

New Data on the Upper Jurassic (Middle–Upper Oxfordian and Middle Volgian) Foraminifers in the East of the Moscow

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Abstract—The Middle–Upper Oxfordian foraminifera were studied from the borehole section drilled in the east of the Moscow Region (Russia). The foraminiferal zones were distinguished in Oxfordian clays: *Ophthalmidium strumosum*–*Lenticulina brestica* and *Lenticulina russiensis*–*Epistomina uhligi*. It was established that the distribution of foraminiferal assemblages varies throughout the Moscow Region.

Keywords: foraminifera, Oxfordian, Volgian, Moscow, clays

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The extensive factual paleontological material from the Jurassic deposits of the central regions of the European Russia has been obtained (Azbel' et al., 1991; Kuznetsova, 1979; *Srednii ...*, 1989). The recent data (Colpaert et al., 2017) make it possible to revise the previously distinguished boundaries between the foraminiferal zones and the assemblage of foraminiferal species characteristic of these zones. This work could complement the data available.

The material for our study comes from the core of a borehole drilled in Kozhukhovo area during the construction of the metro in the Kosino-Ukhtomsk district (the Eastern Administrative District of Moscow). A depth of the well is 52 m; samples were collected in a depth range of 33.0–51.0 m. The uncovered interval includes the Mnevnik Formation of the Middle Volgian substage, Upper Oxfordian Kolomna Formation and, partially, Middle–Upper Oxfordian Moscovian Formation (a total drilled depth). The microfauna are represented by well-preserved foraminifera, ostracods, small gastropods and bivalves, nannoplankton.

Moscovian Formation is composed of black heavy micaceous clays with interbeds of greenish clays, which grade in the lower part of the uncovered interval into dark brown clay. Macrofauna is represented by ammonites. The visible thickness is 15.8 m. Foraminifera: *Textularia jurassica* Gümbel, 1862, *Astacolus batrakiensis* (Mjatliuk, 1939), *Bojarkaella lagenoides* (Wiśniowski, 1890), *Ceratolamarckina ? adiposa* Azbel, 1986, *Citharina chanica* (Mjatliuk, 1961), *C. effrenata* Azbel, 1989, *C. ornitocephala* (Wiśniowski, 1890), *C. raricostata* (Furssenko et Poljenova,

1950), *Dentalina jurensis* Terquem, 1870, *D. longiscata* d'Orbigny, 1846, *Epistomina parastelligera* Hofker, 1954, *E. nemunensis* Grigelis, 1961, *E. uhligi* Mjatliuk, 1939, *E. unzshensis* Azbel, 1989, *E. volgensis* Mjatliuk, 1953, *Geinitzinita nodulosa* (Furssenko et Poljenova, 1950), *Globuligerina oxfordiana* (Grigelis, 1958), *Labalina milioliniformis* (Paalzw, 1932), *Lenticulina ectypa costata* Cordey, 1962, *L. ex gr. brestica* Mitjanina, 1957, *L. muensteri* (Roemer, 1839), *L. pirjatiensis* Pjatkova, 1974, *L. russiensis* (Mjatliuk, 1939), *L. tumida* (Mjatliuk, 1955), *L. tympana* Grigelis, 1985, *Lituotuba bulbifera* (Paalzw, 1932), *Lingulonodaria? tuberosa* (Schwager, 1965), *Marginulinopsis embaensis* (Furssenko et Poljenova, 1950), *Nodosaria euglypha* Schwager, 1865, *N. muensterana* Gümbel, 1862, *N. penium* Wiśniowski, 1890, *Oolina apiculata* (Reuss, 1851), *Ophthalmidium sagittum* (E. Bykova, 1948), *O. stuiense* (Paalzw, 1932), *O. strumosum* (Gümbel, 1862), *Orthella paalzowi* E. Bykova, 1956, *Planularia oxfordiana* K. Kuznetsova, 1960, *Tristix jurassica* (Furss. et Pol.) , *T. tutkowskii* Kaptarenko, 1961, *Ramulina spandeli* Paalzw, 1917, *Saracenaria cornicopiae* (Schwager, 1865), *S. triquetra* (Gümbel, 1862) (Figs. 1, 2).

In the southwest of the Moscow Region, foraminifera of this formation are represented only by secreting forms. The most part of recognized species occurs in other sections, but in the south-west, epistomines, dentalins, and lenticulins are more diverse (Ustinova, 2009).

