

It dives over a thousand metres beneath the sea, where the lungs of normal air-breathing vertebrates collapse. It wanders in arctic and subarctic waters in search of food, surviving freezing temperatures. It maintains its body temperature well over that of the surrounding environment by thermoregulation, using layers of insulation. It has a beautifully streamlined body with which it swims powerfully through the water, migrating thousands of kilometres across the open oceans to breed. And it is over two metres long and weighs over 500 kg. This might sound like a whale or some other marine mammal, but the creature answering this description is, in fact, a leatherback turtle. It combines the magnificent with the incredible, going places and doing things that you would not expect any reptile to do.

The leather hunt

I had been waiting nearly 13 years to see a leatherback turtle. From the moment I started working on sea turtles, it has been my dream (and that of every fellow turtle lover) to see this amazing animal. Sea turtles have now become part of polite drawing-room conversation, though it's species such as olive ridleys and green turtles that are more familiar to most. In India, ridleys nest throughout the mainland coast and thanks to many popular conservation programmes, most wildlife enthusiasts and even members of the general public have seen a ridley. The leatherback is more elusive. In India, it nests mostly on remote islands, which government restrictions and poor transport have conspired to render inaccessible. The Andamans was once a favoured nesting site for many leatherbacks,

but these populations have now declined due to coastal erosion and depredation of eggs. Today, most of the good nesting sites are on Carrot and Little Nicobar, 400 km south of the Andamans, and a stones throw away from Suvarn.

Our journey to the Nicobars is long and arduous and includes a long wait at Permas at Port Blair and a four-day journey aboard the Shipping Corporation's *Savitri*. Once at Campbell Bay, the gateway to the Great Nicobar island, we discover that the bus no longer runs to Galathea, the nesting beach, since a landslide washed away the road four kilometres from the beach. Though we are assured that there will be tractor cycles and other means of covering the four-kilometre gap, we find one of Campbell Bay's three *avachshaws* to ferry us over. Galathea is a

Joyages of the Leatherback

by Kartik Shanker



two-kilometre beach in a south-facing bay and we are lodged in a small camp of the forest department. We don't have to walk long for first evidence of leatherbacks. We are patrolling the beach and soon come upon one of the huge tracks that reads that we are very used to in the days to come. I have worked much of my life on ridley beach, with a low inventory of turtles. I was used to looking tensely at the tracks in fear of any hole for tracks. The first thing to do on finding one track is to look for another one, which would indicate that the turtle has returned to the sea. Time then to start searching for the nest and the eggs. Occasionally, a track would be fresh and we would creep up slowly to an unsuspecting ridley and watch it build its nest or lay its eggs.

On a leatherback beach, however, the main ethos of turtle walking is different. Apart from tracks, one's eyes have to be peeled for beaching leatherbacks, their mountainous forms heaving out of the sea. The Karen held assistants, Agline and Glen, and Meera, my colleague, are far better at this than I am, often spotting the beasts as they left the breakers, a good half-hour or more before reaching the high-tide line and the nesting site on dry sand. For the visually-impaired, such as I, there are noisy, uncouth grunts to listen for, or the slap of the front flippers against their sides as they fling sand to clear nesting space. And one always has to be careful not to break an ankle stepping into a huge body pit or abandoned nest-hole.

