PREVENTING AQUATIC INVASIVE SPECIES TRANSPORT BY BOATS TRAVELING THE COASTS OF CALIFORNIA AND BAJA CALIFORNIA

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Introduction

Small craft are implicated in transporting aquatic invasive species (AIS) from ports to smaller harbors along the coast. For example, AIS from San Francisco Bay are found in Elkhorn Slough, which drains into Monterey Bay. Small craft, such as commercial fishing and pleasure boats, are likely to have brought them from San Francisco Bay where commercial ships dock (Wasson et al. 2001).

Recreational boating is characterized by races, fishing tournaments and coastal cruising that convene boats from many areas at locations far from home ports. Approximately 80% of boats in Baja California marinas are from the United States, primarily California and Arizona according to Fonatur (Mexico's Federal Tourism Promotion Fund). Mexico's streamlined customs clearance policy (Puerto de Ensenada 2005) and planned expansion of Baja California marina capacity (Escalera Nautica 2005) will increase binational boat traffic and AIS transport risks. Our literature review found that cruising, races and fishing draw many California boaters along the coast and across the border (Conlon 2002). This increases risks that boats will exchange and carry AIS to new locations.

New, California water quality programs may reduce antifouling paint use and increase reliance on strategies, such as in-water hull cleaning, slip liners and dry storage, to control fouling and reduce AIS transport risks. Boat owners need to learn the importance of hull cleaning before departure to, travel among and return from other areas and especially to vulnerable, island ecosystems. The authors have created a bilingual outreach program for marina managers, boat owners and contractors on AIS risks and risk reduction measures. They are surveying boaters on attitudes and businesses on availability and costs of fouling control supplies and services along the coasts of California, United States, and Baja California and Baja California Sur, Mexico.

Background

Fouling control is necessary to maintain vessel speed and hull integrity and to reduce fuel consumption and petroleum pollution. Copper-based antifouling paints are the most popular means for slowing fouling growth. When dissolved copper exceeds the federal and California standard of 3.1 μg/l, it harms mollusks, crustaceans and echinoderms and alters phytoplankton communities (Johnson and Gonzalez 2004). California State Water Resources Control Board approved a Total Maximum Daily Load (TMDL) regulatory program in 2005

and the US EPA granted final approval of the TMDL on February 8, 2006 for Shelter Island Yacht Basin of San Diego Bay, to reduce copper discharges from antifouling paints by 76% over 17 years (CRWQCB, SDR 2005). TMDL programs to regulate copper discharged from antifouling paints encourage nontoxic or less toxic coatings for new boats and replacing copper paints with these coatings at the next routine hull-stripping. A TMDL assessment has also been completed for Newport Bay in Orange County (US EPA 2002) and an assessment is underway at Marina Del Rey in Los Angeles County (CRWQCB, LAR, 2005). Section 303(d) of the federal Clean Water Act requires each state to maintain a list of impaired water bodies (CWA 2005). In late 2005, the California Regional Water Quality Control Board, San Diego Region recommended that other areas of San Diego Bay be added to the section 303(d) list of water bodies impaired by dissolved copper (CRWQCB, Region 9 2005). Thus, similar restrictions on leaching of copper from antifoulants may be extended to other parts of southern California in coming years.

In 2007 the California Department of Pesticide Regulation (CDPR) conducted a multi-regional study to evaluate the extent and magnitude of copper pollution in California marinas. They found elevated copper levels in boat basins of San Francisco and Monterey Bays, Santa Cruz and Santa Barbara Harbors, Marina Del Rey and Long Beach (Singhasemanon 2007). As a result of the field study and of their additional examinations of antifouling paint related issues, CDPR concluded that copper antifouling paints can be a significant source of copper in marina waters; that copper concentrations in many marinas in California exceed water quality standards; and that this is a multi-regional issue in California. In response to these conclusions CDPR is re-evaluating all antifouling paint pesticides registered for use in California. Copper-based antifouling paint registrants will be required to identify, demonstrate, and implement mitigation practices to reduce copper loading from their antifouling paint use. (Warmerdam 2002) The goal of reevaluation is to determine the extent of the potential hazard and to identify ways to reduce or eliminate problems (CDPR 2007). CDPR is also working with California State Water Boards to explore regulatory options. They are working with stakeholders to develop and encourage adoption of alternative coatings and management practices to help reduce copper concentrations in marinas. These policy developments suggest that nontoxic and less-toxic hull coatings may become more common. These coatings require companion strategies, such as frequent hull cleaning, to control fouling growth.

