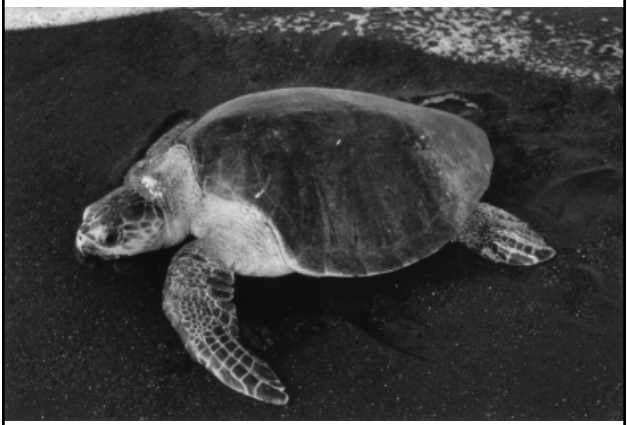
# ANCIENT SEA TURTLES:

# STRANDED

# IN A MODERN WORLD



## Teaching Kit

**by**

**Scott Lee**

**Sea Turtle Restoration Project**

# PREFACE

*Greetings,*

*Thank you for your purchase of this video and your choice to use it as a teaching tool in the classroom. The video gives your students an overview of the very real threat that the fishing industry and other exploitative industries pose to the survival of sea turtles. Contained in the video you will find scientifically supported information that directly implicates human activities in the decline of sea turtle populations worldwide. You will hear directly from scientists that support the protection of sea turtles and from fishermen that feel the sea turtles are not in need of protection from their fishing methods. The use of TEDs, Turtle Excluder Devices, and the way they can lessen the impact of trawling in our oceans is explained.*

*To give you and your students a better understanding of why the threats to the survival of sea turtles posed by the fishing industry are so great, we have included a description of and follow up short answer/discussion questions about sea turtle natural history, and the obstacles that they may encounter as they struggle to survive to maturity. The packet and the questions that follow may be copied and distributed to your students prior to or after viewing of the video. Simple steps that you and your students can take to ensure the survival of sea turtles are presented as well. (i.e. Certified Turtle-Safe® Shrimp)*

*Thank you again for your interest and support. If you wish to learn more about these mystical creatures of the sea, please do not hesitate to contact us. We will either be able to supply you with further educational materials or point you in the direction of such materials.*

*Sincerely,*
*The staff at the Sea Turtle Restoration Project*

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# ANCIENT SEA TURTLES STRANDED IN A MODERN WORLD

## Teaching Kit

by Scott Lee, Sea Turtle Restoration Project

# Sea Turtle Background Information

200 million years. This is how far back fossil records can trace the existence of sea turtles. Fossil records also tell us that today's modern species appeared between 60 and 100 million years ago. Leatherback, loggerhead, green, hawksbill, Kemp's ridley, olive ridley and Australian flatback are the seven species of sea turtles recognized by most scientists today. Of these seven species, five (leatherback, loggerhead, green, hawksbill, and Kemp's ridley) can be found nesting or migrating along the coast of North America. All species of sea turtles are listed as endangered, except the loggerhead, which is listed as threatened and endangered depending on the sub-population. The sea turtle's unusual life cycle has ensured the livelihood of these gentle creatures for these millions of years in spite of all the natural obstacles that the turtles encounter along the way. Only in the recent past has the irresponsible actions of human beings threatened their survival.

Contained within, you will find a brief description of the various stages of the sea turtles life along with the threats to their survival in each stage. Following this, you will find short answer/discussion questions designed to increase your understanding of the sea turtles plight and what actions you and your students can take to help ensure their survival.

### Nesting

Sea turtles, like other reptiles, begin their life as an egg. The mother sea turtle, after reaching maturity between 12 to

25 years of age, returns to her natal beach to lay her eggs. How the mother finds this beach again is still something of a mystery. Under cover of darkness she drags her cumbersome body, which is specially adapted to life at sea with flippers instead of legs, onto the beach, and locates a suitable nesting site out of reach of the seawater. She now has the exhausting task of excavating a nest. The mother turtle will first construct a shallow body pit using her front flippers. Then with an alternating motion of her rear flippers, she will scoop sand out of and then brush sand away from her nest. She continues this motion until her flippers can reach no further and she is left with a flask- shaped nest just the right size to house her clutch of eggs.

