

Rapid Assessment Shore Survey for Exotic Species in San Francisco Bay - May 2004

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Introduction

Exotic species constitute one of the main environmental stressors in the San Francisco Estuary. To further assess the extent of this problem, we conducted a Rapid Assessment (RA) survey of exotic species at shoreline stations in San Francisco Bay in the spring of 2004. The survey involved a team of marine taxonomic experts, employed methods that were initially developed in

four RA surveys conducted in the Bay in 1993-1997, and sampled several of the same stations. The survey focused primarily on artificial hard substrates, shallow-water sediments, lagoon and intertidal habitats where exotic species are expected to be abundant. It thus provides a snapshot of the composition and distribution of exotic species across selected habitats in the Bay.

The survey was funded jointly by the California State Coastal Conservancy, the Association of Bay Area Governments/San Francisco Bay-Delta Science Consortium, the National Geographic Society and the Rose Foundation. We are especially grateful to the U.S. Food and Drug Administration and District Director Barbara Cassens for allowing us to use the USFDA laboratory facilities in Alameda, and to Ron Asmundson and Luis Solórzano for assisting with laboratory arrangements and logistics.

Methods

The approach generally used for RA surveys for exotic species was initially developed in San Francisco Bay surveys organized by the Principal Investigator in 1993-97. In the current survey, a team of taxonomic experts sampled and identified organisms at 15 sites within the Bay. At thirteen sites, sampling primarily focused on dock fouling along with adjacent soft-bottom benthos and nearby intertidal sites. Two other intertidal sites included mixed sandy-mud, shell and rock substrates and patches of cordgrass (*Spartina alterniflora* or hybrid) along with pilings at one site, and both were adjacent to popular dock- or shore-fishing locations. Station coordinates were measured with a hand-held GPS unit. Near-surface and near-bottom salinity and temperature were measured with both a YSI meter and, as a check on near-surface measurements, a refractometer and thermometer. At each site, samples were collected during a period of approximately one hour using a variety of manual techniques. Float fouling (organisms growing on the sides and undersides of floating docks and associated bumpers, tires, ropes, etc.) and fouling on fixed subtidal and intertidal structures (pilings, bridge supports, etc.) were sampled with scrapers and other hand implements. Benthic samples were taken with a 0.0225 m² Ponar grab and washed onto a 0.5 mm sieve. Participants targeted the full range of biotic assemblages represented by the available substrates and microhabitats at the sites in order to maximize the number of species collected. Within the major groups of field-identifiable organisms, selected species at each site were ranked in four relative abundance categories. Such semi-quantitative, "directed search" techniques produce a more complete species list for a given effort than quantitative, spatially-based sampling methods (*e.g.* Gotelli & Colwell 2001; Cohen 2004b).

Sampling was conducted in the morning. Specimens were initially examined in the field and then transported to the laboratory in insulated containers. In the afternoons and evenings, the expedition team examined samples in live or fresh condition in the laboratory, on the same day in which they were collected. Examination of live or fresh material facilitates identification especially where colors or forms of soft-bodied organisms are lost or distorted by preservation techniques. Identification was to the lowest possible taxon. Specimens were fixed and preserved by appropriate techniques, and representative voucher specimens have been deposited with the Invertebrate Zoology Department of the California Academy of Sciences and the University of California Jepson Herbarium.

Organisms were classified by invasion status as native, cryptogenic or exotic, using a "weight of the evidence" approach as defined in Cohen (2004a). The criteria used were essentially those listed by Chapman and Carlton (1994) as modified by Cohen *et al.* (2005). Organisms that were not identified to a sufficiently low taxon to determine their origin status were classified as indeterminate. In most cases, determinate organisms were identified to species, but in a few cases higher taxon identification allowed determination of origin status (for example, identification to genus when the genus is known only from other ocean regions [and therefore exotic status], or when all known species in the genus are native to the study region [and therefore native status]).

Results

The survey team sampled at 15 sites on May 23-28, 2004, distributed broadly around San Francisco Bay (Figure 1). The 15th site included sampling at two nearby locations on the Napa River, with brief sampling at a fishing dock at Moore's Landing and a full sampling as described in the Methods section at the Napa Valley Marina. Two of the sites are intertidal sites (Brisbane Lagoon on the western shore of the Bay and Fruitvale Bridge on the eastern shore), and the rest are sites with floating docks (Table 1). All are quite shallow, with the deepest being around 5 meters (Table 2). The coldest and saltiest sites were the Presidio Yacht Club in Sausalito and Pier 39 in San Francisco, near the mouth of the Bay, and the warmest and freshest was the Petaluma River Turning Basin, at the head of the Petaluma River. Overall the temperature range at the surface was 13.8-22.9° C (57-73° F) and the salinity range was 8.0-30.7 parts per thousand (ppt). There was little evidence of stratification, with all bottom temperatures and salinities within 0.2° C and 0.3 ppt of surface measurements, except at the Napa Valley Marina, where the bottom salinity was 1.1 ppt higher than the surface salinity.

Figure 1. Distribution of Sampling Sites

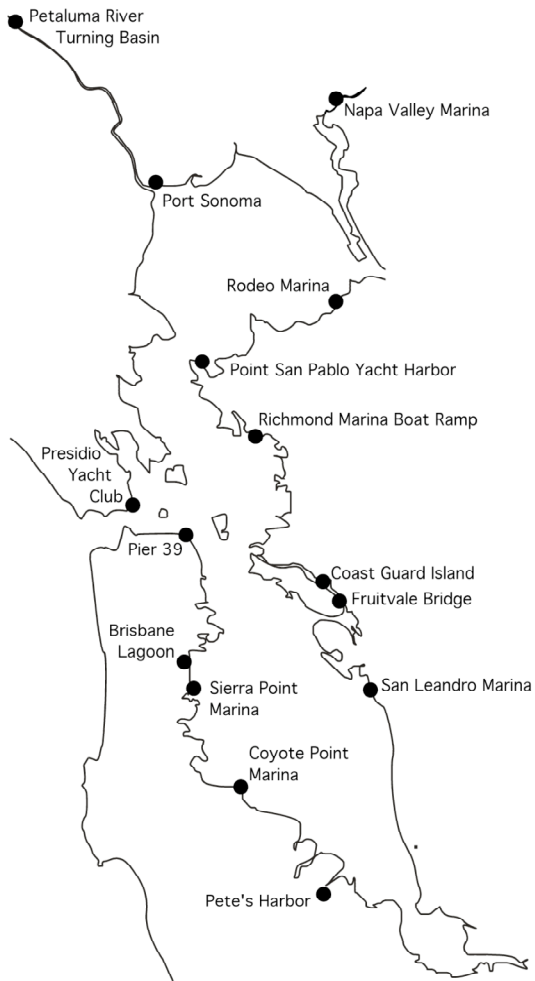


Table 1. Sampling Sites: Name, Type, Sampling Date and Co-ordinates

Site Name	Site Number	Site Type	Sampling Date	Latitude N	Longitude W
Sierra Point Marina	1	dock	5/23/04	37° 40.393'	122° 22.842'
Brisbane Lagoon	2	intertidal	5/23/04	37° 41.171'	122° 23.436'
Pier 39 Marina	3	dock	5/23/04	37° 48.682'	122° 24.588'
San Leandro Marina	4	dock	5/24/04	37° 41.797'	122° 11.593'
Fruitvale Bridge	5	intertidal	5/24/04	37° 46.141'	122° 13.778'
Coast Guard Island Marina	6	dock	5/24/04	37° 46.870'	122° 14.749'
Presidio Yacht Club	7	dock	5/25/04	37° 49.953'	122° 28.446'
Port Sonoma	8	dock	5/25/04	38° 6.937'	122° 30.155'
Petaluma River Turning Basin	9	dock	5/25/04	38° 14.130'	122° 38.293'
Richmond Marina Boat Ramp	10	dock	5/26/04	37° 54.834'	122° 21.249'
Pont San Pablo Yacht Harbor	11	dock	5/26/04	37° 57.746'	122° 25.125'
Pete's Harbor	12	dock	5/27/04	37° 30.034'	122° 13.451'
Coyote Point Marina	13	dock	5/27/04	37° 35.442'	122° 19.082'
Rodeo Marina	14	dock	5/28/04	38° 02.348'	122° 16.265'
Moore's Landing	15a	dock	5/28/04	38° 13.564'	122° 18.453'
Napa Valley Marina	15b	dock	5/28/04	38° 13.198'	122° 18.766'

