

NEW LATE DEVONIAN SPECIES OF CONODONTS FROM SOUTH OF WEST SIBERIA

© 2025 N. G. Izokh

*Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch of RAS, Novosibirsk,
Russia*

e-mail: izokhng@ipgg.sbras.ru

Received July 29, 2024

Revised September 23, 2024

Accepted September 23, 2024

Abstract. A new species of conodonts *Polygnathus ovaliformis* sp. nov. from the Upper Devonian deposits of the northeastern margins of the Kuznetsk Basin is described. This species is most closely related to the Late Frasnian species *Po. brevis* Miller et Youngquist and *Po. costulatus* Aristov.

Keywords: *conodonts, Late Devonian, south of West Siberia, Russia*

DOI: 10.31857/S0031031X250108e2

INTRODUCTION

The Upper Devonian of the northern margins of the Kuznetsk Basin is represented by carbonate and terrigenous-carbonate deposits, which are exposed in quarries and natural outcrops along the banks of the Tom and Yaya rivers and their tributaries (Tyzhnov, 1931; Rotay, Tyzhnov, 1940; Kartseva, Tsirlina, 1956; Rzhonsnitskaya, 1968, 1973; Type sections..., 1992; Yolkin et al., 1997, 2000; Legend..., 1999; Key sections..., 2004; Middle-Upper..., 2011; Yazikov et al., 2011; etc.). These deposits contain numerous remains of benthic and pelagic fauna characterizing the Frasnian and Famennian intervals. The results of their study formed the basis for the development of unified stratigraphic schemes of the Devonian of the western part of the Altai-Sayan Folded Area (ASFA)

(Decisions..., 1959, 1982). Brachiopods were the main group for characterization, as well as intra- and interregional correlation of local units for a long time. Based on the study of their associations, a zonal scale was developed, which is still relevant today (Tyzhnov, 1931; Khalfin, 1933; Rzhonsnitskaya, 1952, 1968, 1973; etc.). In recent decades, work has been carried out to clarify the stratigraphic sequence of Devonian deposits in Western Siberia and to develop a new version. In this case, conodonts play a significant role in correlating regional units with the standard stratigraphic scale. This is explained by the fact that the detailed conodont zonal scale is the basis for characterizing the stages of the Devonian system, and its zonal index species are selected to justify the lower boundaries of the stages (Ziegler, 1962; Ziegler, Sandberg, 1990; Becker et al., 2012, 2020; Spalletta et al., 2017; etc.).

Conodonts were studied for biostratigraphic subdivision of the Upper Devonian deposits of the northern margins of the Kuznetsk Basin and their correlation with the international scale. The most continuous Frasnian-Famennian sections with rich faunal assemblages, including findings of diverse conodont species, are known along the right bank of the Tom River, Kosoy Utes section, and along the left bank of the Yaya River, in the area of the former villages of Yaya-Petropavlovskoye and Nevsky (Ratanov, Aksenova, 1991; Typical sections..., 1992; Yolkin et al., 1997; Gutak et al., 2001; Key sections..., 2004; Izokh, Yolkin, 2006; Middle-Upper..., 2011; Rodygin, 2011; Izokh, Andreeva, 2013; Izokh et al., 2022, 2024; etc.). During the study of conodonts from the Upper Devonian deposits of the Kuznetsk-Alatau structural-facies zone (SFZ) on the left bank of the Yaya River (Fig. 1), along with known cosmopolitan taxa, a new species was established, the description of which is presented in this article.

MATERIAL AND RESEARCH METHODS

The studied conodont material was obtained from the Upper Devonian deposits of the Yaya-Barzas structural-facies subzone (SFSZ) of the Kuznetsk-Alatau SFZ, exposed in a canyon-like gully

