

# Flotsam & Jetsam

A Newsletter for Massachusetts Marine Educators

Summer 2007

www.massmarineeducators.org

Vol. 35, No. 4

## Marine Science Activities

### President's Message Ocean Education: Catch the Wave!



Take a globe and turn it so that you are looking at Antarctica. Hold it at arm's length and examine the surface of the earth for a moment from this unfamiliar perspective. You can spin it slowly clockwise to get the effect of earth's rotation. What do you notice as you look?

First, probably, that Antarctica is big and very asymmetrical. Next, though, you probably find yourself looking for land, and realizing that almost everything you can see besides Antarctica is ocean.

Earth is truly an ocean planet. Oceans cover 71 % of the surface with a volume of 1.37 billion cubic kilometers (328 million cubic miles). Oceans control weather and climate, and are the major force moving heat from the equator toward the poles. Marine phytoplankton in their teeming abundance are the major suppliers of oxygen to the atmosphere, and oceans take up more carbon dioxide annually than any other part of the carbon cycle. Yet in spite of their vast extent, oceans are subject to human influences, and conditions in the oceans are changing under pressure from overfishing, contamination, and warming temperatures. We citizens of the ocean planet today have the ability to study the ocean with tools and technology that were in the realm of science fiction just 50 years ago, but we also have an obligation to restore and protect this salty majority of our world. It's a huge task – how can we begin to understand and care for something so big and complex?

*President (cont on page 6)*

**Next Issue of F&J will be posted on the website September 15**

### Bringing Deep-Sea Research to the Classroom



Written by Carolyn Sheild with input from Susan Humphris and Eric Simms

Do you want to get your students involved in learning about the deep-sea and how scientists do research? Being a middle school teacher who is passionate about marine science, I try to incorporate the "ocean realm" into my Life

Science curriculum whenever possible. Fostering scientific inquiry and bringing out the scientist in each student is always invigorating. This article will describe web sites and curricular material that will help you immerse your students in the fascinating environment of the deep-sea as well as the research process.

There are two web sites that I use to help my students learn about the deep sea. Both of these

*Sheild (cont on page 4)*

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Members who would like to download the complete current issue of Flotsam and Jetsam from our web pages should do the following:  
 Under the graphic of the first page of the newsletter where it says to, click to open a new screen. After the current issue, click to download, and enter the username **mme** and the password (for this year) **cod** (both words all in lower case). Info will be mailed to all members in August for new access passwords

**Calendar 2007****July 23-27, 2007**

NMEA National Conference  
 Portland Me  
<http://gommea.org/downeast2007/>

**September 12, 2007**

MME Board Meeting.  
 Tabor Academy  
 Contact: Susan Nourse  
[Sue.Nourse@taboracademy.org](mailto:Sue.Nourse@taboracademy.org)

**October 13, 2007**

Boston Harbor Educators Conference  
 UMass Harbor Campus  
 Contact: Peg Collins  
[Ccndpclns@aol.com](mailto:Ccndpclns@aol.com)

**March 27-30, 2008**

NSTA National Convention & NMEA  
 Share-a-thon, Boston, MA

## A Coral Reef Decorates our School

Donna Maxwell, Art Specialist  
Potter Road Elementary School, Framingham, MA

*When can we begin the teaching of marine science? Who is qualified to teach marine science? This article is about art teacher Donna Maxwell using marine science as a hook for her first grade art classes. It is not necessary to be a science teacher to prepare an exciting lesson about ocean habitats. (Editor's Note)*

Just inside the front doors of the Potter Road Elementary School in Framingham, MA, a colorful coral reef and its inhabitants greet visitors. There is a distinct sense of depth to the setting as it is installed in and around a former coat rack area featuring both recessed and projecting surfaces. From the "ocean floor" to the water above it one can experience life in the coral reef thanks to the artful renderings of sea life and coral painted by 90 first grade students.



Coral Reef Coat Rack



Coral Reef Corner

Our first grade curriculum introduces students to a variety of habitats. For this lesson on the coral reef we began by looking at specimen coral. Is coral a plant or an animal? Ask any first grade artist and they will have the answer. We talked about how fragile and important the reefs are, and why. We continued our exploration

by reading **Coral Reef, Watch it Grow** by Kate Scarborough. This wonderful book illustrated the growth of a reef over an 1100-year period! There are so many different kinds of coral in the sea. We focused on finger coral.



Coral Reef Mural

Our finger coral grew from the shape of the artist's hands. Once the coral had been rendered onto the paper the artists indicated the textured surface with small black circles, then painted it colorfully. The coral was cut out and the final "reef" grew from the individual efforts. Then each artist was challenged to draw a large fish on 12" x18" paper. We discussed how fish breathe, what gives them their mobility, what they are covered in and what textures and patterns are evident. Posters of reef fish were provided for inspiration and each young artist produced an original drawing.



The Reef Fish

The fish were painted in a tempera color of the artist's choice. During our last class each fish or other reef dweller was further distinguished with the application of designs in oil pastel, then rubbed with crayon. This technique created new colors and textures that present a feeling of movement and fluidity to the surfaces.

The Coral Reef is an exciting addition to our school, and a reminder that together we can do great things.  
Pictures by Donna Maxwell - [dmaxwell@framingham.k12.ma.us](mailto:dmaxwell@framingham.k12.ma.us)

Sheild (cont from page 1)

web sites contain a wealth of information about the ocean environment and how it is studied, as well as providing opportunities for the public to follow research expeditions each year. *Dive and Discover* ([www.divediscover.whoi.edu](http://www.divediscover.whoi.edu)) is targeted at middle-school students (Grades 6-8) and the general public, but is structured to provide information to cover a wide range of educational experience. The backbone of the site is a series of educational modules that address basic science concepts central to marine science and research being conducted at sea. Some of the topics included are Deep Ocean Circulation, Earth's Anatomy, History of Oceanography, and Mid-Ocean Ridges. Students at our school learn about plate tectonics in sixth grade, but I review the information in seventh grade using the Plate Tectonics module on this web site. The "Milky Way" candy bar plate tectonics activity (included in this issue of F&J) is a great follow-up. Students have the opportunity to construct 3-D models of hydrothermal vents using clay or some other medium using information on the Dive and Discover web site. We also use the Vent Biology module to explore the differences between photosynthesis and chemosynthesis.

When a research cruise is taking place, I take my students to the computer lab to read the daily updates on the *Dive and Discover* web site, which include still and video images from the seafloor and shipboard operations. There are graphical representations of a wide variety of oceanographic data, explanations about the technology being used, and general information about life at sea and the scientists, engineers, and mariners that make oceanographic research possible. Following a research expedition as it is happening and learning about scientific discoveries as they are being made makes the scientific process more "real" to students.

In addition, a "Mail Buoy" on the site allows students to communicate directly by email with scientists at sea. My students really enjoy being able to send their questions to the researchers and shipboard personnel and receiving responses. I use this as an extra credit opportunity, where students comment on the experience of their correspondence as well as expressing their opinion about the answer they received.

Another web site that brings the intrigue of deep-sea hydrothermal vents and current scientific research to middle and high school students is the *Student Experiments At Sea* (SEAS) web site, [www.ridge2000.org/seas/](http://www.ridge2000.org/seas/), sponsored by the National Science Foundation's Ridge 2000 program.

