OUTLINES OF THE SIBERIAN PLATFORM SEQUENCE STRATIGRAPHY IN THE LOWER AND LOWER MIDDLE CAMBRIAN (LENA-ALDAN AREA)

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ABSTRACT

The development of Cambrian reefal complexes on the inherited pre-Cambrian uplifts determined a subdivision of the Siberian Platform basin into three facies belts: western saliferous basin, eastern open shelf, and transitional reefal belt. Facies shifts which affected all belts emphasised the sequence and parasequence boundaries. The study of the stratotype area of the Russian Lower Cambrian stages (middle courses of the Aldan and Lena rivers) allowed us to distinguish four (third-order?) sequences spanning the Tommotian-lower Mayan interval. The sequence boundaries, except for the base of the Nemakit-Daldynian Stage, are restricted to intrazonal levels rather than to the boundaries between stages and even between zones. Such a relationship between biostratigraphic and sequential boundaries excludes significant chronostratigraphic hiatuses in the Siberian Early Cambrian time scale. This fact together with high fossil content, and good magnetostratigraphic, chemostratigraphic (C and Sr isotopes), and radiometric data show that stable cratons located at low latitudes keep a better record of events serving the chronostratigraphic basis. A special attention should be paid to the fact of the absence of a pronounced correlation between biostratigraphic and sequential events.

Key words: Lower Cambrian, sequence stratigraphy, Siberian Platform.

RESUMEN

El desarrollo de complejos arrecifales cámbricos sobre las elevaciones heredadas de tiempos precámbricos determinó la subdivisión de la cuenca de la Plataforma Siberiana en tres cinturones de facies: cuenca salina occidental, plataforma abierta oriental y cinturón arrecifal transicional. Los desplazamientos de las facies, que afectaron a los tres cinturones, enfatizaron los límites entre secuencias y parasecuencias. El estudio del área tipo de los pisos rusos para el Cámbrico Inferior (cursos medios de los ríos Aldan y Lena) nos ha permitido distinguir cuatro secuencias (probablemente de tercer orden) que abarcan el intervalo Tommotiense-Mayiense inferior. Excepto para la base del Piso Nemakit-Daldyniense, los límites de secuencia están restringidos a intervalos intrazonales más que a límites entre pisos o zonas. Este tipo de relaciones entre los límites bioestratigráficos y los secuenciales excluye la posibilidad de hiatos cronoestratigráficos significativos en la escala temporal para el Cámbrico Temprano de Siberia. Este hecho, junto con el rico contenido fósil y la abundancia de datos magneto y quimioestratigráficos (de isótopos de C y Sr) así como radiométricos, muestra que cratones estables situados a bajas latitudes guardan un mejor registro de eventos útiles para construir una escala cronoestratigráfica. En este sentido, hay que prestar especial atención a la ausencia de una correlación marcada entre eventos bioestratigráficos y secuenciales.

Palabras clave: Cámbrico Inferior, estratigrafía secuencial, Plataforma Siberiana.

INTRODUCTION

The Siberian Platform is one of the key regions for the study of the Cambrian. Fossiliferous, flat-lying platformal deposits cut out by multiple rivers and penetrated by boreholes are outlined in numerous publications which brought out an elaborated picture of Cambrian bio-, magneto- and chemical stratigraphy as well as facies analysis and ecological features of Cambrian organisms and communities. The Cambrian sections of the Siberian

