

MARINE INVASIVE SPECIES PROGRAM

Karen Bigham

Steve Foss

Sharon Shiba

Key Responsibilities

- 1) Monitor new introductions by conducting field biological sampling in coastal water**
- 2) Monitor spread of existing NIS**
- 3) Publicize data and analysis**
- 4) Assess ballast water controls**

Main Points

- 1) Recent Surveys**
- 2) Future of our Program**
- 3) Special Studies**
- 4) Accessing our data**

Recent Field Surveys

Bays & Harbors Survey

- 52 Sites
- 18 Bays & Harbors
- 11% of 775 species introduced

Outer Coast Survey

- 22 Sites
- areas impacted by ballast water
- <1% of 1,225 species introduced

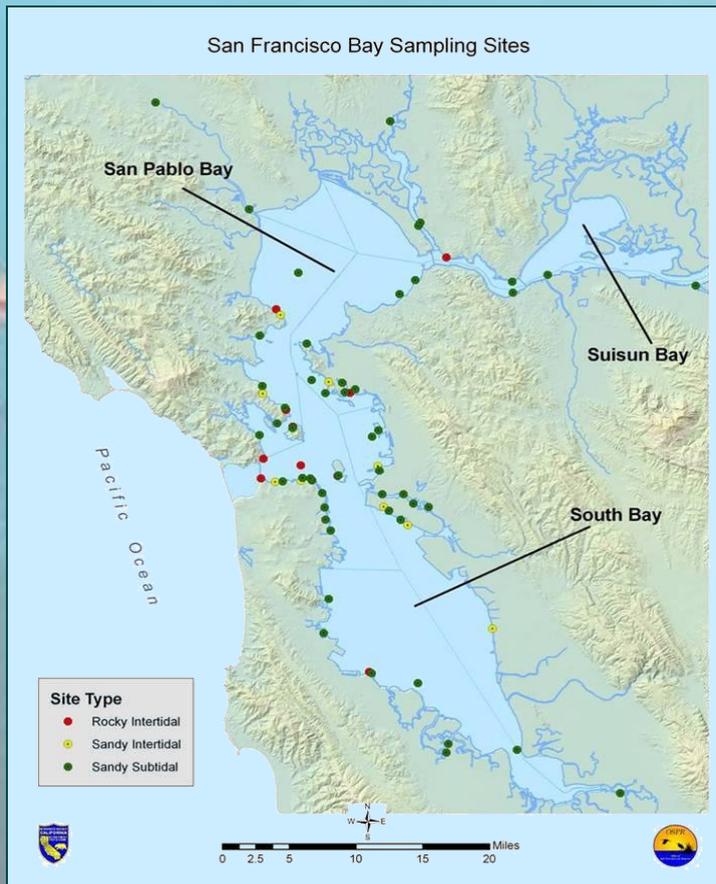
San Francisco Bay Survey

- 50 Sites
- Multiple habitats
- 20% of 497 species introduced

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BH												
				OC								
					SF							
						BH						
							OC					
										SF		
											BH	

San Francisco Bay Survey

SF Bay is the most invaded estuary on the West Coast of North America



4 Habitat Types

- Rocky Intertidal
- Sandy Intertidal
- Subtidal Fouling
- Subtidal Infaunal

Methods

- Sediment Grabs
- Quadrat Clearing
- Qualitative Samples during visual scans

San Francisco Bay Survey

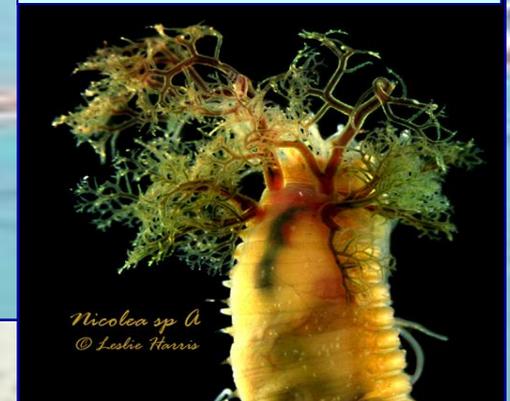
20% of 497 Species Sampled were *Introduced*

4 New Invasive Species in SF Bay

Caprella simia



Nicolea sp A Harris



Grateloupia lanceolata



Amphibalanus eburneus

San Francisco Bay Pilot Study

Joint study with:

