

This is the first issue of a projected series concerning the fossil vertebrate animals of Florida. The purpose of these newsletters is to foster communication among the growing number of enthusiasts of this subject.

Each number in this series will be devoted to some important topic or topics related to vertebrate paleontology. In addition, it will serve as a forum for announcements and news notes regarding activities in this field. Questions and communications are solicited from all subscribers. Information of general interest will be included in future issues of the PLASTER JACKET.

It is our intent to produce this series at the rate of about one issue per quarter year. We hope to add as many genuinely interested paleontologists as possible to our mailing list. If you are interested please send your name and address to the PLASTER JACKET. The price of this series is a real interest in the subject matter.

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CENOZOIC SHARKS OF FLORIDA

The sharks and their cousins, the skates and rays, constitute one of the two major groups of modern fishes. They are distinguished from the other major group, the *Osteichthyes*, or bony fishes, by the total absence of bone. Instead of bone, a shark's skeleton is composed of flexible cartilage. For this reason sharks and their relatives are called *Chondrichthyes*, or cartilaginous fishes.

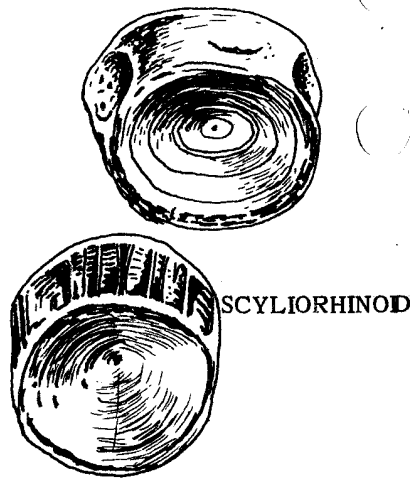
Because cartilage is quite destructible, the fossil record of sharks consists mainly of teeth, which are made of enamel and fossilize well. Unlike the condition in most higher vertebrates, in which the teeth are anchored in bone and the number of sets is limited, sharks teeth are attached by leathery skin, and are produced continuously throughout the life of the shark. Thus any given shark may add to the fossil record not only those teeth which it carried at the time of its death, but many times this number which were used and shed during its lifetime. It has been estimated that a single tiger shark may produce 24,000 teeth during a ten-year period. When one considers this "mass production" of teeth and couples with it Florida's marine origin and repeated marine submergence, it is not surprising that sharks are extremely common in our fossil record.

Although the oldest surface rock in Florida is of Eocene age, or about 60 million years old, the fossil record of sharks in other parts of the world goes back to Devonian times, or about 350 million years.

Sharks are often thought of as being "primitive", yet surprisingly they are the last major group of fishes to appear.

While the teeth are the most commonly fossilized part of sharks, occasionally vertebrae are also preserved. Two distinct types of vertebrae are readily distinguished. The more primitive shark families have less completely developed vertebrae, referred to as LAMNOID vertebrae, whereas the higher families have a more solid type which are known as SCYLIORHINOID vertebrae.

Throughout their history nearly all the cartilaginous fishes have inhabited salt water. There are, however, in the living Florida shark fauna, certain species that habitually frequent estuarine and brackish water situations. The bull shark, *Carcharhinus leucas*, ascends far into fresh water in the larger rivers. This is the same species that lives in entirely fresh water in Lake Nicaragua. The lemon shark, *Negaprion brevirostris*, and the sharp-nosed shark, *Rhizoprionodon terraenovae*, are also found in brackish-water situations. It is significant that these species are never found in deep-water, off-shore areas. At the opposite extreme are sharks such as the blue shark, *Prionace glauca*, and the mako, *Isurus oxyrinchus*, which inhabit only off-shore areas and are seldom found within sight of land. This selectivity of habitat among sharks may become a useful tool to the paleontologist. By interpreting the habitat of the recent relatives of shark species found in a fossil site, it is possible to judge whether the site was a large estuarine river, a shallow sea, or ocean bottom at the time of deposition.



LAMNOID
Figure 1

FAMILY : HEXANCHIDAE - cow sharks.

RECENT FLORIDA SPECIES : *Hexanchus griseus*. (Figure 2.)

The six-gilled cow shark is occasionally taken on the Atlantic coast.

VERTEBRAE : lamnoid.