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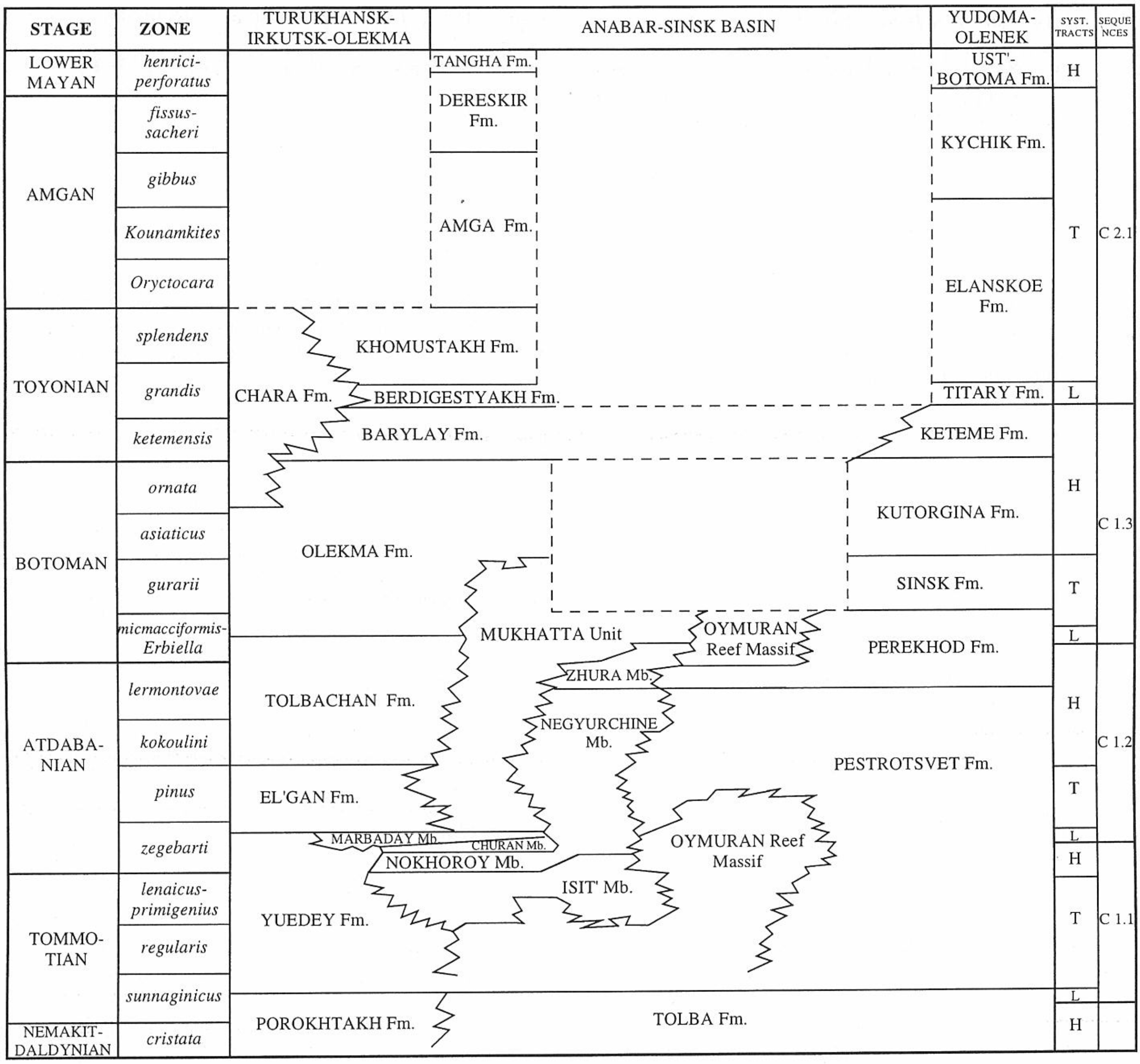

Figure 1. Lower and lower Middle Cambrian stratigraphic units, sequence stratigraphic and biostratigraphic frameworks of the southern Siberian Platform (Lena River middle courses basin). Time lines are horizontal but figure is not to scale. Keys for systems tracts: H=highstand; L=lowstand; T=transgressive.

Platform served as the basis for the Lower and Middle Cambrian stage and zonal time scale accepted in the former Soviet Union and now in Russia.

Palaeogeographic subdivision

The Lower and lower Middle Cambrian of the Siberian Platform has three major facies basins (Arkhangel'skaya *et al.*, 1960; Khomentovsky and Repina, 1965; Bobrov *et al.*, 1968; Savitsky *et al.*, 1972; Pisarchik *et al.*, 1975; Zhuravleva, 1979; Astashkin *et al.*, 1991).

The south-western Turukhansk-Irkutsk-Olekma Facies Basin was a region of dolostone, sulphate and common salt deposition. Limestones are scarce, consisting mainly of Tommotian and Atdabanian calcimicrobial reefs and trilobite-containing limestones deposited during transgression maxima. Evaporites progressively diminished eastward. Along the Lena River middle courses, these basin is spread out upstream Malykan village (Fig. 1).

The transitional Anabar-Sinsk Facies Basin is a relatively narrow tract of calcimicrobial-archaeocyathan reefs and skeletal or ooid calcarenites. It is about 200 km wide along the Lena River middle courses and narrows to the north-west, where it lies mostly in the subsurface (Shabanov *et al.*, 1987). This basin is subdivided into back reef shoal, reef barrier (core reef) and fore reef slope facies (Savitsky *et al.*, 1980; Varlamov and Sundukov, 1979). Along the Lena River middle courses, these facies occupy areas from Malykan village to the Mukhatta River mouth, from the Mukhatta River mouth to the Ulakhan-Taryng River mouth (Oymuran Reef Massif) and from the Ulakhan-Taryng River mouth to the Ulakhan-Kyyry-Taas River mouth, respectively (Fig. 1).