Table 2 Sampling Sites: Depth, Temperature and Salinity

Site Name	Water Depth (m)	Temperature (°C)		Salinity (ppt)	
		Near-Surface	Near-Bottom	Near-Surface	Near-Bottom
Sierra Point Marina	3	16.9	16.8	27.9	28.0
Brisbane Lagoon	intertidal	18.1	—	28.0	—
Pier 39 Marina	5	15.2	15.0	29.6	29.4
San Leandro Marina	1	17.9	17.8	25.1	25.2
Fruitvale Bridge	intertidal	17.9	—	26.0	—
Coast Guard Island Marina	—	18.1	—	26.6	—
Presidio Yacht Club	1.7	13.8	13.6	30.7	31.0
Port Sonoma	—	21.2	—	20.2	—
Petaluma River Turning Basin	≈0	22.9	—	8.0	—
Richmond Marina Boat Ramp	5.5	18.7	18.8	28.3	28.3
Pont San Pablo Yacht Harbor	0.7	17.1	—	22.5	—
Pete's Harbor	5.5	18.6	—	24.5	—
Coyote Point Marina	4	20.4	20.5	28.0	28.0
Rodeo Marina	—	17.2	—	18.5	—
Moore's Landing	—	20.4	—	11.1	—
Napa Valley Marina	2	20.2	20.2	10.3	11.4

The data on organisms collected are organized into six habitat categories:

- *Floating Docks and Associated Structures* includes organisms growing on the sides and undersides of floating docks and associated bumpers, tires, ropes, etc.
- *Intertidal Benthos* includes benthic organisms collected by hand, hand dredge or net on the bottom or on or under rocks, debris or other hard substrates, but not including organisms collected by benthic grab or on pilings.
- *Pilings (Intertidal)* includes organisms collected by hand or hand-held scraper from the intertidal portions of wood or concrete pilings.
- *Benthic Grabs* includes organisms collected from soft-bottom beneath the docks with a Ponar grab as described in the Methods section.
- *Extracted from Wood* includes organisms living in burrows in wood.
- *Miscellaneous Other* includes organisms collected as drift, in traps, benthic-pelagic organisms and other collected organisms that don't fit into any of the five preceding categories.

There are 896 records of 294 distinct taxa in different sites and habitats. Most records are from Floating Docks (62% of records), Intertidal Benthos (20% of records) and Benthic Grabs (13% of records) (Table 3). The other 3 habitat categories together accounted for less than 5% of the records. Lower level diversity was highest in the Floating Dock and Intertidal Benthos habitat, with 221 and 124 taxa respectively. Higher level diversity was also highest in these habitats, with Floating Docks collections yielding macroalgae, plants, protozoans, invertebrates and vertebrates, and Intertidal Benthos yielding all of these except protozoans (which were certainly present, but not reliably collected and processed by our methods). In contrast, only invertebrates were collected from Pilings and Benthic Grabs.

Table 3 Number of Taxa and Records by Habitat Category

	Taxa	Collection Records	Percent of Total Records
Floating Docks and Associated Structures	221	560	62.5%
Intertidal Benthos	124	179	20.0%
Pilings (Intertidal)	15	20	2.2%
Benthic Grabs	57	120	13.4%
Extracted from Wood	4	6	0.7%
Miscellaneous Other	11	11	1.2%
All Habitats	294	896	100.0%

Of the 232 determinate taxa for which the invasion status could be determined, 81 (35%) are native, 38 (16%) are cryptogenic and 113 (49%) are exotic (Table 4), and these proportions were generally consistent across the three habitat types that were most extensively sampled (Floats, Intertidal Benthos and Benthic Grabs). We estimated the number and percentage of taxa that are exotic by treating the number of taxa classified as exotic as a low estimate, and those classified

as either exotic or cryptogenic as a high estimate (Cohen *et al.* 2005), and calculated percentages as a percentage of the determinate taxa (Table 5). Thus 50-70% of the taxa on floats, 63-76% of intertidal benthic taxa and 55-70% of the soft-bottom taxa collected in benthic grabs are estimated to be exotic, as are 49-65% of all the taxa collected on the survey.

Table 4 Number of Taxa by Invasion Status and Habitat Category

	Native	Cryptogenic	Exotic	Indeterminate	Total
Floating Docks and Associated Structures	53	35	88	45	221
Intertidal Benthos	26	14	69	15	124
Pilings (Intertidal)	4	1	10	0	15
Benthic Grabs	12	6	22	17	57
Extracted from Wood	0	0	4	0	4
Miscellaneous Other	6	0	4	1	11
All Habitats	81	38	113	62	294

Table 5 Estimates of Number and Percent Exotic, by Habitat Category (see text for explanation)

	Number of Exotic Taxa	Percent Exotic
Floating Docks and Associated Structures	88-123	50-70%
Intertidal Benthos	68-83	63-76%
Pilings (Intertidal)	10-11	67-73%
Benthic Grab	22-28	55-70%
Extracted from Wood	4	100%
Miscellaneous Other	4	40%
All Habitats	112-151	49-65%

Invasion status can also be examined by site (Table 6). To consider this data, it's helpful to sort the sites into five groups (Table 7). The first four groups consist of sites that are primarily dock-fouling sites: Group A, two sites near the mouth of the Bay in the West Central Bay; Group B, six sites that are in the East Central Bay or the South Bay; Group C, three sites in San Pablo Bay; and Group D, two sites in the Petaluma and Napa rivers, which are tributary to San Pablo Bay (the partially sampled location (15a) at Moore's Landing on the Napa River is not included in this comparison). In terms of physical characteristics, these range from Group A, the saltiest and coldest through B and C to Group D, the freshest and warmest. The remaining group, Group E, consists of the two primarily intertidal sites, which are located in and have salinities and temperatures typical of the East Central Bay/South Bay region.

Table 6 Number of Taxa by Invasion Status and Site (see Table 1 for site names and co-ordinates)

Site Number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
Floats																
Native	5	–	23	5	–	5	30	2	2	10	6	9	7	8	2	3
Cryptogenic	6	–	8	11	–	10	17	4	0	7	3	4	13	4	0	0
Exotic	25	–	19	23	–	25	29	10	13	24	19	33	31	17	7	17
Indeterminate	5	–	11	7	–	6	11	1	0	2	1	12	4	0	0	4
Total	41	–	61	46	–	46	87	17	15	43	29	58	55	29	9	24
Intertidal Benthos																
Native	–	13	–	–	11	4	0	1	2	1	2	–	1	7	2	0
Cryptogenic	–	9	–	–	9	0	0	0	0	0	1	–	0	2	0	0
Exotic	–	35	–	–	28	3	1	6	2	0	2	–	4	9	1	2
Indeterminate	–	4	–	–	10	1	0	0	0	0	0	–	0	5	1	0
Total	–	61	–	–	58	8	1	7	4	1	5	–	5	23	4	2
Pilings																
Native	1	–	–	0	0	–	4		0	–	–	–	1	–	–	–
Cryptogenic	0	–	–	0	1	–	0		0	–	–	–	0	–	–	–
Exotic	0	–	–	5	3	–	0		2	–	–	–	3	–	–	–
Indeterminate	0	–	–	0	0	–	0		0	–	–	–	0	–	–	–
Total	1	–	–	5	4	–	4		2	–	–	–	4	–	–	–
Benthic Grabs																
Native	0	–	4	3	–	0	4	0	1	1	1	2	1	1	–	0
Cryptogenic	0	–	1	1	–	1	2	0	0	1	0	2	1	0	–	0
Exotic	2	–	5	1	–	5	7	3	2	4	7	8	7	3	–	1
Indeterminate	2	–	7	7	–	3	7	0	0	4	1	3	2	1	–	1
Total	4	–	17	12	–	9	20	3	3	10	9	15	11	5	–	2
In Wood																
Native	–	0	0	–	–	0	–	–	–	–	–	–	–	–	–	–
Cryptogenic	–	0	0	–	–	0	–	–	–	–	–	–	–	–	–	–
Exotic	–	3	1	–	–	2	–	–	–	–	–	–	–	–	–	–
Indeterminate	–	0	0	–	–	0	–	–	–	–	–	–	–	–	–	–
Total	–	3	1	–	–	2	–	–	–	–	–	–	–	–	–	–
Misc. Other																
Native	–	–	–	–	–	–	1	2	1	–	0	–	–	2	0	–
Cryptogenic	–	–	–	–	–	–	0	0	0	–	0	–	–	0	0	–
Exotic	–	–	–	–	–	–	0	1	1	–	1	–	–	0	1	–
Indeterminate	–	–	–	–	–	–	0	0	0	–	1	–	–	0	0	–
Total	–	–	–	–	–	–	1	3	2	–	2	–	–	2	1	–
All Habitats																
Native	5	13	27	7	11	8	38	4	5	11	7	9	8	14	4	3
Cryptogenic	6	9	9	11	10	10	20	4	0	8	4	6	13	5	0	1
Exotic	26	38	25	26	29	32	34	15	17	27	27	38	41	20	9	20
Indeterminate	7	4	17	11	10	9	16	1	0	5	3	13	5	6	1	5
Total	44	64	78	55	60	59	108	24	22	51	41	66	67	45	14	29