Similar to the *Dive and Discover* web site, students and the general public have the opportunity to follow annual research expeditions and ask questions of the scientists and crew on the ship. A key component of the SEAS program is the "Classroom to Sea" mussel lab, where students conduct a classroom laboratory exercise that parallels research conducted by scientists at sea. Students compare their data with those collected by deep-sea scientists, and have the option of writing and submitting a report that can be entered in an annual Student Report Fair. Future SEAS program opportunities are anticipated to include enhanced opportunities for student and educator involvement in deep-sea hydrothermal vent research through collaborative efforts with the international GLOBE education program.

A comprehensive deep-sea curriculum is available on the SEAS web site for download by teachers. I have used many hands-on activities from this curriculum to make the study of the deep sea 'come alive' in my classroom. Here are some examples:



**Alvin dive hoola** - Students in Ms. Sheild's class simulate the discovery of hydrothermal vents in 1977 by using hoola hoops (ALVIN sphere), bottom images and flashlights.

Sheild (cont on page 5)

### Student Activity

One of the activities that Carolyn uses with her classes is called Feeding Strategy and Gill Size in Shallow-Water (or Intertidal) and Deep-Sea Hydrothermal Vent Mussels: Is there a difference? the activity with necessary data sheets comes from the SEAS "Classroom to Sea" Laboratory. This activity ready to use is posted at the curriculum section of the MME web site at the following link: <http://massmarineeducators.org/curriculum/>



**Volume displacement** – Part of the SEAS Classroom to Sea lab involves determining the ratio of gill volume to total body volume of mussels using graduated cylinders. Here, Ms. Sheild's students are making that determination.

- \* **ALVIN Dive with Hoola Hoops** (Cruise 1-Activity 6). Students get into hoola hoops in groups of three and move around in a darkened room with a flashlight, visiting sites with color images and making observations of what they find. This is a role-play of the discovery of hydrothermal vents in 1977.
- \* **Hydrothermal Vent Illustration and Model** (Cruise 3-Activity 1). Students fill in a colored pencil worksheet illustrating the flow of cold water into the earth's crust and hot water coming out of hydrothermal vents. Then the teacher uses a tank model with colored water to simulate a hydrothermal vent; this demonstrates the interaction of hot and cold fluids due to differences in density.
- \* **Surface Ocean Food Web and Seafloor Food Web** (Cruise 4-Activity 1). Students use cut outs of organisms to construct posters and examine the flow of energy in these two ecosystems.
- \* **Using Photo Images to Sample Mussels on the Seafloor** (Cruise 4-Activity 3). Students collect data from a mussel bed photomosaic using grids and transects to learn about sampling and correlations.



**Mussel sampling** (previous column) – Ms. Sheild's students use quadrat sampling to determine percent cover of mussels on the seafloor. The photomosaic images and lesson plan are available through the SEAS web site.

Many of these activities, including the mussel dissection lab, allow students to BE scientists, which is very valuable. By following research cruises via the internet, students feel a connection with marine scientists active in the field. I encourage you to use these web sites and curriculum to bring the thrill of discovery of the deep-sea to your classroom.

NOTE: The next *Dive and Discover* cruise will take place from 1 July – 10 August 2007 in the Arctic Ocean. Scientists aboard an ice-breaking ship will send autonomous underwater vehicles through the ice to the seafloor to find hydrothermal vents.



**Getting in Alvin** - Carolyn Sheild climbs into ALVIN for Dive #4313 on Jan. 29, 2007.

**Experience of a Lifetime:** Carolyn Sheild was selected to be the 2007 *Student Experiments At Sea* (SEAS) Teacher-at-Sea, due to her students' successful involvement with the program. In January, she participated in a month-long research expedition to the East Pacific Rise, working alongside scientists from various research institutions who conducted research on hydrothermal vent systems. The ALVIN submarine was used to gather data, and Carolyn was fortunate enough to be able to go on a dive (see photo). While at sea, she explained the scientists' research and aspects of shipboard life via the web site, <http://www.ridge2000.org/SEAS/>. Information about this research expedition is still available on-line.

Carolyn Sheild teaches seventh grade science at Clarke Middle School in Lexington, MA and may be contacted at [csheild@sch.cl.lexington.ma.us](mailto:csheild@sch.cl.lexington.ma.us) if you have questions about deep sea curriculum,

**All photographs are courtesy of Carolyn Sheild.**

Please see accompanying activity on bottom of page 4.

## Editor's Notes

Flotsam and Jetsam continued its transformation over the past school year. The Journal has continued to bring to you current up to date marine science information this year. In four issues we have presented issues that have looked at

### **Oceans and Climate Change**

### **Marine Animal Stranding**

### **Remote Sensing in Oceanography**

### **Marine Science Activities (this edition)**

In each case we have sought out and received materials from scientists in the field and educators who are familiar with the topics at hand. At the same time we have devoted space to current MME activities.

In this issue, we are highlighting marine science activities. Each activity is prepared in a standards based format, and MA Frameworks as well as National Standards are cited. Some of the past issues have used hyperlinks to send you to marine activities from other sources.

Our plans for coming year journals are as follows:

Fall - Salute to Stellwagen Bank NMS

Winter - Ocean Floor Geology

Spring - International Polar Year

These topics are planned, and they might be moved an issue away, based on hot topics which may appear.

Each issue will still have information on upcoming and just held MME activities, in some cases with links to other parts of the website

Our membership roster has been updated, and as a result, all members will receive, in August, a 2007-2008 MME Membership Card. On the back of the card will be new password information for accessing the next year's Journals on line. There will also be information on how to get a hard copy of each Journal if you do not have computer access. We will also send to each member whose e-mail is on file, a notification each time a new copy of F&J is posted on the web site.

Your board of directors and editor would like to hear your comments on each issue of the Journal. They can be sent to the president, Pat Harcourt at Waquoit Bay National Marine Estuary in Falmouth MA, or our editor at 7015 Avondale Road in Fort Collins, CO. 80525.

I would be remiss if I did not thank Doug Corwine, our Managing Editor and webmaster for his work in putting each issue together after I get the materials to him. His skills have made this a successful year. We sincerely hope that you are enjoying the new format for F&J.

*Howard Dimmick - Editor-in Chief*

*President (cont from page 1)*

That's where Massachusetts Marine Educators comes in. We are a group of colleagues who love the ocean and want to share the richness, variety, and just plain fun of teaching about all ocean-related topics from ocean research to maritime art. We share classic and novel teaching ideas, swap ocean news, and meet at the Massachusetts coast as often as possible. Members of Massachusetts Marine Educators can often be identified in school as the teacher with the papier maché fish hanging from the ceiling and aquaria bubbling in the corner. We learn as much as we can about oceans and share our knowledge and enthusiasm with students, administrators, and parents. If you want to teach about oceans, MME is your best resource.

