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TEN YEAR RESURVEYS OF THE BIODIVERSITY OF MARINE COMMUNITIES AND INTRODUCED SPECIES IN PEARL HARBOR, HONOLULU HARBOR, AND KE‘EHI LAGOON, O‘AHU, HAWAI‘I

S. L. Coles, H. Bolick, B. Hauk and A. Montgomery

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Final Report prepared for the Department of Defense Legacy Program

S. L. Coles
H. Bolick
B. Hauk
A. Montgomery

Bernice Pauahi Bishop Museum
Hawai‘i Biological Survey

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EXECUTIVE SUMMARY

The marine and estuarine algae, invertebrate, and fish communities in Pearl Harbor, Honolulu Harbor and Ke‘ehi Lagoon Oahu, Hawai‘i were surveyed between October 2007 and April 2008 for a comparison of the biotic communities with results determined by previous surveys in Pearl Harbor in 1996 (Coles et al. 1997) and Honolulu Harbor-Ke‘ehi Lagoon in 1997 (Coles et al. 1999b). Both the 1996 Pearl Harbor study and the present study were conducted under the auspices and funding provided by the Department of Defense (DoD) Legacy Resource Management Program, which provides financial assistance to DoD efforts to preserve our natural and cultural heritage. The program assists DoD in protecting and enhancing resources while supporting military readiness while maintaining biological diversity and sustainable use of land and water resources for mission and other uses.

For the present study samples were taken and observations were made at fourteen stations at or near fifteen stations previously surveyed in Pearl Harbor and six stations in Honolulu Harbor-Ke‘ehi Lagoon. Organisms were identified to species or the lowest practicable taxonomic level, and results were added to the lists determined by the previous study and other published and unpublished marine biological surveys conducted in Pearl Harbor, published taxonomic descriptions of organisms collected from the harbor and Pearl Harbor specimens cataloged in the Bernice P. Bishop Museum collections.

In addition to sampling and observations at the former collection stations, snorkeling surveys were conducted throughout Pearl Harbor and Ke‘ehi Lagoon to estimate the abundance of introduced algae and in Pearl Harbor to document the occurrence of reef corals. An observer, either towed on a “Manta Board” or swimming freely, semi-quantitatively estimated abundance of Acanthophora spicifera and Gracilaria salicornia and other introduced invasive algae approximately every 50 m and recorded the location of observations using a GPS unit. Another snorkeling observer also recorded by GPS the locations of reef corals that were identified to species and photographed. The results from both data series were mapped using ArcGIS 9.1.

This study collected or observed a total of 298 species or higher taxa from the 14 stations sampled in Pearl Harbor and 195 in Honolulu Harbor-Ke‘ehi Lagoon. Dendrograms based on Sorensen Indices of Similarity of species composition among stations indicate clustering of sites based on the physical environments of the sites, which is also reflected in the patterns of species richness. Sites located near harbor mouths had the most taxa, reflecting the oceanic conditions that support the presence of organisms characteristic of both harbor and reef environments, while fewest taxa occurred at sites furthest within Pearl Harbor and Ke‘ehi Lagoon characterized by sluggish, highly turbid conditions and dominated by mangroves. The harbor mouth locations were also where the greatest number of the 91 new species reports for Pearl Harbor and the 41 new reports for Honolulu Harbor-Ke‘ehi Lagoon occurred.

Ninety-six genera or species, or 32%, of the total taxa found in Pearl Harbor, are previously designated or newly reported as introduced or cryptogenic (i.e. of uncertain geographic origin). For Honolulu-Ke‘ehi Lagoon 68, or 35%, of the total taxa are designated introduced or cryptogenic. These values are comparable to but somewhat higher than the percentages determined for the 1996-97 studies in the
same harbor areas, but the higher values are probably related to smaller samples sizes taken in the present study than previously, which reduced the total number of total taxa reports. However the higher numbers do indicate wide distribution of introduced and cryptogenic species throughout the harbors and lagoon, reflected in that most stations had higher percentages of introduced and cryptogenic than the overall averages. Only 17 of the genera or species found in the study, mostly sponges, were new reports for Hawaiian waters and these were tentatively designated as cryptogenic.

