The mailing list for the PLASTER JACKET has now reached 507. Of these, 387 subscribers are in Florida, 114 in the rest of the United States, and 6 are in foreign countries.

We are anxious to increase the length of each issue by including news notes from both the personnel of the Florida State Museum and those who receive the PLASTER JACKET. We would enjoy hearing from you and sharing your news with others via this section. Please let us also have your suggestions on how we can improve the PLASTER JACKET so that it would be more helpful to you. In future issues we hope to cover such diverse topics as geologic time, fossil preparation, various mammal groups, and even vertebrate paleontology as a career.

The response to our early issues has encouraged us to step up production to eight issues per year.

THE PLASTER JACKET
Florida State Museum
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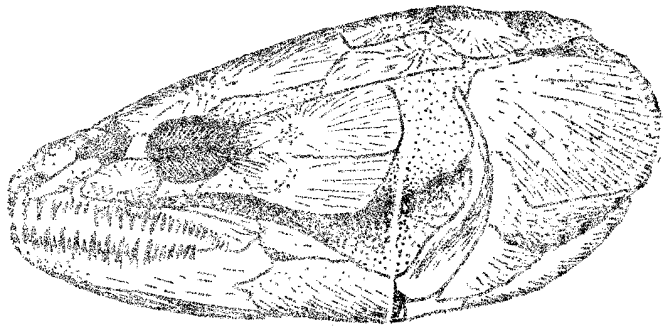
THE PLASTER JACKET



- FLORIDA STATE MUSEUM
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Number 7. February 8, 1968

FOSSIL BONY FISHES FROM FLORIDA

CAMM SWIFT AND ELIZABETH WING

The bony fishes constitute the largest group of modern fishes. They are distinguished from the next largest group, the sharks and rays, or cartilaginous fishes (treated in earlier issues of the PLASTER JACKET) by skeletons that are made of bone. For this reason they are called bony fishes or *Osteichthyes* (*osteo* = bone; *ichthyes* = fishes).

Bony fishes first appeared some 400 million years ago in the Devonian period. They are the most successful group of vertebrates in the sense that they are far more numerous than any other group. There are 20 to 30 thousand living species.

Cenozoic fossil fishes are poorly known as compared with the profusion of modern species. Reasons for the lag in fossil studies are that the vast number of living species are less well known taxonomically and osteologically than other vertebrate groups.

There has been relatively little exploration in critical freshwater and marine deposits for fossil fishes. The bony fishes present a major opportunity for further research.

Bony fishes inhabit almost every conceivable niche in fresh and salt water. Certain species are restricted to fresh water, others to salt or brackish water, while still others are restricted to different habitats during the various developmental stages of their lives. When a number of indicator species occur together in a fossil deposit, they provide convincing evidence of the original type of aquatic habitat at that deposit.

In Florida most fossil bony fishes occur as isolated bones and usually only the stronger skeletal parts such as otoliths, teeth, spines, vertebrae, and jaws are preserved. They occur principally in Miocene, Pliocene, and Pleistocene deposits. However, whole skeletons are preserved in minute detail in the Oligocene limestones near Marianna in Jackson County.

In the earliest Devonian sediments two major groups of bony fishes are already distinguishable; the ray-finned fishes and the lobe-finned fishes. The lobe-finned forms included the ancestors of the land vertebrates, but few survived the Mesozoic era. None are known from Florida. Thus only the ray-finned fishes will be covered in our survey of fossil vertebrates of Florida.

The ray-finned fishes may be divided into three orders; the CHONDROSTEI, the HOLOSTEI, and the TELEOSTEI.

CHONDROSTEI

The chondrosts were the characteristic fishes of the Paleozoic era. Their distinctive features include the presence of a long fleshy lobe in the tail fin, broad-based, stiff, paired fins, and in most recent species a largely cartilaginous skeleton. The only surviving chondrosts are the bichir, the paddlefishes, and the sturgeons. All these species live in fresh water, although *Polypterus* can also get around on land.

