

The author, an American field biologist with the Smithsonian Institution, has been on the trail of the turtle for 20 years. He spent the past two years in India—the land of Kurma, one of Vishnu's avatars (right)—studying native turtles and tortoises.



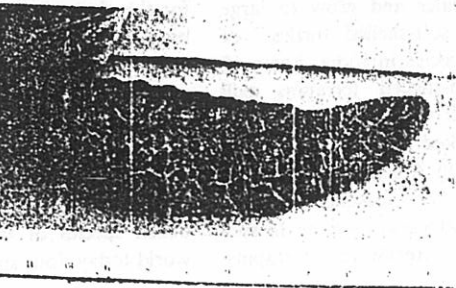
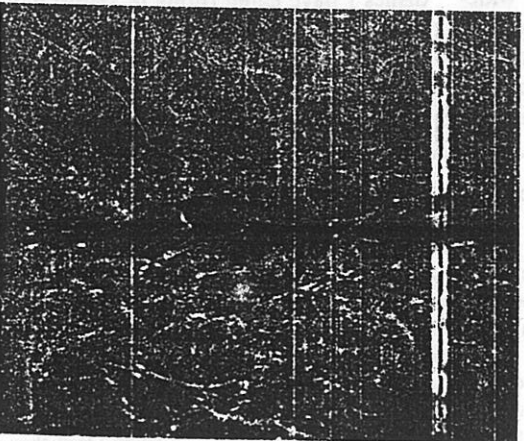
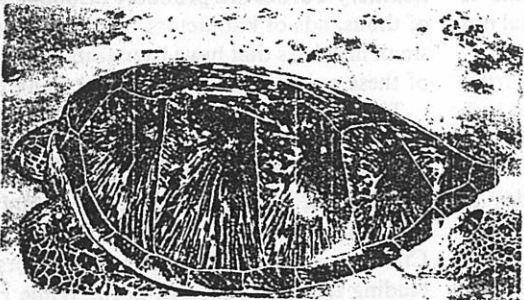
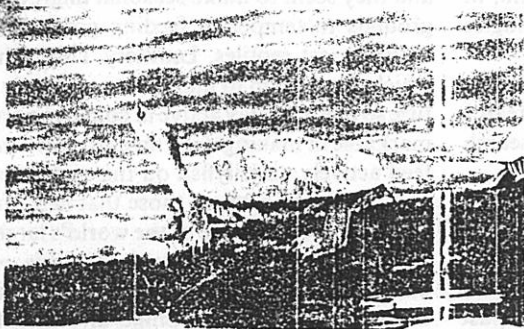
# In Search of Kurma

Text and Photographs by JOHN FRAZIER

On a sultry August day in 1985, a fateful letter found its way to the top flat of the foreign professors' hostel at Fujian Teachers University. We were catching up on field notes made during a two-month trip down the coast of China from Fujian to Hainan, and at the same time sheltering from the furnacelike conditions outside. The letter, from the Indo-American Subcommittee on Education and Culture, notified us of the approval by the Government of India for our "Biology and Conservation of Indian Turtles" project.

This exciting news, however, had to be tempered with the tasks before us and, although just across the Himalayas, India was still a long way off. The research in China was only half completed, a final report would have to be written and left in key offices to stimulate much needed conservation activities on the marine turtles we were studying. It was necessary to go back to the United States, unpack the specimens and equipment from China, catch up with half a year's unanswered correspondence from colleagues all over the world, finalize numerous manuscripts, and evacuate several tons of books, files and assorted possessions stored in the flood-prone basement of a friend's house. Other seminomadic field biologists came to our rescue and as if by magic an endless series of car loads disappeared into an attic closet, under some basement stairs and into an old barn loft in the country.

Finally, with countless recently discovered muscles aching and what seemed like an infinity of sleepless nights, we piled into a friend's car and dashed for the airport, somehow changing our clothes and doing the final packing on the way. We were in Delhi in time for the monsoon.



