



IGCP 406

Circum-Arctic Palaeozoic Vertebrates

1996-2000

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Fossils and strata of the Circum-Arctic Region are of outstanding importance for the resolution of major issues in mid-Palaeozoic biostratigraphy, palaeobiogeography, palaeoecology, and vertebrate evolution. Modern palaeobiographic reconstructions suggest that areas that are now located in the far north were parts of several different continental fragments. Historical factors have led to largely separate study of these areas by geologists and palaeontologists in different northern nations, leading to confusion about international and intercontinental correlations and duplication of fossil taxa. Recent biostratigraphic studies further suggest the probability that some fossil groups, containing widespread taxa, are most useful for correlations across great distances, while others, containing regionally distinct assemblages, are most useful for distinguishing palaeogeographic provinces and reconstructing palaeobasins. Furthermore, recent phylogenetic studies have pointed to the exceptional significance of northern fossil vertebrates for understanding early vertebrate evolution.

Unfortunately, field work in the far north is difficult and expensive. Field seasons are very short, weather is unpredictable, locations are very remote, transportation costs are high, and safety of field personnel must be paramount. Such difficulties have meant that, in recent years, relatively few expeditions to the far north have been carried out for the purpose of resolving these outstanding research issues. Careful, detailed sampling of strata and fossils is needed in order to apply modern knowledge and techniques to these problems.

Moreover, international expertise is required so that the sampling strategy and the resulting fossils and data can yield their maximum benefits.

The rewards of such studies should be great. Geological exposures in the far north are often excellent, and some very complete stratigraphic sections have the potential to yield useful information to a wide variety of specialists. In addition, there are already numerous examples of fossil localities that produce exceptionally preserved specimens and many formations that contain a remarkable diversity of fossil taxa. Also fortunately, there exist many collections of unstudied residues and even unprocessed samples from earlier expeditions, needing only the appropriate funding and international cooperation to allow their scientific study.

Therefore, IGCP 406 was organized to encourage the international cooperation necessary to promote the study of these important, far northern strata and fossils. Originally proposed by me together with my co-leader Dr. Tiiu MÄRSS of Estonia, the project now has a third co-leader, Dr. Peep MÄNNIK, also of Estonia. Among the project's most important goals are to foster interdisciplinary study of important stratigraphic sections, to encourage international cooperation in field work and in laboratory preparation and analysis of existing samples and important fossils, and to encourage sharing of ideas and results among scientists, including graduate students, who represent many nations and who have diverse scientific specialties. The most important way in which cooperation is encouraged is through sponsorship of an annual

scientific meeting and smaller workshops each year. It is primarily at these meetings that results are shared and plans are made for future collaborations.

During its first year (1996), IGCP sponsored several smaller meetings and workshops in Canada, Sweden, Estonia, and Lithuania. Working groups began research initiatives involving the Canadian, Greenland, Spitsbergen, and northern Russian parts of the Circum-Arctic region. Planning also began for international collaboration in field studies in the Canadian Arctic and Greenland.

During 1997, IGCP 406 held two major meetings, first in Buckow, Germany, and later in St. Petersburg, Russia. Both meetings were well attended and resulted in substantial volumes of abstracts (*Ichthyolith Issues Special Publications 2, 3*). Smaller workshops were held in London, Vilnius, and Edinburgh, and project-related field work took place in northern Canada, Alaska, and Scotland.

During 1998 the annual meeting of IGCP 406 was held in Warsaw, Poland. This meeting brought together more than 50 scientists and graduate students from 16 countries to share research results, to plan further collaborative studies of fossil collections, and to plan collaborative applications for field-work and research funding. Workshops on Lower and Middle Palaeozoic geology of the Timan-Pechora region and on the early fossil record of chondrichthyans were part of the meet-

ing. In addition, a new working group was established to focus on palaeotectonics and palaeogeography of Palaeozoic basins in the Circum-Arctic Region. Extended abstracts for the papers presented at the meeting were published in the conference proceedings volume, *Ichthyolith Issues Special Publication 4*. As decided in Warsaw, future meetings will be in Riga, Latvia, in 1999, and Syktyvkar, Russia, in the year 2000, the last year of the project.

It is particularly fortunate that, through the courtesy of the journal *Acta Geologica Polonica*, a special issue was conceived to contain original research papers based on studies presented at the Warsaw meeting. The present volume is the result of those efforts. This volume is an outstanding example of the kind of international cooperation that IGCP 406 was established to encourage.

