

# SEABROOK ISLAND TURTLE PATROL INFORMATION MANUAL



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## SECTION 1

MISSION: The mission of the Seabrook Island Turtle Patrol (The Turtle Patrol) is to recruit, train, and organize volunteers in a collective effort to monitor, preserve, protect, and facilitate the propagation of sea turtles on Seabrook Island. This is accomplished through identification and protection of nests, inventory of nests, data collection, and education of island residents and visitors.

### ACTIVITIES:

The activities of the Seabrook Island Turtle Patrol are as follows:

- To locate all turtle nesting sites on Seabrook Island as they are laid.
- To protect the sites, relocating the nests as necessary, until the turtle eggs hatch.
- To inventory the nests after hatching.
- To make appropriate reports to the South Carolina Department of Natural Resources (SCDNR).
- To collect tissue samples to support SCDNR sea turtle DNA research.
- To take action to keep the beaches clear of litter and obstacles that might be harmful to the sea turtle population.
- To assist in educating of the public concerning sea turtle protection.
- To respond to stranding incidents involving live or dead sea turtles, including reporting incident details to the DNR.

## SECTION 2

### GENERAL ORGANIZATIONAL INFORMATION:

- The Turtle Patrol is an unincorporated association of volunteers, operating on a not-for-profit basis, that was formed and exists on Seabrook Island for the purpose of protecting sea turtles and their habitat. The activities of The Turtle Patrol are coordinated under the leadership of Jane Magioncalda with the support of the Town of Seabrook Island and the Seabrook Island Property Owners Association (SIPOA).
- The Turtle Patrol is licensed by and operates under the guidelines



established by the SCDNR, which have been passed on to The Turtle Patrol leadership through meetings, seminars, and training and are reinforced through continuing communication.

- The Turtle Patrol conducts an annual training session or presentation for its members and communicates ongoing training considerations to members throughout the season, as needed - **see Section 5.**

### SECTION 3

#### INFORMATION ABOUT LOGGERHEAD SEA TURTLES (see also: APPENDIX E)

- The Loggerhead Sea Turtle (scientific name *caretta caretta*) is South Carolina's official state reptile. The Loggerhead turtle is circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, tropical, and subtropical waters. The Loggerhead is the most often observed sea turtle in the United States. In the Atlantic the Loggerhead range extends from Newfoundland to as far south as Argentina. This Atlantic area narrows during the nesting season to nesting sites that extend from North Carolina to Texas. The Loggerhead Sea Turtle generally arrives to nest on Seabrook Island from the start of May to the end of August.
- All sea turtle species, including the Loggerhead Sea Turtle, are protected under the Endangered Species Act (ESA). Globally, the Loggerhead population is divided into nine distinct population segments, five of which are classified as endangered and four of which are classified as threatened. Seabrook Island's Loggerhead Sea Turtles are part of the Northwest Atlantic population segment, which is classified as threatened. Further decline in Loggerhead numbers in this population segment will result in it being listed as endangered. The Turtle Patrol members' work contributes to the efforts to insure this does not happen. The following is a list of human activities which have a negative impact on Sea turtles:
  - Egg poaching for food or for a perceived health benefit from eating turtle eggs.
  - Beach erosion causes loss of nesting habitat. Beach erosion can be driven by multiple factors including climate change, rising sea levels, and reduction in plant life which reinforces dunes.
  - Beachfront development that results in beach fortification which in turn limits nesting sites.

- o Beach nourishment projects.
- o Artificial lighting causes disorientation for both adult turtles and hatchlings.
- o Excessive nighttime beach activities deter female turtles from nesting.
- o Pollution including marine debris, such as plastics, styrofoam, tar balls and balloons may entangle or be ingested by sea turtles and their young, both of which can lead to death.
- o Commercial fishing has had a serious impact on sea turtle survival. It is estimated that before the requirement to modify shrimp fishing nets with Turtle Exclusion Devices (TEDS) between 5,000 and 50,000 Loggerhead turtles were killed each year. Today long line fishing in the Atlantic and Pacific Oceans are taking a toll on sea turtles.
- o Commercial trade in sea turtle products such as shell, skin and meat.
- Adult Loggerheads are reddish brown in color, average 200 to 300 pounds and grow up to five feet in length. They have been known to live for a hundred years and the females begin nesting upon reaching sexual maturity at about 20-30 years of age. Their name is derived from their exceptionally large head that may be 10 inches wide and from the wood-like plates that cover their head. Loggerheads have powerful jaws that allow them to crush shellfish. Loggerheads feed on Horseshoe Crabs, clams, mussels, and other invertebrates.
- The Loggerhead Sea Turtle is the most prevalent on Seabrook Island but Turtle Patrol members should be alert to the possibility of other sea turtles visiting Seabrook. Green Sea Turtles, Kemp's Ridley Sea Turtles, and Leatherback Sea Turtles have been known to nest in South Carolina. As of 2020, Loggerhead-Hawksbill hybrids have also been observed nesting in South Carolina.

## SECTION 4

### SEABROOK ISLAND AS A SEA TURTLE NESTING AREA:

- As a barrier island, Seabrook provides the necessary habitat for nesting sea turtles.
- Except for the Jenkins Point and Beach Club areas, development on Seabrook is far enough back from the beach so as to minimize the threat to

sea turtles and to allow nesting sites in the dunes.

- The SIPOA building guidelines specifically address the requirements for oceanfront lighting, which favor the sea turtle nesting program. Lights, which shine directly on the beach, have been known to confuse baby sea turtles and the mothers, which crawl toward the light rather than the surf. Ideally all beachfront lighting should be turned off during the nesting season; however, downlighting is also permitted.

