formosagnostus Ergaliev, 1980

Galbagnostus Whittington, 1965  
Gallagnostoides Kobayashi, 1939  
Gallagnostus Howell, 1935  
Geragnostella Kobayashi, 1939  
Geragnostus Howell, 1935  
Geratrinodus Kobayashi & Hamada, 1978  
Girvanagnostus Kobayashi, 1939  
Glaberagnostus Romanenko, 1985  
Glyptagnostotes Lazarenko, 1966  
Glyptagnostus Whitehouse, 1936  
Glyptagnostus (Lispagnostus) Öpik, 1967  
Goniagnostus (Goniagnostus) Howell, 1935  
Goniagnostus (Allobodochus) Öpik, 1979  
Goniagnostus (Criotypus) Öpik, 1979  
Grandagnostus Howell, 1935  
Granulatagnostus Kolobova, 1981  
Granuloagnostus Pek, 1970  
Gratagnostus Hairullina, 1975  
Gymnagnostus Robison & Pantoja-Alor, 1968

Hadragnostus Öpik, 1967  
Hastagnostus Howell, 1937  
Homagnostoides Kobayashi, 1939  
Homagnostus Howell, 1935  
Huaragnostus Rusconi, 1950  
Hypagnostus Jaekel, 1909  
Hypagnostus (Breviagnostus) Liu, 1982  
Hypagnostus (Metahypagnostus) Qiu, 1983  
Hyperagnostus Kobayashi, 1955

Idolagnostus Öpik, 1967  
Iniospheniscus Öpik, 1979  
Innitagnostus Öpik, 1967  
Itagnostus Öpik, 1979  
Ivshinagnostus Ergaliev, 1980

Kitatagnostus Petrunina, 1966  
Kormagnostella Romanenko, 1967  
Kormagnostus Resser, 1938  
Kunshanagnostus Qian & Zhou, 1984  
Kymagnostus Hohensee, 1989

Leiagnostus Jaekel, 1910  
Lejopyge Hawle & Corda, 1847  
Linguagnostus Kobayashi, 1939  
Lisogoragnostus Rozova, 1988  
Litagnostoides Schrank, 1975  
Litagnostus Rasetti, 1944

Diplagnostidae, Diplagnostinae  
Spinagnostidae, Doryagnostinae

[=Diplagnostus Jaekel, 1909]  
Spinagnostidae, Spinagnostinae  
[=Lotagnostus (Eolotagnostus) Zhou, 1982]  
Spinagnostidae, Spinagnostinae  
[=Neoagnostus (N.) Kobayashi, 1955]  
[=Oncagnostus (O.) Whitehouse, 1936]

[=Condylopyge Hawle & Corda, 1847]  
Agnostidae, Ammagnostinae

Metagnostidae  
[rejected from Agnostida]  
Family uncertain  
Metagnostidae  
Metagnostidae  
[=Geragnostus Howell, 1935]  
[=Arthrorhachis Hawle & Corda, 1847]  
Family uncertain  
[=Agnostotes (Pseudoglyptagnostus) Lu, 1964]  
Agnostidae, Glytagnostinae  
[=Ammagnostus Öpik, 1967]  
Ptychagnostidae  
Ptychagnostidae  
Ptychagnostidae  
Family uncertain  
[=Corrugatagnostus Kobayashi, 1939]  
Metagnostidae  
Peronopsidae  
Agnostidae, Agnostinae

Agnostidae, Ammagnostinae  
Family uncertain  
Family uncertain  
[=Agnostus (Homagnostus) Howell, 1935]  
[=Goniagnostus Howell, 1935]  
Spinagnostidae, Spinagnostinae  
[=Hypagnostus Jaekel, 1909]  
[=Hypagnostus Jaekel, 1909]  
[=Neoagnostus (N.) Kobayashi, 1955]

?Agnostidae, Subfamily uncertain  
Diplagnostidae, ?Diplagnostinae  
Agnostidae, Agnostinae  
Spinagnostidae, Doryagnostinae  
Agnostidae, ?Agnostinae

nomen nudum  
Agnostidae, ?Ammagnostinae  
Agnostidae, Ammagnostinae  
[=Formosagnostus Ergaliev, 1980]  
[=Oncagnostus (Kymagnostus) Hohensee, 1989]

Family uncertain  
Ptychagnostidae  
Diplagnostidae, Diplagnostinae  
Phalacromidae  
[=Kormagnostella Romanenko, 1967]  
Diplagnostidae, Pseudagnostinae

Lotagnostus (Lotagnostus) Whitehouse, 1936  
 Lotagnostus (Eolotagnostus) Zhou, 1982  
 Lotagnostus (Distagnostus) Shergold, 1972

Machairagnostus Harrington & Leanza, 1957

Mallagnostus Howell, 1935  
 Mesagnostus Jaekel, 1909  
 Mesospheniscus Hawle & Corda, 1847  
 Metagnostus Jaekel, 1909  
 Miagnostus Jaekel, 1909  
 Micagnostus Hairullina, 1975  
 Micagnostus Howell, 1935  
 Monaxagnostus Liu, 1982  
 Myrmecomimus Öpik, 1979

Neoagnostus (Neoagnostus) Kobayashi, 1955  
 Neoagnostus (Machairagnostus) Harrington & Leanza, 1957  
 Neptunagnostella Pek, 1970

Oculagnostus Ahlberg, 1988  
 Oedorhachis Resser, 1938  
 Oidagnostus Westergård, 1946  
 Oncagnostus (Oncagnostus) Whitehouse, 1936  
 Oncagnostus (Kymagnostus) Hohensee, 1989  
 Oncagnostus (Strictagnostus) Shergold, 1975  
 Onymagnostus Öpik, 1979  
 Onymagnostus (Agnostonymus) Öpik, 1979  
 Ovalagnostus Lu, 1974  
 Oxyagnostus Öpik, 1967

Paragnostascus Peng, 1987  
 Paragnostus Jaekel, 1909  
 Parapseudagnostus Petrunina, 1966  
 Pentagnostus Lermontova, 1940  
 Peratagnostus Öpik, 1967  
 Peronopsella Sdzuy, 1967  
 Peronopsis Hawle & Corda, 1847  
 Peziziopsis Ju, 1983  
 Phalacroma Hawle & Corda, 1847  
 Phalacromina Kobayashi, 1962  
 Phalagnostus Howell, 1955  
 Phaldagnostus Ivshin, 1960  
 Phoidagnostoides Pillet, 1978  
 Phoidagnostus Whitehouse, 1936  
 Platagnostus Howell, 1937  
 Plethagnostus Clark, 1923  
 Pleuroctenium Hawle & Corda, 1847  
 Plurinodus Öpik, 1967  
 Proagnostus Butts, 1926  
 Pseudagnostella Koroleva, 1982  
 Pseudagnostina Palmer, 1962  
 Pseudagnostus (Pseudagnostus) Jaekel, 1909  
 Pseudagnostus (Pseudagnostina) Palmer, 1962  
 Pseudagnostus (Sulcatagnostus) Kobayashi, 1937  
 Pseudagnostus (Tririmagagnostus) Qiu, 1983  
 Pseudoglyptagnostus Lu, 1964  
 Pseudoperonopsis Harrington, 1938  
 Pseudophalacroma Pokrovskaya, 1958  
 Pseudorhaptagnostus Lermontova, 1940  
 Pseudotrinodus Kobayashi & Hamada, 1971

Agnostidae, Agnostinae  
 Agnostidae, Agnostinae  
 Agnostidae, Agnostinae

[=Neoagnostus (Machairagnostus) Harrington & Leanza, 1957]  
 [rejected from Agnostida]  
 [=Peronopsis Hawle & Corda, 1847]  
 [=Peronopsis Hawle & Corda, 1847]  
 [=Arthrorhachis Hawle & Corda, 1847]  
 [=Lejopyge Hawle & Corda, 1847]  
 Spinagnostidae, Spinagnostinae  
 Agnostidae, Agnostinae  
 Family uncertain  
 Ptychagnostidae

Diplagnostidae, Pseudagnostinae  
 Diplagnostidae, Pseudagnostinae  
 [=Geragnostus Howell, 1935]

[=Chatkalagnostus Hairullina & Abdullaev, 1970]  
 Diplagnostidae, Diplagnostinae  
 Diplagnostidae, Oidagnostinae  
 Agnostidae, Agnostinae  
 Agnostidae, Agnostinae  
 Agnostidae, Agnostinae  
 Ptychagnostidae  
 [=Onymagnostus Öpik, 1979]  
 [=Oidagnostus Westergård, 1946]  
 Diplagnostidae, Pseudagnostinae

[=Proagnostus Butts, 1926]  
 [=Condylropyge Hawle & Corda, 1847]  
 nomen nudum  
 Ptychagnostidae  
 Spinagnostidae, Spinagnostinae  
 Peronopsidae  
 Peronopsidae  
 [=Dividuagnostus Koroleva, 1982]  
 Phalacromidae  
 [=Phalagnostus Howell, 1955]  
 Family uncertain  
 Family uncertain  
 [=Leiagnostus Jaekel, 1909]  
 Family uncertain  
 [=Phalacroma Hawle & Corda, 1847]  
 [=Pseudagnostus Jaekel, 1909]  
 Condylropygidae  
 Family uncertain  
 Agnostidae, Ammagnostinae  
 nomen nudum  
 Diplagnostidae, Pseudagnostinae  
 Diplagnostidae, Pseudagnostinae  
 Diplagnostidae, Pseudagnostinae  
 Diplagnostidae, Pseudagnostinae  
 [=Trisulcagnostus Ergaliev, 1980]  
 [=Agnostotes (Pseudoglyptagnostus) Lu, 1964]  
 Spinagnostidae, Subfamily uncertain  
 [=Lejopyge Hawle & Corda, 1847]  
 [=Neoagnostus (N.) Kobayashi, 1955]  
 [rejected from Agnostida]

Ptychagnostus Jaekel, 1909

Quadragnostus Howell, 1935

Quadrahomagnostus Zhu, 1959

Raragnostus Hairullina, 1975

Rhaptagnostus Whitehouse, 1936

Rhodotypiscus Öpik, 1979

Rudagnostus Lermontova, 1951

Segmentagnostus Pek, 1977

Skryjagnostus Šnajdr, 1957

Solenagnostus Whitehouse, 1936

Sphaeragnostus Kobayashi, 1939

Spinagnostus Howell, 1935

Stigmagnostus Poulsen, 1960

Strictagnostus Shergold, 1975

Sulcatagnostus Kobayashi, 1937

Svenax Öpik, 1979

Tarayagnostus Suarez-Soruco, 1975

Tasagnostus Jago, 1976

Tentagnostus Sun, 1989

Tomagnostella Kobayashi, 1939

Tomagnostus Howell, 1935

Tomorhachis Resser, 1938

Toragnostus Robison, 1988

Triadapis Öpik, 1967

Trilobagnostus Harrington, 1938

Trinodus M'Coy, 1846

Triplagnostus (Triplagnostus) Howell, 1935

Triplagnostus (Aotagnostus) Öpik, 1979

Tririmagnostus Qiu, 1983

Trisulcagnostus Ergaliev, 1980

Utagnostus Robison, 1964

Valenagnostus Jago, 1976

Wanagnostus Qiu, 1983

Xestagnostus Öpik, 1967

Zeteagnostus Öpik, 1979

Ptychagnostidae

Family uncertain

Agnostidae, Subfamily uncertain

Spinagnostidae, Spinagnostinae

Diplagnostidae, Pseudagnostinae

Spinagnostidae, Doryagnostinae

[= Trilobagnostus Harrington, 1938]

[= Corrugatagnostus Kobayashi, 1939]

Family uncertain

[= Triplagnostus (Triplagnostus) Howell, 1935]

Sphaeragnostidae

Spinagnostidae, Spinagnostinae

[= Clavagnostus Howell, 1937]

[= Oncagnostus (Strictagnostus) Shergold, 1975]

[= Pseudagnostus (Sulcatagnostus) Kobayashi, 1937]

Spinagnostidae, Spinagnostinae

[= Neoagnostus (N.) Kobayashi, 1955]

Diplagnostidae, Diplagnostinae

[= Ammagnostus (Tentagnostus) Sun, X.-W., 1989]

Spinagnostidae, Spinagnostinae

Ptychagnostidae

[= Clavagnostus Howell, 1937]

Family uncertain

Clavagnostidae, Clavagnostinae

Agnostidae, Agnostinae

Metagnostidae

Ptychagnostidae

Ptychagnostidae

[= Trisulcagnostus Ergaliev, 1980]

Diplagnostidae, Pseudagnostinae

Clavagnostidae, Subfamily uncertain

Family uncertain

[= Acmarhachis Resser, 1938]