Kolomna Formation (thickness 6.4 m) overlies conformably the Moscow deposits. This formation is

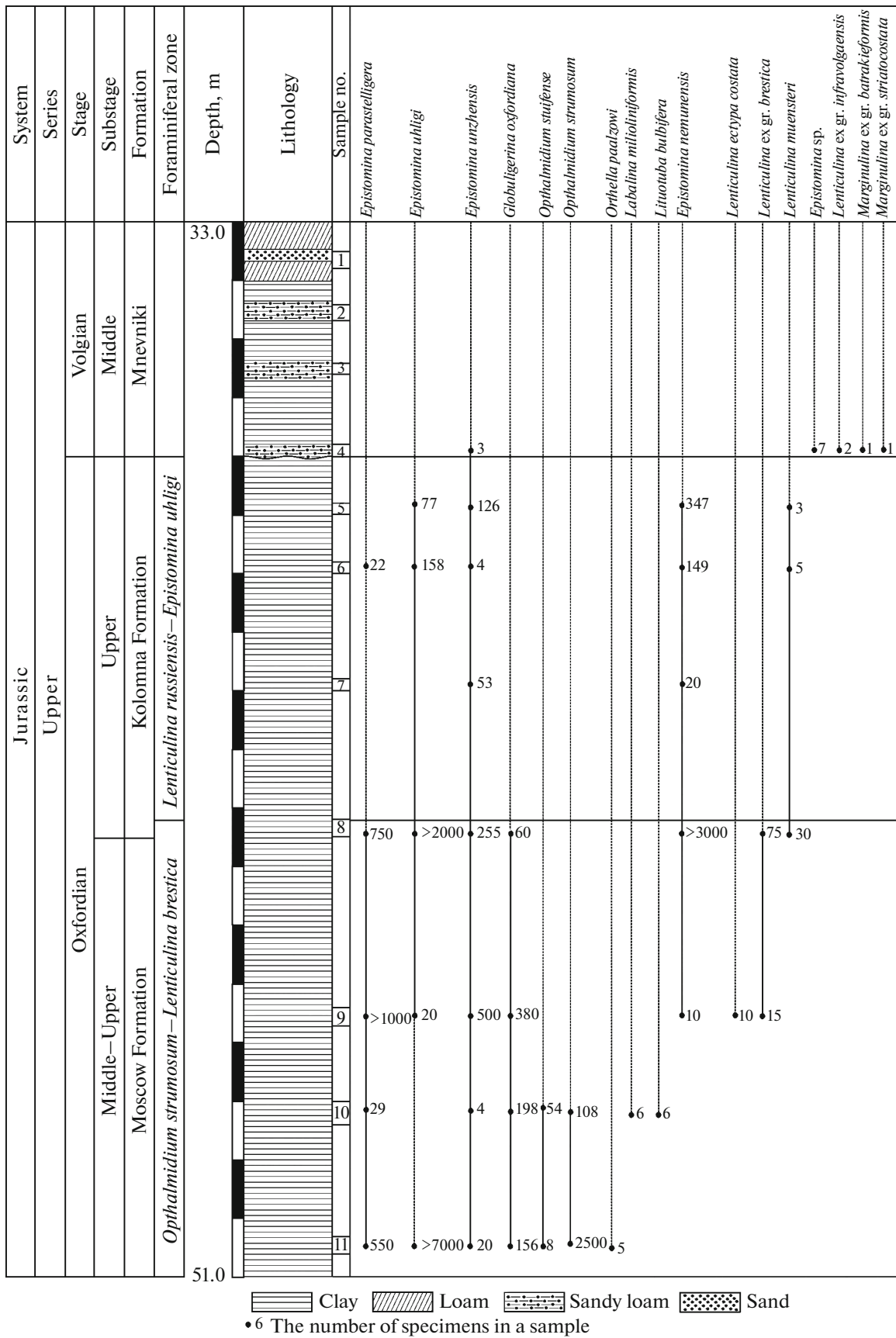


Fig. 1. Distribution of characteristic foraminifers in the Kozhukhovo section.

