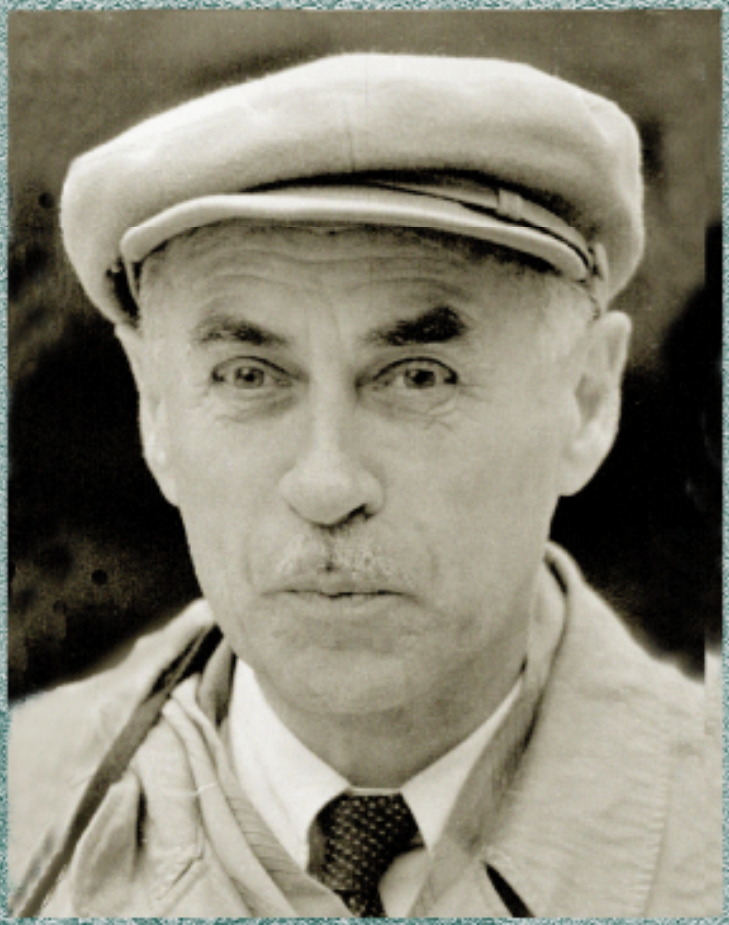

Palaeozoic Early Vertebrates

II Obruchev Symposium

Abstracts

Saint Petersburg
2011

Department of Palaeontology, Geological Faculty, Saint Petersburg State University
Borissiak Palaeontological Institute of the Russian Academy of Sciences
Russian Foundation for Basic Research
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Palaeozoic Early Vertebrates

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Abstracts

Edited by Oleg Lebedev and Alexander Ivanov

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Dmitry Vladimirovich Obruchev

CURRICULUM VITAE

compiled by N. V. OBRUCHEVA

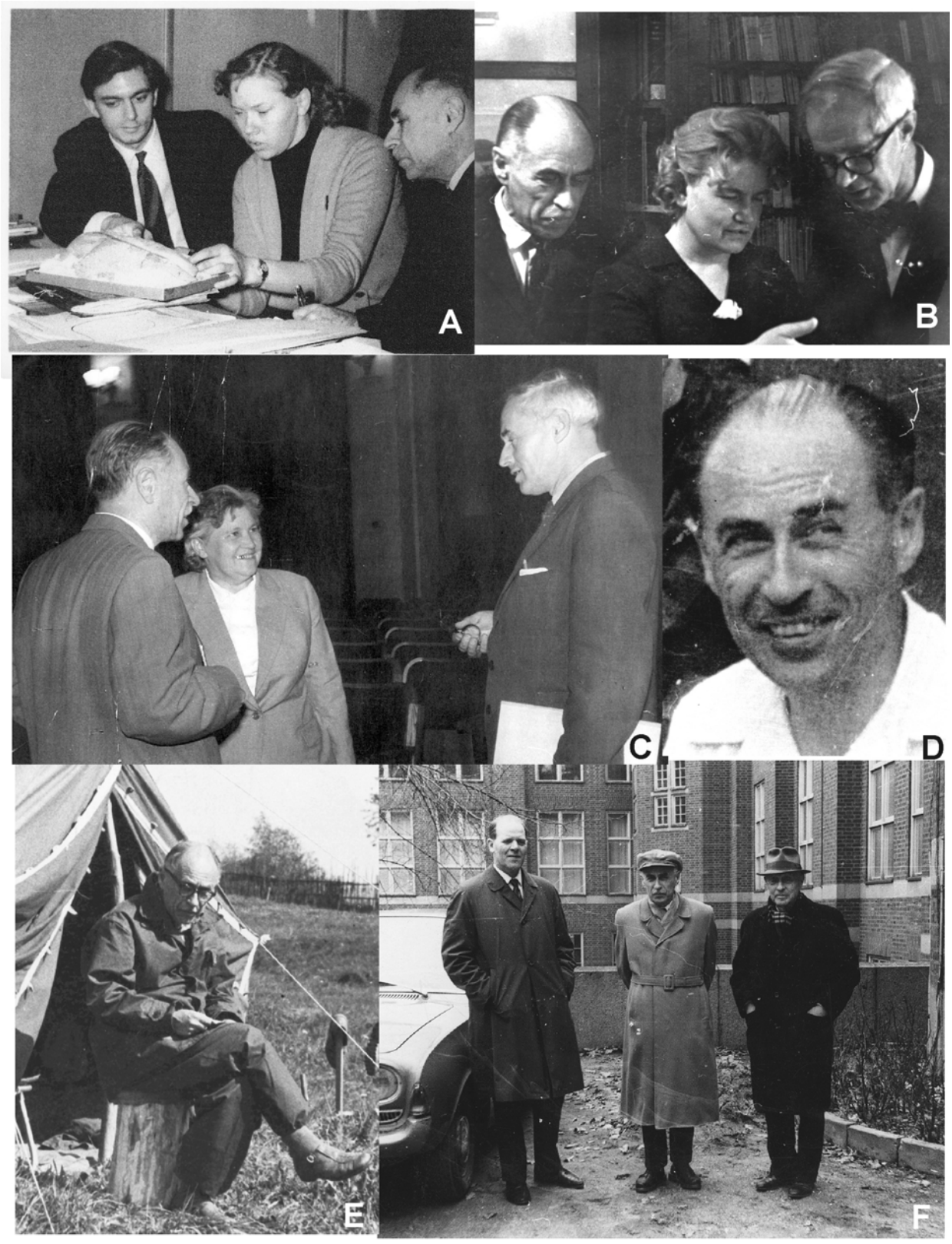
K.A. Timiryazev Institute of Plant Physiology of the RAS, n.obroucheva@mail.ru

26.07.1900	**Born in Luga town, St. Petersburg Gouvernement, Russia**
1901-1911	**Childhood in Tomsk and studies in the grammar school**
1911-1918	**Studies at the Flyorov high school, Moscow**
1918-1924	**Studies at the Moscow University, Natural History Department of the Physico-Mathematical Faculty, under the guidance of Prof. Nikolai K. Koltsov**
1925	**First studies of Devonian fishes from Siberia**
1926-1933	**Postgraduate student in the Geological Committee (later VSEGEI), Leningrad**
1927	**First publication of an arthrodire from the Yenissei River area**
1929-1931	**Participation in the expeditions aimed at Devonian stratigraphy of the Main Devonian field with Roman F. Hecker**
1933-1936	**Temporary staff member in the Paleozoological (later Palaeontological) Institute of the Academy of Sciences of USSR in Leningrad, then in Moscow**
1933	**A mountain in Greenland named after D.V. Obruchev by the Swedish palaeontologist G. Säve-Söderberg**
1935	**Conferment of the Ph.D. degree without defence**
1935	**Resulting joint publication "Deposits of the Main Devonian Field" of previous biostratigraphical research**
1936-1970	**Permanent staff member in the Paleontological Institute, Moscow**
1937	**Foreign member of Geological Society of London and Honorary**

	Member of the New York Academy of Sciences
1937	**Publications in the Stratigraphic Thesaurus of the USSR**
1939	**Discovery and publication of amphiaspid agnathans in Siberia**
1941-1943	**Evacuation during the II World War to Sverdlovsk and Alma-Ata**
1943	**Defence of the Doctor of Science (Biology) dissertation**
1945	**Borissyak prize of the Presidium of the Academy of Sciences of USSR**
1948	**Marriage to Olga P. Turovskaya**
1949	**Birth of his daughter Elena**
1953	**Monograph "Edestid Studies and the Works of A.P. Karpinsky"**
1958	**Participation in the International Zoological Congress, UK. Report: Body form, fins and mode of life of ancient vertebrates**
1964	**Publication of the Russian version of "Fundamentals of Palaeontology. Agnathans, Fishes" volume**
1965	**Monograph "Psammosteids (Agnatha, Psammosteidae) from the Devonian of the USSR" in coauthorship with E. Mark-Kurik**
1966	**Participation in the congress Problèmes actuels de paléontologie: Évolution des vertébrés (Paris, France). Report: On the evolution of the Heterostraci**
1966	**Publication of the Russian translation of the International Code of Zoological Nomenclature**
1966 and 1967	**Visits to the Geological Museum (Oslo, Norway)**
1967	**Publication of the English version of "Fundamentals of Palaeontology, vol. XI. Agnatha, Pisces"**
21.12. 1970	**Passed away in Moscow**

A, Dima Obruchev with mother and brother, 1901. **B**, D.V. Obruchev as a graduate student, 1924. **C**, D.V. Obruchev studying the Devonian sections by the Velikaya River (Pskov Region), 1929. **D**, D.V. Obruchev, R.F. Hecker and O.P. Obrucheva during the field work in Latvia, 1946. **E**, Palaeoichthyologists of USSR, Moscow, 1950. From right to the left: A.A. Sergienko, E. Mark-Kurik, E.I. Vorobyeva, D.V. Obruchev, P.G. Danil'chenko, L.S. Glikman, V.N. Karatajūtė-Talimaa and others.

A, Field works in Minusa, 1954. **B**, Krasnaya Sluda locality, Oredezh River, 1959. **C**, D.V. Obruchev and V.N. Karatajūtė-Talimaa studying the Krasnaya Sluda locality, 1959. **D**, Field crew of D.V. Obruchev in Ketleri, Latvia, 1958.



A, D.V. Obruchev, E. Mark-Kurik and an English palaeontologist L.B.H. Tarlo, 1961. **B**, A. Heintz (Norway), V.N. Karatajūtė-Talimaa and D.V. Obruchev, Moscow, 1962. **C**, R.F. Hecker, M.F. Filippova, D.V. Obruchev**,** Devonian Conference in Vilnius, 1962. **D**, D.V. Obruchev, 1950's-1960's. **E**, Dmitry Vladimirovich in the field camp, Stolbovo, 1966. **F**, D.V. Obruchev with his Swedish colleagues E. Jarvik and E. Stensiö, by the Riksmuseum Stockholm, 1967.

