Pacific Coast Science and Learning Center
Point Reyes National Seashore

National Park Service
U.S. Department of the Interior

Coastal Science Review

Issue 2, Summer 2004

Tomales Bay Biodiversity Partnership Updates

"Bio-Quests"

Since the fall of 2003, the Tomales Bay Biodiversity Inventory (TBBI) has conducted two "Bio-Quests." The first, an "Invertebrate-Quest" took place over the course of a week and included over six different partners whose combined talent, skills, and expertise covered the gamut of invertebrate taxonomy. The second, an "Algae-Quest" lasted two-days and revisited several rocky beaches that were inventoried in spring of 2004. Specimens are being identified and an algae species list for Tomales Bay is expected by December 2004.

Information from these "Bio-Quests," as well as other TBBI relevant data are being compiled in the Tomales Bay Biodiversity Database, which can be found online at www.tomalesbaylife.org. Compilation of the database is the first step to using science-based management to achieve the goals of the TBBP.

"Invertebrate-Quest" Partners

Bodega Marine Laboratory
The Natural History Museum of Los Angeles County
Dominican University
University of Oregon
Los Angeles Marine Biology Lab
Hydrozoologica

New Partnership to Develop Water Quality Database

The Tomales Bay Watershed Council (TBWC) has teamed with the National Park Service and the Pacific Coast Science and Learning Center to develop a water quality database for the Tomales Bay watershed. Dwight Shackleford and Daniel George are developing the database and incorporating all available water quality data from a myriad of agencies and scientists currently collecting data in the region. The new database will allow the TBWC to identify current gaps in monitoring effort and aid development of a robust new monitoring program to address water quality issues in the watershed.

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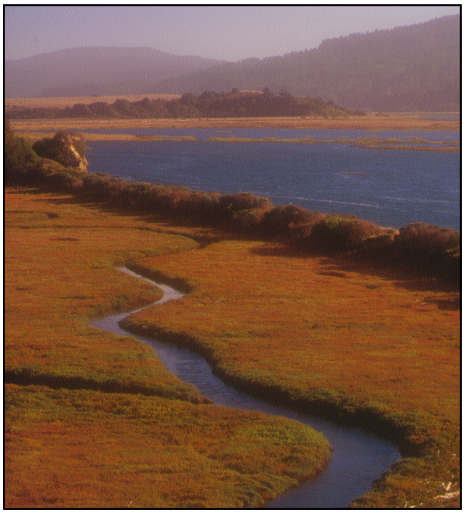

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Tomales Bay watershed is 220 square miles and represents about one third of the area of Marin County.

TOMALES BAY Watershed Council

"Working collaboratively to protect and restore the waters and lands of Tomales Bay Watershed"

www.tomalesbaywatershed.org

Tomales Bay Biodiversity Partnership Website

www.tomalesbaylife.org

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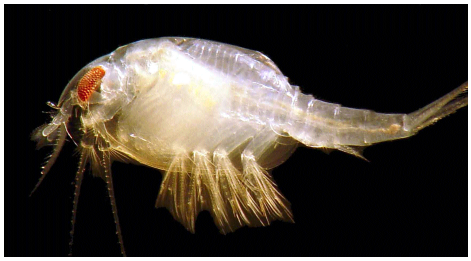
Tomales Bay Biodiversity Partnership Updates

New Species in the Bay

Invertebrate taxonomist Leslie Harris of the Natural History Museum of Los Angeles County (NHMLAC) recently collected a species new to science in the eelgrass beds of Tomales Bay. The as yet unnamed species is a crustacea, order *Leptostraca*, genus *Nebalia*. Todd Haney, a PhD student jointly at UCLA and NHMLAC is revising the phylogeny of the Leptostraca and will describe the new species.



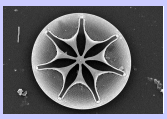
Leslie

The species new to Tomales Bay looks similar to this image of its tropical relative. However the new species is bright green, an ideal camouflage for life in the eelgrass beds.

Update on the *Didemnum vexillum* Invasion of Tomales Bay

In the last issue of Costal Science Review, we reported on the recent discovery of *Didemnum vexillum* (synonymous with *D. lahillei*), in Tomales Bay. This invasive clonal tunicate has fouled oyster growing operations and displaces native biodiversity in other estuaries and is thus an issue of concern for Tomales Bay mariculturists and conservationists. Our first steps in mitigating this threat are a partnership between the Natural History Museum of Los Angeles (NHMLAC) County, Dominican University, and Tomales High School. Interns from the University will systematically document the distribution of *D. vexillum* along the Tomales Bay shoreline. Future projects will attempt to remove the invasive. Other native and non-native invertebrates will also be collected and send to NHMLAC for taxonomic identification. While removal of D. vexillum has been unsuccessful in other estuaries, a tedious but effective physical removal process may slow the tunicates spread and keep the population below a threshold level where population growth remains slow.

