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It is our intent to produce this series at the rate of six issues per 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. These issues are distributed free of charge to all interested people.

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FOSSIL SIRENIA OF FLORIDA

Roy H. Reinhart

The sirenians or sea cows are little known, almost extinct, retiring, aquatic herbivorous mammals, yet they appear abundantly as fossils in Florida. There are two living genera: Trichechus (the manatee), which inhabits shallow salt water bays and fresh or brackish waters of sluggish coastal rivers of the Caribbean islands and the surrounding continental coasts (including Florida) and the Atlantic coasts of South America and Africa; and Dugong (the dugong), an inhabitant of the shallow waters of the western Pacific islands, the Indian Ocean, and the Red Sea. A third genus, Hydrodamalis (Steller's sea cow), which formerly lived near several islands in the Bering Sea, was exterminated by the whaling operations in this region about 200 years ago.

Dense massive bones, especially the ribs, are characteristic of both fossil and living members of the order. All the sirenians have a similar overall appearance resulting, in part, from their complete adaptation to water. Body hair is essentially lacking. The bulbous seal-shaped body tapers gradually back to a broad, round-paddle-like fin in Trichechus and to a flattened, forked tail in Dugong and Hydrodamalis. The tail fin is flattened horizontally and moves up and down unlike a fish's tail fin, which is flattened vertically and moves laterally. This fin serves as the chief organ in swimming. Sirenians at rest in the water have a strange posture with the back humped up and head and tail dangling, the tail curled under the body so that its dorsal surface rests upon or points to the bottom. The anterior appendages are modified into paddles for maneuvering, grasping the young, and manipulating food. Posterior appendages are vestigial or lacking in recent species. A round, elongate head with a blunt snout merges with the body through a short neck (Figure 1).

The ears and eyes are minute in relation to the animal's large size. The cleft upper lip covered with stiff bristles is used for grasping succulent water vegetation, and the slow manner of grazing is the basis for the name "sea cow." Horny plates are present on the front part of the jaws behind which lie 4 or 5 bunodont teeth in Dugong, 7 or 8 similar lophodont molariform teeth in Trichechus, which serve as the chief masticating surfaces. Hydrodamalis lacked teeth but retained horny plates throughout its mouth. The usual adult