Dmitry Vladimirovich and his field crew, Syas' River, 1969.

One of the latest D.V. Obruchev's photos in the old Palaeontological Museumin Moscow. From the left to the right: K.K. Flerov, A.S. Romer, D.V. Obruchev, A.K. Rozhdestvensky. 1970.

LIST OF D.V. OBRUCHEV'S PUBLICATIONS

Published papers

1. 1927. *Angarichthys*, новый род Arthrodira из девона р. Бахты {*Angarichthys*, noviy rod Arthrodira iz devona r. Bakhty} [*Angarichthys*, a new genus of Arthrodira from the Devonian of the Bakhta River]. Izvestiya Geologicheskogo Komiteta 45 (6), 679-691 (in Russian, with German summary).
2. 1928a. Ненормальный экземпляр зубного аппарата *Myliobatis* {Nenormal'niy ekzemplyar zubnogo apparata *Myliobatis*} [An abnormal specimen of the *Myliobatis* dentition]. Yezhegodnik Russkogo Paleontologicheskogo Obshchestva 7, 139-141 (in Russian).
3. 1928b. Орбитальные окостенения *Bothriolepis panderi* {Orbital'niye okosteneniya *Bothriolepis panderi*} [Orbital ossifications of *Bothriolepis panderi*]. Yezhegodnik Russkogo Paleontologicheskogo Obshchestva 7, 142-144 (in Russian).
4. 1930. Значение ихтиофауны для стратиграфии северо-западного девона {Znacheniye ikhtiofauny dlya stratigrafii severo-zapadnogo devona} [Importance of ichthyofauna for Devonian stratigraphy of the North-West]. Izvestiya Glavnogo Geologo-Razvedochnogo Upravleniya 49 (9), 92-99 (in Russian).
5. 1931. Über *Coccosteus trautscholdi* (Eastman). Trudy Geologicheskogo Muzeya Akademii Nauk SSSR 8, 285-310 (in German).
6. 1932. Список рыб из среднедевонских песчаников р. Славянки (бл. Ленинграда) {Spisok ryb iz srednedevonskikh peschanikov r. Slavyanki (bl. Leningrada)} [Fish list from the Middle Devonian sandstones of the Slavyanka River (close to Leningrad)]. Izvestiya Vsesoyuznogo Geologo-Razvedochnogo Obyedineniya 51 (8), 175-177 (in Russian).
7. 1933a. Holonemidae des russischen Devons. Trudy Paleozoologicheskogo Instituta Akademii Nauk SSSR 2, 97-116 (in German, abstract in Russian).
8. 1933b. К стратиграфии среднего девона Ленинградской области {K stratigrafii srednego devona Leningradskoy oblasti} [On the stratigraphy of the Middle Devonian of Leningrad Region]. Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva 62 (2), 405-420 (in Russian, with German summary).
9. 1933c. Описание четырех новых видов рыб ленинградского девона {Opisaniye chetyrekh novikh vidov ryb leningradskogo devona} [Description of four new fish species from the Devonian of Leningrad]. Materialy Tsentral'nogo Nauchno-Issledovatel'skogo Geologo-Razvedochnogo Instituta, Paleontologiya i Stratigrafiya, sbornik 1, 12-15 (in Russian, with English summary).
10. 1934. Über zwei *Coccosteus*-Funde in der Sowjet-Arktis und den Umfang der Gattung *Coccosteus*. Trudy Arkticheskogo Instituta 13, 185-190 (in German, abstract in Russian).
11. 1935a. 5. Разрез по р. Великой около г. Пскова {5. Razrez po r. Velikoy okolo g. Pskova} [5. Section by the Velikaya River by Pskov]. In: Gekker, R.F., Obruchev, D.V., Filippova, M.F. Otlozheniya Glavnogo Devonskogo polya. [Deposits of the Main Devonian Field]. Trudy Leningradskogo Geologo-Gidrogeodezicheskogo Tresta 9, pts. V-VII, 5-22 (in Russian, with English summary).
12. 1935b. Палеонтологические результаты Датской экспедиции в Восточную Гренландию {Paleontologicheskiye rezul'taty Datskoy ekspeditsii v Vostochnuyu

Grenlandiyu} [Palaeontological results of the Danish expedition to East Greenland]. Priroda 4, 84-85 (in Russian).
13. 1935c. Первая находка силурийских позвоночных в СССР {Pervaya nakhodka siluriyskikh pozvonochnykh v SSSR} [First find of Silurian vertebrates in USSR]. Priroda 5, 70 (in Russian).
14. 1935d. Ещё о природе конодонтов {Yeshche o prirode konodontov} [More on conodont nature]. Priroda 9, 79-81 (in Russian).
15. 1935e. Девонские рыбы Сибири {Devonskiye ryby Sibiri} [Devonian Fishes of Siberia]. Yezhegodnik Vserossiyskogo Paleontologicheskogo Obshchestva 10, 155 (in Russian).
16. 1936a. Две новые панцирные рыбы в СССР {Dve noviye pantsirniye ryby v SSSR} [Two new armoured fishes in USSR]. Priroda 3, 118-119 (in Russian).
17. 1936b. Новые реконструкции панцирных рыб {Noviye rekonstruktsii pantsirnykh ryb} [New reconstructions of armoured fishes]. Priroda 5, 128-130 (in Russian).
18. 1936c. Памяти Иоганна Киаера {Pamiati Ioganna Kiaera} [*In memoriam* Johann Kiaer]. Trudy Paleozoologicheskogo Instituta Akademii Nauk SSSR 5, 264 (in Russian).
19. 1936d. О раскопках девонских рыб на р. Ловати {O raskopkakh devonskikh ryb na r. Lovati} [On excavations of the Devonian fishes at the Lovat' River]. Trudy Paleozoologicheskogo Instituta Akademii Nauk SSSR 5, 263 (in Russian).
20. 1937a. Лужские слои {Luzhskiye sloi} [Luga Beds]. In: Stratigraficheskiy Slovar' SSSR [Stratigraphic Thesaurus of USSR], Gosgeolizdat, Leningrad, 123 (in Russian).
21. 1937b. Наровские слои {Narovskiye sloi} [Narova Beds]. In: Stratigraficheskiy Slovar' SSSR [Stratigraphic Thesaurus of USSR], Gosgeolizdat, Leningrad, 140 (in Russian).
22. 1937c. Оредежские слои {Oredezhskiye sloi} [Oredezh Beds]. In: Stratigraficheskiy Slovar' SSSR [Stratigraphic Thesaurus of USSR], Gosgeolizdat, Leningrad, 152 (in Russian).
23. 1937d. Подснетогорские слои {Podsnetogorskiye sloi} [Subsnetnaya Gora Beds]. In: Stratigraficheskiy Slovar' SSSR [Stratigraphic Thesaurus of USSR], Gosgeolizdat, Leningrad, 161 (in Russian).
24. 1938. Верхнесилурийские и девонские позвоночные Урала {Verkhnesiluriyskiye i devonskiye pozvonochniye Urala} [Upper Silurian and Devonian vertebrates of Urals]. Materialy Tsentral'nogo Nauchno-Issledovatel'skogo Geologo-Razvedochnogo Instituta, Obshchaya seriya 2, 36-43 (in Russian, with German summary).
25. 1939a. *Bothriolepis turanica* n. sp. из западного Тянь-Шаня {*Bothriolepis turanica* n. sp. iz zapadnogo Tian'-Shanya} [*Bothriolepis turanica* n. sp. from western Tien-Shan]. Doklady Akademii nauk SSSR 23 (1), 115-116 (in Russian).
26. 1939b. Открытие нижнедевонской ихтиофауны в СССР {Otkrytiye nizhnedevonskoy ikhtiofauny v SSSR} [Discovery of the Lower Devonian ichthyofauna in USSR]. Doklady Akademii nauk SSSR 22 (5), 291-292 (in Russian).
27. 1939c. Панцирные рыбы {Pantsirniye ryby} [Armoured fishes]. Bol'shaya Sovetskaya Entsiklopediya 44, 78-79 (in Russian).
28. 1939d. Девонские рыбы с р. Курейки {Devonskiye ryby s r. Kureyki} [Devonian fishes from Kureyka River]. In: Akademiku V.A. Obruchevu k 50-letiyu nauchnoy i pedagogicheskoy deyatel'nosti [Festschrift to Academician V.A. Obruchev to Commemorate the 50th Anniversary of his Scientific and Pedagogic Activities]. Academy of Sciences of USSR, Moskva, v. 2, 315-330 (in Russian, with English summary).

29. 1940a. Девонские рыбы Сибири и Средней Азии {Devonskiye ryby Sibiri i Sredney Azii} [Devonian fishes of Siberia and Middle Asia]. Doklady Akademii nauk SSSR 27 (8), 889-892 (in Russian).
30. 1940b. Дельта девонской реки на Ловати {Del'ta devonskoy reki na Lovati} [Devonian river delta at the Lovat']. In: Kosaya sloistost' i yeyo geologicheskaya interpretatsiya [Cross-Bedding and its Geological Interpretation]. Trudy Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Mineral'nogo Syr'ya 163, 154-161 (in Russian).
31. 1940c. О некоторых псаммостеидах ленинградского и прибалтийского среднего девона {O nekotorykh psammosteidakh leningradskogo i pribaltiyskogo srednego devona} [On some psammosteids from the Leningrad and Baltic Middle Devonian]. Doklady Akademii nauk SSSR 28 (8), 766-768 (in Russian).
32. 1940d. О находке *Latimeria* {O nakhodke *Latimeria*} [On the discovery of *Latimeria*]. Paleontologicheskoye Obozreniye 3, 88-89 (in Russian).
33. 1941a. О находках древнейших позвоночных {O nakhodkakh drevneyshikh pozvonochnykh} [On the finds of earliest vertebrates]. Priroda 1, 80-81 (in Russian).
34. 1941b. Остатки *Aspidosteus* n.g. (Heterostraci) из верхнего девона р. Ловати {Ostatki *Aspidosteus* n.g. (Heterostraci) iz verkhnego devona r. Lovati} [Rests of *Aspidosteus* n.g. (Heterostraci) from the Upper Devonian of Lovat' River]. Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR 8 (4), 7-22 (in Russian, with English summary).
35. 1941c. Девонские рыбы Минусинского края {Devonskiye ryby Minusinskogo kraya} [Devonian fishes of the Minusa area]. Trudy Paleontologicheskogo Instituta Akademii Nauk SSSR 8 (4), 23-48 (in Russian, with English summary).
36. 1941d. К столетию со дня рождения Р.Х. Траквера {K stoletiyu so dnya rozhdeniya R.H. Trakvera} [To the 100th anniversary of R.H. Traquair]. Paleontologicheskoye Obozreniye 4, 93-94 (in Russian).
37. 1943a. *Yoglinia* n.g., последний представитель птераспид из среднего девона Ленинградской области {*Yoglinia* n.g., posledniy predstavitel' pteraspid iz srednego devona Leningradskoy oblasti} [*Yoglinia* n.g., the latest pteraspid from the Middle Devonian of the Leningrad Region]. Doklady Akademii nauk SSSR 41 (1), 36-38, 41-43 (in Russian and English).
38. 1943b. Новая реконструкция *Drepanaspis* {Novaya rekonstruktsiya *Drepanaspis*} [A new restoration of *Drepanaspis*]. Doklady Akademii nauk SSSR 41 (6), 263-271, 269-272 (in Russian and English).
39. 1944a. Попытка реконструкции *Psammolepis paradoxa* {Popytka rekonstruktsii *Psammolepis paradoxa*} [An attempted restoration of *Psammolepis paradoxa*]. Doklady Akademii nauk SSSR 42 (3), 143-145, 147-149 (in Russian and English).
40. 1944b. Алексей Алексеевич Борисяк [Aleksey Alekseyevich Borissiak]. 1872-1944. Doklady Akademii nauk SSSR 42 (7), 283-284, 297-298 (in Russian and English).
41. 1944c. Псаммостеиды девона СССР и Шпицбергена и эволюция Agnatha {Psammosteidae devona SSSR i Spitsbergena i evolyutsiya Agnatha} [Devonian Psammosteidae of USSR and Spitsbergen and evolution of Agnatha]. In: Abstracts of Papers in the Institutions of the Biological Department of the Academy of Sciences of USSR for 1941-1943, 227-228.
42. 1945a. Эволюция Agnatha {Evolyutsiya Agnatha} [Evolution of Agnatha]. Zoologicheskiy Zhurnal 24 (5), 257-272.