Two species of sturgeons live in Florida today: the Atlantic sturgeon, *Acipenser oxyrhynchus*, and the shortnose sturgeon, *A. brevirostris*. Fossil sturgeons have never been recorded from Florida before. However, three bony plates of a fossil sturgeon (*Acipenser*), species not yet determined, recently were donated to the museum by Mrs. Lucius A. Buch (see Figure 1). They were collected along Ponte Vedra Inlet south of Jacksonville Beach, probably from a Pleistocene freshwater deposit.

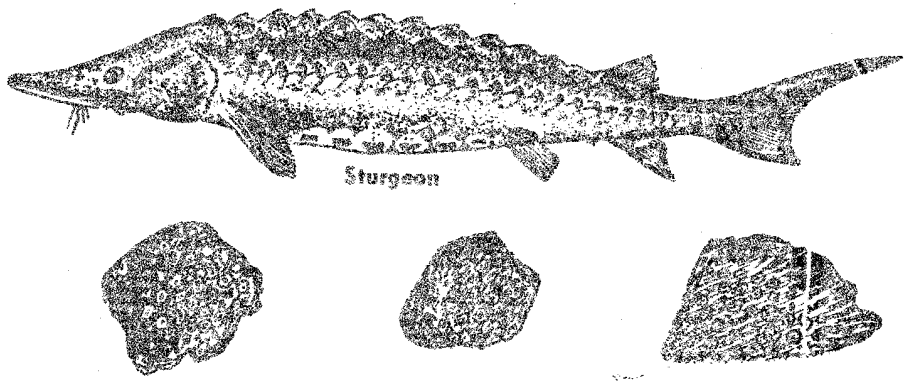


Figure 1.

HOLOSTEI

The holosts were the dominant group of bony fishes during most of the Mesozoic. The tail fin lacks the long fleshy lobe seen in the chondrosts and the paired fins are narrow-based and more flexible. The skeleton consists of bone throughout except for some areas around the brain where there is an external armor of diamond-shaped, non-overlapping scales. In the garfish these scales bear a shiny, enamel-like surface of ganoine and closely resemble the scales of the Mesozoic holostean ancestors.

The only surviving holosts are the North American freshwater bowfin and the garfish. The bowfin and four species of gar live in Florida today.

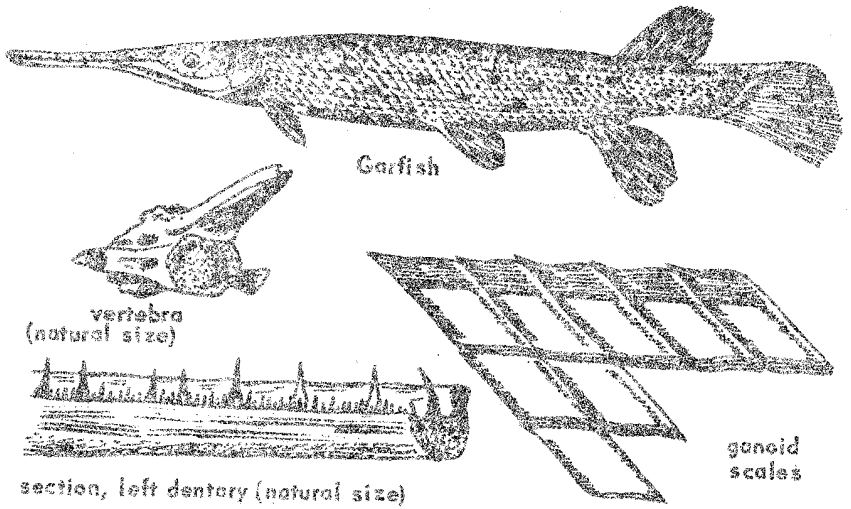


Figure 2.