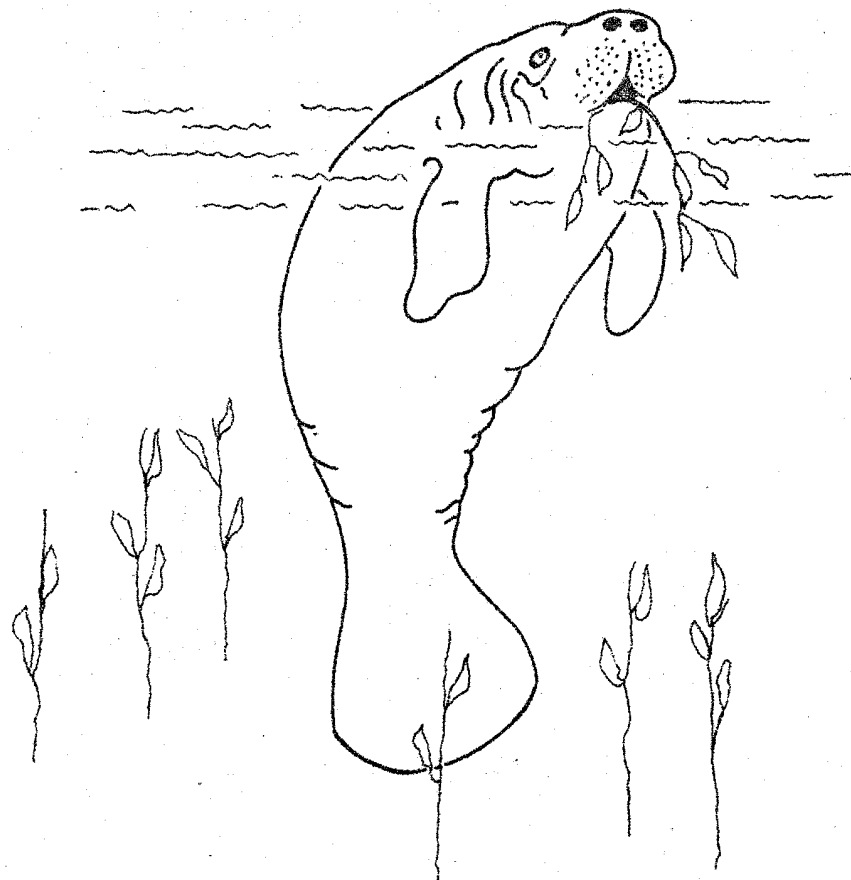


Figure 1

Trichechus has a length of 7-10 feet, Dugong, 8-12 feet, and Hydrodamalis is estimated to have been 20-25 feet long.

It is a strange paradox that these ugly creatures may have formed the basis for some of the legends of sirens or mermaids. Undoubtedly the fanciful resemblance is based upon the appearance of the sirenian resting vertically with its head above water, breasts on the thorax, hair on the upper lip, and short maneuverable forelimbs. Credit must be given to the imagination and the ingenuity of the human spirit that created the myths of these creatures, half fish and half human in English legends, the sirens and tritons of classical Homeric antiquity, and similar stories among the American Indians. Unfortunately the real sirenians are ugly and rather stupid, whereas the legendary sirens are beautiful and enticing.

Relationships

Sirenians branched off from quadrupedal terrestrial mammals in early Eocene or earlier time, and the fossil record indicates a close relationship with the proboscideans (Figure 2). They are in this sense like seals and whales, descended from land mammals, yet in their adaptation to aquatic life having lost all superficial resemblance to their ancestors. The most ancient forms date back to the Middle Eocene of Egypt, Florida, and Jamaica, 50 million years ago, but even at that time the Sirenia were well adapted to an aquatic life and would have been unable to move on land.

The order Sirenia is subdivided into two families, the Dugongidae and Trichechidae. Dugongidae range from Middle Eocene to the present with a moderately well documented history. Fossil representatives occur on all continents but are best known in North Africa, Europe, and the United States. Caribosiren, from the Middle