Diplagnostidae, Pseudagnostinae

Ptychagnostidae



## REFERENCES

- ABDULLAEV, R.N. & KHALETSKAYA, O.N., 1970 - *Nizhniy Paleozoy Chatkalskogo Khrebt: Trilobity i Graptolity Ordovika Pskemskogo Khrebt*. 104p., 8 pls. Institut Geologii i Geofiziki, Tashkent.
- ADAMS, G. I., BUTTS, C., STEPHANSON, L. W. & COOKE, W., 1926 - Geology of Alabama. *Geological Survey of Alabama, Special Report, 14*, 312 p., 97 pls.
- AHLBERG, P., 1988 - Ocular structures in an Ordovician agnostid trilobite. *Lethaia*, 21, 115-120.
- ALLEN, P.M., JACKSON, A.A., RUSHTON, A.W.A., 1981 - The stratigraphy of the Mawddach Group in the Cambrian succession of North Wales, *Proceedings of the Yorkshire Geological Society*, 43(3), 295-329, pls 16-17.
- ANGELIN, N.P., 1851 - *Palaeontologia Suecica, Pars 1. Iconographia crustaceorum formationis transitionis*. Fasc.1, 1-24, pls 1-19.
- ANGELIN, N. P., 1854 - *Palaeontologia Scandinavica*. 92 pp., 41 pls. Lipsiae.
- BARRANDE, J., 1846 - *Notice préliminaire sur le Système silurien et les Trilobites de Bohême*. 96p. Hirschfeld, Leipzig.
- BARRANDE, J., 1852 - *Système silurien du centre de la Bohême, I. Recherches paléontologiques, 1 (Crustacés: Trilobites)*. 935p., 51 pls. Prague, Paris.
- BARRANDE, J., 1872 - *Système silurien du centre de la Bohême, I. Recherches paléontologiques, Supplement au Vol.1 (Trilobites, Crustacés divers et Poissons)*. 647p., 37 pls. Prague, Paris.
- BELT, T., 1867 - On some new trilobites from the upper Cambrian rocks of North Wales. *Geological Magazine*, 4, 294-295, pl.12.
- BELT, T., 1868 - On the 'Lingula Flags' or 'Festiniog Group' of the Dolgelly District. Part III. *Geological Magazine*, 5, 5-11, pl.2.
- BERGERON, J., 1889 - Étude géologique du Massif ancien situé au sud du plateau central. *Annales des Sciences Géologiques*, Paris, 22, 361p., 9 pls.
- BERGSTRÖM, J., 1973 - Organization, life and systematics of trilobites. *Fossils and Strata*, 2, 1-69, pls 1-5.
- BEYRICH, E., 1845 - *Über einige böhmischer Trilobiten*. 47p., 1pl. Berlin.
- BILLINGS, E., 1860 - On some new species of fossils from the limestone near Point Lvi opposite Quebec. *Proceedings of the Canadian Naturalist and Geologist*, 5, pls. 301 - 324.
- BILLINGS, E., 1865 - *Palaeozoic fossils, Vol.1 (4)*, 169-344. Geological Survey of Canada, Montreal.
- BRÖGGER, W. C., 1875 - Fossiler fra Øxna og Kletten. *Geologiska Foreningens i Forhandlingar*, 2, 572-580, pl. 25.
- BRÖGGER, W.C., 1878 - Om paradoxidesskifrene ved Krekling. *Nyt Magazin for Naturvidenskaberne*, 24, 18-88, pls 1-6.
- BRONGNIART, A. & DESMAREST, A.G., 1822 - *Histoire naturelle des crustacés fossiles, sous les rapports zoologiques et géologiques. Savoir: Les Trilobites*. F.G. Levrault, Paris. 154p., 11pls.
- BUTTS, C., 1926 - The Palaeozoic Rocks. In ADAMS, G. I. et al., 1926, pp. 41-230, pls. 3-76.
- CALLAWAY, C., 1877 - On a new area of Upper Cambrian rocks in South Shropshire, with a description of a new fauna. *Quarterly Journal of the Geological Society of London*, 33, 652 - 672, pl. 24.
- CAPERA, J.C., COURTESOLE, R. & PILLET, J., 1978 - Contribution à l'étude de l'Ordovicien inférieur de la Montagne Noire. Biostratigraphie et révision des Agnostida. *Annales de la Société Géologique du Nord*, 98, 67-88.
- CHU Chaoling, 1959 - See ZHU Zhaoling, 1959.
- CLARK, T.H., 1923 - A group of new species of Agnostus from Levis, Quebec. *The Canadian Field-Naturalist*, 37(7), 121-125.
- COOPER, G.A., KINDLE, C.H., 1936 - New brachiopods and trilobites from the Upper Ordovician of Perce, Quebec. *Journal of Paleontology*, 10(5), 348-372, pls 51-53.
- DALMAN, J. W., 1828 - *Nya Svenska Palaeder. Årsberättelse om Nyare Zoologiska Arbeten och Upptäckter, Kongliga Svenska Vetenskapsakademien, Årseberättelser, Stockholm*, pp. 134 - 135.
- DAWSON, J. W., 1868 - *Acadian Geology. The geological structure, organic remains, and mineral resources of Nova Scotia, New Brunswick and Prince Edward Island*, 2nd Edition. 694 pp., Macmillan, London.
- ECKEL, E. B., 1982 - The Geological Society of America. Life history of a learned society. *Geological Society of America, Memoir 155*.

- ERGALIEV, G.Kh., 1980 - *Trilobity Srednego i Verkhnego Kembriya Malogo Karatau*. 211pp., 20pls. Nauka, Alma-Ata.
- ERGALIEV, G. Kh., 1983 - Nekotorye trilobity Verkhnego Kembriya i Nizhnego Ordovika Bolyshogo Karatau i Ulutau. IN *Stratigrafiya i Paleontologiya Nizhnego Paleozoya Kazakhstana* (Ed. M. K. Apollonov, S. M. Bandeletov & N. K. Ivshin) pp. 35-66, pls. 1-6. Nauka, Alma-Ata.
- ETHERIDGE, R., Jr., 1902 - Official Contributions to the Palaeontology of South Australia. No.13. Evidence of further Cambrian trilobites. *South Australian Parliamentary Papers*, 3-4, pl.2.
- FORTEY, R.A., 1980 - The Ordovician trilobites of Spitsbergen. III. Remaining trilobites of the Valhallfonna Formation. *Norsk Polarinstitutt Skrifter*, 171, 163p., 25 pls.
- FORTEY, R.A., OWENS, R.M., 1987 - The Arenig Series in South Wales: Stratigraphy and Palaeontology. I. The Arenig Series in South Wales. *Bulletin of the British Museum (Natural History)*, *Geology*, 41(3), 69-307.
- GRÖNWALL, K.A., 1902 - Bornholms Paradoxideslag og deres Fauna. *Danmarks geologiske Undersogelse, Series 2, No.13*, 1-230, 1-4.
- GÜRICH, G., 1907 - Versuch einer Neueinteilung der Trilobiten. *Zentralblatt für Mineralogie, Geologie und Paläontologie*, 1907, 129-133.
- HAIRULLINA, T. I., 1975 - See REPINA, L. N. et al., 1975.
- HAIRULLINA, T. I. & ABDULLAEV, R. N., 1970 - See ABDULLAEV, R. N. & KHALETSKAYA, O. N., 1970.
- HALL, J., 1863 - Preliminary notice of the fauna of the Potsdam Sandstone; with remarks upon the previously known species of fossils and descriptions of some new ones, from the sandstone of the Upper Mississippi Valley. *New York State Cabinet of Natural History, 16th Annual Report, Appendix D, Contributions to Palaeontology*, 119-184, pls. Va-XI.
- HARRINGTON, H.J., 1938 - Sobre las faunas del ordoviciano inferior del norte Argentino. *Revista del Museo de la Plata, N.S.*, 1, 109-289, pls 1-14.
- HARRINGTON, H.J. & LEANZA, A.F., 1957 - Ordovician trilobites of Argentina. *Special publication of the University of Kansas, Department of Geology*, 1, 276p.
- HARRINGTON, H.J., HENNINGSMOEN, G., HOWELL, B.F., JAANUSSON, V., LOCHMAN-BALK, C., MOORE, R.C., POULSEN, C., RASETTI, F., RICHTER, E., RICHTER, R., SCHMIDT, H., SDZUY, K., STRUVE, W., STORMER, L., STUBBLEFIELD, C.J., TRIPP, R., WELLER, J.M. & WHITTINGTON, H.B., 1959 - *Treatise on Invertebrate Paleontology, Part O. Arthropoda 1*. 560p. Geological Society of America, New York and University of Kansas Press, Lawrence.
- HARRINGTON, H. J., MOORE, R. C. & STUBBLEFIELD, C. J., 1959 - Morphological terms applied to Trilobita. In MOORE, R. C. (Editor), 1959, 0117 - 0126.
- HARTT, C. F., 1868 - See DAWSON, J. W., 1868.
- HAWLE, I. & CORDA, A.J.C., 1847 - Prodrum einer Monographie der böhmischen Trilobiten. *Abhandlungen der Königliche Böhmischen Gesellschaft Wissenschaften*, 5, 121-292, pls 1-7.
- HENNINGSMOEN, G., 1951 - Remarks on the classification of trilobites. *Norsk Geologisk Tidsskrift*, 29, 174-217.
- HENNINGSMOEN, G., 1958 - The Upper Cambrian faunas of Norway with descriptions of non-olenid invertebrate fossils. *Norsk Geologisk Tidsskrift*, 38, 180-195, pls 1-7.
- HICKS, H., 1875 - On the succession of the Ancient Rocks in the vicinity of St. David's, Pembrokeshire. *Quarterly Journal of the Geological Society of London*, 31, 167-193, pls 8-11.
- HILL, D., PLAYFORD, G. & WOODS, J.T., 1971 - *Cambrian fossils of Queensland*. 32p., 15 pls. Queensland Palaeontographical Society, Brisbane
- HOHENSEE, S.R. & STITT, J.H., 1989 - Redeposited *Elvinia* Zone (Upper Cambrian) trilobites from the Collier Shale, Ouachita Mountains, west-central Arkansas. *Journal of Paleontology*, 63(6), 857-869.
- HOLM, G. & WESTERGÅRD, A.H., 1930 - A Middle Cambrian fauna from Bennett Island. *Zapiski Akademii Nauk Soyuz SSR, po Otdeleniyu Fiziko-Matematicheskikh Nauk*, 21(8), 1-25, pls 1-4.
- HORNY, R. & BASTL, F., 1970 - *Type specimens of fossils in the National Museum, Prague. Volume 1, Trilobita*, 354 pp., 20 pls. Museum of Natural History, Prague.
- HOWELL, B.F., 1935a - New Middle Cambrian agnostian trilobites from Vermont. *Journal of*

*Paleontology*, 9(3), 218-221, pl.22.

HOWELL, B.F., 1935b - Cambrian and Ordovician trilobites from Herault, southern France. *Journal of Paleontology*, 9(3), 222-238, pls 22-23.

HOWELL, B. F., 1935c - Some New Brunswick Cambrian agnostians. *Bulletin of the Wagner Free Institute of Science*, 10 (2), 13 - 16, 1 pl.

HOWELL, B.F., 1937 - Cambrian Centroleura vermontensis fauna of northwestern Vermont. *Geological Society of America, Bulletin*, 48, 1147-1210.

HOWELL, B.F., 1955 - Phalagnostus, a new genus for trilobite Battus nudus Beyrich. *Journal of Paleontology*, 29, 925-926.

HOWELL, B.F. & RESSER, C.E., 1936. In COOPER, G.A., KINDLE, C.H. - New brachiopods and trilobites from the Upper Ordovician of Perce, Quebec. *Journal of Paleontology*, 10(5), 348-372, pls 51-53.

HUPÉ, P., 1953 - Classe des Trilobites. In Piveteau, J. (ed.) *Traité de Paléontologie*, 3, 44-246. Paris.

ILLING, V.C., 1916 - The Paradoxidian fauna of a part of the Stockingford Shales. *Quarterly Journal of the Geological Society*, 71(3), 386-450.

IVSHIN, N.K., 1953 - *Srednekembriyskie trilobity Kazakhstana, Chast I. Boshchekulskiy faunisticheskiy gorizont*. 226p. Institut Geologicheskikh Nauk, Akademiya Nauk, Alma-Ata

IVSHIN, N. K., 1956 - *Verkhnekembriyskie trilobity Kazakhstana, Chast I. Kuyandinskiy faunisticheskiy gorizont mezhdurechiya Olenty-Shiderty*. 98 pp., 9 pls. Institut Geologicheskikh Nauk, Akademiya Nauk, Kazakhskoy SSR, Alma-Ata.

IVSHIN, N.K., 1962 - *Verkhnekembriyskie trilobity Kazakhstana, Chast II. Seletinskiy Gorizont Kuyandinskogo Yarusy tsentralnogo Kazakhstana*. 412p., 21pls. Institut Geologicheskikh Nauk, Akademii Nauk Kazakhskoy SSR, Alma-Ata.

JAEKEL, O., 1909 - Über die Agnostiden. *Zeitschrift der Deutschen Geologischen Gesellschaft*, 61(4), 380-400.

JAEKEL, O., 1910 - Über die Agnostiden. *Zeitschrift der Deutschen Geologischen Gesellschaft*, 61(4), 401

JAGO, J.B., 1976 - Late Middle Cambrian

agnostid trilobites from northwestern Tasmania. *Palaeontology*, 19(1), 133-172.

JAGO, J.B., 1987 - Idamean (Late Cambrian) trilobites from the Denison Range, south-west Tasmania. *Palaeontology*, 30(2), 207-231.

JELL, P.A., 1970 - Pagetia ocellata, a new Cambrian trilobite from northwestern Queensland. *Memoirs of the Queensland Museum*, 15(4), 303-313, pls 23-24.

JELL, P.A., 1975a - Australian Middle Cambrian Eodiscoids with a review of the Superfamily. *Palaeontographica, Abt A*, 150, 1-97, pls 1-29.

JELL, P.A., 1975b - The abathochroal eye of Pagetia, a new type of trilobite eye. *Fossils and Strata*, 4, 33-43.

JU TIANYIN, 1983 - See QIU HONGAN et al., 1983.

KHALFIN, L.L. (ed.), 1960 - Biostratigrafiya Paleozoya Sayano-Altayskoy Gornoy Oblasti, Tom 1. Nizhniy Paleozoy. *Trudy Sibirskogo Nauchno-Issledovatel'skogo Instituta Geologii, Geofiziki i Mineralnogo Syrya*, 19, 498p.

KOBAYASHI, T., 1935 - The Cambro-Ordovician formations and faunas of South Chosen. *Palaeontology, Part III. Journal of the Faculty of Science, Imperial University of Tokyo, Section II*, 4(2), 49-344, pls 1-24.

KOBAYASHI, T., 1937 - Restudy of the Dames' Types of the Cambrian trilobites from Liaotung. *Transactions and Proceedings of the Palaeontological Society of Japan*, 12(7), 70-86, pl.17.

KOBAYASHI, T., 1937 - The Cambro-Ordovician shelly faunas of South America. *Journal of the Faculty of Science, Imperial University of Tokyo, Section II*, 4(4), 369-522, pls 1-8.

KOBAYASHI, T., 1938 - Upper Cambrian fossils from British Columbia with a discussion on the isolated occurrence of the "Olenus" Beds of Mt. Jubilee. *Journal of Japanese Geology and Geography*, 15, 149-192, pls 15-16.

KOBAYASHI, T., 1939a - On the Agnostids (Part I). *Journal of the Faculty of Science, Imperial University of Tokyo, Section II*, 5(5), 69-198.

KOBAYASHI, T., 1939b - Supplementary notes on the Agnostida. *Journal of the Geological Society of Japan*, 46, 97-100.

KOBAYASHI, T., 1943 - Brief notes on the

eodiscids I, their classification with a description of a new species and a new variety. *Proceedings of the Imperial Academy, Tokyo*, 19, 37-42.

KOBAYASHI, T., 1949 - The Glyptagnostus hemera, the oldest world instant. *Journal of Japanese Geology and Geography* 21 (1 - 4), 1 - 6, pl. 1.

KOBAYASHI, T., 1955 - The Ordovician fossils from the McKay Group in British Columbia, western Canada, with a note on the Early Ordovician palaeogeography. *Journal of the Faculty of Science, University of Tokyo, Section II*, 9(3), 355-493, pls 1-9.

KOBAYASHI, T., 1962 - The Cambro-Ordovician formations and faunas of South Korea, Part IX. Palaeontology VIII, The Machari fauna. *Journal of the Faculty of Science, University of Tokyo*, 14(1), 1-152, pls 1-8.

KOBAYASHI, T. & HAMADA, T., 1971 - Agnostoid trilobites in a Devonian formation in west Malaysia. *Proceedings of the Japan Academy*, 47(4), 396-400.

KOBAYASHI, T. & HAMADA, T. 1978 - Upper Ordovician trilobites from the Langkawi Islands, Malaysia. *Geology and Palaeontology of Southeast Asia*, 19, 1-27, pl.I-II.

