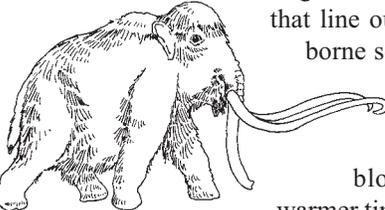


## Pleistocene Mammals in the Natural History Exhibit?

Standing on our dock gazing at the landscape around us, the shoreline—visible in all directions—carries the distinct stamp of the Pleistocene epoch. This geologic period lasting from 1.6 million to 11,000 years ago was a time of climactic extremes, with frigid glacial periods alternating with mild interglacial periods. The bluffs that line our shoreline are made up of ice-borne sediments compressed by the glaciers that advanced and retreated over Puget Sound, layered with freshwater and wind-blown deposits laid down during warmer times. As ice built-up on land or returned to the sea as melt water, sea levels fell and rose, allowing major animal groups such as mammoths, bison, camels and horses to move freely between Asia and the Americas. Although most of these large mammals no longer live here, the teeth and bones of some of them are occasionally exposed when the glacial bluffs erode.



Most visitors to the Natural History Exhibit are aware that mammoths and mastodons roamed our landscape during the Pleistocene and many have even held the mammoth tooth in our exhibit. This winter, thanks to the generous loan of fossil specimens from the Burke Museum and display cases from Jefferson County Historical Society, we have an exciting exhibit on Pleistocene mammals to share with exhibit visitors from January through March. Don't miss the **Grand Opening** on **Thursday, January 13**, at the NHE, from **4:30–6:30 pm**.

Spend some time with us and learn about elephants that lived in the tundra, relatives of the three-toed sloth that grew to giant proportions and horses that evolved on the Americas and became extinct here after spreading to the rest of the world. Ponder with us why so many of these large mammals became extinct, and why certain others are still with us. To learn more, don't miss our weekend programs on glaciers, ice age mammals, and Pleistocene fossils, including activities especially for kids.

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Don't miss the  
**GRAND OPENING**  
**OF THE DISCOVERY LAB**  
*PTMSC's New Research Lab*  
**April 9, 2005**

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Port Townsend Marine Science Center  
PRESENTS  
**THE TIDES OF MARCH**  
BENEFIT AUCTION

March 5<sup>th</sup> 2005



6 pm to 9:30 pm Jefferson County Fairgrounds

Hold the date! We are having our first-ever large scale fundraising event on March 5! It will be an auction, with both silent and live sections, accompanied by music, appetizers, wine, and lots of fun and good cheer. We have investigated several different types of fundraisers, and think that this will give us the best return for our efforts. We also looked at several sites and decided on the Fairgrounds. It has plenty of parking, a sound system, and a nice kitchen.

We want to make the theme unique to the PTMSC, with a strong emphasis on our distinctive hands-on approach to the teaching and learning of marine and shoreline science. And speaking of effort, we will be contacting you to help in some way with the event, as a donor, a volunteer, or an attendee—or all three! All of us want to see the Center continue to develop and prosper, and this goal depends on assuring a sound and stable financial foundation. Let's work together to make this happen!

—Johanna King, Ph.D., President, 2004 Board of Directors

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## Smithsonian Exhibit at The Burke



## DEATH IN THE CANAL: A Who Done It.

By Chuck Louch, PTMSC Docent

The Hood Canal is one of about 30 man-made marine dead zones in the world. These differ in details but all have a common feature, that of oxygen depletion caused by high nutrient levels in the water. The most important of these nutrients is nitrogen, in the form of nitrate, that must be available for all healthy plant growth. High concentrations of nitrates in bodies of water lead to dense populations of planktonic green algae. These may initially raise oxygen levels in surface waters through photosynthesis but as they die, sink to lower levels, and decay, these algae will deplete the oxygen in the depths.

Hood Canal is ideally-suited for the production of dead zones since it is a long narrow inlet that is quite deep in some parts. Hydrologically speaking, it is a two-layered system. The surface water is less saline and thus less dense than that of Admiralty Inlet because of runoff from streams and rivers, septic systems, etc. This water tends to move northward towards the entrance of the Canal. At the same time dense seawater from Admiralty Inlet flows southward into Hood Canal under the less saline surface water. But there is some mixing of water at the interface between the two layers so that some surface water pollutants tend to stay, or flow back into the Hood Canal rather than moving towards the sea.

