

**FRANCINE JACOBS**  
**SEA TURTLES**

illustrated by Jean Zallinger



MORROW EAGLE  
Library Edition

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Until recently sea turtles have remained creatures of mystery, spending most of their lives in remote oceans. Now, however, scientists have learned more about them. Here the author presents the facts about the major species constituting the sea-turtle family—the leatherback, green, loggerhead, hawksbill, and ridley—concentrating on the green, which is the best known.

In spite of their differences, the sea turtles share several characteristics. All—except for the leatherback—have a tough shell, all are strong swimmers, enjoy protective coloration, and are endowed with sharp senses. The only time of year a sea turtle leaves the water is when the female lays her eggs in a nest she scoops out on the beach. This habit has made her increasingly vulnerable to man. One interesting program developed as a result is the green turtle hatchery that has been established at a protected beach called Turtle Bogue in Costa Rica.

Well-organized, lively text, with beautifully drawn illustrations, make this book a valuable addition to the nature-science collection available for children.

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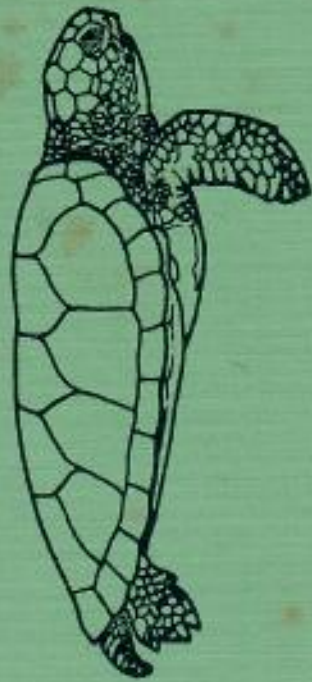
ABOUT THE AUTHOR

Francine Jacobs was born in New York City and has a B.A. in Education from Queens College. She has taught in the elementary grades in Rye, New York, and also conducted a reading enrichment program in Chappaqua, New York. A travel enthusiast, Mrs. Jacobs finds that her trips often stimulate ideas for books. In fact, the discovery of a turtle farm on Grand Cayman Island was what led her to write *Sea Turtles*. Mrs. Jacobs and her husband live in Westchester County. They have two children, a son and a daughter.

ABOUT THE ARTIST

A native of Boston, Massachusetts, Jean Zallinger attended the Massachusetts College of Art and has the degree of B.F.A. from the Yale School of Fine Arts. In addition to illustrating books, she teaches at the Paier School of Art in Hamden, Connecticut. She and her husband, who is also an artist and a professor at the University of Hartford, live in North Haven, Connecticut. They have three grown children, a son and two daughters.

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**SEA TURTLES**

ILLUSTRATED BY JEAN ZALLINGER

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The author wishes to express her thanks and appreciation to Dr. David Ehrenfeld, Professor of Biology at Barnard College, Columbia University, for reading the manuscript of this book.

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SUMMARY: Discusses the physical characteristics, habits, and habitats of the five species of sea turtles.

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FOR MY DAUGHTER LAURIE



PROGANOCHELYS



PLACOCHELYS

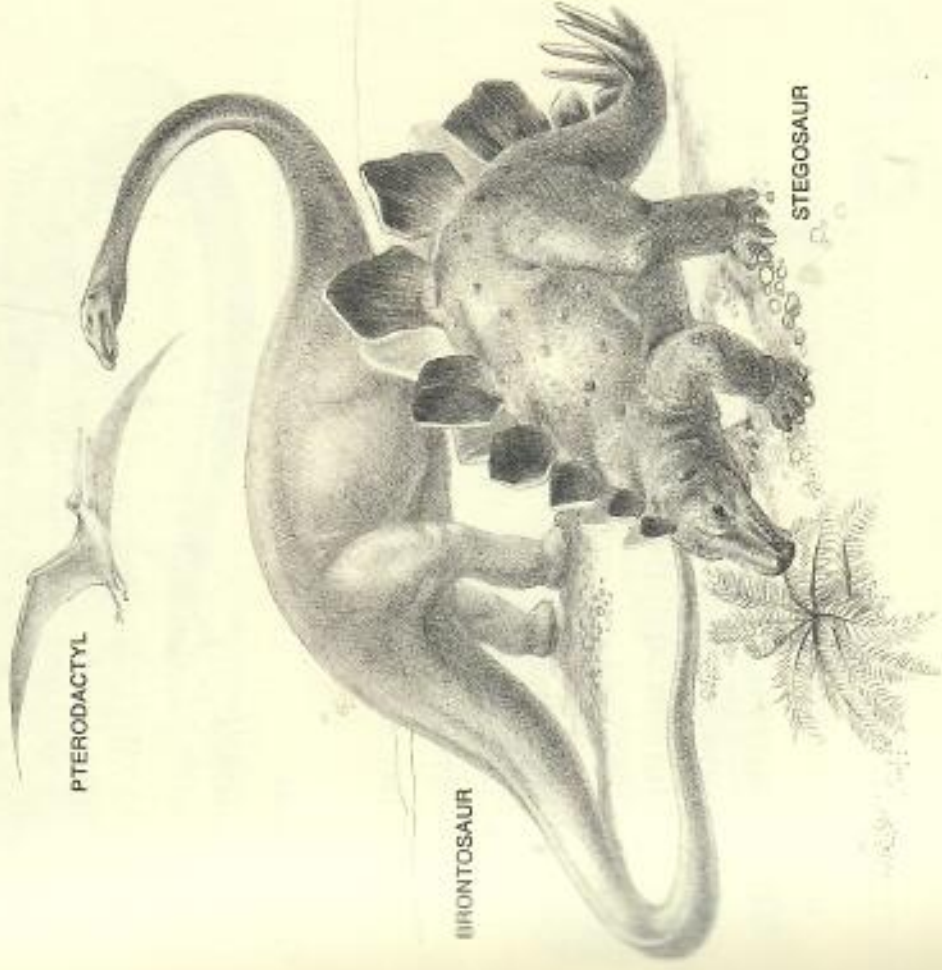
The turtle dates back to the time, ages ago, when the earth was a hot and steamy place. He swam in lakes and ponds and plodded about the swampy land, eating ferns and other low plants. Gigantic in size, he carried his thick, heavy shell on short, powerful legs.

No one really knows why some of these ancient turtles left the land and went into the sea. Perhaps the turtle was looking for food. Or perhaps he found that warm water currents were comfortable. Maybe, as some scientists believe, he was able to carry his great weight around more easily in water. He did not have gills for breathing or fins for swimming, but his legs, no longer used for standing or climbing on rocks, became paddle-shaped flippers. His body grew streamlined and his shell lighter. He became a much better swimmer.

While the turtle was adapting to life in the sea, other reptiles became rulers of the land. They were the largest and mightiest of all reptiles, the dinosaurs. The gigantic brontosaurus, so heavy that it could not support its weight on land, lived in lakes and rivers. Overhead flew the great winged pterodactyl. The stegosaurus, its spine covered by large pointed scales, browsed on marsh plants.



