

Flotsam & Jetsam

A Newsletter for Massachusetts Marine Educators

website: www.capecod.net/~MME

Summer/Fall 2002

Vol. 31, No. 3 & Vol. 32, No. 1

President's Message



MME President Howard Dimmick of Stoneham High School and President-Elect Linda McIntosh, Dana Hall School, who organized the WHOI Conference this year.

Welcome back! A new school year has started... and I have several items to report on. In April, we had a successful

Woods Hole Conference, and each teacher went home with a bag of goodies from this program. The morning session consisted of three speakers reporting on their research at Woods Hole. Dr. Chris Weidman spoke about how research on bivalves can help us learn about past and future climates. After that, Susan Mills described her work tracking clam settlements through analysis of shells. Lastly, Dr. Anne Cohen talked about how analysis of fossil coral skeleton structures reveals climate history.

A short business meeting and presentation of awards with a "chowdah lunch" completed the group sessions. Several afternoon workshops were held for small groups of

continued on page 4

Woods Hole 2002



Above, MME President Howard Dimmick presents Dr. Chris Weidman, Visiting Investigator, Geology and Geophysics, WHOI, with a whale sculpture after Dr. Weidman's talk on "What Shells Can Tell Us."



Susan Mills, Senior Research Assistant, Department of Biology at WHOI, spoke on "Tracking Soft-shell Clam Dispersal Using Trace Element Fingerprinting."



Department of Geology and Geophysics Research Associate Dr. Anne Cohen, holding coral, explains how fossil corals can provide information about the history of the Earth's environment in her talk, "The Secrets of Corals: What Can They Tell Us?"

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- Barbara Waters.....Educational Consultant

From the Editor....

I admit it...I love turtles. And sea turtles are particularly fascinating since we know so little about them. Here's your chance to find out everything you need to teach about sea turtles...pages 7-15.

Activities in this issue come from several sources including the New England Aquarium, the Gulf of Maine Aquarium, Mystic Aquarium, EuroTurtle, Sea World/Busch Gardens, and Scholastic Press.



Check out the sea turtle costume on page 15 - maybe your students will dress up like turtles this year.

Courtesy of Fisheries, Virginia Institute of Marine Sciences



Loggerhead sea turtle, *Caretta caretta*.

Courtesy of EuroTurtle

Also: Thanks to Barbara Harris of Port Isabel, TX, for the yummy shrimp recipe on page 5.

And my thanks to Betty Edwards-Cabana, who helped me immensely by looking over this newsletter (and finding typos before they became embarrassing).

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website: www.capecod.net/~MME

Flotsam and Jetsam is published three times a year by the Massachusetts Marine Educators, Inc. Please submit items for the calendar, classroom projects, curriculum materials, or other information to the editor. Please submit dates for the calendar at least two months prior to the event or call the editor (617) 484-6961 (email: barbarap@thecia.net).

Publications Officer.....Barbara Passero

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Massachusetts Marine Educators 2002 Awards

Presented at the 26th Annual WHOI Conference
April 27, 2002

MME Annual Award

In recognition of outstanding leadership in marine biology and for implementing the New England Aquarium's mission into the 21st century:

Jerry R. Schubel, Ph.D., President Emeritus,
New England Aquarium

MME Traditional Teacher of the Year

In recognition of outstanding contribution and dedication in promoting marine science:

Thomas L. Pezzella, teacher, Milford High School



MME Nontraditional Teacher of the Year

In recognition of outstanding contribution and dedication in presenting marine publications to educators and the general public:

Vicki Cullen, Director of Communications, WHOI, shown with MME's Frank Taylor



John Patrick Crowley Teacher Grants

Simone Bourgeois and Arthur Dutra (both of the New Bedford School System) with MME Executive Director Jack Crowley



MME Lifetime Achievement Award

Presented posthumously for a lifetime of achievement in marine education, as a writer, lecturer, and as former director of education at the Peabody Essex Museum

Sara Fraser Robbins

Accepted by her son,
Hanson C. Robbins



K.E.L.P. Award
Margaret Greaves, teacher,
Boston Latin School



MME Book Award
Kristan Pateraude,
Falmouth High School
Nominating Teacher: Chris Brothers
Sponsor: WHOI /MI T Sea Grant Program

the teachers, and the day was completed with a wine and cheese reception at the Clark Building 5th floor on the Quissett Campus. The Woods Hole Conference will be on the agenda again next year. Once the date has been firmed up, we will inform our members.

In March, a very successful **High School Marine Sciences Symposium** was held at the University of Massachusetts at Dartmouth. Over 250 students participated in the program that featured two very interesting speakers and 20 workshops. As a kick-off, Dr. Kevin Stokesbury presented a session on research of the sea scallop. This very interesting presentation set a high tone for the day. In the final presentation, Dr. David Gallo showed previously unreleased video footage from recent deep-sea expeditions, including images from famous shipwrecks such as the *DKM Bismarck* and *RMS Titanic*.

As I went from workshop to workshop, I observed dozens of engrossed high schoolers. Plans are already being made to present this program again in March 2003. Watch for information in your mailings this year and sign up to bring your students.

MME received a **marine education teacher-training grant**, and the teachers began meeting during the summer in Fairhaven, MA, and they will have a callback session later in the year. Thanks to Jack Crowley for his work in getting this grant up and running.

The **MME board** held five meetings last year, and a lot of work has been accomplished. MME along with many other organizations is carefully weighing its expenditures as budgets tighten up. We have been working on a budget for the coming year in line with our income for the year.

In addition, a subcommittee of the board met in March to complete a revision of the **MME Constitution and Bylaws** -- the first time this has been done since the organization was formed. The committee looked at ways to make the organization more efficient. Each paid-up member should have received a copy of the revisions by mail during June. This revision needs to be adopted by a ballot vote, so please return the ballot by the date requested (early September). Please read the revisions, and send in your ballot as soon as possible, because if it is simply put on your desk to do it later, then it probably will not be completed in time. I know this from first-hand experience that if I do not do something very soon after it arrives on my desk, then it is probably going to get buried.

We are working to get the MME web site back up and running this year, after a year in which it was missing. Watch *F&J* for details.

