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EARLY CRETACEOUS MICROPHYTOFOSSILS FROM THE ANABAR BAY REGION (NORTH SIBERIA)

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ABSTRACT. The present report is concerned with palynological analysis of Valanginian aged deposits from the Anabar Bay section. The results of palynological investigation have allowed the determination of three aged dinocyst zones, which are calibrated against macro- and microfauna scales and standard dinocyst zonation developed for Western Asia areas of Russia. These dinocyst assemblages display significant similarity with those from Arctic regions of Russia and Canada, but differ from European ones. All palynological assemblages contained adundant spore and pollen grains, the composition of which allow the examinator of the Anabar Bay region as a part of the Siberian paleofloristic province. Taxonomical fluctuations of microphytofossils may be related with paleoenviromental changes in the paleobasin.

KEY WORDS: Lower Valanginian, nothern Siberia, palynological zonation, biostratigraphy, paleoenviroments

INTRODUCTION

The investigated section of the marine Valanginian is exposed in the eastern coast of Anabar Bay and a single outcrop of marine sediments of about 120 m thicknest (Fig. 1). The first lithological occurs as description and stratigraphic subdivisions were proposed by the research group headed by Saks (1963). Subsequently Bogomolov and Plotnikov (Bogomolov 1989) restudied the Anabar Bay sequence. Although detailed lithological, biogeochemical and macrofauna analyses were carried out, no palynological data were obtained previously.

All samples used in this study were kindly provided by Bogomolov. They were rather rich in palynomorphs of different, mostly moderate, degree of preservation, containing abundant spores, pollen of Gymnospermae as well as diverse dinocysts, acritarchs, green algae and prasinophyts. Spores and pollen grains were predominant in all palynological assemblages. Subdivision have been based upon microphytoplankton, mainly upon dinocysts.

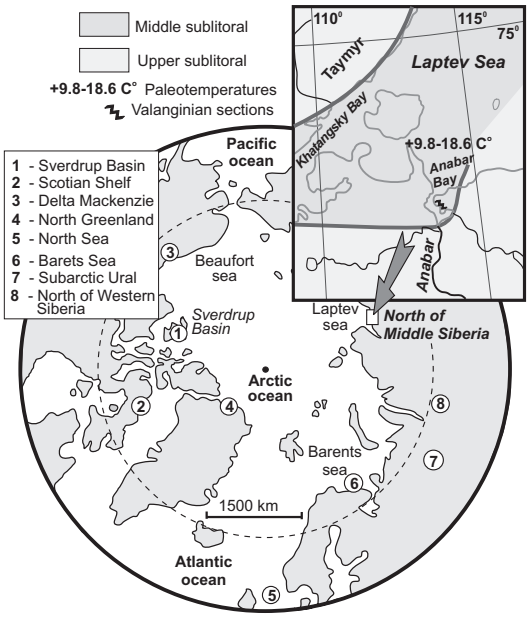

Fig. 1. Location of Anabar bay section (North of Middle Siberia) and paleogeographic reconstruction in Early Valanginian (Zakharov & Yudovny 1974)

BIOSTRATIGRAPHY

Three dinocyst local zones have been established using first and last appearance as well as abundance and variety of some species. The calibration of dinocyst local zones against macro- and microfossil scales is represented on Fig. 2.

Pareodinia spp. Assemblage Zone

Characteristic assemblage. Characteristic taxa: *Paragonyaulacysta capillosa* (Brid. et Fish.) Lent et Will., *Pareodinia arctica* Wigg., *P.* o*smingtonensis* (Sarjeant) Wigg., *Wallodinium* sp., *Fromea* sp., *Chlamydophorella* spp. Group of *Escharisphaeridia-Sentusidinium* as well as *Cleistosphaeridium* spp. are common. Rare acritarchs are represented by acanthomorph

Substage	Biostratigraphic subdivision of Lower Valanginian of the North Middle Siberia				
	Ammonite zones	Belemnite zones	Bivalve zones	Forams zones	Dinocysts zones
	(Zakharov et al. 1997)				
LOWER VALANGINIAN	*Beani*	*Cylindroteuthis harabylensis*	*Buchia keyserlingi*	*Cribrostomoides infracretaceous*	*Aldorfia sp. A.*
	Ramulicosta				
	Astieriptychus			*Valanginella tatarica*	*Dingodinium spp.-Trichodinium speetonese*
	Quadrifidus	*Acroteuthis chetae*			
	Klimovskiensis		*Buchia inflata*		*Pareodinia spp.*

Fig. 2. Calibration of dinocyst zones against Valanginian autonomous parallel zonal scales of the Northern Middle Siberia

species of *Micrhystridium* and *Poligonium*. In general this assemblage is dominated by prasinophyts of *Leiosphaeridia* group.

