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Research Article

BIOSTRATIGRAPHIC CHARACTERISTICS OF THE NEOPROTEROZOIC DEPOSITS OF THE NURATA MOUNTAINS IN WESTERN UZBEKISTAN

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ABSTRACT
Different Newlandian biota is widely distributed in the Precambrian sections of the Nuratau region. Fossils are found in suvliksai, suyaltasch and bogambir suites of Upper Riphean. They are compared with similar remains of other regions. A new species and genus are described.

Key Words: *paleontology of Precambrian, Newlandian biota, Tien Shan, Nurata range*

INTRODUCTION
The Nevlandia biota is a macroscopic volumetric fossil composed with columns of different sizes and shapes. The fossils of the nevland biota were first described by Walcott in 1914 (Walcott, 1914) based on the Middle Ripheanan deposits of the Supergroup Belt in North America. They published 7 species belonging to 4 genus (*Newlandia, Camasia, Copperia, Greysonia*). The first two were found in the Nurata region.
C. Walcott related them to stromatolites on the basis of the discovery in *Newlandia frondosa* of filamentous microfossils of plant origin, and *Camasia spongiosa* - chains of spherical cells (coccoid microfossils) forming filament in blue-green algae. Thus, back in 1914, the opinion was expressed that stromatolites, and hence also the non-Irelandites attributed to them, are the derivatives of "blue-green algae" in the modern sense of cyanobacteria.

MATERIALS AND METHODS
The most effective way to study the sections and conduct stratigraphic dissection and correlation of the strata was the complex application of various methods of stratigraphy: paleontological, lithological, petrographic, structural and genetic approach to the identification of stratons. For comparison and definition of taxonomic affiliation information on paleontological objects from other regions of the world was used.

RESULTS AND DISCUSSION
Filamentary cyanobacteria ("blue-green") were discovered in 1996 by Abduazimova in the layers with the non-Atlantic biota in the Upper Proterozoic Tasskazgan suite of the Central Kyzyl Kum (Abduazimova *et al.*, 2017).
Sosnovskaya (2014) defined the participation of cyanobacteria in the formation of one of the groups of the nonlandic Saralinskiida biota. These facts indicate that the formation of some groups of non-Land biota together with other biolithes (stromatolites and microphytolites) was controlled by participation of cyanobacteria and are an integral part of the carbonate strata of the Upper Proterozoic.
For a hundred years from the date of discovery, the unfolded biota was discovered in the Upper Proterozoic deposits of many regions in Russia, Uzbekistan, China, India, Africa, and in other countries (Sosnovskaya, 2010).
Today, these organic remains, along with microfossils, stromatolites, microphytolites, are involved in the practice of stratigraphic studies of the Upper Precambrian deposits, especially in the regions of the Southern Tien Shan and other folded areas where the dislocated complex-built sections of Precambrian

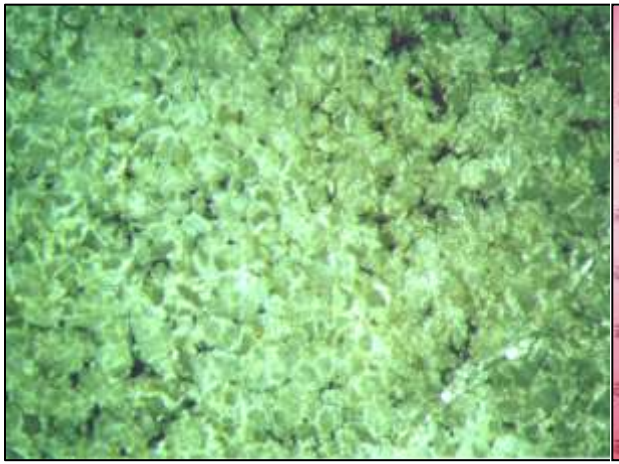

Fig. 1. Dolomite with recrystallized microphytolites in the Suwlksai suite.

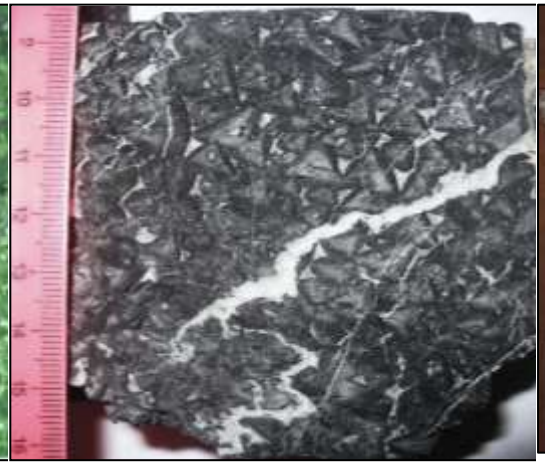

Fig. 2. Kamaziades - Tridia koptevi Schip. (triangular cross-section of columns) in the Suyattash suite.