on the left bank of the Yaya River (see Fig. 1). The description of the section and the lithological column with detailed binding of samples to layers have been provided earlier (Yolkin et al., 1997; Middle-Upper..., 2011; etc.). Sampling of carbonate and terrigenous-carbonate rock varieties was carried out during several field seasons in 1990, 2006, 2009, and 2011. The weight of one sample ranged from one to two kg. Disintegration of the rock in weak solutions (5-7%) of acetic and formic acids was carried out according to the traditional methodology. A total of 93 samples from the E-9014 section, which has a thickness of about 95 m, were processed. After examining the insoluble residue, a collection of conodonts was obtained, which is represented by taxa of the genera *Icriodus*, *Mehlina*, *Belodella*, *Polygnathus*, *Siphonodella* (*Eosiphonodella*). The brown-colored conodont elements have good and satisfactory preservation. Specimen photography was performed using TESCAN MIRA 3 scanning electron microscopes at the Analytical Center for Collective Use (CCU) of the V.S. Sobolev Institute of Geology and Mineralogy SB RAS (IGM SB RAS), as well as on ZeissEvo-10 at the CCU "GEOCHRONOLOGY" of the A.A. Trofimuk Institute of Petroleum Geology and Geophysics SB RAS (IPGG SB RAS). The conodont collection is stored in the laboratory of Paleozoic paleontology and stratigraphy of IPGG SB RAS, as well as in the CCU "GEOCHRONOLOGY" of IPGG SB RAS under the numbers E-9014.

When describing the new species, only the Pa-element is characterized due to the small number of ramiform elements in the studied collection. The terminology and systematics of conodonts are used according to I.S. Barskov et al. (1975) and "Treatise..." (1981).

BIOSTRATIGRAPHIC SECTION

In the studied section (E-9014), the Kelbes, Peshcherkin, and Podonin formations are exposed (Fig. 2; Yolkin et al., 1997; Middle-Upper..., 2011; Yazikov et al., 2011), in which conodont assemblages of different ages have been identified, characterizing the rhenana–linguiformis, triangularis, and Lower praesulcata zones (Izokh, Andreeva, 2013; Izokh, 2023). In the Kelbes

Formation, the basis of the assemblage consists of species of the genus *Polygnathus*, in which, together with the new species *Po. ovaliformis* sp. nov., *Po. brevilaminus* Branson et Mehl, 1934, *Po. aff. Po. gracilis* Klapper et Lane, 1985, *Po. seraphimae* Ovnatanova et Kononova, 1996, *Polygnathus* sp. and *Mehlina gradata* Youngquist, 1945 are identified, characterizing the *rhenana*–*linguiformis* zones of the Upper Frasnian (Ziegler, Sandberg, 1990; Ji, Ziegler, 1993; et al.). Higher up in the section, at the base of the Peshcherkin Formation (samples E-9014-15/1 and E-9014-15/2), conodonts of the *triangularis* zone are established – *Polygnathus izmensis* Kuzmin, 1998, *Icriodus iowaensis* Youngquist et Peterson, 1947, and *I. cornutus* Sannemann, 1955. It should be noted that this Early Famennian assemblage is recorded in the section above the position of the lower boundary of the Famennian Stage, which is substantiated in the upper part of layer 13 (sample E-9014-13/5) by the appearance of the Famennian zonal brachiopod assemblage of *Cyrtospirifer tschernyschewi* Khalfin, 1933, *Athyris globularis* (Phillips, 1835), and others (Yolkin et al., 1997; Middle-Upper..., 2011; Yazikov et al., 2011). A similar situation of Early Famennian brachiopods and conodonts distribution was also revealed in the Kosoy Utes section on the right bank of the Tom River on the northwestern margin of the Kuznetsk Basin. In this section, the appearance of the same Early Famennian conodont assemblage as in the Yaya River section is established in the middle part of the Kosoutyos beds of the Peshcherkin Horizon (Middle-Upper..., 2011; Izokh et al., 2024). To clarify the position of the lower boundary of the Famennian Stage in the studied section, additional discussion and revision of the available materials on conodonts and brachiopods are required.

DESCRIPTION OF CONODONTS

① CLASS CONODONTA

③ FAMILY POLYGNATHIDAE BASSLER, 1925

④ Genus *Polygnathus* Hinde, 1879

⑤ **Polygnathus ovaliformis** Izokh, sp. nov.

⑥ Table X, figs. 1–5 (see insert)

Species name from ovalis *Latin* – oval.

Holotype – IPPG SB RAS, Core Facility GEOCHRONOLOGY No. E9014/2; northeastern margin of the Kuznetsk Basin, left bank of the loop-shaped bend of the Yaya River, upstream from the former Yaya-Petropavlovskoye village, section E-9014, layer 12, sample E-9014-12/7; Upper Frasnian, Solominsky horizon, Kelbes Formation, conodont zones rhenana–linguiformis (Table X, fig. 2).