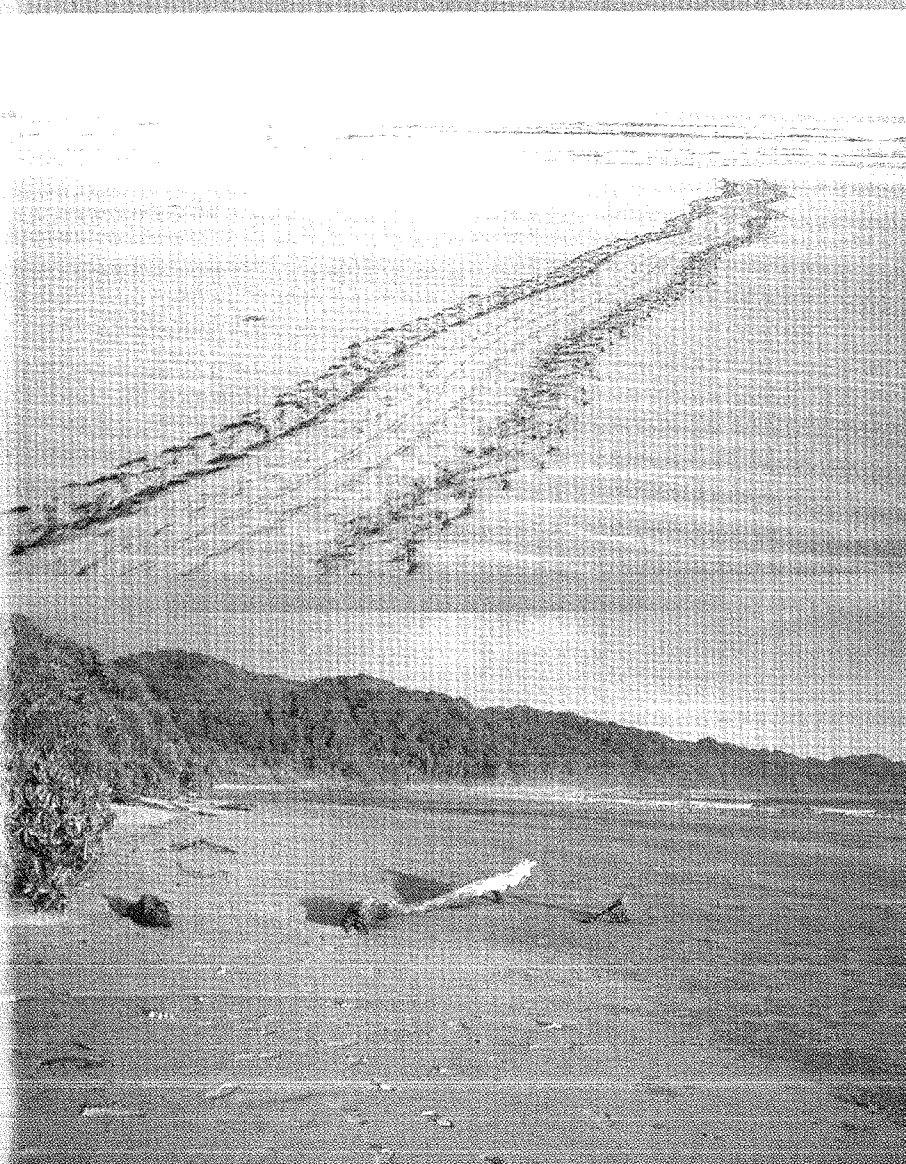
Sea turtles, though remarkably adapted for marine life, are still tied to the land for the

most important aspect of their lives — reproduction. This is one of the constraints in their adaptation to the aquatic environment. They still have to be able to move on land, often several times in a season. Leatherbacks nest only once in two or three years, but may nest six or more times in the same season. This is also a stage of their life cycle when they are the most vulnerable, the adults as well as their eggs and hatchlings. In addition to natural problems and erosion, human-related problems such as exploitation of eggs and killing of adults for meat have depleted many populations. Fortunately, adult leatherbacks are not eaten in most parts of the world, though egg exploitation remains a major threat.

For all the years I waited, it did not take too much time for me to get my fill of them! During the peak season, ten or more leatherbacks come ashore each night on the two-kilometre beach. And each one can spend hours on the beach. They take an hour or more just to haul themselves ashore and then spend another hour clearing away the surface sand and digging a nest, often only to decide that the site is unsuitable. That means starting afresh somewhere else. The egg-laying itself is quick and lasts about 10 minutes. Throwing sand over the eggs and camouflaging the nest takes up another hour. The forest department maintains a hatchery at Galathea to protect the eggs from predators and erosion. At night, while patrolling, the guards must be alert to catch the turtles during the act of egg-laying. Once the turtle has started covering up, finding the eggs and the nest is no walk in the park. The next morning, the beach looks as if it has been bombed and the line of tracks looks like a field that has been ploughed.

Leatherbacks that come ashore late at night are often still on the beach at the morning. At the harsh light of day, they sometimes give the impression of not being the brightest of animals, especially one that came ashore at noon, and attempted to make a nest in the middle of a tidal pool! But they have an undeniable gentleness and elephantine beauty about them, with their hanging folds of skin and ponderous outlook on life.