Also, although there are significant tides in the Hood Canal, they are not great enough to clear the Canal at each change so that, in the southern part of the Canal at least, the water just sloshes back and forth. For these reasons the Hood Canal flushes itself out relatively slowly, only once in a year according to one estimate.

I should emphasize that the above is a very simplified picture of a very complex system that can change with changing meteorological conditions. Drought, for instance, can reduce the amount of freshwater entering the Canal and an el Nino could warm the ocean waters entering the Canal thus changing patterns of water movement. Strong south winds may push the surface waters out of the Canal more rapidly than usual causing some upwelling of deep, more saline, waters.

The Hood Canal extends through three counties—Mason, Kitsap, and Jefferson—that have an aggregate population of about 310,000 people, up from about 19,000 in 1980. Of these about 50,000 live in the Hood Canal watershed. In the past, most of the dwellings along the Canal were weekend cottages or cabins that stood empty much of the time. But now, many people make their homes in the area and commute to Olympia, Tacoma, Bremerton, or even Seattle. As a consequence more homes are occupied year-round, small communities have sprung up, and small businesses have developed.

This all puts a heavier burden on the Canal especially since most of the private houses and businesses have their own septic systems, some of them many years old and poorly maintained. Undoubtedly, many of these estimated 5,500 septic systems are contributing their share of nitrogenous wastes to the waters of the Canal. Other sources of effluents are heavily fertilized lawns and gardens, animals wastes, and wastes from small businesses.

The result of all this is that dead zones, which were initially only occasional, autumnal occurrences in the southern part of the Canal around the Great Bend region, have now spread to a much larger area and persist for much of year. This is most noticeable in the deeper parts of the Canal but now has been observed at shallower levels also.

Fish need between 5 and 20 parts per million (ppm) (the same thing as mg. per liter) of dissolved oxygen to survive and thrive. Below 5 ppm they are stressed and below 3 ppm they die. But recently, for a stretch of the Canal extending from Hamma Hamma to Belfair at the south end of the Canal, the levels have measured below 2 ppm for much of the year. Usually the dissolved oxygen (DO) problem is worse at depths of 30 feet or lower but even surface waters have been affected so that there is no place where the fish can escape. Not only fish have been

... continued on page 4

*Octopress is a quarterly publication of the Port Townsend Marine Science Center, A 501(C)(3) nonprofit educational organization. Your comments, contributions, and support are greatly welcomed and appreciated. PTMSC is located at Fort Worden State Park in Port Townsend, Washington on the Olympic Peninsula.*

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*The Main Office is located on the 2nd floor of the Fort Worden State Park Office. The Marine Exhibit & Natural History Exhibit are located on the Pier and on the Beach at Fort Worden State Park.*

