

KALERIA B. KHAIZNIKOVA

EVOLUTION OF PALEOZOIC CORALS OF THE VERKHUYANSK MOUNTAINS

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The class Anthozoa is represented by Tabulata and Heliolitida in Paleozoic series of the Verkhoyansk Mountains (Verkhoyanie). Representatives of all the seven tabulate orders and of the heliolitid orders (Heliolitida, Proporida) moved into this area from the Siberian platform in the late Ordovician. At the end of the Ordovician and the beginning of the Silurian the orders Lichenariida, Sarcinulida, Tetradlida and Proporida died out in Verkhoyanie. The families Halysitidae, Favositidae, Pachyporidae experienced a burst of speciation in the early Silurian. The orders Halysitida and Heliolitida became extinct by the early Upper Silurian. With the Gedinnian-Siegenian transgression Favositidae, Pachyporidae, Alveolitidae, Coenitidae, Syringoporidae migrated from the Arctic basin into the Verkhoyansk sea. Known from the Givetian and Frasnian are only numerous representatives of Pachyporidae, Alveolitidae, Coenitidae and Syringoporidae. Corals Syringoporida and Auloporida disappeared by the beginning of Viséan time and those of the order Favositida in the Early Permian.

Key words: corals, Tabulata, Heliolitida, paleogeographic distribution, Verkhoyansk Mountains (Verkhoyanie), Siberian platform.

Kaleria B. Khaiznikova, Institute of Geology, USSR Academy of Sciences, 677007 Yakutsk, USSR. Received: September 1979.

In the Verkhoyansk Mountains (Verkhoyanie), the subclass Anthozoa is represented by Tabulata and Heliolitida of which the former strongly predominate in coral associations.

First heliolitids are known from the late Ordovician deposits, their first appearance, greatest diversification and abundance being observed in late Caradocian and Ashgillian deposits. Heliolitids sharply decrease in number already in the Silurian. Solitary species of *Stelliporella* are known from Verkhoyanie during that period. Especially abundant in Upper Caradocian and Ashgillian deposits were the genera *Cyrtophyllum* and *Sibiriolites*, the genera *Plasmoporella* and *Heliolites* being far more rare.

However, Heliolitida play a subordinate role even in late Ordovician deposits. Tabulata predominate both in the number of taxa and abundance. Of them, first to appear in the early Caradocian of the Verkho-

yansk basin were solitary *Paratetradium* and *Tollina* (Rozman *et al.* 1970) which might have migrated here from the Siberian platform where *Tabulata* and *Heliolitida* had been numerous at still earlier times (Sokolov, and Tesakov 1963).

In the late Caradocian, together with the first appearance of *Heliolitida*, *Tabulata*, i.e., *Nyctopora*, *Vacuopora*, *Septentrionites*, *Tollina*, *Catenipora*, *Syringoporinus*, *Fletcheriella*, *Lyopora* began flourishing in the Verkhoyansk basin; most of their species persisted throughout the late Ordovician.

Some of the genera such as *Saffordophyllum*, *Foerstephyllum*, *Lyopora*, *Calapoecia*, *Coxia*, *Eocatenipora* are found as single specimens in the Upper Ordovician deposits and represented by individual species.

Besides rare *Paratetradium*, a single species of *Rhabdotetradium* is known among Tetradiidae in late Ashgillian deposits. The disappearance of Tetradiidae from late Ordovician coral associations is a local feature. At the same time, the late Ordovician coral associations of the Verkhoyansk basin are closely related in abundance and specific diversity of heliolitids, i.e., *Cyrtophyllum*, *Sibiriolites*, of tabulates, i.e., *Nyctopora*, *Vacuopora*, *Tollina*, *Lyopora*, *Calapoecia*, *Coxia*, *Fletcheriella*, *Catenipora* and first representatives of *Palaeofavosites* and *Mesofavosites* to the coral associations of the adjacent epicontinental seas of the Siberian platform, Taimyr, Arctic Islands and islands of north-eastern Asia and have affinities with the coral fauna of the Canadian Arctic region (Sokolov 1962).

Unexpected in the Ashgillian deposits were findings of a number of species of the genus *Agetolites* that had been one of the main constituents of late Ordovician coral fauna (Central Asia region). These findings might be indicative of mutual influence of coral associations from the Canadian Arctic and Central Asia regions.

