

MARINE INVASIVE SPECIES PROGRAM

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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

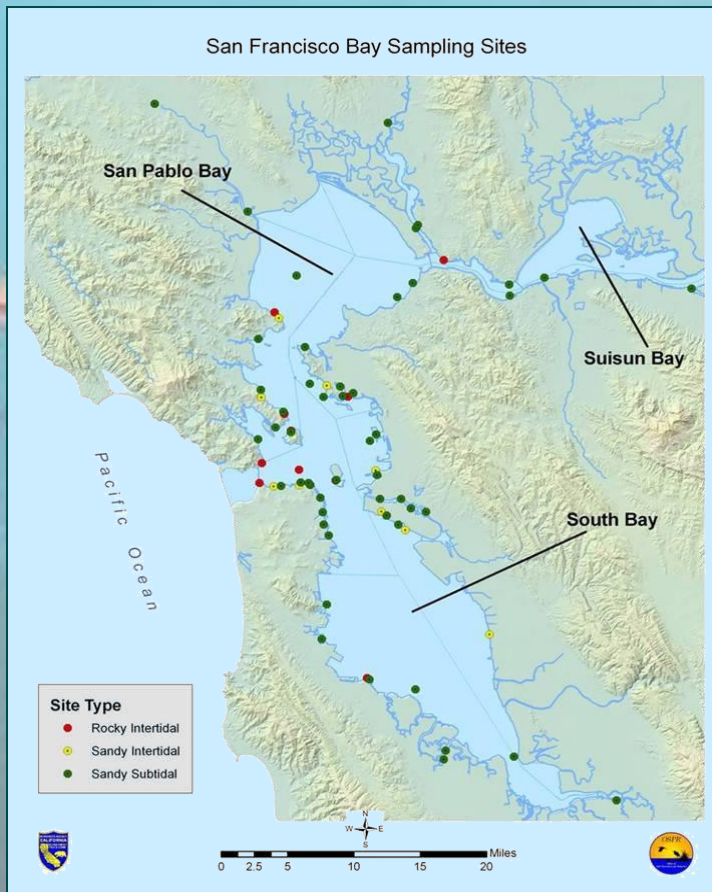
San Francisco Bay Survey

- 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

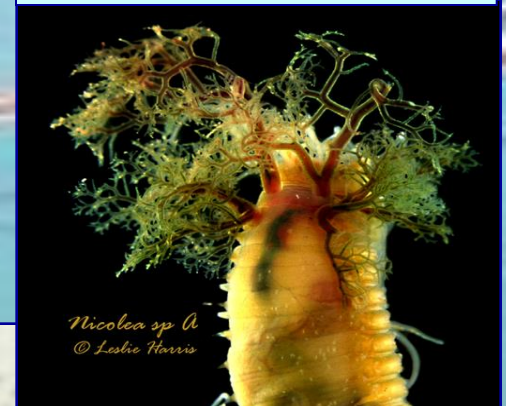
20% of 497 Species Sampled were ***Introduced***

