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Migration Patterns of Some Bivalves in the Jurassic Proto-Atlantic*

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The migration of bivalves takes place primarily at the larval stage. Dispersal ability depends on which larval type they have. Most of marine shallow-water bivalves have planktotrophic larvae with stonger spreading capability. A part of non-planktotrophs, called lecithotrophic larvae, may have certain dispersal potential, too. Migration patterns are directly related to various environmental conditions. The environmental factors which are advantageous to bivalve migration include the existence of seaways between sea basins, sea expanding, marine currents and favourable climate. The environmental factors which hinder the spreading of bivalves are mainly physical barriers, withdrawal of sea water and apparent temperature gradients. Bivalve faunas from the Jurassic Proto-Atlantic consist of cosmopolitan taxa, Tethyan taxa, Boreal taxa and Pacific taxa. The latter three bivalve groups are of importance for bivalve provinciality and their migration patterns in the Proto-Atlantic are consistent with environmental conditions.

1 Migration of two Palaeo-Pacific bivalve taxa

During the Early Jurassic, a continuous rise in sea level[1] brought about a link-up of the Eastern Pacific and Western Tethys via Central America—— "Hispanic Corridor"[2]. It was one of five possible marine migration routes for molluscs during the Jurassic[3] and opened in the Pliensbachian. The occurence of "Hispanic Corridor" facillitated the exchange of bivalves between the Eastern Pacific and Western Tethys. Two important Pacific bivalve genera *Weyla* (*Weyla*) and *Codakia* (*Epilucina*) were aided by this seaway to migrate into the Proto-Atlantic. *Weyla* was a characteristic eastern Pacific pectinid from the Hettangian to the Toarcian, present from Canada (perhaps even Alaska) to Argentina[4]. During the Pliensbachian it moved along "Hispanic Corridor" from the Central America into Morocco, Portugal, Spain and southwestern France. By the Toarcian it migrated to the eastern Tethys and then extincted. *Codakia* (*Epilucina*) appeared in Mexico in the Kimmeridgian and through the same seaway migrated to West Europe by the Tithonian.

2 Migration of several Boreal bivalves

Another important seaway in the Proto-Atlantic during the Early Jurassic was the

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"North Atlantic" epicontinental strait connecting the Arctic sea and Tethys[3, 5]. *Hippopodium* is a typical Early Jurassic Boreal bivalve. *Hippopodium ponderosum* first occurred in the Sinemurian of England. By the Pliensbachian, the species had migrated northwards to Greenland and further, using the "North Atlantic" epicontinental strait. As a bivalve type which was adapted to cool or cold water conditions, it could not disperse southwards. During the Bathonian, as a result of formation of the North Sea High, this seaway was interrupted and in turn the faunal differenciation between Greenland and the areas in the south was caused. From the Callovian onwards, the strait opened again with rising sea level. A southward migration of Boreal bivalves, however, apparently did not take place. The existence of temperauture gradients and the establishment of deeper water conditions during the Oxfordian to Kimmeridgian in Greenland[5] led to the isolation of Boreal bivalves. During the Tithonian, with the diminishing of latitudinal changes in temperature, some Boreal bivalves expanded to the south. For example, *Camptonectes* (*Mclearnia*) and *Discoloripes*, which were only restricted to Greenland in the precious Jurassic stages, moved into southern England during Tithorian time.

3 Migration of some Tethyan bivalves

A number of bivalve elements in the Proto-Atlantic were of Tethyan affinities. Some of them were just restricted to the lower latitudes, e.g. Morocco, and never migrated northwords within the Jurassic. Many Tethyan bivalves, however, changed their distribution and migration patterns as a sequence of the changes in environmental conditions with times. During the Pliensbachian, most Tethyan elements were limited in the areas south to nouthern France, especially in Morocco. From Toarcian onwards, Tethys spreaded towards the north, with the northward shifting of the trophical-subtrophical climatic belts. As a result, many Tethyan bivalve taxa migrated northwards. In the Bathonian, Tethys reached its greatest spread of the Jurassic. A number of taxa reached southern England, such as *Arcomytilus*, *Falcimytilus*, *Trichites*, *Stegoconcha*, *Catinula*, *Praeexogyra*, *Radulopecten Spondylopecten* (*Plesiiopecten*), *Eomiodon*, *Opis* (*Trigonoopis*), *Praeconia*, *Ceratomyopsis* and *Pholadomya* (*Bucardiomya*). Some even reached northern England and Scotland, such as *Dacryomya*, *Eopecten*, *Isognomon* (*Mytiloperna*), *Actinostreon*, and *Praemytilus*. Right after this spread, Tethys withdrew toward the south. These Tethyan bivalves migrated back south to Portugal and Morocco during the Callovian. The genus *Eligmus* was a very characteristic Tethyan bivalve. It originated in the Late Bajocian of the Middle East and reached as far as northern France during the Bathonian, but appeared only sporadically in southwestern France with the withdrawal of Tethys sea by the Callovian.

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古大西洋侏罗纪双壳动物的迁移模式

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摘 要 对一些典型的古大西洋侏罗纪双壳分子的迁移模式以及与环境条件的关系进行了讨论,说明了海路与地理障碍的存在,气候条件,海流等是影响迁移模式的重要因素.

关键词 迁移,双壳动物,侏罗纪

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