Garfish are abundantly represented in Pliocene and Pleistocene deposits by their characteristic hard, shiny ganoid scales and by their vertebrae, which have one concave and one convex end to each centrum, (Fig. 2). A presumably extinct species of gar, *Lepisosteus (Atractosteus) lepidosteus*, was named from a few scales and two opercles from Pleistocene deposits at Vero, Florida. However, it probably represents one of the living species. Fossils of longnose gar, *Lepisosteus osseus*, are recognized by their elongate skull bones.

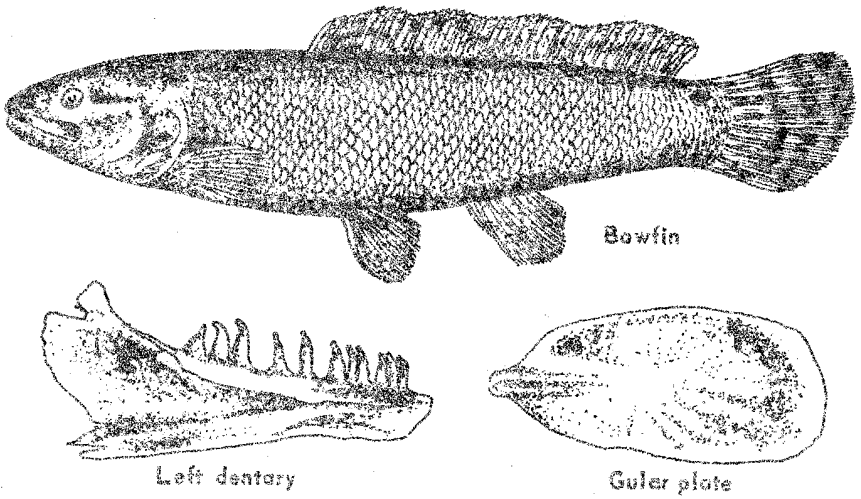


Figure 3.

An articular and a dentary bone from the jaw of a bowfin (*Amia*) were found in Pleistocene sands near Vero Beach. The large gular plate that covers the throat region is also a distinctive element of the bowfin. These fish are common today in lakes and sluggish streams in Florida, and with further study of fossil fishes, probably will be commonly found in Pleistocene fresh-water deposits. The texture of the head bones and the distinctive vertebrae and scales permit ready identification of these fish (Figure 3 and front cover).

TELEOSTEI

Near the end of the Mesozoic era this progressive order of ray-finned fishes replaced the holosts as the dominant type. Today in Florida alone there are about 1200 species of teleosts. They occupy almost every aquatic situation from deep-water marine to fresh-water spring.

The skeleton is composed entirely of bone. The jaws tend to be shorter and more flexibly hinged than in more primitive ray-finned fishes. A supraoccipital bone, not present in earlier types, forms a prominence at the back of the skull. The tail fin has no fleshy lobe. The paired fins are narrow at their bases and quite flexible; in many teleosts the hind pelvic fins have moved forward under the front (pectoral) paired fins. The scales are thin, lack a shiny surface of ganoine (seen in the gar), and overlap extensively.

As pointed out previously, Cenozoic fossil fishes are inadequately known, and many more groups will become known as fossils as this subject receives more attention. At present a small number of species are known from the Oligocene through the Pleistocene. Many other species that probably occur in the fossil record have simply not been studied, and therefore cannot be dealt with in this discussion. Of five or more suborders of teleosts, only two are known from Florida fossils. These are the OSTARIOPHYSI (carp, minnows, suckers, and catfish) and the ACANTHOPTERYGII, a very diverse group of spiny-finned fishes.

OSTARIOPHYSI

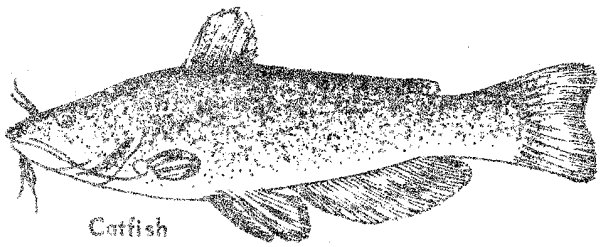


Figure 4.

