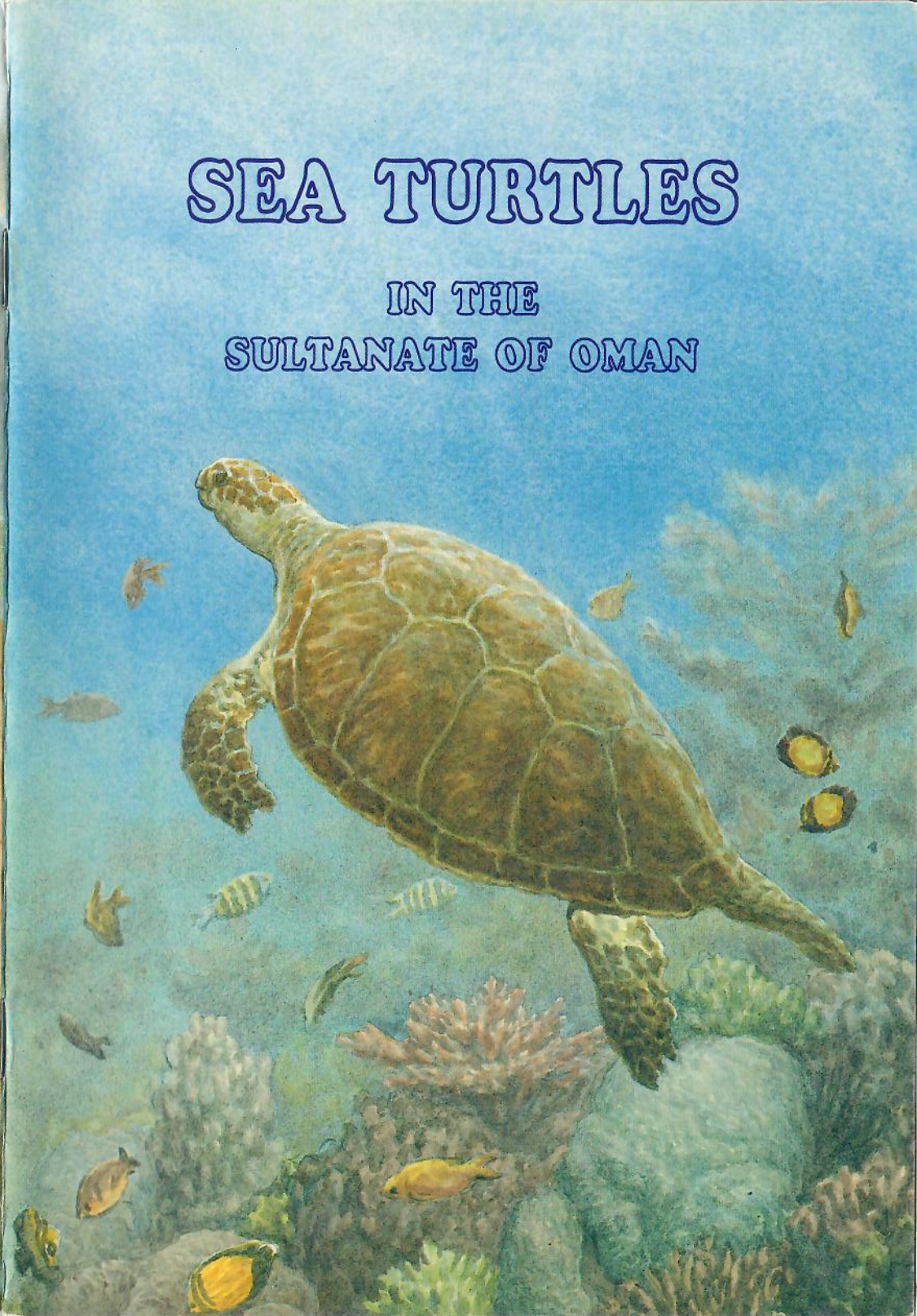


SEA TURTLES

IN THE
SULTANATE OF OMAN



Rod Saleh



FOREWORD Acknowledgements

We are grateful to the following for their assistance in the preparation of this book:

SEA TURTLES

IN THE

SULTANATE OF OMAN

Rod and Susan Salm



THE HISTORICAL ASSOCIATION OF OMAN

1991

Acknowledgements

We are grateful to the Publications Subcommittee of the Historical Association for their encouragement, support and suggestions.

Concern for turtles in the Sultanate was first expressed by the then Ministry of Agriculture, Fisheries, Oil and Minerals. It is largely thanks to the original efforts of that Ministry and the continuing turtle tagging by the Directorate General of Fisheries, that turtles remain prolific in the seas and on the beaches of the Sultanate.

Much of the information in this book results from surveys of turtle beaches carried out over six years by the IUCN Coastal Zone Management Project sponsored by the Ministry of Commerce and Industry.

Credits

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FOREWORD

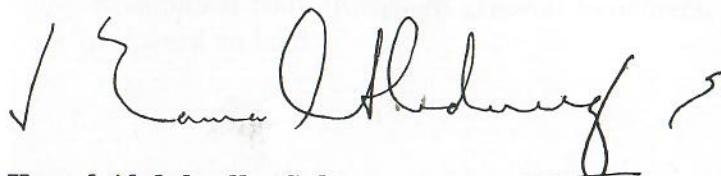
Sea Turtles in the Sultanate of Oman

After its first successful book on "Traditional Spinning and Weaving" the Historical Association of Oman has great pleasure in publishing its second book, this time on the "Sea Turtles in the Sultanate of Oman" by Rod and Susan Salm. Dr Rod Salm has carried out extensive research on behalf of the Government about the various species of turtles that use the very important Omani beaches as their nesting sites and the Omani waters as valuable grounds for their feeding, particularly the rare green turtles.

As the turtles migrate, the authors point out, over considerable distances, the existence and well being of these rare and fascinating creatures becomes the duty and responsibility not only of this Government but of several countries which are involved.

The researcher has incorporated in this booklet several rules of conduct for watching turtles which are very important to study and follow by the various visitors to the sites for the conservation of the turtles.

The Association, by its project to bring forth this important booklet, hopes to contribute its part towards a conservation attitude in which the public has become increasingly interested, and where the Government has set high standards in the conservation and preservation of environment policies in the region.



Kamal Abdulredha Sultan

Vice President

The Historical Association of Oman

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TURTLES AND THEIR KIN

Turtles are reptiles, along with crocodiles, snakes and lizards. Being "cold-blooded" is one of the characteristics they share, which means they need to bask in the sun, or rest on sun-heated objects to raise their body temperature. This temperature dependence restricts most of them to the warmer areas of the world.

The closest relatives to turtles are tortoises and terrapins. Although similar in many ways (all may be called turtles in some parts of the world), each has evolved in a specific environment leading to certain differences.

Tortoises have domed shells and heads that generally can be pulled in under the carapace for protection. Their feet are adapted for walking since their entire life is spent on land.

Terrapins are semi-aquatic, living part of their lives on land and part in water. Their shells are less domed to suit this dual life, and their feet are webbed for swimming.

Turtles are well adapted for life in the seas, but must surface to breathe, and need to lay their eggs on land. They have enlarged and flattened limbs for swimming, and a streamlined body. Although graceful swimmers, they are awkward on land.