I hope you all had a relaxing summer by the beach and enjoyed this respite from our daily schoolwork.

Howard Dimmick

Special Thanks

The many tasks that went into organizing the **Woods Hole Conference** were shared by the officers and the board of directors of MME. Special thanks go to Linda McIntosh of MME, Dr. John Farrington and Dr. Kate Madin of the Education Office at WHOI, and Tracy Crago of the Sea Grant Communications Office at WHOI.

MME offers MANY THANKS to the following contributors of services and items for the information packets and door prizes including:

- Cape Cod Museum of Natural History
- Connecticut Valley Biological Supply
- Frey Scientific
- Gordon Estabrooks (K.E.L.P.)
- Harbor Explorations
- International Wildlife Coalition
- NASCO
- New England Aquarium
- Tamra Schiappa, Boise State University



From left, Jack Crowley, MME Executive Director, Dr. Kate Madin, WHOI, and Linda McIntosh, MME Vice-President and coordinator of the WHOI Conference.



MME Board Member George "The Sandman" Duane passing out door prizes at the WHOI conference.

and not to forget.....a lot of interesting stuff from our fellow Massachusetts Marine Educators

Calendar 2002-2003

September 18, 2002

MME Board Meeting - Tabor Academy

October 5, 2002 -- 10 AM - 4 PM

Open House at Northeastern's Marine Science Center, Nahant, MA. Directions can be obtained from web site: <http://www.marinescience.neu.edu/>

October 19, 2002

Stellwagen Banks Marine Sanctuary program. New England Aquarium. Information: Anne Smircina, see p. 6.

November 6-8, 2002

MAST, Holiday Inn, Worcester, MA. Information: Howard Dimmick, (781) 438-5018.

November 13, 2002

MME Board Meeting - location TBA

January 8, 2003

MME Board Meeting - location TBA

January 31, 2003

Poster/Art Contest Deadline. Information: see page 6.

March 12, 2003

MME Board Meeting. Dana Hall School. Information: Howard Dimmick, (781) 438-5018.

March 19, 2003 -- 8 AM - 2 PM

High School Marine Studies Symposium. University of Massachusetts at Dartmouth.

The Galley's Bounty

Garlic Shrimp Tapas

4-5 Tbsp olive oil
4 garlic cloves, finely minced
1 tsp red pepper flakes
1 lb medium shrimp, peeled and deveined
1 Tbsp fresh lemon juice
1 Tbsp dry white wine
salt and pepper to taste

Position rack 3-4 inches under broiler. Place 2 tapas pans (or pans for searing) under broiler. Preheat up to 5 minutes. In a bowl, toss together oil, garlic, pepper flakes, shrimp, lemon juice, wine, salt, and pepper. Divide shrimp mixture among pans. Broil until shrimp are lightly golden, pink and opaque throughout (about 4-5 minutes). Serve this appetizer immediately.

From the kitchen of Barbara Harris, Port Isabel, TX. Reprinted from *Dolphin Talk* (July 2002), the newsletter for the Texas Marine Education Association.

NMEA Conference Highlights

Would you like to visit the gorgeous Galapagos Islands? How about joining the search for the giant squid!? Well, I didn't get to do either of those, but I FELT like I was when I listened to the inspiring presentations of the renowned scientists studying this neat stuff! The NMEA conference at Connecticut College in July was a great learning experience, and I'm very grateful to MME for sponsoring my visit.

The week ranged from overwhelming to fun to inspiring. The highlight of the week for me was the trip to Avery Point, where the Project Oceanology folks reside. The location, looking out over Long Island Sound, is breathtaking. The buildings are beautiful, and what they are accomplishing on sea and land over there is exemplary.

I opted for the 3-hour "cruise" aboard the EnviroLab III. This teaching vessel has lots of equipment for studying the sea. We were assigned to teams to handle different tasks on-board, ranging from measuring dissolved oxygen levels to sediment analysis. We also lowered an otter trawl, and

got to see lots of interesting creatures. Squid eggs, all formed in jelly-like strings of hair clumped together, were the most intriguing.

I met people from aquarium personnel, to elementary teachers, to renowned doctors. It was a wonderful cross section of people, but all with the same goals.

Choosing among the various sessions during the week was very difficult. There were so many interesting topics and bright presenters I wanted to hear! It is so amazing to see all the dedicated people doing work in their different corners of the country/world coming together to spread the word about our ocean resources. I came home with lots of reading material, which is already inspiring me to make up some new experiments and hands-on activities for our traveling sea life presentations.

I would be remiss if I talked only about the technical content of the conference. Equally interesting were the

continued on page 6

Poster/Art Contest

Grades K-12

Sponsored by: Massachusetts Marine Educators,
Stellwagen Bank National Marine Sanctuary,
New England Aquarium

DIVISIONS: Grades: K-2, 3-5, 6-8, 9-12, and scientific illustration

DEADLINE: January 31, 2003

SPECIAL GUEST JUDGE:

Famed Marine Artist Robert Lyn Nelson

THEME: 1992-2002: The Stellwagen Bank National Marine Sanctuary Turns 10

In 1992, Congress created the Stellwagen Bank National Marine Sanctuary. This area, historic as a fishing ground, and now considered one of the premiere whalewatching destinations in the world, joined a select group of marine protected areas earning this federal designation. The area also serves as an important location for marine research and education. To participate in the poster/art contest students are invited to select one or more of the Sanctuary's species for their artwork or they may focus on any of the multitude of uses of the Sanctuary and its resources. For information on the Gerry E. Studts Stellwagen Bank National Marine Sanctuary, visit the Sanctuary's web page at <http://stellwagen.nos.noaa.gov>

GENERAL INFORMATION

There will be four age divisions in the contest: grades K-2, 3-5, 6-8, and 9-12 with a winner, second, and third place selected from each division. There will also be a special scientific illustration division open to all levels. First place artists in each of the age divisions will receive four New England Aquarium passes each. Second and third place winners will receive two NEA passes. The winner of the scientific illustration division will also receive four aquarium passes. Winning entries may be used as the design for the 2003 Massachusetts Marine Educators annual t-shirt or in publicity for its annual meeting. A BEST OF SHOW Award (selected from all the division winners) will receive four New England Aquarium Behind-the-Scenes Tour passes and a copy of the book *Stellwagen Bank: A Guide to the Whales, Sea Birds, and Marine Life of the Stellwagen Bank National Marine Sanctuary*. Entry deadline is January 31, 2003. Submit entries to: Poster Contest, Stellwagen Bank NMS, 175 Edward Foster Road, Scituate, MA 02066.

