

Research Advances

Devonian Bivalve Faunas, Life-habits, and Biodiversity Changes in Guangxi, South China

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Objective

The Devonian bivalves are well developed, highly diversified and widely distributed in Guangxi. However, they have not been well studied previously, although several papers have dealt with it. Meanwhile, the biodiversity change of bivalves which is one of the most important benthos during Devonian in South China has not been studied yet. The aim of present project is focused on the study of systematic palaeontology, the life-habits, of Devonian bivalves of Guangxi. The study of bivalve life-habits allows the clams to be used for interpretation and reconstructions of depositional environments. The relations of the Devonian bivalve distributions of Guangxi to the sedimentary facies and substrata are studied. In addition, the biodiversity changes of Devonian bivalves in South China are also involved in present project.

Methods

About three thousands specimens of Devonian bivalves were collected from 15 stratigraphic sections and 60 localities, distributed in the shoreline, carbonate platform, and trough in platform facies areas respectively in Guangxi. Geographically, the western Dayashan Mountain, Longling, Nandan, Daxin, Deba, and Yongfu are the districts where the Devonian bivalves are most abundant. Stratigraphically, the Lochkovian-Pragian periods have only fairly developed bivalve faunas. However, bivalves are highly flourished and diversified during the early Emsian, while very poorly known during Late Devonian in Guangxi. Above-mentioned huge amounts of collections are the base of the systematic paleontology studies. The observations on the life-habits of living bivalves in the intertidal-subtidal zones in Sanya of Hainan Island, Beihai of Guangxi, and Qingdao of Shandong were undertaken, in order to make the comparison with the life-habits of Devonian bivalves. A great deal of information about Devonian bivalves has been gathered throughout South China. Up to now, 365

species of marine bivalves placed in 115 genera and 41 families from 125 localities have involved in the database of Devonian bivalves in South China. The establishment of database makes the possibility of the discussion on the biodiversity changes of Devonian bivalves in South China.

Results

One hundred and ninety three species of marine bivalves placed in 93 genera, 36 families, including 19 endemic genera and 3 endemic families have been recognized in Guangxi. It is concluded that Guangxi is one of the developed and endemic centers of bivalves in the world during Devonian. Two distinct types the Xiangzhou and Nandan type of bivalve fauna, during the periods from Emsian to Givetian in Guangxi have been determined. The Xianzhou type bivalve fauna is characterized by the highly diversity, with rather thick shell, and mostly the benthos. It consists of 169 species placed in 83 genera and 31 families. In generic level, 77% are the infaunal and semi-infaunal taxa, the rest 23% are the epifaunals. That bivalve fauna may compare with the contemporaneous faunas of North America (New York State of USA), West Europe (the Rhine of Germany, L'Ardenne of France-Belgium boundary area). In contrast, the Nandan type bivalve fauna is much lower diversity, small-sized, and thin shell. It consists of 24 species, attributed in 13 genera and 7 families. Among them, 54% of total genera are psudoplanktonics, 12% epifaunals, and 31% the infaunal and semi-infaunals. However, by number of fossil individual, among the statistical 1632 of fossil individual, 1571 are the pseuoplanktonic taxa (taking 96.3%), 52 (taking 3.2%) the epifaunal, and 9 (taking 0.5%) infaunal and semi-infaunal taxa. The Nandan fauna may compare with that of the Naples of western New York, USA, the Bohemia of Czech, the southern Timans of northwest Russia. One hundred and eighty-seven species and 90 genera, including 27 new species and 2 new genera were figured and systematically described by the present authors in the monograph "Devonian bivalve faunas, life-habits of Guangxi, and biodiversity changes of Devonian

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bivalves in South China”.

The biodiversity of Devonian bivalves in South China changed gradually from lower to higher during Early and Middle Devonian. That biodiversity reaches the peak during Early Emsian, then getting lower. The diversity (total number of genera) of Devonian bivalves in South China are 10 (Lochkovian), 20 (Pragian), 76 (Emsian), 31 (Eifelian), 49 (Givetian), 12 (Frasnian), and 12 (Famennian) respectively. The Devonian bivalve radiation occurred during Early Emsian. It arose a large number of bivalves, 71 genera in all, including 36 origination genera. Meanwhile, 2 endemic families Sinodoriidae and Guangxiconchiidae were originated in Guangxi during Emsian. The origination of bivalve genera are 6 (Lochkovian), 5 (Pragian), 41 (Emsian), 10 (Eifelian), 12 (Givetian), 2 (Frasnian), and 2 (Famennian) respectively. The proportional origination of Devonian bivalves is highest during Lochkovian with the proportional origination 60%, and second high in Emsian with 50.7%. The proportional extinction is highest during Givetian (account for 57.1%), and second high in Famennian (41.7%), while other stages of Devonian is 10% (Lochkovian), 20% (Pragian), 35.5% (Emsian), 19.4% (Eifelian), and 33.3% (Frasnian) respectively. The changeover events in Devonian history of the bivalves in South China are mainly displayed as the changes of generic aspects, while the changes of family and high grade taxon are not very clear. Up to now, the Upper

Devonian bivalves are very poorly known in South China. So, the F/F mass extinction event, and the recovery event occurred in the Late Famennian have not been shown by the bivalve faunas in studying area.

Conclusions

(1) One hundred eighty-seven species and 90 genera, including 27 new species and 2 new genera of Guangxi Devonian bivalves were figured and systematically described. Two distinct types, the Xiangzhou and Nandan types of bivalve faunas during the periods from Early Emsian to Givetian have been recognized in Guangxi. It is confirmed that Guangxi is one of the developed and endemic centers of Devonian bivalves in the world.

(2) The biodiversity of Devonian bivalves in South China changed gradually from lower to higher during Early and Middle Devonian. The bivalve radiation occurred during Early Emsian, while the great extinction occurred during Givetian in South China. The changeover events of Devonian bivalves in South China are mainly displayed as the changes of generic aspects.

Acknowledgment

This Project was financially supported by the National Natural Science Foundation of China No. 41172025