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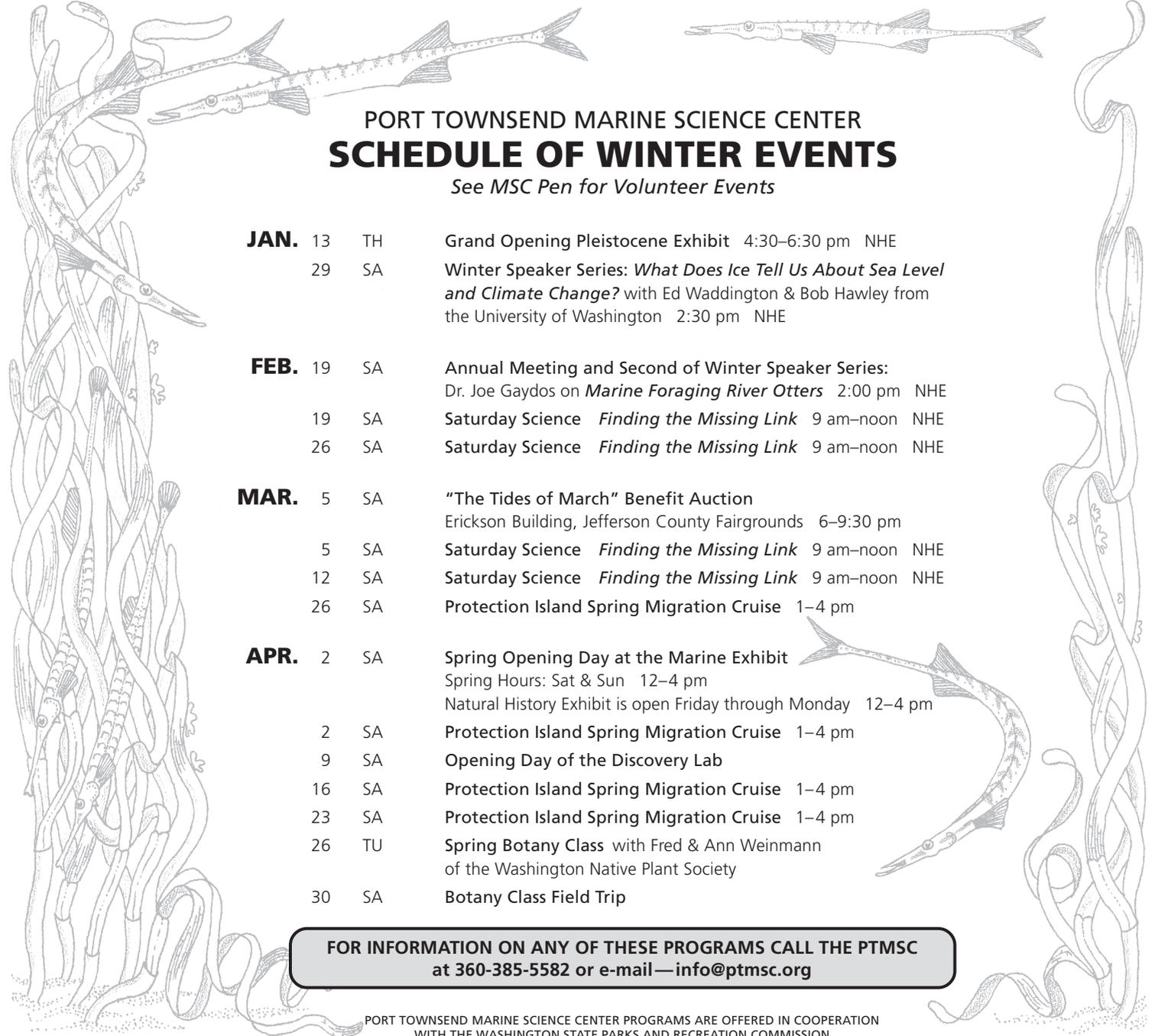


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## PORT TOWNSEND MARINE SCIENCE CENTER SCHEDULE OF WINTER EVENTS

See MSC Pen for Volunteer Events

<b>JAN.</b>	13	TH	Grand Opening Pleistocene Exhibit 4:30–6:30 pm NHE
	29	SA	Winter Speaker Series: <i>What Does Ice Tell Us About Sea Level and Climate Change?</i> with Ed Waddington & Bob Hawley from the University of Washington 2:30 pm NHE
<b>FEB.</b>	19	SA	Annual Meeting and Second of Winter Speaker Series: Dr. Joe Gaydos on <i>Marine Foraging River Otters</i> 2:00 pm NHE
	19	SA	Saturday Science <i>Finding the Missing Link</i> 9 am–noon NHE
	26	SA	Saturday Science <i>Finding the Missing Link</i> 9 am–noon NHE
<b>MAR.</b>	5	SA	“The Tides of March” Benefit Auction Erickson Building, Jefferson County Fairgrounds 6–9:30 pm
	5	SA	Saturday Science <i>Finding the Missing Link</i> 9 am–noon NHE
	12	SA	Saturday Science <i>Finding the Missing Link</i> 9 am–noon NHE
	26	SA	Protection Island Spring Migration Cruise 1–4 pm
<b>APR.</b>	2	SA	Spring Opening Day at the Marine Exhibit Spring Hours: Sat & Sun 12–4 pm Natural History Exhibit is open Friday through Monday 12–4 pm
	2	SA	Protection Island Spring Migration Cruise 1–4 pm
	9	SA	Opening Day of the Discovery Lab
	16	SA	Protection Island Spring Migration Cruise 1–4 pm
	23	SA	Protection Island Spring Migration Cruise 1–4 pm
	26	TU	Spring Botany Class with Fred & Ann Weinmann of the Washington Native Plant Society
	30	SA	Botany Class Field Trip

**FOR INFORMATION ON ANY OF THESE PROGRAMS CALL THE PTMSC  
at 360-385-5582 or e-mail—[info@ptmsc.org](mailto:info@ptmsc.org)**

PORT TOWNSEND MARINE SCIENCE CENTER PROGRAMS ARE OFFERED IN COOPERATION  
WITH THE WASHINGTON STATE PARKS AND RECREATION COMMISSION

### Annual Meeting Features River Otter Presentation

Hear a recap of the Port Townsend Marine Science Center’s activities from Executive Director, Anne Murphy, and then settle in for an entertaining presentation from Dr. Joe Gaydos on “Marine Foraging River Otters.” This takes place at the Natural History Exhibit on the beach in Fort Worden State Park, **February 19 at 2 pm**. The fee is \$5.00 nonmembers and \$3.00 members or youth.