General Requirements

- The posters should be between 8.5" x 11" and 18" x 24".
- Use white, non-glossy paper, please do not laminate.

- Teachers may send in as many posters as they like, but we do request that some selective screening be attempted first. (Let us know how many students took part in the project even if all of their posters are not sent.)
- Label each entry on the back with student's name and grade, along with the teacher's name, school name, address and telephone number.
- Students may use any medium including markers, paints, pastels, colored pencils, pen and ink, pencil, collage - Please do not send any collages using sand. Students may use any technique including fish printing or style of art. (See special instructions for scientific illustration division).
- Please indicate which topic (specific resource and/or use) is being depicted in the poster.
- Individual students may submit entries on their own.

Grades K-2 Requirements

Students are to create a poster/artwork that relates to this year's theme. Students should include on the back of the poster a slogan or statement about their poster's subject.

Grades 3-5 and Grades 6-8 and 9-12 (judged separately)

Students are to create a poster/artwork that relates to this year's theme. The student must include on the back of the poster (or attach a separate sheet of paper) with information about the art - what species is/are pictured (common and scientific names) or resource use, and the role the Sanctuary should maintain in regard to the species and/or use. Please be concise and neat. (Be sure that lettering does not show through the illustration.)

Scientific Illustration Division (all grades)

Students are to use pen and ink or #2 black pencil on white paper only. Illustration must be technically accurate and may show a single creature, a predator-prey relationship, a food chain or food web. Information on the back should be similar to that which is required for the Grades 3-5/Grades 6-8/Grades 9-12 entrants.



NMEA 2002, cont. from page 5

evening "sessions." The entertainment committee made sure there was plenty of nighttime activity for almost any taste in music. From songs of the sea to jazz ensembles, we had something to dance to. We traveled to Mystic Seaport for a clam boil one evening and to the Mystic Aquarium for dessert and a live band the next.

Hope to see y'all in North Carolina at next year's event. From the preliminary taste of it that the group gave us, it should be an equally fun and enriching week!

Pam Ellis

Coalition for Buzzards Bay

Turtles That Went To Sea

(Grades 1-7)

There are turtles and turtles and turtles—250 kinds of them. Almost all live in wet or dry places on land: streams, ponds, marshes, woods—even deserts.

But several million years ago, a few turtles left land to live in the sea. Their descendants live in the sea today. There are seven species (kinds) of sea turtles, ranging in length from 30 inches to 8 feet. Found in many places around the world, they live in tropical (warm) and temperate (near-warm) waters, although one species spends time in both warm water and cold water.

About Sea Turtles

Except for brief periods when females crawl ashore to lay eggs, almost all these turtles spend their entire lives in the sea. They even sleep at sea. Sea turtles look very much like land turtles with some important differences:

Land turtles have legs and feet. In sea turtles, these have been replaced by flippers, two large ones in front and two smaller ones in the rear. Sea turtles “fly” through the water by moving their front flippers up and down, stroking with both at the same time, like a penguin. (Freshwater turtles swim by moving their legs in a kind of dog-paddle.) The shorter rear flippers and the stumpy tail are used mainly for steering.

All but one kind of sea turtle have shells. These are lighter than the shells of land turtles, and they do not form a “box” into which the animal can withdraw when threatened. A sea turtle’s head and flippers are always outside the shell, protected only by a thick scaly skin. The light shell allows a sea turtle to swim more easily, but it does not protect the animal from losing a flipper—or even its head—to a hungry shark.

Sea turtles are reptiles (snakes, lizards, and crocodiles are also reptiles), and they breathe air. But they also have a gill-like structure in their throats that allows them to draw oxygen from



water. Some species also have other body parts that take oxygen directly from seawater. These special ways of getting oxygen let these marine reptiles sleep in underwater caves and spaces between rocks, and even to bury themselves in seafloor mud for long periods.

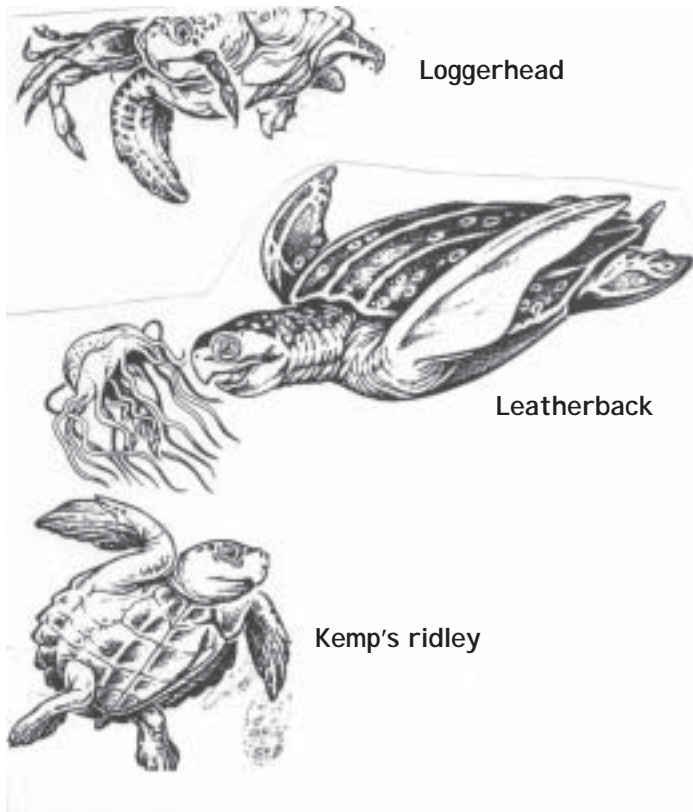
More interesting facts: Sea turtles do not have teeth. They tear their food, or crush shelled animals, with sharp, horny beaks. They also have three eyelids—a thick upper lid, a thin lower lid, and a thin lid that moves sideways across the eye.