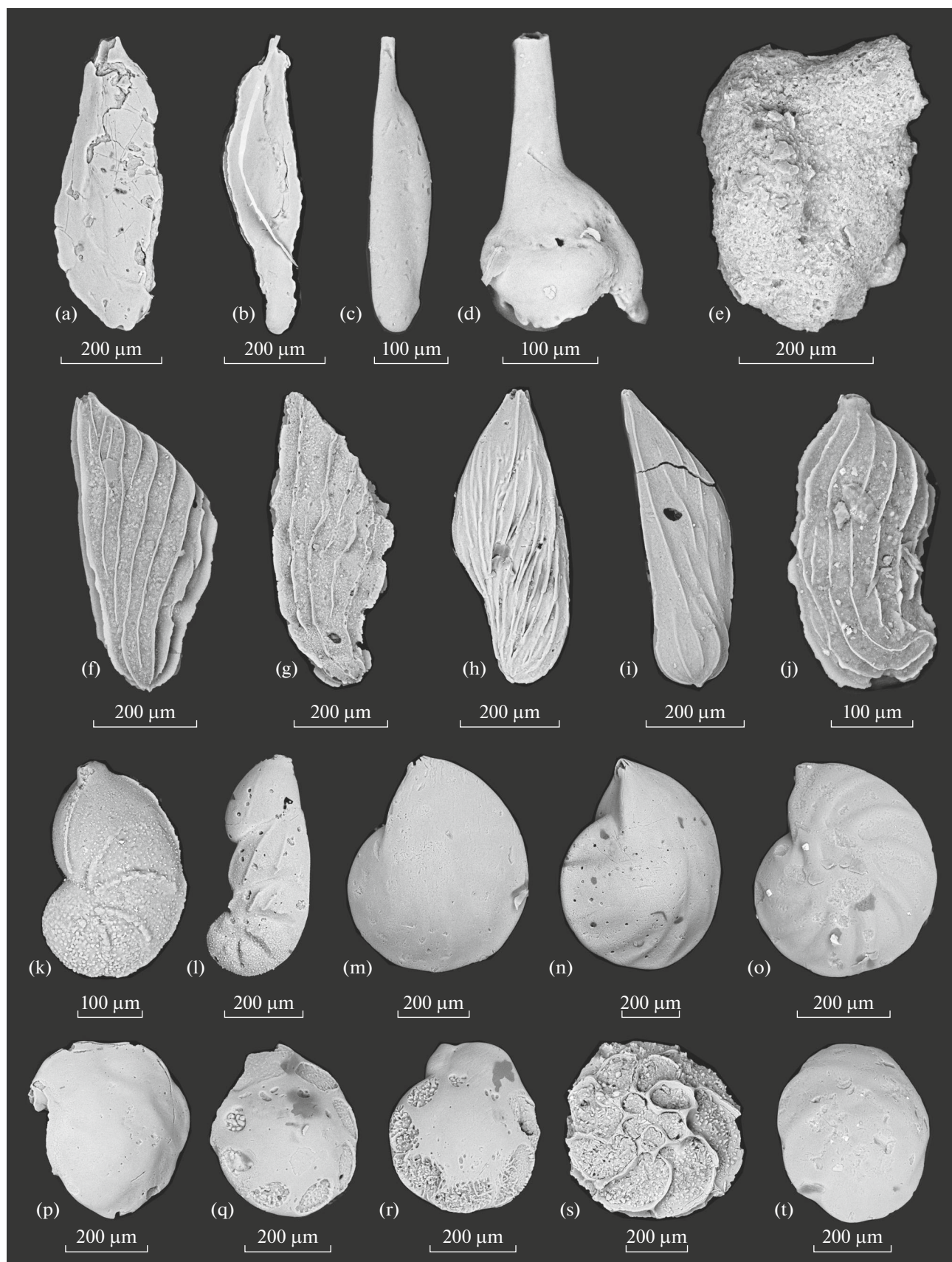


Fig. 2. Characteristic foraminifera of the *Ophthalmidium strumosum*–*Lenticulina brestica* and *Lenticulina russiensis*–*Epistomina uhligi* zones in the Kozhukhovo borehole section, Middle–Upper Oxfordian. (a) *Ophthalmidium strumosum* (Gümbel, 1862), lateral view, sample 11, spec. GIN, no. 2014/17; (b) *Ophthalmidium stuiense* (Paalzow, 1932), lateral view, sample 11, spec. GIN, no. 2014/21; (c) *Labalina milioliniformis* (Paalzow, 1932), lateral view, sample 10, spec. GIN, no. 2014/32; (d), *Orthella paalzowi* E. Bykova, 1956, sample 11, spec. GIN, no. 2014/20; (e) *Lituotuba bulbifera* (Paalzow, 1932), sample 10, spec. GIN, no. 2014/37; (f) *Citharina rariostata* (Furssenko et Poljenova, 1950), lateral view, sample 11, spec. GIN, no. 2014/10; (g) *Citharina chanica* Mjatluk, 1961, lateral view, sample 11, spec. GIN, no. 2014/11; (h) *Citharina effrenata* Azbel, 1989, lateral view, sample 9, spec. GIN, no. 2014/44; (i) *Citharina ornitocephala* (Wiśniowski, 1890), lateral view, sample 8, spec. GIN, no. 2014/58; (k), *Marginulina* ex gr. *batrakieformis* Azbel, 1989, lateral view, sample 4, spec. GIN, no. 2014/66; (l) *Lenticulina* ex gr. *brestica* Mitjanina, 1957, lateral view, sample 9, spec. GIN, no. 2014/39; (m) *Lenticulina ectypa costata* Cordey, 1962, lateral view, sample 9, spec. GIN, no. 2014/43; (n) *Lenticulina muensteri* (Roemer, 1839), lateral view, sample 5, spec. GIN, no. 2014/60; (o) *Lenticulina* aff. *tumidiuscula* Pyatkova, 1974, lateral view, sample 5, spec. GIN, no. 2014/63; (p) *Lenticulina* ex gr. *infravolgaensis* (Furssenko et Poljenova, 1950), lateral view, sample 4, spec. GIN, no. 2014/67; (r) *Epistomina parastelligera* Hofker, 1954, dorsal view, sample 11, spec. GIN, no. 2014/1; (s) *Epistomina uhligi* Mjatluk, 1939, dorsal view, sample 11, spec. GIN, no. 2014/6; (t) *Epistomina unzhensis* Azbel, 1989, dorsal view, sample 11, spec. GIN, no. 2014/8; (u) *Epistomina nemunensis* Grigelis, 1961, dorsal view, sample 8, spec. GIN, no. 2014/52; (v) *Epistomina* sp., dorsal view, sample 4, spec. GIN, no. 2014/68.