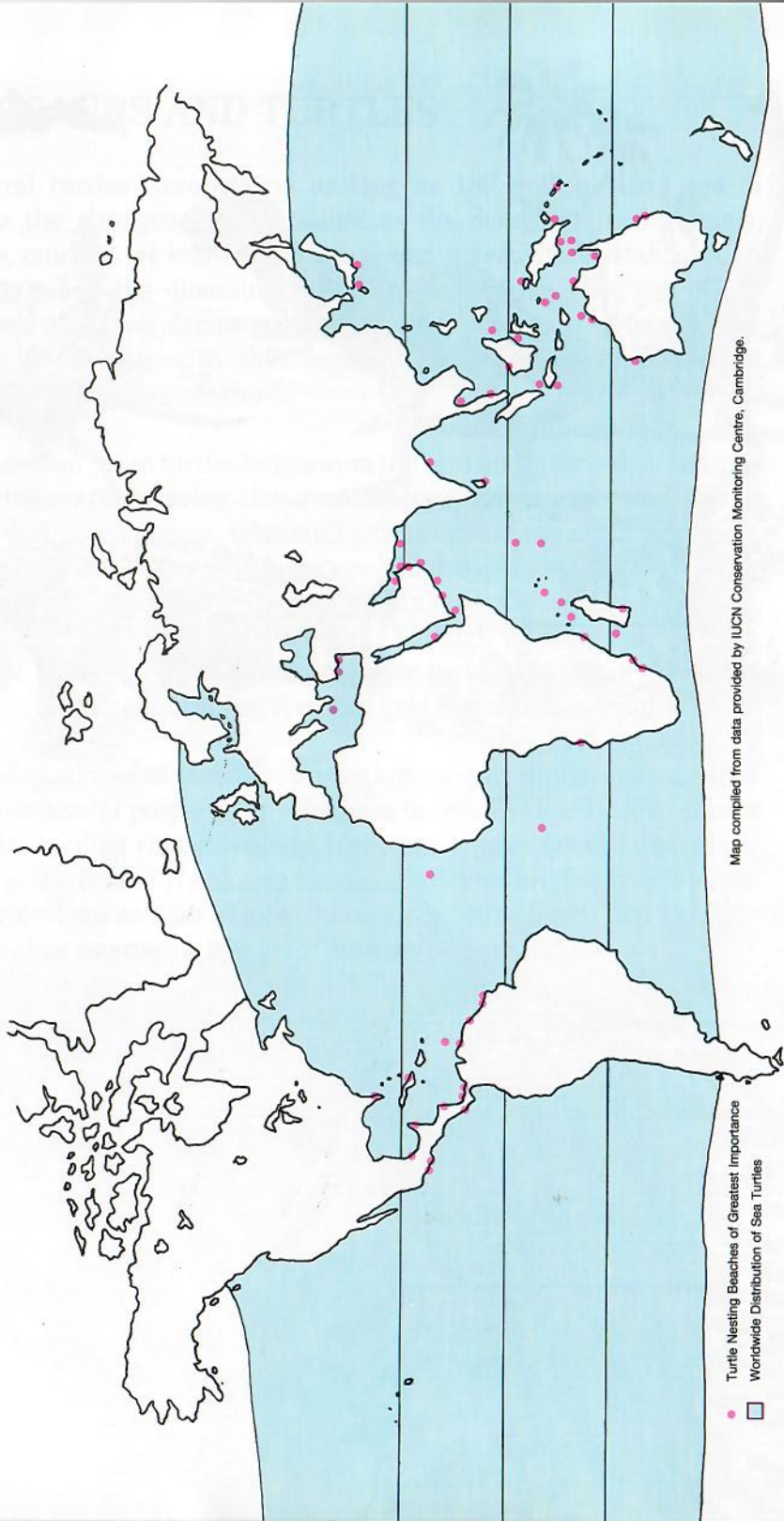
DINOSAURS AND TURTLES

Ancestral turtles were around as long as 180 million years ago to witness the emergence of dinosaurs as the dominant land animals. Turtles, much as we know them today, were already well established in the seas when the dinosaurs lapsed into extinction. The age of the dinosaurs and their demise excites the interest of most of us, and the turtle's direct link with that mysterious bygone era makes them especially fascinating creatures.

For 90 million years turtles have swum the seas and emerged on beaches to lay their eggs. During this time continents have split and moved across vast ocean spaces. Glaciers have advanced towards the tropics, locking up much of the world's waters and dropping sea level far below present levels. Later, they retreated melting into the oceans and raising sea level far higher than it is today. Through all this, turtles have remained little changed, their formula for survival resisting upheavals of the world environment that few of us have the ability to comprehend.

It is with good reason then that turtles are the only reptile in Oman that large numbers of people go any distance to see. The spectacle of dozens of turtles hauling themselves out of the sea to nest draws hundreds of people to the Ra's al Hadd area every year. There are few places left in the world where one can witness this ancient rite so freely, and examine at such close quarters a species of such great antiquity.





TURTLES IN OMAN

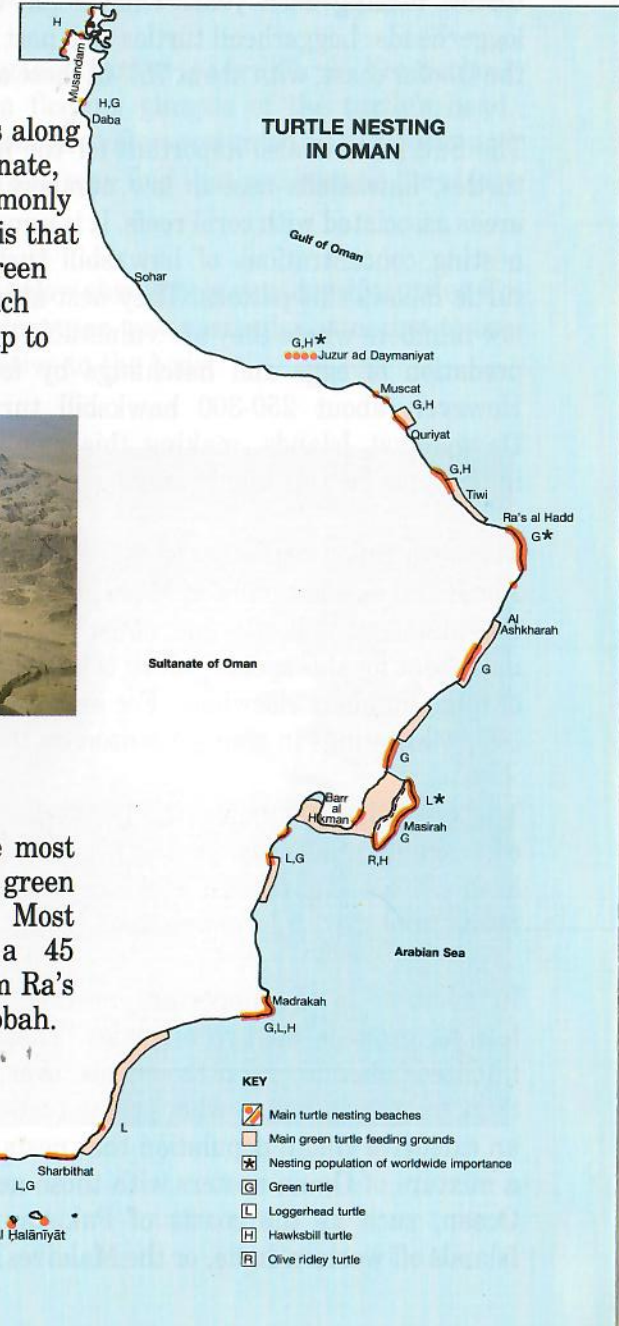
There are 5 kinds of turtles in the seas off Oman.

