



Shark Tale: *A Focus on the Pacific Shark Research Center*

By Erin Loury

Shark. The word conjures up a sea of fearsome images – tell-tale dorsal fins, enormous mouths, jagged white teeth. Thanks to the movie *Jaws*, these associations usually revolve around a single species, the white shark. This deceptively narrow portrait lacks a crucial component – shark diversity. Sharks come in all shapes and sizes, ranging from the tiny hand-sized pygmy shark, to the plankton-eating whale shark the length of a city bus. The vast majority of sharks grow no larger than six feet in length, hardly measuring up to the behemoths of popular imagination.

“We know very little about the life histories of sharks commonly occurring in our California waters,” said Dr. David Ebert, Research Faculty of the Ichthyology Lab and 1984 MLML alumnus. Ebert serves as

the program manager for the Pacific Shark Research Center (PSRC), a program established with federal funding in 2002 and widely regarded as the leading shark research center on the west coast. Dr. Gregor Cailliet, professor emeritus of Ichthyology, oversees the Center where eight current graduate students are pursuing their Master’s theses on PSRC-supported projects. The PSRC is the only Pacific coast institution of four organizations comprising the National Shark Research Consortium (NSRC): Mote Marine Laboratory in Florida, the University of Florida/Florida Museum of Natural History, and the Virginia Institute for Marine Science. The four NSRC centers conduct basic and applied research on sharks and related species, and help inform public policy, fisheries management, outreach, and education.

describe new species (see Creature Feature on page 4). PSRC researchers and students have described nine new species in the past three years, with five species currently being reviewed for publication.

Research at the PSRC includes chondrichthyan fauna found along the North American Pacific coast, ranging from the Bering Sea to the tip of Baja California. Areas of study include age and growth, reproduction, feeding ecology, and systematics (the study of diversity, classification, and evolutionary relationships). Students also use tagging and tracking techniques to assess shark movement patterns and habitat associations. Results from PSRC research help the Highly Migratory Species division of the National Marine Fisheries Service (NMFS) fill in knowledge gaps on sharks and their relatives. Sharks, skates and rays are targeted by many fisheries, but also wind up as unintended “bycatch,” and are discarded. Many shark populations in the United States have declined sharply since the mid 1980’s, underscoring the need for scientific research to inform management and conservation decisions.

Much of the current research at the PSRC focuses on skates, the most species-rich group of chondrichthyans. Seven years ago, Ebert’s search for basic information on skate biology for

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Dr. Dave Ebert and PSRC Students Mariah Boyle, Jenny Kemper and Kelsey James examine specimens of a Pacific Black Dogfish.

Sharks and their relatives provide the shark centers a wide array of potential research subjects. The class Chondrichthyes (fishes with cartilaginous skeletons) consists of about 494 species of sharks, 44 species of chimaeras (the ratfishes) and over 630 species of batoids (rays and skates), for a total of over 1,100 described species. These numbers keep growing as scientists continue to recognize and



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SCIENCE CAFE

Friends of MLML created the first Science Café on the Monterey Bay. Science Café's are springing up all over the country to advance public literacy in marine science. This grassroots effort develops dialogue between scientists and their audiences. To check out this effort advanced by NOVA scienceNOW,

Notes from the Helm Dr. Kenneth Coale Director of MLML



Greetings All. It is certainly a pleasure to share some of the brighter stories with you following what has been a very difficult year. This helps us to maintain perspective: in spite of the budget crisis, the suspension of bond-funded research projects, the furloughs of our staff and faculty, and the increase in student fees, our metrics of performance are very encouraging. In brief, student applications are strong, our research activity is gaining ground, awards are increasing this year, and publications continue to roll out of MLML, securing our reputation among the research institutions around the Bay. There have been some large awards through the American Recovery and Reinvestment Act to help upgrade systems aboard the Research Vessel Point Sur. A large grant has been submitted to the National Institute for Standards and

Technology which, if funded, will help to rebuild our research pier and integrated aquaculture facility. We are engaged in a planning process with the County of Monterey to produce an innovative community development plan for Moss Landing over the long term. Working with the public and local businesses, this plan is calling for more innovative solutions to problems facing the coastal zone. So, MLML continues to be an active force for responsible development and community outreach in some very tangible and exciting ways. We look forward to sharing these projects with you and wish for you the very best in this new year.

Best regards,

Kenneth
Kenneth

What's New?

visit sciencecafes.org and click on "find a café." At MLML we begin each evening with a short ice breaker question for small group discussion. As we develop a more informed and engaged public, we promote marine science as part of our everyday understanding and concern.