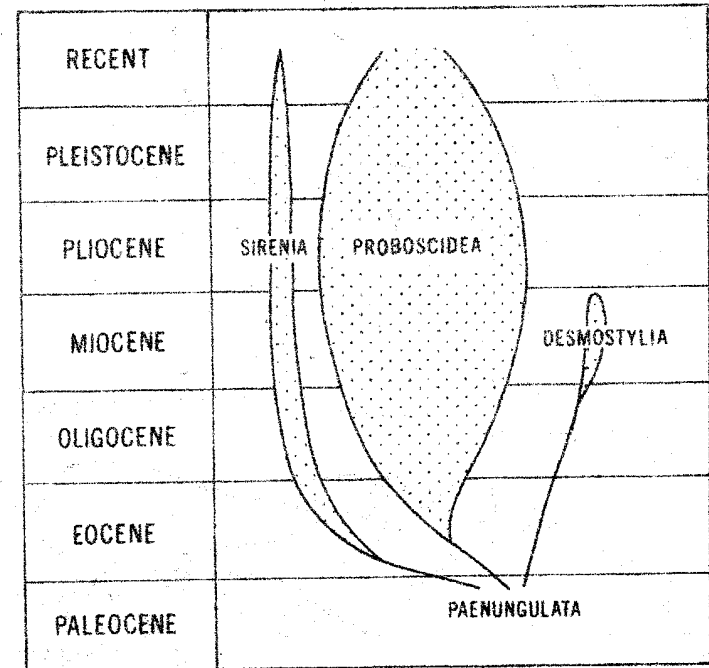
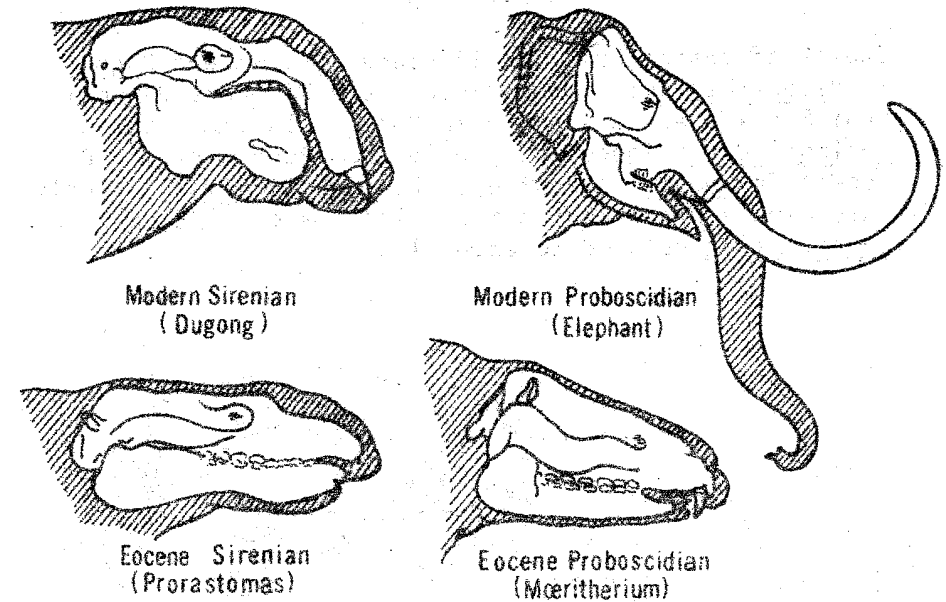
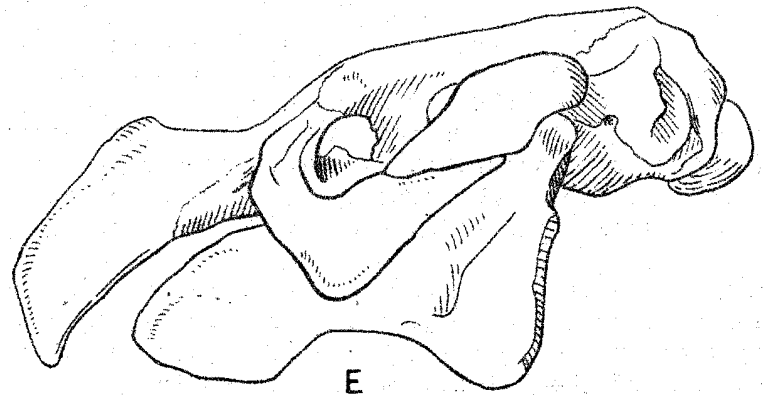
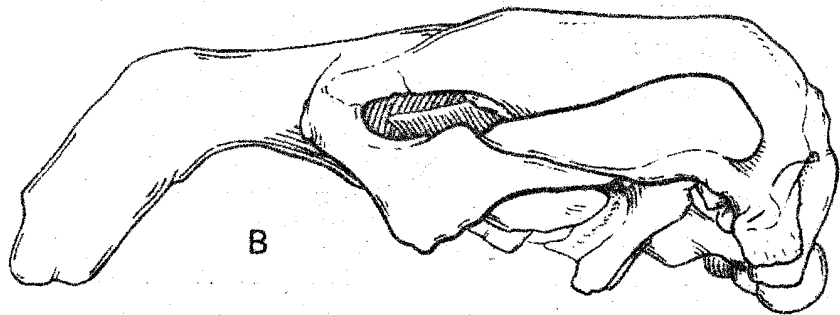
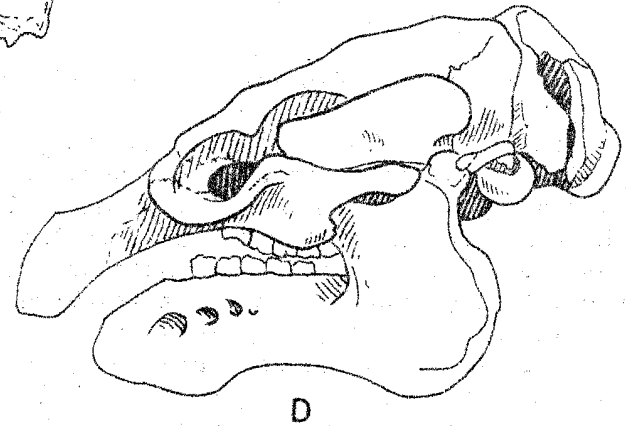
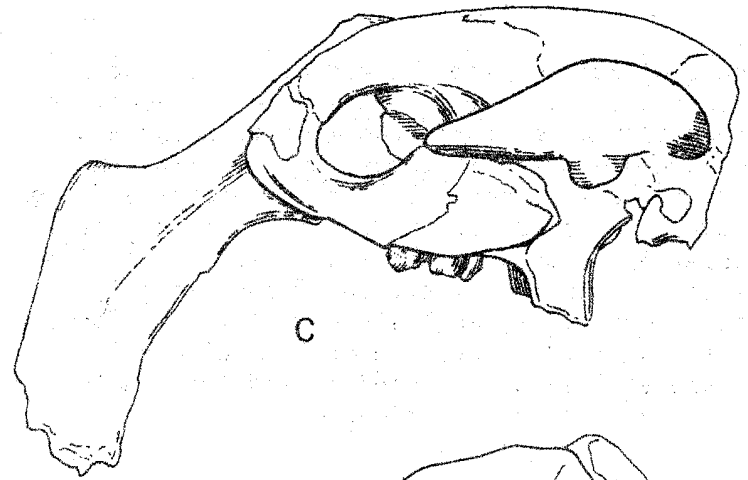
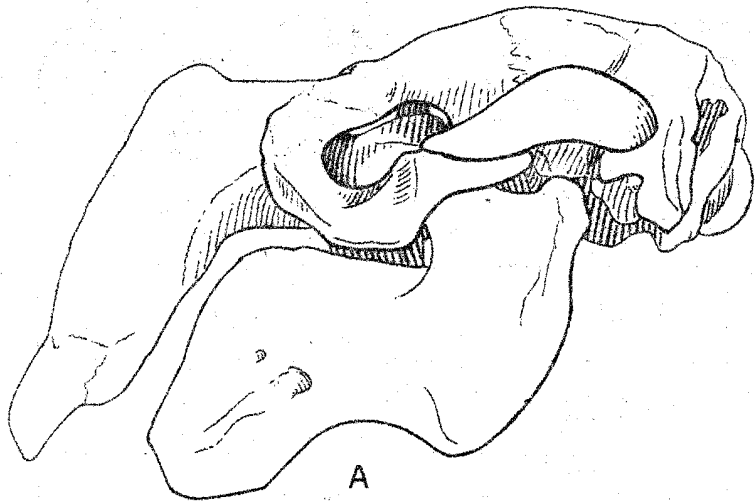