KOLOBOVA, I.M., 1981 - Granulatagnostus - novyy rod trilobitov iz Ordovika Kazakhstana. *Ezhegodnik Vsesoyuznogo Paleontologicheskogo Obshchestva*, 24, 257-260. Nauka, Leningrad

KOROLEVA, M.N., 1982 - *Trilobity Ordovika severo-vostochnogo Kazakhstana*. 192pp., 26pls. Nedra, Moskva.

LAKE, P., 1906 - A monograph of the British Cambrian trilobites, Part 1. *Monographs of the Palaeontographical Society*, 1-28, pls 1-2.

LAURIE, J.R., 1988 - Revision of some Australian Ptychagnostinae (Agnostida, Cambrian). *Alcheringa*, 12(3), 169-205.

LAURIE, J.R., 1989 - Revision of species of Goniagnostus Howell and Lejopyge Corda from Australia (Agnostida, Cambrian). *Alcheringa*, 13(3), 175-191.

LAZARENKO, N.P., 1966 - Biostratigrafiya i nekotorye novye trilobity Verkhnego Kembriya Olenekskogo podnyatiya i Kharaulakhskikh Gor. *Uchenye Zapiski, Paleontologiya i Biostratigrafiya*, 11, 33-78, pls 1-8.

LERMONTOVA, E. V., 1940 - Arthropoda. In

VOLOGDIN, A. et al., 1940, 112-162, pls. 35-49. LERMONTOVA, E. V., 1951 - *VerkhnekembriyskietrilobityibrakhiopodyBoshche-Kulya (severo-vostochnyy Kazakhstan)*. 49pp., 6pls. Vsesoyuzniy Nauchno-Issledovatel'skiy Geologicheskii Institut (VSEGEI), Gosudarstvennoe Izdatel'stvo, Moskva.

LINNARSSON, J.G.O., 1869 - Om Vestergötlands Cambriska och Siluriska aflagringar. *Kongliga Svenska Vetenskaps-Akademiens Handlingar*, Bd 8, No.2, 1-89, pls 1-2.

LINNARSSON, J.G.O., 1879 - Om faunen i kalken med Conocoryphe exsulans ("coronatuskalken"). *Sveriges Geologiska Undersökning, Series C*, 35, 1-31, pls 1-3.

LISOGOR, K.A., ROZOV, S.N. & ROZOVA, A.V., 1988 - Korrelyatsiya srednekembriyskikh otlozheniy Malogo Karatau i Sibirskoy Platformy po trilobitam. *Institut Geologii i Geofiziki, Trudy*, 720, 54-82, pls 4-7.

LIU Yi-ren, 1982 - Trilobita. IN The Palaeontological Atlas of Hunan. *Ministry of Geology and Mineral Resources, Geological Memoirs, Series 2, No.1*, 290-346.

LOCHMAN C., 1944 - See LOCHMAN, C. & DUNCAN, D., 1944.

LOCHMAN, C. & DUNCAN, D., 1944 - Early Upper Cambrian faunas of central Montana. *Geological Society of America, Special Papers* 54, 181 pp., 19 pls.

LU Yanhao, 1964 - See WANG Yu et al., 1964.

LU Yanhao, 1974 - See LU Yanhao et al., 1974.

LU Yanhao, ZHANG Wentang, QIAN Yiyuan, ZHU Zhaoling, LIN Huanling & 4 others, 1974 - Cambrian Trilobita. IN *Handbook of the stratigraphy and palaeontology of southwest China*, 82-107. Geological Press, Beijing.

LUDVIGSEN, R., WESTROP, S.R. & KINDLE, C.H., 1989. Sunwaptan (Upper Cambrian) trilobites of the Cow Head Group, western Newfoundland, Canada. *Palaeontographica Canadiana*, 6, 175p., 50pls.

MATTHEW, G. F., 1896 - Faunas of the Paradoxides Beds in eastern North America, No. 1. *Transactions of the New York Academy of Sciences*, 15, 192-247, pls 14-17.

M'COY, F., 1846 - *A synopsis of the Silurian Fossils of Ireland*, 72p., 5pls. Dublin

- M'COY, F., 1849 - On the classification of some British fossil Crustacea with notices of some new forms in the University collection at Cambridge. *Annals and Magazine of Natural History, Series 2*, 4, 161-179, 330-335, 392-414.
- MOORE, R. C. (Ed), 1959 - *Treatise on Invertebrate Paleontology, Part 0, Arthropoda 1*, xix + 560 pp., Geological Society of America and University of Kansas Press, Lawrence, Kansas.
- MÜLLER, K.J. & WALOSSEK, D., 1987 - Morphology, ontogeny and life habit of *Agnostus pisiformis* from the Upper Cambrian of Sweden. *Fossils and Strata*, 19, 1-124, pls 1-33.
- MUNIER-CHALMAS, E. P. & BERGERON, J., 1889 - See BERGERON, J., 1889.
- NIKOLAISEN, F. & HENNINGSMOEN, G., 1989 -
- NOVAK, O., 1883 - Zur Kenntnis der böhmischen Trilobiten. *Beiträge zur Paläontologie Österreich - Ungarns und des Orients*, 3, 1/2, 23-63, pls 8-12.
- ÖPIK, A. A., 1959 - Genal caeca of agnostids. *Nature*, 183 (4677), 1750-1751.
- ÖPIK, A.A., 1961a - Alimentary caeca of agnostid and other trilobites. *Palaeontology*, 3(4), 410-438.
- ÖPIK, A.A., 1961b - The geology and palaeontology of the headwaters of the Burke River, Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 53, 249pp.
- ÖPIK, A.A., 1963 - Early Upper Cambrian fossils from Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 64, 133p.
- ÖPIK, A.A., 1967 - The Mindyallan fauna of north-western Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 74, v.1, 404pp., v.2, 167pp., 67pls.
- ÖPIK, A. A., 1968 - The Ordian Stage of the Cambrian and its Australian Metadoxididae. *Bureau of Mineral Resources of Australia, Bulletin* 92, 133-168, pls. 19-20.
- ÖPIK, A. A., 1975 - Cymbric Vale Fauna of New South Wales and Early Cambrian biostratigraphy. *Bureau of Mineral Resources of Australia, Bulletin* 159, 78 pp., 7 pls.
- ÖPIK, A.A., 1979 - Middle Cambrian agnostids: systematics and biostratigraphy. *Bureau of Mineral Resources of Australia, Bulletin*, 172, v.1, 188pp., v.2, 67pls.
- PALMER, A.R., 1960 - Trilobites of the Upper Cambrian Dunderberg Shale, Eureka district, Nevada. *U.S. Geological Survey Professional Paper*, 334C, 109 pp., 11 pls.
- PALMER, A.R., 1962 - Glyptagnostus and associated trilobites in the United States. *U.S. Geological Survey Professional Paper*, 374F, 63p.
- PEK, I., 1970 - *Granuloagnostus* g. n. (Trilobita) from the Sarka formation of the Barrandian area. *Acta Universitatis Palackianae Olomucensis Facultas rerum naturalium*, 29, 129-131.
- PEK, I., 1977 - Agnostid trilobites of the central Bohemian Ordovician. *Sbornik Geologických Ved, Paleontologie*, 19, 7-44.
- PEK, I., VANEK, J., 1971 - Revision of the genera *Peronopsis* Hawle et Corda, 1847 and *Diplorrhina* Hawle et Corda, 1847 (Trilobita) from the Middle Cambrian of Bohemia. *Vestník Ustředního Ústavu Geologického*, 46, 269-275, pls 1-2.
- PENG Shanchi, 1987 - Early Late Cambrian stratigraphy and trilobite fauna of Taoyuan and Cili, Hunan. *Collection of Postgraduate Theses, Nanjing Institute of Geology and Palaeontology*, 1, 53-134.
- PETRUNINA, Z.E., 1966 - *Trilobity i biostratigrafiya Tremadoka zapadnoy chast Sayano-Altayskoy Gornoy oblasti*. 30p. Institut Geologicheskikh Nauk, Akademiya Nauk Kazakhskoy SSR, Alma-Ata.
- PILLET, J., 1978 - See CAPERA, J. C. et al., 1978.
- POKROVSKAYA, N.V., 1958 - Agnostidy Srednego Kembriya Yakutii, Chast I. *Trudy Geologicheskogo Instituta*, 16, 96p., 5pls.
- POKROVSKAYA, N.V., 1960 - Otryad Miomera. In Chernysheva, N.E. (ed.), *Osnovy Paleontologii: Chlenistonogie - Trilobitoobraznye i Rakoobraznye*, 54-61. Gosudarstvennoe Nauchno-Tekhnicheskoe Izdatelstvo, Moskva.
- POULSEN, C., 1960 - Fossils from the late Middle Cambrian Bolaspidella Zone of Mendoza, Argentina. *Matematisk-fysiske Meddelelser, Det Kongelige Danske Videnskabernes Selskab*, 32(11), 1-42, pls 1-3.
- PRATT, B., in press - Trilobites of the Marjuman and Steptoean Stages (Upper Cambrian), Rabbitkettle Formation, southern Mackenzie Mountains, northwest Canada. *Palaeontographica Canadiana*.

PRIBYL, A., 1970 - See HORNY, R. & BASTL, F., 1970.

QIAN Yiyuan, 1982 - Ontogeny of *Pseudagnostus benxiensis* sp. nov. (Trilobita). *Acta Palaeontologica Sinica*, 21(6), 632-644, 1pl.

QIAN Yiyuan & ZHOU Zemin, 1984 - Middle and Early Upper Cambrian trilobites from Kunshan, Jiangsu with reference to their distribution in the Lower Yangtze Region. *Acta Palaeontologica Sinica*, 23(2), 170-184, pls 1-2.

QIU Hongan, LU Yanhao, ZHU Zhaoling, BI Dechang, LIN Tianrui, ZHOU Zhiyi, ZHANG Quanzhong, QIAN Yiyuan, JU Tianyin, HAN Nairen & WEI Xu, 1983 - Trilobita. In *Palaeontological Atlas of East China*, 1, Early Palaeozoic Volume, 28-254. Geological Publishing House, Beijing.

RASETTI, F., 1944 - Upper Cambrian trilobites from the Levis Conglomerate. *Journal of Paleontology*, 18(3), 229-258, pls 36-39.

RASETTI, F., 1945 - New Upper Cambrian trilobites from the Levis Conglomerate. *Journal of Paleontology*, 19(5), 462-478, pls 60-62.

RASETTI, F., 1948 - Middle Cambrian trilobites from the conglomerates of Quebec. *Journal of Paleontology*, 22(3), 315-339, pls 45-52.

RASETTI, F., 1952 - Revision of the North American trilobites of the Family Eodiscidae. *Journal of Paleontology*, 26, 434-451, pls. 51-54.

RASETTI, F., THEOKRITOFF, G., 1967 - Lower Cambrian agnostid trilobites of North America. *Journal of Paleontology*, 41(1), 189-196, pl.20.

RAYMOND, P. E., 1913 - Some changes in the names of genera of trilobites. *The Ottawa Naturalist*, 26 (11), 137-142.

REPINA, L.N., YASKOVICH, B.V., AKSARINA, N.A., PETRUNINA, Z.E., PONIKLENKO, I.A. and 5 others 1975 - Stratigrafiya i fauna Nizhnego Paleozoya severnykh predgoriy Turkestanskogo i Alayskogo Khrebtov (yuzhnyy Tyan-Shan). *Trudy Instituta Geologii i Geofiziki*, 278, 351pp., 48pls.

RESSER, C.E., 1938 - Cambrian System (restricted) of the southern Appalachians. *Geological Society of America, Special Paper*, 15, 140p., 16pls.

RESSER, C.E. & HOWELL, B.F., 1938 - Lower Cambrian Olenellus Zone of the Appalachians. *Bulletin of the Geological Society of America*, 49, 195-248, 13pls.

RICHTER, R., 1932 - Crustacea. In *Handwörterbuch der Naturwissenschaften*, 840-863. 2nd Edition, Jena.

RICHTER, R. & RICHTER, E., 1941 - Die Fauna des Unter-Kambriums von Cala in Andalusien. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*, 455, 1-90, pls 1-4.

ROBISON, R.A., 1964 - Late Middle Cambrian faunas from Western Utah. *Journal of Paleontology*, 38(3), 510-566, pls 79-92.

ROBISON, R.A., 1972 - Mode of life of agnostid trilobites. *24th International Geological Congress, Section 7*, 33-40.

ROBISON, R.A., 1972 - Hypostoma of agnostid trilobites. *Lethaia*, 5(2), 239-248.

ROBISON, R.A., 1982 - Some Middle Cambrian agnostoid trilobites from western North America. *Journal of Paleontology*, 56(1), 132-160.

ROBISON, R.A., 1984 - Cambrian agnostida of North America and Greenland. Part I, Ptychagnostidae. *The University of Kansas Paleontological Contributions, Paper 109*, 59p.

ROBISON, R.A., 1988 - Trilobites of the Holm Dal Formation (late Middle Cambrian), central North Greenland. *Meddelelser om Grønland, Geoscience*, 20, 23-103.

ROBISON, R.A., PANTOJA-ALOR, J., 1968 - Tremadocian trilobites from the Nochixtlan region, Oaxaca, Mexico. *Journal of Paleontology*, 42(3), 767-800, pls 97-104.

ROBISON, R. A., ROZOVA, A. V., ROWELL, A. J. & FLETCHER, T. P., 1976 - Cambrian boundaries and divisions. *Lethaia*, 10, 257-262.

ROMANENKO, E. V., 1967 - See ROMANENKO, E. V. & ROMANENKO, M. F., 1967.

ROMANENKO, E.V., 1985 - Trilobity iz pogranichnykh otlozheniy Srednego i Verkhnego Kembriya Altaya. *Paleontologicheskii Zhurnal*, 1985, 4, 54-63, pl.5.

ROMANENKO, E.V., ROMANENKO, M.F., 1967 - Nekotorye voprosy paleogeografii i trilobity Kembriya Gornogo Altaya. *Izvestiya Altayskogo Otdela Geograficheskogo Obshchestva Soyuzo SSR*, 8, 62-96.

ROZOVA, A.V., 1960 - Verkhnekembriyskie trilobity Salaira. *Trudy Instituta Geologii i Geofiziki*, 5, 116 pp.

ROZOVA, A.V., 1988 - See LISOGOR et al., 1988.

RUSCONI, C., 1950 - Nuevos trilobitas y otros organismos del Cambrico de Canota. *Revista del Museo Historia Natural de Mendoza*, 4(3-4), 85-94.

RUSCONI, C., 1951 - Mas trilobitas Cambricos de san Isidro Cerro Pelado y Canota. *Revista del Museo Historia Natural de Mendoza*, 5, 3-30.

