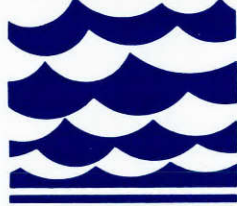


**TEXAS A&M  
SEA GRANT  
COLLEGE PROGRAM**



# Marine Education

DISTRIBUTED AS A PUBLIC SERVICE TO TEACHERS AND STUDENTS BY THE TEXAS SEA GRANT COLLEGE PROGRAM

## **Maritime museum underway in Rockport**

A detailed design model of the Texas Maritime Museum to be built in Rockport, Tex., is scheduled by the end of 1987, with construction set to begin in Spring 1988. Museum Executive Director Rob Robison says present plans call for the grand opening to be in Fall 1988.

The Museum, to be located adjacent to Rockport Harbor, will include both educational and entertaining programs that will attract both casual observers and dedicated students of maritime history. An extensive use of graphics, audiovisuals and participatory exhibits is planned. A complete schedule of educational programs that highlight maritime skills will be developed in addition to the museum exhibits.

Robison says the project was initiated by local civic leader Bill Christian and received official designation as  
(See *Museum*, page 2)

## **Experience Galveston at April 16 Symposium**

*Experience Galveston!* is the theme of the ninth annual Marine Education Symposium scheduled for Saturday, April 16, 1988, at Texas A&M University at Galveston. Co-sponsored by the Texas A&M Sea Grant College Program and Texas A&M at Galveston, the program is intended for students in grades 9 through 12, elementary and secondary teachers and other interested adults.

The change in location means a number of changes in the program, according to Symposium Coordinator Amy Broussard, all which "hopefully will increase the value of the day while introducing even more students to the marine environment."

The major program change calls for students to be divided into two groups, with one group attending lectures and the other field trips or workshops in the morning and a reversal of the arrangement in the afternoon. The Symposium will begin at 9 a.m. at the Galveston campus, with two clusters of lecture sessions and provisions for approximately 20 field trips, tours or work-

shops. All sessions and activities will be repeated in the afternoon.

"If past experience is a guide," said Broussard, "we can expect between 1,500 and 1,700 participants. Our goal is to be able to accommodate at least 850 in the lectures and another 850 in a field trip or tour activity at one time.

"The Galveston location enables us to do a number of things that students have requested in previous years. Not only will participants be able to visit a campus that is totally dedicated to marine-related studies, but they also will be able to experience the marine environment. Our field trips include visits to a marsh, a sandy beach, the Port of Galveston, the turtle hatchery and Sea-Arama Marineworld as well as many other places."

Lecture presentations will include sessions on sandy beach ecology, coastal planning, endangered sea turtles, marine mammals, marine sanctuaries, oceanographic research aboard ships, recently discovered hydrocarbon seep communities in the

(See *Symposium*, page 7)

## **Texas A&M at Galveston has new research emphasis**

Texas A&M University at Galveston has been one of the few universities in the country that offers an undergraduate major in marine sciences. Now, the University is moving into a new age — one that will see development of comprehensive research programs in addition to its ongoing undergraduate marine and maritime education programs.

This research emphasis is explicit in Senate Bill 1487 of the 70th Texas State Legislature, which states in part "Texas A&M University at Galveston shall be a research institute supporting the marine sciences and oceanography academic degree programs at Texas A&M University and The University of Texas at Austin. Research

endeavors benefiting the academic strength of Texas A&M University and The University of Texas at Austin or the economic strength of the State of Texas shall be conducted, with emphasis on establishing and maintaining an internationally recognized research institute. The Galveston institute may also contract with other institutions of higher education to provide research and other related services..."

In an effort to initiate collaborative research efforts between faculty at Texas A&M University and those at Texas A&M at Galveston, the Board of Regents recently approved allocation of \$500,000 to be administered by the Texas Sea Grant Program. Efforts are

already underway to study the Galveston Bay system and to attract established researchers to Galveston.

Joint programs with The University of Texas at Austin have also been initiated. Texas A&M and The University of Texas have combined ship operations to offer a joint chart repository and a communications center, and to exchange equipment and personnel. Future plans include headquartering the joint operations at the Texas A&M at Galveston campus.

These Texas universities also have been joined by the University of Miami in a bid to secure assignment of a major new ocean research vessel to be built by the U.S. Navy.



# Year of Ocean should be perpetual

*(The following letter to the editor was written by Larry Peabody, Forecaster-in-Charge and Marine Special Programs Meteorologist at the National Weather Service Forecast Office in San Antonio, Tex. It first appeared in the November 1987 of the **American Weather Observer**, and is reprinted here with permission of the editor.)*

On March 8, 1984, in a ceremony at the White House in Washington, D.C., President Ronald Reagan signed a proclamation declaring July 1, 1984, to July 1, 1985, as "Year of the Ocean."

The proclamation issued and signed by President Reagan read:

"I want to take this opportunity to recognize July 1, 1984, to July 1, 1985, as the Year of the Ocean. This special designation will heighten our awareness of the essential role of the sea in the life and future of our nation.

