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GEOLOGY

First Find of Lower Jurassic Ammonites (*Dactylioceras*) in West Siberia

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Lower Jurassic sediments are widespread in West Siberia, where they rest upon compositionally variable Triassic–Precambrian strata. Their stratigraphy is based on the concept of the gradual cyclic (reciprocal) advancement of marine sedimentation settings from north to south and the substantial influence of eustatic sealevel changes in the paleobasin [1–3]. Three sublatitudinal facies zones with facies–genetic differences in Lower Jurassic sedimentary sequences are defined in West Siberia (Fig. 1). The northern zone is dominated by marine sediments; the middle (transitional) zone, by coastal-marine facies with admixture of deltaic and continental sediments; and the southern zone, by a prevalence of continental facies [4]. Thus, these zones correspond in fact to the transgression limits of the Early Jurassic sea to West Siberia, i.e., to maximal and minimal sea transgressions.

The Lower Jurassic biostratigraphy in West Siberia remains poorly substantiated because of the insufficient paleontological characteristics of relevant sediments. The Lower Jurassic marine sequences of the study region contain abundant bivalves, rare gastropods, well-studied assemblages of foraminifers, ostracods, and spores–pollen complexes. Similar fossils are recorded in interbeds of marine sediments in the transitional zone, while the biostratigraphy of the Lower Jurassic continental sequences is based exclusively on palynological assemblages.

At present, parallel zonal scales based on all these fossils are available for Lower Jurassic sediments of West Siberia [5]. Ammonites, which are a guide group for the Lower Jurassic biostratigraphy, are to date unknown in West Siberia. Until recently, the biostratigraphic subdivision of Lower Jurassic sequences in the

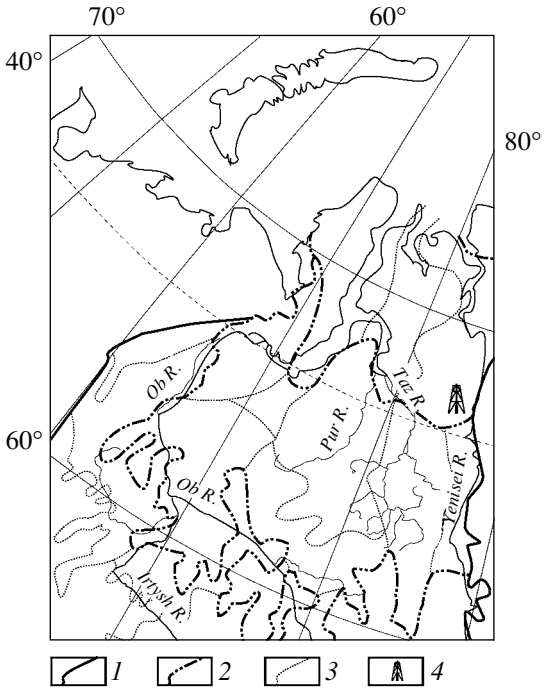

Fig. 1. Location of the examined section. (*1–3*) Boundaries of the (*1*) West Siberian Plate, (*2*) marine, transitional, and continental facies zones, and (*3*) Lower Jurassic facies areas of West Siberia (after [4]); (*4*) location of Borehole Medvezh'ya-316.

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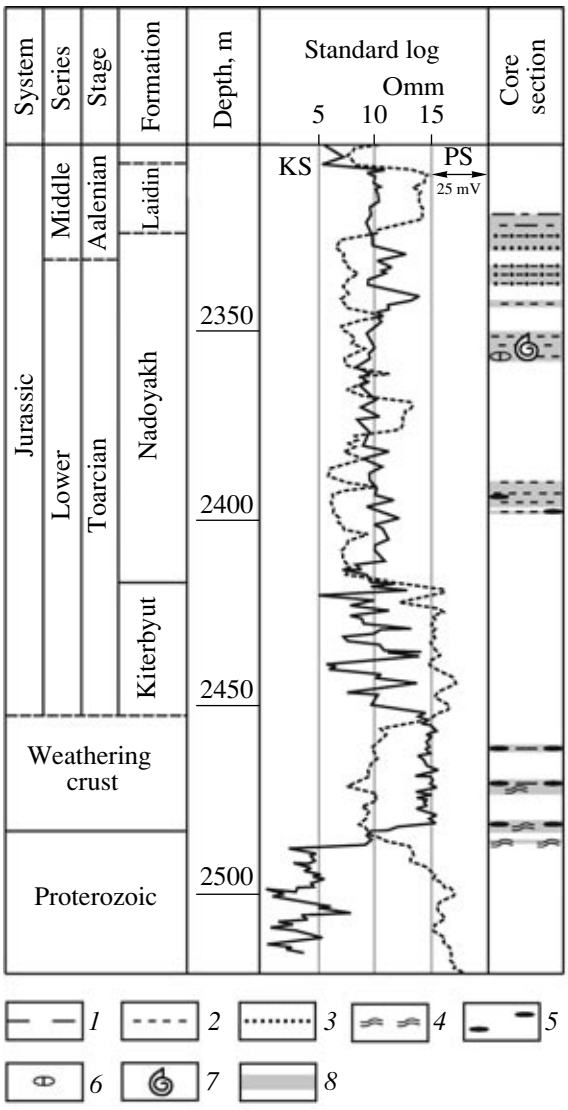