Tears. Turtles don’t drink seawater, but they can’t help swallowing some when they feed. Too much salt from seawater can make a turtle sick. It gets rid of unwanted salt by means of special glands near its eyes. These produce tears twice as salty as seawater. A “crying” sea turtle, therefore, is flushing excess salt from its body. On a beach, a “crying” turtle might also be flushing sand from its eye.

Kinds of Sea Turtles

Of the seven species of sea turtles, two of them--the Australian flatback and the Pacific ridley--are not found in the Gulf of Mexico or along our Atlantic Coast. A third, the hawksbill, is concentrated in the Caribbean (as well as in other tropical seas around the world) but only rarely ventures as far north as New York and New England. The four sea turtles pictured in this article are ones you might see along our coastline in summer. These are the green turtle, Kemp’s ridley, loggerhead, and the leatherback.

Note: Pages 7-9 are courtesy of the Mystic Aquarium.



Loggerhead

Leatherback

Kemp's ridley

The **Green turtle** is a large animal averaging 400-500 lbs and measuring 4 feet long. Green turtles are not green! Their shells are black and white with a touch of rusty brown or olive. The green in their name refers to the color of their fat. When more than a year old, they feed almost entirely on plants. In the shallow Caribbean waters where they live, greens feed on turtle grass. Some of them travel, more than 1400 miles to beaches where they lay eggs, Unfortunately for this turtle, its meat is tasty, and for many years, great numbers of greens were killed for their meat. This species appears in New England waters in summer, although in smaller numbers than the other three turtles.

The **Loggerhead** is a long-distance swimmer. On our side of the Atlantic, it goes as far north as Canada and as far south as Argentina. Found 500 miles at sea, as well as in bays and rivers, this 5-foot, 500-lb turtle has powerful jaws for cracking the hard shells of clams and other shellfish that are part of its diet. The loggerhead also eats sponges, jellyfishes, and seaweed. Loggerheads are common visitors to New England waters in summer.

The **Leatherback** is the largest of all sea turtles. A jumbo of this species can weigh upwards of 1,500 lbs and reach a length of 8 feet. Its most striking feature is that it does not have a shell like other sea turtles. Instead, it has a leathery hide (hence its name) with long ridges on it. This turtle is also unique because it can control its body temperature, which is something few other reptiles can do in cold water, the leatherback can maintain a body temperature as much as 18 degrees higher than the water temperature. This ability allows it to range from tropical waters to the cold waters of the Arctic, following drifting jellyfish, the main item in its diet. This big turtle migrates great distances to and from nesting beaches. In summer, a fair number of leatherbacks appear along the New England, coastline and farther north, in the Gulf of Maine.

Kemp's ridleys are the smallest of the sea turtles, weighing under 100 lbs and measuring less than 2 feet long. Virtually all of these are born on one 10-mile stretch of beach along the Mexican coast on the Gulf of Mexico. In summer months, some juvenile ridleys drift with seaweed as it moves up the East Coast and show, up in Long Island Sound and New England. After a summer of feeding in those areas they return south before winter. Adult Kemp's ridleys live primarily in the Gulf of Mexico. They feed on shrimp, snails, clams and other small animals.

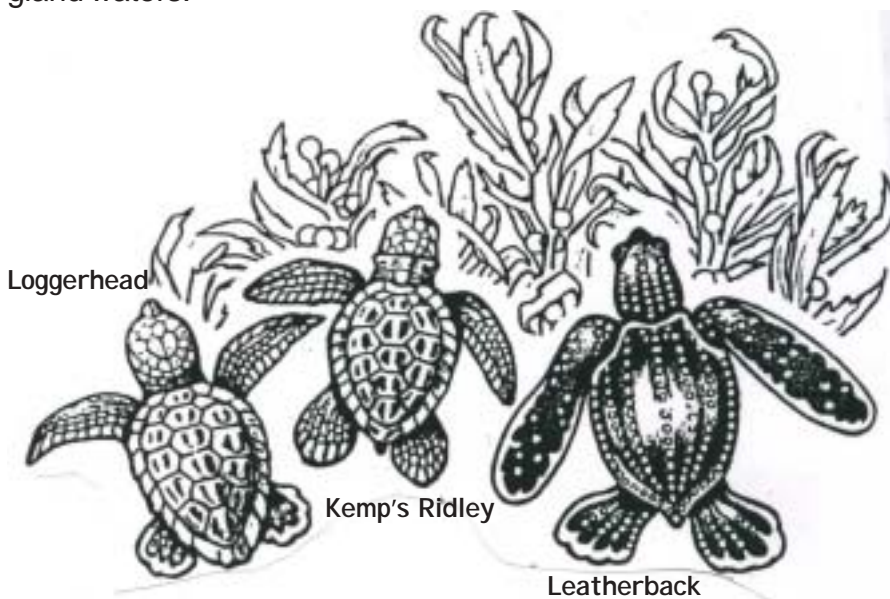
Eggs. When it is time for a mother sea turtle to lay eggs, she crawls ashore—usually at night—to a point above the high-tide line. She digs a foot-deep hole with her large front flippers and lays as many as 100 eggs in the hole. Each egg is about the size of a ping-pong ball, with a leathery shell.



When she finishes laying the eggs, the female uses her flippers to cover the eggs and fills the hole with sand. Then she returns to sea. During a breeding season, a female may make several visits to a beach to lay eggs.

Hatchlings - Sea turtle eggs hatch in about 60 days. As soon as the two-inch baby turtle comes out of its egg, it makes a desperate dash for the sea. This is a dangerous time. Hungry crabs, dogs, raccoons, birds and other animals catch and eat many of the hatchlings. Despite these dangers, baby turtles must head for the sea. If they get confused and run away from the sea, they will die for lack of food or be eaten by predators. Baby turtles that reach the water are not entirely out of danger, however. Sharks and other large fish also have a taste for turtles. Out of every 100 turtles that hatch in a nest, only one will survive to become an adult.

