NONINDIGENOUS MARINE SPECIES INTRODUCTIONS IN THE HARBORS OF THE SOUTH AND WEST SHORES OF OAHU, HAWAII

June 1999

COVER

Aerial photographs of the five harbors surveyed in this study. Top left: Ala Wai Yacht Harbor; Top right: Kewalo Basin; Center: Honolulu Harbor behind Sand Island; Bottom left: Keehi Lagoon; Bottom right: Barber's Point Deep Draft Harbor. Photographs provided by Kim Beasley, Manager, Honolulu Clean Islands Council.

NONINDIGENOUS MARINE SPECIES INTRODUCTIONS IN THE HARBORS OF THE SOUTH AND WEST SHORES OF OAHU, HAWAII

Final Report prepared for the David and Lucile Packard Foundation

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EXECUTIVE SUMMARY

The south and west shore harbor system of Oahu consists of five harbors used for commercial vessels, fishing boats or recreational craft, in addition to the U.S. Naval Base at Pearl Harbor. The oldest of these harbors is Honolulu Harbor, which has been in use by ocean going vessels for more than 200 years, and the youngest is the Barber's Point Deep Draft Harbor, which was enlarged to accommodate ocean-going cargo vessels about 25 years ago. The remaining three harbor areas are Kewalo Basin, used primarily for small to medium-sized fishing craft, the Ala Wai Yacht Harbor, which provides docks for more than 1000 sailboats and motor vessels, and Keehi Lagoon, the site of a small marina and water-related recreational activities. Kewalo Basin and the Ala Wai have been in use for much of this century, while the three seaplane runways that make up much of Keehi Lagoon were dredged from shallow areas during and after WW II. The current configurations of all of the harbors have been highly modified from natural conditions, especially for Honolulu Harbor where extensive dredging and filling has been conducted for than a century, enlarging the harbor to over more than twice its original size.

Little marine biological information existed for these harbors prior to the present study, and no comprehensive survey had previously been conducted which could define the composition of the marine biota or provide information on the presence or impact of nonindigenous species. We conducted surveys at 32 locations in the harbors from 1997 to 1998. The benthic biota were sampled using a semi-quantitative technique, and observations were recorded of common macroinvertebrate and fish species. Collected organisms were identified in the laboratory to species or the lowest practicable taxa, and the resulting array of species by station was compared with the limited information available for these harbors and the results of a similar study conducted by the authors 1-2 years previously in Pearl Harbor.

A total of 728 taxa, including 585 named species were identified from these surveys for the five harbors. Of these, 604 taxa including 440 species occurred in Honolulu Harbor, the largest harbor where 15 of the 32 sampling stations were located. Total taxa and species in the other harbors were about one-third the Honolulu Harbor values. A gradient of biota types from coral reef-related organisms near harbor entrances to organisms adapted for eutrophic turbid conditions was noted, especially in Honolulu Harbor, where reef corals were common near the main entrance. Dendrographs of station percent similarity based on total invertebrates showed systematic groupings by harbor and by locations within the harbors. Amphipoda was the most diverse taxonomic group with more than 60 species found, and the percent similarity dendrograph for amphipod species showed a similar pattern of station clustering as that of the total invertebrates.

A total of 73 nonindigenous and 27 cryptogenic species were found in the five harbors, comprising about 17 % of the 585 named species. Honolulu Harbor had most of these (73 nonindigenous and cryptogenic species) with about 40 to 50 found in the remaining harbors. When viewed as a percentage of the total species found in each harbor, Honolulu had the lowest at 15%, with the other harbors ranging 27-33%. This was due not to these harbors having

greater numbers of introduced species, but rather to an even distribution of introduced species throughout the harbor system and greater numbers of total species occurring in Honolulu Harbor. Species not previously reported in Hawaii accounted for 13 of the 73 nonindigenous species, while only two new records were designated cryptogenic species. Most of the nonindigenous and cryptogenic species were first reported in these harbors in the 1970s and 1990s. However, analysis indicates that this apparent recent increase in reported introductions is sampling related, and many of these introduced species have occurred in Hawaii for most of the century. With the exception of the intertidal barnacle *Chthamalus proteus*, the sponge *Gellioides fibrosa*, the amphipod *Leucothoe micronesiae* and the bryozoan *Bugula dentata*, recently introduced nonindigenous species occurred only at one or two stations in one or two harbors. As previously noted in Pearl Harbor and elsewhere in Hawaii, *C. proteus* remains the only recently arrived nonindigenous invertebrate that has proliferated and spread throughout the Hawaiian Islands.

The results of the present study show a remarkable similarity with the findings of the recent surveys in Pearl Harbor. Both studies revealed about twelve new reports for nonindigenous species out of a total of about 100 nonindigenous and cryptogenic species. Only four of the new nonindigenous species found in the present study's harbors also occurred in Pearl Harbor, but 70% of the total nonindigenous and cryptogenic biota occurred in both study areas. Introductions into both areas were dominated by species originating in or with a previously reported range in the central Pacific or south and east Asia.

Comparing the results for Oahu harbors with nonindigenous reports for other areas in the world, the numbers of species found are intermediate between much higher values reported for temperate areas of North America, the Mediterranean Sea and Australia, and totals of only 15 nonindigenous and 15 cryptogenic species reported for twelve harbors surveyed in North Queensland, Australia. This suggests a decreased sensitivity of tropical marine systems to nonindigenous species invasions and negative impacts resulting from such introductions that remains to be verified by further sampling in tropical areas. However, such findings should not be the basis for lack of concern for nonindigenous species introductions in Hawaii or elsewhere. The recent rapid proliferation and transport of *C. proteus* throughout the north central Pacific, the impact of nonindigenous algae on Hawaiian reefs and a recent near outbreak of an introduced mussel in Darwin, Australia all indicate the importance of vigilance against marine introductions and the need for continued baseline and monitoring surveys to allow early detection and control.

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I. INTRODUCTION

A. Nonindigenous marine species introductions and their impacts on native populations.

The distributions of marine organisms throughout the world have been established with the influence of natural physical barriers such as landmasses, temperature or salinity gradients, or current systems, which isolated populations and promoted speciation through evolutionary time scales. However, the geographic ranges of formerly separated species populations have always been in flux as changing current systems, shifting temperature environments or disappearance of land barriers with sea level rise have permitted range extensions of organisms through natural means. What we often traditionally view as a relatively static marine ecosystem with defined boundaries dividing distinct populations has in fact been subject to continual transport, invasion, competition and changes in dominance at low rates of natural introduction.

When natural means causing redistribution of species populations in the sea become superceded by man-related activities, dramatic changes can occur in the resident communities of the areas receiving the introductions. As stated by Briggs (1974) “dominant species can not only succeed in colonizing when they manage to migrate across barriers but often show spectacular success as the result of man-made introductions, either purposeful or accidental”. Human-mediated transport of nonindigenous species is not a new phenomenon. For thousands of years vessels have transported boring organisms and fouling organisms (Carlton 1992; Carlton and Hodder 1995), and circumnavigation of the world by sailing vessels has been underway since the early sixteenth century. In fact, because classification and identification of marine organisms began only in the mid-eighteenth century, and few marine biological surveys were conducted prior to the mid-nineteenth century, the “natural” distributions of many widely distributed marine shallow water species remain in question (Carlton 1989).

In the last century, and more especially during the last two decades, man-related redistribution of marine shallow water organisms has become more frequent and ever more important in its impacts on native communities. These introductions of nonindigenous species have been promoted though five principal vectors (Carlton 1987, Ruiz et al. 1997):

- Transport of planktonic or larval forms in ship ballast water or benthic forms in ballast water sediments in large cargo vessels.
- Transport of fouling organisms attached to vessel hulls or of nonattached organisms associated with fouling communities
- Intentional or unintentional release or propagation in the natural environment of edible or commercially important organisms, or of organisms that are associated with organisms brought in for culture purposes.
- Ornamental organisms such as exotic fishes or algae, originally intended for aquarium observation, teaching or research but escaping or released into the environment.

- Reconnection of formerly isolated bodies of water by canal construction, the most famous example being “Lessepsian migration” of organisms through the Suez Canal between the Red and Mediterranean Seas (Por 1978; Zibrowius 1991).

The primary vector responsible for recent invasions in coastal and inland waters is believed to be worldwide commercial and military shipping. Ships may transport viable organisms within their ballast water or on their hulls as fouling organisms. If precautions are not taken, these potential invaders may be discharged in harbors where, with no natural predators of controls, they may proliferate rapidly. The role of ballast water and ship fouling as transport vectors of nonindigenous species has been demonstrated in many parts of the world (Carlton and Geller 1993;Rainer 1995; Chu et al. 1997; Smith et al. 1996). Although these mechanisms for species transport are not new, aquatic species introductions may have accelerated in many areas of the world in the last decade due to more rapid ship movement and increased traffic to and from some areas such as China.

Since the 1970s, a striking surge of exotic species invasions has occurred in harbors, ports, and other coastal ecosystems around the world (See Carlton 1985; Carlton and Geller 1993 and Ruiz et al. 1997 for reviews). Introduced species can rapidly monopolize energy resources, act as voracious predators, overcome endemic species, or transmit parasites and diseases that can be passed to humans through the food chain or direct exposure. Because of the serious consequences that can result from nonindigenous introductions, marine species invasions have been ranked among the most serious potential perturbations of marine ecosystems (Carlton 1994). As an indication of the growing extent of the problem, more than 75 papers were presented at the January, 1999 First National Conference on Marine Bioinvasions on the patterns, transport vectors, impacts and control measures for nonindigenous marine species throughout the world. Most introductions of nuisance marine nonindigenous species have occurred in the last two decades, such as the fouling mussel *Perna perna* along the Texas Gulf coast in the late 1980s (Hicks and Tennel 1993), the Japanese shore crab *Hemigrapsus sanguineus* on the US Atlantic coast in 1988 (McDermott 1991, 1999; Brousseau et al, 1999, Larson et al. 1999; Seeley 1999; Tyrrell 1999), a variety of molluscs (Zolotarev 1996) and the North American ctenophore *Mnemiopsis leidyi* (Shushkina et al. 1990) into the Black Sea in the early 1980s, the *alga Codium fragile tomentosoides* (Trowbridge 1996) and a variety of invertebrates (Hayward 1997) into New Zealand waters, and Japanese dinoflaggelates (*Alexandrium* spp.) macroalga (*Undaria pinnatifida*), starfish (*Asterias amurensis*) and the European green crab *Carcinus maenus* into Australian waters in the late 1980s (Sanderson 1980; Hallegroff and Bolch 1991; Buttermore et al. 1994; Rodriguez et al 1999).

San Francisco Bay, which has had a long history of direct commerce and exchange of shipping with Hawaii, has been especially impacted by marine species invasions. Species introductions in San Francisco Bay have been so prolific and successful that no shallow water habitat in the Bay is free of exotic species, and it is difficult to find any abundant native species (Carlton 1979; Cohen and Carlton 1995). Moreover, species invasions continue in San Francisco Bay (Cohen and Carlton 1997; Cohen 1999; Daehler and Strong 1996; Greenberg et al. 1996) which have the

potential to be ecologically devastating. The Chinese river clam, *Potamocorbula amurensis*, has reached densities as high as 10,000 per m^2 in shallow areas of the bay, sufficient to strip the bay of phytoplankton blooms that form the basis of the food chain (Carlton et al. 1990) and alter food webs (Thompson and Luoma 1999). The European green crab *Carcinus maenus* consumes a wide variety of prey (Grosholz and Ruiz 1999) and is capable of greatly altering the San Francisco Bay ecosystem through predatory consumption, competition and indirect effects such as hybridization. This crab has recently extended its range to Oregon coast (Behrens Yamada et al. 1999) and Puget Sound (Cohen 1999). The estuarine Chinese mitten crab *Eriocheir sinensis*, harbors a human parasite, damages levees and shorelines and interferes with fisheries (Cohen and Carlton 1998). Cohen and Carlton (1995, 1998) have estimated that a new invasion occurs in San Francisco Bay an average of every 10 to 12 weeks, and new invasions continue to be documented (Cohen et al. 1995; Gosliner 1995; Mills and Sommer 1995; Cohen and Carlton 1998).

B. Marine Nonindigenous Species Introductions in Hawai'i

The main Hawaiian Islands are the most isolated land area in the world, lying more than 4300 km from the North America and more than 6400 km from Japan, and the native biota of these islands have one of the highest rates of endemism in the world (Kay and Palumbi 1987). The Hawaiian islands have been a principal port of call for ocean-going ships sailing from San Francisco Bay and elsewhere in the Pacific for more than 150 years. Located at the crossroads of the Pacific, Hawai'i receives ship traffic from all oceans, principally from the west coast of North America, Asia and the South Pacific (Carlton 1987). Virtually all international shipping passes through Honolulu Harbor and Barbers Point Deep Draft Harbor on Oahu, making these the most likely entry points for introduced marine species into Hawai'i.

Only recently has information become available concerning the abundance of nonindigenous species in Hawaiian waters. Maciolek (1984) listed 19 species of diadromous and marine fishes to be present in Hawaiian waters, which was increased to 21 marine species by Randall (1987), about 4% of a total of 536 Hawaiian shore fish species (Randall 1992). Carlton and Eldredge (in prep.) reviewed the marine and brackish water invertebrates of Hawai'i and determined approximately 205 species to be demonstrably or potentially nonindigenous, again about 4% of the approximate 5000 marine species estimated for Hawai'i (Allison et al. 1995). Approximately 18 species of macroalgae have been introduced to Hawai'i since 1950 (Russell 1992, Rogers 1997, 1999), again about 4% of the approximately 430 estimated total macroalgal species for Hawai'i (G. Smith, pers. comm.).

Baseline studies of Hawaiian nearshore marine biota directed toward the detection of introduced species and their impact have shown that nonindigenous introductions vary substantially from these average values, depending on the characteristics of the area surveyed. The most comprehensive survey conducted to date, a 1996 survey completed in Pearl Harbor (Coles et al. 1997; 1999), found 95 known or potentially nonindigenous species, which composed 23% of the 419 invertebrates, macroalgae and fishes found. Only three nonindigenous invertebrates and

one nonidigenous fish occurred at Midway Atoll in 1997 out of a total 444 taxa found (DeFelice et al. 1998). No nonindigenous algae or invertebrates were found in the nearshore and intertidal of Kaho'olawe Island in 1998 out of a total of 298 species observed or collected (Coles et al. 1998).

Despite the potential importance of Honolulu Harbor or other commercial harbors on Oahu as potential gateways for nonindigenous marine species to enter the Hawaiian marine ecosystem, no studies have previously been conducted of introduced species in Hawaiian commercial harbors, and little information is available for the composition of the marine communities for these harbors. Therefore, we conducted surveys in Honolulu Harbor and Keehi Lagoon in 1997, and in Kewalo Basin, the Ala Wai Yacht Harbor and the Barbers Point Deep Draft Harbor in 1998. The results of this study are reported herein and the presence and impact of nonindigenous marine introductions in these harbors are evaluated. Studies of nonindigenous introductions in stream mouths along Oahu's south and west shores and a evaluation of the role of hull fouling, ballast water and sediments as vectors for marine introductions were conducted as part of this overall project and will be reported in separate reports.

II. HONOLULU HARBOR AND OTHER SOUTH SHORE HARBORS

A. Historical Perspective

Although the first contacts between Hawaiians and Europeans occurred on the islands of Hawai'i and Kauai, Honolulu has played a major role in the history of Hawai'i since the Honolulu Harbor was first located by British and American ships in the late 18th century (Appendix A). The first European to see Honolulu Harbor may have been a crewman in 1786 from the HMS *King George*, captained by Nathaniel Portlock, which was the third ship to visit the Islands and the first to reach Oahu. However, European discovery of the harbor in 1794 is credited to Captain Brown of the British schooner *Jackal* and Captain Gordon of the sloop tender *Prince Lee Boo*, later joined by the American ship *Lady Washington* commanded by Captain John Kendrick (Cartwright 1923).

The harbor was first surveyed by W. R. Broughton of the HMS *Providence* in 1796, although this earliest chart was lost. Although it was difficult for sailing ships to enter the harbor against the usually prevailing northeast tradewinds, mariners soon recognized the value of the harbor as a calm berthing spot with relatively deep water, conditions rare in the Hawaiian Islands where few natural harbors occur. With the increased shipping brought to the islands by sandalwood trade and whaling in the early nineteenth century, the population and power center of Hawai'i shifted to the formerly small village on the dusty plain of Honolulu. It is no exaggeration that Honolulu Harbor is the primary factor for Honolulu being the present capital and commerce center of Hawaii, since the harbor has historically provided the principal access for goods transported by sea to and from the Hawaiian Islands.

As an indication of the increasing importance that Honolulu and Oahu were to play in his recently established Kingdom of the Hawaiian Islands, King Kamehameha moved his court to Oahu from Kailua-Kona in 1804, establishing one of his three residences along the harbor near the mouth of Nuuanu Stream. It was near this site in 1816 that a fort was built by the Russian trader Georg Scheffer and then refurbished by the Hawaiians to become Honolulu Fort, which dominated the harbor shoreline until the fort was dismantled in 1856-57. The fort stood at the intersection of the present Queen Street and Fort Street Mall, and its seaward walls were along the shoreline of that period.

Between 1816 and 1819 three maps were prepared by European visitors which give a good idea of the configuration of Honolulu Harbor and the earliest development of the waterfront of the village that would become Hawaii's capital city. The charts show the dimensions of the harbor in its natural state, formed from the outflow of Nuuanu Stream through the coral reef, before the harbor had been altered by dredging and filling. The earliest map (Figure 1), drawn in 1816 under the direction of the Russian commander Otto von Kotzbue, is the most detailed of the three in terms of shoreline landmarks, and provides the first data available for depths (missing on the English translation version) in the harbor and at its entrance. It shows the newly built fort, fishponds on the Iwilei side of Nuuanu Stream and southeast of the harbor entrance, which is

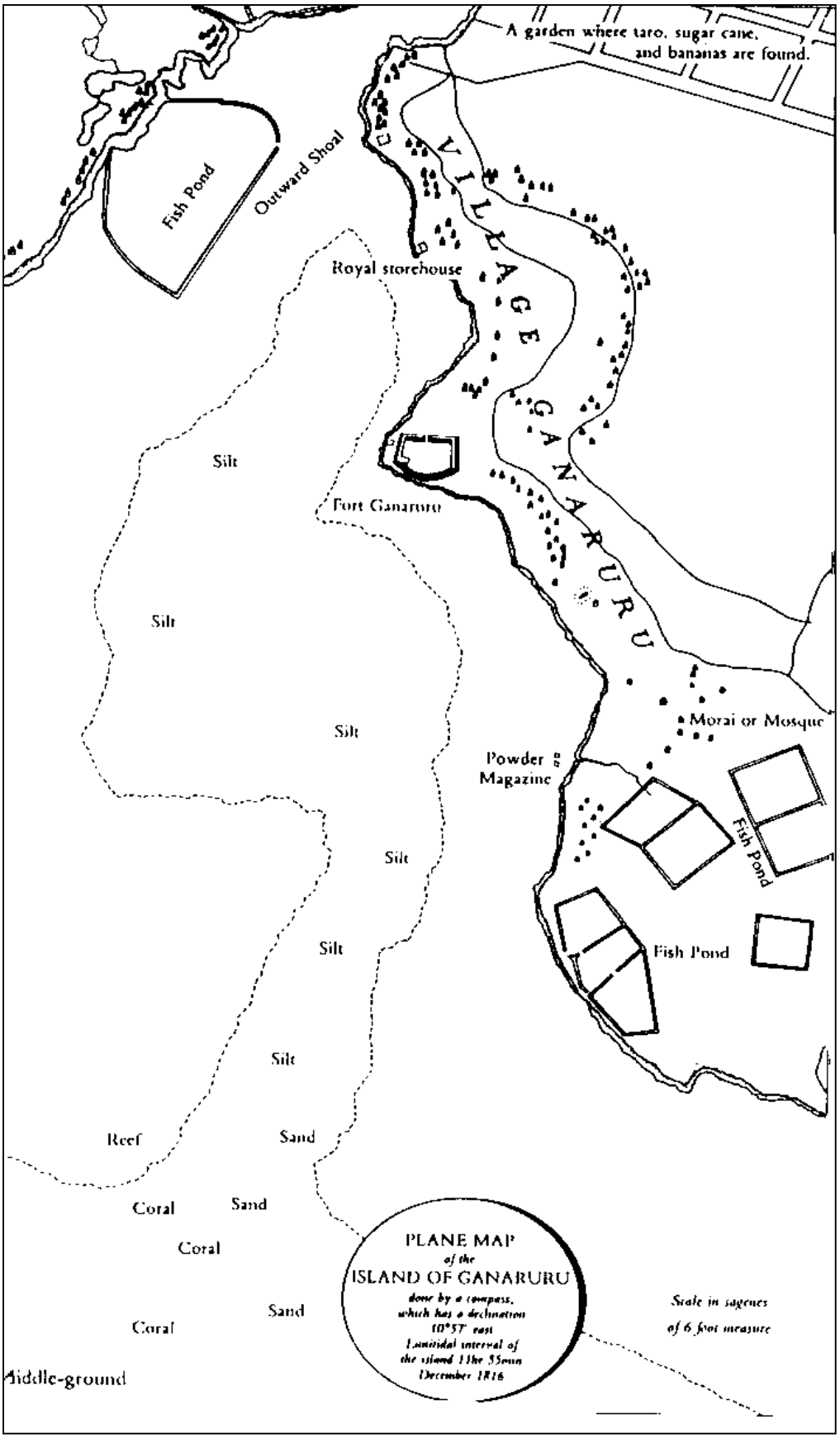


Figure 1. English translation of von Kotzebue's 1816 chart of Honolulu Harbor.

restricted on both sides by a broad coral reef. The extent of the village of Honolulu is indicated by dwellings along the shoreline north and south of the fort.

Two arrivals to Honolulu Harbor that would significantly affect the history and economy of Hawai'i were the arrival of two first whaling ships in 1819 and the first company of Christian missionaries on the brig *Thaddeus* in 1820. A few years after, the first pier in the harbor was improvised in 1825 by sinking a ship's hull near the present Pier 12 site. During this same year the first harbor regulations were published and the fourth existing map of the harbor prepared by C. R. Malden, an officer of the HMS *Blonde* under the command of Lord Byron. (Figure 2). This rendering shows great detail for depth soundings, which indicate the narrowness and relative shallowness of the harbor entrance, and the configuration of both the coral reef and substantial intertidal areas that became exposed at low tide. Honolulu had grown from a village to a small town, with the beginnings of a grid work of streets. Two years later, in 1827, two shipwrecked sailors, James Robinson and Robert Lawrence formed Robinson and Company and built Honolulu's first combined wharf and shipyard in the vicinity of the Honolulu Fort.

By 1840, when the fifth existing map of Honolulu Harbor was prepared by the U. S. Exploring Expedition under C. R. Wilkes (Figure 3), Honolulu had grown to have a network of streets connecting the residences, commercial, and public buildings that made up a town increasingly dependent on goods and income derived from ships entering and leaving Honolulu Harbor. The map provides the greatest detail to date for harbor depths and indicates that fishponds formerly located southeast of the harbor entrance were no longer present.

By the 1850s development of Honolulu and harbor use had increased to a point where it was apparent that alterations of the harbor would be necessary to continue increases in shipping and commercial uses. In 1852 the first steam powered ship, the schooner *Constitution*, arrived in the harbor from San Francisco. A 940-foot long wall was constructed in the harbor in 1853 to divert sediments entering from Nuuanu Stream toward Kalihi Basin. The seriousness of sedimentation that was occurring at that time into the harbor was suggested by a newspaper report that water depth in the harbor was decreasing at a rate of 0.6 m (2 ft) per year. In 1854 the first steam tug was used to pull sail powered ships into dock against the prevailing tradewinds, a task originally performed by Hawaiians in outrigger canoes and later by men or ox teams pulling ropes along the reef or intertidal area south of the harbor entrance.

In 1856-57 the most prominent landmark on the Honolulu shoreline, the Honolulu Fort was torn down and its materials were used to extend the shoreline seaward of the former fort site, in the area of the present Aloha Tower complex. Dredging was also conducted along Robinson's Pier and the Market and Custom House piers in this area, which provided additional fill material as well as dock access for ships with deeper drafts. This new area was called the Esplanade, and it marked the beginning of extensive dredging and filling activities that would drastically alter the size and configuration of the harbor over the next century. The Esplanade was later expanded in 1889 by extending the sea wall and filling with dredge material to support the construction of wharves and covered storage areas.

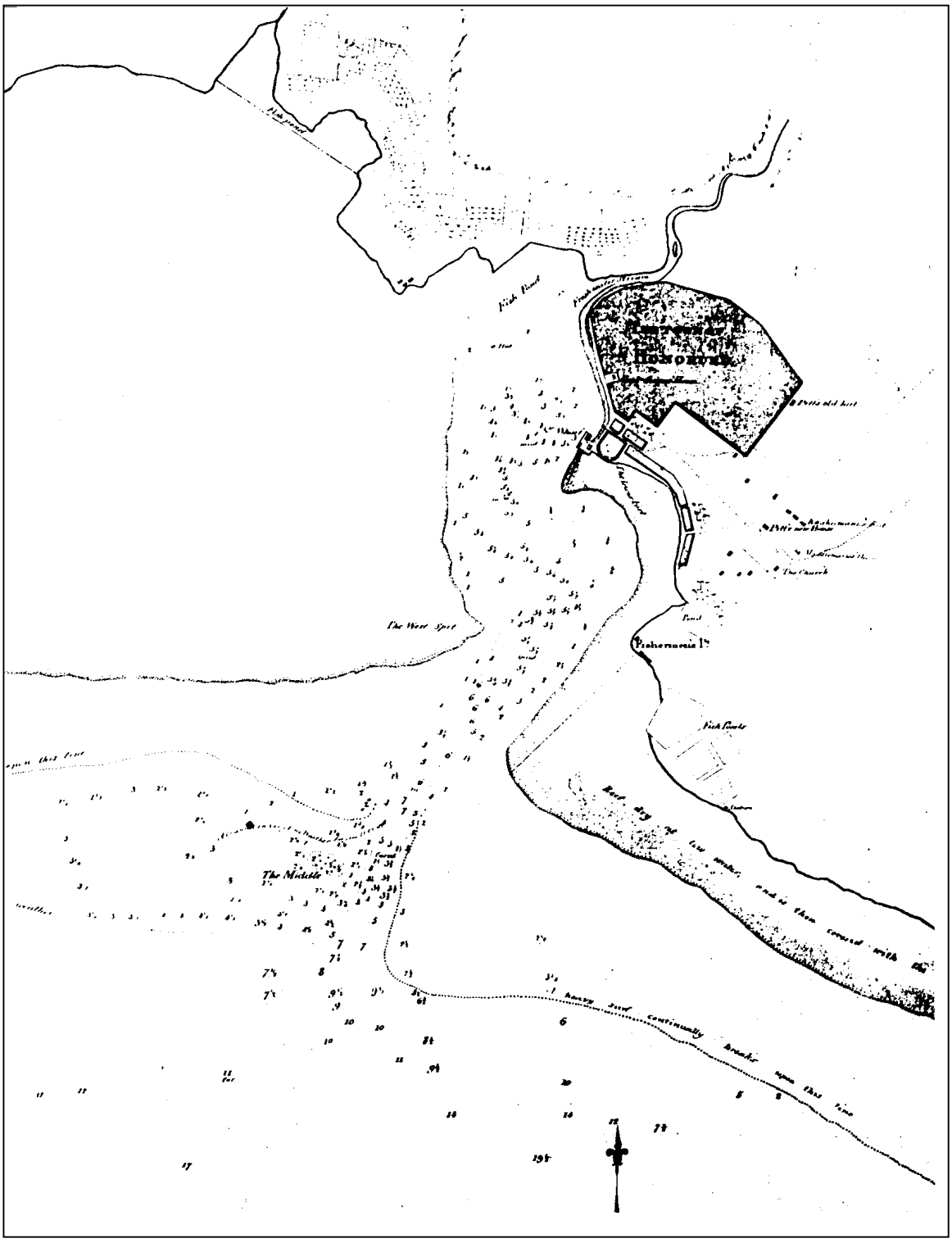


Figure 2. Map of Honolulu Harbor prepared by C. R. Malden in 1825.

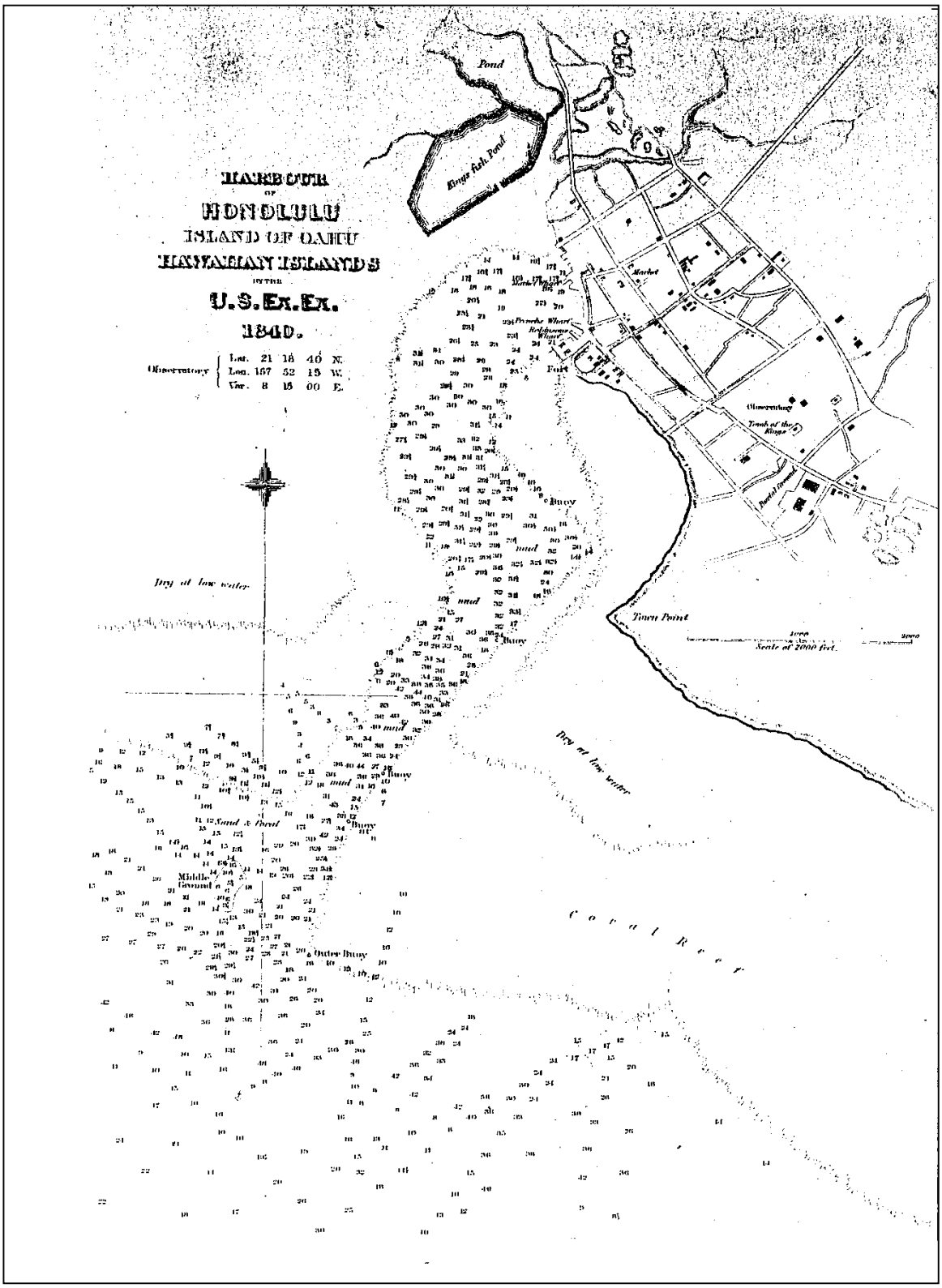


Figure 3. Map of Honolulu Harbor prepared in 1840 by the U. S. Exploring Expedition under C. R. Wilkes.

Honolulu Harbor's first lighthouse was first put in use in 1869. It was located on the north side of the entrance channel and was accessible by foot on a boardwalk from Immigration Island, the forerunner of Sand Island, which was originally an intertidal area awash at high tide. Mail service by steamship to Honolulu began in 1875 and the first marine railway, located at the Pier 2 location, began service in 1883.

Major alteration of Honolulu from its natural configuration began in 1890 with the dredging of the main channel to 60 m (200 ft) width by 9 m (30 ft) deep for about 303 m (1000 ft) through the sand bar at the entrance, which formerly restricted ships to those having a draft of less than about 6 m (20 ft). Dredging required two years to complete, and the first large vessel to enter the harbor though the new entrance channel was the *Oceanic*, in 1893. Many dredging and filling operations soon followed, and the 1890s and 1900s saw the construction of many new piers and channels in the harbor, the dredged material going to create new dry land areas. In 1898 docking areas in the harbor were dredged to provide access to wharves for ships up to 182 m (600 ft) long in the vicinity of Nuuanu stream. The entrance channel was further widened to 121 m (400 ft) and deepened to 10.6 m (35 ft) in 1905 and the main harbor enlarged to 364 m (1200 ft) wide in 1905, and 158,000 cubic yds. of dredged material were deposited on Immigration (Sand) Island in 1906. Further dredging was conducted at the base of Alakea Street in 1906 and the dredge material used as fill material in the Pier 1 area around Immigration Island. Piers were constructed at the base of Richards Street in 1896, at the site of Piers 17 and 18 in 1901 to accommodate sugar loading in 1901, and at Piers 7 and 12 in 1907. Along with this increased activity in Honolulu Harbor during this period, Oahu's second harbor was constructed at the site of the Ala Wai Yacht Harbor during the 1900s.

By 1900 (Figure 4) it was apparent that Honolulu Harbor was becoming insufficient to accommodate the shipping activities of the growing city of Honolulu, and a channel was proposed to be dredged form the main harbor to Kalihi. Dredging commenced in 1915 and was completed in 1920, connecting the original harbor and the area that would be Kapalama Basin with a 303 m (1000 ft) long by 10.6 m (35 ft) deep and 242 m (800 ft) wide channel. This allowed the construction of additional piers, and the first fuel oil line for oil powered vessels was constructed at Pier 16 in 1920. This year also saw the completion of Hawaiian Electric's Honolulu Generating Station at Pier 7. This facility was the primary source the electricity for the city for the next twenty years and is still used today during peak load periods. At maximum operation it circulated 200,000 gpm of cooling water from its intake to its discharge basin, increasing the water temperature 5-6°C and providing one of the principal sources of water circulation in the harbor.

In 1921 Oahu's third harbor was constructed at Kewalo Basin, primarily to provide berthing for fishing boats in clean water, to prevent contamination of cleaning fish catches in the polluted runoff of Nuuanu Stream. At about the same time, the Ala Wai Canal was dredged in 1921-28 to drain Waikiki marshes. The original mouth of the canal was not at its present location near the Ala Wai Harbor, but was into a channel dredged along the shore to join the recently completed Kewalo Basin channel.

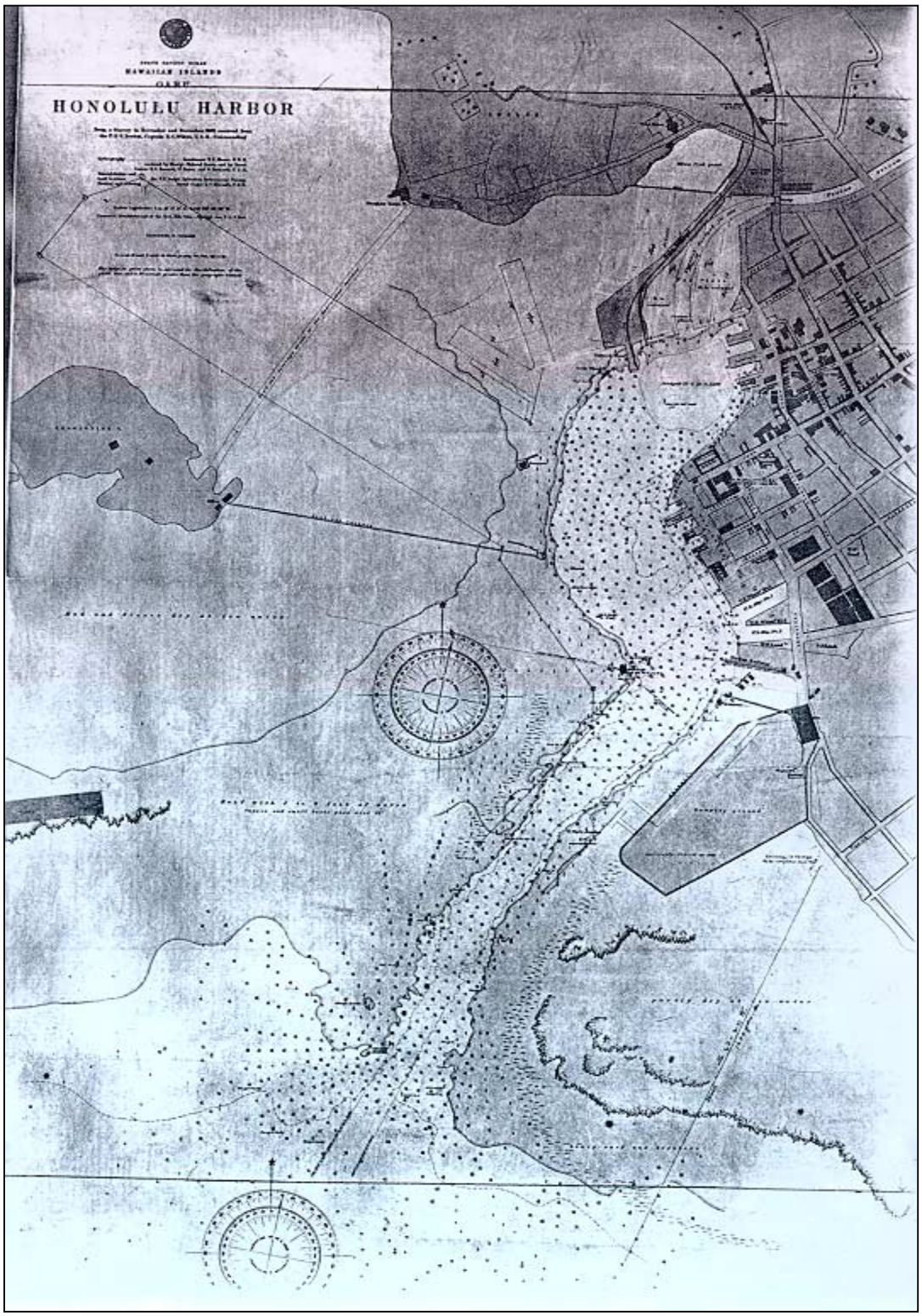


Figure 4. Map of Honolulu Harbor around 1900 showing dredged entrance channel, lighthouse, marine railway, the Esplanade and new piers.

The 1920s and 1930s were a time of rapid harbor expansion and alteration (Figures 5 and 6). The Kapalama channel was widened to 242 m (800 ft) and deepened to 10.6 m (35 ft) in 1922-27 and further widened in 1931-35 when the entrance channel was dredged to a depth of 12 m (40 ft) and widened to 152 m (500 ft). The Aloha Tower and Piers 8 to 11 were completed in 1926 on the site of the Esplande, ushering in a new era of tourism that would dominate Hawaii's future economy. Pier construction continued in the enlarged Honolulu Basin as well as in the Kapalama Channel. By 1940 the total harbor area had at least doubled in size from its natural state and had a total of 32 piers (Figure). With the onset of World War II, administration of the harbor was assumed by the U. S. Navy, and a massive expansion of the harbor and Keehi Lagoon was begun. Between 1941 and 1945 the Kapalama Channel was widened another 303 m (1000 ft) and the Kapalama Basin was dredged to of 10.6 m (35 ft) deep, 303 m (1000 ft) wide by 1030 m (3400 ft) long. A second entrance channel, originally proposed in 1900 to provide two entrances to an enlarged harbor, was scheduled to be dredged, but the project was considered unnecessary by the end of the war and abandoned.

Considerable dredging was also conducted outside of Honolulu Harbor during this period. The Kewalo Basin and channel were deepened to 4.8-5.2 m (16-17 ft), and three seaplane runways and a mooring basin were dredged in Keehi lagoon with more than 16 million cu. yds. of dredged material deposited on the Keehi Lagoon shoreline to form the area of the Honolulu airport.

In 1946 a liberty ship, the SS *Britain Victory*, grounded on the entrance channel reef, blocking the harbor for one week. This renewed interest in opening a second entrance channel to the harbor at the west end of Kapalama Basin, which was recommended for construction in 1949 by the chief of the U. S. Army Corps of Engineers. However this project was not completed until 1962 when the Kalihi entrance channel was opened. Road access to Sand Island was maintained by the use of a Bascule drawbridge, which could be opened to allow ships to pass through the Kalihi Channel. Opening of the Kalihi Channel constituted the last major alteration of Honolulu Harbor, which appears today much the same as it did in 1968 (Figure 7).

Keehi Lagoon however, was substantially altered during the 1960s and 1970s. The Keehi Lagoon Marina was completed in 1963, and the Honolulu Airport Reef Runway was constructed from 1972 to 1975. This involved the filling of an area 666 m (2200 ft) by 3,636 m (12,000 ft) on former reef, burying an area of 1,240 acres off shore of the airport outside of Keehi lagoon. Within the lagoon, the project also involved dredging of channels that increased circulation, alleviating the stagnant water conditions that had been created by dredging the seaplane runways in the 1940s. Elsewhere, the Ala Wai Yacht harbor was enlarged in the early 1970s to accommodate two additional basins and berths for more than 350 additional boats.

During the 1980s activity in Honolulu Harbor included dredging of the main entrance channel to 13.6 m (45 ft) depth and dredging of the main basin, Kapalama Channel and Kapalama Basin to 12.1 m (40 ft). Piers 16, 17 and 18 were reconstructed or modified to provide moorings for commercial fishing boats in the same area from where they had been removed to Kewalo Basin

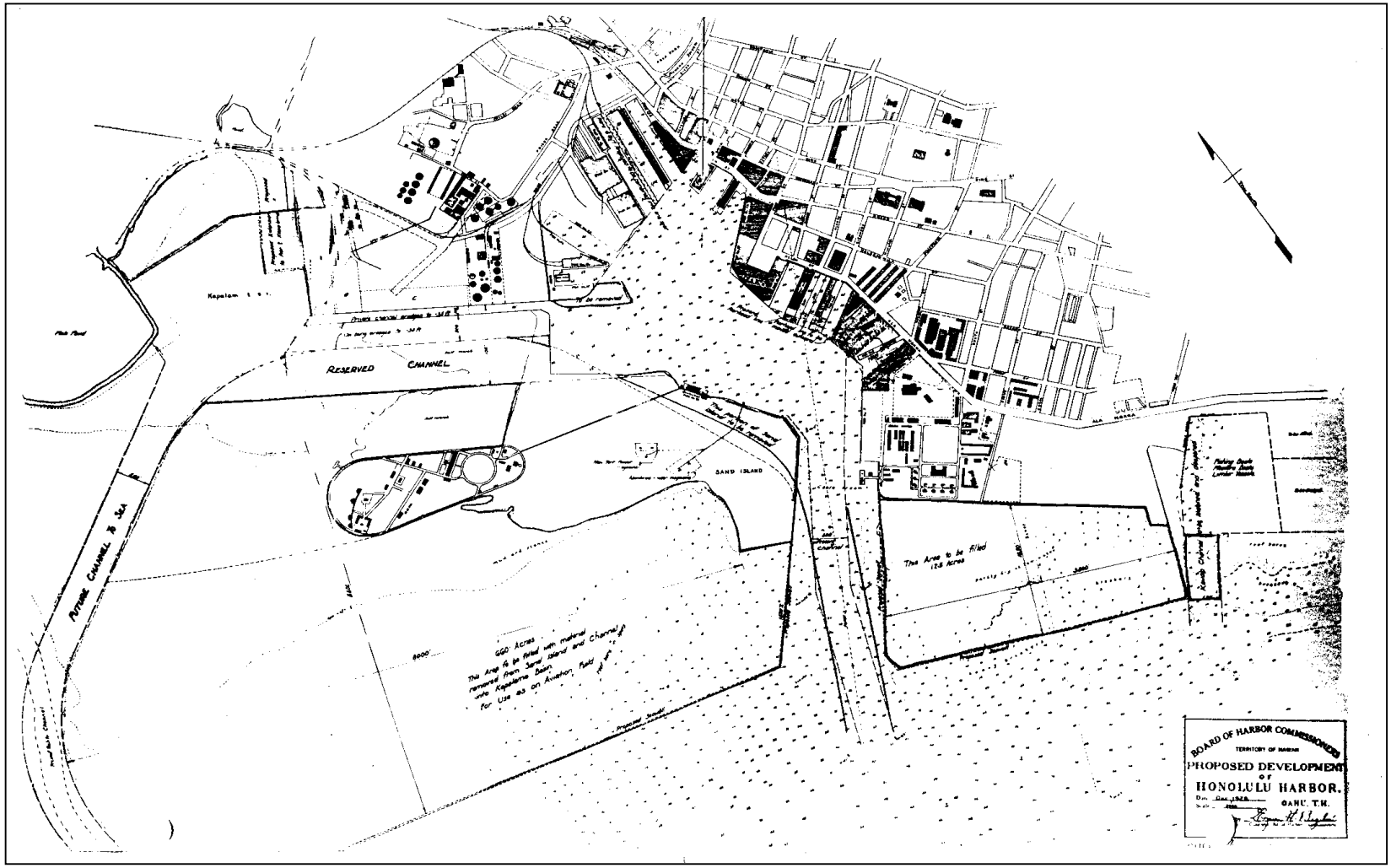


Figure 5. Map of Honolulu Harbor in 1928 showing widened channel entrance and main basin, channel dredged to Kapalama Basin, proposed Kalihi Channel and fill areas on Sand Island and on the reef east of the harbor entrance.

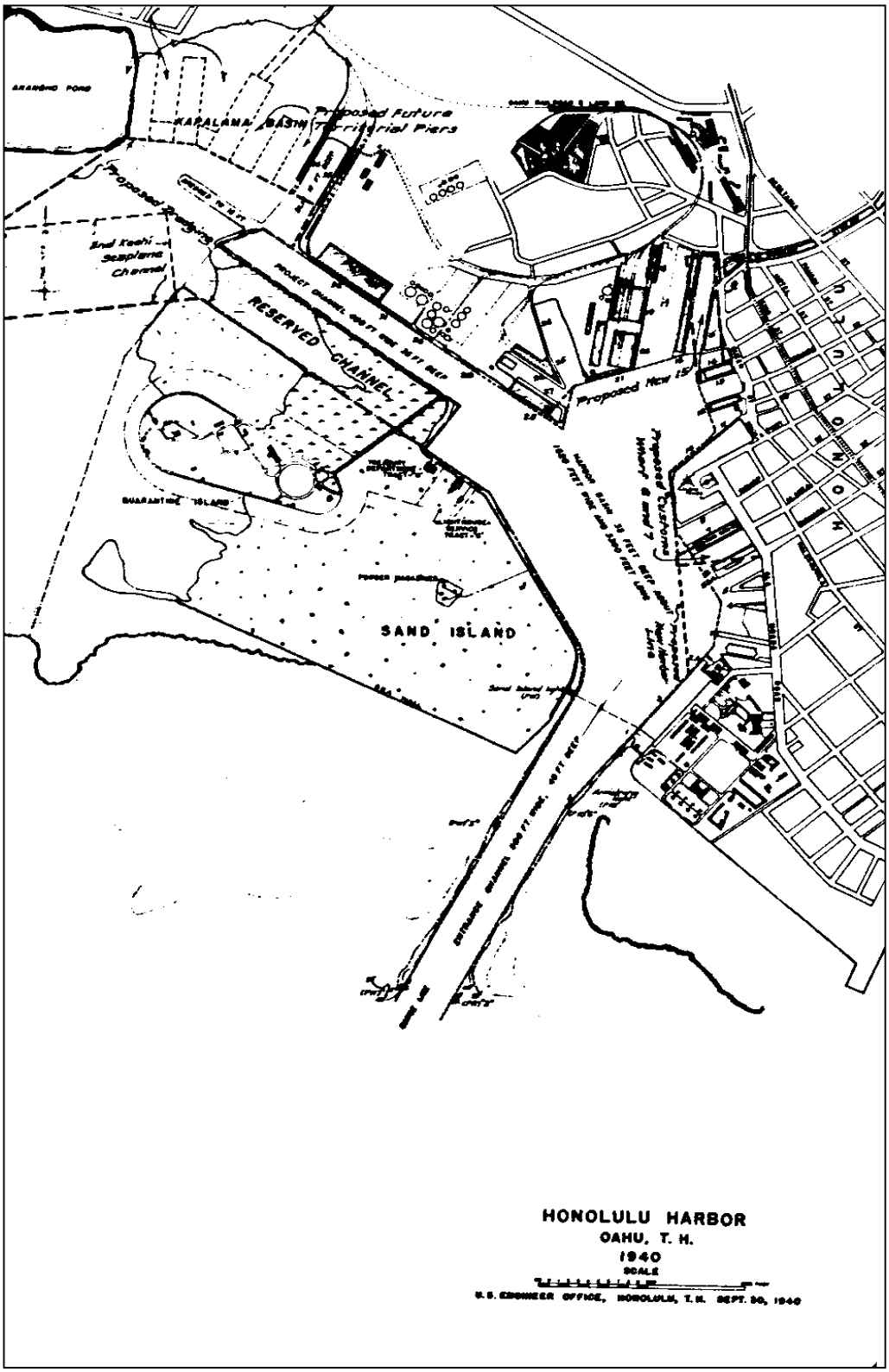


Figure 6. Map of Honolulu Harbor in 1940.

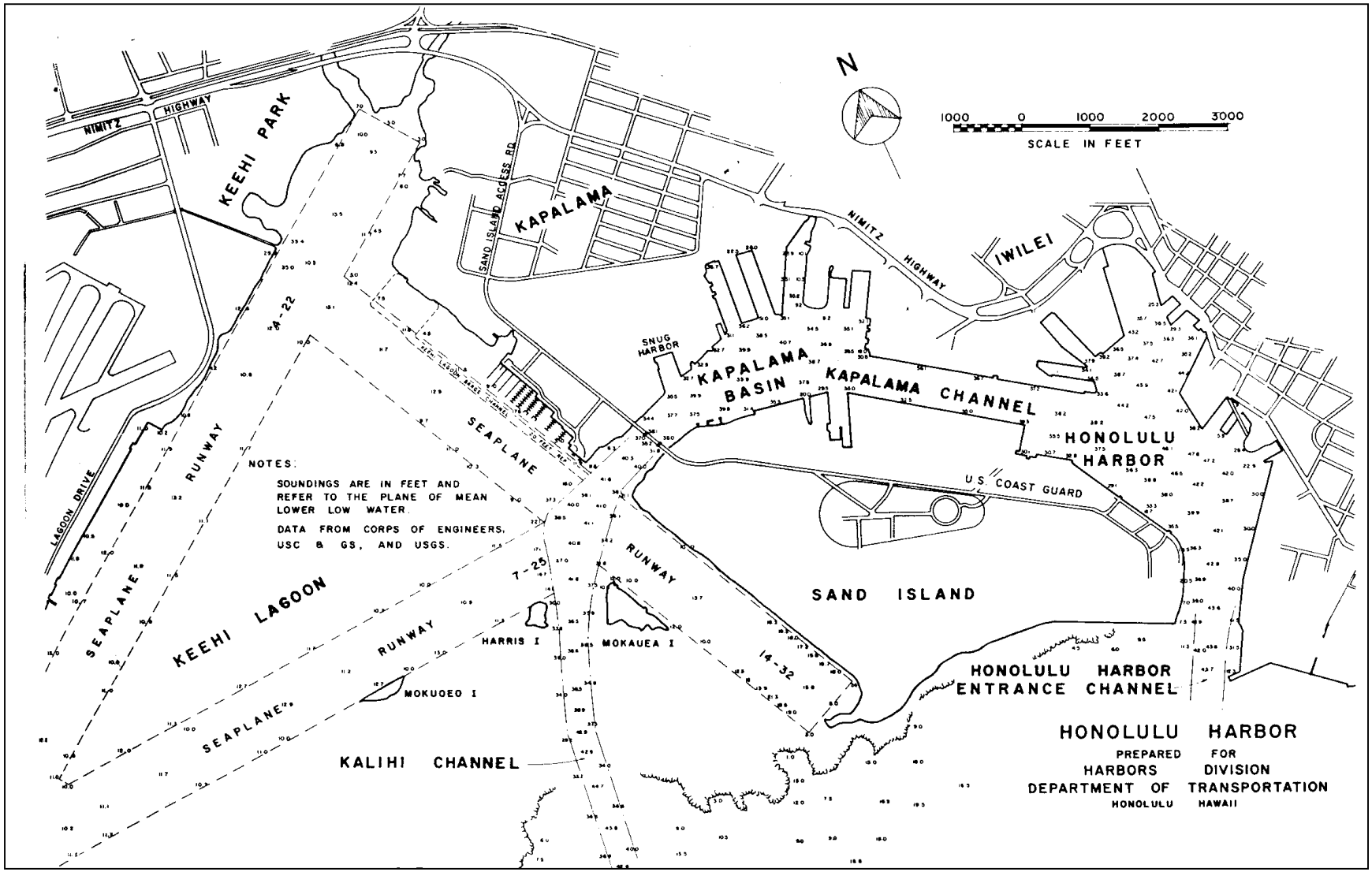


Figure 7. Honolulu Harbor and Keehi Lagoon in 1968.

in the 1920s. However, the main harbor activity during this period was the creation of a deep draft harbor at Barbers Point on Leeward Oahu in 1982-85. This harbor was constructed to divert large ship cargo, especially those carrying flammable or explosive cargo, away from the highly populated areas around Honolulu Harbor.

The most recent phase of development of Honolulu Harbor was the conversion in 1990-1993 of the Aloha Tower complex from its former use as Harbormasters offices to a shopping and visitor's center. This has included the moving of the historic four-masted *Falls of Clyde* museum ship to the Pier 7-8 basin, the opening of the Maritime Museum on Pier 7, and the placing of numerous restaurants and shops along the historic waterfront of the former Esplanade. The juxtaposition of such facilities adjacent to the docks and wharves of a working harbor has provided an interesting opportunity for visitors to view the vital role that Honolulu Harbor continues to play in the lives of Oahu residents.

B. Environmental Settings

1. Honolulu Harbor

Honolulu Harbor originally was a deep embayment formed by the outflow of Nuuanu Stream creating an opening in the shallow coral reef that lies along the south shore of Oahu. It was first described scientifically by Agassiz (1889) as "nothing but a channel kept open by the flow of the Nuuanu River, which…has killed the corals in its path, scouring at the same in freshets the whole harbor and the adjacent limestone forming the channel…. The river forming the Honolulu Harbor brings down a large amount of volcanic mud in its short course, and has deposited this in the harbor and channel, so that there appears to be nothing but dark volcanic mud for a considerable distance out towards the entrance to the channel, where the coral limestone reappears."

In its natural state the harbor consisted only of this river-formed main basin, which was only 6 m deep at its entrance. Its perimeter was enclosed by shallow reef and intertidal areas that were exposed at low tide. A small white sand beach extended along the eastern shoreline from the present Aloha Tower complex to the Pier 1 area. The reef extended across the present Kapalama Channel continuous with the area that is now Sand Island. Formerly this was a much smaller island (Immigration Island) surrounded by a large shallow reef flat (Figures 4 and 5).

Honolulu Harbor now consists of a main basin which has been substantially enlarged and deepened from the original natural embayment, Kapalama Channel, which was first dredged through the reef west of the main basin in 1915-20, and Kapalama Basin, first dredged to 10.6 m (35 ft) depth in 1941-45 (Figure 8). The harbor receives the runoff of two major fresh water sources, Nuuanu Stream at the head of the original harbor between Piers 15 and 16, and Kapalama Canal which empties into Kapalama Basin between Piers 38 and 39. The harbor originally had only one opening to the sea until the Kalihi Channel was completed in 1962, and the presence of this channel at the west end of the harbor has undoubtedly increased circulation and water quality. Limited salinity data (Oceanit 1990) suggests that surface salinities can be

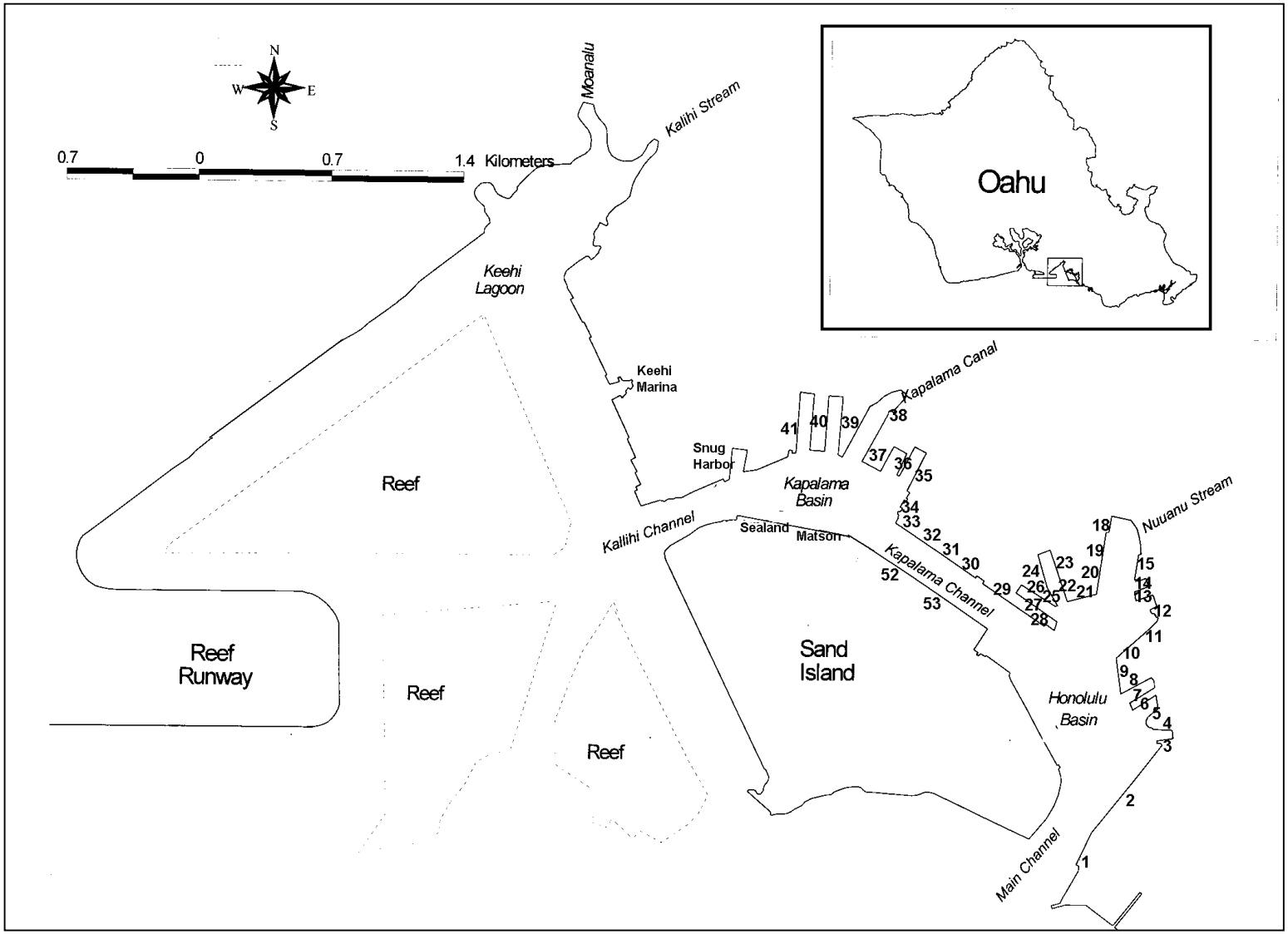


Figure 8. Current map of Honolulu Harbor and Keehi Lagoon showing Pier Locations.

reduced in the harbor by freshwate runoff by as much as one third, but subsurface salinities remain at an oceanic 35 ^{o}/oo. Overall average salinities in the harbor average 34 ^{o}/oo (Buske and McCain 1972).