*Facing page: The Star Tortoise is the most common land tortoise in India. Left top: The River Terrapin is one of the more common species of freshwater turtles of the subcontinent. Left center: A Green Turtle from the Indian Ocean. Left: A newly hatched Green Turtle swims out to sea. Below: Close-ups of different turtle and terrapin limbs; from left, Green Turtle; columnar-shaped, elephantlike leg of a Star Tortoise; and the paddle-shaped leg of a freshwater terrapin.*

One might think that this bizarre odyssey was stimulated by the promise of precious stones or exotic silks and spices. In fact, it was Kurma that was luring us to India.

As the second (or 11th, depending on the interpretation you choose) avatar of Vishnu, Kurma, the Lord of Turtles, has tremendous importance. But the turtle has far greater cultural significance in India: even before the great trinity of Hindu gods was recognized, Prajapati, the creator, took the form of a turtle. In Vedic times the turtle was a symbol of the omnipotent sun and the manifestation of all life. It is the vehicle of deities of water such as Jamuna and Jalgi, and can even be seen as a base upon which the Buddha stands. Indeed, for Muslims, turtles take on a unique religious significance at the shrine of Hazrat Byazid Bostami, in Chittagong, Bangladesh. According to many Eastern mythologies the world itself rests upon the back of a turtle.

Pilgrims are of many kinds and no two pilgrimages are identical, but to be truthful it was not the mythical Lord of Turtles, Creator of all life, or other deity, that drew us to India. We came in search of those mortal reptiles that dwell within their own shells.

Since 1968, when I took part in the Royal Society expedition to Aldabra Atoll (a remote island belonging to the Seychelles), I have been chasing turtles or tortoises of one form or another (see box "Turtles, Tortoises and Terrapins"), and sea turtles of the Indian Ocean have been the focus of my attention for most of these past two decades. The usual response by anyone hearing this is disbelief. A pilgrimage—fine—but for 20 years? And, the goal not only cannot talk but crawls along on its belly!

The reasons for this "Kurmaphilia" are many. Although turtles are familiar to everyone on this planet—from aborigines in lush tropical rain forests to Eskimos on barren wind-swept ice floes to city dwellers in climate-controlled offices—there are a great many basic facts about these animals that have defied decades of dedicated study. To begin with, we do not even know how many different kinds of turtles there are. Take the sea turtles, the most distinctive group of "chelonians" (the word used to mean all types of turtles and tortoises). It is agreed that there are five wide-ranging species found in most oceans of the world, but there is no agreement about the Ridley Turtle that nests on the east coast of Mexico, "Kemp's Ridley": is it really a different species from the Olive Ridley found all round the world? Or, is it just a variant?

Likewise, the Black Turtle from the east Pacific may or may not be a different species from the Green Turtle, which is found throughout the world's oceans.

Luckily, neither Kemp's Ridley nor the Black Turtle is found in the Indian Ocean, and identifying India's sea turtles is a relatively simple task (see box "Marine Turtles of India"): there are just five kinds, and only four of these regularly occur in Indian waters. The largest of all is the Leathery Turtle, which may grow to over half a ton in body weight and to more than two meters in length. They may once have nested on the Malabar Coast, but today the only place in India where they nest regularly is on the Nicobar Islands. Curiously, the gigantic Leathery Turtles feed on lowly jellyfish and they seem to make seasonal migrations from tropical nesting grounds to temperate feeding grounds in search of their prey. Unlike most reptiles, Leathery Turtles have special adaptations which allow them to maintain a relatively constant body temperature so they can stay active in cold temperate seas. They also are remarkable in making deep dives to more than 500 meters. Yet, they feed actively on jellyfish on the surface of the ocean.