Like several other places on the West Coast, Puget Sound river otters have adapted to life in the marine water. Because of this, these lively little creatures are often mistaken for sea otters, a different species. River otters spend time on land and forage in the nearshore marine environment. This, and their dependence on fresh water, make



them excellent sentinels for the health of our nearshore marine ecosystem. Joe Gaydos, a wildlife veterinarian and Regional Director of the San Juan Island Office of the SeaDoc Society\*, has been studying river otters for several years. His presentation will include the life history of these fascinating animals, information on research he has conducted and a description of how otters serve as important indicators of ecosystem health.

\* *The SeaDoc Society is a program of the Wildlife Health Center at the UC Davis School of Veterinary Medicine. The Wildlife Health Center aims to ensure the health of wildlife populations and the environments in which they live. It is one of the premier institutions in the country establishing integrative wildlife and ecosystem health programs.*



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## Port Townsend Marine Science Center Receives Support from Area Surfriders



Surfrider  
Foundation

The nonprofit Surfrider is holding a fundraiser to purchase equipment for our new Discovery Lab to monitor the health of local recreational beaches.

A pancake feed at Point Hudson Marina on **January 15, 2005**, from **7:30 am–12:00 pm**, will be the kick-off for the fundraising effort. The \$5.00 per person cost gets the donor pancakes donated by The Otter Crossing Café and a cup of Sunrise coffee. A \$25.00 donation gets the donor pancakes and coffee for two and a Surfrider membership. 100% of money received will go towards the Discovery Lab equipment purchase and Surfrider memberships. A self-directed beach cleanup along the beach north of Point Hudson to Chetzemoka Park (or further) will take place as well.

# Winter PROGRAMS

Natural History Exhibit (NHE) is open Friday through Monday, 12 noon–4 pm

## JANUARY 2005

DATE	DAY	PROGRAM	BLDG	TIME
1	SA	Closed		
2	SU	Tracking the Invasive Tunicate	NHE	
8	SA	Geologic Timeline	NHE	2:30
9	SU	Glaciers On the Go	NHE	2:30
15	SA	What Fossils from the Bluff Tell Us	NHE	2:30
16	SU	Rocks and Minerals	NHE	2:30
22	SA	Fossil Detectives*	NHE	2:30
23	SU	Whales—Journey from Land to Sea	NHE	2:30
29	SA	What Does Ice Tell Us About Sea Level and Climate Change?	NHE	2:30
30	SU	Sloths of the Pleistocene	NHE	2:30

\* especially for kids

### What Does Ice Tell Us About Sea Level and Climate Change?

Saturday, January 29 2:30 pm NHE classroom  
Fee: \$5.00 nonmembers; \$3.00 members or youth

A special program by University of Washington glaciologists, Ed Waddington and Bob Hawley.

Many of us have heard about melting glaciers in the Pacific Northwest and around the world, about rising sea levels and eroding coastlines, and about ships that have reached the North Pole without encountering floating pack ice. Earth's climate is clearly changing, and the ice is clearly involved. Changes appear to be largest in the polar regions.

University of Washington faculty and students are active participants in polar climate research, and are partners with teachers to introduce the excitement of climate science into K–12 classrooms. Ed and Bob will explain how glaciers work, and how the big glaciers (which includes the Antarctic and Greenland Ice Sheets) are able to capture and preserve the history of climate changes over the past hundreds of thousands of years. They will also reveal “up close and personal” details of the lifestyle of researchers as they live and work “on the ice.”

While humans are responsible for recent climate changes, Earth can also undergo large climate shifts without our help. Ice-core records from Antarctica have now revealed close to one million years of Earth's climate history. Major climate changes occur roughly on 100,000-year, 40,000-year and 20,000-year cycles. Because water that forms glaciers comes ultimately out of the ocean, sea levels rise and fall as glaciers and continental ice sheets shrink and grow. These changes in sea levels have had big impacts on human migrations, and will continue to alter coastlines as glacier ice melts.

WE WILL BE HOSTING



## SPRING COOKING CLASSES



Stay tuned for more information.

*Death in the Canal ... continued from page 2*

adversely affected by this situation but also shrimp, crabs, octopuses, and other invertebrates.