The families Favositidae, Halysitidae, Syringoporidae and Auloporidae constitute a link between coral compositions of the Ordovician and Silurian sequences of the Verkhoyansk Mountains. In the early Ashgillian the genus *Palaeofavosites* appeared earlier than other genera of Favositidae and reached diversification in the late Ashgillian and early Silurian; somewhat later the genus *Kolymopora* and first species of the genus *Mesofavosites* made their appearance. In the late Ashgillian *Agetolites* grew quite numerous and solitary *Plicosolenia* appeared. Of these genera, only *Kolymopora* and *Agetolites* became extinct in the late Ordovician, while other genera of Favositidae flourished further in the Silurian and developed until the Ludlow.

Of Halysitidae, a very abundant and diversified genus *Catenipora* appeared, together with the first *Nyctopora*, *Vacuopora* and *Tollina*, as early as the beginning of the late Caradocian. Representatives of this genus existed here in Llandovery times along with the genus *Cystihalysites*

and first species of *Halysites*. This latter genus became especially widespread in the late Llandovery and Wenlock, while the number and diversity of *Catenipora* were reduced.

Of Syringoporidae, species of the genus *Syringoporus* predominated in the late Caradocian and Ashgillian. At the beginning of Ashgillian there appeared first solitary species of *Syringopora* and, a bit later, *Troedsonites* that existed for a short period of time. The genus *Syringopora* persisted until and through the Carboniferous with bursts of speciation in the early Silurian and early Carboniferous.

The Silurian coral associations differ greatly from the Ordovician corals in their systematic composition. Representatives of the tabulate orders Lichenariida, Sarcinuliida and Tetradiida disappeared at the Silurian-Ordovician boundary, but other tabulate orders became more numerous and diverse. In the Silurian there predominated the order Favositida represented by suborders Favositina and Thamnoporina. The early Llandovery transgression in this basin is associated with the appearance of the genus *Favosites* that flourished together with *Palaeofavosites* and *Mesofavosites* in the late Llandovery and Wenlock. At the close of the middle Llandovery first species of *Multisolenia* appeared that attained greater diversification in Wenlock times together with *Mesosolenia* and *Sapporipora*.

Of the family Pachyporidae, besides the late Ordovician genus *Kolympora* there appeared first species of *Parastriatopora* by the end of the late Ordovician whose representatives flourished in the Devonian together with the genus *Striatopora*. In the Silurian, the genus *Parastriatopora* was represented by a single species in Verkhoyanie as distinct from various species of the genus in other basins of East Siberia. The early Silurian Tabulata of Verkhoyanie were also impoverished due to the disappearance of the genus *Subalveolites*.

Thus, the Silurian coral fauna of Verkhoyanie is characterized by such a generic composition of the tabulate corals as is rather common for East Siberia. The only distinctive feature of the Silurian coral associations of Verkhoyanie is the presence of the genera (?) *Angopora* and *Sinopora*.

The Upper Silurian regression accounted for unfavourable conditions for the tabulate formation in the Verkhoyansk basin; only individual representatives of *Halysites*, *Favosites*, *Dictyofavosites* and *Thecostegites* persisted.

The Devonian was marked with a new transgression in the Verkhoyansk basin associated with migration of tabulate corals from the Arctic basins. There appeared first several species of *Favosites* in the Gedinnian, then representatives of the genus *Squameofavosites*, the genera *Pachyfavosites*, *Striatoporella*, *Yacutiopora*, *Parastriatopora*, *Striatopora*, *Gracilopora*, *Alveolitella*, *Caliapora*, *Coenites* and *Egosiella* in the Siegenian and *Thamnopora* and *Alveolites* by the end of the Early Devonian.

With the Givetian transgression the Verkhoyansk basin became inhabited by new tabulate coral associations which impoverished systematically in early Givetian times. Branched *Thamnopora* and *Alveolitella*, solitary species of *Crassialveolites*, *Placocoenites*, *Scoliopora*, *Trypanopora* and *Hillaepora* prevailed here. Representatives of the above genera as well as the genera *Lecomptia*, *Cladopora*, *Coenites*, *Natalophyllum*, *Multithecopora* and *Aulopora* became once more abundant and diversified in the late Givetian and early Frasnian. The tabulate corals are unknown from the late Frasnian and Famennian deposits of the Verkhoyansk Mountains.

On the whole, only three of the seven Ordovician tabulate orders, i.e., Favositida, Syringoporida and Auloporida persisted and developed further in the Devonian. Representatives of the order Halysitida became extinct in the Silurian. Of the three orders it was especially Favositida that formed new genera and a lot of endemic species in the Devonian.

The Early Carboniferous was characterized by species diversification of the genera *Syringopora*, *Michelinia*, *Kueichowpora* and *Pseudoroemeripora*. All the above-mentioned tabulates became once and for all extinct by the Viséan. It was only in the Permian that the genus *Sakhopora* Koks. grew rather numerous for a short period of time. By the Late Permian the Tabulata became extinct in Verkhoyanie.

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