
GEOLOGY

The Early Jurassic Fauna from the Gurumdy and Mynhajir Zones of the East Pamirs

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The Southeast Pamirs is a unique region with a wide development of Jurassic marine sediments that are characterized by complete different-facies sections and diverse fossils. Of particular interest are Early Jurassic corals, which represent the first finds in mountainous Central Asia and the entire eastern Mediterranean belt. Finds of such fossils are extremely rare in other regions of the world so far.

According to [1], Jurassic sediments in the Southeast Pamirs can be divided into three (Gurumdy, Mynhajir, and Istyk) structural–facies zones. Upper Jurassic fossils are confined to the Gurumdy and Mynhajir zones, which occupy marginal parts of the Southeast Pamirs and make up a horseshoe-shaped framing around the Inner Istyk zone (Istyk Uplift), where sedimentation commenced in the terminal-Early-initial-Middle Jurassic (Toarcian–Aalenian). The Gurumdy and Mynhajir zones constitute the southwestern and northeastern segments of this horseshoe-shaped zone, respectively (figure). In the Jurassic, both zones were elements of a single trough located along the periphery of the Istyk Uplift inside a sea basin. The Gurumdy segment of the trough experienced intense subsidence and accumulated thick sediments, while the Mynhajir segment subsided less significantly to accumulate thinner sediments of variable composition.

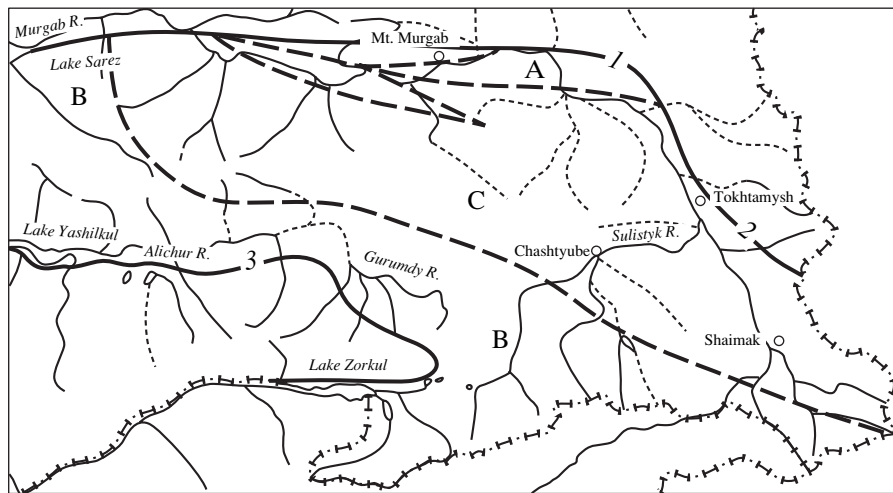
The present communication is dedicated to the characteristic of distribution, lithology, age, and fossils of the Lower Jurassic sediments developed in the Gurumdy and Mynhajir zones of the Southeast Pamirs. Different fossil groups from Lower Jurassic sediments have been determined and described by many paleontologists, including G.K. Melnikova (corals); V.P. Makridin, S.A. Melnikova, and A.S. Dagys (brachiopods); L.D. Kiparisova, L.V. Sibiryakova, and T.F. Andreeva (bivalves); and G.Ya. Krymgol'ts, V.I. Dronov, and Yu.S. Repin (ammonites).

In the present-day structure of the Gurumdy zone, Jurassic sediments are developed in the river basins draining the Vahan Ridge beginning from upper reaches of the Beik River to the Zorkul Depression. Farther northwestward, they are widespread in the basins of the Mashale, Gurumdy, Irikyak, Alichur, Karademur, Kat-tamarjanai, and Vatasaf rivers that drain the eastern part of the South Alichur and western part of the North Alichur ridges. In the zone under consideration, the Jurassic rocks are unconformably sandwiched between upon Permian–Triassic strata and Tertiary sediments. The zone is characterized by the continuous Jurassic section that includes sediments ranging from the basal part of the system to upper Callovian layers. Its lower series is very thick because of the development of reeflike sequences in some areas. The total thickness of the Lower Jurassic rocks amounts to 700 m.