The OSTARIOPHYSI had their origins in the mid-Mesozoic and include a vast number of fresh-water fishes such as minnows, shiners and, in South America and Africa, the characins. They are characterized by the absence of stiff spines projecting from their dorsal fins. Catfish are the only members of this group that have been recognized in Florida.

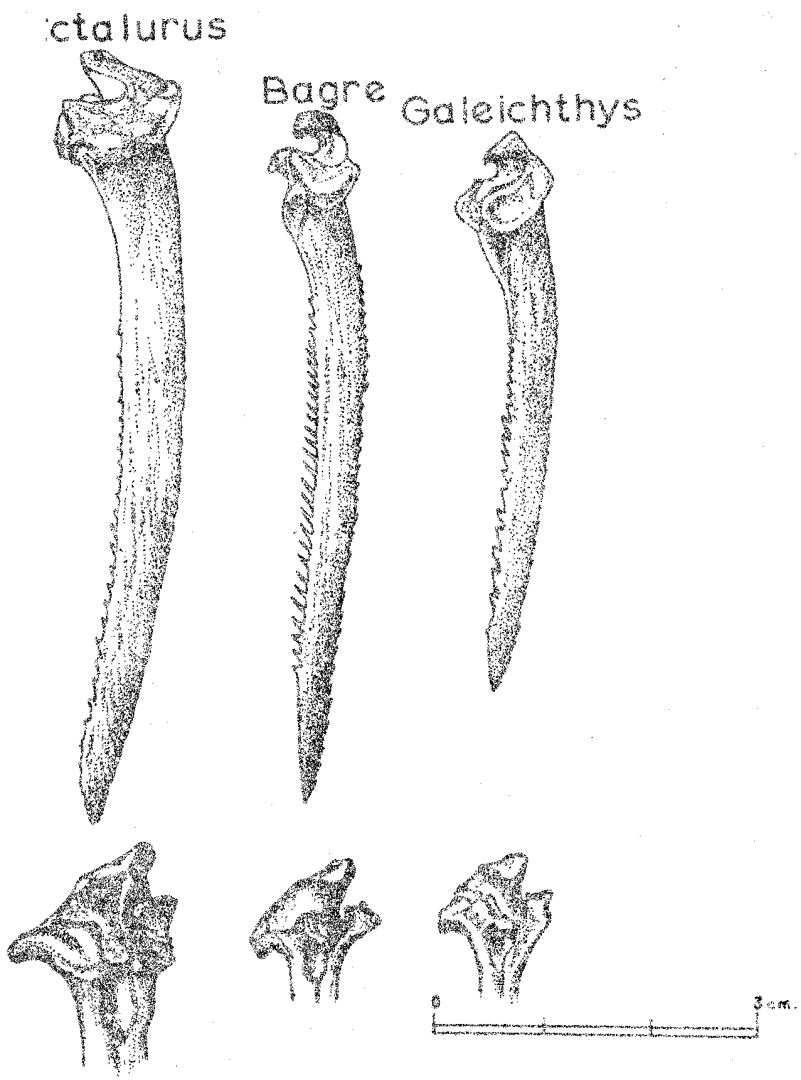
Three genera and 5 species of catfish now live in Florida waters, and the same forms occur as fossils in the Pliocene and Pleistocene. They are:

Bagre marinus (Mitchill) - gafftopsail catfish.
Galeichthys felis (Linnaeus) - sea catfish.
Ictalurus catus (Linnaeus) - white catfish.
Ictalurus nebulosus (LeSueur) - brown bullhead.
Ictalurus punctatus (Rafinesque) - channel catfish.

Bagre and *Galeichthys* occur in coastal waters, while the three species of *Ictalurus* all occupy fresh or brackish waters.

