

# SAN FRANCISCO BAY EXOTICS/INVASIVES

As of 1995: "The San Francisco Estuary can now be recognized as the most invaded aquatic ecosystem in North America. Now recognized in the Estuary are 212 introduced species : 69 percent of these are invertebrates, 15 percent are fish and other vertebrates, 12 percent are vascular plants and 4 percent are protists."

-- December 1995 -- <http://www.anstaskforce.gov/Documents/sfinvade.htm> -- Biological Study NONINDIGENOUS AQUATIC SPECIES IN A UNITED STATES ESTUARY: A CASE STUDY OF THE BIOLOGICAL INVASIONS OF THE SAN FRANCISCO BAY AND DELTA

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## FISH

*Acanthogobius flavimanus* YELLOWFIN GOBY, MAHAZE

*Alosa sapidissima* AMERICAN SHAD, ATLANTIC SHAD

*Ameiurus catus* WHITE CATFISH, SCHUYLKILL CAT, FORKED-TAIL CATFISH, COMMON CATFISH

*Ameiurus melas* BLACK BULLHEAD

*Ameiurus natalis* YELLOW BULLHEAD

*Ameiurus nebulosus* BROWN BULLHEAD, COMMON BULLHEAD, HORNED POUT, HORNPOUT, SQUARE-TAIL CATFISH, BULLHEAD CATFISH

*Carassius auratus* GOLDFISH

*Cyprinus carpio* COMMON CARP

*Dorosoma petenense* THREADFIN SHAD, MISSISSIPPI THREADFIN SHAD

*Gambusia affinis* WESTERN MOSQUITOFISH

*Ictalurus furcatus* BLUE CATFISH

*Ictalurus punctatus* CHANNEL CATFISH, SPOTTED CAT

*Lepomis cyanellus* GREEN SUNFISH

*Lepomis gulosus* WARMOUTH

*Lepomis macrochirus* BLUEGILL, BLUE BREAM

*Lepomis microlophus* REDEAR SUNFISH

*Lucania parva* RAINWATER KILLIFISH

*Menidia beryllina* INLAND SILVERSIDE, MISSISSIPPI SILVERSIDE

*Micropterus dolomieu* SMALLMOUTH BASS, SMALLMOUTH BLACK BASS

*Micropterus salmoides* LARGEMOUTH BASS, LARGEMOUTH BLACK BASS

*Morone saxatilis* STRIPED BASS, STRIPER, ROCK BASS

*Notemigonus crysoleucas* GOLDEN SHINER

*Percina macrolepida* BIGSCALE LOGPERCH

*Pimephales promelas* FATHEAD MINNOW

*Pomoxis annularis* WHITE CRAPPIE

*Pomoxis nigromaculatus* BLACK CRAPPIE, CALICO BASS, STRAWBERRY BASS

*Tridentiger bifasciatus* Steindachner SHIMOFURI GOBY

*Tridentiger trigonocephalus* CHAMELEON GOBY, TRIDENT GOBY, SHIMAHAZE

## MOLLUSCS

### Bivalve

Eastern Oyster (*Crassostrea virginica*)

Pacific of Japanese Oyster (*C. gigas*)

Soft-shelled Clam (*Mya arenaria*)

Ribbed or Horse Mussel (*Ischadium demissum*)

Japanese Littleneck Clam (*Tapes japonica*)

Mediterranean Mussel (*Mytilus galloprovincialis*)

Ribbed Mussel, Ribbed Horse Mussel, Atlantic ribbed marsh mussel (*Arcuatula demissa*)

Asian Clam (*Corbicula fluminea*)

Amethyst Gem Clam (*Gemma gemma*)

Blacktip Shipworm (*Lyrodus pedicellatus*)  
Baltic Clam (*Lyrodus pedicellatus*)  
*Musculista senhousia*  
False Angelwing (*Petricolaria pholadiformis*)  
Amur River Corbula, Asian Clam (*Potamocorbula amurensis*)  
Naval Shipworm (*Teredo navalis*)  
Asian Semele (*Theora fragilis*)