From its earliest days America has been a seafaring nation and a naval power, depending on the ocean for food, transportation and recreation. The ocean is a significant element in our national security.

As our country has grown, its ties to the sea have assumed greater importance. In this era of expanded need for resources, the oceans will play an even more critical part in helping mankind build a better world. To underscore this fact, I proclaimed in 1983 a United States Exclusive Economic Zone over all resources out to the 200-mile limit.

This great saltwater resource reaches, directly or indirectly,

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## Guest Editorial

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into every American life. Among other things, it provides fish for our tables, petroleum for heat and fuel, and waterways for transportation. It serves as our pathway to the rest of the world and as the medium for the majority of our foreign trade.

As we rely increasingly on the ocean's bounty, the demands for its resources will grow. The Year of the Ocean will provide an excellent opportunity to examine our ocean heritage and our ocean future as we approach the twenty-first century."

During this year, a nationwide observance designed to expand public understanding of the ocean's potential and problems, to promote ocean stewardship, and to help build a public-private partnership for the wise management of ocean resources was undertaken.

Efforts were concentrated to acquaint the nation with the ocean's benefits and the demands upon it; to strengthen the dialogue among those who use the sea; and to foster both its productivity and its health.

Perhaps most importantly, the year focused on stewardship, the wise management and conservation of the ocean.

On July 1, 1985, the Year of the Ocean "officially" came to an end.

In actuality, the Year of the Ocean should never end. It should be a perpetual event, unrestricted by calendar bonds. The Year of the Ocean should be a natural and continuing part of our lives, not just a passive honorary title,

all too quickly over, then forgotten.

The list of ocean problems is long and well known. Solutions do not come easily. Nationally and locally, communication and action among the many interests involved with the sea is needed.

Just within this decade America has been severely affected by events along our shores: killer hurricanes; oil spills; massive fish-kills; erosion of coastlines; man-made and natural pollution; loss of wildlife habitat; and littering of our coastal waters and beaches, just to name a few.

Most recently, worldwide attention has focused on, and national pride rekindled by, the America's Cup yacht races in Australia.

Also on the plus side, renewed knowledge and education of our marine environment and ecosystem has increased. But we still have a long way to go before nature, science, industry, technology and people combine resources toward a common goal.

What can you do to help preserve our ocean heritage? Become involved and become educated! Become involved in national, state and local decisions. Become educated to the problems facing our oceans and suggest possible solutions.

Simply put, become an active member of the year-round "Year of the Ocean" team!

*(Additional information and literature concerning the ocean and its environment may be obtained from the National Oceanic and Atmospheric Administration; the Sea Grant College Program or Marine Advisory Service representative nearest you; or from nearby scientific and educational institutions involved in oceanography and the marine sciences.)*

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Marine Education is to inform elementary and secondary teachers about current research and activities in the marine environment. Amy Broussard, editor. Letters to the editor should be sent to Sea Grant College Program, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553.

## Museum . . . .

*(Continued from page 1)*

Texas' maritime museum by the 1987 Texas Legislature.

Museum administrators are working with the Texas Sea Grant Program and the Texas Marine Advisory Service to develop a cooperative program that will depict the past and present impact of marine life and the maritime industries on Texas. Richard Tillman, Aransas County marine extension agent, will be officed in the museum building when it is completed.

The planned Maritime Museum is

the third educationally related facility to be announced for the Texas coast in recent months. The Texas State Aquarium is being developed in Corpus Christi, and a feasibility study currently is underway for a Marine Education Center to be built in Palacios, Tex. Representatives of these three developments will meet with Sea Grant and Marine Advisory Service representatives in December to explore ways to cooperate and assist each other in devising complementary marine education programs.



## Marine Facts

# 'Quiet' sandy beach teems with life

by Dr. Donald E. Harper Jr.\*

To a casual visitor walking along the waterline of a Texas sandy shore, the beach may appear utterly barren, devoid of life, with only dead shells and pieces of shells giving any indication that life exists in the vicinity. A frequent visitor will know that following a major storm, mollusks, crabs, annelids and other organisms may be cast onto the beach in huge numbers, but these animals are normally found offshore and are not part of the beach fauna. A frequent visitor will also note that there are periodic "blooms" of the small coquina clam, *Donax*. The average beachgoer, however, is completely unaware of the enormous numbers of small organisms living in the sand in the intertidal zone, how valuable these organisms are in the ecosystem, and how man's activities can disrupt the natural beach processes.

A sandy shore is comprised of several zones, all of which intergrade with each other to provide a smooth transition from one habitat type to another. A generalized classification of a sandy beach is shown in Figure 1. Farthest from the water is the dune system. Stable dunes are those covered by vegetation and relatively fixed in position. Active dunes are those closest to the beach proper, and are constantly being formed and destroyed by natural processes. Dunes may range in height from less than a meter to several meters depending on the beach location. The berm is a region of relatively level, usually dry and powdery, sand in front of the dunes. The next major region is the intertidal zone, or that part of the sandy shore that is alternately covered and uncovered by the tide. There may be a fairly sharp drop-off, called the scarp, where the berm and intertidal zone meet. Offshore from the intertidal zone there is usually a series of bars and troughs that parallel the beach.