Table 7 Site Groups

Group	Site Numbers & Names	Site Type	Location	Near-Surface Salinity (ppt)	Near-Surface Temperature (°C)
A	3 Pier 39 Marina 7 Presidio Yacht Harbor	dock	West Central Bay	29.6-31.0	13.8-15.2
B	1 Sierra Point Marina 4 San Leandro Marina 6 Coast Guard Island Marina 10 Richmond Marina Boat Ramp 12 Pete's Harbor 13 Coyote Pont Marina	dock	East Central Bay and South Bay	24.5-28.3	16.9-20.4
C	8 Port Sonoma 11 Point San Pablo Yacht Harbor 14 Rodeo Marina	dock	San Pablo Bay	18.5-22.5	17.1-21.2
D	9 Petaluma River Turning Basin 15 Napa Valley Marina	dock	San Pablo Bay Tributaries	8.0-11.1	20.2-22.9
E	2 Brisbane Lagoon 5 Fruitvale Bridge	intertidal	East Central Bay and South Bay	26.0-28.0	17.9-18.1

Overall diversity steadily declines from Group A, near the mouth of the Bay, through Groups B and C to Group D, low salinity sites in the San Pablo Bay tributaries, decreasing from 78-108 total species (including both determinate and indeterminate species) collected in Group A sites, to 22-29 total species in Group D sites (Table 8). (When determinate species are considered alone they show a similar decline.) The estimated number of exotic taxa also declines, but in one step from Groups A and B to Groups C and D rather than steadily over the four groups: that is, the low estimate (based on the number of taxa classified as exotic) drops from 25-42 for Groups A and B combined to 15-20 for Groups C and D combined; and the high estimate (based on the number of taxa classified as either exotic or cryptogenic) similarly drops in a single step. The resulting effect in the estimated fraction of taxa that are exotic is that it rises in two steps, from Group A, to Groups B plus C, to Group D, as follows: from Group A to Group B the number of exotic taxa stays the same but the total number of taxa decreases, so the fraction of taxa that are exotic increases; from Group B to Group C the number of exotic taxa and of total taxa both decrease, so that the fraction of taxa that are exotic stays about the same; and from Group C to Group D the number of exotic taxa stays the same while the total number of taxa decreases, so the fraction of taxa that are exotic increases. This can be seen in both the low estimates and the high estimates in Table 8.

Group E, consisting of the two primarily intertidal sites in the East Central Bay/South Bay, not only resembles Group B, the primarily dock-fouling sites in the East Central Bay/South Bay, in its physical characteristics as noted above, but also in its biological characteristics: Group E's statistics for total taxa and for estimates of number and percent of exotic species all fall entirely within or almost entirely within the range for Group B. From this it appears that these biological characteristics depend more on a site's location within the estuary (or the associated salinity and thermal factors) than on the type of habitat samples (dock-fouling or intertidal).

Table 8 Range of Number of Taxa and Range of Estimates of Number and Percent Exotic, for Site Groups
(see text for explanation)

Group	Total Taxa	Number of Exotic Taxa		Percent Exotic	
		Low Estimate	High Estimate	Low Estimate	High Estimate
A	78-108	25-34	34-54	31-32%	44-50%
B	44-67	26-42	32-54	47-61%	67-81%
C	24-45	15-20	19-25	44-66%	56-79%
D	22-29	17-20	17-21	69-77%	72-77%
E	60-64	29-38	39-47	48-59%	65-73%

Table 9 lists the exotic species collected by the survey. These include three species that had not been previously reported from the Pacific Coast, the hydroid *Bimeria vestita*, collected at Fruitvale Bridge in the Oakland Estuary, the hydroid *Laomedea calceolifera*, collected at the Richmond and Coyote Point marinas, and the ctenostome bryozoan *Nolella* cf. *gigantea*, collected in the Napa Valley Marina. The sponge *Prosuberites* sp., collected at Port Sonoma, had only been reported on the Pacific Coast once before, in San Francisco Bay in 1953 (Carlton 1979, pp. 217-218; Cohen & Carlton 1979, p. 31); and the ctenostome bryozoan *Victorella pavidia*, collected in the Petaluma River Turning Basin where it coated virtually all hard surfaces in the intertidal zone in a thick fuzz, was collected in the Bay in the late 1960s (Carlton 1979, pp. 710-713; Cohen & Carlton 1979, p. 109) but had not been seen on the Pacific Coast since. Ten other species collected by the survey had only been discovered or recognized as exotic on the Pacific Coast since the last San Francisco Bay survey in 1997. The complete collection data for the survey are provided in the Appendix.

Table 9 Exotic Species Collected

CHLOROPHYTA	MOLLUSCA: GASTROPODA	ARTHROPODA: AMPHIPODA
<i>Codium fragile tomentosoides</i>	<i>Crepidula convexa</i>	<i>Ampelisca abdita</i>
PHAEOPHYTA	<i>Crepidula plana</i>	<i>Ampithoe valida</i>
<i>Sargassum muticum</i>	<i>Haminoea japonica</i>	<i>Caprella mutica</i>
PHAEOPHYTA	<i>Hopkinsia plana</i>	<i>Corophium alienense</i>
<i>Lomentaria hakodatensis</i>	<i>Ilyanassa obsoleta</i>	<i>Corophium heteroceratum</i>
PLANTAE	<i>Littorina saxatilis</i>	<i>Gammarus daiberi</i>
<i>Carpobrotus</i> sp.	<i>Myosotella myosotis</i>	<i>Grandidierella japonica</i>
<i>Cotula coronopifolia</i>	<i>Philine auriformis</i>	<i>Incisocalliope derzhavini</i>
<i>Lepidium latifolium</i>	<i>Philine</i> sp.A	<i>Melita nitida</i>
<i>Rumex crispus</i>	<i>Sakureolis enosimensis</i>	<i>Melita rylovi</i>
<i>Salsola soda</i>	<i>Tenellia adspersa</i>	<i>Monocorophium acherusicum</i>
<i>Spartina alterniflora</i> /hybrid	<i>Urosalpinx cinerea</i>	<i>Monocorophium insidiosum</i>
PROTOZOA	MOLLUSCA: BIVALVIA	<i>Monocorophium uenoi</i>
<i>Mirofolliculina limnoriae</i>	<i>Corbula amurensis</i>	<i>Stenothoe valida</i>
PORIFERA	<i>Gemma gemma</i>	ARTHROPODA: DECAPODA
<i>Clathria prolifera</i>	<i>Geukensia demissa</i>	<i>Carcinus maenas</i>
<i>Halichondria "bowerbanki"</i>	<i>Macoma petalum</i>	<i>Eriocheir sinensis</i>
<i>Haliclona "loosanofi"</i>	<i>Musculista senhousia</i>	<i>Palaemon macrodactylus</i>
<i>Prosuberites</i> sp.	<i>Mya arenaria</i>	<i>Rhithropanopeus harrisi</i>
CNIDARIA: HYDROZOA	<i>Teredo navalis</i>	BRYOZOA
<i>Bimeria vestita</i>	<i>Venerupis philippinarum</i>	<i>Alcyonidium polyoum</i>
<i>Cordylophora caspia</i>	ARTHROPODA: CIRRIPIEDIA	<i>Anguinella palmata</i>
<i>Ectopleura crocea</i>	<i>Amphibalanus amphitrite</i>	<i>Bowerbankia gracilis</i>
<i>Garveia franciscana</i>	<i>Amphibalanus improvisus</i>	<i>Bugula neritina</i>
<i>Gonothyraea loveni</i>	ARTHROPODA: CUMACEA	<i>Conopeum</i> cf. <i>tenuissimum</i>
<i>Laomedea calceolifera</i>	<i>Nippoleucon hinumensis</i>	<i>Cryptosula pallasiana</i>
<i>Moerisia gangetica</i>	ARTHROPODA: MYSIDACEA	<i>Nollela</i> cf. <i>gigantea</i>
<i>Obelia bidentata</i>	<i>Neomysis japonica</i>	<i>Schizoporella unicornis</i>
<i>Obelia longissima</i>	ARTHROPODA: TANAIIDACEA	<i>Victorella pavida</i>
CNIDARIA: ANTHOZOA	<i>Sinelobus</i> sp. A	<i>Watersipora subtorquata</i>
<i>Diadumene franciscana</i>	ARTHROPODA: ISOPODA	CHORDATA: TUNICATA
<i>Diadumene leucolena</i>	<i>Dynoides dentisinus</i>	<i>Ascidia zara</i>
<i>Diadumene lineata</i>	<i>Iais californica</i>	<i>Botrylloides diegensis</i>
<i>Diadumene</i> sp.	<i>Ianiropsis</i> sp. A	<i>Botrylloides violaceus</i>
ANNELIDA: POLYCHAETA	<i>Limnoria quadripunctata</i>	<i>Botryllus schlosseri</i>
<i>Amaeana</i> sp. A of Harris	<i>Limnoria tripunctata</i>	<i>Ciona savignyi</i>
<i>Ficopomatus enigmaticus</i>	<i>Munna</i> sp. A	<i>Didemnum</i> sp.
<i>Heteromastus filiformis</i>	<i>Paranthura japonica</i>	<i>Molgula manhattensis</i>
<i>Marenzelleria viridis</i>	<i>Pseudosphaeroma campbellensis</i>	<i>Styela clava</i>
<i>Neanthes succinea</i>	<i>Sphaeroma quoianum</i>	CHORDATA: PISCES
<i>Neoamphitrite</i> sp. A of Harris	<i>Synidotea laevidorsalis</i>	<i>Lucania parva</i>
<i>Pseudopolydora kempii japonica</i>		<i>Morone saxatilis</i>
<i>Pseudopolydora paucibranchiata</i>		<i>Tridentiger trigonocephalus</i>
<i>Streblospio benedicti</i>		CHORDATA: AMPHIBIA
<i>Typosyllis nipponica</i>		<i>Rana catesbeiana</i>