## SECTION 5

### MEMBERSHIP AND ORGANIZATION:

- Membership in the Turtle Patrol is voluntary. Members must participate in required training to obtain their letter of authorization and must be willing to assume responsibility for their walk route or perform their other Patrol duties including finding a substitute when they cannot perform the assigned walk or other task. A roster of members, including alternates, with phone numbers and e-mail addresses, is provided to each member.
- There are four routes, which must be walked daily (see APPENDIX B). Generally, a walker will walk one day per week on one route, often in partnership with other walkers scheduled to walk that day (Beach Patrol Team).
- The Turtle Patrol leadership and assigned dispatchers coordinate the daily activities.

## SECTION 6

### TRAINING AND CERTIFICATION:

- Beach Patrol Teams who walk a designated beach zone in search of turtle crawls must participate in a training session or presentation coordinated by a team member trained and licensed by the SCDNR for Nest Protection Activities. Jane Magioncalda is presently licensed for these activities and she participates in yearly training activities to maintain her license.
- First Responder Teams are those volunteers called in by the Beach Patrol Teams (via the Dispatcher) to locate the nests. These volunteers are specifically trained by experienced Patrol responders and may attend a training session conducted by SCDNR that will provide information on sea

turtle nesting, probing for the nest, and relocating a nest.

- Nest Inventory teams that conduct the formal scheduled nest inventories may be required to participate in a training conducted by Patrol personnel, or may be trained on-the-job.
- While education on sea turtle basics is provided as part of new volunteer training, Patrol members are encouraged to do their own research in order to further their understanding of sea turtles. (See APPENDIX E: References)
- Following attendance at these training sessions Patrol members will be issued a letter of authorization, good for one year, which they must carry with them whenever on the beach Patrol activities. This letter of authorization allows them to perform specified duties under the license of a team member licensed by the SCDNR for Nest Protection Activities. Federal and South Carolina laws prohibit the disturbance of sea turtles and their nests without this certificate.
- Seabrook Island Turtle Patrol members are required to wear clothing that identifies them as a volunteer. Shirts and hats are made available through a sale at the beginning of each nesting season.

## SECTION 7

### THE SEARCH FOR SEA TURTLE NESTS:

- Most female adult Loggerhead turtles nest every two or three years, laying up to five clutches of from 60 to 175 eggs per clutch during a nesting season. The egg incubation period is from 50 to 70 days but early and late egg development is common depending on environmental factors, especially heat. Research indicates that the hotter and drier the nest, the shorter the incubation period. Early and late development eggs experience a much higher attrition rate.
- The nesting Loggerhead will come on the beach at night and, if undisturbed, will crawl to a dry nesting site in the dunes above the high tide line. Upon selecting a nesting site, she will dig a shallow body pit before excavating the nest. She will usually dig facing away from the water using her rear flippers alternately to excavate a nest cavity that is 18 to 22 inches deep and wider at the bottom than at the top.
- Patrol members who are assigned a patrol route should be prepared to walk that route near the time that the sun rises and **prior to 7:00AM**. The

reasons for this are as follows:

- o The survey is conducted before most other people are on the beach.
- o Patrol members may find baby turtles, adult turtles or other marine life on the beach and it is important that responsible people make those discoveries first so that reports can be made, and appropriate action taken.
- o Temperatures increase as the day goes on and team members, the turtles and their hatchlings could become dehydrated.
- The patrol should be conducted along the high tide line. This is required since tracks might not be seen otherwise. Tide levels vary greatly based upon time of year and phase of the moon. Winds and a seven-foot high tide can put the water into the dunes making it difficult to patrol.
  - o The Beach Patrol members' tools of the trade are as follows:
    - Patrol shirts should be worn to ensure the public recognizes you as having an official role. This is important as the activities of the patrol are otherwise prohibited by law and we do not want to give the impression that anyone can engage in them.
    - Comfortable clothing appropriate for weather conditions including footwear, a hat, and sunglasses
    - Eco-friendly insect repellent and reef-safe sun block
    - Water bottle with water
    - A backpack or other container to carry:
      - your letter of authorization, patrol roster, a cell phone and a camera. Water-tight bags in which to carry a cell phone and camera in the event of rain and to protect them from the sand are good ideas. An image of your letter of authorization stored on your phone is generally acceptable.
      - Black marker, paper, and pencil
      - Bright orange plastic marking tape
      - A small hammer and a small trowel or shovel
      - A small kitchen garbage bag, preferably biodegradable, or a reusable bag, to pick up litter from the beach. Beach litter can be harmful to both baby and adult sea turtles. It is important that Patrol members remove beach litter as they patrol their beach routes. Consider a "grabber" or gloves to avoid touching sharp objects or

other garbage.

- First Responder Teams will use/supply the following:
  - A plastic 3-5 gallon bucket
  - A small garden trowel for digging a new nest during relocations
    - Some First Responder Teams may prefer to use their hands some or even all of the time. ALL DIGGING IN AN ESTABLISHED NEST MUST BE BY HAND ONLY.
  - Protective screening, stakes and hammer to secure the screening, and nest identifier signage.
  - Marker and appropriate marking tape to be used in highlighting the specific nest location.
  - Predator deterrents such as motion detectors.
- Patrol activities evolve as each nesting season matures.
  - Early in the season, the primary focus is the identification of fresh adult sea turtle crawls and locating the nests. The First Responder Teams must be contacted through the Dispatcher on each identified crawl; the First Responder Team will probe for the nest, facilitate movement of the nest when necessary, and install or supervise installation of protective screening and marker signage at the nest site. The Beach Patrol Team members discovering the nest are encouraged to assist in all activities except the probing activities provided no restrictions on this activity are in effect.
  - As the season progresses and the number of found nests increases, the patrol activity evolves to two primary activities:
    - The search for fresh adult turtle crawls and locating and installing protection for nests.
    - Maintenance of existing protective screening, predator deterrents, signage, etc. The Beach Patrol members should act to ensure that the protective screen is still at or below the sand surface at each existing nest site and remove excess sand that has accumulated on top. The Beach Patrol members should check to ensure that motion sensors are functional on nests where they are installed. If the Patroller is unable to perform these steps, they should report the maintenance condition to the Dispatcher who will arrange to correct the unsatisfactory condition.
  - As the nesting season progresses to the point at which nests are

ready to hatch and lasting until the last known nest on the assigned walk has boiled, the Patrol activities are:

