



# Ballast Exchange

Newsletter of the West Coast Ballast Outreach Project

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## Greetings

*Alisha Dahlstrom, Coordinator, West Coast Ballast Outreach Project*

Welcome to the Winter 2007 issue of Ballast Exchange, the newsletter produced by the California Sea Grant Extension Program's West Coast Ballast Outreach Project (WCBOP). This issue includes articles on a variety of topics (from treatment technologies to Quagga mussels) and from a wide geographic range (New Zealand to Michigan and beyond). While editing the articles for this issue, however, I observed several recurring themes running through many of them: a plethora of jargon and acronyms; the difficulties associated with taxonomy and species identification; and the emerging recognition of commercial vessel fouling as an important aquatic invasive species (AIS) vector. These themes seem not to be unique to *Ballast Exchange*, but to reflect trends in the larger AIS and ballast world.

Education and outreach efforts will be most effective if we avoid difficult jargon and use clear and accessible definitions and consistent terminology. The WCBOP has created an "AIS Acronym and Vocabulary Guide" section in the AIS/Ballast Background and Research program link on our website to help readers understand new terms and concepts. Please contact us if you notice any missing terms. Taxonomic confusion was a second theme mentioned by several newsletter authors, that has also been emphasized at recent AIS and ballast conferences. While genetic tests and other technologies will help solve this problem, many agree that identification based on morphological characteristics will always be the fallback method - and for this, local experts are in high demand. Additional help will also come in the new edition of *The Light and Smith Manual*, a 1000-page definitive guide to invertebrates from Point Conception, Calif., to the Columbia River. And finally, while ballast water has historically received significant attention, recent research shows a stronger role for commercial vessel fouling as a vector than previously believed. Several states and countries have introduced legislation on vessel fouling; keep track of this issue via the WCBOP website's vessel fouling section.

The last six months has seen much activity and changes not only in the ballast world, but also within the WCBOP. Some highlights include the creation of an AIS/ballast water/vessel fouling blog (updated daily), which can be found by clicking the "In the News" link on the WCBOP webpage. The blog provides a professional forum for legislative, regulatory, and news updates related to AIS, ballast water, and vessel fouling.

The biggest change to the WCBOP, however, is the departure of the WCBOP Coordinator, Holly Crosson. Holly left the WCBOP to take a joint position as Interpretation Coordinator for the UC Davis Arboretum and GATEways (Gardens, Art and the Environment) Program and the Extension Outreach Coordinator for Aquatic Invasive Species with the UC Davis Department of Environmental Science and Policy. We would like to thank Holly for all her great work with the WCBOP and wish her well in her new work! Fortunately, Holly will remain on the Advisory Committee. We are pleased to announce that Annie Pierpoint has been hired as the WCBOP's new Education Coordinator (*see article on page 2*).

We hope you enjoy this issue of Ballast Exchange and as always, we welcome your feedback at any time.

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# A Survey of Aquatic Invasive Species on California's Outer Coast

Steve Foss, California Department of Fish and Game

Resource managers and researchers have long known that California's ports and bays are home to many aquatic invasive species (AIS), but less well known is the extent of invasion on the outer coast. Until now, surveys for non-native species on California's outer coast have been isolated and small-scale. The recent survey by the California Department of Fish and Game's Office of Spill Prevention and Response (OSPR) represents the first comprehensive investigation of the state's open coast habitats and will help answer the question, "Have ballast water exchange initiatives been successful in slowing the rate of species invasions?"



*Intertidal AIS survey. Using a square sampling frame, biologists are able to estimate the relative abundance of native and non-native species in an area.*

The California Ballast Water Management Act of 1999 required the California Department of Fish and Game (CDFG) to conduct several studies to develop baseline data of AIS on the California coast. The Marine Invasive Species Prevention Act of 2003 expanded ballast water control measures to include coastwise traffic and specified that the initial baseline study conducted by CDFG should be expanded to include outer coastal habitats. The 2004 open coast study targeted prominent headlands that were in proximity to shipping lanes, as well as other locations where ballast water exchange could likely result in AIS invasions. Surveys were jointly conducted by CDFG/OSPR and Moss Landing Marine Laboratories (MLML). In all, 22 sites were sampled as part of this field investigation, which will be repeated in 2007.

At each of the 22 sites, 4 main habitat types were targeted: rocky intertidal, rocky subtidal (kelp forests if possible), sandy intertidal, and sandy subtidal. Sampling included a variety of techniques. Benthic infaunal organisms (those living within the ocean-bottom substrate) were collected from sandy intertidal and subtidal areas by sieving sediment core samples collected by a boat-mounted winch, SCUBA divers, or by hand on beaches. Epifaunal organisms (those living on the ocean's bottom substrate) were collected quantitatively from rocky intertidal and subtidal substrate by scraping and collecting from quadrats placed in areas that appeared to have high species diversity. Also, taxonomists and/or natural historians familiar with the local flora and fauna conducted qualitative visual searches for introduced species at each site. Samples were then preserved and transported to laboratories and taxonomists for identification.

Researchers identified 1,265 species from these samples, which were categorized by their introduction status: 26 were introduced, 127 were cryptogenic (not demonstrably introduced or native), and 1,112 were native to California

(615 specimens could not be identified to species level and were classified as "unresolved.") Of the 26 AIS identified along the open coast, 5 were not previously known in California (all 5 were bryozoans). At least 5 additional AIS identified in this survey (2 polychaete worms and 3 bryozoans) had previously only been reported from California bays or estuarine habitats and were not known to be present on the open coast. An average of 3.3 AIS were found per site, representing an average of 1% of the total species collected from each site. There was no obvious difference in the number of AIS or percentage of AIS relative to total species between northern and southern California sites.

On a state-wide level, results from the recent outer coast field survey can be generally compared to results from the 2000-2001 bays and harbors field survey. Although far more species were identified on the outer coast (1,265) relative to the bays and harbors survey (818), introduced species accounted for a much smaller percentage of the total species identified in the outer coast (2%) than in the bays and harbors (10%). It is unknown whether the open coastal environment is more resistant (or less exposed) to invasions.

As mentioned earlier, an unusually large percentage of the total specimens were classified as unresolved (32%). The inability to adequately identify species is due to a variety of reasons, including damaged or juvenile specimens, undescribed species, and problems in the taxonomic literature. This highlights one of the difficulties facing scientists when evaluating introductions throughout the world and demonstrates the need for continued basic research on resolving taxonomy of marine species.

There appears to be little overlap between AIS observed from open coast survey sites and nearby major ports in Southern California. For example, Point Fermin, one of the open coast survey sites with the highest number of AIS, is near Los Angeles/Long Beach harbor. However, none of the 8 AIS found at Point Fermin are recorded in L.A./L.B. harbor. This lack of correspondence between AIS present within harbors and nearby open coast sites is counter-intuitive and indicates a need for investigation of mechanisms of open coast introductions.

Based on literature reviews, introduction vectors have been identified for 13 of the 26 outer coast AIS found in the current survey. Only 3 probable vectors were implicated in the introduction of these species: oyster aquaculture, ballast water, and ship fouling. This suggests that shipping may play a significant role in dispersal of new species not just into California harbors and bays, but into outer coastal areas, as well.

Data from the current survey can be found in OSPR's California Aquatic Non-native Organism Database (CANOD). The database (and the MLML outer coast survey report to CDFG) is available to the public on the OSPR Web site at <http://www.dfg.ca.gov/ospr/about/science/misp.html>