RUSCONI, C., 1952 - Varias especies de trilobitas del Cambrico de Canota. *Revista del Museo Historia Natural de Mendoza*, 6(1-4), 5-17, 1pl.

RUSHTON, A.W.A., 1966 - The Cambrian trilobites from the Purley Shales of Warwickshire. *Palaeontographical Society Monographs*, 120, 1-55, pls 1-6.

RUSHTON, A.W.A., 1978 - Fossils from the Middle-Upper Cambrian transition in the Nuneaton district. *Palaeontology*, 21(2), 245-283.

RUSHTON, A.W.A., 1979 - A review of the Middle Cambrian Agnostida from the Abbey Shales, England. *Alcheringa*, 3, 43-61.

RUSHTON, A.W.A., 1983 - Trilobites from the Upper Cambrian *Olenus* Zone in central England. *Special Papers in Palaeontology*, 30, 107-139.

RUSHTON, A.W.A., HUGHES, C.P., 1981 - The Ordovician trilobite fauna of the Great Paxton Borehole, Cambridgeshire. *Geological Magazine*, 118(6), 623-646.

SALTER, J. W., 1864a - A monograph of the British trilobites from the Cambrian, Silurian and Devonian formations. *Monograph of the Palaeontographical Society*, 1-80, pls 1-6.

SALTER, J.W., 1864b - Figures and descriptions illustrative of British organic remains. *Memoirs of the Geological Survey of the United Kingdom*, 64p., 9pls.

SCHRANK, E., 1975 - Kambrische Trilobiten der China-Kollektion v. Richthofen, 2. Die Fauna mit Kaolishania? quadriceps von Saimaki. *Zeitschrift für Geologische Wissenschaften*, 3, 591-619, pls 1-8.

SDZUY, K., 1967 - Trilobites del Cambrico Medio de Asturias. *Trabajos de Geologia*, 1, 77-133, pls 1-10.

SHERGOLD, J.H., 1972 - Late Upper Cambrian trilobites from the Gola Beds, western Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 112, 127pp., 19pls.

SHERGOLD, J.H., 1975 - Late Cambrian and Early Ordovician trilobites from the Burke River Structural Belt, western Queensland, Australia. *Bureau of Mineral Resources of Australia, Bulletin*, 153, v.1, 251pp., v.2, 58pls.

SHERGOLD, J.H., 1977 - Classification of the trilobite *Pseudagnostus*. *Palaeontology*, 20(1), 69-100.

SHERGOLD, J.H., 1980 - Late Cambrian trilobites from the Chatsworth Limestone, western Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 186, 111 pp., 35 pls.

SHERGOLD, J. H., 1981 - Towards a global Late Cambrian agnostid biochronology. In TAYLOR, M. E. (Editor). Short papers for the Second International Symposium on the Cambrian System, 1981. *U.S. Geological Survey, Open File Report* 81-743, 208-214.

SHERGOLD, J.H., 1982 - Idamean (Late Cambrian trilobites, Burke River Structural Belt, western Queensland. *Bureau of Mineral Resources of Australia, Bulletin*, 187, 69 pp., 17 pls.

SHERGOLD, J. H., 1989 - Australian Phanerozoic Timescales: 1. Cambrian biostratigraphic chart and explanatory notes. *Bureau of Mineral Resources of Australia, Record* 1989/31, 25 pp.

ŠNAJDR, M., 1958 - Trilobiti ceskeho sredniho Kambria. *Vestník Ústředního ústavu Geologického*, 24, 280 pp., 46 pls. [English summary pp. 237-280].

SUAREZ-SORUCO, R., 1975 - Nuevos trilobites del Tremadociano inferior (Ordovicio) del sur de Bolivia. *Rer. Tec. Y.P.F.Bolivia*, 4(3), 129-146, pls 1-2.

SUN Y.-C., 1924 - Contributions to the Cambrian faunas of North China. *Palaeontologia Sinica, Series B*, 1(4), 1-109, pls 1-5.

SUN X.-W., 1989 - Cambrian agnostids from the North China Platform. *Palaeontologia Cathayana*, 4, 53-129, pls 1-15.

THOMAS, A.T. & OWENS, R.M., 1978 - A review of the trilobite family Aulacopleuridae. *Palaeontology*, 21(1), 65-81, pl.7.

TROEDSSON, G.T., 1937 - On the Cambro-Ordovician faunas of the western Quruq Tagh, eastern Tien-Shan. *Palaeontologia Sinica*, 106, N.S. B, No.2.

TULLBERG, S.A., 1880 - Om Agnostus-arterna i de kambriska aflagringarna vid Andrarum. *Sveriges Geologiska Undersökning, Series C*, 42, 1-

38, pls 1-2.

VOGDES, A.W., 1925 - A list of the genera and subgenera of the Trilobita. *Transactions of the San Diego Society of Natural History*, 4, 89-115.

VOLOGDIN, A., LERMONTOVA, E., YAVORSKY, V., YANISHEVSKY, M., 1940 - *Atlas rukovodyashchikh form iskopaemykh faun SSSR. 1, Kembriy*. 194pp., 49 pls. Gosgeolizdat, Moscow.

WAHLENBERG, G., 1818 - Petrificata Telluris Svecanae. *Nova Acta Regiae Societatis Scientiarum Upsaliensis*, 8, 1-116, pls 1-4.

WANG Yu (ed.), 1964 - *Handbook of Index fossils of China, Huanan Region*. 173p., 92 pls. Geology Press, Beijing.

WEBBY, B. D. & NICOLL, R. S., (Compilers), 1989 - Australian Phanerozoic Timescales: 2. Ordovician biostratigraphic chart and explanatory notes. *Bureau of Mineral Resources of Australia. Record* 1989/32, 42 pp.

WESTERGÅRD, A. H., 1922 - Sveriges Olenidskiffer. *Sveriges Geologiska Undersökning, Ser. Ca, No. 18*, 1-205, pls 1-16.

WESTERGÅRD, A. H., 1936 - Paradoxides oelandicus beds of Oland. *Sveriges Geologiska Undersökning, Series C, 394*, 66 pp., 12 pls.

WESTERGÅRD, A.H., 1946 - Agnostidea of the Middle Cambrian of Sweden. *Sveriges Geologiska Undersökning, Series C, 477*, 1-141, pls 1-16.

WESTERGÅRD, A.H., 1947 - Supplementary notes on the Upper Cambrian trilobites of Sweden. *Sveriges Geologiska Undersökning, Series C, 489*, 1-35.

WHITEHOUSE, F.W., 1936 - The Cambrian

faunas of northeastern Australia. Parts 1 and 2. *Memoirs of the Queensland Museum*, 11(1), 59-112, pls 8-10.

WHITEHOUSE, F.W., 1939 - The Cambrian faunas of north-eastern Australia, Part 3: The polymerid trilobites (with supplement no.1). *Memoirs of the Queensland Museum*, 21(3), 179-282, pls 19-25.

WHITTINGTON, H.B., 1950 - Sixteen Ordovician genotype trilobites. *Journal of Paleontology*, 24(5), 531-565, pls 68-75.

WHITTINGTON, H.B., 1965 - Trilobites of the Ordovician Table Head Formation, western Newfoundland. *Bulletin of the Museum of Comparative Zoology*, 132(4), 275-442, pls 1-68.

XIANG Liwen, ZHANG Tairong, 1985 - Systematic description of trilobites. IN Wang Zigu (ed.), *Stratigraphy and trilobite faunas of the Cambrian in the western part of northern Tianshan, Xinjiang. Ministry of Geology and Mineral Resources, Geological Memoirs, Series 2, 4*, 64-243, pls 1-49.

ZHANG Jinlin, WANG Shaoxin, 1985 - Trilobita. IN *Palaeontological Handbook of North China, Palaeozoic Volume*, 327-488, pls 103-147. Geological Publishing House, Beijing.

ZHOU Zhiqiang, 1982 - See ZHOU Zhiqiang et al., 1982.

ZHOU Zhiqiang, LI Jinseng, QU Xinguo, 1982 - Trilobita. IN *Palaeontological Atlas of northwest China, Shaanxi-Gansu-Ningxia Volume 1*, 215-294, pls 57-72.

ZHU Zhaoling, 1959 - Trilobites from the Kushan Formation of north and northeastern China. *Memoirs of the Institute of Palaeontology*, 2, 44-128, pls 1-7.



---

**ILLUSTRATIONS OF TYPE AND OTHER MATERIAL**

---

## FIGURE 9

1. *Agnostus (Agnostus) pisiformis* (Wahlenberg, 1818)

1a. Cephalon, SGU 119, X8; Westergård, 1922, pl. 1, fig. 1;

1b. Pygidium, SGU 120, X8; Westergård, 1922, Pl. 1, fig. 2; Hönsäter, Kinnekulle, Västergötland, Sweden.

2. *Agnostus (Homagnostus) obesus* (Belt, 1867)

Complete exoskeleton, Institute of Geological Sciences, London, No. TE 6, X14; Rushton, 1978, pl. 25, fig. 4; Chilvers Coton, near Nuneaton, England.

3. *Innitagnostus innitens* Öpik, 1967

3a. Holotype cephalon, CPC 5853, X8; Öpik, 1967, pl. 58, fig. 2;

3b. Pygidium, CPC 5854, X8; Öpik, 1967, pl. 58, fig. 3; Pomegranate Limestone, Wills Creek, western Queensland, Australia.

4. *Oncagnostus (Oncagnostus) tumidosus* (Hall & Whitfield, 1877)

4a. Cephalon, USNM 136831a, X15; Palmer, 1960, pl. 4, fig. 1;

4b. Pygidium, USNM 136831b, X15; Palmer, 1960, pl. 4, fig. 2; Dunderberg Shale, Eureka district, Nevada, USA.

5. *Oncagnostus (Strictagnostus) chronius* Shergold, 1975

5a. Cephalon, CPC 11730, X15; Shergold, 1975, pl. 13, fig. 3;

5b. Holotype pygidium, CPC 11732, X14; Shergold, 1975, pl. 13, fig. 5; Chatsworth Limestone, Black Mountain, western Queensland, Australia.

6. *Gymnagnostus gongros* Robison & Pantoja-Alor, 1968

6a. Cephalon, USNM 158887, X10; Robison &amp; Pantoja-Alor, 1968, pl. 97, fig. 24;

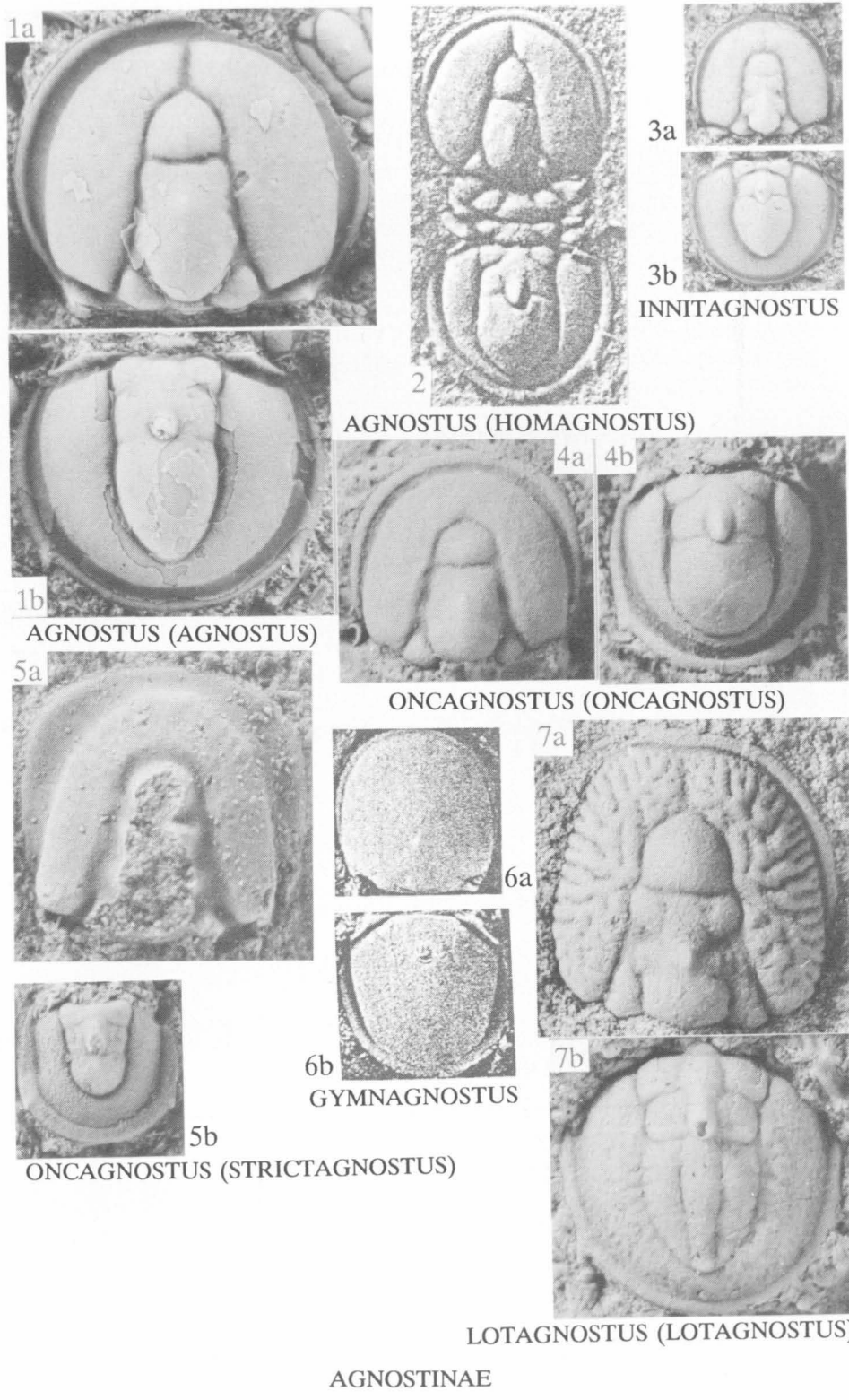
6b. Holotype pygidium, USNM 158892, X10; Robison &amp; Pantoja-Alor, 1968, pl. 97, fig. 29; Tiñu Formation, Nochixtlán region, Oaxaca, Mexico.

7. *Lotagnostus (Lotagnostus) trisectus* Salter, 1864

7a. Cephalon, Museum of Natural History, Mendoza No. 9973, X10; Rusconi, 1951, fig. 5; Upper Cambrian, Cerro Pelado, Argentina;

7b. Pygidium, SGU 124, X8; Westergård, 1922, pl. 1, fig. 12; Alum Shale, Andrarum, Scania, Sweden.

FIGURE 9



## FIGURE 10

1. *Lotagnostus (Distagnostus) irretitus* Shergold, 1975

1a. Holotype cephalon, CPC 11518, X15; Shergold, 1975, pl. 14, fig. 1;

1b. Pygidium, CPC 11523, X15; Shergold, 1975, pl. 14, fig. 6; Chatsworth Limestone, Black Mountain, western Queensland, Australia.