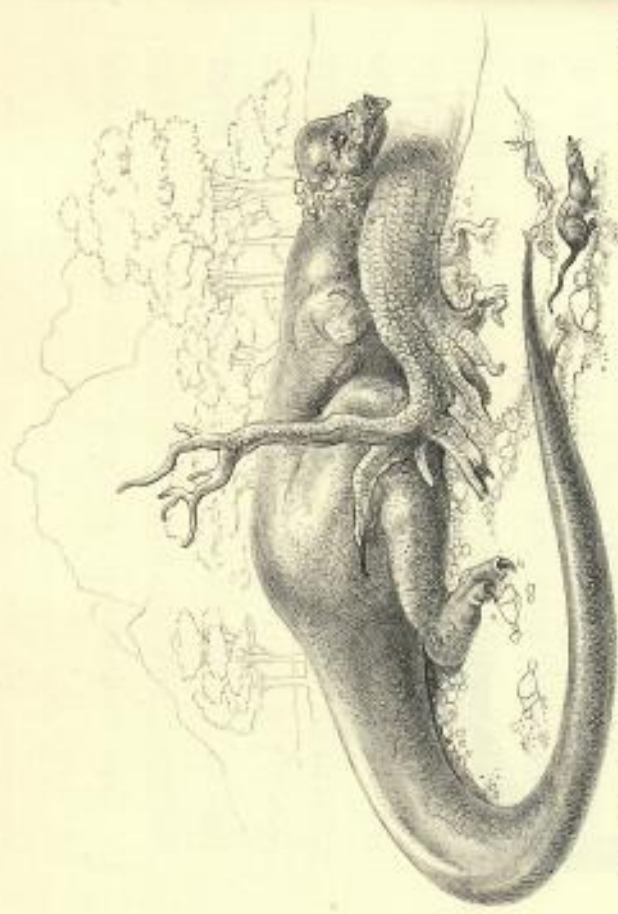
PTERODACTYL



BRONTOSAUR

STEGOSAUR





PACHYCEPHALOSAURIUS

DELTATHERIUM

Then very slowly conditions on earth changed. Great mountains pushed up through the earth's crust and swept away the swamps and inland seas. The homes of the land reptiles were destroyed. The earth became cooler and drier, and the swamps dried up. In many places the ferns and other tropical plants died. Food grew scarce. Early mammals, little animals with long whiskers, large snouts, and sharp teeth, lived under-

ground and were better able to withstand the cold than the reptiles. They were fierce for their size and competed with the reptiles for the little food there was. One by one the various kinds of reptiles began to die off and become extinct. Of all the different reptiles that once lived, only four types remain today: the crocodiles and alligators, the lizards and snakes, the tuatara, and the turtles.

ALLIGATOR



CROCODILE



SNAKE

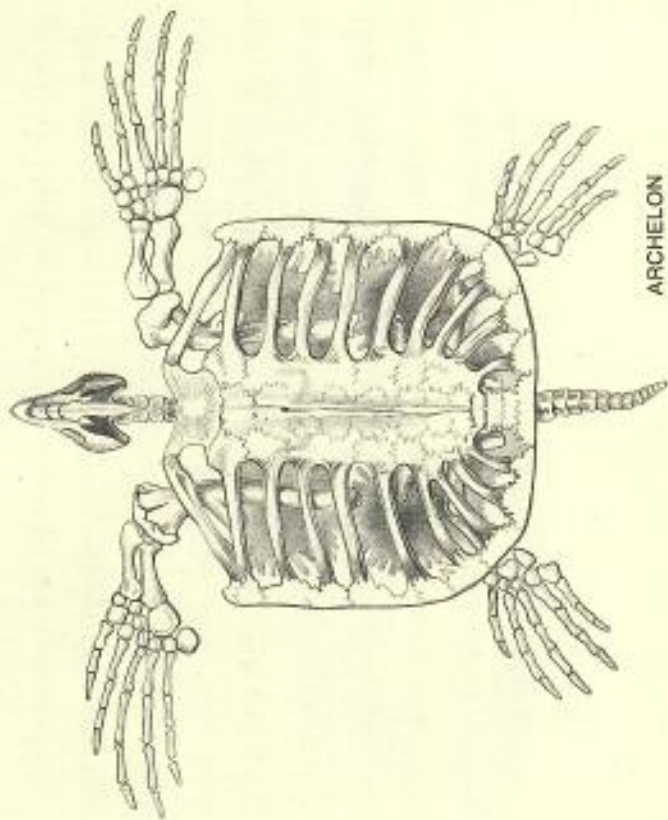
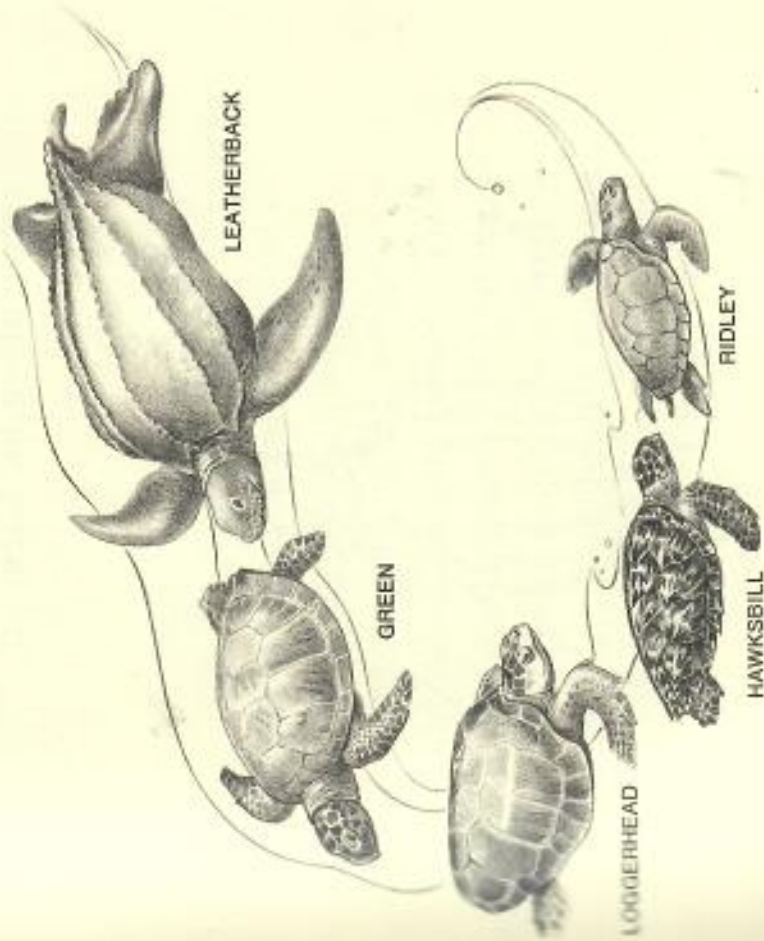


