



# Sea Star

## Glass-Sponge Reefs

### Deep-sea Habitats and Inhabitants Astound Scientists on WSG-funded Cruise

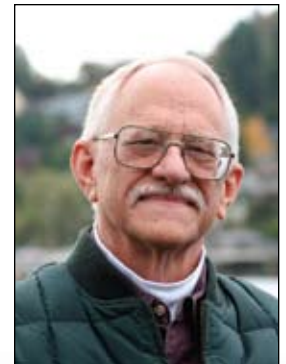
by Colleen Craig

This past summer's newspaper headlines told the tale: a glass-sponge reef had been located, 30 miles off the coast of Grays Harbor, Washington.

Reef-building glass sponges were thought to be extinct until Canadian scientists discovered them off the coast of British Columbia in the late 1980s. With funding from Washington Sea Grant, UW oceanographer Paul Johnson expanded our understanding of glass-sponge reefs the range and conditions under which their unusual builders can operate.

The Washington reefs are thousands of feet long and 15 feet tall, growing at depths of 650 feet below the ocean's surface. They represent an oasis of life in an otherwise barren stretch of seafloor, providing protection for zooplankton, rockfish, squat lobsters and other species. Unlike the British Columbia reefs, which exist in relatively protected waters, the Washington reefs grow in the open ocean, meaning they can withstand large ocean swells associated with winter storms. This suggests that glass-sponge reefs may exist in other regions of the Pacific continental shelf.

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Paul Johnson



The research vessel *Thomas G. Thompson* (right) leaves its home moorage at the University of Washington's School of Oceanography Pier on Portage Bay, bound for the sponge reefs (far right) off Washington's Pacific Ocean coast.



In June 2007, Johnson spearheaded the cruise that located Washington's reefs. The UW professor of marine geology and geophysics has spent 30 years studying deep-sea geological phenomena. He was inspired to look for glass sponges in Washington after joining a Canadian expedition to study an 8000-year-old reef in the Georgia Strait.

"I've spent a lot of time looking at exotic animals around hydrothermal vents, but this was really impressive," says Johnson of the biologically dynamic, 20-meter tall Georgia Strait reef.

After obtaining circumstantial evidence that the Washington continental shelf hosted its own reef, he received funds from Washington Sea Grant to support the research, plus six days of ship time aboard the RV *Thompson* from the UW School of Oceanography.

"I'm grateful to Washington Sea Grant for its support," says Johnson. "Research done at sea is really expensive but, fortunately, Sea Grant recognized the potential of the project."

## A Sponge Made of Glass

Glass sponges are among the most primitive of animals and may date to the Pre-Cambrian era. Although individual sponges can grow up to 1½ feet tall, they are basically single-celled organisms supported by a skeleton of tiny glass shards, called "spicules." The organisms precipitate the spicules from silica that is dissolved in sea water. Most species of glass sponges have unconnected spicules, so their supporting structures fall apart when they die. The spicules of reef-building sponge species are fused together, says Jonathan Rose, research

assistant in biology at University of Victoria, British Columbia, and a member of the June cruise. "When they die, the glass skeleton remains intact," allowing future generations of sponges to build on the skeletons of the dead.

The glass-sponge skeletons "look like a pile of very thin barbed wire, and they don't dissolve in seawater," says Johnson. "They'll last for 100 million years." There are fossilized glass-sponge reefs running through Europe that are nearly 200 million years old.

Although individual glass sponges have been found at various depths in every ocean, the reef-building sponges were thought to have been extinct for 100 million years — until they were discovered in the Georgia and Hecate straits in British Columbia. Scientists believed that the evolution of diatoms — single-celled algae that build their cell walls from silica — drove the reef-builders to extinction, due to competition for silica. Apparently, the sponges simply adapted by living deeper in the ocean, out of reach of the sun and the photosynthetic, silica-hungry diatoms.

## Meet the Methanotrophs

Glass sponges remain fixed in place during their 100- to 200-year life spans. They feed by filtering bacteria from seawater. In the case of the Washington reefs, the bacteria may be living on methane, or natural gas, that the crew discovered as it seeped out of the ocean floor near the reefs.

Although an organism that lives on natural gas may seem improbable, so-called "methanotrophic" ("methane-eating") bacteria are very common.