The Yudoma-Olenek Facies Basin occupies the eastern and north-western parts of the Siberian Platform and contains open marine carbonates. These facies are represented by Tommotian-Atdabanian red argillaceous limestone and mudstone, and Botoman-Amgan dark, bituminous limestone and chert with features of slope deposition (Gurari, 1945; Sukhov and Pereladov, 1979). However, Rozanov and Zavarzin (1997: fig. 2) do not exclude that this basin was a shallow dysaerobic semiclosed estuary during the middle Early-early Middle Cambrian time. Along the Lena River middle courses, this basin is spread out downstream the Ulakhan-Kyyry-Taas River mouth (Fig. 1).

Palaeogeographic facies distribution patterns suggest that the Anabar-Sinsk facies represented some sort of barrier complex separating the largely evaporitic facies in the west from deeper water, deep ramp and slope facies in the east (Astashkin *et al.*, 1984; Budnikov *et al.*, 1995).

Time scale

Despite facies contrasts, abundant and diverse fossils (over 1,200 species of about 500 genera) provided a firm basis for correlation between these belts at a zonal level. In addition, the Anabar-Sinsk and Yudoma-Olenek basins were peculiar by their diverse cosmopolitan elements.

The following formal stages are established on the Siberian Platform in ascending order: Tommotian, Atdabanian, Botoman, Toyonian (Lower Cambrian), Amgan and Mayan (Middle Cambrian). Recently, the informal Nemakit-Daldynian Stage (or its synonym Manykayan Stage) is commonly used as the lowermost Cambrian pre-Tommotian division. However, in Russia it is a correlative equivalent of the Rovno Horizon crowning the Vendian System. The Nemakit-Daldynian Stage may be correlated, at least in its upper part, with the basal Cambrian of Newfoundland where the Precambrian/Cambrian boundary stratotype occurs (Zhuravlev, 1995; see also Rozanov *et al.*, 1997). It should be emphasised that the lowermost Tommotian (*Nochoroicyathus sunnaginicus*) zone by its original as well as official definitions, that means including the uppermost metres of the Ust'yudoma Formation, Yudoma Group (Rozanov *et al.*, 1969; Spizharski, Ergaliev *et al.*, 1983; Spizharski, Zhuravleva *et al.*, 1986), is a partial equivalent of the uppermost Nemakit-Daldynian (*Purella cristata*) zone *sensu* Khomentovsky and Karlova (1993).

Except for the stratotype of the Nemakit-Daldynian Stage, all Lower and Middle Cambrian stage stratotypes mentioned above are established in the south-western Siberian Platform, in the Aldan Anteclise, along the Aldan (Tommotian Stage), Lena (Atdabanian and Toyonian stages), Botoma (Botoman Stage), Amga (Amgan Stage), and Yudoma and Maya (Mayan Stage) rivers. Thus, the stratotypes embrace the south-eastern Anabar-Sinsk Basin (Tommotian, Atdabanian, Botoman in part, Toyonian, and Amgan stages) and south-western Yudoma-Olenek Basin (Botoman in part and Mayan stages) (Savitsky *et al.*, 1980).

SEQUENCE RECONSTRUCTION

Pre-Tommotian hiatus

Within the stratotype area of the Tommotian Stage (Aldan River middle courses), the basal layers of the lowermost Tommotian (*sunnaginicus*) zone are restricted to the uppermost 1.5-2.0 m of the Ust'yudoma Formation where the first diagnostic Tommotian fossil assemblage occurs in glauconitic shelly grainstone known as Bed 8 (Rozanov *et al.*, 1969: 27). Commonly the origin of this layer is explained by the subsequent impregnation of the grainy material from the overlying Pestrotsvet Formation along karstic fissures developed on the Ust'yudoma surface during the pre-Pestrotsvet time (e.g., Khomentovsky and Karlova, 1993). In turn, this suggestion brought about a developed hypothesis on a sizeable sub-Tommotian hiatus in south-western Siberia (Knoll, Grotzinger *et al.*, 1995; Knoll, Kaufman *et al.*, 1995; Brasier *et al.*, 1996; Kaufman *et al.*, 1996).