Figure 2

Figure 3

Skulls of characteristic Sirenians. A, Recent Dugong. B, Metaxytherium, common Miocene and Pliocene dugongid from Florida and elsewhere in North Atlantic. C, Caribosiren, Oligocene dugongid from Puerto Rico. D, Recent Trichechus (Manatee). E, Hydrodamalis, recently exterminated from Bering Sea. Scale about 1/5, but Hydrodamalis reduced to about 1/8.



Oligocene of Puerto Rico is unusually well known. Other than the living Trichechus, the Trichechidae are known from a few rare specimens from the Miocene of South America (Potamosiren) and from the Gulf Coast Pleistocene of the United States. Though they have achieved a worldwide distribution, sea cows apparently have always been relatively limited in numbers. With the exception of the recently extinct Hydrodamalis, both living and fossil forms have been confined to warm waters. A climax in number and variety was reached during the middle and the late parts of the Miocene epoch.

Sirenia of Florida

The manatee (Trichechus) is one of the most unusual animals living in the state of Florida, but little is known of its ancestry before the Pleistocene. Collecting in the older rocks of Florida has revealed sirenian remains from Middle Eocene, but these are not diagnostic enough to tell whether they are trichechids or dugongids. In rocks of Oligocene age one can find sirenian ribs and even skeletons, but these are rare and are barely mentioned in the literature. Sirenian remains become relatively common in rocks of Miocene and Pliocene age and are particularly abundant in the Bone Valley phosphates of Hillsborough and Polk counties. It is quite probable that every county in Florida has produced sirenian fossils. They have even been discovered in the deep ocean bottom off the continental shelf of southeast Florida. The usual specimen is a portion of the dense banana-shaped rib, which can only be identified as sirenian. Roofing bones of the skull and isolated teeth and large bones such as the humerus are found less frequently, and whole skeletons are rare.