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San Francisco Bay Rapid Assessment Survey for Exotic Species, May 2004																
Site Data																
Station Name	Sierra Point Marina	Brisbane Lagoon	Pier 39	San Leandro Marina	Fruitvale Bridge	Coast Guard Island	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina
Station Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
GPS-Latitude North	37° 40.393'	37° 41.171'	37° 48.682'	37° 41.797'	37° 46.141'	37° 46.870'	37° 49.953'	38° 6.937'	38° 14.130'	37° 54.834'	37° 57.746'	37° 30.034'	37° 35.442'	38° 2.348'	38° 13.564'	38° 13.198'
GPS-Longitude West	122° 22.842'	122° 23.436'	122° 24.588'	122° 11.593'	122° 13.778'	122° 14.749'	122° 28.446'	122° 30.155'	122° 38.293'	122° 21.249'	122° 25.125'	122° 13.451'	122° 19.082'	122° 16.265'	122° 18.453'	122° 18.766'
Date Sampled (2004)	5/23	5/23	5/23	5/24	5/24	5/24	5/25	5/25	5/25	5/26	5/26	5/27	5/27	5/28	5/28	5/28
Depth (m)	3	—	5	1	—	—	1.7	—	≈0	5.5	0.7	5.5	4	—	—	2
Temperature (°C)																
Near-Surface																
thermometer (G Lambert)	16.5	—	15	17	17	17.5	13	20.5	23	18.5	16.5	18	20	—	—	—
thermometer (D Calder)	16.8	—	14.5	17.5	17.5	18	14	21.2	23	18.7	17	18.5	20.5	17	20	20.5
YSI meter	16.9	18.1	15.2	17.9	17.9	18.1	13.8	21.2	22.9	18.7	17.1	18.6	20.4	17.2	20.4	20.2
Near-Bottom																
YSI meter	16.8	—	15.0	17.8	—	—	13.6	—	—	18.8	—	—	20.5	—	—	20.2
Salinity (ppt)																
Near-Surface																
refractometer (G Lambert)	28	29	30	25	26	26	31	20	8	28.5	23	25	29	—	—	—
refractometer (D Calder)	31	—	30	24	24	27	31	22	9	29	22	24	27	18	11	10
YSI meter	27.9	28.0	29.6	25.1	26.0	26.6	30.7	20.2	8.0	28.3	22.5	24.5	28.0	18.5	11.1	10.3
Near-Bottom																
YSI meter	28.0	—	29.4	25.2	—	—	31.0	—	—	28.3	—	—	28.0	—	—	11.4

San Francisco Bay Rapid Assessment Survey for Exotic Species, May 2004

Species List

Category Number	Category	Species List	Invasion Status
2.100	Protoctista: Algae: Chlorophyta	Bryopsis corticulans	C
2.100	Protoctista: Algae: Chlorophyta	Cladophora sp.	C
2.100	Protoctista: Algae: Chlorophyta	Codium fragile tomentosoides	E
2.100	Protoctista: Algae: Chlorophyta	Enteromorpha sp.	C
2.100	Protoctista: Algae: Chlorophyta	Ulva sp.	C
2.200	Protoctista: Algae: Phaeophyta	Egregia menziesii	N
2.200	Protoctista: Algae: Phaeophyta	Fucus gardneri	N
2.200	Protoctista: Algae: Phaeophyta	Fucus sp.	N
2.200	Protoctista: Algae: Phaeophyta	Melosira sp.	-
2.200	Protoctista: Algae: Phaeophyta	naviculoid diatoms	-
2.200	Protoctista: Algae: Phaeophyta	Sargassum muticum	E
2.300	Protoctista: Algae: Rhodophyta	Ceramium sp.	-
2.300	Protoctista: Algae: Rhodophyta	Cryptopleura violacea	N
2.300	Protoctista: Algae: Rhodophyta	Desmarestia ligulata	N
2.300	Protoctista: Algae: Rhodophyta	Gelidium sp.	-
2.300	Protoctista: Algae: Rhodophyta	Gracilariopsis andersonii	N
2.300	Protoctista: Algae: Rhodophyta	Grateloupia andersonii	N
2.300	Protoctista: Algae: Rhodophyta	Grateloupia doryphora	C
2.300	Protoctista: Algae: Rhodophyta	Lomentaria hakodatensis	E
2.300	Protoctista: Algae: Rhodophyta	Mastocarpus papillatus	N
2.300	Protoctista: Algae: Rhodophyta	Mazzaella splendens	N
2.300	Protoctista: Algae: Rhodophyta	Microcladia coulteri	N
2.300	Protoctista: Algae: Rhodophyta	Polyneura latissima	N
2.300	Protoctista: Algae: Rhodophyta	Polysiphonia sp.	C
2.300	Protoctista: Algae: Rhodophyta	Porphyra perforata	N
2.300	Protoctista: Algae: Rhodophyta	Rhizoclonium sp.	-
2.700	Protoctista: Other Protoctista	folliculinids	-
2.700	Protoctista: Other Protoctista	Mirofolliculina limnoricae	E
2.700	Protoctista: Other Protoctista	sessile ciliate protist	-
3.000	Plantae	Atriplex patula	N
3.000	Plantae	Carpobrotus sp.	E
3.000	Plantae	Cotula coronopifolia	E
3.000	Plantae	Lepidium latifolium	E
3.000	Plantae	Rumex crispus	E
3.000	Plantae	Salicornia virginica	N
3.000	Plantae	Salsola soda	E
3.000	Plantae	Scirpus californianus	N
3.000	Plantae	Spartina alterniflora/hybrid	E
3.000	Plantae	Spartina foliosa	N
3.000	Plantae	Spartina sp.	-
3.000	Plantae	Typha sp.	N
3.000	Plantae	Zostera marina	N
4.000	Porifera	Clathria prolifera	E
4.000	Porifera	Halichondria cf. bowerbanki	E
4.000	Porifera	Haliclona cf. loosanofi	E
4.000	Porifera	Haliclona sp. A knobbed tubes	C
4.000	Porifera	Haliclona white	C
4.000	Porifera	Prosuberites sp.	E
4.000	Porifera	Scypha sp. A	C
4.000	Porifera	Scypha sp. B	C
4.000	Porifera	Scypha sp. C	C
5.000	Cnidaria	Vellela vellela	N
5.100	Cnidaria: Hydrozoa	Bimeria vestita	E
5.100	Cnidaria: Hydrozoa	Clytia aff. hemisphaerica	C
5.100	Cnidaria: Hydrozoa	Cordylophora caspia	E
5.100	Cnidaria: Hydrozoa	Ectopleura crocea	E
5.100	Cnidaria: Hydrozoa	Eudendrium sp.	-
5.100	Cnidaria: Hydrozoa	Garveia franciscana	E