Description. The Pa-element is characterized by an oval platform, widest in its middle part and narrowing toward the anterior and posterior ends. Its posterior end has a tongue-shaped outline. The platform is flattened, but in the anterior part its lateral margins are elevated. The adcarinal grooves are moderately deep in the anterior part of the platform, and they narrow and flatten in the posterior direction. The platform is ornamented with coarse elongated ribs or rows of nodes that do not reach the carina. The carina is high, arcuately curved, consisting of fused nodes that separate into individual nodes in its posterior third.

The free blade makes up 1/3–1/4 of the element's length and consists of three to five high massive denticles.

On the lower side of the element, there is a small basal cavity with thickened flanges, located in the anterior third of the platform. A high keel extends from it to the posterior end. A short thickened keel extends from the basal pit in the anterolateral direction.

Dimensions in μm . Holotype (Table X, fig. 2): element length 1700, width 800. Paratypes: length from 1300 to 1400, width from 500 to 600.

Variability. The variability of *Po. ovaliformis* sp. nov. is manifested in the ornamentation of the platform, which is represented either by coarse elongated ribs (Table X, fig. 1) or rows of nodes (Table X, fig. 2–4). Juvenile specimens have the general structure of the element similar to the holotype of the species but are characterized by a strongly narrowed posterior part of the platform.

Comparison. In general outline and platform morphology, the new species is most similar to the Late Frasnian *Po. brevis* Miller et Youngquist, 1947 and *Po. costulatus* Aristov, 1985 (Miller, Youngquist, 1947; Aristov, 1988; Barskov et al., 1991), from which it differs by the presence of a short thickened anterolateral keel on the lower side of the platform. *Po. ovaliformis* sp. nov. also differs from *Po. brevis* by its oval platform shape, the development of discontinuous ribs that do not reach the carina on the posterior third of the platform, and a larger number of denticles on the free blade. From *Po. costulatus*, the new species differs by an arcuately curved carina that reaches the posterior end of the platform, and a rounded small basal cavity with thickened flanges.

Remarks. On the lower side of the element, an anterolateral keel forms on the right side, both in right and left Pa-elements.

Distribution. Northeastern margin of the Kuznetsk Basin, Yaya-Barzas SFPZ of Kuznetsk-Alatau SFZ; Upper Frasnian, rhenana-linguiformis zones, Kelbes Formation, Solomino Horizon and, possibly, Lower Famennian, lower part of triangularis zone, lower part of Peshcherkin Horizon (sample E-9014-13/9).

Material. Six specimens of good and satisfactory preservation: Kemerovo Region, Anzhero-Sudzhensk, left bank of the Yaya River, section E-9014; samples E-9014-9/5, E-9014-12/6, E-9014-12/7, E-9014-12/11, E-9014-13/3, E-9014-13/9.

FUNDING

The work was funded by project No. FWZZ-2022-0003 of the State Program of the Trofimuk Institute of Petroleum Geology and Geophysics, Siberian Branch of the Russian Academy of Sciences. No additional grants were received to conduct or supervise this specific research.

CONFLICT OF INTERESTS

The author declares that he has no conflict of interest.

REFERENCES

1. *Aristov V.A.* Devonian conodonts of the Central Devonian Field (Russian Platform). Moscow: Nauka, 1988. 120 p.
2. *Barskov I.S., Vorontsova T.N., Kononova L.I., Kuzmin A.V.* Guide to Devonian and Lower Carboniferous conodonts. Moscow: Moscow State University Press, 1991. 184 p.
3. *Barskov I.S., Khalymbadzha V.G., Kosenko Z.A. et al.* Terminology and description plan of platform conodonts // *Paleontol. journ.* 1975. № 3. P. 121–126.
4. State geological map of the USSR at scale 1:200000. Sheet O-45-XXXIII. M.: Gosgeotekhnizdat, 1962.
5. *Gutak Ya.M., Rodygin S.A., Rodina O.A.* Paleontological characteristics of the Podonian horizon (Famennian stage, Devonian) of the Altai-Sayan folded region // *Evolution of life on Earth. Mater. II Internat. symp. "Evolution of life on Earth", November 12-15, 2001, Tomsk / Ed. V. M. Podobina.* Tomsk: NTL Publishing House, 2001. P. 170–171.
6. *Izokh N.G.* Conodonts of the Upper Devonian of Western Siberia // *Proceedings of the XVIII All-Russian Micropaleontological Conference (St. Petersburg, October 30 - November 3, 2023).* SPb.: VSEGEI Publishing House, 2023. P. 265–269.