Besides the natural affinity people have for the ocean, which makes marine-themed lessons engaging for all ages, there are deeper currents carrying marine education forward. If you look beneath the surface of a lesson on oceans, you will find serious educational goals supporting the plankton tow or density experiment. Teaching about oceans is the most powerful way to establish ocean literacy, the key to supporting future research and sustainable use of the ocean and its resources. Moreover, ocean topics fit nicely into the content requirements stipulated by the state Department of Education, and ocean topics are naturally interdisciplinary, providing plenty of opportunities to compliment science and math activities with writing and social studies lessons.

Massachusetts Marine Educators stands ready to provide you with teaching ideas, information, and even opportunities to get out on the water and encounter the ocean in person. Don't hesitate-dive right in and join us. The water's fine!

### **Pat Harcourt**

*President, Massachusetts Marine Educators*



## Strandings – a Personal Odyssey

Don Lewis, MME Board Member & Cape Cod Consultants

Part 2 of 2 Parts

In our winter Journal, Don Lewis reported on his experiences working with other professionals on Cape Cod as they deal with marine animal strandings. In this installment, he continues his report. (Editor's Note)

### Furry Fuzz Balls



For the last few years, the number of juvenile harp seals found along the beaches and in the marsh channels of the Outer Cape has increased sharply. Usually these critters are simply looking for a place to sit out storms in “hurricane holes” or to find a spot for some piece and quiet. There is a federal prohibition on disturbing these marine mammals, and the public is directed to give them a wide berth

Many of the animals I run into during my patrols of the Cape Cod coastline are healthy juveniles, just sniffing the breeze and enjoying the isolation of the Outer Cape in winter, like this wonderful harp which gave me the impression of a contented kitten. I snapped its picture with a telephoto lens and moved on before it even opened its eyes.

Still,  
about one in  
five pups

I've encountered has not shown the same healthy demeanor. When examined by vets, they are often discovered to have gastro-intestinal obstructions from eating sand which they may have mistaken for ice and snow. These sick critters need attention. When discovered, the public first needs to alert the stranding network for an assessment by a wildlife professional. Seals, even sick and injured ones, can be cantankerous; they can give you a nasty nip if you don't take the right precautions. But who could resist trying to save such a beautiful, if helpless, animal?



### More Than 1,000 Rescued

Each year endangered sea turtles such as loggerheads, greens and especially Kemp's ridleys find their way from subtropical regions to Cape Cod Bay. Most are juveniles which began their journey within the Atlantic gyre as mere hatchlings and reach the shores of New England during their wild oats youth.



For ridleys (on the left), the lion's share of turtles falls within the two and three year old range. For loggerheads (next page, top), they're largely two through five years old.

Greens are similarly young. For each of these turtle species, this visit to the Cape marks a one time event ... an experience of a lifetime, I guess.

In fall, many of these turtles become trapped in the natural hook of Cape Cod. As water temperatures plunge and gales pound the Northeast, juvenile

Lewis (cont on page 8)



turtles ranging in size from three to over a hundred pounds, are tossed on bay-side beaches, cold-stunned and near hypothermic death. This phenomenon was first recognized in the late 1970s by Bob Prescott, now the director of Mass Audubon's Wellfleet Bay Wildlife Sanctuary and sea turtle stranding coordinator. He single handedly activated and organized rescue efforts on the Cape, building it into an annual campaign responsible for saving over a thousand of the world's most endangered sea turtles.

Rescuers patrol storm-battered shores night and day to recover animals as soon as they strand at high tide to increase the odds of their survival. Labs and classrooms at the sanctuary are transformed into triage, emergency and recovery rooms where turtles are stabilized before other volunteers transport them to the New England Aquarium in Boston for medical treatment and rehabilitation.



The stranding pace has intensified over the last two decades, increasing from an average of sixteen per year in the early 80s to over 100 a year since the turn of the century.

### Tiny

While each turtle I've rescued from sure death on an icy winter beach has created an indelible moment in my memory, the recovery of "Tiny" on November 17th, 1999 may have been the most memorable. The year 1999 set the record for sea turtle strandings on the Cape with nearly 300 animals found on beaches during November and December. On the night of the 17th, we were patrolling the 9 p.m. high tide through Brewster and Dennis. The wind howled from near due north at 30 knots, slicing the top off cresting waves and pelting the beach with briny spray. As we leap-frogged along the coast, sand blasted our faces as we scoured beaches along the seaweed strewn wrack line.

At each beach we rescued a Kemp's ridley or two, and lugged it back to the unheated jeep. ASIDE: Cold-stunned turtles cannot be excessively heated, no more than 5 degrees a day; so vehicles must remain cold during transport from beach to ER. As I walked Breakwater in Brewster with a ridley under each arm, Bob Prescott called me on cell phone. "Don! Get over here to Sea Street as fast as you can. I've found the largest sea turtle I've ever seen."

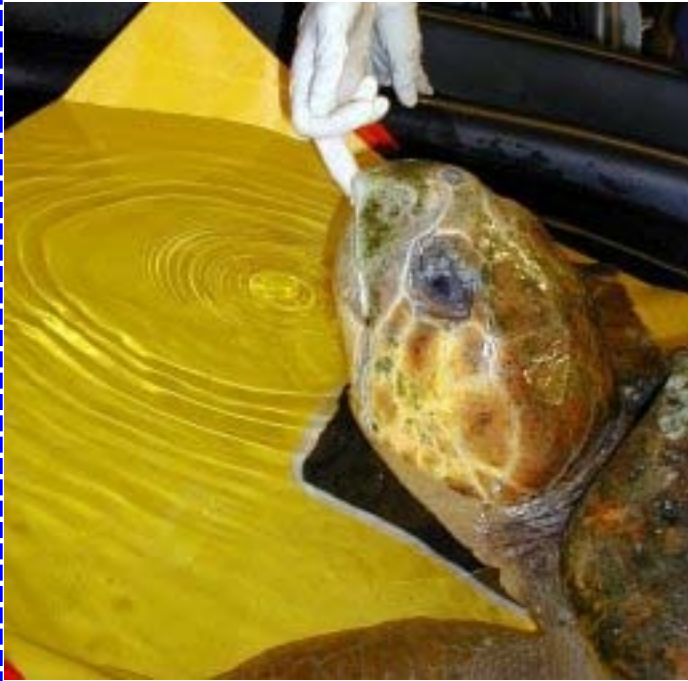


I assembled the other two rescuers and headed to Sea Street in Dennis. We met up with Bob and walked a half mile back down the beach to see a 200 pound mature female loggerhead. She had been tagged ten years earlier nesting in North Carolina, and that tag had miraculously fallen off her flipper right on the beach as she stranded. Not



simply a cold-stunned animal, this turtle ... whom we nicknamed "Tiny" because of her less than diminutive size ... had a cracked shell from a boat strike which had paralyzed her right rear flipper. Thus compromised, even her adult size could not protect her from the elements.

We pondered how to get her off the beach without a stretcher. We could lift her by the shell, but the additional stress this would place on her organs might kill her. Luckily one of the rescuers had taken delivery of a new stove that day and still had the carton in his pick-up. We used it as a stretcher and hauled her back to my jeep, and then to the sanctuary for emergency treatment.



We placed her in a plastic swimming pool to relieve her of gravity's pull on her organs. But Tiny was so weak she could not lift her head on her own to breathe. Each ten minutes we lifted her head above water to give her a chance to catch a breath.