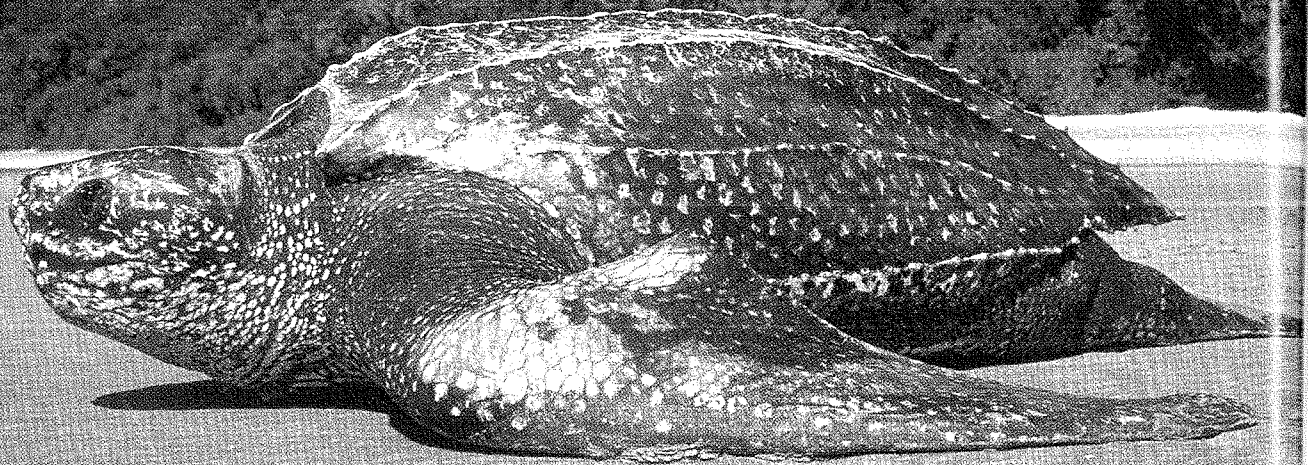
Leatherbacks are well-known for two remarkable features: their ability to survive in arctic and subarctic waters and their deep sea diving ability. Like other sea turtles, they have been known to migrate several thousands of



Galathea (above) is one of the main leatherback nesting beaches on the east coast of Great Nicobar. During the peak season, the morning sun sometimes reveals the tracks (top) of ten or more turtles that have nested during the night. Hatchlings (left) face huge odds, with only a few surviving to adulthood.

MEERA ANNA GOMMEN / LARSEN SUAMNER

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This leatherback, for some strange reason, was trying to nest in a tidal pool in the middle of the afternoon! Members of ANET such as Aghue (below) have been monitoring leatherbacks since the year 2000 using Passive Internal Transponders. Over 300 animals have been tagged at this beach alone and data has been collected on hundreds of nests

kilometres, using the earth's geomagnetic field to navigate. In a fascinating study in the Pacific, it was found that several leatherbacks followed the same narrow route into the southern Pacific from their breeding grounds in central America. They were following sub-oceanic ridges during these migrations. Elsewhere, they have been sighted consistently off the coast of Newfoundland, Canada and even Greenland. Leatherbacks have been known to dive consistently to depths of 400 m. and on occasion, to depths exceeding 1,000 m., in search of their favourite food, jellyfish. The leatherbacks' ability to dive is dependent on remarkable physiological adaptations related to their ability to regulate body temperatures and an astonishing tolerance of their brains to the accumulation of toxins in their blood on account of anaerobic respiration.