Fig. 2. Stratigraphic subdivision of the Lower Jurassic section of Borehole Medvezh'ya-316. (*1*) Mudstone; (*2*) siltstone; (*3*) sandstone; (*4*) shale; (*5*) pebbles and rock fragments; (*6*) concretions; (*7*) ammonite shells; (*8*) sampling intervals of the core.

study region substantiated by bivalve, foraminifer, ostracod, and palynological assemblages was based on dates provided by parastratigraphic fossil groups from Lower Jurassic sediments that were studied in natural outcrops of northern Central Siberia, where they contain diverse ammonites, belemnites, bivalves, and all the other mentioned fossils [5–8].

The Lower Jurassic ammonites (representatives of the genus *Dactylioceras*) were first found in the Medvezh'ya-316 parametric borehole drilled in northeastern West Siberia corresponding to the southeastern margin of the marine sedimentation region (Fig. 1). The core study and GIS data analysis revealed the succession of formations corresponding to the marine Lower–Middle Jurassic Bol'shaya Kheta Group that is defined in northern West Siberia [5]. The lower part of the sedimentary sequence is represented by the Kitterbyut Formation, resting upon the weathering crust, and by the overlying Nadoyakh Formation, which contains ammonites. The considered sampled interval of 2350.0–2360.1 m (drilled interval 10.1 m, core recovery 8.9 m) is referred to the Nadoyakh Formation or upper Dzhagoda Subformation (Fig. 2) and is composed of light gray siltstone with subhorizontal bedding in the upper 1 m emphasized by plant detritus. Downward the section, sediment bedding is mainly obscure or horizontal with signs of slumping, particularly in the lower part of the core. Concretions of limy siltstone occurring 0.1 m above the core base and at the core top yielded two fragments of ammonite shells identified as *Dactylioceras* aff. *commune* (Sowerby) (Fig. 3). The same levels provided the bivalves *Pseudomytiloides* sp. juv. (ex gr. *mytileformis*) and *Tancredia* ex gr. *bicarinata*, which are typical of lower Toarcian molluscan assemblages in Siberia.

The first finds of *Dactylioceras* ammonites of the *D. commune* group indicate the presence of the lower Toarcian *Dactylioceras commune* Zone in the section. Previously, the lower Toarcian in West Siberia was substantiated only on the basis of characteristic bivalves, foraminifers, ostracods and spores–pollen complexes. The occurrence of ammonites among West Siberian molluscan assemblages implies normal marine settings in the northern West Siberian basin during the early Toarcian and its stable connections with Boreal epicontinental seas of Central Siberia.

The ammonites detected are described below.

Dactylioceras aff. *commune* (Sowerby, 1818)

Shape. Shell is medium-sized, narrow (with medium umbilicus), and slightly evolute (Fig. 3, table). Transverse section of the whorl is highly ovate with wide slightly flattened lateral sides, narrow convex ventral side, very narrow slightly rounded umbilical area, and moderately concave narrow dorsal side. The whorl section is widest in its lower third.

Sculpture is represented by closely spaced moderately narrow ribs, most of which bifurcate. Approximately one-fourth of ribs crossing the ventral side show no bifurcation. The half-whorl of the shell (25 mm across) contains approximately 25 primary ribs with the ratio ranging from 1.5 to 1.6. Direction of short primary ribs varies from radial to proradial. Secondary ribs slightly deflecting anteriorly are distinctly curved and slightly thickened at the ventral margin to form an obscure "visor." Branching points lacking thickenings are located in the area between the middle and lower third of the whorl. Umbilical areas are smooth.