Pectoral spines are the most common fossil remains of catfishes. Pectoral spines of *Ictalurus* have tooth-like projections only on one edge of the spine, whereas those of *Bagre* and *Galeichthys* are toothed on both edges. It is possible to distinguish species by details of the pectoral spine, see Fig 5, A and B.

A. Dorsal views of pectoral spines as they lie in an unerected position on the right side just behind the skull.



B. Lateral view of anterior articulation of pectoral spines.

Figure 5.

The second suborder of teleosts represented by Florida fossils is ACANTHOPTERYGII. This group originated at the very end of the Mesozoic and includes the vast variety of species of both marine and freshwater fishes. They are characterized by stiff spines that project from the dorsal fins. Of nearly a hundred families of these spiny-finned fishes living in Florida waters today, only eleven families are presently known as fossils. Each of these families is discussed below.

Holocentridae (squirrelfishes)

The living squirrelfishes occur in marine waters especially around coral reefs. *Holocentrites ovalis* Conrad is an extinct squirrelfish from the Eocene limestones near Marianna in Jackson County. The unusual ear cavity, the membranous channels in the head, and the serrated and striated bones distinguish *Holocentrites* from other kinds of fish. In the same creamy limestone deposits are an assemblage of fossil microorganisms (foraminifera) that indicate a water depth of more than 10 fathoms. The excellent preservation of the fish from the Marianna limestones must be attributed to the quiet water situation in which they were deposited.

Lutjanidae (snappers)

A fossil snapper, *Lutjanus avus* (Gregory), is also from the limestone beds near Marianna, but it is Oligocene in age. The fossil consists of a fragmentary skull and the scaly surface of the body. The animal was about 2 feet long. It is readily recognized as a snapper by its very strong canine teeth. It does not differ greatly from the living red snapper, *Lutjanus aya* (Block), that lives in marine waters.

Centrarchidae (sunfishes)

Many species of sunfishes live in Florida's lakes and streams, but the shellcracker, *Lepomis microlophus* (Gunther), is the only one found as a fossil. It is readily recognized in fresh-water deposits of Miocene, Pliocene, or Pleistocene age by its diagnostic pharyngeal grinding mill.

Sciaenidae (drums)

Twenty-two species of drum occur along the coasts of Florida today. All are shallow-water species and most reach a foot or more in length. Most have large distinctive ear stones (otoliths) which function in hearing. They also have "mills" of grinding teeth in the gill region that produce

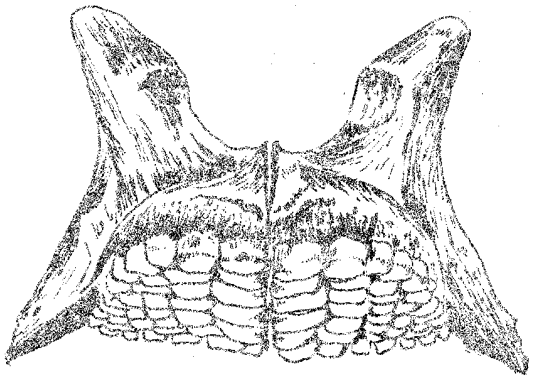


Figure 6. Pharyngeal grinding mill.

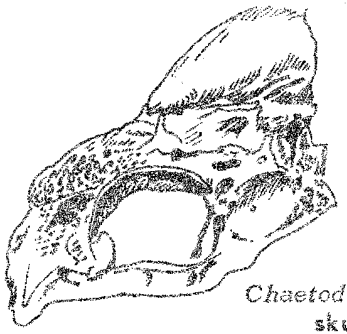
sounds used in courtship. Many of the pebble-like teeth in fossil deposits come from these pharyngeal grinding mills of the drums. As the isolated teeth are similar to those found in porgies, they are difficult to identify when not in place in the tooth-bearing element.

