BENCH MARK LEVEL OF THE MIDDLE CARBONIFEROUS IN WESTERN VERRKHOYANYE

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ABSTRACT

The paper deals with new evidence on the Middle Carboniferous of Western Verkhoyanye. Study and correlation of a faunal level in the Upper Baraiy River area containing ammonoidea and brachiopods suggest it is of late Bashkirian age on the east European correlation scale. Combined with other paleontological material it allows one to provide a more reliable age for the lithostratigraphic units and to make an interregional correlation of the known strata.

In recent years the Verkhoyansk meganticlinorium has received widespread attention. Exposed in its arch, are thick Upper Paleozoic terrigenous strata that were deposited in a marine paleobasin in the near-flank zone of the passive continental margin. Here the geologic record of the Late Paleozoic sedimentogenesis is the most complete and the sedimentary sections show a distinct cyclic pattern of deposition expressed in regular recurrence of transgressive and regressive stages (Budnikov, 1988).

On the west the Verkhoyansk paleobasin is bordered through Taimyr by the East European paleobasin, which is a stratotype locality for the Carboniferous and Permian section in Russia. On the south it is adjacent to areas composed of strata containing the Tethys fauna. Its location of the paleobasin suggests its importance for the correlation of three international scales: the east European, North American and Tethys.

In the Upper Paleozoic sections of Verkhoyanye orthofaunal assemblages such as fusulinids and conodonts are unrepresented. The only fossil group that allows interregional correlation and differentiation of intervals equivalent to stages of the international stratigraphic scale appears to be the Ammonoidea. Their study is of paramount importance.

Permian collections from the area may be somewhat generalized (Andrianov, 1966, 1985); but in the Carboniferous any finding is of great significance, especially since not long ago the lower-most Verkhoyansk terrigenous complex was attributed to the Permian.

This paper gives the results of the investigation of ammonoids and accompanying fossil materials from two sections of the Solonchan Suite (Formation) that were described during a large-scale mapping in the upper Baraiy (western Verkhoyanye) (see fig. 1). This stratigraphic level is confined to the upper part of the lower Solonchan subsuite.

The cyclical Solonchan Suite comprises a succession of transgressive-regressive sediments as thick as 1250 to 1300 m. As a whole these are deposits of the frontal part of a thick delta complex, consisting of alternating of inequigranular, banded prodelta siltstones up to 20-60 m, sometimes 80 m thick. The marine fossil fauna appears to be confined to these units. The siltstones alternate with thick beds ("wedges") of medium- and fine-grained sandstone.

In the lower part of the suite there is a higher proportion of thick siltstone interbeds with slump features indicating deposition at the foot of the paleodelta. In the upper suite the sandstone is dominant, interbedded with intrasuite conglomerate and argillaceous siltstone lenses containing imprints of fossil flora. The subdivision of the suite is based on the differention of these two sedimentary packages.

The Solonchan Suite conformably overlies the generally coarse-grained rocks of the Imtandzha Suite and is overlain by the finer-grained sediment of the Kygyltas Suite.

In the Birandyn River section (layer 6026) the marine fauna, including ammonites, has been found in clay-carbonate concretions distributed as interlayers and small pods within the fine-grained siltstone in both river banks, 7.2 km from the river mouth.

In the Rost Brook section (layers 24, 25), the fauna has been found 3.6 km from the mouth of the stream, in fine-grained siltstone on the left bank, 10 m above the water edge (see fig. 1).

Cephalopods from layers 6026, 24, and 25 form a rich and varied assemblage. It includes the following species: Ammonoidea - *Yakutoceras aldanicum* Libr. in Popov, 1965, *Orulganites trianguliumbilicatus* (Popov), *Bisatoceras solominae* Popov, *Paraschrtimites sakhaensis* Sobolev sp. nov. (MS), *Syngastrioceras sp.*, *Glaphyrites sp.*; Nautiloidea - *Adnatoceras boreale* Sob. sp. nov. (MS).