Invasion Status

N Native

C Cryptogenic

E Exotic

- Undetermined

Category Number	Category	Species List	Invasion Status
5.100	Cnidaria: Hydrozoa	Gonothyrea loveni	E
5.100	Cnidaria: Hydrozoa	Laomedea calceolifera	E
5.100	Cnidaria: Hydrozoa	Moerisia gangetica	E
5.100	Cnidaria: Hydrozoa	Obelia bidentata	E
5.100	Cnidaria: Hydrozoa	Obelia longissima	E
5.100	Cnidaria: Hydrozoa	Opercularella sp.	-
5.100	Cnidaria: Hydrozoa	Plumularia lagenifera	N
5.400	Cnidaria: Anthozoa	Anthopleura elegantissima	N
5.400	Cnidaria: Anthozoa	Diadumene sp. (not cincta)	E
5.400	Cnidaria: Anthozoa	Diadumene franciscana	E
5.400	Cnidaria: Anthozoa	Diadumene leucolena	E
5.400	Cnidaria: Anthozoa	Diadumene lineata	E
5.400	Cnidaria: Anthozoa	Metridium senile	N
5.400	Cnidaria: Anthozoa	unidentified anemone	-
7.000	Platyhelminthes	Caspar-the-Ghost flatworm	-
7.000	Platyhelminthes	large green polyclad	-
7.000	Platyhelminthes	small polyclad #1	-
7.000	Platyhelminthes	small polyclad #2	-
8.000	Nemertea	Emplectonema gracile	N
8.000	Nemertea	unidentified nemerteans	-
9.100	Annelida: Polychaeta	Amaeana sp A Harris	E
9.100	Annelida: Polychaeta	Armandia brevis	N
9.100	Annelida: Polychaeta	Brania	-
9.100	Annelida: Polychaeta	Capitella	C
9.100	Annelida: Polychaeta	Capitella	-
9.100	Annelida: Polychaeta	Cirratulidae	-
9.100	Annelida: Polychaeta	Cirriformia sp.	-
9.100	Annelida: Polychaeta	Cossura	-
9.100	Annelida: Polychaeta	Dipolydora	-
9.100	Annelida: Polychaeta	Dorvillea	-
9.100	Annelida: Polychaeta	Eteone dilatata?	N
9.100	Annelida: Polychaeta	Eteone lighti	N
9.100	Annelida: Polychaeta	Eupolyornia heterobranchia?	N
9.100	Annelida: Polychaeta	Exogone lourei	C
9.100	Annelida: Polychaeta	Exogoninae	-
9.100	Annelida: Polychaeta	Ficopomatus enigmaticus	E
9.100	Annelida: Polychaeta	Glycera capitata/nana complex	N
9.100	Annelida: Polychaeta	Glycinde polygnatha	N
9.100	Annelida: Polychaeta	Goniada polygnatha	N
9.100	Annelida: Polychaeta	Halosydna brevisetosa/ johnsoni	N
9.100	Annelida: Polychaeta	Harmothoe imbricata group	C
9.100	Annelida: Polychaeta	Heteromastus	-
9.100	Annelida: Polychaeta	Heteromastus filiformis	E
9.100	Annelida: Polychaeta	Leitoscoloplos pugettensis	N
9.100	Annelida: Polychaeta	Marenzelleria viridis	E
9.100	Annelida: Polychaeta	Marphysa sp. TB?	C
9.100	Annelida: Polychaeta	Mediomastus	-
9.100	Annelida: Polychaeta	Naineris dendritica	N
9.100	Annelida: Polychaeta	Neanthes succinea	E
9.100	Annelida: Polychaeta	Neanthes, not succinea?	-
9.100	Annelida: Polychaeta	Neoamphitrite sp. A	E
9.100	Annelida: Polychaeta	Nephtys cornuta	N
9.100	Annelida: Polychaeta	Nephtys caecoides	N
9.100	Annelida: Polychaeta	Nereiphylla	-
9.100	Annelida: Polychaeta	Nereis	-
9.100	Annelida: Polychaeta	Nereis latescens?	N
9.100	Annelida: Polychaeta	Nereis vexillosa	N
9.100	Annelida: Polychaeta	Platynereis	-
9.100	Annelida: Polychaeta	Polycirrus	-
9.100	Annelida: Polychaeta	Polydora	-
9.100	Annelida: Polychaeta	Pseudopolydora kempii japonica	E
9.100	Annelida: Polychaeta	Pseudopolydora paucibranchiata	E

Category Number	Category	Species List	Invasion Status
9.100	Annelida: Polychaeta	Pseudopotamilla?	-
9.100	Annelida: Polychaeta	Pterocirrus montereyensis	N
9.100	Annelida: Polychaeta	Schizobranchia insignis	N
9.100	Annelida: Polychaeta	Scoletoma tetraura group	-
9.100	Annelida: Polychaeta	Sphaerosyllis	-
9.100	Annelida: Polychaeta	Streblospio benedicti	E
9.100	Annelida: Polychaeta	Syllis cf. gracilis	C
9.100	Annelida: Polychaeta	Syllis elongata	N
9.100	Annelida: Polychaeta	Typosyllis adamanteus	N
9.100	Annelida: Polychaeta	Typosyllis nipponica	E
9.200	Annelida: Oligochaeta	oligochaete	-
12.100	Mollusca: Polyplacophora	unidentified chiton	-
12.200	Mollusca: Prosobranchia	Assiminea californica	N
12.200	Mollusca: Prosobranchia	Crepidula convexa	E
12.200	Mollusca: Prosobranchia	Crepidula nummaria	N
12.200	Mollusca: Prosobranchia	Crepidula plana	E
12.200	Mollusca: Prosobranchia	Ilyanassa obsoleta	E
12.200	Mollusca: Prosobranchia	Lacuna marmorata	N
12.200	Mollusca: Prosobranchia	Littorina plena	N
12.200	Mollusca: Prosobranchia	Littorina saxatilis	E
12.200	Mollusca: Prosobranchia	Lottia digitalis	N
12.200	Mollusca: Prosobranchia	Lottia pelta	N
12.200	Mollusca: Prosobranchia	Lottia strigatella	N
12.200	Mollusca: Prosobranchia	Odostomia sp.	C
12.200	Mollusca: Prosobranchia	Urosalpinx cinerea	E
12.300	Mollusca: Opisthobranchia	Archidoris montereyensis	N
12.300	Mollusca: Opisthobranchia	Dendronotus sp.	-
12.300	Mollusca: Opisthobranchia	Haminoea japonica	E
12.300	Mollusca: Opisthobranchia	Hermisenda crassicornis	N
12.300	Mollusca: Opisthobranchia	Hopkinsia plana	E
12.300	Mollusca: Opisthobranchia	Janolus fuscus	N
12.300	Mollusca: Opisthobranchia	Philine cf. auriformis	E
12.300	Mollusca: Opisthobranchia	Philine sp. A SCAMIT 1988	E
12.300	Mollusca: Opisthobranchia	Polycera atra	C
12.300	Mollusca: Opisthobranchia	Sakuraeolis enosimensis	E
12.300	Mollusca: Opisthobranchia	Tenellia adspersa	E
12.300	Mollusca: Opisthobranchia	unidentified nudibranch	-
12.400	Mollusca: Pulmonata	Myosotella myosotis	E
12.500	Mollusca: Bivalvia	Adula diegensis	N
12.500	Mollusca: Bivalvia	Corbula amurensis	E
12.500	Mollusca: Bivalvia	Gemma gemma	E
12.500	Mollusca: Bivalvia	Geukensia demissa	E
12.500	Mollusca: Bivalvia	Hiatella artica	N
12.500	Mollusca: Bivalvia	Lyonsia californica	N
12.500	Mollusca: Bivalvia	Macoma petalum	E
12.500	Mollusca: Bivalvia	Macoma sp.	-
12.500	Mollusca: Bivalvia	Musculista senhousia	E
12.500	Mollusca: Bivalvia	Mya arenaria	E
12.500	Mollusca: Bivalvia	Mytilus californianus	N
12.500	Mollusca: Bivalvia	Mytilus trossulus/galloprovincialis	C
12.500	Mollusca: Bivalvia	Ostrea conchaphila	N
12.500	Mollusca: Bivalvia	Pododesmus macrochisma?	C
12.500	Mollusca: Bivalvia	Tellina bodegensis	N
12.500	Mollusca: Bivalvia	Teredo navalis	E
12.500	Mollusca: Bivalvia	Venerupis philippinarum	E
13.130	Arthropoda: Chelicerata: Pycnogonida	Achelia sp. A	-
13.130	Arthropoda: Chelicerata: Pycnogonida	Ammothea hilgendorfi	C
13.130	Arthropoda: Chelicerata: Pycnogonida	Phoxichilidium femoratum	N
13.130	Arthropoda: Chelicerata: Pycnogonida	unidentified pycnogonid	-
13.210	Arthropoda: Crustacea: Copepoda	harpacticoid copepods	-
13.220	Arthropoda: Crustacea: Cirripedia	Amphibalanus amphitrite	E
13.220	Arthropoda: Crustacea: Cirripedia	Amphibalanus improvisus	E