It was nip and tuck for the next couple of days. I had to sweet-talk a local clinic to give us a fetal heart monitor to check her pulse. She nearly died twice en route to New England Aquarium for more intensive treatment once we had her stabilized. Then, nearly ten months later, and after several operations to repair her paralysis, a hefty 250 pound Tiny was released from Marathon Florida, a healthy and happy loggerhead sea turtle. We can't wait to hear that she has resumed nesting in North Carolina.

### Release

In the end, all the wintry patrols, all the heroic rescues, all the medical treatment, all the months of rehabilitation, all these steps mean nothing if we don't reach the end state: release of these endangered animals back into the wild to help with the recovery of sea turtle populations. So, those digital images we receive from our colleagues at Mote Marine Lab when they release our Kemp's ridleys, or the snapshot from Marathon when Tiny is taken out to sea, these are the moments that make all the sacrifice worth while. And the very best moment is when we have the opportunity to release our own turtles, as in this image of Dennis Murley of Wellfleet Bay Sanctuary releasing a juvenile green sea turtle at a beach in Osterville on Cape Cod.



All Photo Credits Don Lewis



## Take a Whale to School...

By J. Michael Williamson  
Associate Professor-Science, Wheelock College  
Director - WhaleNet



Figure 1: Lucy – The Inflatable Whale

*Imagine your child coming home from school and yelling “**Hey Mom, I was in a whale at school today!**” You think to yourself, “What is she talking about?” Well this happens more than you think.*

### Background

I have been teaching about the oceans and marine sciences since 1973, and I have been researching blue whales since 1980. In that capacity, I visit schools, make presentations, and spread the word about whales and the importance of the marine environment. Among other various questions like “How close have you been to a whale?” students always ask “How big is a whale?” I tired of the same mundane answer of “They are a big as a school bus.” So one day I decided to make a model that I could take to schools to show students how BIG a whale is. While stuck in one of Boston’s notorious traffic jams I made a prototype of the model using an extra piece of paper and my Swiss army knife. I then enticed my Senior seminar class at Wheelock College in Boston, Massachusetts to develop this project as part of a class activity on problem solving. The challenge was “to make a life sized whale model that fits into a duffle bag and can be carried by one person. Eventually “Lucy”, named for the founder of Wheelock College, was born. Actually, the original Lucy was born. Since that time hundreds more Lucy’s have been created. I not only made Lucy the Inflatable Whale for myself, but I also developed an instruction booklet that allows anyone who wishes to make his or her own Inflatable Whale. Classes, community groups, churches groups, and museums all over the country and world have constructed their own whales. Institutions such as the Boston Museum of Science and the Bermuda Underwater Exploration Institute have exhibited their own inflatable whale models.

In the beginning I had no idea the impact that Lucy would have on students of all ages, but watching the students eyes get a large as the whale as it inflates is an experience in itself. I now have Lucy III. The first two saw at least 20,000 students pass through their interiors. One day while visiting a school in Connecticut, a teacher came running up to me, grabbed my arm, and said, “You can’t believe what just happened!” At this point in the day after what seemed like the 200th fifth grade class, I had no idea what might have happened. Excitedly and seemingly breathless, the teacher said that they had an autistic student who hadn’t uttered a real word much less a sentence in two years, who saw Lucy and the other students and said to her teacher “I want to go in the whale.”

*School (cont on page 11)*

**Science Teaching: A State of Mind**

In addition to teaching about whales I instruct teachers that science really isn't "scary." It can be fun and exciting to teach science if you aren't afraid to answer a student's question at times with, "I don't really know, but I do know how we can find out." Within the instruction booklet, I include some seed activities that can lead to more investigations. I help launch the boat, and the class and the teacher then sail off on their own adventures.

**Creating Lucy: You can do it!**

The learning experience begins with the problems of constructing the whale. Where do I begin? How do I interpret the instructions and organize the crew? It usually takes four or five adults about 5 hours to construct the whale. The more students you have helping the longer it takes, but that is part of the adventure.

The construction is like sewing with plastic and tape instead of fabric and thread. The instructions in the booklet have been field tested, and I have had relatively few questions by phone and email on construction, which I've been glad to answer.

The crew uses some math, some materials, some problem solving, some organizational skills, and some ingenuity, but the project gets completed. The first time the whale inflates is a real show stopper. The inflation of the finished whale is usually a media event for the school and the local papers. Seize the opportunity.

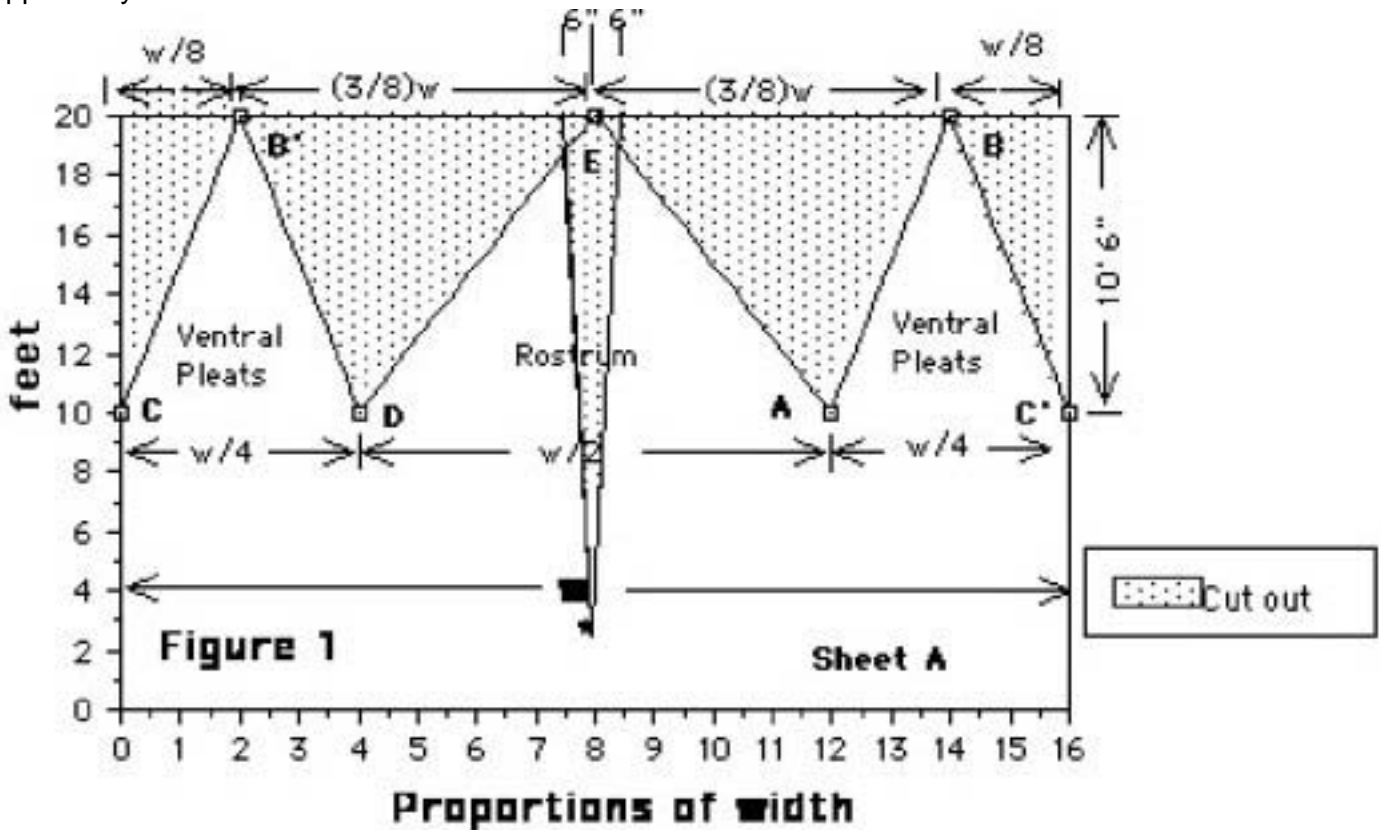
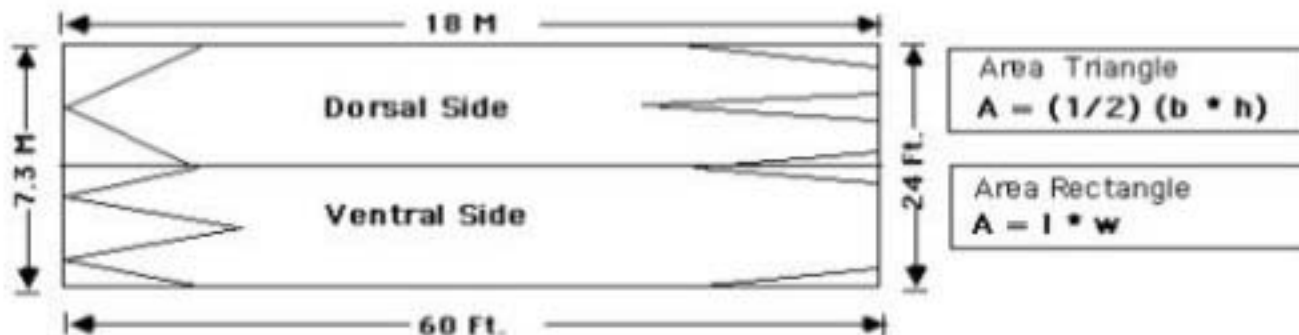


