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## REVISION OF SYNECHODONTIFORM SHARKS (NEOSELACHII; GALEOMORPHII)

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Synechodontiform sharks are basal neoselachians within galeomorphs and have no extant representatives. All members of this clade were small, bottom-dwelling sharks inhabiting shallow marine habitats. Eight genera, ranging from the Late Triassic to the Eocene, were described from the Northern and Southern Hemisphere. Most taxa are only known by isolated material such as teeth, fin spines, and placoid scales. Articulated specimens, especially jaws, vertebrae or complete skeletons are, conversely, extremely rare. Articulated skeletons only occur in the Upper Jurassic lithographic limestones of southern Germany (Nusplingen, Solnhofen, Eichstätt), and in Lower Jurassic deposits of England (Lyme Regis).

The taxonomy of most clades within Synechodontiformes, especially of the Palaeospinacidae, is very controversially discussed. The scarcity of skeletal specimens and the resemblance of isolated teeth are the main reasons for this dispute.

The stratigraphic oldest genera, *Mucrovenator* and *Rhomphaiodon*, are known by isolated teeth from the Upper Triassic and Lower Jurassic. The family Pseudonotidanidae comprises *Pseudonotidanus* and *Welcommia* and ranges from the Lower Jurassic to Lower Cretaceous. The most famous genus within Synechodontiformes is *Sphenodus*, which occurs from the Lower Jurassic to the Eocene. This genus is known by isolated teeth, placoid scales, and articulated skeletons from the Solnhofen area and Nusplingen.

The current systematic scheme of palaeospinacid sharks includes at least two valid genera, *Synechodus* and *Paraorthacodus* respectively. A third taxon, *Palaeospinax*, is considered a *nomen dubium*. The revision of synechodontiform sharks, especially of the palaeospinacidae, provides new insights into the systematics, relationships, and diversity of this group.

New finds of articulated skeletons of *Paraorthacodus* and *Synechodus* from the lithographic limestones of Solnhofen provide new insights into the phylogenetic relationships of synechodontiform sharks. A phylogenetic analysis employing 42 characters of all known synechodontiforms was conducted using cladistic principles. The analysis resulted in two

most parsimonious trees (MPTs) of 66 evolutionary steps. The consistency index (CI) of the resulting strict consensus tree is 0.66; the retention index (RI) is 0.52.

Combined skeletal and dental characters support the monophyly of Synechodontiformes (e.g., pseudoanulacorrhize root pattern of teeth). *Mucrovenator* and *Rhomphaiodon* are the most basal and plesiomorphic synechodontiforms. However, their interrelationships and relationships to the remaining synechodontiforms are not resolved. The other taxa are grouped into two monophyletic clades (families), Orthacodontidae and Palaeospinacidae respectively. Orthacodontidae comprises the taxa previously assigned to Pseudonotidanidae plus *Sphenodus*. The other clade, Palaeopinacidae, includes *Paraorthacodus* and *Synechodus*, and two new genera.

## NEW INSIGHTS INTO DIVERSITY AND DISTRIBUTION OF PALAEOSPINACID SHARKS (NEOSELACHII, SYNECHODONTIFORMES) FROM THE LITHOGRAPHIC LIMESTONES OF SOUTHERN GERMANY (UPPER JURASSIC)

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Synechodontiform sharks were small, bottom-dwelling sharks inhabiting shallow marine habitats. They are assumed to be basal Galeomorphii without any extant representatives. Eight genera and dozens of species have been described from the Northern and Southern Hemisphere up to now, ranging from the Late Triassic to Eocene. The majority of synechodontiform taxa are only known by isolated material such as teeth, fin spines, and placoid scales. Articulated material, especially jaws, vertebrae or complete skeletons are, conversely, extremely rare. Articulated skeleton from the Jurassic are only known from Lyme Regis (England) and, Nusplingen, Solnhofen and Eichstätt (southern Germany).

The taxonomy of most clades within Synechodontiformes, especially of the Palaeospinacidae, is controversially discussed. The scarcity of skeletal specimens and the resemblance of isolated teeth are the main reasons for this dispute.

Up to now, only a single palaeospinacid has been described from the lithographic limestones of southern Germany. This specimen of *Paraorthacodus*, the holotype of *P. jurensis*, is represented by the anterior, partially disarticulated part of the vertebral column, portions of the shoulder girdle, and the branchial skeleton with gill arches, jaws and parts of the dentition. In addition, a single specimen of a new, hitherto undescribed species of *Synechodus* occurs in Nusplingen.

A revision of the well-known selachian fauna from the famous lithographic limestones of Solnhofen and Eichstätt yielded the first specimens of *Paraorthacodus*.

In addition to this species of *Paraorthacodus*, the revision of synechodontiform sharks resulted also in recognizing another palaeospinacid genus, *Synechodus*. This taxon is represented by two specimens in the Solnhofen area. The first one is also present in Nusplingen, whereas the other one represents a different species based on skeletal characters. The find of completely articulated specimens of *Paraorthacodus* and *Synechodus* provides new insights into the systematics of Palaeospinacidae, their diversity, and occurrence in the Upper Jurassic reef environments of Southern Germany.