I would like to take this opportunity, on behalf of my project co-leaders and the many project participants, to sincerely thank Dr. Michał GINTER and his colleagues for the outstanding way in which the Warsaw meeting was prepared and the generous hospitality with which the participants were treated. I wish also, on behalf of co-leaders, participants, and authors of the contributions, to thank sincerely the editors and publishers of the present volume for the important part they have played in fostering international cooperation in the study of the geological and palaeontological problems that we all find so interesting and rewarding.



Circum-Arctic Palaeozoic Faunas and Facies IGCP 406 Meeting, Warsaw, September 1998

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INTRODUCTION

The meeting of IGCP 406 in 1998 was held at the Faculty of Geology, University of Warsaw, in Warsaw, Poland. More than 50 participants from 16 countries (Australia, Canada, Estonia, France, Germany, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Russia, Sweden, Ukraine, U.K., U.S.A.) attended. The main emphasis was on palaeobiological and biostratigraphic studies of both vertebrates and invertebrates in the Canadian, Russian, Danish, and Norwegian Arctic. However, the total scope of the conference was much wider than suggested by its title. Papers strictly connected with the geology and palaeontology of the circum-arctic areas, as well as those dealing with Palaeozoic vertebrates, regardless to the origin of the material, were accepted. Such decision allowed the organisers to invite more vertebrate palaeontologists, especially those who formerly took part in the activities of IGCP 328 "Palaeozoic Microvertebrates" project. Therefore, the spectrum of presented talks and posters was very broad: from the study on paragenetic associations of rocks in Pechora Basin (Natal'ya BELYAEVA, Syktyvkar) to the fossil parasitic flatworms found on Frasnian placoderms and acanthodians from Latvia (Ieva UPENIECE, Riga), to the heterochrony and evolution of xenacanth sharks (Rodrigo SOLER-GIJÓN, Berlin). Several papers fulfilled both conditions and treated of Palaeozoic vertebrates from circum-Arctic regions (*e.g.* IVANOV 1999).

Some 40 extended abstracts were published in the conference proceedings volume (GINTER & WILSON 1998).

Only one-third of manuscripts of papers presented during the Meeting were submitted to the present volume of *Acta Geologica Polonica*. The others either were given for publication elsewhere, or will be published in one of the future issues of this journal. Seven of the contributions included in this volume are extended versions of papers presented during Warsaw conference; their topics fully reflect the vast thematic area covered by the sessions. One paper (GINTER & TURNER 1999, *this volume*) was presented a year before, during IGCP 406 Meeting in St. Petersburg.

WORKSHOPS AND EXCURSION

Two workshops were held, one on geology of the Timan-Pechora region, and another on the early fossil record of Chondrichthyes.

The main topics of discussion during **Timan-Pechora Workshop** were: 1) the state of studies of Lower-Middle Palaeozoic strata in the region; 2) publication; 3) IGCP 406 future meeting in Syktyvkar and excursions to the Timan-Pechora region. During recent decades extensive geological studies have been carried out in the Timan-Pechora region. A large amount of information (unfortunately, mainly in Russian) about palaeontology, sedimentology, mineralogy, geochemistry etc. is available. All participants in the discussions agreed that the main task in the near future will be to publish the general information about the region in English. To begin with, 4-5 papers dealing with general problems of Silurian and Devonian palaeontology, stratigraphy, sedimentology and palaeogeography

will be published at the end of 1999 in Estonia (in the Proceedings of the Estonian Academy of Sciences, Geology Series).

As the Timan-Pechora region is one of the easiest, and least expensive of the Arctic regions to reach, and as the Palaeozoic strata are well exposed and studied there, it was decided that the final meeting of IGCP 406 will be organised in Syktyvkar. The First Circular of the IGCP 406 Meeting "Palaeozoic pan-Arctic Tectonics, and the Evolution of Basins and Fauna", Syktyvkar, Russia, July 12-15, 2000 (CAPV-2000) has already been prepared.

Participants in the **Chondrichthyan Workshop** could examine several collections of Palaeozoic shark teeth and scales from many places in the world, among them Arctic Canada, USA, France (Montagne Noir), Germany (Thuringia), Poland, and Iran. A discussion arose over the teeth of Permian orthacanthid and xenacanthid sharks, viz. *Orthacanthus texensis*, *O. compressus*, *O. platypternus*, and *?Xenacanthus slaughteri* JOHNSON, 1999, and over occipital spines of *O. platypternus*, brought to the meeting by Gary JOHNSON (Vermillion). He thought *Orthacanthus texensis* and (especially) *O. compressus* might be conspecific with European Lower Permian species, but Oliver HAMPE (Berlin) assured him they are not. The latter also thought G. JOHNSON would probably be safe in removing the query from *Xenacanthus* (in *?X. slaughteri*); but, as you can see from the paper (JOHNSON 1999), he did not.