43. 1945b. О девонских рыбах с реки Волонги {O devonskikh rybakh s reki Volongi} [On the Devonian fishes from the Volonga River]. Paleontologicheskoye Obozreniye 5, 80 (in Russian).
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45. 1947a. О роде *Psammosteus* (Heterostraci) {O rode *Psammosteus* (Heterostraci)} [On the genus *Psammosteus* (Heterostraci)]. Doklady Akademii nauk SSSR 56 (5), 517-520 (in Russian).
46. 1947b. Тип Chordata. Хордовые. Подтип Vertebrata. Позвоночные {Tip Chordata. Chordoviye. Podtip Vertebrata. Pozvonochniye} [Type Chordata. Chordates. Subtype Vertebrata. Vertebrates]. In: Atlas rukovodyashchikh form iskopayemykh faun SSSR. Tom 3, Devonskaya sistema [Atlas of Index-Fossils of Extinct Faunas of USSR. Vol. 3, Devonian System]. Gosudarstvennoye Geologicheskoye Izdatel'stvo, Leningrad, 191-206, 212-213 (in Russian).
47. 1947c. Предисловие редактора {Predisloviye redaktora} [Editor's preface]. In: Академик А.А. Борисяк. Основные проблемы эволюционной палеонтологии {Akademik A.A. Borissiak. Osnovniye problemy evolyutsionnoy paleontologii} [Akademician A.A. Borissiak. Major Problems of Evolutionary Palaeontology]. Akademiya Nauk SSSR, Moskva, 3-5 (in Russian).
48. 1947d. Верхнедевонские рыбы {Verkhnedevonskiye ryby} [Upper Devonian Fishes]. In: Атлас Развитие жизни на Земле {Atlas Razvitiye zhizni na Zemle} [Atlas Development of Life on Earth]. Pl. 14 and explanations, 10-11 (in Russian).
49. 1947e. Родословное древо рыб {Rodoslovnoye drevo ryb} [Family tree of Fishes]. In: Атлас Развитие жизни на Земле {Atlas Razvitiye zhizni na Zemle [Atlas Development of Life on Earth]. Pl. 54 and explanations, 32-34 (in Russian).
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54. 1949c. Тип Vertebrata. Позвоночные{Tip Vertebrata. Pozvonochniye} [Type Vertebrata. Vertebrates]. In: Atlas rukovodyashchikh form iskopayemykh faun SSSR. Tom 2, Siluriyskaya sistema [Atlas of Index-Fossils of Extinct Faunas of USSR. Vol. 2, Silurian System]. Gosudarstvennoye Geologicheskoye Izdatel'stvo, Leningrad, 316-328, 339-340 (in Russian).
55. 1951a. О границе между средним и верхним девоном в Главном поле {O granitse mezhdu srednim i verkhnim devonom v Glavnom pole} [On the Middle-Upper Devonian boundary in the Main {Devonian} Field]. Doklady Akademii nauk SSSR 78 (5), 981-984 (in Russian).
56. 1951b. Новая находка *Edestus protopirata* Trautschold {Novaya nakhodka *Edestus protopirata* Trautschold} [A new specimen of *Edestus protopirata* Trautschold]. Doklady Akademii nauk SSSR 81 (2), 273-276 (in Russian).
57. 1952a. Гигантские панцирные рыбы {Gigantskiye pantsirniye ryby} [Gigantic armoured fishes]. Priroda 4, 122 (in Russian).
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59. 1953a. Стратиграфическое распределение остатков рыб в девоне Русской платформы в связи с вопросом о границе среднего и верхнего девона {Stratigraficheskoye raspredelenie ostatkov ryb v devone Russkoy platformy v svyazi s voprosom o granitse srednego i verkhnego devona} [Stratigraphical distribution of fish remains in the Devonian of the Russian Platform in connection to the discussion on the position of the Middle-Upper Devonian boundary]. In: Девон Русской платформы {Devon Russkoy platformy} [Devonian of the Russian Platform]. Vsesoyuzniy Nauchno-Issledovatel'skiy Geologo-Razvedochniy Institut, Leningrad, 296-301 (in Russian).
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SCIENTIFIC HERITAGE OF DMITRY VLADIMIROVICH OBRUCHEV AND CONTEMPORARY PALAEOICHTHYOLOGY.

Professor Dmitry Vladimirovich Obruchev was a prominent palaeoichthyologist, evolutionist and stratigrapher, whose name is widely known throughout the world. From 1933 until his death, he worked at the Palaeozoological (later Palaeontological) Institute of the Academy of Sciences of the USSR, where he studied Palaeozoic agnathans and fishes, as well as created the museum exhibits. His research contributed significantly to correlation of the stratigraphical units of the Old Red Sandstone continent, Siberia and other regions of the USSR. Biostratigraphical works were based on his own field studies as well as materials sent to him by geologists. These materials greatly enlarged the collections of the Palaeontological Institute and became the base for further research in other regions: Yakutia, Timan, Ferghana, Central Devonian field and others.

D.V. Obruchev's significant achievement was the education of young scientists and creation of a palaeoichthyological school, the traditions of which are kept and continue today. V.N. Karatajūtė-Talimaa (Lithuania), E. Mark-Kurik (Estonia), L.A. Lyarskaya (Latvia), A.A. Matveeva-Kazantseva and E.I. Vorobyeva were his first students; L.I. Novitskaya, E.K. Sychevskaya and V.N. Yakovlev entered later.

During the 40's Dmitry Vladimirovich focused his research on the Devonian agnathan psammosteid heterostracans. In 1943 he defended his doctorate dissertation ”Devonian psammosteids of USSR and Spitsbergen, and the evolution of Agnatha”. This work was awarded the A.A. Borissyak prize. Later, in 1965, the materials of this dissertation were published in collaboration with E. Mark-Kurik in the monograph "Psammosteids of USSR."

In 1940’s- 1950’s, Dmitry Vladimirovich became deeply interested in the evolution of early fishes and agnathans. He composed a family tree demonstrating the relationships of extinct and modern primarily aquatic vertebrates. This scheme was published in 1947 in the atlas "The development of life on Earth".

In 1953, in his first monograph devoted to the development of Acad. A.P. Karpinsky's scientific heritage and based upon an integrated study of helicoprionid morphology, taxonomy and palaeoecology, Obruchev suggested a new reconstruction of the tooth whorl position on the snout of the Permian *Heliocoprion*, which later became included in various textbooks.

In 1957, Dmitry Vladimirovich headed the newly established Palaeoichthyological laboratory in PIN (the Palaeontological Institute). Being a leader, he proposed a broad research programme to this team. This plan of activities was based upon his notes dated to the 1930’s and 1940’s concerning morphology, taxonomy, phylogeny and evolution of various groups of fossil fishes and agnathans. These notes were also used during the preparation of the "Agnathans and Fishes" volume of the "Fundamentals of Palaeontology", prepared for publication in 1956. It was authored by P.G. Danilchenko (Holostei and Teleostei), L.S. Glickman (Elasmobranchii) and D.V. Obruchev (all other groups).

However, accelerated development of palaeoichthyology required radical revision of this manuscript. The new laboratory members L.I. Novitskaya (Acanthodei), A.A. Kazantseva (Palaeonisci), E.I. Vorobyeva (Crossopterygii, Dipnoi), V.N. Yakovlev (Pholidophorida) and S.P. Sergeeva (Conodonti) became involved in the preparation of the volume as new authors.

The "Agnathans and Fishes" volume published in 1964 became not only a summary of accumulated information, but also a critical review reflecting the authors' viewpoints on agnathan and fish systematics and phylogeny. This manual became a handbook for palaeontologists and geologists of USSR, and with the 1967 publication of the English translation, for foreign specialists as well. One of the main challenges faced by Prof. Obruchev as the editor of this volume was unification of sections. This task was entrusted to me as the publishing editor of the volume. Sometimes it was not easy, but I always kept in

mind the main Obruchev precepts: phrases must be clear, short and contain no "parasitic words", like "numerous", "quite deep", etc.

Dmitry Vladimirovich, among other scientists (Yu.A. Orlov and V.N. Ruzhentsev) became the winner of the State Prize of USSR for this publication.

Prof. Obruchev was very demanding and strict not only to himself but to his students as well. He often said: "I treat my students like puppies, throw them into the water, - those who can swim would survive." Dmitry Vladimirovich himself was a man of high culture, education and modesty. He unselfishly served science and his high level of demand with respect to his students was combined with his constant willingness to help those who were truly industrious, talented and devoid of careerism.

Apart from research, he did a lot of editorial work, including the edition of the "Transactions (Trudy) of the Palaeontological Institute". He was also a member of the editorial board of the Paleontologicheskiy Zhurnal and of the International Commission on Zoological Nomenclature. He translated the "International Code of Zoological Nomenclature" from English into Russian and was one of the principal compilers of the "Stratigraphical Dictionary of the Soviet Union" and the Lexique Stratigraphique International. All this was left as a heritage to future generations.