Gigantothermy – size does matter

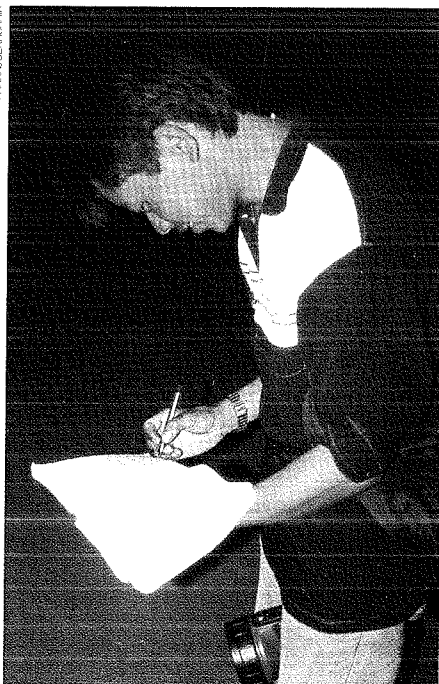
Reptiles have generally been described as sluggish, cold-blooded ectotherms. This stereotype has been demolished by leatherbacks. These animals have been known to maintain their body temperatures 18°C above the ambient temperature, which allows them to foray into the cold temperate waters

of the northern Atlantic and Pacific oceans, and also to forage for jellyfish in the deep sea. Leatherbacks are believed to regulate their body temperature by a combination of their large size, insulation and a blood circulation mechanism, known as a countercurrent heat exchanger, located at the junction of the

flippers and the body. This mode of thermoregulation, that can neither be classified as homeothermy (constant temperature as in birds or mammals) or poikilothermy (as in fish, amphibians and most reptiles), has been called gigantothermy. The study of this aspect of leatherback physiology has actually provided clues to the life of dinosaurs, answering questions such as: "How did they occupy temperate regions and remain active there?"

Galathea

Until recently, the Galathea river flowed around a huge sand-dune for more than a kilometre before entering the sea. This high dune was a major leatherback nesting area. During a violent storm in 2001, the river cut right through the dune and washed away the entire nesting beach. Turtles now only nest north of the river and during high tide, there is often less than a metre between the high water mark and the vegetation. Leatherbacks are forced under the pandanus and scaevola, to the very edge of the nesting beach. Worse, they often dig at the high water mark, only to find water at the bottom of the nesting pit. Many turtles abandon these nests, but those who cannot retain their eggs any



longer, nest anyway. Most of these eggs are eventually destroyed.

Since leatherbacks and olive ridleys nest near rivermouths, many of their nesting sites are dynamic and change from year to year. These are, in fact, natural phenomena. However, in many parts of India (and the world), this has been aggravated by human activities such as sand mining. Another major problem is anti-erosion measures, such as the construction of sea walls. Much of Kerala and Lakshadweep has been walled by granite to prevent the erosion of developed land. Most often, this has simply led to the erosion of beaches elsewhere, often those used by turtles. This could already be a problem in the Nicobars and is certain to increase with increasing human activity.

Searching for clues

We were in the Nicobars to collect tissue samples from leatherbacks and other sea turtles. Using molecular genetic analysis, we have found that olive ridley turtles on the east coast of India may be ancestral to populations in the Atlantic and Pacific oceans. They are the closest relatives of the Kemp's ridley, the sister species found in the Gulf of Mexico. Other molecular studies suggest that Indo-Pacific leatherbacks may be ancestral to global leatherback populations. The origin of many sea turtle species in the Indian ocean may be due to more conducive climatic conditions in the region in the recent geological past. We believe that the large leatherback nesting populations in Great Nicobar may hold some clues to the evolutionary history of this species.

At Galathea, the forest department maintains a hatchery where eggs threatened by inundation and predators, such as pigs and dogs, are translocated. Turtles lay 80 to 100 eggs each, which are about five centimetres in diameter and weigh approximately 80 gm. (twice that of ridley eggs)