The present harbor ranges in depth down to 13.5 m (45 ft), maintained by periodic dredging. Very little natural substrata remain in the harbor. Extensive modifications by dredging and filling have greatly enlarged the deeper areas of the harbor and reduced the reef flats that enclosed the original main basin. More than 50 piers compose most of the shoreline throughout the harbor, and the original entrance channel is lined and reinforced with large basalt boulders. Natural coral reef substratum occurs only in two places in the harbor, between Piers 29 and 30 on the landward side of Kapalama Channel and on both sides of Kalihi channel between Snug Harbor and the Bascule bridge. Elsewhere the benthic substratum above the silt or sand bottom is composed of concrete abutments or pilings supporting docks and piers, many of which jut out 10-25 m (33-82 ft) from the dredged shoreline. The bottom of most of the harbor is composed primarily of flocculent loose silt, which becomes finer as the mouths of Nuuanu Stream and Kapalama Canal are approached. However, with approach to the harbor entrance at Piers 1 and 2 the bottom sediments become fine, white calcareous sand, as described by Agassiz (1989) over a century ago.

Honolulu Harbor (Figure 8) remains the primary shipping port for commercial goods entering Honolulu or being trans-shipped to the neighbor islands, and port activity is dominated by container ships unloading at the Matson and Sealand Terminals at Pier 52 on Sand Island. Just eastward Pier 53 provides berthing for U.S. Coast Guard ships and a cable repair ship, and the University of Hawai'i berths its fleet of research vessels at Snug Harbor, near the Kalihi Channel entrance. Pier 2 is the foreign trade zone docking area, and cruise ships that transport thousand of passengers utilize Piers 10 and 11. Commercial fishing boats moor at Piers 16-18, and Piers 19-27 are berths for harbor and inter-island tugs. The Clean Islands Council oil spill emergency response vessels dock at Pier 35, Young Brothers interisland tugs and barges utilize Piers 38-40, and a floating dry dock is in place at Pier 41. Although wastes from the pineapple canneries were originally discharged into Kapalama Canal until the early 1970s, resulting some of the highest bacterial concentrations measured in the state waters at that time (Cox and Gordon 1970), the only significant industrial use of harbor water at the present time is for once-through cooling of the Hawaiian Electric Generating Station. This facility has, in the past, raised the temperature of up to 200,000 gpm cooling water 5-6°C circulating from its intake by Pier 7 to its discharge at Pier 5, but usage has decreased in recent decades as generation load has been shift to more efficient newer power stations.

2. Keehi Lagoon

Keehi Lagoon (Figure 8) was originally a large shallow reef and subtidal area no more than 1-2 m deep that extended more than two miles off the mouths of Kalihi and Moanalua Streams. Its present eastern boundary is formed by Kalihi Channel, which was originally a shallow channel across the reef through which the combined outflow of Kalihi and Moanalua Streams reached the sea. Much of the present land for Honolulu International Airport was originally reef, Keehi Lagoon shoreline, ponds or marshes.

Dredge and fill activities in the 1940s and the 1970s drastically altered Keehi Lagoon from its original state. A mooring basin and three seaplane runways two to three miles long by 30.3 m (100 ft) wide and 3 m (10 ft) deep were dredged in the lagoon in 1941-45 and the dredged material placed along the shore. Because these channels essentially trapped water that otherwise would have moved on and off shore with tidal exchange and wide movement, stagnant conditions and lowered water quality resulted, retaining pollutants in the deeper water in the runways.

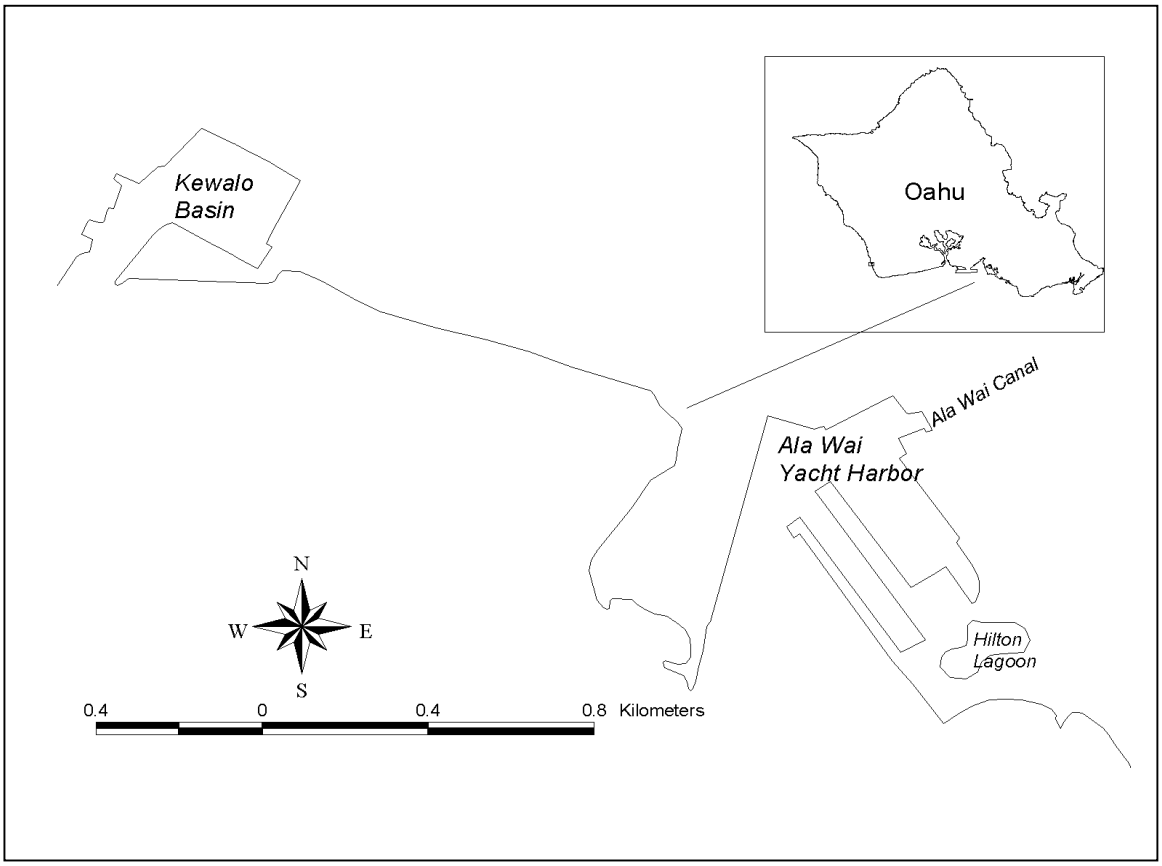
Further alteration of the lagoon resulted from the construction of the Honolulu International Airport Reef Runway, constructed in 1972-75. This effectively divided the lagoon into an eastern portion extending from the western end of the runway to the Kalihi channel entrance, and a western portion adjoining the Hickam small boat harbor. In the process of constructing the runway, some 1,240 acres of former reef and shallow flats were buried under 2.7 m (9 ft) of fill material. Also, to increase circulation and provide boat access, channels were dredged around the eastern end of the runway to the seaplane runways and to Hickam Harbor. Monitoring conducted prior to and following completion of the runway construction indicated a substantial improvement in water quality due to the increased circulation provided by these channels (Environmental Consultants 1977, 1979; OI Consultants 1986; Noda & Assoc. 1978; Chapman, 1979).

The eastern portion of Keehi Lagoon sampled in this study consists of a shallow reef flat enclosed by the three seaplane runways, the Kahili Entrance Channel to Honolulu Harbor and the access channel east of the reef runway that was dredged in 1971-75. The lagoon receives the combined drainage of Kalihi and Moanalua Streams on its north apex, which is completely lined with a dense growth of red mangrove (*Rhizophora mangle*). A series of small islands line the northeast-southwest directed seaplane runway and more are forming on the central reef flat where mangroves have begun to grow and accumulate sediments.

3. Kewalo Basin

Kewalo Basin (Figure 9) is located between Honolulu Harbor and Ala Moana Park on Oahu's south shoreline. It was dredged from coral reef along the shoreline in the 1920s to provide mooring for fishing boats away from the pollution of Nuuanu Stream entering Honolulu Harbor. The basin is approximately 242 m (800 ft) wide by 303 m (1000 ft) long and 6.1 m (20 ft) deep, with a 61 m (200 ft) wide entrance channel at its southwest side. The basin entrance is highly exposed to south swell waves, and popular surf sites exist both east ("Shark Hole") and west ("Point Panic") of the entrance. No freshwater streams or industrial discharges enter the basin, although at one time it did receive wastes from a tuna cannery that is no longer in operation. However, the bottom of the basin is highly littered with chunks of concrete, coral, bottles, tires and other debris that has been discarded from moored boats through the years.

A total of more than 120 berths accommodate boats of various sizes and uses in Kewalo Basin, including cruise, charter fishing and research vessels. The largest of these are commercial tour boats, which take on passengers daily at a dock on the basin's northwest side for trips to Waikiki, Honolulu Harbor and Pearl Harbor. Adjacent to this dock is Honolulu Marine ship repair. Other smaller commercial tour boats



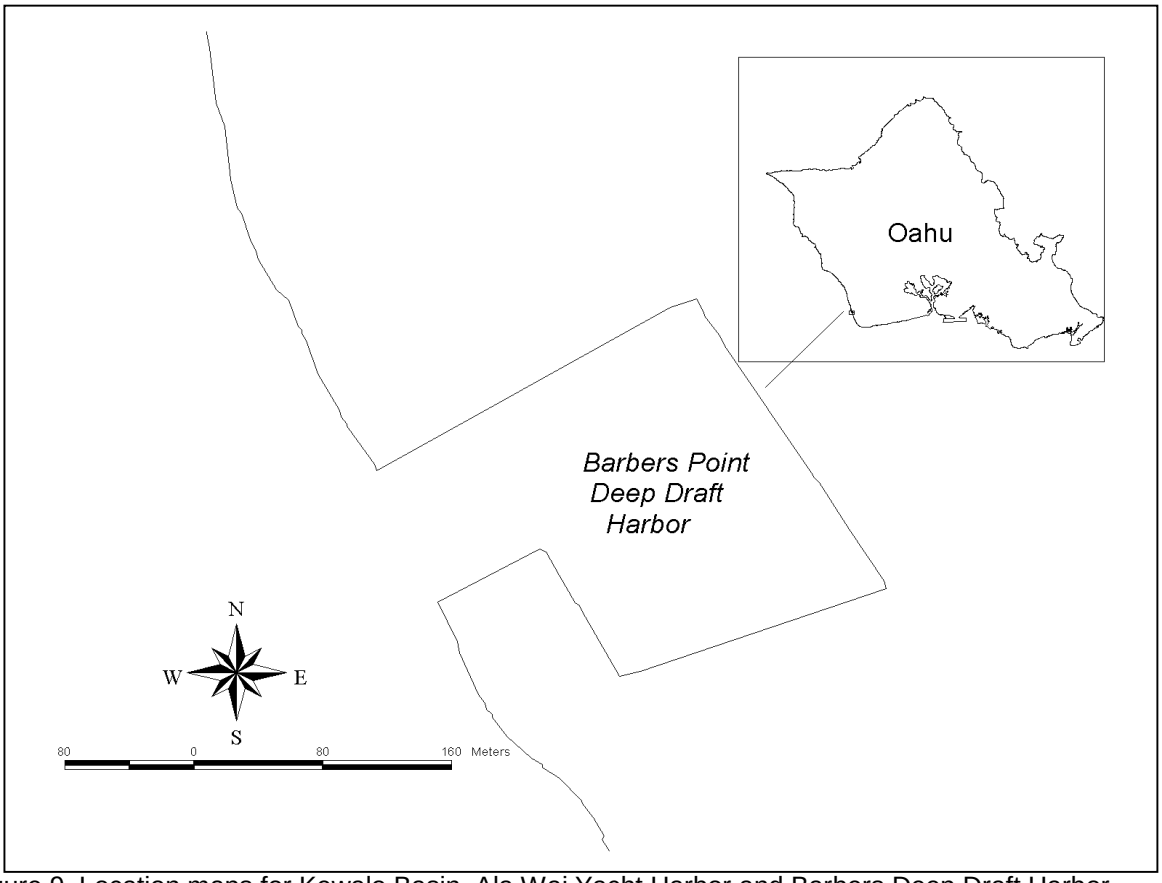


Figure 9. Location maps for Kewalo Basin, Ala Wai Yacht Harbor and Barbers Deep Draft Harbor

are berthed along the northeast (Ala Moana Boulevard) side of the basin. Two research facilities are located at Kewalo Basin, the University of Hawai'i Pacific Biological Research Center located along the west of the entrance, and the Kewalo Basin Marine Mammal Laboratory near the basin's southeast corner.

4. Ala Wai Yacht Harbor

The Ala Wai Yacht Harbor (Figure 9), located on the south shore of Oahu between Ala Moana Park and Waikiki Beach, was first constructed from a barge channel in the 1900s and has been periodically enlarged to where it presently provides more than 1000 berths for pleasure craft. It is surrounded by resort and commercial properties, the largest being the Ilikai and Prince Hotels. A small man-made salt-water pond ("Hilton Lagoon") adjacent to the harbor discharges into its southeast corner. Along with public berthing of power and sailing boats, the harbor accommodates two yacht clubs, the larger Waikiki Yacht Club located on the northeast side of the harbor, and the Honolulu Yacht Club located at the end of the central groin.

The Ala Wai Canal discharges into the northwest corner of the harbor near the Waikiki Yacht Club docks and is a source of reduced salinity and increased sedimentation, turbidity and pollution from canal runoff. The canal, which was dredged in 1921-1928, provides an outlet to the sea for Palolo and Manoa Streams, which formerly drained into the Waikiki marshes that were eliminated by construction of the canal. However, the discharge of the original canal did not empty into the Yacht Harbor but flowed into a channel dredged along the present Ala Moana shoreline and joined the Kewalo Basin entrance channel.

5. Barbers Point Deep Draft Harbor

Barbers Point Deep Draft Harbor (Figure 9) is the newest harbor on Oahu and is located near Oahu's industrial park at the southwest end of Oahu. It was dredged entirely from coral rock above the shoreline and receives no stream inflow. A smaller version of the harbor was enlarged in 1982-1985 to form its present configuration of about 121m (700 ft) by 182 m (600 ft) with an entrance channel 85 m (280 ft) wide. Design depth of the harbor is 13.6 m (45 ft) to accommodate the largest vessels arriving in Honolulu. The harbor is the Oahu offloading point for large bulk carriers and oil tankers, and one docking area along the south pier is used exclusively for offloading coal which is carried from the pier by a conveyor belt system for use in power generation. A large floating dry dock is moored along the harbors southwest pier, and a shallow channel on the northwest side connects the harbor with a private marina controlled by the Ko Olina resort area.

C. Previous Biological Studies

1. Honolulu Harbor

Despite its early discovery and the importance that it has played in Hawaii's history and economy since European contact, biological sampling has been sporadic in Honolulu Harbor and little was known about its marine biota prior to the present study. Only 205 records of marine invertebrates collected from

Honolulu harbor are listed in Bishop Museum's collection catalog, the earliest a being a decapod, *Saron marmoratus*, collected by W. A. Bryan in 1915. Other than 38 decapods collected by T. Dranga in the early 1920s, most of the collections were made Dr. C. H. Edmondson between 1940 and 1956.

The first systematic surveys of the biota of Honolulu Harbor were conducted by staff and contractors of the Environmental Department of the Hawaiian Electric Co. during the early 1970s (McCain and Peck 1972; McCain and Coles 1973; McCain et al. 1975; Environmental Consultants and Hawaiian Electric 1974). These studies were made in the area of Piers 5 to 7, in the vicinity of Hawaiian Electric's Honolulu Power Station intake and discharge, and focused on plankton, reef corals and fish. Later studies made in the 1990s in the same area (Brock 1991, 1992, 1993, 1994, 1995, 1997) have described benthic invertebrates and fish encountered on annual monitoring surveys in this area.

With the exception of a master's thesis conducted on the benthic community associated with the introduced octocoral *Carijoa (=Telesto) riisei* (Thomas 1979), all remaining biological information for marine organisms in Honolulu Harbor has been derived from project related environmental baseline or impact assessment surveys. These have been conducted in the vicinity of Sand island (U. S. Army Corps of Engineers 1978), the commercial fishing vessel berthing area at Pier 16 (AECOS 1982), Piers 12 to 15 (AECOS 1982), Pier 1 (AECOS 1988), and the waterfront at Aloha Tower (Oceanit 1990). All of these surveys were based on field observations with little or no laboratory analysis of sampled organisms, and therefore were likely to report only the most abundant and prominent of the organisms present.

2. Keehi Lagoon

All biological reports for Keehi Lagoon are from environmental baseline or impact assessment surveys, and most these are from studies associated with the construction of the Honolulu Airport Reef Runway. The earliest available biological information for the lagoon comes from a report by Harvey (1970), which listed an assortment of macroalgae and micromolluscs found in the sediments throughout the lagoon. An environmental impact assessment prepared in 1975 for disposal of solid waste bales in Keehi Lagoon (Parsons 1975) listed a number of invertebrates by their common name but did not identify them by genus or species. Post construction monitoring surveys for the reef runway (Environmental Consultants Inc. 1977, 1978, 1979) were more specific and provide information on the composition of the benthic and fish biota in the lagoon, along with a ten-year follow up survey conducted in 1988 (Guinther 1988). A brief survey in the mangrove areas at the mouths of Moanalua and Kalihi Steams (Environmental Consultants Inc. 1978) provided limited information about biota in this sector of the lagoon. Like past studies in Honolulu Harbor, the previous surveys in Keehi Lagoon were field studies and reported only the most obvious organisms.

3. Kewalo Basin, Ala Wai Yacht Harbor and Barbers Point Deep Draft Harbor.

Of the three reports available for Kewalo Basin (Appendix B) only one (Harbors Division 1984) mentions biological conditions, stating that no coral was found in the basin channel and that the bottom in the basin ranged from soft silt and clay sediments to coarse shells, sand and coral blocks. Because of extensive environmental studies conducted in the 1970s (Gonzalez 1971; Shultz 1971; Harris 1972; Luoma 1974;

Miller 1975) and the 1990s (Laws et al. 1993; Beach et al. 1995; Glenn and McMurtry 1995;Glenn et al 1995; McMurtry et al. 1995; Raine et al. 1995; Resig et al. 1995; Spencer et al. 1995) much more information is available for the Ala Wai Canal, but these studies were concerned with conditions above the Ala Moan Boulevard bridge, and no information has existed for the biota in the Yacht Harbor itself. The only reference to biological conditions in the harbor is a brief mention of fishes, using popular names, as part of a 1974 draft environmental statement for harbor expansion (Department of the Army 1974).

Extensive biological surveys have been conducted on the reef areas off the entrance of the Barbers Point Deep Draft Harbor (Environmental Consultants 1975; Bienfang and Brock 1980; OI Consultants 1990). However, the only information related to biological conditions inside the harbor can be derived form two stations located in the small barge harbor that was expanded in 1978-1980 to the present deep draft harbor (Environmental Consultants 1975).

III. METHODS

A. Literature Search

A variety of sources of information on the environmental conditions and biological communities of the harbors on the south shore of Oahu were examined. Literature consulted included published papers in the open scientific literature, taxonomy-based monographs and books, unpublished reports for environmental studies in the harbors, and newspaper and magazine articles that were concerned with the development or environmental and biological communities of the harbors. Resources that were consulted in this search were the libraries of Bishop Museum, the University of Hawaii, and the Pacific Maritime Center. Environmental reports and Environmental Impact Statements and Assessments were reviewed from the University of Hawai'i Environmental Center, the Hawaiian Electric Co. Environmental Department and AECOS Inc. An annotated bibliography of all the literature assembled is presented in Appendix B.

B. Bernice P. Bishop Museum Collections

Bishop Museum collections databases for algae, invertebrates, malacology and ichthyology were reviewed for all marine or estuarine organisms indicated to have been collected in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, the Ala Wai Yacht Harbor or the Barbers Point Deep Draft Harbor. The retrieved data were assembled into a combined database for Oahu south shore harbors (other than Pearl Harbor) containing taxa identity, taxonomic authority, collection location and date, collector and collectors notes, when available. This information is included with the general listing of all taxa for the study developed from all sources and presented in Appendix C.

C. Field Surveys

Benthic fouling and sediment biota were sampled and observations of fishes were made at 15 stations in Honolulu Harbor and five stations in Keehi Lagoon in 1997, and four stations in Kewalo Basin, five stations in Ala Wai Yacht Harbor and three stations in Barber's Point Deep Draft Harbor in 1998. Station locations, coordinates and dates of sampling are given in Table 1, and station locations are shown in Figures 10-12.

Table 1. Station locations and sampling dates for Oahu south and west shore harbors. Longitude and latitude coodinates are in WGS84 datum.

			Latitude			Longitude			Sampling Date	
Station	Harbor	Location	Deg.	Min.	Sec.	Deg.	Min.	Sec.	Fouling	Sediments
1	Honolulu	Pier 3-4 Coast Guard Landing	21	18	13.6	157	51	49.8	20-Aug-97	13-Nov-97
2	Honolulu	Pier 5-6 HECO Discharge Basin		18	18.1		51	52.4	20-Aug-97	13-Nov-97
3	Honolulu	Pier 7-8 HECO Intake Basin		18	21.6		51	53.9	26-Aug-97	13-Nov-97
4	Honolulu	Pier 11		18	32.9		51	52.2	26-Aug-97	13-Nov-97
5	Honolulu	Pier 13-14 Basin		18	38.9		51	54.4	16-Sep-97	13-Nov-97
6	Honolulu	Pier 20		18	38.2		52	2.0	16-Sep-97	13-Nov-97
7	Honolulu	Pier 27		18	33.2		52	10.6	23-Sep-97	13-Nov-97
8	Honolulu	Pier 29		18	39.4		52	24.3	23-Sep-97	13-Nov-97
9	Honolulu	Pier 36		19	0.4		52	37.2	15-Oct-97	13-Nov-97
10	Honolulu	Pier 39		19	0.5		52	50.4	9-Oct-97	13-Nov-97
11	Honolulu	Pier 41 Dry Dock		19	2.4		52	5707	9-Oct-97	13-Nov-97
12	Honolulu	Snug Harbor		18	55.5		53	12.3	9-Oct-97	13-Nov-97
13	Honolulu	Sand Island Coast Guard Station		18	24.7		52	19.5	15-Oct-97	13-Nov-97
14	Honolulu	Sand Island Park		18	8.0		52	9.4	5-Nov-97	13-Nov-97
15	Honolulu	Sea Land Dock		18	50.7		53	9.5	5-Nov-97	13-Nov-97
16	Kalihi Channel	Wreck		17	58.6		54	2.2	11-Dec-97	13-Nov-97
17	Keehi Lagoon	Airport Rescue Dock		18	42.2		55	9.3	11-Dec-97	13-Nov-97
18	Keehi Lagoon	Floating Docks		19	11.0		53	39.8	17-Dec-97	13-Nov-97
19	Keehi Lagoon	Barge Wreck		19.	5.2		54	26.8	17-Dec-97	13-Nov-97
20	Keehi Lagoon	Moanalua-Kalihi Stream Mouths		19	54.6		53	35.2	17-Dec-97	13-Nov-97
21	Kewalo Basin	Honolulu Marine Pier		17	36.4		51	30.1	8-Jul-98	16-Jul-98
22	Kewalo Basin	Marine Mammal Lab.		17	29.5		51	56.9	8-Jul-98	16-Jul-98
23	Kewalo Basin	Fishermans Wharf		17	38.9		51	26.6	16-Jul-98	16-Jul-98
24	Kewalo Basin	McWaynes		17	34.7		51	19.5	16-Jul-98	16-Jul-98
25	Ala Wai	Ala Moana Bridge		17	15.6		50	26.8	23-Jul-98	23-Jul-98
26	Ala Wai	Waikiki Yacht Club		17	16.3		50	30.8	23-Jul-98	23-Jul-98
27	Ala Wai	Hobron Lane		17	6.5		50	26.8	23-Jul-98	23-Jul-98
28	Ala Wai	Fuel Dock		17	5.6		50	36.8	30-Jul-98	30-Jul-98
29	Ala Wai	Hilton Lagoon Discharge Pipe		16	58.2		50	27.4	30-Jul-98	30-Jul-98
30	Barbers Point	Coal Pier		19	18.5	158	7	11.2	6-Aug-98	6-Aug-98
31	Barbers Point	Floating Drydock		19	18.9		7	14.9	6-Aug-98	6-Aug-98
32	Barbers Point	Barge Pier		19	19.8		7	16.7	6-Aug-98	6-Aug-98

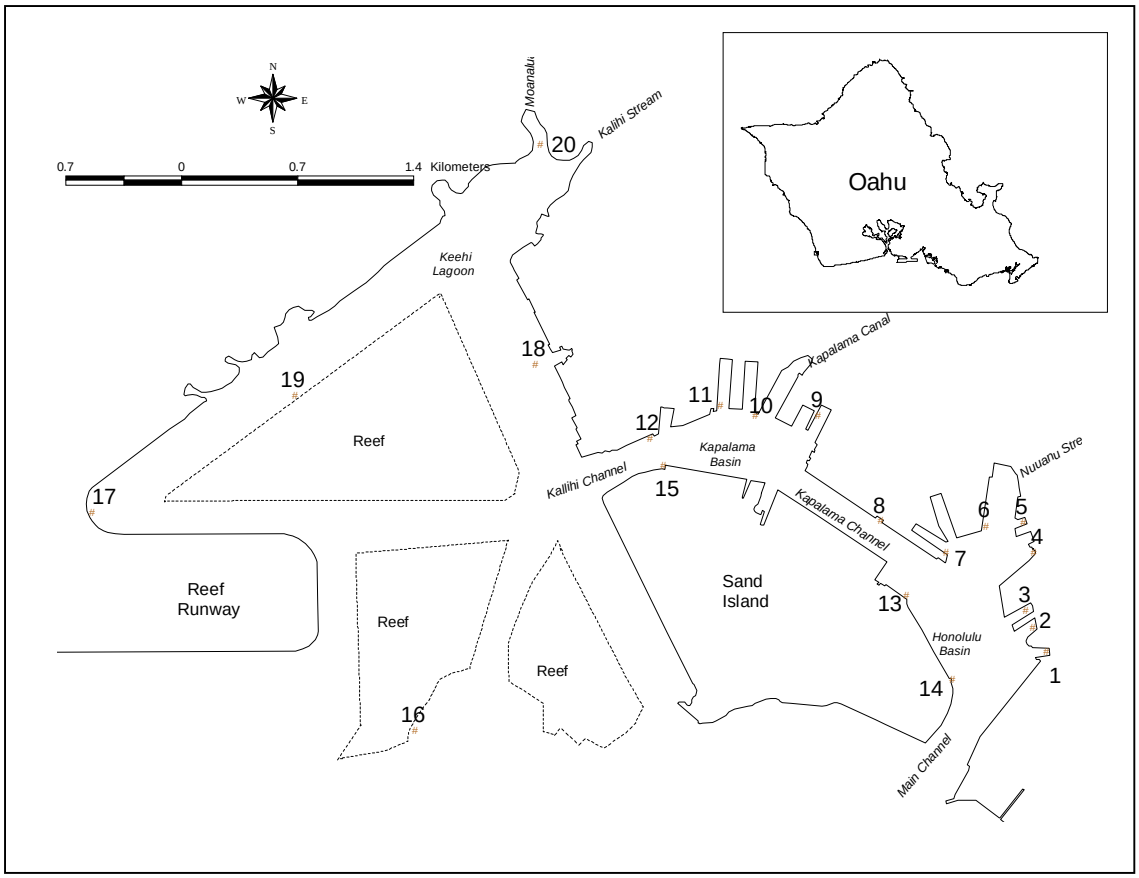


Figure 10. Locations of sampling stations in Honolulu Harbor and Keehi Lagoon.

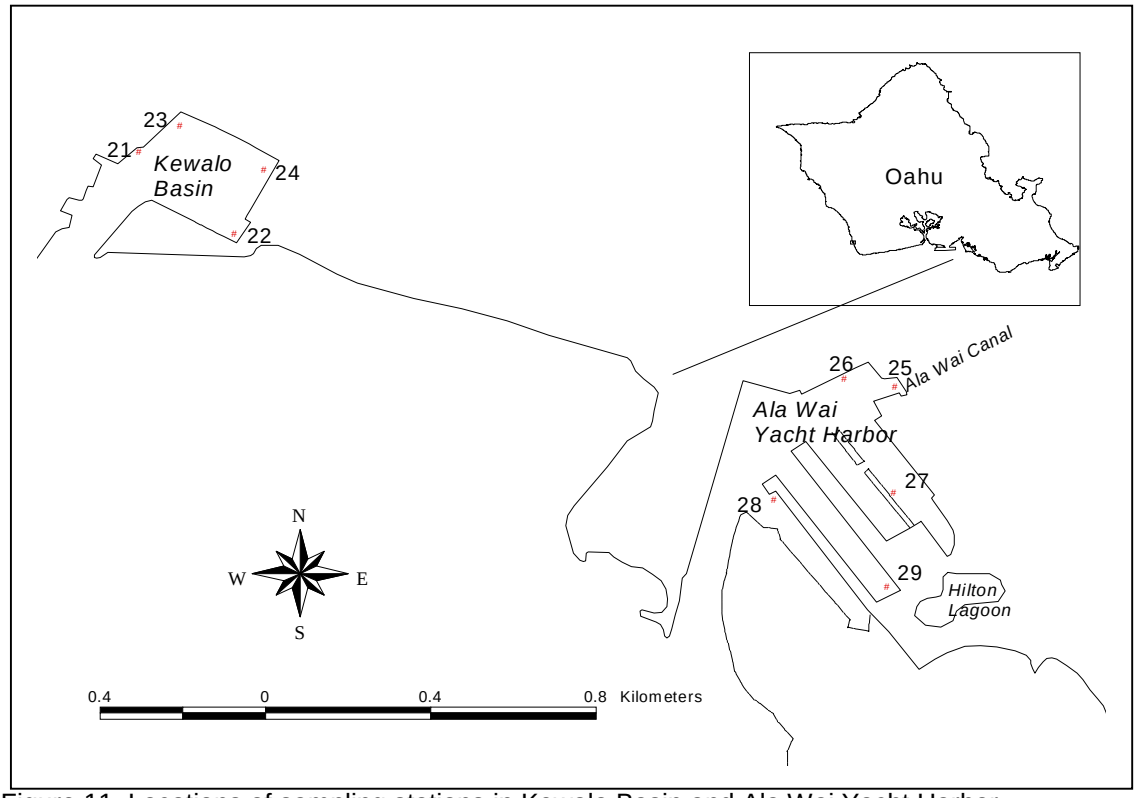


Figure 11. Locations of sampling stations in Kewalo Basin and Ala Wai Yacht Harbor.

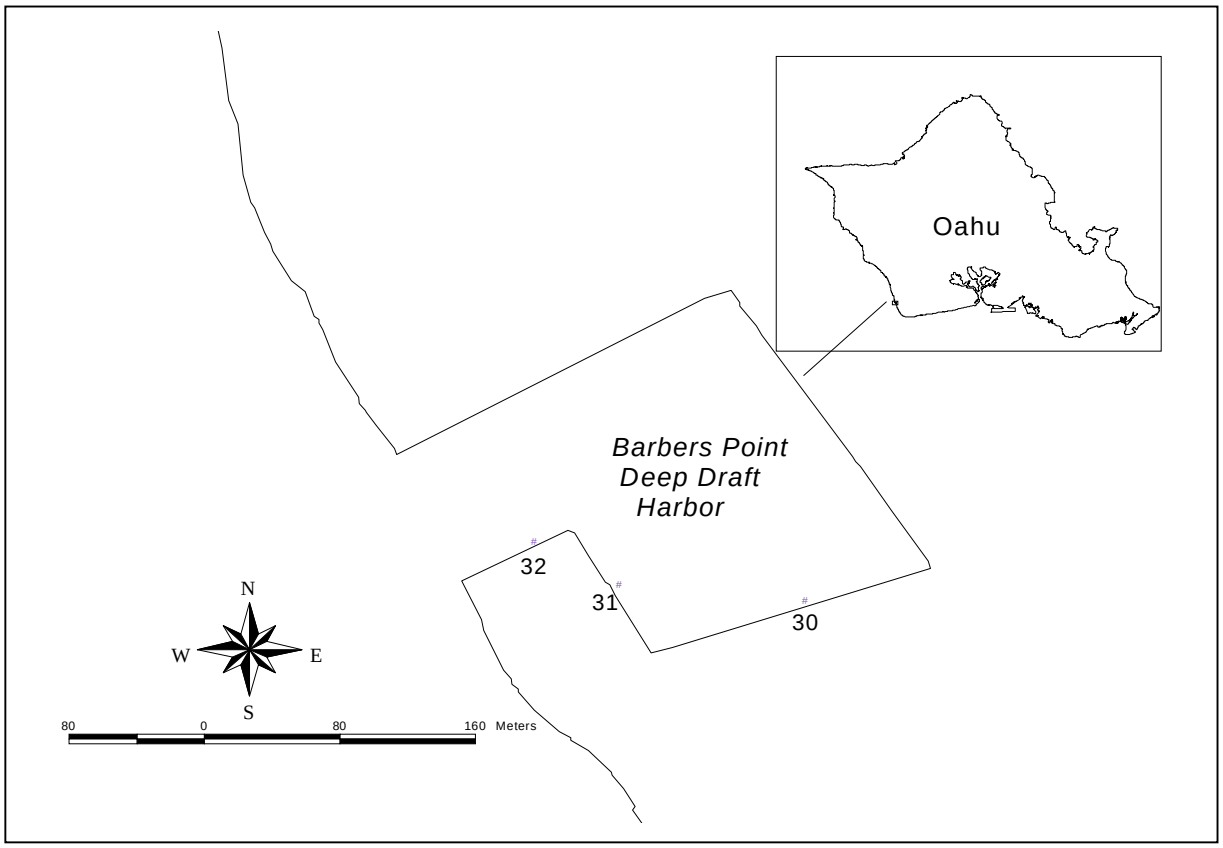


Figure 12. Locations of sampling stations at Barber's Point Deep Draft Harbor.

The sampling and analysis process is summarized in Figure 13. Collections and observations were made by two experienced investigators sampling as large a variety of habitats as possible at each station while snorkeling or using Scuba. One diver sampled fouling organisms growing on hard surfaces from the intertidal zone to the bottom by scraping three samples of approximately 0.1 m^2 each. The other diver observed fishes swimming in the area, recorded their identities and also noted the presence of abundant invertebrate megafauna and macroalgae. Collected organisms, which range 4-8 liters in total volume for each station were inspected on site and selected hydroids and tunicates were removed to be relaxed in a solution of Epsom salts and seawater before preserving in 5% formalin. The remaining organisms were preserved on site in 70% alcohol before returning the samples to the laboratory for sorting and identification of organisms.

Sediment-dwelling organisms and their substratum were collected by inserting a 12.5 cm diameter cylinder 15 cm into the sediment, closing off the bottom and top with lids and then transporting the sample to the laboratory where it was sieved through a 0.5 mm mesh size screen. A subsample of 10 to 25 cm^3 was retained from each sample for determination of micromollusc populations.

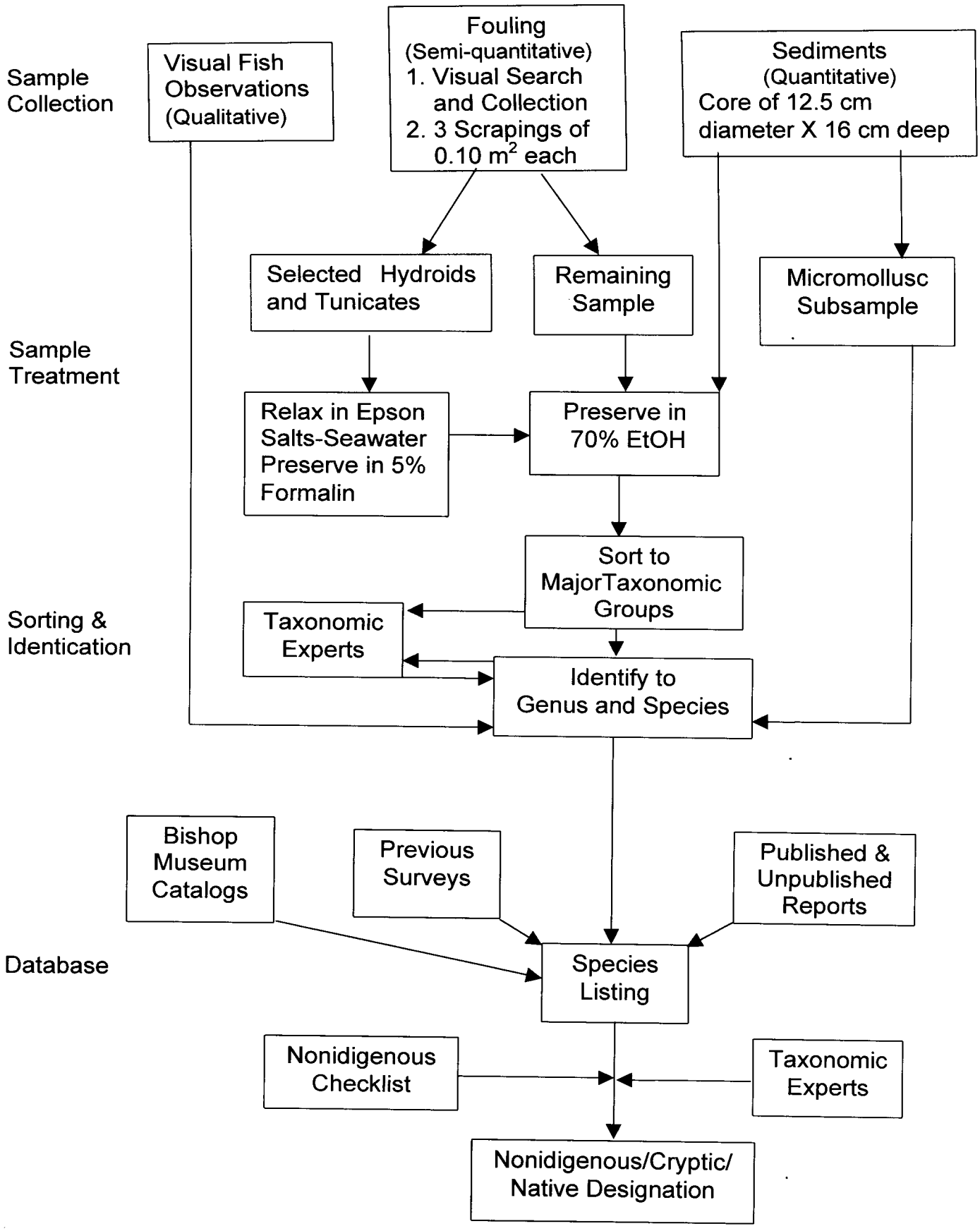


Figure 13. Summary of field and laboratory methods.

Specimens collected were sorted and identified to species or the lowest practicable taxa, using dissecting or compound microscope magnification when necessary. Identifications were made using descriptions available in Reef and Shore Fauna of Hawai'i Sections 1 to 4 (published), 5 and 6 (unpublished), various taxonomic references, and voucher specimens in the Bishop Museum collections. Specimens from various groups were sent to taxonomic experts for verification of preliminary identifications (see Acknowledgments).

D. Data Analysis

All organisms identified from the field study were entered on an Access database relational with the databases for previous literature reports and museum collections of organisms from Pearl Harbor. The combined information was used to track the occurrence of species chronologically as they were reported from Pearl Harbor.

The Sorenson's Index of percent similarity, based on presence-absence of species at station pairs, was used to measure the degree of association between stations. By this index, the more species two stations share relative to their total species complements, the greater their ecological similarity. Based on a matrix of Sorensen Index values, cluster analysis was used to arrange stations into groups or clusters. Intercluster distances were calculated using an unweighted pair group average method. In this analysis, similar stations will form clusters distinct from other stations. These clusters are arranged in a hierarchical, treelike structure called a dendrogram (see Figures 14 and 15). Calculation of the similarity measures and cluster analysis were performed using the Multi-Variate Statistical Package, ver. 3.1 (Kovach 1993).

IV. RESULTS

A. Station Locations and Descriptions

Locations of station sampled are shown in Figures 10-12, and details for sampling dates and coordinates in Latitude-Longitude (WGS84 Datum) are given in Table 1.

Station 1. (Latitude 21° 18' 13.6"N, Longitude 157° 51' 49.8"W)
Concrete pier walls and pilings and basin bottom along Pier 3, Ala Moana Boulevard and Pier 4 used as a landing for Coast Guard shuttle boats. Walls and pilings support abundant red algae *Galaxaura acuminata,* a few corals and some bryozoans, primarily *Schizoporella* sp. A. The bottom depth along the walls is about 3 m, deepening in the center of the basin to 10 m (33 ft) maximum, with numerous trash such as tires, pipes sheet plastic and bottles along the piers. Going deeper, the bottom is coarse white sand, coral rubble and pebbles, with some hard coral substratum from the middle to the end of Pier 4.

Station 2. (Latitude 21° 18' 18.1"N, Longitude 157° 51' 52.4"W)
This area is a rectangular basin about 40 m (132 ft) x 100 m (330 ft) between Piers 5 and 6, which receives the thermal discharge from the Hawaiian Electric Honolulu Generating Station. The perimeters of the basin are concrete walls about 3 m deep constructed on top of fringing reef that has been dredged to about 10 m (33 ft) depth. The wall along Pier 5 that is directly in the path of the thermal discharge has abundant oysters and limpets, and many fish were observed in the discharge plume which increases turbidity in this part of the discharge basin. Reef corals are very abundant along the Ala Moana Boulevard wall, where occurs a large colony of *Pocillopora eydouxi* with a diameter of ca. 1 m, the largest of this species that has been reported in Hawaii. The west side of the basin is a dock which juts out from Pier 6 and is supported by concrete pilings, and addition hard surface is formed by two concrete abutments in the middle of the basin which formerly support a parking lot road. These abutments formerly supported an abundant growth (Thomas 1979) of the introduced octocoral *Carijoa (=Telesto) riisei*, but only a few colonies were found at the time of our survey. The bottom of the basin is primarily soft silt and fine sand ranging down to 10 m (33 ft) except along the sides in depths of 4-6 m (13-20 ft) where pieces of coral rubble range up to boulder size.

Station 3. (Latitude 21° 18' 21.6"N, Longitude 157° 51' 53.9"W)
This basin is the location of the intake for the Hawaiian Electric power station cooling water along the Ala Moana Boulevard wall, where a concrete wall extends to 2.5 m (8 ft) depth to the top of the dredged reef. Reef corals are abundant along this wall, similar to the Ala Moana side of Station 2. The east side of the basin at Pier 7 and the west side at Pier 8 are wooden piers supported by concrete pilings which were been constructed with the development of the Hawai'i Maritime Center Museum and the Aloha Tower Market Place within the last ten years. Pier 7, which is also the mooring place for the museum ship *Falls of Clyde*, was formerly a parking lot with concrete walls that supported abundant corals (McCain and Coles 1973; McCain et al 1975), but corals are now scare because of the deck's shading of the pier walls. The pillars now have

an abundant fouling community of suspension feeders. Also, the iron hull of the *Falls of Clyde*, which is moored at Pier 7, provides additional surface for benthic organisms and was the only location in Honolulu Harbor where the pearl oyster *Pinctada margaretifera* was found. The depth of the basin away from the walls is about 10 m (33 ft) and is composed of loose fine silt with intermittent coral rubble and a fine coating of algae.

Station 4. (Latitude 21° 18' 32.9"N, Longitude 157° 51' 52.2"W)
This site is the basin located between Pier 11 and the former Pier 12, which was the location of the first pier that was made in Honolulu Harbor in 1825 by sinking a ship's hull at the foot of Nuuanu Avenue and building a dock around the hull (Rush 1957). When the Honolulu Fort was torn down in 1857 and its materials were used in filling the nearshore reef and subtidal area which make up the present Aloha Tower area, formerly known as the Esplanade (Anon. 1936; Judd 1975). Pier 12 was built in 1907 (Wilson, Okamoto & Assoc. 1968) and is no longer present, but a small area used for docking small boats exists at the former Pier 12 site. The perimeter of this area is made of cut coral blocks, stated in Oceanit (1990) to be taken from the Honolulu Fort, but this is unverified. The blocks extend down to about 6 m (20 ft) depth in a mixed silt-rubble bottom which has abundant trash such as wire, old appliances and fishing lines. Despite generally poor water clarity in this area, live reef corals are abundant along the pier, especially *Porites lobata* and *Montipora capitata* (=*verrucosa*) at the edge of the dredged reef. The zoanthid *Zoanthus pacificus* and the coral *Pocillopora damicornis* are also abundant on the coral blocks right up to the pilings which support Nimitz Highway. These pilings stand in front storm drainage culverts and have a rich coverage of oysters, bryozoans, hydrozoans and a few corals. The Pier 11 side of the basin is a pier that extends about 10 m (33 ft) from the shore and is supported by concrete pilings that have an abundant fouling community. Depth in the basin ranges up to 10 m (33 ft), with a bottom of soft muddy sediments and abundant trash.

Station 5. (Latitude 21° 18' 38.9"N, Longitude 157° 51' 54.4"W)
Located along Pier 14, this site is one of the two closest to the mouth of Nuuanu Stream and its freshwater runoff. The pier extends 10 m (33 ft) from the shore and is supported on pilings that have an abundant coverage of fouling organisms such as fanworms, tunicates and the coral *Montipora capitata* (=*verrucosa*). The depth along the pier is 8 m (26 ft), with a bottom of fine muddy sediments

Station 6. (Latitude 21° 18' 38.2"N, Longitude 157° 52' 2.2"W)
This site is at Pier 20, which is the docking area for numerous harbor and interisland tugs, and is just outside of the mooring areas for commercial fishing vessels at Piers 16-18. It is also the area most directly exposed to runoff from Nuuanu Stream which discharges into the harbor about 91 m (300 ft) northeast of the site. The dock is supported by concrete piers extending up to 10 m (33 ft) out from the shoreline in dredged coral substratum, and depths along the shore and outside the dock range 2-10.5 m (6.6-35 ft). Fouling is abundant on the dock pilings and the fine sediments are composed mostly of terrigenous material.

Station 7. (Latitude 21° 18' 33.2"N, Longitude 157° 52' 10.6"W)
This station lies at the end of Pier 27, which is the approximate location of the northwest edge of the original Honolulu Harbor that existed before the Honolulu Basin was enlarged and the Kapalama Channel dredged in the early part of this century. All characteristics of this site are otherwise similar to those at Station 6.

Station 8. (Latitude 21° 18' 39.4"N, Longitude 157° 52' 24.3"W)
This site lies between Piers 29 and 30 along the Kapalama channel, and it represents a relatively natural environment compared to other areas this far into the harbor. Although the area was formed from dredging the channel through a former reef flat, it has the appearance of reef slope outside of a narrow fringing reef which extends about 5 m (16.5 ft) from the shoreline. Although this 1-2 m flat area is quite barren, the slope outside the reef has a variety of coral species with moderate coverage and numerous fishes, which are probably attracted to the rugose habitat provided by the numerous small holes and ledges on the slope. The reef extends to nearly 10 m (33 ft) depth where the bottom levels off to a fine silt substratum. Just southeast of this site at Pier 29, the concrete pilings of the pier and the reef substratum below have heavy fouling and abundant sponges with a heavy coating of silt.

Station 9. (Latitude 21° 19' 0.4"N, Longitude 157° 52' 37.2"W)
This site is in the most interior section of the harbor at Pier 36, across from the mooring area where the Clean Island Council docks its vessels used for rapid oil spill response. Pier 39 itself is used for docking large fishing boats. The area is at the end of a basin that has been dredged from fossil reef and is quite isolated from the more open parts of the harbor, suggesting relatively stagnant conditions. The pier supports of concrete pilings extend to 8.5 m (28 ft) depth along Pier 39 to a shallow area at the head of the basin about 1 m 3.3 ft) deep. The pilings are heavily fouled with suspension feeders, while the algae *Acanthophora spicifera* and *Galaxaura acuminata* are abundant in the shallows. A school of tilapia (*Oreochromis mossambicus*) was observed along the Nimitz Highway end of the basin, the only place this fish was observed to be abundant in the harbor.

Station 10. (Latitude 21° 19' 0.5"N, Longitude 157° 52' 50.4"W)
Located at the end of Pier 39, where the pier is a grooved concrete wall extending down 9 m (30 ft) to a deep soft silt bottom. Fouling on the pier wall was relatively sparse, and surfaces were heavily sedimented, probably from runoff from Kapalama Canal, which reaches the harbor at the head of this basin about 400 m (1320 ft) landward of this site. The bottom depth is about 9.5 m (31 ft) with a substratum of fine muddy silt.

Station 11. (Latitude 21° 19' 2.4"N, Longitude 157° 52' 57.7"W)
Sampling for this station was done from the surface of the main dry-dock operating in Honolulu Harbor, located at the end of Pier 41. The dry-dock is on jack-up legs standing in 11 m (36 ft) of water on a fine sediment bottom. The dry-dock is heavily fouled with tunicates and hydrozoans.

Station 12. (Latitude 21° 18' 55.5"N, Longitude 157° 53' 12.3"W)
This site is just outside of the Snug Harbor mooring area for ships operated by the University of Hawaii. The water at the site is shallow, ranging 2-5 m (6.6-16.5) and the shoreline has a row of wooden piers that are the main hard surface at the site. The sediment has a greater component of calcareous material than occurs further into the harbor, but biotic coverage on the available surface is relatively sparse.

Station 13. (Latitude 21° 18' 24.7"N, Longitude 157° 52' 19.5"W)
Located at the east end of the Coast Guard Station Docking area. Concrete pilings extend to 9.5 m (31 ft) depth in a turbid area with numerous coils of cable, tires, rope and other trash next to the dock. Fouling was moderate, with virtually no corals and few fish present.

Station 14. (Latitude 21° 18' 8.0"N, Longitude 157° 52' 9.4"W)
Located at the border of Anuenue Fisheries Center and Sand Island Park near the beginning of the harbor entrance channel. Substratum is a steep slope dredge from the reef and small boulders from 1-2 m (3.3-6.6 ft) to the fine sediment harbor bottom at 9 m depth. Corals and associated invertebrates were moderately abundant and a variety of fish species were present.

Station 15. (Latitude 21° 18' 50.7"N, Longitude 157° 53' 9.5"W)
Located west of the Sea Land Pier and adjacent to the entrance of the Kalihi entrance channel. Substratum is a rock seawall made of large basalt boulders on top of the reef, which has been dredged to 11 m (36 ft) depth. Boulder and trash are abundant on the silt bottom. Corals were common and reef fish were abundant.

Station 16. (Latitude 21° 17' 58.6"N, Longitude 157° 54' 2.2"W)
This site is the most exposed to open ocean conditions of any in the study, being located on a reef along the west side of the Kalihi Channel, approximately 1.75 km the entrance, in 2-3 m (6.6-10 ft) depth. The substratum is consolidated reef with numerous sand channels and large pieces of the iron hull of a wrecked boat or barge. Abundant filamentous algae and macroalgae dominate the benthos.

Station 17. (Latitude 21° 18' 42.2"N, Longitude 157° 55' 9.3"W)
The site is the docking area for the Department of Transportation Fire Rescue boat hanger located at the Reef Runway end of the seaplane runway that runs along Lagoon Drive. This dock was constructed as part of the completion of the Reef Runway in 1972-1975 and therefore can be utilized as a dated surface no more than 25 years old. The site's surfaces are concrete pilings in 3 m (10 ft) of water which have an abundant fouling community, and the bottom substratum is primarily medium to fine grained calcareous sediments.

Station 18. (Latitude 21° 19' 11.0"N, Longitude 157° 53' 39.8"W)
Keehi Lagoon Marina floating docks located midway between Honolulu Harbor's Kalihi Channel and mouths of Kalihi and Moanalua Streams. The dock surfaces are very heavily fouled and are anchored in 3 m (10 ft) of turbid water over a muddy sediment bottom.

Station 19. (Latitude 21° 19' 5.2"N, Longitude 157° 54' 26.8"W)
Located midway along the reef side of the Lagoon Drive seaplane runway, the site was an iron barge hull stranded on the reef edge. The barge has since been removed. Depth on the runway side of the barge was 4.5 m (15 ft) and decreased to 1 m (3.3 ft) on the reef side of the barge. The hull had only moderate fouling with a heavy sediment coating, and the bottom substratum was fine sand to silt.

Station 20. (Latitude 21° 19' 54.6"N, Longitude 157° 53' 35.2"W)
The site was at the mouth of Moanalua Stream where abundant red mangrove (*Rhizophora mangle*) roots provide the only solid substratum in the muddy bottom. Samples were taken from the roots at 0-0.5 m (0-1.7 ft) depth.

Station 21. (Latitude 21° 17' 36.4"N, Longitude 157° 51' 30.1"W)
Located in Kewalo Basin, along Honolulu Marine Dock on north side of the basin just inside the entrance. Along with vessel repair activities conducted by Honolulu Marine this area is used for docking tourist ferries that conduct daily tours of Waikiki, Honolulu Harbor and Pearl Harbor. Depths along the dock range down to 6 m, and the fouling community on hard surfaces is dominated by macroalgae. The fine sand bottom has a great deal of litter and trash, especially old tires.

Station 22. (Latitude 21° 17' 29.5"N, Longitude 157° 51' 56.9"W)
This is the docking area for small boats at the southwest corner of Kewalo Basin, across the road from the offices and training pools of the Hawai'i Marine Mammal Center. The area is shallow, ranging down to only 3 m (20 ft), and both the hard surfaces on the docks and the sandy bottom are dominated by a heavy growth of the algal-like bryozoan *Zoobotryon verticillatum*.

Station 23. (Latitude 21° 17' 38.9"N, Longitude 157° 51' 26.6"W)
Docking area for large fishing boats along Fisherman's Wharf at the northwest corner of Kewalo basin. The docks extend about 10 m (33 ft) from the share on cement piers that extend down to a maximum of 4 m (13 ft) over a mixed sand/silt/shell bottom. The area can receive storm water runoff from drainage culverts located along Ala Moana Boulevard, which runs along the north side of Kewalo Basin.

Station 24. (Latitude 21° 17' 34.7"N, Longitude 157° 51' 19.5"W)
Small boat docks near site of former McWaynes Marine Center at the northeast corner of Kewalo Basin. Sampling site was a concrete wall along the shoreline extending down to 3 m (10 ft) and a fine sand-shell bottom.

Station 25. (Latitude 21° 17' 15.6"N, Longitude 157° 50' 26.8"W)
Ala Wai Canal Bridge where the canal empties into the Ala Wai Yacht Harbor. Samples were taken only from the concrete base of the a bridge abutment in the intertidal zone at 0-0.5 m (0-1.7 ft) depth

Station 26. (Latitude 21° 17’ 16.3”N, Longitude 157° 50’ 30.8”W)
Located along the wall in front of the Waikiki Yacht Club on the northwest side of the Ala Wai Yacht Harbor and by on adjacent cement pilings and floating docks. Depth is shallow, maximum 2 m (6.6 ft) over a muddy, soft silt bottom.

Station 27. (Latitude 21° 17’ 6.5”N, Longitude 157° 50’ 26.8”W)
Floating docks in Ala Wai Yacht Harbor’s most shoreward channel, in front of end of Hobron Lane. Depth was 3.5 m (12 ft) over a muddy bottom with abundant trash, water was very turbid with a surface oil sheen.

Station 28. (Latitude 21° 17’ 5.6”N, Longitude 157° 50’ 36.8”W)
Along the Texaco fueling area at the end of the most seaward dock in the Ala Wai Yacht Harbor, adjacent to the harbor entrance. Substratum was cement pilings, floating docks and walls along the front of the fueling area. The fine sand bottom is up to 6 m (20 ft) deep along the sloping coral rubble side of the basin.

Station 29. (Latitude 21° 16’ 58.2”N, Longitude 157° 50’ 7.4”W)
Southeast interior of the Ala Wai Yacht Harbor adjacent to the Hilton Lagoon, which discharges effluent circulated from the lagoon to this site. Depth ranges down to 4 m (13 ft) to a bottom of coarse shells in fine sand.

Station 30. (Latitude 21° 19’ 18.5”N, Longitude 158° 7’ 11.2”W)
Located at the principal cargo area along the south side of the Barber’s Point Deep Draft Harbor, which presently is used primarily for unloading coal transported by a conveyor belt from docked bulk carriers. Concrete pilings, many almost completely covered with the nonindgenous bryozoan *Amathia distans*, stand along the dock front in about 10 m (33 ft) depth over a silt-mud bottom.

Station 31. (Latitude 21° 19’ 18.9”N, Longitude 158° 7’ 14.9”W)
This site is a floating dry-dock, which is moored about 10 from the shore on the west side of Barber’s Point Deep Draft Harbor in 11.5 (38 ft) m water. All fouling samples were taken from the dry-dock’s hull, which was in approximately 9.5 m (31 ft) deep along the ship’s bottom.

Station 32. (Latitude 21° 19’ 19.8”N, Longitude 157° 7’ 16.7”W)
Barge Pier along south side of the Barber’s Point Deep Draft Harbor channel, near the entrance. The hard substratum was a concrete wall extending to 7 m (23 ft) depth on a mixed pebble-sand bottom with abundant twisted metal and wrecked car debris along the wall.

B. Benthos and Fish Surveys

A total of 1122 taxa with 852 named species algae, invertebrates and fishes, listed in Appendix C, have been reported in all studies in the five south and west shore Oahu harbors. Of these, 728

taxa including 585 named species were observed or collected in the five harbors or basins. Table 2 shows the distribution of the total taxa and named species among major taxonomic groups for each of the five harbors.

Table 2. Numbers of total taxa and named species in major groups observed or collected in the five harbor areas.

	Ala Wai		Barbers		Honolulu		Keehi		Kewalo	
Group	Total	Named	Total	Named	Total	Named	Total	Named	Total	Named
Cyanophycota			1		2					
Bacillariophyta	1				1					
Chlorophycota	2	2	4	2	20	13	4	4	5	3
Phaeophycophyta	1	1			7	4	1	1		
Rhodophycota	19	14	7	4	75	48	14	9	5	2
All Algae	23	17	12	6	105	65	19	14	10	5
Magnoliophyta							1	1		
Protozoa			1		1					
Porifera	13	8	11	5	35	14	21	10	12	5
Cnidaria	7	4	7	6	25	20	4	2	6	4
Platyhelminthes	1	27	1		1		1		1	
Nemertea									1	
Annelida	37	29	38	21	72	38	31	21	28	16
Mollusca	16	15	28	21	78	64	15	14	26	19
Arthropoda	60	53	44	35	134	109	45	39	65	57
Sipuncula	4	4	4	4	8	7	2	2	2	2
Bryozoa	14	11	12	10	32	22	11	6	18	12
Echinodermata	1	1	1	1	14	12	2	2	2	2
Ascidiacea	16	13	9	9	21	17	16	13	16	14
All Invertebrates	169	136	155	112	420	303	148	109	177	131
Osteichthyes	34	33	18	17	78	72	17	17	26	25
Total	226	215	186	135	604	440	185	141	213	161

The greatest numbers overall of both total taxa and total named species were for the combined 15 stations in Honolulu Harbor, followed by the Ala Wai Harbor, and Kewalo Basin. A similar pattern was shown for most major taxonomic groups, with Honolulu Harbor having the most taxa and species for all groups, and the Ala Wai having the second or third greatest numbers for all major taxonomic groups except Mollusca and Cnidaria.