Fig. 3. Plastoid construction of the colony Newlandia frondosa Walcott. in the Bogambir suite.

Fig. 4. Oncolites of the Osagia group in the dolomites Boghambir suite.

Fig. 5. Kamazidy - Camasia alta Sosn. (rounded and oval-round cross sections of the columns) in the Bogambir suite.

Fig. 6. Barrel-shaped columns of kamaziids - Caryschia magna Sosn. in the Bogambir suite.

deposits are tectonically interspersed with the Paleozoic for recognizing the Upper Precambrian sediments.

The fossils of the nonlanded biota in the Nurata region are found mainly in carbonate rocks - limestones and dolomites, where biostrong structures of great length are created. The Nurata fossils differ in amazing variety and similarity to the forms from the Upper Proterozoic deposits of the Altai-Sayan mountain region, the folded frame of the Siberian platform and North America, which confirms the existence of a vast Paleo-Asiatic ocean on the planet in the late Proterozoic, whose marginal seas were connected with the basins of other oceans and among themselves. This allowed planktonic and pseudoplankton microorganisms to spread quickly over vast areas, creating at the bottom of the basins original formations - microbiolites.

The Nivlandia biota in the Nurata region is found in the Suwiksai, Suyattash, Bogambirsky formations, composed with volcanogenic-siliceous-carbonate and siliceous-carbonate rocks containing of microfossils (acritarchs, filamentous and coccoid forms, lower fungi), stromatolites of microphytolites of the Late Proterozoic age.

In the rocks of these suites, in the study of thin sections and paleontological preparations, neither skeletal Paleozoic organic remains nor traces of Vendian-Ediacar fauna were found.

Suvlksaiskaya suite - R_3 *sv* is developed in the west of Northern Nuratau ridge, where it is exposed by small fragments composing tectonic plates and scales, by separate block horizons located among the greenstone rocks of the rocks of the Uchmalinskaya suite PR_2 (R_{1-2}?) and metatrigent formations of the lower subordinate of the Kansai suite O_{1-2} kn_1.

Only the carbonaceous-quartz-siliceous schists, carbonaceous banded quartzites, dolomites and limestones with biogenic-chemogenic origin and containing late Riphean organic remains belong to the Suwlksai suite, the rocks are often metasomatically recycled, crumpled, and squashed.

The section of the Suwlksai suite consists mainly of quartzites with subordinate interlayers and lenticular bodies of dolomites, dolomitized limestones and small packs of carbonaceous-quartz-siliceous-schists. All rocks are intensively dislocated, crumpled into folds, with the development of micro-folding and cleavage, often developed metasomatically.

The Late Precambrian (Late Riphean) age of the Suwicksa suite is based on finds in the dolomites of the acritarchs: *Leiosphaeridia jacutica* (Tim.), *Leiosphaeridia holtedahlii* (Tim.). Recrystallized microphytolites - *Osagia aculeata Z.Zhur* - occur in these layers (Figure 1) and Camaside - *Camasia sp.*

Contacts of the Suvlksaiskaya suite with the host metaterrigenous formations of the Lower Kansai subsuite of the Lower Paleozoic are tectonic everywhere. The fractured zones are expressed by altered, hydrothermally elaborated, shattered shales of the Lower Kansai subsuite, into which the metasomatically developed and dislocated bodies and "horizons" of the Suwixai suite have been tectonically pressed. Quartz veins are usually confined to this interval. Such violations are the most optimal for the localization of ore chemical elements, which is confirmed by the search and survey work.

The presence of lenses and interlayers of dolomites and dolomitized limestones containing microphytolites, kamasides, indicates that the formation of the sediments of the Suwlksaiskaya suite was chemogenic-biogenic in ocean uplifts.

These formations were formed in the Late Riphean in a rift-spreading environment on the basaltic crust of oceanic hills and their slopes at considerable depths.

The Suyaltash suite - R_3 sl is developed on the southern slopes of the N.Nuratau ridge in its central part, in the vicinity of the Suyalthash ridge. The rocks of the formation are exposed in the form of tectonic blocks with a thickness of several meters and do not have stratigraphic contacts with the surrounding formations.