First of all, Bed 8 is a layer continuous over two hundred metres (and not "for a few metres along strike", cf. Khomentovsky and Karlova, 1993: 42) without any features of karstic sinks and fissures connecting it with the Pestrotsvet Formation but with distinct cross-lamination (Fig. 2). Similar microfacies are common in the upper Ust'yudoma Formation within entire southern Anabar-Sinsk and south-eastern Yudoma-Olenek basins (Fedorov, 1982; Khomentovsky *et al.*, 1990) which is accumulated during a highstand tract. Small shelly fossils are not restricted to the glauconitic grainstone but are present in overlying and underlying mudstones (Fedorov *et al.*, 1992: 16). In addition, the observed faunal, microfacies, geochemical, mineralogical, and isotopic differences between Bed 8 and basal Pestrotsvet Bed 12 (Ivanovskaya, 1980; Ivanovskaya and Tsipursky, 1982; Nazarov *et al.*, 1983; Magaritz *et al.*, 1986; Fedorov *et al.*, 1992) do not allow us to explain the origin of Bed 8 by karstic processes.

The suggestions about a sizeable pre-Tommotian hiatus are based on carbon isotopic correlation of northern Siberian sections with southern Siberian ones and some theoretical suggestions concerning rates of speciation (Knoll, Grotzinger *et al.*, 1995; Kaufman *et al.*, 1996). Pure isotopic correlation can not be accepted as reasonable one because even adjacent sections of the same basin are characterised by a difference in the magnitude and number of isotope excursions comparable with that in remote parts of the region (e.g., cf. plots on Kirschvink *et al.*, 1991: fig. 2; or on Brasier *et al.*, 1994: figs. 6, 7 and 8; and on Kaufman *et al.*, 1996: fig. 9). Neither the claim on the simultaneous appearance of "more than 100 species" in basal Tommotian rocks of south-eastern Siberia (Kaufman *et al.*, 1996: 517) can be