Category Number	Category	Species List	Invasion Status
13.220	Arthropoda: Crustacea: Cirripedia	Balanus crenatus	N
13.220	Arthropoda: Crustacea: Cirripedia	Balanus glandula	N
13.220	Arthropoda: Crustacea: Cirripedia	Chthamalus dalli	N
13.220	Arthropoda: Crustacea: Cirripedia	Chthamalus fissus	N
13.220	Arthropoda: Crustacea: Cirripedia	Semibalanus balanoides	N
13.230	Arthropoda: Crustacea: Mysidacea	Neomysis japonica	E
13.240	Arthropoda: Crustacea: Cumacea	Eudorella pacifica	C
13.240	Arthropoda: Crustacea: Cumacea	Nippoleucon hinumensis	E
13.250	Arthropoda: Crustacea: Tanaidacea	Leptocheilia cf. dubia	C
13.250	Arthropoda: Crustacea: Tanaidacea	Sinelobus sp. A	E
13.260	Arthropoda: Crustacea: Isopoda	Cirolana harfordi	C
13.260	Arthropoda: Crustacea: Isopoda	Dynoides dentisimus	E
13.260	Arthropoda: Crustacea: Isopoda	Gnorimosphaeroma oregonense	N
13.260	Arthropoda: Crustacea: Isopoda	lais californica	E
13.260	Arthropoda: Crustacea: Isopoda	Ianiropsis sp. A, not tridens	E
13.260	Arthropoda: Crustacea: Isopoda	Ligia occidentalis	N
13.260	Arthropoda: Crustacea: Isopoda	Limnoria quadripunctata	E
13.260	Arthropoda: Crustacea: Isopoda	Limnoria tripunctata	E
13.260	Arthropoda: Crustacea: Isopoda	Munna sp. A	E
13.260	Arthropoda: Crustacea: Isopoda	Paranthura japonica	E
13.260	Arthropoda: Crustacea: Isopoda	Pseudosphaeroma campbellensis	E
13.260	Arthropoda: Crustacea: Isopoda	Sphaeroma quoianum	E
13.260	Arthropoda: Crustacea: Isopoda	Synidotea laevidorsalis	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Americorophium spinicorne	N
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ampelisca abdita	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ampithoe lacertosa	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ampithoe sp.	-
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ampithoe valida	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Aoroides secundus	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Corophium alienense	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Corophium heteroceratum	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Corophium sp.	-
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Dulichia n. sp.	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Gammarus daiberi	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Grandidierella japonica	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Hyalé sp.	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Incisocalloipe (Parapleustes) derzhavini	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Jassa marmorata yellow cap	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Leucothoe pacifica	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Melita nitida	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Melita rylovi	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Monocorophium acherusicum	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Monocorophium insidiosum	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Monocorophium uenoi	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Photis sp.	-
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Pontogeneia rostrata	N
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ptilohyalé (Hyalé) cf littoralis/plumulosa	C
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Stenothoe valida	E
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Trasorchestia traskiana	N
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella californica	C
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella equilibra	N
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella incisa	C
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella mutica	E
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella sp. * not natalense	C
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	unidentified caprellids	-
13.280	Arthropoda: Crustacea: Decapoda	Cancer sp.	-
13.280	Arthropoda: Crustacea: Decapoda	Carcinus maenas	E
13.280	Arthropoda: Crustacea: Decapoda	Crangon nigricauda	N
13.280	Arthropoda: Crustacea: Decapoda	Eriocheir sinensis	E
13.280	Arthropoda: Crustacea: Decapoda	Hemigrapsus oregonensis	N
13.280	Arthropoda: Crustacea: Decapoda	Pachycheles rudis	N
13.280	Arthropoda: Crustacea: Decapoda	Pachygrapsus crassipes	N

Category Number	Category	Species List	Invasion Status
13.280	Arthropoda: Crustacea: Decapoda	Pagarus sp.	-
13.280	Arthropoda: Crustacea: Decapoda	Palaemon macrodactylus	E
13.280	Arthropoda: Crustacea: Decapoda	Pinnixa sp.	-
13.280	Arthropoda: Crustacea: Decapoda	Rhithropanopeus harrisi	E
13.280	Arthropoda: Crustacea: Decapoda	unidentified shrimp	-
13.292	Arthropoda: Crustacea: Other Crustaceans: Ostracoc	unidentified ostracodes	-
13.310	Arthropoda: Uniramia: Insecta	chironomid larva	-
16.100	Bryozoa: Ctenostomata	Alcyonidium polyoum	E
16.100	Bryozoa: Ctenostomata	Anguinella palmata	E
16.100	Bryozoa: Ctenostomata	Bowerbankia gracilis	E
16.100	Bryozoa: Ctenostomata	Nolella cf. gigantea	E
16.100	Bryozoa: Ctenostomata	Victorella pavida	E
16.300	Bryozoa: Cheilostomata	Bugula cf. californica	C
16.300	Bryozoa: Cheilostomata	Bugula cf. mollis	N
16.300	Bryozoa: Cheilostomata	Bugula neritina	E
16.300	Bryozoa: Cheilostomata	Conopeum cf. tenuissimum	E
16.300	Bryozoa: Cheilostomata	Cryptosula pallasiana	E
16.300	Bryozoa: Cheilostomata	Hippothoa hyalina	N
16.300	Bryozoa: Cheilostomata	Schizoporella unicornis	E
16.300	Bryozoa: Cheilostomata	Schizoporella sp. A	C
16.300	Bryozoa: Cheilostomata	Schizoporella sp. B	C
16.300	Bryozoa: Cheilostomata	Scrupocellaria or Tricellaria	-
16.300	Bryozoa: Cheilostomata	Smittoidea	-
16.300	Bryozoa: Cheilostomata	Smittoidea prolifica	N
16.300	Bryozoa: Cheilostomata	Watersipora subtorquata	E
17.000	Kamptozoa	Barentsia sp.	-
17.000	Kamptozoa	kamptozoans	-
18.200	Echinodermata: Ophiuroidea	unidentified ophiuroid	-
18.300	Echinodermata: Asteroidea	Pisaster brevispinus	N
21.100	Urochordata: Ascidiacea	Aplidium californicum	N
21.100	Urochordata: Ascidiacea	Aplidium sp.	-
21.100	Urochordata: Ascidiacea	Ascidia zara	E
21.100	Urochordata: Ascidiacea	Botrylloides diegensis	E
21.100	Urochordata: Ascidiacea	Botrylloides violaceus	E
21.100	Urochordata: Ascidiacea	Botryllus schlosseri	E
21.100	Urochordata: Ascidiacea	Ciona savignyi	E
21.100	Urochordata: Ascidiacea	Didemnum sp.	E
21.100	Urochordata: Ascidiacea	Diplosoma listerianum	C
21.100	Urochordata: Ascidiacea	Molgula manhattensis	E
21.100	Urochordata: Ascidiacea	Styela clava	E
23.000	Other Invertebrate Phyla	nematodes	-
24.100	Chordata: Pisces	Clevelandia ios	N
24.100	Chordata: Pisces	Cottus asper	N
24.100	Chordata: Pisces	Gasterosteus aculeatus	N
24.100	Chordata: Pisces	Gobiosox	-
24.100	Chordata: Pisces	Lucania parva	E
24.100	Chordata: Pisces	Morone saxatilis	E
24.100	Chordata: Pisces	Tridentiger trigonocephalus	E
24.100	Chordata: Pisces	unidentified percoid fish	-
24.200	Chordata: Amphibia	Rana catesbeiana	E

Category Number	Category	Species	Invasion Status	Sierra Point	Brisbane Lagoon	Pier 39	San Leandro	Fruitvale Bridge	Coast Guard	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
9.100	Annelida: Polychaeta	Sphaerosyllis	-						X						X				
9.100	Annelida: Polychaeta	Streblospio benedicti	E														X		
9.100	Annelida: Polychaeta	Syllis cf. gracilis	C							X									
9.100	Annelida: Polychaeta	Syllis elongata	N							X					X				
9.100	Annelida: Polychaeta	Typosyllis nipponica	E	X			X		X	X					X	X			
12.100	Mollusca: Polyplacophora	unidentified chiton	-			X			X	X									
12.200	Mollusca: Prosobranchia	Crepidula convexa	E				X												
12.200	Mollusca: Prosobranchia	Crepidula nummaria	N			X													
12.200	Mollusca: Prosobranchia	Crepidula plana	E												X				
12.200	Mollusca: Prosobranchia	Ilyanassa obsoleta	E														X		
12.200	Mollusca: Prosobranchia	Lacuna marmorata	N			X				X									
12.200	Mollusca: Prosobranchia	Lottia pelta	N							X			X						
12.200	Mollusca: Prosobranchia	Lottia strigatella	N										X						
12.200	Mollusca: Prosobranchia	Odostomia sp.	C				X												
12.200	Mollusca: Prosobranchia	Urosalpinx cinerea	E						X										
12.300	Mollusca: Opisthobranchia	Archidoris montereyensis	N			X				X									
12.300	Mollusca: Opisthobranchia	Dendronotus sp.	-			X													
12.300	Mollusca: Opisthobranchia	Haminoea japonica	E	X			X								X	X			
12.300	Mollusca: Opisthobranchia	Hermisenda crassicornis	N			X				X									
12.300	Mollusca: Opisthobranchia	Hopkinsia plana	E			X													
12.300	Mollusca: Opisthobranchia	Janolus fuscus	N			X													
12.300	Mollusca: Opisthobranchia	Polycera atra	C							X									
12.300	Mollusca: Opisthobranchia	Sakuraeolis enosimensis	E												X				
12.300	Mollusca: Opisthobranchia	Tenellia adspersa	E																X
12.300	Mollusca: Opisthobranchia	unidentified nudibranch	-			X				X									
12.400	Mollusca: Pulmonata	Myosotella myosotis	E				X								X				
12.500	Mollusca: Bivalvia	Adula diegensis	N			X				X									
12.500	Mollusca: Bivalvia	Corbula amurensis	E									X							
12.500	Mollusca: Bivalvia	Geukensia demissa	E				X												
12.500	Mollusca: Bivalvia	Hiatella artica	N							X						X			
12.500	Mollusca: Bivalvia	Lyonsia californica	N			X													
12.500	Mollusca: Bivalvia	Musculista senhousia	E	X					X					X	X	X			
12.500	Mollusca: Bivalvia	Mya arenaria	E																
12.500	Mollusca: Bivalvia	Mytilus californianus	N							X									
12.500	Mollusca: Bivalvia	Mytilus trossulus/galloprovincialis	C	X			X		X	X	X		X	X	X	X	X		
12.500	Mollusca: Bivalvia	Ostrea conchaphila	N	X		X	X		X				X	X	X	X	X		
12.500	Mollusca: Bivalvia	Pododesmus macrochisma?	C							X									
13.130	Arthropoda: Chelicerata: Pycnogonida	Ammothea hilgendorfi	C			X										X			
13.130	Arthropoda: Chelicerata: Pycnogonida	Phoxichilidium femoratum	N			X													
13.210	Arthropoda: Crustacea: Copepoda	harpacticoid copepods	-												X				
13.220	Arthropoda: Crustacea: Cirripedia	Amphibalanus improvisus	E			X	X				X	X		X	X		X	X	
13.220	Arthropoda: Crustacea: Cirripedia	Balanus crenatus	N	X		X			X	X			X	X		X	X		
13.220	Arthropoda: Crustacea: Cirripedia	Balanus glandula	N	X		X	X		X	X			X	X	X	X	X		
13.220	Arthropoda: Crustacea: Cirripedia	Chthamalus fissus	N							X			X						
13.240	Arthropoda: Crustacea: Cumacea	Nippoleucon hinumensis	E				X										X		
13.250	Arthropoda: Crustacea: Tanaidacea	Leptocheilia cf. dubia	C			X													
13.250	Arthropoda: Crustacea: Tanaidacea	Sinelobus sp. A	E			X				X		X	X		X	X	X		X