Sorensen coefficients were calculated to detect patterns of community similarity for presence-absence data for all invertebrate+fish data, for invertebrates alone and for the following major taxonomic groups Algae, Porifera, Cnidaria, Polychaeta, Gastropoda, Bivalvia, and combined Mollusca, Amphipoda, Decapoda, Bryozoa, Ascidia and fish. Similar patterns of the were found for dendrographs constructed from the similarity coefficients of invertebrate data and the invertebrate+fish data, and the former is shown in Figure 14.

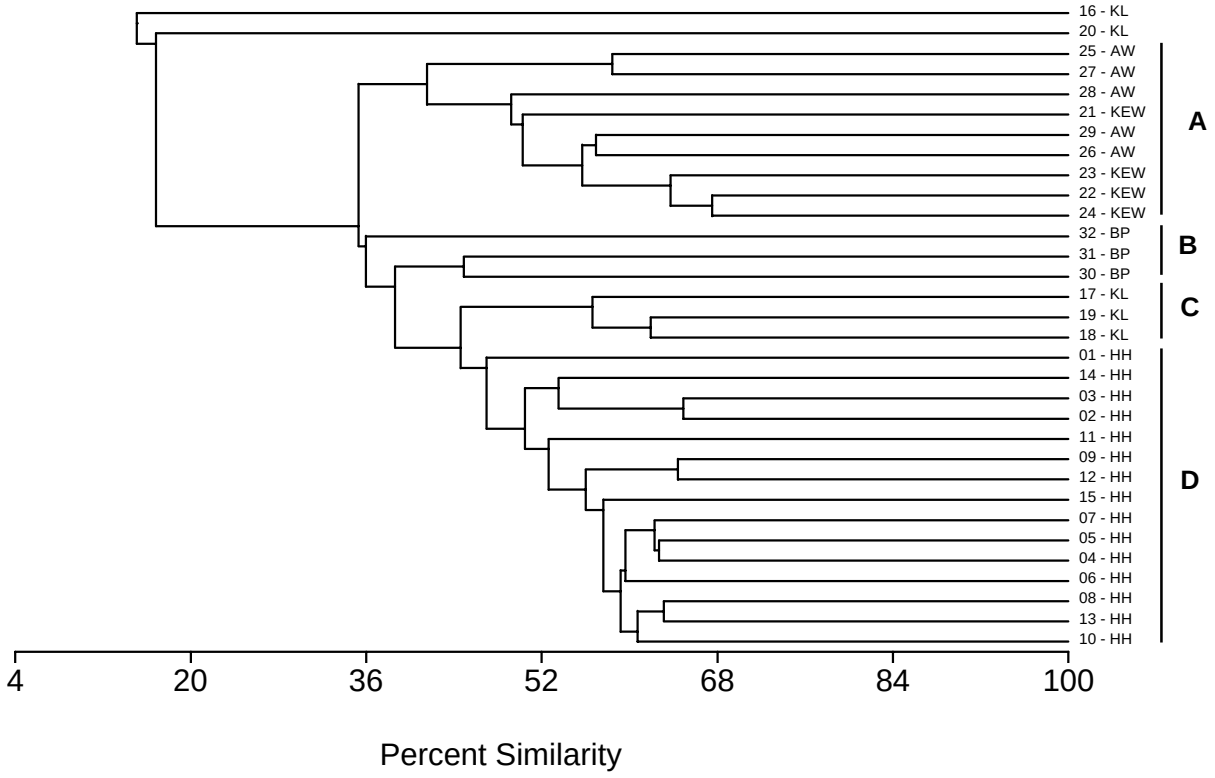


Figure 14. Percent similarity cluster analysis of all invertebrate taxa by station.

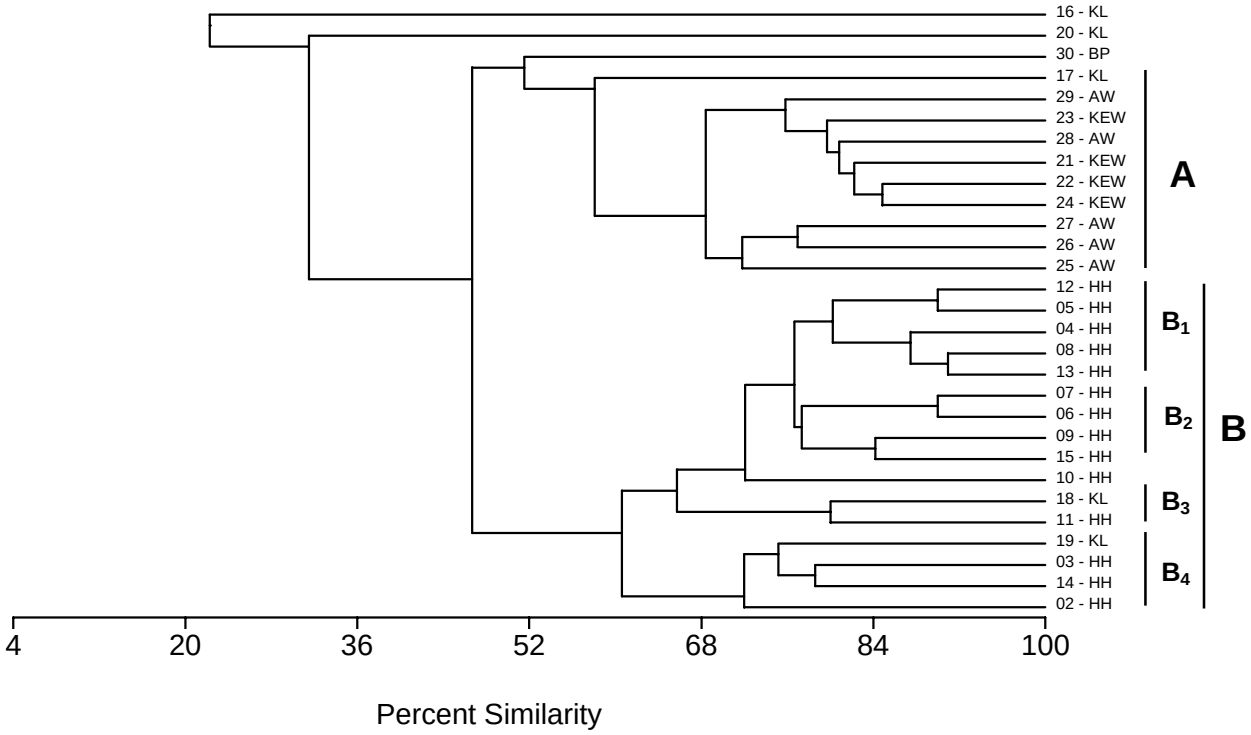


Figure 15. Percent similarity cluster analysis of amphipod crustacean taxa by station.

Although levels of association within any station groups were not very high (maximum 68%), the overall pattern of station clusters corresponds to environmental conditions and locations among and within the harbors (Figures 10-12). Four clusters of stations are suggested, with three outliers. Station 16, along the Kalihi channel outside of Keehi Lagoon, and Station 20, in Moanalua Stream mouth showed low association with other stations, indicating the uniqueness of the communities at those locations. Also, Station 32, at the Barber's Point barge pier, although lying within Cluster B, was separated from all other stations in that cluster. Cluster A was composed of nine stations all within Kewalo basin and the Ala Wai Yacht Harbor, with two stations, 25 at the Ala Wai Bridge, and 27, at the end of Hobron Lane forming a subcluster. Environmental conditions at these two stations were noted at the time of sampling to be the poorest of any in the harbor, with abundant floating garbage, turbid conditons and an oil sheen on the water at Station 27.

The stations at the coal loading dock (30) and the floating dry-dock (31) at Barber's Point composed Cluster B, while Cluster C was made up of three stations in Keehi Lagoon. The remaining Cluster D was composed of the 15 Honolulu Harbor stations arranged into two groups and one outlier. The larger of the groups contained Stations 4 to 13 and 15 from the interior of the harbor, and the other group was composed of three stations near the harbor's main entrance (Stations 2, 3 and 14). Station 1, also near the entrance, was the final station within Cluster D.

Of the analyses done for the major invertebrate taxonomic groups and the fishes, only the similarity indices and dendrographs for the Amphipoda (Figure 15) showed a discernable pattern. The station groupings are similar to those for the total invertebrates (Figure 14) and have a generally higher lever of association within clusters, suggesting that much of the pattern shown for the total invertebrates was accounted for by distributions of amphipods. The Kalihi Channel, Moanalua Stream mouth and Barber's Point barge pier stations remain as outliers, while Cluster A contains Kewalo Basin and Ala Wai Harbor stations plus a single Keehi Lagoon station, grouped in two subclusters. Cluster B contains all Honolulu Harbor stations except for two from Keehi Lagoon, arranged in four subclusters. Subclusters B1 and B2 are from the interior of Honolulu Harbor, B3 has Station 11 from the Honolulu Pier 41 dry-dock and Station 18 from Keehi Lagoon. Subcluster B4 contains the three stations near the Honolulu Harbor main channel and one form the reef edge in Keehi Lagoon. Station 1 is missing from this analysis because the amphipods from this station were apparently misplaced before identification.

The distribution of total numbers of taxa of invertebrates and fishes among the stations is shown in Figure 16. Total taxa ranged from a low of 24 at the mouth of Moanalua Stream (Station 20) where the only hard substratum to sample was on mangrove prop roots, to highs of more than 180 taxa at Station 2, in the discharge basin of Hawaiian Electric's Honolulu Plant, and at Station 14, across the harbor on the Sand Island side of the entrance. Numbers of taxa for eight major groups of invertebrates and fishes are shown for each station in Figure 17. Although the patterns vary, the highest or second highest numbers for seven of the nine groups were at stations near the Honolulu Harbor main entrance, with maximum numbers occurring at Station 14, on the Sand

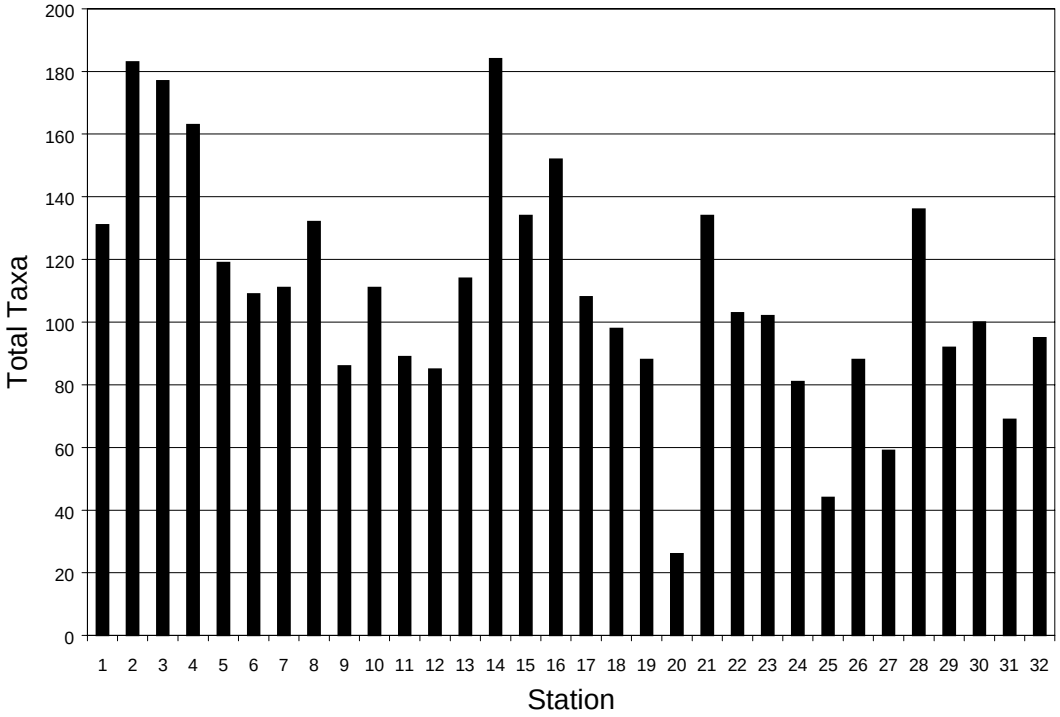


Figure 16. Total numbers of invertebrates and fish taxa observed or collected at the stations.

Island side of the main channel for Cnidaria, Mollusca and fishes. Echinoderms also showed maximal numbers in this area at Stations 1 and 3. For the remaining two groups, Crustacea were most abundant at Station 16 along the Kalihi Channel outside of Keehi Lagoon, where amphipods and isopods accounted for 20 of the 61 taxa that occurred. Highest numbers of ascidian taxa were at piers well within Honolulu Harbor (Station 10) and Keehi Lagoon (Station 18) and at the Honolulu Marine Pier (Station 21) in Kewalo Basin.

Taxonomic richness was highest among the Crustacea, with a maximum number at Station 16 along the Kalihi Channel outside of Keehi Lagoon, where 26 of the 61 crustaceans were amphipod or isopod species occurring only at that site. Other groups with high species richness were the Polychaeta, which had 36 taxa at Station 2 near the Honolulu Harbor entrance, and fishes, which had 33 taxa at Station 14, on the other side of the harbor entrance along Sand Island. The distribution of the Echinodermata was highly restricted, with more than one or two species occurring only near the Honolulu Harbor main entrance at Stations 1, 2, 3 and 14, or at Station 16, in open ocean water along the Kalihi Channel outside of Keehi Lagoon.

The patterns of abundance for total taxa are shown on the dot maps for each harbor in Figures 18 to 20. Except for Barber's Point, every location shows a distinct increase in numbers of taxa with proximity to a harbor entrance. This is shown most clearly for Honolulu Harbor, where three of the four stations near the entrance had more than 150 taxa, but also held for Kewalo Basin and the Ala Wai, where taxa numbers near the entrance exceeded 100 while 50 to 100 were found at more interior stations. Lowest numbers of taxa occurred at the mouths of Moanalua Stream in Keehi Lagoon (Station 20) and the Ala Wai Canal (Station 25). This is due in part to the low

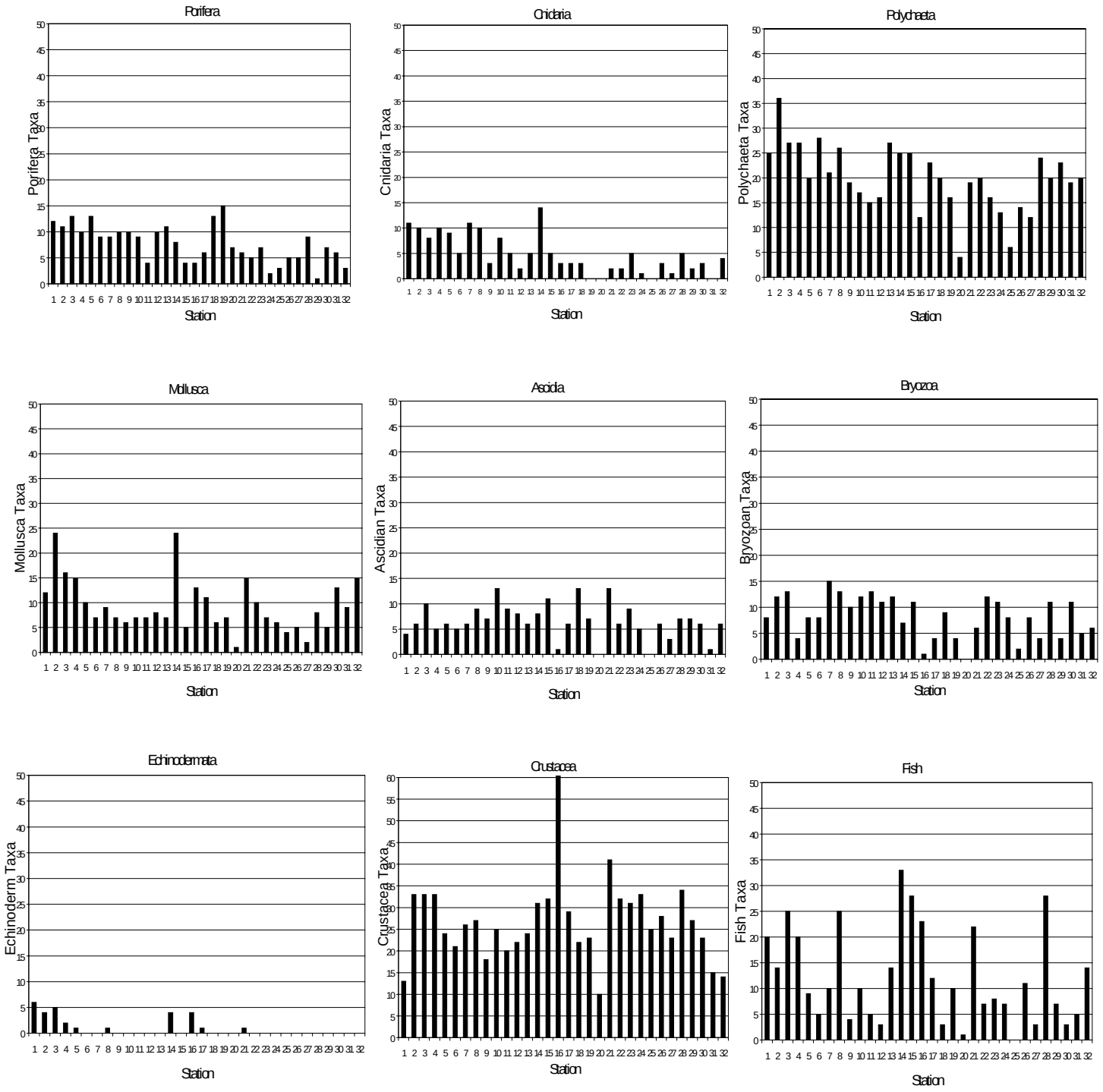


Figure 17. Numbers of taxa at the stations in major taxonomic groups.

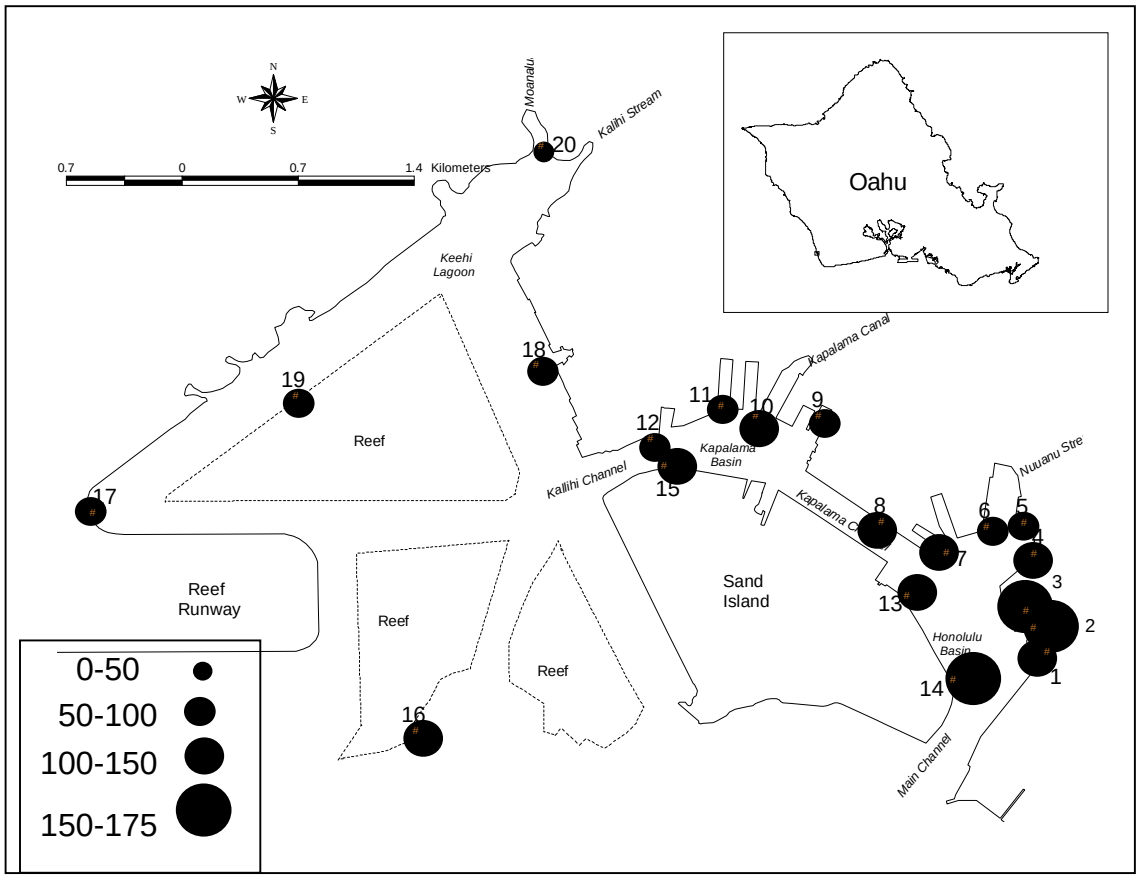


Figure 18. Total invertebrate and fish taxa at Honolulu Harbor and Keehi Lagoon stations.

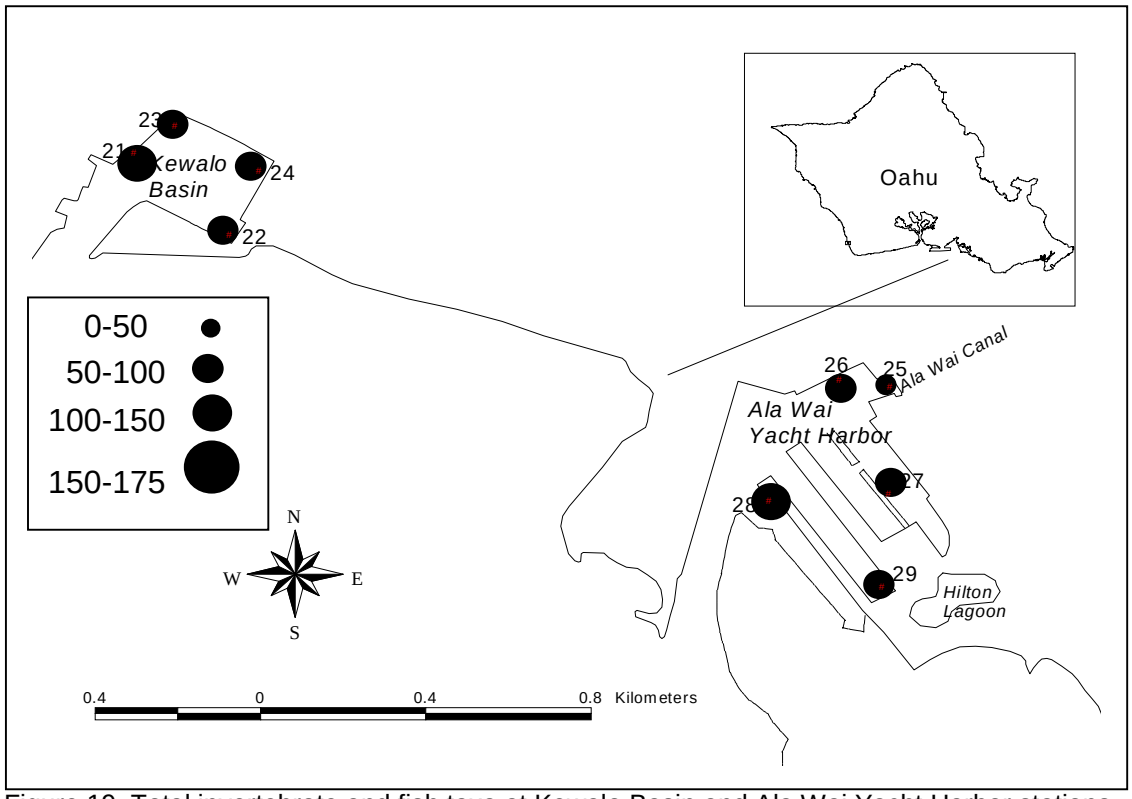


Figure 19. Total invertebrate and fish taxa at Kewalo Basin and Ala Wai Yacht Harbor stations.

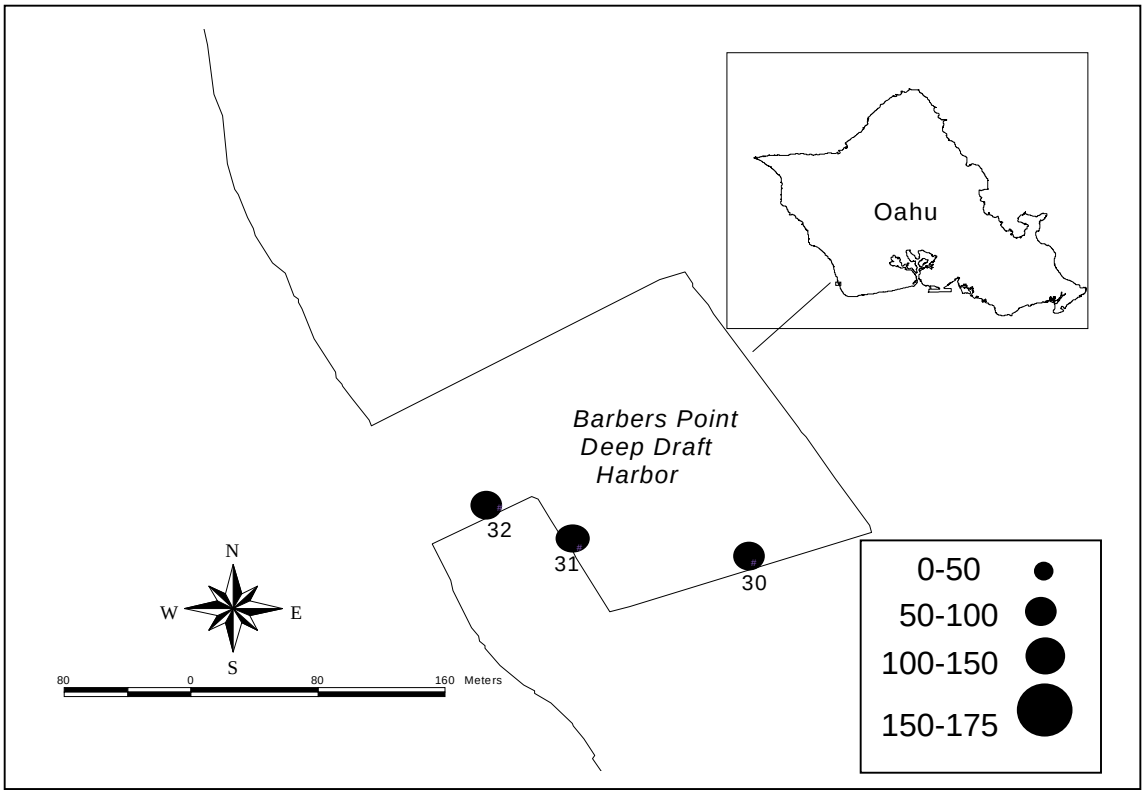


Figure 20. Total invertebrate and fish taxa at Barber's Point Deep Draft Harbor stations.

water quality and high turbidity at these sites preventing diving observations, consequently sampling was conducted only near the water's surface. However, the lack of suitable substrate high siltation from stream outflow, and the likelihood of considerable salinity fluctuations probably result in a limited marine biota at these locations.

C. Comparison with Previous Reports

A total of 728 taxa including 585 named species (Appendix D) were collected or observed in the present study at all sites Tables 3 and 4 summarize the numbers of total taxa and named species for major taxonomic groups in each harbor area in for the present study, along with the corresponding numbers for all previous surveys combined. The greatest numbers of taxa and species were in Honolulu Harbor, where the total taxa for the 15 stations of the present study of 598 is about 1.4 times the number of taxa from all previous reports from this harbor, and is about three times the numbers for each of the other harbors. With the exception of Keehi Lagoon, where previous numbers of taxa reported were slightly more than found in the present study, the numbers of taxa found in the present study exceeded by many times those for previous reports. These greater numbers applied across all major taxonomic groups except for the Keehi Lagoon results, where the greater number of taxa from previously reported studies were due primarily to a single survey (Harvey 1970), which listed 70 of the 74 molluscs noted in Appendix D.

Comparing values of Table 3 with Table 4 indicates that most taxonomic identifications were made to the species level. Named species as a percentage of total taxa ranged from 73% for

Table 3. Numbers of total taxa in present study compared with totals of previous studies.

	Ala Wai		Barbers		Honolulu		Keehi		Kewalo	
Group	Present	Past	Present	Past	Present	Past	Present	Past	Present	Past
Cyanophycota			1		2	2		2		
Bacillariophyta	1				1	18				
Chlorophycota	2		4		20	9	4	11	5	
Pyrrophycophyta						10				
Phaeophycophyta	1				7	5	1	7		
Rhodophycota	19		7		75	18	14	17	5	
All Algae	23	0	12	0	105	62	19	37	10	0
Pterophyta								1		
Magnoliophyta							1	1		
Protozoa			1		1					
Porifera	13	1	11		35	18	21	3	12	1
Cnidaria	7		7	5	25	16	4	7	6	
Platyhelminthes	1		1		1	1	1		1	
Nemertea						1			1	
Annelida	37	3	38		72	43	31	36	28	1
Mollusca	16		28	4	78	12	15	74	26	
Arthropoda	60	1	44		134	115	45	19	65	10
Sipuncula	4		4		8	1	2		2	
Bryozoa	13	1	11		26	12	8	1	16	
Echinodermata	1		1	7	14	10	2	9	2	1
Chaetognatha						1				
Ascidiacea	16		9	1	21	14	16	3	16	
All Invertebrates	168	6	155	17	415	244	145	154	175	13
Osteichthyes	34	0	18	32	78	111	17	29	26	0
Total	225	6	185	49	598	417	182	191	211	13

Table 4. Numbers of named species in present study compared with totals of previous studies

	Ala Wai		Barbers		Honolulu		Keehi		Kewalo	
Group	Present	Past	Present	Past	Present	Past	Present	Past	Present	Past
Cyanophycota								2		
Bacillariophyta						6				
Chlorophycota	2		2		13	8	4	10	3	
Pyrrophycophyta						8				
Phaeophycophyta	1				4	4	1	5		
Rhodophycota	14		4		48	5	9	8	2	
All Algae	17	0	6	0	65	31	14	25	5	0
Pterophyta								1		
Magnoliophyta							1	1		
Porifera	12	1	9		30	16	19	2	11	1
Cnidaria	4		6	4	20	15	2	7	4	
Platyhelminthes						1				
Annelida	30	2	29		54	11	26	14	23	1
Mollusca	15		21	2	66	11	14	56	19	
Arthropoda	55		35		109	96	39	14	58	8
Sipuncula	4		4		7		2		2	
Bryozoa	13	1	11		23	8	8	1	14	
Echinodermata	1		1	6	12	10	2	7	2	1
Chaetognatha						1				
Ascidiacea	15		9		19	7	15	1	15	
All Invertebrate	149	4	125	12	347	176	127	102	148	11
Osteichthyes	33		17	32	72	100	17	28	25	
Total	199	4	148	44	484	307	159	157	178	11

Honolulu Harbor to 87% for Keehi Lagoon. As suggested in Table 3 for total taxa, Honolulu Harbor had the most species, and numbers of species found in the present study were substantially greater than numbers for previous studies at all harbors except at Keehi Lagoon, where the values were about equal.

D. Nonindigenous and Cryptogenic Species

Species previously reported in Hawai'i were categorized as native, nonindigenous or cryptogenic (i. e. of uncertain origin but with indications of being introduced) according to the designations in Carlton and Eldredge (in prep) and Coles et al. (1997, 1999). For species new to Hawaii, status was assigned using the criteria presented by Chapman (1988) and Chapman and Carlton (1991) and described in Coles et al. (1997). These criteria include new appearances in the region, association with known dispersal mechanisms or other introduced species and disjunct geographic distributions. Taxonomic specialists were also consulted for their input in assessing the status of newly reported species.

Of the total 585 named species found in the five harbors in this study, 27 are considered to be cryptogenic and 73 are designated nonindigenous (Appendix E), for a total of 100 non-native species, or 17% of the total species overall. Tables 5 and 6 list the numbers of designated nonindigenous and cryptogenic species found in the present study and in all previous surveys for each harbor area. As was the case for total taxa and named species (Tables 3 and 4) Honolulu Harbor had the greatest numbers, with a maximum of 51 nonindigenous and 23 cryptogenic species in the present study. Past surveys in Honolulu Harbor also reported a substantial number of nonindigenous and cryptogenic species, in contrast to the other harbors, where limited sampling did not detect introductions at Barbers Point or Kewalo Basin, and only one nonindigenous organism was found in the Ala Wai Harbor. Similarly, only 13 nonindigenous and two cryptogenic species were previously reported in Keehi Lagoon.

Totals for introduced and cryptogenic species in each harbor are shown in Table 7, which indicates that Honolulu Harbor has had the greatest numbers of nonindigenous and cryptogenic species and therefore has been the most impacted by marine introductions. However, when these data are compared with the total numbers of named species in each harbor, a different pattern emerges. Expressing the introduced species as a percentage of the total named species found in each harbor in 1997-98 (Table 4), Honolulu Harbor has the lowest value of 15%, while the remaining harbors have values ranging from 27% to 33%, with the highest value occurring in Keehi Lagoon.

The distribution of the nonindigenous and cryptogenic species among the sites sampled (Appendix E) indicates that introductions were not concentrated in any harbor. Most species occurred at multiple sites, with only 13 of the 100 species unique to any station (three at Barbers Point, three at Keehi lagoon, three at the Ala Wai and four in Honolulu Harbor). This indicates that most introduced species were frequently encountered and well distributed among the five

Table 5. Introduced species in Oahu south and west shore harbors.

Group	Ala Wai		Barbers		Honolulu		Keehi		Kewalo	
	Present	Past	Present	Past	Present	Past	Present	Past	Present	Past
Rhodophycota	1				1	1	1	1	1	
Magnoliophyta							1	2		
Porifera	5		2		5	4	5	2	3	
Cnidaria	3		1		3	2			2	
Platyhelminthes						1				
Annelida	2		4		4	1	3	1		
Mollusca	2		5		6	3	4	2	3	
Arthropoda	13		6		9	10	9	2	13	
Bryozoa	6	1	8		9	5	3	1	7	
Ascidiacea	12		7		12	4	12	1	10	
Osteichthyes	4				2	1		1	1	
Total	48	1	33	0	51	32	38	13	40	0

Table 6. Cryptogenic species in Oahu south and west shore harbors.

Group	Ala Wai		Barbers		Honolulu		Keehi		Kewalo	
	Present	Past	Present	Past	Present	Past	Present	Past	Present	Past
Porifera	3		2		9	2	6		2	
Cnidaria			2		2		1		1	
Annelida	3		3		4	2	4	1	2	
Mollusca			3		3		1	1		
Arthropoda	3		2		3	2	2		3	
Ascidiacea					1					
Total	9	0	12	0	22	6	14	2	8	0

Table 7. Introduced + cryptogenic species in Oahu south and west shore harbors.

Group	Ala Wai		Barbers		Honolulu		Keehi		Kewal	
	Present	Past	Present	Past	Present	Past	Present	Past	Present	Past
Rhodophycota	1		0		1	1	1	1	1	
Magnoliophyta	0		0		0	6	1	2	0	
Porifera	8		4		14	6	11	2	5	
Cnidaria	3		3		5	2	1		3	
Platyhelminthes						1				
Annelida	5		7		8	3	7	2	2	
Mollusca	2		8		9	3	5	3	3	
Arthropoda	19		8		12	12	11	2	15	
Bryozoa	6	1	8		9	5	3	1	9	
Ascidiacea	12		14		13	4	12	1	10	
Osteichthyes	4		0		2	1	0	1	1	
Total	57	1	45	0	73	38	52	15	49	0
% of Tot. Species	28		30		15		33		27	

harbors. Honolulu Harbor, with more than twice as many total species than any other harbor, did not have a corresponding increase in nonindigenous or cryptogenic forms. Instead the percentage of the total species that were nonindigenous or cryptogenic was around half the values for other harbors. This suggests that, although the discovery of rare or introduced species will always be a function of sampling effort, the greater effort in Honolulu Harbor did not yield increased numbers of introduced species relative to the total community. The five harbors therefore can be considered as a single entity regarding nonindigenous and cryptogenic species.

E. Recent Introductions

Table 8. Nonindigenous species first noted in Oahu south and west shore harbors (including Pearl Harbor) since 1995.

Taxa	Species	Location					
		AW	BP	HH	KL	KB	PH
Porifera	*Gelliodes fibrosa*	X	X	X	X	X	X
	Neofolitipsa ungiculata			X	X		
	Sigmadocia caerulea				X		X
Cnidaria	*Diadumene franciscana*	X					
	Actinodiscus nummiformis	X					
Bivalvia	*Saccostrea cucullata*						X
	Chama elatensis						X
	Abra sp.						X
	Sphenia coreanica						X
Pycnogonida	*Pigrogromitus timsanus*	X				X	X
	Anoplodactylus arescus		X				
Tanaidacea	*Parapseudes pedispinus*						X
Amphipoda	*Grandidierella japonica*						X
	Jassa falcata				X		
	Leucothoe micronesiae			X			
Cirripedia	*Chthamulus proteus*	X	X	X	X	X	X
Decapoda	*Nanosesarma minutum*						X
Bryozoa	*Bugula dentata*	X	X	X			
	Bugula robusta		X	X			
	Caulibugula caliculata			X			
	Caulibugula dendrograpta		X	X			
Ascidia	*Botrylloides simodensis*	X				X	
	Eusynstyela aliena		X	X	X		
	Symplegma reptans						X
Fish	*Centropyge flavissima*	X					
	Total	8	7	9	6	4	12

Table 8 lists all the nonindigenous species from the present study that are first reports for Hawaii, along with similar first reports that were determined by the Pearl Harbor Study in 1996 (Coles et al. 1997, 1999). Thirteen new nonindigenous species were found for the five harbors of the present study, compared to 12 new species for Pearl Harbor. Only two of the species, the sponge *Gelliodes fibrosa* and the barnacle *Chthamalus proteus*, both from the Caribbean, occurred at all stations in the present study and in Pearl Harbor. Two more species, the sponge

Sigmadocia caerulea and the pycnogonid *Pigrogromitus timsanus,* previously found in Pearl Harbor, also occurred in one or two harbors in the present study, while the eight remaining Pearl Harbor were not found elsewhere. Three of the four bryozoans (*Bugula dentata, B. robusta* and *Cailibugula dendrograpta*), the ascidians *Bottryloides simodensis* and *Eusynstela aliena* and the sponge *Neofolitipsa ungiculata* were quite widely distributed in two or three of the harbors in the present study, but the remaining seven species occurred only at a one or two stations in a single harbor.

Three of the unique reports were from the Ala Wai Yacht Harbor. The corallimorpharian *Actinodoscus nummiformis* was first found near Station 28 in December 1997 by staff of the Waikiki Aquarium. The organism zooids were artificially attached to a piece of coral rubble, indicating that the organisms had been discarded from a salt-water aquarium. Three small clumps of *A. nummiformis* were still growing at the site in April 1999, but the organism has not been observed elsewhere in or outside of the harbor. Another cnidarian found only in the Ala Wai was *Diadumene franciscana*, previously known only from San Francisco Bay (D. Fautin, pers. comm.) which only occurred at Station 26, near the Waikiki Yacht Club, and at Station 28, near outflow into the harbor from Hilton Lagoon. The only occurrence of the Lemon Peel fish *Centropyge flavissima* in this study was an observation near the harbor boat ramp. However, R. Pyle (pers. comm.) has sighted this species infrequently over at least the past ten years at Keehi Lagoon, Kewalo Basin, the Ala Wai and Kaneohe Bay.

The remaining single reports were of the pycnogonid *Anoplodactylus arescus*, the amphipods *Jassa falcata* and *Leucothoe micronesiae* and the bryozoan *Caulibugula caliculata*. *Anoplodactylus arescus* is a sediment dwelling pycnogonid occurring in this study only at the Barber's Point coal loading dock and previously found throughout the Indo-Pacific as far west as East Africa. *Jassa falcata* is a common circumtropical and temperate species with unknown origins, reported from harbors around the world. *Leucothoe micronesiae* was originally described from the Caroline Islands and has also been reported from Madagascar. *Caulibugula caliculata* and *C. dendrograpta*, which occurred here only in Honolulu Harbor, have previous known distributions in the western Indo-Pacific (C. Zabin, pers. comm.). These bryozoans, along with the more widely distributed *B. dentata* and *B. robusta*, although first reported here for Hawaii, are very likely to also occur in Pearl Harbor, which wil be verified by a review of the samples taken for the 1996 study.

F. Introductions with Time

Of the 100 nonindigenous or cryptogenic species found in the present study, all but four have a recorded date of first appearance in Hawaiian waters, shown in Appendix F along with data on the location of the first Hawaiian report, origins or previous ranges of the introduced species, and sources of information. These first Hawaiian reports are grouped by decade and shown in Figure 21. The graph can be interpreted to suggest that substantial increases in first reports of introduced species occurred in the 1970s and 1990s when 17 to 21 nonindigenous and 7 to 12 cryptogenic species were first reported in Hawaii. Figure 22 shows the decades when the same

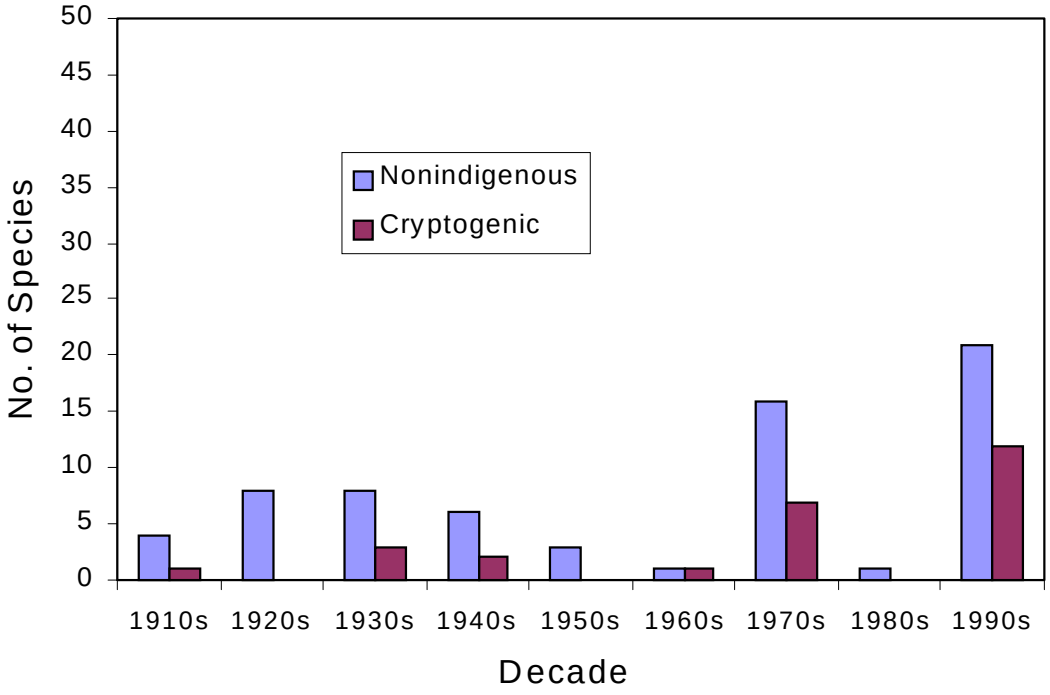


Figure 21. First Hawaiian reports of nonindigenous and cryptogenic species found in Oahu south and west shore harbors in 1997-98.

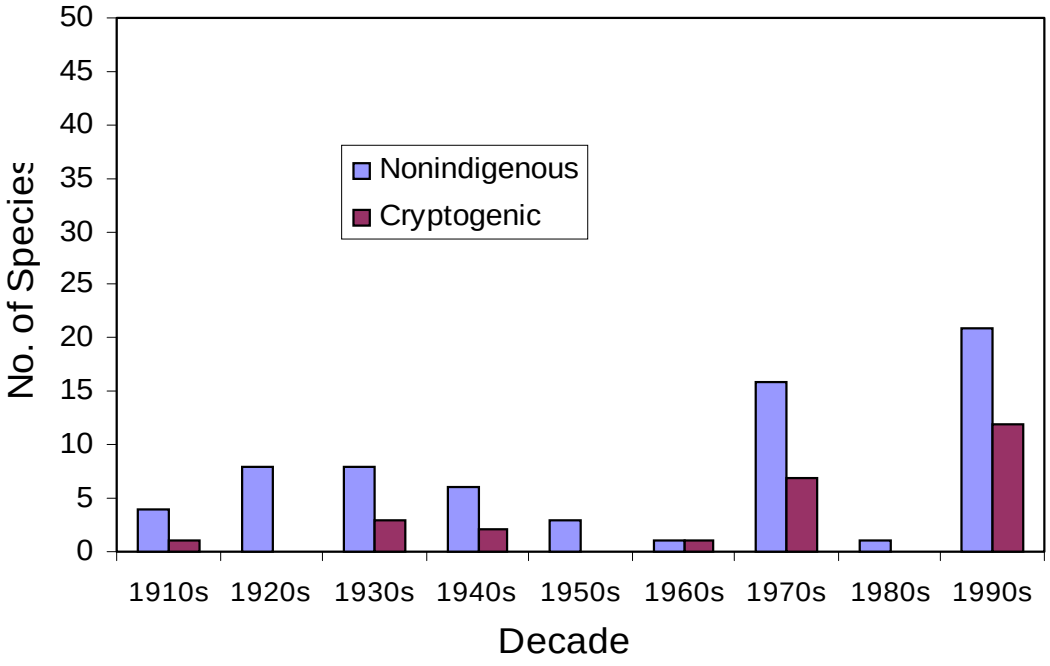


Figure 22. First occurrences of nonindigenous and cryptogenic species found in Oahu south and west shore harbors in 1997-98.

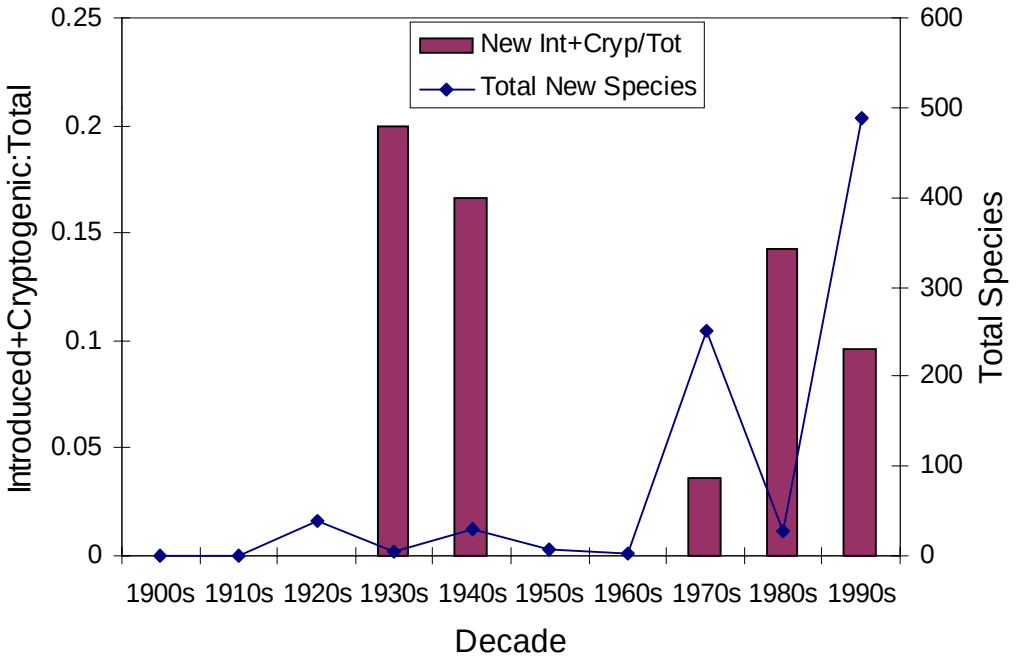


Figure 23. Ratio of new reports of nonindigenous and cryptogenic species to first reports for all species by decade (bars) and total new species reports by decade for Oahu south and west shore harbors (line).

species were first reported in one of the five harbors of the present study. An even greater recent increase is suggested by this graph, where 69 of the 100 nonindigenous and cryptogenic species were first observed or collected in these harbors in the 1990s, most of them during the two years of the present study.

A comparison of the two figures suggests that in decades when sampling effort has been low, it is likely that a relatively rare species, introduced or otherwise, may be present but undiscovered until a threshold effort has been made which will result in collection of the species. Prior to the 1990s the only substantial sampling that had been done in Honolulu Harbor or Keehi Lagoon was in the 1940s and 1970s. These decades were also the only periods of substantial introductions introduction into these harbors previous to the 1990s (Figure 22) despite numerous first reports of introduced species elsewhere (Figure 21).

Further indication that the apparent recent increases in nonindigenous and cryptogenic species in these harbors is sampling effort related is shown in Figure 23, which plots the ratio of new reports in the five harbors to the total number of species newly reported in the same decade, along with the numbers of total new reports. In contrast to the relatively high numbers of introductions suggested for the 1970s and 1990s in Figures 21 and 22, the ratio of introductions to total species is lower for the 1990s than for the 1930s or 1940s, and the value for the 1970s is the lowest for any decade in which introduced species were first reported. This data presentation is

highly sensitive to low numbers, as in the case of the 1930s when only one nonindigenous out a total of five newly reported species occurred, resulting in the highest ratio value for any decade. However, the results support a conclusion that increased numbers of newly detected introduced species may correlate strongly with total numbers of species found, with both increases probably related to sampling effort.

G. Origins and Previous Distributions of Nonindigenous Species.

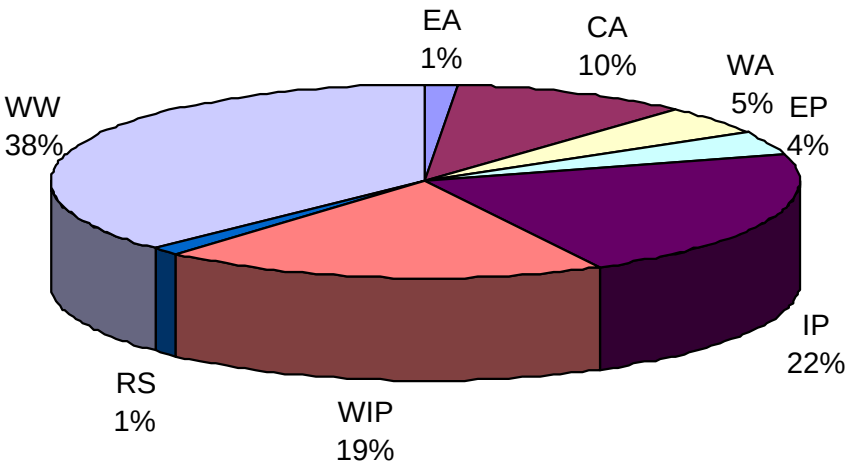


Figure 24. Origins or previous distributions of nonindigenous and cryptogenic species collected or observed in Oahu south and west shore harbors in 1997-98. EA: Eastern Atlantic, CA: Caribbean, WA: Western Atlantic, EP: Eastern Pacific, IP: Indo-Pacific, WIP: Western Indo-Pacific, RS: Red Sea, WW: Tropical or Temperate World Wide.

The origins or previous recognized distributions of the nonindigenous and cryptogenic species collected or observed in the present study are listed in Appendix E, and the totals are summarized in Figure 24. Information was insufficient to assign an origin or distribution to 21 of the 99 species. Twenty-nine species, or 38% of the remainder, were considered to have tropical or temperate worldwide distributions with unknown origins. The Indo-Pacific accounted for 42% of the species with recognized origins or previous distributions, with 22% coming from the central Indo-Pacific, 19% from the western Indo-Pacific regions, 1% from the Red Sea, and only 4% from the Eastern Pacific. The Atlantic accounted for only 16% of the total, with most of this (10%) coming from the Caribbean Sea.

V. DISCUSSION

These surveys conducted in 1997-98 detected 13 nonindigenous and two cryptogenic marine species not previously reported in Hawaii. These introductions are in addition to the 12 nonindigenous and 12 cryptogenic species first found for Hawai'i in Pearl Harbor in 1996 surveys (Coles et al. 1999). Only two of these species, the sponge *Gelliodes fibrosa* and the barnacle *Chthamalus proteus,* occur in all the harbors, while many of the other newly reported species occurred at only a single station within a given harbor.

The discovery of 25 nonindigenous species and 14 cryptogenic species within a three-year period is a substantial increase in introduction reports above previous periods. At least three factors may be responsible for such an apparent increase in marine introductions.

- An increase in transport, survival and propagation of introduced species has occurred from various vectors such as hull fouling, ballast water transport, aquaculture or fisheries introductions and aquarium releases. These factors have undoubted been responsible for the recent appearance of the *Gelloides fibrosa* and other sponges, the barnacle *Chthamalus proteus*, (fouling), the cnidarian *Actinodiscus nummiformis* and the fish *Centropyge flavissimus* (aquarium releases).
- Increased sampling effort in the 1990s has increased the probability of discovering and rare introduced species that may have either recently arrived or may have been in Hawai'i for many years, but in low abundance or in rarely sampled localities that prevented their discovery. The present study was the first comprehensive biological sampling that had been conducted throughout Honolulu Harbor and Keehi Lagoon, and the only substantial sampling that has ever been done in Kewalo Basin, the Ala Wai Harbor or Barbers Point Deep Draft Harbor. It is logical that this increased effort would detect a substantial number of introduced species that may have been present but previously missed. An analysis of the nonindigenous and cryptogenic introductions by decade in Pearl Harbor indicated a strong relationship with total species reported, considered to be an indicator of sampling effort (Coles et al. 1999).
- Increased attention to a taxonomic group, especially one with species likely to have been transported and introduced to a new area, can produce an apparent increase in introductions when these species may have been resident in an area for an undetermined period of time. For example the ascidian *Botrylloides simodensis*, although first reported here, has probably been in Hawai'i for a very long time (G. Lambert, pers. comm.).

Insufficient information exists to determine which of these factors is most responsible for the increased incidence of nonindigenous species reports in the 1990s, but all three undoubtedly contribute. Some species, such as *Chthamalus proteus* and *Actinodiscus nummiformis* are verifiable recent introductions with identifiable vectors, while others like the ascidians *Botrylloides simodensis* and *Eusynstyela aliena* are probably the result of increased sampling and taxonomic effort. After review of the 25 newly reported nonindigenous species listed in Table 8, we conclude that approximately eight are verifiable recent arrivals. These are *Gelliodes fibrosa,*

Sigmadocia caerulea, Actinodiscus nummiformis, Chama elatensis, Chthamulus proteus, Nanosesarma minutum, Symplegma reptans and Centropyge flavissimus

The results of this study are very similar to those obtained from the comprehensive survey of Pearl Harbor in 1996 (Coles et al. 1997, 1999). Both studies found around 100 nonindigenous and cryptogenic species, each with about 12 new nonindigenous reports. Both studies found numbers of new introductions by decade to be strongly related with the total numbers of newly reported species, indicating that high values for introductions in the 1970s and the 1990s were sampling effort related. In Pearl Harbor during the 1910s and 1940s, the ratio of introductions to total species were substantially higher than in all other decades, corresponding to periods of harbor opening and construction after 1911, and intense increase in shipping activity during and following WW II (Coles et al. 1999). The increase for this ratio shown during the 1940s in Figure 23 may also have been related to increased shipping activities in Honolulu and other harbors during the decade of WW II when harbor construction and activity increased (Sec. II.A).

Although there was substantial overlap in the nonindigenous and cryptogenic populations of the five south and west shore harbors of the present study with Pearl Harbor, this overlap was not complete. Seventy-one of the 100 species in the five harbors also occurred in Pearl Harbor, 30 species which occurred in the present study's five harbors were not in Pearl Harbor, and 27 in Pearl Harbor were not in the five harbors. Even less overlap occurred for the new introductions, where only five of the 25 species found for the two studies occurred in Pearl Harbor and at least one other harbor and only two occurred in all harbors (Table 8). This suggests that most introduced species have remained highly restricted in their habitat, achieving only low abundance in limited locations. The sampling effort of the present study was equivalent or greater to that conducted in Pearl Harbor, and sampling and most identifications were completed by the same researchers. It is therefore unlikely that sampling or analytic inconsistencies contributed substantially to finding different assortments of introduced or cryptogenic species in the two studies.

Despite this degree of difference between the introduced species determined for the two studies, similar results were found for their probable origins or previous distributions. The central and west Indo-Pacific and Red Sea accounted for 42% of the introduced species in the present study, compared to 39% for Pearl Harbor (Coles et al. 1997). Only 4% were from the eastern Pacific in the present study compared to 3% for Pearl Harbor, while the Atlantic and Caribbean accounted for 16% in the present study and 13% for Pearl Harbor. Both surveys therefore suggest a dominance of marine introductions in Hawai'i by organisms originating in the waters of the tropical Indo-Pacific, with a large component coming from south and east Asia.

Both the Pearl Harbor and the present study indicate that nonindigenous and cryptogenic species are a major component of the total marine biota of the harbors and suggest that introductions have been occurring for a long time. Nonindigenous and cryptogenic species composed 17% of the total biota in the present study and 22-23% of the total in Pearl Harbor (Coles et al. 1997, 1999). Based on first reports, many of these have been in Hawai'i since early in the century. In

Pearl Harbor, where sufficient sampling has been conducted throughout the century to support a conclusion, introductions have been estimated to have occurred at a rate of about 5-10% of the total population except during wartime activity (Coles et al. 1999). This is similar to the introduction rates for the present study in the 1970s and 1990s when sufficient data are available to sustain such an estimate (Figure 22).

Although nonindigenous species are a major component of the total biota in these harbors, there is little evidence of recent introductions that have proliferated to a degree that they constitute a nuisance situation, monopolize habitats or negatively impact native organisms or commercially important species. The small intertidal barnacle *Chthamalus proteus* is the only newly introduced organism that is abundant throughout all of the harbors and elsewhere in Hawai'i (Southward et al. 1998). Of the remaining 25 nonindigenous species that have been newly detected since 1995 (Table 8) only the sponge *Gelliodes fibrosa*, the amphipod *Leucothoe micronesiae* and the bryozoan *Bugula dentata* occurred at multiple stations throughout most of the five harbors. Many other nonindigenous species such as the octocoral *Carijoa (=Telesto) riisei*, the hydrozoan *Halocordyle disticha* and the bryozoans *Amathia distans* and *Schizoporella* sp. A (previously called *S. errata* or *S. unicornis* but presently under review, C. Zabin pers. comm.) are frequently found and abundant components of harbor fauna throughout the Hawaiian Islands. However, these are introductions dating back many decades which have apparently had minimal success invading environments outside of harbor areas. This contrasts strongly with numerous circumstances in temperate regions where nonindigenous marine species have invaded multiple habitats causing a variety of negative impacts on local species and commercial fisheries (see Ruiz et al. 1997 for review).

There is very limited information on nonindigenous species introductions into tropical marine systems to compare with these Oahu studies. However, a recent comprehensive survey of twelve commercial ports in North Queensland, Australia, and comparison of the results of this study with findings by the Centre for Research on Introduced Marine pests (CRIMP) at temperate Australian ports provides valuable information for comparison (Hilliard et al. 1997). The Queensland ports are in a prototypical tropical environment ranging 12-25°S latitude along the northeast Australian coastline inshore of the Great Barrier Reef. Substantial export of bulk cargo occurs from these harbors, therefore the harbors receive large volumes of ballast water discharge, exceeding the volumes discharged at temperate southern Australian ports (Hilliard et al. 1997).