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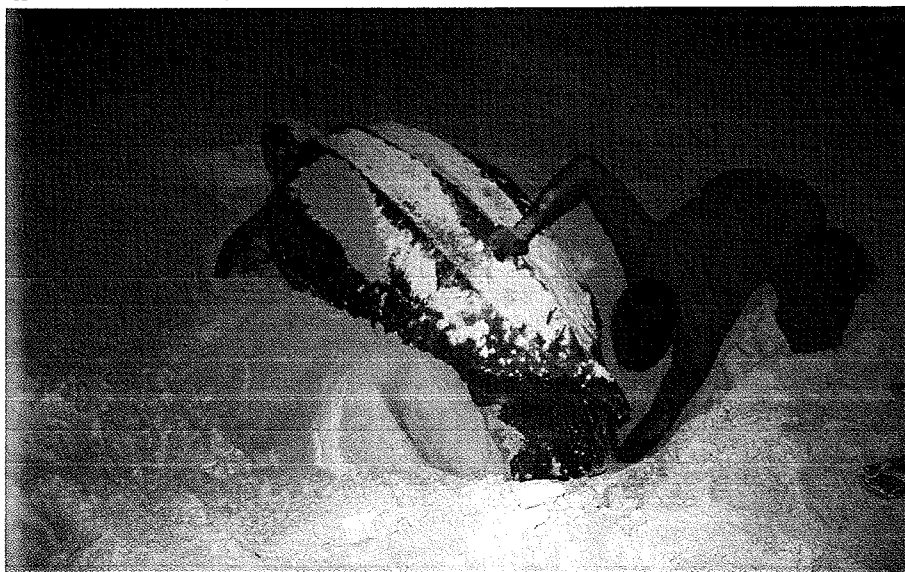
The Galathea river at the point where it enters the ocean. The rivermouth is the location of a spectacular leatherback nesting beach, which now enjoys wildlife sanctuary status.

As recently as 10 years ago, large amounts of DNA were required for analysis and, therefore, blood was often essential. However, with today's techniques, very little tissue is required and a small scraping of skin will also suffice. The barnacles from the backs of the turtles are also of importance as their origin may also provide clues about where the turtles have been.

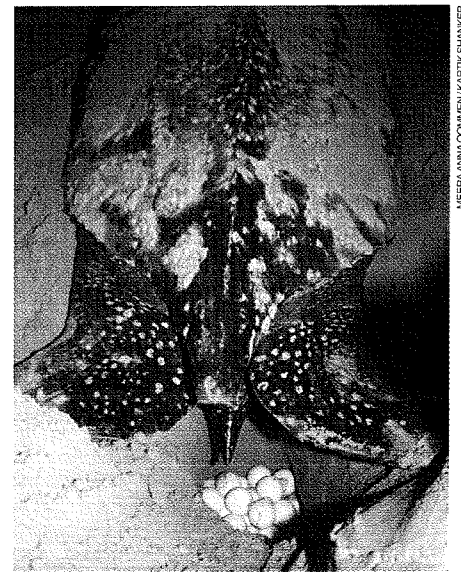
The Andaman and Nicobar Environmental Team (ANET) has been monitoring leatherbacks since 2000 using PIT (Passive Internal Transponders) tags – which are injected under the skin and read using scanner-like bar codes. They have tagged 300 animals at this beach alone and collected data on several hundred nests.

In danger of extinction?