The Jurassic sediments of the Mynhajir zone are developed in the East and West Mynhajir mountains separated by the Aksu River and along the northern foothill of the Zougan Ridge, in the Karasu River basin, and at the estuary of the North Boztere, Kaindy, and other rivers. They are unconformably sandwiched between Permian–Triassic and Tertiary layers. The Mynhajir zone also includes a complete section extending from the basal Jurassic to the Bathonian–Lower Callovian strata, although the Mynhajir zone differs from the previous zone in more diverse lithology and two times lower thickness of the Lower Jurassic sequence (220–285 m).

Following below is a description of the Jurassic type sections of the Gurumdy and Mynhajir zones with Early Jurassic faunal assemblages. The integral Lower Jurassic section of the Gurumdy zone is compiled on the basis of outcrops on the watershed between the Sedek and Irikyak rivers. The author of the present communication studied it first together with V.P. Novikov (in 1969), E.V. Boiko (1970), and V.I. Dronov (1970s–1980s).

In this area, the Upper Triassic olistostrome reef–conglomerate Tashjilga Formation is overlain progressively with a sharp unconformity and without basal



Schematic zoning of Jurassic sediments in the Southeast Pamirs. Zones: (A) Mynhajir, (B) Gurumdy, (C) Istyk. Major boundary faults of the Southeast Pamirs (numbers in boxes): (1) North Murgab, (2) Dunkeldyk, (3) Yashilkul–South Gurumdy.

conglomerates by the Gurumdy Formation. In the examined section, the Gurumdy Formation is not divided into subformations, because it is composed of uniform dark thick-bedded organogenic-detrital limestones with abundant remains of small hardshell gastropods, corals, and fragments of peculiar platy algae. The basal part of the formation encloses a member (5–15 m) of orangish rusty marls, sandy limestones, and calcareous sandstones with bivalves *Mytilus* sp., *Tancredia* sp., *Thracia* sp., and *Pecten aequiplicatus* Terquem. These rocks are overlain by the so-called *Cardinia* coquina beds that are recorded at this stratigraphic level worldwide [2]. Some layers consist entirely of Hettangian–Sinemurian *Cardinia* shells [1]: *Cardinia* cf. *elliptica* Quenst., *C.* cf. *hybrida* Quenst., *Pachyrisma* aff. *chamaefrnis* Schlot., and platy thalluses of peculiar algae. The overlying dark gray organogenic-detrital limestones yielded coral remains [3–5]: *Archaeosmilia beata* Melnikova, *Archaeosmiliopsis densus* Melnikova, *Cyclismilia brevis* (Melnikova), *C. longa* (Melnikova), *Eocomoseris lamellata* (Melnikova), and *E. ramosa* Melnikova. In the Sedek–Irikyak watershed area, Dronov found in 1979 together with corals an ammonite impression, which was determined to be close to the late Sinemurian genera *Angulaticeras* and *Glevice-ras*. As a whole, the cited assemblage indicates the Hettangian–Sinemurian age of the Gurumdy Formation, which is 30 m thick in the considered section.

The Gurumdy Formation is conformably overlain by the lower Jurassic Sedek Formation, composed of bedded black clayey limestones with cherty nodules and concretions. The Sedek Formation is lithologically uniform and characterized by stratal and platy jointing (plates up to 20–40 cm). The stratotype section of the formation exposed along the right slope of the Sedek Ravine encloses the following rare brachiopods and abundant ammonites [1, 6] (from the base to top): late Sinemurian (Lotharingian) *Vermiceras* cf. *spiratissi-*