After his death in 1970, many of the Obruchev's students defended their doctorate theses and published monographs on various groups of fossil fishes and agnathans. The publication of the "Agnathans and Early Fishes" volume from the "Fossil Vertebrates of Russia and Adjacent Countries" in 2005 was a significant event in Russian palaeoichthyology. This guide, being a summary of some groups of the earliest palaeoichthyofaunas, naturally extends the "Agnathans and Fishes" (1964) volume. At the same time this is a kind of posthumous report to Prof. Obruchev on the progress achieved by his disciples and followers. This guide includes updated information on the morphology, phylogeny and principles of systematics of the fundamental palaeoichthyofaunistic groups of key relevance to the gnathostome origin (thelodonts, heterostracans and osteostracans) and to the origin of tetrapods (sarcopterygian and dipnoan fishes). For the first time in world practice, this volume includes the diagnoses of all taxonomic ranks including the species ones. The major task achieved in this publication was that elucidated by Dmitry Vladimirovich during all of his scientific life: linking biology to geology. The main tenets of his theoretical heritage followed in this volume are: 1. Adherence to geochronological principles in phylogenetics, which resulted in his time in the idea that thelodont-like scale cover preceded the continuous armour, the conclusion opposite to that adopted by the members of the Swedish school, and 2. recognition of the role of parallelisms and negative anaboly (essentially paedomorphosis or phoetalisation) during the origin of various taxa.

Noteworthy is that three of six authors of this new manual (V.N. Karatajūtė-Talimaa, E.I. Vorobyeva and L.I. Novitskaya) were the pupils of Dmitry Vladimirovich.

The town of Luga, the birthplace of Dmitry Vladimirovich Obruchev in the Leningrad Region will host the International Symposium in August 2011. The localities which he excavated and explored will be visited by the members of the International Obruchev Symposium. I wish success to all its participants.

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DEVELOPMENT OF THE EXOSKELETON IN OSTEOSTRACANS: NEW EVIDENCE OF GROWTH

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During the last decade considerable progress has been made in the study of the development of the dermal skeleton in osteostracans. A mode of exoskeleton ossification of the *Thyestes verrucosus* Eichwald, 1854 shield from the Silurian of Saaremaa Island (Estonia) was suggested (Afanassieva, 2002, 2004). New information on the juvenile well-preserved articulated specimens of *Superciliaspis gabrielsei* (Dineley, Loeffler, 1976) from the Early Devonian of the Northwest Territories (Canada) could help to determine that the dermoskeleton of the tessellate form grew by multiple means, through the formation of exoskeletal elements, the enlargement of existing elements by cyclomorial growth, and fusion of exoskeletal elements (Hawthorn et al., 2008). Exoskeleton reconstruction of *Ungulaspis arctoa* Afanassieva et Karatajūtė-Talimaa, 1998 based upon new well-preserved material from the Early Devonian of Severnaya Zemlya Archipelago, Russia was made. A complex three-dimensional superficial structure was found in the exoskeleton of *Ungulaspis*. It is suggested that this structure is the second generation of dentine covering the first one consisting of numerous tubercles. The model of the formation of the exoskeleton in *Ungulaspis arctoa* during ontogeny is presented.

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A NEW STEM TETRAPOD FROM THE LOWERMOST FAMENNIAN OF SOUTH TIMAN

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Over the past two decades, increased research interest in the origin and early evolution of Devonian tetrapods has resulted in many new discoveries that have greatly enhanced our understanding of this sequence of evolutionary events. Here we present an overview of the material of a new tetrapod from South Timan, first identified by A.O. Ivanov from a jaw fragment kept in St. Petersburg, and now also represented by numerous bones collected during field seasons in 2008-2010. Extensive material of cranial, mandibular and some postcranial bones are preserved in dolomitised limestone of the Sosnogorsk Formation, allowing preparation with acetic acid. All skeletal elements are attributable to a single species, making this taxon one of the most complete Devonian tetrapods besides *Acanthostega*, *Ichthyostega* and *Ventastega*, and permitting us to present a provisional skull reconstruction.
A cleithrum and partial scapulocoracoid demonstrate tetrapod morphology, differing strongly from *Panderichthys* or *Tiktaalik* and allowing us tentatively to identify the Sosnogorsk animal as a limbed vertebrate. However, the material shows a mosaic of primitive and autapomorphic characters. The shape of the snout differs from that of other early tetrapods. The skull table resembles that of *Tiktaalik*, the vomeral morphology is intermediate between those of elpistostegids and previously known Devonian tetrapods, the braincase possibly retains traces of the intracranial joint, the squamosal was separated from the supratemporal by the postorbital as in *Tiktaalik*, and the cleithrum is partly ornamented. Autapomorphic features include radiating rows of small teeth on pterygoid and prearticular bones, and an angular orbit with anterior vertical buttress. These features place the new taxon between *Tiktaalik* and *Ventastega* as the most primitive tetrapod known from extensive material.

EARLY DIVERSIFICATION OF TELEOSTEI AND PHYLOGY

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The Teleostei, the largest living fish group had a modest beginning, presumably in the Late Triassic, with about six genera inhabiting Europe and Asia. Ten genera are known from the Early Jurassic when the "true" teleosts (leptolepids) appeared, setting the beginning of an extraordinary radiation throughout the Mesozoic, especially in the Late Jurassic with over 40 genera. Together with the notable diversification, the distribution of teleosts became worldwide. It is during the Late Jurassic when some of the modern teleostean lineages arose, e.g., elopomorphs and euteleosts. However, all Jurassic species had, apparently, a restricted geographical distribution and lived a few million years. None of the Jurassic species have been recovered in the Cretaceous, so that replacements of species have operated through time; it is unknown how many events are involved up today. The understanding of the phylogenetic relationships of this highly diversified group is not resolved. The phylogenetic position of certain groups may change depending whether the database is morphological or molecular. The elopomorphs (with a fossil record of about 150 MY) stand as the most basal teleostean group followed by the osteoglossomorphs (with a fossil record of about 140 MY), ostarioclupeomorphs, and euteleosts when fossil and recent taxa are considered. When only recent taxa are included in the analysis, the osteoglossomorphs occupy the basal position.

However, new molecular evidence supports the elopomorphs as the basal group. Furthermore, there are major disagreements about the monophyly and relationships of some groups, e.g., ostarioclupeomorphs depending on morphological or molecular evidence. Different phylogenetic hypotheses as well as disagreements between ages of the oldest records of Teleostei (or of some lineages) versus molecular ages of divergence will be discussed as well as the synapomorphies supporting the stem-based, apomorphy based, and crown-group-based teleosts.

A UNIQUE VERTEBRATE COMMUNITY FROM THE SOSNOGORSK FORMATION (LOWER FAMENNIAN, SOUTH TIMAN)

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Only the isolated plates of the antiarch *Bothriolepis jeremejewi* and scales of the porolepiform *Holoptychius* as well as a single jaw fragment of an undescribed tetrapod were known from the Sosnogorsk Formation until recently. A great number of well-preserved specimens including some partially articulated skulls and skeletons was collected during the 2008-2010 field seasons. This new material allows the porolepiform *Duffichthys* and the lungfishes cf. *Jarvikia* and cf. *Andreyevichthys* to be added to the faunal list. Extensive material of skeletal elements of a new tetrapod has been found as well. A preliminary morphological study indicates an endemic species composition of the community.

The assemblage is restricted to a single, about 40-65 cm thick bed of dolomitised limestone, the so-called “fish dolomite” bed, yielding numerous carbonate incrustations and oogonia of charophyte algae, and calcite-filled vertical tubes. The bed contains a clay tempestite at its base, is underlain by clayey deposits including finely laminated ones with mud cracks and raindrop impressions on the bedding surfaces, and is overlain by massive fine-crystalline dolomite. Vertebrate remains show uneven distribution, including vertical orientation in the middle part of the bed, moderately high fragmentation, reorientation, and sorting, as well as almost complete absence of corrosion and abrasion. Very rare articulated specimens occur in the uppermost part only. No marine invertebrates have been recorded from the Sosnogorsk Formation. Sedimentological data indicate shallow-water environment, whereas taphonomical study suggests the assemblage formed under conditions of moderate turbulence, rather high or periodically high rates of carbonate sedimentation, and dysoxic environment. Vertebrate remains most likely were rewashed in a storm event. Taken together with the presence of a Late Frasnian barrier reef to the east of this site, which became dry during the earliest Famennian due to a sea regression, the Sosnogorsk Formation most probably represents a wide shallow lagoon or lake in a back-reef zone.

EARLY AND MIDDLE PALAEOZOIC VERTEBRATE PALAEOBIOGEOGRAPHY: RECENT ADVANCES AND CRITICAL COMMENTS

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Oldest known possible vertebrates are Early Cambrian in age. They are small, naked and unossified. Oldest species with a mineralized exoskeleton (euvertebrates) are from the Ordovician, which ends with the Talimaa's Gap (Rhuddanian, earliest Silurian). Ordovician and Silurian vertebrate faunas are dominated by ossified agnathans (ostracoderms). Early Palaeozoic vertebrates have occupied a wide range of environments: from proximal marine to restricted marine in the Ordovician, all along the marine epicontinental shelves in the Silurian. Silurian-Devonian vertebrates are useful biostratigraphic indicators and good markers of palaeocontinental margins. Two main palaeobiogeographic units are defined for the Ordovician: a Gondwana Realm and a Laurentia-Siberia-Baltica Realm. Vertebrate fossil localities are more numerous in the Silurian, therefore a series of palaeobiogeographic provinces are defined on the Old Red Sandstone Continent, Siberia and South China. No formal units are defined for the other palaeocontinental masses. Gnathostomes, and in particular placoderms, become dominant upon agnathans in the Devonian, for which a series of provinces have been defined, including Gondwana. Several palaeobiogeographic analyses of Silurian, and mainly Devonian vertebrates have been proceeded by different authors who used different biogeographic methodologies, such as their results can hardly be compared. Devonian vertebrates suffered of two biotic crises: ostracoderms disappear at the Frasnian-Famennian boundary, placoderms at the Devonian-Carboniferous boundary. However, contrary to what is usually said for marine invertebrates, the F-F boundary is not the strongest extinction of both end-Devonian crises for vertebrates; the D-C one corresponding to a more important turnover in vertebrate faunas with the development of eugnathostomes (chondrichthyans and osteichthyans). This event is followed by the Tournaisian Romer's Gap for tetrapods.