Casual visitors may assume that the beach always has the same appearance. Frequent and observant visitors will be aware that the changes do occur in the beach; the beach appears to increase in height and breadth during the summer, then grow smaller and narrower during the winter. There is,

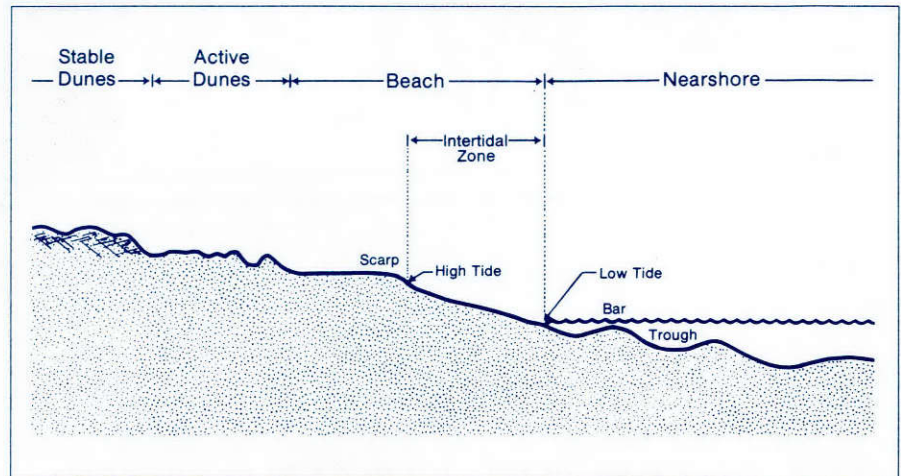


Figure 1. Diagram of major zones found on a typical sandy beach.

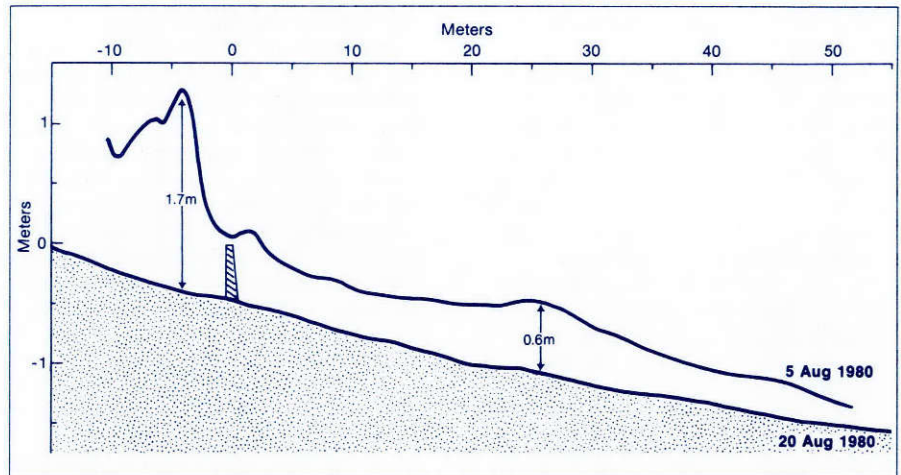


Figure 2. Comparison of beach profiles at Galveston Island before and after being impacted by waves from Hurricane Allen.

in fact, a seasonal cycle of beach building and destruction. During the summer, waves have less energy and a longer period, and under these conditions, sand is transported from the offshore bars onto the beach. In winter, waves are more energetic and have a shorter period, and sand is removed from the beach, added to the bars and the bars migrate offshore. In addition to this regular seasonal cycle, the beach is subjected to episodic events such as gale force storms or hurricanes. These intense storms generate large turbulent waves that can remove large volumes of sand from a beach very quickly. This is demonstrated by comparing beach profiles before and after the storm waves generated by Hurricane Allen in 1980 (Figure 2).

Another factor affecting the shape of the beach is the size and shape of the sediment particles comprising the beach. Coarse sand and pebble beaches tend to have steeper slopes than fine sand beaches. This is because of differences in porosity (the size of spaces between particles) and permeability (the ease with which water percolates through the beach). Porous, permeable beaches allow some of the water from a wave washing up the beach to percolate down through the sediment particles and return to the sea. Sand or pebbles being carried by the wave are dropped as the water percolates into the beach. Fine sand beaches, on the other hand (such as those at Galveston), have very little space between sand grains, and a wave will wash up the beach

\*Department Head and Associate Professor, Department of Marine Biology, Texas A&M University at Galveston.



