

Chondrichthyans from the devonian-early carboniferous of belarus

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018 Authors. Diverse remains of chondrichthyans were found in several stratigraphic levels in 18 cores of the Devonian and Lower Carboniferous of Belarus. Most of the taxa were first reported in that territory. A new species of ctenacanthiform shark, *Tamiobatis elgae*, is described. The internal structure of teeth of this species is reconstructed for the first time using microtomography. The distribution of chondrichthyan taxa is analysed.

<http://dx.doi.org/10.3176/earth.2018.03>

Keywords

Belarus, Chondrichthyes, Lower devonian-lower carboniferous

References

- [1] Bonaparte, C. L. J. L. 1838. Selachorum tabula analytica. *Nuovi Annali delle Scienze Naturali*, 1, 195-214.
- [2] Cappetta, H., Duffin, C. & Zidek, J. 1993. Chondrichthyes. In *The Fossil Record 2* (Benton, M. J., ed.), pp. 593-609.
- [3] Chapman and Hall, London, Dean, B. 1909. Studies on fossil fishes (sharks, chimaeroids and arthrodiros). *Memoirs of the American Museum of Natural History, Part V*, 9, 211-287.
- [4] Downs, J. P. & Daeschler, E. B. 2001. Variation within a large sample of *Ageleodus pectinatus* teeth (Chondrichthyes) from the Late Devonian of Pennsylvania, U.S.A. *Journal of Vertebrate Paleontology*, 21, 811-814.
- [5] Eastman, C. R. 1897. *Tamiobatis vetustus*: a new form of fossil skate. *American Journal of Science*, 4, 85-90.
- [6] Esin, D., Ginter, M., Ivanov, A., Lebedev, O., Luksevics, E., Avkhimovich, V., Golubtsov, V. & Petukhova, L. 2000. Vertebrate correlation of the Upper Devonian and Lower Carboniferous on the East European Platform. *Courier Forschungsinstitut Senckenberg*, 223, 341-359.
- [7] Garvey, J. M. & Turner, S. 2006. Vertebrate microremains from the presumed earliest Carboniferous of the Mansfield Basin, Victoria. *Alcheringa*, 30, 43-62.
- [8] Ginter, M. & Ivanov, A. 1992. Devonian phoebodont shark teeth. *Acta Palaeontologica Polonica*, 37, 55-75.
- [9] Ginter, M. & Ivanov, A. 1995. Middle/Late Devonian phoebodont-based ichthyolith zonation. *Géobios, Mémoire Special*, 19, 351-355.
- [10] Ginter, M. & Ivanov, A. 2000. Stratigraphic distribution of chondrichthyans in the Devonian on the East European Platform margins. *Courier Forschungsinstitut Senckenberg*, 223, 325-339.
- [11] Ginter, M. & Sun, Y. 2007. Chondrichthyan remains from the middle Tournaisian of Muhua, South China. *Acta Palaeontologica Polonica*, 52, 705-727.
- [12] Ginter, M., Hairapetian, V. & Klug, C. 2002. Famennian chondrichthyans from the shelves of North Gondwana. *Acta Geologica Polonica*, 52, 169-215.
- [13] Ginter, M., Hampe, O. & Duffin, C. J. 2010. Chondrichthyes. *Paleozoic Elasmobranchii: Teeth. Handbook of Paleichthyology, Vol. 3D* (Schultze, H.-P., ed.). Verlag Dr. Friedrich Pfeil, Munich, 168 pp.