Comprehensive surveys of the twelve Queensland harbors detected a total of only 15 nonindigenous and 15 cryptogenic marine species, with none of these considered being of nuisance status or potentially damaging to the resident communities. By contrast, nonindigenous species reported for all Australian ports and harbors by CRIMP surveys totaled 139, with an additional 31 species designated as cryptogenic. These 170 nonindigenous and cryptogenic species included nine found in the present study. The number of nonindigenous species occurring in each of the Australian states is shown in Table 9, along with comparative data for the two Oahu studies and information available for temperate systems throughout the world.

Table 9. Numbers of marine nonindigenous species found in various world locations

Location	Nonindigenous Species	Source
Mediterranean Sea	240	Ruiz et al. 1997
San Francisco Bay	234	Cohen and Carlton 1998
Chesapeake Bay	116	Ruiz et al. 1997
Pearl Harbor, Hawaii	69	Coles et al. 1997, 1999
South and West Oahu Harbors,	73	Present study
Victoria (Australia)	80	Hilliard et al. 1997,
New South Wales	43	" "
South Australia.	36	" "
Tasmania	33	" "
Queensland	15	" "

Greater abundance of nonindigenous species in temperate areas is suggested, both worldwide and within Australia. The Hawaiian reports of around 70 nonindigenous species are in the middle of the range of findings, and between those of New South Wales and Victoria. Although Hawai'i is located within the tropics, the physical environment may be considered subtropical in regard to seasonality and prevailing water temperatures, conditions which also apply to much of New South Wales. The Hawaiian environment is therefore likely to be amenable to introduced species from temperate zones, and temperate organisms are a substantial component of the nonindigenous species reported in Oahu harbors. By contrast, the Queensland marine environment is entirely tropical, and only nine of the fifteen nonindigenous species found in Queensland occur in temperate areas elsewhere in Australia (Hilliard et al. 1997).

The limited available information therefore tentatively supports conclusions that tropical areas are less receptive to marine invasions, and that nonindigenous species that do survive in tropical environments are less likely to cause disruptions in the ecology or economy of the receptor environment. A number of hypotheses are considered in Hilliard et al (1997) to explain a proposed paradigm of greater resistance by tropical marine systems to invasions, which will not be considered here. It should be noted, however, that this model does not consider the serious impacts that have resulted from the massive proliferation in Hawai'i of the introduced red algae *Hypnea musciformis*, *Kappaphycus alvarezii*, *K. striatum* and *Gracilaria salicornia* (Abbott 1987; Russell 1983,1992; Rodgers 1997; Rodgers and Cox, in press). Such outbreaks of nonidigenous algae are unreported elsewhere in the tropics, but are similar to algal invasion in the Mediterranean Sea where the green algae *Caulerpa taxifolia* has proliferated unrestricted since its introduction in the early 1980s (Meinesz et al. 1993; Siguan 1996).

It is apparent that more data on nonindigenous species are needed from other tropical areas to confirm or deny a paradigm of resistance to invasions by tropical marine communities. A study nearing completion on nonindigenous species in the harbors of Guam (Paulay et al. in prep.) and

surveys proposed for Lautoka and Suva Harbors in Fiji hopefully will provide information usable for this purpose.

VI. CONCLUSIONS AND MANAGEMENT CONSIDERATIONS

The present study is the first to comprehensively examine the benthic and fish biota of the five main, non-military harbors of Oahu, which are the major points of entry to the Hawaiian Islands for commercial shipping, fishing vessels and long-range sailing craft that might transport nonindigenous species into Hawaiian waters. The present study's surveys were conducted within one year of a similar comprehensive study of Pearl Harbor, the center of U.S. Naval ship movement in the Pacific. The combined information from these studies provides a complete picture of the present conditions of nonindigenous and cryptogenic species in major Oahu harbors, and the impacts that these introductions have had on resident biota within these harbors.

The findings of the present study are remarkably similar to those of the Pearl Harbor surveys conducted 1-2 years previously, with a total of about 100 nonindigenous and cryptogenic species and about 12 new nonindigenous species found in both studies. Contrary to many areas in temperate regions in the world, there is little indication of recent increases in nonindigenous species introductions into Oahu harbors, nor of proliferation of species impacting native populations or commercially important species that would constitute a nuisance invasion. Although nonindigenous and cryptogenic species make up a larger component of the total biota of harbors than has been found in other tropical areas, most of the more common introduced species have been in Hawaiian waters for much of the century, and most recent introductions have remained restricted in the occurrence and are infrequently found.

Although these findings provide encouraging information about the limited impact that nonindigenous species have had in Oahu's harbors, it should not be construed that no potential exists for marine introductions that would be damaging to Hawaii's marine communities. The example of the barnacle *Chthamalus proteus*, which has arrived in Hawaiian waters in the last 25 years and now dominates the shallow intertidal in harbors and embayments throughout the Hawaiian chain, represents a warning that a more damaging nonindigenous species is capable of invading Hawai'i at any time. Nor can the information found for these harbors be extrapolated to other marine environments in Hawai'i such as coral reefs, rocky shores or sandy beach communities. The serious impact that nonindigenous algae have had on reef areas and shorelines on the south and west shores of Maui, along Ewa Beach on Oahu, and in Kaneohe Bay is perhaps the best example of how each environment is subject to a variety of nonindigenous species invasions. In order to assure that invasions are detected early enough that action can be taken to reduce impacts, baseline conditions must be determined for specific locations, and monitoring programs should incorporate methodologies for nonindigenous species detection. Pursuant to this need, nonindigenous species baseline assessment surveys have been proposed for Kaneohe Bay, Kuapa Pond and Waikiki as areas of transition between harbors and open ocean coral reefs.

As an example of the need for continued vigilance and an active program for assessing nonindigenous marine introductions, a recent occurrence in the area of Darwin Harbor, Northern Territory, Australia is instructive. In March, 1999, during a resurvey of a marina being conducted

as part of a baseline assessment program, CRIMP researchers discovered a proliferation of the nonindigenous mussel identified as *Mytilopsis (=Congeria) sallei*. This species is similar to the infamous freshwater Zebra Mussel *Dreissena polymorpha* which has infested all the waterways of the eastern and central United States, causing millions of dollars in economic costs and enormous ecological damage. It is known that the introduction of *M. sallei* was recent, since it had not occurred in the area during a survey conducted six months earlier, and further investigation found that it had already spread to two other marinas in the area. Fortunately, because the mussels had been detected early, it was possible to conduct an eradication program using sodium hypochlorite and copper sulfate in the marinas which apparently was affective in eliminating the invading organisms.

Detection of this nonindigenous mussel was possible only because an active program conducted by knowledgeable personnel was underway, and because knowledge of baseline conditions had been established. It is important for the protection of Hawaii's marine communities from nonindigenous invasions that surveys be made of the baseline conditions in critical areas, and that efforts continue in the detection and assessment of introduced marine organisms.

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APPENDIX A

Chronology of Important Events in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, the Ala Wai Yacht Harbor and the Barbers Point Deep Draft Harbor

1786. According to Cartwright (1923), the first European to visit Honolulu Harbor was a Mr. Hayward, crewman on Nathaniel Portlock's HMS *King George*, who was taken to "a small bay with very deep water, close to a sandy beach…in the district of Whyteetee" (Waikiki).

1794. First European entry of Honolulu Harbor credited to Captain Brown of the British schooner *Jackal*, accompanied by Captain Gordon in the sloop tender *Prince Lee Boo*. They called the harbor "Fair Haven" which may be a rough translation of the Hawaiian name *Houo-o-no-o-no*. The location may also have known to Hawaiians as the district of Kou (Cartwright 1937), but according to Beechert (1991) there is little or no historical evidence for this. Later Brown and Gordon were joined by an American ship, the *Lady Washington*, commanded by John Kendrick, who was accidentally killed by a salute broadside fired by one of the British Ships. Later Brown and Gordon were themselves killed by Hawaiians in January, 1795 (Anon. 1875; Waldman 1892; Cartwright 1923,1938; Beechert 1991).

1796. Honolulu Harbor first surveyed by W. R. Broughton of the HMS *Providence* in February 1796 (Cartwright 1925). However, the chart was lost, probably when Broughton's ship was wrecked off Formosa in 1797 (Anon. 1938).

1804-12. King Kamehameha moves to Oahu from Kailua-Kona and resides at various times in Waikiki, Kailua and at Honolulu, establishing his court there in 1809 at Pakaka Point, near Nuuanu Stream (Beechert 1991; Rockwood 1957).

1816. Rudimentary fort built by the Russian Georg Scheffer on the site of a heiau next to the Honolulu Harbor shore. The Russians were ordered to leave by Kamehameha's troops after which the fort was refurbished to become Honolulu Fort. It was built of cut coral blocks and was the largest structure in Honolulu until it was dismantled in 1857. It was located along the former shoreline just seaward of the present Queen Street and end of Fort Street Mall (Anon. 1936; Judd 1975; Beechert 1991).

1816. Earliest known map of Honolulu Harbor prepared by Otto von Kotzbue, another Russian commander, in 1816. The map shows the reef on both sides of the harbor, the newly built fort, fishponds on the Iwilei side of Nuuanu Stream and in the vicinity of present Piers 1 and 2, and the layout of Honolulu Village from the harbor entrance to Nuuanu Stream (Fitzpatrick 1947).

1818. Second known map of Honolulu Harbor prepared by Tabulevitch during the voyage of Vasili Golovnin, which show less detail than the more carefully prepared map of von Kotzbue (Fitzpatrick 1947).

1819. Third map of Honolulu Harbor, compiled by Louis Duperrey during French expedition commanded by Freycinet. Map gives good detail of channel and harbor depths but little of landmarks other than the fort and the two largest fishponds (Fitzpatrick 1947).

Arrival of first two whaling ships in Honolulu Harbor, the *Balena* out of New Bedford, and the *Equator*, out of Nantucket (Judd 1929, Waldman 1982)

1820. Arrival of the brig *Thaddeus*, with the first company of missionaries to arrive in Honolulu (Judd 1929, Waldman 1982)

1822. First published laws and port charges issued for the Port of Honolulu, printed in both Hawaiian and English (Beechert 1991)

1825. First pier in Honolulu Harbor placed near the present Pier 12 site by sinking a ship's hull at the foot of Nuuanu Avenue (Rush 1957).

First harbor regulations made and published in 1825 at the suggestion of Lord Byron, commander of the HMS *Blonde*, who had returned the bodies of King Liholiho and Queen Kamamalu after their deaths in England (Waldman 1982).

Fourth map of Honolulu Harbor, prepared by C. R. Malden, an officer of the *HMS Blonde* under the command of Lord Byron. Map was highly detailed, showing numerous bottom soundings and arrangements of Honolulu streets (Fitzpatrick 1947).

1826. The USS *Dolphin*, under the command of John (Mad Jack) Percival and the first American naval vessel to visit the Hawaiian Islands, entered Honolulu Harbor (Stroup 1959; Beechert 1991).

1827. Two shipwrecked sailors, James Robinson and Robert Lawrence, formed Robinson and Co. and built a combined wharf and shipyard in the vicinity of the Honolulu Fort (Stroup 1959; Beechert 1991).

1840. Fifth map of Honolulu Harbor, prepared by the U. S. Exploring Expedition under C. R. Wilkes. Bottom depths in the harbor were shown in detail, as well as good representations of the extent of the harbor's fringing reef, fishponds and landmarks of Honolulu town (Fitzpatrick 1947).

1852. The first steam powered schooner, the *Constitution*, arrived in Honolulu Harbor from San Francisco (Stroup 1959).

Sailors from whaling ship burned down the police station on Nuuanu Avenue, rioted in the streets and tried to break into the Fort to release prisoners (Beechert 1991).

1853. A 940-foot wall was built to divert Nuuanu Stream and its sediments southwest across the inner harbor toward Kalihi basin (Beechert 1991).

1854. The first steam tug, the *Pele*, was used to pull ships into dock, replacing the use of men or animals to bring ships into the harbor against the prevailing northeast tradewinds (Waldman 1982).

1856. Pacific Commercial Advertiser reported that water depth at the harbor's piers was decreasing at a rate of two feet per year (Beechert 1991).

1856-57. After considerable controversy over the cost and benefits (Anon. 1854; Amicus 1854; Webster 1854a & b) the Honolulu Fort was torn down, and its materials used for the seawalls and fill material of the Esplanade. This was built on the former reef shoreward of the Fort at the site of the present Aloha Tower complex. (Walsh 1898; Anon. 1936; Judd 1975). Also, dredging was conducted in this area along Robinson's Pier (Pier 11) and Market and Custom House Wharves (Pier 10) to provide fill and increase depths for ship access (Anon. 1856a, b; Anon. 1857).

1869. First use of newly constructed Honolulu Harbor Lighthouse, originally placed on north side of harbor entrance channel and accessible by foot on a boardwalk from Immigration (Sand) Island (Stroup 1959)

1875. Ocean mail service by steamship established to Honolulu from San Francisco (Beechert 1991).

1883. Completion and first use of a marine railway and drydock in the Hawaiian Islands (Anon. 1883, 1906). The facility was constructed on the former reef at the site of present Pier 2.

1888. Survey completed to determine feasibility and cost of dredging a 30 foot deep 200 feet wide channel to increase depth from the then existing 21.5 feet at the entrance (Rush 1957).

1889. Construction of additional wharves with covered storage areas at the foot of Fort St. along the Esplanade, extending the sea wall and filling behind with dredged material (Beechert 1991)

1890-92. The entrance to Honolulu Harbor described by Agassiz (1889) as "nothing but a channel kept open by the flow of the Nuuanu River" is widened and deepened by dredging. A channel 200 feet wide by 30 feet deep was dredged for about 1000 feet through the sand bar which had limited depth to as shallow as 18 feet, restricting entry of the largest ocean vessels (Allardt 1890; Anon. 1892a, b).

1893. The first large ocean steamer, the *Oceanic*, entered Honolulu Harbor after the channel was dredged to 30 feet depth (Walsh 1898).

1896. Richard Street slip area dredged and pier constructed (Beechert 1991).

1898-1900. Dredging and filling continued to be conducted to provide access and wharves for vessels up to 600 feet and to change the course and dimensions of the Nuuanu Stream mouth (Anon. 1898, 1899, 1900).

1900. First proposal to enlarge Honolulu Harbor by dredging a channel to Kalihi (Anon. 1900)

1900s. Construction of Ala Wai Boat Harbor from a large barge channel by the U. S. Armed Forces (Oceanic Institute 1971).

1901. Piers 17 and 18 built by Oahu Land and Railway west of Nuuanu Stream to accommodate loading of sugar and other bulk freight (Fitzpatrick 1947).

1905. Further widening and deepening of harbor entrance channel to 35 feet and 400 feet wide, and enlargement of main harbor to 1200 feet wide (Rush 1957; U. S. Army C of E. 1958).

Plans presented for movement of lighthouse from its former location along the north side of the channel to 400 feet seaward (Anon. 1905).

1906. Filling of reef around Quarantine (Sand) Island with 158,000 cu. yd. of material dredged from entrance channel (Beechert 1991).

1906-7. Dredging of reef at the base of Alakea Street for a new wharf and filling of reef around Immigration Island (Pier 1).

1907. Construction of Pier 12 (Wilson Okamoto & Assoc. 1968) at the site of the first wharf to have been placed in the Harbor in 1825.

Completion of Alakea Street dock and slip (Pier 7) with an average depth of 34 feet, for the berthing of the Pacific Mail and other big steamships.

Wiiliam Matson moves his center of operations from Hilo to Honolulu and affiliates with Castle and Cook, giving him the major portion of the sugar hauling business (Beechert 1991).

1914. Number of wharves in Honolulu Harbor totaled twenty (Rush 1957; Wilson, Okamoto and Assoc. 1968), all located in main Honolulu basin.

1915-20. Development of plans for extending Honolulu harbor by dredging a 35 feet deep, 800 feet wide by 1000 feet long channel to the Kalihi (Kapalama) basin from north of the Iwilei section of the harbor. (Anon. 1915; Rush 1957).

1916. Piers 19 and 29 built by Oahu Land and Railway.

1918. Construction of Piers 24, 25 and 26 by Inter-Island Steam & Navigation Co. (Rush 1957).

1918-20. Matson Lines become the dominant carrier for fuel, general cargo and visitors traveling to Hawaii from the U. S. (Beechert 1991).

1920. First oil line for fueling oil burning vessels installed at Pier 16 (Beechert 1991).

Beginning of operation of Hawaiian Electric's Honolulu Generation Station located next to the Alakea Dock (Pier 7). This facility would, at the peak of its operation, continuously circulate approximately 200,00 gallons per minute of water from its Pier 7-8 basin intake, through its condensers and out its discharge in the Pier 5-6 Basin, with a temperature increase of 5-6°C (McCain and Coles 1973)

1921. Start of development of Kewalo Basin, initially for providing docking for lumber schooners and fishing boats, which were in jeopardy of contaminating their catches by cleaning them in the polluted water of Nuuanu Stream (Anon. 1922a, 1922b; Rush 1957).

1921-27. Dredging of the Ala Wai Canal to drain Waikiki wetlands fed by Manoa and Palolo Streams. However, the original canal did not discharge at its present location near the Ala Wai Yacht Harbor, but rather a channel was dredged along the shore to join the Kewalo basin channel (Cox and Gordon 1970).

1922. Construction of Pier 2 at site of former marine railway and drydock. (Board of Engineers 1936).

1922-27. Dredging of the Kapalama Channel to the Kapalama Basin to a depth of 35 feet and 800 feet wide, giving anchorage for vessels of over 1000 feet length. (Anon. 1924; Board of Engineers 1926; US Army C. of E. 1958).

1926. Completion of the Aloha Tower and Piers 8 to 11 on the site of the Esplanade, seaward of the original Honolulu Fort. The Aloha tower complex was the principal embarkation point for most ship passengers through most of this century. The peak year was 1957, when over 85,00 passengers disembarked at Aloha Tower (Waldman 1982).

1929. Construction of Pier 35 (Rush 1957).

1931. Construction of Piers 13 and 14 by Inter-Island Steam and Navigation Co. (Wilson Okamoto & Assoc. 1968) and Pier 36 (Rush 1957).

1931-35. Further widening of the Kapalama Channel and dredging of the harbor entrance channel to 40 foot depth and width of 500 feet. Construction of 3800 feet long rock revetment along southwest side of Sand Island to retain deposited dredged material (Rush 1957; US Army C. of E. 1958).

1938. Construction of Piers 27 and 28 and Piers 31, 31A and 32 by Oahu Railway and Land Co. (Rush 1957).

1941. Administration of Honolulu Harbor turned over to the U. S. Navy for the duration of WW II (Beechert 1991).

1941-45. Dredging of the Kapalama Basin to 35 feet deep and 1000 feet wide by 3400 feet long, dredging of Pier 39 slip to 250 feet wide, and widening of Kapalama Channel by 600-1000 feet (Rush 1957; US Army C. of E. 1958). Kalihi entrance channel scheduled to be dredged, but abandoned as unnecessary at end of the war (Llewellyn 1947; Rush 1957; Beechert 1991). Additional dredging of Kewalo Basin and channel to depths of 16-17 feet (Rush 1957).

Dredging of three 10 feet deep seaplane runways 2-3 miles long and one 400 by 800 foot mooring basin in Keehi Lagoon, with removal of over 17 million cu. yds. of dredged material. This was used for fill along the southwest shore of Keehi Lagoon, creating the land area for the John Rogers (Honolulu) airport (Richardson, 1945; Beechert 1991).

1946. A liberty ship, the SS *Britain Victory*, grounded on the entrance channel reef, blocking the harbor for one week and substantiating the need for Honolulu Harbor to have two entrance channels (Beechert 1991).

1947. Construction of a new terminal on the Pier 2 site, later combined with additional adjoining property to make up the present Diamond Head terminal, first used in 1954 (Stroup 1959). Construction of Pier 33 by Oahu Railway and Land Co. (Rush 1957).

1949. Kalihi entrance channel recommended for construction by the chief of the Army Corps of Engineers (Beechert 1991).

1954 Completion and first use of present Diamond Head Terminal built at Pier 2 (Stroup 1959; Wilson Okamoto & Assoc. 1968).

1958 Matson introduces containerized transport of cargo in Honolulu Harbor (Waldman 1982).

1960 Container handling facilities began at Pier 2 and continually expanded into Pier 1 (Wilson Okamoto & Assoc. 1968).

1962. Completion of Kalihi entrance channel to Honolulu Harbor from Keehi Lagoon, including construction of two lane bascule bridge over this channel to enable automobile traffic to reach Sand Island (Wilson Okamoto & Assoc. 1968).

1963. Construction completed for the Keehi Lagoon Marina (Wilson Okamoto & Assoc. 1968).

1972-75. Construction of the Reef Runway in Keehi Lagoon area, involving filling an area 2200 feet wide by 12,000 feet long to nine feet above sea level, displacing 1,240 acres of former shallow coral reef. Project also involved dredging channels to increase water circulation in areas of Keehi Lagoon that were made stagnant by the dredging of the seaplane runways in the 1940s (Anon. 1972).

Ala Wai Yacht Harbor enlarged to include two more basins and berthing for more than 350 additional boats.

1981. Additional dredging in main entrance channel, main basin, Kapalama Channel and Kapalama Basin to increase depth to 45 feet in entrance channel and to 40 feet elsewhere (Anon. 1986).

1982. Construction of Barbers Point Deep Draft Harbor to relieve congestion in Honolulu Harbor and to accommodate bulk-carrying vessels (Waldman 1982).

1986-87. Consolidation of major lift on-lift off container operations by Matson and Sea Land to Sand Island docks (Anon. 1986).

Construction of second bridge across Kalihi Channel, increasing road to four lanes (Anon. 1986) and conversion of the bascule drawbridge to a fixed structure, once again limiting Honolulu Harbor to have one entrance channel.

Construction of Piers 16, 17, 19 and 37 to accommodate mooring of local and transient commercial fishing boats (Anon. 1986).

1990-93. Development of the Aloha Tower complex to include the Maritime Building and Terminal at Piers 5 and 6, the mooring of the *Falls of Clyde* at Pier 7, the site of the Honolulu Maritime Museum, and restaurants and shops in the Aloha Market place along Piers 8-10.

APPENDIX B

Annotated Bibliography of Literature for Honolulu Harbor,
Keehi Lagoon, Kewalo Basin, Ala Wai Yacht Harbor
and Barber's Point Deep Draft Harbor

AECOS (1979). Oahu Coral Reef Inventory. Part A, Atlas, and Part B, Sectional Map Descriptions. U. S. Army Corps of Engineers, Honolulu.

Basic descriptive resource for Honolulu Harbor and all Oahu nearshore marine environments, containing extensive annotated references.

AECOS (1982). Marine environmental baseline study in support of the development plan and environmental impact statement for Piers 12 to 15 in Honolulu Harbor, Oahu, Hawaii. Austin, Tsutsumi & Assoc. Inc., Honolulu.

Literature search and surveys for evaluating the potential impact of dock construction at Piers 12-15. Measurements made of water turbidity and observation of dominant benthic and fish organisms made in Nov. 1982.

AECOS (1988). Biological reconnaissance survey and environmental assessment for Pier 1 modifications, Honolulu Harbor, Hawaii, Honolulu.

Brief environmental survey made for alteration of docks at Pier 1, describes most apparent benthic and fish organisms in area, along basalt boulders at Fort Armstrong entrance to harbor.

AECOS (1992). Water quality survey for the Marine Education and Training Center at Sand Island. Wilson Okimoto & Assoc., Honolulu.

Review of water quality and sediment pollutant information for Honolulu Harbor in general and METC site on the west end of Sand Island near the bascule bridge.

Agassiz, A. (1889). The coral reefs of the Hawaiian Islands. Bull. Mus. Comp. Zool. Harv. 17(17): 122-170.

Early description of Honolulu Harbor entrance as a channel kept open by Nuuanu River flow and muddy character of the bottom and channel.

Allardt, C. E. (1890). Special report on the dredging of the Honolulu Bar. , Honolulu.

Proposal for dredging sandbar at entrance to Honolulu Harbor from a minimum low tide depth of 20 feet to a uniform 30 feet deep. Channel to be 200 feet wide and require removal of approximately 60,000 cu. yds. Mentioned that about 61,000 cu. yds. of mud were removed from the harbor in 1884-85 and deposited on the shore near the New Market vicinity of Alakea St. Map shows harbor configuration and depths in 1890.

Aloha, T. M. C. I. (1980). A proposal from the Aloha Maritime Center to the estate of James Campbell for sponsorship of a maritime museum at Aloha Tower, Honolulu Harbor, Hawaii. James Campbell Estate, Honolulu.

Description of planned changes in the Aloha Tower complex to make it the focus of downtown development.

Aloha Tower Associates (1990). The plan for the new harbor. The Associates, Honolulu.

Brochure describing planned changes in the Aloha Tower complex from 1990 to 1995

Amicus (1854). Untitled. The Polynesian. Honolulu, Jan. 21.

Anonymous letter to the newspaper criticizing the proposed dredging and filling of Honolulu waterfront and selling to highest bidders, and questioning the estimated total cost of the project.

Anon. (1826). The South Eastern Part of the Town of Hanarura at Oahu. BPBM CP2199, CP29158.

View of grass houses on Honolulu Harbor shoreline looking toward Diamond Head and Palace of Kamehameha

Anon. (1843). Map of Honolulu City. Honolulu, Existing Urban Resources of Honolulu (1939), p. 341.

Map showing Honolulu and its waterfront with principal buildings.

Anon. (1854). Proposed improvement of government property. The Polynesian. Honolulu: Jan. 14.

Description of proposed project to dredge and fill waterfront area in front of Honolulu Fort to accommodate berths for shipping and sell property created by filling to highest bidders.

Anon. (1854). The water lots. The Polynesian. Honolulu, Jan. 28.

Rebuttal to criticism by "Amicus" of proposed dredging and filling of Honolulu shoreline to create additional wharfage and reclaimed land to be sold to highest bidder, the primary purpose of the project to provide needed docking area for the business of the port.

Anon. (1856). Untitled. The Polynesian. Honolulu, Oct. 18.

Description of progress of dredging of Honolulu Harbor waterfront between Market and Custom House wharves, where depth had been increased an average of five feet.

Anon. (1856). Untitled. The Polynesian. Honolulu, Nov. 20.

Description of progress of dredging of Honolulu Harbor waterfront at Robinson's wharf, where depth had been increased to 23 feet.

Anon. (1857). Untitled. The Polynesian. Honolulu, June 17.

Description of driving of piles along Robinson's Wharf, and beginning of transfer of coral blocks from the Honolulu Fort to be used in constructing the harbor retaining walls, while dredged harbor mud supplying the landfill material. "What a revolution among the animacules!"

Anon. (1862). Plan of Honolulu:

Map showing Honolulu waterfront with principal buildings and shoreline of landfilled esplanade.

Anon. (1878). Discovery of Honolulu Harbor. Hawaiian Almanac Annual for 1878, Thrum and Oat. 4: 24.

Brief description of discovery of Honolulu Harbor by Capt. Brown, commanding English ship HMS *Butterworth* and its tender *Jackall* in 1794, who called the harbor Fairhaven. Honolulu Harbor first entered by the *Jackall* and the *Prince Le Boo* on Nov. 21, 1794.

Anon. (1883). The marine railway finished and in good working order. Pacific Commercial Advertiser. Honolulu, Jan. 2, p. 2.

Description of first use of newly completed marine railway at Pier 2, constructed at cost of $100,000 to Hawaiian government and leased to Samuel Wilder for $5000/year.

Anon. (1884). Shipping notes. Pacific Commercial Advertiser. Honolulu, June 17, p. 2.

Note of dredging activity at Likelike wharf.

Anon. (1891). Map of Honolulu City, Hawaiian Islands. Honolulu, Hawaiian Annual:

Map showing Honolulu waterfront with principal buildings.

Anon. (1891). Harbor dredging. Pacific Commercial Advertiser. Honolulu, Nov. 12, p. 3.

Notice of dredging to begin in Jan. 1892 in Honolulu Harbor, first on channel bar, then interior. All areas to be dredged to 30 feet depth.

Anon. (1892). Honolulu Harbor improvements. Hawaiian Almanac Annual for 1893, Press Publishing. 19: 77-81.

Brief description of discovery of Honolulu Harbor by Capt. Brown of the English ship SS *Butterworth* and its tender *Jackall* in 1794, who called the harbor Fairhaven. First survey of harbor by Capt. Broughton in 1796, later surveys by Kotzebue in 1816 and Malden in 1825. Article describes dredging of harbor entrance channel for a distance of 1100 feet long by 200 feet wide, work beginning in June 1892. 67,000 cu yds of dredge material removed and place on shoreline east of harbor entrance

Anon. (1892). The dredger narrowly escapes destruction last evening. Pacific Commercial Advertiser. Honolulu, May 4, p. 3.

Description of near loss of dredger while anchored on Waikiki side of Honolulu Harbor entrance for dredging entrance sand bar. Dredger platform barge slipped anchors and came to rest on Ewa side of channel on reef.

Anon. (1892). Work on the bar. Pacific Commercial Advertiser. Honolulu Sep. 20, p. 3.

Note of completion of dredging the sand bar at entrance of Honolulu Harbor to 30 feet depth.

Anon. (1892). Dredging the Honolulu Harbor bar. Scientific American. Issue 875; 244-225.

Full description of Honolulu Harbor project for dredging entrance and harbor to 30 feet, removing an estimated 60,000 cu. yds from entrance and 640,000 from harbor basin. Work on entrance bar commenced on Apr. 7, 1892 and was essentially complete by end of August, with minor additional dredging to be completed in September to bring entrance depth to an unobstructed 30 feet.

Anon. (1892). The harbor bar. The Scientific American writes an article about it. Pacific Commercial Advertiser. Honolulu, Oct. 20, p. 4.

Reprint of Oct. 8, 1892 Scientific American article about dredging of Honolulu Harbor entrance channel and basin.

Anon. (1892). The hydraulic dredger. Pacific Commercial Advertiser. Honolulu, Oct. 30.

Description and diagram of the dredger built by Risdon Iron Works of San Francisco for dredging the Honolulu Harbor entrance bar and basin.

Anon. (1894). Honolulu. North Pacific Coast Ports, J. D. Spreckels & Bros.**:** 68-76.

Instructions and information for shipmasters entering Honolulu Harbor.

Anon. (1895). Our golden gate. Paradise of the Pacific. 8: 19.

Brief description of Honolulu Harbor, and mention that 315 foreign vessels utilized harbor in 1893.

Anon. (1897). Public works and improvements. Hawaiian Almanac Annual for 1897, Press Publishing. 23: 126.

Description of changing course of Nuuanu stream course at harbor entrance and deepening of harbor at eastern end of the esplanade.

Anon. (1897). On the water front. Paradise of the Pacific. 10: 115.

Photo of Honolulu Harbor dock facing mountains.

Anon. (1898). Public works and improvements. Hawaiian Almanac Annual for 1898, Press Publishing. 24: 158.

Progress report on changing course of Nuuanu stream course at harbor entrance and deepening of harbor at eastern end of the esplanade.

Anon. (1898). Honolulu Harbor-Crossroads of the Pacific. Paradise of the Pacific. 11: 17-18.

Description of harbor channel dimensions, dredging date and material removed and shoreline before building of the Esplanade. First ocean steamer to utilize new harbor channel after dredging was the *Oceanic* in May, 1893

Anon. (1899). Wharf and wave. Pacific Commercial Advertiser. Honolulu, Aug. 18, p. 8.

Note of deployment of hydraulic dredger at foot of Richards St. for excavation of new slips, dredged spoils to be deposited on land Waikiki of the public market.

Anon. (1899). The new harbor. Official description of the boundaries. Pacific Commercial Advertiser. Honolulu. Aug. 26, p. 7.

Detailed verbal description of Honolulu Harbor boundaries as shown on recently issued map from the War Department.

Anon. (1900). Public improvements. Hawaiian Almanac Annual for 1900, Press Publishing. 26: 161-62.

Progress report on deepening of harbor and wharf extension, and project proposed to link harbor with Kalihi.

Anon. (1900). Extension of the harbor. Paradise of the Pacific. 13: 3.

Proposal that Honolulu Harbor expansion should be done by extending of the Nuuanu stream

rather than by dredging shallow areas of the harbor basin

Anon. (1902). Honolulu Harbor map. Honolulu, Paradise of the Pacific. 15: 12.

Map of Honolulu Harbor at turn of the century

Anon. (1903). Honolulu Harbor. Paradise of the Pacific. 16: 10-11.

Descriptions of locations of ship docking areas for various companies and plans to increase wharfage in six months.

Anon. (1904). Plans for a new Alakea dock. Hawaiian Star. Honolulu, Jul. 6, p 7.

Description of new docks and slip to be built at base of Alakea St. for Pacific Mail and other steamers. Construction to include widening of adjacent street, building or modification of two wharves and dredging basin to 34 feet.

Anon. (1905). First steps in improvement of harbor started. Hawaiian Star. Honolulu, May 16, p. 1.

Description of plans for widening Honolulu Harbor entrance channel 150 feet and moving of entrance lighthouse 400 feet seaward.

Anon. (1905). Work commences on Alakea Dock. Hawaiian Star. Honolulu, Jul. 8, p. 1.

Description of equipment and dredging operations for construction of Alakea dock and slips for docking large ocean liners.

Anon. (1905). Dredger Pacific hard at work. Hawaiian Star. Honolulu, Nov. 14, p. 5.

Description of progress of dredging of Alakea St. slip and deposition of dredge spoils inside the naval sea wall makai of the Immigration Station, which had been raised two feet by this deposition.

Anon. (1906). Honolulu marine railway. Pacific Commercial Advertiser. Honolulu, Jul. 2, p. 69.

Brief history of the development of the Honolulu marine railway built in 1882 and its early lessees and operators.

Anon. (1906). Harbor dredging finished. Hawaiian Star. Honolulu, Aug.7, p. 8.

Note of completion of harbor dredging and filling in of some of Quarantine Island.

Anon. (1907). Shipping sugar. Paradise of the Pacific. 20: 16-17.

Picture of docking area for Oahu Land and Railway.

Anon. (1907). Honolulu's harbor light. Paradise of the Pacific. 20: 12-13.

Picture and description of Honolulu Harbor's old lighthouse, which stood at the Ewa side of the entrance channel.

Anon. (1907). Alakea wharf. Ready for delivery next week with a prospect of pilikia. Hawaiian Star. Honolulu, Nov. 12, p. 8.

Notice of completion of construction of Alakea St. wharf, to be used for docking large ocean liners.

Anon. (1907). Alakea wharf accepted today. Hawaiian Star. Honolulu, Dec. 11, p. 1.

Completion and transfer of Alakea St. wharf to Hawaiian Territory, built at cost of $91,000 and eight months to construct.

Anon. (1911). No title. Hawaiian Almanac Annual, Press Publishing. 35:

Minimum depth at Honolulu Harbor channel entrance given as 33 feet and general depth in harbor as 35 feet.

Anon. (1914). Honolulu Harbor extension plans. Hawaiian Almanac Annual, Press Publishing. 39: 110-120.

Description of proposed dredging of the of a 600 foot long 400 foot wide channel from Kalihi Basin to Palama Basin to increase harbor area above the existing 97 acres.

Anon. (1920). Harbor Extension. Hawaiian Almanac Annual, Press Publishing. 44: 149.

Description of proposed harbor plan, which would add ten additional large piers on the west side of the harbor which would provide wharfage for a total of 52 vessels. However, project was turned down.

Anon. (1922). Health Board wants fishing sampans moved. Hawaiian Star Bulletin. Honolulu, Feb. 21, p. 2.

Request by Board of Health to move fishing boats to not yet completed Kewalo Basin due to concern that polluted water from Nuuanu Stream (characterized as "simply an open sewer") would contaminate fish catches when used for washing down boat decks and compartments.

Anon. (1922). Harbor board would develop Kewalo Basin. Hawaiian Star Bulletin. Honolulu, Dec. 21, p. 1.

Description of planned acquisition of land and budgeting of $300,000 of public funds to dredge and construct Kewalo basin for docking of fishing sampans and lumber cargoes, which then required wharfage in Honolulu Harbor.

Anon. (1923). Untitled Photo. Paradise of the Pacific. 36: 92.

Aerial view of Honolulu Harbor before Kalihi entrance channel was dredged

Anon. (1924). Harbor Extension. Hawaiian Almanac Annual, Press Publishing. 48: 161.

Bids received at the end of 1922 for 800 foot wide, 35 foot deep Kalihi channel extension. When completed this project would give an extended wharfage of over 1000 feet.

Anon. (1924). Untitled Photo. Paradise of the Pacific. 37: 120.

View toward Sand Island with HECO's Honolulu Generating Station in foreground and a four masted ship at Pier 1 area.

Anon. (1925). Untitled Photos. Paradise of the Pacific. 38: 5.

Aerial view of harbor entrance channel before it was increased by dredge spoils from Kalihi channel, and a view of the harbor from a ship leaving the main channel.

Anon. (1927). Untitled Photos. Paradise of the Pacific. 40: 8-9.

Photo of Honolulu Harbor looking toward railway docks, and view along docks showing sailing ships as they appeared in 1900.

Anon. (1927). Untitled Photo. Paradise of the Pacific. 40: 9.

Aerial view toward Sand Island showing entire harbor before dredging of Kalihi Channel and enlargement of Sand Island.

Anon. (1927). Untitled Photos. Paradise of the Pacific. 40: 74.

Aerial view of Honolulu Harbor looking toward mountain, and similar view from the water.

Anon. (1928). Kalihi Basin entered. Hawaiian Almanac Annual, Press Publishing. 52: 129.

First large craft entered new Kalihi Basin on June 27, 1927

Anon. (1929). King Kalakaua's famous boathouse in Honolulu Harbor. Paradise of the Pacific. 42: 26.

Photo of boathouse taken in Nov. 1885 with view toward mountains.

Anon. (1933). Untitled Photo. Paradise of the Pacific. 46: 49.

Aerial view of west section of the harbor showing tip of Sand Island and new Kalihi Channel.

Anon. (1936). The old Honolulu Fort. Paradise of the Pacific. 48: 43-49.

Description of the building of the Honolulu Fort in 1816, its history until its destruction in 1857 and use of its material for filling in the waterfront and making seawalls.

Anon. (1938). Plan of Honolulu Harbor, 1818. Paradise of the Pacific. 50: 8.

Copy of earliest existing chart of Honolulu Harbor, made by Tabulevitch of the Russian sloop *Kamschtaka* in 1818, showing harbor entrance and various identified buildings and docks.

Anon. (1938). The "Broughton" survey of Honolulu Harbor, 1796. Paradise of the Pacific. 50: 14.

Short description of the first survey of Honolulu Harbor by Capt. Broughton of the *HMS Providence* in Feb. 1796, and its subsequent loss, probably in a shipwreck off Formosa in 1797.

Anon. (1950). The ports of Hawaii. Propeller Club of the U. S., Honolulu.

Brief description of events for Honolulu Harbor from its discovery in the 1890s to 1950

Anon. (1967). The ports of Oahu. Honolulu Propeller Club, Honolulu.

Condensed history and description of Honolulu Harbor in 1967.

Anon. (1978). A study to determine the feasibility of providing shore protection to portions of Sand Island, Oahu, Hawaii. U. S. Army Engineer District, Honolulu.

Description and anticipated environmental impacts of repairing and maintaining seawall to prevent further erosion along 2615 ft length of shoreline along Sand Island Park on east side of Sand Island.

Anon. (1985). Honolulu Harbor educational resource packet. Univ. Hawaii Sea Grant Extension Serv., Honolulu.

Concise history of Honolulu Harbor (duplication of 1967 Ports of Honolulu article for the Propeller Club)

Baker, R. J. (1950). Sketches and Maps of Old Honolulu. Honolulu, R. J. Baker.

Collection of copies of artists sketches and maps of Honolulu, including harbor area from pre-20th century.

Beechert, E. D. (1991). Honolulu, Crossroads of the Pacific. Columbia, S. C., Univ. South Carolina Press.

Detailed history of events and uses of Honolulu Harbor and its central importance in the economy of Hawaii.

Board of Engineers for Rivers and Harbors (1926). The port of Honolulu, Hawaii. The ports of the territory of Hawaii. Washington, D. C., U. S. War Department**:** 5-79.

Detailed description, regulations and practical information for mariners concerning Honolulu Harbor in 1926.

Brock, R. E. (1991). An analysis of benthic communities in the zone of mixing for the Honolulu and Kahului Electrical Generation Facility. Hawaiian Electric Environmental Department, Honolulu.

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Burgess, G. H. (1857). Port of Honolulu: BPBM CP21209 and CP76782.

View of Honolulu waterfront looking mauka at approx. Nuuanu St.

Buske, N. and J. C. McCain (1972). A preliminary survey of the marine environmental impact oof the Honolulu Power Plant. Hawaiian Electric Environmental Department, Honolulu.

Temperature and salinity measurements in the vicinity of the Honolulu Generating Station in Honolulu Harbor.

Cartwright, B. (1923). The first discovery of Honolulu Harbor. Hawaii Historical Society, Honolulu.

Detailed account of the discovery of Honolulu Harbor in December 1786 by Mr. Hayward of the the *King George* under command of Captain Nathaniel Portlock, or of an alternative opinion by Professor Alexander, the historian, of its first entry by a foreign vessel in February, 1794 by Captain Brown in the schooner *Jackal* and Captain Gordon in the sloop *Prince Lee Boo*. They called the harbor "Fair Haven", which may be a rough translation of the Hawaiian name *Honoonoono*.

Cartwright, B. (1925). Honolulu in 1809-10. Paradise of the Pacific. 38: 59-66.

Description of early Honolulu, known as Kou, and its earliest European inhabitants who came around or before 1795. Drawing of shoreline showing beach and Nuuanu Stream mouth with grass huts and palm trees in background. Mentions first survey of harbor in 1796 by Captain Broughton of British Navy.

Cartwright, B. (1937). Punia-iki -- A legend of Honolulu. Paradise of the Pacific. 49: 25-27.

Hawaiian Legends associated with district of Kou, print showing Honolulu Harbor near fishpond and Nuuanu Stream from anchorage in 1828 and map of harbor made by Duperrey in 1819.

Cartwright, B. (1938). Old Honolulu. Paradise of the Pacific. 50: 33-34.

Description of earliest European visitors to Honolulu (Fairhaven) and Honolulu Harbor and the earliest charts made.

Choris, L. (1822). Vue du port hanarourou:

View of Honololu Harbor showing Old Fort and grass housed to right

Choris, L. (1822). Port d'hanorourou:

View of grass houses on Honolulu Harbor shoreline looking toward harbor entrance

Cox, D. and G. Gordon, Jr. (1970). Estuarine pollution in the State of Hawaii. Vol. 1. Statewide survey. Water Resources Research Center, Univ. Hawaii, Honolulu.

General description of Honolulu Harbor water resources, stream flow and pollution sources in early 1970's. Median coliform counts at that time were only 6 MPN/100 for six years of sampling at harbor entrance, but soared to 125,000 MPN/100 in the Sand Island Channel, and to 20 million MPN/100 in the Kapalama Canal. Fish kills affecting up to 100,000 fish had occurred in the Kapalama Canal in May, 1963, July, 1965, and September, 1966.

Department of Accounting and General Services (1972). Draft environmental impact statement for Marine Expeditionary Center, Snug Harbor, Honolulu, Oahu, Hawaii.

Description of the development proposed for the Marine Expeditionary Center to be located at Piers 43-46 in Honolulu Harbor and very brief coverage of the anticipated environmental effects of the proposed development

Emmert, P. (1862). Honolulu Harbor:

Lithograph of view of Honolulu waterfront looking mauka at approx. Fort St. and showing west end of esplanade.

Environmental Consultants Inc. and Hawaiian Electric Company Inc. (1974). The marine biological impact of the Honolulu Power Plant. A summary of the 1974 investigations. Hawaiian Electric Environmental Department, Honolulu.

Description of third and final year of monitoring of marine environmental effects of discharge from Honolulu Power Plant. Provides data for water temperatures, biomass of zooplankton, phytoplankton species composition, and species composition and growth of resident fish species.

Fitzpatrick, G. L. (1947). The Early Mapping of Hawai'i. Volume I. *Palpal'aina*. Honolulu, Editions Limited.

Compilation of all of early maps of Honolulu Harbor and annotations, beginning with original 1816 chart of the harbor by Otto von Kotzebue. Also, description of first use of the harbor and its probable discovery by William Brown and Captain Gordon of the ships *Jackal* and *Prince Lee Boo* in November, 1793, at its probable first survey by William Broughton in 1796. However, survey results have never been located.

Harbors Division, H. D. (1986). 2010 Master plan for Honolulu Harbor. Hawaii State Dep. Transportation and Maritime Affairs Committee, Hawaii Chamber of Commerce, Honolulu.

Descriptions of changes in Honolulu Harbor from 1995 plan that had been completed to date, and recommendation for changes to be enacted in the future.

Honolulu, City and. County (1914). Extension of Honolulu Harbor to Kapalama Basin. U. S. Board of Engineers for Rivers and Harbors, Honolulu.

Statement in support of developing Honolulu Harbor to meet increases in shipping traffic expected from opening of Panama Canal.

Judd, W. F. (1975). Palaces and Forts of the Hawaiian Kingdom. Palo Alto, Pacific Books.

Detailed description of the construction, structure, use and removal of the Honolulu Fort which existed from 1816 to 1857.

Lacayo Planning Inc. (1993). Pier 38 Master Plan. Hawaii State Dep. Bus., Econ. Dev. and Tourism, Honolulu.

Master plan of redevelopment of Pier 38 area for utilization as University marine research complex and docking facilities.

Larrison, G. K. (1941). Background and data on activities pertaining to the development of Honolulu Harbor. Maritime Affairs Committee of Honolulu Chamber of Commerce, Honolulu.

Brief history of dredging activities from 1898 to 1941, ownership of piers in 1914 and subsequent construction, and dredging activities authorized by the Board of Engineers for 1941 and following.

Llewellyn, A. D. (1947). Honolulu Harbor. The Military Engineer. 39: 51-55.

Detailed account of dredging and filling operations in Honolulu Harbor from first widening of entrance channel in 1889 to seaplane runways in Keehi Lagoon during WW II.

McCain, J. C. and J. M. J. Peck (1972). The marine biological impact of the Honolulu Power Plant. A summary of the 1972 investigations. Hawaiian Electric Environmental Department, Honolulu.

Description of first years monitoring of marine environmental effects of discharge from Honolulu Power Plant. Conclusions not specific but provides data for water temperatures, biomass of zooplankton, benthic fouling and fish species found and tissue residues of heavy metals.

McCain, J. C. and S. L. Coles (1973). The marine biological impact of the Honolulu Power Plant. Hawaiian Electric Environmental Department, Honolulu.

Description of second years monitoring of marine environmental effects of discharge from Honolulu Power Plant. Provides substantial data for water temperatures, biomass of zooplankton, phytoplankton species composition, coral abundance and size distributions in intake and discharge basins, fish species and growth rates and tissue residues of heavy metals.

McCain, J. C., S. L. Coles, et al. (1975). The marine biological impact of the Honolulu Power Plant. Univ. Hawaii Sea Grant, Honolulu.

Duplication of 1973 HECO report describing second years monitoring of marine environmental effects of discharge from Honolulu Power Plant.

Mellen, G. W. (1938). Ships come in. The Sales Builder 11(6): 2-15.

Rambling account of Hawaii's maritime history, with excerpts on first arrivals in Honolulu Harbor of various type of craft, marine related businesses and changes in Harbor itself.

Metcalf, T. (1847). Land Grants and Awards. Honolulu

Map showing Honolulu and its waterfront with ownership of buildings and property.

Oceanit Laboratories Inc. (1990). Marine environmental assessment for the waterfront at Aloha Tower. Hawaii State Aloha Tower Development Corp., Honolulu.

Marine environmental survey results and assessment of impact for redevelopment of Aloha tower waterfront complex (Piers 5-14). Additional data given for Kapalama and Kalihi Channels. Stated "Water quality results indicated that the harbor is in relatively good condition and falls with State DOH water quality standards.... Results from marine and benthic habitat investigations show that marine life is neither abundant nor diverse in most areas of Honolulu Harbor. There

are no rare, endangered or threatened species identified within or near the project area.... A major area of abundant sea life is the sea wall extending from the base of Pier 8 to Pier 7 (electric plant inlet) and around the rock revetment of Piers 5 and 6 (electric plant outlet)".

Perkins, R. W. (1917). Six mile view of Honolulu from busy harbor to Diamond Head. Honolulu, Paradise of the Pacific. 30: 16-17.

Early picture of Honolulu Harbor's waterfront

Pitzer, P. (1980). New life for Aloha Tower. Honolulu: 43-48.

Description of Hawaii Maritime Museum originally located in the Aloha Tower but later moved to Pier 7.

Pollack, J. B. (1928). Fringing and fossil coral reefs of Oahu. B. P. Bishop Mus. Bull. 55: 1-56.

Description of process of Honolulu Harbor formation and of dredged and filled areas for Sand Island and Kalihi Basin that existed to date.

Rockwood, P. (1957). Honolulu in 1810. Bishop Museum Press, Honoulu.

Detailed map and notes indicating sites of residences and structures in Honolulu and along its waterfront in 1810.

Rush, B. F. (1957). History of construction and development of Honolulu Harbor. Board of Harbor commissioners, Honolulu.

Detailed history of Honolulu Harbor and Kewalo Basin, with extensive information on dates of dock and pier development and filling operations.

Sabin, W. F. (1902). Rotten Row. Paradise of the Pacific 15(12): 58-59.

Description of final resting place (location unspecified) in Honolulu Harbor for derelict ships and some of their descriptions.

Sakai, K. T. (1968). Investigation of Harbor Disturbances in Honolulu Harbor, Oahu, Hawaii. Civil Engineering. Honolulu, Univ. of Hawaii:

Analysis of factors responsible for disturbances of moored ships at Piers 1, 2, (most severe) and Piers 8, 9 and 10. Possible causes were southern swells with periods of 14 to 22 sec. and Kona storms generating long period waves.

Scott, E. B. (1968). A wife poisoner swung from the gallows. A Saga of the Sandwich Islands, Sierra Tahoe Publishing

Drawing showing walls of Honolulu Fort looking seaward, and narrative describing its building in 1816 and history, including its use as site for Hawaii's first hanging, and its demolition in 1857.

Shell Oil Co. (1972). Final environmental statement administrative action for Project A-61002 Pipeline-Honolulu Harbor to International Airport Storage Terminal-Sand island Access Road. Hawaii State Department of Transportation, Honolulu.

Evaluation of the environmental impact of Shell Oil storage site at Sand Island Access Road and approximately 2.8 miles of pipeline easements between Honolulu Harbor and Honolulu International Airport.

Simpson, A. (1843). Map of the city of Honolulu. Honolulu, The Saga of the Sandwich Islands:

Map published on August 25, 1843 showing listing of business houses, residences and Honolulu Fort.

Stangenwald, H. (1854). Tower, cupola and bell. Honolulu, The Saga of the Sandwich Islands:

Earliest known photo of Honolulu taken in 1854 from the tower of Kawaihao Church and looking Ewa, showing Oahu Charity School, Sumners Island and the western tip of Quarantine Island in Honolulu Harbor.

Stewart, C. H. (1936). Honolulu Harbor. Military engineer 28(157): 22-28.

Detailed history of Honolulu Harbor and its development with information of dredging dates and quantities.

Stroup, E. (1959). The ports of Oahu. Honolulu Propeller Club, Honolulu.

Brief history and detailed description of Honolulu Harbor, especially Piers 39-40, at time of statehood.

Thomas, W. J. (1979). Aspects of the micro-community associated with *Telesteo riisei*, an introduced alcyonarian Species. Masters Thesis, Dep. of Zoology. Honolulu, Univ. of Hawaii: 88 pp.

A three year study of the introduced shallow-water octocoral *Telesteo riisei* and its associated micro-community in Honolulu Harbor revealed a fairly stable community, in terms of biomass, for the first two and a half years, with seasonal fluctuations of species composition and numbers of species and individuals in this community.

Towill, R. M. (1982). Revised environmental impact statement for commercial fishing berthing area pier 16, Honolulu Harbor, Oahu. Hawaii Department of Transportation, Honolulu.

EIS prepared for extension of Piers 16 and 17 for additional fishing boat docking.

U. S. Army Corps of Engineers (1958). General design for modification of Honolulu harbor. U. S. Army Engineer District, Honolulu, Honolulu.

Design memorandum describing dredging to be done to complete the Kalihi Channel to Kapalam Basin originally began pre-WW II but discontinued toward the end of the war. Renewed project provided for an entrance channel 40 ft deep 500 ft wide and 400 ft long

U. S. Army Corps of Engineers (1963). Review report on survey of Honolulu Harbor and Barbers Point Harbor for navigation, Oahu, Hawaii. U. S. Army Engineer District, Honolulu, Honolulu.

Statement authorizing the modification of Honolulu Harbor to deepen entrance channel and interior areas by 5 feet and to widen interior connecting channel by 60 feet, and to construct supplementary deep draft harbor at Barbers Point.

U. S. Army Corps of Engineers. (1976). Final environmental impact statement, Honolulu Harbor. U. S. Army Engineer District, Honolulu, Honolulu.

Environmental impact statement describing the plan and estimated impacts of dredging main entrance channel of Honolulu Harbor to 45 ft, dredging basins and Kapalama Channel to 40 ft, ,

and widening Kapalama channel by 60 ft for a distance of 3100 ft. Dredged material of about 1.3 million cu. yds. to be disposed of at deep ocean disposal site.

U. S. Army Corps of Engineers (1976). Honolulu Harbor Phase I general design memorandum plan formulation. U. S. Army Engineer District, Honolulu, Honolulu.

Presents the results of the Phase I post-authorization studies for modification of Honolulu Harbor, including dredging main entrance channel of Honolulu Harbor to 45 ft, dredging basins and Kapalama Channel to 40 ft, and widening Kapalama channel by 60 ft for a distance of 3100 ft. Dredged material of about 1.3 million cu. yds. to be disposed of at deep ocean disposal site.

U. S. Army Corps of Engineers (1977). Honolulu Harbor Design memorandum No. 1. Phase II project design. U. S. Army Engineer District, Honolulu, Honolulu.

Provides details of the plan of improvement presented in the plan formulation study and summarized in the Phase I post-authorization studies for modification of Honolulu Harbor, including dredging main entrance channel of Honolulu Harbor to 45 ft, dredging basins and Kapalama Channel to 40 ft, and widening Kapalama channel by 60 ft for a distance of 3100 ft. Dredged material of about 1.3 million cu. yds. to be disposed of at deep ocean disposal site.

U. S. Army Corps of Engineers (1978). Sand Island shore protection, Oahu, Hawaii. U. S. Army Engineer District, Honolulu, Honolulu.

Environmental assessment of effects of constructing a revetment along Honolulu Harbor side of Sand Island. Limited information on marine biota.

Ultramar Laboratory. (1968). Water quality study Honolulu Harbor, Keehi Lagoon and nearshore waters from Kewalo Basin to Ahua Point. Hawaii State Department of Health, Honolulu.

Results of water quality sampling in vicinity of Honolulu Harbor prior to removal of Sand Island sewage outfall offshore.

United States Foreign trade Board (1974). Final environmental impact statement. U. S. Dep. Commerce, Washington, D. C.

Description of proposed development and environmental impacts of Hawaii Independent Refinery trans-shipment terminal in Honolulu Harbor on Sand Island Access Road.

Waldman, A. (1982). Honolulu, port of perpetual change. Honolulu: 62-65.

Brief historical excerpts for Honolulu Harbor from pre-European contact to 1982.

Walsh, W. (1898). Honolulu Harbor. Paradise of the Pacific. 11: 17-18.

Description of harbor with details on area (73 acres) and channel dimensions (1200 ft long, 200 ft wide, 30 ft deep) at that time. First ship to enter after the dredging of the deep channel was the *Oceanic,* which entered on May 9, 1893. Description of the Esplanade, built by filling sand behind the walls of the former fort, which was torn down in the 1850s and the walls used to build a retaining wall at the edge of the harbor. Further work to expand wharfage mentioned.

Waterfront, D. C. (1976). A waterfront design concept for Honolulu Harbor. Downtown Improvment Association, Honolulu.

Description of planned changes in the Aloha Tower complex to make it the focus of downtown development.

Watson, L. J. (1933). A comprehensive survey of the harbor system of Honolulu. Special Committee on Honolulu Harbor Development, Honolulu Chamber of Commerce, Honolulu.

List and details of eight projects proposed to develop Honolulu Harbor as of 1933, including increasing main channel width and depth, dredging direct channel from Kapalama Basin to the sea, enlarging Kapalama Basin, filling areas of Kapalama, Sand Island and Fort Armstrong and improving Kewalo Basin entrance.

Webster, W. (1854). Untitled. The Polynesian. Honolulu, Mar. 28.

Letter of rebuttal by the designing engineer of the project to dredge and fill the Honolulu waterfront to the anonymous critic "Amicus", regarding estimated costs of construction and completion of the project.

Webster, W. (1854). The water lots again. The Polynesian. Honolulu, Feb. 4.

Description by the designing engineer of the project to dredge and fill the Honolulu waterfront detailing dimensions of property to be created by filling and an itemized estimates of the costs of the project, based on the availability of 1500 cu. yds. of coral blocks from the to be dismantled Honolulu Fort.

Wendt, D. (1989). Teachers resource book for Honolulu Harbor and shoreline cruises. Univ. Hawaii SeaGrant, Honolulu.

Map copies and descriptions of Honolulu's waterfront development from 1840 to 1957.

Wilson Okimoto & Assoc. (1969). Honolulu Harbor 1968. A planning and engineering guide for the development of the Honolulu waterfront. Harbors Division, State of Hawaii Dep. Transportation, Honolulu.

Detailed history of pier development and ownership, maps indicating topography, locations and ownership of piers in 1968.

Wilson Okimoto & Assoc. (1991). EIS and preparation notice for the Marine Education and Training Center and public boat launch facility, Sand Island, Oahu. Honolulu Waterfront Project, State of Hawaii Dep. Bus. Econ. Dev. and Tourism. Honolulu.

Description and anticipated environmental impacts of development of Marine Education and Training Center and public boat launch facility at west end of Sand Island.

AECOS (1995). Final report: water quality for the Sand Island Marine Education and Training Center and Public Launch Facility, Ke'ehi Lagoon. Hawaii State Dep. Bus. Econ. Devel. and Tour. Honolulu Waterfront Project, Honolulu.

Water quality parameters monitored at six stations in vicinity of proposed METC , at NW end of Sand Island, in waters of Ke'ehi lagoon and seaplane runway "D". Area was well mixed vertically and horizontally, and no impacts from METC construction activities were apparent.

Anon. (1945). Army activities resulting in benefits to the Territory of Hawaii. U. S. Army Forces Middle Pacific, Honolulu.

Information on material removed and costs for dredging seaplane runways in Keehi Lagoon before and during WW II.

Anon. (1972). Honolulu's Reef Runway. Airport World. October 1972:

Bathen, K. H. (1970). The circulation in Keehi Lagoon, Oahu, Hawaii, during July and August, 1968. Haw. Inst. Mar. Biol., Honolulu.

The surface circulation was found to be strongly dependent upon the prevailing winds. A westward flow of surface water occurred in most areas of the lagoon except during periods of weak winds. The subsurface flow was strongly dependent on bathymetry. This flow was either to or from the lagoon whether a flooding or ebbing tide was in process. However, on the eastern side of the lagoon, the incoming transport was greater than the outgoing transport, particularly in a dredged ship channel that crossed the lagoon entrance reef. In contrast, the outgoing transport was greater than the incoming transport on the western side of the lagoon. These conditions result in a limited amount of daily flushing of the lagoon from the west to the east.

Chapman, G. A. (1979). Honolulu International Airport Reef Runway post construction environmental impact report. Vol. 1. Executive Summary. Hawaii State Dep. Transportation, Honolulu.