It is unknown where those that nest on the beaches of Nicobar go after breeding. One of the world's largest rookeries of Leathery Turtles is in Trengganu, west Malaysia, where thousands of the animals nest every year; females tagged here have been recaptured as far away as Japan, China and the Philippines. The Nicobar Leathery Turtles are probably also making transoceanic journeys of thousands of kilometers. We have no census but, based on the small numbers that have been found, there may be fewer than 100 of these animals nesting in a year in all of India.

The Green Turtle is the second largest of marine turtles in India and this is the best known of all turtles. In fact, the Green Turtle wears the epitaph of "the world's most valuable reptile," because it was bought in Occidental and Oriental capitals all around the world. Its rich meat is relished by people of many different nations. The Chinese even say that there are five flavors of meat in one turtle, including those of beef and pork. While I agree that all the turtle dishes I have eaten (none in India) have been delicious, the five flavors seems a bit exaggerated. India holds the singular position of having been both exporter and importer of Green Turtle depending on the period in question. As with the other species of sea turtles, the eggs are highly prized throughout most coastal areas

## TURTLES, TORTOISES AND TERRAPINS

Although everyone can immediately recognize a turtle or tortoise, few people know how to differentiate between the main groups of these ancient animals. In general, there are three basic kinds: marine turtles, freshwater turtles (also called terrapins) and land tortoises. In fact, marine turtles are as different from land tortoises as whales are from elephants.

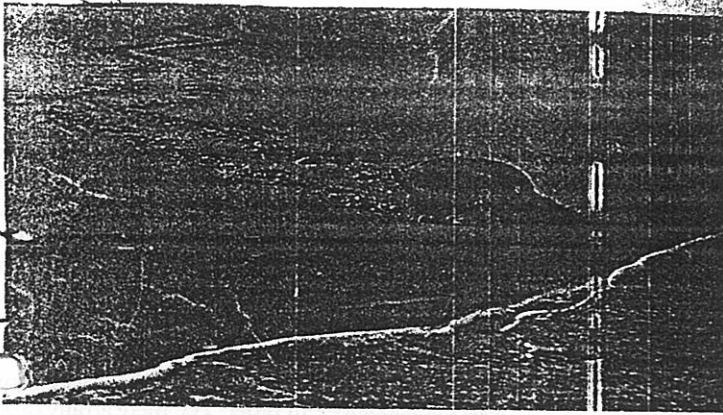
**Marine turtles** live in the sea; there are only half a dozen different kinds, all growing to immense size; the largest may be half a ton in weight; the front legs, in the form of flippers, propel the animal with great speed through the sea; the body is hydrodynamically streamlined; the head and legs are so large that they cannot be withdrawn inside the shell. Five species of marine turtle are found in India.

**Terrapins, or freshwater turtles** are the most

diverse group; there are about 200 different kinds; most live in freshwater streams, lakes and ponds, but some are terrestrial and a few species venture into saltwater estuaries. With but two exceptions, the head and limbs can be pulled completely inside the shell; the front and back feet are webbed. Most freshwater turtles have hard shells, but nearly two dozen species have soft shells without scales and grow to large size—these are the "soft-shelled turtles," of which there are six species in India. Some 60 species of the hard-shelled terrapins pull the neck into the shell with a horizontal "S" shape; these "side-necked turtles" live in Australia, Africa and South America; none live in India (although there are fossils). However, India does have a good variety—some 16 species—of hard-shelled freshwater terrapins.

They rarely grow larger than the size of a dinner platter.

**Land tortoises:** With but one exception the animals are completely terrestrial, going to water only to drink or bathe. Nearly all of the land tortoises live in arid habitats; the legs are columnar and covered with heavy scales; the toes are so stubby that they are indistinguishable except for the claws. Most of the land tortoises have highly domed shells like hemispheres. The gigantic Land Tortoises of the Galapagos Islands and Seychelles are the most famous, but it is more commonly known that the largest of all land tortoises once lived in India. This fossil, with shell like a Volkswagen "beetle," is from the Pliocene Epoch of the Siwalik Hills. Of the dozen species of land tortoises living in the world today, four species are in India.