Figure 2: Construction of the head.

Educational units on life science (whale anatomy), physical science (air pressure), and mathematics are included in the booklet. Students can research questions such as:

- \* How does the whale stay inflated?
- \* What is the surface area and volume of the whale?
- \* Why is the surface area to volume ratio (SA/V) so important to a whale?
- \* How is the SA/V ration different from that of plant plankton (phytoplankton)?
- \* Why is the SA/V ratio different?

**Surface Area Diagram**



**Volume Diagram**

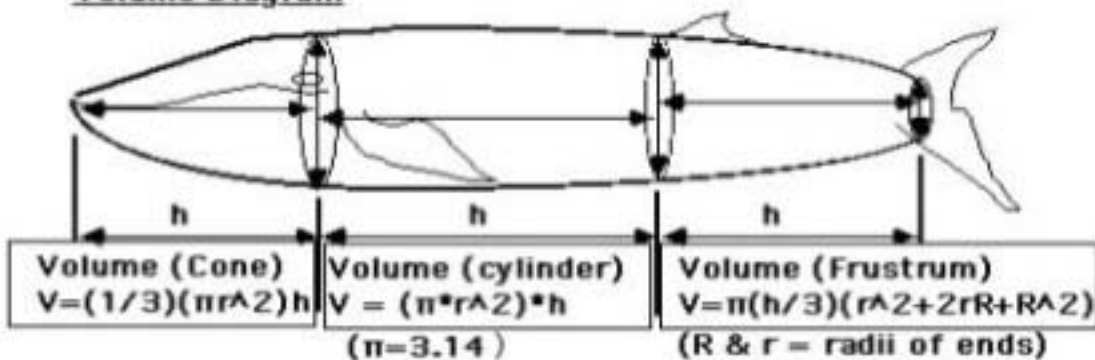


Figure 3: Mathematics - Surface Area and Volume

The students use proportions (Table 1) to determine the placement of the eye, the flipper and the dorsal fin using data taken from actual whales. They use mathematics to calculate the surface area to volume ratio of the whale (Figure 3).

The eye is about 22% of the whales length back from the tip of the snout. How long is the whale model? So where does the eye go? The flipper is about 35% of the whales length back from the tip of the snout? So where does the flipper go? The breadth of the flukes is about 23% of the whale's length (wow!!) So, how wide do we make the flukes?



Figure 4: Lucy's clear side

Table 1: The Anatomical Proportions of a Blue Whale (balaenopterid)

**Anatomical Dimensions for your whale**

**Use the average body dimensions in percent body length of YOUR model.**

Balaenoptera musculus	14	19	3	4	1	9	20	12	21	22
Number	14	19	3	4	1	9	20	12	21	22
24 Avg.										
Sex	f	f	f	f	f	f	f	f	f	f
Total Length (feet)	77	75	74	74	72	72	70	67	65	66
61 69.8										
	%	%	%	%	%	%	%	%	%	%
Tip of Snout to eye	21.8	21.7	21.6	22.1	20.9	21.5	20.3	21.6	20.	21.
220.	21.2									
Tip of Snout to blowhole	18.9			18.8			17			18.3
Tip of Snout to post. base pectoral	34.4	34.7	34.1	35.4	33.8	35.5	34.4	36.2		34
Tip of Snout to post base of dorsal	76.9	77.3		78.9	72.0		75.7			76.2
Length of pectoral from post base	10.6		11.1	10.3	10.8	9.0	10.5	10.0	11.0	10.9
Length of pectoral fr hd of humerus	15.2	15.4	14.9	15.8	13.9	15.3	15.5	15.9	15.8	15.3
Greatest breadth of pectoral	4.1		3.8	3.8	3.7	3.6	4.1	3.8	3.9	4.1
Height of dorsal	1.1	1.1	1.0	0.9	1.4	1.1	1.9	0.9	1.4	1.2
eye to ear										
Length of longest whalebone										
Lower jaw beyond upper										
Breadth of flukes	23.3		24.4	25.6	24.1	20.3	20.4	19.6		22.5



Figure 5: "Bob" The Whale in Vermont

**The Adventure**

The voyage of learning should never be complete. "Lucy" offers one more leg of the journey. "Lucy" The Inflatable Whale offers a hands-on, minds-on, multidisciplinary adventure that most students and teachers never forget. The inflatable whale models have been used as reading rooms where upper class students read stories to lower classes, as senior projects in biology, as temporary classroom areas to study scientific concepts, as bible school's Jonah and the Whale activities, and other unique learning experiences. Remember, "Lucy" should be the launching point not the destination to your learning journey.