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# Serving Coastal Constituents

by Steve Harbell, WSG Marine Field Agent,  
Pacific and Grays Harbor counties

**This is the first in a series of essays, exploring the opportunities and issues addressed by Washington Sea Grant specialists in offices throughout western Washington.**

Many years ago as a graduate student at the University of Washington's College of Fisheries, I was impressed with the incredible knowledge and expertise within the university and saw many examples of how that strength was used to benefit those outside the institution. In my nearly 30 years with Washington Sea Grant's Marine Advisory Program since that time, I've worked to bring research-based knowledge to the marine community in our state, to address a variety of issues and problems.

Lying adjacent to one of the richest marine areas in the world, the outer coast of Washington has been my primary area of focus. This region includes a diverse marine sector dominated by commercial fishing, shellfish aquaculture and seafood processing. It is also a favorite recreational area for Washington residents. Including Astoria, Oregon, the southwest coast of Washington is the third largest commercial fishing area by value in the United States.

Dungeness crab dominates the commercial fishing industry in the region, with an average annual ex-vessel value of more than \$50 million. Crab harvest levels and prices have remained high for more than a decade. However, this fishery takes place during the worst weather conditions of the year. To better prepare fishermen to deal with the dangers in this environment, Washington Sea Grant has trained more than 1,500 individuals to respond to fires, flooding, man-overboard events and other emergencies at sea. Every participant made significant improvements in their safety gear and operations as a result of the training. These U.S. Coast Guard-certified courses have been credited with saving the lives of several fishermen as well as nearly two million dollars in vessels and equipment.

One in every four oysters in the United States is grown on the Washington coast, representing nearly 50 million pounds of production annually in Grays Harbor and Willapa Bay. With harvest declines elsewhere in the country because of hurricanes and development, Washington's shellfish growers are enjoying strong demand and higher prices for their products. However, regulatory concerns about the potential impacts of shellfish farming on the

estuarine environment have threatened the future of the industry. With support from the Western Regional Aquaculture Center and Washington Sea Grant, we've worked to assess impacts to eelgrass, benthic fauna, and juvenile salmon. These research-outreach projects have provided critical information to reduce regulatory restrictions for shellfish growers, allowing them to develop best management practices to minimize impacts to those areas where they farm. We've also worked for many years with industry to control the exotic cordgrass *Spartina* and to develop alternative control techniques for burrowing shrimp in shellfish-growing areas.

Inaccurate marine weather forecasts have caused safety and operations problems for vessels off the coast for many years, due to a lack of data in both the nearshore and offshore areas. Through support from the National Oceanic and Atmospheric Administration and collaboration with Oregon Sea Grant, we recently completed the Coastal Storms Initiative project, designed to improve weather forecasting, particularly in the Columbia River area. A number of research projects and equipment upgrades were completed as part of the program, including the launching of a new weather buoy, 75 miles west of Seaside, Oregon. The buoy now provides much-needed wind and wave data in a critical area for marine vessel traffic. National Weather Service staff are now using enhanced data to improve weather forecasts for mariners and coastal residents.

These are a few examples of the types of programs with which I am involved and that have benefited the marine community locally. For more information on these and related topics, contact me at 360.875.9331 or [sharbell@u.washington.edu](mailto:sharbell@u.washington.edu).

Steve Harbell poses with a survival-suited dummy at a recent event at Seattle's Benaroya Hall.





# Field Notes

**E**ric Olsson, WSG's Oil Spill Prevention Education Specialist, received the Superior Outreach Award at the biennial Sea Grant Week conference, for his efforts as part of a team of Sea Grant specialists who brought a 60-ton boat hoist from Valdez, Alaska, to Louisiana's Plaquemines Parish. The boat hoist provided the sole means of removing boats damaged during Hurricane Katrina, helping to repair Louisiana's commercial fishing fleet and rebuild its fishing and ocean farming industries.

**M**arine Conservation Specialist Kim Dietrich is leaving WSG to pursue professional and personal goals in South Africa. Since 1999, Dietrich has been a vital part of Ed Melvin's team, working on seabird bycatch mitigation in longline and trawl fisheries in Alaska and internationally. Please join us in wishing Dietrich the very best.