A NEW ISCHNACANTHID (ACANTHODII) BASED ON DISARTICULATED REMAINS FROM THE LOWER DEVONIAN OF SPAIN

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Acid preparation of carbonate rocks from the Lochkovian and Pragian (Lower Devonian) of the Iberian Chains (Spain) yields an abundant and diverse assemblage of microichthyoliths studied during the last decades (e.g. Mader, 1986; Wang, 1993). This material appears as

disarticulated elements: mainly teeth, spines and scales, and, in the absence of articulated or semi-articulated skeletons, its taxonomic studies have been based on sclerite taxa (*sensu* Bengtson, 1985; i.e. teeth, spine or scale taxa, depending of the element they are based on). Nevertheless, sometimes different sclerites can be placed together in a unique scleritome taxon (*sensu* Bengtson, 1985) on the base of correspondence with articulated fishes from other localities, histological studies and stratigraphical occurrence.

Following this perspective, in the present work we describe new disarticulated material, consisting of spines, scales and tooth whorls that occur recurrently together in numerous levels of the Lower Devonian deposits of the Nogueras and Luesma Formations (Iberian Chains, Spain). Based on their stratigraphical occurrence and histological evidence both, we propose including all these remains in a unique natural assemblage. Part of the scales we describe here was previously assigned to *Gomphonchus hoppei* and *Gomphonchus* aff. *hoppei* by Wang (1993), however our conclusions favours the erection of a new species of ischnacanthid acanthodian for all these remains.

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REMAINS OF A LARGE TETRAPODOMORPH FISH FROM THE ZARAND FORMATION (UPPER DEVONIAN) OF SOUTHEASTERN IRAN

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An incomplete jaw with large teeth was discovered by one of us (J. W.) during geological prospection near the village of Gask, southeastern Iran. This locality is part of the Zarand Formation, which spans from the lowest Devonian up to Tournaisian. The material consists of a single large jaw, presumably a left mandible. It is preserved in a siliciclastic conglomerate, consisting of coarse sandstone with large quartz pebbles. This heterogeneity made it difficult to envisage a physical preparation of the specimen. As a consequence, it was visualized with CT-scan imaging, and a three-dimensional model was produced using the software *Mimics*. The anterior and posterior parts of the jaw are missing and the specimen underwent a side

flattening, due to diagenetic process. However, as demonstrated by the presence of large fangs on the internal face of the jaw and other anatomical features, this material can almost certainly be assigned to a tetrapodomorph, and probably to a tristichopterid fish. Devonian tetrapodomorph fish remains are very scarce in Iran and, if our determination is correct, it would be the first occurrence of tristichopterid fish in this part of the northern margin of Gondwana.

LATE VISÉAN PELAGIC CHONDRICHTHYANS FROM CENTRAL EUROPE

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The rich assemblages of shark teeth from isolated horizons of pelagic limestones (Mississippian, late Viséan, late Asbian – early Brigantian) representing three Central European regions: the Rhenish Mountains (Westenfeld Quarry, Germany), the Holy Cross Mountains (Ostrówka Quarry, Poland), and the Krakow Upland (Czerna, Poland) display great similarities, with the absolute predominance of *Denaea* cf. *D. fournieri* Pruvost, 1922 and the constant presence of *Thrinacodus* spp. At this stage of investigations, the assemblages from Poland appear to be more diverse, additionally containing *Denaea williamsi* Ginter and Hansen, 2011, *Bransonella nebraskensis* (Johnson, 1984) and a few ctenacanthiform and hybodontiform teeth. Anachronistids (*Cooleyella*, *Ginteria*), common in only slightly younger pelagic deposits of England and Russia, are absent from the studied samples. The material under study differs from the shallow-water chondrichthyan fauna, hitherto described from the upper Mississippian, by its lower diversity and the complete lack of euchondrocephalan teeth and tooth-plates.

NEW INFORMATION ON PETALODONT CHONDRICHTHYANS

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The Mississippian Bear Gulch Limestone of Central Montana, USA, has yielded a diverse array of petalodont remains. Of these, *Belantsea* and *Netsepoye* and the Permian *Janassa bituminosa* are the only species described from holomorphic material.

We now describe a new Bear Gulch petalodont that is nearly complete, lacking only the posteriormost aspect of the caudal fin. Preservational details include a complete neurocranium with sclerotic and labial cartilages, first dorsal fin originating at the level of the otic region and extending beyond the pectoral girdle, smaller second dorsal fin, vertebral elements, and large paired fins and girdles generally of the *Belantsea* design. An iliac extension occurs for

the pelvic girdle and a pelvic clasper is evident. A shagreen of small single cusped denticles is complemented by enlarged bifid denticles located distally on the first eight pectoral radials and spike-like denticles on the pelvic fin. Specialized bifid denticles are present on labial cartilages. This small form presents a heterodont dentition with symphysial and distal teeth comparable to *Petalorhynchus* and *Janassa*, respectively. The distribution of teeth on the jaws form a 'U' shaped arch, and in contrast to *Janassa* wherein the dentition is concentrated anteriorly into a transverse arrangement. The new species shares features in common with *Netsepoye hawesi*, including incisiform symphysial teeth and molariform distal teeth that grade in size posteriorly. Differences exist in the shape of the pectoral girdle and Meckel's cartilage. Like *Belantsea* the upper dentition matches that of the lower jaw in number and size, with multiple tooth families. The lower jaw dentition of *Netsepoye* (and two other unpublished Bear Gulch petalodonts), however, exhibit one to two prominent teeth and a well developed upper jaw series.

TOURNAISIAN CHONDRICHTHYAN REMAINS FROM THE TIZI MOUNT, CENTRAL IRAN

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Type section of the siliciclastic Zarand Formation (Devonian-Lower Carboniferous) is well-exposed on the western flank of the Tizi Mount, 25 km NE of Kerman, southern part of east-central Iran microplate. During field missions in this locality (2006-2007), extensive collecting from a dolomitic bed of middle Tournaisian age provided a rich and diverse chondrichthyan material, including numerous isolated teeth, scales and spines.

So far, several taxa including phoebodonts (*Thrinacodus bicuspidatus*), protacrodonts (*Protacrodus aequalis*, *Protacrodus* sp., ?*Deihim mansureae*), holocephalians (*Psephodus* cf. *magnus*, *Deltodus* sp., *Psammodus* sp., Helodontiformes gen. et. sp. indet.), hybodonts (*Lissodus* spp.), petalodonts (*Chomatodus* sp.) and cladodonts (ctenacanthiform teeth and spines) are identified. Holocephalian remains are considerably predominant among the assemblage. Associated to this fauna are acanthodian ("*Acanthodes*" sp.) and actinopterygian (*Moythomasia* sp.) scales. A chondrichthyan assemblage with a comparable taxonomic composition is already reported from the Tournaisian dolomitic beds of the Neyok Quarry, Yazd Province, Iran (Hairapetian et al., 2005).

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PALAEOICHTHYOLOGICAL RESEARCH IN THE LUGA DISTRICT OF THE LENINGRAD REGION: PAST AND PRESENT

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A list of Devonian vertebrates from the Luga District of the Leningrad Region (Russia) was originally mentioned by P.N. Venyukov (1884). However, detailed palaeoichthyological studies in this territory started in only during 1926-1931 in the framework of the geological mapping programme. Two field crews studied the sections of the Middle and Upper Devonian by the Luga, Lemovzha, Oredezh, Tesovaya and Vruda rivers. One of the teams was the Devonian Lithological expedition under guided by R.F. Hecher. D.V. Obruchev was also involved in the works of this expedition. Other team headed by B.P. Asatkin surveyed the western part of the Leningrad Region. Both teams sampled numerous outcrops and boreholes, and collected abundant vertebrate remains. As a result the Devonian deposits were subdivided into the regional beds characterised by diverse vertebrate assemblages.

Collectioning and research of Devonian vertebrates in this area continued in the 1950-1960ties by D.V. Obruchev and his students: V.N. Karatajute-Talimaa, E. Mark-Kurik, L.A. Lyarskaya. Their descriptions of Eifelian-Frasnian agnathans and fishes were published in the series of monographs or papers (e.g. Karatajute-Talimaa, 1963, Obruchev & Mark-Kurik, 1965, Lyarskaya, 1981). During the last thirty years J. Valiukevičius and some of the authors of the present report supplemented the vertebrate collections from some sections.

The new localities in this area were reported by the 2001 Latvian-Russian Expedition (A. Ivanov, E. Lukševičs, I. Zupiņš and others).

The 2009-2010 Russo-Franco-Latvian expedition discovered a new diverse material from the historical and new localities of that area.

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A NEW DIPNOAN FROM THE LATE GIVETIAN (MIDDLE DEVONIAN) OF THE EAST-EUROPEAN PLATFORM

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An incomplete dipnoan palate found in the Pavlovsk (Shkurlat) industrial quarry to the south-east from the Pavlovsk town (Voronezh Region), in the debris of the Vorobyevo- Ardatov Regional Stages interval, was generously donated to the Borissiak Palaeontological Institute of the Russian Academy of Sciences (Moscow) by private collector S.V. Bagirov. The exceptional feature of this specimen is the presence of large separated marginal and mesial teeth as an alternative to paired pterygoid tooth plates typical of dipnoans. The specimen is referred to a new species of the dipnorhynchid genus *Dipnotuberculus*. *D. gnathodus* Campbell et al., 2002 is based upon several isolated palate and mandible fragments from the early - middle Givetian (Phacopid bed) of the Moroccan Sahara (Campbell et al., 2002). The new species is comparable to *D. gnathodus* by arrangement of swollen robust teeth (tuberosities) on the palatal surface, but the palate of the former is narrower and more elongated; the medial suture is present in its anterior part.

The following other fish taxa were earlier reported from the Pavlovsk quarry (Ivanov, 2009): psammosteids *Psammolepis* sp. and *Schizosteus shkurlatensis* Moloshnikov; arthrodires *Holonema* sp., *Livosteus* sp. nov., *Eastmanosteus* cf. *pustulosus* (Eastman) and *Actinolepis* sp.; ptyctodont placoderms *Rhynchodus* sp. and "*Ptyctodus"* sp., antiarchs *Byssacanthus* sp.; teeth and scales of osteolepiform rhipidistians. The new specimen is the first reliable find of a lungsfish in the Givetian of the Central Devonian field. The occurrence of lungfishes enlarges the ichthyofauna diversity of the Vorobyevo- Ardatov time in this area. Earlier palaeozoogeographic research (Lukševičs et al., 2010) found out the connections of this fauna only to the Main Devonian field and Laurentia provinces; the new find establishes a connection of the south-eastern part of the Baltica Province also to the North Gonwana paleozoogeographical province.

UPPER DEVONIAN (FRASNIAN) TETRAPODS OF THE LENINGRAD REGION, RUSSIA

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All known Frasnian tetrapods (*Metaxygnathus*, *Sinostega*, *Obruchevichthys*, *Elginerpeton* and a new, yet unnamed form from the Leningrad Region of Russia) are known only from partially preserved mandibles. These elements are, with pectoral elements, the most robust and the most easily recognizable bones of the tetrapod skeleton.