After the mother has completed depositing her eggs in the sand, she will cover them, disguise the nest by spreading sand about the nest, and return to the sea. Mature females, depending on the species, will repeat this process up to 8 times in a single nesting season, with approximately 10 to 14 days between nesting. Nesting is not an annual event for a single female sea turtle, but instead she participates in this activity every 2 to 3 years. This is the standard nesting scenario for most species of sea turtles except the olive and Kemp's ridley. They follow the same steps in the actual deposition of the eggs into the sand, but ridleys place their own little twist to the nesting game. It's called La Arribada, which is Spanish for the arrival.

Instead of spacing out their nesting over several months, ridleys complete the majority of their nesting activity during a nesting frenzy over the course of a few days. The Kemp's are unusual in that they are the only sea turtle to nest during the day. At the height of an arribada the entire nesting beach is covered with females carrying out the age-old ritual of depositing their offspring into the sand. This event is an annual one for the turtles, but one that no longer occurs in many places. There are only five known sites of olive ridley arribadas on the Pacific coast of Central America and only one for the Kemp's ridley at Rancho Nuevo, Mexico, on the Gulf of Mexico.

## Obstacles to Nesting

Unlike many tortoises and aquatic turtles, sea turtles do not have the ability to withdraw their bodies into their shells. This limitation makes them vulnerable to many land- based predators while nesting. Creatures such as jaguars, lions, hyenas,

coyotes, wild dogs and man prey on them as they emerge from the sea to nest. In addition to these predators, there are various other obstacles that the mother may encounter while attempting to nest. Beach development is one common obstacle.

Development along sea turtles nesting beaches can deter a female from nesting. Along with the building of houses, hotels and resorts come people and lights. If, as the mother emerges from the sea to nest, she detects people near by, or artificial lights, such as porch lights, or even beachcombers carrying flashlights, illuminating a beach, she may turn right around and go back without nesting. Items such as beach chairs, tents and canopies, and small boats left on the beach that the nesting mother could literally run into can cause her to return to the sea also. The repetitive occurrence of any of these events could possibly lead to the mother releasing her clutch of eggs into the sea, where they have no chance of developing into baby sea turtles. Alteration of nesting beaches can also be an obstacle to nesting for a sea turtle.

Construction of structures such as sea walls to slow the erosion of the beach can prevent the mother from locating a suitable place to deposit her eggs. Wave action along beaches with sea walls causes the sand to become more compacted. When a sea turtle attempts to nest in such a location they find the sand too hard to excavate a nest in. Jetties, walls constructed out into the ocean with the intention of slowing erosion, and the dredging and deepening of shipping channels also alters sand distribution along beaches. This creates a situation in which a beach that was once a suitable nesting site for sea turtles is no longer suitable due to increased erosion or accretion of beach sand. Renourished beaches also show a decrease in the number of nests. This could be due to several factors, but is thought to be due mainly to the changes in the physical characteristics of the beach and mineral content of the beach sand that take place when offshore sand is pumped up onto a nesting beach.

## Eggs In the Nest

A mother sea turtle will deposit an average of 100 eggs per nest. The eggs, like all reptile eggs, have a leathery shell that is permeable. The leathery shell allows the eggs to withstand the impact of being dropped from their mother into the nest. The permeability of the shell allows the eggs to be able

to absorb oxygen during incubation, which on the average takes 55 days. The amount of time it takes for the eggs to incubate is temperature dependent. The gender of the baby turtle is also dependent on the temperature at which the eggs incubate. The optimum incubation temperature range is between 24 and 31 degrees Celsius, and it takes the presence of other eggs in the clutch to assist in maintaining this temperature. Eggs in the nest that incubate at a temperature near the high end of the temperature range will be females. Eggs in the nest that incubate at a temperature near the low end of the temperature range will be males. Thus, eggs that are located in the middle of the nest will probably be females and eggs located along the edges, top and bottom of the nest will most likely be males. Since the presence of the other eggs assist in maintaining the ambient temperature of the nest, thus increasing hatching success, and the gender of the babies is not determined until during incubation, it is imperative that a majority of the eggs remain undisturbed during this time. But, this is not the case for many of the eggs due to a whole array of circumstances.