**A**t the 7th annual Bainbridge Island Environmental Conference in September, **Jim Brennan, WSG's Marine Habitat Specialist**, was recognized by the Association of Bainbridge Communities with their 2007 Environmentalist of the Year Award. "Jim has been an invaluable area resource, both for his work with Bainbridge planners and with shoreline property owners and residents," says Charles Schmid, the Association's Secretary.

**W**SG's Marine Water Quality Specialist Teri King has been appointed to the Puget Sound Partnership's Ecosystem Coordination Board. The main role of the 27-person board will be to advise the Partnership's Leadership Council in developing and carrying out its 2020 Action Agenda. King will represent the Action Area of Hood Canal.

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"Methane is a tremendous energy source for biology," says Johnson. "Whenever you find methane seeps in the ocean, you find massive populations of bacteria." The bacteria extract energy from methane in much the same way a human cell extracts energy from sugar. Such bacterial mats usually support sea-life communities dominated by tubeworms and clams, says Rose. The Washington reef could represent a new kind of undersea community.

Methane is a simple compound of carbon and hydrogen and is produced from ancient organic matter buried deep in the Earth's crust. While undersea methane seeps are not unusual, "our sponges are sitting right on top of one, which is unusual," says Johnson. He believes that this ancient methane could be supporting an entire food chain off the Washington coast, with the methanotrophic bacteria nourishing the sponges and other creatures in the vicinity.

In the main laboratory of the RV *Thompson*, researchers examine the output of a side-scan sonar tool used to map the extent of the glass-sponge reefs.



"That's my fantasy anyway," Johnson says. He has an idea of how to test the reality. Carbon atoms come in three forms, called isotopes. The ratio of carbon isotopes in the methane near the Washington reef is very distinct, and Johnson predicts that the cells of organisms depending on the methane seep will carry the same ratio.

"We don't have the right samples yet to prove this island of life gets its nutrients using chemosynthesis from fluid from below the seafloor, rather than photosynthesis from the sea surface," says Johnson. "I'm working hard to get another cruise to go out there."

University of Victoria researchers recently found evidence of a methane seep near the Hecate Strait glass sponge reef. However, a connection to methanotrophic bacteria has not been established. There is no indication of a seep near the Georgia Strait reef, but this community is probably supported by nutrients from the Fraser River, says Rose.

## Don't Trawl on Me

The Washington coast supports an extremely active fishery, possibly attributed in part to the existence of glass-sponge reefs. The adults of species such as rockfish don't spend much time in the reefs, but the reefs do provide protection for juveniles and pregnant females, says Johnson. He also predicts that such marine nurseries could be found in many locations along the northern Pacific Rim, from California to Alaska and across the Pacific Ocean to the coast of Russia. "This is an enormous fishing area," says Johnson, "and these are all very similar environments."

Washington Sea Grant will host the Assembly of Sea Grant Program Leaders and Sea Grant Communicators conference in September 2008. Approximately 120 Sea Grant professionals will gather at an as-yet-identified Puget Sound locale to plan, strategize and share information to better serve the people who manage, use and enjoy the nation's oceans and coasts. For more information, contact **Pete Granger, Program Leader for Marine Advisory Services**, at 206.685.9261 or [pgranger@u.washington.edu](mailto:pgranger@u.washington.edu).

**Benjamin Larson** is the first recipient of WSG's new Science Writing Fellowship. He is a Ph.D. candidate in Chemical Oceanography at the UW and, last summer, was a fellow in the American Association for the Advancement of Science's Mass Media Science & Engineering Fellows Program. In this latter capacity, Larson reported and wrote articles pertaining to environmental science issues for *The Oregonian* newspaper.

One Science Writing Fellow will be selected for each of three quarters during the academic year. Applications

are due on or before November 19, 2007, for the winter quarter and on or before January 28, 2008, for the spring quarter 2008 fellowships. For more information: **Deborah Illman**, search committee chair, at [illman@u.washington.edu](mailto:illman@u.washington.edu).

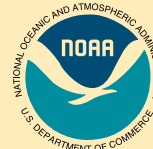
#### SEA GRANT PUBLICATIONS

Many marine-related publications are available from Washington Sea Grant. To order publications: WSG Publications, University of Washington, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. 206.543.0555. [sgpubs@u.washington.edu](mailto:sgpubs@u.washington.edu), [wsg.washington.edu](http://wsg.washington.edu).