Summary of environmental impact studies on water circulation, water quality, benthos and fish, noise and birds post construction of reef runway. Overall, all were substantially improved or unaffected by the runway construction. Flushing of Keehi Lagoon was increased 25-35% by the channels dredged for the runway, and water quality improved by the increased flushing that resulted, as well as by removal offshore of the Sand Island sewage outfall. Dredged areas showed quick recovery of infaunal organisms and fish, and rapid habitation of new circulation channels and borrow pits formed by dredging. Although there was an irretrievable loss of over 500 ha of shallow reef by dredging and filling for the runway, the steep walls of the channels and barrow pits and the increased circulation permitted the establishment of complex marine communities in areas where stagnant conditions and low relief supported minimal populations of marine organisms.

Cox, D. and G. Gordon, Jr. (1970). Estuarine pollution in the State of Hawaii. Vol. 1. Statewide survey. Water Resources Research Center, Univ. Hawaii, Honolulu.

General description of Keehi Lagoon stream flow and pollution sources in early 1970's, before completion of the Honolulu Reef Runway. Tidal transport was to the westward, water entering

through Kalihi Ship Channel and leaving past Ahua Point. Major pollution sources were Moana lua and Kalihi Streams and localized sources in vicinity of seaplane runway. Coliform analyses in 1960's showed elevated concentrations in stream mouths, Kalihi Channel, and in reef runway areas up to 1 million MPN/100ml. Keehi Lagoon was second largest producer of baitfish in 1965, but subject to fish kills. A kill of ca. 100 fish occurred in the Lagoon in May 1966, and two more kills occurred at drainage canal entrances on the shore between Keehi Lagoon and Pearl Harbor in Oct. 1960 and January 1964.

Environmental Consultants Inc. (1977). Post construction water quality, benthic habitat and epifaunal survey for the reef runway, Honolulu International Airport. Ralph M. Parsons C., Honolulu.

Interim report for post construction surveys of impacts of reef runway construction on marine biota of Keehi Lagoon. Stations located in lagoon proper, outside of runway and in Hickam Harbor basin.

Environmental Consultants Inc. (1978). Marine environmental survey for the Ke'ehi Lagoon unauthorized landfill. U. S. Army Engineer Division , Pacific Ocean, Honolulu.

Measurements of soluble petrochemical concentrations (expressed as naphthalene and "asphalt" aromatic hydrocarbons and infaunal densities in sediments of northeast Keehi Lagoon in vicinity of Kalihi and Moanalua Stream mouths to beginning of seaplane runway. Result showed substantial oil contamination of sediments tha may have been leaching form the landfill but also suggested other sources such as drainage ditches. Sediments in northeast basin were almost entirely terrigenous, with a substantial portion of asphalt fragments worn form the shoreline. Predominant benthic habitat was mud bottom dominated by small oligochaetes and polychaetes by number, an alpheids and large polychaetes by biomass. Few attached invertebrates found along the shoreline of the landfill dominated by a single sponge species.

Environmental Consultants Inc. (1979). Post construction water quality, benthic habitat and epifaunal survey for the reef runway, Honolulu International Airport. Final Report. Water Quality. Ralph M. Parsons Co., Honolulu.

Final report for post construction surveys of impacts of reef runway construction on water quality of Keehi Lagoon. Stations located in lagoon proper, outside of runway and in Hickam Harbor basin. Water quality in most areas surrounding the Reef Runway found to improve over conditions prior to construction, primarily due to increased flushing efficiencies resulting from reconfiguration of Keehi Lagoon and Hickam Harbor. Increased water transport thorough Honolulu Harbor had improved conditions in contiguous areas. This reflected by decreased turbidity, nutrient levels and chlorophyll concentrations throughout Keehi Lagoon.

Guinther, E. (1988). Biological reconnaissance surveys of selected areas in Ke'ehi Lagoon, O'ahu, Hawai'i. OI Consultants, Inc., Honolulu.

Survey of site at outer end of N-S Seaplane Runway "D" extending off Kalihi Channel. Scattered corals, abundant macroalgae and macroinvertebrates, few fish. Coral and fish abundances increase immediately west of the channel

Harvey, G. W. (1970). Keehi Lagoon Ecological Survey. June to September, 1970. Oceanic Institute, Makapu'u Oceanic Center, Waimanalo.

Brief report on benthic flora and fauna inside and outside of Keehi Lagoon pre-reef

runway construction. Organism reports limited to micromolluscs and macroalgae.

Harvey, G. W., R. Q. Palmer, et al. (1971). Plan to enhance water quality in Keehi Lagoon and ponds makai of proposed reef runway. Ralph M. Parsons Company, Honolulu.

Current studies and analysis for design of circulation channels to enhance water circulation and quality with the construction of the reef runway.

Hawaii Office of Environmental Quality Control (1971). Report on Keehi Lagoon and Waikiki Beach water quality. Honolulu.

Measurements of coliform bacteria, pathogens and toxic chemicals in waters of Keehi Lagoon and Waikiki.

Noda, E. K. a. A. (1978). Post construction circulation study for the reef runway at Honolulu International Airport. Ralph M. Parsons Co., Honolulu.

Current studies and calculations to estimate flushing of Keehi Lagoon following construction of the Reef Runway and compare with pre-construction conditions. Flushing estimated to increase by 255 for tradewind conditions and 32% for light and variable winds. Ironically, flushing under light-variable winds exceeded tradewind flushing by about 50%. Flushing was much larger than the volume of a tidal prism, 31/2 to 51/2 times as much water than would be expected from a simple tidal prism transfer. Major portion of the water transferred in a flushing was between Keehi lagoon and Honolulu Harbor. In portions of Keehi Lagoon isolated from the main lagoon by runway construction, flushing was still high. Water exchanged between Hickam Harbor and the marine pond was about 14% on a tidal cycle. Between Hickam Harbor and the open ocean, about 26% of the total volume, or 2.24 times the tidal prism volume, was exchanged through the circulation channel.

Noda, E. K. and Assoc. (1989). Ke'ehi Lagoon recreation plan. Hawaii State Dep. Transportation, Honolulu.

Plan and environmental impacts for development of recreation opportunities in Ke'ehi Lagoon, including recreational and commercial boating, canoe and yacht racing, water skiing, waterfront parks, ocean education, research facilities and commercial-industrial developments.

OI Consultants Inc. (1986). Survey of the water quality, benthic habitat and infaunal populations for Keehi Lagoon, Hickam Harbor and marine pond, Honolulu International Airport. KFC Airport, Inc., Honolulu.

Follow-up study to 1979 post construction environmental assessments of effects of reef runway construction on circulation, water quality and biota of Keehi Lagoon. Water quality conditions were not different, with a few exceptions, from the 1978-78 post construction results. Any differences detected were not indicative of any pattern of degradation in overall water quality. Biotic communities were similar to previous conditions, with development of attached macrofauna, esp. sponges and the coral *Pocillopora damicornis*, which had become moderately common in 1986. Total results suggested an overall stability of the biotic community through time.

Palmer, R. Q. and J. R. Walker (1971). Hydraulic model investigation: proposed development of Anuenue and Keehi Lagoon areas. Univ. Hawaii Look Lab, Honolulu.

Hydraulic model used to predict effects of storm waves, tsunami and water circulation associated with development of the Reef Runway. Model suggested maximum wave height would be approximately two feet during unusually large or infrequent waves, not significantly higher than previous conditions.

Parsons, R. M. I. (1975). Environmental impact statement for the proposed disposal of solid waste bales in Keehi Lagoon and the coast waters of Oahu. Honolulu Dep. Pub. Works, Honolulu.

EIS for disposal of solid waste bales in Keehi lagoon marine pond, within area enclosed by proposed Reef Runway and offshore of Hickam Golf Course.

Richardson, R. C. (1945). Army activities resulting in benefits to the Territory of Hawaii. Series A. Subject 1. Keehi seaplane harbor. U. S. Army Forces, Middle Pacific, Honolulu.

Dredging of three 10 feet deep seaplane runways 2-3 miles long and one 400 by 800 foot mooring basin in Keehi Lagoon, with removal of over 17 million cu. yds of dredged material used for fill along the shoreline.

Beach, K. S., R. Harris, et al. (1995). Net phytoplankton of the Ala Wai Canal, O'ahu, Hawai'i. Pac. Sci. 49(4): 332-340.

Phytoplankton includes a minimum of 20 diatom genera, four dinoflagellaate genera and one cyanophyt genus. Dinoflagellates dominate between head of the Ala Wai Canal and the Manoa-Palolo Stream mouth because of physical conditions of stagnation and low oxygen. *Lyngbya* (Cyanophyta) occurs throughout th canal at low densities. Distribution of the dominant diatom *Skeletonema costatum* and similarity of phytoplankton population across sites indicates the migration of plankton is tidally controlled.

Brasfeild, C. W. and C. E. Chatham (1967). Magic Island complex, including Kewalo basin and Ala Wai boat harbor, Honolulu, Oahu, Hawaii. U. S. Army Engineers Waterways Experiment Station, Honolulu.

Hydraulic model for testing effect of filling shoreline between Ala Wai and Kewalo Basin to create beaches adjacent to Ala Moana Park and Magic island. Model indicated sufficient circulation to prevent stagnation of inner lagoon, but aggravation of unfavorable wave conditions existing in Kewalo Basin.

Calderone, P. A. (1971). A descriptive study of boat dwellers at the Ala Wai Yacht Harbor, Hawaii. Ph. D. Thesis University of Hawaii. Honolulu, Hawaii:

Narrative and socological analysis of lifestyles and views of residents of Ala Wai Yacht Harbor.

Cox, D. and G. Gordon, Jr. (1970). Estuarine pollution in the State of Hawaii. Vol. 1. Statewide survey. Water Resources Research Center Tec Rep 31, Univ. Hawaii, Honolulu.

Description of formation of Ala Wai Canal, Yacht Harbor and Kewalo Basin by dredging in 1920s. Ala Wai Canal was dredge to drain marsh lands for mosquito control, and Yacht Harbor also constructed, but Ala Wai Channel was originally not dredged through the reef. Instead, channel was dredged along the Ala Moana shoreline to the Kewalo Basin and Channel, which were dredged at about the same time. The Ala Wai channel was later dredged in the 1950s and the shoreline channel filled at both ends.

Analyses performed in the 1960s indicated coliform concentrations ranging up to 70,000 MPN/100 in the Ala Wai canal and and median of 2400 MPN/100ml in the yacht harbor. Kewalo Basin showed a median MPN of 2400/100ml and an upper value of 7000/100ml. However, cannery wastes that were disposed of into the Basin at that time were rerouted to the munipal sewer system by the 1970s.

De Carlo, E. H. and K. Spencer (1995). Record of lead and other heavy metal inputs to sediments of the Ala Wai Canal, O'ahu, Hawai'i. Pac. Sci. 49(4): 471-491.

Sediment cores from the Ala Wai representing 60 years of sedimentation indicate a spike of elevated Pb concentrations ranging from < 10 ppm in the oldest samples up to 750 ppm during the mid-1970s and decreasing to 100-300 ppm in recent deposits, indicating the influence of vehicle emissions and restriction of PB from gasoline. Other metals (CD, Cu, Zn) also showed increasing concentrations with time, but no mid 70s spike, indicating a continued and gradual increased input of the metals from the watershed associated with increasing anthropogenic activity. Co and Ni occurred in concentrations consistent with natural sediments.

Department of the Army. (1974). Draft environmental impact statement: Ala Wai Boat Harbor, Oahu, Hawaii. Pavific Ocean Division, Corps of Engineers, Honolulu.

Desciption of planned expansion of Ala Wai Harbor by 78 berths and its anticipated impact. Limited biological information given.

Giles, M. L. (1975). Wave and current conditions for various modifications of Kewalo Basin, Honolulu, Oahu, Hawaii. U. S. Army Engineering Division, Pacific Ocean, Honolulu.

A 1:75 scale physical model was used to test several palns of improvement proposed to eliminate crosscurrents and breaking waves in the channel and undesirable wave action in Kewalo Basin. Determined that addition of a wave absorber along the sides of the entrance channel was the most effective means of reducing wave heights in the basin.

Glenn, C. R. and G. M. McMurtry (1995). Scientific studies and history of the Ala Wai Canal. and artificial tropical estuary in Honolulu. Pac. Sci. 49(4): 307-318.

The Ala Wai Canal is an artificial estuary created in the 1920s to drain coastal wetlands borderin the present tourist are of Waikiki. Today it is polluted and hypereutrophic and receives high levels of nutrients that sustains primary production rates rivaling the highest in the world.The canal traps sediments from Manoa and Plalolo streams that have formed two large sills that restrict seawater exchange. This restricted flow and high input of organic matter from streams has resulted in severe oxygen depletion behind the sills.

Glenn, C. R., S. Rajan, et al. (1995). Geochemistry, minerology and stable isotopic results from Ala Wai estuarine sediments: record of hypereutrophication and abiotic whitings. Pac. Sci. 49(4): 367-399.

High abundance of organic carbon and carbonate in Ala Wai sediments indicates biologically induced precipitation of carbonate from the water column. Ths is the first known report of this precipitation process (whiting) in an estuarine system, although it has previously ben described in the ocean and in lakes.The canal has undergone episodes of progressive eutrophication at least twice since 1935, indicating increasing primary productivity and water stratification through time.

Gonzales, F. I. J. (1971). A descriptive study of the physical oceanography of the Ala Wai Canal. Hawaii Inst. Geophysics Tech Rep 71-7, Honolulu.

Circulation and the temperature-salinity structure of the Ala Wai Canal were measured Mar.-Dec. 1969. Heavy siltation has altered the original bathymetry of the canal into a channel, sill and basin region. Average silting rate on the sill was 20 cm/yr , renewal of water in the basin was infrequent, and anoxic conditions prevailed in the bottom meter of the average 2 m depth. Water had a minimum average residence time below the sill of at least four days. The Manoa-Palolo drainage was the principal source of high bacterial counts in the canal, although bacterial pollution from vessels in the Ala Wai Yacht Harbor was also a locally significant source.

HarborsDepartment (1984). Environmental assessment, Kewalo Basin improvements, Honolulu, Hawaii. Hawaii State Department of Transportation, Honolulu.

Description of project to increase berthing capacity of Kewalo Basin from 122 to 191 berths by 2000. Very little information provided concerning existing environment or anticipated impacts.

Harris, C. L. (1972). Primary production in a small tropical estuary. Hawaii Inst. Geophysics Rep 75-7, Honolulu.

Measurement of physical parameters, turbidity, particulate matter, chlorophyll and planktonic primary production at three stations in the Ala Wai Canal over 13 months in 1970-71 and occasionally at one station in Ala Wai Yacht Harbor. High production rates, high chlorophyll and particulate concentrations and turbidity decreased with approach to Yacht Harbor. Production primarily light limited except at Yacht Harbor. Percentage of suspended particulate matter that was living increased from 8% near Yacht Harbor to 30% at head of the canal.

Kusao, T. T. I. (1986). Environmental assessment report, Kewalo Basin landside improvements. Hawaii State Department of Transportation, Honolulu.

Description of land based activities associated with project to increase berthing capacity of Kewalo Basin from 122 to 191 berths by 2000. Virtually no information provided concerning existing environment or anticipated impacts.

Laws, E. A., D. Doliente, et al. (1993). Hypereutrophication of the Ala Wai Canal, Oahu, Hawaii: prospects for cleanup. Pac. Sci. 47(1): 59-75.

Gross photosynthetic rates in the Ala Wai are about 5.5 g C /sq. m daily, and increase by a factor of three from the mouth to the head of the estuary. Photosynthesis appears to be limited only by light availability and phytoplankton concentrations. Allocthonous imports of organic carbon exceed photosynthetic rates by about 60%. Respiration consumes about 70% of total carbon input, 18% accumulates in sediments and 12% is flushed out the canal's mouth. Sedimentation occurs at about 7-8 cu. m per year and has greatly altered the canal's bathymetry. Concentrations of particulate carbon, particulate nitrogen and chlorophyll a are comparable to values measured in the early 1970s. Surface waters are supersaturated with oxygen during the day and undersaturated at night, and subsurface waters undergo even greater diurnal fluctuations due to poor oxygen exchange with the atmosphere.

Luoma, S. N. (1974). Aspects of the Dynamics of Mercury Cycling in a Small Hawaiian Estuary. Ph. D. Thesis, University of Hawaii. Honolulu, Hawaii:

Three indicator species, *Nereis succinea, Palaemon dibilis* (deposit feeders) and *Thalamita crenata* (predator) used to study the environmental dynamics of mercury in the Ala Wai Canal. The deposit feeders concentrated mercury 160-310 times above its concentrations in seawater. However, the predator 's muscle tissue concentration of mercury never exceeded 26% of its concentration in food, indicating no food chain magnification of mecury at this trophic level. Sediments in Ala Wai showed no obvious pattern of temporal vaiation, however there was an obvious decrease in total mercury in the two detritus feeders btween the rainy and the dry season.

McMurtry, G. M., A. Snidvongs, et al. (1995). Modeling sediment accumulation and soil erosion with ^{137}Cs and ^{210} Pb in the Ala Wai Canal and central Honolulu watershed, Hawai'i. Pac. Sci. 49(4): 412-451.

Analyses indicate Ala Wai collects sediment at a mean rate of 3100 tons per year, with about 80% of the sediment composed of detrital clays and 20% of marine authigenic and biogenous phases. This equates to a physical annual denudation rate for the central O'ahu of six mg per cm. sq. , at the low end of previous estimates. At this rate the average time to fill the canal would be 60 years if little sediment escapes. The fill time for the central section receiving Manoa-Palolo

Stream runoff would only be 40 years.

Miller, J. M. (1975). Ecological studies of the biota of the Ala Wai Canal. Hawaii Inst. Mar. Biol.Tech. Rep. 32, Honolulu.

A detailed description of the physical chemical parameters of temperature, oxygen, and salinity with regard to their horizontal, vertical and seasonal distributions in the waters of the Ala Wai Canal. These parameters are in turn used to evaluate the distributions and species compositions of various marine organisms of recreation value and their associated food species.

Raine, L. M., B. Z. Siegel, et al. (1995). Mercury accumulation in sediments of the Ala Wai Canal and in soils and stream sediments of the central Honolulu watershed. Pac. Sci. 49(4): 511-525.

Highest Hg concentrations in Ala Wai Canal sediments were at the Ala Wai Yacht Harbor (0.054-2.81 ug/g) and decreased exponentially to the most distal part of the canal (0.009-0.237ug/g), suggesting tidal transport of Hg from the Yacht Harbor into the canal. Chronological analysis showed a Hg peak in sediments in the late 1950s, corresponding to the use of antifouling paints, which ended in the 1970s. A minor Hg spike occurred in 1986 coincident with the lasdt year of the intense Pu'u O'o eruption at Kilauea.

Raymond, L. P. (1972). The environmental impacts of proposed construction (Phase I) for the Ala Wai Boat harbor. Hawaii State Dep. Transportation, Honolulu.

Analyses of environmental effects of expansion of Ala Wai Yacht Harbor, measurements of water circulation and water quality in the harbor in July-Aug. 1972. Data presented for temperature-salinity, water circulation, dissolved oxygen, nutrients, primary productivity, coliform concentrations and boat activity.

Resig, J. M., K. Ming, et al. (1995). Foraminiferal ecology, Ala Wai Canal, Hawai'i. Pac. Sci. 49(4): 341-366.

Foraminifera of the Ala Wai Canal are controlled by the canal's shallow location, marine salinity, sedimentation form runoff and phytoplankton productivity. Pollutants may have produced up to 7% abnormalities in test growth, but high food availability in the back basin have produced the highest foram abundances of up to 140 tests per gram of sediment. Five foram species have dominated the assemblage for at least the last 50 years. These are widespread geographically but generally found together in areas with normal to hypersaline conditions. Maximum numbers of species of forams occurred near the Ala Wai entrance and diversity decreased with distance into the canal.

Shultz, C. D. (1971). Some chlorinated pesticides in the water, sediment and selected biota in the Ala Wai Canal, a tropical estuary on Oahu, Hawaii. Hawaii Inst. Mar. Biol. Tech. Rep. 28, Honolulu.

Measurement of pesticide contamination in the Ala Wai Canal and its accumulation in tissues of the the fishes *Elops hawaiensis* and *Chanos chanos*. Average concentrations for both species was below FDA limits, although individual fish did exceed these limits. Major source of contamination appeared to the Manor-Palolo Drainage Canal, with Manoa Stream the larger contributor. DDEE, DDD, DDT and dieldrin were the diominant pesticides throughout the Ala Wai.

Spencer, K., E. H. De Carlo, et al. (1995). Isotopic clues to sources of natural and anthropogenic lead in sediments and soils from O'ahu, Hawai'i. Pac. Sci. 49(4): 492-510.

Sediment cores from the Ala Wai representing 60 years of sedimentation indicate a spike of elevated Pb concentrations ranging during the mid-1970s. The timing of the Pb concentration peak and the simultanoues rise in ZN and Cd, two elements used in tire vulcanization, strongly suggest the the primary source of Pb was tetraethyl Pb used in gasoline. Elevated concentrations of Pb continue to deposti in the Ala Wai from Manoa Stream, which has uncontaminated sediments at its headwaters, suggesting local anthropogenic souces along the stream's watershed, as well as natural souces of Pb from rock weathering and aerosols.

Walker, J. R. (1973). Surfing assessment, Ala Wai Small Boat Harbor, Oahu, Hawaii. James K. K. Look Lab. Tech Rep. 7, Honolulu.

Effects of sea wall construction along shoreline at Ala Wai Yacht Harbor analyzed for impact on surfing by wave refraction and reflection. Both estimated to be increased by 10% and considered to be insignificant impacts.

Wolbrink, D. and Assoc.. (1969). Ala Wai Boat Harbor, Honolulu, Hawaii. Hawaii State Dep. Transportation, Honolullu.

Plan for expansion and upgrading of Ala Wai harbor for a net increase of 359 slips, to be done by construction of one new mole and the extension.

AECOS, I. (1986). Water quality monitoring study, Barbers Point Deep-Draft Harbor, Oahu, Hawaii. U. S. Armey Corps of Engineers, Pacific Ocean Division, Honolulu.

Bienfang, P. K. and R. E. Brock (1980). Predevelopment reconnaisssance of the water quality and macrobiota conditions affronting West Beach coastline, Oahu, Hawaii. Environmental Communications, Inc., Honolulu.

Environment Consultants Inc. (1975). Marine Environmental Assessment, Barbers Point Barge Harbor, Oahu, Hawaii. U. S. Army Engineering Division, Pacific Ocean, Honolulu.

Description and assessment of impact of the Barber's Point Barge Harbor on the nearshore marine environment prior to construction of the Deep Draft Harbor. Two stations taken inside the harbor provide the only description of biota inside the harbor prior to the present study.

Mink & Yuen, I. (1993). Hydrogeological impacts, proposed expansion of the Barbers Point Harbor. Hawaii State Department of Transportation, Honolulu.

M_&_E_Pacific (1978). Revised environmental impact statement for the Barbers Point Deep-Draft Harbor on Oahu. Hawaii Department of Transportation, Honolulu.

Final EIS for proposed expansion of Barbers Point Barge Harbor to Deep Draft Harbor involving removal of 10.6 million cu. yd. for 92 acre landlocked basin 45 feet deep, connected with ocean by entrance channel 4280 feet long by 450 feet wide. Three fish reported present in barge harbor (*Pomacentrus jenkinsi, Thallosoma duperryi* and *Stethojulis balteata*)

OI_Consultants (1987). Baseline suvey of water qulity and benthic resources in the nearshore marine environment off West Beach, Oahui. West Beach Estates, Honolulu.

OI_Consultants (1990). Post-Construction survey of nearshore marine water quality at West Beach, Oahu, Part I. West Beach Estates, Honolulu.

Parsons, B., Quade & Douglas (1995). Final Supplemental Environmental Impact Statement. Hawaii Department of Transportation, Honolulu.

Environmental impacts of basin and tug pier expansion, future pier and storage yard improvements at Barbers Point Harbor.

U. S Army Corps of Engineers (1976). Barbers Point Harbor, Oahu, Hawaii: Final Environmental Statement. Hawaii Department of Transportation, Honolulu.

Plans and potential impacts of construction of Barbers Point Deep Draft Harbor.

U. S Army Corps of Engineers (1991). Barbers Point Harbor modification study, island of Oahu, Hawaii. Hawaii Department of Transportation, Honolulu.

Description and justification of expansion of Barbers Point Deep Draft Harbor.

APPENDIX C

Listing of Marine Organisms Reported for all studies in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, Ala Wai Yacht Harbor and Barber's Point Deep Draft Harbor

South and West Oahu Harbors Checklist

Kingdom: Monera
Phylum: Cyanophycota
- Unidentified Cyanophycota
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- *Ocillatoria* sp.
1998 - Current Project Spec (Barbers Point Harbor)
Class: Cyanophyceae
Order: Nostocales
Family: Oscillatoriaceae
- *Lyngbya majuscula*
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
- *Lyngbya* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- *Symploca hydnoides*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Kingdom: Protista
Phylum: Bacillariophyta
Class: Bacillariophyceae
Order: Centrales
Family: Biddulphiaceae
- *Biddulphia longicruris*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Eucampia* sp.
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Chaetoceraceae
- *Chaetoceros compressus* Lauder
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Chaetoceros compressum*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Chaetoceros compressum*.)
Family: Coscinodiscaceae
- *Coscinodiscus* sp.
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Rhizosoleniaceae
- *Rhizosolenia* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Thalassiosiraceae
- *Skeletonema costatum*
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Thalassiosira* sp.
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)

Order: Pennales
Family: Achnanthaceae
- *Cocconeis* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
Family: Cymbellaceae
- *Amphora* sp.
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Diatomaceae
- *Asterionella formosum*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Diatoma* sp.
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
Family: Naviculaceae
- *Amphiprora* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Diploneis* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
- *Navicula* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Pleurosigma* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Nitzschiaceae
- *Nitzschia longimissima*
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Nitzschia seriata*
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Nitzschia* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Surirellaceae
- *Surirella* sp.
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Phylum: Chlorophycota
Class: Chlorophyceae
Order: Ulotrichales
Family: Ulotrichaceae
- *Ulothrix flacea*
1997 - Current Project Spec (Honolulu Harbor)
Family: Ulvaceae
- *Enteromorpha intestinalis* (Linnaeus) Nees, 1820

1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Enteromorpha lingulata*** J. Agardh
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- ***Enteromorpha* sp.**
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- ***Ulva fasciata*** Delile, 1813
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
- ***Ulva lactuca*** Linnaeus, 1753
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Ulva reticulata*** Forsskål, 1775
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Ulva rigida*** C. Agardh
1998 - Current Project Spec (Kewalo Basin)
- ***Ulva* sp.**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Order: Cladophorales

Family: Cladophoraceae
- ***Cladophora dotyana*** Gilbert
1997 - Current Project Spec (Keehi Lagoon)
- ***Cladophora socialis*** Kützing
1997 - Current Project Spec (Honolulu Harbor)
- ***Cladophora vagabunda*** (Linnaeus) Hoek
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- ***Cladophora* sp.**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

Order: Caulerpales

Family: Caulerpaceae
- ***Caulerpa racemosa forma peltata*** (Forsskal) J. Agardh
1997 - Current Project Spec (Honolulu Harbor)
- ***Caulerpa racemosa*** (Forsskal) J. Agardh, 1872
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Caulerpa webbiana***
1982 - AECOS, 1982 (Honolulu Harbor. Recorded as *Chlorophyta webbiana*.)
- ***Caulerpa* sp.**
1997 - Current Project Spec (Honolulu Harbor)
- ***Caulerpella ambigua*** (Okamura) Prud'homme van Reine & Lockhorst
1997 - Current Project Spec (Honolulu Harbor)

Family: Codiaceae
- ***Chlorodesmis caespitosa*** J. Agardh
1997 - Current Project Spec (Honolulu Harbor)
- ***Codium arabiculum*** Kützing
1997 - Current Project Spec (Keehi Lagoon)
- ***Codium arabicum*** Kützing, 1856
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- ***Codium edule*** Silva, 1952

1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)

- *Codium* sp.

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Halimeda opuntia*

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Halimeda* sp.

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Family: Derbesiaceae

- *Derbesia minima* Weber-Van Bosse

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Order: Zygnematales

Family: Desmidiaceae

- *Cosmarium* sp.

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)

Order: Dasycladales

Family: Dasycladaceae

- *Neomeris annulata*

1997 - Current Project Obs (Honolulu Harbor)

- *Trichosolen oahuensis* (Egerod) Taylor

1997 - Current Project Spec (Keehi Lagoon)

Order: Siphonocladales

Family: Siphonocladaceae

- *Cladophoropsis herpestica* (Montagne) Howe

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Cladophoropsis sundanensis* Reinbold

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)

Family: Valoniaceae

- *Dictyosphaeria cavernosa*

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Dictyosphaeria versluysii* Weber-van Bosse, 1905

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)

- *Ventricaria ventricosa* (J. Agardh) Olsen & West

1997 - Current Project Spec (Honolulu Harbor)

Order: Bryopsidales

Family: Bryopsidaceae

- *Bryopsis hypnoides* Lamouroux

1997 - Current Project Spec (Honolulu Harbor)

- *Bryopsis pennata* Lamouroux

1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Bryopsis plumosa* (Hudson) C. Agardh

1982 - AECOS, 1982 (Honolulu Harbor)

- *Bryopsis* sp.

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Pseudochlorodesmis parva*
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Phylum: Pyrrophycophyta
Class: Dinophyceae
Order: Prorocentrales
Family: Prorocentraceae
- *Prorocentrum gracile* Schott
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Order: Peridiniales
Family: Ceratiaceae
- *Ceratium furca*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Ceratium minutum*
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Ceratium* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Gonyaulaceae
- *Gonyaulax diacantha*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Gonyaulax polygramma*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Family: Peridiniaceae
- *Peridinium claudicans*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Peridinium conicum*
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
- *Peridinium steinii*
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
- *Peridinium* sp.
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
Phylum: Phaeophycophyta
- *Hincksia mitchellae* (Harvey) Silva, Meñez & Moe
1997 - Current Project Spec (Honolulu Harbor)
Class: Phaeophyceae
Order: Ectocarpales
Family: Ectocarpaceae
- *Giffordia breviarticulata*
1988 - AECOS, 1988 (Honolulu Harbor)
Order: Dictyotales
Family: Dictyotaceae
- *Dictyopteris repens* (Okamura) Børgesen
1997 - Current Project Spec (Honolulu Harbor)

- ***Dictyota acutiloba*** J. Agardh, 1848
    1970 - Harvey, G. W., 1970 (Keehi Lagoon)
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)
- ***Dictyota bartayresii***
    1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
    1992 - Brock, R. E., 1992 (Honolulu Harbor)
    1993 - Brock, R. E., 1993 (Honolulu Harbor)
    1994 - Brock, R. E., 1994 (Honolulu Harbor)
    1997 - Brock, R. E., 1997 (Honolulu Harbor)
- ***Dictyota friabilis***
    1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Dictyota* sp.**
    1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
    1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
    1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
    1997 - Current Project Obs (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)
- ***Lobophora variegata*** ((Lamouroux) Womersley)
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Zonaria variegata*.)
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
- ***Padina crassa*** Yamada
    1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Padina* sp.**
    1997 - Current Project Obs (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)

Order: Fucales

Family: Sargassaceae

- ***Sargassum echinocarpum*** J. Agardh
    1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- ***Sargassum* sp.**
    1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
    1997 - Current Project Obs (Honolulu Harbor)

Order: Scytosiphonales

Family: Scytosiphonaceae

- ***Colpomenia sinuosa*** ((Roth) Derbes & Solier)
    1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- ***Rosenvingea orientalis*** (J. Agardh) Børgesen
    1998 - Current Project Spec (Ala Wai Harbor)

Phylum: Rhodophycota

- **Unidentified Rhodophycota**
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
- ***Spyridea filamentosa*** (Wülfen) Harvey
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Stylonema alsidii*** (Zanardini) Drew
    1997 - Current Project Spec (Honolulu Harbor)
- ***Stylonema elegans***
    1998 - Current Project Spec (Ala Wai Harbor)

Class: Rhodophyceae

Order: Bangiales

Family: Erythropeltidaceae

- ***Erythrotrichia carnea*** (Dillwyn) J. Agardh

1997 - Current Project Spec (Honolulu Harbor)
Order: Nemaliales
Family: Acrochaetiaceae
- *Acrochaetium* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
Family: Bonnemaisoniaceae
- *Asparagopsis taxiformis* (Delile)
1997 - Current Project Obs (Honolulu Harbor)
- *Falkenbergia hillebrandii*
1997 - Current Project Spec (Honolulu Harbor)
Family: Chaetangiaceae
- *Galaxaura acuminata*
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- *Galaxaura marginata* (Ellis & Solander) Lamouroux
1997 - Current Project Spec (Honolulu Harbor)
- *Galaxaura* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
Family: Gelidiellaceae
- *Gelidiella myrioclada* (Børgesen) Feldmann & Hamel
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Gelidiella* sp.
1998 - Current Project Spec (Barbers Point Harbor)
- *Gelidiella* sp.?
1997 - Current Project Spec (Honolulu Harbor)
Order: Gigartinales
Family: Caulacanthaceae
- *Caulacanthus ustulatus* (Turner) Kützing
1997 - Current Project Spec (Honolulu Harbor)
Family: Gracilariaceae
- *Gracilaria* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Hypneaceae
- *Hypnea pannosa* J. Agardh
1997 - Current Project Spec (Keehi Lagoon)
- *Hypnea spinella* (C. Agardh) Kützing, 1849
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Hypnea* sp. J. Agardh
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
Family: Peysonneliaceae
- *Peysonnelia rubra* (Grev.) J. Ag.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Plocamiaceae
- *Plocamium sandvicense* J. Agardh
1997 - Current Project Spec (Honolulu Harbor)
Order: Cryptonemiales
Family: Corallinaceae
- Unidentified Corallinaceae

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Amphiroa beavoisii*
1997 - Current Project Spec (Honolulu Harbor)

- *Amphiroa* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Jania micrarthrodia* Lamouroux
1997 - Current Project Spec (Honolulu Harbor)

- *Jania* sp.
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Lithophyllum* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Porolithon onkodes* (Heydrich) Foslie, 1909
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Porolithon sandvicense*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Porolithon* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)

Family: Cryptonemiaceae

- *Desmia hornemanni* Lyngbye
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Halymenia formosa* Harvey
1997 - Current Project Obs (Honolulu Harbor)

- *Halymenia* sp.
1998 - Current Project Spec (Kewalo Basin)

Family: Squamariaceae

- *Peyssonnelia* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

Order: Rhodymeniales

- Unidentified Rhodymeniales?
1997 - Current Project Spec (Honolulu Harbor)

Family: Champiaceae

- *Champia parvula* ((C. Agardh) Harvey)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Champia vieillardii* Kützing
1997 - Current Project Spec (Honolulu Harbor)

- *Lomentaria hakodatensis* Yendo
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Lomentaria* sp.
1997 - Current Project Spec (Honolulu Harbor)

Family: Lomentariaceae

- *Gelidiopsis intricata* (C. Agardh) Vickers
1997 - Current Project Spec (Honolulu Harbor)

- *Gelidiopsis* sp.
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)

Family: Rhodymeniaceae
- *Chrysymenia okamurae* Yamada & Segawa
1997 - Current Project Spec (Honolulu Harbor)
- *Chrysymenia* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Chrysymenia* sp.?
1997 - Current Project Spec (Honolulu Harbor)
- *Spirocladia* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Order: Gelidiales
Family: Gelidiaceae
- *Gelidium pusillum* (Stackhouse) LeJolis, 1863
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
- *Gelidium* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Pterocladia* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Order: Ceramiales
- Unidentified Ceramiales
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
Family: Ceramiaceae
- Unidentified Ceramiaceae
1997 - Current Project Spec (Honolulu Harbor)
- *Aglaothamnion boergesenii* Aponte & Ballantine
1997 - Current Project Spec (Honolulu Harbor)
- *Aglaothamnion cordatum* (Børgesen) Feldmann-Mazoyer
1997 - Current Project Spec (Honolulu Harbor)
- *Anotrichium secundum* Cormaci, Furnari & Pizzuto
1997 - Current Project Spec (Honolulu Harbor)
- *Antithamnion antillanum* Børgesen
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Antithamnion erucacladellum*? R. E. Norris
1997 - Current Project Spec (Honolulu Harbor)
- *Antithamnion* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- *Antithamnionella breviramosa* (Dawson) Wollaston
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Antithamnionella graeffei*
1997 - Current Project Spec (Honolulu Harbor)
- *Antithamnionella* sp.
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Callithamnion cordatum*
1997 - Current Project Spec (Honolulu Harbor)
- *Centroceras clavulatum* ((C. Agardh) Montagne)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Centroceras* sp.
1988 - AECOS, 1988 (Keehi Lagoon)

- ***Ceramium aduncum*** Nakamura
  1998 - Current Project Spec (Barbers Point Harbor)
- ***Ceramium borneense*** Weber van Bosse
  1997 - Current Project Spec (Honolulu Harbor)
- ***Ceramium clarionense*** Setchell & Gardner, 1930
  1997 - Current Project Spec (Honolulu Harbor)
- ***Ceramium fimbriatum*** Setchell & Gardner
  1997 - Current Project Spec (Honolulu Harbor)
- ***Ceramium flaccidum*** (Kützing) Ardissone
  1997 - Current Project Spec (Honolulu Harbor)
  1998 - Current Project Spec (Ala Wai Harbor)
- ***Ceramium vagans*** P. C. Silva
  1997 - Current Project Spec (Honolulu Harbor)
- ***Ceramium* sp.**
  1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
  1997 - Current Project Spec (Honolulu Harbor)
  1998 - Current Project Spec (Ala Wai Harbor)
- ***Cermium clarionense*** Setchell & Gardner
  1998 - Current Project Spec (Ala Wai Harbor)
- ***Cermium codii*** (Richards) Mazoyer
  1997 - Current Project Spec (Honolulu Harbor)
- ***Croaunia* sp.**
  1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- ***Diplothamnion jolyi*** Hoek
  1997 - Current Project Spec (Honolulu Harbor)
- ***Griffithsia heteromorpha*** Kützing, 1863
  1997 - Current Project Spec (Honolulu Harbor)
  1998 - Current Project Spec (Barbers Point Harbor)
- ***Melanamansia glomerata*** (C. Agardh) R. E. Norris
  1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Amansia glomerulata*.)
  1997 - Current Project Obs (Honolulu Harbor)
  1997 - Current Project Spec (Honolulu Harbor)
- ***Mesothamnion* sp.**
  1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- ***Monosporus indicus*** Børgesen
  1997 - Current Project Spec (Honolulu Harbor)
- ***Monosporus* sp.?**
  1997 - Current Project Spec (Honolulu Harbor)
- ***Polysiphona sphaerocarpa*** Hollenberg
  1998 - Current Project Spec (Ala Wai Harbor)
- ***Polysiphona subtilissima*** Montagne
  1998 - Current Project Spec (Ala Wai Harbor)
- ***Porteria hornmanni*** (Lyngbye) Silva
  1997 - Current Project Spec (Honolulu Harbor)
- ***Spyridia filamentosa*** ((Wulfen) Harvey)
  1970 - Harvey, G. W., 1970 (Keehi Lagoon)
  1988 - AECOS, 1988 (Keehi Lagoon)
  1993 - Brock, R. E., 1993 (Honolulu Harbor)
  1994 - Brock, R. E., 1994 (Honolulu Harbor)
  1995 - Brock, R. E., 1995 (Honolulu Harbor)
- ***Spyridia* sp.**
  1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- ***Tolypiocladia* sp.**
  1993 - Brock, R. E., 1993 (Honolulu Harbor)
  1994 - Brock, R. E., 1994 (Honolulu Harbor)

- *Wrangelia pencillata*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Dasyaceae
- *Dasya iridescens* (Schlech) Abbott & Millar
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Dasya pilosa* Weber van Bosse
1997 - Current Project Spec (Honolulu Harbor)
- *Dasya* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Heterosiphonia crispella* (C. Agardh) Wynne
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
Family: Delesseriaceae
- *Branchioglossum prostratum* Schneider
1997 - Current Project Spec (Honolulu Harbor)
- *Hypoglossum* sp.
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Malaconema minimum* Hollenb.
1997 - Current Project Spec (Honolulu Harbor)
Family: Rhodomelaceae
- *Acanthophora pacifica* (Setchell) Kraft
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Cladymenia pacifica*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Cladymenia pacifica*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Cladymenia pacifica*.)
- *Acanthophora spicifera* ((Vahl) Børgesen, 1802) **(Introduced)**
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Chondria arcuata* Hollenberg
1998 - Current Project Spec (Ala Wai Harbor)
- *Chondria simpliciuscula*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Chondria* sp.
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Herposiphonia tenella*
1998 - Current Project Spec (Ala Wai Harbor)
- *Herposiphonia* sp.

1997 - Current Project Spec (Honolulu Harbor)
- *Laurencia* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- *Lophocladia* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Polysiphonia scopulorum* Harvey, 1968
1997 - Current Project Spec (Honolulu Harbor)
- *Polysiphonia setacea*? Hollenb.
1997 - Current Project Spec (Honolulu Harbor)
- *Polysiphonia subtilissima* Montagne
1998 - Current Project Spec (Ala Wai Harbor)
- *Polysiphonia* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
Phylum: Protozoa
Class: Granuloreticulosea
Order: Foraminiferida
- Unidentified Foraminiferida
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
Kingdom: Plantae
Phylum: Pterophyta
Class: Leptosporangiopsida
Order: Filicales
Family: Polypodiaceae
- *Polypodium dictyopteris* Mett.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Phylum: Magnoliophyta
Class: Magnoliopsida
Order: Cornales
Family: Rhizophoraceae
- *Rhizophora mangel* Linnaeus **(Introduced)**
1997 - Current Project Obs (Keehi Lagoon)
Order: Euphorbiales
Family: Euphorbiaceae
- *Acalypha anisodonta* Mull. Arg.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Kingdom: Animalia
Phylum: Porifera
- Unidentified Porifera
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Class: Calcarea
Order: Clathrinida
Family: Clathrinidae
- *Clathrina sp. 2*
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)
Order: Leucosoleniida
Family: Grantiidae
- *Leuconia n. sp. 1*
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

Family: Heteropiidae
- *Heteropia glomerosa* (Bowerbank, 1873) **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
Class: Demospongiae
Order: Homosclerophorida
Family: Plankinidae
- *Oscarella* sp. Vosmaer, 1884
1997 - Current Project Obs (Honolulu Harbor)
- *Plakortis n. sp. 1*
1997 - Current Project Obs (Honolulu Harbor)
- *Plakortis simplex* Schultz, 1880
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Order: Hadromerida
Family: Chondrillidae
- *Chondrosia chucalla* de Laubenfels, 1936
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
Family: Spirastrellidae
- *Spirastrella coccinea* (Duchassaing and Michelotti, 1864)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Family: Suberitidae
- *Suberites zeteki* de Laubenfels **(Introduced)**
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
- *Terpios granulosa* Bergquist, 1967
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Family: Tethyidae {Porifera}
- *Tethya cf. diploderma*
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Kewalo Basin)
Order: Poecilosclerida
Family: Desmacellidae
- *Biemna fistulosa* Topsent, 1897 **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
Family: Coelosphaeridae
- *Lissodendoryx* sp. Topsent, 1892
1997 - Current Project Obs (Honolulu Harbor)
Family: Microcionidae
- *Microcionia maunaloa* de Laubenfels, 1951
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Family: Mycalidae
- Unidentified Mycalidae Lundbeck, 1905 **(Cryptogenic)**
1978 - U. S. Army, Corps of Engineers, 1978 (Honolulu Harbor)
- *Mycale (Aegogropila) armata* Thiele, 1903 **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
- *Mycale (Carmia) cecilia* (de Laubenfels, 1936) **(Introduced)**
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
- *Zygomycale parishii* (Bowerbank, 1875) **(Introduced)**
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Zygomycale parishi*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Zygomycale parishi*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Zygomycale parishi*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Zygomycale parishi*.)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Zygomycale parishi*.)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
Family: Crambidae
- *Neofolitispa unguiculata* (Introduced)

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

Family: Myxillidae

- *Iotrochota protea* (de Laubenfels, 1950)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

Family: Raspailiidae

- *Echinodictyum asperum* Ridley and Dendy, 1886 **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)

Family: Tedaniidae

- *Tedania macrodactyla* (Lamarck, 1814) **(Cryptogenic)**
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Tedania n. sp. 1*
1997 - Current Project Obs (Honolulu Harbor)

- *Tedania reticulata* Thiele, 1903 **(Cryptogenic)**
1997 - Current Project Obs (Keehi Lagoon)

Order: Halichondrida

Family: Halichondriidae

- *Amorphinopsis n. sp. 1*
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

- *Halichondria coerulea* Bergquist, 1967 **(Cryptogenic)**
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Halichondria melanadocia* de Laubenfels, 1936 **(Introduced)**
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

- *Halichondria cf. dura*
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Halichondria* sp. Fleming, 1828
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)

- *Topsentia* sp. (Cryptogenic)

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Order: Haplosclerida

Family: Callyspongiidae

- *Callyspongia cf. diffusa* (Ridley, 1884) **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Callyspongia* sp. Duchassaing and Michelotti, 1864
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Barbers Point Harbor)

Family: Chalinidae

- *Chalinidae n. gen. n. sp. 1*
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)

- *Haliclona cf. permolis*
1965 - BPBM-C 321 (Ala Wai Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Sigmadocia cf. caerulea* Hechtel, 1965 **(Introduced)**
1997 - Current Project Obs (Keehi Lagoon)

- *Toxadocia violacea* de Laubenfels, 1950
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Toxiclona n. sp. 1*
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- *Gellius n. sp. 1*
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

Family: Niphatidae

- *Gelliodes fibrosa* (Wilson) **(Introduced)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Gelliodes* sp.
1997 - Current Project Obs (Honolulu Harbor)

Order: Dictyoceratida

Family: Spongiidae

- *Hyattella intestinalis* Lamarck, 1814 **(Cryptogenic)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Barbers Point Harbor)

- *Spongia oceania* de Laubenfels, 1950
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)

1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Family: Thorectidae

- *Cacospongia n. sp. 1*

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

Order: Dendroceratida

Family: Aplysellidae

- *Chelonaplysilla violacea* (Lendenfeld, 1883)

1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Aplysilla violaceae*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Aplysilla violaceae*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Aplysilla violaceae*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Aplysilla violaceae*.)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Aplysilla violaceae*.)

Family: Darwinellidae

- *Aplysilla cf. sulfurea*

1997 - Current Project Obs (Honolulu Harbor)

- *Aplysilla violacea* Lendenfeld, 1883

1966 - BPBM-C 339 (Kewalo Basin)

Family: Dictyodendrillidae

- *Dictyodendrilla n. sp. 1*

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Dictyodendrilla n. sp. 2*

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

Family: Dysideidae

- *Dysidea cf. avara* (Schmidt) **(Cryptogenic)**

1997 - Current Project Obs (Honolulu Harbor)

- *Dysidea n. sp. 1*

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- *Dysidea n. sp. 3* (Cryptogenic)

1997 - Current Project Obs (Honolulu Harbor)

- *Dysidea cf. arenaria* (Cryptogenic)

1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

Phylum: Cnidaria

- Unidentified Cnidaria?

1997 - Current Project Spec (Honolulu Harbor)

Class: Hydrozoa

- Unidentified Hydrozoa

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1978 - U. S. Army, Corps of Engineers, 1978 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- Unidentified Hydrozoa?

1997 - Current Project Spec (Honolulu Harbor)

Order: Hydroida
Family: Bougainvilliidae
- *Bougainvillia* sp.?
1997 - Current Project Spec (Honolulu Harbor)
Family: Haleciidae
- *Halecium beani*? (Cryptogenic)
1998 - Current Project Spec (Barbers Point Harbor)
Family: Halocordylidae
- *Halocordyle disticha* (Goldfuss, 1820) **(Introduced)**
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)
Family: Sertulariidae
- *Dynamena crisiodes* (Cryptogenic)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Thyroscyphus fructicosus* (Cryptogenic)
1997 - Current Project Spec (Honolulu Harbor)
Class: Scyphozoa
Order: Semaeostomeae
Family: Ulmaridae
- *Aurelia* sp. (Introduced)
1998 - Current Project Obs (Ala Wai Harbor)
Order: Rhizostomeae
Family: Mastigiidae
- *Phyllorhiza punctata* von Ledenfeld, 1884 **(Introduced)**
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
Class: Anthozoa
Order: Telestacea
Family: Telestidae
- *Carijoa (=Telesto) riisei* (Duchassaing & Michelotti, 1860) **(Introduced)**
1975 - Thomas, W. J., 1979 (Honolulu Harbor. Recorded as *Testeo riisei*.)
1988 - AECOS, 1988 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Telesteo riisei*.)
1998 - Current Project Spec (Barbers Point Harbor)

1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)
Order: Alcyonacea
Family: Xenidae
- *Anthelia edmondsoni*
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
Order: Zoanthidea
Family: Zoanthidae
- *Palythoa tuberculosa* (Esper, 1791)
1997 - Current Project Obs (Honolulu Harbor)
- *Zoanthus pacificus* Walsh & Bowers, 1971
1982 - AECOS, 1982 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- *Zoanthus* sp.
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
Order: Corallimorpharia
Family: Actinodiscidae
- *Actinodiscus nummiformis* (Introduced)
1999 - Current Project Spec (Ala Wai Harbor)
Order: Actiniaria
Family: Aiptasiidae
- *Aiptasia pulchella* Carlgren, 1943
1988 - AECOS, 1988 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)
Family: Diadumenidae
- *Diadumene franciscana* (Introduced)
1998 - Current Project Spec (Ala Wai Harbor)
- *Diadumene leucolena* (Verrill, 1866) **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
- *Diadumene* sp.
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Hormathiidae
- *Calliactis polypus* (Forsskål, 1775)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Family: Isophelliidae
- *Epiphellia humilis* (Verrill, 1928)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Family: Stoichactinidae
- *Antheopsis papillosa* (Kwietniewski, 1898)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Radianthus cookei*.)
Order: Scleractinia
- Unidentified Scleractinia
1997 - Current Project Spec (Honolulu Harbor)
Family: Acroporidae
- *Montipora capitata* (Dana, 1846)

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

- *Montipora patula* Verrill, 1864
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Montipora verrilli* Vaughan, 1907
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Montipora* sp.
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

Family: Agariciidae

- *Leptoseris incrustans* Quelch, 1886
1997 - Current Project Spec (Honolulu Harbor)

- *Pavona varians* Verrill, 1864
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Family: Faviidae

- *Cyphastrea ocellina* (Dana, 1846)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Leptastrea purpurea* Dana, 1846

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)

Family: Pocilloporidae

- *Pocillopora damicornis* Linnaeus, 1758

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Pocillopora eydouxi* Milne-Edwards & Haime, 1860

1997 - Current Project Obs (Honolulu Harbor)

- *Pocillopora meandrina* Dana, 1846 [or 1848?]

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

Family: Poritidae

- *Porites compressa* Dana, 1846 [or 1848?]

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Porites evermanni* Vaughan, 1907
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Porites lobata* Dana, 1846 [or Vaughan?]
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Phylum: Platyhelminthes

- Unidentified Platyhelminthes
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Class: Turbellaria

Order: Polycladida

Family: Latocestidae

- *Taenioplana teridini* Hyman, 1944 **(Introduced)**
1941 - BPBM-F 108 (Honolulu Harbor)
1944 - BPBM-F 114 (Honolulu Harbor)
1944 - BPBM-F 117 (Honolulu Harbor)
1944 - BPBM-F 118 (Honolulu Harbor)
1944 - BPBM-F 119 (Honolulu Harbor)
1944 - BPBM-F 120 (Honolulu Harbor)
1944 - BPBM-F 133 (Honolulu Harbor)
1945 - BPBM-F 134 (Honolulu Harbor)
1948 - BPBM-F 121 (Honolulu Harbor)
1950 - BPBM-F 122 (Honolulu Harbor)

Phylum: Nemertea

- Unidentified Nemertea?
1998 - Current Project Spec (Kewalo Basin)

Phylum: Nematoda
- Unidentified Nematoda
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
Phylum: Annelida
Class: Polychaeta
- Unidentified Polychaeta
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Family: Arabellidae
- Unidentified Arabellidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Family: Chrysopetalidae
- *Paleanotus sp. 1*
1997 - Current Project Spec (Honolulu Harbor)
Family: Dorvilleidae
- Unidentified Dorvilleidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- *Dorvillea angolana*?
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Dorvillea monilocerus*
1998 - Current Project Spec (Ala Wai Harbor)
- *Dorvillea* sp.
1997 - Current Project Spec (Honolulu Harbor)
Family: Lysaretidae
- *Oenone sp. 1*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Magelonidae
- *Magelona* sp.
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
Family: Maldanidae
- Unidentified Maldanidae
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Family: Oweniidae
- *Galathowenia* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Family: Sigalionidae
- *Euthalenessa chacei*
1998 - Current Project Spec (Barbers Point Harbor)
Family: Spintheridae
- *Spinther japonicus* Iwajima & Hartman, 1964 **(Cryptogenic)**
1997 - Current Project Spec (Keehi Lagoon)
Family: Spirorbidae
- Unidentified Spirorbidae
1997 - Current Project Spec (Honolulu Harbor)
Family: Sternaspidae
- *Sternaspis* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Order: Phyllodocida

Family: Amphinomidae

- Unidentified Amphinomidae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Eurythoe complanata* (Pallas, 1776 [or 1766?])

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)

- *Pherecardia striata* (Kinberg, 1857)

1991 - Brock, R. E., 1991 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

Family: Glyceridae

- *Glycera tesselata* Grube, 1863

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Hesionidae

- Unidentified Hesionidae

1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

Family: Nereididae

- Unidentified Nereididae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Ceratonereis tentaculata*

1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)

- *Laeonereis* sp.

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)

- *Naneris laevigata* (Grube, 1855)

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)

- *Nereididae sp. 3*

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Nereididae sp. 3*?

1997 - Current Project Spec (Honolulu Harbor)

- *Nereis succinea* Frey & Leuckart, 1847 **(Introduced)**

1944 - BPBM-R 1023 (Honolulu Harbor)
1944 - BPBM-R 1024 (Honolulu Harbor)
1944 - BPBM-R 1025 (Honolulu Harbor)
1944 - BPBM-R 1026 (Honolulu Harbor)
1945 - BPBM-R 1027 (Honolulu Harbor)
1945 - BPBM-R 1028 (Honolulu Harbor)
1945 - BPBM-R 1029 (Honolulu Harbor)
1945 - BPBM-R 1030 (Honolulu Harbor)
1945 - BPBM-R 1031 (Honolulu Harbor)
1945 - BPBM-R 1032 (Honolulu Harbor)
1945 - BPBM-R 1033 (Honolulu Harbor)
1945 - BPBM-R 1034 (Honolulu Harbor)
1945 - BPBM-R 1035 (Honolulu Harbor)

- *Perinereis nigropunctata*
1998 - Current Project Spec (Kewalo Basin)
Family: Phyllodocidae
- Unidentified Phyllodocidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- *Eulalia sp. 1*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Phyllodoce sp. 1*
1998 - Current Project Spec (Barbers Point Harbor)
- *Phyllodoce sp. 2*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Phyllodoce sp. 3*
1997 - Current Project Spec (Honolulu Harbor)
- *Phyllodoce sp. 4*
1998 - Current Project Spec (Kewalo Basin)
Family: Syllidae
- Unidentified Syllidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Autolytus* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Branchiosyllis exilis* (Gravier, 1900)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Brania rhopalophora* (Ehlers, 1897)
1998 - Current Project Spec (Ala Wai Harbor)
- *Brania* sp.
1997 - Brock, R. E., 1997 (Honolulu Harbor)
- *Ehlersia* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Exogone occidentalis*
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Exogone verugera* (Claparède, 1869)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Exogone* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Haplosyllis spongicola* (Grube, 1855)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Myrianida crassicirrata*
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- ***Opisthosyllis* sp.**
    1997 - Current Project Spec (Honolulu Harbor)
- ***Sphaerosyllis sublaevis***
    1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- ***Sphaerosyllis* sp.**
    1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
    1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
    1997 - Brock, R. E., 1997 (Honolulu Harbor)
- ***Syllis gracilis***
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Trypanosyllis zebra*** Grube, 1860
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
- ***Typosyllis hyalina*** (Grube, 1863)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Typosyllis prolifera***
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Typosyllis sp. 1***
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Typosyllis sp. 2***
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Typosyllis sp. 3***
    1997 - Current Project Spec (Honolulu Harbor)
- ***Typosyllis variegata*** (Grube, 1860)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Typosyllis* sp.**
    1998 - Current Project Spec (Barbers Point Harbor)

Order: Archiannelida

- ***Chaetogordius* sp.**
    1997 - Brock, R. E., 1997 (Honolulu Harbor)
- ***Mesonerilla* sp.**
    1997 - Brock, R. E., 1997 (Honolulu Harbor)

Order: Eunicida

Family: Eunicidae

- **Unidentified Eunicidae**
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Eunice afra*** Peters, 1854

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Eunice antennata* (Savigny, 1820)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
- *Eunice cariboea* Grube, 1856
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Eunice filamentosa* Grube, 1856
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Eunice vittata* (Delle Chiaje, 1828)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- *Lysidice ninetta* Audoin & Milne-Edwards, 1833
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
- *Marphysa sanguinea* (Montagu, 1815)
1944 - BPBM-R 984 (Honolulu Harbor)
1945 - BPBM-R 982 (Honolulu Harbor)
1945 - BPBM-R 983 (Honolulu Harbor)
1945 - BPBM-R 985 (Honolulu Harbor)
1945 - BPBM-R 986 (Honolulu Harbor)
1945 - BPBM-R 987 (Honolulu Harbor)
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
- *Marphysa* sp. (Montagu, 1815)
1944 - BPBM-R 988 (Honolulu Harbor)
- *Nematonereis unicornis* Schmarda, 1861
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Palola siciliensis* (Borradaile, 1898)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
Family: Lumbrineridae
- Unidentified Lumbrineridae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- *Lumbrineris* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Order: Spionida
Family: Spionidae
- Unidentified Spionidae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- Unidentified Spionidae?

1997 - Current Project Spec (Keehi Lagoon)

- *Boccardia* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Malacoceros* sp.

1978 - BPBM-R 980 (Ala Wai Harbor)

- *Minuspio cirrifera* (Wirren)

Unknown - BPBM-R 994 (Kewalo Basin)
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)

- *Prionospio fallax*?

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Pseudopolydora antennata* Claparède, 1870

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Spio* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

Order: Chaetopterida

Family: Chaetopteridae

- Unidentified Chaetopteridae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

- *Chaetopterus sp. A* (Cryptogenic)

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)

- *Mesochaetopterus sagittarius* (Claparède, 1870)

1988 - AECOS, 1988 (Keehi Lagoon)

- *Phyllochaetopterus* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

Order: Cirratulida

Family: Cirratulidae

- Unidentified Cirratulidae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Cirriformia punctata* (Grube, 1856)

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Cirriformia semicincta*

1997 - Current Project Spec (Honolulu Harbor)

- *Cirriformia* sp.