## Obstacles during Incubation

The obstacles to the successful incubation of a clutch of sea turtle eggs are many, and can be present from the moment the mother deposits them in the nest. If the mother does not choose a nesting site above the full moon (spring) tide level, then the eggs are likely to experience a level of seawater inundation that would halt their development. Storm tides may push the water level up to points that would inundate nests that under normal conditions would be safe. Storms can also bring excessive amounts of rain, and thus inundate the nest with fresh water. Winds from storms can cause the surface sand to be shifted and expose the nest to higher temperatures halting incubation. It is not uncommon for seasonal storms to take a heavy toll on sea turtle nests. They often wash entire nests away, leaving no trace.

The mother may also deposit the eggs in an area of heavy vegetation. This can place the eggs at risk of being penetrated by the roots of plants or the nest being shaded by plants to the point where the optimal incubation temperature can not be maintained. Placement of the nest by the mother in an area of high foot traffic, both human and non-human, can cause

the surface sand of the nest to become so compacted that the hatchlings (baby turtles) are not able to emerge from the nest even after a successful incubation period. The choice of a suitable nesting site high enough up on the beach, away from vegetation and foot traffic does not ensure that the eggs will make it to term though. There is a plethora of predators that are waiting to prey upon the eggs in the nest.

Terrestrial (land) predators of sea turtle eggs come in all sizes and are persistent. It seems that almost every creature that inhabits the coast in substantial numbers is out to get turtle eggs. Ants, maggots, beetles, raccoons, pigs, dogs, coyotes, opossums, monkeys, badgers, jaguars, skunks, lizards, ghost crabs, vultures, humans, and others that have yet to be well documented, are all pilferers of sea turtle nests. Some of these predators will ravage the entire nest, while others are only capable of predating a few of the eggs. All of them have the ability to disturb the incubation of the nest and decrease the percentage of eggs that will hatch.

The eggs are most vulnerable to predators during the two to three days that follow their deposition into the nest. During this period the clues as to the existence of the nest are most noticeable to predators. In some instances, the predator may not even wait for the eggs to be placed into the nest before they start enjoying them. Once oviposition (releasing of eggs) has begun, the mother is seemingly oblivious to what is going on around her, and will not cease nesting. Any opportunistic predators can simply wait behind the mother and catch the eggs as she attempts to deposit them into the nest. Raccoons and humans are the predators' best known for this behavior.

Poaching of eggs by humans is still a common occurrence in countries where sea turtles nest, including the U.S. The turtle eggs are a good source of protein, but often times they are needlessly sold in bars as a novelty shot or used in the baking of fine pastries. Poaching certainly claims the most turtle eggs, but other human activities and pollution can cause harm to turtle eggs as well.

Many human activities on and near beaches are detrimental to sea turtle eggs during incubation. Beach renourishment is one such activity. This practice of taking sand from offshore and dumping it onto the beach can cause many

difficulties in the incubation of turtle eggs. Any nest placed on a beach that was being renourished would more than likely be disturbed by the heavy equipment used to move the sand around or never complete incubation. The nests that were not destroyed would subsequently be buried too deeply by the additional sand to complete incubation. If by chance the eggs did successfully incubate, the hatchlings would stand very little chance of ever emerging from the nest due to its distance from the surface.

Renourished sand is not the same as beach sand. The sizes of the sand grains are different, and thus have different heat retention capabilities. Renourished sand grains can alter the temperature at which the eggs incubate, with possible negative effects to the prevailing sex ratio. This can result in a population of adult turtles with too many females or males. The minerals and pollutants found in beach sand and renourished sand are also different. Renourished sand tends to contain more heavy metals. Due to the permeability of sea turtles' eggshells, these heavy metals, and additional pollutants from land runoff that collect in offshore sediment, can be absorbed into the egg and have a detrimental effect on the development of turtle embryos.