7. *Izokh N.G., Anastasieva S.A., Andreeva E.S.* Microfauna of the Podonian horizon of the Upper Famennian in the northeastern margin of the Kuznetsk Basin // *Geology and mineral resources of Siberia*. 2022. № 11s. P. 13–20.
8. *Izokh N.G. Andreeva E.S.* Conodonts of the *Siphonodella praesulcata* zone in the Upper Devonian sections of the northeastern margin of the Kuznetsk Basin // *Interexpo GEO-Siberia-2013. IX Internat. scientific Congr., April 15-26, 2013, Novosibirsk: Internat. scientific conf. "Subsoil use. Mining. New directions and technologies for prospecting, exploration and development of mineral deposits. Geoecology"*. Proc. mater. Novosibirsk: SGGA, 2013. Vol. 1. P. 120–122.
9. *Izokh O.P., Izokh N.G., Popov B.M., Saraev S.V.* Bio-, lithostratigraphic and geochemical markers of global events of the Upper Devonian in the south of Western Siberia and their potential for interregional correlations // *Geol. and Geophysics*. 2024. Vol. 65. № 8. doi: 10.15372/GiG2023207.
10. *Kartseva G.N., Tsirlina V.B.* Stratigraphy of Devonian deposits of the Kuznetsk Basin // *Proc. VNIGRI. New ser.* 1956. Issue 95. Geol. coll. № 2. P. 147–164.
11. Key sections of the Devonian of the Rudny Altai, Salair and Kuzbass / Ed. E.A. Elkin. Novosibirsk: SB RAS Publishing House, 2004. 104 p.
12. Legend of the Kuzbass series of sheets of the State Geological Map of the Russian Federation at scale 1:200,000 (2nd edition) / Performed by G.A. Babin, S.P. Shokalsky, V.N. Tokarev et al. Novokuznetsk: FGUGP "Zapsibgeolsyemka", 1999. 194 p., 11 tables.
13. *Ratanov L.S., Aksenova L.M.* Safonovsky, Alchedatsky and Peshcherkinsky horizons of the Middle and Upper Devonian of the western part of the Altai-Sayan region // *Stratigraphy and major events in the geological history of Siberia. Collection of scientific papers*. Novosibirsk: SNIIGGiMS, 1991. P. 60–67.

14. Decisions of the All-Union Meeting on the development of unified stratigraphic schemes for the Precambrian, Paleozoic and Quaternary system of Central Siberia. Novosibirsk, 1979. Part II. Middle and Upper Paleozoic. Novosibirsk: SNIIGGiMS, 1982. 130 p.
15. Decisions of the Interdepartmental Meeting on the development of unified stratigraphic schemes of Siberia. Moscow: Gosgeoltekhizdat, 1959. 91 p.
16. *Rzhonsnitskaya M.A.* Spiriferids of the Devonian deposits of the margins of the Kuznetsk Basin. Moscow: Gosgeolizdat, 1952. 232 p.
17. *Rzhonsnitskaya M.A.* Biostratigraphy of the Devonian of the margins of the Kuznetsk Basin. Volume 1. Stratigraphy. Leningrad: Nedra, 1968. 287 p.
18. *Rzhonsnitskaya M.A.* Kuznetsk depression and adjacent regions of Western Siberia // Stratigraphy of the USSR. Devonian system. Book 2 / Eds. V.D. Nalivkin, M.A. Rzhonsnitskaya, B.P. Markovsky. Moscow: Nedra, 1973. P. 15–55.
19. *Rotay A.P., Tyzhnov A.V.* Upper Devonian of the margins of the Kuznetsk Basin // Geology of the USSR. Kuznetsk Basin / Ed. V.I. Yavorsky. Moscow-Leningrad: State Publishing House of Geological Literature, 1940. Vol. 16. P. 99–119.
20. Type sections of the boundary deposits of the Middle and Upper Devonian, Frasnian and Famennian stages of the margins of the Kuznetsk Basin (Materials of the V field session of the MSK Commission on the Devonian system, Kuzbass, July 16-29, 1991). Novosibirsk: SNIIGGiMS, 1992. 136 p.
21. *Tyzhnov A.V.* Materials on the stratigraphy and tectonics of the Devonian deposits of the northwestern margin of the Kuznetsk coal basin // Bulletin of the West Siberian Geological Department. 1931. Vol. 11. Issue 1. P. 1–32.
22. *Khalfin L.L.* Upper Devonian of the Zharkovsky village on the Yaya River // Materials for the stratigraphy of the northern margin of the Kuzbass. Novosibirsk: GNTGI, 1933. 72 p.