Green turtles nest on beaches along the entire length of the Sultanate, and are the species most commonly seen here. Our best estimate is that between 50,000 and 60,000 green turtle egg clutches are laid each year in Oman - the effort of up to about 20,000 turtles.



Ra's al Junayz nesting beaches

This makes Oman one of the most important nesting sites for green turtles in the Indian Ocean. Most green turtles nest along a 45 kilometre stretch of coast from Ra's al Hadd south to Ra's al Khabbah.



Masirah Island has an incredible total of about 30,000 loggerhead turtles nesting each year. This is the world's largest population of loggerheads. Loggerhead turtles also nest in fairly large numbers along the Dhofar coast, with about 75% of these on the Al Halānīyāt Islands.

The Sultanate is also important for the hawksbill turtle. Unlike other turtles, hawksbills nest in low numbers spread over vast geographic areas associated with coral reefs. It is unusual to find beaches with large nesting concentrations of hawksbill turtles. In Oman the hawksbill turtle follows this pattern. They nest at a number of mainland sites in low numbers where they are vulnerable to disturbance by people and to predation of eggs and hatchlings by foxes, wolves, and feral dogs. However, about 250-300 hawksbill turtles nest each year on the Daymaniyat Islands, making this small cluster of islands of global importance for this highly endangered species.

The olive ridley turtle is the fourth species of turtle to nest in Oman. About 100 nest annually on Masirah island, and low numbers nest along the mainland opposite and down into Dhofar. The Sultanate is not important for this species which is known to nest in synchronised waves of huge numbers elsewhere. For example, there have been as many as 300,000 nestings in a single season on the Orissa coast of India.

The giant among turtles, the leatherback, feeds in Oman's seas, and occasionally washes up dead on beaches. Unfortunately, it does not nest here - at least not regularly - for to watch these monsters labour up the beach to nest is truly impressive.

In addition to the important nesting beaches, Oman has valuable feeding grounds for green turtles. These turtles accumulate in their hundreds, possibly even thousands, over the larger feeding areas. It is intriguing to speculate where these turtles come from. Are they part of an exclusive Oman population that nests and feeds in Oman? Are they a mixture of Oman nesters with those nesting elsewhere in the Indian Ocean, such as the coasts of Pakistan, Somalia, the Lakshadweep islands off western India, or the Maldives? Only years of patient tagging

studies on both the nesting beaches and the feeding grounds will enable researchers to answer these important management questions.

Telling the different types of turtles apart at sea is difficult. From a boat one seldom gets more than a fleeting glimpse of the turtle's head. However, snorkellers and divers are often rewarded with longer and better views - remain still, and you may find that you become the object of scrutiny!

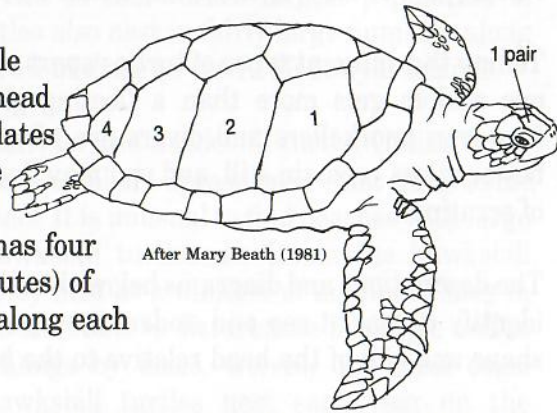
The descriptions and diagrams below should help you identify turtles. To identify turtles at sea and underwater, pay particular attention to the shape and size of the head relative to the body.



Hawksbill turtle resting on a reef

Green Turtle (*Chelonia mydas*)

Description: the green turtle has a small bluntly rounded head with one pair of elongated plates between the nostrils and the top of the eye. The carapace (upper shell) is smooth and has four large paired plates (costal scutes) of variable colour and pattern along each side of the shell.



Size: about 50 millimetres at hatching; a typical adult green turtle weighs 136-158 kilograms and the carapace is 1-1.2 metres long. Formerly, greens weighed up to 390 kilograms, but overharvesting has reduced the average size.

Distribution: worldwide in the tropics and warmer seas of temperate areas. About 20,000 green turtles nest in Oman, with between 6,000 and 13,000 in the Ra's al Hadd area alone.

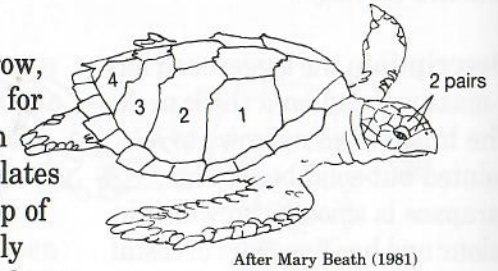
Migration: they feed as far away as the coasts of Africa and India. One tagged turtle was found in Ethiopia, swimming a distance of 2,220 kilometres in three months.

Reproduction: green turtles reach maturity at age 30-50 years depending on the quality of their diet. About 110 eggs are laid in a clutch. Copulation can last as long as six hours.

Food: except for their carnivorous first year, greens are the only completely herbivorous sea turtle, feeding on seagrasses and algae. Special bacteria in their stomachs help digest cellulose.

Hawksbill Turtle (*Eretmochelys imbricata*)

Description: the head is narrow, ending in a pointed beak used for poking into narrow crevices on reefs. There are two pairs of plates between the nostril and the top of the eye. The carapace is usually rough with thick overlapping plates and a serrated trailing edge. There are four pairs of costal scutes.



Size: a small to medium size turtle that weighs 35-50 kilograms. Nesting females in Oman average 80 centimetres in length.

Distribution: worldwide in tropical seas over rock or coral substrates. Most nesting in Oman occurs in the Muscat area. As many as 300 nest each year on the Daymaniyat Islands, making these of global importance for the survival of this highly endangered species.

Migration: not known.

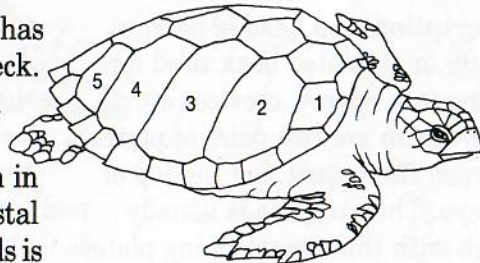
Reproduction: hawksbills lay up to 160 eggs, but in Oman they lay about 100 normal eggs plus 10% or so that are yolkless, misshapen or small. In Oman most nest at night, but a few nest in the late afternoon. Because they dig shallow nests their eggs are prone to predation by foxes. This is a difficult species to protect because they nest in low numbers spread over a wide area.

Food: hawksbills are omnivorous, mixing a diet of reef creatures, particularly sponges, seaquirts and soft corals, with seaweeds. As reef invertebrates (especially sponges) can be highly toxic, hawksbills can poison people who eat them.