*A female Olive Ridley returns to the sea after nesting, leaving footprints in the sands of time.*

the country, and in certain places these turtles have been hunted for their meat. For example, in Tuticorin every Sunday, Green Turtles used to be slaughtered in the market, but before the animals were killed, scores of glasses of fresh blood were sold as an elixir.

Curiously, this belief in the great curative properties of turtle blood is also common in Mexico, the Seychelles and elsewhere, and it seems to bring out the more base qualities in men. On some islands in the Indian Ocean I have watched in silent horror as fishermen hacked off the flippers of a struggling Green Turtle and then—as blood squirted out of the severed arteries—vied with each other to drink directly from this live fountain.

Although Green Turtles are found all along the coast of India, they are only common in the Gulf of Mannar and around the Lakshadweep, Andaman and Nicobar Islands, and to a lesser extent in the Gulf of Kachchh. Nesting only occurs regularly on the islands, but the gulfs are important feeding areas. The Gulf of Mannar is well known for having vast pastures of sea grasses, and the algae in the Gulf of Kachchh are varied and abundant beyond description. The Green Turtle is a most singular reptile, for after the first few years of its life it is a herbivore, and a very efficient one. Special microorganisms in the gut digest the cellulose and other complex molecules in plants that most animals cannot digest. But these microorganisms are so specialized that an algae-eating Green Turtle in the Gulf of Kachchh would not be able to efficiently digest the sea grasses from the Gulf of Mannar, and vice versa.

Green Turtles are famous for making tremendous oceanic migrations between nesting beaches and feeding grounds. Nesting beaches are nearly always in tropical areas, as are most feeding pastures, but immature Green Turtles sometimes stray into subtropical and even temperate waters. The reptiles that feed in the shallow gulfs of India may nest on the beaches of Pakistan, Maldives and Sri Lanka; those that nest on Indian islands may migrate across the Arabian Sea or Bay of Bengal to rich feeding areas.

The number of Green Turtles that live in Indian waters has evidently been decreasing rapidly over the past few decades because fewer and fewer are seen and caught each year. It is difficult to say how many Green Turtles there are in India, but it seems that no more than a few hundred nest each year

throughout the entire territory.

The distinction of "the world's most valuable reptile" could in fact be contested, and one of the prime contenders is the Hawksbill Turtle. Although not especially large by sea-turtle standards, nor abundant, the Hawksbill is the producer of thick scales called "tortoise-shell," probably the world's first plastic. In the hands of a skilled artisan, tortoise-shell can be molded, welded and transformed into an infinite variety of shapes and objects; these have been used as regal gifts in the Orient as well as in the Occident over the millennia. The price of just the scales stripped off the shell of the turtle has recently been as much as Rs. 1,300 per kilogram, and a good sized Hawksbill may yield two kilograms or more of tortoise-shell.

Needless to say, with this price on its shell, the Hawksbill is hunted by fishermen all around the world, and it is regarded as one of the most endangered of all turtles. Also, it is the most restricted of all the sea turtles in distribution, for it is rarely found outside the tropics. Its preferred habitat is rich coral reefs, where it feeds on soft animals. Sponges are the main diet, and this raises a great question, for sponges are full of poisons and glass spines: no one can explain how the Hawksbill thrives on this nor do we have an answer to the mystery of why the meat of the Hawksbill Turtle is so often poisonous to humans. Perhaps the two phenomena are related, but we must wait for definitive research before there will be an answer. Several years ago a number of people in Tamil Nadu died horrible deaths shortly after eating the meat of a Hawksbill.

Not all Hawksbill meat is poisonous however. I once met a one-legged fisherman in the Seychelles who made his living hunting—and eating—Hawksbill Turtles. His secret was to push a gold or silver ring into the freshly cut meat: if the metal tarnished within a minute or so, the meat was poisonous; if the ring stayed shiny, the meat was edible.