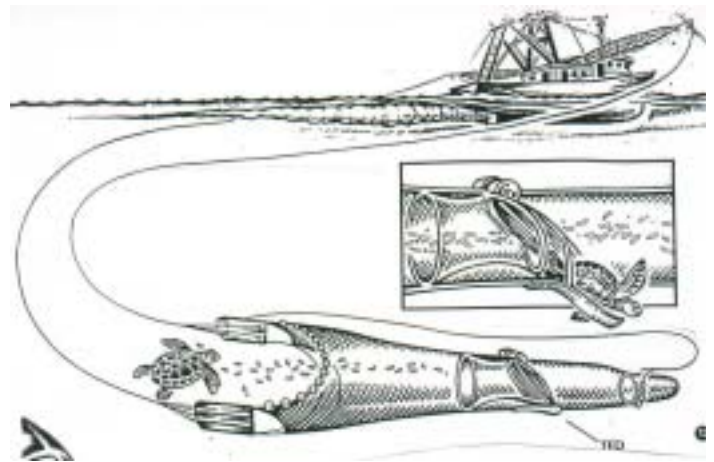
Drifting with Seaweed. Once they reach the sea, newborn turtles swim frantically away from shore until they find a mass of floating seaweed. For some time—scientists aren't sure how long—the hatchlings live in the seaweed mass, feeding on the plant and animal life found there. The turtles are carried wherever the floating seaweed is pushed by currents. This is how ridley turtles born in the Gulf of Mexico find their way into New England waters.



Hatchlings (approximately life size)

Struggling to Survive

Except for the flatback, all sea turtles are endangered or threatened. Even though sea turtles and their eggs are protected in many countries, these animals are still struggling to survive. Dune buggies crush their eggs. Homes, stores and hotels built on coastlines eliminate nesting grounds. Sea turtles drown in fishing nets, and are slashed by boat propellers. Plastic litter in the ocean also harms them. They eat plastic bags, mistaking these for jellyfish. The bags block their digestive tracts and they die.



Turtle Excluder Device (TED)

Saving Turtles from Nets. Many sea turtles used to drown in the nets of shrimp fishermen. Today shrimp boats in United States waters are required to place a Turtle Excluder Device (TED)—an escape hatch for turtles—in their nets. A TED is a slanted grill that forces the turtle down toward a flap-covered opening leading out of the net.

SEA TURTLES (Grades 8-12)

Sea turtles are the largest existing marine reptiles. They were not the first turtles to appear, but fossil records show they date back 75-150 million years. Sea turtles spend most of their life at sea: females only return to land to nest; once hatched, males never return to land. These turtles differ from tortoises (land turtles) in the shape and size of their shells and legs. Tortoises have highly arched, thickened shells and legs that can lift their bodies off the ground. Sea turtles are streamlined in shape to facilitate swimming. The limbs of sea turtles are flattened and are good paddles or flippers that have fused digits and only one or two claws. Sea turtles are very slow and clumsy on land. Sea turtles cannot pull their heads or legs into their shell.

Range

Most sea turtles are primarily tropical and sub-tropical, found off every continent except Antarctica, usually in shallow water where their food is, except the Leatherback that feeds in cold water and is found in the open ocean. Loggerheads are the only species that nests in the temperate zone, and they can be found in the U.S. from the Carolinas to Florida.

Physical Characteristics

Carapace (shell) - is a modified rib cage which supports internal organs and grows by forming new bony plates under the old ones and increasing the size of the horny plates (**scutes**).

Plastron - Bottom shell.

Hearing - There are no external ears but Green turtles are known to be sensitive to low frequency sounds in their environment.

Smell - The Green turtle has an excellent sense of smell underwater and probably in air as well.

Sight - Green turtles and probably other turtles with the exception of the Kemp's ridley are thought to have good vision under water but are very nearsighted on land. Green turtles have color vision and can see ultraviolet light but their sensitivity to red light is poor.

Teeth - Sea turtles do not have teeth but the edges of the jaws are developed into sharp ridges.

Male/Female? - Before they reach adulthood, it is impossible to tell them apart. The different species reach maturity at different times (10-40+ years). When viewed from above, a mature male's tail extends well beyond the end of the shell, but a female's tail is very short.

Breathing - When active, turtles breathe every 5-15 minutes. When sleeping, they slow down their bodily processes, conserve oxygen, and can remain under water for 1-3 hours. The nostrils of a sea turtle are located near the top of its head, so that the turtle won't have to stick its head far out of the water to breathe.

Life Style

Diet - Most sea turtles eat animals, especially invertebrates such as sponges (Hawksbill), marine worms, crustaceans and mollusks (Loggerhead), jellyfish (Leatherback); adult Green turtles are largely vegetarian, eating sea grasses and sea weed.

Temperament: Most sea turtles are docile around humans (in aquariums).

Sleep - Sea turtles sleep at night. Adult turtles may wedge themselves into a crevice deep underwater or merely sleep floating on the surface. Hatchlings sleep floating with their flippers tucked back over their carapaces after the 36-48 hour period of "juvenile frenzy" when they swim constantly after they first enter the water.

Communication - Most do not make much sound except when surfacing to breathe and expel water and air from their nostrils. Leatherbacks make gurgling and rumbling noises on the nesting beach and terrible noises when injured.

Breeding/Nesting - Mating takes place off shore in the waters near the nesting site and nesting takes place on beaches where the adults were born. Most of the egg laying takes place at night but some is done during the day. Only the Olive and Kemp's ridleys partake in "arribadas," or "nest en masse" (very large numbers). Females may nest 3 to 5 times per breeding season, but do not nest every season. Females dig their nests with hind flippers and never see the cavity themselves. During the process of egg laying, they are oblivious to everything else. While on land, the female sheds large sticky tears which help remove salt from her body and protect her eyes from sand. Once the 50-250 eggs are laid and the nest is covered, she pays no further attention to the nest. Eggs weigh about 30 grams, look like ping pong balls, are leathery, and hatch in 22 1/2 months. About 4-8% of the eggs hatch.

