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Olenekian ammonoid and brachiopod successions of the Kamenushka River basin and their environmental conditions based on N- and C-isotope data from the Lower Triassic of South Primorye, Russian Far East

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Ammonoid- and brachiopod-bearing silty-clayey sediments of the lower-middle Olenekian Kamenushka Fm. in South Primorye, overlaying mainly Induan submarine conglomerate (60m), were investigated in detail. As a result, four succession phases have been distinguished, reflecting a degree of diversity for the marine communities which existed at that time.

Phase 1, corresponding to the levels with *Arctoceras septentrionale* and *Flemingites kamenushkaensis* (15 m), was the time for invasion of the first ammonoids for this basin during early Olenekian (early Smithian) transgression. Pioneer community was formed by ammonoid species of about six genera and numerous small bivalves but no brachiopods.

Phase 2, corresponding to the levels with early Olenekian (late Smithian) *Prionites markevichi* and *Churkites syaskoi* (21 m), is characterized by abundance and high taxonomic diversity of the most active consumers, ammonoids, which are represented by more than 24 genera, including *Prionites* (dominant), *Shimanskyites*, *Monneticeras*, *Arctoceras*, *Churkites*, *Brayardites*, *Subvishnuites?*, *Meekoceras*, *Anasibirites*, *Hemiprionites*, *Radioprionites*, *Nyalamites*, *Xenoceltites?*, *Mianwaliites*, *Paranannites*, *Prospiringitoides*, *Ussurijuvenites*, *Ussuriaspenites*, *Aspenites*, *Proptychitoides*, *Pseudoflemingites*, *Subbalchaeceras*, *Parussuria* and *Pseudosageceras*. Very rare brachiopods (*Lepismatina*, *Bittnerithyris*), as well as other benthic forms, are present. *Arctoceras* and *Prospiringitoides* in the Kamenushka River basin are associated with late Smithian conodont *Scythogondolella milleri*.

The community structure of Phase 3, corresponding to the levels with late Olenekian (early Spathian) *Bajarunia magna* (42.5 m), was changed radically in ammonoid taxonomic content, but with some reduction in their taxonomic diversity. They are represented mainly by the following seven genera: *Koninckitoides* (dominant), *Tirolites*, *Bajarunia*, *Albanites*, *Nordophiceratoides*, *Jeanbesseiceras* and *Palaeophyllites*?. Among comparatively rare brachiopods *Lepismatina*, *Bittnerithyris* and *Holcorhynchella* are known.

Phase 4, corresponding to the levels with late Olenekian (middle Spathian) *Inyoceras singularis* (85-100 m), is rich in both ammonoids (15 genera) and benthic forms (brachiopods and gastropods). Species of the genus *Koninckitoides* became predominant, among other ammonoids *Inyoceras*, *Tirolites*, *Albanites*, *Nordophiceratoides*, *Yvesgalleticeras*, *Palaeophyllites*, *Kamenushkaites*, *Ussurijuvenites*, *Khvalynites*?, *Goudemandites*, *Jeanbesseiceras*, *Goricanites*, Keyserlingitidae and *Eudanubites*? are known. Brachiopods are represented by more than five genera (e.g., *Holcorhynchella* (dominant), *Lepismatina*, *Bittnerithyris*, *Hustedtiella*, *Heterelasma*?). The uppermost beds of the Kamenushka Fm. contain rare crinoids. Characteristics of early to middle Spathian ammonoids from Kamenushka and other regions of South Primorye appear to suppose that some of them are directly ancestral to corresponding generic representatives, occurred in the western USA.

Discussion on favorable conditions for recovery of ammonoids and brachiopods after end-Permian mass extinction has been realized on the basis of isotope records of Lower Triassic sequences in South Primorye and other regions.