The main discussion concerned the generic assignment of *O. platypternus*. The occipital spines displayed at the workshop definitely belong to this species (which is based on teeth). O. HAMPE and Jörg SCHNEIDER (Freiberg) have consistently assigned this species to *Xenacanthus* because the tooth cusps are not serrated, although they are compressed (lanceolate cross-section). However, the spines definitely belong to *Orthacanthus*, stated R. SOLER-GUJÓN, and therefore so must the teeth. O. HAMPE now agrees, especially facing the fact that some *O. compressus* teeth are also not serrated.

A two-day post-conference field excursion, guided by Dr. Stanisław SKOMPSKI (Warsaw), included visits to most of the important Devonian localities of the western part of the Holy Cross Mountains:

1. Ostrówka Quarry, Gałęzice region – Frasnian through Viséan sequence, including condensed upper Famennian rich in shark and placoderm remains;
2. Zamkowa Góra (Castle Hill) – early Frasnian biostromal stromatoporoid-coral-brachiopod limestones; panorama of the Holy Cross Mountains;
3. Kowala railroad cut / Kowala Quarry – major part of the Upper Devonian and lowermost part of the Carboniferous; transition of the southern margin of the carbonate platform into expanding basin flanking it to the south;
4. Kadzielnia Quarry – Frasnian reef covered by late Frasnian/early Famennian pelagic limestones;
5. Wietrznia Quarry – Upper Devonian carbonate succession showing synsedimentary block faulting; Permian and Lower Triassic palaeokarst;
6. Śluchowice Quarry – Upper Devonian slope/basinal succession; scenic variscan folds;
7. Zachełmie Quarry – Middle Devonian dolomites truncated by Variscan unconformity, covered by fluvial succession of Buntsandstein.

Stops 1, 4 and 5 are well known to palaeoichthyologists from J. KULCZYCKI's monograph on Palaeozoic fishes from the Holy Cross Mountains. Most of the material presented in that paper (KULCZYCKI 1957) came from those three localities.

REFERENCES

- GINTER, M. & WILSON, M.V.H. (Eds) 1998. Circum-Arctic Palaeozoic Faunas and Facies. Warszawa, Poland, 1998. *Ichthyolith Issues Special Publication*, **4**, 1-62. Warszawa.
- GINTER, M. & TURNER, S. 1999. The early Famennian recovery of phoebodont sharks. In: M. GINTER & M.V.H. WILSON (Eds), Circum-Arctic Palaeozoic Faunas and Facies. *Acta Geologica Polonica*, **49** (2), 105-117. Warszawa.
- IVANOV, A. 1999 (in press). Late Devonian – Early Permian chondrichthyans of Russian Arctic. *Acta Geologica Polonica*, **49** (3). Warszawa.
- JOHNSON, G.D. 1999 (in press). Denticitions of Late Palaeozoic *Orthacanthus* species and new species of *?Xenacanthus* (Chondrichthyes: Xenacanthiformes) from North America. *Acta Geologica Polonica*, **49** (3). Warszawa.
- KULCZYCKI J. 1957. Upper Devonian fishes from the Holy Cross Mountains. *Acta Palaeontologica Polonica*, **2** (4), 285-380. Warszawa.

PROGRAMME OF THE MEETING

SEPTEMBER 3, 1998

1st session: Stratigraphy and invertebrates

*Rostislav G. Matukhin, Vladimir Menner, Valentina Karatajute-Talimaa,
Sergey Melnikov, Tatiana Modzalevskaya, Peep Männik, Tiit Märss*

On the reconstruction of the Palaeozoic sedimentary basins and palaeotectonic conditions
in the modern Arctic shelves

Anna F. Abushik, Irina O. Evdokimova

Lagoon to normal marine Late Silurian – Early Devonian ostracode assemblages of the Eurasian Arctic

Tatiana Modzalevskaya, Bernd Wenzel

Biostratigraphy and isotopic composition of Upper Silurian brachiopods from
the Timan-Pechora region