Greg Ruiz, SERC

**San Francisco Bay Settling Plates
(a.k.a Artificial Fouling Plates)**



- **Settling Plates**
- **Hard-substrate clearing**
- **Plankton Samples**

Jon Geller, MLML

**Molecular Genetic
Analysis**



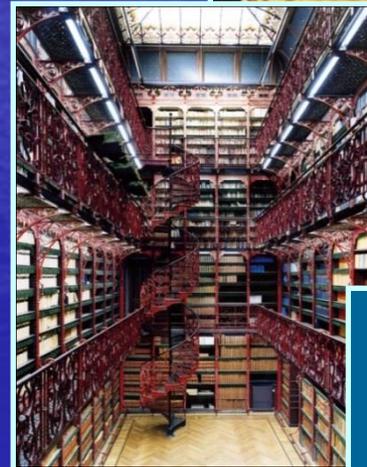
Pilot Study

Traditional, Morphological-Based Method



- **Slow Turnaround Time**
- **Difficult to Identify:**
 - *damaged specimens,*
 - *juvenile specimens, &*
 - *morphologically identical species*
- **Many of Worlds Species Undiscovered!**

Molecular Genetic Analysis



**Cost-Efficient, Faster &
More Accurate**

New Monitoring Design

Previous Design

- To create baseline and track NAS
- Not designed to measure spatial, temporal, and taxonomic species diversity

New Design

- Based on methods developed in Pilot Study
- Aim to measure and statistically test for species richness
- Sample design will improve by including:
 - Stratified Random Sampling*
 - Increased Replication*

Able to test key questions about NAS in CA and understand invasion dynamics in CA

New Monitoring Design

Key Questions

- Is the rate of new introductions increasing?
- What is the pattern of spread across estuaries and habitat types?
- What is the relative strength of different vectors over time, and
- What is the efficacy of management actions (e.g., ballast water management)

Special Study Vector Analysis

Is California the 1st point of entry for NAS into western North America?



What is the relative contribution of different introduction vectors over time?