Only seven of the 95 introduced or cryptogenic genera or species that occurred in Pearl Harbor or the 68 in Honolulu Harbor-Ke’eihi Lagoon are considered invasive, i.e. have been found to substantially alter the environments of their area of introduction or interfere with the survival and propagation of native species. These invasive species include the red mangrove Rhizophora mangle, two red algae Acanthophora spicifera and Gracilaria salicornia, the orange keyhole sponge Mycale armata, the snowflake octocoral Carijoa aff. riisei, the Caribbean barnacle Chthamalus proteus and the Asian stomatopod Gonodactylaceus falcatus. With the exception of the red mangrove, which was first reported on O’ahu in 1922, all of these are recent introductions to Hawaiian waters that have proliferated in the last 30 years and either monopolize habitat space in their habits of introduction, pose a potential threat to native organisms in those habitats, or both. All seven have become dominant organisms elsewhere in Hawai’i where they have various degrees of invasiveness depending on local conditions, but it is the red alga Gracilaria salicornia that is the most problematic in both the present study locations and elsewhere in Hawai’i and especially on O’ahu.

Gracilaria salicornia was first introduced to O’ahu in 1971 and again in 1978 and has since become the most invasive algal species in shallow shoreline areas along south O’ahu and throughout Kāne’ohe Bay. At the time of the 1996 Pearl Harbor Legacy study it was found to be moderately abundant in shallow depths at only three of the 15 sampling and observation sites, although it was known to be established at the heads of all three lochs as early as 1946. For the present study it was found to occur at 10 of the 14 stations in Pearl Harbor and one in Ke’ehi Lagoon, where it did not occur in 1998. Moreover, it is now the dominant benthic organism throughout all of Pearl Harbor where shorelines have not been altered to vertical piers or jetties or it is too turbid to allow growth of this alga. Snorkeling survey observations found G. salicornia at 72% of 1215 sampled locations throughout the harbor, with 34% of the total having three dimensional dense mats, 24% with abundant coverage and 14% with low or patchy coverage. Only 8% of the locations surveyed had no G. salicornia present. In Ke’ehi Lagoon abundance was lower, with less than half of the locations having G. salicornia present and only 1.8% having abundant mats. However, the other invasive alga surveyed, Acanthophora spicifera was more abundant in Ke’ehi Lagoon than Pearl Harbor, occurring at 652 (83%) of the 778 locations, with 553 (78%) of those having low or patchy A. spicifera cover. Acanthophora spicifera is apparently highly stress resistant, being the only alga and one of the few organisms found growing in highly turbid conditions on fine silt among mangrove roots at the head of West Loch in Pearl Harbor.

The findings of the present study support the conclusion from the 1996 Legacy study that environmental physical conditions in the Pearl Harbor have improved since naval shipboard effluent release ceased in the 1970s and most sewage discharges were removed in the 1980s. The last of these, the Fort Kamehameha outfall that discharged into the main ship channel was closed in 2005. The present study
found considerably more organisms representative of less organic-rich conditions than the 1996 survey, with most of these occurring in areas of higher water circulation along the main channel and loch entrances. This and other recent surveys have found considerable numbers of reef corals and previously unreported species in addition to those that appeared to be beginning to colonize hard substrata in the harbor in 1996, and many previously unreported reef-associated invertebrates were found in the present study. The present study also found previously unreported reefs of *Porites compressa* well into West Loch that have apparently existed for at least decades, contrary to conclusions from studies conducted in the 1970s that no reef corals were present in Pearl Harbor in the early 1970s.