In India the Hawksbill is commonly found only on the islands of Lakshadweep and Andaman and Nicobar. How many nest in one year on Indian beaches is not known, but again 100 seems like a generous estimate.

The smallest of the marine turtles are the Ridelys, both Olive and Kemp's, which grow to about 40 kilograms in body weight. Although large, the size is not outstanding since there are several kinds of soft shell turtle in the rivers and estuaries of India that grow to a comparable or even larger size. The Olive Ridley makes up for its relatively small size by being the most abundant sea turtle. It nests along the entire coast of the Indian subcontinent, from Pakistan to Bangladesh. There is even nesting reported from the Lakshadweep and Andaman and Nicobar Islands; remarkable in that this turtle normally nests on continental beaches.

Without doubt, the most noteworthy nesting area in India, and one of the best known in the world, is at Gahirmatha Beach in Orissa. There is no exact count of the numbers of Ridelys that nest at Gahirmatha, but a quarter of a million may be involved in a single massed nesting, occurring over a period of several days. In February 1984, we visited Gahirmatha, invited by the Forest Department of Orissa, to witness an "arribada" (the Spanish word, now used the world over, for a massed nesting). Night after night the beach is transformed into the Theater of Primeval Time. As their ancestors had done since there were dinosaurs, turtles left the sea—not in ones or twos nor, in tens or twenties, but in the hundreds—and they crawled out onto the sand, scrambling up the beach to find a place to lay their eggs. There were so many turtles that it was impossible to count those within a radius of even ten



meters. They crawled out of the sea, into the sea, up the beach, down the beach, along the beach and over one another. In the exact meaning of the word, they *covered* the beach. No photograph, no book, can portray the intensity and timelessness of such an event.

Even more staggering is the number of eggs left on an "arribada" beach. The average Olive Ridley lays about 100 eggs, so, after a massed nesting, Gahirmatha becomes a vast omelet with eggs that were dug out of nests by subsequent females nesting themselves in the same places. The eggs of the Olive Ridley are collected throughout India and, in Orissa, the haul was once measured in boat loads; how many millions are taken every year is unknown.

One of the great mysteries in wildlife studies in India is the source of these countless numbers of Ridelys: Where do they live when they are not on the beaches of Orissa? Seemingly endless flotillas have been observed between Sri Lanka and India progressing northward but, since there is no permanent population

around Sri Lanka, this does not answer the question. In the Pacific, the Olive Ridley seems to spend a great deal of time on the high seas; perhaps the hordes of turtles that nest at Gahirmatha live in the Bay of Bengal, Arabian Sea and the Indian Ocean. Only detailed and long-term studies will provide the answer.

A similar sort of problem arises with the rarest of all sea turtles in India, the Loggerhead. On the island of Masirah, outside the mouth of the Persian Gulf, is the largest population of Loggerheads in the world, with tens of thousands nesting each year. Although they disappear, and no one knows where they go, one might think that, with this tremendous number of Loggerheads nesting at the north end of the Arabian Sea, this turtle should be seen at least occasionally—in India. Yet, there is only one definite record.

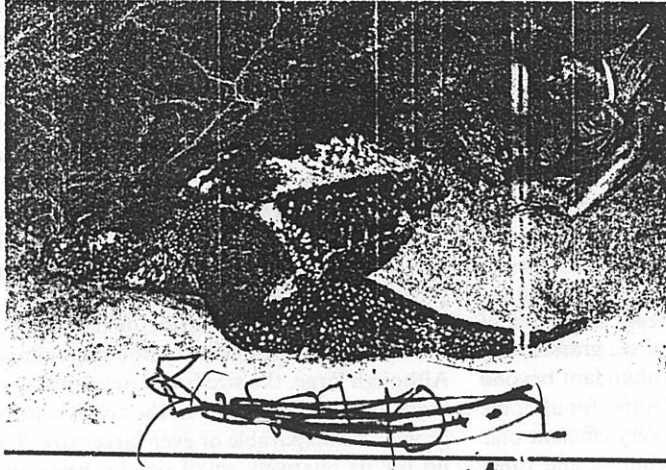
This is a large turtle with a head the size of a soccer ball, and in several ways it is similar to the Olive Ridley. For more than a century the identity of these two turtles has been confused. Reports sometimes give the impression that the Loggerhead was a common turtle in India. Perhaps it was, but it is difficult to be sure since the identification has been questionable.