BOARDWALK BENCHES

The Boardwalk project inched forward with three Memorial Benches. The families and friends of Dorothy Carnie, Michael Newcomer and Jeffrey Schrock were relieved and grateful to see the names of their loved ones finally memorialized on beautiful hand-crafted redwood benches. The sturdy benches, constructed of mostly recycled old growth redwood were the last ones built by Tom Schots

Redwood Furniture. Come sit awhile on John Martin's Point of View deck and enjoy the memory of these great Friends of MLML.



his book *Sharks, Rays, and Chimaeras of California* (University of California Press, 2003), lead him to the docks of Moss Landing. He queried fishermen for skate specimens to examine their diet and reproduction firsthand. Discerning similar-looking skate species can be problematic, leading fishermen and managers to lump them as “unidentified skate” when reporting their catch. “You can’t develop regulatory management policies if you don’t know what species you’re dealing with,” Ebert said.

Skates live on or near the seafloor, making them particularly susceptible to trawl nets targeting other bottom-dwelling species, like halibut. Several MLML graduate students are studying skate diets to identify the role these animals play in marine food webs, and how their removal through fishing may impact the ecosystem. Many chondrichthyans can live a relatively long time (up to 75 years for the spiny dogfish), grow slowly, and mature late in life, meaning their populations turn over slowly.

“If you couple that with low reproductive output and any kind of mortality at all, it reduces the ability to recover from heavy fishing,” said Cailliet, who has studied the age, growth, and demography of elasmobranchs since 1979 and is considered a leading authority in the field. Inaccurate estimates of growth rate and longevity can lead to serious overexploitation of fish stocks. Sharks

and skates lay down growth bands in their vertebrae, which scientists can count like tree rings to estimate their age. These band counts must also be validated. Validation methods for long-lived fishes like sharks include tetracycline marking, tag-recapture studies and newer radiometric techniques. These newer methods, used mainly on corals and bony fishes, identify the spike of radioactivity that came from radiocarbon released into the atmosphere from nuclear bomb testing in the 1950s and ’60s. PSRC scientists Lisa Kerr, Daniele Ardizzone, Allen Andrews and Cailliet used this technique to successfully confirm age estimates of the shortfin mako and the white shark.

Information on chondrichthyan biology is available to the public via a life-history data matrix on the PSRC website (<http://psrc.mlml.calstate.edu>). This table summarizes the available knowledge of about 106 chondrichthyan species found on the Pacific coast, and highlights information gaps to prompt future research. Monthly “Featured Elasmobranch” profiles provide details on biology, habitat and distribution. The PSRC also maintains a museum collection of some 100 species of chondrichthyans which represents about 9% of all known species, and contains specimens from Alaska and Antarctica to the Galapagos and Taiwan.

In June 2009, funding was cut for the entire shark consortium at the national level due to its volatility as an earmark. Cailliet will continue to seek funding for the PSRC while serving as its director in retirement, and the PSRC will continue to operate and conduct research through the efforts of Ebert and MLML



Author and PSRC student Erin Loury with a Pacific Sleeper Shark aboard a NMFS groundfish survey. The shark was released alive.

graduate students. The MLML group has produced over 100 scientific, peer-reviewed publications in its 7 years of operation. PSRC publications were presented at a symposium on shark and ray age and growth held in Cailliet's honor in 2005 at the annual American Elasmobranch Society meeting in Tampa Bay, Florida. Many have since been published in the journal *Environmental Biology of Fishes*, and published as a book by Springer.

“PSRC publications are being used in fishery management plans and stock assessments for sharks and rays on both coasts and the Gulf of Mexico,” Cailliet said. Cailliet gave the keynote address for the fifth World Fisheries Congress in Yokohama, Japan in October, 2008, and oversaw the thesis defense of his 103rd graduate student in September 2009. When asked to share the favorite parts of his career in research and academia, Cailliet says, “Seeing the glow in students’ eyes when they come up with a new answer. It’s always been my joy in life.” The next time you think of sharks, we hope you will think of the Pacific Shark Research Center and the groundbreaking research conducted by the professors, research scientists and graduate students of Moss Landing Marine Laboratories.



PSRC student Megan Winton holds a Sixgill Shark aboard a NMFS groundfish survey.

Creature Feature

By Erin Loury

Your assignment: describe a new species and submit the description for publication. Such is the syllabus for the MLML graduate systematics class taught by Ichthyology Research Faculty members Dr. David Ebert and Dr. Lara Ferry-Graham. The field of systematics covers the diversity, classification and evolutionary relationships of different species. Students have an extensive collection of specimens at their disposal through the MLML Museum and Pacific Shark Research Center (PSRC).

Ichthyology graduate student, Jonathan Walsh, took this class in 2005 to sharpen his writing skills and get a publication under his belt. He chose to re-describe four species of angel sharks (Genus *Squatina*) found in the western North Pacific near Japan and Taiwan. Angel sharks have a flattened, bell-shaped upper body and large, wing-like pectoral fins. Angel sharks often spend time on the seafloor, and are caught in fisheries around the world.