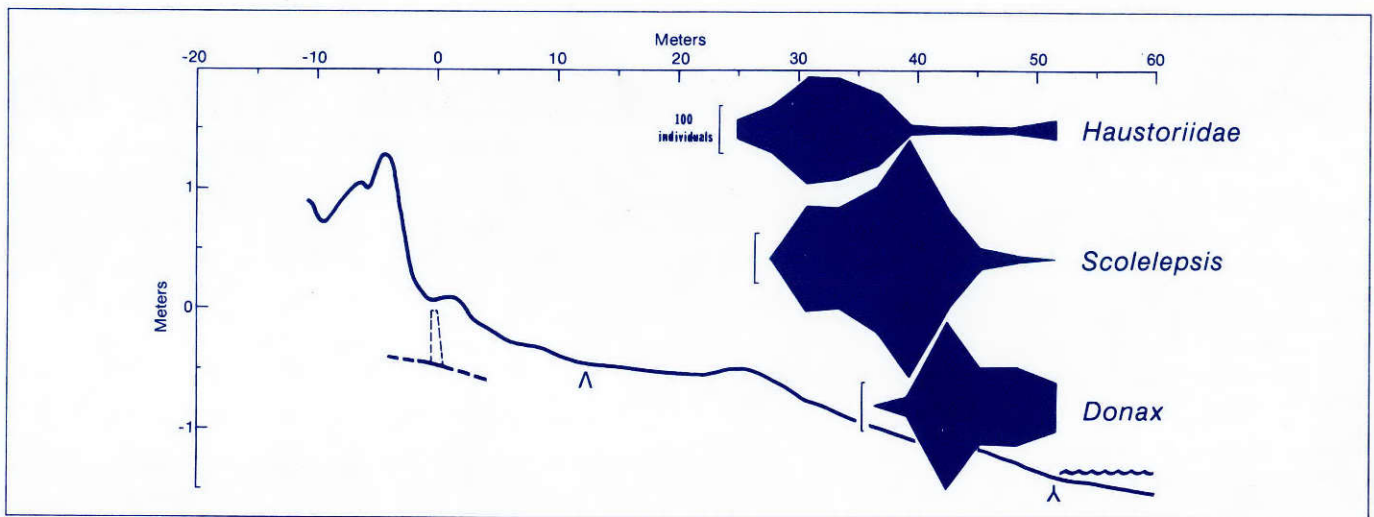


Figure 3. Typical distribution of dominant sand beach dwellers. (inverted V = high tide; inverted Y = low tide)

and back down again without losing much water to the sand. Sand carried by the wave tends to wash up the beach and back again with very little being deposited, creating a gently sloping beach.

Particle size and shape also play a role in determining what organisms inhabit the beach. Large coarse particles with sharp edges are much less hospitable than smaller rounded particles because the former tend to grind organisms as the sediment grains are rolled about by waves; volcanic beaches are notably inhospitable because of their sharp angular grains. The shifting characteristic of sandy beaches also precludes attached vegetation. Thus attached kelp and other algae, so characteristic of rocky intertidal surfaces, are absent. Most organisms that live in the intertidal zone are adapted to rapid reburrowing because of the tendency of waves to uncover and wash out intertidal inhabitants. The mechanical impediment to motion produced by sand also selects for organisms that are smooth and tapered.

Sandy beaches tend to be very stressful habitats. To survive, an organism must be able to adapt to heat, cold, exposure, low dissolved oxygen, excess salt (from evaporation) and fresh water (from rain), and be able to reburrow if exposed by waves. The rather harsh conditions imposed by the environment have resulted in relatively few species being able to adapt, but many of those species that do adapt develop enormous populations. This is due to reduced competition for resources. As one walks toward a Galveston beach through the dunes a number of hardy plants are encountered. Pennywort (*Hydrocotyle bonariensis*), bitter panicum (*Panicum*

*amarum*), smooth cordgrass (*Spartina patens*), beach morning glory (*Ipomoea stolonifera*), railroad vine (*Ipomoea pes-caprae*) and beach primrose (*Ocnothera drummondii*), are the dominant dune plants. Further south, sea oats (*Uniola peniculata*) and other plants may be more common. Moving beyond the active dunes, one usually crosses an expanse of dry sand, the berm, which may or may not harbor a number of insects. Some tiger beetles and staphylinid beetles are adapted to beach conditions, but appear to be less common on beaches subjected to vehicular traffic.

In the intertidal zone proper, the number of species remains low, but the numbers of individuals of those species often reaches hundreds or thousands per square meter; the lower mid-intertidal is often where the greatest overall abundances will be found. Three species comprise the bulk of this abundance on Galveston beaches as illustrated in Figure 3. Members of a family of amphipods, the Haustoriidae, are encountered first, followed by a polychaetous annelid, *Scolelepis squamata*, and then coquina clams in the genus *Donax*. Two types of *Donax* may occur on Galveston Island, *D. texasianus* and *D. variabilis*. *Donax texasianus* remains in the lower intertidal and subtidal zones. *D. variabilis* migrates up and down the beach with the tides.