Tetrapod mandibles bear enough information to be distinguished from those belonging to tetrapodomorph fishes. Earlier suggested and newly found anatomical features characterise tetrapods at their earliest stage of evolution: 1/ superficially positioned closed mandibular sensory canal with pores opening directly into it (without a tube) or mandibular sensory canal partly opened to form a deep furrow; 2/ loose attachment of the dentary to the rest of the mandible; 3/ elongation of the precoronoid part of the mandible and reduction of the precoronoid fossa; 4/ emergence of fangs on the adsymphysial plate; 5/ lateral shift of coronoid fangs to the row of denticles at the vertical lamina; 6/ reduction of the coronoid vertical lamina; 7/ reduction of shagreen dentition in the ventral part of the prearticular and formation of a dorsal longitudinal ridge of denticles; 8/ trend to an ornamentation with a "starburst" pattern. However, all Frasnian tetrapods still lack the characteristic pit-and-ridge dermal ornamentation.

Following this list of characters a new incomplete lower jaw found at the Oredezh River in the Leningrad Region (Amata Regional Stage, Upper Givetian - Lower Frasnian) is attributed to an early tetrapod due to the presence of characters (1-2) and (5-7).

Comparison of the two previously published tetrapod lower jaws of *Obruchevichthys gracilis* Vorobyeva, 1977 from Latvia and Russia reveals several newly found features, like the depth of the vertical coronoid lamina, differences in the dentition, mode of the seismo-sensory canal opening to the surface and dermal ornament used to erect a new *Obruchevichthys* species for a Russian specimen.

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PALAEOZOIC PALAEOICHTHYOLOGY AND COLLECTIONING IN RUSSIA: 1813-1930

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Gathering collections of Palaeozoic fishes started in Russia at the beginning of the 19th century. It was bound to mining activity as well as amateur and academic natural history research in the universities in St. Petersburg, Derpt (now Tartu, Estonia) and Moscow. The earliest materials originated from the Middle Devonian of Livland, upper Silurian of Oesel (now Saaremaa, Estonia), and the Upper Devonian of Central and north-western Russia. The early papers by Kutorga and Asmuss ascribed teeth and bones of placoderms and sarcopterygians to various reptiles, but very soon the materials became properly identified and took the right position within the geochronological succession due to establishment of the Devonian, as well as pioneering palaeoichthyological works in Great Britain.

Prospection and mining for coal, copper and limestone in Central Russia and Cisurals led to creation of collections of Carboniferous and Permian chondrichthyan and actinopterygian remains, especially in the Moscow and Kazan' universities. P.V. Yeremeyev,

G. Romanowsky, P. Semenov and V. Möller, J.G. Fischer von Waldheim, H. Trautschold, P.I. Krotov and A.V. Khabakov described these fossils in the second half of the 19th and the beginning of the 20th century.

During the last quarter of the 19th and the first quarter of the 20th centuries collections and studies concentrated mostly in the Geological Committee of Russia, which started an extensive program of geological mapping. This research covered large areas of European Russia and Siberia. One of its brightest palaeontologists, A.P. Karpinsky, studied the Lower Permian helicoprionid chondrichthyans. Devonian and Carboniferous fishes in Siberia were gathered and studied by I.A. Lopatin, I.D. Chersky, V.G. Rohon, D.A. Klementz, Ya.S. Edelstein and I.P. Tolmatchow. The first paper on the Palaeozoic fishes by D.V. Obruchev also describes arthrodires from this area.

STESHEVIAN (EARLY CARBONIFEROUS, SERPUKHOVIAN) VERTEBRATES FROM THE SOUTH OF THE MOSCOW REGION, RUSSIA

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An abundant and taxonomically diverse vertebrate fauna inhabited the Steshevian (Lower Serpukhovian, Lower Carboniferous) shallow-water marine basin in the Moscow syneclyse. The deposits of this age crop out extensively in two quarries by the Kalinovskie Vyselki and Zaborye villages in the Serpukhov District of the Moscow Region of Central Russia. The section is a 10-metre thick intercalation of bedded clays, silstones and limestones. Invertebrate fauna is dominated by brachyopods, bryozoans, corals, echinoderms and sea lilies supporting the shallow marine origin of the deposits. Vertebrates are presented by rare complete skeletons and abundant teeth, scales and finspines of chondrichthyans, actinopterygians and sarcopterygians. The chondrichthyans occupied a variety of ecological niches in the Serpukhovian Sea, from gigantic predators to various benthic sclerophagues. Elasmobranchs include Phoebodontiformes, Bransonelliformes, Xenacanthiformes, Ctenacanthiformes, Symmoriiformes, Protacrodontoidea, Hybodontiformes, anachronistid neoselachians and Synechodontiformes. Euchondrocephalians were even more diverse; their teeth include those belonging to Orodontiformes, Edestiiformes, Petalodontiformes, Cochliodontiformes, Menaspiformes, Psammodontiformes, Chondrenchelyiformes and Copodontiformes. Many specimens are still waiting for identification of their systematic position. Abundant scales and skeletal fragments of osteolepiform, rhizodontiform and coelacanthiform sarcopterygians are present in all fossiliferous layers. The rhizodontids reached the size comparable to that of the largest sharks. Few tiny bone fragments suggest the presence of small tetrapods. Scales and bone fragments of actinopterygians also demonstrate significant variety. Several palaeoniscid articulated scale cover fragments are not infrequent.

THE MICROSTRUCTURE OF THE SCALE ENAMELOID IN THE EVOLUTIONARY HISTORY OF CHONDRICHTHYES

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The microstructure of the enameloid of chondrichthyan tooth has been widely studied since Reif (1973) to nowadays. It has been shown to be a useful taxonomic and phylogenetic tool for the study of the group (e.g. Reif, 1977, 1978; Guinot, Cappetta 2011). Moreover, changes in the enameloid organisation in Chondrichthyes have been related to the emergence of new trophic strategies and to the Mesozoic radiation of the neoselachian crown group (e.g., Duffin, Cuny, 2008; Gillis, Donoghue, 2007).

In contrast to the relative abundance of literature regarding tooth enameloid, descriptions of enameloid microstructrure of the chondrichthyan scales are scarce. We present a systematic study of scale enameloid microstructure in fossil and living taxa trying to span the phylogeny of the group. Our study considers taxa belonging to Cladoselachidae, Phoebodontiformes, Xenacanthiformes, Ctenacanthiformes, Hybodontiformes and Neoselachii (including both batoids and sharks). Scales were embedded in Canada balsam and polished, etched with 10% HCl and studied under the SEM. Etched freshly fractured surfaces of scales were also studied. The enameloid microstructure (i.e. thickness of the enameloid layer, organization of the enameloid, shape and size of single crystallites, etc.) were studied in detail for each taxon. The evolutionary changes from the very thin enameloid capping layer, composed of single randomly oriented crystallites observed in Paleozoic Cladoselachidae to more thick and organized enameloid layer present in the scales of several euselachians are discussed.

NEW VIEW ON THE DEVONIAN LIMBS

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In 1986 Neil Shubin and Pere Alberch suggested that the prolongation of the metapterygial axis in autopodium is the succession of distal elements of basipodium (distal carpals and distal tarsals), which they called the digital arch following Schmalhausen (Shubin, Alberch, 1986).

Developing Shubin`s and Alberch`s idea at the base of the limbs development studies of the urodelous amphibian *Ranodon sibiricus* the hypothesis of the origin of tetrapod limb from the biserial archipterygium is suggested. The preaxial elements of the zygopodium and

autopodium which are positioned proximal to the digital arch correspond to the preaxial rays of the biserial fin, and digits correspond to its postaxial rays. At the same time as the fin transformed into the limb, the central axis curved preaxially, forming the digital arch and resulting in partial reduction and fusion of preaxial rays (Mednikov, 2009).

Supposedly, the tetrapod limbs could preserve biserial structure to a great extent at the early stages of their evolution. This could be expressed in retaining two groups of digits – preaxial and postaxial.

If this is true, the strange hindlimb pattern of the Devonian amphibian *Ichthyostega* displaying two groups of digits greatly differing in morphology and arrangement becomes clearer. The first three small digits of this early tetrapod looking like a paddle, as well as poorly ossified mass (may be tibial) resting anteriorly adjacent to these digits may be compared to preaxial rays of the biserial fin. The four large digits following the above mentioned small ones are postaxial rays and may be properly comparable to the digits of modern tetrapods. Preaxial digits being clamped and immobilised between the first large preaxial ray and digital arch underwent reduction. Post-Devonian tetrapods preserve only the bases of the preaxial rays (digits). The bases are represented by the radius (tibia), the intermedium and few central elements of the basipodium (centrals).

THE WORKS OF D.V. OBRUCHEV AND FURTHER DEVELOPMENT OF THE STUDY OF AGNATHANS

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The publications of the volume “Agnathans, Fishes” (1964, “Fundamentals of Paleontology”) and of the book “Devonian psammosteids (Agnatha, Psammosteidae) of the USSR” (co-authored by E. Mark-Kurik, 1965) is an impressive sum of scientific research by Prof. D.V. Obruchev. In parallel (in 1964-65) L.B. Halstead Tarlo published his capital monograph on the psammosteids. These works completed one another and gave the notion about morphology and systematic composition of this agnathan group at the data level existing in the middle of the XX century. Simultaneously E. Stensiö reconstructed the internal structure of agnathans which is similar in his interpretation to that of hagfishes (Stensiö, 1958, 1964). This interpretation has not been supported by D.V. Obruchev.

Considerable changes in palaeoichthyology took place already during the last decades of the XX century. By this time the new agnathans have been discovered in the Ordovician of Australia and Bolivia and in the Silurian and Devonian of China and Canada. The methods of investigations and the main problems in the study of relationships of lower vertebrates changed. The study of phylogenetic relationships between agnathan and gnathostome vertebrates, that is the theoretical research became focused on the study of the gnathostome origin. Recent results in the studies of this problem are analysed in the “Agnathans and Early Fishes” volume (series “Fossil vertebrates of Russia and adjacent countries”, 2004). The book is dedicated to the memory of Prof. D.V. Obruchev. The part of this volume concerning agnathans contains the following sections: Agnatha (brief characteristic), classes Diplorhina

and Monorhina (author of diagnoses L.I. Novitskaya), subclass Thelodonti (V.N. Karatajūtė-Talimaa and T. Märss), subclass Heterostraci (L.I. Novitskaya), subclass Osteostraci (O.B. Afanassieva). It is shown that heterostracans are similar to gnathostomes (sharks) by the fundamental characters of their internal structure and type of ontogeny. The origin of gnathostomes is related to Diplorhina that is to Heterostraci and Thelodonti.