2. *Glyptagnostus reticulatus* (Angelin, 1851)

2a. Lectotype cephalon, Ar 9794, X8; Westergård, 1947, pl. 1, fig. 2;

2b. Pygidium, Ar 9796, X8; Westergård, 1947, pl. 1, fig. 4; Olenus Zone, Andrarum, Scania, Sweden.

3. *Agnostardis amplinatis* Öpik, 1963

3a. Cephalon, CPC 4265, X8; Öpik, 1963, pl. 3, fig. 3;

3b. Holotype pygidium, CPC 4270, X8; Öpik, 1963, pl. 3, fig. 8; Pomegranate Limestone, De Little Range, western Queensland, Australia.

4. *Ammagnostus psammius* Öpik, 1967

4a. Cephalon, CPC 5936, X8; Öpik, 1967, pl. 66, fig. 2;

4b. Holotype pygidium, CPC 5937, X8; Öpik, 1967, pl. 66, fig. 3; O'Hara Shale, Selwyn Range area, western Queensland, Australia.

5. *Idolagnostus agrestis* Öpik, 1967

5a. Holotype cephalon, CPC 5766, X8; Öpik, 1967, pl. 60, fig. 2;

5b. Pygidium, CPC 5872, X8; Öpik, 1967, pl. 59, fig. 9; O'Hara Shale, Selwyn Range area, western Queensland, Australia.

6. *Hadragnostus las* Öpik, 1967

Cephalon, CPC 5860, X8; Öpik, 1967, pl. 58, fig. 7; Mungerebar Limestone, Mungerebar area, western Queensland, Australia.

7. *Proagnostus bulbus* Butts, 1926

7a. Lectotype exoskeleton, USNM 94867, X8.8; Robison, 1988, fig. 8.12; Conasauga Formation, Cedar Bluff, Alabama, USA;

7b. Cephalon, MMK No. 17.126; X8.8; Robison, 1988, fig. 8.14;

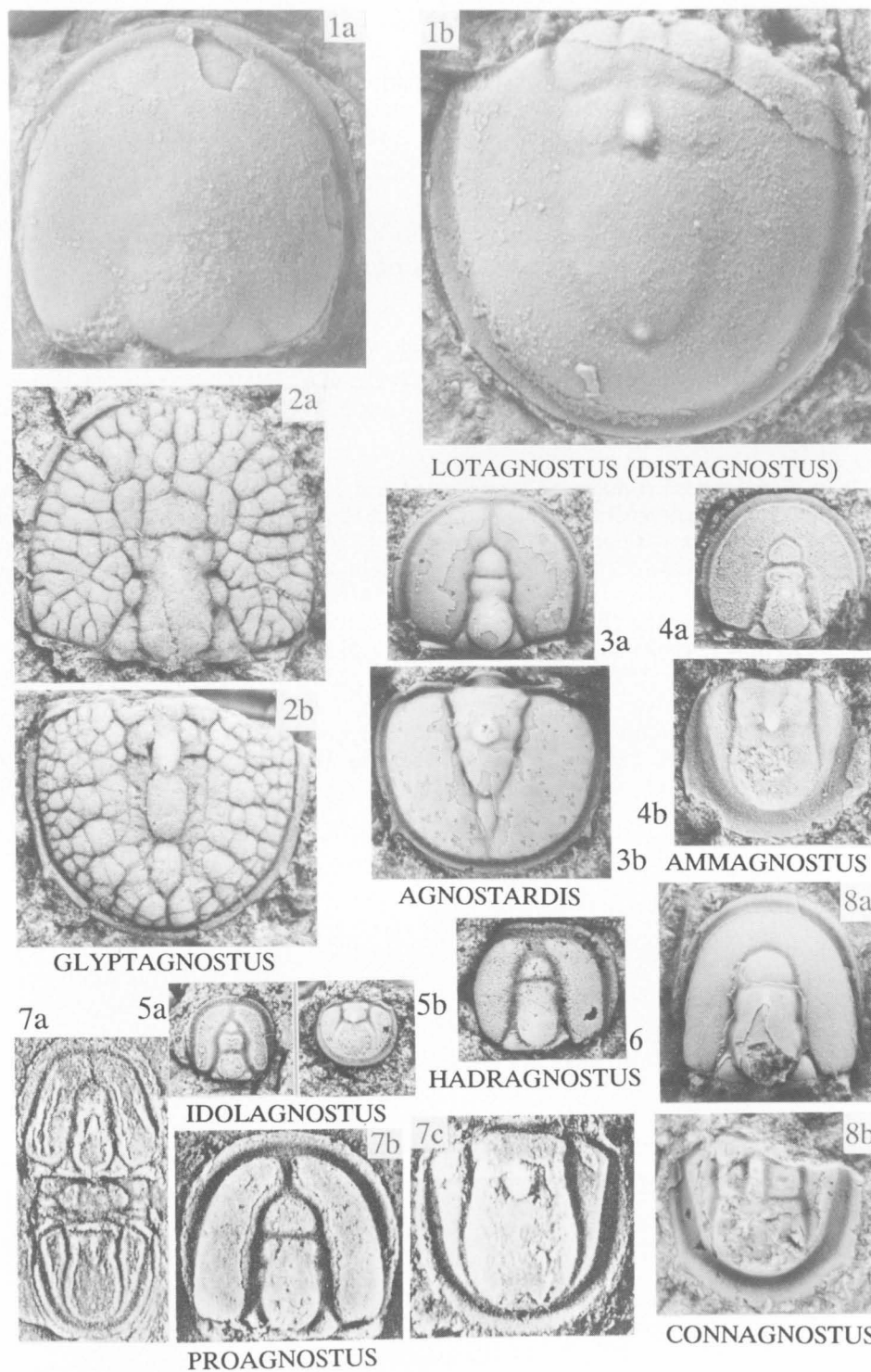
7c. Pygidium, MMK No. 17.128; X8.8; Robison, 1988, fig. 8.15; Holm Dal Formation, central North Greenland.

8. *Connagnostus venerabilis* Öpik, 1967

8a. Cephalon, CPC 5812, X8; Öpik, 1967, pl. 54, fig. 14;

8b. Holotype pygidium, CPC 5809, X8; Öpik, 1967, pl. 54, fig. 11b; Georgina Limestone, Glenormiston area, western Queensland, Australia.

FIGURE 10



AGNOSTINAE, GLYPTAGNOSTINAE, AMMAGNOSTINAE,  
SUBFAMILIAE INCERTAE SEDIS

## FIGURE 11

1. *Ptychagnostus punctuosus* (Angelin, 1851)

1a. Lectotype cephalon, Ar 9539, X8; Westergård, 1946, pl. 12, fig. 3;

1b. Pygidium, Ar 9540, X8; Westergård, 1946, pl. 12, fig. 4; Andrarum, Scania, Sweden.

2. *Acidusus acidusus* Öpik, 1979

Holotype exoskeleton, CPC 14248, X9; Laurie, 1988, fig. 6A; NW of Mt Isa, western Queensland, Australia.

3a. *Goniagnostus (Allobodochus) spiniger* (Westergård, 1931)

Cephalon, CPC 14342, X8; Laurie, 1989, fig. 6E; Tobermory area, Northern Territory, Australia.

3b,c. *Goniagnostus (Allobodochus) fumicola* Öpik, 1961

3b. Cephalon, CPC 3601, X8; Laurie, 1989, fig. 4D;

3c. Holotype pygidium, CPC 3598, X9; Laurie, 1989, fig. 4E; Glenormiston area, western Queensland, Australia.

4a. *Goniagnostus (Criotypus) lemniscatus* Öpik, 1979

Holotype cephalon, CPC 14311, X8; Laurie, 1989, fig. 3F; Camooweal area, western Queensland, Australia.

4b. *Goniagnostus (Criotypus) oxytorus* Öpik, 1979

Holotype exoskeleton, CPC 14309, X8; Laurie, 1989, fig. 3A; NW of Mt Isa, western Queensland, Australia.

5. *Lejopyge laevigata* (Dalman, 1828)

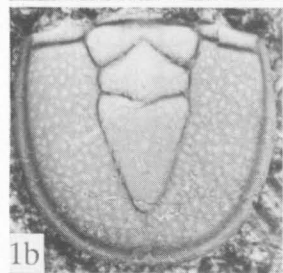
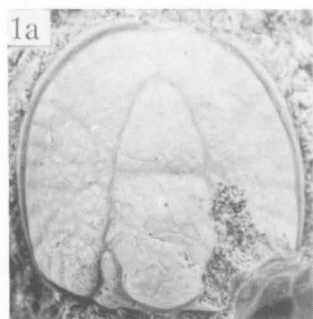
5a. Lectotype cephalon, Ar 287b, X6; Westergård, 1946, pl. 13, fig. 21;

5b. Pygidium, Ar 287f, X6; Westergård, 1946, pl. 13, fig. 23; Hönsäter, Kinnekulle, Västergötland, Sweden.

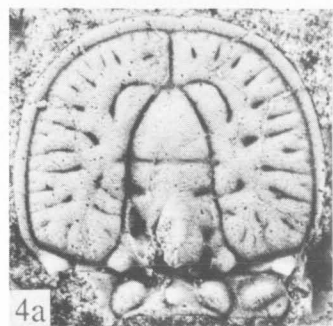
6. *Goniagnostus (Goniagnostus) nathorsti* (Brögger, 1878)

Exoskeleton, CPC 25890, X 8; Laurie, 1989, fig. 1F; Camooweal area, western Queensland, Australia.

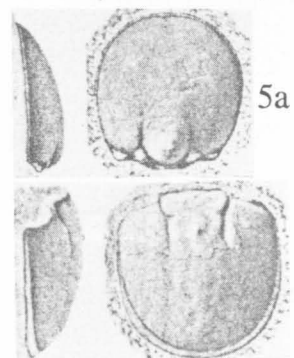
FIGURE 11



PTYCHAGNOSTUS



GONIAGNOSTUS  
(CRIOTYPUS)

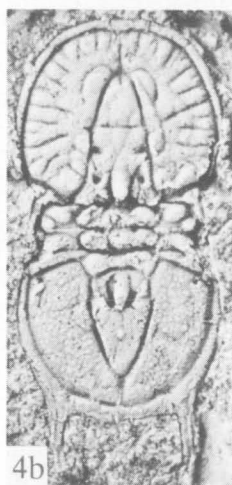


LEJOPYGE

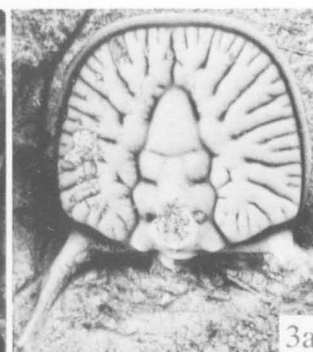
PTYCHAGNOSTIDAE



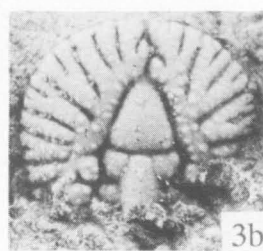
ACIDUSUS



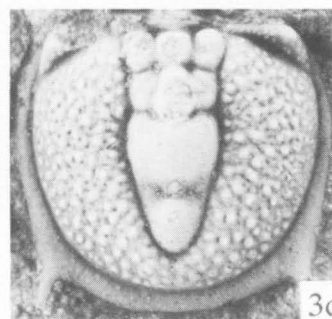
4b



3a



3b



3c

GONIAGNOSTUS  
(ALLOBODOCHUS)



6

GONIAGNOSTUS (GONIAGNOSTUS)



## FIGURE 12

1. *Myrmecomimus tribulis* Öpik, 1979

Holotype exoskeleton, CPC 14179, X10; Öpik, 1979, pl. 36, fig. 1; NW of Mt Isa, western Queensland, Australia.

2. *Onymagnostus hybridus* (Brögger, 1878)

2a. Cephalon, CPC 14269, X9; Laurie, 1988, fig. 12A;

2b. Pygidium, CPC 14274, X9; Laurie, 1988, fig. 12E; Camooweal area, western Queensland, Australia.

3. *Triplagnostus (Aotagnostus) culminosus* Öpik, 1979

Holotype exoskeleton, CPC 14166, X9; Laurie, 1988, fig. 19A; NW of Mt Isa, western Queensland, Australia.

4. *Zeteagnostus incautus* Öpik, 1979

4a. Holotype cephalon, CPC 14242, X14; Laurie, 1988, fig. 3D;

4b. Exoskeleton, CPC 14239, X14; Laurie, 1988, fig. 3A; Inca Formation, NW of Mt Isa, western Queensland, Australia.

5. *Triplagnostus (Triplagnostus) gibbus* (Linnarsson, 1869)

5a. Cephalon, SGU 4894, X6; Westergård, 1946, pl. 9, fig. 22;

5b. Pygidium, SGU 4896, X6; Westergård, 1946, pl. 9, fig. 24; Edsbergs Sanna, Närke, Sweden.

6. *Tomagnostus fissus* (Lundgren in Linnarsson, 1879)

6a. Neotype cephalon, SGU 4840, X9; Westergård, 1946, pl. 7, fig. 22;

6b. Pygidium, SGU 4839, X9; Westergård, 1946, pl. 7, fig. 23; Exsulans Limestone, S of Brantevik, Scania, Sweden.

7. *Pentagnostus anabarensis* Lermontova, 1940

7a. Cephalon, unnumbered, X8; Laurie, in prep.;

7b. Pygidium, unnumbered, X8; Laurie, in prep.; Elkedra area, Northern Territory, Australia.