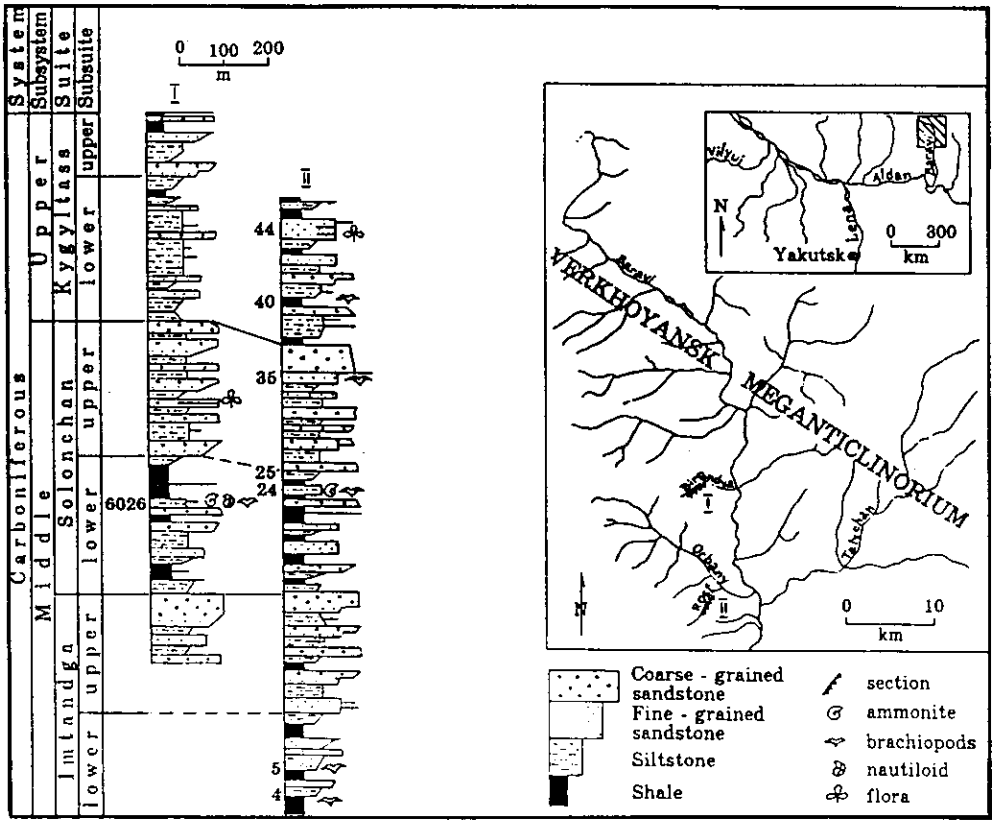

Fig. 1. Carboniferous type sections in the Upper Baraiy River.
6026, 4, 5, 24, 25, 35, 40, 44 - numbers of the layers.

Representatives from the endemic family of Orulganitidae prevail. The assemblage characterized by the broad-umbo species *Yakutoceras aldanicum* Popov, with triangle-like earlier volutions. This species, as well as the other Ammonoidea from this assemblage, indicate the presence of Bashkirian deposits corresponding to the *Yakutoceras-Aldanites* genozone. According to Andrianov (1985), this biostraton can be considered to be conventionally equivalent to the *Brannerоceras-Gastrioceras* genozone from the Bashkirian of the unified Carboniferous scale elaborated by Ruzhentsev and Bogoslovskaya (1971).

Within Siberia representatives of the assemblage (species of *Yakutoceras* and *Ogulganites*) are reliably identified in the lower Nataliinskaya Suite of Sette-Daban, at the base of the Yupencha horizon (Niolon Suite) of Orulgan (Ruzhentsev, 1975) and in the Carboniferous of the Omulevskoye uplift (Popov, 1970).

Not all scientists agree concerning the stratigraphy and age of the Solonchan Suite (Budnikov et al., 1991). In official document (Decision of the Second Interdepartmental Regional Stratigraphic Conference, 1978) the Solonchan Suite is attributed to Middle-Late Carboniferous, overlying the Kygyltas Suite.