Carangidae (jacks)

Fossil jacks (*Caranx hippos* and *Caranx* sp.) have been reported from the Pleistocene beds at Vero. These records are based on "inflated bones" which are found on the median fin supports, neural arches of the vertebrae and shoulder girdle of some of the jacks. It is yet to be determined at what size these growths appear, whether they grow with the fish and how widely among the jacks they are distributed. They are found in this and the following family.

Ephippidae (spadefishes)

In the spadefish the neural crest of the vertebrae may become inflated. Such inflated bones have been reported from many Pleistocene deposits in Florida. The only species of spadefish that occurs in Florida today is the Atlantic spadefish, *Chaetodipterus faber* (Broussonet). See Fig. 7. It is common in most inshore waters in the state. Spadefishes are fine food fish and their remains have been found in several archeological sites.



Chaetodipterus faber
skull.

Figure 7.

Labridae (wrasses)

Wrasses are abundant today in coral reefs. One species has been described from the Miocene of Florida. The crushing pharyngeal teeth of wrasses have been reported from the Pleistocene deposits of Seminole Springs, Lake County and from Lake Monroe, Seminole County. In DeLeon Springs, Volusia County they were found in Pliocene beds. This family and the Scaridae, the parrotfishes, are closely related. Both families are often bright-colored, possess characteristic pharyngeal teeth, and occur around reefs and rocky areas.

Scombridae (mackerels and tunas)

A fossil mackerel is reported from probable Miocene deposits near Seminole Springs, Lake County. Mackerels and tunas generally occur today in deep ocean waters.

Triglidae (searobins)

A fossil armored skull found in Florida is probably referable to *Prionotus*.

Sphyraenidae (barracudas)

Fossil barracudas are commonly recognized by their sharp, triangular, blade-like teeth. Their teeth may be distinguished from other similar teeth by the razor-sharp enamel cutting edge that passes the length of at least one edge of the tooth. Some are sharp on only one edge; others on both edges. Fossil barracudas are common in Miocene, Pliocene,

barracuda (Walbaum), lives in marine waters.

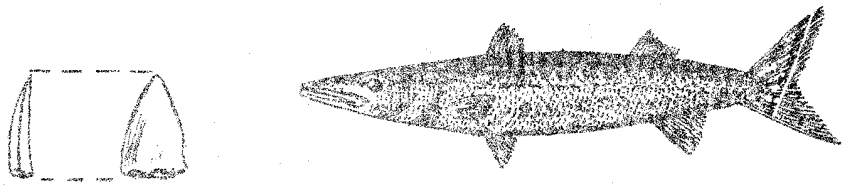


Figure 8. Barracuda, views of typical tooth.

Diodontidae (porcupinefishes)

Remains of porcupinefishes are, next to shark and ray elements, probably the most abundant fossilized fish remains in Florida. Fossil porcupinefishes are usually represented by the upper or lower half of their beak-like jaws. These beaks are fused teeth. The fossil porcupinefish, *Diodon circumflexus* Leriche, was based on an upper jaw from the middle Miocene Hawthorne formation near Kingston, Florida. Modern porcupinefishes live near shore, generally near reefs.

* * *

The identification of bony fish remains requires a good knowledge of the skeletons of recent fishes and a large collection of modern skeletons is needed for comparisons. A shark can often be identified by a single tooth. Many different elements are diagnostic among the bony fishes and often a certain combination of several bones is needed. Many groups have not been described osteologically. Until the osteology of the diverse groups of bony fishes is more thoroughly studied we will know much less about their fossils than about shark fossils.

Camm C. Swift, a doctoral student at Florida State University, is co-author of this issue of the PLASTER JACKET. From schools in California he pursued his studies in the evolution and classification of recent and fossil fishes at the University of Michigan. He is interested in the taxonomy and zoogeography of the freshwater fishes of the southeastern United States and in the fossil fishes of Florida's Eocene limestones.

Dr. Elizabeth Wing was introduced to our readers in the second issue of this newsletter.