- The search for fresh adult turtle crawls and locating the nest.
  - The maintenance activities detailed in the preceding paragraph, including the deployment of Pre-hatch Activity Team volunteers, who perform nest maintenance activities on nests that have reached 45 days of incubation.
  - Watching for signs of nest “boiling” on each existing nest and looking for nest depressions and baby turtle tracks. It is important to be alert for baby turtle tracks over the entire length of the patrol walk as there is the chance of a “wild” nest being discovered or a previously identified “false crawl” turning out to be a successful nest. These finds should be reported to the Dispatcher.
- o Throughout the entire season, the Beach Patrol members should act to clean the beach of man-made debris.

## SECTION 8

### PROCEDURES TO FOLLOW UPON FINDING A SEA TURTLE NEST, SEA TURTLES, OR OTHER MARINE LIFE ON THE BEACH:

- Sea turtles:
  - Female Loggerheads are skittish out of the water. If a female turtle is frightened away from a nesting site, she may attempt to nest further down the beach later or return the next night. If her attempts to nest are unsuccessful, she may dump her eggs at sea or select a poor nesting site out of frustration.
- People who observe a sea turtle attempting to come ashore to nest should:
  - o Avoid interfering with the turtle - STAY CLEAR.
  - o Move away from the path of the turtle, squat down and stay still.
  - o Excessive movement will cause the turtle to return to the water without nesting.
  - o If the turtle is discovered in the process of nesting, stay to the rear of the turtle to avoid being seen.
  - o Turtle Patrol members should diplomatically “manage” the public to ensure that they comply with the above guidelines.

- Sea turtle nest: Female turtles may nest several times a season laying 60 to 175 eggs each time. South Carolina’s average is 120 eggs in a nest. It is believed that a female must lay at least 1,000 eggs in order to replace themselves with another adult nesting female.
  - Immediately upon finding a turtle crawl, the Beach Patrol members should call the Dispatcher, report the location of the possible nest, and mark the crawl with an orange ribbon affixed to a stick.
  - The Dispatcher will then dispatch a First Responder Team member, who will probe the area to locate the nest confirming it is not a false crawl. If the probe is successful, they will dig to determine the presence of eggs. If eggs are present, the next step is to verify the nest is in a safe location or decide the nest needs to be relocated.
  - The mouth of a nest with eggs will be filled with loose sand by the mother turtle. The purpose of probing is to find the mouth of the nest, i.e., the loosely packed sand. This is done by first trying to find the body pit area and standing outside of this area. Next probe the body pit area by holding the probe perpendicular to the beach, feet spread apart and applying steady pressure push it into the sand. It is recommended that an undisturbed portion of the beach be probed first to get a feel for the hard packed sand in the area. This way when the probe hits an area of loosely packed sand, the nest location will be easier to verify.
  - In years where the SCDNR is performing DNA research, a single egg will be sacrificed for DNA collection. If an egg is broken during probing activities, it should be used for this purpose.

## SECTION 9

### PROCEDURE FOR DETERMINING A GOOD NEST LOCATION:

- The First Responder Team makes the determination as to whether a nest is to be relocated. In general, nests should be relocated if they are below the Spring high tide line.
- The nest site should be well above the high tide line so that even in a wind driven high tide the nest will not be inundated.
- There should be an unobstructed area of beach between the nest and the ocean. Large tidal pools, rough areas of beach or beach vegetation can all



hinder the hatchling as they attempt to get to the ocean. Holes dug in the sand and vehicle tracks can easily trap hatchlings on the beach.

- Nests should not be moved into an area that shows excessive predator activity (ghost crabs, raccoons, armadillos, etc.) or has active red ant colonies.
- Nests should be on the front side of a dune with a clear view of the ocean.

## SECTION 10

### PROCEDURE FOR RELOCATING A SEA TURTLE NEST:

- The relocation of a nest must be supervised by a member of the First Responder team that is trained by the SCDNR or an SCDNR-licensed volunteer for this activity.
- Once a determination has been made that a nest is to be relocated and a new nest site has been selected, the First Responder organizes those who will assist in the process.
- The new nest is excavated and made ready for the transfer of eggs. The new nest is dug about **18** inches deep, about **10** inches wide at the mouth and about **16** inches wide at the bottom. The new nest should not be close to dune vegetation, as the roots will grow into the eggs killing the embryo.
- The nest to be relocated is excavated and the eggs carefully transferred to a plastic bucket with an inch of sand in the bottom. The eggs are very carefully lifted, one by one, from the old nest to the bucket, taking care to keep the egg in the same position as it was in the nest, i.e., not twisting or turning the eggs during the transfer. This is to prevent the yolk from detaching from the shell, which makes the egg inviable. A damp towel is put over the eggs in the bucket, and then sand is put over the towel for the trip to the new nest.
- Carefully count the eggs removed from the nest and confirm the count when putting them in the new nest.
- Place the eggs in the new nest one by one and loosely cover them with sand. Again, make sure that live vegetation is not included in the fill sand. Do not pack the sand as this may hinder the hatchling as they dig out. Screen the nest with a mesh staked at each corner. The mesh should have 2-inch openings and is designed to deter predators (See APPENDIX E). A finer mesh screen is also added beneath the wire screen and removed after

45 days of incubation in order to deter predators attempting to excavate the nets.