All of the better known tertiary sirenians from Florida belong to the Dugongidae, which apparently became extinct along the Gulf and Atlantic coasts during or at the end of the Pliocene time. These include:

Halitherium olsenensis
Hesperosiren crataegensis
Metaxytherium ossivalense
Metaxytherium floridanum
Metaxytherium calvertense

The great bulk of Tertiary fossils found to date are referable to Metaxytherium.

The history of the Florida manatee remains a mystery. It appears to have come from South America and possibly invaded the Caribbean area near the end of the Pliocene. The appearance of Trichechus in Florida coincides with the demise of the Dugongidae in this area, but whether this was due to direct competition cannot be demonstrated.

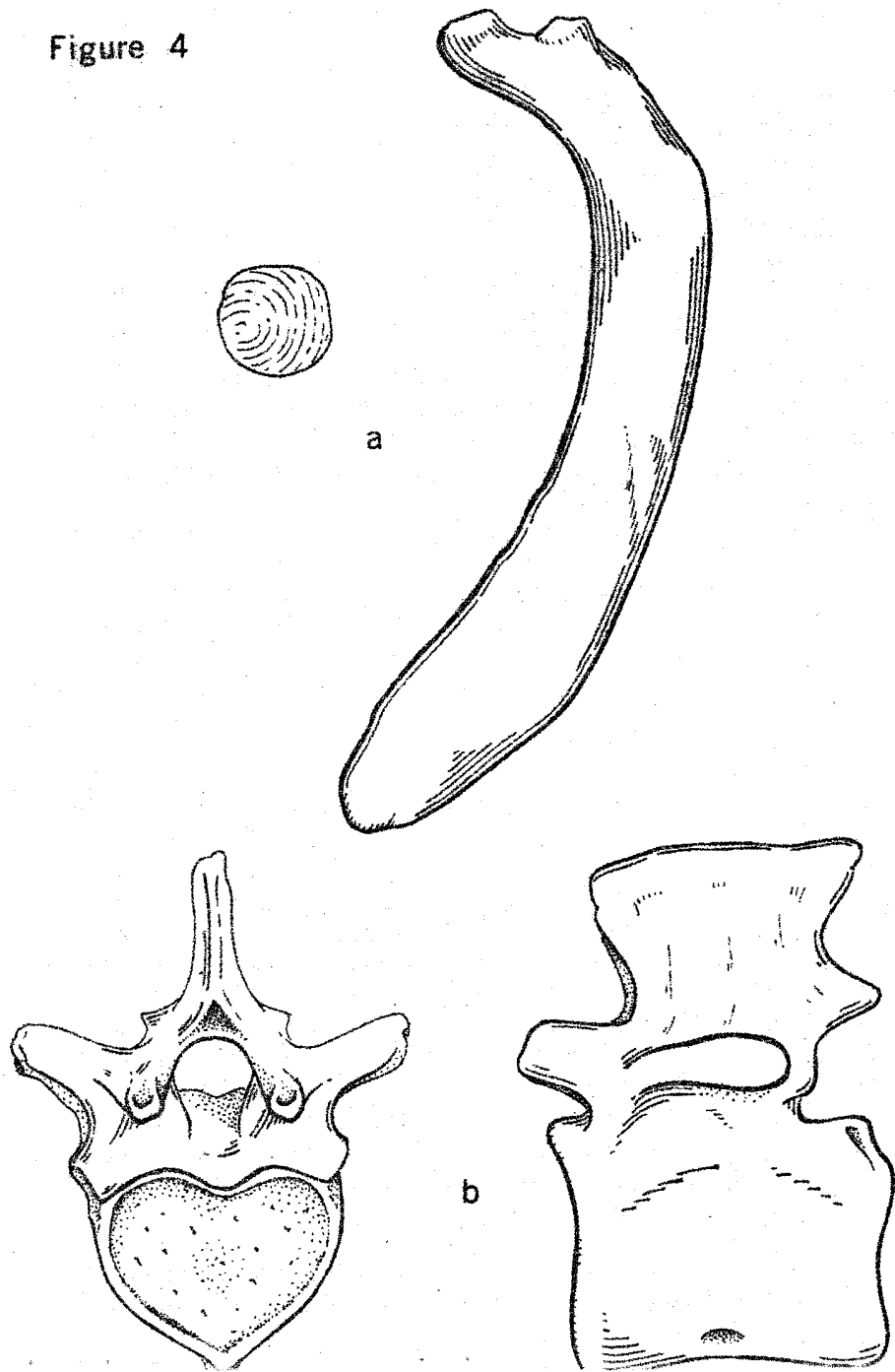
It is a curious fact that Florida is the only area in the world with evidence of continuous sirenian habitation from the earliest Middle Eocene to the present.