TUATARA



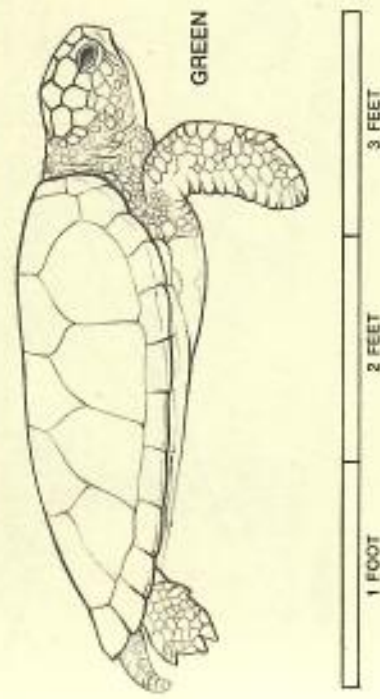
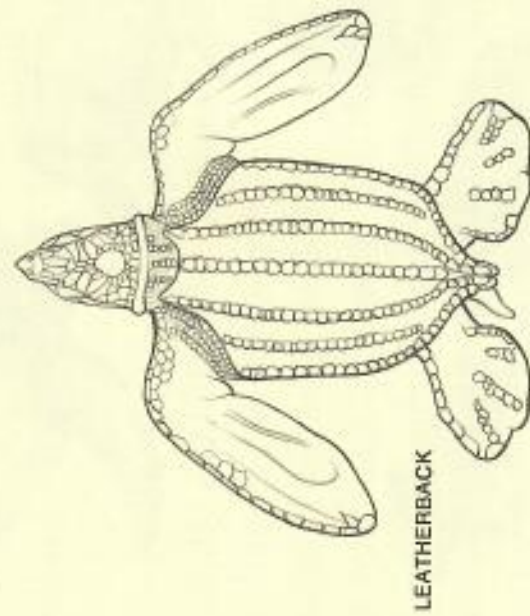
TURTLE

Of the many kinds of turtles that exist today, five species make up the sea turtle family. They are the leatherback, the green, the loggerhead, the hawksbill, and the ridley. All of these turtles are found off our Atlantic shores and in warm seas around the world.

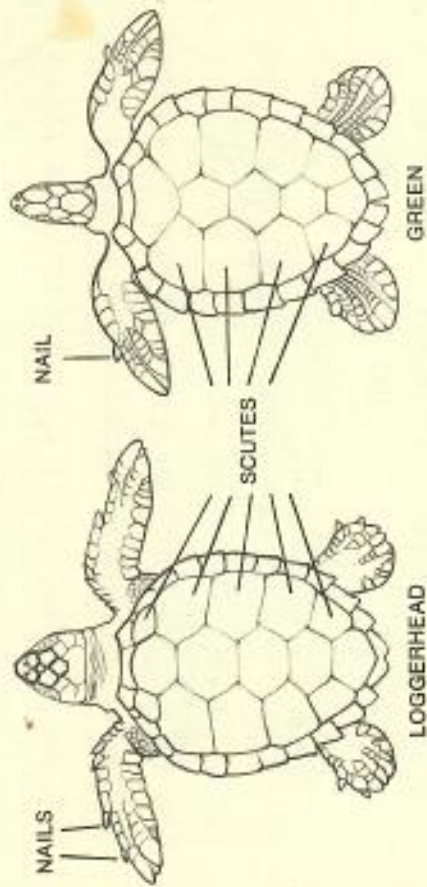


Two hundred million years have passed since the turtle left the swampy land for the sea. The fossil skeleton of one of these prehistoric creatures, Archelon, was found not too long ago in South Dakota, where an inland sea once existed. Archelon's skeleton is so large that two automobiles could park side by side between his front flippers.

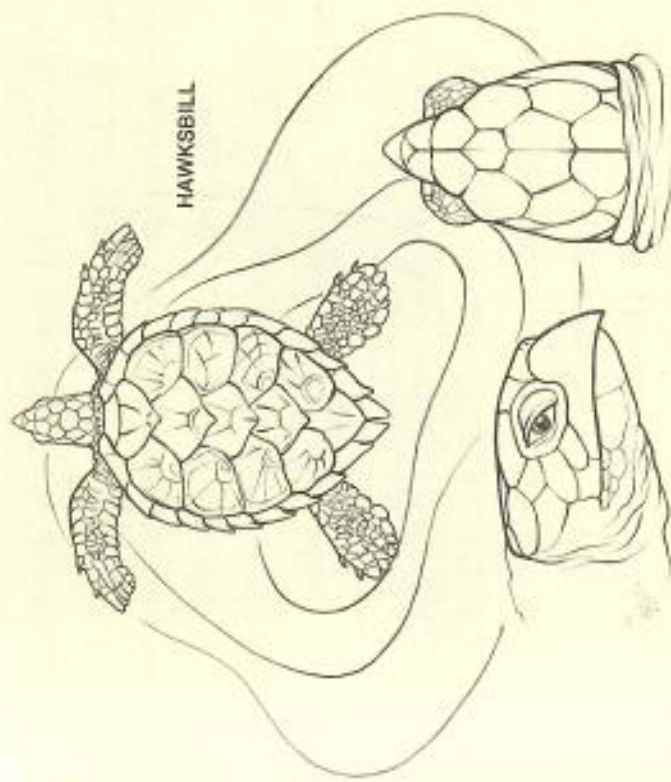
The leatherback is the largest sea turtle and may be a direct descendant of Archelon. He grows as long as six or seven feet, the length of a bed, and weighs as much as a ton. The only one without a shell, the leatherback looks very different from any other turtle. A thick, dark brown leathery skin covers him, and there are seven lengthwise ridges along his back.



Although the green turtle is half the size of the gigantic leatherback, he is still a large turtle. He is as long as a yardstick and weighs as much as four or five hundred pounds. His shell is heart-shaped, and his color is really brown instead of green. He gets his name from the greenish color of the fat *inside* his body. The green is the only vegetarian among the sea turtles and is found grazing on sea grass in shallow waters all the way from Florida to Brazil.



Most people have difficulty distinguishing the loggerhead from the green turtle. Although the loggerhead has a much thicker neck and a larger head, this difference isn't too apparent unless the turtles are seen together. The size, color, and shape of their shells are very similar. However, one can identify the turtles by counting the scales, or scutes, on their top shell. The green turtle has four scutes along each side whereas the loggerhead has five. Also, the green has only one nail on the forward edge of each front flipper. The loggerhead normally has two.

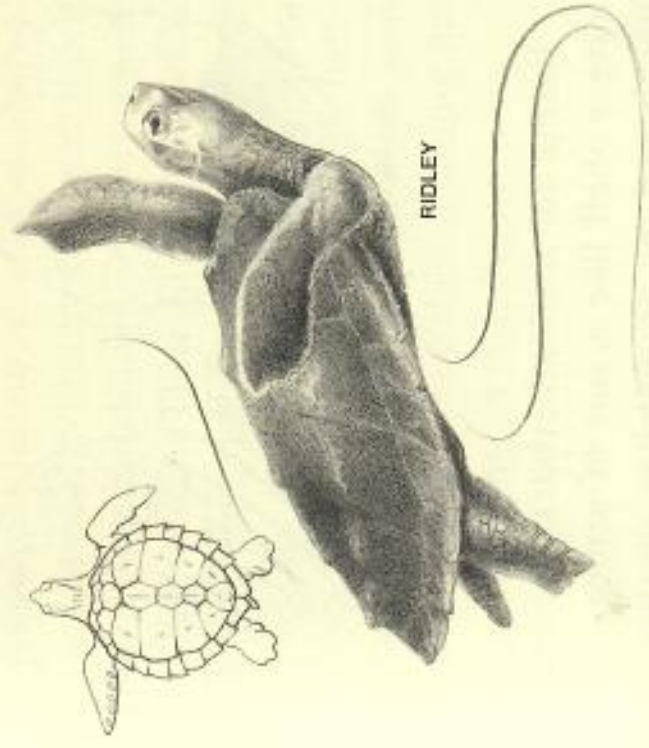


The hawksbill turtle is recognized easily by the feature that gives him his name. His upper jaw hooks down and over his lower one like a hawk's or a parrot's. He is a smaller, brown turtle. Less than three feet in length, he usually weighs under one hundred pounds.