Unfortunately, the improved environmental conditions that have developed in Pearl Harbor in the last two decades are being negated by the proliferation of the invasive alga *Gracilaria salicornia* and to a lesser extent, the alga, *Acanthophora spicifera*, and the sponge *Myciella grandis*. The 1996 Legacy study found “no indication of monopolization of resources by a single species or population outbreaks of a recently introduced species.” This is clearly not the case now. *Gracilaria* and *Acanthophora* cover large areas and exclude other benthic organisms throughout Pearl Harbor and much of Kā‘ehi Lagoon, similar to their explosive spreading and growth in the last decade along much of O‘ahu’s south shore and in Kā‘e‘ōhe Bay. *Myciella grandis* overgrowth threatens the survival of the apparently long-standing *Porites compressa* reefs recently discovered in West Loch, where other similar reefs have already been lost to *Gracilaria*. These invasive species are apparently preventing the possible recovery of biotic conditions that have probably not existed in Pearl Harbor since pre-European contact.
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INTRODUCTION

A. Historical Perspective
The harbors of the south shore of O‘ahu have played a principal role in shaping the history of the Hawaiian Islands since the late 18th century when European contact with Hawaiians first occurred. The main Hawaiian Islands are the most isolated major island group in the world, lying more than 2666 miles (4300 kilometers) from the nearest major landfalls in North America and the South Pacific and more than 3968 miles (6400 kilometers) from Japan, the nearest Asian land mass. Prior to the arrival of Europeans to the Islands in the late eighteenth century, the only vessel movement was between neighboring islands or by infrequently arriving Polynesian canoes from the South Pacific.

This isolation of Hawai‘i from the rest of the world rapidly decreased through the 19th century. In the 81 years after European discovery of the Hawaiian Islands in 1778, more than 300 ships from foreign ports made landfall in Hawaii, with the maximum number of arrivals (78) occurring in the 1840s, coinciding with the peak of whaling activity and the discovery of gold in California (Judd 1920). This was only the beginning of Hawai‘i’s interaction with the outside world, and shipping traffic continued to increase as steam replaced sail and Hawai‘i commercial and shipping requirements expanded with urbanization and development of the plantation-based economy.

This increased ship movement and requirement for harbor and port facilities occurred first in the Honolulu Harbor and then Pearl Harbor, both of which provided natural deep water ports that were later expanded and modified for the increased ship traffic that occurred with expanding populations, commercial development and military presence on the island of O‘ahu. Honolulu Harbor was the focus of commercial ship traffic and, until the completion of the Kaleloa (Barber’s Point) Deep Draft Harbor in 1985, provided the only docking and offloading facilities for shipping to the city of Honolulu and for interisland transport to the neighbor islands. Pearl Harbor became a focus of naval operations for U.S. Navy operations in the Pacific after its establishment as a coaling station and dry-dock at the beginning of the 20th century. Although its access has been restricted from commercial traffic, it nonetheless has long been a site of major movement of military vessels of all sizes, especially since before World War II in the late 1930s and 1940s.

The histories of the two harbor areas and of Ke‘ehi Lagoon, which was highly modified in the early 1940s to accommodate seaplane runways, are described in detail in Coles et al. (1997, 1999a) for Pearl Harbor and in Coles et al (1999b) for Honolulu Harbor-Ke‘ehi Lagoon, and detailed chronologies of important events in the histories of each harbor are provided in appendices in the Coles et al 1997 and Coles et al 1999b reports. No further detail will be provided here other than to note that modification and development of both harbors and of Ke‘ehi Lagoon have had extensive and far reaching impacts on the environment and the ecology of marine communities at those locations.
B. Environmental Characteristics

Pearl Harbor

Pearl Harbor is a coastal plain estuary located between the Ko'olau and Waianae mountain ranges in central O’ahu, Hawai’i (Figure 1). The harbor is the most landlocked large estuarine body of water in the Hawaiian Islands and has about 8 square miles (21 square kilometers) of surface water area with a mean depth of 29.2 m and about 58 km of shoreline. It is divided into three main lochs (East, Middle and West Lochs) and one smaller Loch (Southeast Loch), which are remnants of drowned river valleys joined together by a main channel connecting the harbor with the open ocean. With this relative isolation of the harbor from oceanic circulation, water exchange of the harbor with the open ocean is relatively slow, and residence time of water within the harbor has been estimated as about six days maximum for bottom water and one to three days for surface water (Grovhoug, 1992).