Although their distinctive appearance easily separates them from other shark groups, angel shark species are very difficult to tell apart from each other. "Identification of different western North Pacific angel sharks isn't just for the sake of knowledge," Walsh said. "There is a real need to know how to tell these species apart since they are caught by fishermen."



Correctly indentifying species is key to conducting proper research, collecting accurate catch information, and effectively managing fisheries.

With the discerning eye of a detective, Walsh made careful morphometric measurements such as fin shape and position, and searched for distinguishing species characteristics. He coped with the challenges of having limited specimens at his disposal, the poor condition of the type specimens used in the original descriptions, and their distant locations of storage, like Taiwan and London. After many manuscript revisions with co-author Dave Ebert, Walsh successfully submitted his paper, which was published in the journal *Zootaxa* in 2007.

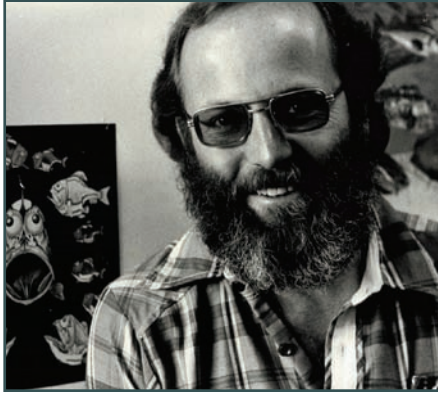
The project also yielded an unexpected surprise. In the process of combing through shark specimens,

Walsh examined a foot-long, immature female collected by shark expert Leonard Compagno on a research cruise in the Philippines. Careful scrutiny convinced Walsh that this angel shark was a species new to science. He and Ebert decided to honor MLML's long-time professor of Ichthyology, Dr. Gregor Cailliet, by naming the species after him. "Greg has never had a fish named after him, and he did some pioneering life-history work on the California angel shark with MLML alumna, Dr. Lisa Natanson," Ebert said. The manuscript describing this new species is currently in review, and according to the International Commission on Zoological Nomenclature, the new name cannot appear in print until it is officially published in a journal.

This new species, in addition to three others recently described by Australian scientists, means that a total of 22 angel shark species are recognized worldwide. "I have a lot of respect for the scientists who did this 100 years ago without the benefit of all the technology, especially email, that we have now," said Walsh. "There is a reason why we have old photos of scientists barricaded in their lab for months surrounded by millions of jars of dead fish." Cailliet, for his part, thinks the honor is wonderful, but expressed concern that the name might imply a resemblance to this, short, stubby and grayish angel shark.



YIPPIE I O ... Greg Caillet Retires



by Jim Harvey with input from Mike Foster, Milton Love, and Mary Yoklavich

Dr. Gregor Cailliet (aka Yippie I O) is retiring after 35 years as the Ichthyologist, main keeper of records, and jovial steward of Moss Landing Marine Laboratories (MLML). Born Gregor Michel Cailliet in a small chalet in France and raised on wine and French fries...wait a minute there... Greg hasn't ever consumed French fries...although the wine sounds about right. Greg attended the University of California at Santa Barbara for his B.A. and his Ph.D. His doctoral research, under the guidance of Dr. Al Ebeling, was on deep-sea fishes associated with the Santa Barbara Channel. Greg has been on the faculty of California State University, Fresno and MLML since 1972.

His statistics are impressive: Greg has been the major advisor for more than 100 MLML graduate students, has published close to a zillion peer-reviewed papers and books (actually about 150 publications), is the Program Director of the Pacific Shark Research Center, and a consultant for the State and Regional Water Quality Control Board and the California Energy Commission. What is more difficult to document, is his dedication and tireless contribution to MLML and all of its students. I can recall seeking his advice about my own Master's thesis, course work, and life in general.

Unable to say no to any request, Greg has been an initiator and participant in central coast marine research and conservation. He was a founding representative and served 13 years on the Advisory Committee for the Elkhorn Slough Estuarine Research Reserve, and was a founder of the Research Activity Panel of the Monterey Bay National Marine Sanctuary, on which he has served since 1993. He has provided expert opinion on fish-related topics and ecological principles to many state, federal, and international agencies as well as non-government organizations. You would be hard pressed to find anyone in the research community around Monterey Bay that does not know Greg.

Greg has taught Marine Ecology, Ichthyology, Population Biology, and numerous seminar and specialty courses at MLML. His lab has been instrumental in developing age determination and verification techniques, counting growth zones in calcified structures such as the vertebral centra of elasmobranchs, skates, fin rays, and otoliths of bony fishes.