The name of the ridley is a reminder of the riddle of this turtle's origin. For a long time scientists were uncertain whether the ridley was a separate species or the result of mating between the loggerhead and the hawksbill. Finally, however, when Atlantic ridleys were observed nesting in great numbers, the riddle was solved. Since the ridley, not the loggerhead or hawksbill, lays eggs that become ridleys, we now know that he is a separate species.

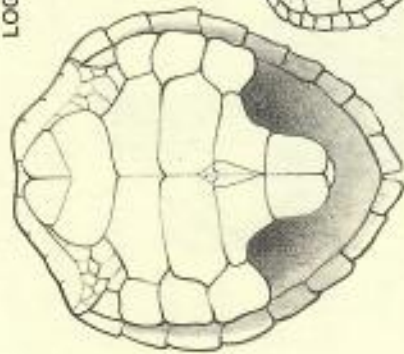
The ridley is the smallest of all the sea turtles. He is about two feet in length and is the only one whose color is gray, not brown. Whereas the other sea turtles are more docile, he has a nasty temper. He will thrash about, bite, scratch, and fight to his death when caught. Also, unlike the others who nest many times during their egg-laying season and prefer the nighttime, the ridley nests but once and during the day.

In spite of their differences, all the sea

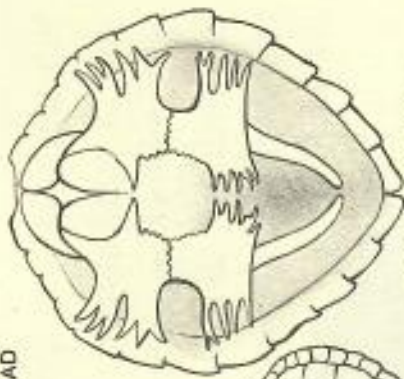


turtles have developed similar habits and have multiplied until this century. Except for man, the turtle lives longer than any other animal. He often reaches the age of one hundred years. What has enabled the sea turtle to survive over millions of years? He has many advantages that protect him.

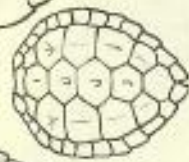
LOGGERHEAD



PLASTRON



BONY STRUCTURE



CARAPACE

Except for the leatherback, the sea turtles have a shell like a suit of armor. No other backboned sea animal has anything like it. The back shell, called the carapace, is curved and made of tough, thick bone. It is further strengthened by the scales that cover it. Few animals can bite through the carapace. The flat undershell, the plastron, is slightly softer, but still a strong defense. The turtle's backbone and ribs are part of his shell, and the shell, which is never shed, grows as the turtle grows.

The colors of the turtle help to conceal him. They especially protect the small green and leatherback hatchlings, who swim near the water's surface. Their dull black backs blend with the sea, helping to make them less visible to gulls and vultures looking down from above. The color of the turtle's belly conceals him too. It is yellowish-white and merges with light entering the sea, hiding the hatchling from hungry fish below.



LEATHERBACK HATCHLING

The turtle's strong flippers are another of his advantages. They act like paddles and make the sea turtle a powerful swimmer. He depends mainly on his two large front flippers. The smaller back pair assist in swimming, but they also serve as rudders and brakes. When he is in danger, the turtle races



LEATHERBACK



GREEN

away quickly. The green and leatherback turtles have the largest flippers and are the best swimmers. Graceful and fast, they swim as quickly as twenty miles per hour. That rate is four times faster than a champion Olympic swimmer's.

Sharp senses also help the sea turtle to survive. He sees well in the water and can sight enemies at a great distance when the water is clear. The turtle cries frequently, but his tears are not caused by sadness nor do they interfere with his excellent vision. By crying the turtle eliminates much of the salt he absorbs in the sea, which helps keep him healthy.



Out of the water, the sea turtle is near-sighted. But this characteristic hasn't affected him much, since he spends almost all of his long life in the water. Only the female ever comes ashore, and then only to nest and lay her eggs. When the time comes for her to return to the sea, she uses her vision to help find her way.



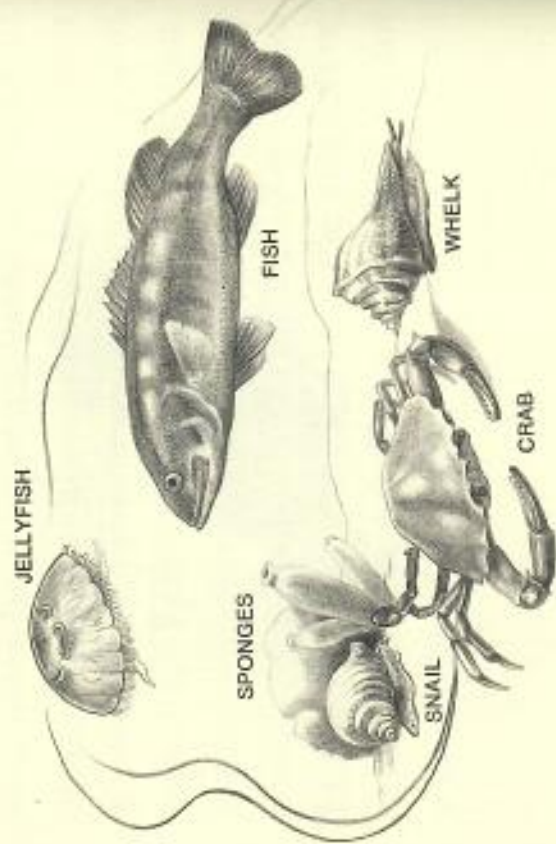


A short time ago, a scientist, Doctor David Ehrenfeld, conducted an unusual experiment in which he proved that at least the green turtle has a definite sense of color. More is known about the green turtle than the other sea turtles, because he has been captured and experimented with a great deal. Doctor Ehrenfeld fitted greens with sunglasses and watched them crawl around on the beach. By using different color lenses, he discovered what colors the turtle could see. Red lenses blocked out blue and green, the sea colors, and caused the turtles to lose their way and wander like lost children.

By the end of the experiment, Doctor Ehrenfeld decided that the colors the turtle sees best are blue, green, yellow, and orange. Brightness, especially at the horizon line, is what helps the turtle find the sea, even at night when colors are dulled. Reflected light is brighter over the water where trees and foliage do not block it. The brightness of the sea gives the nesting turtle and the baby hatchling their bearings in the dark. It acts as a guide for them.



The turtle's good vision also aids him in finding food. All the sea turtles, except for the green, prefer snails, crabs, whelks, fish, and other sea animals like sponges and jellyfish. The ridley and the hawksbill feed at the bottom in relatively shallow waters around rocks and coral reefs. The loggerhead and the leatherback search the deeper depths. The leatherback is the greatest wanderer of all. He often follows the Gulf Stream all the way north to Maine and Nova Scotia.



While the other sea turtles need to travel to locate the creatures they feed upon, the green turtle may spend months grazing on sea grass in one area. Turtles have no teeth; instead, they have sharp ridges on their jaws. The green uses them to cut the sea grass near its roots. Greens eat sea grass to such a great extent that sea grass is known as "turtle grass."