## Hatchlings

For the first twelve months following a sea turtle's emergence from its shell, it is known as a hatchling. Life is a struggle for hatchlings from the very beginning. The first turtles in a nest to emerge from their shells find themselves buried in the beach with a varying number of other turtles and the remaining eggs that have yet to hatch. These little turtles spend the next 2 to 7 days completing the absorption of their yolk and probably waiting on some of the remaining turtles to break out of their shells, before they can emerge from the nest. In order for a hatchling to successfully emerge from the nest, they must have the assistance of some of their nest mates.

Through a cooperative effort the turtles slowly fill with sand the additional space they created by emerging from their eggshells. By flinging their small flippers about they cause the sand above and along the sides of the nest to shift towards the bottom of the nest cavity. Moving the sand about in such a fashion raises the tiny turtles ever closer to the surface until they finally breach the surface of the sand and emerge from the nest.

On rare occasions all of the turtles emerge from the nest simultaneously. But, usually they emerge from the nest on consecutive nights in groups of varying sizes until all the hatchlings – except a few stragglers too weak to make it – have emerged from the nest. Emergence from the nest occurs mostly at night, generally after midnight. This is most likely due to the cooling of the surface sand that occurs during the non-daylight hours and is an indicator to the hatchlings of a preferable time to emerge from their nest.

Once the 6-centimeter long hatchlings have emerged from the nest, they now have to crawl down the beach to the sea. Depending on the level of the tide, this can either be a short crawl or a long exhausting crawl. Hatchlings orient themselves to the sea by visual brightness clues. Under natural conditions the ocean horizon is the brightest area that the hatchling can see following emergence from the nest and will subsequently start crawling towards the sea. Making their way to the ocean successfully appears to be made easier if there are other hatchlings present.

The occurrence of disorientation and the period of time spent resting by a hatchling on their way to the sea decreases when there is a group of them headed for the ocean. They assist one another in maintaining the correct direction and stimulate others to keep moving by bumping into each other. As the hatchlings crawl they use their front flippers in an alternating motion to pull themselves down the beach. This practice immediately changes to a simultaneous motion of the flippers when the hatchlings come in contact with the surf.

Swimming is what the hatchlings are now prepared to do and must do. Waves are the first water they must navigate on their way to offshore currents. It could be as far as 40 or more miles until these currents are reached, but refuge from the open sea and food awaits the hatchlings here. Sargasso grass, also known as turtles grass, and other sea weeds floating in these warm currents provide cover from predators and house various food sources that will nourish the hatchlings during their first year of existence. Little to nothing else is known for certain about the behavior of sea turtles during this first, or so called lost, year of their life.

## Obstacles for Hatchlings

Artificial lights, predators, and pollution can all be fatal to turtle tots. When people place lights on or near a sea turtle nesting beach they can create a situation in which the horizon of the ocean is no longer the most brightly lit area, and this causes the hatchlings to become disoriented. This disorientation can lead to the demise of baby turtles.

Crawling in the wrong direction into nearby roads and parking lots, where cars then inadvertently crush them, or into dense vegetation, where they become entangled or completely lost in the vegetation, are just a few of the problems that lights may cause for the hatchlings. Lights may also cause a hatchling to crawl around aimlessly on the beach all night until they succumb to exhaustion or the heat of the following day's sun, which dries them out.

Natural lights such as star, moon and sunlight can cause disorientation problems as well, but this occurs very infrequently and even less frequently causes death. Natural light, primarily moonlight reflecting from a tide pool, may cause a hatchling to crawl along the beach instead of directly down the beach. But, it does not attract the hatchling to crawl landward instead of seaward as artificial light so often does. Any unnecessary crawling around, whether caused by artificial or natural light, makes the tiny turtles more vulnerable to predators. There are many predators lurking in the dark waiting to pounce on them and even more if the emergence occurs during daylight hours.