***Didemnum vexillum*, a nonnative clonal ascidian discovered in Tomales Bay.**



TOMALES BAY BIODIVERSITY PARTNERSHIP RESEARCH

Completion of nearshore fishes inventory

Jim Pettigrew, San Francisco State University

Completion of the first year of research into the factors determining the distribution of native oysters

David Kimbro, University of California, Davis

Initial sampling and identification of intertidal benthic diatoms

Eileen Hemphill-Haley, Humboldt State University

Initial sampling and Identification of pelagic and epiphytic diatoms in Tomales Bay

Mary Ann Tiffany, San Diego State University and University of California Davis

Established long-term monitoring plots for algae biodiversity along the axis of Tomales Bay

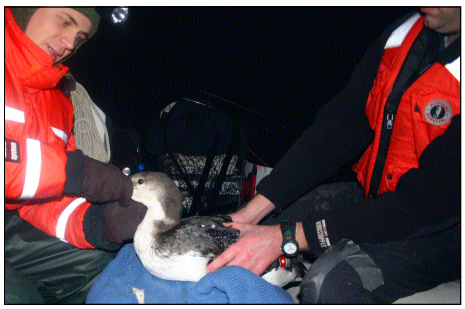
Lawrence Glacy, University of California, Davis

Loon Research Project Expands to Tomales Bay

As a combined effort between the BioDiversity Research Institute (BRI) and California State University, Chico, a study of overwintering loons has begun at several West Coast sites, including Tomales Bay. Over several years, loons will be captured from a boat during wintering seasons and re-released after a brief assessment.

Feather and blood samples for toxicology assays and genetic profiles will be taken to assess uptakes of environmental contaminants and to genetically trace wintering birds to geographically-identified breeding populations. Legbands are also applied to track movements of individual loons through resighting reports.

Along with high winter loon occupancy, Tomales Bay was selected as a study site due to mercury discharge from Walker Creek. This mercury discharge was a result of leakage from a defunct mercury mine several miles up Walker Creek. As toxicology through loons can yield significant information on the health of a watershed. This study will help clarify these areas of loon biology and ecology to better manage the species year-round, since comparatively little study exists of loons during their stressful and physiologically demanding overwintering months.



Loons are captured for a brief assessment and application of leg bands.

Statewide Population Assessment of Harbor Seals

The harbor seal population at Point Reyes represents the largest concentration of harbor seals in California other than the Channel Islands, and is estimated to account for 20% of the mainland breeding population. Consequently, the National Marine Fisheries Service (NMFS) identified Point Reyes as the primary area for implementing their program to estimate the total harbor seal population in California. In early June, researchers from the NMFS, Moss Landing Marine Laboratory, U.C. Davis Veterinary School, and Marine Mammal Center captured nearly 50 harbor seals at Point Reyes and affixed radio-tags on 40 of the seals. The researchers also captured and tagged another 50 seals in other parts of the state. The process includes tagging seals with flipper and radio-tags, and then surveying by airplane in all haul out sites looking for the radio-tagged seals (during the peak molt when many of the seals are visible on land). NMFS then estimates the population based on the proportion of tagged to un-tagged seals resting onshore and then multiplying the hauled out number based on the correction factor of how many tagged seals are NOT hauled out. This is called a “mark-recapture population estimate”.

The short-term disturbance will yield important results for this statewide population estimate and implications on how the seals are managed and protected by the state. Presently, the park is estimating that the population at Point Reyes is around 6,000 animals based on direct counts.

Researchers capture and tag harbor seals to estimate their populations for the entire state.

Marine Protected Areas Update

Pt. Reyes National Seashore continues to work with local fisherman, and agencies such as National Oceanic and Atmospheric Administration, Environmental Action Committee of West Marin, Environmental Defense Fund, Natural Resources Defense Council, and University of California Davis to suggest potential Marine Protected Areas (MPAs) for the Marin Coast. When the state resumes its implementation of a statewide network of MPAs, we hope to have a Marin coast MPA proposal supported by all stakeholders that will have both scientific and socioeconomic support.

Training Future Scientists

Homeschool Students Assist with Intertidal Monitoring

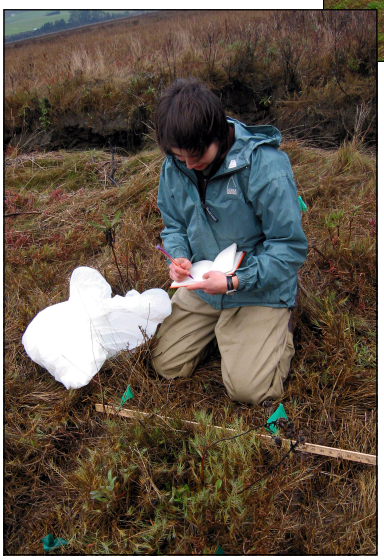
A twelve-week environmental science course designed by educator Ruth Lopez included intertidal monitoring experience for a dozen local homeschool students through the Pacific Coast Science and Learning Center (PCSLC). Each month, during low tide cycles, students would work under the supervision of the PCSLC Education Coordinator and closely follow a protocol designed by Gulf of the Farallones National Marine Sanctuary to observe the density and abundance of intertidal life. This field work was concurrent with student's other coursework, taught by Erin Blackwood, which included a study of how intertidal species interact with their environment and each other, basic ecology concepts such as adaptation and interdependency, and environmental issue analysis.