The sea turtle also has a good sense of hearing, although his ears don't show. There are special hearing organs in his skull just behind his eyes. The sea turtle's eyes and ears are always ready and alert, because he never pulls his head into his shell the way a land turtle does. He isn't able to.

The sea turtle's sense of smell is well developed too. This characteristic may account for the very remarkable fact that the female always returns to nest on the very same beach where she was born. Some scientists suggest that certain ocean currents carry odors she remembers from birth. They believe that she follows them all the way back to her home beach. This ability no doubt aids in her survival. Beaches safe enough for her birth are probably safer for her young than strange beaches.

Even his leisure habits help the sea turtle. Thus, he takes time to float about and bask in the tropical sun. Sun bathing is especially

good for the turtles. It destroys fungi, leeches, and other parasites that can attack his shell and skin. Loggerheads and greens are seen frequently bobbing about in the sun. The friendly, almost tame, brown booby bird often lands on the lazy turtle's back for a free ride.





During the mating season, in late spring and summer, male sea turtles arrive at the breeding waters and wait to court the females. Two or more males may compete for each female, but only one wins. The male climbs onto the floating female's back, clasping her shell with his tail and his front flippers. He fertilizes her eggs by depositing sperm in an opening called the "cloaca." If not for the sea, which keeps the turtles afloat, the female might be crushed by the weight of the male.



The turtles mate in the sea, but they lay eggs that must incubate on land. Every two or three years, the sea turtle travels long distances, sometimes more than a thousand miles, to nest. Each species along the Atlantic Ocean has its own favorite nesting beach. The loggerhead nests along the southern coast of the United States, sometimes as far north as North Carolina. The Atlantic ridley prefers the Gulf Coast of Mexico. On one stretch of beach the ridley has nested in such teeming numbers that this event has been given a special name. Mexicans call it the *arribada*, which means the arrival. Curiously, a colony of Pacific ridleys nest off the coasts of Surinam and British Guiana. The leatherback and green visit Costa Rica, Surinam, and French Guiana. The hawksbill may be found nesting anywhere along the coast of Central America and the northern coast of South America.

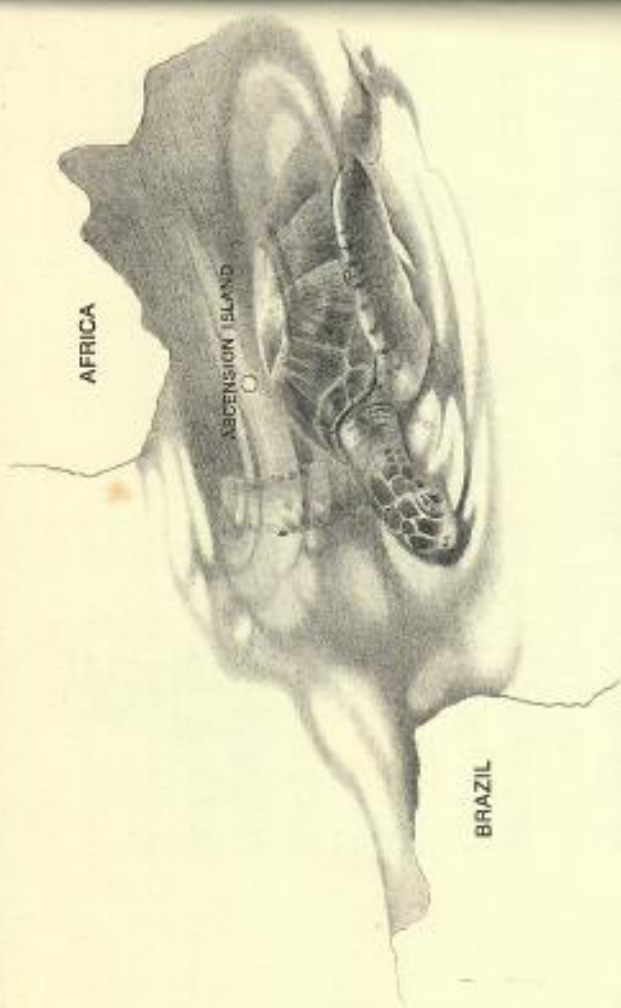
As difficult as the task is for her, the female



must come up onto the shore to nest and lay her eggs. At night, when the beach is dark and still, she drags herself high up onto the soft, warm sand well beyond the high-tide water. During the nesting season she prepares a separate nest each time she lays eggs. First she digs a shallow pit in which to rest, and then, with her hind flippers, she scoops out a bottle-shaped nest hole. Into it she lays about one hundred soft, white leathery eggs, which look like Ping-Pong balls. The large number of eggs that are laid also aids the survival of the species.



The female is on land for only about an hour while laying her eggs, but this period is an extremely dangerous time in her life. She doesn't see well on land, and her heavy shell makes her slow and awkward. Moreover, nothing at all can take her mind off what she is doing. For as cautious as she may be at other times, she is so determined to lay her eggs that once she starts she ignores distractions. Dogs, noises, and even scientists crowding around will not stop her. Even if an observer takes her picture with a flashbulb or removes some eggs, she will continue.



Because the turtles very rarely nest where they feed, they must travel long distances to return to their feeding grounds. Scientists have caught nesting greens and tagged their flippers on Ascension Island near Africa, and they have traced the turtles to sea-grass beds fourteen hundred miles across the Atlantic Ocean off the coast of Brazil. On such journeys the green turtle survives on fat she produces from turtle grass. The female also lives on this stored fat during the two month period of her nesting.

Over the years the nesting female has been an easy target for enemies such as the jaguar and puma. Her eggs are in danger too. Un-



like birds, turtles and other reptiles do not watch over their eggs. During the sixty days they incubate on land, packs of wild dogs, skunks, racoons, and ocelots dig them up and eat them. Only a few turtles are hatched out of every one hundred eggs laid.



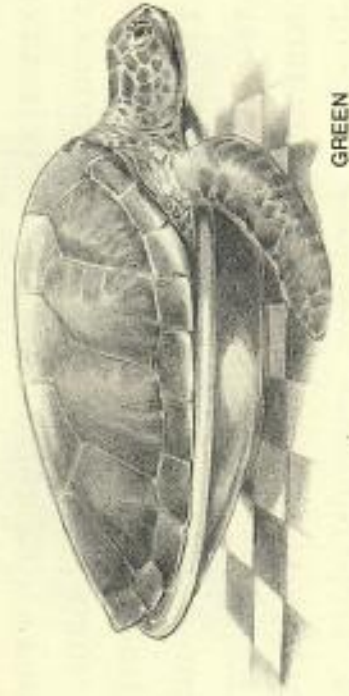
These baby hatchlings also face many dangers. They weigh about two ounces and are only as big as your little finger. Their shells are soft, and larger animals can eat them easily. Hungry lizards, crabs, vultures, and night herons attack them on land. Even in the sea they are not entirely safe. There they are hunted by mackerel, sharks, and other meat-eating fish.



Fortunately, the hatchlings have one advantage. They do have fast-working flippers. They can cross a beach quickly and swim away far out to sea. There they travel with the current, seeking floating beds of weeds, which hide and protect them. In the weeds they find tiny plants and animals called "plankton" to eat.