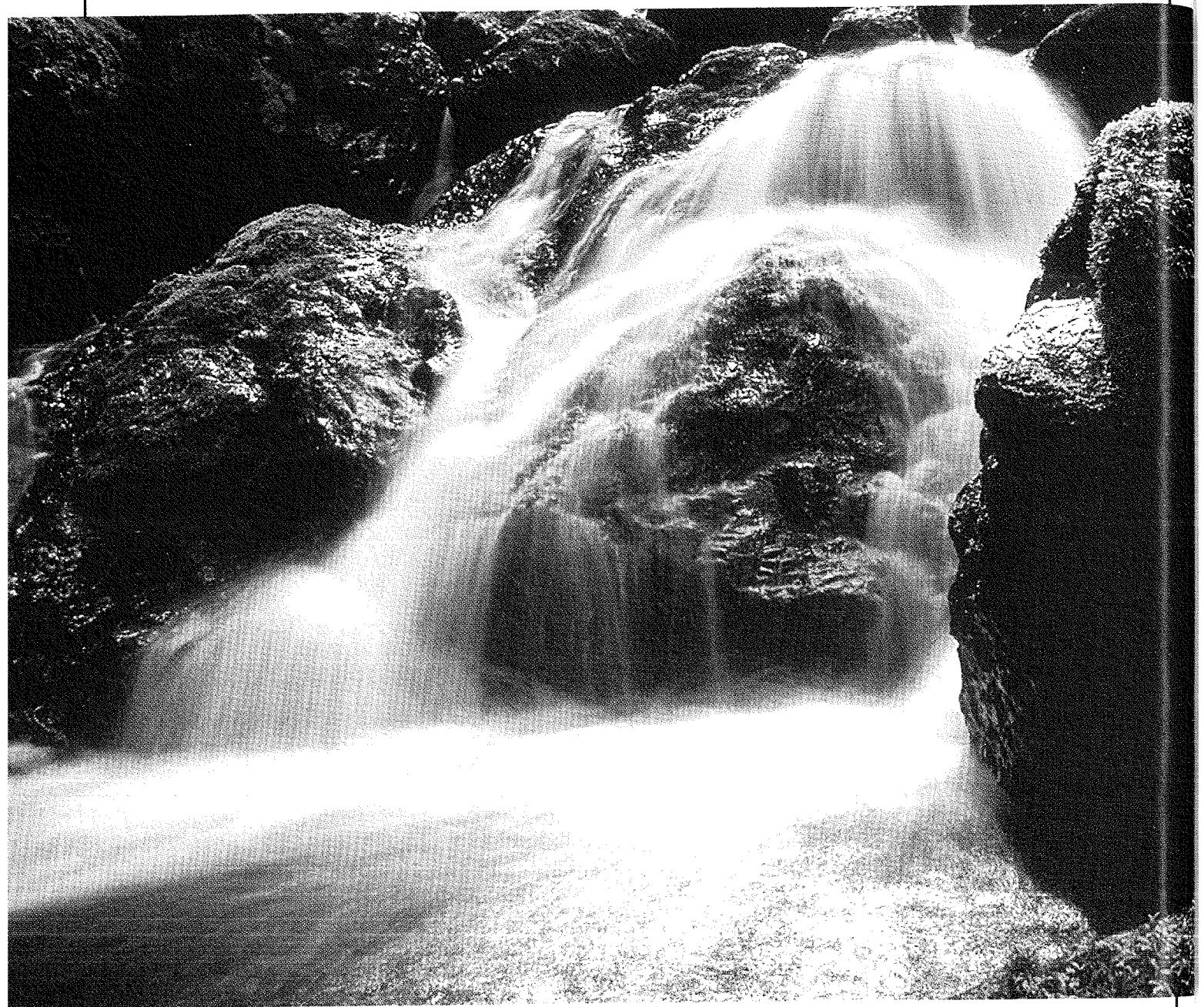
Leatherback turtles have been recorded nesting on the Indian mainland in Kerala, Tamil Nadu and Andhra Pradesh, though not recently. In other parts of the world, as in the Andaman and Nicobar islands, they share nesting beaches with olive ridley turtles, preferring deep-water approaches. Galathea, on the east coast of Great Nicobar, is the most accessible leatherback nesting beach on the island. The beaches on the west coast are largely uninhabited and still very wide, compared to Galathea. Predation of eggs by wild boar, monitor lizards and feral dogs, particularly in areas inhabited by the Nicobarese is a problem here. Other than that, the main threat to leatherbacks comes from