The 2 to 7 day period during which hatchlings are still in the nest completing absorption of their yolk is a very dangerous time for them. Their movement within the nest brings the hatchlings existence to the attention of many predators such as ants, ghost crabs, raccoons, opossums, coyotes and dogs. If the hatchlings are not discovered inside of the nest, all of these predators as well as night herons are waiting to grab them on their journey to the ocean. Should their emergence from the nest occur during the day, the hatchlings are safe from the nocturnal (night) predators, but they still must contend with ants, ghost crabs, the sun’s heat, which can quickly dry them out, and the swarming hordes of shorebirds that can now easily pick them off the beach. Making it to the sea is no easy task for the hatchlings

and life does not get any easier once they reach their aquatic home.

Just about any fish that can open its mouth large enough to swallow a hatchling will do so. Grouper, snapper and sea bass are notorious for gobbling down the bite-size turtles. Sea bass have even been known to congregate offshore from a nesting beach waiting for the hatchlings to come into the water. Marauders from the sky are after the little guys as well. Hatchlings are buoyant and do not yet possess the strength to dive more than a few feet below the surface of the water. This limitation makes them easy targets for sea birds as they swoop down to prey upon the hatchlings. Avoiding all of these fish and birds will land a hatchling in sea grasses floating in warm offshore currents, where they are less susceptible to predators. But, predators are not the only obstacles that the hatchlings must avoid in the water. Pollution must also be avoided.

Plastics and congealed oil floating in the water can be mistaken for jellyfish or comb jellies, which are common food sources for the hatchlings. If these items are ingested by a hatchling they can result in death. Various kinds of marine debris, such as monofilament fishing line, can entangle hatchlings. This entanglement can greatly limit their ability to collect food, avoid predators, and may even cause injury, as the hatchling grows larger.

## Subadult and Adult

The subadult stage of a sea turtle's life lasts from the time they reach one year of age until they are capable of reproduction (adulthood) which may take 12 to 25 years depending on the species. Adult sea turtles are believed by some to live to be 90 years or more. Subadulthood appears to begin with the young turtles leaving the relative safety of the floating sea grasses.

At exactly what stage in their development the turtles abandon the grass drifts altogether is not certain, but their increased rate of growth would suggest that it is during this time period. Food sources located within the grasses are not believed to be substantial enough to support the increased rate of growth exhibited during subadulthood. As the turtles begin this stage of their life they are about the size of a coffee cup saucer and grow

to the size of a large Frisbee within 5 years. The turtles continue to grow at a rate that has some species reaching a mature size of over 125 centimeters in length and over 90 centimeters wide in just 7 additional years. To support this rapid rate of growth, the turtles must now begin migrating to feeding grounds located closer to shore.

What constitutes a suitable feeding ground depends on what species of sea turtle you are concerned with and what stage of development the turtle is at. Sea turtles feed on a wide variety of both pelagic (open ocean) and coastal water organisms as subadults and adults. Almost every type of crab imaginable and other crustaceans, tunacates, mollusks, jellyfishes and fish make their way into the stomach of a sea turtle. It seems that most species, except the green, have the same diet both as subadults and adults. The proportional amount of each type of foodstuff does change as the turtles grow older, but with greens this proportional change is drastic. They go from an omnivorous (both animal and plant matter) diet as subadults to a strictly herbivorous (plant matter) diet as adults, feeding on sea grasses and algae that grow in the shallow coastal flats of warm water regions. A great majority of the sea turtle's life is spent in search of and consuming food. The remainder of their time is spent resting and migrating from feeding grounds to mating and nesting sites.

Subadult and adult sea turtles will generally rest at the surface of the water. They are also known to rest underwater, by lodging themselves under some sort of structure or digging themselves into the ocean floor. Exactly how long the turtles can remain under water resting is not known and most likely varies from species to species. However, it is known that most species can spend approximately 40 minutes underwater while swimming. With body functions slowed, it seems logical to presume that turtles can remain submerged longer than 40 minutes when they are resting. The amount of time spent resting can not be too great, because sea turtles migrate such great distances.

Distances covered by sea turtles migrating between feeding grounds and mating and nesting sites can be greater than 6,000 miles. They often traverse entire oceans. Swimming such distances shows incredible stamina and an even greater navigational ability. The turtle's ability to locate these sites for

mating and nesting is truly incredible and not yet fully understood. It is presently believed that the turtles use a combination of physical markers, mineral imprinting and some sort of biological directing device to find these areas again. Further research into this subject will hopefully solve this mystery. Now that the turtles have migrated this far, it is time for mating to commence.