You can visit WhaleNet at <http://whale.wheelock.edu> to download more educational resources and information on the marine mammals that inhabit the oceans of the world. WhaleNet offers real-time satellite tagging data on marine animals. There you can find active and archived satellite tracking data on over 100 other whales, dolphins, porpoises, seals and sea turtles. The Lucy page is at <http://whale.wheelock.edu/whalenet-stuff/LucyPage.html>. Log on and reap the educational rewards of the deep.

**J. Michael Williamson is the Director of WhaleNet and an Associate Professor of Science at Wheelock College in Boston, Massachusetts. He is also the Associate Director of the Mingan Island Cetacean Study ([www.rorqual.com](http://www.rorqual.com)), and he has 30 year of experience in whale research.**



Most of us are quite proud of what we accomplish daily in our work. Experience has been a good teacher, enabling us to use good judgment so that our personality, knowledge, and skills can bring successful results.

We can always sit back and just do what we know works, or we can push forward to try and do even better. Doing even better is a result of becoming inspired. Inspired by innovation, by new ideas. But how does this inspiration come about? Where are these new ideas to be had? You can find these new ideas as well as become part of a national network of valuable resources by attending the National Marine Educators Conference a year from this summer in Portland Maine July 23 - 27, 2007.

“NMEA 2007” as it is called, is more than sharing and gaining ideas. It’s about joining together with like-minded people from all over the USA to celebrate our “Downeast” part of the world, in a spirit of fun, laughter, and exploration.

We hope you will start planning now to join us for the National Marine Educators Association 2007 conference to be held in Portland, Maine.

Save the dates: July 23 - 27, 2007! For information go to here <http://gommea.org/downeast2007/>



## Earth's Crust Missing In Mid-Atlantic

*Science Daily* — Cardiff University scientists set sail (March 5) to investigate a startling discovery in the depths of the Atlantic.

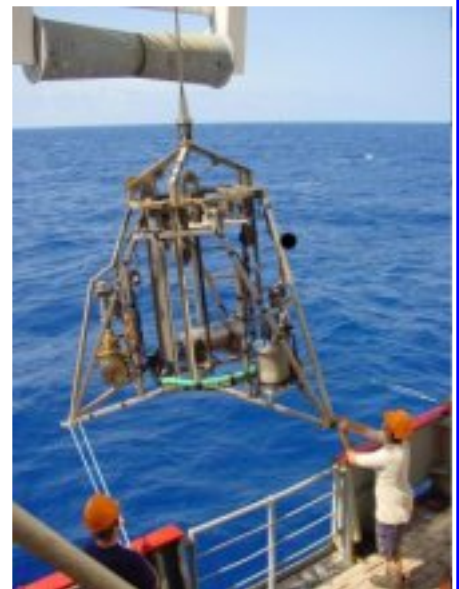
Scientists have discovered a large area thousands of square kilometres in extent in the middle of the Atlantic where the Earth’s crust appears to be missing. Instead, the mantle - the deep interior of the Earth, normally covered by crust many kilometres thick - is exposed on the seafloor, 3000m below the surface.

Marine geologist Dr Chris MacLeod, School of Earth, Ocean and Planetary Sciences said: "This discovery is like an open wound on the surface of the Earth. Was the crust never there? Was it once there but then torn away on huge geological faults? If so, then how and why?"

To answer some of these questions Dr MacLeod with a team of scientists, led by marine geophysicist Professor Roger Searle, Durham University, will travel to the area which lies mid-way between the Cape Verde Islands and the Caribbean.

The expedition will be the inaugural research cruise of a new UK research ship RRS JAMES COOK. The team intends to use sonars to image the seafloor and then take rock cores using a robotic seabed drill. The samples will provide a rare opportunity to gain insights into the workings of the mantle deep below the surface of the Earth.

Progress of the cruise can be monitored via a live web link to the ship <http://www.noc.soton.ac.uk/gg/classroom@sea/JC007/>



A drill will be used to extract samples of the exposed mantle. (Credit: Image courtesy of Cardiff University)

## CLASSROOM ACTIVITY

### Milky Way Candy Bar Plate Tectonics Demonstration

The following activity can be done after students have been introduced to the different types of plate tectonic boundaries, to help them visualize what can happen at each. The only materials needed are a small Milky Way candy bar for each student. Make sure you are aware of any student allergies before beginning the activity.

Before passing out the candy bars, tell the students that they must follow directions and do what you say when you say to or you will take their candy bar away. This works every time to assure that the students pay attention.

#### Materials

- Small Milky Way Candy Bar for each student
- A paper towel for their desk

Massachusetts Science, Technology and Engineering Standards  
Earth and Space Science Grades 6-8

#### Earth History

- \* Describe how the movement of the earth's crustal Plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes)

National Science Education Content Standards  
Earth and Space Science Grades 5-8

- \* Lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle. Earthquakes, volcanic eruptions and mountain building result from these movements.

#### Procedure:

1. With the wrapper on, tell students to crack the chocolate on the surface of the candy bar. This can be achieved by pressing gently on the surface of the chocolate. You are creating tectonic plates.
2. After plates are created, have students slowly remove the wrapper and visualize what they have done to the "surface of the earth".
3. Then instruct students to hold the two ends of the candy bar by the sides. Have them slowly pull the candy bar apart until the caramel is visible. Ask the students what type of boundary they are creating, and what can occur at that type of boundary. (This illustrates a divergent boundary; you are seeing "magma" (caramel). Earthquakes, volcanic eruptions, ocean ridges, and hydrothermal vents can form at this type of boundary.)
4. Now have students push the candy bar together until "mountains" are formed with the chocolate. Ask the students what type of boundary they are creating, and what can occur at that type of boundary. (This is a convergent boundary that creates mountains). Also inquire whether any students got plates to subduct. Explain that this is how ocean trenches, along with volcanic mountains, or chains of islands are formed. At this point I encourage students to share their earth surface features with students around them- they love showing off their mountains!
5. Next have students gently pull the candy bar apart, but only enough so some mountains subside. Then have them slide the chocolate plates past each other to illustrate a transform plate boundary. Again, ask students what can occur at this type of boundary (earthquakes).
6. Tell the students that we wouldn't want anyone to get hurt during an earthquake, so they'd better eat their candy bars!!
7. A class discussion can be held at this point to help students understand the types of plate boundaries.

Developed by Carolyn Sheild  
Clarke Middle School, Lexington, MA  
(Adapted from an activity presented at Sea Education Association, Woods Hole, MA)

## Unlocking the Secrets of Marine Science

Bob Rocha

Lobster sex? Man-eating amphipods? Whale secrets? These topics and many more were covered during the 24th annual high school marine science symposium. Held on March 21, 2007, at University of Massachusetts-Dartmouth, over 270 students and 18 teachers from 13 Massachusetts high schools devoted their morning to learning more about the broad field of marine science.

Our keynote speaker Trevor Corson, author of **The Secret Life of Lobsters**, entertained and educated the students about the many unusual and sometimes comical daily habits of lobsters. Whether it was urinating on each other to send important messages or taking over the neighborhood by bullying the smaller males, the crustaceans proved to be a source of constant amazement and amusement. We noticed that several of the UMD staff and faculty found their way into the auditorium to check out Corson's presentation.