During his teaching career, Greg has experienced the dramatic changes in technology, from the use of cuneiform tablets, quill pens, typewriters, and mimeographs to computers and PowerPoint presentations. Although some weak-willed individuals rapidly advanced to graphic software programs, Greg, like a monk in a



cloistered monastery, continued using *Greg Graph*. This proprietary program is basically Greg preparing nice, hand-drawn line images on a piece of paper, which he then scans into a presentation program. "When in doubt plot it out." He also spiced up his lectures with what was on his mind, such as his hip replacement, faculty issues, world travels, and the ups and downs of married life.

One of Greg's greatest legacies to MLML will be his meticulous notes, taken at seminars, thesis defenses and faculty meetings. The history of the Lab and all the faculty meetings are well chronicled on note paper replete with arrows, highlighting and white-out. I fear for a day when we sit dumbfounded waiting for someone to recall what we decided weeks or months ago.

During his early years at MLML Greg was often found on the V-ball court, demoralizing opponents with his famous "Scuzz Dink." His dancing skills and costumes are legend at the MLML Halloween Parties. Greg represents the great things about MLML: dedication to teaching and student development; an emphasis on organismal science and the ecosystem; integration of science into the community; and the feeling that WE CAN DO THIS. Though Greg will still be around, I will miss the passion, commitment, memory, notes, and the highlighter pen.

MLML Research Centers Updates

Benthic Ecology

In our second season on “the Ice” in Antarctica under the guidance of Dr. Stacy Kim, the Benthic Lab-built ROV SCINI dove to 300 m depths and under ice 200 m thick. We brought back exciting images of surprisingly rich seafloor communities that live 80 km back under the permanent McMurdo Ice Shelf, and are now faced with a new mystery – what are the animals eating? Follow our Fall 2009 Antarctic expedition at <http://scini2009.mlml.calstate.edu/updates>. Our current student research includes the reproductive and dispersal patterns of deep sea hydrothermal vent animals.



Benthic Lab engineers Bob Zook and Francois Cazenave deploy the remotely operated vehicle SCINI (Submersible Capable of under Ice Navigation and Imaging) through the ice in Antarctica.

Biological Oceanography

Headed by Dr. Nick Welschmeyer, our lab is currently collaborating with Dr. Larry Breaker on a California Sea Grant-funded project to identify and characterize regime shifts in the California Current. The project will identify relationships between physical changes based on sea surface temperature, and ecosystem changes based on the available biological records. Our lab will do pigment analyses to assess phytoplankton community composition and determine if physical ocean properties can be used to predict changes in ecosystem dynamics and nutrient cycling in the biological community. Students are

also reevaluating methods currently used to measure primary production in the ocean, and researching the effectiveness of treatment procedures to remove invasive plankton from ship ballast water in California harbors.

Chemical Oceanography

Although the distractions of the directorship have taken much of Dr. Coale's attention, the Laboratory continues to make headway, pushing back the frontiers of Chemical Oceanography. The Chemical Oceanography lab and students are wrapping up a long term study in the Bay Delta Complex where mercury contamination from the gold rush era continues to plague the ecosystem. Pioneering work by MLML graduate, Amy Byington, shows that much of the neurotoxic methyl mercury is naturally degraded by sunlight. Her findings now allow for a balance of the mercury budget in the delta. Graduate student Elizabeth Sassone has put these findings to use in the study of artificial wetlands that can be designed to produce less of this neurotoxin. Graduate student John Negrey is studying the role that mercury plays in the ability of young salmon to transition to salt water. Dr. Coale continues his interests in coastal observations and trace metal biogeochemistry. Coale has been invited to address the American Association for the Advancement of Science regarding the use of open ocean iron fertilization to mitigate atmospheric carbon dioxide.

Ecomorphology

Dr. Lara Ferry-Graham heads the Ecomorphology Lab Group in the study of organismal structure and function. Interesting new tools acquired this year with NSF grant funding are two field-ready, high-speed digital video cameras that film up to 1000 frames per second.



Ben Perlman and crew from the Monterey Bay Aquarium sorting out fishes captured using a seine net at Del Monte beach. Ben is studying fin morphology and swimming physiology in the surfperch.

This complements our lab-based cameras that film up to 8000 frames per second, used to slow down and analyze the movement of various body structures, and our “water tunnel”, which is basically a treadmill for fishes. Multiple papers were published over the summer demonstrating the application of this technology to ecological and evolutionary questions, and on-going collaborations allow us to continue to expand the sorts of questions we are able to answer. We are looking forward to several Ecomorphology thesis defenses on topics such as the functional use of eelgrass as habitat in Elkhorn Slough, and the relationship between jaw morphology and ecology in the surfperches.

Fisheries & Conservation Biology

Under the direction of Dr. Rick Starr, students and technicians spent 52 days at sea in 2008 and successfully completed surveys of central California marine protected areas. We worked with Dean Wendt of Cal Poly San Luis Obispo and fishermen in Morro Bay, Monterey, and Half Moon Bay



Dr. Rick Starr holds a cabezon tagged during a survey of marine protected areas.

as part of the California Collaborative Fisheries Research Program (CCFRP). Dr. Starr also spent much of September and October at sea with Co-PI Mary Yoklavich of NMFS, conducting submersible surveys of the deeper portions of MPAs in central California. In December 2008, our team organized an international workshop to provide the California Department of Fish and Game with ways to manage data-poor fisheries.