Loggerhead Turtle

(*Caretta caretta*)

Description: the loggerhead has a massive head on a thick neck. The broad head narrows to a pointed but solid beak. The carapace is smooth, brownish in colour and has five pairs of costal scutes. The skin of loggerheads is often orange to reddish brown in colour.



After Mary Beath (1981)

Size: about 40 millimetres at hatching. Adults are slightly smaller than green turtles, having an average weight of 91-160 kilograms. Their carapace length is usually 91-96 centimetres.

Distribution: throughout the world in temperate and subtropical regions. Oman has the largest loggerhead nesting area in the world on Masirah Island where about 30,000 nest each year. They also nest widely on the Dhofar coast and the Al Halāniyāt islands.

Migration: not much is known about their activities away from their nesting sites. They appear to migrate along coastlines, sometimes for long distances.

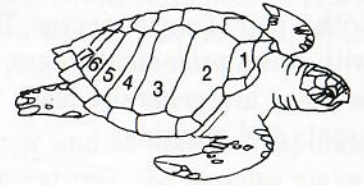
Reproduction: loggerheads nest in late spring and summer. On Masirah their egg clutches average 101 eggs.

Food: loggerheads are carnivorous with huge jaws set in a head that is far larger than that of a green turtle. They feed on crabs, shells and other reef creatures, their powerful jaws enabling them to crush thick shells.

Olive Ridley Turtle

(*Lepidochelys olivacea*)

Description: the olive ridley has a broad head that narrows abruptly to a triangular beak. The carapace is smooth with seven or more pairs of costal scutes. The colour of the carapace is often a pale olive green and the skin can be quite yellow to yellow-green.



After Mary Beath (1981)

Size: this is a small turtle, reaching about 45 kilograms and a length of 65-75 centimetres.

Distribution: worldwide in tropical seas. In Oman about 100 nest each year on Masirah Island and a few nest scattered along the mainland coast south from there to about Marbat in Dhofar.

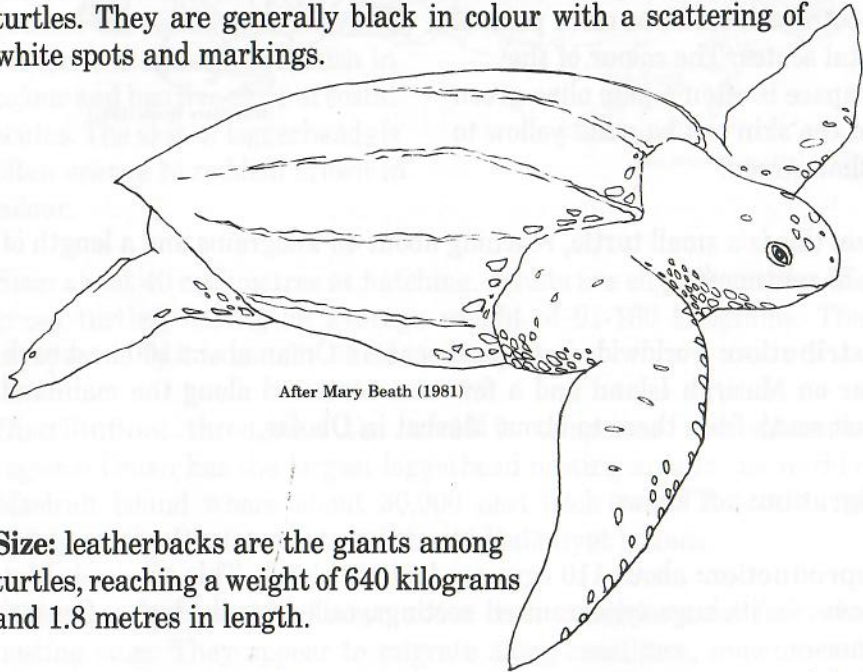
Migration: not known

Reproduction: about 110 eggs are laid per clutch. This species is best known for its huge synchronised nestings, called "arribadas" in Central America.

Food: mainly crabs and shrimps, but also jellyfishes and seasquirts.

Leatherback Turtle (*Dermochelys coriacea*)

Description: leatherbacks have large smooth heads and the upper jaw ends with a pair of obvious cusps. The upper shell is covered by a smooth skin with seven prominent ridges, and lacks the plates typical of other turtles. They are generally black in colour with a scattering of white spots and markings.



Size: leatherbacks are the giants among turtles, reaching a weight of 640 kilograms and 1.8 metres in length.

Distribution: worldwide, nesting in tropical seas but forage widely in temperate seas. Leatherbacks are not known to nest in Oman, but regularly feed in offshore waters, particularly in the vicinity of the Al Halāniyāt Islands.

Migration: range widely from tropical nesting areas to feeding grounds in temperate areas.

Reproduction: roughly 85 eggs are laid per clutch.

Food: leatherbacks are carnivorous, feeding almost exclusively on jellyfish.

THE LIFE OF A TURTLE

A lumbering turtle emerging to lay its eggs ashore bears little similarity to the graceful swimmer it is underwater. Tens of millions of years after their first appearance on earth, turtles still remain tied to land for this one part of their life cycle.

Most turtle species nest in the summer and at night when, under the cover of darkness and in cooler temperatures, the females make their way up the beach. Since the nesting behaviour is basically the same for each species the following description for green turtles seen in the Ra's al Hadd area can apply to all.

The females will reach maturity somewhere between 30 and 50 years of age. Mature male and female turtles are easily told apart by the size of the tail. A female's tail is short, thin and barely noticeable, while that of a male is long and thick. The male's tail is longer than the rear flippers and fills nearly all the space between them where it emerges from behind the shell.



Loggerhead turtle digging its nest

The males have a stout curved claw on the elbow of the fore flipper that they use to clip onto the shell of the female during mating. The claw tends to be straight, narrow and pointed on females.

Turtles mate in the sea approaching or just off the nesting beach, and lay up to about three times at two week intervals each season. The three clutches might all be inside her at one time in different stages of development. Female turtles always return to the same beach to nest, which is believed to be the one where they were born.

She is very nervous as she leaves the security of the sea to struggle up the beach into a terrestrial world she must face only every two to four years. She rests on the beach while the sea still swirls around her, lifting her head and checking for danger. Movement and light easily scare her for she and her eggs are very vulnerable to predators on land during the long and exhausting task ahead.

The female slowly drags herself up the beach, pausing often to make sure she is safe. If she feels secure, she will continue up the beach until she finds a suitable spot for digging well above the high water mark. Once she has found a good site, sand begins to fly as the female patiently sweeps her fore flippers powerfully backwards again and again, slowly digging a pit for her body. The body pit will generally be the same depth as her shell, or a little more.



Nesting green turtle

She stops frequently during this stage to rest and check for danger. If all is well, she will use her back flippers to dig the egg chamber. Her back flippers alternately scoop out and throw sand forward, causing the rear of her shell to be periodically lifted and lowered and moved from left to right. She can still be easily frightened away from her task.

The reason for all of this activity becomes apparent as many white, spherical, glistening eggs are dropped into the egg chamber. For 15 to 20 minutes the female lies quietly, heaving an occasional sigh as one to four eggs slip out of her at a time, until approximately 120 have been laid.



Hawksbill turtle laying eggs

When she finishes laying her eggs the female uses her back flippers to pack down sand over them. Then, using her front flippers, she covers the entire nest, disguising it from marauding foxes and other predators that relish a meal of freshly laid turtle eggs.