Boundaries. Base: the occurrence of characteristic assemblage of dinocysts.

Type locality. Anabar Bay region (northern Siberia), outcrop 1A, layers 1–2 (10.8 m), comprising of dark blueish grey aleurolitic claystones with sand laminas and calcareous nodules.

Distribution. Anabar Bay region.

Calibration. Lower part of *Tollia (Neotollia) klimovskiensis* ammonite Zone.

Geological age. Earliest Early Valanginian.

Dingodinium spp. – *Trichodinium speetonense* Davey Assemblage Zone

Characteristic assemblage. Age diagnostic taxa include *Oligosphaeridium deluculum* Dav., *O. complex* (White) Dav. et Will., *Sirmiodinium grossi* Alb., *Nelchinopsis kostromiensis* (Vozzh.) Wigg., *Wallodinium krutzschii* (Alb.) Habib. Group of gonyaulacacean dinocysts becomes more diverse, comprising *Cribroperidinium* spp., *Leptodinium* spp., *Trichodinium* spp. and others. Golocavate forms, represented by *Chlamydophorella* spp. and *Dingodinium* spp., are common as well as *Escharisphaeridia-Sentusidinium* group. *Leiosphaeridia* group dominates in this assemblage.

Boundaries. Base: reduction of *Pareodinia* diversity, occurrence of characteristic species: *Oligosphaeridium deluculum, O. complex, Dingodinium albertii* Sarj., *D. cerviculum* Cook. et Eis., *Trichodinium speetonense*. Unsampled 3d layer could be considered whether a part of *Pareodinia* spp. or *Trichodinium speetonense – Dingodinium* spp. zone. Therefore a boundary has been conditionally established at the top of 2nd layer.

Type locality. Anabar Bay region (northern Siberia), outcrop 1A, layers 3–11 (55.2 m), which are represented by grey aleurolitic claystones with calcareous nodules.

Distribution. Anabar Bay region.

Calibration. Uppermost part of *Tollia (Neotollia) klimovskiensis* zone, *Propolyptychites quadrifidus* Zone and lower part of *Astieriptychites astieriptychus* Zone.

Geological age. Early Valanginian.

Aldorfia sp. A. Assemblage Zone

Characteristic assemblage. *Cassiculasphaeridia reticulata* Dav., *Gonyaulacysta cassidata* (Eis. et Cook.) Sarj., *G. helicoidea* (Eis. et Cook.) Sarj., *Microdinium* sp., *Chlamydophorella nyei* Cook. et Eis. are charecteristic feature of the assemblage, with *Cleistosphaeridium* spp., *Escharisphaeridia-Sentusidinium* group and *Leiosphaeridia* spp. remaining common. Acritarchs are enriched with some species of *Michrystridium, Veryhahium* and others.

Boundaries. Gradual transition from previous zone have been observed throughout the interval of samples 16–19, so the boundary has been conditionally established at the top of 18th layer with the occurrence of specific dinocyst assemblage: *Gonyaulacysta cassidata, G. helicoidea, Cassiculasphaeridia reticulata, Microdinium* sp., *Batioladinium* sp. and others.

Type locality. Anabar Bay region (nothern Siberia), outcrop 1A, layers 12–21 (56.7 m): layers 12–13 are represented by grey aleurolitic claystones with calcareous nodules, 19 – by grey sandstones with calcareous nodules, 20 – by sandy aleurolite with sandy laminas, 21 – by grey oblique laminated sandstones.

Distribution. Anabar Bay region.

Calibration. Upper part of *Astieriptychites astieriptychus* Zone, *Sibirites ramulicosta* zone (subzones *Ramulicosta* and *Beani*).

Geological age. Late Early Valanginian.

Dinocyst local zones established for Anabar Bay region are compared most closely with those from Subarctic Ural (Lebedeva & Nikitenko 1998) and nothern areas of Western Siberia (Lebedeva & Pestchevitskaya 1998).