Editor, David G. Gordon; Designer, Robyn Ricks; Web Editor, Marcus Duke; Communications Manager, Dan Williams. Photos: sponges — pages 1, 2 and 5, Verena Tunnicliffe, University of Victoria; ship, page 2, Paul Johnson; portraits, pages 1 and 6 (bottom), Tayler Brooks; all other photos © Washington Sea Grant, except as noted. ©2007, University of Washington, Board of Regents. WSG-MR 07-04

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**Sea Grant**  
Washington

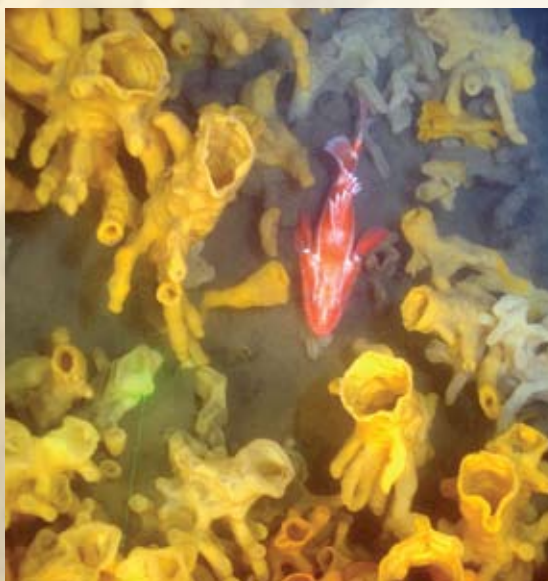


Washington reefs were probably once much larger and more productive than they are now. They grow in an area that is open to trawling, a method of fishing in which a giant net is dragged across the sea floor. "In the late 1980s, they were dredging tons of sponges out there. They have just about scraped the Washington margin clean," says Johnson. "What we're seeing is basically the stumps of a logged-over forest." If left alone, the reef should regenerate within 10 or 20 years. However, "every time the sponge reefs start to grow back, they get trawled again," says Johnson.

"It's a bit short-sighted to trawl this area, because you're destroying the reef area that acts as a nursery. That's where all the baby fish live, in and among the sponges, until they're big enough to live by themselves," says Johnson. Johnson's team hopes that the results of this and future cruises will draw attention to the delicate and long-lived glass-sponge communities, and, hopefully, lead to their protection.

"If you leave the reef areas alone, then you've got a nursery that would feed the whole adjacent margin," Johnson offers. "You could fish the periphery of the reefs forever. But if you trawl through the core, you're destroying an area that is nurturing the fish you're trying to get."

For more information about this project, contact Paul Johnson, 206.543.8474 and [johnson@ocean.washington.edu](mailto:johnson@ocean.washington.edu), or Raechel Waters, 206.685.8209 and [rlwaters@u.washington.edu](mailto:rlwaters@u.washington.edu).



Sponge reefs provide habitat for deep-dwelling adult and juvenile rockfish (left). On the *Thompson's* aft deck, researchers (bottom left) keep tabs on the winch that controls the tow fish, a hi-tech tethered device that gathered acoustic data for the side-scan sonar survey.





Sue Blake

## Introducing Sue Blake

**M**et Sue Blake, Washington Sea Grant's new Water Resource Educator, based in Bellingham.

Prior to joining the WSG team in July 2007, Blake spent the past 25 years working for local government in Whatcom County, addressing a wide range of water resource issues. Her work has encompassed numerous watershed planning, groundwater and stormwater management, education and outreach, shellfish protection and technical assessment efforts. This has required extensive involvement with community members, local governments, elected officials and tribes.

Blake's WSG position is a joint appointment with Washington State University Extension in Whatcom County, where her work includes providing support for the Watershed Masters/Beach Watchers and Shore Stewards programs.

"It's exciting for me to combine my background and interests in fresh water and marine waters, and to focus on the big-picture issues," says Blake, who holds a Bachelor of Science degree in freshwater ecosystems and a Master of Science degree in water resource management from Western Washington University.

