West Indian Tuskers
by Daryl P. Domning

Amid the contemporary traffic of the Florida and Caribbean coasts, the rotund marine mammals known as West Indian manatees attempt to live the slow, deliberate life of aquatic grazers. Found in both tropical salt water and the fresh waters of inland springs, these sirens, or sea cows, placidly paddle through warm waters, grazing on a wide assortment of fibrous-leaved water plants, including the introduced water hyacinth. Intermittently, a manatee snout breaks the surface; after a breath of air, the animal closes its nostrils and silently submerges. Half a world away, the manatees' look-alike but strictly saltwater cousins, the dugongs, quietly ply warm shallows of the Indian and southwestern Pacific oceans. While manatees have an ever-growing series of teeth adapted to the abrasive grasses that grow in fresh water, dugongs specialize in eating softer, less abrasive sea grasses that they uproot with a pair of tusks in their upper jaws.

Sirens have a long history, first appearing on earth some fifty million years ago, and their family tree has included denizens of cold as well as warm waters. The huge Steller's sea cow, for example, inhabited the waters of the North Pacific and Bering Sea, until it was hunted to extinction in 1768, just twenty-seven years after its discovery (see "A Sea Cow Family Reunion," Natural History, April 1987). Nor have dugongs and manatees always so neatly divided their tropical realms between the Atlantic and Indopacific oceans. West Indian manatees are, geologically speaking, relative newcomers to the Caribbean; for millions of years, their cousins the dugongs dominated the tropical Western Hemisphere. Not only were these ancient dugongs abundant, they were diverse. From the Oligocene to the Pliocene—that is, from more than thirty to less than five million years ago—at least three, probably more, kinds of dugongs lived together in the Caribbean.

This newly discovered diversity raises the question of how these different species, which had such similar diets, could have coexisted in the same environment. Today, no place in the world supports more than a single species of sirenian. What, if anything, was different about the Caribbean during much of the Age of Mammals that promoted a degree of sea cow diversity unknown today? And what caused these animals to later die out? Much of my work with fossil sirenians has focused on how various combinations of anatomy and behavior might have allowed these separate species to share the available marine plant foods.

Most of the extinct Caribbean dugongs, like their living Indopacific relatives, wielded impressive tusks. Some were more than a foot long and were shaped like knives or chisels, with self-sharpening enamel edges. These were not carried for show; lodged solidly in deep sockets in the upper jaw, with only a few inches of tip exposed, they were powerful tools that could have been used in combat, as are the tusks of modern male dugongs. But while...
in the living species males have the larger
tusks, we have no evidence for a differ­
ence in tusk size between the sexes in an­
cient dugongs. I believe that these big, 
bladelike tusks were used by both males 
and females to dig up and consume the 
large, woody rhizomes, or underground 
stems, of the largest sea grasses, for ex­
ample, those of turtle grass (Thalassia), 
which are inaccessible to tuskless sireni­
ans such as manatees. (Dugongs eat the 
whole plant, half of which is the nutritious 
rhizome. Manatees can chew gritty grass 
but can't get at the rhizomes.)

Another dugong that inhabited the an­
cient Caribbean at the same time as the 
great tuskers was Metaxytherium. Some 
ten feet long, this creature also sported a 
pair of tusks at the front of its upper jaw, 
but these appendages were so tiny, with 
conical crowns only about half an inch 
long, that they appear useless compared 
with the daggers and hoes of other du­
gongs. Metaxytherium was probably a rela­tively unspecialized feeder. It most likely 
grazed on the leaves of various sea grasses 
and on the nutritious rhizomes of the 
smaller sea grasses, which would not have 
been hard to uproot. This is the strategy 
that the completely tuskless Florida mana­
tee uses in salt water today.

Was the ancient Caribbean full of big 
sea grasses with tough rhizomes that filled 
the bill for an array of sea cows? Evidence 
in the form of fossil sea grasses is rare. At 
one Florida site, however, fossil sea grass 
some forty-five million years old was 
found, giving us a window on the past 
plant life of the Caribbean. These fossils 
reveal that, while sea-grass beds must 
have looked much the same for as long as 
sea cows have been on earth, at one time, 
sea-grass communities in the Caribbean 
were somewhat more diverse than those of 
today, which comprise a mere four genera.

Did the abundance of robust sea grasses 
permit the evolution of several kinds of 
large-tusked dugongs? Did the plants sur­
vive throughout the dugongs' twenty-mil­
lion-year heyday? We have only clues, but 
after studying them, I find the following 
scenario to be a plausible one. I suspect 
that sea-grass beds supported diverse spe­
cies of plants until about two to three mil­
lion years ago, and that these sea grasses in 
turn supported a contingent of large-tusked rhizome eaters. Turtle grass, for ex­
ample, is considered a climax species and characterizes the stable composition to­
ward which sea-grass communities tend if left to themselves. Suppose, however, 
these grasses were not left alone, but were 
periodically ripped up by mammalian dig­
ging machines in the form of dugongs? 
Rather than maintain a static climax com­
munity, this would enhance plant diversity 
and productivity and maintain ecological 
niches that could have supported other, 
less capable diggers such as tiny-tusked 
Metaxytherium. The large-tusked dugongs 
would have acted as keystone species in 
the ecosystem, keeping both sea-cow and 
sea-grass diversity at higher levels than 
they would otherwise have attained.

Two to three million years ago, in the 
grip of a major ecological upheaval, the 
Caribbean saw the extinction of many 
shallow-water mollusks and other inverte­
brates and most likely some of the marine 
plant life. This upheaval, like most in the 
earth's history, stemmed from the move­
ments of crustal plates and the building of 
mountains. The isthmus of Central Amer­
ica was completed, joining North and 
South America but also separating the 
Caribbean and Pacific and disrupting cur­
rents that had flowed between them. The 
changes in water circulation and salinity 
that produced the mass extinction of Car­
ibbean invertebrates could explain the dis­
appearance of dugongs from the area at 
roughly the same time.

At this time too, manatees made their 
first appearance in the Caribbean and in 
southern North America. They had 
evolved in the rivers of South America 
(see “Marching Teeth of the Manatee,” 
Natural History, May 1983) and only now 
spread northward into marine waters. Per­
haps their constantly replenished, wear-re­
sistant batteries of grinding teeth, which 
were superior to those of dugongs, gave 
them a competitive edge; or maybe the de­
cline of the dugongs simply created an 
ecological vacuum into which the mana­
tees expanded. Surviving sea grasses with 
the biggest rhizomes—such as turtle 
grass—could now live happily ever after, 
their manatee-proof root systems undis­
turbed by hungry plowers of the sea.

An underwater panorama depicts, 
from left, the ancient whale 
Basilosaurus, two dugongs, and a 
variety of other marine mammals 
and fishes. Metaxytherium, a tiny­ 
tusked dugong, and her calf feed on 
Caribbean sea grasses. Before three 
million years ago, the Caribbean 
was a garden of sea grasses with 
large, nutritious roots that were 
plowed up and savored by resident 
dugongs, many with long tusk. 
Today only tuskless manatees 
inhabit these waters.

Mural by Ely Kish; courtesy of the Smithsonian Institution.