- Mark the nest with a standard turtle nest sign centered 3 feet to the right of the nest opening (facing away from the beach) and parallel to the beach.

## SECTION 11

### EGG HATCHING AND NEST INVENTORY:

- The eggs will normally hatch from between 55-65 days from the date the nest was laid. Patrol members will be provided with a hatching window so that nests may be checked by Patrol members for evidence of "boiling," as evidenced by large nest indentations and hatchling tracks. Once the nest has "boiled," the SCDNR guideline is to wait three days before performing an inventory of the nest. The waiting period is particularly important because the time spent in the nest after hatching is an important part of the hatchlings' development.
- The inventory is conducted by the Inventory Team and is performed by digging into the nest to count the hatched eggs, dead baby turtles, live baby turtles still in the nest and undeveloped eggs. The inventory results will be reported to SCDNR. The Inventory Team should supervise all inventories to ensure the inventory is properly performed and to confirm the data reported to SCDNR.
- Live baby turtles found in the nest should be allowed to crawl to the water, as this is the final step in their development prior to spending their lives at sea. Upon reaching the water, the hatchlings will have a 20-60 mile swim to reach the relative safety and abundant food supply found in the seaweed banks of the Gulf Stream. The crawl to the water helps prepare their system for their arduous journey. They will need to be protected from birds and other predators until they reach the water.
- Upon completion of the inventory the nest debris will be buried. Care should always be given to keep from harming dune vegetation.

## SECTION 12

## OFF-BEACH ACTIVITIES:

Turtle Patrol member activities include important functions in support of the beach activities and go beyond those directly related to identifying and protecting turtle nests. These activities are organized into several committees as follows.

- Education Committee – The Education Committee is responsible for providing new volunteers, residents, visitors, and the public with educational opportunities about sea turtles and other related wildlife and conservation topics. This may include developing training materials, scheduling educational sessions, and assessing education and training needs both for the Turtle Patrol members and the public.
- Social Committee – The Social Committee is responsible for all aspects of facility and refreshments for the Kick-Off Meeting, the T-shirt Pick-Up Party, and the Year-End Dinner.
- Government and Community Outreach – The Government & Community Outreach Committee is responsible for government, civic, and public relations communications.

Turtle Patrol members are encouraged to participate in these activities in addition to or in place of on-the-beach activities. These groups provide important support for the Patrol's overall mission.

## APPENDIX A: GLOSSARY OF TERMS:

**BODY PIT (PRIMARY):** The excavation made by a sea turtle on the beach just prior to digging the egg chamber.

**BODY PIT (SECONDARY):** An excavation made by a nesting sea turtle using the front flippers following the depositing of eggs. The spoil from this pit is used to cover the primary pit and the egg chamber.

**BOIL:** The term used to describe the exit of the baby turtles from the nest, usually a large percentage of them all at once. Generally, the hatchlings wait until most eggs are hatched and in a collective effort "boil" out of the nest, normally at night.

**CAPTAIN SAM'S INLET:** Where Captain Sam's Creek and the Kiawah River breach the beach between Seabrook and Kiawah at the end of North Beach.

**CRAWL:** Tracks and other signs left on the beach by a nesting sea turtle. (See APPENDIX D)

**EGG CHAMBER:** The egg chamber is the cavity excavated by a nesting sea turtle into which she deposits a clutch of eggs.

**FALSE CRAWL:** When a nesting female crawls onto the beach but does not deposit a nest.

**FIRE ANTS:** Fire Ants are small red ants that may seek out a turtle nest and will kill the baby turtles.

**GHOST CRAB:** A ghost crab is white to yellow crab that digs holes on the beach and which will dig into a turtle nest and destroy the eggs. A ghost crab will also attack baby turtles as they crawl from the nest to the water.

**HIGH TIDE LINE:** The high water mark from the most recent tide cycle. This is where the Patrol member walks during morning beach surveys.