Geological Oceanography

Under the guidance of Dr. Ivano Aiello, our lab works to investigate the interaction between biology and geology, and map the changes to our coastline as sea level continues to rise. Last summer, Dr. Aiello acquired a new 3-D Terrestrial Laser Scanner and started work on a yearlong scanning and costal mapping project, which involved both Moss Landing State Beach and the Elkhorn Slough. Students have begun to use the scanner to map changes in sediment volumes for theses such as saltpan development in the Elkhorn Slough, and the relationship between sediment transport and beach morphology on the coastline of Central Monterey Bay. Other student projects include the study of rhodoliths (calcareous algae), deep marine sediments, and the use of heavy minerals to trace near-shore sediment transport.

Invertebrate Zoology & Molecular Ecology

Dr. Jon Geller's Lab is involved in diverse projects including a study of biological invasions tracing the global distributions of *Halichondria* sponges to determine which are new to California. A second, in partnership with the Smithsonian Environmental Research Center, monitors experimental substrates and plankton for invasive species in San Francisco Bay. He collaborates with the Smithsonian Institution in both the Moorea Biocode project, which seeks a

DNA sequence from every species on the Polynesian island of Moorea, and the Census of Coral Reef Ecosystems project, which monitors the health of coral reefs by sequencing DNA of organisms on settlement apparatus deployed around the world. Student research topics include the effects of ocean acidification on jellyfish development, the historic genetic diversity of endangered white abalone in southern California, red octopus development and behavior, the effects of microclimate on intertidal mollusks, tropical corals and their endosymbiotic algae in Panama, and the evolution of deep-sea sponges.

Physical Oceanography

Dr. Erika McPhee-Shaw and her students are working on a variety of collaborative projects, such as partnering with MBARI on the Land Ocean Biogeochemical Observatory in Elkhorn Slough. Another project with the University of Washington involves analyzing data collected from the Monterey Bay Canyon to investigate internal waves and boundary mixing. An interdisciplinary Sea Grant-funded project in conjunction with the Vertebrate Ecology lab will track sooty shearwater movements through the California current system in the summer months, and analyze the tracks with the physical oceanography of the region.

Phycology

The Phycology Lab has seen many recent transitions. Dr. Michael Graham recently received tenure and is now on sabbatical for 2009/2010.



Phycology Lab students and Dr. Michael Graham



*Nate Jones getting up close and personal with a Northern Fulmar (*Fulmarus glacialis*)*

During that time Dr. Graham will be working to write grants to support an Integrative Aquaculture facility at MLML, and continue his funded research from NSF on climate impacts on kelp recruitment, and from NOAA/Seagrant to further the development of integrated techniques for seaweed/abalone aquaculture. The Phycology Lab also was involved in the hosting of the Annual Meeting of the Western Society of Naturalists in Seaside, November 2009, for which Dr. Graham serves as the local chair. Several Phycology students presented their thesis research at the Annual Meeting of the Phycological Society of America in Honolulu, July 2009, and the whole lab will be traveling to Ensenada, Mexico in Spring 2010 to participate in the International Seaweed Symposium.

Vertebrate Ecology

Dr. Jim Harvey heads this lab, which recently instrumented leatherback sea turtles with video cameras to learn more about their feeding ecology and diving behavior. Current student research includes the study of scyphozoan jellies as leatherback sea turtle prey and foraging patterns and diet of seabirds in the Bering Sea, Alaska. Student research on marine mammals includes the foraging ecology of harbor seals in San Francisco Bay, the effects of vessels on harbor seal behavior and energetics in Glacier Bay, Alaska, and the effects of refrigeration, freezing, and long-term storage on blood sample chemistry and hematology values for California sea lions.

MLML Graduates 2007, 2008, 2009

2006

Robinson, Heather

Spatial and Temporal Patterns of Movement and Habitat Utilization of Adult and Juvenile Leopard Sharks in Elkhorn Slough, California

Beatman, Luke (SJSU)

Design and performance of the Moss Landing Marine Labs COOPS sun photometer.

Kimball, Thomas (CSUMB)

Mercury methylation in sediments from Coastal and Sierra watersheds: implication for methyl mercury mitigation in San Francisco Bay-Delta Complex

2007

Schaaf-DaSilva, Jayna (SJSU)

A revision of the north Pacific Cephaloscyllium

Rinewalt, Christopher (CSUMB)

*Diet and ecomorphological aspects of the sandpaper skate, *Bathyraja kincaidii*, from the eastern north Pacific.*

Camilli, Luis (SJSU)

Optical-chemical ecological assessment of Pacific Panamanian reef Habitats.