Hatchlings - Once hatched, the baby sea turtles take several days to work their way to the surface of the sand and emerge when the temperature drops. Sex is believed to be influenced by incubation temperature - warmer temperatures produce more females (opposite of alligator hatchlings!). Hatchlings move to toward the brightest spot on the horizon.

Migration - The majority of species migrate to feeding areas and nesting sites. The Leatherback makes the longest migrations.

Longevity - Life span is unknown at present. They grow very slowly, so it is thought they probably live as long as their counterparts on land.

Learning ability - Probably as good as a rat or pigeon. In the laboratory, Green turtles have been taught to press underwater keys when they detect specific light and chemical signals. They do not learn well if punished for failure.

Note: Materials on pages 10-11 and 15 are courtesy of the New England Aquarium's Education Department.

Concerns and Issues

Status - All turtles are endangered or threatened. Unless drastic and effective measures are put into place worldwide, it is believed by many scientists that in the next 20-50 years, several species may become extinct. The Kemp's ridley are the most endangered, and the Leatherbacks probably the second most endangered. In 1947 there were 40,000 Kemp's ridleys nesting at one beach (Rancho Nuevo, Mexico) where they still nest. In 1992 there were fewer than 500 females remaining. The populations of Loggerheads, Green and Hawksbill turtles are rapidly declining.

Predators

Eggs - animals living on or near the beach, humans.

Hatchlings - beach animals, marine carnivorous fish and humans; Adults - sharks, humans - sometime intentional; sometimes accidental.

Human Uses

Eggs are eaten and regarded as a much-prized aphrodisiac by some cultures. Skin is used for leather. Shells of the Hawksbill are used for jewelry making (shell dealers would like to revoke the 1992 treaty with Japan which halted imports). Meat of the Green turtle is used for food. Turtle oil used in cosmetics. Cartilage or "calipee" used in soup making. Hatchlings preserved whole in plastic and used as paperweights. Immature turtles are stuffed and polished and made into wall ornaments.

Conservation Issues

The harvest of turtles for human use. Habitat destruction and development on nesting sites, pollution of nesting sites, oil spills. Plastic pollution in the oceans - floating plastic resembles jelly fish and is ingested by turtles. Accidental drowning in fishing nets - Turtle Extraction Devices (TEDs) which are being-used on 90% of nets in the Gulf of Mexico should help prevent drowning in fishing nets. Accidental injury by dredges and pleasure boats.



Further Studies Needed

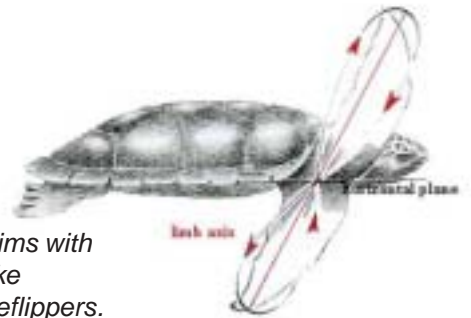
Sea turtles have only been studied scientifically since 1954 (Archie Carr), but much more is needed to learn where the various species grow to maturity, how long it takes them to become mature, survival rates, how they navigate to their birthplace and how to raise them in captivity and successfully reintroduce them into their natural habitat. See related story on turtle research on page 13.

Sea Turtle Adaptations for an Aquatic Environment

<http://www.seaworld.org/infobooks/SeaTurtle/stadapt.html>

Swimming

1. Sea turtles are strong swimmers. The cruising speed for Green sea turtles is about 1.5 to 2.3 kph (0.9-1.4 mph). Leatherbacks have been recorded at speeds of 1.5 to 9.3 kph (0.9-5.8 mph).
2. Forelimbs are modified into long, paddle-like flippers for swimming.
3. Neck and limbs are nonretractile. The shell adaptations necessary for retractile extremities would impede rapid swimming.



Diving

1. Sea turtles are excellent divers. Leatherbacks routinely dive more than 305 m (1,000 ft.), and they may reach depths of more than 1,190 m (3,900 ft.) seeking jellyfish.
2. Since they are ectothermic, sea turtles have a slow metabolic rate. This slowed metabolism allows them to stay submerged for long periods of time.
 - a. Hawksbill turtles have been known to remain submerged for 35 to 45 minutes.
 - b. Green sea turtles can stay under water for as long as five hours. Their heart rate slows to conserve oxygen: nine minutes may elapse between heartbeats.
 - c. In the north-central Gulf of California, black sea turtles return each year to specific areas. They bury themselves under water in sand or mud and may remain dormant from November to March.

*The information on this page was taken from **SeaWorld's** online educational resource, www.seaworld.org. If you desire additional sea turtle information or other educator resources, please visit www.seaworld.org.*

Sea Turtle Information Resources



Web Links

Print Resources

www.teacher.scholastic.com/turtles/tguide.htm

Lower Elementary (Grades K-3)

Follow the Moon, by Sarah Weeks. HarperCollins Juvenile Books, 1995.

The story of a newborn sea turtle who's rescued by a young boy. Appropriate for primary students.

Sea Turtles (Early Bird Nature Books), by Frank Staub. Lerner Publications, 1994.

An introduction to sea turtles for young readers. Includes color photos, a map, and a wealth of information about sea turtles — including their nesting practices and threats to their environments.

Sea Turtles, by Gail Gibbons. Holiday House, 1998.

This introduction for young readers provides basic information about these fascinating reptiles through colorful drawings and simple text. Includes facts about how they've adapted to life in salt water, and descriptions of the different kinds of sea turtles.

Upper Elementary (Grades 4-6)

Into the Sea, by Brenda Z. Guiberson. Henry Holt & Company, 1996.

The story of the life and challenges of a sea turtle, from hatchling to female adult, told through lively text and watercolors.

Furs, Feathers, and Flippers: How Animals Live Where They Do, by Patricia Lauber. Scholastic, 1994.

Discover how animals adapt to five very different habitats — the ocean, grasslands, forests, desert, and the tundra — through text, photographs, and maps.

"Sea Turtles: In a Race for Survival," by Ann & Jack Rudloe. *National Geographic*, February 1994, vol. 185, no. 2, pp. 94-121.

The Sea Turtle: So Excellent a Fish, by Archie Carr. University of Texas Press, 1986.