Just prior to mating the turtles begin congregating en masse in waters adjacent to their nesting beach. This three or four week period, before the female first emerges to nest, is believed to be the only time that she is receptive to mating. Females generally mate with several males during this period of time. This ensures that the eggs will be fertilized by several males and likely assists in keeping the genetic diversity high within the population.

Before mating can actually occur the male must first court the female. Courtship in sea turtles entails the nuzzling of heads and the playful biting of the back of the females' neck and rear flippers by the male. If the love bites and nuzzles do not chase the female away, the male will attach himself to the carapace (top shell) of the female using claws that protrude from his front flippers. Copulation (sexual intercourse) occurs once the male wraps his long tail, which only the males have, under the female pressing it against her plastron (bottom shell). This sperm is then stored by the female to be used to fertilize the eggs that she shall lay 2 to 3 years later. Copulation can occur either underwater or at the surface.

## Obstacles for Subadults and Adults

Although the number of obstacles that sea turtles face during these stages of their lives is fewer, there are still many to be overcome. As sea turtles grow from subadults to adults the number of natural predators decreases. This is simply due to the fact that the turtles are growing larger, and the number of predators that can actually successfully prey upon them is fewer. Sharks and other fish continue to prey upon them, but by the time a sea turtle reaches full mature size these attacks seldom result in death for the turtles. Females often emerge from the sea to nest with flippers, both rear and front, mangled or completely missing, which can greatly limit her ability to nest. These injuries are most likely the result of an attack from a large shark,

and can also prevent a male from successfully mating. Sea turtles will eventually outgrow the majority of their natural predators. But there are two threats they cannot outgrow: disease and man.

Diseases do afflict sea turtles, but naturally occurring diseases – meaning diseases not enhanced by human activities – do not seem to occur with any great frequency or cause a large number of deaths. There is however one disease that is currently having a very adverse affect upon sea turtles, and will be discussed in more detail later in this section. Human beings are the second natural predator that sea turtles do not outgrow and our actions are causing mortality in sea turtles with great frequency.

Humans have harvested sea turtles for food consumption and for their shells and leather for various purposes throughout history with seemingly little or no affect on their overall survival. But, the population of humans, and thus the areas that we inhabit, have been increasing through the ages. These increases, along with the non-selective fishing practices in use today, have placed additional pressure on the ability of populations of sea turtles to survive.

Historically sea turtle meat has been a primary source (and when fishing was poor, an alternative source) of protein for many coastal communities. Some communities still partly rely on sea turtles as a source of protein. The primary sea turtle dish that is consumed by humans today is green turtle soup, and a lot of this soup is prepared to satisfy foreign market and tourist demand. It is a luxury or novelty item, just as so many of the items produced using sea turtle shells and skins are. Until 1990, when the Mexican government placed a ban on the trade of sea turtle products, up to 50,000 sea turtles a year were slaughtered in Mexico alone for their skins and shells. Today it is estimated that tens of thousands of turtles are slaughtered each year for the production of luxury items such as boots, belts, purses and eyeglasses frames made from sea turtle parts. Thousands of sea turtles are also dying as so-called bycatch in the nets and on the hooks of fishermen each year.

Sea turtles breathe air and must surface regularly to survive. When they get caught in fishing nets or on fishing hooks, they drown. Modern fishing methods such as shrimp

trawls, large nets drug behind boats, drift nets, and long lines, baited hooks stretching out great distances, inadvertently capture sea turtles. These turtles are wastefully discarded as by-(unwanted) catch, since they are not the intended quarry of the fishermen. An estimated 150,000 sea turtles were captured worldwide in fishing nets last year, with one-third of those being caught in U.S waters. Numerous other non-targeted species suffer the same fate. Shrimp trawling has been identified as having the largest bycatch rate of all fisheries, representing 35 percent of the worldwide total for all fisheries combined. Shrimping in U.S. waters is responsible for close to 1.5 million metric tons of bycatch per year. Up to fourteen pounds of fish are destroyed and discarded for each pound of shrimp harvested in some shrimp fisheries. Therefore not only do these fishing practices place sea turtles at great risk; they threaten the biodiversity of the entire ocean. However, there is a simple and inexpensive, device that can be installed in the nets of shrimp trawlers that can greatly reduce these negative affects of the industry.