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**



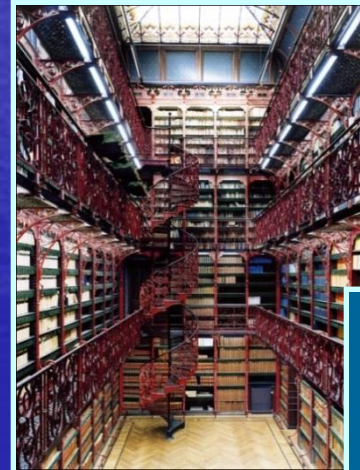
Pilot Study

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



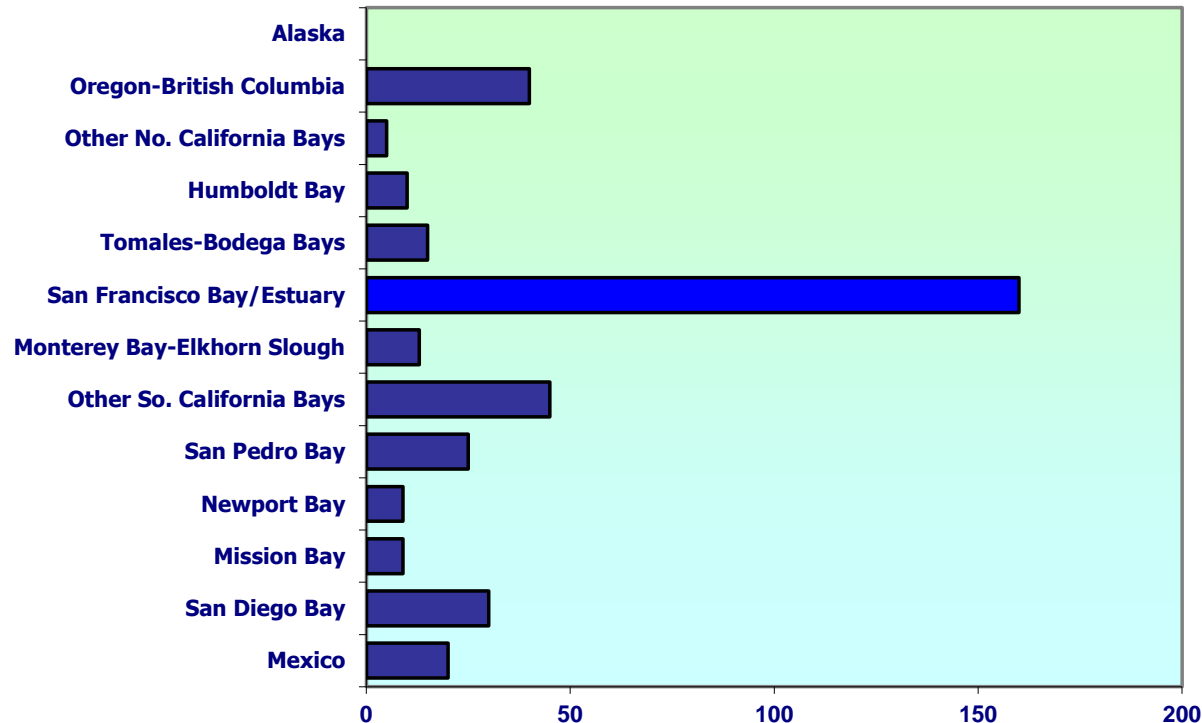
Vector Analysis Results

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

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

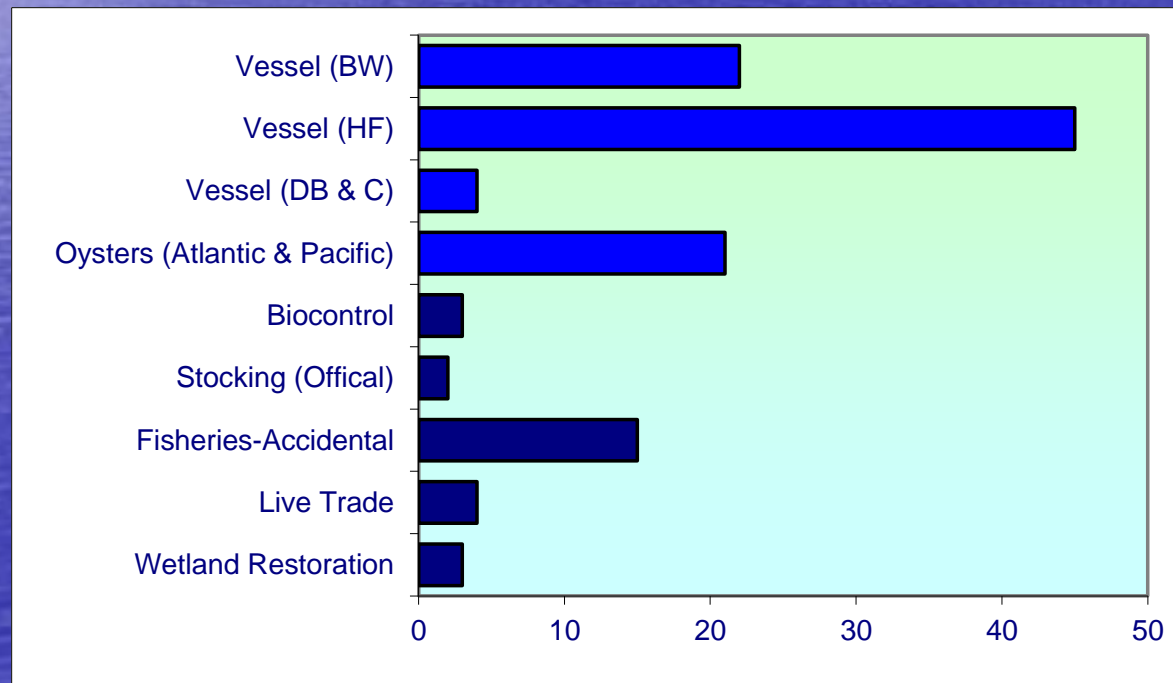
Vector Analysis Results

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
Scaphiopus flavianus	Chordata	Actinopterygii	Perciformes	Cobitidae
Acanthomyia	Arthropoda	Malacostraca	Myrsidea	Myrsidea
Acanthomyia aspera	Arthropoda	Malacostraca	Myrsidea	Myrsidea
Acanthomyia hwanhaiensis	Arthropoda	Malacostraca	Myrsidea	Myrsidea
Acartiella sinensis	Arthropoda	Maxillopoda	Calanoida	Acartidae
Aglaohammonia				
Alitta succinea				
Amaeana sp. 2				
Amblyosyllis				
Ampelisca abd.				
Amphibalanus				
Amphibalanus				
Amphibalanus				

Record: 14

Species List by Station

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



CANOD

The California Aquatic Non-Native Organism Database



Searchable Forms

Non Native Organisms

Non Native Organisms by Vector

Organism Lookup

Station Lookup

Find Current Taxonomic Names

Click for Reports and Maps

EXIT CANOD

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/>

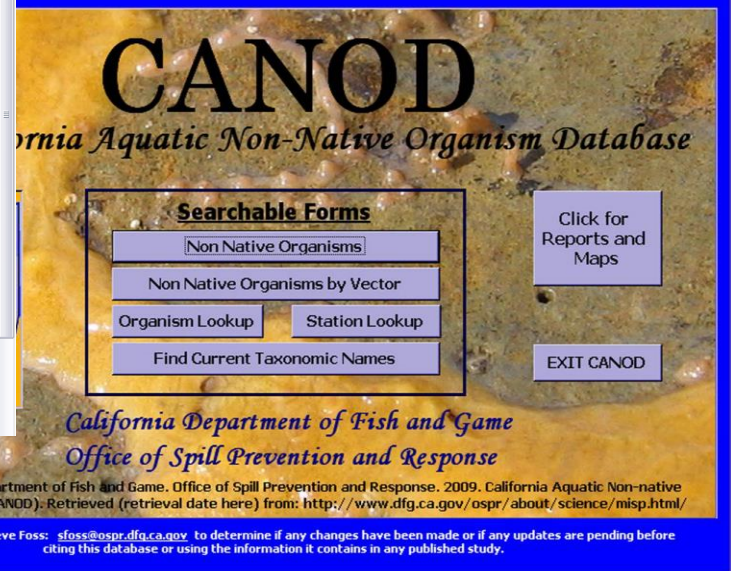
Please Contact Steve Foss: sfoss@ospr.dfg.ca.gov to determine if any changes have been made or if any updates are pending before citing this database or using the information it contains in any published study.