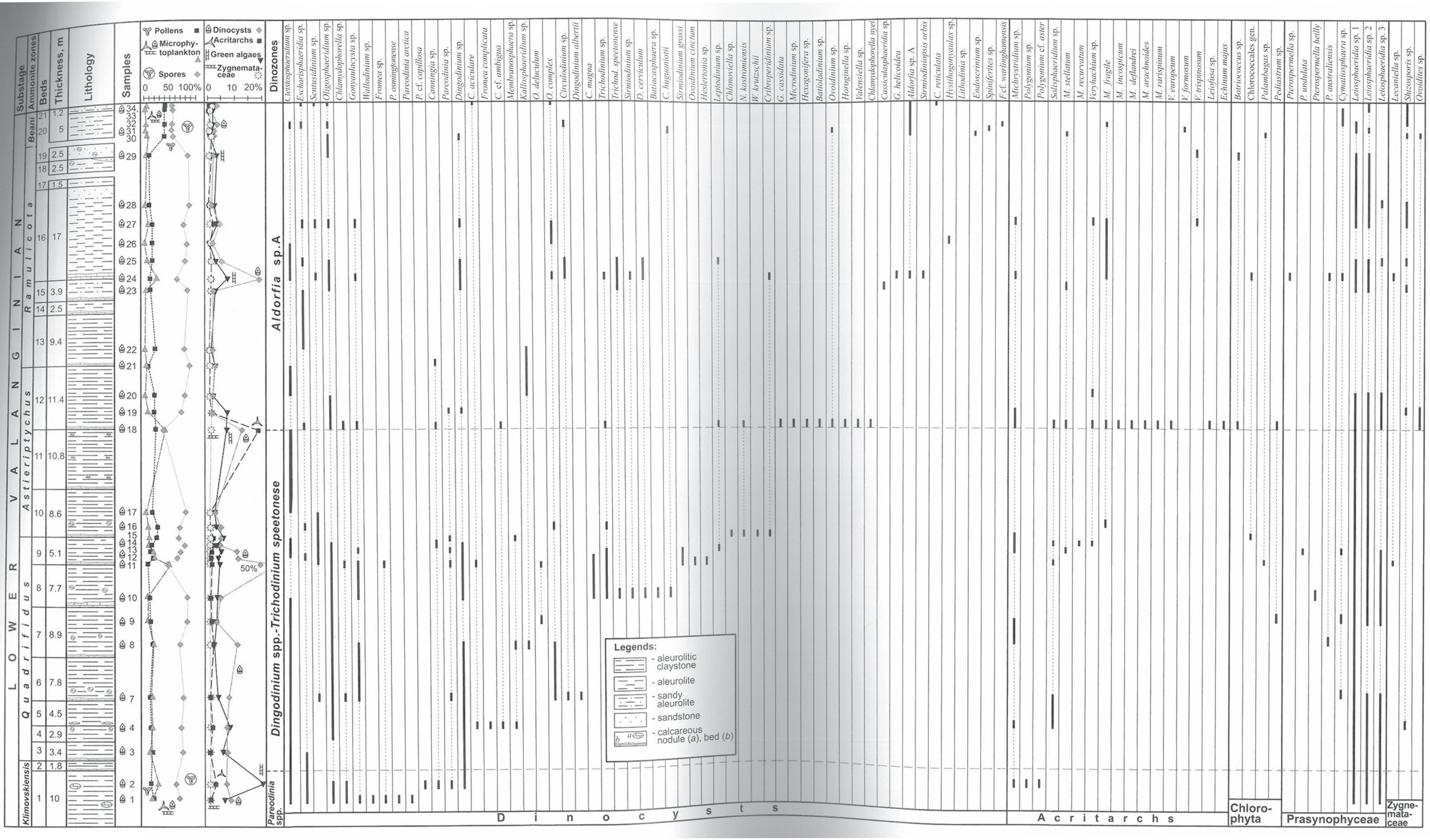

Fig. 3. Microphytofossils distribution and dinocyst ranges in Valanginian section from Anabar Bay