But something is being done. On October 14 of this year the Puget Sound Action Committee announced \$790,000 in awards to various organizations to help solve the problem. I will mention just a few of them here to give you an idea of what's going on. The Skokomish Tribal Nation is receiving \$92,000 to research what to do with the chum salmon carcasses remaining after they have been stripped of eggs. In the past they were simply thrown back into the Canal to rot. The Hood Canal Coordinating Council will receive \$160,000 to assess new septic system technologies and educate shoreline residents about them. Other grants are going to organizations to study new ways to treat livestock wastes, to educate homeowners about ways to keep fertilizer and pesticides out of the Canal, to perform shoreline surveys, and collect water samples to check for pollution, etc. But, so far as I know, no new laws or regulations to limit pollution have been passed. The complete list of these grants can be found at: [www.psat.wa.gov/News/releases/new\\_04\\_10.htm](http://www.psat.wa.gov/News/releases/new_04_10.htm)

In closing, I must admit that collecting information for this article and writing it was pretty much like Yogi Berra's “déjà vu, all over again.” I wonder if we can ever learn from other people's experiences or must we repeat their mistakes over and over again to the last syllable of recorded time?

*The author cites seven online references. Those interested can find the entire article, with links to the references, on our website at “Citizen Science/Topics/Death in the Canal”.*

**Those who have been waiting for the second half of Chuck Louch's article on “Species” can find the sequel, as well as the first article, on our website at: [www.ptmsc.org/science/topics.htm](http://www.ptmsc.org/science/topics.htm)**

## Port Townsend Marine Science Center Membership Rates Go Up in January

The Board of Directors of the Marine Science Center has decided to raise membership fees in order to support our educational programs.

Individual	\$25
Friend	\$75
Business/Professional	\$125

All other categories remain the same. The \$35 Family membership is still the best deal in town.

## Students Monitor Eelgrass Restoration Site

Working with scientists from Battelle, local high school students are studying the health and recovery of an eelgrass bed on the Port Townsend waterfront. This underwater habitat surrounds the Northwest Maritime Center's eelgrass-friendly demonstration dock, designed with the goal of casting less shade on the plants growing below it. In May 2004, when the renovation was completed, volunteers from the community, including some of these students, helped scientists plant eelgrass in places the old dock had shaded.

Students from Port Townsend High School and the Chimacum Pi program are now monitoring how well the new dock is working. They're measuring how much sunlight reaches the eelgrass below the dock at different times of the year, and working with volunteer diver Grant Ausk, who is helping photograph the replanted area to help students watch for signs of recovery. They're also monitoring other parts of this habitat—the temperature, salinity and dissolved oxygen of the water, the kinds of plankton that move through the area from season to season, and even birds seen in the area. These data are helping the students and the Battelle scientists determine how well the eelgrass bed is functioning as a habitat.



*The two students with a plankton net are (from left) Tristan Stoch and Chantelle Quackenbush*

## "Storming the Sound"—A Regional Gathering of Environmental Educators

January 21 9 am–4 pm Maple Hall, La Conner

This annual one-day conference will energize and inspire about environmental education. Hear amazing speakers, network with other educators, enjoy a local organized lunch, and gather a wealth of information. Registration required, \$5 optional donation. If you are an organization wishing to sponsor this year's conference, please contact the North Sound Office at 360-336-1931.



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## Summer Camps 2005 (including a New Teen Camp)

### Rock 'n Fossil Day Camp

July 11–15 For ages 9 to 14

### Marine Biology Adventures Overnight Camp

July 17–23 For ages 9 to 13

### Adventures in Marine Research Overnight Camp

July 17–23 For high school teens

### Marine Biology Adventures Day Camp

August 1–5 For ages 8 to 12

In **Rock 'n Fossil Day Camp**, campers explore the geology of the shoreline and learn about animals living there. Campers build skeletons of marine mammals, use a seismograph to detect earthquakes here and around the world, learn about mysteries of bluffs and make connections between fossil animals and the animals of today. From experiments in the learning lab exploring volcanoes, earthquakes and hydrothermal vents, to field sessions on the beach studying beach rocks and sand—this camp offers fun, hands-on experiential learning.

In **Marine Biology Adventures Residential and Day Camps**, campers are immersed in scientific study, creative projects and respectful play. Activities include lots of lab time, participating in PTMSC on-going research or conducting their own experiments, and lots of field time, studying and enjoying intertidal habitats on a variety of Olympic Peninsula beaches. Campers get familiar with the microscopic world of plankton, eelgrass, fish and other underwater neighbors while learning to be stewards of our marine waters.