Other organisms that may be found in the sand at low tide include the mole crabs, *Emerita* and *Lepidopa*, which may be seen scurrying over the surface of the sand and then disappearing into the sand after being washed out by a wave, the bright red polychaetous annelid, *Lumbrineris*, which burrows through the sand in search of food, and two snails, the moon snail (*Polini-*

*ces duplicatus*) and the olive shell (*Oliva sayana*) burrow through the sand in search of bivalves upon which they feed. The snails are generally easiest to find at low tide and can be located by the distinctive mounded trail of sand left by their passage.

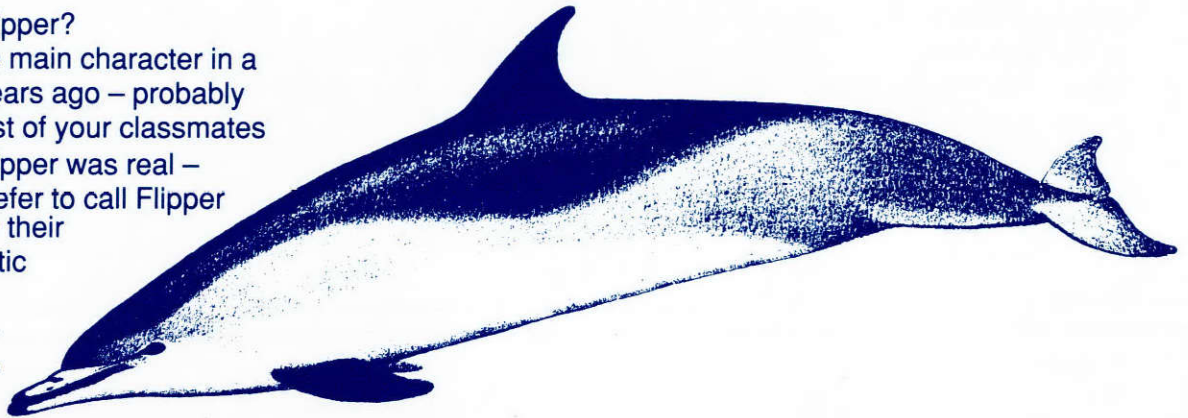
Several types of birds are often seen feeding on a sandy beach. These include laughing gulls, willits, sanderlings and black skimmers. Haustoriid amphipods, *Scolelepes* polychaetes and *Donax* clams feed on algal cells and other small particles. Birds feed on amphipods and polychaetes, and, if they are small enough, *Donax*. Snails and some fish also feed on *Donax*. There is a well-defined food web associated with sandy beaches.

Man's activities can have some profound effects on beach fauna and, thus, affect the food web. For example, the ALVENUS oil spill in August 1984 was associated with virtual elimination of sand dwelling organisms. It is not certain if the oil killed the organisms directly, or if the beach cleanup technique of removing large volumes of oily sand with road graders. Some organisms were also removed with front-end loaders. The net result was a depopulated beach within a month after the oil stranded. *Scolelepis*, which has a planktonic larvae, began repopulating within two months of the spill, and *Donax* reappeared within three months. The haustoriid amphipods still have not repopulated parts of the beach (as of September 1987). This probably is because they do not produce planktonic larvae and must creep or swim from one point to another as adults. This means that the birds have been deprived of part of their food source.



Ever hear of Flipper?

Flipper was the main character in a TV show many years ago – probably before you or most of your classmates were born. But Flipper was real – except that we prefer to call Flipper and his friends by their real names, Atlantic Bottlenosed Dolphins or, in scientific terms, **Tursiops truncatus**.



The bottlenosed dolphin is probably the most recognized species in the United States, since it is the one generally seen in marine aquaria shows. It also is the one studied most often since it is easy to capture and train, and is used by scientists and the U.S. Navy for a number of jobs.

Bottlenosed dolphins are bluish- or brownish-gray along their backs and basically off-white along their stomachs. They can be from 6 to 12 feet long when they are adults, and they have a curved dorsal fin in the middle of their backs.

### ***Bowriding or surfing***

These dolphins love to ride the bow of a ship and, occasionally, are seen riding the surf. They frequently live close to shore, in bays or lagoons, and are found in the Atlantic Ocean south of Cape Cod and in the Gulf of Mexico. They are very friendly, social animals, generally traveling in groups called pods, and seem to enjoy attention from humans.

Dolphins are quite curious – they spend a great deal of time investigating their surroundings. They have been known to approach swimmers, surfers and boaters although, by nature, they also are cautious creatures.

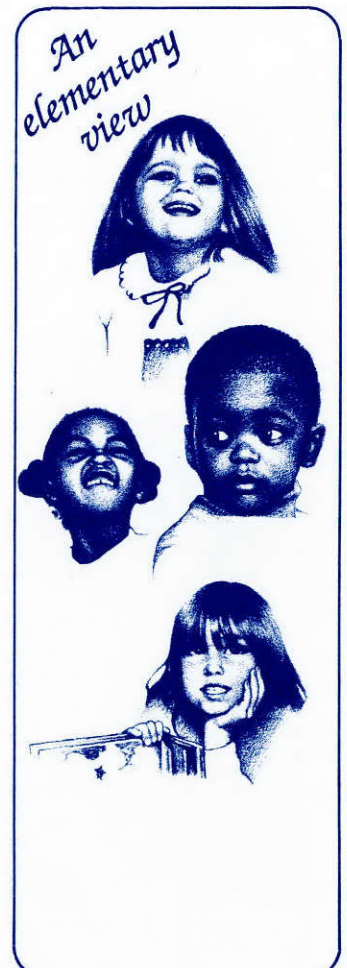
Bottlenosed dolphins seems to spend a great deal of time just playing, and many of the activities that we usually associate with trained mammal shows have been seen in the wild. This includes leaps, spins and tossing objects. Pods have been seen playing catch with fish or other objects, and pod members also chase each other and seem to engage in rough-housing.