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Tharyx* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

Order: Opheliida
Family: Opheliidae
- Unidentified Opheliidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- *Armandia intermedia* Fauvel, 1902
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Armandia* sp.
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
Order: Capitellida
Family: Capitellidae
- Unidentified Capitellidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- Unidentified Capitellidae?
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Capitella* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
- *Capitita* sp.
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
- *Dasybranchus* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Decamastus* sp.?
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Leiochrides africans*?
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Mediomastus* sp.
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Parheteromastus* sp.?
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- *Pulliella* sp.?
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
- *Scyphoproctus* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Order: Terebellida
Family: Polynoidae
- *Iphione muricata* Savigny, 1818
1997 - Current Project Spec (Honolulu Harbor)
- *Lepidonotus sp. 1*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
- *Paralepidonotus ampulliferus* (Grube, 1878)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)

Family: Terebellidae

- *Loimia medusa* Savigny, 1818

1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

- *Thelepus setosus* (Quatrefages, 1865)

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Order: Cossurida

Family: Cossuridae

- *Cossura coasta* Kitamori, 1960

1997 - Current Project Spec (Honolulu Harbor)

- *Cossura* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Order: Sabellida

Family: Sabellidae

- Unidentified Sabellidae

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1978 - U. S. Army, Corps of Engineers, 1978 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Amphiglena* sp.

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Branchiomma nigromaculata* (Baird, 1865) **(Cryptogenic)**

1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Hypsicomus phaeotaenia*

1997 - Current Project Spec (Honolulu Harbor)

- *Laonome* sp.

1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Megalomma intermedium* (Montagu, 1815)

1944 - BPBM-R 989 (Honolulu Harbor)

- *Sabellastarte sanctijosephi* Gravier, 1906 **(Cryptogenic)**

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)

- *Sabellidae sp. A*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Sabellidae sp. B*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Sabellidae sp. C*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Sabellidae sp. D*
1997 - Current Project Spec (Honolulu Harbor)

- *Sabellidae sp. E*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Serpulidae

- Unidentified Serpulidae
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)

- *Hydroides brachyacantha* Rioja, 1941 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)

- *Hydroides dirampha* (Morch, 1863) **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Hydroides elegans* Haswell, 1883 **(Introduced)**
1998 - Current Project Spec (Barbers Point Harbor)

- *Hydroides lunulifera* (Claparède, 1868)
1968 - BPBM-R 923 (Ala Wai Harbor)

- *Hydroides sp. 1*
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

- *Hydroides sp. 2*
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

- *Hydroides* sp.
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)

1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
- *Mercierella enigmatica* Fauvel, 1923
1946 - BPBM-R 510 (Ala Wai Harbor)
- *Neodexiospira* sp.
1997 - Current Project Spec (Honolulu Harbor)
- *Pileolaria militaris* (Claparède, 1868)
1997 - Current Project Spec (Honolulu Harbor)
- *Pomatoleios kraussii* (Baird, 1865) **(Introduced)**
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
- *Protula atypha* Bush, 1904
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Salmacina dysteri* (Huxley, 1855) **(Introduced)**
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Serpula vermicularis* Linnaeus, 1767 **(Cryptogenic)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Serpula* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
- *Spirobranchus giganteus corniculatus* Grube, 1862
1997 - Current Project Spec (Honolulu Harbor)
- *Spirobranchus giganteus* (Pallas [or Grube?], 1766 [or 1862?])
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
- *Spirobranchus* sp.
1997 - Current Project Obs (Honolulu Harbor)
- *Vermiliopsis infundibulum* Philippi
1997 - Current Project Spec (Honolulu Harbor)
- *Vermiliopsis torquata* Treadwell, 1943
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Vermiliopsis* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Order: Orbiniida
Family: Orbiniidae
- *Naineris bicornis minuta* Hartmann-Schröder, 1965
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Class: Oligochaeta
- Unidentified Oligochaeta
1982 - AECOS, 1982 (Honolulu Harbor)

- Unidentified Oligochaeta?
1997 - Current Project Spec (Honolulu Harbor)
Phylum: Mollusca
Class: Gastropoda
- Unidentified Gastropoda
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Dialidae
- *Diala* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Order: Archaeogastropoda
Family: Fissurellidae
- Unidentified Fissurellidae
1998 - Current Project Spec (Barbers Point Harbor)
- *Diodora granifera* (Pease, 1861)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Diodora octagona*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- *Diodora octogona* (Reeve, 1850)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Diodora ruppelli* (Sowerby, 1834) **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Neritidae
- Unidentified Neritidae?
1998 - Current Project Spec (Barbers Point Harbor)
- *Nerita picea* (Recluz, 1841)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Phasianellidae
- Unidentified Phasianellidae
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Tricolia (Hiloa) variabilis* (Pease, 1861)
1997 - Current Project Spec (Honolulu Harbor)
- *Tricolia (Hiloa) variabilis*? (Pease, 1861)
1998 - Current Project Spec (Kewalo Basin)
Family: Scissurellidae
- *Scissurella* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Skeneidae
- *Lophocaclias minutissimus* (Pilsbry, 1921)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Trochidae
- *Euchelus gemmatus* Gould, 1845
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- *Gibbula marmorata*
1997 - Current Project Spec (Honolulu Harbor)
- *Synaptocochlea concinna*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Trochus histrio* Reeve
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Family: Turbinidae
- *Leptothyra candida* (Pease, 1861)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Leptothyra rubricincta* (Mighels, 1845)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
Order: Mesogastropoda
Family: Calyptraeidae
- *Cheilea equestris*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Crepidula aculeata* (Gmelin, 1791) **(Introduced)**
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Crepidula aculeata*? (Gmelin, 1791) **(Introduced)**
1998 - Current Project Spec (Barbers Point Harbor)
- *Crucibulum spinosum* (Sowerby, 1824) **(Introduced)**
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
Family: Cerithiidae
- *Bittium impendens* (Hedley, 1899)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Bittium parcum* (Gould, 1861)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- *Cerithiopsis* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Cerithium interstriatum*
1997 - Current Project Spec (Honolulu Harbor)
- *Cerithium nesioticum* Pilsbry & Vanatta, 1905
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Scaliola* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Styliferina goniochila*
1997 - Current Project Spec (Honolulu Harbor)
Family: Cymatiidae
- *Cymatium (Septa) rubeculum* (Linnaeus, 1758)
1997 - Current Project Spec (Honolulu Harbor)
- *Cymatium intermedius*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Cymatium pileare*? Linnaeus, 1758
1997 - Current Project Spec (Honolulu Harbor)
- *Cymatium pyrum* (Linnaeus, 1758)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Cypraeidae
- *Cypraea isabella* Linnaeus, 1758

1997 - Current Project Spec (Honolulu Harbor)

Family: Diastomidae

- *Lucidestea sp. 1*

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Lucidestea sp. 2*

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Obtortio fulva* Watson

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Family: Eulimidae

- Unidentified Eulimidae

1997 - Current Project Spec (Honolulu Harbor)

- *Eulima metcalfei*

1998 - Current Project Spec (Kewalo Basin)

Family: Hipponicidae

- Unidentified Hipponicidae

1997 - Current Project Spec (Honolulu Harbor)

- Unidentified Hipponicidae?

1998 - Current Project Spec (Ala Wai Harbor)

1998 - Current Project Spec (Barbers Point Harbor)

- *Antisabia foliaceus*

1997 - Current Project Spec (Honolulu Harbor)

- *Hipponix (Pilosabia) pilosus* (Deshayes, 1832)

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

1998 - Current Project Spec (Kewalo Basin)

- *Hipponix imbricatus*

1997 - Current Project Spec (Honolulu Harbor)

1998 - Current Project Spec (Ala Wai Harbor)

1998 - Current Project Spec (Kewalo Basin)

- *Sabia conica* (Schumacher, 1817) **(Cryptogenic)**

1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Hipponix conicus*.)

Family: Littorinidae

- *Littoraria pintada*

1997 - Current Project Spec (Honolulu Harbor)

1998 - Current Project Spec (Barbers Point Harbor)

1998 - Current Project Spec (Kewalo Basin)

- *Littoraria pintado* (Wood, 1828)

1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Littorina pintado*.)

1982 - AECOS, 1982 (Honolulu Harbor. Recorded as *Littorina pintada*.)

1997 - Current Project Obs (Honolulu Harbor)

- *Littoraria scabra* (Linnaeus, 1758)

1997 - Current Project Spec (Honolulu Harbor)

1998 - Current Project Spec (Ala Wai Harbor)

1998 - Current Project Obs (Barbers Point Harbor)

- *Nodilittorina picta*

1997 - Current Project Spec (Honolulu Harbor)

Family: Naticidae

- *Natica gualteriana* Recluz, 1844

1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Natica marochiensis*.)

Family: Planaxidae

- *Planaxis suturalis*

1997 - Current Project Spec (Honolulu Harbor)

Family: Rissoellidae

- *Rissoella longispira*

1997 - Current Project Spec (Honolulu Harbor)

- *Rissoella* sp.

1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)

- *Rissoella* sp.?
1997 - Current Project Spec (Honolulu Harbor)

Family: Rissoidae

- *Merelina* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Parashiela* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Pusillina (Haurakia) marmorata*
1997 - Current Project Spec (Honolulu Harbor)

- *Rissoina (Apotaxia) cerithiformis*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)

- *Rissoina ambigua* (Gould, 1849)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)

- *Rissoina ephamilla*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Rissoina miltozona* Tomlin, 1915
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Rissoina triticea*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Stosiscia hiloense*
1998 - Current Project Spec (Kewalo Basin)

- *Zebina tridentata* (Michaud, 1830)
1997 - Current Project Spec (Honolulu Harbor)

Family: Triphoridae

- Unidentified Triphoridae
1997 - Current Project Spec (Honolulu Harbor)

- *Mastonia cingulifera* (Pease, 1861)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Triphora cingulifer*.)

- *Viriola flammulata* (Pease, 1861)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Triphora flammulata*.)

Family: Vermetidae

- Unidentified Vermetidae
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

- *Dendropoma sp. cf. rhysochonca*
1997 - Current Project Spec (Honolulu Harbor)

- *Dendropoma* sp.
1998 - Current Project Spec (Kewalo Basin)

- *Petaloconchus keenae*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Serpulorbis* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Vermetus alii* Hadfield & Kay, 1972 **(Introduced)**
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)

Family: Vitrinellidae

- *Vitrinellidae sp. 1*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Vitrinellidae sp. 2*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Vitrinellidae sp. 3*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Vitrinellidae sp. 4*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Order: Neogastropoda

Family: Buccinidae

- *Prodotia iostomus*
1997 - Current Project Spec (Honolulu Harbor)

Family: Columbellidae

- *Seminella virginea* (Gould, 1860)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Seminella peasi*.)
1997 - Current Project Spec (Honolulu Harbor)

- *Seminella virginea*? (Gould, 1860)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Seminella* sp.
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Zafra sp. cf. hervieri*
1997 - Current Project Spec (Honolulu Harbor)

Family: Conidae

- *Conus ebraeus* Linnaeus, 1758
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Conus lividus* Hwass in Bruguiere, 1792
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Conus miles* Linnaeus, 1758
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Conus quercinus* Lightfoot, 1786
1995 - Brock, R. E., 1995 (Honolulu Harbor)

- *Conus sponsalis* Hass in Brugière, 1792 [or 1795?]
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

Family: Fasciolariidae

- *Peristernia chlorostoma* (Sowerby, 1825)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Family: Marginellidae

- *Cysticus huna*
1998 - Current Project Spec (Kewalo Basin)

- *Marginella* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Family: Mitridae

- *Mitra assimilis* Reeve, 1868
1997 - Current Project Spec (Honolulu Harbor)

- *Mitra coronata*
1997 - Current Project Spec (Honolulu Harbor)

- *Vexillum (Pusia) tusum*

1997 - Current Project Spec (Honolulu Harbor)
Family: Muricidae
- *Aspella* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Drupella ochrostoma* (Blainville, 1832)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Morula ochrostoma*.)
- *Morula granulata* (Duclos, 1832)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Morula uva* (Röding, 1798)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
Family: Pyramidellidae
- Unidentified Pyramidellidae
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Hinemoa indica* (Melvill, 1896) **(Cryptogenic)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Miralda paulbartschi* Pilsbry, 1918
1997 - Current Project Spec (Honolulu Harbor)
- *Odostomia oxia*?
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Odostomia suta* Pilsbry, 1918
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Terebridae
- *Hastula incostans* (Hinds, 1844)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Terebra incostans*.)
Family: Thaididae
- *Muricodrupa funiculus* (Wood)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Morula fiscella*.)
Family: Turridae
- *Daphnella* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Order: Cephalaspidea
- Unidentified Cephalaspidea
1997 - Current Project Spec (Honolulu Harbor)
Family: Bullidae
- *Bulla vernicosa* Gould, 1855
1997 - Current Project Spec (Honolulu Harbor)
Family: Cylichnidae
- *Acteocina sandvichensis* Pilsbry, 1921
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Acteocina honoluluensis*.)
- *Acteocina* sp.
1997 - Current Project Spec (Honolulu Harbor)
Family: Haminoeidae
- *Atys debilis*?
1998 - Current Project Spec (Barbers Point Harbor)
- *Atys semistriata* Pease, 1860
1997 - Current Project Spec (Honolulu Harbor)
- *Atys* sp.
1997 - Current Project Spec (Honolulu Harbor)
Family: Hydatinidae
- *Hydatina amplustre* (Linnaeus, 1758)
1997 - Current Project Spec (Honolulu Harbor)
Order: Basommatophora
Family: Siphonariidae
- *Siphonaria normalis* Gould, 1846

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Siphonaria normalis*? Gould, 1846
1998 - Current Project Spec (Kewalo Basin)

- *Williamia radiata*
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)

Order: Anaspidea

Family: Aplysiidae

- *Aplysia juliana* Quoy and Gaimard, 1832
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Order: Sacoglossa

Family: Caliphyllidae

- *Cyerce* sp.?
1998 - Current Project Spec (Kewalo Basin)

Family: Elysiidae

- *Elysia reticulata*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Elysia* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)

Family: Juliidae

- *Julia exquisita* Gould, 1862
1997 - Current Project Spec (Honolulu Harbor)

Order: Nudibranchia

- Unidentified Aeolidacea
1998 - Current Project Spec (Kewalo Basin)

Family: Doridiidae

- *Chromodoris imperialis*
1998 - Current Project Spec (Ala Wai Harbor)

- *Glossodoris rufomarginata*?
1998 - Current Project Spec (Ala Wai Harbor)

- *Hypselodoris infurcata*
1997 - Current Project Spec (Keehi Lagoon)

- *Hypselodoris vibrata* (Pease, 1860)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Glossodoris vibrata*.)

- *Hypselodoris* sp.
1998 - Current Project Spec (Kewalo Basin)

Family: Goniodorididae

- *Goniodoris* sp.
1998 - Current Project Spec (Kewalo Basin)

Family: Polyceridae

- *Tambja morosa*
1997 - Current Project Obs (Honolulu Harbor)

- *Tambja morosa*?
1997 - Current Project Spec (Honolulu Harbor)

Family: Pteraeolididae

- *Pteraeolidia ianthina*
1997 - Current Project Spec (Honolulu Harbor)

Class: Polyplacophora
Order: Ischnochitonida
Family: Ischnochitonidae
- *Ischnochiton petaloides*? Gould
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
Order: Acanthochitonida
Family: Acanthochitonidae
- *Acanthochiton viridis* (Pease, 1872)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Ischnochiton viridis*.)
Class: Bivalvia
- Unidentified Bivalvia
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
Order: Arcoida
Family: Anomiidae
- *Anomia nobilis* Reeve, 1856/59? **(Cryptogenic)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
Family: Arcidae
- *Arca ventricosa*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Barbatia (Acar) plicata*
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Barbatia tenella* Reeve, 1844
1997 - Current Project Spec (Honolulu Harbor)
- *Barbatia* sp.
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Isognomonidae
- *Isognomon californicum*
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Isognomon incisum*? Conrad
1998 - Current Project Spec (Barbers Point Harbor)
- *Isognomon perna* (Linnaeus, 1767)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Isognomon perna*? (Linnaeus, 1767)
1998 - Current Project Spec (Barbers Point Harbor)
- *Isognomon* sp.
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
Family: Mytilidae
- *Brachidontes crebristriatus* (Conrad, 1837)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Hormomya crebristiatus*.)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Crenella* sp.
1998 - Current Project Spec (Barbers Point Harbor)

Family: Ostreidae

- *Crassostrea gigas* (Thunberg, 1793) **(Introduced)**

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

- *Crassostrea* sp.

1982 - AECOS, 1982 (Honolulu Harbor)

- *Dendostrea sandvichensis* (Sowerby, 1871)

1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Ostrea sandvichensis*.)

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon. Recorded as *Ostrea sandvichensis*.)

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon. Recorded as *Ostrea sandvichensis*.)

1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Ostrea sandvichensis*.)

1988 - AECOS, 1988 (Keehi Lagoon. Recorded as *Ostrea sandvichensis*.)

1997 - Current Project Spec (Honolulu Harbor)

1997 - Current Project Obs (Keehi Lagoon)

1997 - Current Project Spec (Keehi Lagoon)

1998 - Current Project Spec (Ala Wai Harbor)

1998 - Current Project Spec (Barbers Point Harbor)

1998 - Current Project Spec (Kewalo Basin)

- *Dendostrea sandvichensis*? (Sowerby, 1871)

1997 - Current Project Spec (Honolulu Harbor)

1998 - Current Project Spec (Ala Wai Harbor)

1998 - Current Project Spec (Barbers Point Harbor)

- *Ostrea hanleyana* Sowerby

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

1982 - AECOS, 1982 (Honolulu Harbor)

1997 - Current Project Spec (Honolulu Harbor)

- *Ostrea lima*? Sowerby, 1871

1997 - Current Project Spec (Honolulu Harbor)

- *Ostrea sandvichensis* Sowerby

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

1988 - AECOS, 1988 (Honolulu Harbor)

- *Ostrea* sp.

1988 - AECOS, 1988 (Keehi Lagoon)

1997 - Current Project Obs (Honolulu Harbor)

1997 - Current Project Spec (Honolulu Harbor)

1997 - Current Project Obs (Keehi Lagoon)

1997 - Current Project Spec (Keehi Lagoon)

1998 - Current Project Spec (Barbers Point Harbor)

- *Saccostrea* sp.

1997 - Current Project Spec (Honolulu Harbor)

Family: Pectinidae

- Unidentified Pectinidae

1997 - Current Project Spec (Honolulu Harbor)

Family: Pinnidae

- *Streptopinna saccata* (Linnaeus, 1758)

1994 - Brock, R. E., 1994 (Honolulu Harbor)

Family: Pteriidae

- *Pinctada margaritifera* (Linnaeus, 1758)

1997 - Current Project Obs (Honolulu Harbor)

- *Pinctada* sp.

1970 - Harvey, G. W., 1970 (Keehi Lagoon)

- *Pteria brunnea*

1997 - Current Project Spec (Honolulu Harbor)

Family: Spondylidae
- *Spondylus hystrix*?
1997 - Current Project Spec (Honolulu Harbor)
- *Spondylus linguaefelis* Sowerby, 1847
1997 - Current Project Spec (Honolulu Harbor)
- *Spondylus tenebrosus*
1997 - Current Project Spec (Honolulu Harbor)
Order: Veneroida
Family: Chamidae
- *Chama fibula* Reeve, 1846 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Chama pacifica* Brodrip, 1835 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Honolulu Harbor)
Family: Kelliidae
- *Kellia hawaiensis*?
1997 - Current Project Spec (Honolulu Harbor)
Family: Lasaeidae
- *Lasaea hawaiensis* Dall, Bartsch & Rehder, 1938
1997 - Current Project Spec (Keehi Lagoon)
Family: Lucinidae
- Unidentified Lucinidae
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
- *Ctena bella* (Conrad, 1837)
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Mesodesmatidae
- *Ervilia bisculpta* Gould, 1861
1970 - Harvey, G. W., 1970 (Keehi Lagoon)
Family: Tellinidae
- *Tellina (Arcopagia) robusta* (Hanley, 1844)
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Pinguitellina robusta*.)
- *Tellina (Quidnipagus) palatan* Iredale, 1929
1970 - Harvey, G. W., 1970 (Keehi Lagoon. Recorded as *Quidnipagus palatum*.)
Order: Myoida
Family: Hiatellidae
- *Hiatella arctica* (Linnaeus, 1767) **(Cryptogenic)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
Class: Cephalopoda
Order: Octopoda
Family: Octopodidae
- *Octopus cyanaea* Gray, 1849
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Phylum: Arthropoda
- Unidentified Arthropoda
1953 - BPBM-B 395 (Honolulu Harbor)
1956 - BPBM-B 399 (Honolulu Harbor)
1959 - BPBM-S 7095 (Keehi Lagoon)
1959 - BPBM-S 7096 (Keehi Lagoon)
1959 - BPBM-S 7097 (Keehi Lagoon)
1959 - BPBM-S 7098 (Keehi Lagoon)
1959 - BPBM-S 7099 (Keehi Lagoon)
1959 - BPBM-S 7100 (Keehi Lagoon)

1959 - BPBM-S 7101 (Keehi Lagoon)
1959 - BPBM-S 7102 (Keehi Lagoon)
- *Leucifer* sp.
1945 - BPBM-S 5141 (Ala Wai Harbor)
1945 - BPBM-S 5113 (Honolulu Harbor)
Class: Pycnogonida
- Unidentified Pycnogonida
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
Family: Coloscenidae
- Unidentified Coloscenidae
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
Order: Pantopoda
Family: Ammotheidae
- *Achelia nana* (Loman)
1942 - BPBM-S 7218 (Honolulu Harbor)
1945 - BPBM-S 7224 (Honolulu Harbor)
1947 - BPBM-S 7237 (Honolulu Harbor)
1948 - BPBM-S 7210 (Honolulu Harbor)
1949 - BPBM-S 7217 (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Achelia* sp.
1945 - BPBM-S 7209 (Honolulu Harbor)
- *Ammothella pacifica* Hilton
1948 - BPBM-S 7215 (Honolulu Harbor)
1948 - BPBM-S 7238 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
Family: Endeidae
- *Endeis nodosa* Hilton, 1942
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
Family: Pallenidae
- Unidentified Pallenidae
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
Family: Phoxichilidiidae
- *Anoplodactylus arescus* (Introduced)
1998 - Current Project Spec (Barbers Point Harbor)
- *Anoplodactylus californicus* Hall
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Anoplodactylus portus* Calman
1942 - BPBM-S 7241 (Honolulu Harbor)
1944 - BPBM-S 7222 (Honolulu Harbor)
1945 - BPBM-S 7242 (Honolulu Harbor)
1947 - BPBM-S 7228 (Honolulu Harbor)
1948 - BPBM-S 7214 (Honolulu Harbor)
1948 - BPBM-S 7226 (Honolulu Harbor)
1948 - BPBM-S 7244 (Honolulu Harbor)
1949 - BPBM-S 7216 (Honolulu Harbor)
1950 - BPBM-S 7225 (Honolulu Harbor)
- *Anoplodactylus portus*? Calman
1948 - BPBM-S 7239 (Honolulu Harbor)
- *Anoplodactylus projectus* Hilton
1975 - Thomas, W. J., 1979 (Honolulu Harbor)

- *Anoplodactylus pycnosoma*
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Kewalo Basin)
Family: Pycnogonidae
- *Pigrogromitus timsanus* Calman **(Introduced)**
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
Class: Insecta
Order: Collembola
- Unidentified Collembola
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
Class: Maxillopoda
- Unidentified Cirripedia Burmeister, 1834
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Order: Thoracica
Family: Balanidae
- *Balanus amphitrite* Darwin **(Introduced)**
1946 - BPBM-B 338 (Honolulu Harbor)
1947 - BPBM-B 340 (Honolulu Harbor)
1949 - BPBM-B 359 (Honolulu Harbor)
1956 - BPBM-B 407 (Honolulu Harbor)
1956 - BPBM-B 408 (Honolulu Harbor)
1956 - BPBM-B 410 (Honolulu Harbor)
1956 - BPBM-B 411 (Honolulu Harbor)
1978 - U. S. Army, Corps of Engineers, 1978 (Honolulu Harbor)
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon. Recorded as *Balanus amphitrite hawaiiensis*.)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Balanus amphitrite*? Darwin **(Introduced)**
1945 - BPBM-B 336 (Honolulu Harbor)
- *Balanus eburneus* Gould, 1841 **(Introduced)**
1950 - BPBM-B 375 (Honolulu Harbor)
1954 - BPBM-B 396 (Honolulu Harbor)
1956 - BPBM-B 398 (Honolulu Harbor)
1956 - BPBM-B 400 (Honolulu Harbor)
1956 - BPBM-B 401 (Honolulu Harbor)
1956 - BPBM-B 402 (Honolulu Harbor)
1956 - BPBM-B 403 (Honolulu Harbor)
1956 - BPBM-B 406 (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Balanus reticulatus* Utinomi, 1960 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Balanus tintinnabulum peninsularis*
1947 - BPBM-B 341 (Honolulu Harbor)
- *Balanus trigonus* Darwin, 1854

1947 - BPBM-B 339 (Honolulu Harbor)

- *Balanus* sp.

1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Balcis letsonae*?

1997 - Current Project Spec (Honolulu Harbor)

- *Tesseropora wireni pacifica*

1997 - Current Project Spec (Honolulu Harbor)

Family: Chthamalidae

- *Chthamalus proteus* Darbo & Southward, 1980 **(Introduced)**

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Nesochthamalus intertextus* Darwin

1998 - Current Project Spec (Kewalo Basin)

Family: Lepadidae

- *Conchoderma auritum* (L.)

1947 - BPBM-B 343 (Honolulu Harbor)

- *Conchoderma* sp.?

Unknown - BPBM-B 425 (Kewalo Basin)

- *Lepas anatifera* Linnaeus, 1758

1947 - BPBM-B 342 (Honolulu Harbor)

Family: Tetraclitidae

- *Tetraclitella divisa*

1997 - Current Project Spec (Honolulu Harbor)

- Unidentified Copepoda Milne Edwards, 1840

1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

Order: Harpacticoida

Family: Laophontidae

- *Esola hirsuta*

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Family: Thalestridae

- *Phyllothalestris* sp.

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

- *Rhynchothalestris* sp.

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Order: Cyclopoida

Family: Corycaeidae

- *Corycaeus* sp.

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Class: Malacostraca

Order: Stomatopoda

- Unidentified Stomatopoda Latreille, 1817

1975 - Thomas, W. J., 1979 (Honolulu Harbor)

Family: Gonodactylidae

- *Gonodactylus aloha* Manning & Reaka, 1981 **(Introduced)**

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon. Recorded as *Gonodactylus falcatus*.)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Gonodactylus falcatus*.)

1988 - AECOS, 1988 (Keehi Lagoon. Recorded as *Gonodactylus falcatus*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Gonodactylus* sp.
1993 - Brock, R. E., 1993 (Honolulu Harbor)
- *Pseudosquilla ciliata* (Fabricius, 1787)
1944 - BPBM-S 5068 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Gonodactylus cillata*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Gonodactylus cillata*.)
- *Pseudosquilla oculata* (Brullé)
1925 - BPBM-S 2211 (Honolulu Harbor)
Family: Squillidae
- Unidentified Squillidae
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
Order: Mysidacea
- Unidentified Mysidacea Boas, 1883
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
Order: Amphipoda
Family: Amphilochidae
- *Amphilochidae sp. A*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
- *Amphilochus likelike* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Amphilochus menehune* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Gitanopsis pele* Barnard, 1970 [or 1971?]
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
Family: Ampithoidae
- *Ampithoe ramondi* (Aud.)
1997 - Current Project Spec (Honolulu Harbor)
- *Ampithoe waialua* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Paragrubia vorax* Chevreaux, 1901
1997 - Current Project Spec (Honolulu Harbor)
Family: Anamixidae
- *Anamixis stebbingi*
1997 - Current Project Spec (Honolulu Harbor)
Family: Aoridae
- *Aoroides nahili* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
- *Lembos leapakahi* Barnard, 1970

1997 - Current Project Spec (Honolulu Harbor)
- ***Lembos macromanus*** Shoemaker, 1925
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Lembos waipio*** Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Lembos* sp.**
1997 - Current Project Spec (Honolulu Harbor)

Family: Caprellidae

- ***Caprella acutifrons*** Latreille **(Introduced)**
1941 - BPBM-S 5232 (Honolulu Harbor)
- ***Caprella incisa***
1998 - Current Project Spec (Ala Wai Harbor)
- ***Caprella scaura*** Templeton, 1836 **(Introduced)**
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Caprella* sp.**
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Paracaprella pusilla*** Mayer, 1890 **(Introduced)**
1937 - BPBM-S 5260 (Honolulu Harbor)
1941 - BPBM-S 5261 (Honolulu Harbor)
1948 - BPBM-S 7307 (Honolulu Harbor)
- ***Paracaprella sp. 1***
1997 - Current Project Spec (Honolulu Harbor)
- ***Paracaprella sp. 2***
1998 - Current Project Spec (Ala Wai Harbor)

Family: Colomastigidae

- ***Colomastix kapiolani*** Barnard, 1970
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Colomastix lunalilo*** Barnard, 1970
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Colomastix pusilla*** Grube, 1855
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Corophiidae

- ***Corophium ascherusicum*** (Costa, 1857) **(Introduced)**
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Corophium baconi*** Shoemaker, 1934 **(Introduced)**

1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- ***Ericthonius brasiliensis*** (Dana, 1853) **(Introduced)**
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Eusiridae

- ***Eusiroides diplonyx*** Walker [or Barnard?], 1904 [or 1971?]
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Gammaridae

- ***Elasmopus ecuadorensis hawaiiensis*** Schellenberg, 1938
1997 - Current Project Spec (Honolulu Harbor)
- ***Elasmopus hooheno*** Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
- ***Elasmopus pectenicrus*** (Bate, 1862)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Elasmopus pseudoaffinis***
1997 - Current Project Spec (Honolulu Harbor)
- ***Elasmopus rapax*** (Costa, 1853) **(Introduced)**
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Elasmopus sp. B***
1997 - Current Project Spec (Honolulu Harbor)
- ***Elasmopus spinidactylus***
1997 - Current Project Spec (Honolulu Harbor)
- ***Eriopisa hamakua*** Barnard, 1970
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Eriopisella sechellensis upolu*** Barnard, 1970
1998 - Current Project Spec (Ala Wai Harbor)
- ***Gammarellus amikai*** Barnard, 1970
1975 - Thomas, W. J., 1979 (Honolulu Harbor. Recorded as *Nuuanu amikai*.)
- ***Maera insignis*** (Chevreux, 1901)
1948 - BPBM-S 6003 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- ***Maera pacifica***
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Maera quadrimana*** Dana
1997 - Current Project Spec (Honolulu Harbor)
- ***Maera serrata***

1997 - Current Project Spec (Honolulu Harbor)

Family: Hyalidae

- *Hyale ayeli* Barnard, 1955
1997 - Current Project Spec (Honolulu Harbor)

- *Hyale honoluluensis* Schellenberg, 1938
1997 - Current Project Spec (Honolulu Harbor)

- *Hyale laie* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)

Family: Isaeidae

- *Gammaropsis alamoana* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Gammaropsis pali* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)

- *Photis aina* Barnard, 1970 [or 1971?]
1975 - Thomas, W. J., 1979 (Honolulu Harbor)

- *Photis hawaiensis*
1975 - Thomas, W. J., 1979 (Honolulu Harbor)

- *Photis hawaiiensis* Barnard, 1955
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Photis kapapa* Barnard, 1970
1975 - Thomas, W. J., 1979 (Honolulu Harbor)

Family: Ischyroceridae

- *Ischyrocerus kapu* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)

- *Ischyrocerus oahu* Barnard, 1970
1997 - Current Project Spec (Honolulu Harbor)

- *Jassa falcata* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)

- *Notopoma n. sp. 1*
1997 - Current Project Spec (Honolulu Harbor)

Family: Leucothoidae

- *Leucothoe hyhelia* Barnard, 1965
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Leucothoe micronesiae* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)

- *Leucothoe micronesiae*? (Introduced)
1997 - Current Project Spec (Honolulu Harbor)

- *Leucothoe tridens* Stebbing, 1888
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Leucothoides pottsi*
1997 - Current Project Spec (Honolulu Harbor)

- ***Paraleucothoe flindersi*** Stebbing, 1888 **(Cryptogenic)**
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Kewalo Basin)

Family: Liljeborgiidae

- ***Liljeborgia heeia*** Barnard, 1970
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Kewalo Basin)

Family: Lysianassidae

- ***Lysianassa ewa*** Barnard, 1970
    1997 - Current Project Spec (Honolulu Harbor)
- ***Lysianassa ewa*?** Barnard, 1970
    1998 - Current Project Spec (Barbers Point Harbor)

Family: Pleustidae

- ***Parapleustes honomu*** Barnard, 1970
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)

Family: Podoceridae

- ***Laetmatophilus hala*** Barnard, 1970
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Podocerus brasiliensis*** (Dana, 1853) **(Introduced)**
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Podocerus hanapepe*** Barnard, 1970
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Podocerus talegus lawai*** Barnard, 1970
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Kewalo Basin)
- ***Podocerus talegus lawai*?** Barnard, 1970
    1998 - Current Project Spec (Kewalo Basin)

Family: Stenothoidae

- ***Stenothoe gallensis*** Walker [or Barnard?], 1904 [or 1971?] **(Introduced)**
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Stenothoe haleloke*** Barnard, 1970 [or 1971?]
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Stenothoe valida*** Dana [or Barnard?], 1853 [or 1971?] **(Cryptogenic)**
    1975 - Thomas, W. J., 1979 (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)

Order: Isopoda

- **Unidentified Isopoda** Latreille, 1817
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Family: Anthuridae

- **Unidentified Anthuridae**
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
- ***Mesanthura hieroglyphica*** Miller & Menzies, 1952
    1997 - Current Project Spec (Honolulu Harbor)
- ***Mesanthura n. sp. 1***

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Mesanthura* sp.

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Cirolanidae

- *Cirolana* sp.

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)

Family: Gnathiidae

- *Gnathia* sp.

1998 - Current Project Spec (Barbers Point Harbor)

Family: Idoteidae

- *Colidotea edmondsoni* Miller, 1940

1997 - Current Project Spec (Honolulu Harbor)

Family: Jaeropsididae

- *Jaeropsis hawaiiensis* Miller, 1941

1997 - Current Project Spec (Honolulu Harbor)

- *Jaeropsis* sp.

1997 - Current Project Spec (Honolulu Harbor)

Family: Janiridae

- *Carpias algicola*

1997 - Current Project Spec (Honolulu Harbor)

Family: Limnoriidae

- *Limnoria tripunctata* Menzies, 1957 **(Introduced)**

Unknown - BPBM-S 5724 (Honolulu Harbor)
Unknown - BPBM-S 5725 (Honolulu Harbor)
Unknown - BPBM-S 5726 (Honolulu Harbor)
1945 - BPBM-S 5722 (Honolulu Harbor)
1947 - BPBM-S 5721 (Honolulu Harbor)
1949 - BPBM-S 5723 (Honolulu Harbor)
1949 - BPBM-S 5727 (Honolulu Harbor)
1949 - BPBM-S 5728 (Honolulu Harbor)
1949 - BPBM-S 5729 (Honolulu Harbor)

- *Limnoria* sp.

1998 - Current Project Obs (Kewalo Basin)

Family: Paranthuridae

- *Paranthura* sp.

1997 - Current Project Spec (Honolulu Harbor)

Family: Sphaeromatidae

- Unidentified Sphaeromatidae

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Order: Tanaidacea

- Unidentified Tanaidacea Hansen, 1895

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)

Family: Apseudidae

- *Apseudes sp. b*

1997 - Current Project Spec (Honolulu Harbor)

- *Apseudes tropicalis* Miller

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Apseudes* sp.

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Parapseudes neglectus*

1997 - Current Project Spec (Honolulu Harbor)

- *Parapseudes pedispinis* (Introduced)

1997 - Current Project Spec (Honolulu Harbor)

Family: Pseudozeuxidae

- *Leptochelia dubia* (Krøyer, 1852) **(Cryptogenic)**

1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Tanaidae

- Unidentified Tanaidae

1997 - Current Project Spec (Honolulu Harbor)

- *Anatanais insularis* Miller, 1940

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Order: Decapoda

Family: Alpheidae

- *Alpheus brevipes* De Haan, 1849

1997 - Current Project Spec (Honolulu Harbor)

- *Alpheus clypeatus* Coutiere, 1905

1923 - BPBM-S 1022 (Honolulu Harbor)
1925 - BPBM-S 2209 (Honolulu Harbor)

- *Alpheus collumianus* Stimpson, 1860

1925 - BPBM-S 2210 (Honolulu Harbor)

- *Alpheus gracilis* Heller, 1861

1925 - BPBM-S 2208 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Alpheus leptochirus*? Coutiere, 1906

1997 - Current Project Spec (Honolulu Harbor)

- *Alpheus lobidens* de Haan

1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Alpheus mackayi* Banner & Banner, 1974

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon. Recorded as *Alpheus malabaricus mackayi*.)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Alpheus malabaricus mackayi*.)
1982 - AECOS, 1982 (Honolulu Harbor. Recorded as *Alpheus malabaricus mackayi*.)
1988 - AECOS, 1988 (Keehi Lagoon. Recorded as *Alpheus malabaricus mackayi*.)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- ***Alpheus pacificus*** Dana, 1852
1944 - BPBM-S 5083 (Honolulu Harbor)
1944 - BPBM-S 5085 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- ***Alpheus paracrinitus*** Miers, 1881
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Alpheus paralcyone*** Coutiere, 1905
1997 - Current Project Spec (Honolulu Harbor)
- ***Alpheus pugnax***
1998 - Current Project Spec (Ala Wai Harbor)
- ***Alpheus ventrosus*** Milne-Edwards, 1837
1923 - BPBM-S 1021 (Honolulu Harbor)
- ***Alpheus* sp.**
1982 - AECOS, 1982 (Honolulu Harbor)
- ***Metalpheus paragracilis*** (Coutière, 1897)
1998 - Current Project Spec (Kewalo Basin)
- ***Salmoneus sp. A***
1997 - Current Project Spec (Honolulu Harbor)
- ***Synalpheus bituberculatus*** deMan, 1911
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Synalpheus paraneomeris*** Coutière, 1905
1923 - BPBM-S 1024 (Honolulu Harbor)
- ***Synalpheus paroneomeris***
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- ***Synalpheus reductocarpus***
1997 - Current Project Spec (Honolulu Harbor)
- ***Synalpheus streptodactylus*** Coutiere
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
- ***Synalpheus thai*** Banner & Banner, 1966
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Atyidae

- **Unidentified Atyidae**
1997 - Current Project Spec (Honolulu Harbor)

Family: Bresiliidae

- ***Discias* sp.**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

Family: Calappidae

- ***Calappa hepatica*** (Linnaeus, 1767)
1928 - BPBM-S 3054 (Kewalo Basin)
1960 - BPBM-S 6872 (Keehi Lagoon)

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)

Family: Callianassidae

- *Callianassa articulata* Rathbun
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Callianassa variabilis*
1995 - Brock, R. E., 1995 (Honolulu Harbor)

- *Callianassa* sp.
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

Family: Cryptochiridae

- Unidentified Cryptochiridae Paulson, 1875
1997 - Current Project Spec (Honolulu Harbor)

- *Hapalocarcinus marsupialis* Stimpson, 1859
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Family: Diogenidae

- *Calcinus elegans* (Milne-Edwards)
1930 - BPBM-S 3152 (Kewalo Basin)

- *Calcinus herbsti* de Man
1930 - BPBM-S 3147 (Kewalo Basin)
1960 - BPBM-S 6871 (Keehi Lagoon)

- *Calcinus latens* Randall, 1839
Unknown - BPBM-S 2212 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)

- *Ciliopagurus strigatus* (Herbst)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Aniculus strigatus*.)

- *Dardanus gemmatus* (H. Milne Edwards)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

Family: Dynomenidae

- *Dynomene hispida* Desmarest, 1825
1997 - Current Project Spec (Honolulu Harbor)

Family: Galatheidae

- *Galathea spinosorostris* Dana
1997 - Current Project Spec (Honolulu Harbor)

Family: Grapsidae

- Unidentified Grapsidae? MacLeay, 1838
1997 - Current Project Spec (Honolulu Harbor)

- *Metapograpsus messor* (Forsskål, 1900)
1930 - BPBM-S 3148 (Kewalo Basin)

- *Metapograpsus thukuhar* Owen, 1839
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Pachygrapsus longipes*
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Pachygrapsus minutus* Milne-Edwards, 1900
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- ***Pachygrapsus plicatus*** Milne-Edwards
    1998 - Current Project Spec (Ala Wai Harbor)
- ***Percnon abbreviatum*** (Dana, 1852)
    1923 - BPBM-S 1006 (Honolulu Harbor)
- ***Plagusia depressa tuberculata*** Lamarck, 1818
    1998 - Current Project Spec (Kewalo Basin)

Family: Hippolytidae

- ***Leptodius sanguineus*** (Milne-Edwards, 1834)
    1930 - BPBM-S 3150 (Kewalo Basin)
- ***Lysmata paucidens*** Rathbun
    1923 - BPBM-S 1023 (Honolulu Harbor)
- ***Saron marmoratus*** (Olivier, 1811)
    1915 - BPBM-S 961 (Honolulu Harbor)
    1925 - BPBM-S 2207 (Honolulu Harbor)
- ***Saron* sp.**
    1997 - Current Project Spec (Honolulu Harbor)
- ***Thor maldivensis*** Borradaile, 1915
    1997 - Current Project Spec (Honolulu Harbor)
- ***Thor paschalis*** (Heller, 1862)
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)

Family: Leucosiidae

- ***Oreotlos lagarodes***
    1959 - BPBM-S 6756 (Keehi Lagoon)

Family: Majidae

- ***Menaethius monoceros*** Latreille
    1925 - BPBM-S 2205 (Honolulu Harbor)
- ***Oncinopus neptunus*** Adams & White
    1997 - Current Project Spec (Honolulu Harbor)
- ***Perinea tumida*** Dana
    1923 - BPBM-S 1011 (Honolulu Harbor)
- ***Schizophrys hilensis*** Rathbun
    1925 - BPBM-S 2204 (Honolulu Harbor)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Simocarcinus simplex*** (Dana)
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
- ***Trigonothir simplex***
    1975 - Thomas, W. J., 1979 (Honolulu Harbor. Recorded as *Simocarcinus simplex*.)

Family: Ocypodidae

- ***Macrophthalmus telescopicus*** (Owen, 1839)
    1988 - AECOS, 1988 (Keehi Lagoon)
    1998 - Current Project Spec (Barbers Point Harbor)

Family: Paguridae

- ***Pagurus deformis*** Milne-Edwards
    1925 - BPBM-S 2442 (Kewalo Basin)

Family: Palaemonidae

- **Unidentified Pontoniinae** Kingsley, 1878
    1997 - Current Project Spec (Honolulu Harbor)
- ***Conchodytes tridacnae*** Peters, 1852
    1925 - BPBM-S 1865 (Honolulu Harbor)
- ***Epipontonia* sp.?**
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Harpiliopsis depressus*** Stimpson, 1860
    1997 - Current Project Spec (Honolulu Harbor)

- ***Leander pacificus***
    1946 - BPBM-S 5192 (Honolulu Harbor)
- ***Onycocaris quadratophthalma*** Balss
    1997 - Current Project Spec (Honolulu Harbor)
- ***Palaemon debilis*** (Dana, 1852)
    1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
- ***Palaemon lata*** Kemp
    1944 - BPBM-S 5149 (Honolulu Harbor)
- ***Palaemon tenuipes*** Dana
    1944 - BPBM-S 5150 (Honolulu Harbor)
- ***Palaemonella lata*** Dana
    1997 - Current Project Spec (Honolulu Harbor)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Palaemonella rotumana***
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Barbers Point Harbor)
- ***Palaemonella tenuipes*** Dana, 1852
    1945 - BPBM-S 5111 (Honolulu Harbor)
    1947 - BPBM-S 5301 (Honolulu Harbor)
- ***Palaemonella* sp.**
    1929 - BPBM-S 3520 (Kewalo Basin)
- ***Periclimenaeus tridentatus*** (Miers)
    1923 - BPBM-S 1025 (Honolulu Harbor)
- ***Periclimenes elegans***
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
    1998 - Current Project Spec (Barbers Point Harbor)
    1998 - Current Project Spec (Kewalo Basin)
- ***Periclimenes grandis*** (Simpson)
    1997 - Current Project Spec (Honolulu Harbor)
    1997 - Current Project Spec (Keehi Lagoon)
    1998 - Current Project Spec (Ala Wai Harbor)
- ***Periclimenes* sp.**
    1997 - Current Project Spec (Honolulu Harbor)

Family: Parthenopidae

- ***Daldorfia horrida***
    1925 - BPBM-S 2199 (Honolulu Harbor)
- ***Parthenope calappoides***
    1959 - BPBM-S 6791 (Keehi Lagoon)
- ***Parthenope* sp.**
    1959 - BPBM-S 6672 (Keehi Lagoon)

Family: Portunidae

- ***Carupa laeviuscula*** Heller
    1923 - BPBM-S 1009 (Honolulu Harbor)
- ***Charybdis hawaiensis***
    1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Charybdis orientalis*.)
- ***Libystes villosus*** Rathbun
    1997 - Current Project Spec (Honolulu Harbor)
- ***Podophthalmus vigil*** (Weber, 1795)
    1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)
    1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)
    1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)

1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Podophalmus vigil*.)

- *Podophthalmus vigil*? (Weber, 1795)
1997 - Current Project Spec (Honolulu Harbor)

- *Portunus sanguinolentus* (Herbst, 1796)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Thalamita crenata* Latreille, 1900
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Thalamitra crenulata*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Thalamitra crenulata*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Thalamitra crenulata*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Thalamitra crenulata*.)

- *Thalamita edwardsi* Borradaile, 1900
1922 - BPBM-S 705 (Honolulu Harbor)
1930 - BPBM-S 3151 (Kewalo Basin)
1945 - BPBM-S 5146 (Honolulu Harbor)
1953 - BPBM-S 6231 (Honolulu Harbor)
1954 - BPBM-S 6132 (Honolulu Harbor)
1954 - BPBM-S 6133 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Thalamitra edwardsi*.)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Thalamita integra* Dana, 1852
1922 - BPBM-S 704 (Honolulu Harbor)
1945 - BPBM-S 5145 (Honolulu Harbor)
1946 - BPBM-S 5162 (Honolulu Harbor)
1955 - BPBM-S 6226 (Honolulu Harbor)
1955 - BPBM-S 6232 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
1998 - Current Project Obs (Kewalo Basin)

- *Thalamita spiceri*?
1998 - Current Project Spec (Kewalo Basin)

Family: Scyllaridae

- *Paribacus antacticus* Lund, 1793
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

- *Parribacus antarcticus* (Lund, 1793)
1925 - BPBM-S 2206 (Honolulu Harbor)

Family: Sergestidae

- *Lucifer chacei* Bowman, 1966

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

Family: Stenopodidae

- *Stenopus hispidus* (Olivier [or Rathbun?], 1811 [or 1906?])
1949 - BPBM-S 5387 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

Family: Xanthidae

- *Actaea speciosa* (Dana, 1852)
1923 - BPBM-S 997 (Honolulu Harbor)

- *Actaea variolosa* Borradaile
1923 - BPBM-S 1012 (Honolulu Harbor)
1925 - BPBM-S 2202 (Honolulu Harbor)

- *Carpilius convexus* (Forsskal, 1775)
1925 - BPBM-S 2203 (Honolulu Harbor)

- *Carpilius* sp.
1997 - Current Project Obs (Honolulu Harbor)

- *Carpilodes bellus* Dana, 1852
1923 - BPBM-S 1010 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Carpilodes ruber* A. Milne Edwards, 1865
1925 - BPBM-S 2201 (Honolulu Harbor)

- *Chlorodiella niger* Forsskal, 1775
1923 - BPBM-S 1007 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Kewalo Basin)

- *Chlorodopsis areolata* (Dana [or Milne-Edwards, 1873?])
1925 - BPBM-S 2197 (Honolulu Harbor)

- *Chlorodopsis oahuensis*
1997 - Current Project Spec (Honolulu Harbor)

- *Domecia hispida* Eydoux & Souleyet
1923 - BPBM-S 998 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Eriphia sebana* Shaw [or Rathbun?]
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon. Recorded as *Eriphia laevimana*.)

- *Etisus laevimanus* Randall, 1839
1928 - BPBM-S 3055 (Kewalo Basin)

- *Liocarpilodes integerrimus* (Dana, 1852)
1997 - Current Project Spec (Honolulu Harbor)

- *Liomera bella*
1997 - Current Project Spec (Honolulu Harbor)

- *Lophozozymus dodone* (Herbst, 1801)
1923 - BPBM-S 1008 (Honolulu Harbor)

- *Medaeus simplex* Milne-Edwards, 1873
1925 - BPBM-S 2200 (Honolulu Harbor)

- *Panopeus pacificus* Edmondson, 1931 **(Introduced)**

1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- ***Phymodius laysani*** Rathbun, 1906
1997 - Current Project Spec (Honolulu Harbor)
- ***Phymodius nitidus*** (Dana, 1852)
1923 - BPBM-S 1000 (Honolulu Harbor)
1925 - BPBM-S 2196 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Phymodius ungulatus*** Milne Edwards, 1834
1923 - BPBM-S 999 (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Pilumnus longicornis*** Hilgendorf, 1878
1954 - BPBM-S 6259 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
- ***Pilumnus nuttingi***
1959 - BPBM-S 6782 (Keehi Lagoon)
1997 - Current Project Spec (Honolulu Harbor)
- ***Pilumnus oahuensis*** Edmondson, 1931
1947 - BPBM-S 5309 (Honolulu Harbor)
1955 - BPBM-S 6225 (Honolulu Harbor)
1956 - BPBM-S 6247 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Pilumnus* sp.**
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- ***Platypodia eydouxii*** (A. Milne Edwards, 1865)
1923 - BPBM-S 1004 (Honolulu Harbor)
1925 - BPBM-S 2198 (Honolulu Harbor)
1950 - BPBM-S 5641 (Honolulu Harbor)
- ***Platypodia granulosa*** (Rüppell)
1998 - Current Project Spec (Ala Wai Harbor)
- ***Platypodia semigranosa*** (Heller)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
- ***Polydectus cupulifer*** Latreille [or Dana?]
1997 - Current Project Spec (Honolulu Harbor)
- ***Pseudozius trianguiculatus***
1997 - Current Project Spec (Honolulu Harbor)
- ***Trapezia digitalis*** Latreille
1923 - BPBM-S 1002 (Honolulu Harbor)
- ***Trapezia intermedia*** Miers
1923 - BPBM-S 1001 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
- ***Trapezia maculata*** (Macleay)
1923 - BPBM-S 1003 (Honolulu Harbor)
- ***Trapezia tigrina***
1997 - Current Project Spec (Honolulu Harbor)

- *Xanthias canaliculatus* Rathbun
1923 - BPBM-S 1005 (Honolulu Harbor)
1925 - BPBM-S 2195 (Honolulu Harbor)
- *Xantho crassimanus* A.M.E.
1997 - Current Project Spec (Honolulu Harbor)
Class: Ostracoda
- Unidentified Ostracoda Latreille, 1806
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
Phylum: Sipuncula
- Unidentified Sipuncula
1997 - Current Project Spec (Honolulu Harbor)
Class: Sipunculidea
- Unidentified Sipunculidea
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Family: Golfingiidae
- *Themiste langeniformis*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
Class: Phascolosomatidea
Order: Aspidosiphoniformes
Family: Aspidosiphonidae
- *Aspidosiphon cumingi*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- *Aspidosiphon elegans*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
Order: Phascolosomatiformes
Family: Phascolosomatidae
- *Phascolosoma glabrum*?
1997 - Current Project Spec (Honolulu Harbor)
- *Phascolosoma nigrescens* Keferstein, 1865
1997 - Current Project Spec (Honolulu Harbor)
- *Phascolosoma scolops*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Phascolosoma stephensoni* (Stephen, 1942)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Phylum: Bryozoa
- Unidentified Bryozoa
1945 - BPBM-K 325 (Honolulu Harbor)
1945 - BPBM-K 326 (Honolulu Harbor)
1946 - BPBM-K 329 (Honolulu Harbor)

1946 - BPBM-K 337 (Honolulu Harbor)
1948 - BPBM-K 345 (Honolulu Harbor)
1949 - BPBM-K 320 (Honolulu Harbor)
1949 - BPBM-K 331 (Honolulu Harbor)
1952 - BPBM-K 352 (Honolulu Harbor)
1952 - BPBM-K 353 (Honolulu Harbor)
1954 - BPBM-K 372 (Honolulu Harbor)
1956 - BPBM-K 361 (Honolulu Harbor)
1956 - BPBM-K 362 (Honolulu Harbor)
1956 - BPBM-K 376 (Honolulu Harbor)
1956 - BPBM-K 384 (Honolulu Harbor)
1956 - BPBM-K 386 (Honolulu Harbor)
1956 - BPBM-K 389 (Honolulu Harbor)
1956 - BPBM-K 390 (Honolulu Harbor)
1956 - BPBM-K 391 (Honolulu Harbor)
1956 - BPBM-K 392 (Honolulu Harbor)
1956 - BPBM-K 393 (Honolulu Harbor)
1956 - BPBM-K 394 (Honolulu Harbor)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Class: Gymnolaemata

Order: Ctenostomata

Family: Vesiculariidae

- *Amathia distans* Busk, 1886 **(Introduced)**
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)

- *Amathia distans*? Busk, 1886 **(Introduced)**
1946 - BPBM-K 335 (Honolulu Harbor)
1949 - BPBM-K 340 (Honolulu Harbor)

- *Zoobotryon verticillatum* (Della Chiaje) **(Introduced)**
1946 - BPBM-K 341 (Honolulu Harbor)
1954 - BPBM-K 371 (Honolulu Harbor)
1955 - BPBM-K 368 (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)

Order: Cyclostomata

Family: Crisiidae

- *Crisia circinata*
1997 - Current Project Spec (Honolulu Harbor)

Family: Diaperoeciidae

- *Diaperoforma intricata* (Cryptogenic)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)

Order: Cheilostomata

- *Cheilostomata gen. sp. 1*
1997 - Current Project Spec (Honolulu Harbor)

- *Cheilostomata gen. sp. 2*
1998 - Current Project Spec (Kewalo Basin)

- *Cheilostomata gen. sp. 3*
1997 - Current Project Spec (Keehi Lagoon)

- *Cheilostomata gen. sp. 3*?
1998 - Current Project Spec (Ala Wai Harbor)

Family: Aeteidae

- *Aetea anguinea*
1997 - Current Project Spec (Honolulu Harbor)

- *Aetea truncata* Landsborough, 1852 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Aetea truncata*? Landsborough, 1852 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)

Family: Bugulidae

- *Bugula dentata* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Bugula neritina* (Linnaeus, 1758) **(Introduced)**
Unknown - BPBM-K 468 (Ala Wai Harbor)
1940 - BPBM-K 222 (Honolulu Harbor)
1952 - BPBM-K 351 (Honolulu Harbor)
1954 - BPBM-K 374 (Honolulu Harbor)
1954 - BPBM-K 375 (Honolulu Harbor)
1955 - BPBM-K 354 (Honolulu Harbor)
1955 - BPBM-K 357 (Honolulu Harbor)
1956 - BPBM-K 359 (Honolulu Harbor)
1956 - BPBM-K 360 (Honolulu Harbor)
1956 - BPBM-K 378 (Honolulu Harbor)
1956 - BPBM-K 381 (Honolulu Harbor)
1956 - BPBM-K 382 (Honolulu Harbor)
1956 - BPBM-K 387 (Honolulu Harbor)
1956 - BPBM-K 388 (Honolulu Harbor)
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
1978 - U. S. Army, Corps of Engineers, 1978 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Bugula robusta* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Bugula stolonifera* (Robertson) **(Introduced)**
1946 - BPBM-K 338 (Honolulu Harbor)
1949 - BPBM-K 343 (Honolulu Harbor)
1950 - BPBM-K 273 (Honolulu Harbor)
1955 - BPBM-K 355 (Honolulu Harbor)

1955 - BPBM-K 356 (Honolulu Harbor)
1955 - BPBM-K 358 (Honolulu Harbor)
1956 - BPBM-K 370 (Honolulu Harbor)
1956 - BPBM-K 373 (Honolulu Harbor)
1956 - BPBM-K 377 (Honolulu Harbor)
1956 - BPBM-K 379 (Honolulu Harbor)
1956 - BPBM-K 380 (Honolulu Harbor)
1956 - BPBM-K 385 (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Bugula* sp.

1949 - BPBM-K 342 (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Caulibugula caliculata* (Introduced)

1997 - Current Project Spec (Honolulu Harbor)

- *Caulibugula dendrograpta* (Introduced)

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

- *Caulibugula* sp.

1997 - Current Project Spec (Honolulu Harbor)

Family: Celleporariidae

- *Celleporaria aperta*

1945 - BPBM-K 324 (Honolulu Harbor)
1945 - BPBM-K 334 (Honolulu Harbor)
1946 - BPBM-K 244 (Honolulu Harbor)
1946 - BPBM-K 333 (Honolulu Harbor)
1947 - BPBM-K 317 (Honolulu Harbor)
1947 - BPBM-K 321 (Honolulu Harbor)
1948 - BPBM-K 323 (Honolulu Harbor)
1949 - BPBM-K 322 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Celleporaria fusca*

1997 - Current Project Spec (Honolulu Harbor)

- *Celleporaria fusca*?

1998 - Current Project Spec (Ala Wai Harbor)

- *Celleporaria pilaefera*

1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Celleporaria vagans* Busk, 1881

1998 - Current Project Spec (Kewalo Basin)

- *Celleporaria vagans*? Busk, 1881

1997 - Current Project Spec (Honolulu Harbor)

- *Celleporaria* sp.?

