

# Environments and functional anatomy of certain Mesozoic fishes

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## Abstract

Body shape and arrangement of fins refer to manners of swimming in both living and fossil fishes. In addition, mobility is also reflected in the structure of the scales. The Mesozoic “holosteans” show a rich radiation; they are functionally comparable with some living marine teleosts. Before fossilization, the fishes of the Solnhofen-limestone were transported from different other environments into the area where they were conserved. Thus, fishes characteristic of various environments are represented in the fossil record; some fusiform large animals were fast swimmers and pelagic predators; fishes with a fin pattern arranged in order to perform slow and precise maneuvering movements lived in an environment of hard structures with niches such as reefs and rocky areas; some fishes related to sedimentary bottoms.

## Jurassic fishes in the area of Eichstätt and Solnhofen

The paleoenvironment of the plattenkalk basins was that of rather quiet and protected waters (BARTHEL et al. 1990). The basins which were in some connection with the open Tethys sea showed an important salinity-stratification (VIOHL 1994). The stagnant hypersaline bottom waters were hostile to organisms and performed excellent conditions for later fossilization. Less saline surface waters covering the bottom waters represented a wonderful environment for living animals. Pelagic fishes could migrate in connection with the open ocean. Topographic elevations extending into the surface waters produced substrates supporting benthonic life: coral patch reefs (mostly in the south of the Franconian Alb), colonies of algae, sponges and octocorals (growing on top of ancient sponge microbial mounds) and elevated soft sedimentary bottoms.

The stagnating waters of the lagoon provided also excellent conditions for fossilization (WELLNHOFER 1983). However, the exceptional quality of fossils could be due to various types of poisonous properties of the stagnant waters. Whether hypersalinity (BARTHEL et al. 1990), anoxicity (KEUPP 1977), or blooms of algae or microorganisms (BUISONJÉ 1972, 1985) occurred at the beginning of fossil preservation, the animals certainly were introduced from different other environments. We find pelagic animals as well as benthonic forms; among the latter ones, some were reef dwellers.

The excellent condition of Solnhofen fossils allows comparison with living forms. Some of the Mesozoic “holosteans”, i.e., non-teleost halecostomes conspicuously resemble some modern teleost fishes.

## Anatomy and locomotion

The shape of the fish body and its size already express the way of swimming in an excellent manner. In addition, differentiation and arrangement of the fins may help to interpret the ways of swimming and propulsion. Locomotion is also influenced by the structure and size (weight) of scales, a character that may easily be noticed in fossil fishes.

**Body shape and fins:** There is a rich variation among fishes concerning body shape and size, shape and arrangement of the fins (NORMAN 1966). This relates to swimming functions, which are also highly

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