There have been a number of stories told of how a dolphin has tried to rescue a drowning human. While this has not been proven, there are things about dolphins that make this possible. Many dolphins and whales are known to respond to distress signals from each other and from other species, and some have been known to attack other animals that are attacking one of their own kind. Dolphins certainly have shown an interest in man and seem to try to communicate with man, so perhaps they can respond to a human distress signal.

### ***Communication***

Dolphins certainly seem to have a very sophisticated form of communication – some people even believe they have a formal language. Even if this isn't true, dolphins can call each other, report information or danger, and "tell" another dolphin to perform a certain task.

When Flipper was a TV star, he was also portrayed as being friendly and helpful, and generally was the one who solved the weekly problems. The human actors with him were also friendly and helpful – they never did anything that might be harmful to the dolphin. Unfortunately, that isn't always the case in real life. Although humans are seldom found deliberately hurting dolphins, man's activities in the oceans are known to affect these playful mammals. Toxic pollution and oil spills have been known to cause dolphin illnesses or deaths, and trash – or just plain garbage – is an ever-present





problem. Dolphins feed on top of the water and they have been known to eat plastic bags or other manmade items that proved fatal to them. Most coastal states now have groups of volunteers who attempt to rescue stranded dolphins, as well as other mammals, and to nurse them back to health so they can be returned to the sea.

### Resources

**The Blue Whale**, Donna K. Grosvenor, Books for Young Explorers, National Geographic Society, 1977.

**The Blue Whale**, Kazue Mizumura; illustrated by the author, Thos. Crowell, New York, 1971.

**Dolphins**, Margaret Davidson, Scholastic Books, New York, 1964.

**A Closer Look at Whales and Dolphins**, Bernard Stonehouse, Gloucester Press, New York, 1978.

**The Dolphin and the Mermaid**, Ruth Carroll, Henry Z. Walck, New York, 1974.

**Dolphin Island**, Arthur C. Clarke, Holt, Rinehart & Winston, New York, 19763.

**The Great Whales**, Herbert S. Zim, Scholastic Books with William Morrow & Co., New York, 1951.

**Nine True Dolphin Stories**, Margaret Davidson, Scholastic Books, 1974.

**Sandro's Dolphin**, Karen B. Winnick, William Morrow & Co., New York, 1980.

**Sea Full of Whales**, Richard Amour, Scholastic Books, New York, 1974.

**Sea Mammals**, Dorothy Childs Hogner, Thos. Crowell, New York, 1979.

**Sharp Ears**, John Beatty, J.B. Lippincott Co., New York, 1938.

**Some Mammals Live in the Sea**, John F. Waters, Dodd, Mead & Co., New York, 1972.

**Splash the Dolphin**, Cynthia Overbeck, Carolrhoda Books, Minneapolis, 1976.

**Whales and Dolphins**, J.I. Anderson, Troll Associates, 1973.

**Whales – by the Kids of the San Juan Islands**, edited by Sally Anderson, Longhouse Printcrafters, Friday Harbor, Washington, 1979.

**Whales-Friendly Dolphins and Mighty Giants of the Sea**, Jane Werner Watson, Goldren Press, Racine, Wisc., 1975.

The Texas Marine Mammal Stranding Network is a group of volunteers who are dedicated to understanding and conserving marine mammals. When a mammal beaches itself, or strands, alive, these volunteers attempt to nurse them back to health so they can be returned to the sea. If the mammal is found dead on the beach, as most are along the Texas coast, they are moved to a laboratory such as one at Texas A&M University at Galveston for further study. Blubber, liver, kidney and muscle tissue samples, along with the stomach contents, are analyzed to determine the cause of death. These data are then used for various research.

During the first six months of this year, there have been 136 mammal strandings along the Texas coast. Most (126) have been bottlenosed dolphins. Three stranded alive, but only one survived to be released back into the sea. There also were two reports of **Pseudorca crassidens** strandings, the first reports of false killer whales on the Texas coast.

Most of these strandings were in March and April, which are birthing months. Unfortunately, the mothers and their babies sometimes don't survive. Generally, there are few strandings during summer months, with most occurring between November and April.

The Texas network is only one in the country. Nearly every other coastal state has a similar stranding network, and the data collected throughout the country are sent to the Smithsonian Institution in Washington, D.C. As scientists continue to study this material, perhaps one day we will learn why mammals strand and find a way to save more dolphins and whales in the future.