1997 - Current Project Spec (Honolulu Harbor)

Family: Celleporidae

- *Costazia costazii*

1997 - Current Project Spec (Honolulu Harbor)

Family: Epistomiidae

- *Synnotum aegyptiacum*

1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)

Family: Escharellidae
- *Hippopodina feegeensis* Busk, 1884
1948 - BPBM-K 344 (Honolulu Harbor)
1948 - BPBM-K 347 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Microporellidae
- *Microporella orientalis*
1997 - Current Project Spec (Honolulu Harbor)
Family: Mucronellidae
- *Parasmittina trispinosa*
1997 - Current Project Spec (Honolulu Harbor)
Family: Reteporidae
- *Rhynchozoon* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Family: Savignyellidae
- *Savignyella lafontii* Audouin, 1826 **(Introduced)**
1950 - BPBM-K 327 (Honolulu Harbor)
1954 - BPBM-K 369 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Schizoporellidae
- *Schizoporella sp. A* (Introduced)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
1998 - Current Project Spec (Kewalo Basin)
- *Schizoporella sp. A*? (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
- *Schizoporella unicornis* (Johnston, 1847) **(Introduced)**
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
Family: Scruparіidae
- *Scruparia* sp.
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
Family: Scrupocellariidae
- *Scrupocellaria sp. cf. sinuosa*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Scrupocellaria* sp.
1998 - Current Project Spec (Kewalo Basin)
Family: Watersiporidae
- *Watersipora arcuata*
1998 - Current Project Spec (Kewalo Basin)
- *Watersipora edmondsoni* Soule & Soule, 1968 **(Introduced)**
1997 - Current Project Spec (Keehi Lagoon)
Phylum: Echinodermata
- Unidentified Echinodermata
1997 - Current Project Spec (Honolulu Harbor)
Class: Asteroidea
Order: Valvatida
Family: Ophidiasteridae
- *Leiaster leachi hawaiiensis* Fisher, 1925
1973 - BPBM-W 2223 (Honolulu Harbor)
- *Linckia* sp. Forbes, 1839
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Class: Ophiuroidea
Order: Ophiurida
Family: Ophiactidae
- *Ophiactis savignyi* (Müller & Troschel, 1842)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Ophiocomidae
- *Ophiocoma brevipes* (Peters [or Agassiz?], 1851 [or 1835?])
1975 - Thomas, W. J., 1979 (Honolulu Harbor)
- *Ophiocoma* sp. Agassiz, 1835
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
Class: Echinoidea
Order: Cidariida
Family: Cidaridae
- *Eucidaris metularia* Lamarck, 1816
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)
Order: Diadematida
Family: Diadematidae
- *Diadema paucispinum* Agassiz, 1863
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Centrichinus paucispinus*.)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- *Diadema paucispinum*? Agassiz, 1863
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Diadema setosum*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Diadema setosum*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Diadema setosum*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Diadema setosum*.)
- *Echinothrix calamaris* (Pallas, 1774)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
- *Echinothrix calamaris*? (Pallas, 1774)
1997 - Current Project Obs (Honolulu Harbor)

- *Echinothrix diadema* (Linnaeus, 1758)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Diadema diadema*.)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

Order: Temnopleurida

Family: Toxopneustidae

- *Pseudoboletia indiana* (Michelin, 1862)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)

- *Tripneustes gratilla* (Linnaeus, 1758)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Order: Echinida

Family: Echinometridae

- *Echinometra mathaei* (de Blainville, 1825)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Echinometra oblonga* (de Blainville, 1825)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)

- *Echinostrephus aciculatus* Agassiz, 1863
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Echinostrephus acidulatum*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Heterocentrotus mammillatus* (Linnaeus, 1758)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Heterocentradus mammilatus*.)
1997 - Current Project Obs (Honolulu Harbor)

Class: Holothuroidea

- Unidentified Holothuroidea
1997 - Current Project Spec (Honolulu Harbor)

Order: Aspidochirotida
Family: Holothuriidae
- *Actinopyga mauritiana* (Quoy & Gaimard, 1833)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)
- *Actinopyga* sp. Bronn, 1860
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
- *Holothuria (Halodeima) atra* Jäger, 1833
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
- *Holothuria (Stauropora) pervicax* Selenka, 1867
1988 - AECOS, 1988 (Keehi Lagoon)
- *Holothuria atra* Jaeger, 1833
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
Order: Apodida
Family: Synaptidae
- *Chiridota rigida*? Semper, 1868
1928 - BPBM-W 752 (Kewalo Basin)
- *Opheodesoma spectabilis* Fisher, 1907
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
Phylum: Chaetognatha
Class: Sagittoidea
Order: Aphragmophora
Family: Sagittidae
- *Sagitta enflata* Grassi, 1883
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1973 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
Phylum: Chordata
Class: Ascidiacea
- Unidentified Ascidiacea
1943 - BPBM-Y 148 (Honolulu Harbor)
1945 - BPBM-Y 149 (Honolulu Harbor)
1945 - BPBM-Y 150 (Honolulu Harbor)
1945 - BPBM-Y 152 (Honolulu Harbor)
1945 - BPBM-Y 153 (Honolulu Harbor)
1945 - BPBM-Y 154 (Honolulu Harbor)
1946 - BPBM-Y 160 (Honolulu Harbor)
1946 - BPBM-Y 161 (Honolulu Harbor)
1947 - BPBM-Y 165 (Honolulu Harbor)
1947 - BPBM-Y 166 (Honolulu Harbor)
1947 - BPBM-Y 169 (Honolulu Harbor)
1947 - BPBM-Y 170 (Honolulu Harbor)
1956 - BPBM-Y 179 (Honolulu Harbor)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
Order: Aplousobranchia
Family: Didemnidae
- *Didemnum candidum* Savigny, 1816 **(Introduced)**
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Diplosoma listerianum* (Milne-Edwards, 1841) **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Diplosoma* sp.
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Leptoclinides madara*
1997 - Current Project Spec (Honolulu Harbor)

- *Trididemnum profundum* Sluiter, 1909
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Trididemnum savignii*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Polyclinidae

- Unidentified Polyclinidae
1945 - BPBM-Y 151 (Honolulu Harbor)
1945 - BPBM-Y 155 (Honolulu Harbor)
1945 - BPBM-Y 156 (Honolulu Harbor)
1945 - BPBM-Y 157 (Honolulu Harbor)
1946 - BPBM-Y 158 (Honolulu Harbor)
1946 - BPBM-Y 159 (Honolulu Harbor)
1946 - BPBM-Y 162 (Honolulu Harbor)
1946 - BPBM-Y 163 (Honolulu Harbor)
1946 - BPBM-Y 164 (Honolulu Harbor)

- *Polyclinum constellatum* Savigny, 1816 **(Introduced)**
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Ala Wai Harbor)

Order: Phlebobranchia
Family: Ascidiidae
- *Ascidia interrupta*
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
- *Ascidia sp. A*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Ascidia sp. B* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
- *Ascidia sydneiensis* (Stimpson, 1855) **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Ascidia* sp.
1943 - BPBM-Y 107 (Honolulu Harbor)
1943 - BPBM-Y 108 (Honolulu Harbor)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
- *Phallusia nigra* Savigny, 1816 **(Introduced)**
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Ascidia nigra*.)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)
Family: Corellidae
- *Corella minuta* (Cryptogenic)
1997 - Current Project Spec (Honolulu Harbor)
Family: Perophoridae
- *Perophora annectans*
1997 - Current Project Spec (Honolulu Harbor)
Order: Stolidobranchia
Family: Pyuridae
- *Herdmania momus* (Savigny, 1816) **(Introduced)**
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Herdmania monus*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Herdmania monus*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Herdmania monus*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Herdmania monus*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Herdmania monus*.)

1997 - Current Project Spec (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Herdmania monus*.)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Microcosmus exasperatus* Heller, 1878 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

Family: Styelidae

- *Botrylloides simodensis* (Introduced)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Botrylloides* sp.
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Kewalo Basin)

- *Cnemidocarpa areolata*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Eusynstyela aliena* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Barbers Point Harbor)

- *Polyandrocarpa sagamiensis* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Polyandrocarpa zorritensis* (Introduced)
1997 - Current Project Spec (Keehi Lagoon)

- *Polyandrocarpa* sp.?
1997 - Current Project Spec (Honolulu Harbor)

- *Polycarpa aurita*
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Styela canopus* Savigny, 1816 **(Introduced)**
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Styela* sp.
1943 - BPBM-Y 146 (Honolulu Harbor)
- *Symplegma brakenhielmi* (Introduced)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Spec (Kewalo Basin)
- *Symplegma connectans* Tokioka, 1949
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
- *Symplegma viride* Herdman
1998 - Current Project Spec (Kewalo Basin)
- *Symplegma* sp. Tokioka, 1949
1943 - BPBM-Y 109 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
Class: Osteichthyes
Order: Syngnathiformes
Family: Aulostomidae
- *Aulostomus chinensis* (Linnaeus, 1766)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
Family: Fistulariidae
- *Fistularia commersonii* Rüppell, 1838
1988 - AECOS, 1988 (Honolulu Harbor. Recorded as *Fistularia petimba*.)
1998 - Current Project Obs (Barbers Point Harbor)
Family: Syngnathidae
- *Doryrhamphus baldwini* Herald & Randall, 1972
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)
Order: Scorpaeniformes
Family: Scorpaenidae
- *Dendrochirus barberi* (Steindachner, 1900)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- *Pterois sphex* Jordan & Evermann, 1903
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- ***Scorpaenopsis gibbosa*** (Bloch & Schneider, 1801)
    1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
    1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
- ***Taenianotus triacanthus*** Lacepède, 1802
    1997 - Current Project Obs (Honolulu Harbor)

Order: Perciformes

Family: Acanthuridae

- ***Acanthurus achilles*** Shaw, 1803
    1988 - AECOS, 1988 (Honolulu Harbor)
    1997 - Current Project Obs (Honolulu Harbor)
- ***Acanthurus blochii*** Valenciennes in Cuvier & Valenciennes, 1835
    1997 - Current Project Obs (Honolulu Harbor)
    1998 - Current Project Obs (Ala Wai Harbor)
    1998 - Current Project Obs (Barbers Point Harbor)
    1998 - Current Project Obs (Kewalo Basin)
- ***Acanthurus dussumieri*** Valenciennes in Cuvier & Valenciennes, 1835
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
    1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
    1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
    1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
    1991 - Brock, R. E., 1991 (Honolulu Harbor)
    1992 - Brock, R. E., 1992 (Honolulu Harbor)
    1993 - Brock, R. E., 1993 (Honolulu Harbor)
    1994 - Brock, R. E., 1994 (Honolulu Harbor)
    1995 - Brock, R. E., 1995 (Honolulu Harbor)
- ***Acanthurus guttatus*** (Forster in Bloch & Schneider, 1801)
    1998 - Current Project Obs (Ala Wai Harbor)
- ***Acanthurus leucopareius*** (Jenkins, 1903)
    1982 - AECOS, 1982 (Honolulu Harbor)
    1988 - AECOS, 1988 (Keehi Lagoon)
    1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
    1997 - Current Project Obs (Honolulu Harbor)
- ***Acanthurus mata*** (Cuvier, 1829)
    1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
    1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
    1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
    1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
    1991 - Brock, R. E., 1991 (Honolulu Harbor)
    1993 - Brock, R. E., 1993 (Honolulu Harbor)
- ***Acanthurus nigrofuscus*** (Forsskål, 1775)
    1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
    1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
    1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
    1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
    1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
    1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
    1991 - Brock, R. E., 1991 (Honolulu Harbor)
    1992 - Brock, R. E., 1992 (Honolulu Harbor)
    1993 - Brock, R. E., 1993 (Honolulu Harbor)
    1994 - Brock, R. E., 1994 (Honolulu Harbor)
    1995 - Brock, R. E., 1995 (Honolulu Harbor)
    1997 - Brock, R. E., 1997 (Honolulu Harbor)

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Acanthurus nigroris* Valenciennes in Cuvier & Valenciennes, 1835

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Acanthurus nigrosis*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Acanthurus nigrosis*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- *Acanthurus olivaceus* Bloch & Schneider (ex Forster), 1801

1998 - Current Project Obs (Barbers Point Harbor)

- *Acanthurus triostegus* (Linnaeus, 1758)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Acanthurus triostegus sandvicensis*.)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor. Recorded as *Acanthurus sandvicensis*.)
1988 - AECOS, 1988 (Honolulu Harbor. Recorded as *Acanthurus sandvicensis*.)
1988 - AECOS, 1988 (Keehi Lagoon. Recorded as *Acanthurus sandvicensis*.)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor. Recorded as *Acanthurus sandvicensis*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Acanthurus xanthopterus* Valenciennes in Cuvier & Valenciennes, 1835

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

- *Ctenochaetus strigosus* (Bennett, 1828)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)

1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Ctenochaetus* sp. Gill, 1884

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Ctenochaetus holocanthus*.)

- *Naso brevirostris* (Cuvier, 1829)

1988 - AECOS, 1988 (Honolulu Harbor)

- *Naso hexacanthus* (Bleeker, 1855)

1997 - Current Project Obs (Honolulu Harbor)

- *Naso lituratus* (Forster in Bloch & Schneider, 1801)

1988 - AECOS, 1988 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Naso unicornis* (Forsskål, 1775)

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Zebrasoma flavescens* (Bennett, 1828)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- *Zebrasoma veliferum* (Bloch, 1795)

1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Zebrasoma velifrum*.)

Family: Apogonidae

- Unidentified Apogonidae

1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Apogon kallopterus* Bleeker, 1856

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Foa brachygramma* (Jordan & Seale [or Jenkins?], 1905 [or 1903?])

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

Family: Blenniidae

- Unidentified Blenniidae
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Cirripectes variolosus* Valenciennes in Cuvier & Valenciennes, 1836
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

- *Enchelyurus brunneolus* (Jenkins, 1903)
1998 - Current Project Spec (Kewalo Basin)

- *Istiblennius zebra* Vaillant & Sauvage, 1875
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

- *Omobranchus ferox* Herre, 1927
1997 - Current Project Spec (Keehi Lagoon)

- *Omobranchus rotundiceps obliquus* (Garman, 1903)
1997 - Current Project Spec (Keehi Lagoon)

Family: Carangidae

- Unidentified Carangidae
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Caranx ignobilis* (Forsskål, 1775)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Caranx melampygus* Cuvier in Cuvier & Valenciennes, 1833
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

- *Caranx sexfasciatus* Quoy & Gaimard, 1825
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Caranx* sp. Lacepède, 1801
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Gnathanodon speciosus* (Forsskål, 1775)
1988 - AECOS, 1988 (Honolulu Harbor)

- *Scomberoides lysan* (Forsskål, 1775)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Scomberoides sanctipetri*.)

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Scomberoides sanctipetri*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Scomberoides sanctipetri*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Family: Chaetodontidae

- *Chaetodon auriga* Forsskål, 1775
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)

- *Chaetodon ephippium* Cuvier in Cuvier & Valenciennes, 1831
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

- *Chaetodon lunula* (Lacepède, 1802)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Chaetodon miliaris* Quoy & Gaimard, 1825
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
- ***Chaetodon ornatissimus*** Cuvier (ex Solander) in Cuvier & Valenciennes, 1831
1997 - Current Project Obs (Honolulu Harbor)
- ***Chaetodon quadrimaculatus*** Gray, 1831
1997 - Current Project Obs (Honolulu Harbor)
- ***Chaetodon trifasciatus*** Park, 1797
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Chaetodon unimaculatus*** Bloch, 1787
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Forcipiger flavissimus*** Jordan & McGregor in Jordan & Evermann, 1898
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Forcipiger*** **sp.** Jordan & McGregor in Jordan & Evermann, 1898
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)

Family: Cichlidae

- ***Oreochromis mossambicus*** (Peters, 1852) **(Introduced)**
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon. Recorded as *Tilapia mossabicus*.)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
- ***Sarotherodon melanotheron*** Rüppell, 1852 **(Introduced)**
1998 - Current Project Obs (Ala Wai Harbor)

Family: Cirrhitidae

- ***Cirrhitops fasciatus*** (Bennett, 1829)
1997 - Current Project Obs (Honolulu Harbor)
- ***Cirrhitus pinnulatus*** (Forster in Bloch & Schneider, 1801)
1997 - Current Project Obs (Honolulu Harbor)
- ***Paracirrhites forsteri*** (Schneider in Bloch & Schneider, 1801)
1991 - Brock, R. E., 1991 (Honolulu Harbor)

Family: Gobiidae

- **Unidentified Gobiidae**
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Asterropteryx semipunctatus*** Rüppell, 1830

1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Spec (Honolulu Harbor)

- *Bathygobius cocosensis* (Bleeker, 1854)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Bathygobius fuscus*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Bathygobius fuscus*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Bathygobius fuscus*.)

- *Eviota ephiphanes*
1997 - Current Project Spec (Honolulu Harbor)
1998 - Current Project Spec (Kewalo Basin)

- *Eviota epiphanes* Jenkins, 1903
1993 - Brock, R. E., 1993 (Honolulu Harbor)

- *Gnatholepis anjerensis* (Bleeker, 1851)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Kelloggella oligolepis*? (Jenkins, 1903)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)

- *Priolepis eugenius*? (Jordan & Evermann, 1903)
1997 - Current Project Spec (Honolulu Harbor)
1997 - Current Project Spec (Keehi Lagoon)

- *Priolepis farcimen* (Jordan & Evermann, 1903)
1997 - Current Project Spec (Honolulu Harbor)

- *Psilogobius mainlandi* Baldwin, 1972
1988 - AECOS, 1988 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Family: Kuhliidae

- *Kuhlia sandvicensis* (Steindachner, 1876)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Family: Kyphosidae

- *Kyphosus bigibbus* Lacepède, 1801
1997 - Current Project Obs (Honolulu Harbor)

Family: Labridae

- Unidentified Labridae

1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1998 - Current Project Spec (Barbers Point Harbor)
- ***Anampses cuvier*** Quoy & Gaimard, 1824
1997 - Current Project Obs (Honolulu Harbor)
- ***Bodianus bilunulatus*** Lacepède, 1801
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Cheilinus bimaculatus*** Valenciennes in Cuvier & Valenciennes, 1840
1993 - Brock, R. E., 1993 (Honolulu Harbor)
- ***Cheilinus unifasciatus*** Streets, 1877
1997 - Current Project Obs (Honolulu Harbor)
- ***Cheilio inermis*** (Forsskål, 1775)
1997 - Current Project Obs (Honolulu Harbor)
- ***Coris flavovittata*** (Bennett, 1829)
1998 - Current Project Obs (Ala Wai Harbor)
- ***Coris gaimard*** (Quoy & Gaimard, 1824)
1988 - AECOS, 1988 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
- ***Gomphosus varius*** Lacepède, 1801
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
- ***Labroides phthirophagus*** Randall, 1958
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
- ***Labrus balanus*** Fleming, 1828
1982 - AECOS, 1982 (Honolulu Harbor)
- ***Labrus scarus*** Linnaeus, 1758
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
- ***Pseudocheilinus tetrataenia*** Schultz in Schultz et al., 1960
1997 - Current Project Obs (Honolulu Harbor)
- ***Stethojulis balteata*** (Quoy & Gaimard, 1824)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Stethojulis balteatus*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Stethojulis balteatus*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
- ***Thalassoma ballieui*** (Vaillant & Sauvage, 1875)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
- ***Thalassoma duperrey*** (Quoy & Gaimard, 1824)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)
- ***Thalassoma purpureum*** (Forsskål, 1775)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
- ***Thalassoma trilobatus*** Lacépède, 1801
1997 - Current Project Obs (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Thalasomma fuscum*.)
1998 - Current Project Obs (Barbers Point Harbor)

Family: Lethrinidae

- ***Monotaxis grandoculis*** (Forsskål, 1775)
1982 - AECOS, 1982 (Honolulu Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

Family: Lutjanidae

- ***Lutjanus fulvus*** (Forster in Bloch & Schneider, 1801) **(Introduced)**
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

Family: Mugilidae

- ***Neomyxus leuciscus*** (Günther, 1872 [or 1871?])
1998 - Current Project Obs (Ala Wai Harbor)

Family: Mullidae

- **Unidentified Mullidae**
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
- ***Mulloidichthys flavolineatus*** (Lacépede, 1801)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Mulloidichthys samoensis*.)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Mulloidichthys samoensis*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Mulloidichthys samoensis*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Mulloidichthys samoensis*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1982 - AECOS, 1982 (Honolulu Harbor. Recorded as *Mulloidichthys samoensis*.)
1988 - AECOS, 1988 (Honolulu Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor. Recorded as *Mulloidichthys*

samoensis.)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)
1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Mulloides flavolineatus*.)

- *Mulloidichthys vanicolensis* (Valenciennes in Cuvier & Valenciennes, 1831)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Mulloidichthys auriflamma*.)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Mulloidichthys auriflama*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Mulloidichthys auriflama*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Mulloidichthys auriflamma*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor. Recorded as *Mulloidichthys auriflama*.)
1991 - Brock, R. E., 1991 (Honolulu Harbor. Recorded as *Mulloides vanicolensis*.)
1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Mulloides vanicolensis*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Mulloides vanicolensis*.)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

- *Parupeneus bifasciatus* (Lacepède, 1801)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Parupeneus multifasciatus* (Quoy & Gaimard, 1825)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)

- *Parupeneus pleurostigma* (Bennett, 1831)
1995 - Brock, R. E., 1995 (Honolulu Harbor)

- *Parupeneus porphyreus* (Jenkins, 1903)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Upeneus arge* Jordan & Evermann, 1903

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)

Family: Percidae

- *Etheostoma blennius* Gilbert & Swain in Gilbert, 1887
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)

Family: Pomacanthidae

- *Centropyge flavissima* (Cuvier in Cuvier & Valenciennes, 1831) **(Introduced)**
1998 - Current Project Obs (Ala Wai Harbor)

Family: Pomacentridae

- Unidentified Pomacentridae
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

- *Abudefduf abdominalis* (Quoy & Gaimard, 1825)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Abudefduf sordidus* (Forsskål, 1775)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Chromis ovalis* Steindachner, 1900
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)

- *Chromis vanderbilti* (Fowler, 1941)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

- *Dascyllus albisella* Gill, 1862
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu

Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Spec (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Plectroglyphidodon imparipennis* (Vaillant & Sauvage, 1875)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Dascyllus imparipennis*.)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)

- *Plectroglyphidodon sindonis* Jordan & Evermann, 1903
1998 - Current Project Obs (Ala Wai Harbor)

- *Stegastes fasciolatus* (Ogilby, 1889)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Pomacentrus jenkinsi*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Pomacentrus jenkensi*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Pomacentrus jenkensi*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor. Recorded as *Pomacentrus jenkensi*.)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

Family: Priacanthidae

- *Heteropriacanthus cruentatus* (Lacepède, 1801)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

Family: Scaridae

- *Calotomus carolinus* (Valenciennes in Cuvier & Valenciennes, 1840)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

- *Calotomus spinidens* (Quoy & Gaimard, 1824)
1997 - Current Project Obs (Honolulu Harbor)

- *Scarus perspicillatus* Steindachner, 1879
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Scarus psittacus* Forsskål, 1775
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Scarus rubroviolaceus* Bleeker, 1847
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Scarus sordidus* Forsskål, 1775
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Scarus* sp. Forsskål, 1775

1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

Family: Schindleriidae

- *Schindleria* sp. Giltay, 1934

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

Family: Scorpididae

- *Microcanthus strigatus* (Cuvier (ex Langsdorf) in Cuvier & Valenciennes, 1831)

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

Family: Sphyraenidae

- *Sphyraena barracuda* (Walbaum, 1792)

1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1982 - AECOS, 1982 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

Family: Zanclidae

- *Zanclus cornutus* (Linnaeus, 1758)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Zanclus canescens*.)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Zanclus canescens*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Zanclus canescens*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Zanclus canescens*.)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor. Recorded as *Zanclus canescens*.)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Order: Pleuronectiformes

Family: Bothidae

- *Bothus mancus* (Broussonet, 1782)

1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)

Order: Tetraodontiformes

Family: Balistidae

- *Rhinecanthus rectangulus* (Bloch & Schneider, 1801)

1988 - AECOS, 1988 (Honolulu Harbor)
- ***Sufflamen bursa*** (Bloch & Schneider, 1801)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

Family: Diodontidae

- ***Diodon holocanthus*** Linnaeus, 1758
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
- ***Diodon hystrix*** Linnaeus, 1758
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Keehi Lagoon)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

Family: Monacanthidae

- ***Pervagor spilosoma*** (Lay & Bennett, 1839)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1988 - AECOS, 1988 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

Family: Ostraciidae

- ***Lactoria fornasini*** (Bianconi, 1846)
1978 - Environmental Consultants Inc., 1978 (Keehi Lagoon)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Kewalo Basin)
- ***Ostracion meleagris*** Shaw in Shaw & Nodder, 1796
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1988 - AECOS, 1988 (Honolulu Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Family: Tetraodontidae

- *Arothron hispidus* (Linnaeus, 1758)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Canthigaster coronata* (Vaillant & Sauvage, 1875)

1992 - Brock, R. E., 1992 (Honolulu Harbor)

- *Canthigaster jactator* (Jenkins, 1901)

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)
1998 - Current Project Obs (Ala Wai Harbor)
1998 - Current Project Obs (Barbers Point Harbor)
1998 - Current Project Obs (Kewalo Basin)

Order: Elopiformes

Family: Elopidae

- *Elops hawaiiensis* Regan, 1909

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

Order: Anguilliformes

Family: Congridae

- *Conger marginatus* Valenciennes in Eydoux & Souleyet, 1850

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

Family: Muraenidae

- *Echidna nebulosa* (Ahl, 1789)

1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)
1977 - Environmental Consultants Inc., 1977 (Keehi Lagoon)
1979 - Environmental Consultants Inc., 1979 (Keehi Lagoon)

- *Gymnothorax eurostus* (Abbott, 1861)

1975 - Environmental Consultants Inc., 1975 (Barbers Point Harbor)

- *Gymnothorax flavimarginatus* (Rüppell, 1828)

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)

- *Gymnothorax undulatus* (Lacépede, 1803)

1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1995 - Brock, R. E., 1995 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)

Order: Clupeiformes

Family: Engraulidae

- *Encrasicholina purpurea* (Fowler, 1900)

1973 - McCain, J. C.; Coles, S. L., 1973 (Honolulu Harbor. Recorded as *Stolophorus purpures*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Stolophorus purpures*.)
1990 - Oceanit Laboratories Inc., 1990 (Honolulu Harbor. Recorded as *Stolophorus purpureus*.)

Order: Cypriniformes

Family: Cyprinidae

- *Danio apogon* Chu, 1981

1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)

Order: Aulopiformes

Family: Synodontidae

- *Saurida flamma* Waples, 1982

1991 - Brock, R. E., 1991 (Honolulu Harbor)
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)
1994 - Brock, R. E., 1994 (Honolulu Harbor)
1997 - Brock, R. E., 1997 (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

- *Saurida gracilis* (Quoy & Gaimard, 1824)

1992 - Brock, R. E., 1992 (Honolulu Harbor. Recorded as *Suarida gracilis*.)
1993 - Brock, R. E., 1993 (Honolulu Harbor. Recorded as *Suarida gracilis*.)
1994 - Brock, R. E., 1994 (Honolulu Harbor. Recorded as *Suarida gracilis*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Suarida gracilis*.)

- *Synodus synodus* Linnaeus, 1758

1988 - AECOS, 1988 (Honolulu Harbor)

- *Synodus variegatus* (Lacepède, 1803)

1995 - Brock, R. E., 1995 (Honolulu Harbor. Recorded as *Saurida variegatus*.)

- *Synodus* sp. Scopoli (ex Gronow), 1777

1997 - Current Project Obs (Honolulu Harbor)

Order: Lophiiformes

Family: Antennariidae

- *Antennarius commersoni* (Latreille, 1804)

1992 - Brock, R. E., 1992 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1997 - Current Project Obs (Keehi Lagoon)

- *Antennarius drombus* Jordan & Evermann, 1903
1992 - Brock, R. E., 1992 (Honolulu Harbor)
1993 - Brock, R. E., 1993 (Honolulu Harbor)

Order: Beloniformes

Family: Hemiramphidae

- *Hemiramphus depauperatus* Lay & Bennett, 1839
1988 - AECOS, 1988 (Honolulu Harbor)

Order: Beryciformes

Family: Holocentridae

- *Holocentrus epinephelus* Lacepède, 1802
1988 - AECOS, 1988 (Honolulu Harbor)

- *Myripristis amaenus* Castelnau, 1873
1997 - Brock, R. E., 1997 (Honolulu Harbor)

- *Myripristis berndti* Jordan & Evermann, 1903
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Myripristis murdjan*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Myripristis murdjan*.)
1998 - Current Project Obs (Kewalo Basin)

- *Myripristis kuntee* Valenciennes in Cuvier & Valenciennes, 1831
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Myripristis borbonicus*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Myripristis borbonicus*.)

- *Myripristis* sp. Cuvier, 1829
1997 - Current Project Obs (Honolulu Harbor)

- *Neoniphon sammara* (Forsskål, 1775)
1972 - McCain, J. C.; Peck, J. M. Jr., 1972 (Honolulu Harbor. Recorded as *Flammeo sammara*.)
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor)
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Ala Wai Harbor)

- *Sargocentron xantherythrum* Jordan & Evermann, 1903
1974 - Environmental Consultants Inc.; Hawaiian Electric Company Inc., 1974 (Honolulu Harbor. Recorded as *Adioryx xantherythrus*.)
1974 - McCain, J. C.; et al., 1975 (Honolulu Harbor. Recorded as *Adioryx xantherythrus*.)
1997 - Brock, R. E., 1997 (Honolulu Harbor. Recorded as *Adioryx xantherythrus*.)

- *Sargocentron* sp. Fowler, 1904
1997 - Current Project Obs (Honolulu Harbor)
1998 - Current Project Obs (Kewalo Basin)

APPENDIX D

Station Records for Invertebrates and Fishes Collected or Observed in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, Ala Wai Yacht Harbor and Barber's Point Deep Draft Harbor during 1997-98

			Station																															
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Cyanophycota		Unidentified Cyanophycota			X																													
Cyanophycota		*Ocillatoria sp.*																															X	
Cyanophycota	Oscillatoriaceae	*Lyngbya sp.*					X																											
Bacillariophyta	Diatomaceae	*Diatoma sp.*						X										X													X			
Chlorophycota	Ulotrichaceae	*Ulothrix flacea*															X																	
Chlorophycota	Ulvaceae	*Enteromorpha intestinalis*																							X								X	
Chlorophycota	Ulvaceae	*Enteromorpha sp.*														X																		
Chlorophycota	Ulvaceae	*Ulva fasciata*																															X	
Chlorophycota	Ulvaceae	*Ulva rigida*																					X			X								
Chlorophycota	Ulvaceae	*Ulva sp.*			X	X	X	X										X						X	X							X	X	
Chlorophycota	Cladophoraceae	*Cladophora dotyana*																	X															
Chlorophycota	Cladophoraceae	*Cladophora socialis*														X																		
Chlorophycota	Cladophoraceae	*Cladophora sp.*		X				X								X		X																X
Chlorophycota	Cladophoraceae	*Cladophora vagabunda*			X	X											X												X					
Chlorophycota	Caulerpaceae	*Caulerpa racemosa forma peltata*																X																
Chlorophycota	Caulerpaceae	*Caulerpa sp.*														X																		
Chlorophycota	Caulerpaceae	*Caulerpella ambigua*						X					X				X	X																
Chlorophycota	Codiaceae	*Chlorodesmis caespitosa*				X																												
Chlorophycota	Codiaceae	*Codium arabiculum*																	X															
Chlorophycota	Codiaceae	*Codium edule*																X																
Chlorophycota	Codiaceae	*Codium sp.*	X															X																
Chlorophycota	Codiaceae	*Halimeda sp.*																X																
Chlorophycota	Dasycladaceae	*Neomeris annulata*					X																											
Chlorophycota	Dasycladaceae	*Trichosolen oahuensis*																	X															
Chlorophycota	Siphonocladaceae	*Cladophoropsis herpestica*	X																X															
Chlorophycota	Siphonocladaceae	*Cladophoropsis sundanensis*														X															X			
Chlorophycota	Valoniaceae	*Dictyosphaeria versluysii*	X			X																												
Chlorophycota	Valoniaceae	*Ventricaria ventricosa*			X	X												X																
Chlorophycota	Bryopsidaceae	*Bryopsis hypnoides*														X																		
Chlorophycota	Bryopsidaceae	*Bryopsis pennata*																					X											
Chlorophycota	Bryopsidaceae	*Bryopsis sp.*		X																				X		X								
Phaeophycophyta		*Hincksia mitchellae*														X																		
Phaeophycophyta	Dictyotaceae	*Dictyopteris repens*																X																
Phaeophycophyta	Dictyotaceae	*Dictyota acutiloba*		X																														
Phaeophycophyta	Dictyotaceae	*Dictyota sp.*			X	X	X						X					X																
Phaeophycophyta	Dictyotaceae	*Lobophora variegata*	X	X	X	X	X			X	X	X	X	X	X		X	X		X	X													
Phaeophycophyta	Dictyotaceae	*Padina sp.*		X			X																											
Phaeophycophyta	Sargassaceae	*Sargassum sp.*																X																
Phaeophycophyta	Scytosiphonaceae	*Rosenvingea orientalis*																												X				
Rhodophycota		*Unidentified Rhodophycota*		X		X							X							X														
Rhodophycota		*Spyridea filamentosa*					X																										X	
Rhodophycota		*Stylonema alsidii*			X													X																

			Station																															
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Rhodophycota		*Stylonema elegans*																													X			
Rhodophycota	Erythropeltidaceae	*Erythrotrichia carnea*																X																
Rhodophycota	Acrochaetiaceae	*Acrochaetium sp.*	X																												X			
Rhodophycota	Bonnemaisoniaceae	*Asparagopsis taxiformis*		X	X																													
Rhodophycota	Bonnemaisoniaceae	*Falkenbergia hillebrandii*		X		X	X									X		X																
Rhodophycota	Chaetangiaceae	*Galaxaura acuminata*	X			X					X	X	X																					
Rhodophycota	Chaetangiaceae	*Galaxaura marginata*	X			X	X				X																							
Rhodophycota	Chaetangiaceae	*Galaxaura sp.*				X																												
Rhodophycota	Gelidiellaceae	*Gelidiella myrioclada*				X											X												X				
Rhodophycota	Gelidiellaceae	*Gelidiella sp.*					X																											X
Rhodophycota	Caulacanthaceae	*Caulacanthus ustulatus*			X		X																											
Rhodophycota	Hypneaceae	*Hypnea pannosa*																			X													
Rhodophycota	Hypneaceae	*Hypnea sp.*		X																														
Rhodophycota	Hypneaceae	*Hypnea spinella*				X													X															
Rhodophycota	Plocamiaceae	*Plocamium sandvicense*																X																
Rhodophycota	Corallinaceae	*Unidentified Corallinaceae*		X		X		X																	X				X					X
Rhodophycota	Corallinaceae	*Amphiroa beavoisii*																X																
Rhodophycota	Corallinaceae	*Amphiroa sp.*			X																													
Rhodophycota	Corallinaceae	*Jania micrarthrodia*																X																
Rhodophycota	Corallinaceae	*Jania sp.*		X	X	X		X								X																		X
Rhodophycota	Corallinaceae	*Porolithon sp.*	X																															
Rhodophycota	Cryptonemiaceae	*Halymenia formosa*			X																													
Rhodophycota	Cryptonemiaceae	*Halymenia sp.*																					X											
Rhodophycota	Squamariaceae	*Peyssonnelia sp.*						X												X														
Rhodophycota		*Unidentified Rhodymeniales*				X	X																											
Rhodophycota	Champiaceae	*Champia parvula*		X	X	X		X											X															
Rhodophycota	Champiaceae	*Champia vieillardii*													X																			
Rhodophycota	Champiaceae	*Lomentaria hakodatensis*			X			X															X											
Rhodophycota	Champiaceae	*Lomentaria sp.*	X	X		X																												
Rhodophycota	Lomentariaceae	*Gelidiopsis intricata*						X										X																
Rhodophycota	Rhodymeniaceae	*Chrysymenia okamurae*		X	X										X																			
Rhodophycota	Rhodymeniaceae	*Chrysymenia sp.*	X			X																												
Rhodophycota	Gelidiaceae	*Gelidium pusillum*																	X												X			
Rhodophycota	Gelidiaceae	*Gelidium sp.*														X																		
Rhodophycota		*Unidentified Ceramiales*	X					X																							X			
Rhodophycota	Ceramiaceae	*Unidentified Ceramiaceae*				X																												
Rhodophycota	Ceramiaceae	*Aglaothamnion boergesenii*				X						X																						
Rhodophycota	Ceramiaceae	*Aglaothamnion cordatum*	X																															
Rhodophycota	Ceramiaceae	*Anotrichium secundum*										X																						
Rhodophycota	Ceramiaceae	*Antithamnion antillanum*			X														X															
Rhodophycota	Ceramiaceae	*Antithamnion erucacladellum*															X																	
Rhodophycota	Ceramiaceae	*Antithamnion sp.*	X																															

			Station																														
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Rhodophycota	Ceramiaceae	*Antithamnionella breviramosa*	X																										X		X			
Rhodophycota	Ceramiaceae	*Antithamnionella graeffei*		X																														
Rhodophycota	Ceramiaceae	*Antithamnionella sp.*						X			X									X														
Rhodophycota	Ceramiaceae	*Callithamnion cordatum*					X																											
Rhodophycota	Ceramiaceae	*Centroceras clavulatum*		X				X								X				X	X										X		X	
Rhodophycota	Ceramiaceae	*Ceramium aduncum*																																X
Rhodophycota	Ceramiaceae	*Ceramium borneense*														X																		
Rhodophycota	Ceramiaceae	*Ceramium clarionense*				X																												
Rhodophycota	Ceramiaceae	*Ceramium fimbriatum*																X																
Rhodophycota	Ceramiaceae	*Ceramium flaccidum*		X												X														X	X			
Rhodophycota	Ceramiaceae	*Ceramium sp.*	X	X		X						X																X						
Rhodophycota	Ceramiaceae	*Ceramium vagans*				X					X																							
Rhodophycota	Ceramiaceae	*Cermium clarionense*																													X			
Rhodophycota	Ceramiaceae	*Cermium codii*															X																	
Rhodophycota	Ceramiaceae	*Diplothamnion jolyi*														X																		
Rhodophycota	Ceramiaceae	*Griffithsia heteromorpha*		X	X											X		X																X
Rhodophycota	Ceramiaceae	*Melanamansia glomerata*																X																
Rhodophycota	Ceramiaceae	*Monosporus indicus*														X																		
Rhodophycota	Ceramiaceae	*Monosporus sp.*				X																												
Rhodophycota	Ceramiaceae	*Polysiphona sphaerocarpa*																													X			
Rhodophycota	Ceramiaceae	*Polysiphona subtilissima*																													X			
Rhodophycota	Ceramiaceae	*Porteria hornmanni*			X																													
Rhodophycota	Dasyaceae	*Dasya iridescens*			X											X				X														
Rhodophycota	Dasyaceae	*Dasya pilosa*				X										X																		
Rhodophycota	Dasyaceae	*Dasya sp.*	X	X		X	X	X					X			X		X																
Rhodophycota	Dasyaceae	*Heterosiphonia crispella*			X										X	X			X															
Rhodophycota	Delesseriaceae	*Branchioglossum prostratum*	X																															
Rhodophycota	Delesseriaceae	*Hypoglossum sp.*						X																X										
Rhodophycota	Delesseriaceae	*Malaconema minimum*				X																												
Rhodophycota	Rhodomelaceae	*Acanthophora spicifera*					X	X				X				X				X				X		X		X	X		X			
Rhodophycota	Rhodomelaceae	*Chondria arcuata*																													X			
Rhodophycota	Rhodomelaceae	*Chondria simpliciuscula*		X	X													X												X				
Rhodophycota	Rhodomelaceae	*Chondria sp.*		X																X														
Rhodophycota	Rhodomelaceae	*Herposiphonia sp.*														X																		
Rhodophycota	Rhodomelaceae	*Herposiphonia tenella*																												X				
Rhodophycota	Rhodomelaceae	*Laurencia sp.*																X																
Rhodophycota	Rhodomelaceae	*Lophocladia sp.*		X																														
Rhodophycota	Rhodomelaceae	*Polysiphonia scopulorum*					X										X																	
Rhodophycota	Rhodomelaceae	*Polysiphonia setacea*										X																						
Rhodophycota	Rhodomelaceae	*Polysiphonia sp.*		X				X			X		X			X		X	X									X						
Rhodophycota	Rhodomelaceae	*Polysiphonia subtilissima*																												X				
Protozoa		*Unidentified Foraminiferida*		X												X																		X

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Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Magnoliophyta	Rhizophoraceae	*Rhizophora mangel*																				X												
Porifera	Clathrinidae	*Clathrina sp. 2*																X					X											
Porifera	Grantiidae	*Leuconia n. sp. 1*		X				X				X																				X		
Porifera	Heteropiidae	*Heteropia glomerosa*	X		X		X		X	X						X					X		X	X	X	X				X				
Porifera	Plankinidae	*Oscarella sp.*			X									X																				
Porifera	Plankinidae	*Plakortis n. sp. 1*	X		X																													
Porifera	Chondrillidae	*Chondrosia chucalla*																X																
Porifera	Suberitidae	*Suberites zeteki*													X												X		X					
Porifera	Tethyidae	*Tethya cf. diploderma*																X		X					X									
Porifera	Desmacellidae	*Biemna fistulosa*	X	X	X			X											X	X	X									X				
Porifera	Raspailiidae	*Echinodictyum asperum*		X			X		X	X		X		X	X																			
Porifera	Coelosphaeridae	*Lissodendoryx sp.*													X																			
Porifera	Myxillidae	*Iotrochota protea*	X	X	X	X	X	X		X	X	X		X	X	X				X	X	X								X		X		X
Porifera	Tedaniidae	*Tedania n. sp. 1*																X																
Porifera	Tedaniidae	*Tedania reticulata*																		X	X													
Porifera	Mycalidae	*Mycale (Aegogropila) armata*					X													X	X									X			X	X
Porifera	Mycalidae	*Mycale (Carmia) cecilia*		X		X					X			X					X	X			X		X			X	X	X	X			X
Porifera	Mycalidae	*Zygomycale parishii*					X	X			X	X		X		X	X		X	X		X		X	X				X					
Porifera	Crambidae	*Neofolitispa unguiculata*			X							X			X					X	X													
Porifera	Halichondriidae	*Amorphinopsis n. sp. 1*																			X						X	X	X	X		X	X	
Porifera	Halichondriidae	*Halichondria melanadocia*																									X	X	X					
Porifera	Halichondriidae	*Halichondria cf. dura*																						X										
Porifera	Halichondriidae	*Topsentia sp.*	X			X	X		X	X	X	X		X	X				X				X	X	X	X				X			X	
Porifera	Callyspongiidae	*Callyspongia cf. diffusa*									X														X									
Porifera	Callyspongiidae	*Callyspongia sp.*			X	X				X			X			X					X											X	X	
Porifera	Chalinidae	*Chalinidae n. gen. n. sp. 1*																		X	X							X						
Porifera	Chalinidae	*Haliclona cf. permolis*					X				X		X	X	X		X								X									
Porifera	Chalinidae	*Sigmadocia caerulea*																		X														
Porifera	Chalinidae	*Toxiclona n. sp. 1*									X		X								X													
Porifera	Chalinidae	*Gellius n. sp. 1*					X	X	X	X		X									X	X	X							X				
Porifera	Niphatidae	*Gelliodes fibrosa*	X		X	X	X	X	X	X				X	X					X	X	X		X			X		X		X	X	
Porifera	Niphatidae	*Gelliodes sp.*										X																						
Porifera	Spongiidae	*Hyattella intestinalis*	X	X	X	X	X	X	X	X	X				X		X			X	X	X									X		
Porifera	Thorectidae	*Cacospongia n. sp. 1*		X																													X	
Porifera	Aplysellidae	*Chelonaplysilla violacea*														X																		
Porifera	Darwinellidae	*Aplysilla cf. sulfurea*			X	X																												
Porifera	Dictyodendrillidae	*Dictyodendrilla n. sp. 1*	X	X			X		X		X		X	X	X		X						X								X		
Porifera	Dictyodendrillidae	*Dictyodendrilla n. sp. 2*	X	X	X	X	X			X	X			X							X	X												
Porifera	Dysideidae	*Dysidea cf. avara*	X	X	X	X	X		X						X	X																		
Porifera	Dysideidae	*Dysidea n. sp. 1*	X					X	X							X			X															
Porifera	Dysideidae	*Dysidea n. sp. 3*						X																										
Porifera	Dysideidae	*Dysidea cf. arenaria*	X	X	X	X				X		X				X			X	X	X	X												

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Cnidaria		*Unidentified Cnidaria*														X																		
Cnidaria		*Unidentified Hydrozoa*					X					X	X			X			X	X					X			X		X		X		
Cnidaria	Bougainvilliidae	*Bougainvillia sp.*						X																										
Cnidaria	Haleciidae	*Halecium beani*																																X
Cnidaria	Halocordylidae	*Halocordyle disticha*	X	X	X	X	X	X	X		X	X	X		X								X	X	X	X		X		X	X			
Cnidaria	Sertulariidae	*Dynamena crisiodes*								X				X	X	X			X						X							X		
Cnidaria	Sertulariidae	*Thyroscyphus fructicosus*		X	X	X			X						X																			
Cnidaria	Ulmaridae	*Aurelia sp.*																												X				
Cnidaria	Telestidae	*Carijoa (Telestea) riisei*	X	X	X	X			X	X					X	X	X								X							X		
Cnidaria	Xenidae	*Anthelia edmondsoni*																X																
Cnidaria	Zoanthidae	*Palythoa tuberculosa*																X																
Cnidaria	Zoanthidae	*Zoanthus pacificus*	X													X																		
Cnidaria	Zoanthidae	*Zoanthus sp.*	X													X				X														
Cnidaria	Actinodiscidae	*Actinodiscus nummiformis*																																
Cnidaria	Aiptasiidae	*Aiptasia pulchella*									X																							
Cnidaria	Diadumenidae	*Diadumene franciscana*																										X			X			
Cnidaria	Diadumenidae	*Diadumene leucolena*							X																									
Cnidaria	Diadumenidae	*Diadumene sp.*																						X	X					X				
Cnidaria		*Unidentified Scleractinia*					X																											
Cnidaria	Acroporidae	*Montipora capitata*	X	X	X	X	X	X	X	X		X				X																		X
Cnidaria	Acroporidae	*Montipora patula*	X	X	X	X	X		X	X		X				X																		
Cnidaria	Agariciidae	*Leptoseris incrustans*														X																		
Cnidaria	Agariciidae	*Pavona varians*	X	X		X	X		X	X		X				X	X																	
Cnidaria	Faviidae	*Cyphastrea ocellina*							X																									
Cnidaria	Faviidae	*Leptastrea purpurea*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X									X	X				
Cnidaria	Pocilloporidae	*Pocillopora damicornis*	X			X	X	X	X	X		X	X			X	X																	
Cnidaria	Pocilloporidae	*Pocillopora eydouxi*		X																														
Cnidaria	Pocilloporidae	*Pocillopora meandrina*	X	X	X		X			X						X		X																X
Cnidaria	Poritidae	*Porites compressa*		X	X	X				X						X																		
Cnidaria	Poritidae	*Porites lobata*	X			X	X		X	X		X	X			X	X	X					X											X
Platyhelminthes		*Unidentified Platyhelminthes*		X								X	X	X	X				X		X			X	X			X				X		X
Nemertea		*Unidentified Nemertea*																					X											
Annelida	Chrysopetalidae	*Paleanotus sp. 1*	X																															
Annelida	Dorvilleidae	*Dorvillea angolana*		X		X												X		X				X					X	X				
Annelida	Dorvilleidae	*Dorvillea monilocerus*																												X				
Annelida	Dorvilleidae	*Dorvillea sp.*	X	X																														
Annelida	Lysaretidae	*Oenone sp. 1*	X		X	X	X	X	X			X	X		X								X	X	X	X					X			
Annelida	Magelonidae	*Magelona sp.*	X	X		X		X							X	X														X				
Annelida	Sigalionidae	*Euthalenessa chacei*																														X		
Annelida	Spintheridae	*Spinther japonicus*																		X														
Annelida	Spirorbidae	*Unidentified Spirorbidae*		X				X	X	X		X	X	X			X																	
Annelida	Sternaspidae	*Sternaspis sp.*		X				X	X	X	X			X	X	X								X	X	X					X			

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Annelida	Amphinomidae	*Unidentified Amphinomidae*																																X
Annelida	Amphinomidae	*Eurythoe complanata*	X	X	X												X											X			X			
Annelida	Glyceridae	*Glycera tesselata*	X		X	X	X	X					X				X								X			X						
Annelida	Hesionidae	*Unidentified Hesionidae*																	X			X												
Annelida	Nereididae	*Unidentified Nereididae*			X											X			X								X							X
Annelida	Nereididae	*Ceratonereis tentaculata*																	X	X	X												X	X
Annelida	Nereididae	*Nereididae sp. 3*		X	X	X						X						X														X		
Annelida	Nereididae	*Perinereis nigropunctata*																							X									
Annelida	Phyllodocidae	*Eulalia sp. 1*																X														X	X	
Annelida	Phyllodocidae	*Phyllodoce sp. 1*																														X		
Annelida	Phyllodocidae	*Phyllodoce sp. 2*		X																														X
Annelida	Phyllodocidae	*Phyllodoce sp. 3*														X																		
Annelida	Phyllodocidae	*Phyllodoce sp. 4*																						X										
Annelida	Syllidae	*Unidentified Syllidae*	X	X	X	X	X	X	X	X					X	X	X	X	X					X						X	X			
Annelida	Syllidae	*Autolytus sp.*			X																													
Annelida	Syllidae	*Branchiosyllis exilis*	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Annelida	Syllidae	*Brania rhopalophora*																												X	X			
Annelida	Syllidae	*Exogone verugera*																	X	X										X	X		X	
Annelida	Syllidae	*Haplosyllis spongicola*	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X			X	X			X	X	X	X	X	X	X
Annelida	Syllidae	*Myrianida crassicirrata*																									X						X	
Annelida	Syllidae	*Opisthosyllis sp.*																X																
Annelida	Syllidae	*Syllis gracilis*		X	X			X	X		X	X		X	X	X	X		X		X	X	X	X		X				X	X	X	X	
Annelida	Syllidae	*Trypanosyllis zebra*		X	X	X	X			X						X			X	X	X													
Annelida	Syllidae	*Typosyllis hyalina*		X	X					X					X	X							X	X			X		X	X			X	
Annelida	Syllidae	*Typosyllis prolifera*		X	X				X										X											X			X	
Annelida	Syllidae	*Typosyllis sp.*																													X			
Annelida	Syllidae	*Typosyllis sp. 1*	X							X					X				X	X	X		X	X	X	X	X	X	X	X	X		X	X
Annelida	Syllidae	*Typosyllis sp. 2*		X	X	X				X													X	X	X	X					X			
Annelida	Syllidae	*Typosyllis sp. 3*				X	X		X																									
Annelida	Syllidae	*Typosyllis variegata*	X																											X		X		
Annelida	Eunicidae	*Eunice afra*								X						X		X		X														
Annelida	Eunicidae	*Eunice antennata*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X							X	X	X				
Annelida	Eunicidae	*Eunice cariboea*	X	X	X	X	X	X	X	X	X	X		X	X	X	X						X	X	X	X		X			X	X	X	X
Annelida	Eunicidae	*Eunice filamentosa*		X	X	X		X	X	X	X	X		X	X	X	X		X		X		X	X	X	X		X			X			
Annelida	Eunicidae	*Eunice vittata*	X																															
Annelida	Eunicidae	*Lysidice ninetta*	X	X	X				X		X	X			X		X	X	X	X												X	X	
Annelida	Eunicidae	*Nematonereis unicornis*	X	X	X	X	X	X		X	X	X	X	X	X			X						X						X				
Annelida	Eunicidae	*Palola siciliensis*				X	X												X											X				X
Annelida	Lumbrineridae	*Lumbrineris sp.*		X			X	X		X	X				X	X	X				X			X				X			X	X	X	X
Annelida	Spionidae	*Unidentified Spionidae*	X	X	X					X					X	X						X												X
Annelida	Chaetopteridae	*Chaetopterus sp. A*													X	X	X		X	X	X										X			
Annelida	Cirratulidae	*Unidentified Cirratulidae*		X			X																X	X	X	X		X			X			X

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Annelida	Cirratulidae	*Cirriformia punctata*		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X
Annelida	Cirratulidae	*Cirriformia semicincta*														X																		
Annelida	Cirratulidae	*Cirriformia sp.*	X			X		X															X								X		X	X
Annelida	Opheliidae	*Armandia intermedia*													X								X		X					X				
Annelida	Capitellidae	*Unidentified Capitellidae*						X	X	X			X	X			X												X	X	X			X
Annelida	Capitellidae	*Dasybranchus sp.*	X	X				X		X					X																			
Annelida	Polynoidae	*Iphione muricata*		X	X																													
Annelida	Polynoidae	*Lepidonotus sp. 1*		X	X	X	X		X	X	X			X	X		X		X	X	X											X	X	X
Annelida	Polynoidae	*Paralepidonotus ampulliferus*															X														X			
Annelida	Terebellidae	*Thelepus setosus*		X		X					X	X		X	X		X	X	X	X	X		X									X	X	
Annelida	Cossuridae	*Cossura coasta*						X																										
Annelida	Sabellidae	*Unidentified Sabellidae*			X																													
Annelida	Sabellidae	*Branchiomma nigromaculata*	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Annelida	Sabellidae	*Hypsicomus phaeotaenia*		X		X		X		X			X	X			X																	
Annelida	Sabellidae	*Sabellastarte sanctijosephi*	X	X		X	X	X	X	X	X	X	X		X	X	X		X	X	X		X	X	X	X		X	X	X	X	X		X
Annelida	Sabellidae	*Sabellidae sp. A*	X	X		X	X	X		X	X		X		X	X	X			X	X		X	X	X	X		X		X				
Annelida	Sabellidae	*Sabellidae sp. B*	X	X	X	X	X	X	X			X				X	X	X					X											
Annelida	Sabellidae	*Sabellidae sp. C*						X												X														
Annelida	Sabellidae	*Sabellidae sp. D*						X																										
Annelida	Sabellidae	*Sabellidae sp. E*														X							X											
Annelida	Serpulidae	*Hydroides brachyacantha*											X																					
Annelida	Serpulidae	*Hydroides dirampha*									X								X										X		X	X		
Annelida	Serpulidae	*Hydroides elegans*																														X		
Annelida	Serpulidae	*Neodexiospira sp.*							X																									
Annelida	Serpulidae	*Pileolaria militaris*															X																	
Annelida	Serpulidae	*Pomatoleios kraussii*	X								X		X						X												X			
Annelida	Serpulidae	*Protula atypha*				X																								X				
Annelida	Serpulidae	*Salmacina dysteri*		X	X			X		X		X	X	X	X	X				X										X		X	X	X
Annelida	Serpulidae	*Serpula vermicularis*	X			X				X	X																		X					
Annelida	Serpulidae	*Spirobranchus giganteus corniculatus*					X																											
Annelida	Serpulidae	*Spirobranchus sp.*		X																														
Annelida	Serpulidae	*Vermiliopsis infundibulum*										X																						
Annelida	Serpulidae	*Vermiliopsis torquata*					X	X	X	X			X		X		X						X											
Annelida		*Unidentified Oligochaeta*				X		X																										
Mollusca		*Unidentified Gastropoda*														X							X											
Mollusca	Fissurellidae	*Unidentified Fissurellidae*																																X
Mollusca	Fissurellidae	*Diodora octagona*				X				X				X		X			X															
Mollusca	Fissurellidae	*Diodora ruppelli*				X					X					X					X		X	X							X			X
Mollusca	Neritidae	*Unidentified Neritidae*																																X
Mollusca	Phasianellidae	*Tricolia (Hiloa) variabilis*																X					X											
Mollusca	Trochidae	*Euchelus gemmatus*														X																		
Mollusca	Trochidae	*Gibbula marmorata*																X																

			Station																															
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Mollusca	Trochidae	*Synaptocochlea concinna*																X					X											
Mollusca	Turbinidae	*Leptothyra rubricincta*																X																
Mollusca	Calyptraeidae	*Cheilea equestris*						X									X											X						
Mollusca	Calyptraeidae	*Crepidula aculeata*	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X		X	X	X			X			X	X	X	X
Mollusca	Calyptraeidae	*Crucibulum spinosum*				X															X											X		
Mollusca	Cerithiidae	*Bittium parcum*														X																		
Mollusca	Cerithiidae	*Cerithium interstriatum*														X																		
Mollusca	Cerithiidae	*Styliferina goniochila*		X																														
Mollusca	Cymatiidae	*Cymatium (Septa) rubeculum*														X																		
Mollusca	Cymatiidae	*Cymatium intermedius*				X						X												X									X	
Mollusca	Cymatiidae	*Cymatium pileare*	X																															
Mollusca	Cypraeidae	*Cypraea isabella*		X																														
Mollusca	Eulimidae	*Unidentified Eulimidae*																X																
Mollusca	Eulimidae	*Eulima metcalfei*																					X											
Mollusca	Hipponicidae	*Unidentified Hipponicidae*		X																										X			X	X
Mollusca	Hipponicidae	*Antisabia foliaceus*																X																
Mollusca	Hipponicidae	*Hipponix (Pilosabia) pilosus*																								X								
Mollusca	Hipponicidae	*Hipponix imbricatus*	X		X	X								X		X								X	X			X						
Mollusca	Littorinidae	*Littoraria pintada*	X	X		X			X														X											X
Mollusca	Littorinidae	*Littoraria pintado*	X	X		X											X																	
Mollusca	Littorinidae	*Littoraria scabra*														X											X					X		
Mollusca	Littorinidae	*Nodilittorina picta*		X																														
Mollusca	Planaxidae	*Planaxis suturalis*														X																		
Mollusca	Rissoellidae	*Rissoella longispira*																X																
Mollusca	Rissoellidae	*Rissoella sp.*														X																		
Mollusca	Rissoidae	*Pusillina (Haurakia) marmorata*														X																		
Mollusca	Rissoidae	*Rissoina (Apotaxia) cerithiformis*														X														X				
Mollusca	Rissoidae	*Rissoina ambigua*																X																
Mollusca	Rissoidae	*Stosiscia hiloense*																					X											
Mollusca	Rissoidae	*Zebina tridentata*														X																		
Mollusca	Triphoridae	*Unidentified Triphoridae*														X																		
Mollusca	Vermetidae	*Dendropoma sp.*																					X											
Mollusca	Vermetidae	*Dendropoma sp. cf. rhysochonca*												X																				
Mollusca	Vermetidae	*Petaloconchus keenae*			X																				X					X			
Mollusca	Vermetidae	*Vermetus alii*		X	X														X		X			X	X	X					X	X	
Mollusca	Buccinidae	*Prodotia iostomus*	X																															
Mollusca	Columbellidae	*Seminella sp.*																						X								X		
Mollusca	Columbellidae	*Seminella virginea*				X	X					X	X		X	X							X	X						X				X
Mollusca	Columbellidae	*Zafra sp. cf. hervieri*		X																														
Mollusca	Marginellidae	*Cysticus huna*																					X											
Mollusca	Mitridae	*Mitra assimilis*		X																														
Mollusca	Mitridae	*Mitra coronata*		X																														

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Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Mollusca	Mitridae	*Vexillum (Pusia) tusum*		X																														
Mollusca	Pyramidellidae	*Hinemoa indica*		X												X																		X
Mollusca	Pyramidellidae	*Miralda paulbartschi*														X																		
Mollusca	Pyramidellidae	*Odostomia oxia*														X							X											
Mollusca		*Unidentified Cephalaspidea*		X																														
Mollusca	Bullidae	*Bulla vernicosa*														X																		
Mollusca	Cylichnidae	*Acteocina sp.*														X																		
Mollusca	Haminoeidae	*Atys debilis*																																X
Mollusca	Haminoeidae	*Atys semistriata*		X																														
Mollusca	Haminoeidae	*Atys sp.*										X																						
Mollusca	Hydatinidae	*Hydatina amplustre*	X																															
Mollusca	Siphonariidae	*Siphonaria normalis*		X	X	X	X	X	X			X	X			X	X		X				X	X			X					X		
Mollusca	Siphonariidae	*Williamia radiata*																		X														X
Mollusca	Caliphyllidae	*Cyerce sp.*																								X								
Mollusca	Juliidae	*Julia exquisita*																X																
Mollusca	Doridiidae	*Chromodoris imperialis*																												X				
Mollusca	Doridiidae	*Glossodoris rufomarginata*																												X				
Mollusca	Doridiidae	*Hypselodoris infurcata*																	X		X													
Mollusca	Doridiidae	*Hypselodoris sp.*																								X								
Mollusca	Goniodorididae	*Goniodoris sp.*																							X									
Mollusca	Polyceridae	*Tambja morosa*		X	X		X	X							X																			
Mollusca		*Unidentified Aeolidacea*																					X											
Mollusca	Pteraeolididae	*Pteraeolidia ianthina*																																
Mollusca	Ischnochitonidae	*Ischnochiton petaloides*																X	X													X		
Mollusca		*Unidentified Bivalvia*											X																			X		X
Mollusca	Anomiidae	*Anomia nobilis*		X	X																											X		
Mollusca	Arcidae	*Arca ventricosa*		X	X				X																									X
Mollusca	Arcidae	*Barbatia tenella*																X																
Mollusca	Isognomonidae	*Isognomon californicum*																				X				X	X	X	X					
Mollusca	Isognomonidae	*Isognomon incisum*																															X	
Mollusca	Isognomonidae	*Isognomon perna*		X	X					X								X												X	X		X	
Mollusca	Mytilidae	*Brachidontes crebristriatus*	X	X	X	X	X		X		X		X	X	X	X			X	X			X	X	X						X	X	X	X
Mollusca	Mytilidae	*Crenella sp.*																																X
Mollusca	Ostreidae	*Dendostrea sandvichensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Mollusca	Ostreidae	*Ostrea hanleyana*								X																								
Mollusca	Ostreidae	*Ostrea lima*			X																													
Mollusca	Ostreidae	*Ostrea sp.*	X	X	X	X	X	X	X	X	X	X	X		X				X	X													X	X
Mollusca	Ostreidae	*Saccostrea sp.*									X																							
Mollusca	Pectinidae	*Unidentified Pectinidae*																X																
Mollusca	Pteriidae	*Pinctada margaritifera*			X																													
Mollusca	Pteriidae	*Pteria brunnea*	X																															
Mollusca	Spondylidae	*Spondylus hystrix*								X																								