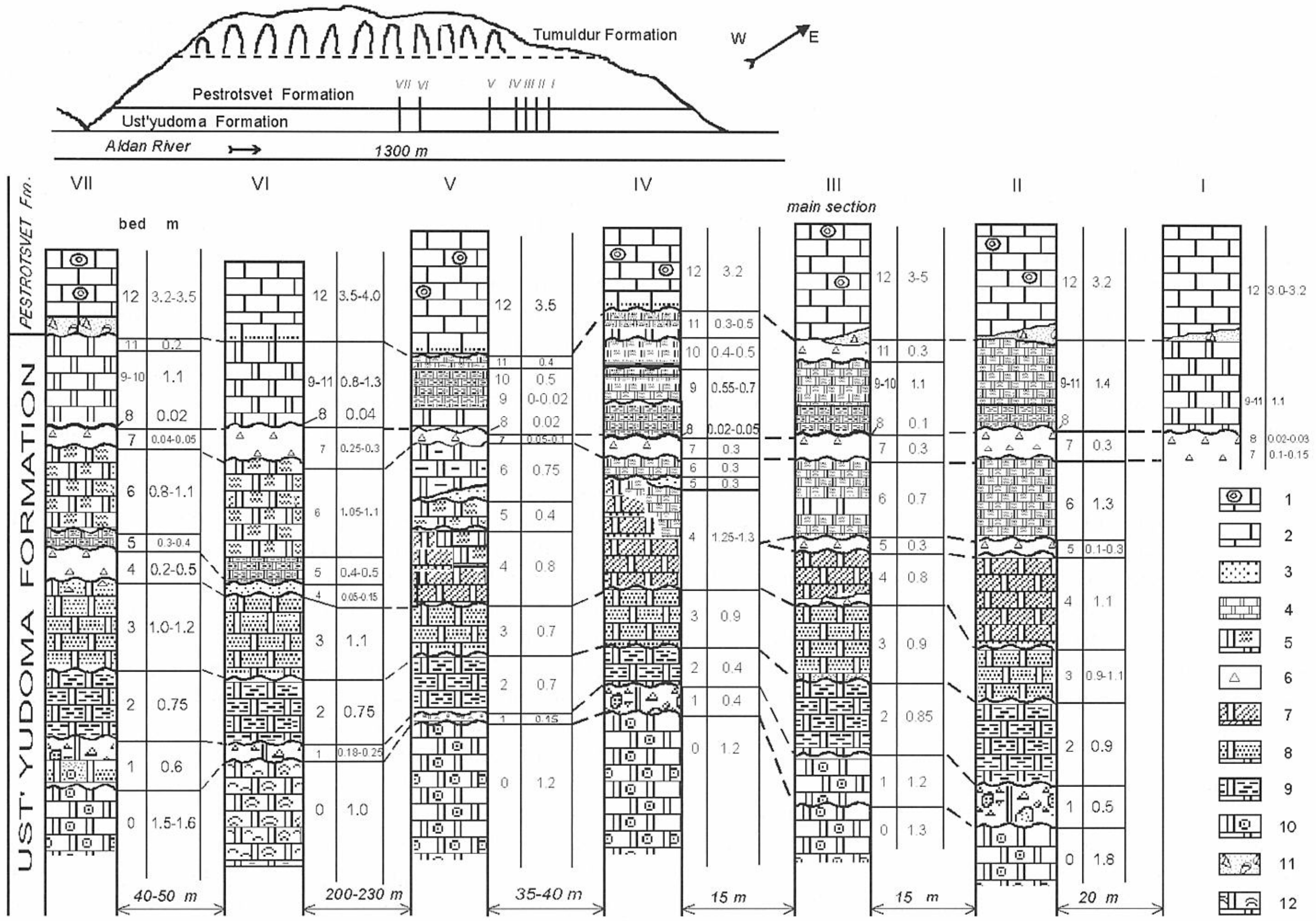

Figure 2. Lithology of the boundary strata of the Ust'yudoma and Pestrotsvet formations in the Ulakhan-Sulugur section, Aldan River middle courses, southern Siberian Platform. Bed 8 of section IV is the stratotype of the Tommotian Stage lower boundary; Bed 12 corresponds to the Sunnagin Member of the Pestrotsvet Formation; beds 8-12 correspond to the *Nochoroicyathus sunnaginicus* Zone of the Tommotian Stage. 1=Archaeocyathan reefal limestone. 2=Greenish mudstone-wackestone. 3=Glauconitic packstone. 4=Parallel-laminated dolomitic mudstone. 5=Cryptomicrobial laminated dolostone. 6=Dolomitic flat-pebble intraclast. 7=Cross-laminated dolomitic grainstone. 8=Dolomitic grainstone. 9=Argillaceous dolomitic mudstone. 10=Cross-laminated oolitic grainstone. 11=Shelly floatstone. 12=Stromatolitic dolostone.

accepted. The list of species compiled by Khomentovsky and Karlova (1993) contains indeed 113 species but in the entire southern Siberia (several thousand square km) and not in a single section. A number of them are synonyms (e.g., *Coleolella billingsi* and *Spinulitheca billingsi, Archaeospira regularis* and *Yangtzespira regularis,* and *Mellopegma indecora* and *Anabarella indecora*, respectively, are objective synonyms; and *Egdetheca aldanica* is a junior synonym of *Exilitheca multa* even according to the authors of these taxa, Val'kov *et al.*, 1983: 69). On the second hand, these species do not appear simultaneously and some authors recommend to subdivide the *sunnaginicus* Zone into 2-3 separate zones distinct by their fossil assemblages (Pel'man *et al.*, 1990). Thirdly, rates of speciation have to be counted for the entire Tommotian interval to see their distinctness or indistinctness from the Nemakit-Daldynian/Tommotian boundary interval. For instance, the speciation rates of archaeocyaths are higher at the *sunnaginicus/regularis* Zone boundary rather than at the Nemakit-Daldynian/Tommotian boundary (Zhuravlev and Wood, 1996: fig. 2A). Finally, if pre-Tommotian hiatus could be indeed observed on the Olenek Uplift and western Anabar Area (Knoll, Grotzinger *et al.*, 1995; Knoll, Kaufman *et al.*, 1995; Kaufman *et al.*, 1996), this would not be the case for the Aldan Anteclise and north-western Siberian Platform (Igarka Area). In the later area, along the Sukharikha River, a sequence, which is very similar to the Aldanian one, is observed. Here highstand tract deposits of the uppermost Sukharikha Formation contain a typical *sunnaginicus* assemblage of archaeocyaths and small shelly fossils which continues to occur in the overlying transgressive deposits of the reddish Krasny Porog Formation (Rozanov *et al.*, 1969: 48). The same is probably true for the Yudoma-Maya Area of the Yudoma-Olenek Basin where the Pestrotsvet Formation conformably lies on the Ust'yudoma Formation (Khomentovsky *et al.*, 1990).

