

annular elevation. Some of these features were also discovered in Mesozoic and Recent nautilids. These structures are here interpreted as the septal furrow and imprints of blood vessels and contractile fibres of the septal mantle (subepithelial musculature). Most of these structures were not found in ammonoids younger than Middle Devonian yet. The nature of these imprints was examined by sectioning the septal mantle of Recent *Nautilus*; longitudinal and transverse sections of contractile fibre bundles and of blood vessels were found, arranged exactly like the imprints on nautilid septa.

We suggest that the differing shapes in ammonoid septa can be explained by the tension produced by contractile fibres of the septal mantle which was higher in derived ammonoids than in all other ectocochleate cephalopods. If this is correct, more contractile fibres were present on the septum surface than in cephalopods with simple septa because of the folded margin of the septal mantle which was attached at the mural band. These fibres pulled the unmineralised septum in opposing directions and offered a larger attachment surface than in early ammonoids. Consequently, the organic septum was possibly more tightly stayed within shell tube.

Organs in more or less direct contact with the septa may leave imprints only in septa of those cephalopods which have simple septa with a low number of sutural elements, including even malformations of these organs. The septum surface lacks these imprints only in derived ammonoids.

Cameral liquid removal from new chambers with incompletely mineralised septa probably started earlier in derived ammonoids than in cephalopods with simple septa. The higher growth rates of ammonoids compared to nautiloids agree with this. New chambers of derived ammonoids were functional earlier and the buoyancy apparatus was perhaps more efficient. The function of ammonoid septa was probably to create an efficient buoyancy apparatus rather than to enhance resistance of the shell towards hydrostatic pressure.

In combination with their generally improved manoeuvrability, this partially explains the evolutionary success of ammonoids: Ammonoids potentially were able to deal with adverse conditions by quickly migrating to shallower water depths and predators were probably not able to follow the more highly mobile ammonoids because of their often rather demersal habit in the Early Devonian.

Skeletal remains of the Miocene lamniform shark, *Cosmopolitodus hastalis*, from Peru

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Tooth shapes and ornamentations certainly have high taxonomic potential in modern sharks and batoids, and are almost the only diagnostic aspect of extinct neoselachians. However, intraspecific and ontogenetic changes in neoselachian tooth morphologies remain poorly known and only few studies revealed that neoselachian tooth morphologies are a possible subject of ontogenetic changes, intraspecific variability and sexual dimorphism. Similarities in tooth morphologies are generally related to similar food adaptations. This leads to the preponderant supposition of many shark specialists that variations in morphology and ornamentation are less important for taxonomic purposes. Nevertheless, isolate teeth are widely used in the literature to reconstruct tooth sets and to identify characteristic dental patterns for taxonomic purposes. Sufficient specimens (e.g., isolated teeth of obviously different tooth files, partly articulated tooth sets) are necessary, however, for reliably reconstructing dental patterns in fossil sharks, especially in lamniform taxa, of which no skeletal remains have been preserved. The family Lamnidae, includes three extant genera, *Carcharodon*, *Isurus*, and *Lamna*. Mainly isolated teeth document the evolutionary history of these three taxa and related extinct forms only. In Oligocene deposits, ca. 30 million years old, teeth were found being very similar to those of the living White Shark but without the characteristic serrations. These fossil teeth have traditionally been identified as *Isurus hastalis* and thus being closely related to modern mako (*Isurus*) sharks. Many assume that the saw-toothed *Carcharodon* evolved from *Isurus hastalis* based on the assumption that the appearance of serrations coincides with the origin of the Great White. However, serrated teeth developed several times independently in different lamniform and carcharhiniform shark lineages and thus might not be a good character for inferring evolutionary scenarios. A recent interpretation of the lamniform fossil record and the phylogenetic interrelationships of extinct and extant taxa suggest that the *Carcharodon carcharias* and *Isurus hastalis* lineages split off long ago. Consequently, *hastalis* is now considered to belong to a different, extinct taxon, named *Cosmopolitodus*, a name coined by a Russian palaeoichthyologist for a Miocene (ca. 15 million years) and early Pliocene (ca. 5 million years) lamniform, which is not the direct ancestors but the sister group to *C. carcharias*. However, all information for this scenario is based on evidence from isolated teeth or artificial tooth sets. Here, we present the first articulated skeletal remains of *Cosmopolitodus hastalis* from the upper Miocene (ca. 7 million years) of Peru, which allow a more detailed analysis of the systematic position of this shark and the origin of the modern White Shark. Accordingly, the basal sister group relationship of this shark to a clade *Carcharodon* is confirmed. The origin of *Carcharodon* as group must have been occurred in the Miocene.