Erdey, Mercedes (CSUMB)

Development of an ArcGIS seafloor characterization toolbox for analyzing nearshore multibeam and side scan sonar

Lopez, Holly (CSUMB)

Characterizing Sedimentary Bedforms as Habitat for Fishes and Invertebrates in the San Jan Archipelago, Washington, USA and the Georgia Basin, British Columbia

Murai, Lee (CSUMB)

Continental Shelf Morphology and Trans-Terrestrial Landslide Potential along the Big Sur Coast of California

Al-AmEri, Lubna (CSUMB)

Geological and Geochemical factors controlling Seagrass Habitat distribution in the Marawah Marine Protected Area and the Ras Emasih area in United Arab Emirates

Gehring, Daphne (CSUMB)

*Molecular, histological, and behavioral differences in largemouth bass (*Micropterus salmoides*) and topmelt (*Altherinops affinis*) exposed to methyl mercury.*

Hoos, Phillip (CSUMB)

*The introduction of the wettern Atlantic clam *Gemma gemma* to California: comparing inferences from genetic and historical data.*

Lundsten, Lonny (CSUMB)

The Biogeography and Distribution of California Seamount Megafauna

Byington, Amy (SJSU)

Photo-degradation of methylmercury in the Sacramento-San Joaquin Delta Estuary

Sanders, Rhea (CSUMB)

Historic atmospheric Hg deposition in California

Hughes, Brent (East Bay)

*Effects of *Egretta menziesii* populations on rocky intertidal benthic assemblages*

Dawson, Cyndi (SFSU)

*Movements, habitat use, and seasonality of the prickly shark *Echinorhinus coolei*, in the Monterey Canyon*

2008

Cazenave, Francois (SJSU)

Internal waves over the continental shelf in south Monterey Bay.

Brooks, Cassandra (CSUMB)

*Radiometric Age Validation and spatial distribution of Antarctic toothfish, *Dissostichus mawsoni*.*

Hall, Laurie (CSUMB)

Characterizing the dispersal patterns and social system of

*marbled murrelets (*Brachyramphus marmoratus*) using microsatellites.*

Sweeney, Joelle (SFSU)

*Variables affecting hardpart recovery from scats and spews of California Seal Lion (*Zalophus californianus*)*

Thomas, Kate (CSUMB)

*Movement, dive behavior, and survival of the California sea lion (*Zalophus californianus*) post-rehabilitation for domoic acid toxicity.*

Sassoubre, Lauren (CSUMB)

Sediment Resuspension and Intermediate Nepheloid Layers in Soquel Canyon, Monterey Bay.

Kohtio, Diana (SJSU)

*Population Biology of the Invasive Kelp *Unidaria pinnatifida* in Central California*

Szoboszlai, Amber (SJSU)

Positive and negative effects of intertidal macroalgal caopies on fucoid recruitment

Alifano, Aurora (SJSU)

*Effects of Algal Drift and Site-Specific Geology on Abundance, survival, and reproduction of intertidal *Strongylocentrotus purpuratus* Populations in Central California*

Jorve, Jennifer (SJSU)

Physical and biological consequences of morphological variability in a dominant habitat-forming alga

Smith, Sarah (SJSU)

Flow cytometric analysis of estuarine phytoplankton viability in Elkhorn Slough, CA.

Vega, Gabriela (Stanislaus)

*Biological collections from the Gakkel Ridge, a slow-spreading ridge in the high Arctic; investigating the trophic ecology of near vent *Porifera**

Huber, Matthew (CSUMB)

CO2 effects on marine

MLML Graduates 2007, 2008, 2009 cont.

phytoplankton: inhibition of photosynthetic processes

Scianni, Christopher (Stanislaus)
Oxygen-based verification of a new dilution protocol for determining microzooplankton grazing rates.

Brady, Briana (SJSU)
*Long-term changes in the size, sex, fecundity, and fishery of *Loligo opalescens*.*

Barnett, Lewis (CSUMB)
*Age, Growth, and reproduction of the white-spotted ratfish, *Hydrolagus coliei* (Lay and Bennett, 1839).*

2009

Overstrom-Coleman, Max (SJSU)
Spatio-temporal variability and ecological significance of macrophyte-derived particulate matter (POM) within and surrounding a central California giant kelp forest.

Glenn, Kyle (CSUMB)
*Effects of light, depth, and parent morphology in growth from polymorphism in the giant kelp, *Macrosystis pyrifera*.*

Kauffman, William (SJSU)
Analysis of Microbial Diversity in Elkhorn Slough Sediment along vertical geological gradients.

Ainsley, Shaara (CSUMB)
*Age, Growth, Reproduction of Bering Skate, *Bathyraja interrupta* (Gill and*

Townsend, 1897) from the Bering Sea and the Gulf of Alaska.