The suite consists mainly of dark gray massive layered dolomites, dolomite limestones with interlayers of brown and yellowish-gray siliceous-carbonate rock. Among the massive and thick-layered differences, there are assises of small thickness (from 0.4 to 2.5 m) of medium and thinly layered dolomites interbedded with thin (1-4 to 10 mm) interlayers of siliceous-carbonate rock. The formation is characterized by the presence of numerous organogenic reservoirs-biostromes, overcrowded with microphytolites, microstroisms, kamasides, saralinskides, among which are

identified: microphytolites - *Glebosites guttatus* Jaksch., *Glebosites gentilis* Z Zhur .; microfossils: acritarchs - *Leiofusidium dubium* Jank., *Trachyhystrichosphaera parva Mikh., Trachyhystrichosphaera cf. aimica* Herm., *Leiosphaeridia jacutica* (Tim.), etc.

Carbonate rocks contain strata structures - biostromes of microstromatites - *Pseudogymnosolen cf. pandum* L. et L., *Floriscolumella figurata* X., *Liaoheella liaoheensis* Cao; biostromes of kamasides - *Tridia koptevi* Schip. (Figure 2); saralinskide - *Incertadia lamellifera* Schip. et Sosn., indicating the Late Riphean age of the enclosing strata.

The most fully paleontologically characterized section, which is given the status of a hypostratotype (secondary, additional stratotype), is located in the gorge of the Tamerlane Gate at the eastern margin of the Northern Nuratau ridge.

Hypostratotypic incision is most convenient for viewing, as it is located along the motorway Tashkent-Samarkand. Here in the area of the Tamerlane Gate in the tectonic scales among the Ordovician and Silurian deposits lie the steeply dipping rocks of the Suyalthash suite. This section is one of the most unique sections on paleontological filling, diversity, preservation and the joint discovery of various late Riphean organic remains.

The thickness of the Upper Riphean deposits in the Tamerlane Gate is 71.3 m.

In other locations, the suite is characterized by microphytolites - *Nubecularites antis* Z.Zhur., *Nubecularites sp.* and acritarchs - *Trachyhystrichosphaera cf. aimica* Herm., *Trachyhystrichosphaera parva* Mikh., *Leiosphaeridia crassa* (Naum.), *Leiosphaeridia jacutica* (Tim.), *Satka sp*., found in the Upper Riphean deposits of many regions.

The deposits of the Suyalthash suite formed within the deepened parts of the sea basin, in a calm hydrodynamic water medium saturated with magnesian calcite elements, in the regime of weak occurrences of differential tectonic movements.

The Sultanbay suite - R_3 *sl* is exposed on the Marjanbulak hill and in the South Nuratau ridge near the Sultanbai well in the form of blocks and block horizons in fault zones and in tectonic blocks among the terrigenous rocks of the Ordovician. It is an analogue of the Suwlksai suite.

The suite is composed with banded dark gray carbonaceous quartzites with lenticular interlayers of dolomites. The rocks are mostly brecciated and silicified metasomatically worked. Thickness is from the first meters up to hundred meters. In the dolomites, microfiltolites - *Volvatella cf. zonalis* Nar., *Nubecularites uniformis* Z.Zhur., occurring in the late Riphean complex of analogues of this suite in Western Uzbekistan and other regions.

The Bogambir suite - R_3 *bg* is cropped on the northern slopes of the the Northern Nuratau ridge is predominantly in the Bogambir ridge in the form of tectonic lenses among Paleozoic rocks, sometimes arcuate-bent, elongated by chains parallel to the general bearing of the ridge. In the eastern part, their dimensions along the long axis range from a few meters to a kilometer and a little more; in the northwestern part they are larger and reach a length of up to 4 km, a width of 200-350 meters.

From the north, the Bogambir suite is tectonic in contiguity with greywack-argillic deposits of Ilonchisay O_{2-3} and Curbanazin O^2_1-O^1_2 suites; on separate sites with carbonate deposits of the Yataak suite - S_1v - S_2ld. South contact with the Coibulak suite also passes through disjunctive dislocation. In the band of distribution of the Bogambirsky suite along the faults in tectonic scales, blocks, blocks, small fragments of Paleozoic deposits are exposed. The complete section of the suite is not known. In each tectonic unit, the stratigraphic sequence of layers was restored using litho-biofacial data.

The section of the Boghambra suite is reconstructed from individual tectonic lenses in the following form.

The lower strata of the suite (20-110 m thick) are composed of thick-medium-leafed (from 5-30 to 50 cm) and massive gray dolomites interbedded with thin (2-5 cm to 10 cm) interlayers of dark-brown siliceous-carbonate rock along which is good fixed folding. Among them are often found organogenic layers, which are biostromes with a capacity of 0.3 to 0.95 m, up to 1-3.5 m, created by the colonies of camasides and nevlandides.