When not focusing on ecosystem-based projects, Blake enjoys hiking, kayaking, gardening and stained glass making. One of her glass art pieces — an image of a spring Chinook salmon — recently sold for \$1,000 at an auction for the nonprofit Nooksack Salmon Enhancement Group.

Contact Sue Blake at 360.676.6736 or [sgblake@wsu.edu](mailto:sgblake@wsu.edu).



Mark Gleason

## Seafood Savvy: Retail Sellers to Benefit from WSG-Sponsored Study

by *Adelaide Rhodes*

**W**ith support from Washington Sea Grant, Mark Gleason has been working on a project to assess the need for formal training for retail seafood workers in the Seattle area.

For this project, Gleason, a graduate student at the University of Washington's School of Marine Affairs, has developed an interview protocol, analyzed existing training programs and conducted interviews in the field. He interviewed dozens of people at all levels in the retail seafood industry: members of trade associations, seafood processors and workers at wholesale chains, as well as owners and managers of small independent seafood markets. He then identified the types of training that would be most beneficial to the industry.

Gleason brought his own real-world experiences to the project. Before he started his Sea Grant-funded research project, he worked as a commercial fisherman and as a manager and counterperson for wholesale and retail seafood operations. While employed as a seafood professional, he became aware of the lack of opportunities for formal training. "On the rare occasion where there was formal training, it was conducted primarily on the fly, under less than optimum circumstances" Gleason says.

Training programs in the U.S. vary in formality and are very different than in other countries, including the United Kingdom, where fishmongers and fish fryers have guilds that help guide opportunities for career advancement. In the U.S., retail establishments are often reluctant to invest much in their seafood counter employees, citing high rates of turnover. Alternatively, employees may see the seafood counter as a stepping-stone to better-paying positions within the organization, according to Gleason.

"Clearly, seafood workers will benefit from better training and the industry will benefit from better-trained help," he says.

Gleason is currently writing up his findings, and hopes to provide detailed analyses of the results of his interviews by the end of the year. He also plans to make some recommendations to WSG, including the development of some generalized tools, similar to the *Fishermen's Direct Marketing Manual* (see related item on page 7), to help the seafood industry provide better service to its customers.

For more information about this project, contact Mark Gleason at [gleasonm@u.washington.edu](mailto:gleasonm@u.washington.edu).

## Coming Soon —

### Diesel Engine Troubleshooting

*Tuesday – Thursday, November 27-29, 6:30-9:30 p.m., Nordby Building, Fishermen's Terminal, Seattle*

Designed for commercial fishermen and recreational boaters, this workshop will include an overview of troubleshooting and maintenance and focus on fuel, lubrication, electrical, cooling and exhaust systems. Fee: \$70.

### U.S. Coast Guard-Approved Course on First Aid at Sea *December 6, 8:30 a.m.-4:00 p.m., Nordby Building, Fishermen's Terminal, Seattle*

This one-day course is for commercial fishermen and recreational boaters. Topics will include cardio-pulmonary resuscitation, patient assessment, shock, trauma, burns, fractures, hypothermia, coldwater near-drowning, immobilization, backboards and first-aid kits. Fee: \$80.

These offerings are sponsored by Washington Sea Grant and the Port of Seattle/Fishermen's Terminal. Space is limited, so pre-registration is advised.

To register or for more information, contact Sarah Fiskén, WSG Continuing Education Coordinator, at 206.543.1225 or [sfisken@u.washington.edu](mailto:sfisken@u.washington.edu).

**Visit our booth and meet our staff at Pacific Marine Expo, the largest commercial marine trade show on the West Coast, November 15 – 17 at the Qwest Field Event Center (booth #1241) in Seattle.**

## 16<sup>TH</sup> CONFERENCE FOR SHELLFISH GROWERS

Attendees at the 16th Conference for Shellfish Growers, March 3 and 4, 2008, at the Little Creek Casino Resort in Shelton, will hear an array of presentations on the business of raising, processing and marketing bivalves. For information about this popular event, contact Washington Sea Grant, 206.543.6600 and [seagrant@u.washington.edu](mailto:seagrant@u.washington.edu), or visit our Web site, [wsg.washington.edu](http://wsg.washington.edu).