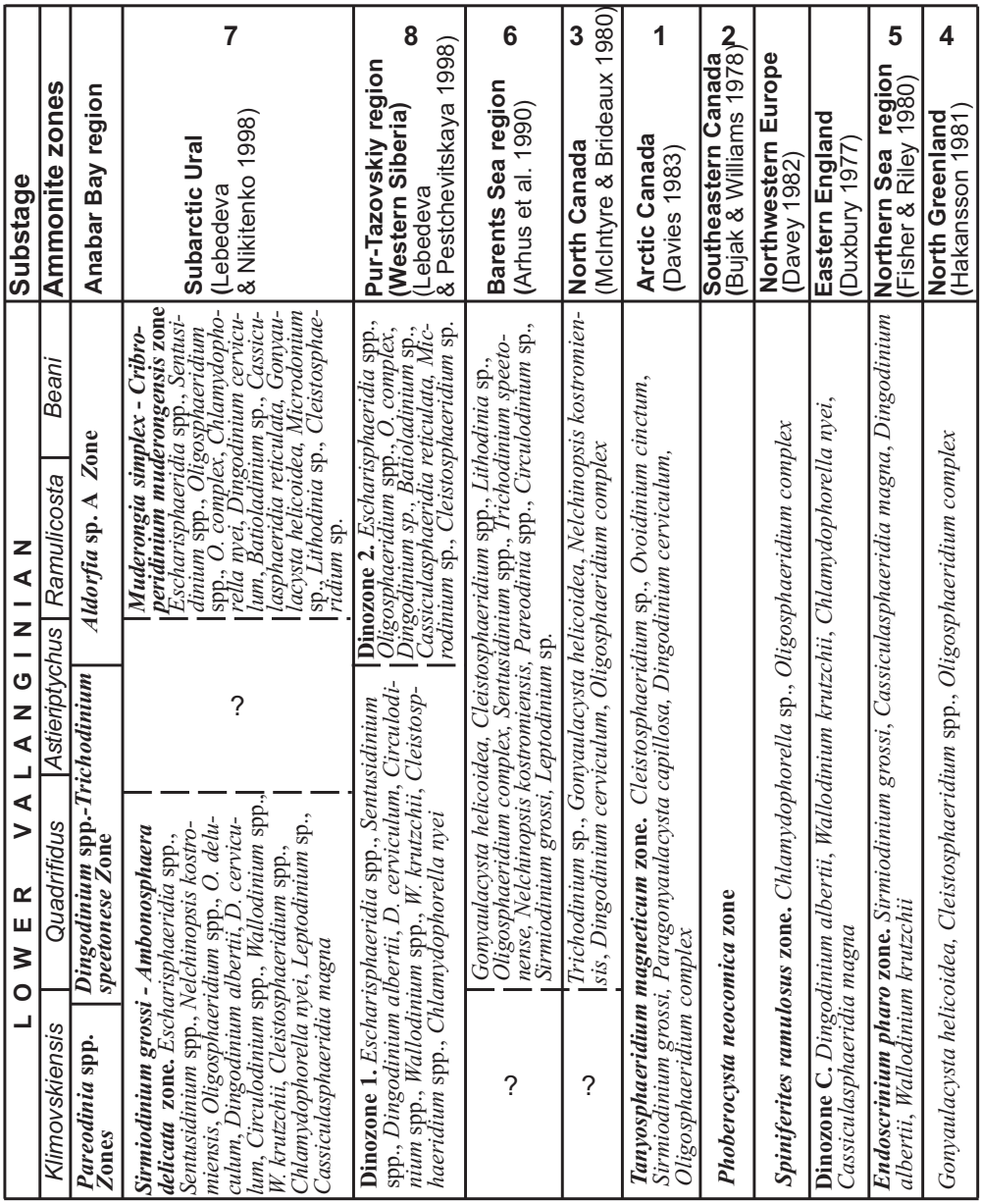

Fig. 4. The correlation of dinocyst zones (list of taxa, similar with Anabar assemblages)

In the Anabar Bay region a continuous Valanginian sequence can be observed, while in Subarctic Ural section the boundary between dinocyst zones are not determined (Fig. 4).

Dinocyst assemblages from Anabar Bay region show similarity with those from the Arctic and Northern Canada, northern areas of Western Europe, Greenland and the Barents Sea, including *Oligosphaeridium complex, Wallodinium krutzschii, Dingodinium albertii, D. cerviculum, Gonyaulacysta helicoidea.* However dinocyst assemblages from Arctic Canada and Northern Europe are slightly different, being richer and often dominating by chorate species of *Achomosphaera, Kleithriasphaeridium, Cyclonephelium* and others.