Green turtle covering nest

Only now, after all of this exhausting work, will the mother turtle slowly drag herself back to the safety of the sea, her sandy cheeks often streaked with tears. These are not tears of pain and strain, but a mechanism evolved in sea turtles to rid themselves of salt ingested from the sea.

The female's interest in her eggs is now complete. There is no caring parent in this reptilian family to watch over the eggs. It is the warmth of the sand that incubates them and, interestingly, the incubation temperature that will determine the sex of the hatchlings. Warmer temperatures produce predominantly females, and colder ones mostly males. In other parts of the world the threshold temperature is around 29°C, but it has yet to be determined for Oman.

Although many factors, such as the grain size, moisture content and depth of sand, stability of beaches, amount of predation, ocean current patterns, and history of harvest all help determine the success of turtle nesting on a beach, none is more important than incubation temperature. If the incubation temperature is below the threshold for females, most hatchlings will be males and the beach will not develop into a major nesting site.

Once a clutch of eggs is laid, the mother turtle swims offshore for 10 to 14 days before warily emerging to lay again. After laying about three clutches in a season she will migrate to distant feeding grounds, returning usually two to three years later to the same beach to mate and lay. Females possibly continue laying until they are over 70 years old, but nobody knows the exact length of their reproductive life, nor how long they will live.

After about 55 days the hatchlings use an egg tooth on the end of their beaks to cut their way out of the eggs. Once they have all hatched, which is more or less simultaneously, they work their way upwards together through as much as a metre of sand. Moving as though in an elevator, the upper hatchlings scrape at the covering sand which filters down

among them and is trampled down by those below. This slowly raises the mass of hatchlings to the surface over three to five days.

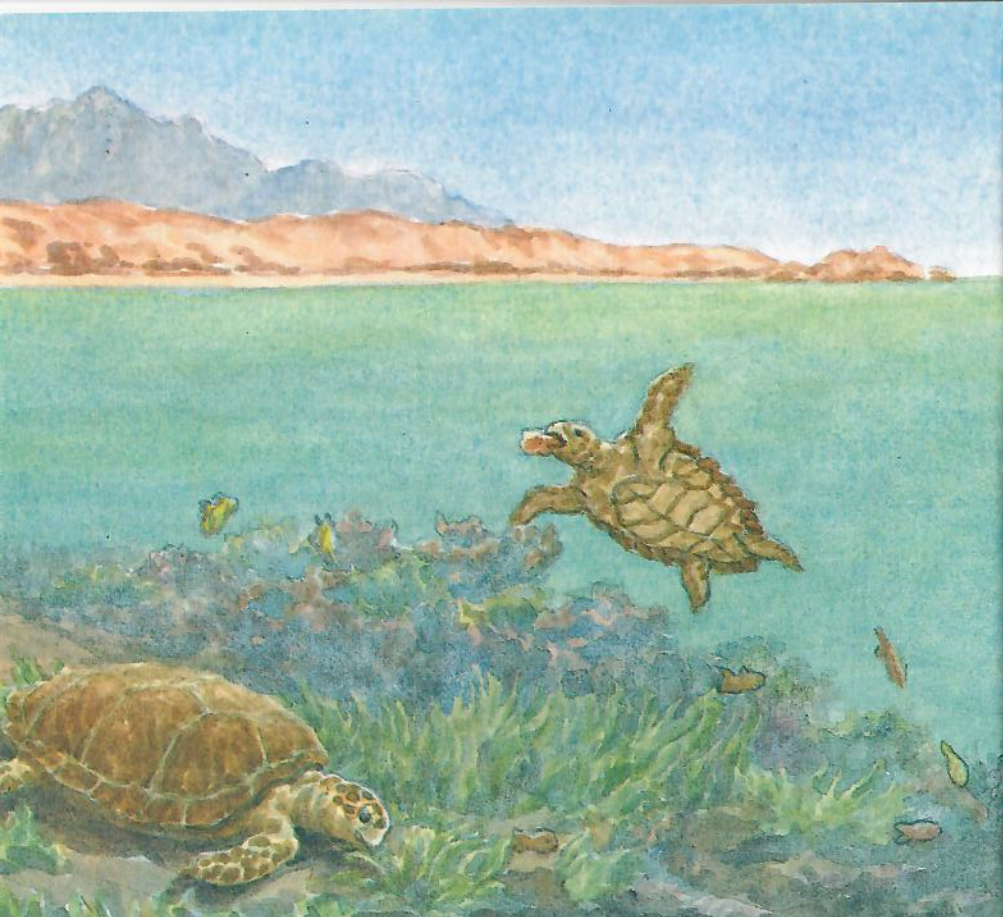
During the cool and dark of night is the best time for hatchlings to emerge and make their dash to the sea. The heat of the sand by day naturally inhibits their movement, preventing a daytime emergence. They become active again as the sand cools, and erupt in a frenzy of thrashing tiny flippers to race in the direction of the lightest horizon. This should be over the sea, but fires and lights will attract the hatchlings away from the sea and disorientate them.



Green turtle hatchling

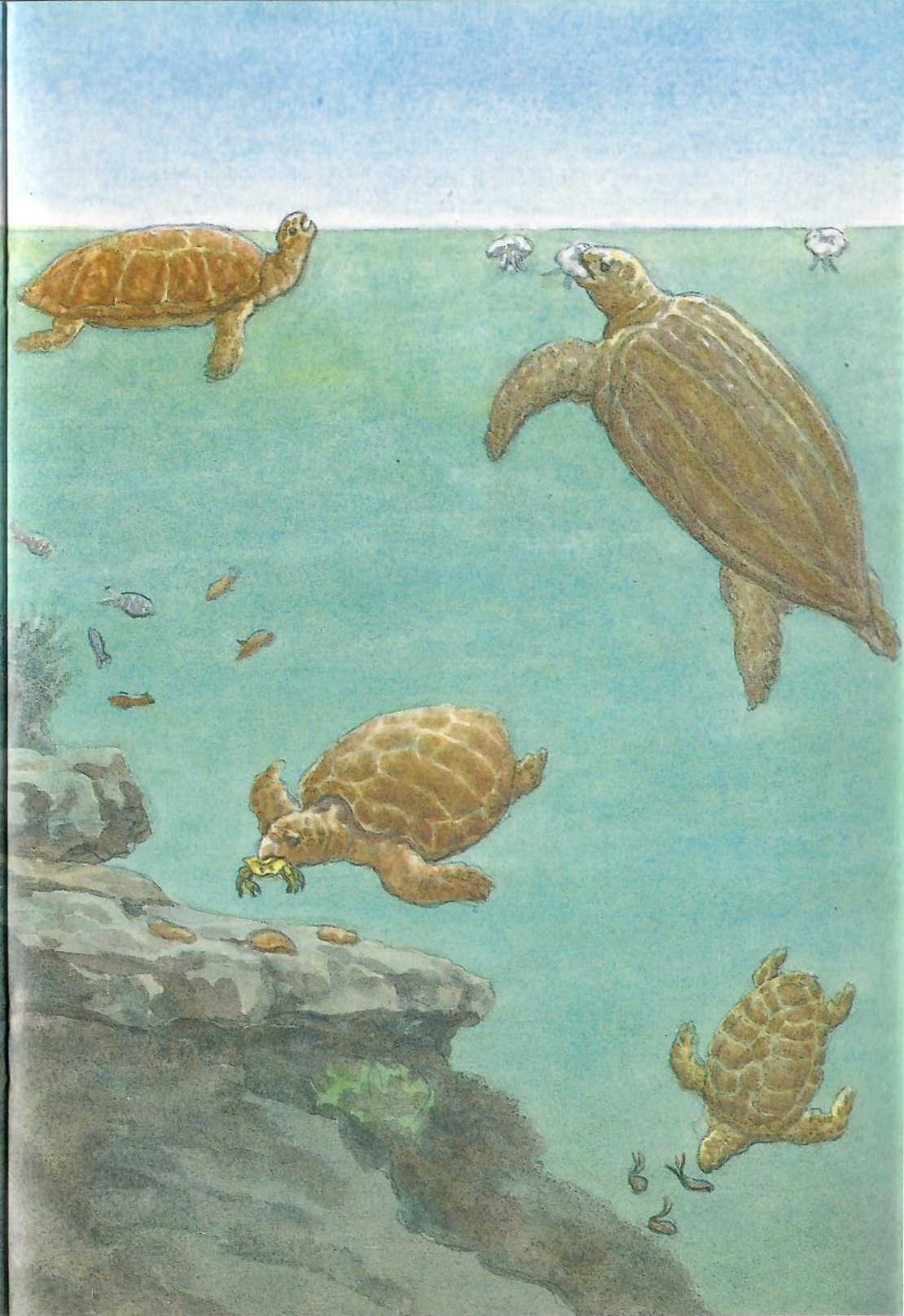
Once in the sea, hatchlings swim energetically to get past the nearshore predators. They swim non-stop for a week, obtaining sustenance from a residual yolk sac. Then they drift at the mercy of the ocean currents, feeding on plankton. In some parts of the world turtle hatchlings climb onto rafts of seaweed, dining on small invertebrate fellow passengers.