DISCUSSION : Cow sharks are not common fossils in Florida. When teeth are found, they are readily distinguished by their "stairstepped" cusps.

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FAMILY : ODONTASPIDAE - sand sharks.

RECENT FLORIDA SPECIES : *Odontaspis taurus*.

VERTEBRAE : lamnoid.

DISCUSSION : Teeth of *Odontaspis* are elongate, slim, and have well-developed lateral denticles or side cusps. Teeth of the porbeagle shark, *Lamna nasus*, are sometimes confused with those of *Odontaspis*; however the latter bears a broad tripod-like base, never found in the porbeagle. *O. macrotis* is the most common fossil species. The teeth of *Odontaspis* are sometimes mistaken for the teeth of the barracuda (a bony fish) because of their elongated outline.

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FAMILY : LAMNIDAE - mackerel sharks.

RECENT FLORIDA SPECIES :

Alopias vulpinus - thresher shark.

Carcharodon carcharias - the white shark, or "man eater."

Centorhinus maximus - basking shark.

Isurus oxyrinchus - mako shark.

Lamna nasus - porbeagle shark.

VERTEBRAE : lamnoid.

DISCUSSION : Of these genera, only *Isurus* and *Carcharodon* are common

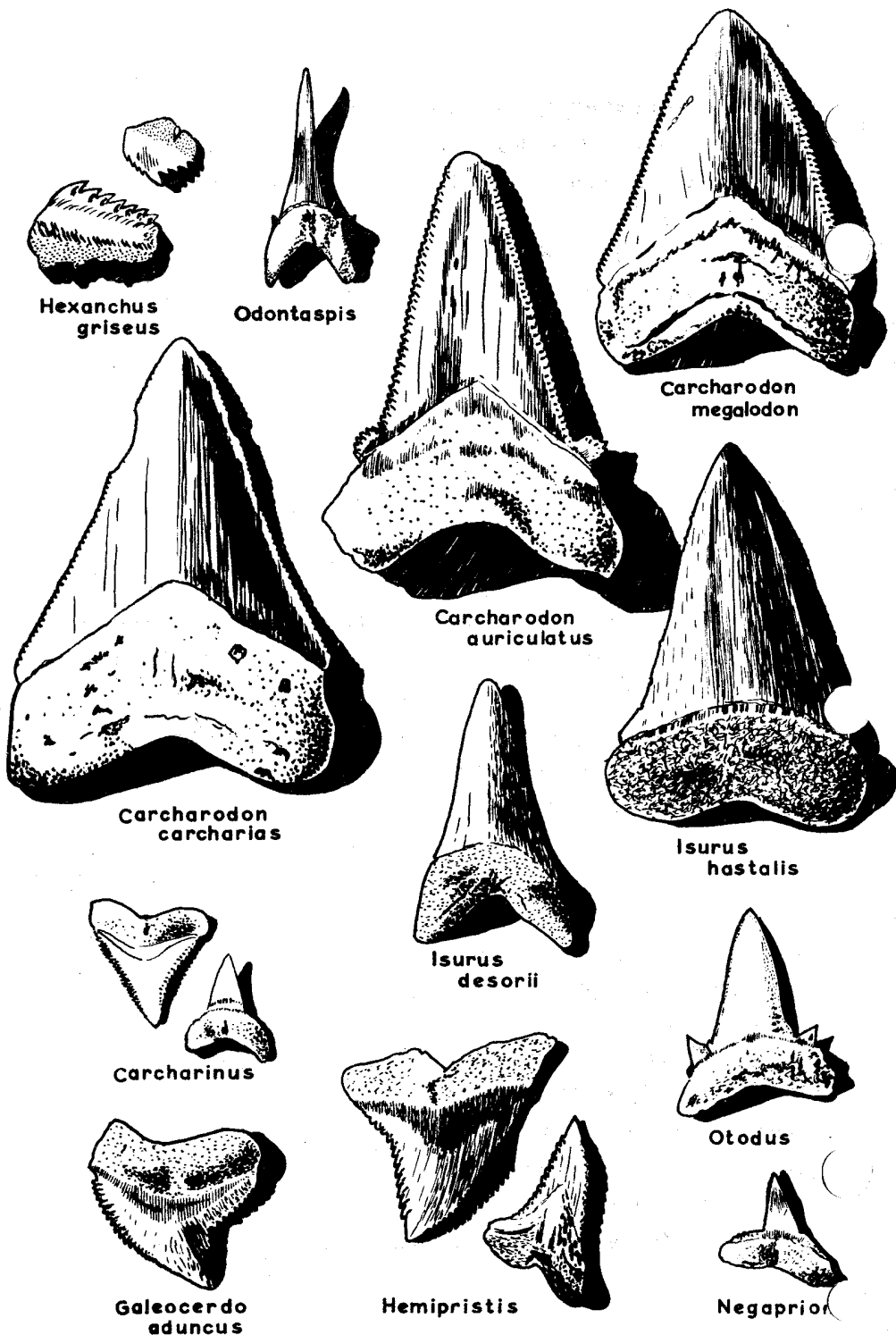


Figure 2.

as fossils, each being represented by three species.

Carcharodon is distinguished from *Isurus* by the presence of serrations along the margins of the teeth, a feature never present in *Isurus*. Because of its large and striking teeth, *Carcharodon* is one of the most popular fossils. Three species are recognized in the Florida fossil record. They are distinguished as follows :

C. carcharias : Tooth edge slightly concave from base. There are no accessory cusps.

C. auriculatus : Tooth edge slightly concave from base. There are always accessory cusps.

C. megalodon : Tooth edge straight or convex from base. (One side may be concave, but never both.) There are never accessory cusps. The largest shark teeth known belong to this species, often exceeding six inches in length.

At least three species of *Isurus* occur as fossils :

I. desorii and *I. oxyrinchus* are difficult to distinguish from one another and may really be positional variants of teeth in a single shark species. On the other hand, *I. hastalis* is noticeably broader than the other two species and may nearly approach the width of *Carcharodon*.

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**FAMILY : CARCHARHINIDAE - requiem sharks.
RECENT FLORIDA SPECIES :**

Rhizoprionodon terraenovae - sharp-nosed shark.

Hypoprion signatus - night shark.

Galeocerdo cuvier - tiger shark.