- [14] Ginter, M., Hairapetian, V. & Grigoryan, A. 2011. Chondrichthyan microfossils from the Famennian and Tournaisian of Armenia. *Acta Geologica Polonica*, 61, 153-173.
- [15] Glikman, L. S. 1964. Subclass Elasmobranchii. Sharks. In *Osnovy Paleontologii. Beschelyustnye, Ryby*[Fundamentals of Palaeontology. Agnathans, Fishes] (Obruchev, D. V., ed.), pp. 196-237. Nauka, Moscow [in Russian].
- [16] Gross, W. 1938. Das Kopfskelett von *Cladodus wildungensis* Jaekel. 2. Teil: Der Kieferbogen. Anhang: *Protacrodus vetustus* Jaekel. *Senckenbergiana*, 20, 123-145.
- [17] Hairapetian, V. & Ginter, M. 2009. Famennian chondrichthyan remains from the Chahriseh section, central Iran. *Acta Geologica Polonica*, 59, 173-200.
- [18] Hairapetian, V. & Ginter, M. 2010. Pelagic chondrichthyan microremains from the Upper Devonian of the Kale Sardar section, eastern Iran. *Acta Geologica Polonica*, 60, 357-371.
- [19] Hay, O. P. 1902. Bibliography and catalogue of the fossil vertebrata of North America. *US Geological Survey Bulletin*, 179, 1-868.
- [20] Huxley, T. H. 1880. On the application of the laws of evolution to the arrangement of the Vertebrata and more particularly of the Mammalia. *Proceedings of the Zoological Society of London*, 1880, 649-662.
- [21] Ivanov, A. 1996. The Early Carboniferous chondrichthyans of the South Urals, Russia. In *Recent Advances in Lower Carboniferous Geology* (Strogen, P., Somerville, I. D. & Jones, G. L., eds), Geological Society, London, Special Publications, 107, 417-425.
- [22] Ivanov, A. & Lucas, S. G. 2011. Fish fossils from the Paleozoic Sly Gap Formation of southern New Mexico, USA. *New Mexico Museum of Natural History and Science, Bulletin*, 53, 52-70.
- [23] Ivanov, A. & Märss, T. 2014. New data on *Karksiodus* (Chondrichthyes) from the Main Devonian Field (East European Platform). *Estonian Journal of Earth Sciences*, 63, 156-165.
- [24] Ivanov, A. O. & Rodina, O. A. 2010. Chondrichthyan assemblage from the Upper Devonian deposits of the Yaya River basin (Kuznetsk Basin). In *Priroda i ékonomika Kuzbassa i sopredel'nykh territorij*[Nature and Economy of the Kuznetsk Basin and Adjacent Territories] (Udodov, V. P., ed.), pp. 47-52. Novokuznetsk [in Russian].
- [25] Ivanov, A., Märss, T. & Kleesment, A. 2011. A new elasmobranch *Karksiodus mirus* gen. et sp. nov. from the Burtneki Regional Stage, Middle Devonian of Estonia. *Estonian Journal of Earth Sciences*, 60, 22-30.
- [26] Jaekel, O. 1921. Die Stellung der Paläontologie zu einigen Problemen der Biologie und Phylogenie. 2. Schädelprobleme. *Paläontologische Zeitschrift*, 3, 213-239.
- [27] Jaekel, O. 1925. Das Mundskelett der Wirbeltiere. *Gegenbaurs Morphologisches Jahrbuch*, 55, 402-409.
- [28] Karatajūtė-Talimaa, V. 1997. *Lugalepis* - a new genus of elasmobranchs from Devonian of the western part of the Main Devonian Field. *Geologija* (Vilnius), 21, 24-31.
- [29] Kruchek, S. A., Makhnach, A. S., Golubtsov, V. K. & Obukhovskaya, T. G. 2001. *Devonskaya sistema* [The Devonian System]. In *Geologiya Belarusi*[Geology of Belarus] (Makhnach, A. S., Garetskij, R. G. & Matveev, A. V., eds), pp. 186-239. Minsk [in Russian].
- [30] Kruchek, S. A., Matveev, A. V., Yakubovskaya, T. V. et al. 2010. *Stratigraficheskie skhemy dokembrijskikh i fanerozojskikh otlozhenij Belarusii: Ob "yasnitel'naya zapiska*[Stratigraphic Charts of the Precambrian and Phanerozoic Deposits of Belarus: Explanatory Note]. *BelNIGRI, Minsk*, 282 pp. [in Russian].
- [31] Lebedev, O. A. 1996. Fish assemblages in the Tournaisian-Visean environments of the East European Platform. In *Recent Advances in Lower Carboniferous Geology* (Strogen, P., Somerville, I. D. & Jones, G. L., eds), Geological Society, London, Special Publications, 107, 387-415.
- [32] Maisey, J. G. 2001. CT-scan reveals new cranial features in Devonian chondrichthyan "*Cladodus*" *wildungensis*. *Journal of Vertebrate Palaeontology*, 21, 807-810.
- [33] Mark-Kurik, E. 2000. The Middle Devonian fishes of the Baltic States (Estonia, Latvia) and Belarus. *Courier Forschungsinstitut Senckenberg*, 223, 309-324.
- [34] Mark-Kurik, E. & Karatajūtė-Talimaa, V. 2004. Chondrichthyan remains from the Middle and Late Devonian of the Baltic area. *Archiv für Geschiebekunde*, 3, 767-772.
- [35] Märss, T., Kleesment, A. & Niit, M. 2008. *Karksilepis parva* gen. et sp. nov. (Chondrichthyes) from the Burtneki Regional Stage, Middle Devonian of Estonia. *Estonian Journal of Earth Sciences*, 57, 219-230.
- [36] Obukhovskaya, T. G., Kruchek, S. A., Pushkin, V. I., Nekryata, N. S. & Obukhovskaya, V. Yu. 2005. *Stratigraficheskaya skhema Devonskikh otlozhenij Belarusi* [Stratigraphic chart of Devonian deposits of Belarus]. *Litasfera*, 1(22), 69-88 [in Russian].
- [37] Owen, R. 1867. On the dental characters of genera and species, chiefly of fishes, from the Low Main Seam and shales of coal, Northumberland. *Transactions of the Odontological Society of Great Britain*, 5, 323-392.
- [38] Plax, D. P. 2008. O devonskoj ikhtiofaune Belarusi [On the Devonian ichthyofauna of Belarus]. *Litasfera*, 2(29), 66-92 [in Russian].
- [39] Plax, D. P. 2011. Devonian ichthyofauna of the Volyn Monocline. *Litasfera*, 2(35), 12-21.