An introduction to the sea turtles and the fight to preserve them.

Turtle Nest, by Lola M. Schaefer, Neesa Becker (Illustrator) Richard C. Owen Publishing, 1996.

The story of one sea turtle's night swim to shore to lay 100 eggs.

The Turtle Watchers, by Pamela Powell. Viking Press, 1992

Three sisters watch a giant leatherback turtle lay her eggs. The sisters must then protect the eggs from poachers and nature until they hatch.

The Bridge web site at the University of Virginia links to any materials you need on sea turtles. The main site (<http://www.vims.edu/bridge/seaturtles.html>) leads you to species specific information on sea turtles and to other sites on the biology, conservation, nesting, and tracking of sea turtles. Some of the organizations among many others that have web sites on sea turtles linked from the Bridge are Mystic Aquarium, Sea World, Scholastic Press, EarthWatch, Virginia Institute of Marine Science, EuroTurtle, and the Gulf of Maine Aquarium.

Some more web sites

Earthwatch Institute

Be sure to explore the "Expeditions" area to learn more about the Costa Rican Sea Turtle field study as well as a host of other studies taking place around the globe — including a few more about sea turtles! <http://www.earthwatch.org>

Caribbean Conservation Corporation

Learn all about sea turtles and the threats to their survival through this site. <http://www.cccturtle.org/>

EuroTurtle

Overview of all sea turtle species, sections on the threats to turtles in the Mediterranean, identification keys, and even an adventure game involving a loggerhead turtle trying to lay her eggs on a popular Greek island frequented by tourists. <http://www.exeter.ac.uk/telematics/EuroTurtle/leather.htm>

Las Baulas Leatherback Turtle Conservation Project

Here you can find information about the project, other activities taking place and turtle biology in general. Results from the current season are presented and will be updated regularly so you can experience "live" biology taking place in a remote field site. <http://www.coas.drexel.edu/environ/costa-rica/index.html>

Save the Sea Turtles

Learn about six species of sea turtles. <http://digital.net/~zerog/leather.html>

Sea Turtles: Sea World/Busch Gardens

Complete information on sea turtles. http://www.seaworld.org/sea_turtle/seaturtle.html

Sea Turtles: National Aquarium in Baltimore

Learn how sea turtles differ, how they've adapted to their environments, and why humans are considered the biggest threat to their survival. <http://www.aqua.org/animals/species/seaturtle.html>

Kate Mansfield, Sea Turtle Biologist

<http://www.vims.edu/bridge/mansfield.html>



In the web site noted above, **Kate Mansfield**, a Ph.D. student under Dr. Jack Musick at the Virginia Institute of Marine Science (VIMS), invites you to follow the path of a female loggerhead turtle (*Caretta caretta*) recently tagged and released as part of a **Satellite Tracking Project**. Kate's doctoral work will focus on aspects of sea turtle

migration, so hopefully the Satellite Tracking Project will provide some important data. When she is not thinking about data or her dissertation, Kate is kept busy recovering stranded sea turtles at any time of the day or night. Her devotion to sea turtles runs deep.

Between the time a female baby sea turtle enters the ocean and the time she comes ashore to nest approximately 20 years later, very little is known about

her life. Even less is known about the lives of male sea turtles since they never come ashore. This makes sea turtle management and conservation very difficult.

The Satellite Tracking Project, headed by Dr. Musick, has been funded by the Army Corps of Engineers since 1993 as mitigation for their dredging and beach nourishment activities. Kate has been involved with the project for the past two years and works in coordination with Back Bay National Wildlife Refuge and Virginia Marine Science Museum volunteers who monitor nesting activity and call VIMS when a nesting turtle is spotted. The tracking data supplied to the Army Corps of Engineers provide information on the at-sea movements and nesting behavior of female sea turtles. This will help ensure that consideration will be given to nesting turtles while coastal work is being done.

This story adapted from web pages on "The Bridge" prepared by Lisa Ayers Lawrence, Laura Rose, and Susanna Musick of the Virginia Institute of Marine Sciences.

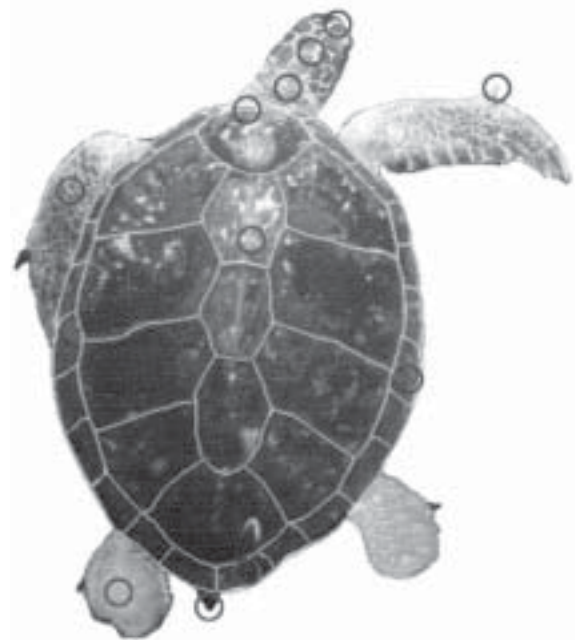
EuroTurtle Match Game

[HTTP://TOFINO.EX.AC.UK/EUROTURTLE/OUTLINE/LOGGER.HTM](http://TOFINO.EX.AC.UK/EUROTURTLE/OUTLINE/LOGGER.HTM)

Match the parts of the turtle with the numbers.

Key

- 1 tail
- 2 head
- 3 front flipper
- 4 back flipper
- 5 central scute
- 6 marginal scales
- 7 precentral scute
- 8 postcentral scute
- 9 claw
- 10 neck
- 11 prefrontal scales
- 12 lateral scale



Where are the turtle's carapace and plastron?