Sequence C1.1

Thus, the claimed pre-Tommotian hiatus is actually within the *sunnaginicus* Zone and is related to the Ust'yudoma/Pestrotsvet Formation boundary which shows features of unconformity including karst-related dissolution features (Khomentovsky and Karlova, 1993). On the Lena River (Isit' section), the uppermost Tolba Formation, which is a correlative equivalent of the Ust'yudoma Formation, bears desiccation-cracked polygons at the bedding plane in microbially laminated dolostone. The biostratigraphic correlation of this hiatus with a similar one over the Anabar Area (Manykay/ Medvezh'ya contact) and Igarka Area (Sukharikha/ Krasny Porog contact) implies a type I unconformity for the base of sequence C1.1.

The sequence C1.1 begins in the Aldan River from the transgressive open-marine limestones of the Pestrotsvet Formation represented by the basal unit (Sunnagin Member) of dolomitic ooid grainstone and shelly grainstone, packstone and wackestone incorporating small rare archaeocyathan-calcimicrobial framework reefs (Riding and Zhuravlev, 1995) and reddish argillaceous mudstone and wackestone with larger calcimicrobial-archaeocyathan and archaeocyathan-calcimicrobial reefs representing a subtidal, low energy, open-shelf environment.

In the Lena River, similar reddish reef-bearing deposits (Oymuran Reef Massif) transgressively overlie Nemakit-Daldynian to lowermost Tommotian Tolba Formation dolostone. Typical sediments are centimetre-scale interbedded, slightly dolomitic, argillaceous mudstone to calcareous siltstone. Red argillaceous sediments contain numerous trace fossils including *Rhizocorallium, Chondrites* (which are indicative of subtidal *Cruziana* ichnofacies) and, in the Atdabanian part, *Plagiogmus* (Rozanov and Sokolov, 1984). Grey, yellowish or reddish calcareous beds are richer in bioclasts (wackestone to floatstone) including large archaeocyath cups and plates, hyoliths, chancelloriid sclerites, brachiopods, hexactinellid spicules, other small shelly fossils, mesoclots as well as occasional burrows. Rounded flat-pebbled intraclasts up to 1-2 cm in diameter and composed of burrowed hyolith mudstone or micrite are common. Large hyoliths form packstone lags in which they are typically current aligned. All bioclasts except archaeocyaths and mesoclots are generally neomorphosed to microspar and fine pseudospar. Glauconite is minor. Some thin (1 cm) beds are cross-laminated. These burrowed, rippled and cross-laminated sediments were collectively deposited in wholly shallow shelf, subtidal environments that were episodically affected by storm reworking producing hummocky cross-stratification and alternating laminated-burrowed units. Such sediments are interpreted as the transgressive systems tract of the overall Pestrotsvet Formation (Tommotian-lowermost Atdabanian) sequence (Kruse *et al.*, 1995). In the core reef facies, the transgressive tract is expressed in the retrograding of reddish argillaceous mudstone of the Yudoma-Olenek Basin and in the weakening of the reef-building. In the Turukhansk-Irkutsk-Olekma Basin, Yuedey Formation was accumulated which was lithologically very similar to the Pestrotsvet Formation but more dolomitic.

In the back-reef facies, an Atdabanian Nokhoroy Member of grainstones and wackestones, intensively burrowed and less argillaceous than underlying sediments, begins the highstand tract. The most typical of this member are *Aulophycus* facies. The geopetal structures with blocky calcite cement and distinct dolomitized wall lining prove that these were open burrow systems. These *Ophiomorpha*-like trace producers (*Aulophycus*) occupied shifting lime muds in shoal agitated lagoonal conditions (Morrow, 1978; Zhuravlev, 1996). In addition, the Nokhoroy Member bears burrowed wackestone containing meshes of *Girvanella* filaments intercalating within burrowed and microbially laminated lime mudstone and tidal-bedded dolostone (Debrenne and Zhuravlev, 1996), which reveal schizohaline pond deposits of intertidal flats (Pratt *et al.*, 1992). Succeeding Churan Member through cross-bedded oolite with local tepees is thought to represent ooid-shoal highstand system tract deposition (Kruse *et al.*, 1995). On the Aldan River, the highstand tract is represented by argillaceous wavy laminated and blocky dolostone of the lagoonal (?) Tumuldur Formation. Core-reef are expressed by a new progradation of the Oymuran Reef.