HATCHLINGS IN GULFWEEED



GREEN

When he is a year old, the hatchling has grown into a strong, sturdy sea turtle and is able to take care of himself. Yearling greens and loggerheads weigh ten to twenty pounds and are as large as a dinner plate. Leatherbacks are even bigger. At this time the turtle comes into the offshore waters and adopts the eating habits of adults. As the years pass, the turtles mature until they can have young of their own. The green may reach this age at about six years.

In spite of his many enemies, the sea turtle has survived until very recently. Today, however, a new and more dangerous enemy has come along: man. Because of man, the sea turtle is in danger of becoming extinct.

The change in the sea turtle's numbers began during the time of Christopher Columbus's voyages to the New World. After Columbus, explorers, conquistadors, colonists, and pirates sailed to the Caribbean. Everyone needed fresh food. Soon the voyagers discovered that the green turtle was fresh and tasty meat. Captured greens tied, kept moistened, and turned over on their backs were docile, and they stayed alive aboard ships for months. They were killed as needed to provide steaks, soups, stews, and delicacies like fondues.



CAPTURED GREEN TURNED ON ITS BACK



The sailors found out that greens grazed in clear, shallow waters. They hunted them there, harpooning and netting them by the thousands. When the turtles became more rare, hunters searched for them in other places. They learned that at night the turtle went to deep waters and slept in sandy hollows under rocks. Often rocks were clustered together, and the hunters spread and anchored nets over the area. When the turtle rose to the surface to breathe, he would become helplessly ensnared in the nets.

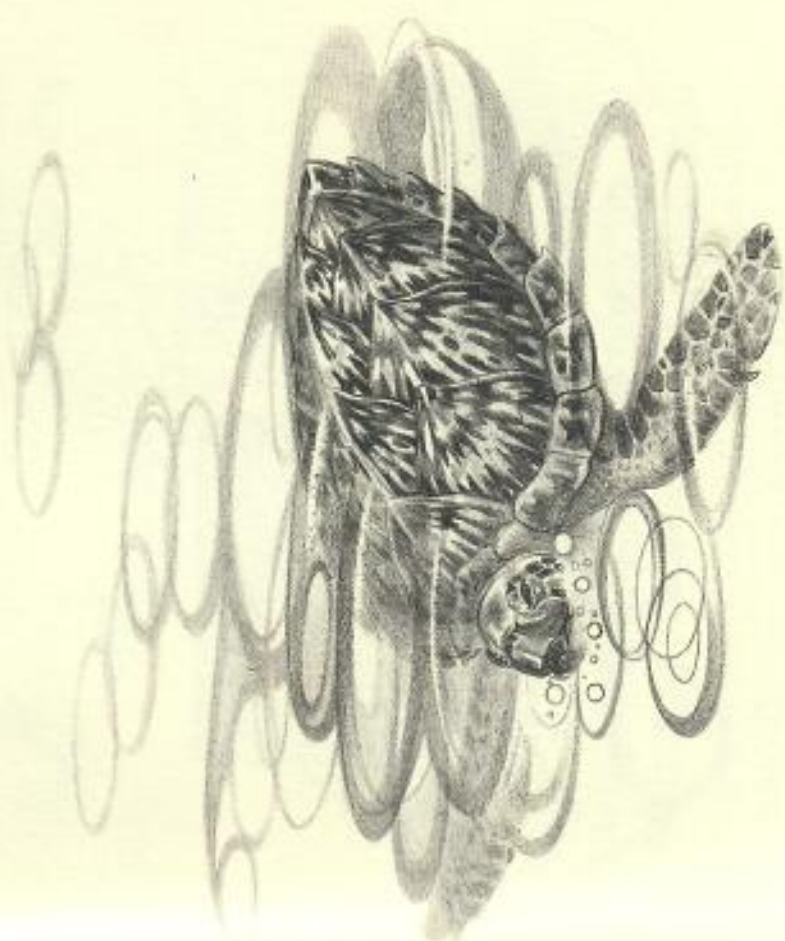
After a while greens began to grow scarce in the water. Then man turned to hunting them on the land. Creeping across the sand, the female is slow, and she can be caught and flipped over easily. She is especially easy to catch while she lays her eggs. Men who hunt turtles on land are known as "turtle turners." They stalk nesting beaches at night, looking



for females that come in to nest. Then alone, or in teams, they seize the turtle and turn her onto her back, making her helpless. For all her strengths, her nesting habits left over from another time are now what endanger her life most. This single link to the land may be the very thing that finally destroys the sea turtle.

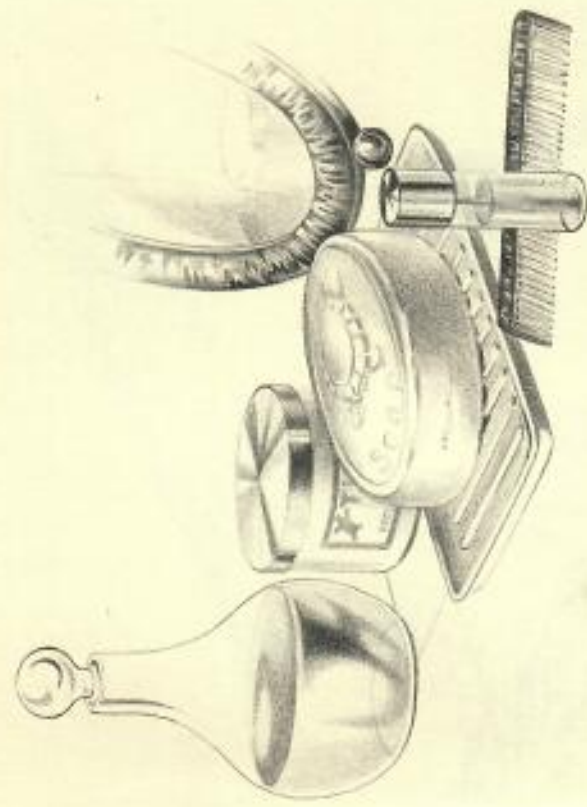
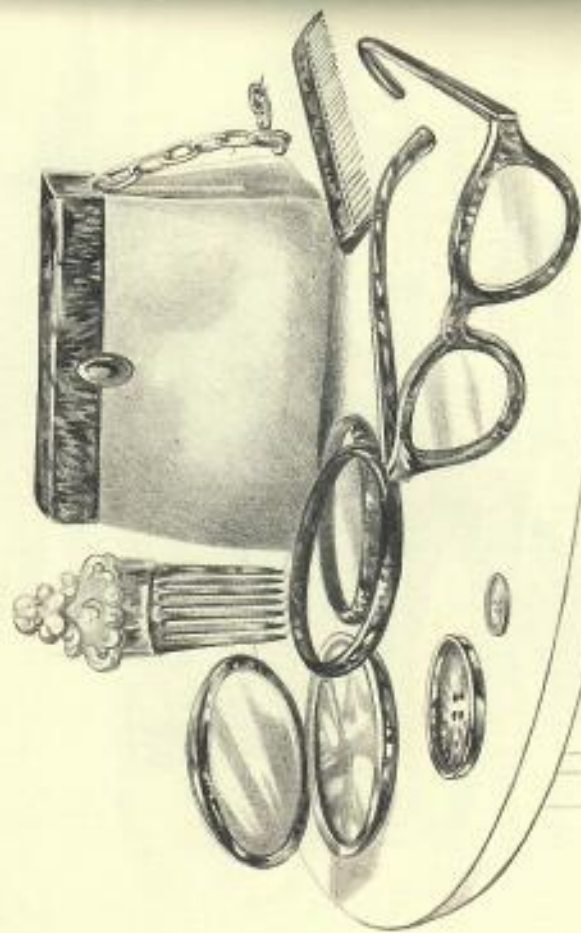


The hawkbill is hunted for another valuable material—his shell. The hawkbill's shell is covered by thin, yellowish-brown scales that overlap like shingles on a roof.