Jeannie Hamilton

Texas Marine Mammal Stranding Network

### Idea in the classroom

## Echolocation in dolphins

### Materials

Two wooden dowels the size of a broomstick  
Scarf or cloth to blindfold all students

Stopwatch  
Tapemeasure

### Procedure

This activity is best performed outdoors since most classrooms will not have enough open area.

1. Give one student two wooden dowels and station him or her 100 feet away from a building.
2. Place all remaining students 120 feet from the building.
3. Blindfold these remaining students. As the first student hits the dowels together, have all the blindfolded students slowly turn in a circle.
4. Describe the echo.
5. Select one blindfolded student to hold and run a stopwatch. **Start** the stopwatch when the dowels are hit together; **stop** it when the echo is heard.
6. How long did it take the sound to echo, or bounce off the building?
7. Move to within 50 feet of the building and repeat steps 3 through 6.
8. What is the difference in echo time?

This demonstrates a dolphin's ability to use echolocation to determine distance. The principle works the same in a human as in a dolphin.



# Beach Buddies collect 300 tons

More than 300 tons of beach trash and marine debris were collected along 158 miles of the Texas coast Sept. 19 as more than 7,000 Beach Buddies joined forces in Texas' annual Coastal Cleanup. The three-hour event, co-sponsored by the Center for Environmental Education and the Texas General Land Office's Adopt-a-Beach Program, included beaches from Boca Chica near the Mexican border to Sea Rim Park near the Louisiana border. Louisiana and Mississippi also held beach cleanups during national Coast Weeks.

CEE's 17 volunteer zone captains and Adopt-a-Beach county coordinators worked throughout the summer to coordinate local cleanups. Some zones attracted more than 1,000 workers.

"We would like to thank everyone for helping," said Linda Maraniss, CEE regional director and state cleanup coordinator. "People in Texas are concerned about the way the Gulf of Mexico is treated and concerned about the health of the coastline. They came to show their support for clean beaches and they have made a difference."

Beach Buddies were asked to complete data cards again this year, with more than 1,500 cards returned that are now being analyzed. Preliminary totals show 31,000 plastic bags collected, 15,000 six-pack holders and 1,700 pieces of fishing nets. CEE's public awareness campaign focused on the number of marine animals that die each year from eating or becoming entangled in plastic marine debris. Maraniss said the final report, and accompanying recommendations, should be available in early 1988.

A number of Texas teachers brought classes to aid in the cleanup effort. The Brownsville Independent School District adopted sections of beach near Boca Chica and students were among the 950 people who worked this zone. School buses from three Austin high schools left at 4 a.m. filled with science students who helped at Port Aransas and Padre Island National Seashore. Following the cleanup, volunteers were presented with "I'm a Beach Buddy" buttons and a special certificate.

Volunteers also had an opportunity to sign petitions at check-in points, asked U.S. Senators to ratify Annex V

of the Marpol Treaty. This provision, which will prevent ships from disposing of plastic in the world's oceans, was passed by the Senate on Nov. 5 by a 93-0 vote.

## Galveston Sea Camp dates set

The summer schedule for **Sea Camp** 1988 has been announced for students aged 10 to 12 and 13 to 16. The five-day camps, co-sponsored by Texas A&M University at Galveston, the Texas Sea Grant Program and Sea-Arama Marineworld, also include an advanced session for ages 14 to 17 from July 31 through Aug. 6.

Camps for the 10- to 12-year-olds will be June 26 through July 2 and July 10 through July 16. The teenaged camps will be June 5 through June 11, July 3 through July 9 and July 31 through Aug. 6. The advanced camp is limited to those with previous experience in the marine environment, such as prior **Sea Camp** attendance or an equivalent learning experience.

Using research vessels, oceanographic equipment, laboratory facilities, an oceanarium, an aquarium and a staff of marine professionals, **Sea Camp** enables students to learn about the ocean through first-hand, on-the-water experience. All sessions offer field trips to Galveston Bay and the marsh areas that consist of visits to shoreline study sites, such as marshes, beaches and the bay area where marine organisms, coastal plants and birds can be observed in their natural habitats. Laboratory and classroom programs also are conducted at Texas A&M at Galveston and at Sea-Arama.

**Sea Camp** also includes entertainment, as well as trips to local attractions and historical sites.

The cost for the basic **Sea Camp** is \$450, which includes tuition, room and board and entertainment fees. The advanced camp is \$500. A \$50 deposit is required with the initial application.

Those interested in receiving more information or an application form should contact **Sea Camp** Director, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553, or call (409) 740-4525. Registrations are processed on a first-come, first-served basis.

## Symposium ....

(Continued from page 1)

Gulf of Mexico, hurricanes, tourism and its effect on the marine environment, and marine occupations.