23. *Becker R.T. Gradstein F.M. Hammer O.* The Devonian Period // The Geologic Time Scale 2012 / Ed. F.M. Gradstein. Elsevier Sci. Ltd., 2012. P. 559–601.
24. *Becker R.T., Marshall J.E.A., Da Silva A.-C. et al.* The Devonian Period // The Geological Time Scale 2020 / Eds. F.M. Gradstein, J.G. Ogg, M.D. Schmitz, G.M. Ogg. Amsterdam: Elsevier, 2020. V. 2. P. 733–810.
25. *Izokh N.G., Yolkin E.A.* Upper Devonian conodonts from the northeastern Kuznetsk Basin (south of West Siberia, Russia): Advanced report // Ancient Life and Modern Approaches: Abstracts of the Second Intern. Palaeontol. Congr. / Eds. Q. Yang, Y. Wang, E.A. Weldon. Univ. of Science and Technology of China Press, 2006. P. 359.
26. *Ji Q., Ziegler W.* The Lali Section: An Excellent Reference Section for Upper Devonian in South China // Cour. Forsch.-Inst. Senckenb. 1993. V. 157. P. 1–183.
27. Middle-Upper Devonian and Lower Carboniferous Biostratigraphy of Kuznetsk Basin. Field Excursion Guidebook. Intern. Conference "Biostratigraphy, paleogeography and events in Devonian and Lower Carboniferous" (SDS / IGCP 596 joint field meeting) / Eds. N.K. Bakharev, N.G. Izokh, O.T. Obut, J.A. Talent. Novosibirsk, July 20 – August 10, 2011. Novosibirsk: Publ. House of SB RAS, 2011. 98 p.
28. *Miller A.K., Youngquist W.* Conodonts from the type section of the Sweetland Creek Shale in Iowa // J. Paleontol. 1947. V. 21. № 6. P. 501–517.
29. *Rodygin S.A.* Conodonts in Middle and Upper Devonian sections from the Kuznetsk Basin margins // Biostratigraphy, Paleogeography and Events in Devonian and Lower Carboniferous (SDS / IGCP 596 joint field meeting): Contrib. of Intern. Conf. in memory of Evgeny A. Yolkin. Ufa, Novosibirsk, July 20 – August 10, 2011. Novosibirsk: Publ. House of SB RAS, 2011. P. 139–140.
30. *Spalletta C., Perri M.C., Over D.J., Corradini C.* Famennian (Upper Devonian) conodont zonation: revised global standard // Bull. Geosci. 2017. V. 92. № 1. P. 31–57.

31. Treatise on Invertebrate Paleontology. Part W. Miscellaneous, suppl. 2. Conodonta / Eds. D.L. Clark, W.C. Sweet, S.M. Bergstrom et al. Boulder, Lawrence: Geol. Soc. Amer.; Univ. Kansas Press, 1981. 202 p.
32. *Yazikov A.Yu., Izokh N.G., Shcherbanenko T.A.* Brachiopods and conodonts from the Frasnian/Famennian boundary strata in the Upper Devonian Yaya section (north-western margin of the Kuznetsk Basin, Barzas Region) // Biostratigraphy, Paleogeography and Events in Devonian and Lower Carboniferous (SDS / IGCP 596 joint field meeting): Contrib. of Intern. Conf. in memory of Evgeny A. Yolkin. Ufa, Novosibirsk, July 20 – August 10, 2011. Novosibirsk: Publ. House of SB RAS, 2011. P. 169–172.
33. *Yolkin E.A., Gratsianova R.T., Bakharev N.K. et al.* Devonian sea-level fluctuations on the south-western margin of the Siberian continent // Cour. Forsch.-Inst. Senckenb. 1997. V. 199. P. 83–98.
34. *Yolkin E.A., Gratsianova R.T., Izokh N.G. et al.* Devonian standard boundaries within the shelf belt of the Siberian Old Continent (southern part of western Siberia, Mongolia, Russian Far East) and in the South Tien Shan // Cour. Forsch.-Inst. Senckenb. 2000. V. 225. P. 303–318.
35. *Ziegler W.* Taxionomie und Phylogenie Oberdevonischer Conodonten und ihre stratigraphische Bedeutung // Abh. Hess. Land. Bodenforschung. 1962. Hf. 38. S. 1–166.
36. *Ziegler W., Sandberg C.A.* The Late Devonian Standard Conodont Zonation // Cour. Forsch.-Inst. Senckenb. 1990. V. 121. 115 p.