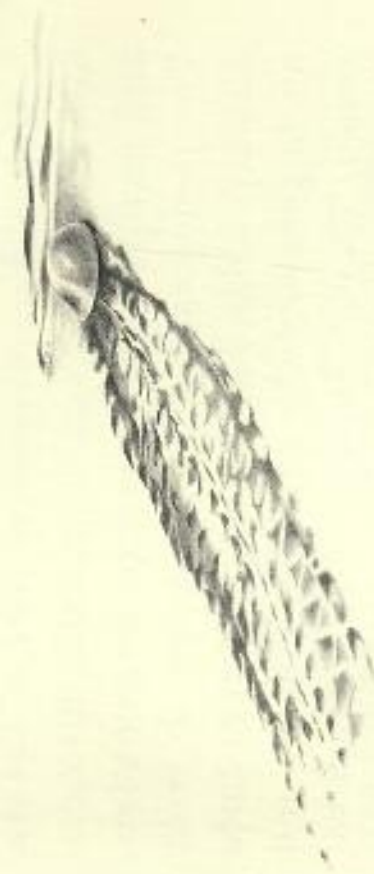


Man does not hunt only the green turtle. He hunts all the sea turtles, except the leatherback, for a valuable jellylike substance called "calipee" in their belly shell. When it is dried, it brings a good price, because it is the essential ingredient in turtle soup.

When they are heated they can be peeled off and used to make tortoiseshell. This material, which is like plastic, is used to manufacture combs, eyeglass frames, parts of musical instruments, jewelry, and pocketbooks. Young hawksbills, because of the beauty of their shells, are stuffed, polished, and sold in gift shops.



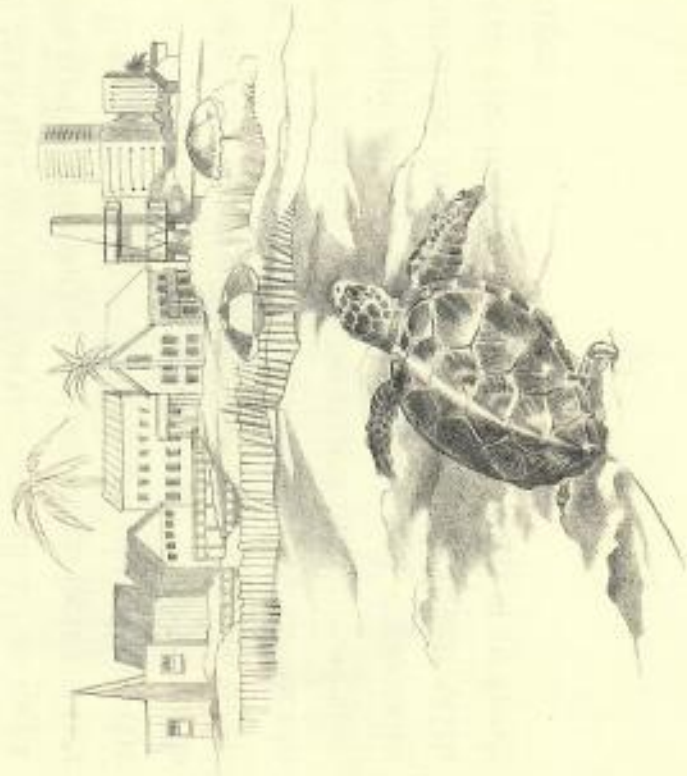
Every part of the sea turtle is sought for some commercial purpose. Turtle hides have become extremely valuable for producing leather goods, such as ladies' shoes and pocketbooks. Oils from turtle fat are used in making perfumes, creams, and soaps. The more uses that are found for the sea turtle, the more the sea turtle is hunted.



Man is a ruthless enemy. Not only does he take the nesting turtle, he takes her eggs. The turtle leaves tractorlike trails behind her in the sand. Hunters follow these trails to the nests and raid them. Hundreds of thousands of sea-turtle eggs have been taken from nesting beaches all over the world to be eaten raw or cooked, or to be dried and preserved. In some places, turtle eggs are especially prized for baking, because cakes made with them rise higher, taste better, and stay fresh longer.



Man is disrupting every part of the sea turtle's life. He hunts him, takes his eggs, and, moreover, is ruining his nesting beaches. The loggerhead, who once nested in great numbers along the Florida coast, now finds his favorite beaches covered by hotels and homes. The development of resorts and vacation homes has deprived all the sea turtles of many nesting beaches throughout the Caribbean.



In the Caribbean, where the turtles once numbered in the millions, there are now only thousands. Grand Cayman Island, when Columbus visited it, was known as Las Tortugas, the land of the sea turtle. In those days many thousands of green turtles nested there. Today greens do not come to Grand Cayman. On the Gulf Coast of Mexico the ridleys hardly are seen any longer. In just a few hundred years, man almost has wiped out the sea turtle.



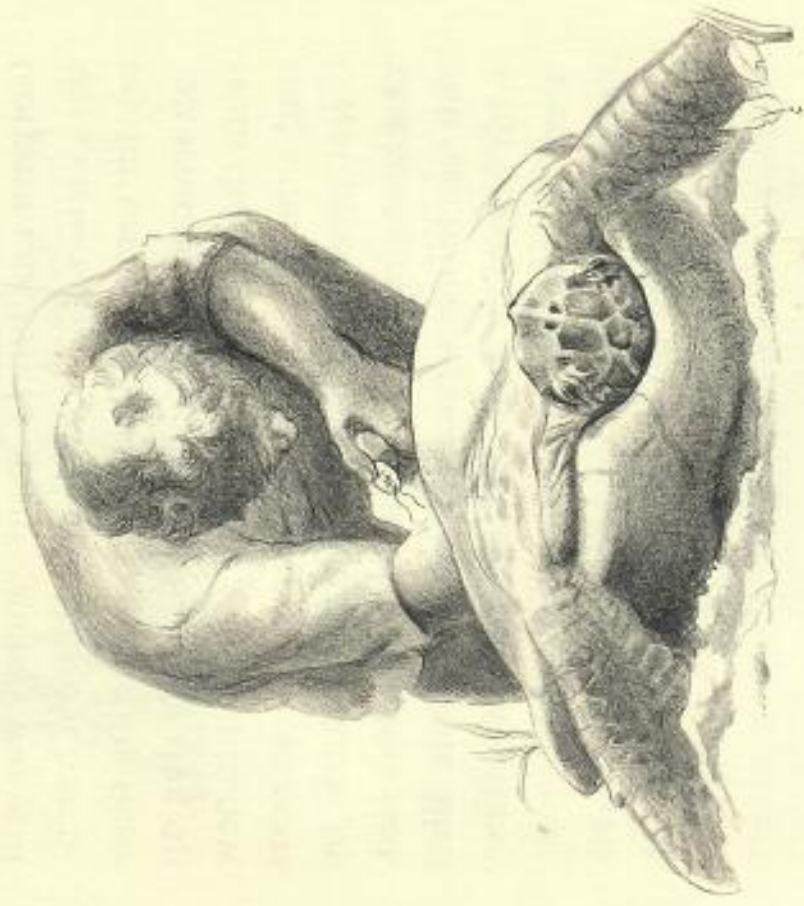
There are people, however, who are trying to save the sea turtle. Conservationists are concerned that their efforts already may be too late for the green turtle. Different countries have placed the green turtle on their list of endangered wildlife. People in government are urging laws to ban the sale of sea-turtle products. Many countries have begun