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 NEMESIS logo and the title "National Exotic Marine and Estuarine Species Information System". A navigation bar contains links for Home, NEMESIS Databases, NEMESIS Research, and NEMESIS News. On the left, a sidebar lists "NEMESIS Overview", "Collaborators", "Citation", "Disclaimer", and "Credits". The main content area features a section titled "NEMESIS is a resource for information on non-native (or exotic) species that occur in coastal waters of the United States." Below this, a paragraph describes the database's scope, mentioning the Smithsonian Environmental Research Center (SERC) and the inclusion of approximately 500 different non-native species. A link for "The Daily Invader" is provided. To the right of the text is a photograph of a crab. A small inset image shows "Photos of invasive species".



The screenshot shows the CANOD website. The header features the title "CANOD" and the subtitle "California Aquatic Non-Native Organism Database". Below the title, a section titled "Searchable Forms" contains four buttons: "Non Native Organisms", "Non Native Organisms by Vector", "Organism Lookup", and "Station Lookup". A fifth button, "Find Current Taxonomic Names", is located below these. To the right of the search forms, there are two buttons: "Click for Reports and Maps" and "EXIT CANOD". At the bottom, the text reads "California Department of Fish and Game" and "Office of Spill Prevention and Response". A citation line states: "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 footer note says: "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."

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:

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