In the interlayers interbedded with camasides and nevlandides biostromes, in the samples selected by V.S. Korsakov, found acritarchs and filamentous microfossils, characterizing, by definition, L.N. Ilchenko and E.A. Aseeva, the Late Riphean age of the enclosing rocks. The acritarch complex is: *Leiosphaeridia jacutica* (Tim.), *Leiosphaeridia crassa* (Naum.), *Leiosphaeridia holtedahlii* Tim.,

Margominuscula rugosa Naum., *Satka elongata* Jank., *Chuaria circularis* Wal. Filamentous microfossils are represented by: *Tortunema sibirica* Herm., *Eomycetopsis typicus* (Herm.), *Polytrichoides lineatus* Herm., *Palaeolyngbya catenata* Herm.

The tops of the section (50-115 m) of the Bogambir suite are composed with gray, layered oncolyte-containing, organogenic-clastic dolomites interbedded with layers of "pure" dolomites, and layers with camasids and nevlandides (Figure 3-6).

The layers of dolomites with oncolites are saturated with fragments of volcanic glass, siliceous and carbonate rocks of the underlying layers, in some of them the fragments of dolomites reach 20 cm. The sharp-angled fragments of black flint are 2 × 5 cm, rarely larger, dark gray and light gray dolomites 5-6 cm, 3x10 cm, 6x20 cm, the latter sometimes overgrown with oncolites.

Silica-carbonate sediments of the Bogambir suite were formed along the periphery of the marginal basin on the seabed rises, near the aureole of volcanic activity and volcanic islands.

The Late Proterozoic age of this part of the section is justified by complex diversities. From the layers that are in stratigraphic interbedding, it is determined:

microphytolites - *Osagia tenuilamellata* Reitl., *Osagia columnata* Reitl., *Osagia cf. alveolata* Schip. (ms), *Osagia nimia* Z.Zhur., *Osagia grandis* Z.Zhur., *Osagia corticosa* Nar., *Osagia nersinica* Jaksch., *Volvatella zonalis* Nar., *Ambigolamellatus horridus* Z.Zhur., *Vermiculites anfractus* Z.Zhur, definitions of V.A . Shipitsyna, V.V. Makarikhin, Z.A. Zhuravlevoy, Z.M. Abduazimova:

- nevlandides - *Clatristroma aff. tarnovskii* Posp., *Clatristroma (Cyclitinia sp.), Clatristroma sp.* (the definitions of V.A Shipitsyn, O.V Sosnovskaya, Z.M Abduazimova);

– acritarch – *Leiosphaeridia crassa* (Naum.), *Leiosphaeridia holtedahlii* (Tim.), *Leiosphaeridia jacutica* (Tim.), *Leiosphaeridia minutissima), (Naum.), Margominuscula rugosa (Naum.), Chuaria circularis Wal*;

-camasides - *Camasia alta* Sosn., *Caryschia sp., Caryschia aff. magna Sosn., Camasia modica Sosn., Plumifascicularia sp.*, (definitions of Z.M. Abduazimova, and O.V. Sosnovskaya);

- stromatolites of columnar-nodular form - *Frutexina aff.* rubia Raaben;

- acritarchs - *Leiosphaeridia crassa* (Naum.), *Leiosphaeridia holtedahlii* (Tim.), *Leiosphaeridia jacutica* (Tim.), *Leiosphaeridia minutissima*), (Naum.), *Margominuscula rugosa* (Naum.), *Chuaria circularis* Wal;

– filamentary cyanobacteria (the locations are the same) – *Tortunema sibirica Herm., Palaeolyngbya catenata Herm., Emycetopsis typicus (Herm.)* defined L.N. Ilchenko.

All these different groups of organic remains unequivocally point to the Late Proterozoic age.

The incomplete thickness of the formation in tectonic lenses varies from 70 up to 225 m.

Conclusion

The above data indicate a widespread development of Upper Proterozoic deposits in the Nurata region, formed in different facial environments. An analysis of the taxonomic composition of the biota collected from sections of the Precambrian suite shows some dependence of the benthos on the paleofacial conditions that existed in the Late Proterozoic sedimentation basin. Attached bottom organisms are well used to dismember the siliceous-carbonate sediments of the upper Riphean. Plankton microfossils, which were not affected by the environment, serve to correlate Upper Proterozoic diverse facies deposits.

Thus, biostratigraphic data can be successfully used to dismember, correlate and justify the age of the ancient strata of the Nurata region.

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