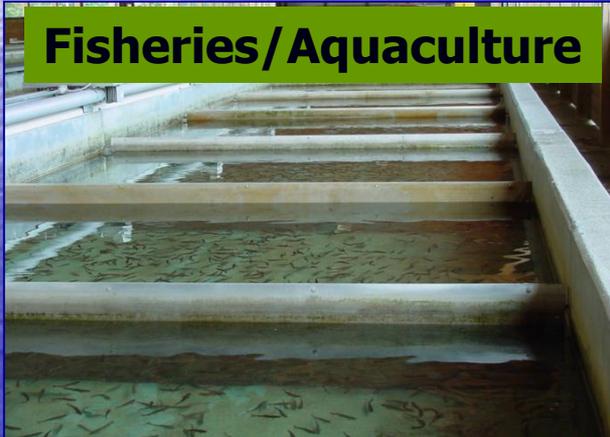
Vector Analysis

Fouling



Ballast Water Exchange

Fisheries / Aquaculture



Oyster Culture

Ornamental



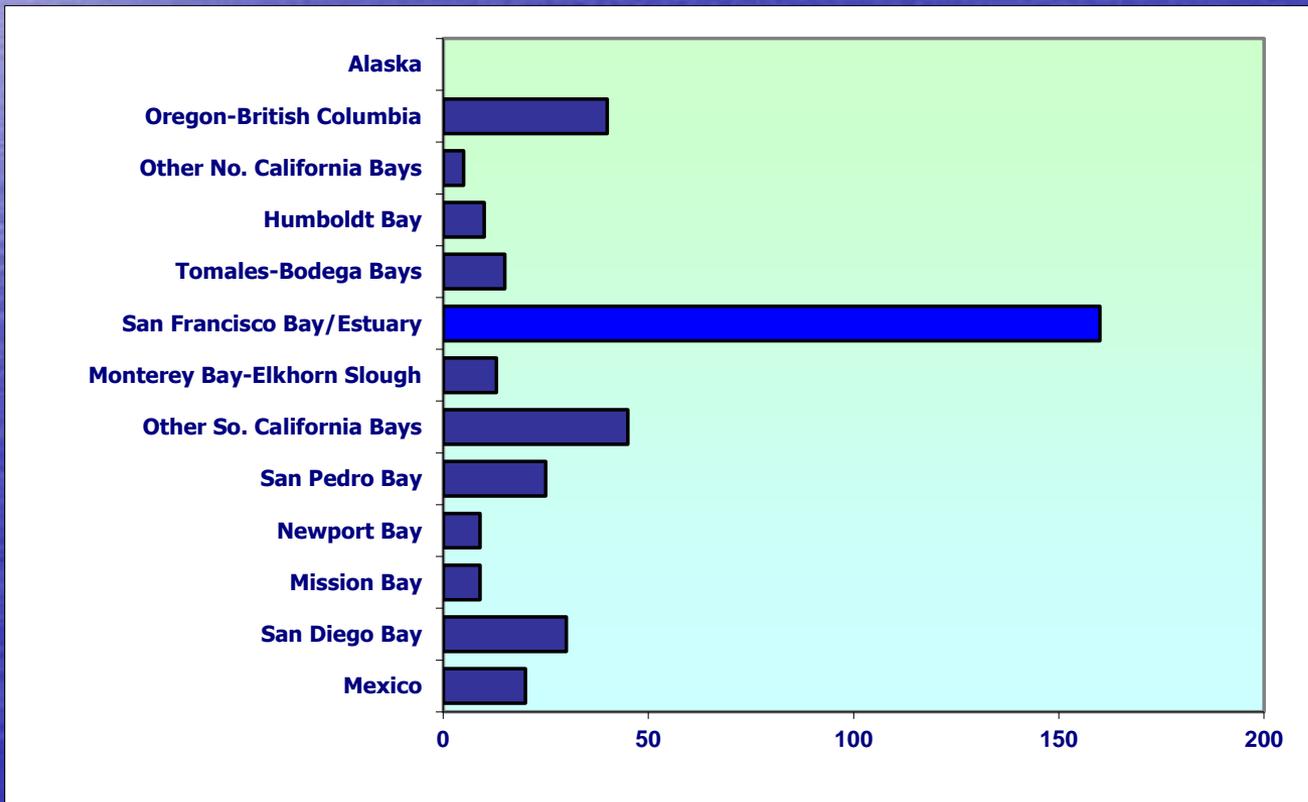
Vector Analysis Results

**California is the
1st Point of Entry
for most NIS**

***79% of 290 established NIS
1st recorded in CA***

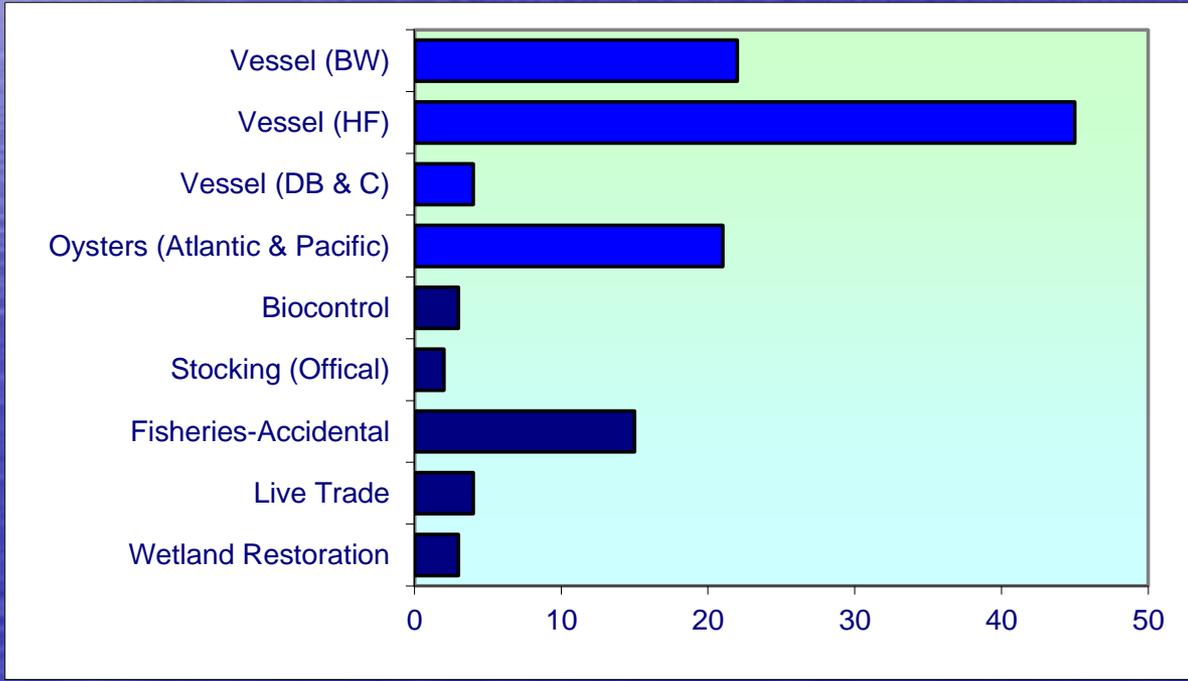
Vector Analysis Results

SF Bay 1st point of entry into California for 65% of NAS



Vector Analysis Results

48% of ALL introduced taxa come to CA by Shipping Vectors



81% of invasive species pathways include ships as a sole or multiple vector

Access Our Data

Legislative Report Due Every 3 Years

**2011 TRIENNIAL REPORT ON THE
CALIFORNIA DEPARTMENT OF FISH AND GAME'S
MARINE INVASIVE SPECIES PROGRAM**

Submitted to the
CALIFORNIA STATE LEGISLATURE
as required by the Coastal Ecosystems Protection Act of 2006

Prepared and submitted by the California Department of Fish and Game,
Office of Spill Prevention and Response
Marine Invasive Species Program

December 2011

Program Manager

Stephen Foss



Last submitted December 2011

CANOD

California Aquatic Non-native Organism Database

Includes:

- Name of species
- Location observed
- Date of introduction
- Vectors of introduction
- Native region

WWW.DFG.CA.GOV/OSPR
Link to "Invasive Species"

Station Information Lookup

Station names are listed alphabetically. You can scroll through or type in the first letter or name of the station that you are looking for. Hit the Find Station button when you have selected a station.