mum (Quenst.); Pliensbachian–Domerian brachiopods *Terebratula curviceps* Quenst. and *Lobothyris punctata* (Sow.); and ammonites *Epideroceras* ex gr. *roberti* Hauer, *Arietoceras* cf. *algovianum* (Oppel), and *A.* cf. *ruthense* Rein; Toarcian ammonites *Porpoceras* cf. *subarmatum* H. et B., *Harpoceras* cf. *falcifer* Sow., *Dactyloceras* cf. *anguinum* Buckm., *Dumortieria explanata* Buckm.; Aalenian ammonites *Hammatoceras* cf. *sieboldi* Oppel, *H.* cf. *pugnax* Vacek, *Pseudolioceras* ex gr. *beyrichi* J. et B., *Ludwigella* ex gr. *rugosa* Buckm., and *Fontanesia curvata* Buckm. Early Bajocian ammonites *Eudmetoceras eudmetum* Buckm. are found in the uppermost part of the formation.

In 1969–1973, the author studied the Lower Jurassic sections along the Karajilga, Bazardara, and Deire rivers (right tributaries of the Alichur River) and in the Jartyrabat Massif. The Permian–Triassic layers are universally overlain by basal red conglomerates of the Darbazatash Formation of variable thickness (from 5–7 to 200–250 m). They are conformably overlain in turn by limestones of the Gurumdy Formation divided into two subformations. On the right slope of the Karajilga River valley, the lower subformation (20–100 m), with the *Cardinia* Beds, peculiar algae thalusses, small hard-shell gastropods, and coral fragments, encloses the assemblage of Early–Middle Liassic brachiopods [6]: *Spiriferina alpina* Oppel, *S.* cf. *angulata* Oppel, *Tetrarhynchia* sp. indet., *Hesperithyris?* sp. indet., *Zeilleria?* sp. Upper reaches of the Bazardara River includes corals *Proaplophyllia basardaraensis* Melnikova [4].

The upper Gurumdy Subformation (100–300 m) is best represented in the Jartyrabat Massif section, where it is composed of light massive, thick-bedded oolitic and organogenic-detrital limestones of the reefal affinity that form forbidding cliffs hundreds of meters high. Limestones of the Jartyrabat Massif section yielded remains of colonial reef-building Sinemurian corals [4, 7]: *Stylos-*

milia alichurica Melnikova, *S. decemseptata* Melnikova, *Pachysmilia prima* Melnikova, *Intersmilia djartyrabatika* Melnikova, and *Prodonacosmilia dronovi* Melnikova. The upper subformation is conformably overlain by black bedded clayey limestones with cherty nodules belonging to the Sedek Formation.

I studied the Lower Jurassic sediments of the Mynhajir zone in the Kyzylbeles River basin together with V.I. Dronov in 1979–1980. In this area, the Triassic Istyk shales are transgressively overlain with a sharp unconformity by the Kyzylbeles Formation of red basal conglomerates (5–50 m). The latter is overlain, in turn, by the Mynhajir Formation, which is divided into three subformations. The lowest of the subformation (50 m thick) is composed of dark medium- to thick-bedded organogenic-detrital limestones with the *Cardinia* Beds, coquinas with Hettangian–Sinemurian mollusks *Plagiostoma* cf. *compressa* Terquem [6], interbeds with small hardshell gastropods, fragments of peculiar algae thalusses, and corals *Cyclismilia longa* (Melnikova) in the basal part of the section. The middle subformation (50 m) is represented by rusty thick-bedded dolomites. The upper Mynhajir Subformation (100 m thick) consists of thick- to very thick-bedded, locally massive oolitic limestones with remains of strongly recrystallized (practically undeterminable) colonial corals. Near the top of the section, the Mynhajir Formation is conformably overlain by the Zormynhajir Formation (20–

50 m), which is composed of black distinctly bedded clayey limestones with cherty nodules and abundant poorly preserved remains of sponges, brachiopods, echinoderms, bivalves, and gastropods.

By its stratigraphic position, lithology, and fossils, the Mynhajir and Zormynhajir formations can be confidently correlated with the Gurumdy and Sedek formations of the Gurumdy zone, which have richer Early Jurassic faunal assemblages [6].

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