So little is known about the first year of a hatchling's life that it is called "the lost year". Scientists assume that during this time the young turtles drift on ocean currents feeding as carnivores off small planktonic organisms. After a year, the survivors reappear inshore having grown to the size of a dinner plate. At this time the turtles begin to settle into a pattern of life that is typical of each species.



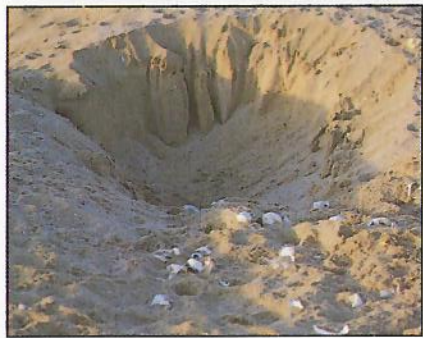
Green turtles change to vegetarians, feeding on seagrasses and seaweeds. Hawksbills move to shallower reefs where their pointed beaks enable them to reach into narrow crevices and feed on sponges and other animals. Deeper reefs provide foraging grounds for loggerheads, and olive ridley turtles feed still deeper. Only the leatherback remains truly pelagic (oceanic), swimming the oceans where it feeds apparently exclusively on jellyfishes.

These specialised feeding habits are one of several adaptations that prevent one turtle species from competing with another. Each species is separated into its own niche by food, and hence the depth and location of its feeding grounds, by type of nesting beach or, if it shares a nesting beach with another species, by nesting season. For example, hawksbills, loggerheads and greens share some nesting beaches in Oman. However, hawksbill turtles nest first with a peak in April. Loggerheads follow with a peak in June, and greens come last with their peak in July-August. In this way the danger of overcrowding a nesting beach is avoided, and the turtles reduce the risk of digging up eggs of earlier nesters.



THE STRUGGLE TO SURVIVE

Over the millions of years of their existence, turtles have survived major changes in the world's climate and coastlines. Beaches around volcanic islands have exploded into oblivion, coral reefs have provided cays and atolls with new beaches, and huge changes in sea level have left present



Nest dug up by fox

against their survival, it is remarkable that turtles have survived successfully for so long, seeing countless other species lapse into extinction along the way. Some examples of the natural threats faced by turtles in Oman include predators, flooding of eggs by high seas and rain water runoff, and washout of egg clutches from beaches by flooding wadis or natural seasonal beach erosion. Hatchlings in Oman must run a difficult gauntlet on their way to the sea, with seagulls, ravens, ghost crabs, feral dogs and cats, wolves, honey badgers and foxes

ready to waylay them on the beach. In the sea many a carnivorous fish or seabird will make a tasty meal of them. It is thought that only about two or three hatchlings in 10,000 actually survive to maturity at about 30 to 50 years of age. As adults, their only predators are sharks and people.



Hatchlings killed by fox

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With a rear flipper lost to a shark, this turtle cannot dig a nest

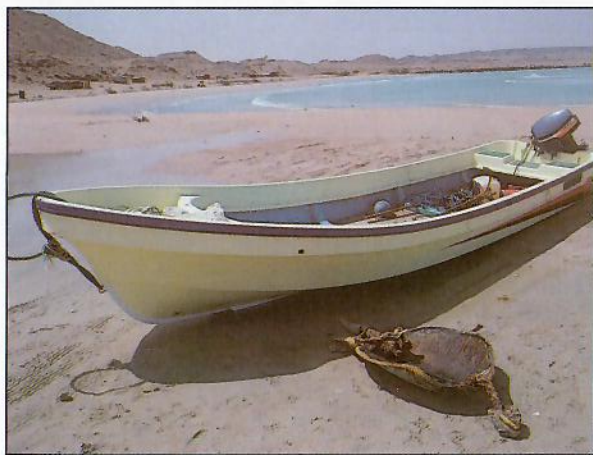
In the face of all the natural threats, it takes little to push turtles over the brink toward extinction. Intervention by people this century is more than the resilience of turtles can withstand, and their numbers are declining worldwide, sometimes to the point of local extinction. For example, excessive turtle egg collection and hunting in the Caribbean Islands has driven the resident green turtle population into extinction. The once world renowned leatherback turtle nesting beaches of Trengganu in Malaysia have had their numbers plummet to so few turtles every year that the extinction of this population seems certain - the victim of egg harvest and disturbance by organised turtle watching for tourists.



The main threats facing turtles throughout the world are hunting of adults for meat, shell, bone, oil and leather, digging up of eggs for food, resort development and other forms of encroachment on their nesting beaches, and pollution of the seas. Plastic bags are a major pollution problem because they are mistaken for jellyfishes and eaten, often choking the turtle to death. Possibly the greatest of all threats is accidental capture in fishing nets, including trawls and the vast "wall-of-death" drift nets set in the open oceans.

All of these threats apply in Oman to a greater or lesser extent. For example, turtles are slaughtered for food widely along the coast of the Sultanate, but active hunting is confined to the central part of the country from about Masirah Island down the Sahil al Jazir in northern Dhofar and the Al Halāniyāt Islands. In addition to the meat, fishermen relish the butter-yellow fat of a female green turtle at the beginning of the nesting season.

Archaeological evidence shows that turtles have been hunted here for more than 7,000 years. However, the use of better boats and outboard motors has opened up remote and formerly safe areas to exploitation, pushing the levels of harvest higher than can be sustained by the populations nesting in Oman, and is a real cause for alarm.



Modern boats make turtle slaughter easier

Although there seems to be no regular pattern of turtle egg harvest, they also are widely eaten here. Many local fishermen claim that turtle eggs are good for health.