Greenley, Ashley (SJSU)
*Seasonal Occurrence and movement patterns of Lingcod (*Ophiodon elongatus*) in Carmel Bay, California.*

Wadsworth, Thomas (SJSU)
Abundance Surveys of Kelp Habitat Fishes of Central California: Applicability for stock assessments.

Burrows, Julia (SJSU)
Effects of productivity on marine mammal abundance and diversity in Monterey Bay, California.

Carroll, Dustin (CSUMB)
Oceanographic Dynamics and nutrient delivery in Stillwater Cove, CA.

Endris, Charles (SFSU)
Monitoring Change in a California Estuary: Application of a terrestrial laser scanner (TLS) in the assessment of high-resolution geomorphologic variability in Elkhorn Slough, CA.

Graham, Tanya (SJSU)
*Distribution and nutritional value of the Scyphomedusan prey of the leatherback sea turtle (*Dermochelys coriacea*) in Monterey Bay, California*

Fry, Jasmine (CSUMB)
Age, growth, and reproduction of two eastern Bering Sea continental

*slope skates: *Bathyraja lindbergi* (Commander skate), and *Bathyraja maculata* (whiteblotched skate).*

Grant, Nora (CSUMB)
*Habitat use of *Zostera marina* by Fishes and Invertebrates in Elkhorn Slough, CA.*

Reyes, Catalina (Fresno)
Effect of Erosion on the Distribution of Subtidal Communities through the Exposure of Sediment with Different Lithological Properties, Elkhorn Slough, Monterey County, California.

Romero, Rosemary (SJSU)
*Recruitment strategies of the ephemeral opportunistic macroalga *Ulva* (Linnaeus) in central California.*

Wehrenberg, Megan (SFSU)
*Population Dynamics and Mechanisms for population persistence of *Gracilariopsis* spp. in Central CA.*

Reynolds, Kyle (CSUMB)
*Reproductive strategies of the dominant gastropods of the Lau Basin hydrothermal vent system: *Alviniconcha hessleri* and *Ifremeria nautilei*.*

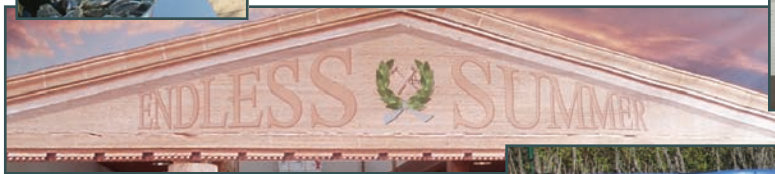
Young, Colleen (SJSU)
*Disturbance of harbor seals (*Phoca vitulina richardii*) by vessels in Johns Hopkins Inlet, Glacier Bay National Park, Alaska.*

In Memoriam: Professor James Nybakken

MLML founding Faculty member, Dr. James Nybakken passed away on June 20, 2009. Dr. Nybakken served on the Board of Friends for ten years, six as Chair. Jim taught Invertebrate Zoology at Moss Landing Marine Laboratories for 32 years and served as Interim Director before retiring to Emeritus status in 1998. After winning a battle with prostate cancer, he and wife Bette enjoyed traveling the globe. In August, 2008, Jim was diagnosed with leukemia. During that year, Jim initiated the Nybakken Scholarship for a student of Invertebrate Zoology. Amanda Kahn was chosen as the first Nybakken scholar for her research describing two new species of deep-sea hexactinellid sponges found in the northeast Pacific Ocean. The Nybakken family ask that donations in Jim's memory be sent to Friends of MLML for the James Nybakken Scholarship Fund. The Fund has taken off with over 56 Friends, Colleagues and Family member donations topping \$9,000. Dr. Bette Nybakken will join Dr. Jonathan Geller and Dr. Gregor Cailliet on the scholarship committee to select the 2010 Nybakken scholar.



Endless Summer 2007, 2008 & 2009



Thank you to our Endless Summer Donors!

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Friends would like to congratulate the following scholarship winners!

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Phillip Hoos, 2007
Lewis Barnett, (Xiphias) 2007
Sarah Smith, 2008
Rosemary Romero, (Xiphias) 2008
Selena McMillan, (Xiphias) 2008
Erinn McKell, 2009
Mariah Boyle, (Xiphias) 2009



Kim Peppard

Hilary Hayford, 2009

Martha Johnston

Danielle Frechette, 2009

Drew Gashler Internship – MBARI

Karen Parker, 2009

Nybakken

Amanda Kahn, 2009 (*First Annual*)

Archimedes

Jennifer Jorve, 2007
Corinne Gibble, 2009

Signe Lundstrom MLML Quilt Guild

Nora Grant, 2007
Jasmine Fry, 2007
Mariah Boyle, 2007
Berkeley Kauffman, 2007
Danielle Frechette, 2009
Arley Muth, 2009
Todd Hallenbach, 2009
Lisa Wertz-Webb, 2009
Ben Pearlman, 2009