- [40] Plax, D. P. 2012. O rannekamennougolnoj ikhtiofaune Belarusi [On the Early Carboniferous ichthyofauna of Belarus]. In *Paleontologiya i stratigraficheskie granitsy*[Palaeontology and Stratigraphic Boundaries], Abstracts of the LVIII Annual Session of Russian Palaeontological Society, April 2012, St. Petersburg, pp. 111-112. VSEGEI, St. Petersburg [in Russian].
- [41] Plax, D. P. 2013. Smena assotsiatsij pozvonochnykh v devonskikh otlozheniyakh Belarusi [Change of vertebrate associations in the Devonian deposits of Belarus]. *Vestnik Brestskogo Universiteta, Seriya 5, Khimiya, Biologiya, Nauki o Zemle*[Bulletin of Brest University, Series 5, Chemistry, Biology, Earth Sciences], 1, 94-102 [in Russian].
- [42] Riemann, F., Schülke, I. & Thies, D. 2002. Mikrovertebratenreste aus dem basalen Famennium (triangularis- bis crepida-Zone) der Montagne Noire (Frankreich). *Geologica et Palaeontologica*, 36, 1-43.
- [43] Roelofs, B., Playton, T., Barham, M. & Trinajstić, K. 2015. Upper Devonian microvertebrates from the Canning Basin, Western Australia. *Acta Geologica Polonica*, 65, 69-101.
- [44] Roelofs, B., Barham, M., Mory, A. J. & Trinajstić, K. 2016. Late Devonian and Early Carboniferous chondrichthyans from the Fairfield Group, Canning Basin, Western Australia. *Palaeontologia Electronica*, 19.1.4A, 1-28.
- [45] St. John, O. & Worthen, A. H. 1875. Description of fossil fishes. *Geological Survey of Illinois, Paleontology*, 6, 245-488.
- [46] Turner, S. 1982. Middle Palaeozoic elasmobranch remains from Australia. *Journal of Vertebrate Palaeontology*, 2, 117-131.
- [47] Williams, M. E. 1998. A new specimen of *Tamiobatis vetustus* (Chondrichthyes, Ctenacanthoidea) from the Late Devonian Cleveland Shale of Ohio. *Journal of Vertebrate Paleontology*, 18, 251-260.
- [48] Xia, F.-S. 1997. Marine microfaunas (bryozoans, conodonts and microvertebrate remains) from the Frasnian-Famennium interval in Northwestern Junggar Basin of Xinjiang in China. *Beiträge zur Paläontologie*, 22, 91-207.
- [49] Zangerl, R. 1981. Paleozoic Elasmobranchii. *Handbook of Paleoichthyology*, Vol. 3A (Schultze, H.-P., ed.). Gustav Fischer, Stuttgart-New York, 115 pp.