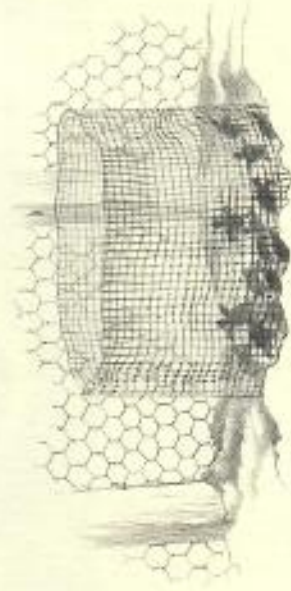
to forbid turtle hunting in their waters. Important nesting beaches, such as those in Costa Rica, are patrolled during nesting season, and all sea turtles and their eggs are now protected by law from hunters. Despite the laws, however, poachers still sneak onto the beaches at night and hunt the turtle illegally.



Scientists, too, are working to save the sea turtle. Doctor Archie Carr, a zoologist and leader in these efforts, has been tagging green turtles on a beach called Turtle Bogue in Costa Rica. This beach is one of the few left in the Caribbean where numbers of greens still come to nest. Doctor Carr places tags on the flippers of the nesting turtles before they return to the sea. He offers a five-dollar reward to anyone who returns a tag. In this way Doctor Carr learns where the turtles travel and where they feed. When they come back to Turtle Bogue, his studies show that they return again and again to the same beach to nest.



Doctor Carr's work has attracted other people who wished to save the green turtle. They organized a group called the Brotherhood of the Green Turtle. This group grew and became the Caribbean Conservation Corporation, but its main concern was still the green turtle. It helped to set up a hatchery for turtles at Turtle Bogue. During nesting season, turtle eggs were carefully dug up from their natural nests and moved into new and safer nests at the hatchery. These nests were protected from animal enemies by chicken-wire fences. When the eggs hatched, the hatchlings were held in large pens filled with seawater and fed chopped fish. They were to take part in an experiment.



The hatchling turtles were to be moved to other beaches, where the green turtle once had nested, and released there. Would they remember the smell of these beaches? Would they return to them to nest instead of to the beach at Turtle Bogue? If so, these beaches, now protected by law, could become breeding grounds once more. The range of the sea turtle could be expanded, and its numbers could be increased.

This experiment was a large undertaking.





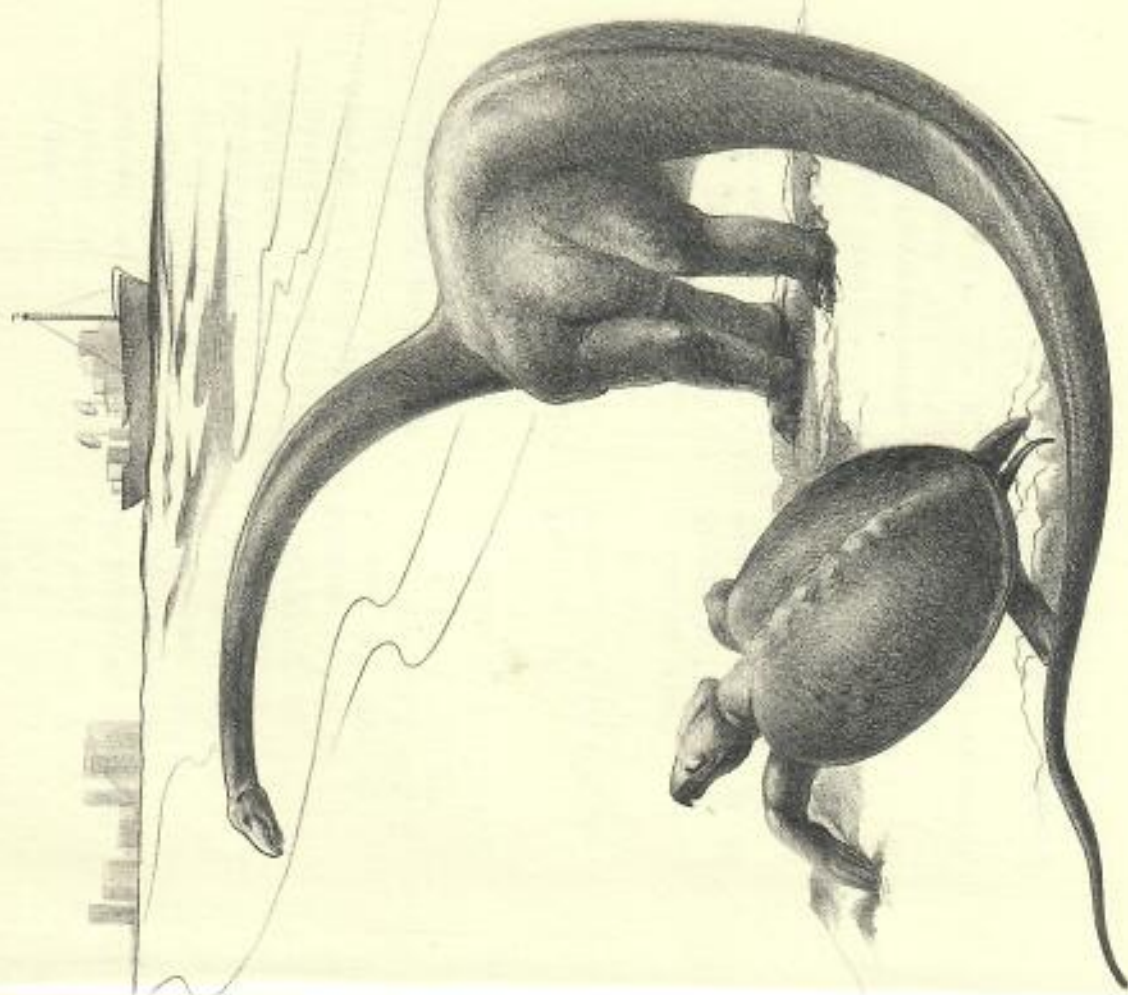
Great numbers of hatchlings had to be taken as soon after birth as possible to many different beaches. The United States Navy was asked to help. Operation Green Turtle, which began in the late 1950's, was one of the most unusual missions in Naval history. Navy pilots and planes flew more than one hundred thousand hatchlings from Turtle



Bogue to twenty-eight beaches on the Gulf Coast of the United States and Mexico, the islands of the Caribbean, and on the coasts of Central and South America. More green turtles are seen in these waters today, but scientists still cannot be certain if the turtles are returning to the beaches to nest. They will need years to tell.



Two hundred million years have passed since the turtle first lumbered down to the shore and entered the sea. The dinosaurs and most of the other creatures that shared the earth with him are gone now. Man has taken their place. He builds cities where the swamps once were. Airplanes sweep overhead, and ships probe the secrets of the sea. Man has become the turtle's enemy. Only recently has he thought to use his knowledge to save the turtle. Will the sea turtle be able to last in our world?



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