2009-2010 RUSSO-FRANCO-LATVIAN EXPEDITIONS IN THE MAIN DEVONIAN FIELD (NORTH-WESTERN RUSSIA)

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In the frame of an international project between the Palaeontological Institute of the RAS (Moscow) and Muséum national d'Histoire naturelle, Paris, a Russo-Franco-Latvian team has been set up to prospect the Main Devonian Field in north-western Russia (Novgorod and Leningrad Regions). This joint project started in 2009 and finishes in 2011. The first two years were mainly devoted to the prospecting of historical localities, some discovered and/or exploited by Dmitry Obruchev himself. Such a method requires rediscovery of the accurate position of the localities, discussing with denizens, fathoming the archives out and providing access to non-weathered layers by removing the altered surface.

Novgorod and Leningrad Regions are topographically excessively flat. Devonian deposits are horizontal, the rocks are most often quite unconsolidated (consisting of loose sands or clays) and excavations are thus relatively easy. The lack of relief and extensive vegetal cover unfortunately lead to few outcrops in the landscape. They are all located along the rivers (Lovat', Syas' and Oredezh rivers for instance) or are represented by outliers. Although most of the localities were easily accessible by cars, others required several kilometers by feet and/or by boat. Roughly 30 localities have been prospected. About one third of them such as Borschovo and Goryn' (Luga District) provided numerous and exquisite placoderm, agnathan and sarcopterygian fossils. The original locality of the Frasnian tetrapod *Obruchevichthys* in Russia, Sondala (Leningrad Region), has been rediscovered.

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FIRST RECORD OF EUGENEODONTIFORMES (CHONDRICHTHYES) IN THE MIDDLE CARBONIFEROUS OF THE LOWER VOLGA REGION

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In 2010 a joint expedition organized by the History of the Universe Museum and "Paleotravel" company visited a quarry in the Melnichniy ravine on the right bank of the Medveditsa River by the town of Zhirnovsk in the Volgograd Region exposing the Middle-Upper Carboniferous Moscovian and Kasimovian deposits.

The deposits are presented by limestones and dolomites interbedded by yellowish-green montmorillonite clays. The lower quarry step exposes a dolomite limestone layer containing numerous trilobites. Until recently, these deposits had been regarded as Myachkovian (Moscovian, Middle Carboniferous) in age (Saltykov, 2009). However, this layer yielded a conodont assemblage belonging to *Idiognathodus sagittalis* Zone, which corresponds in the Moscow Syneclise to the Khamovnikian Substage of the Kasimovian Stage, Upper Carboniferous.

Trilobite search resulted in the find of a tooth whorl of the eugeneodontiform fish (Chondrichthyes) by one of the authors (G.S.P). This fragment consists of 4 tooth crowns set up on a common base. The tips of the crowns are not preserved, teeth are fractured and the base is damaged. The crowns are sculptured by shagreen. The crown axes are inclined in relation to the base at the 70º. The cutting edges bear apically directed cusps also sculptured by shagreen. The anterior and posterior crown edges show difference in the cusps arrangement. The rostral cutting edge of the smallest crown demonstrates bifurcation of the apeces of the three cusps nearest to the base.

This whorl fragment is temporarily assigned to the family Edestidae. The genus and species identification require further study.

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CHANGE OF VERTEBRATE ASSOCIATIONS IN THE DEVONIAN DEPOSITS OF THE VOLYN MONOCLINE

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Lower Devonian (Lochkovian) marine terrigenous-carbonate and terrigenous deposits of the Volyn Monocline contain diverse and abundant vertebrate remains: thelodonts, cyathaspid, tesseraspid, corvaspid and pteraspid heterostracans; placoderms, acanthodians, chondrichthyans and osteichthyans.

Eifelian and Givetian (Middle Devonian) vertebrate assemblage from the shallow marine terrigenous and terrigenous-carbonate deposits, as well as lagoonal-marine sulphate-carbonate-sediments differs taxonomically from that of the Lower Devonian. Heterostracans are represented by psammosteids and thelodonts are missing. Chondrichthyans are scarce. In contrast, the amount of placoderms, sarcopterygians and actinopterygians significantly increased. Only two genera of acanthodians (*Cheiracanthoides* and *Nostolepis*) also known from the Lower Devonian are identified in the Middle Devonian, but their scales dominate again.

The Frasnian (Upper Devonian) vertebrates are scarce within the Volyn Monocline. These vertebrates are confined to marine carbonate and terrigenous-carbonate deposits and are represented by abundant teeth, scales and bones of sarcopterygians and actinopterygians. Meso- and macromeric fragments of placoderm plates are less numerous, and acanthodian fin spines are few. The ichthyofauna of the Famennian marine carbonate and carbonate-terrigenous deposits is taxonomically much more diverse, than that of the Frasnian. Acanthodians and sarcopterygians are quantatively and taxonomically more abundant in the deposits of this age, placoderms are less numerous, and chondrichthyans and actinopterygians are rare. Placoderms are represented by abundant isolated and articulated plate fragments, acanthodians by scales and fin spines, chondrichthyans mainly by teeth and some scales and osteichthyans by numerous discrete scales, vertebrae, dermal bones, teeth and jaw fragments.

NEW DATA ON CHIMAEROID FISHES (HOLOCEPHALI; CHIMAEROIDEI) FROM THE CRETACEOUS AND NEOGENE OF AUSTRALIA

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Previously published fossil chimaeroid assemblage of Australia (Kemp, 1991; Stahl, 1999; Bartolomai, 2008) consisted of 4 genera and 8 nominal species from the Cretaceous and Mio-Pliocene. In 2010 about 100 specimens were studied by the author in the museums in Brisbane, Perth, Adelaide and Melbourne.

The Mid-Cretaceous fauna of the Great Artesian Basin consists of *Ptyktoptychion tayyo* and *Ischyodus cf. thurmanni* (Albian). The former is probably conspecific with *P. wadeae* (Albian). A single specimen of *I. cf. thurmanni* closely resembles *I. thurmanni* from the Senonian of New Zealand. *Edaphodon eyrensis* from the Aptian-Albian must be reidentified as *Ptycktoptychion eyrensis*.

New material from Western Australia consists of mid-Albian (*Callorhinchus cf. borealis*, *Ptyktoptychion cf. tayyo*, *Harriotta* sp.) and mid-Cenomanian (*Callorhinchus* cf. *borealis*, *Ischyodus* sp., *Elasmodectes* cf. *kiprjianoffi*) assemblages. *Callorhinchus* cf. *borealis* is also recorded within M. Cenomanian – E. Coniacian interval and *Ischyodus* cf. *thurmanni* is probably present within M.Cenomanian – M.Coniacian interval. The

Cenomanian-Coniacian yielded *P. cf. wadeae* and *Belgorodon* sp. The Selandian-Thanetian interval presents *Edaphodon* sp.

A revision of the Neogene chimaeroid species from Victoria and Tasmania confirms the validity of *Ischyodus sweeti* (Chapman, Pritchard, 1907) (= *I. mortoni*, =*Ch. anomala*) and *Edaphodon mirabilis* (the last could be a junior synonym of *E. pliocenicus* Carraroli, 1897 from the Pliocene of Northern Italy). *Callorhinchus cf. milii* is also found in this assemblage. The presence of Euro-American Palaeogene species *Ischyodus dolloi* and *Chimaera* species is not confirmed.

As a result, the Cretaceous chimaeroid diversity of Australia consists of regional endemic genus *Ptyktoptychion* and typical Eurasian faunal elements: *Callorhinchus*, *Ischyodus, Elasmodectes*, *Harriotta* and *Belgorodon*, but misses any pre-Palaeocene *Edaphodon* species. The Neogene assemblage consists of *Ischyodus*, *Edaphodon* and *Callorhinchus* species.

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SCALES, ENAMEL, COSMINE, GANOINE, AND EARLY OSTEICHTHYANS

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The distinction between ganoine and cosmine was established by Williamson in 1849. Ganoine is an enamel and thus formed by the epidermis. Its formation is different from that of “true” enamel. The crystallites are ending in the middle of the epidermal cell. These elevations have been shown since the 1960s and have been used to distinguish genera and species. Enamel in contrast shows the borders of the hexagonal epidermal cells. Cosmine is not a tissue but a combination of tissues (“true” enamel and dentine) and a structure (pore-canal system). The pore-canal system opens in regularly arranged pores on the scale surface. Cosmine is limited to sarcopterygians, ganoine to actinopterygians. Ganoine is not known outside actinopterygians, nor the enamel outside osteichthyans. Actinopterygian scales have a narrow peg and an anterodorsal extended corner (*Dialipina*), whereas sarcopterygians have a broadly based peg and no extended anterodorsal corner. The shape of sarcopterygian scales appears to be closer to that in the basal osteichthyan interlocking system (*Lophosteus*).

A UNIQUE ASSEMBLAGE OF MIDDLE DEVONIAN FISHES IN THE LEMOVZHA RIVER (LENINGRAD REGION, RUSSIA)

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The Lemovzha River, a right tributary of the Luga River formes the canyon valley in its middle and lower courses. The deposits exposed in the outcrops include marls, mudstones, clays and sandstones of the Lemovzha and Khotnezha members of the Narova (Narva) Formation (Narva Regional Stage, Eifelian), as well as sandstones and conglomerates of the lower part of the Luga Regional Beds (Aruküla Regional Stage, Givetian). Diverse vertebrate assemblage was discovered in greyish-pink or violet marls of the Khotnezha Member in a set of outcrops upstream from the river mouth, near the Khotnezha and Lemovzha villages.

The fish remains are finely preserved as isolated bones or skeleton parts often occurring in the marl nodules. The assemblage includes arthrodires *Holonema*, *Homostius* and Coccosteidea, an antiarch *Byssacanthus dilatatus*, acanthodians *Archaeacanthus* and *Haplacanthus*, sarcopterygians ?*Gyroptychius grossi*, *Glyptolepis* ? *quadrata*, Struniiformes and *Dipterus arenaceus*. The isolated plates of *Holonema* are sculptured by unusual tuberculated ornamentation. The *Holonema* plates with such ornamentation were mentioned by Mark-Kurik (2000) from the Vadja Member of the Narova Formation in Estonia. The complete ventral part of the trunk shield and isolated plates of Coccosteidea resemble those of *Dickosteus*. The remains of *Byssacanthus dilatatus* dominate in the assemblage, being presented by a complete skull roof, parts of the trunk shield, exoskeletal segments of pectoral fins and isolated plates. The acanthodian macroremains include the isolated fin spines. Osteolepidid sarcopterygians are known by isolated ethmosphenoids and numerous scales; the most abundant are scattered scales of the porolepiform *Glyptolepis* ? *quadrata*. Isolated dipnoan scales and tooth plates are abundant, but two unique specimens of the complete trunks and a cheek-plate of the skull of *Dipterus arenaceus* are also in our collections.

The preservation of fish remains is very similar to that in the Middle Old Red Sandstones of Scotland.