At least one known turtle nesting beach in the Sultanate has fallen victim to development. The Ra's al Hamra Recreation Centre is built on a beach formerly known as "Turtle Beach" for the nesting activity there. These days green turtles can still be seen mating at sea off Ra's al Hamra, and they sometimes come ashore there but are prevented from nesting by the lights, activity and wall on the beach.

These Ra's al Hamra turtles apparently try to nest on the stony beaches east to Muscat and beyond. Some probably make it to Bandar Jissah area where they find suitable sandy beaches, but others are unsuccessful and drop their eggs in the sea near the stony beaches.

Campers on beaches cause considerable disturbance to nesting turtles in some areas. Typical threats to turtles by campers include: the use of bright lights and large fires which scare off emerging nesters and attract hatchlings away from the sea; patrolling of beaches and use of torches and camera flashes by turtle-watchers; harassment of turtles and catching of hatchlings by pet dogs; turtle riding, and deliberate overturning and disorientation of adults and hatchlings trying to get to the sea; digging for eggs; and littering of beaches.



Human and turtle tracks converge, and prevent a nesting

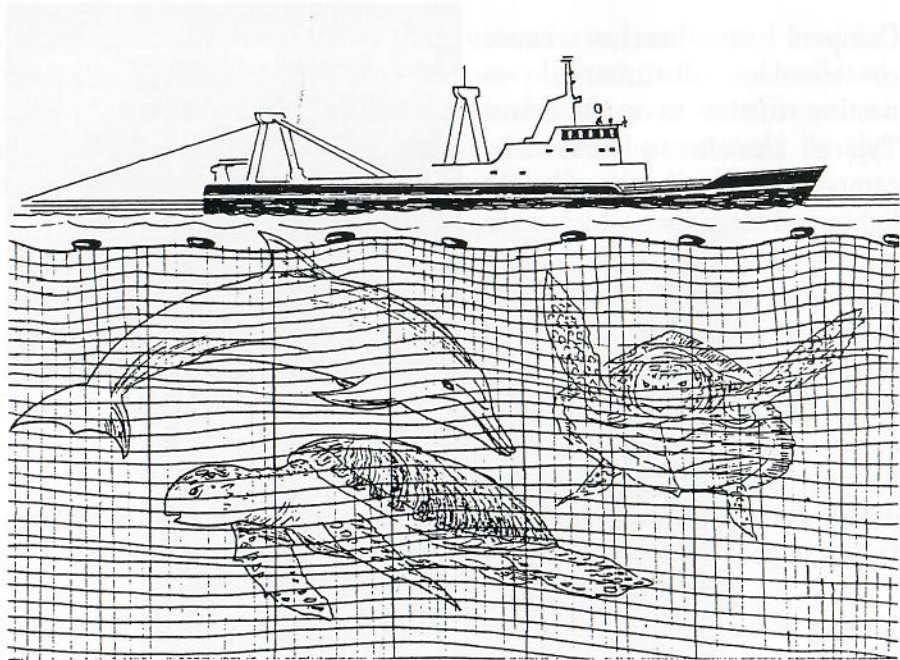
Mining of sand from small beaches used by hawksbill turtles is another activity that affects turtles. These beaches are especially susceptible to erosion.

The threat to turtles from fishery activities is as serious here as elsewhere in the world. Turtles are drowned in gill nets, which also block

off access to nesting beaches. Nets spread over nesting beaches for maintenance trap hatchlings which fall victim to foxes and gulls. The trawl fishery off the Oman coast results in the capture and drowning of a great many turtles.



Nets on beaches are lethal to hatchlings



"Wall-of-death" drift net

EFFORTS TO SAVE TURTLES

Turtle survival requires that the nations of the world unite. Turtle conservation started as a series of localised projects, or at best as discrete national programmes. Now that we know more about both the plight of the different species and their long migrations through the territorial waters of many countries, we recognise the need for international action to safeguard these magnificent creatures.

International cooperation is beginning. For example, eggs of the highly endangered Kemp's ridley turtle, that nests in small numbers in Mexico only, are being transplanted in safer beaches on Padre Island in Texas.

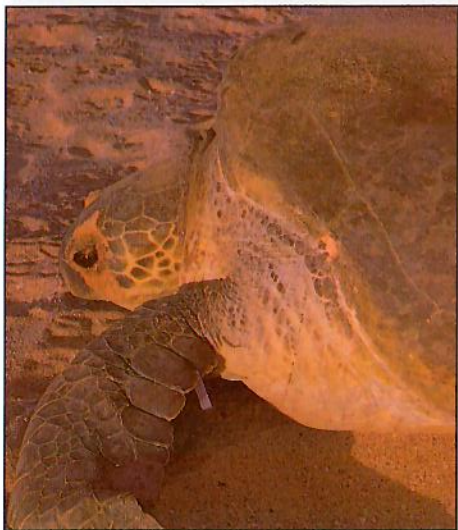
The real difficulty in management of a creature that spends part of its life in the waters of one nation, and part in another, is agreeing to share the responsibility for its conservation. For example, the turtles nesting in Pakistan may well be feeding in Oman, requiring shared management of both these vital habitats. In some cases, one nation may assume the right to exploit a population that others want to protect.

One way of enabling international cooperation is through treaties. The one legal achievement that has done more than most to unite the nations of the world to save turtles is the "Convention on International Trade in Endangered Species of Fauna and Flora" CITES. Through CITES, the export of turtles or turtle products is prohibited among all states party to the convention. However, there are still loopholes that enable the determined turtle traders to operate.

Although the Sultanate is better known around the world for its whale and white oryx conservation efforts, there is a long history of action to safeguard its turtles. The first surveys of turtles in Oman were undertaken in 1977, focusing on Masirah Island and the Ra's al Hadd area. These were carried out by the then Ministry of Agriculture, Fisheries, Oil and Minerals in conjunction with IUCN – the World Conservation Union and WWF – the Worldwide Fund for Nature. At the same time, a turtle tagging project was started by the Directorate General of Fisheries. Two teams of taggers, one at

Masirah and the other at Ra's al Hadd, continue to tag turtles on the nesting beaches there, and record the numbers of any nesters previously tagged. More than 23,000 turtles were tagged during the first 10 years of the project (1977-1986), including a few over the feeding grounds off Masirah Island.

These tagging studies have confirmed that turtles nesting in Oman move great distances between nesting seasons, but return to very nearly the same place to nest. This is a pattern followed by turtles around the world.



Tagged turtle, Ra's al Junayz

coast of Oman. These studies have extended earlier surveys of turtle beaches and feeding grounds beyond Masirah and Ra's al Hadd, and have included management issues.

Under regulations issued by the Ministry of Agriculture and Fisheries, it is illegal to hunt or disturb turtles in Oman, and to collect their eggs.

Tags from turtles nesting at Masirah Island and Ra's al Hadd have been returned from as far away as Saudi Arabia, Ethiopia, Somalia, and Pakistan. Their extraordinary navigational skills allow turtles to home in on the same beach to nest each season, and to within a few hundred metres of the previous site.