Water temperature in the harbor varies annually from 23 to 29°C, and salinities have ranged from 10 to 37% (mean 33%). Salinity is highly influenced by terrestrial and ground water runoff, especially at the heads of the three main lochs. The harbor receives five perennial streams and three intermittent streams draining approximately 109 square miles (285 square kilometers) of watershed and the discharges from five large springs along the lochs’ shorelines. Warming of surface water and freshwater discharge contributes to the development of a pronounced vertical stratification of harbor waters, which in turn promotes differing current conditions between surface and bottom and relative isolation between surface and bottom water masses. Surface water circulation is primarily offshore and driven by tradewinds, while weak tidal flood and ebb flows of 0.15-0.3 m/s control the movement of bottom water in and out of the harbor (Grovhoug, 1992).

Vegetation along much of the West, Middle and East Loch shorelines is dominated by introduced mangroves (*Rhizophora mangle*) at the heads of the three main lochs, which has formed dense growths of bushes and trees up to 10 m high. Elsewhere the shoreline vegetation is cultivated grass, trees and plants in populated areas and kiawe trees (*Prosopis* sp.) along channels. Where mangroves do not occur and the shore has not been altered by construction or dredging the nearshore subtidal zone is largely either vertical concrete walls or a shallow consolidated reef platform to about 2 m depth, which is often covered with fine sediments and, in recent years, introduced macroalgae. Further offshore the substratum slopes deeply to bottom covered with a thick layer of fine silt or mud.

The water of Pearl Harbor has apparently always been relatively turbid from stream runoff and other sources of sediment. A traditional Hawaiian chant recites “Ewa’s lagoon is red with dirt/…A plumage red on the taro leaf/ An ocherous tint in the bay” (Emerson, 1909). However, runoff related sedimentation undoubtedly increased dramatically in the nineteenth century with deforestation, ranching and grazing of hillsides, declining use of taro ponds which would act to retain storm water, and development of sugar cane cultivation. S. Bishop (1901, in Sterling and Summers, 1978) described her memories of Pearl Harbor of 1836: “The lochs or lagoons of Pearl Harbor were not then as shoal as now. The subsequent occupation of the uplands by cattle denuded the country of herbage and caused vast quantities of earth to be washed down by storms into the lagoons…” This resulted in the harbor historically being a highly turbid environment, with thick deposits of fine silt on the bottom throughout most of the lochs.
Figure 1. Aerial perspective of Pearl Harbor, Honolulu Harbor and Ke’ehi Lagoon. Source: http://terrainemap.com.
input of sediments has been estimated to exceed 96 thousand tons annually, and maintenance dredging of about nine million cu. yd. has been required by the Navy on four to five year cycles (Nystedt, 1977 in Grovhourg, 1992). Turbidity measurements indicated by Secchi disk readings in 1990 averaged only 2.5 harbor-wide, resulting from suspended sediments and organic material produced by eutrophic conditions (Grovhoug, 1992).

Early reports describe an abundance of fish and shellfish in Pearl Harbor and the importance of the area as a major Hawaiian population center supported by numerous and extensive fish ponds. According to Handy and Handy (1972) the bays of the harbor “offered the most favorable locality in all the Hawaiian islands for the building of fish ponds and fish traps into which deep sea fish came on the inflow of tidal water...(the bays) provided a greater variety and abundance of edible shellfish, and were famous as the summer home of mullet”. Like many aspects of the Hawaiian culture, fish traps and fishing in the harbor declined in the nineteenth century. However, more than 30 fish traps still existed by the early 1930s (Costa-Pierce, 1987, Figure 2) and oysters introduced in the 1920s thrived for a time.