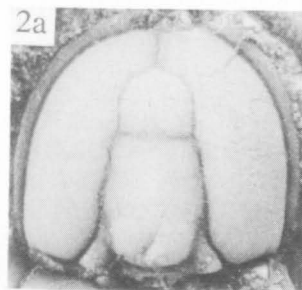


FIGURE 12

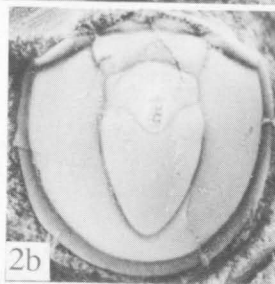


1

MYRMECOMIMUS

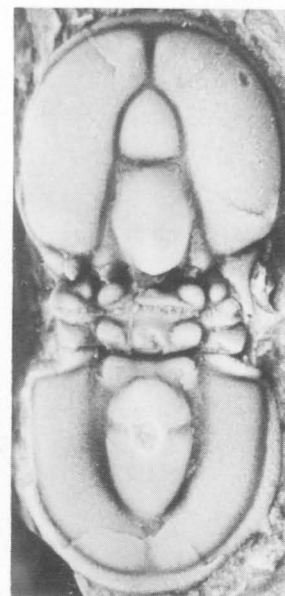


2a

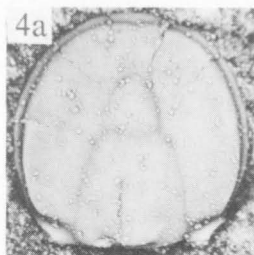


2b

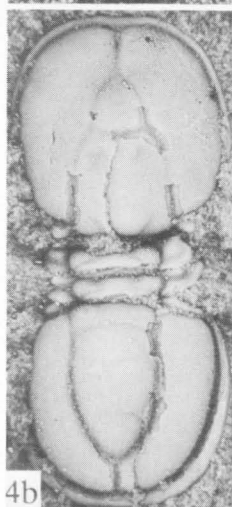
ONYMAGNOSTUS



TRIPLAGNOSTUS  
(AOTAGNOSTUS)

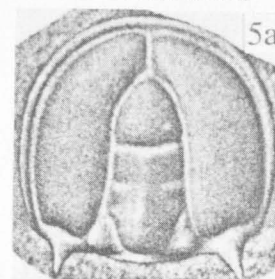


4a

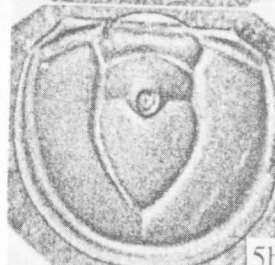


4b

ZETEAGNOSTUS

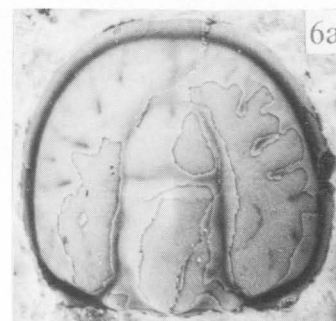


5a



5b

TRIPLAGNOSTUS  
(TRIPLAGNOSTUS)

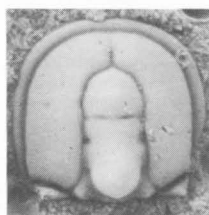


6a

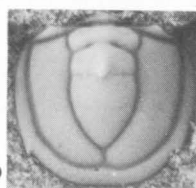


6b

TOMAGNOSTUS



7a 7b



PENTAGNOSTUS

PTYCHAGNOSTIDAE

## FIGURE 13

1. *Hypagnostus parvifrons* (Linnarsson, 1869)

1a. Cephalon, SGU 4769, X9; Westergård, 1946, pl. 4, fig. 29;

1b. Pygidium, SGU 4768, X9; Westergård, 1946, pl. 4, fig. 28; Hällekis, Kinnekulle, Västergötland, Sweden.

2. *Eoagnostus acrorhachis* Rasetti & Theokritoff, 1967

2a. Paratype cephalon, Museum of Comparative Zoology, Harvard University No. 8548/3, X10; Rasetti &amp; Theokritoff, 1967, pl. 20, fig. 8;

2b. Paratype pygidium, No. 8545/4, X10; Rasetti &amp; Theokritoff, 1967, pl. 20, fig. 4; Hatch Hill, New York, USA

3. *Peratagnostus nobilis* Öpik, 1967

3a. Cephalon, CPC 5792, X8; Öpik, 1967, pl. 53, fig. 5a;

3b. Holotype pygidium, CPC 5787, X8; Öpik, 1967, pl. 52, fig. 11a; Pomegranate Limestone, Pomegranate Creek area, western Queensland, Australia.

4. *Tomagnostella sulcifer* (Wallerius, 1895)

4a. Cephalon, SGU 4804, X9; Westergård, 1946, pl. 6, fig. 10;

4b. Pygidium, SGU 4807, X9; Westergård, 1946, pl. 6, fig. 13; Gudhem, Västergötland, Sweden.

5. *Euagnostus opimus* Whitehouse, 1936

Exoskeleton, CPC 14068, X9; Öpik, 1979, pl. 15, fig. 1; NW of Mt Isa, western Queensland, Australia.

6. *Itagnostus elkedraensis* (Etheridge, 1902)

Lectotype exoskeleton, F 54188, X8; Whitehouse, 1936, pl. 9, fig. 3; Elkedra area, Northern Territory, Australia.

7. *Doryagnostus incertus* (Brögger, 1878)

7a. Cephalon, SGU 4968, X8; Westergård, 1946, pl. 12, fig. 23; Gislövshammar, Scania, Sweden;

7b. Pygidium, SGU 4967, X8; Westergård, 1946, pl. 12, fig. 22; Baskemölla, Scania, Sweden.

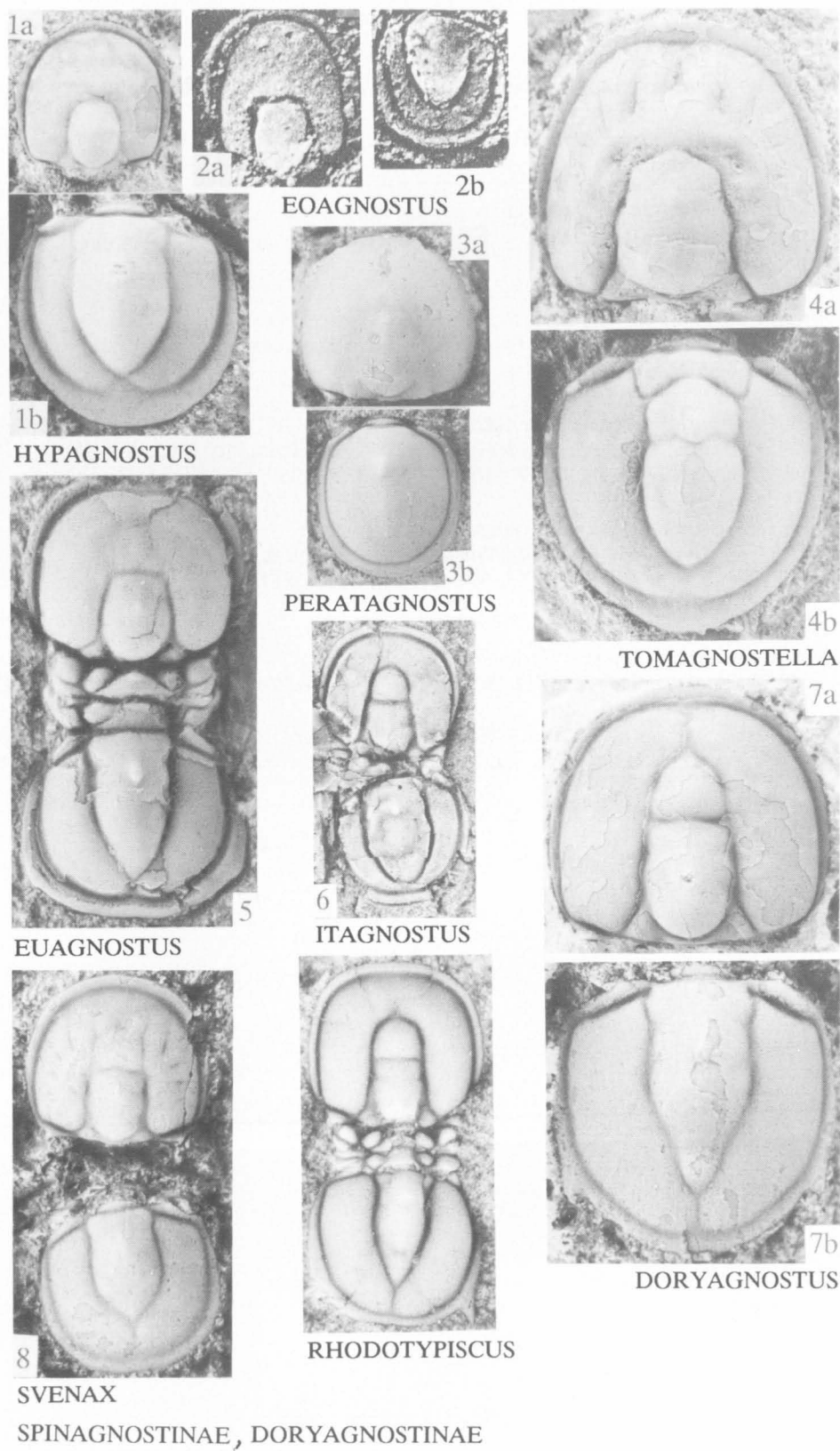
8. *Svenax pusillus* (Tullberg, 1880)

Cephalon and pygidium, Ar 1988, X8; Westergård, 1946, pl. 4, fig. 13; Andrarum, Scania, Sweden.

9. *Rhodotypiscus nasonis* Öpik, 1979

Holotype exoskeleton, CPC 14072, X8; Öpik, 1979, pl. 16, fig. 1; Currant Bush Limestone, Camooweal area, western Queensland, Australia.

FIGURE 13



## FIGURE 14

1. *Peronopsis integra* (Beyrich, 1845)

1a. Exoskeleton, SBNM Br-190/56, X12; Pek &amp; Vanek, 1971, pl. 1, fig. 7;

1b. Lectotype pygidium, Beyrich 86(530), X10; Pek &amp; Vanek, 1971, pl. 1, fig. 6; Jince Formation, Czechoslovakia.

2. *Diplorrhina triplicata* Hawle & Corda, 1847

Lectotype exoskeleton, Hawle 745/66, X10; Pek &amp; Vanek, 1971, pl. 1, fig. 1; Skryje Shales, Czechoslovakia.

3. *Gratagnostus latus* Hairullina, 1975

3a. Cephalon, 483/82, X10; Repina et al., 1975, pl. 11, fig. 6;

3b. Holotype pygidium, 483/189, X10; Repina et al., 1975, pl. 11, fig. 10; Shodymira region, southern Tyan-Shan, USSR.

4. *Peronopsella pokrovskajae* Sdzuy, 1967

4a. Pygidium, Dept Paleontologia, Universidad Oviedo, No. 1003, X8; Sdzuy, 1967, pl. 1, fig. 2;

4b. Holotype cephalon, SMF 24000, X12; Sdzuy, 1967, pl. 1, fig. 1; Riosol area, Asturias, Spain.

5. *Diplagnostus planicauda* (Angelin, 1851)

5a. Cephalon, SGU 4870, X9; Westergård, 1946, pl. 8, fig. 22;

5b. Pygidium, SGU 4871, X9; Westergård, 1946, pl. 8, fig. 23; Andrarum Limestone, Andrarum, Scania, Sweden.

6. *Linguagnostus kjerulfi* (Brögger, 1878)

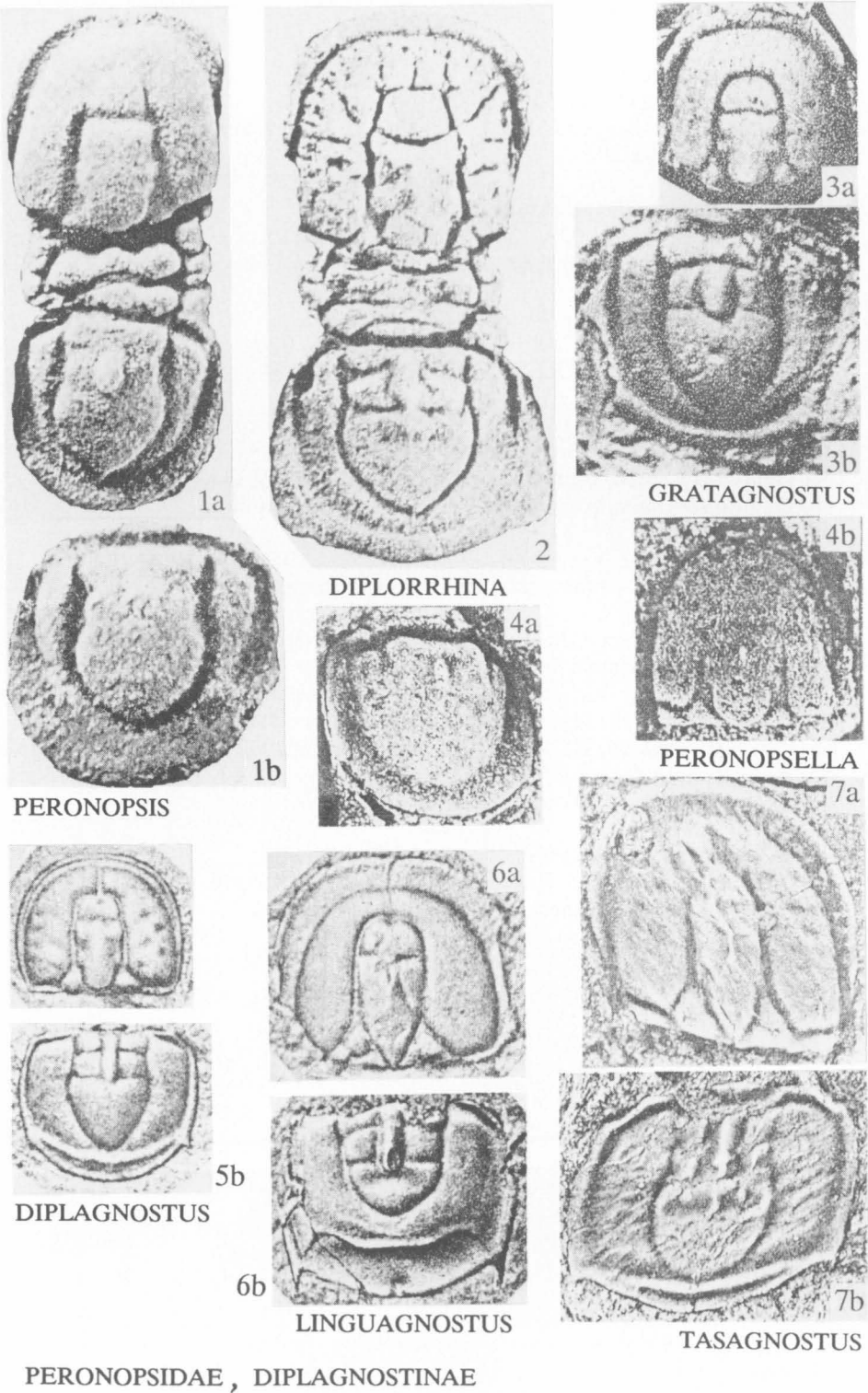
6a. Paratype cephalon, PMO 28684, X5.5; Holm &amp; Westergård, 1930, pl. 4, fig. 13; Westergård, 1946, pl. 8, fig. 31;

6b. Holotype pygidium, PMO 28682, X5.5; Brögger, 1878, pl. 5, fig. 7; Holm & Westergård, 1930, pl. 4, fig. 14; Westergård, 1946, pl. 8, fig. 32; *Paradoxides forchhammeri* Beds, Krekling, Norway7. *Tasagnostus debori* Jago, 1976

7a. Paratype cephalon, UT 86877e, X7.7; Jago, 1976, pl. 26, fig. 9;

7b. Holotype pygidium, UT 86869e, X7.4; Jago, 1976, pl. 26, fig. 1; Christmas Hills, northwestern Tasmania, Australia.