The Ministry of Commerce and Industry has commissioned IUCN - the World Conservation Union to study the entire

The first specific action for conservation of turtle nesting beaches was initiated in the Ra's al Hadd area. In February 1989, in response to the problems caused by campers and turtle watchers, access to the Ra's al Hadd area beaches for these pursuits was prohibited by Order of the Diwan of Royal Court. As a first step to reopening the beaches for controlled turtle watching, the Ministry of Environment began implementation of a conservation management plan for the area.

WHAT NEEDS TO BE DONE TO MANAGE TURTLES

Turtle management is not easy, in fact management of any creature that lives mostly out of sight beneath the seas is difficult. Moving so far between their nesting and feeding areas as turtles do, makes their management still more complex.

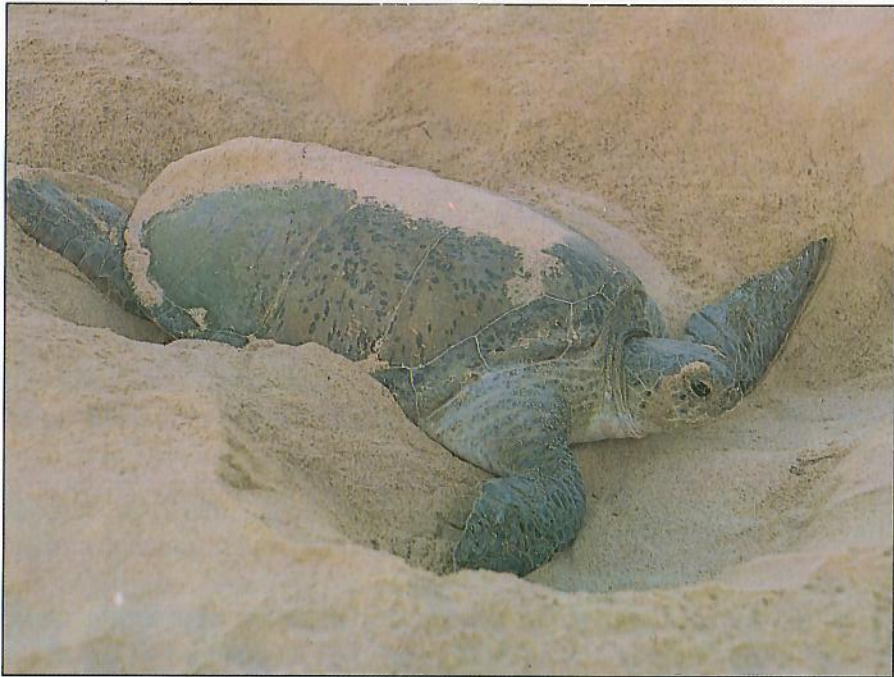
The best we can do is break down the management needs into discrete components, and develop a management action plan for each. A look at what needs to be done will give an insight into the magnitude of the problem.

Clearly, we need to protect the animal from harm during all phases of its life, and we need to protect the critical nesting and feeding habitats from destruction. Directly related to these goals is the need to control predators, accidental capture, and deliberate harvest of turtles. Harvest brings in both national and regional political issues, as it needs to be controlled in Oman, in international waters, and in the seas of nations through which the turtles migrate. Underlying all of these activities, is the need for focused scientific research.

TIPS FOR TURTLE WATCHERS

There are general rules of conduct for watching turtles. Avoid approaching or touching turtles moving along the beach, and be careful not to interfere with nesting. Definitely do not ride turtles, and leave your dogs at home. Visitors should not use lights, lanterns and torches, or light fires on or near the beach. Light scares off turtles and, in addition, hatchlings are attracted to the lightest horizon and could end up in a camp fire.

Please take care to remove all refuse. Plastic rubbish blown into the sea is dangerous to some species of turtle which eat it, mistaking it for jellyfish.



Green turtle digging nest



Hawksbill turtle

To avoid disturbing turtles, find a spot with a good view of the beach at sunset and watch the early nesters emerging. Then return to camp and wait two hours before returning. When walking on the beach keep high on the inland side away from the water line and the crest where your moving silhouette will scare off emerging turtles. If a turtle is in the early stages of nesting and you want to watch the whole process, keep low and directly behind the turtle where it cannot see you. Be patient and follow the sensitivity chart on the next two pages.

In general, keep low, move slowly, keep well up the beach and never point camera flashes towards the sea. In fact, the best way to see turtles is to go to bed early after watching the early nesters emerge, and get up at dawn so you can watch and photograph the late nesters and emerging hatchlings with minimal disturbance. Remember, **turtle watching takes time and patience.**

Stage	1. EMERGING FROM SEA	2. DIGGING BODY PIT	3. DIGGING EGG CHAMBER	4. LAYING EGGS	5. COVERING EGGS	6. RETURN TO SEA
	<p>Moves very cautiously up the beach pausing frequently to look for danger. <i>(15-30 minutes)</i></p>	<p>Sand is thrown backwards with great sweeps of the front flippers. The turtle frequently stops to rest and this should not be mistaken for the onset of the next stage. <i>(20-30 minutes)</i></p>	<p>Back flippers throw sand forwards alternately but not as vigorously as with the previous stage. The rear of the shell periodically is lifted and lowered and moved from left to right. <i>(30-50 minutes)</i></p>	<p>Lying quietly with periodic sighs and a slight lifting of the back flippers. <i>(10-20 minutes)</i></p>	<p>Back flippers cover eggs with sand and then front flippers energetically throw sand backwards covering the nest. This stage is difficult to differentiate from Stage 2 (digging body pit). <i>(15-30 minutes)</i></p>	<p>Turtle moves down the beach. <i>(10 minutes)</i></p>
<p>by S.J. Prakash</p>						
<p>Disturbance factor</p>	<p>VERY HIGH</p> <p>The slightest flicker of light or movement will scare the turtle back to sea. Keep away from the beach crest because your moving silhouette is enough to scare it off. If you see a turtle on the beach, stop immediately, crouch and watch. If she continues moving wait until you can creep behind her out of sight. Keep low – it may take several minutes before she starts again. NO PHOTOGRAPHS.</p>	<p>VERY HIGH</p> <p>Any approach closer than 10 metres or any flash of light will scare the turtle back to the sea. There is a danger of stumbling on turtles at this stage as the animal's shell is often below beach level. Move cautiously and watch for sprays of sand to pinpoint nesters. Keep low and behind the turtle. NO PHOTOGRAPHS.</p>	<p>HIGH/MODERATE</p> <p>The turtle can be approached quietly from behind but touching or lights will scare her off. She will take frequent rests so be patient and be careful not to mistake the pauses for the onset of laying. Wait at least five minutes from when digging stops before approaching to see if laying has started. Keep low and behind the turtle. NO PHOTOGRAPHS.</p>	<p>LOW</p> <p>Turtle is now in "automatic pilot" and is more difficult to disturb. Keep behind the turtle but do not touch. A small pentorch will help to see the eggs being laid but keep lights off the head. Remember don't use a torch if there is another turtle nearby which might be scared off. Use extreme care with pictures by flash at this stage. Always point flash or torches inland and do not attempt a picture if there is another turtle within 50 metres.</p>	<p>MODERATE/HIGH</p> <p>Turtle becomes increasingly sensitive to disturbance as she covers the nest. The same rules for flash photography apply as in the previous stage but the best time to take pictures is in the early morning using natural light.</p>	<p>HIGH</p> <p>NO PHOTOGRAPHS at night because of disturbing other turtles. In the morning take pictures only if no other turtles are emerging or nesting on the beach.</p>

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