Contact roger@kings-taunton.co.uk

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Sea Turtle Questions

For the answers, go to this web page: <http://www.teacher.scholastic.com/turtles/qotd/toc.asp>

1. If sea turtles were to become extinct, how would it affect the environment?
2. Have you found any sea turtles with the same DNA?
3. Are turtles' shells their only defense mechanism?
4. How long does it take a mother to lay her eggs?
5. Why do sea turtles bury their eggs in the ground or sand?
6. How do turtles eat jellyfish?
7. What does the scientist learn from the blood samples taken from the sea turtles?
8. Are Costa Ricans supportive of your efforts?
9. How do leatherback turtles communicate?
10. How many of the leatherback's eggs survive?
11. Why are leatherback turtles valuable to poachers?
12. How do sea turtles breathe under water?
13. How big was the largest leatherback you've ever found?
14. How deep can the leatherback turtle dive and how long does it stay underwater?
15. How can you tell a male and female leatherback apart?
16. Is there a commercial use for the turtles?
17. How many eggs does a mother turtle lay?
18. Are the turtles afraid of people?
19. What is the main cause of death of leatherback turtles?
20. How big are the babies when they first hatch out of their shell?
21. Why are the sea turtles called leatherbacks?
22. How can you tell the turtles apart?
23. Do you think turtles make good pets?
24. Do you use a spotlight at night to help the baby turtles as they hatch so that birds don't eat them?
25. What made you interested in sea turtles?
26. What is the most endangered turtle in the world?
27. How old do leatherback turtles get?
28. Is it true that you can tell a turtle's age by the number of squares on its shell?
29. Do males and females differ in their behavior other than egg-laying?
30. Why do the turtles come back to the beach where they were born to lay their eggs?
31. Why do the nesting females return to the water, leaving their eggs on the beach?

Make Your Own Sea Turtle Costume

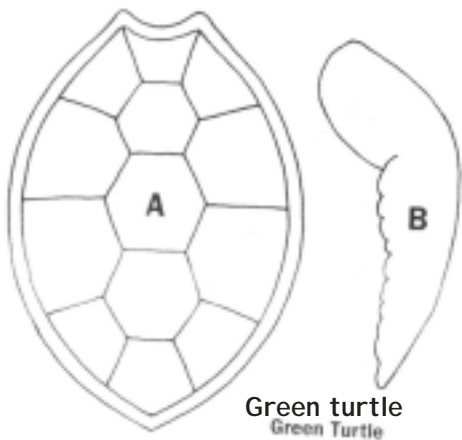
Note: Teacher or parent will need to enlarge pattern pieces to appropriate size.

Materials:

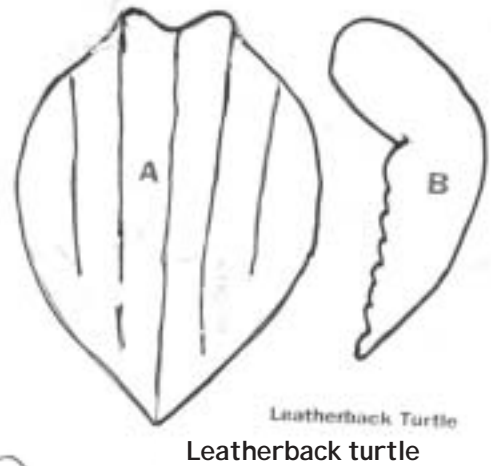
- 2 large pieces of cardboard (large enough to cover your body from shoulders to hips)
- 2 small pieces of cardboard (large enough to cover your arms)
- Thick dark-green string, rawhide or velcro straps
- Paint (colors will depend on the type of turtle you choose to make)
- Large paintbrushes or rollers
- Scissors or heavy-duty cutting knife
- Dark green hat, clothing and face paintss



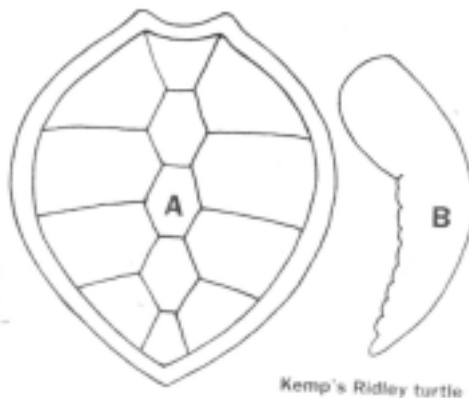
1. Pick a turtle. Which will you be?
2. Enlarge pattern piece **A**. Copy pattern **A** onto one of the large pieces of cardboard
3. Enlarge pattern piece **B**. Copy pattern **B** onto the other large piece of cardboard
4. Enlarge pattern piece **flipper**. Copy the **flipper** pattern outlines onto the smaller pieces of cardboard
5. Paint your top shell (or **carapace**) pattern according to the illustration of your favorite sea turtle.
6. Paint your bottom shell (or **plastron**) in the appropriate color.
7. Paint flipper to match the plastron. If you would like, you can attach **flipper claws** as well.
8. Cut out shells and punch holes to attach shoulder straps.
9. Attach straps by pushing string through hole and knotting it on the inside. Do the same to attach flippers, or use safety pins to attach them to clothing.
10. Dress in green clothing and green hat, and apply green face paint. If you wear your costume for Halloween, remember to use reflectors and a flashlight for safety.



Green turtle
Green Turtle



Leatherback Turtle
Leatherback turtle



Kemp's Ridley turtle

Note: Materials on this page are courtesy of the New England Aquarium's Education Department.

Kemp's Ridley

Membership Application

May 1, 2002 - April 30, 2003



Please send this application and your check made out to MME to:

Joseph La Pointe
67 Maple Street
West Roxbury, MA 02132
jglapointe@aol.com

I wish to become a member of MME New Renewal in the following category:

- | | |
|--|---|
| <input type="checkbox"/> Individual member (1 year) \$20.00 | <input type="checkbox"/> Affiliate member (1 year) \$100.00 |
| <input type="checkbox"/> Individual member (5 years) \$80.00 | <input type="checkbox"/> Student member (1 year) \$ 10.00 |

MAILING ADDRESS (please print)

Name _____
Title _____
Organization _____
Address _____

City _____
State _____ Zipcode _____
Telephone _____
Email address _____

Grades and subjects _____

Fax number (work or home?) _____

- Please check here if you **DO NOT** wish to have your home information published in our membership booklet.

Massachusetts Marine Educators
c/o Rick Schmidt
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