## New from WSG Publications

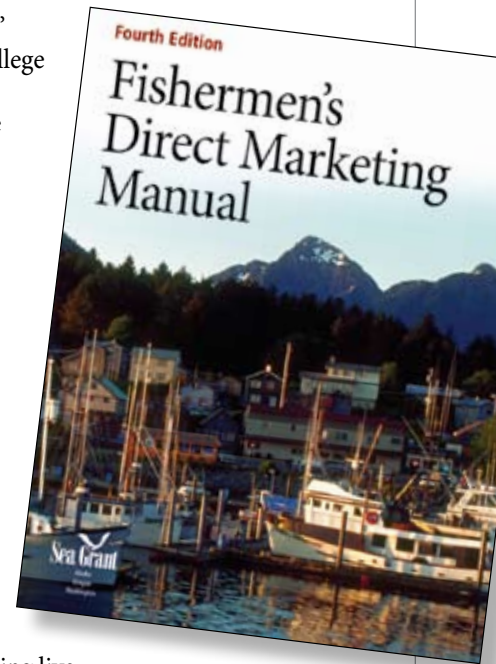
The fourth edition of the Fishermen's Direct Marketing Manual is now available.

"This edition is not only updated but also significantly expanded from previous ones," says Terry Johnson of Alaska Sea Grant College Program's Marine Advisory Services. Johnson compiled the earlier editions of the manual, with help from numerous topic experts, including Washington Sea Grant's Sarah Fiskén and Pete Granger.

"Readers have given us suggestions on how to make [the manual] better and we have tried to incorporate those suggestions in this edition," says Johnson. "Even if you have a copy of an earlier edition, you may want to read through this one; you'll find many changes and we hope they are improvements."

The new edition contains chapters and appendices on e-commerce, accounting, setting up a boat for direct marketing, working with a custom processor and shipping live seafood. It was produced by Washington Sea Grant and distributed by both Washington and Alaska Sea Grant programs.

The Fishermen's Direct Marketing Manual is available from Washington Sea Grant Communications, 206.543.0555 or [sgpubs@u.washington.edu](mailto:sgpubs@u.washington.edu). Plans to put the manual online as a downloadable PDF are also being considered.



Held in September, the Northwest Workshop on Bivalve Aquaculture and the Environment included experts from the United States, Canada and Europe. Among the participants were (left to right): Carter Newell, Blue Hill (Maine) Hydraulics Incorporated; Ken Chew, Professor Emeritus, UW School of Aquatic and Fishery Sciences; Mark Luckenbach, College of William and Mary; Roger L. Mann, Virginia Institute of Marine Science; and Roger Newell, University of Maryland Center for Environmental Science. The two-day event was hosted by the UW School of Ocean and Fishery Sciences and WSG, in partnership with the Washington Department of Ecology, NOAA Fisheries' Northwest Fisheries Science Center and Northwest Regional Office, Washington Department of Natural Resources and Alaska Sea Grant College Program.

# Identifying Ocean, Coastal Research and Information Needs

Help shape the future direction of West Coast marine research and discovery by completing an online survey on the Washington Sea Grant Web site ([www.wsg.washington.edu](http://www.wsg.washington.edu), click on 'Online Survey').

Washington, Oregon, California and University of Southern California Sea Grant programs are working together to develop a Marine Research and Information Plan for the California Current Large Marine Ecosystem. The process of drafting the plan will engage coastal interests throughout the region in identifying marine research and information priorities. To be completed in fall 2008, the final plan will:

- Ensure the region's unique resource management challenges are better understood and represented at the federal level;
- Identify the common scientific needs of West Coast communities to support region-wide collaboration on critical ocean and coastal issues; and

- Encourage regional progress toward ecosystem approaches to research, management and outreach.

Providing your comments now will help ensure that your knowledge, experience and perspectives are incorporated into the regional plan. The survey may take as little as 10 minutes — but your comments will help shape the future of our coastal and marine resources for many generations to come.

Comments must be received by December 31, 2007. For additional information on the project, please visit [wsg.washington.edu/research/econcomdev/regional\\_plan.html](http://wsg.washington.edu/research/econcomdev/regional_plan.html) or contact Washington Sea Grant at 206.543.6600.



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Autumn 2007

GLASS-SPONGE REEFS  
TRAINING FOR SEAFOOD SELLERS  
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