**NEST:** The result of a successful crawl when eggs are deposited.

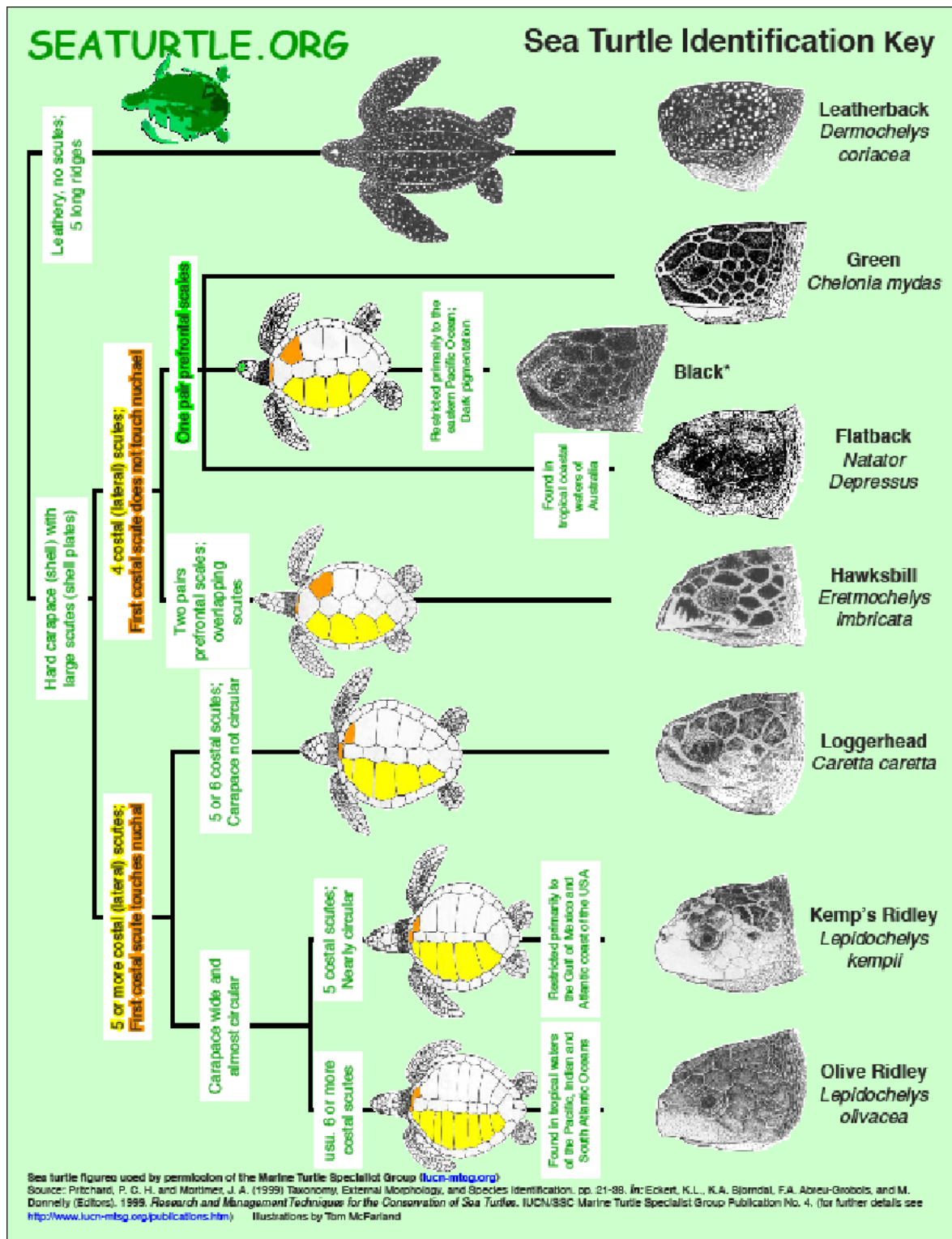
**NEST INVENTORY:** The process of digging the nest after it has boiled to determine the status of all eggs/baby turtles.

PIPPED: An egg where the hatchling has breached the egg shell but has not yet emerged.

PROBE: A pointed wooden stick with a "T" handle used to probe the sand for the nest opening.



APPENDIX C: SEA TURTLE SPECIES IDENTIFICATION



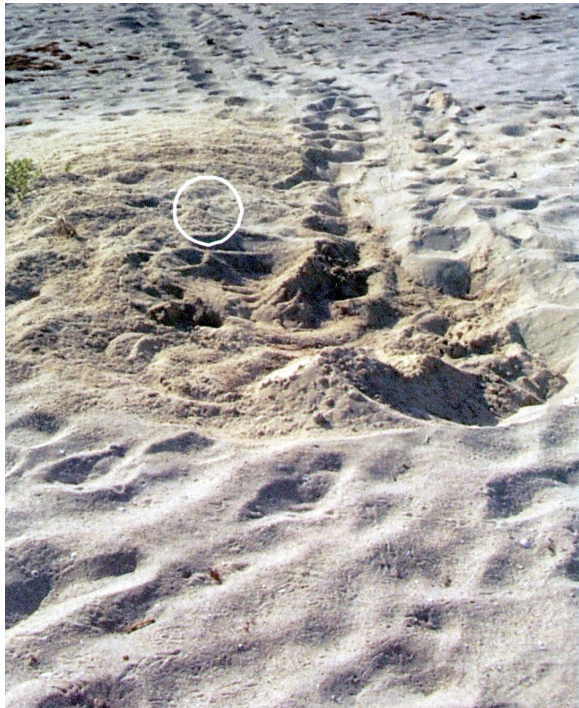


## APPENDIX D: Loggerhead Crawls

### WHERE ARE THE EGGS?



Sometimes, the turtle will continue up the beach for a short distance after nesting. Rely on the mound characteristics in these cases: **this one is a good nest.**



### (Loggerhead Examples)



This turtle crawled over part of the mound. The part that remains will have to suffice to evaluate this crawl. **The thrown sand and circular body pit indicate a nest.**



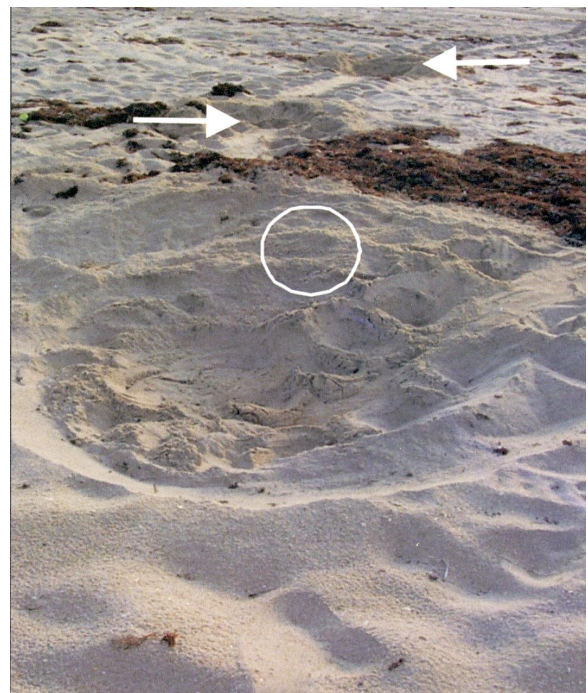
This photo and the one to the left depict common nest mound shapes. As with others, imagine the mid-line of the crawl, then find the highest part of the mound. Whenever possible, try to watch the turtles during the nesting process to become familiar with the movements that create these. **Always remain behind the turtle while viewing; never shine flashlights on**



the beach.