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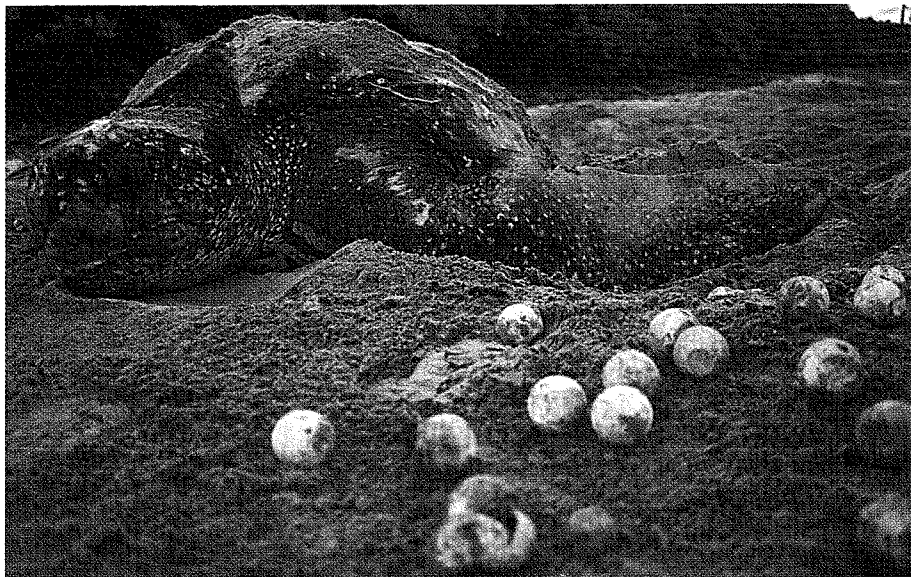
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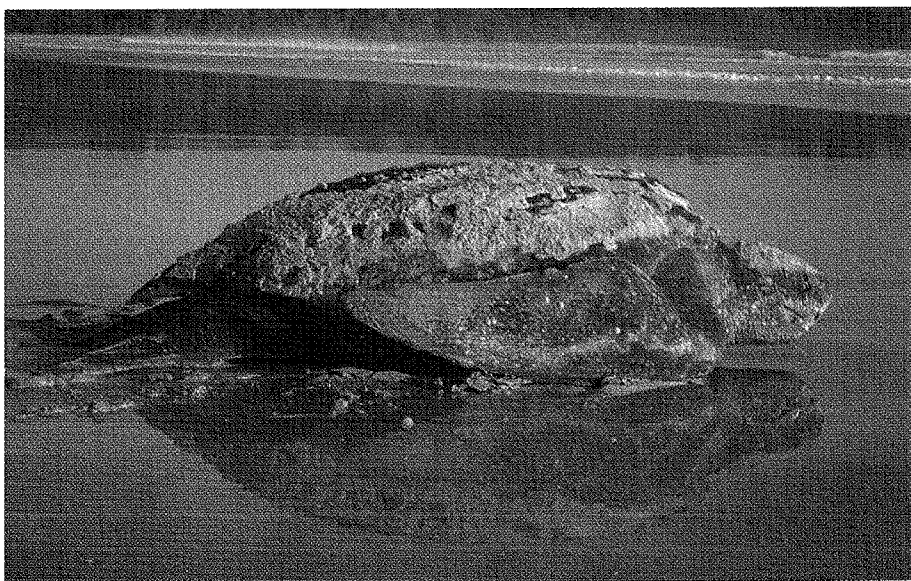
saltwater crocodiles that occasionally grab them while they are nesting.

Recent long-term studies of Pacific leatherbacks have suggested that they may go extinct in the Pacific in the next 50 years. This is due to a combination of egg exploitation, bycatch in deep-sea longline fisheries and other anthropogenic factors. While this has raised questions about the global status of leatherback turtles, populations in the Atlantic seem to be stable or even increasing. The Indian Ocean population has been completely ignored, as little was known about these areas and the populations were believed to be small. However, surveys indicate that there may be a few thousand turtles nesting in Indonesia and India. With the recent ANET surveys of Great and Little Nicobar, we were able to estimate that about a thousand leatherback turtles may be using these islands to nest. With the decline of Pacific populations, these Indian Ocean populations gain importance. While it is heartening that these populations are large and do not currently face any major direct threat, this is not a reason for complacency. The populations need to be carefully monitored and we must ensure that the same threats that have caused the Pacific leatherbacks to decline do not affect this population.

Galathea, as the only currently accessible leatherback-nesting beach in India, has tremendous scientific value. While tourism is sensibly banned below the 10° Channel, locals nevertheless flock to the beach on weekends to catch a glimpse of the turtles. Popular myth has it that the turtles come all the way from Australia, which might be part of the attraction. Though this is indeed possible, there is no evidence on hand for or against this hypothesis. Though it is good that there is interest in the turtles, the beach is awash with flashlights and flashbulbs, causing considerable disturbance to the turtles. This can easily be avoided with basic education and if executed properly, this beach could serve as a focus for environmental education for islanders and a treasure trove of information for scientists. More than anything else, wherever else they may survive, the leatherbacks are a part of India's natural heritage. We know so little and have so much to learn about (and from) these enigmatic animals. 🐢



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Current estimates suggest that about 1,000 leatherback turtles nest on these islands. In the peak season, nesting densities may be so high that some turtles dig up others' nests. Turtles may take up to four hours to nest, and those that come ashore late at night are often still on the beach by morning. The author (above) emphasises that, given the decline of leatherbacks in the Pacific, this population is globally significant and needs total protection.