### **Gastropods**

Channeled Whelk (*Busycotypus canaliculatus*)  
Chinese Mystery Snail (*Cipangopaludina chinensis malleata*)  
Convex Slipper Snail (*Crepidula convexa*)  
Eastern White Slipper Snail (*Crepidula plana*)  
Eastern Mudsnailed (*Ilyanassa obsoleta*)  
Rough Periwinkle (*Littorina saxatilis*)  
Red-Rim Melania (*Melanoides tuberculata*)  
Atlantic Oyster Drill (*Urosalpinx cinerea*)

### **ARTHROPODS**

**Ostracoda** -- *Eusarsiella zostericola*

**Copepoda** -- *Acartiella sinensis*, *Limnoithona sinensis*, *Limnoithona tetraspina*, *Mytilicola orientalis* (Parasitic), *Oithona davisae*, *Pseudodiaptomus forbesi*, *Pseudodiaptomus marinus*, *Sinocalanus doerrii*

**Barnacles** - Striped (*Balanus Amphitrite*), Bay (*Balanus improvises*)

**Mysidacea** -- *Acanthomysis aspera*, an undescribed species of *Acanthomysis*, resembling *A. sinensis*, *Deltamysis holmquistae*

**Isopoda** -- *Dynoides dentisinus* Shen, *Eurylana arcuata*, *Iais californica*, GRIBBLE (*Limnoria quadripunctata* and *tripunctata*), *Sphaeroma quoyanum*, *Synidotea laevidorsalis*

### **Amphipoda**

*Ampelisca abdita*  
*Ampithoe valida*  
*Caprella mutica* SKELETON SHRIMP  
*Chelura terebrans*  
*Corophium acherusicum*  
*Corophium alienense*  
*Corophium heteroceratum*  
*Corophium insidiosum*  
*Gammarus daiberi*  
*Grandidierella japonica*  
*Jassa marmorata*  
*Leucothoe* sp.  
*Melita nitida*  
*Parapleustes derzhavini*  
*Stenothoe valida*  
*Transorchestia enigmatica* SHOREHOPPER

### **Decapoda**

*Carcinus maenas* GREEN CRAB  
*Eriocheir sinensis* CHINESE MITTEN CRAB  
*Orconectes virilis* VIRILE CRAYFISH  
*Pacifastacus leniusculus* SIGNAL CRAYFISH  
*Palaemon macrodactylus* ORIENTAL SHRIMP, KOREAN SHRIMP, GRASS SHRIMP  
*Procambarus clarkia* RED SWAMP CRAYFISH  
*Rhithropanopeus harrisi* HARRIS MUD CRAB

### **SEAWEEDS**

#### **Chlorophyta**

*Bryopsis*  
Dead man's fingers, sputnik weed, oyster thief (*Codium fragile*)

#### **Phaeophyta**

*Sargassum muticum*

## **Rhodophyta**

*Callithamnion byssoides*

*Polysiphonia denudata*

## **PLANTS**

*Chenopodium macrospermum*

Brass Buttons (*Cotula coronopifolia*)

Broadleaf peppergrass, perennial pepperweed, tall whitetop (*Lipidium latifolium*)

Awl-leaved Mudwort (*Limosella subulata*)

Purple Loosestrife (*Lythrum salicaria*)

Parrot's Feather (*Myriophyllum aquaticum* or *brasiliense*)

Eurasian Milfoil (*Myriophyllum spicatum*)

SMARTWEED (*Polygonum patulum* Bieberstein)

WATERCRESS (*Rorippa nasturtium-aquaticum*, *Nasturtium officinale*)

*Salsola soda* Linnaeus

SAND SPURNEY (*Arenaria media*, *Spergularia media*)