WHERE ARE THE EGGS?

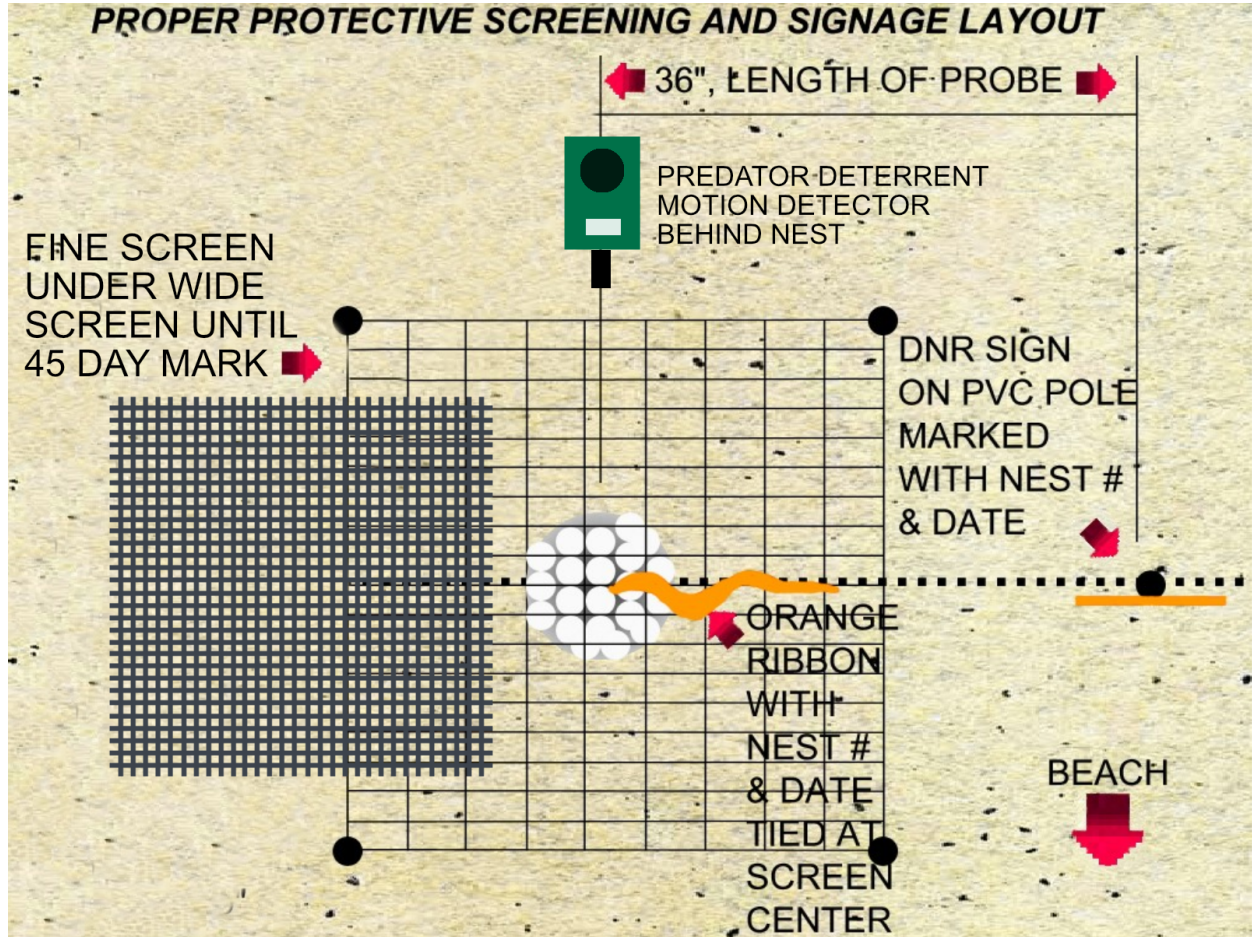
(More Loggerhead Examples)



Nests come in a variety of shapes and sizes. The crescents represent good places to start looking for egg chambers. Notice that the widths of the mounds are wider than the tracks themselves. The arrows in the above photo highlight two egg chambers the turtle abandoned before nesting.



APPENDIX E: NEST PROTECTION DIAGRAM



## APPENDIX F:

### INFORMATION SHEET ON THE NORTHWEST ATLANTIC LOGGERHEAD TURTLE (*Caretta Caretta*)

#### **Status:**

**U.S.** - Listed as Threatened (likely to become endangered, in danger of extinction, within the foreseeable future) under the U.S. Federal Endangered Species Act.

**International** - Listed as Endangered (facing a very high risk of extinction in the wild in the near future) by the International Union for Conservation of Nature and Natural Resources.