Sequence C1.2

The lower Atdabanian Marbaday Member consists of *Girvanella* boundstone, grainstone and finely crystalline peritidal dolostone with desiccation cracks and fenestrae. It shows some features of karst (Varlamov and Sundukov, 1979; Khomentovsky and Gibsher, 1983) and represents the lowstand tract deposits of the sequence C1.2. The Overlying El'gyan Formation includes weakly bituminous dolostone (Varlamov and Sundukov, 1979) and corresponds to the transgressive tract deposits in the Turukhansk-Irkutsk-Olekma Basin. In its innermost area, saliferous deposits gave place to calcimicrobial reefs of the Osa Horizon (Mel'nikov *et al.*, 1989).

In the back-reef facies, middle-upper Atdabanian Negyurchine and Zhura members are highstand tract lithological equivalents of the Nokhoroy and Churan members, respectively. However, there are numerous layers rich in *Epiphyton* and *Renalcis*, and several levels of prolate bioherms in the Negyurchine Member.

Core-reef and fore-reef facies are represented during the highstand tract by the Perekhod Formation members I to III. These members are built of multiple shelf shoaling up cycles of thin bedded grey argillaceous mudstone at the bottom and of *Epiphyton*-type (mostly *Gordonophyton* and *Tubomorphophyton*) prolate biostromes consisting of numerous distinct kaliptrae (0.2-1.0 m in diameter) at the top. Towards the Yudoma-Olenek Basin biostromes pinchout. In the Turukhansk-Irkutsk-Olekma Basin, the Tolbachan Formation comprises the highstand tract. It consists of dolomitic stromatolites with subordinated flat-pebble conglomerate, grainstone and ooid shoals (Varlamov and

Sundukov, 1979). In the innermost part of the basin, common salts of the Bel'sk Formation were accumulated (Astashkin *et al.*, 1993).

Sequence C1.3

To the west of the Oymuran Reef Massif, the Mukhatta Unit (lower Botoman) represents subtidal deposits of the next sequence in the back-reef facies (Varlamov and Sundukov, 1979). The lowstand tract deposits within the Oymuran Reef Massif are characterised by conglomerate and grainstone formed during the reef reworking. In the Turukhansk-Irkutsk-Olekma Basin, the lowstand tract is represented by the uppermost Tolbachan Formation. In the Yudoma-Olenek Basin, the lowstand tract deposits are represented by yellow peritidal dolostone with fenestrae in the lower part of Member IV (lower Botoman) of the Perekhod Formation (Marker Bed "v"-"g" of Khomentovsky and Repina, 1965).

The uppermost Perekhod Formation and overlying Sinsk Formation compose the transgressive tract with the maximum flooding surface (parasequence boundary) at the base of the Sinsk Formation. Some beds of the uppermost Perekhod Formation and the entire Sinsk Formation microfacies include bituminous limestone, chert, and argillaceous, siliceous, or calcareous, sapropelic black shales. All lithologies contain abundant syngenetic framboidal pyrite and C_{org} (up to 17.2% in shales; Zelenov, 1955). The shales commonly show no bioturbation and well-expressed even, submillimetric lamination consisting of an alternation of light calcite and brown clay-rich laminae. The calcitic laminae contain pellets, intraclasts and abundant monospecific acritarchs of *Micrhystridium* group. The clay-rich layers contain finely disseminated organic matter. All this petrologic features as well as features of dysaerobic biota suggest anoxic conditions occurred during the accumulation of the formation (Zhuravlev and Wood, 1996). There are debris flows in the Sinsk Formation in the Achchagyy-Tuoydakh section. The distinctive reefal facies of this age are not proved. In the Turukhansk-Irkutsk-Olekma Basin, the lowstand tract is represented by the lowermost dark mudstone of the Olekma Formation.

Highstand tract deposits are alike in all three basins. Their upper Botoman part are represented by the upper Olekma and Kutorgina formations and the lower Toyonian part consists of lower Chara, Barylay and Keteme formations (from West to East) (Varlamov and Sundukov, 1979). The Kutorgina Formation shows a shoaling trend from facies typical of the underlying Sinsk Formation in its base to small calcimicrobial-archaeocyathan reefs in its top, and the Olekma Formation changes upwards from dolomitic mostly mudstone to dolomitic gravelstone and sandstone (Varlamov, 1982). The upper set of formations indicate the progradation of lagoonal facies into the Anabar-Sinsk Basin and back-reef facies onto shelf, respectively. The back-reef Keteme Formation is composed mostly of *Aulophycus* facies characterised above (Astashkin, 1985).