Copper Tolerance and Invasive Species

Some scientists and regulators fear that antifouling paint restrictions may increase the risk that aquatic invasive species (AIS) will be carried on vessel hulls. The entire California coast has experienced invasions by species not native to the state or to the area of the coast where they have been discovered. AIS threaten biological diversity and ecological integrity worldwide. They can permanently reduce biodiversity by preying on, parasitizing, out-competing,

causing or carrying diseases, or altering habitats of native species. (Convention of Biological Diversity 2005) Some AIS cause or carry human diseases or foster other species that do (Brancato and MacLellan 1999). Hull-borne invasive species can cause severe economic and ecological damage. As more AIS become established in new areas and adapt to a variety of environments, the invasion rate can be expected to increase as they are disseminated to adjacent regions and harbors. (Bax et al. 2003)

Outreach Programs

The authors conducted sixteen seminars in 2007 to boat owners, boating businesses, policy makers, agencies, academics, and environmental representatives on balancing hull-borne invasive species prevention and water quality protection. They have produced and distributed eighteen publications over the past seven years via mail, their website, and at seminars on topics related to invasive species prevention and coastal water quality protection. Eight of those publications were translated into Spanish to address the bi-national nature of these issues. Publications may be downloaded from and a bilingual video documentary may be viewed at http://seagrant.ucdavis.edu

Current Economic Project

The proposed National Aquatic Invasive Species Act of 2007 (US Senate 2007) discourages in-water hull cleaning to prevent the spread of AIS. The 2006 Draft California AIS Management Plan includes strategies to develop a border inspection program for boats and guidelines for disposal of invasive species removed from marina areas (CDFG 2006). Such measures help to prevent AIS transport by boats trailered among lakes and rivers. However, such measures would be logistically difficult and expensive to implement for larger boats that are kept in saltwater and removed only for major maintenance. Currently, in-water hull cleaning, slip liners and boat lifts are used in conjunction with both antifouling paints and nontoxic hull coatings to control fouling on larger recreational boats kept in California harbors. Hauling boats for hull cleaning would cost nine times as much as in-water cleaning and would increase time demands on busy boat owners (Johnson and Gonzalez 2006). Cost effectiveness data and analysis are needed to support decisions on AIS control measures for larger boats kept in saltwater that are economically, technically and environmentally effective. In addition, with the emerging issue of copper tolerance of AIS, boaters may seek cost effective alternatives to copper paints whether or not restrictions on copper antifouling paints increase. Boat owners and boating businesses, coating companies, agencies, policy makers, academics, and environmental organizations will need research-based information in the next few years to make cost effective decisions and create sustainable policies for controlling aquatic invasive species among hull fouling while protecting water quality. The authors are conducting a detailed cost analysis of fouling control supplies and services for California's diverse boats, their usage and

maintenance patterns. It considers boat hull maintenance practices and technologies, as well as AIS and water quality risks and regulations. Geographic scope of the study includes the coast, bays and Sacramento-San Joaquin Delta of California, United States and the coast and bays of Baja California and Baja California Sur, Mexico. Study results will provide detailed data to enable stakeholders to tailor information for their specific situations. This will enhance their ability to make sustainable decisions that are cost and environmentally effective for controlling AIS while protecting water quality.

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