Negaprion brevirostris - lemon shark.

Prionace glauca - blue shark.

and eleven species of the genus *Carcharhinus*.

VERTEBRAE : scyliorhinoid.

DISCUSSION : Three species of fossil tiger shark are known from

Florida :

Galeocerdo aduncus. Teeth of this species are broadly rounded on the outer margin and deeply notched on the inner margin. They are coarsely serrate, more so toward the base than on the tip.

G. triqueter and *G. contortis* are similar to *G. aduncus*, however, both are slimmer-bladed and *G. contortis* is noticeably twisted toward the point.

Rhizoprionodon terrae-novae bears small, oblique, smooth-edged teeth. It is not a common fossil tooth, probably because of its small size.

Negaprion brevirostris is a very common fossil tooth. The upper teeth are symmetrical and erect and bear wavy or crenulate bases. The lowers are similar but have smooth bases.

Hypoprion signatus teeth resemble those of *Negaprion*, but its upper teeth are more oblique and bear two to four large serrations on the base.

Prionace glauca is not represented in the Florida State Museum fossil collections. This is probably a reflection of its "off-shore" habitat. Its teeth resemble those of *Carcharodon* but are more strongly curved.

The species of the genus *Carcharhinus* are difficult but not impossible to separate from one another from tooth material alone. They are all basically subtriangular teeth with serrate edges. The lower teeth are usually slimmer and may be serrate, serrate on the blade only, or entirely smooth.

Hemipristis serra is a common Florida fossil tooth. It is a triangular tooth, strongly curved toward the tip, and bears coarse serrations. Its base has a peculiar "gull-wing" cross section. No living members of this genus are found in Florida waters, but it is extant in southeast Asia.

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OTHER FAMILIES : Sharks of the families SQUALIDAE (dogfish), SPHYRNIDAE (hammerheads) and ORECTOLOBIDAE (nurse sharks) are found in Florida waters today, but fail to appear as fossils. Some *Carcharhinus*-like teeth may actually be from hammerheads, but this is doubtful. It is probable that the very small size of the teeth in the dogfish and nurse sharks accounts for their absence in the fossil record.

The genus *Otodus* occurs infrequently in Florida limestone deposits. It is an erect, smooth-edged tooth, bearing wide lateral denticles. As this genus is completely extinct, its affinities are not known. However, its similarity to *Lamna* suggests it may have been a member of the mackerel sharks.

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