FIGURE 14





## FIGURE 15

1. *Iniospheniscus talis* Öpik, 1979

1a. Cephalon, CPC 14026, X8; Öpik, 1979, pl. 9, fig. 6;

1b. Holotype pygidium, CPC 14021, X8; Öpik, 1979, pl. 9, fig. 1; Inca Formation, Camooweal district, western Queensland, Australia

2. *Cristagnostus papilio* Rushton, 1978

Holotype, GSM BDA 1320, X6; Rushton, 1978, pl. 25, fig. 5; Outwood Shales Formation, Merevale #3 Borehole, Nuneaton, central England.

3. *Oidagnostus trispinifer* Westergård, 1946

3a. Cephalon, SGU 4878, X8; Westergård, 1946, pl. 9, fig. 5;

3b. Holotype pygidium, SGU 4879, X8; Westergård, 1946, pl. 9, fig. 6; Alum Shale, Gudhem, Västergötland, Sweden

4. *Oedorhachis typicalis* Resser, 1938

4a. Figured specimen, cephalon MMK 17.117, X8.8; Robison, 1988, fig. 8.1a;

4b. Figured specimen, pygidium, MMK 17.118, X8.8; Robison, 1988, fig. 8.4; Holm Dal Formation, central north Greenland.

5. *Pseudagnostus (Pseudagnostus) cyclopyge* (Tullberg, 1880)

5a. Topotype cephalon, GMI Lo 3066t, X7; Westergård, 1922, pl. 1, fig. 7; Shergold, 1977, pl. 15, fig. 1;

5b. Topotype pygidium, GMI Lo 3067t, X7; Westergård, 1922, pl. 1, fig. 8; Shergold, 1977, pl. 15, fig. 2; Alum Shale, Andrarum, Scania, Sweden

6. *Pseudagnostus (Pseudagnostina) contracta* (Palmer, 1962)

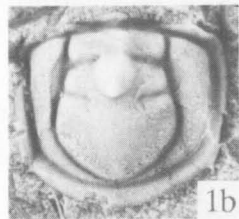
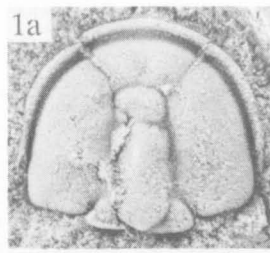
6a. Paratype cephalon, USNM 143150, X16; Palmer, 1962, pl. 2, fig. 22; Shergold, 1977, pl. 15, fig. 11;

6b. Holotype pygidium USNM 143150, X16; Palmer, 1962, pl. 2, fig. 23; Shergold, 1977, pl. 15, fig. 12; Conosauga Formation, Woodstock, Alabama, USA.

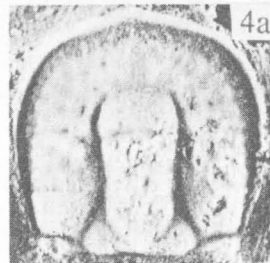
7. *Pseudagnostus (Sulcatagnostus) securiger* (Lake, 1906)

Holotype, GSM 57650, X6; Lake, 1906, pl. 2, fig. 11; Shergold, 1977, pl. 15, fig. 13; Rushton, 1983, pl. 15, fig. 15; Outwoods Shales, Nuneaton, Warwickshire, England.

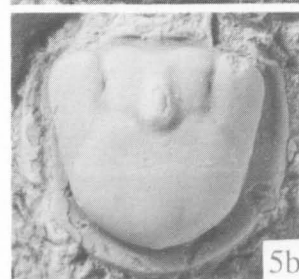
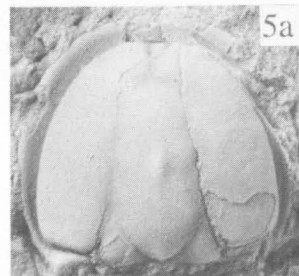
FIGURE 15



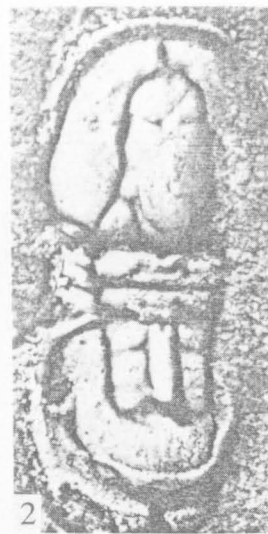
INIOSPHENISCUS



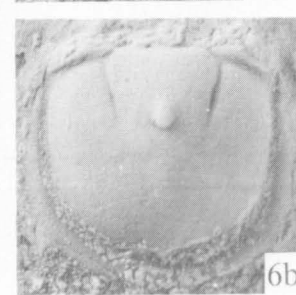
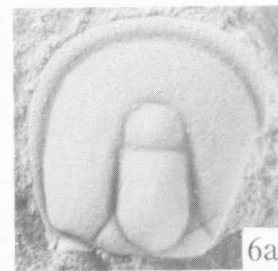
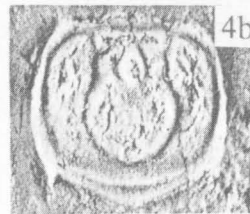
OEDORHACHIS



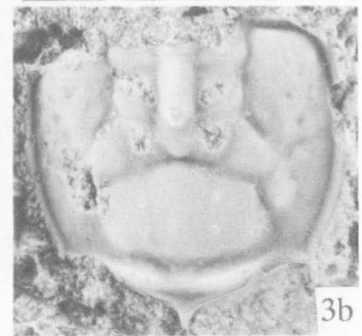
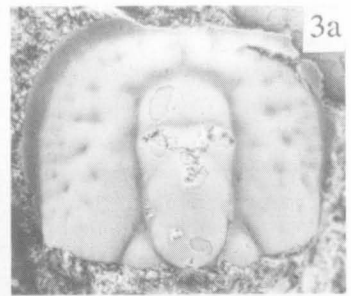
PSEUDAGNOSTUS  
(PSEUDAGNOSTUS)



CRISTAGNOSTUS



PSEUDAGNOSTUS  
(PSEUDAGNOSTINA)



OIDALAGNOSTUS



PSEUDAGNOSTUS  
(SULCATAGNOSTUS)

DIPLAGNOSTINAE, OIDALAGNOSTINAE, PSEUDAGNOSTINAE

## FIGURE 16

1a. *Neoagnostus (Neoagnostus) aspidoides* Kobayashi, 1955

Holotype cephalon, GSC 12745, X7; Kobayashi, 1955, pl. 7, fig. 5; Shergold, 1977, pl. 16, fig. 16; McKay Group, Harrogate, British Columbia, Canada.

1b,c. *Neoagnostus (Neoagnostus) bilobus* (Shaw, 1951)

1b. Paratype cephalon, USNM 124467, X20; Shaw, 1951, pl. 24, fig. 17; Shergold, 1977, pl. 16, fig. 7;

1c. Holotype pygidium, USNM 124468, X22; Shaw, 1951, pl. 24, fig. 20; Shergold, 1977, pl. 16, fig. 8; Gorge Formation, Highgate Falls, Vermont, USA

2. *Oxyagnostus apicula* Öpik, 1967

2a. Paratype cephalon, CPC 5917, X8; Öpik, 1967, pl. 63, fig. 7; Hill et al., 1971, pl. Cm X11, fig. 4;

2b. Holotype pygidium, CPC 5916, X8; Öpik, 1967, pl. 63, fig. 6; Hill et al., 1971, pl. Cm X11, fig. 5; Pomegranate Limestone, Wills Creek, western Queensland, Australia.

3. *Rhaptagnostus cyclopygeformis* (Sun, 1924)

3a. Paratype cephalon, NIGP GSCh 503, X10; Sun, 1924, pl. 2, fig. 1c; Lu et al., 1957, pl. 137, fig. 20; Lu et al., 1965, pl. 4, fig. 10; Sun, 1989, pl. , fig. ;

3b. Lectotype pygidium, NIGP GSCh 507, X10; Sun, 1924, pl. 2, fig. 1e; Lu et al., 1957, pl. 137, fig. 21; Lu et al., 1965, pl. 4, fig. 12; Sun, 1989, pl. , fig. ; Changshan Formation, Taian, Shandong, China

4. *Xestagnostus legirupa* Öpik, 1967

4a. Paratype cephalon, CPC 5924, X8; Öpik, 1967, pl. 64, fig. 3; Hill et al., 1971, pl. Cm X11, fig. 6;

4b. Holotype pygidium, CPC 5922, X8; Öpik, 1967, pl. 64, fig. 1; Hill et al., 1971, pl. Cm X11, fig. 7;

4c. Pygidium, CPC 5923, X8; Öpik, 1967, pl. 64, figs 2a,b; Georgina Limestone, Glenormiston, western Queensland, Australia

5. *Aagnostotes (Aagnostotes) inconstans* Öpik, 1963

5a. Paratype cephalon, CPC 4272, X8; Öpik, 1963, pl. 3, figs. 13-14; Hill et al., 1971, pl. Cm X11, fig. 10;

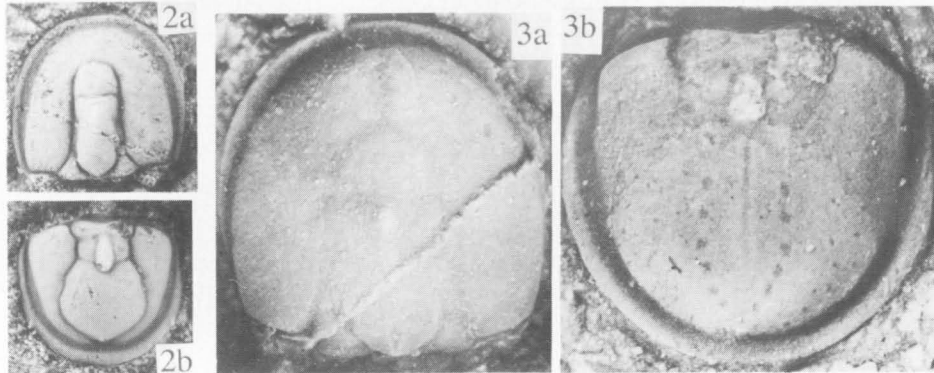
5b. Holotype pygidium, CPC 4272, X8; Öpik, 1963, pl. 3, fig. 11; Hill et al., 1971, pl. Cm X11, fig. 11; Pomegranate Limestone, Burke River area, western Queensland, Australia.



FIGURE 16

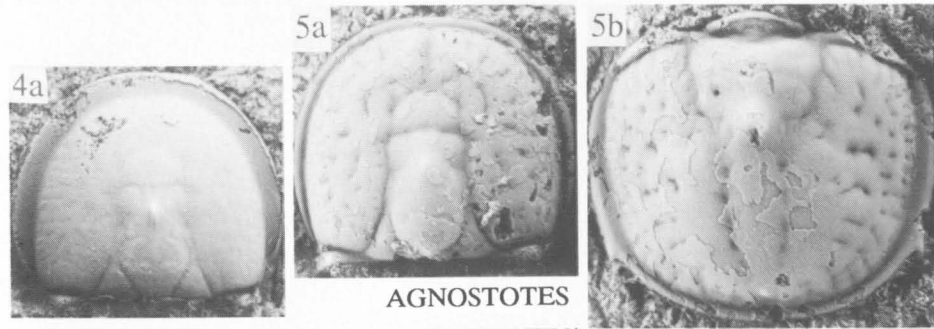


NEOAGNOSTUS (NEOAGNOSTUS)

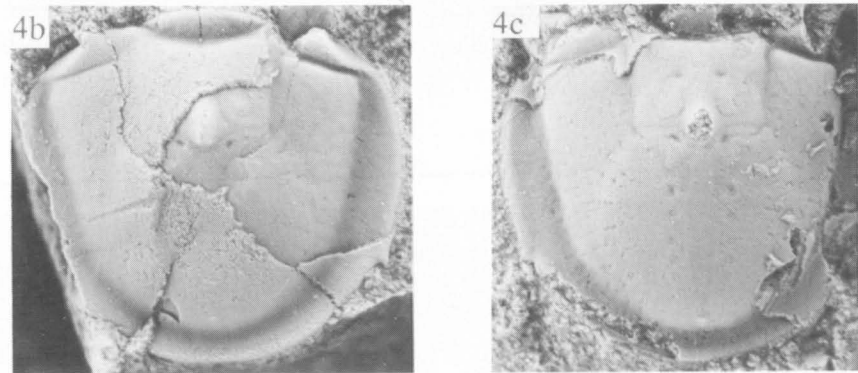


OXYAGNOSTUS

RHAPTAGNOSTUS



AGNOSTOTES  
(AGNOSTOTES)



XESTAGNOSTUS

PSEUDAGNOSTINAE

## FIGURE 17

1. *Clavagnostus repandus* Westergård, 1930

1a. Lectotype cephalon (SD Westergård, 1946), GMI ? , X 9; Westergård in Holm & Westergård, 1930, pl. 4, fig. 11; Westergård, 1946, pl. 4, fig. 19;

1b. Paratype pygidium, SGU ? , X 9.5; Westergård in Holm & Westergård, 1930, pl. 4, fig. 12; Westergård, 1946, pl. 4, fig. 20; Andrarum Limestone, Andrarum, Scania, Sweden.

2. *Aspidagnostus iniquilinus* Öpik, 1967

2a. Holotype cephalon, CPC 5828, X 16; Öpik, 1967, pl. 56, fig. 3; Hill et al., 1971, pl. Cm X1, fig. 10;

2b. Paratype pygidium, CPC 5831, X 12; Öpik, 1967, pl. 56, fig. 4; Hill et al., 1971, pl. Cm X1, fig. 11; Georgina Limestone, Glenormiston, western Queensland, Australia.

3. *Geragnostella tullbergi* (Novak, 1883)

Pygidium, SBNM CD310, X8; Pek, 1977, pl. 3, fig. 4; Horny & Bastl, 1970, pl. 1, fig. 8; Šárka Formation, Praha-Šárka, Czechoslovakia.

4. *Chatkalagnostus mirus* Hairullina & Abdullaev, 1970

4a. Holotype cephalon, IGiG No. 4/3, X5; Abdullaev & Khaletskaya, 1970, pl. 1, fig. 1;

4b. Pygidium, IGiG No. 4/6, X5; Abdullaev & Khaletskaya, 1970, pl. 1, fig. 4; Pskem Ridge, upper Koksuz River, Karakorum, USSR.

5a. *Arthrorhachis danica proxima* Fortey, 1980

Cephalon, PMO NF401b, X8; Fortey, 1980, pl. 2, fig. 1; Valhallfonna Formation, Spitsbergen.