Recent population studies have concluded that the number of females that nest in the Southeast U.S. is continuing to decline. In the U.S., the loggerhead's nesting areas are divided among four states:

Florida (91%)

**South Carolina** (6.5%)

Georgia (1.5%)

North Carolina (1 %)

Florida beaches account for one third of the world's loggerhead turtles.

**Range:** Loggerheads are circumglobal. Found in temperate and subtropical waters throughout most of the world but will range far north and south. Inhabit an enormous range from north to south. In the Western hemisphere they are found as far north as Newfoundland and as far south as Argentina.

**Characteristics:** (1) Head is very large with heavy strong jaws; scales on the top and sides of the head and top of the flippers are reddish-brown with yellow borders. The neck, shoulders and limb bases are dull brown on top and medium yellow on the sides and bottom (2) *Carapace* (back shell) is bony without ridges and has large, non-overlapping, rough scutes (scales) present with 5 lateral scutes; heart shaped. (3) Front flippers are short and thick with 2 claws; rear flippers can have 2 or 3 claws. (4) Carapace is a reddish-brown; plastron is yellowish-brown (bony plate forming underside of turtle's shell). (5) Hatchlings have a dark-brown carapace with flippers pale brown on margins. Average size at hatching is 45 mm long; average weight is 20 g. Juveniles may have pronounced keels on the vertebral scutes. Maturity is reached at between 16-40 years.

**Habitat:** Prefer to feed in coastal bays and estuaries, as well as in the shallow water along the

continental shelves of the Atlantic, Pacific and Indian Oceans. It is assumed that hatchlings live out their "lost years" in rafts of sargassum and/or in open ocean currents. They remain part of this drifting community and grow to about 21inch carapace length. They then migrate to the shallower coastal waters which become their foraging habitat. It is interesting that some loggerheads live in turbid, detritus-laden, muddy bottom bays and bayous of the northern Gulf Coast, while others choose to live in the clear waters of the Bahamas and Antilles, in habitats we more strongly associate with tropical marine turtles. Nothing is known about why these creatures would select such vastly different habitats, or even if there is any movement from one to the other.

**Diet:** Primarily carnivorous and feed mostly on shellfish that live on the bottom of the ocean. They eat horseshoe crabs, clams, mussels, and other invertebrates. Their powerful jaw muscles help them to easily crush the shellfish. Loggerheads will also eat jellyfish.

**Nesting:** Loggerheads nest at night. Mating takes place in late March-early June, and eggs are laid throughout the summer. During the summer, nesting occurs in the lower latitudes. The primary Atlantic nesting sites are along the east coast of Florida, with additional sites in Georgia, the Carolinas, and the Gulf Coast of Florida. The average interval between nesting seasons is two to three years, but this can vary from one to six years; nests between 4 to 7 times per season. Lays average between 100 and 125 eggs in each nest. Eggs incubate for about 50-60 days. Hatching time is inversely related to temperature. As with all sea turtles, sex determination in hatchlings is also temperature dependent.

**Population Estimate\*:** 60,000 nesting females.

Please understand that worldwide population numbers for sea turtle species do not exist and that these are estimates of the number of nesting females based on nesting beach monitoring reports and publications from the early to mid 1990s. Most recent evidence suggests that the number of nesting females in South Carolina and Georgia may be declining, while the number of nesting females in Florida appears to be stable.

Nesting subpopulations of loggerheads in the western North Atlantic have been identified based on genetic research: the Northern Subpopulation produces approximately 6,200 nests/year from North Carolina to Northeast Florida. The Northern Subpopulation declined through the mid 1980s and thereafter a trend is not detected. Recent surveys of *South Carolina nesting beaches* (where more than 30% of the nesting of the Northern Subpopulation occurs) indicate a downward trend and thus the subpopulation is stable or declining. An increase in the numbers of adult loggerheads has been reported in recent years in Florida waters without a concomitant increase in benthic immatures. These data may forecast limited recruitment to South Florida nesting beaches in the future. Since loggerheads take approximately 20-30 years to mature, the effects of decline in immature loggerheads might not be apparent on nesting beaches for decades. The recovery team concluded that nesting trends for the loggerhead are generally declining.

All species of marine turtles are threatened with extinction. This section summarizes the common threats they face. It is based primarily, but not entirely, on material gathered from the various Sea Turtle Recovery Plans adopted by the U.S. National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

The most significant threats to the loggerhead populations are coastal development, commercial fisheries, and pollution. Loggerheads are the most abundant species in U.S. coastal waters and are often captured incidental to shrimp trawling. The loggerhead shares the same threats that menace all marine turtles. Shrimp fishing, gill netting, and activities associated with offshore oil and gas exploitation are particularly dangerous to this species and are thought to have played a significant role in the population declines observed for the loggerhead.

### **Fibropapilloma Tumors**

Fibropapilloma tumors (FP) can infect all soft portions of a turtle's body. Tumors grow primarily on the skin, but they can also appear between scales and scutes, in the mouth, on the eyes, and on internal organs. These tumors often increase in size and number until the turtle is seriously debilitated. Death is a common outcome. By the mid-90s, the single greatest threat to the green turtle was FP. Recently, *fibropapilloma tumors are starting to show up on other sea turtle species in increasing numbers!* If the same pattern of infection occurs as was seen with green turtles, FP may outpace even humans as the single greatest threat to marine turtles.

### **Nesting Threats**

A major reason why marine turtles throughout the world are in danger is the continuing loss of nesting habitat. It is believed that marine turtles have an extremely high affinity for their nesting beaches, and therefore the loss or reduction of even a single nesting beach can have serious effects.