Spore-pollen assemblage is dominated by smooth spores of the *Cyathidites-Leiotriletes* group, including the following taxa: *Cyathidites minor* Coup., *C. australis* Coup., *Biretisporites* spp., *Dyctiophyllidites* spp. and others. Spores of ferns and mosses also comprise abundant *Osmundocidites* spp. (*O. kolpasheviensis* Klim., *O. longirimosus* Klim., and oth.; 10–15% in whole); various *Cicatricosisporites* spp. (*C. australiensis* Pot. et Gel., *C. ludbrooki* Dett., and oth.; 3–5%), *Stereisporites* spp. (*S. antiquasporites* (Wils. et Web.) Dett., *S. congregatus* Bolch.) Schlz., 3–4%). A diverse *Trilobosporites-Impardecispora* group (2–5%) contains *Concavissimisporites variverrucatus* (Coup.) Bren., *Ligodiumsporites granulatum* E.Iv., *Ligodiumsporites japoniciforme* E.Iv., and many others. Species of *Lycopodiumsporites* (1–2%), *Concavisporites* (1–3%), *Densoisporites* (1–2%), *Klukisporites* (0–2%) are common. Rare spesiments of *Undulatisporites* sp., *Todisporites minor* Coup., *Staplinispor-*

ites sp., *Taurocusporites minor* Singh., have been observed. The characteristic feature of the assemblage is a presence of *Foraminisporis wonthaggiensis* (Cook. et Dett.) Dett., *Ceratosporites equalis* Cook. et Dett., *Aequitriradites verrucosus* (Cook. et Dett.) Dett., *A. spinulosus* (Cook. et Dett.) Dett., *Rouseisporites* spp., which are useful for age determination. Pollen grains of Gymnospermae are represented by predominantly poorly preserved Coniferales (5–20%); common *Ginkgocycadophytus* spp. (3–6%), *Classopollis* spp. (1–4%), *Piceapollenites* spp. (1–2%), *Pinuspollenites* spp. (1–9%), *Podocarpidites* spp. (1–3%); rare *Alisporites* spp., *Eucommiidites* spp., *Vitreisporites* spp., *Ephedripites* spp. and others.

Predominance of *Cyathidites-Leiotriletes* group, high diversity of *Trilobosporites-Impardecispora* group as well as lower percentage of *Classopollis* spp., *Gleicheniidites* spp. and *Cicatricosisporites* spp. allow the examination of the Anabar Bay region as a part of the Taymyr palaeofloristic area within the Siberian palaeofloristic province (Chlonova 1974).

PALAEOENVIROMENTS

Palaeoenvironmental investigations of Anabar Bay region, carried out by Zakharov and Yudovny (1974), included detailed lithofacial and geochemical analyses, palaeontological and taphonomic investigations as well as determination of palaeotemperatures, palaeodepth and palaeosalinity. The results suggest this region was a shallow marine basin of a normal salinity with average temperatures of 15°–18° C during the Lower Valanginian.

Dinocyst associations dominated by holocavate *Dingodinium-Chlamydophorella* group, *Cleistosphaeridium* spp. and *Escharisphaeridia-Sentusidinium* group. Chorate dinocysts are rather barren and include only 4 genera: *Cleistosphaeridium* spp, *Oligosphaeridium* spp., *Circulodinium* spp., *Spiniferites* spp. Various acritarchs are represented by species of *Michrystridium, Solisphaeridium, Polygonium* and *Veryhahium.* Prasinophyts comprise rare *Cymatiosphaera, Pterospermella* and *Leiosphaeridia*, which predominance have been observed throughout the whole interval. The upper part of the section is characterized by a decreased abundance of microphytoplankton, higher acritarch diversity and more common Zygnemataceae. It may be attributed to the regression of Lower Valanginian palaeobasin, which is improved by general geological and lithological data (Zakharov & Yudovny 1974).

The most diverse and abundant assemblages of microphytoplankton have been observed from calcareous nodules (samples 11, 18, 24; Fig. 3).

CONCLUSIONS

Palynological and palaeoalgological analyses of marine Anabar Bay section allow the establishment of three local dinozones within the Lower Valanginian interval. Abundant spore/pollen assemblage have been described and callibrated against ammonite zones and dinocyst units. New data may provide the base for subdivision and correlation of boreholes from oil- and gas-bearing areas of Western Siberia.

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