However, brachiopods appear to be of great use in relating the local stratigraphic units to the regional scale and making position of the Solonchan Suite more clear. IN contrast to ammonoidea, their remains are more regularly distributed through the section, permitting their use not only as stratigraphic bench marks, but also for general characterization of litho-units and definition of boundaries. *Cancrinella alazeica* Zav., *Rhynchopora arctica* Lich. et Einor, *Rhynoleichus triangulatum* Abr. et Grig., *Alispirifer dmitrii* Abr. et Grig., as well as *Neochonetes cf. carboniferus* Keys, which are present in layers 24 (Rost Brook) and 6026 (Birandyn River), are also present in the lower Solonchan subsite (layers 24 and 25).

The above species have been described from the Natalinskaya-lowermost Ekachan Suites of southern Verkhoyanye (Abramov and Grigoryeva, 1983), and the Yupencha Suite of northern Verkhoyanye (Solomina, 1970). These data correlate with the Ammonoidea findings from the same level. The upper Solonchan subsuite (layer 35) contain the brachiopods *Verchojania cf. ursovi* Abr. et Grig., *Rhynchopora cf. arctica* Lich. et Einor, and *Verchotomia tukulaensis* (Kasch). All the listed species are characteristic of the Middle Carboniferous (Imtandzha, Yupenchas, and Natalinskaya Suites) of Verkhoyanye, and they demonstrate a probable Middle Carboniferous age for the Solonchan Suite as we. This is indirectly supported by the stratigraphic position of the Ammonoidea found. Accordingly, overlying deposits must be dated as Moskovian.

Along the Rost and Birandya Rivers brachiopods in the underlying Imtandzha Suite (*Muirwoodia martianovi* (Ser. in Lupina) - layers 4 and 5) and in the lowermost of the overlying Kygyltas Suite (*Taimyrella pseudodarwini* (Einor) layer 40) are consistent with the Middle Carboniferous age of the Solonchan Suite.

Plant remains point to this conclusion also. In the overlying Kygyltas Suite, layer 44 (see fig.1), S.G. Gorelova has identified *Angarodendron obrutschevii* Zal., *Demetria asiatica* Zal., *Stigmaria sp., Annularia cf. astericus* Zal., *Paracalamites crassus* Gorel., *Mesocalamites sp., Angaropteridium cardiopteroides* (Schm.) Zal., *A. cf. ligulatum* Neub., *Cardiopteridium cf. parvulum* (Schm.) Tschirk., *Cordaites sp., Rufloria subangusta* (Zal.)

S. Meyen, *R. theodorii* (Tschirk, et Zal.) S. Meyen, *R. derzavinii* (Neub.) S. Meyen, *Tschernovia sp.*, *Cardiocarpus krapivinoensis* Such., *Samaropsis tcheremitchkiensis* Such., *S. pauxilla* Zal., *S. auriculata* Neub., *S. tasichinii* Rassk., *S. cf. mungatica* Neub., *S. euryptera* Such., *S. cf. jurabaensis* Rassk., *Anarocarpus cf. ungensis* (Zal.) Radcz., *Rhabdocarpus (?) tomiensis* Zal., *Cardaicarpus tomiensis* Radcz., *Holcospemum (?) tchelchetensis* Such., *Carpolithus rastribormis* (Neub.) Parf. This assemblage is similar to the Mazurovsky and Alykaevsky horizon assemblages from Kuzbass and the Kata horizon assemblage from the Tunguska basin. This is the first time that some of the species have been found above the Mazurovsky horizon, however.

In summary, the Solonchan Suite is described and mapped in detail in the Baraiy River basin, and is assigned a Middle Carboniferous age based on Paleontological data. In the Lower Solonchan subsuite there is a traceable faunal horizon that contains ammonoidea and brachiopods corresponding to the Upper Bashkirian fauna from the east European scale. From this it can be concluded that the Imtandzha Suite was deposited during the first half of Bashkirian, whereas the Lower Kygyltas Suite is uppermost Middle Carboniferous to Upper Carboniferous in age.

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