Current plans call for workshops on dolphins (to be conducted by Sea-Arama's Ken Ramirez), on oil spill cleanups, establishing saltwater aquaria, and on marine mammal necropsies. Field trips include a tour of Galveston's Tall Ship ELISSA and The Strand Historical District, collecting voyages aboard the ROAMIN' EMPIRE and the MARK IV, collecting trips to Christmas Bay, the beach and a marsh area, scuba demonstrations, a tour of Port of Galveston facilities, and a general sightseeing tour of Galveston Island.

The Texas Maritime Academy's training ship, the TEXAS CLIPPER, also will be open for tours.

The details of the Symposium will be included in a printed program that will be distributed early in January 1988. Registration packets will be mailed to all teachers who have attended in previous years, and to those who have requested materials for this year.

Registration is not limited to these

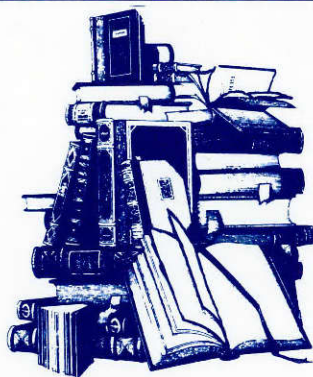
schools, however, and it is not limited to school groups. Individuals, or schools, not receiving a packet can still register by writing Marine Education Symposium, Sea Grant Program, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Tex. 77553, or by calling (409) 740-4460.

The preregistration deadline is March 1, 1988, and the cost is \$4 per person. Registrations received at the door will be \$5. Because of limited lunch facilities in the vicinity of the Galveston campus, plans are under way to offer a cash lunch at Sea Wolf Park, at the opposite end of Pelican Island from the campus. Complete details will be included in the registration packets.

"The Symposium has become an annual event for a number of schools," Broussard said, "but I do want everyone to understand that this year's event will be somewhat different. We are inviting everyone to **Experience Galveston!**, but this won't be nearly so much fun in your best clothes. This is a day for jeans, cutoffs and tennis shoes - whatever is most appropriate for sand, water and fun."



books



& things

A special presentation by Mr. and Mrs. Fish for elementary teachers will begin the 1988 workshop schedule at The University of Texas Marine Science Institute in Port Aransas. The nationally known marine educators from the Gulf of Maine Aquarium will be in Port Aransas Feb. 19-21 according to Coordinator Rick Tinnin.

Following the February workshop, Tinnin plans a Basic Marine Science workshop for both elementary and secondary teachers March 11-13, and a Birds of the Texas Coast session, again for both elementary and secondary teachers, April 15-17.

Workshop registration begins each Friday from 7 until 10 p.m. at the Institute's Visitor's Center. The March and April workshops cost \$45.00, which includes five meals, two nights in the dormitories and a registration fee. The Mr. and Mrs. Fish workshop fee is \$55.00. All workshops are limited to 30 participants.

"I ask that teachers who have attended a specific workshop before but are interested in a refresher course put themselves on a standby basis," says Tinnin. "The allows others who have not been able to participate in a given workshop to do so. All workshops are Texas Education Agency approved for AAT credit hours, and teachers who are not in a target audience are encouraged to inquire if space is available."

The registration deadline is the Friday preceding the week a workshop is scheduled. Further information or registration materials is available by contacting Tinnin at The University of Texas Marine Science Institute, Port Aransas, Tex. 78373-1267, or by calling (512) 749-6729.

The Institute for Chemical Education plans three summer workshops in 1988 designed to address the needs of elementary, middle and high school teachers with a wide range of back-

grounds in chemistry and science. The Institute, established in the University of Wisconsin-Madison Department of Chemistry in 1983, is a national center devoted to helping teachers revitalize science in the nation's schools. Workshops sessions will be offered at the Universities of Wisconsin-Madison, Arizona, California-Berkeley, Maryland-College Park and Northern Colorado, pending commitment of funds by the National Science Foundation and others.

The Chemistry Supplements Workshop is open to all teachers, from elementary and middle school teachers with little or no background in chemistry, through experienced high school chemistry teachers. Participants will practice, refine and share demonstrations and hands-on activities that they can introduce into classrooms.

Chemistry Fundamentals is intended for those who want to enhance or update their background knowledge. These teachers will investigate selected topics in depth, examine chemical phenomena, demonstrations, laboratories, problem solving techniques and effective ways to present scientific concepts.

Experienced high school chemistry teachers with strong backgrounds are eligible for the Chemical Instrumentation Update Workshop. Participants will work with modern chemical instruments, learn the theory involved, hear from researchers about current studies using the equipment, and prepare

materials for use in the classroom.

Exact schedules, more information and application forms are available from Institute for Chemical Education, Department of Chemistry, University of Wisconsin-Madison, 1101 University Avenue, Madison, Wisc., 53706-1396.

**American Weather Observer**, a tabloid newspaper published for the Association of American Weather Observers, includes a number of articles as well as data that might be useful additions for earth science or meteorology classes. The editor, Steven D. Steinke, is interested in hearing from teachers and has agreed to send a free sample issue to anyone who writes to him on official school letterhead.

Requests for sample issues should be mailed to Association of American Weather Observers, P.O. Box 455, Belvidere, Ill. 61008.

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