Along with Corson's presentation, students attended two 45-minute workshops of their choice, out of a roster of twenty. Workshop topics included



scallop dissection, turtle strandings, diving as a career, underwater photography, eelgrass restoration, basking sharks, PCB cleanup, whale biology, ospreys and climate change. Presenters, as they do each year, generously donate their time and expertise as a means to bring these topics to students, provide direct experience (sometimes very hands-on) and cultivate their interest in marine science.

The organizers of the High School Marine Science Symposium and MME extend our gratitude to UMD for hosting this important day of learning. We also thank all of our presenters for sharing their time and knowledge with these students. George Hampson, Pat Harcourt, Vin Malkoski, Bob Michelson, Jamie Bogart and Ross Kessler deserve recognition for participating for several years. We are grateful for their dedication.

We look forward to continuing this major MME event next year, on Wednesday, March 19, at UMass-Dartmouth. Many of the students will be different but the purpose remains the same: to develop a marine literate society, promote awareness of the ocean world and encourage these students to pursue a career in marine science.

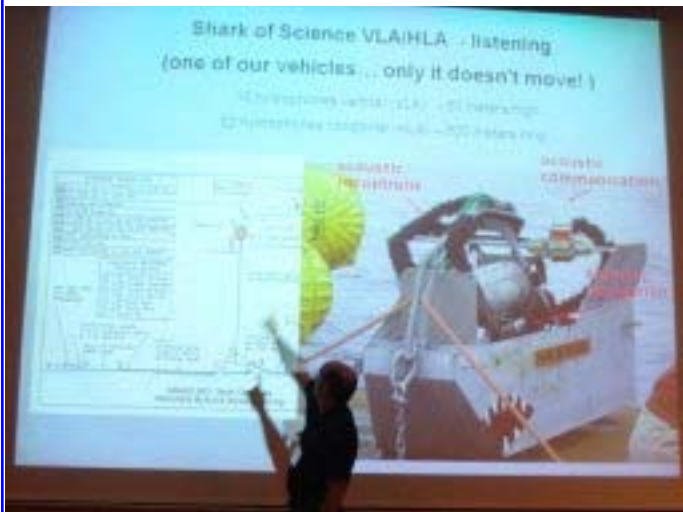




## WHOI Conference Report

Saturday May 5 dawned as a clear crisp day at the Woods Hole Oceanographic Institution (WHOI), as MME held its 31<sup>st</sup> Annual Conference and Meeting. Nearly 100 MME members were present for the scientific presentations offered by research scientists from Woods Hole and marine educators. Dr James Yoder, Academic Dean at WHOI welcomed the group as the morning program began.

The first presentation was by Arthur Newhall of Woods Hole on the topic of Sounding the Depths. In his presentation he discussed the use of acoustics in Oceanographic Research. Using data collected on several cruises, his computer was able to show sounds, both man made and natural, captured in the ocean depths. Sound patterns and the identification of the sound patterns were heard by those present. Each teacher in attendance received a CD **Discovery of Sound in the Sea**. The CD contains powerpoint presentations, dozens of sounds collected underwater and identified, as well as standards based classroom activities.



Arthur Newhall discusses how sound is collected underwater

The second speaker was Chris Linder of WHOI. Chris is the principal investigator and field photographer for **Live from the Poles**, an education and outreach project funded by the US National Science Foundation for the International Polar Year. His presentation dealt with how to connect our students to scientists during the International Polar Year. Chris will be featured in a future issue of **F&J**.

The MME annual Business Meeting and Awards presentations followed this presentation. The slate of officers elected at the meeting is found on page 2 of this journal. Awards presented are also found in this journal. The "passing of the pin" the symbolic change of leadership for MME occurred as Pat Harcourt received the symbol of the presidency from Susan Wieber Nourse the outgoing president.



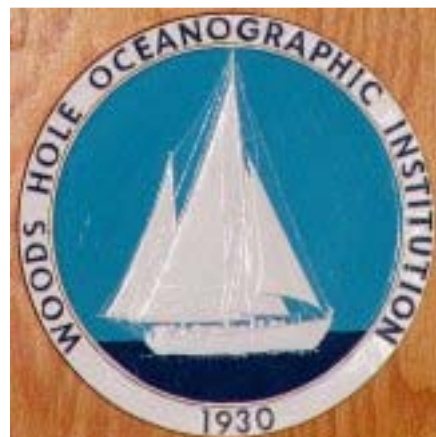
The traditional chowder lunch followed the awards ceremony.

After lunch, Carolyn Sheild from the Clarke Middle School in Lexington discussed bringing deep ocean research to the classroom and her experiences in the East Pacific Rise this winter. Carolyn was selected to be the 2007 Student Experiments At Sea (SEAS) Teacher-at-Sea, due to her students' successful involvement with the program. In January, she participated in a month-long research expedition to the East Pacific Rise. Her experience included a dive in the Deep Submergence Vehicle the Alvin.

Afternoon tours included a cruise of the OceanQuest Vessel SeaStar or workshops with topics as diverse as:

- \* Meet REMUS: an Autonomous Underwater Vessel
- \* The USGS Technology challenge
- \* Using Deep-Sea Sediments in Ceramics
- \* Sound in the Sea
- \* A WHOI Dock Tour
- \* Marine Biological Laboratory's Marine Research Center
- \* The US Coast Guard Station Woods Hole
- \* The WHOI Exhibits Center

A social reception at the Fisher House concluded a very busy day at the Woods Hole Conference.



# Marine Science in the News



In this photo taken on June 16, 2002 in Bali, Indonesia and released on Wednesday, Feb. 28, 2007 by the Australian Commonwealth Scientific and Industrial Research Organization or CSIRO, The Jimbaran Shovelnose Ray is shown. Twenty new species of sharks and rays have been discovered in Indonesia during a five-year survey of catches at local fish markets, Australian researchers said Wednesday. (AP Photo/CSIRO, William White, HO)

## **20 New Ocean Species Found in Indonesia**

By MICHAEL CASEY, AP Environmental Writer

**BANGKOK, Thailand** - Twenty new species of sharks and rays have been discovered in Indonesia in a five-year survey of catches at local fish markets, Australian researchers said Wednesday. The survey by the Australian Commonwealth Scientific and Industrial Research Organization, or CSIRO, represents the first in-depth look at Indonesia's sharks and rays since Dutch scientist Pieter Bleeker described more than 1,100 fish species from 1842-60. Researchers said six of their discoveries have been described in peer review journals, including the Bali Catshark and Jimbaran Shovelnose Ray, found only in Bali, and the Hortle's Whipray, found only in West Papua. Papers on the remaining 14 are being prepared.

"Indonesia has the most diverse shark and ray fauna and the largest shark and ray fishery in the world, with reported landings of more than 100,000 tons a year," said William White, a co-author of the study. "Before this survey, however, there were vast gaps in our knowledge of sharks and rays in this region."