ELODEA, EGERIA, BRAZILIAN WATERWEED (*Egeria densa*, *Elodea densa*, *Anacharis densa*)

WATER HYACINTH (*Eichhornia crassipes*)

YELLOW FLAG, YELLOW IRIS (*Iris pseudacorus*)

CURLY-LEAF PONDWEED, CURLY PONDWEED (*Potamogeton crispus*)

SMOOTH CORDGRASS, SALT-WATER CORDGRASS (*Spartina alterniflora*)

ENGLISH CORDGRASS (*Spartina anglica*)

DENSE-FLOWERED CORDGRASS (*Spartina densiflora*)

SALTMEADOW CORDGRASS, SALT HAY (*Spartina patens*)

NARROW-LEAF CATTAIL, NAIL ROD (*Typha angustifolia*)

## **SINGLE-CELLED PROTISTS**

### **Foraminifera**

*Trochammina hadai*

### **Ciliates**

*Ancistrocoma pelseneeri* or *Parachaenia myae*

*Ancistrum cyclidioides*

*Boveria teredinidi*

*Sphenophyra dosinia*

## **PORIFERA**

Boring Sponge (*Clinoa*)

Bowerbank's Halichondria (*Halichondria bowerbanki*)

LOOSANOFF'S HALICLONA (*Haliclona loosanoffi* or *Haliclona ecbasis*)

RED BEARD SPONGE (*Microciona prolifera*)

*Prosuberites*

## **CNIDARIA**

### **Hydroids:**

*Blackfordia virginica*

*Cladonema uchidai*

*Clava multicornis* or *leptostyla* (Club Hydroid)

*Cordylophora caspia* or *lacustris* (Freshwater Hydroid)

*Corymorpha*

*Garveia franciscana* or *Bimeria franciscana*

*Gonothyraea clarki*

*Maeotias inexpectata*

*Obelia ?dichotoma* and *bidentata*

*Sarsia tubulosa* or *Syncoryne mirabilis* or *Coryne Rosaria*

*Tubularia crocea* or *Parypha microcephala* or *Tubularia elegans*

## **Scyphozoa**

Moon Jelly (*Aurelia labiate*)

#### **Anthozoa**

Orange anemone (*Diadumene ?cincta*)

San Francisco anemone (*Diadumene franciscana*)

White anemone (*Diadumene leucolena*)

Orange-striped green anemone (*Diadumene lineata*)

#### **ANNELIDS**

*Branchiura sowerbyi*

*Limnodrilus monotheucus*

*Paranais frici*

*Potamothenix bavarius*

*Tubificoides apectinatus*

*Tubificoides brownie*

*Tubificoides wasselli*

*Varichaetadrilus angustipennis*

##### **Polychaetes:**

*Boccardiella ligerica*

*Ficopomatus enigmaticus* (Australian Tubeworm)

*Heteromastus filiformis*

*Manayunkia speciosa*

*Marenzelleria viridis*

*Marphysa sanguinea*

*Nereis succinea* (PILE WORM)

*Polydora ligni* (MUD WORM)

*Potamilla*

*Pseudopolydora kemp*

*Pseudopolydora paucibranchiata*

*Sabaco elongates* (Bamboo worm)

*Streblospio benedicti*

#### **BRYOZOA**

*Alcyonidium polyoum*

*Anguinella palmata* AMBIGUOUS BRYOZOAN

*Bowerbankia gracilis* CREEPING BRYOZOAN

*Bugula neritina*

*Bugula stolonifera*

*Conopeum tenuissimum*

*Cryptosula pallasiana*

*Schizoporella unicornis*

*Victorella pavid*

*Watersipora "subtorquata*

*Zoobotryon verticillatum*

#### **CHORDATA: TUNICATA**

*Ascidia* sp.

*Botryllus schlosseri*

*Ciona intestinalis* SEA VASE

*Ciona savignyi*

*Molgula manhattensis*

*Styela clava*