These devices are known as TEDs, or Turtle Excluder Devices. TEDs are metal grids that are sewn into shrimp nets and guide sea turtles and other unwanted bycatch out an escape hatch. U.S. government studies show that the proper design, installation, and use of TEDs can reduce the number of turtles killed by shrimping by 97% or more. Furthermore, TEDs reduce the bycatch of other marine organisms by up to 60%. TEDs are required on U.S. shrimp fishing vessels by way of a provision of the U.S. Endangered Species Act. The problem is in getting some fishermen to properly install, or use, a TED at all.

Like other provisions of the endangered species act, the TED provision is one that is very difficult to enforce. Many fishermen see the value of TEDs. TEDs were actually developed by a fisherman from Georgia in the 1970s to reduce bycatch and increase the time he could pull his net for shrimp. Still other fishermen contend that TEDs cause them to lose shrimp, and thus alter the TED in a manner that makes it ineffective in releasing sea turtles and other bycatch.

Pollution is the final threat from man that subadult and adult sea turtles must contend with. Unfortunately many humans view the ocean as an unlimited resource, and they exploit it by dumping pollution and trash into the sea. Materials such as

plastic bags or congealed oil are often mistaken by sea turtles to be jellyfish, a common food source. When these materials are ingested by the turtles they either choke on them or in rare instances die of starvation because of their inability to digest the foreign object that is now obstructing their digestive tract. Pollutants invisible to the turtles are a very real threat to their survival as well.

A disease known as fibropapilloma is now affecting large numbers of sea turtles and as alluded to earlier it is not a naturally occurring disease. This disease is believed to be caused by a toxin, okadaic acid, which is produced by a microscopic bottom dwelling alga known as a dinoflagellate. These dinoflagellates are always present and producing this toxin, but runoff – primarily nitrogen and phosphorus – from land activities such as farming acts as fertilizer for the algae. Fibropapilloma does not directly cause death, but is instead responsible for the formation of tumors on the turtles. These tumors often form around the eyes and mouth of sea turtles severely limiting their ability to locate and ingest food. Other fertilizing and toxic pollutants introduced into the ocean by man undoubtedly have an adverse affect on food sources of sea turtles. The dying off of turtle grass off the south coast of Florida is only one such example.

# Short Answer/Discussion Questions

*These questions are designed to increase your understanding of sea turtle natural history and the many obstacles that threaten to prevent them from reaching maturity. The questions are in reference to both the video and the background information presented in this teaching kit.*

· Which fishing industry is the world's most wasteful and currently the number one threat to the survival of sea turtles? What piece of information directly implicates this fishery in sea turtle mortality? Is consumer demand in part responsible for this being so? And, what simple step could be taken to lessen the impact of this fishery on marine life?

· What are the arguments of fishermen that are opposed to the use of TEDs? What are some of the positive attributes of TEDs recognized by fishermen who are in favor of their use?

And, what does scientific research tell us about the use of TEDs as it relates to the shrimp fishery?

· What are the seven species of sea turtles, which ones can be found nesting or migrating along the coast of the U.S., and what is the protected status listing of each species?

· Describe the nesting process of most sea turtles. Include the criteria for a suitable nesting site, and the obstacles that a mother sea turtle may encounter on her quest to locate one.

· What are the necessary requirements for the successful incubation of a clutch of sea turtle eggs? Why are these requirements so vital in the gender determination of the hatchlings? And, what events can take place that will interrupt or alter the incubation of the eggs?

· During what two events of a hatchling's life is the cooperative effort of the hatchlings of assistance to them and how is it of assistance?

· Why and in what way are artificial lights an obstacle to survival for hatchlings? What are some of the other obstacles that hatchlings must avoid in order to survive?

· Explain why it is presumed that sea turtles leave the floating sea grasses after their first year of life. Include where it is they venture to and why there are additional threats to the sea turtles survival associated with these travels.