New in 2005, **Adventures in Marine Research—a residential camp for students entering grades 9–12**. Using our new Discovery Lab as a home base, participants will get first-hand experience with monitoring and research projects going on regionally by going out on the Friday Harbor Marine Labs research vessel, operating an ROV, visiting restoration sites and meeting with scientists. Campers will formulate a research hypothesis, create and conduct an experiment with full access to our lab equipment. To round out the marine experience, campers learn to breathe underwater in an Introduction to SCUBA class.

All camps are based in beautiful Fort Worden State Park in Port Townsend, WA.



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## Spring Botany Class

Mark your calendars for late April and early May because this spring, for the first time ever, we will be offering a botany class. Class dates will be **April 26, May 10 and May 17**. We are lucky to have Fred and Ann Weinmann of the Washington Native Plant Society to teach us where to look and how to recognize the common, and the not so common, plants of our area. The class will include evening lab sessions in the Natural History building and two Saturday field trips to as many different nearby habitat types as time allows—beaches, forests, swamps, marshes, riparian areas and more. Watch for further details in our Spring *Octopress*. The class will require preregistration and will have a fee.



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## Many Thanks are in order to ...

- ✧ Joann Saul and Jim Hagen from Fins Coastal Cuisine, Jay Payne of the Wild Coho, Kate Anstine of Ajax Café, Maggie Dahlberg and Tana Kettle of the Blue Moose and Marilyn Staples of the Green Eyeshade for making the Cooking Classes a success.
- ✧ Betty Jo Sargent for her donation of pictures by Zella Schultz. Many are originals and beautifully framed and will be used by PTMSC to raise funds for our education programs.
- ✧ Also to Lucile Mung for three more Zella Schultz originals and Eleanor Stopps for donating frames and mats.
- ✧ Rex & Reba Bates for their very generous donation to the Discovery Lab, helping us meet our matching grant.
- ✧ Also to Patricia Selch and Gary & Gail Eisenberger for their donations to the Discovery Lab. Supporters such as these make this project possible.
- ✧ Mary Cameron for the wonderful *Book of Sea Shells* which we have placed in our library.
- ✧ Sally Robbins for the donation of the vacuum cleaner.



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- ✧ Marilyn & Andy Friedrich for donating the numbered print by Scott Mattlin.
- ✧ Varn Brooks for his help with the Geology Study Group.
- ✧ Heller Ehrman White & McAuliffe—Attorneys at Law, and Matthew Cohen for support of our educational programs.
- ✧ David King for donating a photo printer for pictures of our critters.
- ✧ Kathy Liu and her mother Lydiane Kyte for donating the herbarium paper and the plants.
- ✧ Wind's Eye Design for help with our website.
- ✧ And the anonymous donor who gave a contribution "to be used any way you see fit."

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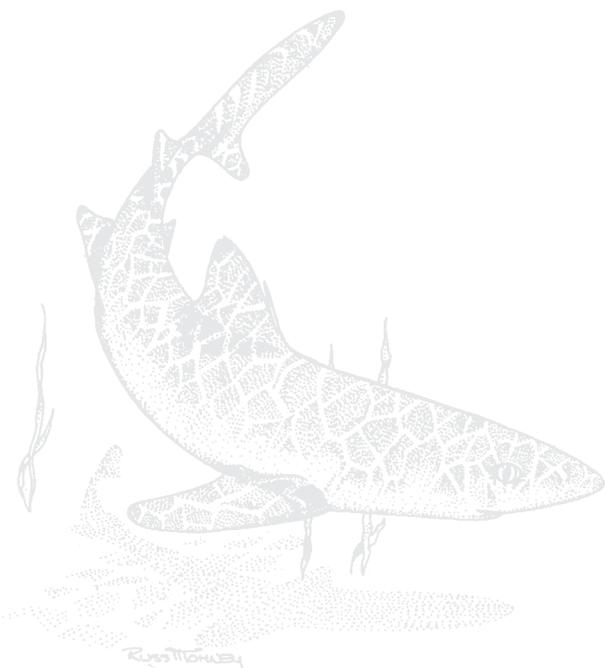
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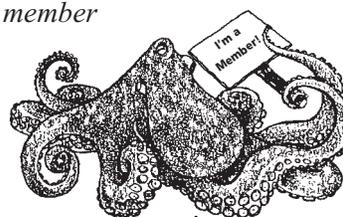
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