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MORPHOMETRIC STUDY OF PA ELEMENTS OF THE *OZARKODINA EOSTEINHORNENSIS* S.L. WALLISER, 1964 (CONODONTA: OZARKODINIDA) IN THE PŘIDOLIAN STRATA OF LITHUANIA

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The aim of this work was to study the hypodigm of Pa elements of *Ozarkodina eosteinhornensis* s. l. Walliser, 1964 in the Silurian strata of Lithuania by means of elliptic Fourier analysis (EFA), traditional morphometrics and uni- and multivariate data exploratory analysis, and explain spectrum of morphological variation in the light of taxonomic differences, ecophenotypic geographical variation and ontogeny of Pa elements.

Analyses were performed on conodont material from the Silurian Baltic Basin of Lithuania. 216 Pa elements were analysed in total: 89 from *O. eosteinhornensis*

eosteinhornensis, 119 from *O. eosteinhornensis remscheidensis* and 8 from *O.* cf. *wimani*. A principal component analysis revealed a large degree of overlap in empirical morphospace between all three groups. Discriminant analysis performed on obtained EFA coefficients and traditional morphometric variables shows with high certainty that all those mentioned groups reliably differed from each other in morphology. Allometric analysis of linear morphometric measurements uncovered that all three investigated populations are distinct from each other in the way ontogeny proceeds. Important differences in the degree of ecophenotypical and geographical variation between *O. eosteinhornensis eosteinhornensis* and *O. eosteinhornensis remscheidensis* was recorded (this sort of analysis was not performed on *O.* cf. *wimani*, because of a small sample size). These results give us rigorous ground to state that all these three varieties previously combined in one species should be separated into different species.

UPPER PALAEOZOIC ACTINOPTERYGIANS AND POSSIBILITY OF THEIR USE FOR BIOSTRATIGRAPHY OF CONTINENTAL PERMO-CARBONIFEROUS BASINS OF CENTRAL EUROPE

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Permo-Carboniferous sediments of the continental basins of Central Europe abound in plentiful actinopterygian species. While the biostratigraphy based on insects, amphibian tetrapods and tetrapod footprints is constantly being refined (Lucas et al., 2006), utilisation of actinopterygians for biostratigraphical purposes has been minimal. This happened because the occurrence of the group is limited to specific lithofacies, and its distribution depends on the fluvial and lacustrine systems. Another substantial reason for the limited use of actinopterygians in biostratigraphy is that their scientific treatment has been largely restricted to listing of taxonomies in separate basins. A more comprehensive view of the taxonomies does not yet exist.

More detailed and comprehensive study of actinopterygians is now providing the posibility of using at least some of them for biostratigraphic and palaeogeographic purposes. The families Amblypteridae Romer, 1945 and Aeduellidae Romer, 1945 present examples used in biostratigraphy of some Permo-Carboniferous basins of Central Europe. *Paramblypterus duvernoyi* (Agassiz, 1833) from the family Amblypteridae is prominent in this respect. This species was only known from the Saar Nahe Basin, but after a review of the material by Dietze (1999), it became possible to use it for comparing to many other closely related species. Eventually it was discovered that *Paramblypterus duvernoyi* is common not only in the Meisenheim Formation of the Saar Nahe Basin (Germany), but also in the Surmoulin Formation of the Autun Basin (France) and Vrchlabí Formation of the Krkonoše Piedmont Basin (Czech Republic). Some species of the Aeduellidae family also hold serious potential for a wider use of actinopterygians in biostratigraphy and palaeogegraphy of the Permo-Carboniferous basins. They are well distinguishable from other Permo-Carboniferous actinopterygians and numerous recent studies suggest that they are far more widely distributed than was previously thought (Štamberg, 2010).

SCYLIORHINIDAE (ELASMOBRANCHII) FROM THE UPPER MAASTRICHTIAN-PALAEOCENE OF THE CRIMEA, UKRAINE

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A number of sections (from west to east): Bakhchisaray, Ak-Kaya, Burunduk-Kaya Mount, Alankyr Mount, Klementiev Ridge investigated for vertebrate remains yielded a significant amount of isolated shark teeth; the maximum concentration is observed at the base of the Danian.

Among those the most productive is the Burunduk-Kaya Mount locality. The same outcrop yielded both Upper Maastrichtian and Danian materials and the fossiliferous facies are similar. Abundant material was obtained by screenwashing of weathered rock at the 0,5 mm sieve.

From more than 5000 teeth collected from the uppermost Maastrichtian only about 50 specimens belong to Scyliorhinidae, including: *Scyliorhinus germanicus* Herman, 1982, *S.* aff. *elongatus* (Davis, 1887) and *Scyliorhinus* sp. 1. The first one is known from the Maastrichtian of Germany, the second type is very close to the species discovered in the Upper Maastrichtian of Morocco. *Scyliorhinus* sp. 1 has no close analogues and will be described elsewhere as a new species.

A twice bigger collection was obtained from the Lower Danian above the contact to the Maastrichtian. About 70 examples of Scyliorhinidae teeth include: *S.* aff. *elongatus* (Davis, 1887), *Scyliorhinus* sp. 1 and *Scyliorhinus* sp. 2; the last two forms significantly dominate. *Scyliorhinus* sp. 2 resembles *S. germanicus* in some respects being different in specific sculpturing making possible its attribution to a new species.

On the western slope of the Alankyr Mount the contact of the Danian/Inkermanian (Selandian) limestones is accentuated by a thin phosphorite layer. *Scyliorhinus ptychtus* Noubhani et Cappetta, 1997 characteristic of the Upper Palaeocene of Morocco was discovered from this stratigraphic level.

This information suggests that the C/P boundary in Crimea may be traced using the change of Scyliorhinidae species composition. At the same time the changes were not as significant to mark the crisis in the development of the group.

TAPHONOMY OF THE FAMENNIAN VERTEBRATE ASSEMBLAGE FROM THE TĒRVETE FORMATION OF LATVIA

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An extensive collection of fish and vascular plant remains, charophyte oogonia and rare trace fossils has been gathered during seven field seasons in the middle Famennian Tērvete Formation consisting mainly of siliciclastic deposits cropping out at the right bank of the Skujaine River downstream from Klūnas, Latvia. Excavations in 2009 and 2010 resulted in new palaeontological and taphonomic data.

Vertebrate remains are forming three taphonomically distinct oryctocenoses differing in the compactness of accumulation, size, disarticulation and fragmentation of bones. The taxonomical composition includes placoderms *Bothriolepis ornata* Eichwald, *B. jani* Lukševičs, *Phyllolepis tolli* Vasiliauskas, *Dunkleosteus* sp. and *Chelyophorus* sp., sarcopterygians *Holoptychius nobilissimus* Agassiz, *Platycephalichthys skuenicus* Vorobyeva, *Cryptolepis* sp., *Conchodus* sp., *Glyptopomus* ? sp., "*Strunius*" ? sp., and *Dipterus* sp., as well as an unidentified actinopterygian. Antiarchs *B. ornata* and *B. jani* dominate all three oryctocenoses by the minimum number of individuals (26,9% and 13,5% respectively).

Fish remains, which by shape and size resemble sarcopterygian scales, dominate the assemblage. The rate of preservation and orientation indicates rather calm sedimentary environment. Only the smallest and lightest remains like acanthodian spines and sarcopterygian teeth show stream-influenced orientation. All three oryctocenoses contain small portion of rewashed remains. The 1st and the 3rd taphocenoses have formed in such environment, which facilitated accumulation of large and mechanically resistant plates, while the 2nd taphocenosis was favourable for accumulation of small and fragile plates. The fossil-rich deposits are likely to be formed in estuarine environment at some local slope settings influenced by slumps and gravity flows.

PLACODERMS OF THE BARRANDIAN AREA NEAR PRAGUE (CZECH REPUBLIC)

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Placoderms are restricted to the Devonian in the Barrandian area, occurring in localities dated from the Lochkovian to the Givetian. Černá rokle near Kosoř with the Radotin Limestone (Lochkovian) is the richest placoderm-bearing locality. The majority of the specimens comes from the old collections picked up since Barrande's time while quarrying was still in action.

A revision of specimens from the collections of the National Museum in Prague confirmed three species belonging to two genera of the placoderm order Acanthothoraci: *Radotina kosorensis* Gross, 1950; *R. tesselata* Gross, 1958 and *Kosoraspis peckai* Gross, 1959. They are preserved as complete skull roofs, neurocrania or isolated dermal bony plates.

The genus *Holopetalichthys* is accepted as valid and a diagnosis of *H. primus* (Barrande, 1872) is amended. Its assignment to higher taxonomic units remains uncertain. Three head shields and separate thoracic plates of this species are described. Four morphological types of yet undetermined specimens classified in the order Arthrodira are defined. Only separate or partly articulated dermal plates are known, some of them very large.

The placoderm diversity in the Barrandian area is compared to neighboring areas at the beginning of the Devonian (Lochkovian and Pragian). Only the members of the primitive

order Acanthothoraci have been found. The migrations of the more advanced arthrodires to the Barrandian area started during the Emsian. They completely replaced the previous group of placoderms but their abundance in the fossil record is far lower.

A NEW PLOURDOSTEID ARTHRODIRE FROM THE EVLANOVIAN (FRASNIAN, UPPER DEVONIAN) DEPOSITS OF CENTRAL EUROPEAN RUSSIA

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The Evlanovian (Upper Frasnian, Upper Devonian) deposits are widely spread in the Orel, Lipetsk and Voronezh Regions of Central Russia. The limestones and clays of this age crop out in numerous localities, most of which provide fossil fish materials. Rich invertebrate assemblage including corals, brachiopods, gastropods, arthropods and conodonts suggests that the sedimentation occurred in the shallow-water marine environment.

Vertebrate fauna inhabiting this geographically limited area was dominated by arthrodire and ptyctodont placoderms. Antiarhs, chondrichthyans, osteolepiforms, struniiforms and dipnoans are scarce. The psammosteid agnathans typical of coeval deposits in the north-western regions of the Russian platform are completely absent.

With few exceptions, the materials found are isolated skull and postcranial skeleton bones. The most frequent are the remains of a small plourdosteid artrodire assigned to a new genus and species. The collection presents a series of its isolated bones and well-preserved fragments of the postorbital part of the skull and the anterior part of the dorsal armour belonging to the same individual. This form is characterised by longitudinally elongated skull roof narrowed in the interorbital part. The nuchal occupies about 35% of the skull length and overlaps the central plate. The posterolateral corners of the nuchal are drawn back; its posterior edge is strongly concave. The postnasal contributes to the formation of the orbital margin. The narrow anterior and wide, anterolaterally directed lateral lobes are characteristic of the central plate. Its posterior lobe is short, it wedges only slightly between the paranuchal and the nuchal. The ventral margin of the suborbital plate close to the supraoral sensory canal forms a distinct ventrally directed process. The dorsal armour is shortened; the MD over the PDL overlap surface is approximately twice less than that of the ADL.