Figure Captions

Fig. 1. Location of the studied Upper Devonian section on the left bank of the Yaya River (A) and a fragment of the geological map O-45-XXXIII (State..., 1962) (B). Legend: 1 – Tournaisian Stage of the Lower Carboniferous, 2 – Famennian Stage of the Upper Devonian, 3 – Frasnian Stage of the Upper Devonian, 4 – Givetian Stage of the Middle Devonian, 5 – section line E-9014.

Fig. 2. Fragment of the lithological column (after: Yolkin et al., 1997) and distribution of conodonts in the E-9014 section on the left bank of the Yaya River. Legend: 1 – limestones, 2 – sandstones, 3 – siltstones, 4 – mudstones, 5 – covered interval, 6 – sampling points.

Explanation to Table X

Fig. 1–5. *Polygnathus ovaliformis* sp. nov. : 1 – specimen No. E9014/1: 1a – upper view, 1b – lower view; sample E-9014-12/6; 2 – holotype No. E9014/2: 2a – upper view, 2b – lower view; sample E-9014-12/7; 3 – specimen No. E9014/3: 3a – upper view, 3b – lower view; sample E-9014-12/11; 4 – specimen No. E9014/4: 4a – upper view, 4b – lower view; sample E-9014-9/5; 5 – specimen No. E9014/5: 5a – upper view, 5b – side view; sample E-9014-13/3; Russia, northeastern margin of the Kuznetsk Basin, Kemerovo region; Upper Frasnian, Solominsky Horizon, Kelbess Formation, rhenana–linguiformis zones. Scale – 100 µm.

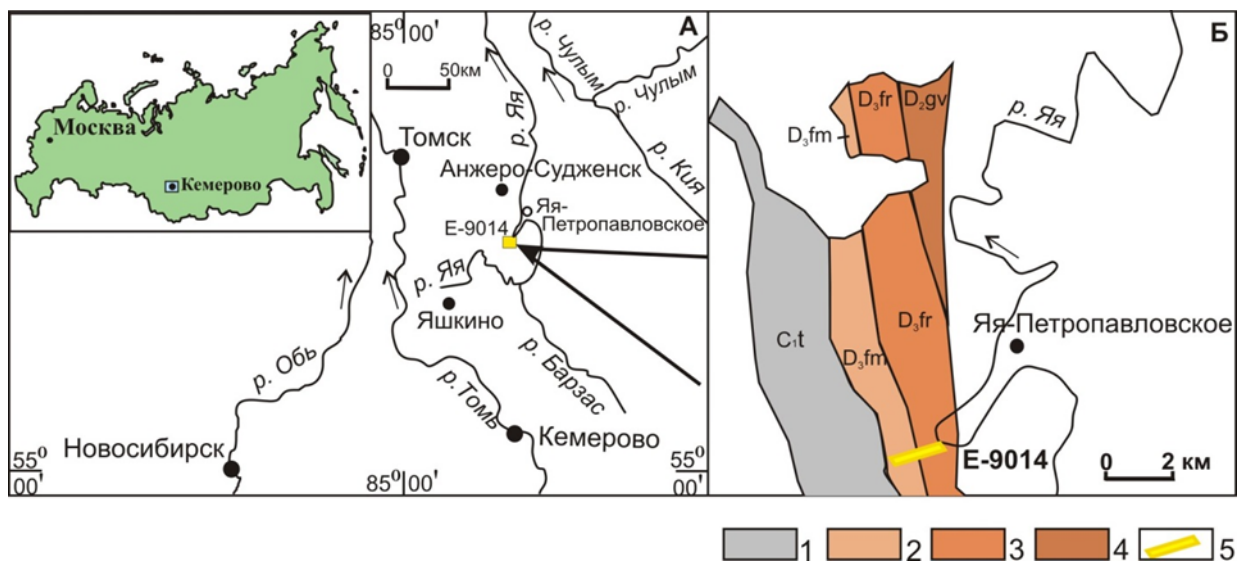


Fig. 1

Table X