Since early in the 20th century, Pearl Harbor has been the center of Pacific Naval Operations and the Pearl Harbor Naval Base, with berthing and maintenance facilities for hundreds of ships. As part of this effort the harbor entrance channel was deepened from its natural depth of about 5 m to 9 m, widened to approximately 60 m, and opened to military ship traffic in 1911. Many nearshore habitats were soon drastically altered as shorelines, especially in Southeast Loch and around Ford Island, and were converted to docks and naval operations facilities. Formerly shallow areas were dredged to accommodate ship traffic, and fish ponds in the vicinity of the naval base were filled with dredge spoils. Urbanization of the East Loch area progressed as the Pearl City area was developed, and the Hawaiian Electric Company’s Waiau Power Station began discharging heated effluent at the head of the harbor’s East Loch in 1938. In addition, two recreational marinas were placed in the harbor at Iroquois Point near the channel entrance and at Rainbow Bay at the head of East Loch.

From 1940 to 1970, Pearl Harbor ship traffic and shipyard activities were at their peak and the environmental quality of the harbor reached its lowest point. Alteration of the shoreline and near-shore areas in the harbor continued, and all but four of the more than 30 fish ponds that had still remained in 1920 were eliminated. Development of the naval base and urbanization of the watershed areas greatly altered the shoreline and quality of water entering the harbor in this century. At one time more than 100 treated or untreated sewage discharges were estimated to enter the harbor, and coliform bacterial levels indicated extremely polluted conditions. Sewage discharge from naval facilities reached an average 24,000 m$^3$/day and City and County of Honolulu sewage discharges averaged 34,000 m$^3$/day in the early 1970s (Evans et al. 1972). The high organic load and polluted conditions that existed at that time were indicated by depressed bottom water oxygen concentrations, especially toward the heads of West and Middle Lochs where sewage outfalls were still in operation (Evans, et al., 1974). Extreme dissolved oxygen lows for bottom water fell to 0.1 ppm, with annual averages as low as below 1.5 ppm at these sites, compared to surface values or bottom water in the channels that generally remained around 6 ppm. Heavy metals and pesticides in sediments indicated further environmental degradation.
Figure 2. Pearl Harbor in ca. 1920, showing many of the fish ponds that still remained after the initial development of the naval base. Of these only the four underlined still existed in 1972 (adapted from Grovhoug, 1992 and based on an undated O‘ahu Fisheries chart).
pollution sources from hillsides under urban development and naval shipyard activities further degraded water quality. Coliform bacterial counts at stream mouths in East Loch and near oyster beds in West Loch ranged from hundreds of thousands to billions of bacteria per 100 ml (Cox and Gordon 1970). Possibly because of such a ready, albeit polluted, supply of particulate food, the oyster population soared, reaching an estimated 36 million oysters in West Loch in the 1960s. However, this was followed by a massive die-off of 99% of the oyster population in West Loch and a fish and invertebrate kill in Middle Loch in 1972 (Kawamoto and Sakuda 1973).

These polluted conditions have been largely abated with the removal of sewage effluents from the harbor and changes in naval operations (Grovhoug 1992). In 1975 the Navy instituted shipboard wastewater collection, holding and transfer tank systems to replace release of vessel wastewater effluents into the harbor. Between 1982 and 1984 sewage effluent discharge ended from all major sources (Grovhoug 1992) except for the Fort Kamehameha outfall that discharged treated sewage into the main channel near the harbor entrance until January 2005, when the point of discharge was moved outside of the harbor entrance to a depth of 45 m in Māmalā Bay. Sediment and pesticides from sugar cane production decreased through the years, ending in the 1990s, urbanization of hillsides of the East and Middle Loch watersheds moderated as developments were completed, and better land management practices during construction helped to alleviate surface runoff-related sedimentation. Generally, Pearl Harbor water quality was indicated to have generally improved substantially since its low point in the 1970s. A 1990 study in the East and Southeast Lochs indicated that water quality parameters were within state water quality standards, that there was no substantial difference between surface and bottom water oxygen concentrations, and that metal concentrations in sediments were significantly less than 1972 values for most metals (Grovhoug 1992). However polychlorinated biphenyl (PCB) concentrations were substantially elevated in the Southeast Loch shipyard area at that time (Grovhoug 1992), and and urbanization related pollutants from additional road surfaces and automobile usage has probably increased from the Pearl Harbor watershed.