composed of brownish-gray clays with abundant burrows of Chondrites. Higher in the succession, these clays are followed by gray micaceous clays with small bioclasts. The taxonomic diversity of foraminifers sharply decreases. The foraminiferal assemblage includes *Astacolus batrakiensis* (Mjatluk, 1939), *Citharina effrenata* Azbel, 1989, *Epistomina nemunensis* Grigelis, 1961, *E. parastelligera* Hofker, 1954, *E. uhligi* Mjatluk, 1939, *L. aff. tumidiuscula* Pyatkova, 1974, *Saracenaria cornicopiae* (Schwager, 1865).

In the southeast of Moscow, the Kolomna Formation is characterized by a high species diversity of the foraminiferal assemblage (Ustinova, 2009), which includes 13 species according to A.Ya. Azbel'.

Mnevniki Formation, which combines Fili and Yegorievsk formations (*Unifitsirovannaya...*, 2012), overlies the deposits of the Kolomna Formation with a significant stratigraphic hiatus. It is evident that a part of the Upper Oxfordian, the entire Kimmeridgian, and the lower Volgian substage are missed in the section. The lower part of the formation is composed of glauconite sandstone; the upper part consists of dark gray clay with ribbon-like worm tubes and black clayey sand. Thickness of the formation is 4 m. The foraminiferal assemblage is very poor that is typical of the Moscow Region (Ustinova, 2009, Ustinova et al., 2014). The following species are represented: *Epistomina* sp., *Lenticulina* ex gr. *infravolgaensis* (Furssenko et Poljenova, 1950), *Marginulina* ex gr. *batrakieformis* Azbel, 1989, *M. ex gr. striatocostata* Reuss, 1862 (Figs. 1, 2).

In the north-west of Moscow (section Krylatskoe; Ustinova et al., 2014), the sole species *Citharina heteropleura* (Terq.) was recognized in the Middle Volgian deposits, whereas, in the southwest of Moscow, Azbel' recognized 16 foraminiferal species and distinguished the *Lenticulina ponderosa*–*Flabellamina lidiae* Zone (Azbel' et al., 1991; Ustinova, 2009).