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Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Mollusca	Spondylidae	*Spondylus linguaefelis*					X																											
Mollusca	Spondylidae	*Spondylus tenebrosus*			X																													
Mollusca	Chamidae	*Chama fibula*		X		X	X		X																							X		
Mollusca	Chamidae	*Chama pacifica*												X																				
Mollusca	Kelliidae	*Kellia hawaiensis*	X		X	X	X	X	X					X	X																			
Mollusca	Lasaeidae	*Lasaea hawaiensis*																	X															
Mollusca	Hiatellidae	*Hiatella arctica*											X						X	X	X											X		
Arthropoda	Ammotheidae	*Achelia nana*																														X		
Arthropoda	Endeidae	*Endeis nodosa*																													X			
Arthropoda	Phoxichilidiidae	*Anoplodactylus arescus*																														X		
Arthropoda	Phoxichilidiidae	*Anoplodactylus californicus*		X																					X		X	X		X		X		
Arthropoda	Phoxichilidiidae	*Anoplodactylus pycnosoma*																	X					X										
Arthropoda	Pycnogonidae	*Pigrogromitus timsanus*																							X			X			X			
Arthropoda		*Unidentified Collembola*																				X										X		
Arthropoda	Balanidae	*Balanus amphitrite*			X									X									X	X	X	X	X	X	X			X	X	X
Arthropoda	Balanidae	*Balanus eburneus*																				X				X	X	X	X					
Arthropoda	Balanidae	*Balanus reticulatus*			X														X	X				X	X		X		X	X	X	X	X	
Arthropoda	Balanidae	*Balanus sp.*																			X	X	X	X		X			X	X		X		
Arthropoda	Balanidae	*Balcis letsonae*														X																		
Arthropoda	Balanidae	*Tesseropora wireni pacifica*																X																
Arthropoda	Chthamalidae	*Chthamalus proteus*			X					X				X		X			X				X						X			X		X
Arthropoda	Chthamalidae	*Nesochthamalus intertextus*																					X											
Arthropoda	Tetraclitidae	*Tetraclitella divisa*			X				X																									
Arthropoda		*Unidentified Copepoda*		X														X														X	X	
Arthropoda	Gonodactylidae	*Gonodactylus aloha*	X	X	X	X		X	X	X		X	X		X	X	X		X		X		X		X			X		X			X	X
Arthropoda		*Unidentified Mysidacea*																						X	X	X	X	X	X					
Arthropoda	Amphilochidae	*Amphilochidae sp. A*										X																		X				
Arthropoda	Amphilochidae	*Amphilochus likelike*		X			X	X				X		X									X	X				X	X	X	X			X
Arthropoda	Amphilochidae	*Amphilochus menehune*			X	X		X	X	X					X	X		X							X									
Arthropoda	Ampithoidae	*Ampithoe ramondi*										X				X		X																
Arthropoda	Ampithoidae	*Ampithoe waialua*		X	X	X	X			X			X	X	X	X	X	X	X	X	X		X	X	X	X				X	X			
Arthropoda	Ampithoidae	*Paragrubia vorax*																X																
Arthropoda	Anamixidae	*Anamixis stebbingi*														X																		
Arthropoda	Aoridae	*Aoroides nahili*																X																
Arthropoda	Aoridae	*Lembos leapakahi*				X																												
Arthropoda	Aoridae	*Lembos macromanus*		X	X											X					X		X	X	X	X					X			
Arthropoda	Aoridae	*Lembos sp.*																X																
Arthropoda	Aoridae	*Lembos waipio*		X	X											X					X		X	X	X	X				X	X			
Arthropoda	Colomastigidae	*Colomastix lunalilo*		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X		X	X		X		
Arthropoda	Colomastigidae	*Colomastix pusilla*		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X		X		
Arthropoda	Corophiidae	*Corophium ascherusicum*																			X	X				X	X	X	X		X			
Arthropoda	Corophiidae	*Corophium baconi*						X	X										X				X	X	X	X	X	X	X	X	X			

			Station																																
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Arthropoda	Corophiidae	*Ericthonius brasiliensis*		X	X											X		X	X			X	X	X	X	X	X	X	X	X	X	X		
Arthropoda	Eusiridae	*Eusiroides diplonyx*																X					X					X				X		
Arthropoda	Gammaridae	*Elasmopus ecuadorensis hawaiiensis*			X													X																
Arthropoda	Gammaridae	*Elasmopus hooheno*								X								X	X															
Arthropoda	Gammaridae	*Elasmopus pectenicrus*		X																			X							X				
Arthropoda	Gammaridae	*Elasmopus pseudoaffinis*																X																
Arthropoda	Gammaridae	*Elasmopus rapax*																					X	X	X	X	X	X		X	X			
Arthropoda	Gammaridae	*Elasmopus sp. B*																X																
Arthropoda	Gammaridae	*Elasmopus spinidactylus*																X																
Arthropoda	Gammaridae	*Eriopisella sechellensis upolu*																													X			
Arthropoda	Gammaridae	*Maera insignis*																X																
Arthropoda	Gammaridae	*Maera pacifica*		X	X	X	X			X		X			X	X		X	X	X	X		X	X	X	X	X	X	X	X	X			
Arthropoda	Gammaridae	*Maera quadrimana*																X																
Arthropoda	Gammaridae	*Maera serrata*																X																
Arthropoda	Hyalidae	*Hyale ayeli*																X																
Arthropoda	Hyalidae	*Hyale honoluluensis*																X																
Arthropoda	Hyalidae	*Hyale laie*																X																
Arthropoda	Isaeidae	*Gammaropsis alamoana*																X	X															
Arthropoda	Isaeidae	*Gammaropsis pali*																X																
Arthropoda	Isaeidae	*Photis hawaiiensis*				X								X						X			X	X	X	X	X	X	X	X	X	X		
Arthropoda	Ischyroceridae	*Ischyrocerus kapu*		X																														
Arthropoda	Ischyroceridae	*Ischyrocerus oahu*																X																
Arthropoda	Ischyroceridae	*Jassa falcata*															X																	
Arthropoda	Ischyroceridae	*Notopoma n. sp. 1*																X																
Arthropoda	Leucothoidae	*Leucothoe hyhelia*		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X		
Arthropoda	Leucothoidae	*Leucothoe micronesiae*		X		X	X	X	X	X	X	X		X	X	X	X																	
Arthropoda	Leucothoidae	*Leucothoe tridens*		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X		
Arthropoda	Leucothoidae	*Leucothoides pottsi*														X		X																
Arthropoda	Leucothoidae	*Paraleucothoe flindersi*		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X				X					X			
Arthropoda	Liljeborgiidae	*Liljeborgia heeia*				X	X	X	X	X	X	X		X	X		X						X											
Arthropoda	Lysianassidae	*Lysianassa ewa*										X					X	X														X		
Arthropoda	Podoceridae	*Podocerus brasiliensis*																					X		X	X		X	X		X			
Arthropoda	Podoceridae	*Podocerus hanapepe*																X	X					X							X			
Arthropoda	Podoceridae	*Podocerus talegus lawai*		X														X		X			X		X									
Arthropoda	Stenothoidae	*Stenothoe valida*		X	X	X		X		X	X	X					X						X	X	X	X	X	X	X	X	X	X		
Arthropoda	Caprellidae	*Caprella incisa*																													X			
Arthropoda	Caprellidae	*Caprella scaura*																	X				X	X	X	X	X	X	X	X	X			
Arthropoda	Caprellidae	*Caprella sp.*																								X	X							
Arthropoda	Caprellidae	*Paracaprella sp. 1*																X																
Arthropoda	Caprellidae	*Paracaprella sp. 2*																										X						
Arthropoda	Anthuridae	*Unidentified Anthuridae*										X						X	X		X													
Arthropoda	Anthuridae	*Mesanthura hieroglyphica*																X																

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Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Arthropoda	Anthuridae	*Mesanthura n. sp. 1*																X						X										
Arthropoda	Anthuridae	*Mesanthura sp.*		X	X							X	X		X				X		X		X									X	X	
Arthropoda	Cirolanidae	*Cirolana sp.*																X																
Arthropoda	Gnathiidae	*Gnathia sp.*																														X		
Arthropoda	Idoteidae	*Colidotea edmondsoni*																X																
Arthropoda	Jaeropsididae	*Jaeropsis hawaiiensis*																X																
Arthropoda	Jaeropsididae	*Jaeropsis sp.*																X																
Arthropoda	Janiridae	*Carpias algicola*																X																
Arthropoda	Limnoriidae	*Limnoria sp.*																						X										
Arthropoda	Paranthuridae	*Paranthura sp.*																X																
Arthropoda	Sphaeromatidae	*Unidentified Sphaeromatidae*		X														X	X				X	X	X	X	X				X			X
Arthropoda	Apseudidae	*Apseudes sp. b*																X																
Arthropoda	Apseudidae	*Apseudes tropicalis*														X																X		
Arthropoda	Apseudidae	*Parapseudes neglectus*		X																														
Arthropoda	Apseudidae	*Parapseudes pedispinis*														X	X																	
Arthropoda	Pseudozeuxidae	*Leptochelia dubia*	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	
Arthropoda	Tanaidae	*Unidentified Tanaidae*																X																
Arthropoda	Tanaidae	*Anatanais insularis*		X		X	X	X		X		X	X		X	X	X	X	X	X	X		X	X				X	X				X	
Arthropoda	Stenopodidae	*Stenopus hispidus*		X		X	X	X	X						X	X			X				X	X		X				X				
Arthropoda	Atyidae	*Unidentified Atyidae*																X																
Arthropoda	Bresiliidae	*Discias sp.*	X																															X
Arthropoda	Palaemonidae	*Harpiliopsis depressus*															X																	
Arthropoda	Palaemonidae	*Onycocaris quadratophthalma*									X																							
Arthropoda	Palaemonidae	*Palaemonella lata*			X																		X					X					X
Arthropoda	Palaemonidae	*Palaemonella rotumana*	X		X	X	X	X	X	X	X	X	X	X			X		X	X												X		
Arthropoda	Palaemonidae	*Unidentified Pontoniinae*			X																													
Arthropoda	Palaemonidae	*Epipontonia sp.*																															X	
Arthropoda	Palaemonidae	*Periclimenes elegans*							X		X	X		X		X				X				X		X	X	X	X	X	X	X	X	
Arthropoda	Palaemonidae	*Periclimenes grandis*			X	X		X	X				X								X						X							
Arthropoda	Palaemonidae	*Periclimenes sp.*														X																		
Arthropoda	Alpheidae	*Alpheus brevipes*																X																
Arthropoda	Alpheidae	*Alpheus gracilis*																X																
Arthropoda	Alpheidae	*Alpheus leptochirus*				X											X																	
Arthropoda	Alpheidae	*Alpheus lobidens*																							X	X	X	X	X					
Arthropoda	Alpheidae	*Alpheus mackayi*					X																											
Arthropoda	Alpheidae	*Alpheus pacificus*																X																
Arthropoda	Alpheidae	*Alpheus paracrinitus*				X			X														X											X
Arthropoda	Alpheidae	*Alpheus paralcyone*	X	X	X					X							X																	
Arthropoda	Alpheidae	*Alpheus pugnax*																												X				
Arthropoda	Alpheidae	*Metalpheus paragracilis*																					X		X									
Arthropoda	Alpheidae	*Salmoneus sp. A*									X																							
Arthropoda	Alpheidae	*Synalpheus bituberculatus*	X	X	X	X	X		X	X	X	X		X	X		X		X		X			X	X	X				X	X	X	X	

			Station																														
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Arthropoda	Alpheidae	*Synalpheus paroneomeris*		X	X	X	X		X	X					X	X	X															X	X	
Arthropoda	Alpheidae	*Synalpheus reductocarpus*					X																											
Arthropoda	Alpheidae	*Synalpheus streptodactylus*	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X									X				
Arthropoda	Alpheidae	*Synalpheus thai*			X											X	X		X	X	X			X						X				X
Arthropoda	Hippolytidae	*Saron sp.*																X																
Arthropoda	Hippolytidae	*Thor maldivensis*																X																
Arthropoda	Hippolytidae	*Thor paschalis*	X	X	X	X	X	X							X	X	X		X	X														
Arthropoda	Galatheidae	*Galathea spinosorostris*							X	X																								
Arthropoda	Dynomenidae	*Dynomene hispida*												X																				
Arthropoda	Majidae	*Oncinopus neptunus*							X																									
Arthropoda	Majidae	*Schizophrys hilensis*		X																														X
Arthropoda	Majidae	*Simocarcinus simplex*														X															X			
Arthropoda	Portunidae	*Libystes villosus*				X		X																										
Arthropoda	Portunidae	*Podophthalmus vigil*												X	X																			
Arthropoda	Portunidae	*Thalamita edwardsi*																	X	X	X					X	X	X		X				
Arthropoda	Portunidae	*Thalamita integra*			X	X					X						X	X					X	X	X	X		X			X		X	
Arthropoda	Portunidae	*Thalamita spiceri*																					X											
Arthropoda	Xanthidae	*Carpilius sp.*								X																								
Arthropoda	Xanthidae	*Carpilodes bellus*			X	X																	X		X					X				
Arthropoda	Xanthidae	*Chlorodiella niger*	X	X		X	X		X					X			X	X		X			X										
Arthropoda	Xanthidae	*Chlorodopsis oahuensis*					X						X																					
Arthropoda	Xanthidae	*Domecia hispida*							X																									
Arthropoda	Xanthidae	*Liocarpilodes integerrimus*				X																												
Arthropoda	Xanthidae	*Liomera bella*						X																										
Arthropoda	Xanthidae	*Panopeus pacificus*																				X				X	X	X	X		X			
Arthropoda	Xanthidae	*Phymodius laysani*																X																
Arthropoda	Xanthidae	*Phymodius nitidus*		X			X										X	X					X			X								X
Arthropoda	Xanthidae	*Phymodius ungulatus*																								X				X				
Arthropoda	Xanthidae	*Pilumnus longicornis*	X							X	X		X							X												X	
Arthropoda	Xanthidae	*Pilumnus nuttingi*									X	X	X																					
Arthropoda	Xanthidae	*Pilumnus oahuensis*		X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X		X	X	X	X	X
Arthropoda	Xanthidae	*Platypodia granulosa*																												X				
Arthropoda	Xanthidae	*Platypodia semigranosa*				X																	X											
Arthropoda	Xanthidae	*Polydectus cupulifer*																X																
Arthropoda	Xanthidae	*Pseudozius trianguiculatus*																X																
Arthropoda	Xanthidae	*Trapezia intermedia*															X																	
Arthropoda	Xanthidae	*Trapezia tigrina*															X																	
Arthropoda	Xanthidae	*Xantho crassimanus*																X																
Arthropoda	Grapsidae	*Unidentified Grapsidae*	X																															
Arthropoda	Grapsidae	*Metapograpsus thukuhar*	X			X							X		X			X				X		X	X	X	X		X	X		X		
Arthropoda	Grapsidae	*Pachygrapsus longipes*																							X		X							
Arthropoda	Grapsidae	*Pachygrapsus minutus*								X			X	X									X										X	

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Arthropoda	Grapsidae	*Pachygrapsus plicatus*																												X				
Arthropoda	Grapsidae	*Plagusia depressa tuberculata*																					X		X									
Arthropoda	Ocypodidae	*Macrophthalmus telescopicus*																																X
Arthropoda	Cryptochiridae	*Unidentified Cryptochiridae*							X								X																	
Arthropoda	Cryptochiridae	*Hapalocarcinus marsupialis*		X								X																						
Arthropoda		*Unidentified Ostracoda*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sipuncula		*Unidentified Sipuncula*		X	X	X										X																		
Sipuncula	Golfingiidae	*Themiste langeniformis*							X												X						X	X						
Sipuncula	Aspidosiphonidae	*Aspidosiphon cumingi*			X	X			X				X			X	X																	X
Sipuncula	Aspidosiphonidae	*Aspidosiphon elegans*				X			X								X													X				X
Sipuncula	Phascolosomatidae	*Phascolosoma glabrum*												X																				
Sipuncula	Phascolosomatidae	*Phascolosoma nigrescens*		X	X										X																			
Sipuncula	Phascolosomatidae	*Phascolosoma scolops*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X			X	X			X			X		X		X
Sipuncula	Phascolosomatidae	*Phascolosoma stephensoni*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						X		X					X		X	X	X
Bryozoa		*Unidentified Bryozoa*				X																												
Bryozoa	Vesiculariidae	*Amathia distans*	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X		X	X	X	X		X		X		X	X	X
Bryozoa	Vesiculariidae	*Zoobotryon verticillatum*																						X	X	X		X	X	X	X	X	X	X
Bryozoa	Crisiidae	*Crisia circinata*						X																										
Bryozoa	Diaperoeciidae	*Diaperoforma intricata*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X				X		X		X
Bryozoa		*Cheilostomata gen. sp. 1*											X																					
Bryozoa		*Cheilostomata gen. sp. 2*																								X								
Bryozoa		*Cheilostomata gen. sp. 3*																				X					X							
Bryozoa	Aeteidae	*Aetea anguinea*					X																											
Bryozoa	Aeteidae	*Aetea truncata*		X	X				X	X	X	X	X	X	X	X	X								X									
Bryozoa	Bugulidae	*Bugula dentata*	X	X	X	X		X	X	X	X	X	X	X	X	X	X													X		X		
Bryozoa	Bugulidae	*Bugula neritina*										X		X	X		X							X	X			X		X				
Bryozoa	Bugulidae	*Bugula robusta*			X		X			X			X																			X		
Bryozoa	Bugulidae	*Bugula sp.*																						X										
Bryozoa	Bugulidae	*Bugula stolonifera*																						X				X				X		
Bryozoa	Bugulidae	*Caulibugula caliculata*									X				X																			
Bryozoa	Bugulidae	*Caulibugula dendrograpta*	X	X							X		X																			X		
Bryozoa	Bugulidae	*Caulibugula sp.*					X																											
Bryozoa	Celleporariidae	*Celleporaria aperta*			X		X	X	X	X	X	X	X	X	X			X		X	X		X							X				
Bryozoa	Celleporariidae	*Celleporaria fusca*												X			X														X			
Bryozoa	Celleporariidae	*Celleporaria pilaefera*											X							X	X													
Bryozoa	Celleporariidae	*Celleporaria sp.*								X																								
Bryozoa	Celleporariidae	*Celleporaria vagans*											X										X											
Bryozoa	Celleporidae	*Costazia costazii*							X																									
Bryozoa	Epistomiidae	*Synnotum aegyptiacum*		X	X		X		X																					X			X	
Bryozoa	Escharellidae	*Hippopodina feegeensis*							X			X			X	X								X	X	X	X	X	X	X	X			
Bryozoa	Microporellidae	*Microporella orientalis*			X																													
Bryozoa	Mucronellidae	*Parasmittina trispinosa*		X					X																									

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Bryozoa	Savignyellidae	*Savignyella lafontii*		X	X				X	X		X	X		X	X	X						X	X		X						X		X
Bryozoa	Schizoporellidae	*Schizoporella sp. A*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X			X	X	X		X	X	X	X	X	X	X
Bryozoa	Scrupocellariidae	*Scrupocellaria sp.*																							X									
Bryozoa	Scrupocellariidae	*Scrupocellaria sp. cf. sinuosa*	X	X	X				X	X						X	X			X			X	X				X				X	X	
Bryozoa	Watersiporidae	*Watersipora arcuata*																						X										
Bryozoa	Watersiporidae	*Watersipora edmondsoni*																		X														
Echinodermata		*Unidentified Echinodermata*		X																														
Echinodermata	Ophiactidae	*Ophiactis savignyi*																X	X		X			X	X	X				X	X	X	X	X
Echinodermata	Cidaridae	*Eucidaris metularia*	X																				X											
Echinodermata	Diadematidae	*Diadema paucispinum*	X		X											X																		
Echinodermata	Diadematidae	*Echinothrix calamaris*	X																															
Echinodermata	Diadematidae	*Echinothrix diadema*	X	X	X	X				X						X		X	X															
Echinodermata	Toxopneustidae	*Tripneustes gratilla*	X	X	X											X																		
Echinodermata	Echinometridae	*Echinometra mathaei*	X	X	X											X																		
Echinodermata	Echinometridae	*Echinometra oblonga*																X																
Echinodermata	Echinometridae	*Echinostrephus aciculatus*			X																													
Echinodermata	Echinometridae	*Heterocentrotus mammillatus*				X																												
Echinodermata		*Unidentified Holothuroidea*	X																															
Echinodermata	Holothuriidae	*Actinopyga mauritiana*		X														X																
Echinodermata	Holothuriidae	*Holothuria atra*					X											X																
Chordata	Didemnidae	*Didemnum candidum*							X			X								X			X		X			X						
Chordata	Didemnidae	*Diplosoma listerianum*								X							X			X			X		X			X						
Chordata	Didemnidae	*Leptoclinides madara*															X																	
Chordata	Didemnidae	*Tridemnum savignii*			X																		X							X				
Chordata	Polyclinidae	*Polyclinum constellatum*										X																		X	X			
Chordata	Ascidiidae	*Ascidia sp.*																										X			X			
Chordata	Ascidiidae	*Ascidia sp. A*										X				X	X			X			X	X							X			
Chordata	Ascidiidae	*Ascidia sp. B*				X					X	X		X							X										X			
Chordata	Ascidiidae	*Ascidia sydneiensis*		X	X		X	X	X	X	X	X	X	X			X			X	X		X			X			X			X		
Chordata	Ascidiidae	*Phallusia nigra*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X		X		X	X	X		X
Chordata	Corellidae	*Corella minuta*			X								X																					
Chordata	Perophoridae	*Perophora annectans*								X																								
Chordata	Pyuridae	*Herdmania momus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X		X	X	X		X		X
Chordata	Pyuridae	*Microcosmus exasperatus*	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X			X	X	X				X				X
Chordata	Stylelidae	*Botrylloides simodensis*																						X	X						X			
Chordata	Stylelidae	*Botrylloides sp.*																		X			X											
Chordata	Stylelidae	*Cnemidocarpa areolata*					X	X			X	X		X		X	X		X				X									X		
Chordata	Stylelidae	*Eusynstyela aliena*			X					X		X								X												X		X
Chordata	Stylelidae	*Polyandrocarpa sagamiensis*		X	X		X			X			X			X				X	X		X	X	X	X				X		X		X
Chordata	Stylelidae	*Polyandrocarpa sp.*										X																						
Chordata	Stylelidae	*Polyandrocarpa zorritensis*																	X															
Chordata	Stylelidae	*Polycarpa aurita*	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X					X					X				X

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Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Chordata	Styelidae	*Styela canopus*			X							X	X		X	X	X		X	X	X		X						X		X		X	
Chordata	Styelidae	*Symplegma brakenhielmi*															X			X			X		X			X						
Chordata	Styelidae	*Symplegma sp.*								X		X		X	X																			
Chordata	Styelidae	*Symplegma viride*																					X											
Chordata	Aulostomidae	*Aulostomus chinensis*	X													X	X	X	X				X	X	X	X		X		X				
Chordata	Fistulariidae	*Fistularia commersonii*																																X
Chordata	Syngnathidae	*Doryrhamphus baldwini*				X																	X											
Chordata	Scorpaenidae	*Taenianotus triacanthus*	X													X																		
Chordata	Scorpaenidae	*Dendrochirus barberi*														X																		
Chordata	Scorpaenidae	*Pterois sphex*										X							X															
Chordata	Kuhliidae	*Kuhlia sandvicensis*							X								X		X						X			X		X				X
Chordata	Priacanthidae	*Heteropriacanthus cruentatus*			X																		X											
Chordata	Apogonidae	*Apogon kallopterus*	X	X	X					X					X								X			X				X				
Chordata	Apogonidae	*Foa brachygramma*								X																								
Chordata	Carangidae	*Caranx melampygus*				X	X					X	X			X	X		X	X	X							X				X		
Chordata	Carangidae	*Caranx sp.*						X																										
Chordata	Lutjanidae	*Lutjanus fulvus*			X	X				X					X		X											X		X				
Chordata	Lethrinidae	*Monotaxis grandoculis*																																X
Chordata	Mullidae	*Mulloidichthys flavolineatus*								X						X																		
Chordata	Mullidae	*Mulloidichthys vanicolensis*							X	X					X	X	X													X				
Chordata	Mullidae	*Parupeneus bifasciatus*														X	X						X											
Chordata	Mullidae	*Parupeneus multifasciatus*	X		X										X			X												X				X
Chordata	Mullidae	*Parupeneus porphyreus*														X																		
Chordata	Kyphosidae	*Kyphosus bigibbus*																X																
Chordata	Scorpididae	*Microcanthus strigatus*										X			X				X		X													
Chordata	Chaetodontidae	*Chaetodon auriga*	X		X					X		X			X	X			X		X									X				
Chordata	Chaetodontidae	*Chaetodon lunula*	X		X	X	X		X	X		X			X	X	X	X	X		X		X							X				
Chordata	Chaetodontidae	*Chaetodon miliaris*		X												X	X																	X
Chordata	Chaetodontidae	*Chaetodon ornatissimus*	X		X	X																												
Chordata	Chaetodontidae	*Chaetodon quadrimaculatus*			X												X																	
Chordata	Chaetodontidae	*Chaetodon trifasciatus*															X																	
Chordata	Chaetodontidae	*Chaetodon unimaculatus*			X				X	X						X																		
Chordata	Chaetodontidae	*Forcipiger flavissimus*	X	X																														
Chordata	Pomacanthidae	*Centropyge flavissima*																													X			
Chordata	Cirrhitidae	*Cirrhitops fasciatus*											X	X																				
Chordata	Cirrhitidae	*Cirrhitus pinnulatus*																X																
Chordata	Mugilidae	*Neomyxus leuciscus*																													X			
Chordata	Labridae	*Unidentified Labridae*																															X	
Chordata	Labridae	*Anampses cuvier*																X																
Chordata	Labridae	*Bodianus bilunulatus*														X																		
Chordata	Labridae	*Cheilinus unifasciatus*													X																			
Chordata	Labridae	*Cheilio inermis*																X																

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Chordata	Labridae	*Coris flavovittata*																												X				
Chordata	Labridae	*Gomphosus varius*														X		X																
Chordata	Labridae	*Labroides phthirophagus*	X			X																	X							X				
Chordata	Labridae	*Pseudocheilinus tetrataenia*	X																															
Chordata	Labridae	*Stethojulis balteata*								X						X		X												X				
Chordata	Labridae	*Thalassoma duperrey*	X	X	X	X			X	X						X	X	X					X					X		X	X			X
Chordata	Labridae	*Thalassoma trilobatus*																X																X
Chordata	Scaridae	*Scarus sordidus*								X																								
Chordata	Scaridae	*Scarus sp.*	X	X	X	X				X						X	X													X				
Chordata	Scaridae	*Calotomus spinidens*														X		X																
Chordata	Cichlidae	*Oreochromis mossambicus*									X													X		X		X	X		X			
Chordata	Cichlidae	*Sarotherodon melanotheron*																										X	X	X	X			
Chordata	Pomacentridae	*Abudefduf abdominalis*	X	X	X	X	X	X	X	X		X	X				X			X				X	X	X								X
Chordata	Pomacentridae	*Abudefduf sordidus*														X	X						X							X				
Chordata	Pomacentridae	*Dascyllus albisella*	X	X	X	X	X			X		X			X	X	X						X			X		X		X				
Chordata	Pomacentridae	*Plectroglyphidodon sindonis*																												X				
Chordata	Pomacentridae	*Stegastes fasciolatus*														X		X																
Chordata	Blenniidae	*Enchelyurus brunneolus*																						X										
Chordata	Blenniidae	*Omobranchus ferox*																				X												
Chordata	Blenniidae	*Omobranchus rotundiceps obliquus*																	X															
Chordata	Gobiidae	*Unidentified Gobiidae*											X				X																	
Chordata	Gobiidae	*Asterropteryx semipunctatus*				X																												
Chordata	Gobiidae	*Eviota ephiphanes*														X							X										
Chordata	Gobiidae	*Priolepis eugenius*							X												X													
Chordata	Gobiidae	*Priolepis farcimen*															X																	
Chordata	Zanclidae	*Zanclus cornutus*	X	X	X	X			X	X	X			X	X	X	X	X	X		X		X		X	X				X	X	X	X	X
Chordata	Acanthuridae	*Acanthurus achilles*																X																
Chordata	Acanthuridae	*Acanthurus blochii*															X									X				X	X		X	X
Chordata	Acanthuridae	*Acanthurus guttatus*																												X				
Chordata	Acanthuridae	*Acanthurus leucopareius*																X																
Chordata	Acanthuridae	*Acanthurus nigrofuscus*		X	X					X								X					X											
Chordata	Acanthuridae	*Acanthurus nigroris*	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X													
Chordata	Acanthuridae	*Acanthurus olivaceus*																																X
Chordata	Acanthuridae	*Acanthurus triostegus*	X		X	X	X			X						X		X					X	X				X		X	X		X	
Chordata	Acanthuridae	*Acanthurus xanthopterus*																												X			X	X
Chordata	Acanthuridae	*Ctenochaetus strigosus*			X	X	X			X							X																	
Chordata	Acanthuridae	*Naso hexacanthus*														X	X																	
Chordata	Acanthuridae	*Naso lituratus*															X																	
Chordata	Acanthuridae	*Naso unicornis*																X																
Chordata	Acanthuridae	*Zebrasoma flavescens*	X	X	X	X				X						X	X				X													
Chordata	Sphyraenidae	*Sphyraena barracuda*									X					X														X				
Chordata	Balistidae	*Sufflamen bursa*																X												X				

			Station																															
Phylum	**Family**	Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Chordata	Monacanthidae	*Pervagor spilosoma*						X																										
Chordata	Ostraciidae	*Lactoria fornasini*		X												X							X								X			
Chordata	Ostraciidae	*Ostracion meleagris*		X	X	X										X		X					X		X						X			X
Chordata	Tetraodontidae	*Arothron hispidus*			X	X	X	X	X						X		X		X		X		X	X	X					X		X		
Chordata	Tetraodontidae	*Canthigaster jactator*	X	X	X	X				X		X		X		X	X		X				X	X	X					X				X
Chordata	Diodontidae	*Diodon hystrix*										X				X												X	X					
Chordata	Muraenidae	*Gymnothorax flavimarginatus*			X					X																								
Chordata	Synodontidae	*Synodus sp.*			X					X						X																		
Chordata	Synodontidae	*Saurida flamma*																					X											
Chordata	Antennariidae	*Antennarius commersoni*	X																		X													
Chordata	Holocentridae	*Myripristis berndti*																					X											
Chordata	Holocentridae	*Myripristis sp.*			X										X		X	X																
Chordata	Holocentridae	*Neoniphon sammara*								X					X		X											X						
Chordata	Holocentridae	*Sargocentron sp.*				X				X					X								X											

APPENDIX E

Station Records for Cryptogenic or Nonindigenous Species Collected or Observed in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, Ala Wai Yacht Harbor and Barber's Point Deep Draft Harbor during 1997-98

			Station																															
Phylum	Taxon	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Porifera	*Heteropia glomerosa*	Cryptogenic	X		X		X		X	X						X					X		X	X	X	X				X				
Porifera	*Biemna fistulosa*	Cryptogenic	X	X	X			X											X	X	X									X				
Porifera	*Echinodictyum asperum*	Cryptogenic		X			X		X	X		X		X	X																			
Porifera	*Tedania reticulata*	Cryptogenic																		X	X													
Porifera	*Mycale (Aegogropila) armata*	Cryptogenic					X													X	X									X			X	X
Porifera	*Topsentia sp.*	Cryptogenic	X			X	X		X	X	X	X		X	X				X				X	X	X	X				X			X	
Porifera	*Callyspongia cf. diffusa*	Cryptogenic									X														X									
Porifera	*Hyattella intestinalis*	Cryptogenic	X	X	X	X	X	X	X	X	X				X		X			X	X	X									X			
Porifera	*Dysidea cf. avara*	Cryptogenic	X	X	X	X	X		X						X	X																		
Porifera	*Dysidea n. sp. 3*	Cryptogenic						X																										
Porifera	*Dysidea cf. arenaria*	Cryptogenic	X	X	X	X				X		X				X			X	X	X	X												
Cnidaria	*Halecium beani*	Cryptogenic																																X
Cnidaria	*Dynamena crisiodes*	Cryptogenic								X				X	X	X			X						X							X		
Cnidaria	*Thyroscyphus fructicosus*	Cryptogenic		X	X	X			X						X																			
Annelida	*Spinther japonicus*	Cryptogenic																		X														
Annelida	*Chaetopterus sp. A*	Cryptogenic													X	X	X		X	X	X											X		
Annelida	*Branchiomma nigromaculata*	Cryptogenic	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Annelida	*Sabellastarte sanctijosephi*	Cryptogenic	X	X		X	X	X	X	X	X	X	X		X	X	X		X	X	X		X	X	X	X		X	X	X	X	X		X
Annelida	*Serpula vermicularis*	Cryptogenic	X			X				X	X																		X					
Mollusca	*Hinemoa indica*	Cryptogenic		X												X																		X
Mollusca	*Anomia nobilis*	Cryptogenic		X	X																											X		
Mollusca	*Hiatella arctica*	Cryptogenic											X						X	X	X											X		
Arthropoda	*Paraleucothoe flindersi*	Cryptogenic		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X				X					X				
Arthropoda	*Stenothoe valida*	Cryptogenic		X	X	X		X		X	X	X					X						X	X	X	X	X	X	X	X	X	X		
Arthropoda	*Leptochelia dubia*	Cryptogenic	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	
Chordata	*Corella minuta*	Cryptogenic			X								X																					
Bryozoa	*Diaperoforma intricata*	Cryptogenic	X	X	X			X	X	X	X	X	X	X	X	X	X			X			X	X	X	X				X		X		X
Rhodophycota	*Acanthophora spicifera*	Nonindigenous					X	X				X				X				X				X		X		X	X		X			
Magnoliophyta	*Rhizophora mangel*	Nonindigenous																				X												
Porifera	*Suberites sp. cf. zeteki*	Nonindigenous													X												X		X					
Porifera	*Mycale (Carmia) cecilia*	Nonindigenous		X		X				X			X						X	X			X		X			X	X	X	X			X
Porifera	*Neofolitispa unguiculata*	Nonindigenous			X						X			X						X	X													
Porifera	*Zygomycale parishii*	Nonindigenous					X	X			X	X		X		X	X		X	X		X		X	X				X					
Porifera	*Halichondria melanadocia*	Nonindigenous																									X	X	X					
Porifera	*Sigmadocia sp. cf. caerulea*	Nonindigenous																		X														
Porifera	*Gelliodes fibrosa*	Nonindigenous	X		X	X	X	X	X	X				X	X					X	X	X		X				X		X		X	X	
Cnidaria	*Halocordyle disticha*	Nonindigenous	X	X	X	X	X	X	X		X	X	X		X								X	X	X	X		X		X	X			
Cnidaria	*Aurelia sp.*	Nonindigenous																												X				
Cnidaria	*Carijoa (Telesto) riisei*	Nonindigenous	X	X	X	X			X	X					X	X	X								X							X		
Cnidaria	*Actinodiscus nummiformis*	Nonindigenous																																

			Station																														
Phylum	Taxon	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Cnidaria	*Diadumene franciscana*	Nonindigenous																										X			X			
Cnidaria	*Diadumene leucolena*	Nonindigenous							X																									
Annelida	*Hydroides brachyacantha*	Nonindigenous											X																					
Annelida	*Hydroides dirampha*	Nonindigenous									X								X										X		X	X		
Annelida	*Hydroides elegans*	Nonindigenous																														X		
Annelida	*Pomatoleios kraussii*	Nonindigenous	X								X		X						X													X		
Annelida	*Salmacina dysteri*	Nonindigenous		X	X			X		X		X	X	X	X	X				X										X		X	X	X
Mollusca	*Diodora ruppelli*	Nonindigenous				X					X					X					X		X	X							X			X
Mollusca	*Crepidula aculeata*	Nonindigenous	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X		X	X	X			X			X	X	X	X
Mollusca	*Crucibulum spinosum*	Nonindigenous				X															X											X		
Mollusca	*Vermetus alii*	Nonindigenous		X	X														X		X			X	X	X						X	X	
Mollusca	*Chama fibula*	Nonindigenous		X		X	X		X																							X		
Mollusca	*Chama pacifica*	Nonindigenous												X																				
Arthropoda	*Anoplodactylus arescus*	Nonindigenous																														X		
Arthropoda	*Pigrogromitus timsanus*	Nonindigenous																							X			X			X			
Arthropoda	*Balanus amphitrite*	Nonindigenous		X									X									X	X	X	X	X	X	X			X	X	X	
Arthropoda	*Balanus eburneus*	Nonindigenous																				X				X	X	X	X					
Arthropoda	*Balanus reticulatus*	Nonindigenous			X														X	X				X	X		X		X	X	X	X	X	
Arthropoda	*Chthamalus proteus*	Nonindigenous			X					X				X		X			X				X						X			X		X
Arthropoda	*Gonodactylus aloha*	Nonindigenous	X	X	X	X		X	X	X		X	X		X	X	X		X		X		X		X			X		X			X	X
Arthropoda	*Corophium ascherusicum*	Nonindigenous																			X	X				X	X	X	X		X			
Arthropoda	*Corophium baconi*	Nonindigenous						X	X										X				X	X	X	X	X	X	X	X	X			
Arthropoda	*Ericthonius brasiliensis*	Nonindigenous		X	X											X		X	X			X	X	X	X	X	X	X	X	X	X	X		
Arthropoda	*Elasmopus rapax*	Nonindigenous																					X	X	X	X	X	X		X	X			
Arthropoda	*Jassa falcata*	Nonindigenous															X																	
Arthropoda	*Leucothoe micronesiae*	Nonindigenous		X		X	X	X	X	X	X	X		X	X	X	X																	
Arthropoda	*Podocerus brasiliensis*	Nonindigenous																					X		X	X		X	X		X			
Arthropoda	*Caprella scaura*	Nonindigenous																	X				X	X	X	X	X	X	X	X	X			
Arthropoda	*Parapseudes pedispinis*	Nonindigenous														X	X																	
Arthropoda	*Panopeus pacificus*	Nonindigenous																				X				X	X	X	X		X			
Bryozoa	*Amathia distans*	Nonindigenous	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X		X	X	X	X		X		X		X	X	X
Bryozoa	*Zoobotryon verticillatum*	Nonindigenous																						X	X	X		X	X	X	X	X	X	X
Bryozoa	*Aetea truncata*	Nonindigenous		X					X	X	X	X	X	X	X	X									X									
Bryozoa	*Bugula dentata*	Nonindigenous	X	X	X	X		X	X	X	X	X	X	X	X	X	X													X		X		
Bryozoa	*Bugula neritina*	Nonindigenous										X		X	X		X							X	X			X		X				
Bryozoa	*Bugula robusta*	Nonindigenous			X		X			X			X																			X		
Bryozoa	*Bugula stolonifera*	Nonindigenous																						X				X				X		
Bryozoa	*Caulibugula caliculata*	Nonindigenous									X				X																			
Bryozoa	*Caulibugula dendrograpta*	Nonindigenous	X	X							X		X																			X		
Bryozoa	*Savignyella lafontii*	Nonindigenous		X	X				X	X		X	X		X	X	X						X	X		X						X		X

			Station																																
Phylum	Taxon	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Bryozoa	*Schizoporella sp. A*	Nonindigenous	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X			X	X	X		X	X	X	X	X	X	X
Bryozoa	*Watersipora edmondsoni*	Nonindigenous																		X														
Chordata	*Polyclinum constellatum*	Nonindigenous										X																			X	X		
Chordata	*Didemnum candidum*	Nonindigenous							X			X								X			X		X			X						
Chordata	*Diplosoma listerianum*	Nonindigenous								X							X			X			X		X			X						
Chordata	*Ascidia sp. B*	Nonindigenous				X					X	X		X							X										X			
Chordata	*Ascidia sydneiensis*	Nonindigenous		X	X		X	X	X	X	X	X	X	X			X			X	X		X			X			X			X		
Chordata	*Phallusia nigra*	Nonindigenous	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X		X		X	X	X		X
Chordata	*Herdmania momus*	Nonindigenous	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X		X	X	X		X		X
Chordata	*Microcosmus exasperatus*	Nonindigenous	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X			X	X	X				X				X
Chordata	*Botrylloides simodensis*	Nonindigenous																						X	X						X			
Chordata	*Eusynstyela aliena*	Nonindigenous			X						X		X							X												X		X
Chordata	*Polyandrocarpa sagamiensis*	Nonindigenous		X	X		X			X			X			X				X	X		X	X	X	X				X		X		X
Chordata	*Polyandrocarpa zorritensis*	Nonindigenous																	X															
Chordata	*Styela canopus*	Nonindigenous			X							X	X		X	X	X		X	X	X		X						X		X		X	
Chordata	*Symplegma brakenhielmi*	Nonindigenous															X			X			X		X			X						
Chordata	*Lutjanus fulvus*	Nonindigenous			X	X				X					X		X											X		X				
Chordata	*Centropyge flavissima*	Nonindigenous																													X			
Chordata	*Oreochromis mossambicus*	Nonindigenous									X													X		X		X	X		X			
Chordata	*Sarotherodon melanotheron*	Nonindigenous																										X	X	X	X			
	Total Nonindigenous +Cryptogenic		6	36	37	29	25	25	30	32	30	31	27	24	33	31	28	3	0	35	29	10	29	32	38	28	14	35	27	33	31	38	15	21

APPENDIX F

Supplementary Information for Nonindigenous and Cryptogenic Species Observed or Collected in Honolulu Harbor, Keehi Lagoon, Kewalo Basin, Ala Wai Yacht Harbor and Barber's Point Deep Draft Harbor During 1997-98 Surveys

Status: PR, I: Previously reported, Nonindigenous; NR, R: New report, Nonindigenous; PR, C: Previously reported, Cryptogenic; NR, C: New report, Cryptogenic

ID: EA: Eastern Atlantic, CA: Caribbean, WA: Western Atlantic, EP: Eastern Pacific, IP: Indo-Pacific, WIP: Western Indo-Pacific, RS: Red Sea, WW: Tropical or Temperate World Wide.

Genus and Species	Status	Status Authority	1st Rept.	Source &/or Comment	Origin and/or Previous Range	ID
Acanthophora spicifera	PR, I	Doty, 1962	1952	Introduced into Pearl Harbor on barge fouling	Guam-Australia (Doty, 1961)	WIP
Rhizophora mangel	PR, I	Wester 1981	1902	Introduced into Molokai and Oahu	Florida	CA
Heteropia glomerosa	PR,C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)		
Suberites zeteki	PR, I	Kelly-Borges & Defelice, ms	1948	1947 in Kaneohe Bay (de Laubenfels, 1950)	Panama-Caribbean (Kelly-Borges and DeFelice, Unpublished)	CA
Biemna fistulosa	PR,C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)	Zanzibar-West Central Pacific (Kelly-Borges and DeFelice, Unpublished)	IP
Echinodictyum asperum	PR,C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)	Zanzibar-West Central Pacific (Kelly-Borges and DeFelice, Unpublished)	IP
Tedania reticulata	PR,C	Kelly-Borges & Defelice, ms	1947	1947 in Kaneohe Bay (de Laubenfels, 1950) as *T. ignis*		
Mycale (Aegogropila) armata	PR,C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)	Indo-Malaysia - Central Pacific (Kelly-Borges and DeFelice, Unpublished)	IP
Mycale (Carmia) cecilia	PR, I	Kelly-Borges & Defelice, ms	1973	McCain (1975), 1947 in Kaneohe Bay (de Laubenfels, 1950)	Caribbean (Kelly-Borges and DeFelice, Unpublished)	CA
Zygomycale parishii	PR, I	Kelly-Borges & Defelice, ms	1947	1947 in Kaneohe Bay (de Laubenfels, 1950)	Indo-pacific (Kelly-Borges et al., ms.)	IP
Neofolitispa unguiculata	NR, I	DeFelice, pers. comm.	1997	Present study, Honolulu Harbor, Keehi Lagoon	Tropical Pacific (DeFelice, pers. comm.)	IP
Topsentia sp.	PR,C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)		
Halichondria melanadocia	PR, I	Kelly-Borges & Defelice, ms	1993	Brock, 1994	Caribbean (Kelly-Borges and DeFelice, Unpublished)	CA
Callyspongia diffusa	PR, C	Kelly-Borges & Defelice, ms	1996	1948 in Kaneohe Bay (de Laubenfels, 1950)		
Sigmadocia caerulea	PR, I	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)	Caribbean (Kelly-Borges and DeFelice, Unpublished)	CA
Gelliodes fibrosa	PR, I	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)	Philippines (Kelly-Borges and DeFelice, Unpublished)	WIP
Hyattella intestinalis	PR, C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)		
Dysidea cf. avara	PR, C	Kelly-Borges & Defelice, ms	1996	1948 in Kaneohe Bay (de Laubenfels, 1950)		
Dysidea n. sp. 3	NR,C	DeFelice, pers. comm.	1997	Present study, Honolulu Harbor, Keehi Lagoon		
Dysidea cf. arenaria	PR, C	Kelly-Borges & Defelice, ms	1996	Pearl Harbor (Coles et al. 1997, 1999)		
Halecium beani	PR, C	Cooke, W., pers. comm.	1945	BPBM-D 260 as *Halecium* sp.	Tropical and Temperate Worldwide (Cooke 1977)	WW
Dynamena crisiodes	PR, C	Carlton & Eldredge, ms	1977	Honolulu Harbor and Kewalo Basin (Cooke 1977)	Tropical and Temperate Worldwide (Cooke 1977)	WW
Thyroscyphus fructicosus	PR, C	Cooke, W., pers. comm.	1973	BPBM Spec. D 462, Honolulu Harbor	Tropical Worldwide (Gibbons and Ryland 1989)	WW
Halocordyle disticha	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec D 183, Pearl Harbor	European Atlantic, Worldwide (Cooke 1977)	EA
Aurelia sp.	PR, I	Carlton & Eldredge, ms	1953	Chu and Cuttress (1954)	Worldwide	WW
Carijoa (Telesto) riisei	PR, I	Carlton & Eldredge, ms	1972	BPBM Spec D-454, Pearl Harbor	Florida-Brazil (Bayer, 1961)	CA
Actinodiscus nummiformis	NR, I	Fautin, D., pers. comm.	1997	Present study, Ala Wai Harbor,	Red Sea to Australia (Fautin, D., pers. comm.)	WIP
Diadumene franciscana	NR, I	Fautin, D., pers. comm.	1997	Present study, Ala Wai Harbor,	San Francisco Bay (Fautin, D., pers. comm.)	EP
Diadumene leucolena	PR, I	Carlton & Eldredge, ms	1954	Pearl and Honolulu Harbors, Ala Wai (Hiatt 1954; Cuttress 1977)	Northwest Atlantic (Carlton & Eldredge, ms)	WA
Chaetopterus sp. A	PR, C	Carlton & Eldredge, ms	1976	Grovhoug and Rastetter (1980) as *C. variopedatus,* Pearl Harbor		WIP
Branchiomma nigromaculata	PR, C	Carlton & Eldredge, ms	1966	Hartmann (1966)		WIP
Sabellastarte sanctijosephi	PR, C	Carlton & Eldredge, ms	1976	Grovhoug and Rastetter (1980), Pearl Harb.		IP

Hydroides brachyacantha	PR, I	Carlton & Eldredge, ms	1939	BPBM Spec 1228, Hawaiian Islands	W. Mexico to E. Australia (Bailey-Brock and Hartman, 1987)	IP
Genus and Species	**Status**	**Status Authority**	**1st Rept.**	**Source &/or Comment**	**Origin and/or Previous Range**	**ID**
Hydroides dirampha	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec D-1083 as *H. lunulifera,* Pearl Harbor	Tropical and Temperate Worldwide (Bailey-Brock and Hartman, 1987)	WW
Hydroides elegans	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec D-1101 as *H. norvegica* Pearl Harbor	Worldwide (Bailey-Brock and Hartman and Hartman, 1987)	WW
Pomatoleios kraussii	PR, I	Carlton & Eldredge, ms	1976	Grovhoug and Rastetter (1980), Pearl Harbor	Tropical Indo-West Pacific (Bailey-Brock and Hartman, 1987)	WIP
Salmacina dysteri	PR, I	Carlton & Eldredge, ms	1972	Long (1972)	Tropical Worldwide (Bailey-Brock and Hartman, 1987)	WIP
Serpula vermicularis	PR, C	Carlton & Eldredge, ms	1938	Staughan (1969) as *S. vermicularis*		
Spinther japonicus	PR, C	Carlton & Eldredge, ms	1976	Grovhoug and Rastetter (1980), Pearl Harbor		
Diodora ruppelli	PR, I	Carlton & Eldredge, ms	1962	Kay (1979)	Tropical Indo-West Pacific -Red Sea (Kay, 1979)	WIP
Crepidula aculeata	PR, I	Carlton & Eldredge, ms	1915	BPBM Spec MO-231366	Worldwide (Kay, 1979)	WW
Crucibulum spinosum	PR, I	Carlton & Eldredge, ms	1950	1946 in Honolulu Harb. (Edmondson, 1946)	Worldwide (Kay, 1979)	WW
Vermetus alii	PR, I	Carlton & Eldredge, ms	1973	Evans et al. (1974)	Florida (Hadfield, pers. comm. in Carlton & Eldredge, ms)	WA
Hinemoa indica	PR, C	Carlton & Eldredge, ms	1973	Evans et al. (1974)		
Anomia nobilis	PR, C	Carlton & Eldredge, ms	1912	BPBM Spec MO-68170		
Chama fibula	PR, I	Carlton & Eldredge, ms	1920	Dall, et al. 1938	Philippines-Australia (Carlton & Eldredge, ms)	WIP
Chama pacifica	PR, I	Paulay, 1996.	1950	USNM Spec. 699565	Thailand-Line Islands (Paulay, 1996)	IP
Hiatella arctica	PR, C	Carlton & Eldredge, ms	1938	as *Saxicava hawaiiensis*, USNM Spec. 484284, Fort Armstrong		
Anoplodactylus arescus	NR, I	Child, pers. comm.	1998	Present Study, Barber's Point Harbor	Brazil, E. Africa to Samoa	IP
Pigrogromitus timsanus	PR, I	Child, pers. comm.	1996	Pearl Harbor (Coles et al. 1997, 1999)	Suez Canal, Tropical Worldwide	WW
Balanus amphitrite	PR, I	Carlton & Eldredge, ms	1913	BPBM Spec B 233, Pilsbry (1928), Pearl Harbor	Red Sea, Worldwide (Carlton & Eldredge, ms)	RS
Balanus eburneus	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec. B 271, Pearl Harbor	Western N. Atlantic, Worldwide (Carlton & Eldredge, ms)	WA
Balanus reticulatus	PR, I	Carlton & Eldredge, ms	1915	Henry & McLaughlin (1975)	Worldwide (Carlton & Eldredge, ms)	WW
Chthamalus proteus	PR, I	Southward et al., in press	1996	Pearl Harbor or Kaneohe Bay (Coles et al. 1997, 1999)	Caribbean (Newman. pers. comm.)	CA
Gonodactylus aloha	PR, I	Carlton & Eldredge, ms	1973	1963 at Waikiki (Kinzie, 1968) as *G. falcatus*	Eastern Pacific- Phillipines (Kinzie, 1968)	WIP
Leucothoe micronesiae	NR, I	Barnard, 1965	1997	Present Study, Keehi Lagoon		IP
Paraleucothoe flindersi	PR, C	Muir, 1997	1996	Pearl Harbor (Coles et al. 1997, 1999)		
Stenothoe valida	PR, C	Carlton & Eldredge, ms	1978	1967 on east coast Oahu (Barnard, 1970)		
Corophium ascherusicum	PR, I	Carlton & Eldredge, ms	1973	1943 at Waikiki (Barnard, 1955)	Tropical and Temperate Worldwide (Barnard, 1971)	WW
Corophium baconi	PR, I	Carlton & Eldredge, ms	1973	1967 in Kaneohe Bay (Barnard, 1970)	Bering Sea- Peru (Barnard, 1970)	EP
Ericthonius brasiliensis	PR, I	Carlton & Eldredge, ms	1938	Barnard (1955)	Tropical and Temperate Worldwide (Muir, pers. comm.)	WW
Elasmopus rapax	PR, I	Carlton & Eldredge, ms	1948	1937 in Kaneohe Bay (Barnard, 1955)	Tropical Worldwide (Bernard, 1970)	WW
Podocerus brasiliensis	PR, I	Carlton & Eldredge, ms	1938	1935 in Kaneohe Bay (Barnard, 1955)	Tropical and Temperate Worldwide (Muir, pers. comm.)	WW
Jassa falcata	NR, I	Barnard and Karaman 1991	1997	Present Study, Keehi Lagoon		WW
Caprella scaura	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec S 5251, Pearl Harbor		
Leptochelia dubia	PR, C	Carlton & Eldredge, ms	1939	BPBM Spec S 5048, Black Point		
Parapseudes pedispinis	PR, I	Muir, 1997	1996	BPBM Spec S 11764 (Coles et al. 1997,1999)	Southern California-Equador	WP

Panopeus pacificus	PR, I	Carlton & Eldredge, ms	1929	BPBM Spec. S 3435	Unknown	
Amathia distans	PR, I	Carlton & Eldredge, ms	1935	Kaneohe Bay (Edmondson and Ingram 1939)	Tropical Worldwide (Carlton & Eldredge, ms)	WW
Genus and Species	**Status**	**Status Authority**	**1st Rept.**	**Source &/or Comment**	**Origin and/or Previous Range**	**ID**
Zoobotryon verticillatum	PR, I	Carlton & Eldredge, ms	1946	BPBM Spec K 341 Honlulu Harbor	Worldwide (Carlton & Eldredge, ms)	WW
Aetea truncata	PR, I	Carlton & Eldredge, ms	1935	BPBM Spec K 284, Kaneohe Bay (Edmondson & Ingram. 1939)	Unknown (Carlton & Eldredge, ms)	
Bugula dentata	NR, I	C. Zabin, pers. comm.	1997	Present Study, Ala Wai, Honolulu and Barber's Point Harbors	Indo-Pacific (C. Zabin, pers. comm.)	IP
Bugula neritina	PR, I	Carlton & Eldredge, ms	1921	BPBM Spec K 235, Pearl Harbor	Tropical Worldwide (Soule & Soule, 1967)	WW
Bugula robusta	NR, I	C. Zabin, pers. comm.	1997	Present Study, Honolulu and Barber's Point Harbors	Tropical Worldwide (C. Zabin, pers. comm.)	WW
Bugula stolonifera	PR, I	Carlton & Eldredge, ms	1935	BPBM Spec K 304	Tropical Worldwide (Gordon & Maatvatari, 1992))	WW
Caulibugula caliculata	NR, I	C. Zabin, pers. comm.	1997	Present Study, Honolulu Harbor	Western Indo-Pacific (C. Zabin, pers. comm.)	WIP
Caulibugula dendrograpta	NR, I	C. Zabin, pers. comm.	1997	Present Study, Honolulu and Barber's Point Harbors	Western Indo-Pacific (C. Zabin, pers. comm.)	WIP
Diaperoforma intricata	NR,C	C. Zabin, pers. comm.	1997	Present Study, all harbors	East Pacific	EP
Savignyella lafontii	PR, I	Carlton & Eldredge, ms	1935	Kaneohe Bay (Edmondson and Ingram 1939)	Tropical Atlantic (Carlton & Eldredge, ms)	CA
Schizoporella sp. A	PR, I	Carlton & Eldredge, ms	1935	Kaneohe Bay as *S. errata*. Poss. pre 1933 (Edmondson, 1933)		
Watersipora edmondsoni	PR, I	Carlton & Eldredge, ms	1972	1966 in Ala Wai (Soule and Soule, 1967)	Tropical-Subtropical Pacific (Carlton & Eldredge, ms)	IP
Polyclinum constellatum	PR, I	Monniot nd Monniot 1997	1973	McCain, 1975	Tropical Worldwide (Abbott et al. 1997; Monniot and Monniot 1997)	WW
Didemnum candidum	PR, I	Carlton & Eldredge, ms	1930	Pearl and Hermes Reef (Tokioka 1967)		
Diplosoma listerianum	PR, I	Carlton & Eldredge, ms	1977	Kaneohe Bay, Rastetter and Cooke (1979)	Worldwide (Lambert and Lambert 1998)	WW
Corella minuta	PR, C	Carlton & Eldredge, ms		Kaneohe Bay (Abbott et al. 1997), date unspecified	Caribbean to Westen Pacific	WW
Ascidia sp. B	PR, I	Carlton & Eldredge, ms		Kaneohe Bay (Abbott et al. 1997), date unspecified	Tropical Western Pacific (Abbott et al. 1997)	WW
Ascidia sydneiensis	PR, I	Carlton & Eldredge, ms	1976	BPBM Spec Y 244, Pearl Harbor	Tropical Worldwide (Abbott et al. 1997)	WW
Phallusia nigra	PR, I	Carlton & Eldredge, ms	1975	BPBM Spec Y 241, Kaneohe Bay	Worldwide (Abbott et al. 1997)	WW
Herdmania momus	PR, I	Carlton & Eldredge, ms	1972	Long (1974)	Tropical Worldwide (Abbott et al. 1997)	WW
Microcosmus exasperatus	PR, I	Carlton & Eldredge, ms	1996	Kaneohe Bay (Abbott et al. 1997), 1st rept. date unspecified	Tropical Worldwide (Abbott et al. 1997)	WW
Botrylloides simodensis	NR, I	Lambert, pers. comm.	1997	Present Study, Kewalo Basin and Ala Wai Harbors	Indo-Pacific (Lambert, pers. comm.)	IP
Eusynstyela aliena	NR, I	Lambert, pers. comm.	1997	Present Study, Honolulu and Barber's Point Harbors	New Caledonia - Mauritius (Monniot and Monniot 1997)	WIP
Polyandrocarpa sagamiensis	PR, I	Carlton & Eldredge, ms		Kaneohe Bay and Pearl Harbor (Abbott et al. 1997), date unspec.		
Polyandrocarpa zorritensis	PR, I	Carlton & Eldredge, ms		Kaneohe Bay and Pearl Harbor (Abbott et al. 1997), date unspec.	Peru, Mediterranean, S. California (Abbott et al. 1997)	WW
Styela canopus	PR, I	Carlton & Eldredge, ms		Kaneohe Bay and Pearl Harbor (Abbott et al. 1997), date unspec.	Eastern North America (Lambert and Lambert 1998)	WA
Symplegma brakenhielmi	PR, I	Carlton & Eldredge, ms	1975	Grovhoug (1976) as *S. oceania*	Temperate and Tropical Pacific (Abbott et al. 1997)	IP
Lutjanus fulvus	PR, I	Maciolek, 1984; Randall, 1987	1973	Introduced in 1956 & 1959 in Kaneohe Bay	Tropical Indo-Pacific (Randall, 1987)	IP

Centropyge flavissima	NR, I	R. Pyle, pers. comm.	1998	Present study, Ala Wai. However, undoc. reports for 10 years	Tropical Indo-Pacific R. Pyle, pers. comm.)	IP
Oreochromis mossambicus	PR, I	Brock, 1952, 1960	1973	Introduced in 1952 around Oahu	East Africa, Tropical Worldwide (Randall, 1987)	IP
Sarotherodon melanotheron	PR, I	Maciolek, 1984; Randall, 1987	1987	Introduced in 1970 around Oahu	West Africa, Tropical Worldwide (Randall, 1987)	WIP