Anna I. Antoshkina

Peculiarities of Palaeozoic reefs in the Pechora Urals, Russia

Natal'ya V. Belyaeva

Paragenetic associations of rocks reflecting incomplete structure of sequences
(Late Devonian of Pechora basin)

Jerzy Fedorowski, Wayne E. Bamber, Calvin H. Stevens

Permian colonial corals of the Cordilleran-Arctic-Uralian Realm

Marek Lewandowski

Assembly of Pangea: combined palaeomagnetic and palaeoclimatic approach

Peep Männik

Telychian sedimentary basins and conodont faunas

Alexei Kuzmin, Alexander Ivanov, Alexander Orlov

Middle to Upper Devonian boundary beds of the Timan, Russia

Tamara Nemyrovska

Bashkirian and Moscovian conodonts of the Donets Basin, Ukraine

SEPTEMBER 4, 1998

2nd session: Non-chondrichthyan vertebrates*Olga B. Afanassieva*

New Data on osteostracans from Severnaya Zemlya (Russia)

Tiiu Märss, Kenneth L. Soehn, Mark V.H. Wilson

Microvertebrate-based correlations of the Llandovery-Wenlock boundary in some sections of the Selwyn and Franklinian sedimentary basins, northern Canada

Ieva Upeniece

The first finds of fossil parasitic flatworms (Platyhelminthes)

Elga Mark-Kurik

Placoderms in the Lower and Middle Devonian of Severnaya Zemlya

Daniel Goujet

Placoderms from the Lower Devonian of Arctic Canada: new anatomical features and stratigraphic distribution

*Robert K. Carr, Elga Mark-Kurik*Reanalysis of *Heterostius* and *Homostius* (brachythoracid arthrodiros: Placodermi): Implications on systematics and paleogeography.*Pierre-Yves Gagnier, Mark V.H. Wilson, Gavin F. Hanke*

A new acanthodian from the early Devonian of the Northwest Territories, Canada

*Hans-Peter Schultze*The primitive actinopterygian *Dialipina**Mikhail A. Shishkin, Evgeniya K. Sytchevskaya*

New data on the endemic vertebrate assemblage from the Permo-(?)Triassic Bugarikhta Formation of the lower Tunguska River Basin, Central Siberia

Poster session

(there were more than 10 posters showed; only those whose abstracts are included in the proceedings volume are listed below)

Tatiana Beznosova

Ordovician-Silurian boundary at the Subpolar Urals: biostratigraphic aspects

Michał Ginter

Taxonomic problems with Carboniferous “cladodont-level” sharks’ teeth

Markus Otto

A new antiarch from the Devonian of Ellesmere Island, Arctic Canada

Jo M. J. Vergoossen

Late Silurian fish microfossils from Klinta, Scania, south Sweden

IGCP 406 business meeting

Chondrichthyan workshop 1. Collections

SEPTEMBER 5, 1998

Session 3 : Chondrichthyes

Gavin F. Hanke, Mark V. H. Wilson

Structure and variation of acanthodian and chondrichthyan scales from the Lower Devonian of the Mackenzie Mountains, Canada

Mark V. H. Wilson, Gavin F. Hanke

Body form and fin spines in species with scales of chondrichthyan growth pattern from the Lower Devonian of the Mackenzie Mountains, Canada

Valentina Karatajute-Talimaa, Roma Mertiniene

Morphogenetic types of squamation of Devonian and Early Carboniferous chondrichthyans

Claire Derycke, Zarela Herrera, Patrick R. Racheboeuf, Roland Trompette

Oldest Middle Palaeozoic ichthyofauna from Mauritania

Kate Trinajstić

Frasnian sharks from the Gneudna Formation, Western Australia

Alexander Ivanov

Late Devonian - Early Permian chondrichthyans of Russian Arctic

Michael Williams

Tooth retention in cladodont sharks

Rodrigo Soler-Gijón

Heterochrony and the evolution of xenacanth sharks

Oliver Hampe

First report on the progress on the revision of the Xenacanthida
(Chondrichthyes: Elasmobranchii) from the Carboniferous of the British Isles

Andrea Tintori

New Chondrichthyan fauna from the Guadalupian (middle Permian) of the Sultanate of Oman

Gary D. Johnson

Dentitions of Late Palaeozoic *Orthacanthus* species and new species of ?*Xenacanthus*
(Chondrichthyes: Xenacanthiformes) from North America

Chondrichthyan Workshop 2. Discussion