Category Number	Category	Species	Invasion Status	Sierra Point Marina	Brisbane Lagoon	Pier 39	San Leandro Marina	Fruitvale Bridge	Coast Guard Island	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
16.100	Bryozoa: Ctenostomata	Alcyonidium polyoum	E							X									
16.100	Bryozoa: Ctenostomata	Anguinella palmata	E	X		X			X					X	X	X			
16.100	Bryozoa: Ctenostomata	Bowerbankia gracilis	E							X				X					
16.100	Bryozoa: Ctenostomata	Nolella cf. gigantea	E																X
16.100	Bryozoa: Ctenostomata	Victorella pavidia	E									X							
16.300	Bryozoa: Cheilostomata	Bugula cf. californica	C	X			X		X				X	X		X			
16.300	Bryozoa: Cheilostomata	Bugula cf. mollis	N													X			
16.300	Bryozoa: Cheilostomata	Bugula neritina	E	X					X				X			X			
16.300	Bryozoa: Cheilostomata	Conopeum cf. tenuissimum	E							X	X	X				X	X	X	X
16.300	Bryozoa: Cheilostomata	Cryptosula pallasiana	E	X					X				X	X	X	X			
16.300	Bryozoa: Cheilostomata	Hippothoa hyalina	N			X				X									
16.300	Bryozoa: Cheilostomata	Schizoporella unicornis	E																
16.300	Bryozoa: Cheilostomata	Schizoporella sp. A	C							X									
16.300	Bryozoa: Cheilostomata	Schizoporella sp. B	C							X									
16.300	Bryozoa: Cheilostomata	Scrupocellaria or Tricellaria	-						X										
16.300	Bryozoa: Cheilostomata	Smittoidea	-							X									
16.300	Bryozoa: Cheilostomata	Smittoidea prolifica	N											X	X				
16.300	Bryozoa: Cheilostomata	Watersipora subtorquata	E	X					X	X			X			X			
17.000	Kamptozoa	Barentsia sp.	-	X															
17.000	Kamptozoa	kamptozoans	-													X			
18.200	Echinodermata: Ophiuroidea	unidentified ophiuroid	-			X				X									
21.100	Urochordata: Ascidiacea	Aplidium californicum	N										X			X			
21.100	Urochordata: Ascidiacea	Aplidium sp.	-	X															
21.100	Urochordata: Ascidiacea	Ascidia zara	E	X		X			X				X			X			
21.100	Urochordata: Ascidiacea	Botrylloides diegensis	E	X					X	X			X			X			
21.100	Urochordata: Ascidiacea	Botrylloides violaceus	E	X		X	X		X	X			X		X	X			
21.100	Urochordata: Ascidiacea	Botryllus schlosseri	E	X			X		X	X			X		X	X			
21.100	Urochordata: Ascidiacea	Ciona savignyi	E	X					X							X			
21.100	Urochordata: Ascidiacea	Didemnum sp.	E			X				X									
21.100	Urochordata: Ascidiacea	Diplosoma listerianum	C							X									
21.100	Urochordata: Ascidiacea	Molgula manhattensis	E	X		X	X		X	X			X	X	X	X			
21.100	Urochordata: Ascidiacea	Styela clava	E	X		X	X		X	X			X		X	X			
23.000	Other Invertebrate Phyla	nematodes	-												X				
24.100	Chordata: Pisces	Cottus asper	N																X
24.100	Chordata: Pisces	Gobiosox	-							X									
24.100	Chordata: Pisces	Tridentiger trigonocephalus	E									X							

Category			Invasion Status	Sierra Point Marina	Brisbane Lagoon	Pier 39	San Leandro Marina	Fruitvale Bridge	Coast Guard Island	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina
Number	Category	Species		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ampithoe valida	E					X											
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Corophium alienense	E														X		
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Grandidierella japonica	E					X											
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Hyalae sp.	C		X														
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Jassa marmorata yellow cap	E		X														
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Melita nitida	E											X					
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Melita rylovi	E					X											
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Moncorophium acherusicum	E		X														
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Moncorophium insidiosum	E		X														
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Ptilohyalae (Hyalae) cf littoralis/plumulosa	C		X			X						X					
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Stenothoe valida	E		X														
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	Trasorchestia traskiana	N														X		
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	Caprella mutica	E		X														
13.280	Arthropoda: Crustacea: Decapoda	Carcinus maenas	E		X														
13.280	Arthropoda: Crustacea: Decapoda	Eriocheir sinensis	E									X		X					
13.280	Arthropoda: Crustacea: Decapoda	Hemigrapsus oregonensis	N		X			X	X				X	X			X		
13.280	Arthropoda: Crustacea: Decapoda	Pachygrapsus crassipes	N						X										
13.280	Arthropoda: Crustacea: Decapoda	Pagarus sp.	-		X														
13.280	Arthropoda: Crustacea: Decapoda	Palaemon macrodactylus	E								X								
13.280	Arthropoda: Crustacea: Decapoda	Rhithropanopeus harrisi	E								X								
16.100	Bryozoa: Ctenostomata	Anguinella palmata	E		X														
16.100	Bryozoa: Ctenostomata	Bowerbankia gracilis	E		X														
16.300	Bryozoa: Cheilostomata	Conopeum cf. tenuissimum	E								X								
16.300	Bryozoa: Cheilostomata	Cryptosula pallasiana	E		X														
16.300	Bryozoa: Cheilostomata	Schizoporella unicornis	E		X														
16.300	Bryozoa: Cheilostomata	Watersipora subtorquata	E		X			X											
18.200	Echinodermata: Ophiuroidea	unidentified ophiuroid	-					X											
21.100	Urochordata: Ascidiacea	Ascidia zara	E		X														
21.100	Urochordata: Ascidiacea	Botrylloides violaceus	E		X			X											
21.100	Urochordata: Ascidiacea	Botryllus schlosseri	E					X											
21.100	Urochordata: Ascidiacea	Molgula manhattensis	E		X			X											
21.100	Urochordata: Ascidiacea	Styela clava	E		X														
24.100	Chordata: Pisces	Tridentiger trigonocephalus	E					X											
24.200	Chordata: Amphibia	Rana catesbeiana	E									X							