Station Name: Alameda County

Station Code: CA28 The print button goes directly to print. Please preview the information you wish to print to ensure that it is sized properly.

Non Native Organisms by Vector

A vector is an agent or pathway through which an organism can be conveyed outside its native range. Factors considered when assigning vectors to organisms included: a) life history; b) timing of introduction; c) previously known introduction event(s) and spread; and d) probable human-mediated transfer mechanisms operating in proximity to where the organism was found.

Vector:

Vector Category:

Organism Name	Phylum	Class	Order	Family
Acanthopodius flavimanus	Chordata	Actinopterygii	Perciformes	Cobinidae
Acanthomyxis	Arthropoda	Malacostraca	Mysida	Mysidae
Acanthomyxis aspera	Arthropoda	Malacostraca	Mysida	Mysidae
Acanthomyxis hwanhaiensis	Arthropoda	Malacostraca	Mysida	Mysidae
Acartiella sinensis	Arthropoda	Maxillopoda	Calanoida	Acartidae
Aglaohammon				
Alitta succinea				
Amacana sp. 4				
Amblyosyllis s				
Ampelisca abd				
Amphibalanus				
Amphibalanus				
Amphibalanus				

Record: 14

Alameda County

Sub-Bay	Waterbody	Bay/Watershed
Alameda County	None	None

Bioregion	Station Comments	Outer Coast
Central California	Interior station	<input type="checkbox"/>

Species List by Station

Query button will show you a list of all stations currently in CANOD. In this list, you can sort and filter the station list according to whichever parameters are listed at the top of this page and search by station name when you have determined the station(s) you would like to see additional information on.



CANOD

The California Aquatic Non-Native Organism Database



Searchable Forms

-
-
-
-

California Department of Fish and Game
Office of Spill Prevention and Response

Cite as: California Department of Fish and Game, Office of Spill Prevention and Response. 2009. California Aquatic Non-native Organism Database (CANOD). Retrieved (retrieval date here) from: <http://www.dfg.ca.gov/ospr/about/science/misp.html/>

Please Contact Steve Foss: sfoss@ospr.dfg.ca.gov to determine if any changes have been made or if any updates are pending before citing this database or using the information it contains in any published study.

CANOD & NEMESIS

NEMESIS: National Exotic Marine and Estuarine Species Information System *Smithsonian Environmental Research Center*

The screenshot shows the NEMESIS website. The header includes the title "National Exotic Marine and Estuarine Species Information System" and the Smithsonian Environmental Research Center logo. A navigation bar contains links for Home, NEMESIS Databases, NEMESIS Research, and NEMESIS News. A left sidebar lists menu items: NEMESIS Overview, Collaborators, Citation, Disclaimer, and Credits. The main content area features a "Photos of invasive species" gallery with images of various organisms. Text describes NEMESIS as a resource for information on non-native species in coastal waters of the U.S. and Alaska, detailing the database's scope and the Smithsonian Environmental Research Center's role. A link for "The Daily Invader" is provided.

The screenshot shows the CANOD website. The title is "CANOD California Aquatic Non-Native Organism Database". A central "Searchable Forms" box contains buttons for "Non Native Organisms", "Non Native Organisms by Vector", "Organism Lookup", "Station Lookup", and "Find Current Taxonomic Names". To the right, a button says "Click for Reports and Maps" and another says "EXIT CANOD". The footer identifies the "California Department of Fish and Game Office of Spill Prevention and Response" and provides a citation: "Cite as: California Department of Fish and Game, Office of Spill Prevention and Response, 2009. California Aquatic Non-native Organism Database (CANOD). Retrieved (retrieval date here) from: http://www.dfg.ca.gov/ospr/about/science/misp.html/". A contact instruction for Steve Foss is also present.

Summary

- 1) OC Survey indicated no major threats
- 2) The 2010 SF Survey revealed 20% (98) NAS and found 4 new invasive species
- 3) New monitoring design is modeled after our SF Bay pilot study and aims to measure and statistically test for species richness
- 4) California is the first point of entry for most NAS along the western North American coast
- 5) SF Bay is the first point of entry into California for 65% of CA's NAS
- 6) Our database, CANOD, can be found at:
WWW.DFG.CA.GOV/OSPR
Link to "Invasive Species"

QUESTIONS?

E-Mail Contact:

KBIGHAM@OSPR.DFG.CA.GOV