Two major petroleum hydrocarbon spills have occurred in Pearl Harbor, one of 100,000 gallons of aviation fuel at the head of Middle Loch in 1987 (AECOS 1987) and one in 1996 of an estimated 39,000 gallons (982 barrels) of bunker fuel oil from the Chevron pipeline supplying the HECO power station at the head of East Loch. The 1987 spill produced leaf yellowing, defoliation and some mortality on about 9.5 acres of mangroves (Rhizophora mangle) along the Middle Loch shoreline (AECOS 1987). The 1996 spill resulted in intense oiling of the intertidal flats at the point of discharge near the HECO station intake, and deposition of oil and tar in the intertidal zone along the shores of Ford Island and Waipio Peninsula that were in the direct path of the oil spill. Although initial mortality to marine organisms or birds was only four pufferfishes and two prawns, other organisms within the intertidal were directly exposed to oil and tar deposits which remained after the initial spill. The long term consequences of this spill on the intertidal and other communities in Pearl Harbor were apparently minimal and are briefly described in Brock (2007).

Opportunities for species introductions into Pearl Harbor have existed since the first Polynesians came to O'ahu and have continued to the present, and colonizing organisms could have established themselves for the last half century from hull fouling or discharge of ballast water by ships within the harbor as part of their normal operations. The probability of such introductions probably increased with the deepening and
widening of the entrance channel in the first decade of the 20th century, and reports of the ratio of newly reported introduced to native species increased during the war time related increased ship traffic (Coles et al. 1999a). Also, an event which triggered substantial renewed interest in species introductions into the harbor was the relocation of the floating dry-dock Machinist from Subic Bay, Philippines in 1992. In correspondence and public affairs releases the Navy affirmed that the hull had been thoroughly cleaned and inspected before leaving the Philippines and the dry-dock deballasted at sea, that water from ballast tanks had been microscopically inspected for pathogens, and that the hull had been inspected and additional cleaning performed on arrival. However, a number of newly reported species were found on the drydock and elsewhere in the harbor in 1996 that may have been brought on its surface as fouling. The drydock was later relocated to Apra Harbor on Guam in 1999 (DeFelice 1999) and was noted to bring a number of newly introduced organisms, most of which did not become established there (Paulay et al. 2002).

Honolulu Harbor and Keʻehi Lagoon

Honolulu Harbor (Figure 3) originally was a deep embayment formed by the outflow of Nuʻuanu Stream creating an opening in the shallow coral reef that lies along the south shore of Oʻahu. It was first described scientifically by Agassiz (1889) as “nothing but a channel kept open by the flow of the Nuʻuanu 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 stream forming the original Honolulu Harbor basin 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 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.

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 depth in 1941-45 (Figure 3). The harbor receives the runoff of two major fresh water sources, Nuʻuanu 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 reduced in the harbor by freshwater runoff by as much as one third, but subsurface salinities remain at an oceanic 35 ‰. Overall average salinities in the harbor average 34 ‰ (Buske and McCain 1972).
The present harbor ranges in depth down to 13.5 m, 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 Kapālama Channel and on both sides of Kalihi channel. 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 from the dredged shoreline. The bottom of most of the harbor is composed primarily of flocculent loose silt or mud, which becomes finer near the mouths of Nu'uanu Stream and Kapālama Canal. 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 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 Maersk Sealand Terminals at Pier 52 on Sand Island. Just eastward Pier 53 provides berthing for U.S. Coast Guard ships, 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 thousands 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. While in operation, the Hawai'i Superferry utilized docking facilities at Piers 22-23 for interisland transport of passengers and vehicles. 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 Kapālama Canal until the early 1970s, resulting in 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 discharge of thermal effluent has decreased in recent decades as generation load has been shifted to more efficient newer power stations.