San Francisco Bay Rapid Assessment Survey for Exotic Species, May 2004

Data for Benthic Grabs habitat

Category Number	Category	Species	Invasion Status	Sierra Point Marina	Brisbane Lagoon	Pier 39	San Leandro Marina	Fruitvale Bridge	Coast Guard Island	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b	
9.100	Annelida: Polychaeta	Amaeana sp A Harris	E			X														
9.100	Annelida: Polychaeta	Armandia brevis	N			X														
9.100	Annelida: Polychaeta	Capitella	-							X			X							X
9.100	Annelida: Polychaeta	Cirriformia sp.	-	X		X	X		X				X		X	X				
9.100	Annelida: Polychaeta	Cossura	-			X	X			X										
9.100	Annelida: Polychaeta	Dorvillea	-			X			X	X			X		X	X				
9.100	Annelida: Polychaeta	Exogoninae	-							X										
9.100	Annelida: Polychaeta	Glycera capitata/nana complex	N							X										
9.100	Annelida: Polychaeta	Glycinde polygnatha	N							X				X	X	X				
9.100	Annelida: Polychaeta	Goniada polygnatha	N			X														
9.100	Annelida: Polychaeta	Harmothoe imbricata group	C				X		X				X		X	X				
9.100	Annelida: Polychaeta	Heteromastus	-				X							X			X			
9.100	Annelida: Polychaeta	Leitoscoloplos pugettensis	N			X														
9.100	Annelida: Polychaeta	Marenzelleria viridis	E																	X
9.100	Annelida: Polychaeta	Marphysa sp. TB?	C												X					
9.100	Annelida: Polychaeta	Mediomastus	-			X	X													
9.100	Annelida: Polychaeta	Naineris dendritica	N			X							X							
9.100	Annelida: Polychaeta	Neanthes, not succinea?	-	X		X														
9.100	Annelida: Polychaeta	Neanthes succinea	E	X		X						X	X							
9.100	Annelida: Polychaeta	Nephtys cornuta	N							X										
9.100	Annelida: Polychaeta	Nephtys caecoides	N							X										
9.100	Annelida: Polychaeta	Nereis vexillosa	N				X								X					
9.100	Annelida: Polychaeta	Platynereis	-							X										
9.100	Annelida: Polychaeta	Polycirrus	-												X					
9.100	Annelida: Polychaeta	Pseudopolydora kempii japonica	E															X		
9.100	Annelida: Polychaeta	Pseudopolydora paucibranchiata	E												X	X				
9.100	Annelida: Polychaeta	Scoletoma tetraura group	-				X		X											
9.100	Annelida: Polychaeta	Streblospio benedicti	E				X							X						
9.100	Annelida: Polychaeta	Typosyllis nipponica	E	X		X			X	X					X					
9.200	Annelida: Oligochaeta	oligochaete	-										X							
12.200	Mollusca: Prosobranchia	Crepidula plana	E													X				
12.300	Mollusca: Opisthobranchia	Philine sp. A SCAMIT 1988	E							X										
12.500	Mollusca: Bivalvia	Corbula amurensis	E								X									
12.500	Mollusca: Bivalvia	Macoma sp.	-				X													
12.500	Mollusca: Bivalvia	Tellina bodegensis	N				X													
13.130	Arthropoda: Chelicerata: Pycnogonida	unidentified pycnogonid	-				X													
13.240	Arthropoda: Crustacea: Cumacea	Eudorella pacifica	C			X														
13.240	Arthropoda: Crustacea: Cumacea	Nippoleucon hinumensis	E			X				X		X		X						
13.250	Arthropoda: Crustacea: Tanaidacea	Leptochelia cf. dubia	C							X										
13.260	Arthropoda: Crustacea: Isopoda	Synidotea laevidorsalis	E								X									
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridae	Ampelisca abdita	E								X		X	X	X	X				
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridae	Ampithoe valida	E						X					X	X					

San Francisco Bay Rapid Assessment Survey for Exotic Species, May 2004

Data for Miscellaneous Other habitats

Category			Invasion Status	Sierra Point Marina	Brisbane Lagoon	Pier 39	San Leandro Marina	Fruitvale Bridge	Coast Guard Island	Presidio Yacht Club	Port Sonoma	Petaluma River	Richmond Marina	Pont San Pablo Yacht Harbor	Pete's Harbor	Coyote Point Marina	Rodeo Marina	Moore's Landing	Napa Valley Marina
Number	Category	Species		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15a	15b
2.200	Protocista: Algae: Phaeophyta	Fucus sp.	N														X		
3.000	Plantae	Zostera marina	N														X		
5.000	Cnidaria	Vellela vellela	N							X									
13.230	Arthropoda: Crustacea: Mysidacea	Neomysis japonica	E									X							
13.280	Arthropoda: Crustacea: Decapoda	Carcinus maenas	E											X					
13.280	Arthropoda: Crustacea: Decapoda	Crangon nigricauda	N									X							
24.100	Chordata: Pisces	Clevelandia ios	N								X								
24.100	Chordata: Pisces	Gasterosteus aculeatus	N								X								
24.100	Chordata: Pisces	Lucania parva	E								X								
24.100	Chordata: Pisces	Morone saxatilis	E															X	
24.100	Chordata: Pisces	unidentified percoid fish	-											X					

San Francisco Bay Rapid Assessment Survey for Exotic Species, May 2004

Categories		
Category Number	Category	Typical Members or Common Names
1.000	Bacteria	bacteria, blue-green algae
2.000	Protoctista	
2.100	Protoctista: Algae: Chlorophyta	green algae
2.200	Protoctista: Algae: Phaeophyta	brown algae, kelps
2.300	Protoctista: Algae: Rhodophyta	red algae
2.400	Protoctista: Algae: Other Algae	diatoms, dinoflagellates, blue-green algae, etc.
2.700	Protoctista: Other Protoctista	ciliates, forams, other protozoans
3.000	Plantae	all plants, including mosses, ferns and flowering plants
4.000	Porifera	sponges
5.000	Cnidaria	
5.100	Cnidaria: Hydrozoa	hydroids
5.110	Cnidaria: Hydrozoa: Anthoathecatae	
5.120	Cnidaria: Hydrozoa: Leptothecatae	
5.200	Cnidaria: Scyphozoa	"true" jellyfish and their scyphistomae
5.400	Cnidaria: Anthozoa	anemones, corals, gorgonians, sea pens
6.000	Ctenophora	comb jellies
7.000	Platyhelminthes	flatworms
8.000	Nemertea	ribbon worms
9.100	Annelida: Polychaeta	bristleworms
9.200	Annelida: Oligochaeta	earth worms
11.000	Sipuncula	peanut worms
12.000	Mollusca	
12.100	Mollusca: Polyplacophora	chitons
12.200	Mollusca: Prosobranchia	snails
12.300	Mollusca: Opisthobranchia	sea slugs
12.400	Mollusca: Pulmonata	pulmonate snails
12.500	Mollusca: Bivalvia	clams, oysters, mussels, scallops and other bivalves
12.600	Mollusca: Cephalopoda	squid, octopuses, cuttlefish
13.000	Arthropoda	
13.120	Arthropoda: Chelicerata: Arachnida	scorpions, spiders, ticks, mites
13.130	Arthropoda: Chelicerata: Pycnogonida	sea spiders
13.210	Arthropoda: Crustacea: Copepoda	copepods
13.220	Arthropoda: Crustacea: Cirripedia	barnacles
13.230	Arthropoda: Crustacea: Mysidacea	mysid shrimp (=opossum shrimp)
13.240	Arthropoda: Crustacea: Cumacea	
13.250	Arthropoda: Crustacea: Tanaidacea	
13.260	Arthropoda: Crustacea: Isopoda	pill bugs
13.270	Arthropoda: Crustacea: Amphipoda	
13.271	Arthropoda: Crustacea: Amphipoda: Gammaridea	scuds, sand fleas
13.272	Arthropoda: Crustacea: Amphipoda: Caprellidea	skeleton shrimp
13.280	Arthropoda: Crustacea: Decapoda	crabs, lobsters, crayfish
13.281	Arthropoda: Crustacea: Decapoda: Thalassinoidea	
13.282	Arthropoda: Crustacea: Decapoda: Anomura	
13.283	Arthropoda: Crustacea: Decapoda: Brachyura	true crabs
13.290	Arthropoda: Crustacea: Other Crustaceans	ostracodes, nebalia, brine shrimp, cladocerans, etc.
13.310	Arthropoda: Uniramia: Insecta	insects
16.000	Bryozoa	=Ectoprocts, moss animals
16.100	Bryozoa: Ctenostomata	
16.200	Bryozoa: Cyclostomata	
16.300	Bryozoa: Cheilostomata	
16.400	Bryozoa: Phylactolaemata	freshwater bryozoans
17.000	Kamptozoa	=Entoprocts
18.000	Echinodermata	
18.100	Echinodermata: Asteroidea	sea stars or starfish
18.200	Echinodermata: Ophiuroidea	brittle stars
18.300	Echinodermata: Echinoidea	sea urchins, sand dollars
18.400	Echinodermata: Holothuroidea	sea cucumbers
19.000	Hemichordata	acorn worms
21.000	Urochordata	
21.100	Urochordata: Ascidiacea	sea squirts, tunicates
21.110	Urochordata: Ascidiacea: Aplousobranchia	
21.120	Urochordata: Ascidiacea: Phlebobranchia	
21.123	Urochordata: Ascidiacea: Stolidobranchia	
23.000	Other Invertebrate Phyla	nematodes, rotifers, acanthocephalans, gastrotrichs, etc.
24.000	Chordata	
24.100	Chordata: Pisces	fish
24.200	Chordata: Amphibia	salamanders, frogs, toads