High school students survey the intertidal zone to determine species diversity and abundance.

College Intern Gains Hands-On Experience

The following article was written by Rosemary Records, a Biological Science Aid at Point Reyes National Seashore and a student at Santa Rosa Junior College.

Student interns gain experience with field work while assisting researchers in various studies.



This is my second year as an intern at Point Reyes National Seashore. I worked from fall 2003 until spring 2004, receiving college credit through Santa Rosa Junior College's school's work experience program. Much of my work was spent in the field, assisting a scientist with her research project on plant biodiversity in a coastal salt marsh within Point Reyes. Besides gaining the hands-on experience of fieldwork, I was also able to discuss with her the methodology of research and her experience working in the sciences.

In addition to fieldwork, an important component of my internship was the research and production of interpretive media on topics related to my work, including a paper on wetland ecosystems, a digital slide show on my experience as an intern, and a short scientific paper on a pilot study I conducted in the field.

These mentor relationships, as well as the hands-on experience of scientific research in a national park, have been deeply important to me, especially in making educational and career goals. In the past few years I have become increasingly more interested in a scientific career path, something I might not have seriously considered if I had not had the opportunity to intern at Point Reyes.

“Summer Science Seminar” for High School Students

The second-annual, week-long "Summer Science Seminar" (also known by the students as "The Point Reyes Adventure") was held at the Historic Lifeboat Station this June. Fifteen students from the San Francisco area became research assistants to conduct a sand crab inventory, water quality monitoring, and coastal restoration. The highlight of the week was an insect inventory conducted at two separate sites. Student teams captured live insects in designated plots and identified them to understand the differences in diversity between the two sites. Eventually, high school students may play a significant role in creating an insect species list for the Seashore. Every student received lodging, meals, and a stipend for their contributions.

From left to right, **students transport equipment to water quality monitoring locations, inspect sand crabs to determine their size and sex, live-capture insects, and identify these insects back at the Lifeboat Station.**

Coastal Air Quality

The National Park Service Air Quality Division's goal is to preserve, protect, enhance, and understand air quality and other resources sensitive to air quality in the National Park System. In March 2004, the Air Quality Division established an air quality web camera overlooking Great Beach looking east from the Point Reyes Lighthouse Visitor Center. Other air quality cameras are located at a dozen other sights which provide spectacular views and monitored readings of the weather and pollutant concentrations.

Air Quality Web Cameras are located across 14 National Park Service sites.

National Park Service Web Camera

http://www2.nature.nps.gov/air/WebCams/

Point Reyes National Seashore Web Camera

http://www2.nature.nps.gov/air/WebCams/parks/porecam/porecam.htm

Tomales Bay Biodiversity Partnership Updates

Algae and Invertebrate Inventories: Summer 2004

Five new college interns are performing systematic algae and invertebrate sampling and mapping for invasive species throughout the bay this summer. Kelly Kneece and Chris Tougeron (Sonoma State University) are visiting many of the beaches, mudflats and rocky coasts of the bay describing algal habitats, collecting specimens, and cataloging species distribution. Their advisor, Professor Chris Kjeldsen, has been visiting Tomales Bay with his students for over 30 years, giving them a keen perspective on temporal changes in habitats and invasive species. Meghan Hartnett, Lawrence Hepworth (both from Dominican University), and Brie Lindsey (recent University of California Berkeley graduate) have teamed with Leslie Harris (polychaetes collections manager, Natural History Museum of Los Angeles County) to survey the invertebrates of the bay over the summer. Data from both teams will provide information on the distribution of invasive species and allow management plans to address these threats.

Native Oyster Restoration Project by UC Davis and Bodega Marine Lab

Over 100 years ago, native oysters were a foundation species in Tomales Bay, providing complex habitat that housed a myriad of species, potentially cleaned the water column through filter feeding, and resisted invasions by non-native species. Overharvesting and siltatation destroyed most of these native oyster reefs. University of California Davis Professor Ted Grosholz and his graduate Student David Kimbro are placing native oyster restoration plots in the bay to help bring back this essential component of a healthy bay ecosystem. Similar restoration projects on the Chesapeake Bay have improved water quality, increased native species and birds, and hindered the spread of invasives. We look forward to the day whey native oysters are once again a major component of the Tomales Bay ecosystem.

The historic Hagmaier Ranch has been adapted-for use as the Pacific Coast Science and Learning Center.

Coastal Science Review is published twice a year by the Pacific Coast Science and Learning Center to share research supporting science-based management and preservation of our coastal resources. The Pacific Coast Science and Learning Center is a part of the National Park Service at Point Reyes National Seashore.

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For more information visit:
www.nps.gov/pore/science.htm

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