Packard Grant Recipients 2008

Erinn McKell
Corrine Gibble
Kyle Glenn
Elsie Tanadjaja
Mariah Boyle
Selena McMillan
Simon Brown
Danielle Frechette
Jasmine Fry
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Jeremiah Brower
Hilary Hayford

Amanda Kahn
Jonathan Walsh
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Jennifer Broughton

Packard Grant Recipients 2009

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Jennifer Jorve
Julia Burrows
Shaara Ainsley
Lewis Barnett
Rosemary Romero
Kristen Green
Cassandra Brooks
Brian Dieter
Joelle Sweeney
Kim Quaranta
Elizabeth Keddy
Diane Haas
Laurie Hall
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Nora Grant
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The SCINI Project Slog

<http://scini.mlml.calstate.edu/>

Follow the SCINI scientists in Antarctica on their blog or “Slog” website. What is SCINI you ask? SCINI stands for Submersible Capable of under Ice Navigation and Imaging, an underwater robot specifically built to complete science missions beneath the frozen surface of the ocean in Antarctica. SCINI is a three year NSF grant that started in 2007. Deployments take place annually during the Antarctica summer season (fall and winter in the USA) and are based out of McMurdo Station. This field season’s biggest goal is to create maps of the seafloor. Log on to find out more information!



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Friends of Moss Landing Marine Laboratories support the research, education and conservation work of Moss Landing marine Laboratories through public education programs, scholarships, and our alumni organization.

Friends Update

For the eleventh year, Moss Landing and numerous Monterey and Santa Cruz County small businesses generously donated to our annual Endless Summer fundraiser. The party continues to delight and astonish with Phil's Fish Market and Haute Enchilada menu creations. Ardent MLML fans from the community mingle with costumed faculty, staff and students. For the past three years, Endless Summer has brought together students and staff to handcraft decorations and celebrate graduate education in marine science. This dedication along with key support from the David and Lucille Packard Foundation make it possible to engage the community with the Labs through public education programs. We host donations for student scholarships and employ students as retail and administrative assistants. Many thanks to you, members and donors, for shaping the future of marine science. In 2009, Friends enjoyed growth in memberships and individual and business donations.

The need for Friends to include our community and encourage dialogue in marine science is critical to our ability to support MLML graduate studies. The glaring difference between the level of excellence and dedication demanded of our marine science students today and our student athletes is financial support. Imagine if our athletes were required to purchase their own sports equipment and pay travel expenses to compete in games out of state! Through increased emphasis on science-based policy decisions, our national and global environmental goals forecast the future of 2030. The marine science graduate students of today will shape this not-so-distant future. Friends of MLML is a vehicle to help this generation of marine scientists to discover sustainable solutions based on sound science.

This Executive Director position has been my idea of a "Dream Job". It is such an honor to work in this stimulating and stunning environment. The opportunity to collaborate with the talented staff and ambitious students to create hand crafted public events has been a great joy. Having recently completed a Master of Public Policy at CSUMB with the Panetta Institute, I have shared the camaraderie of graduate level education with the students of MLML. I also share with you my excitement of selection for a prestigious fellowship. The NOAA Sea Grant program has chosen me for a Dean John A. Knauss Fellowship in Marine Policy. My host is NOAA Program Planning and Integration in Silver Spring, Maryland. I will begin February 1, 2010. My future goal is to return to the west coast to participate in regional management of our nation's marine resources.

The new 20 year plan for MLML includes three new major projects: marine operations to house a new research vessel, research pier with sustainable aquacultures and an academic village to house students. A third of the funds have been raised for The Boardwalk project and we look forward to completion of final designs and necessary permits. To all of you patient plank donors, a restricted fund holds all of your plank donations in anticipation of the next phase in building this ambitious public access project. The next Executive Director of Friends of MLML will share with you the incredible transformation of Moss Landing into a marine science research center for sustainable ocean science innovation led by Moss Landing Marine Laboratories.



Karen Carlson
Executive Director

Join Friends!

Become a Friend of Moss Landing Marine Laboratories and receive these benefits: support for MLML in furthering research, education and conservation in marine and coastal environments, receive a subscription to our newsletter, WAVE, advance notices about Friends activities and programs, and a 10% discount on Friends retail items.

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DropIn!

MLML's New Blog Site

<http://mlmlblog.wordpress.com/>

Ever wish you could follow what MLML students are up to these days? Now you can keep your finger on the pulse of graduate student life through our new blog. "Drop-In" to our photos, videos, and first-hand accounts of research fresh from the field and live at the labs. It's a great resource for future marine scientists, MLML lovers, and ocean enthusiasts alike!