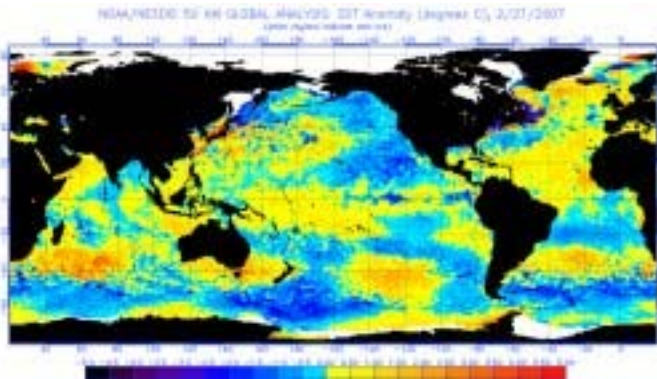
From 2001 to 2006, researchers photographed and sampled more than 130 species on 22 survey trips to 11 ports across Indonesia. More than 800 specimens were lodged in reference collections at the Museum Zoologicum Bogoriense at Cibinong, Java, and the Australian National Fish Collection at Hobart. The survey was part of a broader project working toward improved management of sharks and rays in Indonesia and Australia, researchers said. "Good taxonomic information is critical to managing shark and ray species, which reproduce relatively slowly and are extremely vulnerable to overfishing," White said in a statement. "It provides the foundation for estimating population sizes, assessing the effects of fishing and developing plans for fisheries management and conservation."

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**On the heels of El Niño, its opposite, La Niña may soon arrive.**



(SST Image credit NOAA)

**WASHINGTON, Feb. 28, 2007** - In a weekly update, scientists at the NOAA Climate Prediction Center noted that as the 2006-2007 El Niño faded, surface and subsurface ocean temperatures have rapidly decreased. Recently, cooler-than-normal water temperatures have developed at the surface in the east-central equatorial Pacific, indicating a possible transition to La Niña conditions.

Typically, during the U.S. spring and summer months, La Niña conditions do not significantly impact overall inland temperature and precipitation patterns, however, La Niña episodes often do have an effect on Atlantic and Pacific hurricane activity.

“Although other scientific factors affect the frequency of hurricanes, there tends to be a greater-than-normal number of Atlantic hurricanes and fewer-than-normal number of eastern Pacific hurricanes during La Niña events,” said retired Navy Vice Adm. Conrad C. Lautenbacher, Ph.D., under secretary of commerce for oceans and atmosphere and NOAA administrator. “During the winter, usual La Niña impacts include drier and warmer-than-average conditions over the southern United States.”

“NOAA's ability to detect and monitor the formation, duration and strength of El Niño and La Niña events is enhanced by continuous improvements in satellite and buoy observations in the equatorial Pacific,” Lautenbacher added. “These observing systems include the TAO/TRITON moored and Argo drift buoys, as well as NOAA's polar orbiting satellites.”

La Niña conditions occur when ocean surface temperatures in the central and east-central equatorial Pacific become cooler than normal. These changes

affect tropical rainfall patterns and atmospheric winds over the Pacific Ocean, which influence the patterns of rainfall and temperatures in many areas worldwide.

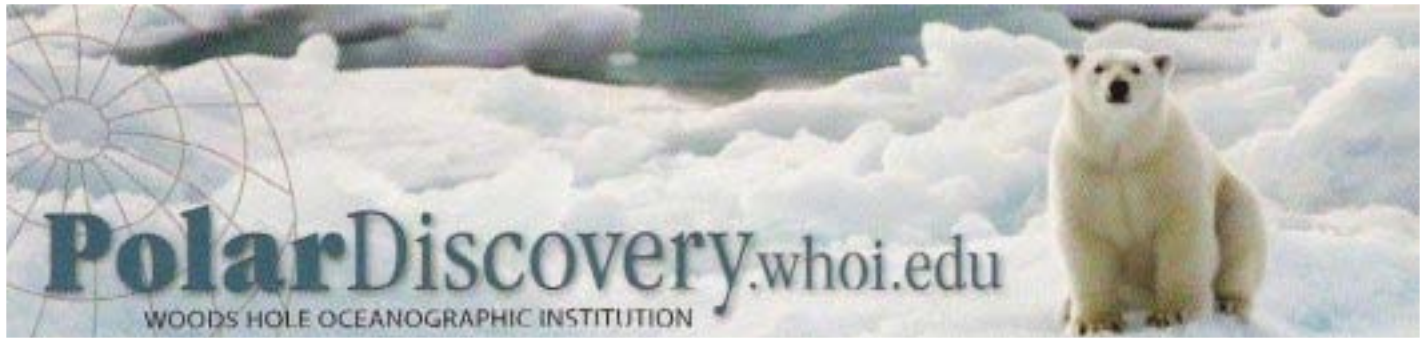
“La Niña events sometimes follow on the heels of El Niño conditions,” said Vernon Kousky, research meteorologist at the NOAA Climate Prediction Center. “It is a naturally occurring phenomenon that can last up to three years. La Niña episodes tend to develop during March-June, reach peak intensity during December-February, and then weaken during the following March-May.

“The last lengthy La Niña event was 1998-2001, which contributed to serious drought conditions in many sections of the western United States,” said Douglas Lecomte, drought specialist at the NOAA Climate Prediction Center.



4/23/07: ROV fleet launched - Instead of "chilling" for spring break, a group of southern Massachusetts fifth- to eighth-grade students spent last week building remotely operated submersible vehicles (ROVs) at the New Bedford Whaling Museum. The ROV workshop climaxed on Friday with a field test of the vehicles in the SMAST acoustic tank. From left, Max Mita, Colton Sousa, and Lucas Spring put their vehicles through their paces. The workshop was one of several spring school vacation activities offered at the Museum during vacation.

**Credit: SMAST The School for Marine Science and Technology UMass Dartmouth**



## **The Massachusetts Marine Educators 2007 Awards**

### **MME AWARD OF Distinction**

*For leadership in environmental education and work with endangered species:*

**Robert Prescott**, Wellfleet Bay Wildlife Sanctuary, Massachusetts Audubon Society

### **MME EDUCATOR OF THE YEAR**

*For outstanding effort and distinguished performance in teaching marine science*

**Joanne Jarzowski**, Provincetown Center for Coastal Studies

### **Nap Buonaparte SERVICE AWARDS**

*For tireless work and leadership in organizing the Boston Harbor Educators Conference:*

**Kelly Fellner**, Boston Harbor Islands National Park

*For his many years of work and leadership on MME projects, events, and conferences:*

**Al Benbenek**, Director Emeritus, MME

### **MME CERTIFICATES of Appreciation**

*For service to MME and outstanding contributions to marine science education*

**Dr. Kevin Trenberth**, NCAR Climate and Global Dynamics Division, Boulder, CO

**Emily Blume**, Northeastern University Marine Science Center, Nahant, MA

**Tracy Hadjuk**, Northeastern University Marine Science Center, Nahant, MA

**Brandy Moran Wilber**, MIT Sea Grant, Cambridge, MA

### **KELP AWARDS**

**Jim Spinale**, MME and Massachusetts Association of Science Teachers

**Bill McSweeney**, Massachusetts Association of Science Teachers

### **JOHN PATRICK CROWLEY SCHOLARSHIP AWARDS**

**Christopher Pires**, Science Teacher, Greater New Bedford Regional Technical School

**William (Toby) Dillis**, Chemistry Department, University of Massachusetts, Dartmouth



To get a membership application, please go to  
<http://www.massmarineeducators.org/membership.shtml>