The suture is slightly differentiated (Fig. 4). The ventral lobe is relatively narrow and is subdivided in two branches by a low moderately narrow medial saddle. The V/U saddle is substantially wider as compared with that in most known *Dactylioceras* species ([9],

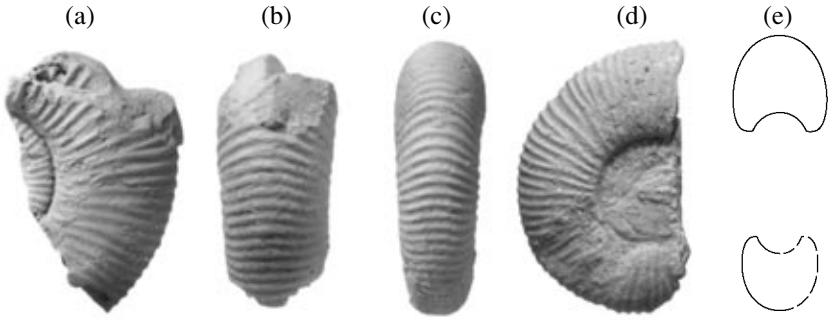

Fig. 3. *Dactylioceras* aff. *commune* (Sowerby); (a, b) specimen 180/802, (c–e) specimen 180/801: (a, d) side view, (b, c) ventral view, (e) transverse section. Magn. 1.5.

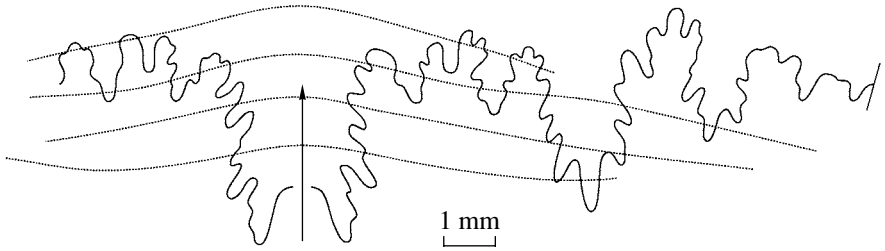

Fig. 4. Suture and direction of ribs in *Dactylioceras* aff. *commune* (Sowerby); specimen 180/802 approximately 29 mm across, 9 mm wide, and 5.5 mm high.

abb. 145f; [10], Figs. 8–12; [11], Fig. 1]). In its upper part, the saddle has three small subsidiary saddles, which is typical of genus representatives. The V/U saddle is characterized by a peculiar box-like shape owing to steep lateral sides and the insignificant rise of a middle saddle over two marginal saddles. Such a shape of the suture element is characteristic of one of the examined *D. commune* specimens ([12], Fig.1j). In the majority of other *Dactylioceras* species, the saddle has a slightly different shape similar to the "maple leaf." The umbilical lobe U is characterized by a simple and nearly symmetrical shape, with a long median and several small lateral denticles. The symmetry is distorted by the lower position of the lower external lateral denticle. The median axis of the lobe deviates slightly toward the umbilical shoulder. The narrow U/U_1 saddle is high, significantly rising over the V/U saddle. Such a feature has never been recorded in *Dactylioceras* species. The upper part of the saddle has two large additional saddles, the inner of which rises over the external one. Like in the U lobe, the median axis of the U/U_1 saddle deflects slightly toward the umbilical shoulder. The small relatively narrow U_1 lobe is almost twice as small as the U lobe and has a three-denticle shape with the lower internal denticle located substantially lower as compared to the external one and with the median axis deviating toward the ventral area. The next saddle is low, wide, and box-shaped. It is complicated by two small rounded denticles. The structure of the suture internal part is unknown.

Comparison and comments. The specimens described above are characterized by a slightly evolute shell with medium umbilicus. Thus, they are substantially distinguished from all *Dactylioceras commune* representatives of comparable size known in Northeast Russia and Siberia that are characterized by an evolute shell with a wide umbilicus. This difference also concerns the majority of other species of the genus in question. This may indicate the affiliation of the identified forms with a new species, which should be substanti-

Dimensions (mm) and ratios (%)

Specimen no.	D	W	H	M	U	W/D	H/D	U/D	M/D	W/H
180/801	24.1	8.2	8.4	6.6	9.2	34.0	34.9	38.2	27.4	97.6
"	17.5	6.6	6.5	5.0	–	37.7	37.1	–	28.6	101.5

Note: (D) Shell diameter; (W) whorl width; (H) whorl height; (M) median whorl height; (U) umbilicus diameter.

ated by more representative material. In terms of the sculpture, the examined specimens resemble *D. commune* varieties that are characterized by closely spaced ribs [12], which is particularly true of one of the specimens from the Tyung River ([11], Plate III, Fig. 5). Because of this similarity, West Siberian forms were preliminarily identified as *D.* aff. *commune*. In terms of shape and sculpture, West Siberian specimens are also similar to the least evolute *D. athleticum* representatives reported by Repin from upper layers of the Shakhmirzad Formation in northern Iran ([13], p. 42, Fig. 3, nos. 3, 5; Fig. 4, nos. 6, 7]), but are distinguished by their short primary ribs and slight anterior deflection.

Distribution. Lower Toarcian, *Dactylioceras commune* Zone.

Material. Fragments of two casts.

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