### **Increased Human Presence**

Residential and tourist use of beaches can result in disturbance to nesting turtles. The most serious threat is caused by increased human presence on beaches, especially at night. This results in nesting females shifting their nesting sites and sometimes being forced to use less suitable beaches. Egg laying can be aborted or delayed as well. Recreational use discourages nesting activity on beaches that have been used for millennia. The introduction of recreational equipment such as lounge chairs, umbrellas, small boats, and beach cycles (to name a few) can further reduce the usefulness of a beach for nesting and can seriously damage or destroy any existing nests.

The invasion of a nesting site by non-native beach vegetation (beach vitex) can lead to increased erosion and destruction of a nesting habitat. Trees shading a beach can also change nest temperatures, altering the natural sex ratio of the hatchlings.

## **Poaching**

Unfortunately for sea turtles, their eggs are still considered highly desirable for several reasons. For example, turtle eggs are supposed to be superior to chicken eggs for use in baking. The theft of turtle eggs continues to be a serious problem everywhere turtles nest, including within the United States.

## **Artificial Lighting**

Baby turtles find their way to the sea based on the relatively bright horizon over the sea. Artificial lighting from buildings, streetlights, and beachfront properties has a disorienting effect on little turtles. The problem of beachfront lighting is not just limited to the baby turtles. Adult turtles can mistakenly move inland after egg laying, and females tend to avoid areas where beachfront lighting is most intense. Turtles also abort nesting attempts more often in lighted areas. Artificial lighting has had profound negative effects on nesting behavior and success.

## **Beach Armoring**

Beach armoring includes the building of sea walls, sandbag installations, groins, and jetties. Such practices save structures and property from erosion, but ultimately result in environmental damage and loss of a dry nesting beach.

## **Beach Nourishment**

Beach nourishment is the practice of adding sand onto a beach to rebuild what has been lost through erosion. Beach nourishment affects turtles by direct burial of nests, or by disturbing nesting activity during the nesting season. Heavy equipment on beaches can pack the sand, making it impossible for turtles to dig proper nests. For example, significant reductions in loggerhead nesting success have been documented on severely compacted nourished beaches, and this probably affects leatherbacks as well.

## **Beach Erosion**

Erosion of nesting beaches results in the loss of nesting habitat. Human interference has hastened erosion in many places. Even attempts to halt erosion can have negative effects on nesting beaches, as described in Beach Armoring above.

## **Beach Cleaning**

Human use of nesting beaches sometimes prompts beach cleaning activity, such as raking and the use of mechanical equipment. Not only can existing nests be disturbed by beach cleaning, but it can also result in compacted beaches that are difficult or impossible to use for nesting.

## **Predators**

Turtle eggs are particularly vulnerable to predators. Many animals seem to be aware of the nesting cycle of marine turtles, and eagerly gather to ravish nests once the turtles have made them. For example, raccoons have been known to destroy as much as 90% of all nests on a beach. The threat does not end when the egg is hatched. Hatchlings must escape the clutches of animals such as crabs and gulls as they try to reach the water, and even when they reach the ocean, predators such as sharks await them. Humans are also a predator for sea turtles at all life stages.

## **II. Marine Environment Threats**

Except for the leatherback, marine turtles live most of their lives in fairly shallow coastal waters. This makes them terribly vulnerable to the excesses and carelessness of the human species.

### **Commercial Fisheries**

The most serious marine environment threat to turtles is commercial fishing. According to NMFS, some 5,000-50,000 loggerheads are killed each year. Most turtles killed are juveniles and sub-adults. In some parts of the world, turtles are still hunted, both for food and for their shells. In places where turtle hunting is banned, the incidental taking of turtles during other fishing operations remains a major threat. For example, shrimp trawlers without turtle excluder devices trap and drown sea turtles. Gill nets also snare turtles, and frequently are not pulled soon enough to free the turtles before they drown. Although turtles can remain underwater for long periods, they need to breathe air. A trapped turtle will struggle, significantly reducing its oxygen supply and shortening the time it has before it needs to reach air. Shrimp and gill nets simply are not removed from the water soon enough to save most trapped turtles.

### **Oil and Gas Exploration**

Human attempts to exploit offshore oil and gas reserves pose a serious threat to marine turtles for several reasons. Activities associated with developing offshore oil and gas resources can destroy or seriously disrupt foraging habitat and nesting habitat. Dredging not only destroys habitat, but it also results in the incidental injuring or killing of sea turtles. The presence of offshore structures alters the characteristics of nesting areas in ways that could well affect nesting habits. The exploitation of offshore oil and gas reserves also leads to oil spills and the presence of tar in the water. Both pollutants have serious effects on marine turtles. Oil on the skin and shell of a marine turtle can affect respiration and salt gland functions, as well as the turtle's blood chemistry. The ingestion of tar pellets is also a major concern. In a 1985 review of available information, it was reported that tar balls were the second most common type of ingested debris.

### **Ingestion of Marine Debris**

We humans are terribly irresponsible when it comes to garbage thrown into the ocean or allowed to find its way there through neglect. This has numerous effects on the marine environment, but one particularly gruesome aspect of this problem is the ingestion of marine debris by turtles.

It is widely assumed--and available evidence supports this theory--that hatchling turtles spend their "lost years" drifting in ocean currents with sargassum and other sea grasses. Unfortunately, drifting garbage collects in the same places as the seaweeds do. Young turtles inevitably attempt to eat some of this material, with devastating consequences. Plastic resembles food closely enough to fool even a mature turtle. Ingested plastic is not only toxic, but it also obstructs the stomach and prevents the turtle from receiving nutrition from real food. This can often lead to a lingering death.

We have listed just the most serious threats. For more information, refer to the sources listed at The Sea Turtle Library (<http://www.turtles.org/library.htm>).

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