· What is aquaculture and why is it a threat to the survival of sea turtles?

· Why are marine biologists especially concerned that most of the world's shrimp trawlers outside the U.S. continue to fish without TEDs?

# What You Can Do

As you now know after reading this text, the obstacles to survival for a sea turtle are many, and exist at every stage in its life. It is estimated that only 1 out of 1,000 to 10,000 hatchlings ever reaches reproductive maturity. It is not hard to imagine that this statistic is accurate given what you now know of their life history.

Combine the information that you were given here with that contained in the video, and you get an idea of what the future holds for sea turtles. Let us not forget though that sea turtles have existed on earth for 200 million years, and if given time would probably be able to adapt to new conditions. But the question remains, will they have time? Or is man altering their habitat too quickly and having too great an impact on existing populations of sea turtles for them to survive?

The process of adaptation can sometimes take hundreds of years to complete, but in just the past sixty years human activity has had a noticeably negative affect on the health of our oceans. Habitat destruction and advances in the ability of the commercial fishing industry to catch fish are two major contributing factors. As a believed result, catch rates are declining in almost every fishing region of the world, and in some cases the decline has been a major one. In 1940, 40,000 Kemp's ridley sea turtles nested at a single beach in Mexico on a single day. Today only about 1,000 nesting females still survive.

Will technological advances and human demands on the ocean outrace sea turtles and other ocean species as they scramble to adapt? Or, will there be time for them to adapt? Will we help to buy them this time?

The following are just a few suggestions of how you can become involved and possibly assist in obtaining for sea turtles some time to adapt.

Contact your representatives and the President to demand that they protect the existing turtle-shrimp law of the Endangered Species Act.

This law has proven tremendously effective in convincing other nations to improve their fishing techniques. As a result of the law, 17 nations now have implemented Turtle Excluder Device policies.

## Sample Text of a Letter

Dear Congressperson/President*

I am writing to ask that you protect the existing US provision of the Endangered Species Act (PL #101-162, section 609) that bans the import of shrimp that is caught without the use of Turtle

Excluder Devices or comparable methods.

I urge you to negotiate multilateral environmental agreements that require the use of TEDs on the vessels of nations who wish to import shrimp into the US.

Please write me and let me know what steps you will take to protect this existing US law. Thank you.

Sincerely,

your name and address

*Address your senator at Senate Office Building, Washington, DC 20510

*Address your representative at House office Building, Washington, DC 20515

## Local production for local consumption

Alternatives still exist in a global economy that often places trade above all other considerations, including the environment. And many of these alternatives stem from consumer choice in the purchasing of products. Consumer demand led to dolphin-safe tuna becoming the standard for the industry. Know what you are buying, where it comes from, and what the true costs are associated with it. Buy locally produced products. By doing this, you support your community and can be assured that the environmental quality of the product meets local standards. For example, buying locally grown organic foods lets you know the quality of the growing methods, helps support the local economy, and is beneficial for the local environment.

## Buy Certified Turtle-Safe shrimp

Sea Turtle Restoration Project is working with progressive shrimp fishers to develop a market for shrimp that is caught using Turtle Excluder Devices. Going one step beyond the federal standards, shrimpers sign an agreement with STRP guaranteeing that the shrimper uses TEDs and allows STRP to board the vessels to monitor compliance. This program, which has certified 3 million pounds of shrimp annually as of 1998, has delivered this eco-friendly product to retailers and consumers in various parts of the country, including the San Francisco Bay Area, the southeast, and the Pacific Northwest. The goal is to

make this campaign as widespread and successful as the one for dolphin-safe tuna. In the short term, cutting back on shrimp in one's diet can only benefit turtles.

## Spread the word

Informing the people you know about the struggle that sea turtles face in their effort to survive, and how the decisions made by individuals can help them in their struggle, is of great assistance.

## Request a public education action kit

To order your free action kit, please contact the

Sea Turtle Restoration Project
PO Box 400, Forest Knolls, CA 94933
415-488-0370 or
email to seaturtles@igc.org

**Bullfrog Films**
**P.O. Box 149, Oley PA 19547**
**(610) 779-8226**
**http://www.bullfrogfilms.com**