Based on the occurrence of characteristic foraminiferal species in the Oxfordian deposits, several foraminiferal zones were distinguished. The *Ophthalmidium strumosum*–*Lenticulina brestica* Zone occupies

the Moscovian Formation and the lowermost part of the Kolomna Formation, as well as it is distributed in the European part of the former USSR and Western Kazakhstan. The *Lenticulina russiensis*–*Epistomina uhligi* Zone in the Kolomna Formation is distributed in Crimea, apart from the above regions (Azbel' et al., 1991). The first zone is characterized by *Labalina milioliniformis* (Paalzow, 1932), *Lenticulina ectypa costata* Cordey 1962, *Lituotuba bulbifera* (Paalzow, 1932), *Ophthalmidium strumosum* (Gümbel, 1862), *Orthella paalzowi* E. Bykova 1956, *Epistomina nemunensis* Grigelis 1961, *E. uhligi* Mjatluk, 1939 (Azbel' et al., 1991) (Fig. 2).

There are no own specific species in the *Lenticulina russiensis*–*Epistomina uhligi* Zone. It is not unlike that the revision of the previously obtained factual material and the occurrence of new data make it possible to revise the distribution boundaries of this zone (Colpaert et al., 2017).

The study results of foraminifers from different sections in the Moscow city area show heterogeneity in their taxonomical composition even at this relatively small distribution area. This can be due to an affect of some local paleoecological and paleogeographical factors. The further study of foraminifers, changes in their assemblages through the lateral and vertical sections, including the quantitative estimation, enables us to draw valuable biostratigraphic and paleoecological conclusions. The reliability of these conclusions, as well as the age references of the foraminiferal assemblages will be greater in case of using the data on ammonites and some other groups of microfauna.

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REFERENCES

- Azbel', A.Ya., Grigyalis, A.A., and Kuznetsova, K.I., Jurassic system. Upper Series. The European part of the USSR, in *Prakticheskoe rukovodstvo po mikrofaune SSSR. T. 5. Foraminifery mezozoya* (Practical Guide to Microfauna of the USSR, Vol. 5: Mesozoic Foraminifers), Leningrad: Nedra, 1991, pp. 64–76.
- Bragin, N.Yu., Radiolaria from the phosphorite basal horizons of the Volgian stage in the Moscow region (Russia), *Rev. Micropaleontol.*, 1997, vol. 40, no. 4, pp. 285–296.
- Colpaert, C., Nikitenko, B.L., and Khafaeva, S.N., Stratigraphy and ecostratigraphic distribution of foraminiferal morphogroups from the Upper Jurassic of the Makar'yev section (Unzha River, Volga River basin), *Russ. Geol. Geophys.*, 2017, vol. 58, no. 1, pp. 70–86.
- Kuznetsova, K.I., *Stratigrafiya i paleobiogeografiya pozdnei yury boreal'nogo poyasa po foraminiferam* (Late Jurassic Stratigraphy and Paleobiogeography of the Boreal Belt by means of Foraminifers), Krashennnikov, V.A., Ed., Tr. Geol. Inst. Akad. Nauk SSSR, vol. 332, Moscow: Nauka, 1979.
- Srednii i verkhonii oksford Russkoi platformy* (Middle and Upper Oxfordian of the Russian Platform), Tr. Mezhd. Stratigr. Kom. SSSR, Mesezhnikov, M.S., Ed., vol. 19, Leningrad: Nauka, 1989.
- Unifitsirovannaya regional'naya stratigraficheskaya skhema yurskikh otlozhenii Vostochno-Evropeskoj platformy. Ob'yasnitel'naya zapiska* (Unified Stratigraphic Scheme of the Jurassic Deposits of the East European Platform. Explanatory Note), Mitta, V.V., Ed., Moscow: Paleontol. Inst. Ross. Akad. Nauk–Vseross. Nauchno-Issled. Geol. Neft. Inst., 2012.
- Ustinova, M.A., The distribution of calcareous nannofossils and foraminifers in the Callovian, Oxfordian, and Volgian deposits in the southwest of Moscow, *Stratigr. Geol. Correlation*, 2009, vol. 17, no. 2, pp. 204–217.
- Ustinova, M.A. and Radugina, S.V., Subdivision of the Callovian and Oxfordian in Moscow: implications of calcareous nannofossils and foraminifers, *Bull. Mosk. O-va Ispyt. Prir., Otd. Geol.*, 2004, vol. 79, no. 3, pp. 20–25.
- Ustinova, M.A., Malenkina, S.Yu., and Vishnevskaya V.S., Micropaleontological characteristics of Upper Oxfordian and Middle Volgian deposits (Upper Jurassic) in the Krylatskoe section (Moscow Region), *Byull. MOIP Otd. Geol.*, 2014, vol. 89, no. 3, pp. 19–32.

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