Sequence C2.1

Middle Toyonian lowstand tract is indicated by a very distinct yellow cavernous (after anhydrite-gypsum dissolution) peritidal dolostone prograding far towards the East (middle Chara, Berdigestyakh and Titary formations) in the Anabar-Sinsk Basin. In the distal part of the Yudoma-Olenek Basin, this interval is characterised by condensed deposits of the Kuonamka Formation with hiatal surfaces (Bakhturov *et al.*, 1988). Soluble potash salts were accumulated in the innermost Turukhansk-Irkutsk-Olekma Basin (Chechel' *et al.*, 1981) indicating that this basin subjected to nearly complete desiccation (James and Kendall, 1992). The transgressive tract began from the spreading of reefal facies (upper Toyonian-lower Amgan Khomustakh, Amga and Elanskoe formations) westwards and culminated in the accumulation of widespread black shales in the Yudoma-Olenek Basin and the Kychik Formation chert and bituminous limestone in the Anabar-Sinsk Basin during the late Amgan time (Sukhov and Pereladov, 1979; Evtushenko, 1982). The lower Mayan highstand tract characterised by formation of subaerial plain in the Turukhansk-Irkutsk-Olekma Basin (Budnikov *et al.*, 1995), formation of the "filling complex" (e.g., argillaceous mudstones of the Ust'-Botoma and Chaya formations) in the Yudoma-Olenek Basin (Sukhov and Pereladov, 1979), and replacing of calcimicrobial (*Gordonophyton*) microframestones (Dereskir Formation) by mostly thrombolites (Tangha Formation) in the Anabar-Sinsk Basin.

CONCLUSIONS

1. Four sequences are recognised in the Lower and Middle Cambrian stage stratotype area of the Siberian Platform, in ascending order, lower Tommotian-lower Atdabanian sequence C1.1, lower Atdabanian-lower Botoman sequence C1.2, lower Botoman-middle Toyonian sequence C1.3 and middle Toyonian-lower Mayan sequence C2.1.

2. The stage boundaries do not coincide with sequence boundaries. The base of sequence C1.1 is within the *Nochoroicyathus sunnaginicus* Zone of the Tommotian Stage. The C1.1/C1.2 sequence boundary is within the *Retecoscinus zegebarti* Zone of the Atdabanian Stage, the C1.2/C1.3 sequence boundary is within the *Bergeroniellus micmacciformis-Erbiella* Zone of the Botoman Stage, and the C1.3/C2.1 sequence boundary is within the *Lermontovia grandis* Zone of the Toyonian Stage. The maximum flooding surface of the sequence C1.3, however, coincides with the base of the *Bergeroniellus gurarii* Zone (early middle Botoman Stage).

3. Remarkably, that C1.1/C1.2 sequence boundary distinguished on the southern Siberian Platform is biostratigraphically correlated with C1.1/C1.2 sequence boundary recognised in Eastern Officer and Arrowie basins of South Australia and sequence C2/C3 sequence boundary revealing in the Amadeus Basin of central Australia (Gravestock and Hibburt ,1991; Lindsay *et al.*,

1993; Zhuravlev and Gravestock, 1994). Also, the Siberian sequence C1.3/C2.1 boundary can be correlated with the Australian sequence C1.3/C2.1 boundary. Thus, both these intervals may express global sea level changes. In the second case, this is the Toyonian or Hawke Bay regression.

4. In general, the Siberian Platform was a large epeiric platform during the Cambrian. The facies profile indicates that during the accumulation of the sequences C1.1 and C1.2, the eastern (in modern coordinates) slope of the Siberian Platform developed as a distally steepened ramp in terms of Read (1981). The ramp turned into a rimmed carbonate shelf with accretionary margins at the beginning of the sequence C1.3 and shortly afterwards, during the transgressive tract deposition, it represented a drowned platform. Although the drowning was incipient and the platform became submerged to depths within the euphotic zone because abundant fleshy algae and cyanobacteria preserved in rocks representing the time of maximum flooding (Zelenov, 1955; Zhuravlev and Wood, 1996). The first two stages of the platform evolution were recognised by Astashkin *et al.* (1984) as "biohermal massif" and "mature reef" stages, respectively. During the rest of the accumulation of sequence C1.3 and following sequence C2.1, the drowned platform turned back into a rimmed shelf and, finally, at the end of the sequence C2.1, when filling complex accumulated, into a homoclinal ramp.

5. The transgressive tract facies contain the most cosmopolitan fauna, which are eodiscids (e.g., *Calodiscus, Lenadiscus*) in the sequence C1.3 and agnostids in the sequence C2.1 (*Triplagnostus gibbus* and *Tomagnostus fissus-Paradoxides sacheri* zones of the Amgan Stage). These levels possess the highest global correlative potential.

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