Consistently, the numbers of sea turtles in India—wherever they are—have declined drastically. It is doubtful that they are on the brink of extinction," as is so often claimed. But there is no doubt that sea turtles hardly exist as an economic resource today.

There are many reasons to satisfy the materialist as to why sea turtles should be rationally and carefully managed. Nutritional needs in protein-poor rural areas, economic gains and sources of foreign exchange and complicated interrelationships between sea turtles and marine ecosystems and between turtles and man are all problems that must be thoughtfully considered before society blindly destroys the sea turtle.

What is more, this is no ordinary reptile we are talking about; this is Kurma, Lord of the Turtles. Are we, Homo sapiens, so fearless that we will banish these creatures from the planet that we all must share and treasure? For myself, I would prefer to see Kurma on a quiet moonlit beach—it is an experience that reflects one's respect for a timeless almighty universe.

*The Leathery Turtle, perhaps the largest of all sea turtles, nesting.*



## MARINE TURTLES OF INDIA

All marine turtles have a similar body form, but it is fairly easy to distinguish one species from the other. Only five of these species are found in India.

**The Leathery Turtle:** Except when only a year or less old, this turtle has no scales, but is completely covered with a leathery skin—thus, the name. It is the only turtle to have a deep notch, with a toothlike cusp, on each side of the upper jaw. It is also unique in having seven (sometimes only five are conspicuous) longitudinal keels, each of which runs from the front to the back of the shell. This is the only turtle that is black with white spots. Its front flippers, without claws in nearly all cases, are enormous and almost always as long as the shell, which is commonly more than 150 centimeters in adults.

**The Green Turtle** in fact is not typically green; it begins life, about five centimeters long, mat black above, cream white below, and its body and legs attractively outlined in white. As it

matures, each scale of the top shell, "carapace," develops a chestnut coloration with radiating lines—like the rays of the setting sun. Finally, at maturity, the back is greenish with black and brown spots and rays. But, scales—not color—are the most direct way to identify the Green Turtle. Just above the nostrils, and on the forehead between the eyes, are two elongated scales. All other hard-shelled sea turtles have at least four scales in this position.

**Hawksbill Turtle**, true to its name, has a pointed, hawklike beak, the head is nearly twice as long as it is wide and the beak projects out to a sharp point.

The scales of the shell are overlapping, like tiles on a roof. No other turtle has these overlapping scales. At the back of the shell the scales along the edges are deeply serrated, like the teeth of a saw. In addition, the scales are singularly thick: this is the "tortoise-shell" of commerce, used for spectacle frames, jewelry, furniture inlay and other luxury products.

**Olive Ridley:** If you see a marine turtle in India, the chances are nine out of ten that it is an Olive Ridley. Although they are olive green in the presence of four nearly square scales above the nostrils and between the eyes, rules out the Green Turtle. The Ridley does have a pointed beak, but it is broad and not pointed forward; the paper-thin scales on the shell have a nearly smooth margin readily distinguished from the Hawksbill.

**Loggerhead:** Rarest of all India's sea turtles, this animal is noted for its enormous head, nearly as broad as long. Its red-brown color and lack of conspicuous pores along the sides of the plastron distinguish it from the Ridley. On the back of the carapace there is a knob, or scute, not found in other turtles.

This is the "dirtiest" of sea turtles; its shell is often covered with algae and barnacles, even worms, small crustaceans and oysters live within the complex community that grows on the back of this turtle.