5b. *Arthrorhachis danica brevis* Fortey, 1980

Holotype pygidium, PMO NF2664, X12; Fortey, 1980, pl. 2, fig. 15; Valhallfonna Formation, Spitsbergen.

6. *Anglagnostus dux* (Callaway, 1877)

Holotype exoskeleton, BU No. 693, X8; Callaway, 1877, pl. 24, fig. 3; Shineton Shales, Sheinton, Shropshire, England.

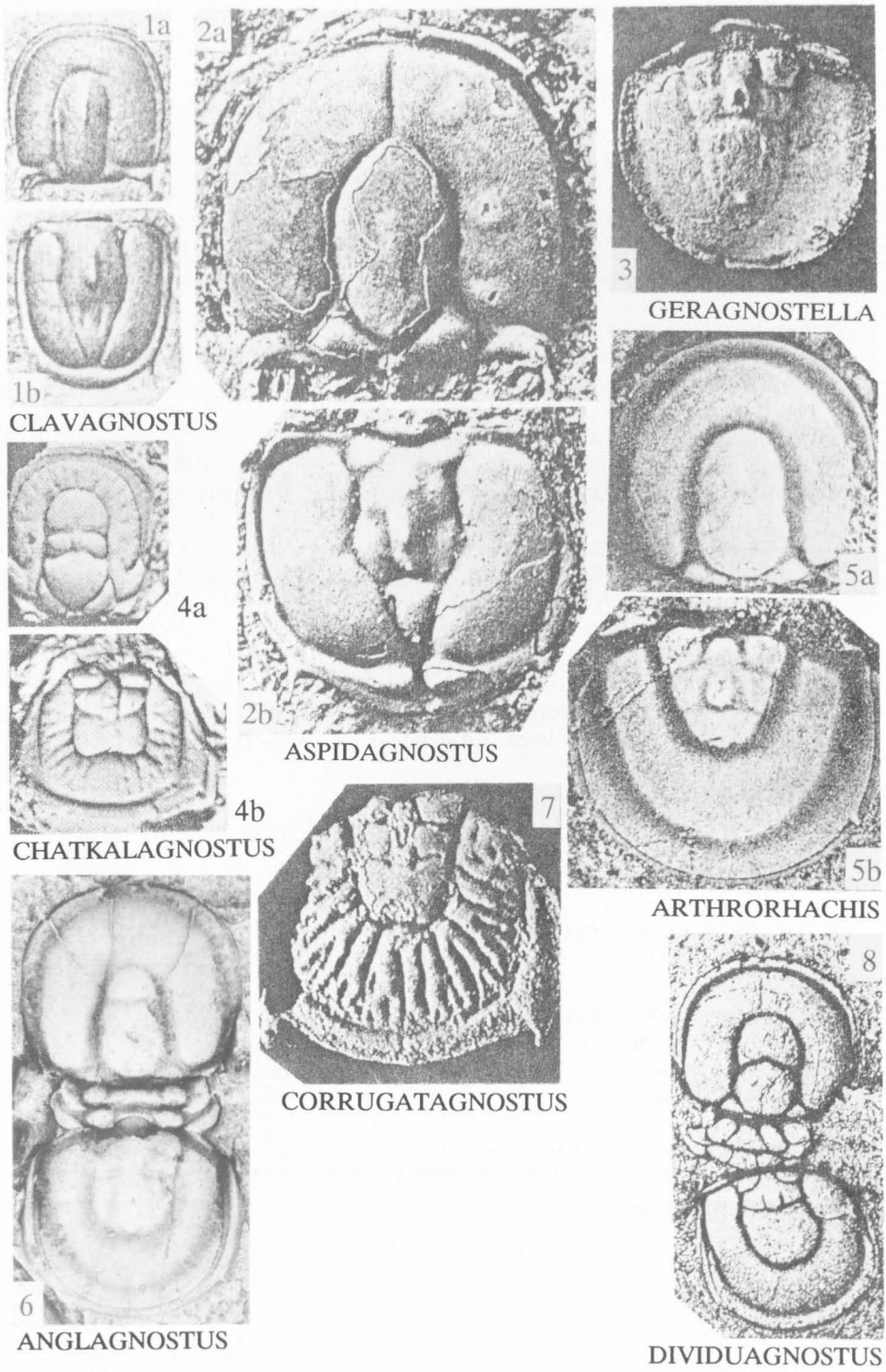
7. *Corrugatagnostus morea* (Salter, 1864)

Pygidium, SBNM CD 484A, X6; Pek, 1977, pl. 5, fig. 8; Horny & Bastl, 1970, pl. 1, fig. 9; Dobrotivá Formation, Svatá Dobrotivá, Czechoslovakia.

8. *Dividuagnostus mccoysi* (Salter in Murchison, 1854)

Exoskeleton, BMNH It 2671, X5; Hughes, 1969, pl. 1, fig. 3; near Pen-cerig Lake, Builth-Llandrindod area, central Wales.

FIGURE 17



CLAVAGNOSTINAE, ASPIDAGNOSTINAE, METAGNOSTIDAE

## FIGURE 18

1. *Galbagnostus galba* (Billings, 1865)

1a. Cephalon, GSC 18391, X15; Whittington, 1965, pl. 3, fig. 7;

2a. Pygidium, GSC 18395, X15; Whittington, 1965, pl. 4, fig. 9; Middle Table Head Formation, western Newfoundland, Canada.

2. *Blystagnostus laciniatus* Öpik, 1961

Holotype pygidium, CPC 3628, X8; Öpik, 1961b, pl. 23, fig. 5; Roaring Siltstone, Burke River area, western Queensland, Australia.

3. *Phurinodus discretus* Öpik, 1967

Holotype pygidium, CPC 5889, X8; Öpik, 1967, pl. 60, fig. 17; O'Hara Shale, Burke River area, western Queensland, Australia.

4. *Delagnostus dilemma* Öpik, 1961

Holotype pygidium, CPC 3633, X8; Öpik, 1961b, pl. 23, fig. 9; Hill et al., 1971, pl. Cm X, fig. 2; Devoncourt Limestone, Burke River area, western Queensland, Australia.

5. *Phoidagnostus limbatus* Whitehouse, 1936

Holotype cephalon, UQF 3207, X6; Whitehouse, 1936, pl. 9, fig. 10; Roaring Siltstone, Burke River area, western Queensland, Australia.

6. *Valenagnostus marginatus* (Brögger, 1878)

6a. Figured specimen, cephalon, SGU 5018, X 8; Westergård, 1946, pl. 14, fig. 25; Jago, 1976, pl. 24, fig. 6;

6b. Figured specimen, pygidium, SGU 5022, X 8; Westergård, 1946, pl. 14, fig. 29; Jago, 1976, pl. 24, fig. 7; *Paradoxides forchhammeri* Beds, Aborrfallet, Ångermanland, Norway.7. *Toragnostus bituberculatus* (Angelin, 1851)

7a. Cephalon, MMK No.17.170, X7.7; Robison, 1988, fig. 12.5;

7b. Pygidium, MMK No.17.171, X8.8; Robison, 1988, fig. 12.6; Holm Dal Formation, central North Greenland.

4. *Gallagnostus geminus* Howell, 1935Holotype, UM H13, X11; Howell, 1935b, pl. 22, fig. 21; *Paradoxides* Beds, Montagne Noire, France.2. *Agnostogonus incognitus* Öpik, 1967

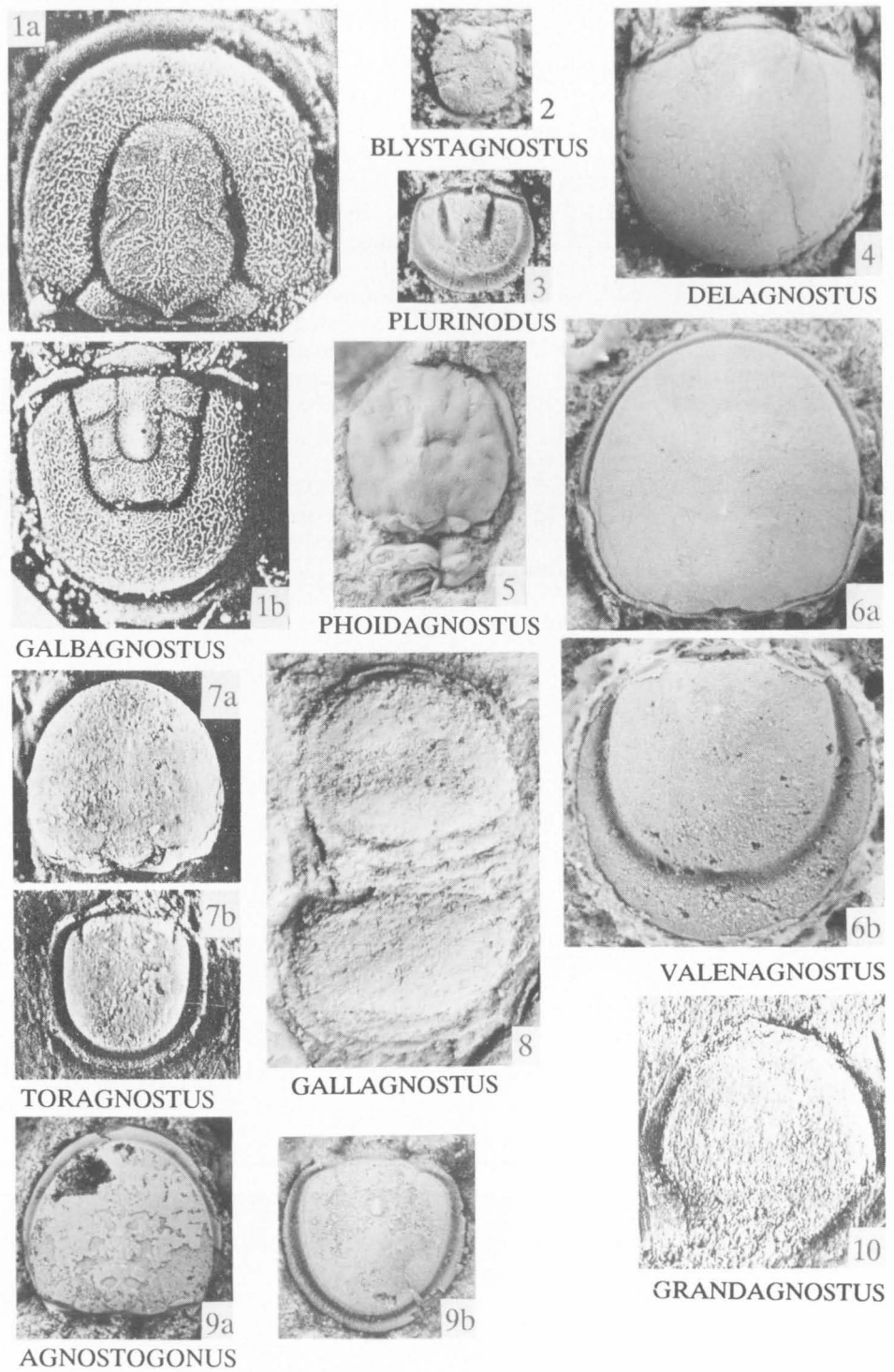
2a. Holotype cephalon, CPC 5846, X 12.6; Öpik, 1967, pl. 57, fig. 8;

2b. Paratype pygidium, CPC 5847, X 12; Öpik, 1967, pl. 57, fig. 9; O'Hara Shale, Burke River area, western Queensland, Australia.

1. *Grandagnostus vermontensis* Howell, 1935

Holotype cephalon, Pu 9736, X 6.5; Howell, 1935a, pl. 22, fig. 8; Robison, 1988, fig. 12.7; St Albans Shales, northwestern Vermont, USA.

FIGURE 18



METAGNOSTIDAE, FAMILIAE INCERTAE SEDIS



## FIGURE 19

1. *Skryjagnostus pompeckji* Šnajdr, 1957

Holotype, SBNM Br-191, X15; Šnajdr, 1957, pl. 1, fig. 11; Šnajdr, 1958, pl. 4, fig. 4; Horny & Bastl, 1970, pl. 1, fig. 3; Jince Formation, Tyrovice, SSR

2. *Condylopyge rex* (Barrande, 1846)

SBNM CC 237, IT 1034, X5; Lectotype (SD Snajdr, 1958); Barrande, 1852, pl. 49, fig. 5; Snajdr, 1958, pl. 2, figs. 1-2; Horny & Bastl, 1970, pl. 1, fig. 2; Jince Formation, Tyrovice, CSSR.

3a. *Pleuroctenium granulatum granulatum* (Barrande, 1846)

SBNM CC 250 IT 1008, X11; Lectotype (SD Snajdr, 1958); Barrande 1852, pl. 49, fig. 5; Snajdr 1958, pl. 2, fig. 5; Horny & Bastl, 1970, pl. 1, fig. 6; Jince Formation, Tyrovice, CSSR.

3b. *Pleuroctenium granulatum* (Barrande, 1846) *scanense* Westergård, 1946

GSM Zs 4571, X6; Rushton 1979, p. 47, fig. 2J; Abbey Shales, Nuneaton, England.

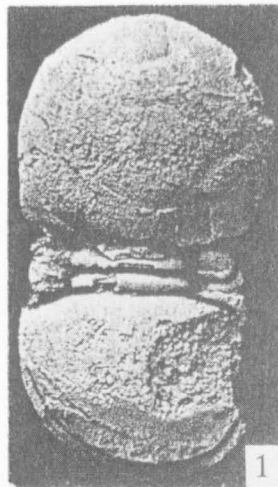
4. *Phalacroma bibullatum* (Barrande, 1846)

Lectotype (SD Snajdr, 1958), SBNM, CC 244, IT 1027, X9; Barrande, 1846, pl. 49, fig. 6; Snajdr, 1958, pl. 4, fig. 32; Horny & Bastl, 1970, pl. 1, fig. 1; Jince Formation, Tyrovice, CSSR

5. *Sphaeragnostus similis* (Barrande, 1872)

Holotype, SBNM CD IT 1339, X13; Barrande, 1872, pl. 14, figs. 17-18; Horny & Bastl, 1970, pl. 1, fig. 7; Dobrotiv Formation, Svat Dobrotiv, CSSR

FIGURE 19



SKRYJAGNOSTUS



CONDYLOPYGE

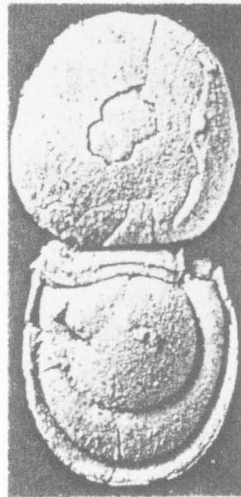


3a



4

PHALACROMA



SPHAERAGNOSTUS



3b

PLEUROCTENIUM

FAMILIAE INCERTAE SEDIS, CONDYLOPYGIDAE, PHALACROMIDAE,  
SPHAERAGNOSTIDAE



9 780644 123075