Identification

As noted above, sirenian bones are readily recognizable by their dense, massive quality. The commonest elements are ribs, and the next commonest are vertebrae. Besides their great density the ribs may be characterized by their rounded, banana-like shape, and in cross-section, by the absence of marrow and indication of thick bone layers (or lamellae) (Figure 4a). The vertebrae also may be recognized by their great density, and by their heavy, heart-shaped centra (Figure 4b). The fore limb forms in effect a short heavy paddle, consisting of three elements distinctive in form and also recognizable by their great density (Figure 5a). Hind limb bones (mainly pelvis) do exist, but they are very small and rarely recovered.

Dugongids and trichechids may be distinguished most readily by differences in dentition. Dugongids have no

Figure 4



more than four or five cheek teeth in each jaw half. They are heavy bunodont teeth with two transverse curved crests. The crests are greatly complicated by numerous small cusps (Figure 5b). They distantly resemble the teeth of gomphotheriid proboscideans. Trichechids have numerous teeth that rapidly develop at the back of the jaw and rotate forward into position throughout the animal's life. At least seven teeth appear in each jaw half at a given time. Each tooth bears two simple transverse crests and a low cingulum (shelf) at each end (Figure 5c). Trichechid teeth are more crenulated than tapir or peccary teeth, which they tend to resemble.

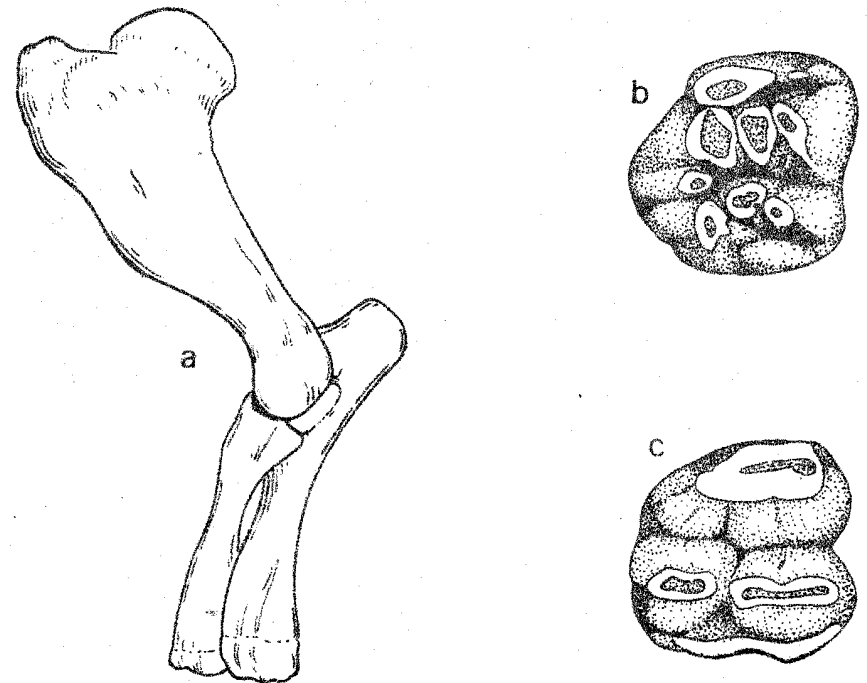


Figure 5