Ke'ehi Lagoon (Figure 3) 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, Ke'ehi Lagoon shoreline, ponds or marshes.

Dredge and fill activities in the 1940s and the 1970s drastically altered Ke'ehi Lagoon from its original state. A mooring basin and three seaplane runways two to three miles long by 30.3 m wide and 3 m 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.
Figure 3. Map of Honolulu Harbor and Ke’ehi Lagoon showing Pier locations.
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 east 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 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).

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 seaplane runway, and more are forming on the central reef flat where mangroves grow and accumulate sediments.

C. Study Objectives

Pearl Harbor has a substantial information base for marine organisms that dates back to the 19th century that was reviewed in Coles et al. 1997, Coles et al. 1999a and Coles 2006. Although collections were made intermittently in 1920s, 1930s and early 1940s, the first comprehensive and extensive surveys were made in the early 1970s by the Naval Undersea Center (Evans et al. 1974). This was the primary baseline of comparison for the comprehensive survey conducted in 1996 for the Department of Defense Legacy Project Number 106 that described environmental conditions and the biota in Pearl Harbor at that time, with an emphasis on introduced marine species (Coles et al. 1997). This project determined that in Pearl Harbor 96 out of a total of 434 marine species, or 22%, were introduced or cryptogenic (i.e. of indeterminate) origin. Comparable figures for a 1997-98 study in Honolulu's commercial and public harbors, including Honolulu Harbor and Ke'ehi Lagoon were 100 introduced or cryptogenic species of a total of 585, or 17%. These introduction percentages are among the highest of any areas that have been surveyed in the world, suggesting that O'ahu's harbors have historically been major recipients of introduced marine species and a possible point from where they may have been distributed elsewhere in Hawaii.

The other major finding from the 1996 Pearl Harbor Legacy project was that reef corals, formerly considered missing from Pearl Harbor due to earlier poor water quality, were becoming re-established in the harbor. Subsequent studies by the Pearl Harbor Naval Facilities Engineering Command (Smith 2002, Smith et al. 2006) verified the increasing occurrence of corals within the harbor but noted that the invasive introduced alga *Gracilaria salicornia*, first reported in Pearl
Harbor by the 1996 Legacy surveys, was also becoming very abundant and overgrowing corals that had become recently established.

The present study was designed to compare environmental conditions and the marine biota in Pearl Harbor with the results of the 1996 surveys using similar sampling sites, sampling methods, and the same project manager as for the previous study, and to compare these results with those obtained for a few selected sites in Honolulu Harbor and Ke’ehi Lagoon that were surveyed in 1997. The sites surveyed in Pearl Harbor included those of the 15 stations surveyed in 1996 that were accessible in 2007-2008, and six sites in Honolulu Harbor or Ke’ehi Lagoon of the 20 that were surveyed in 1997. The results of these surveys conducted after ca. ten years were to be evaluated to determine whether biotic conditions in the harbors had changed substantially, especially in terms of the relative abundance of introduced or invasive species. Also, comprehensive observations throughout Pearl Harbor and Ke’ehi Lagoon were made beyond the locations of fixed sampling sites to determine the extent and impact of introduced invasive algae and the extent of occurrence of reef corals that have become established in areas formerly considered unsuitable for their survival.

METHODS

Sampling and observations of biota were made at or near 14 of the 15 Pearl Harbor stations previously surveyed in 1996 and were intended to duplicate, wherever possible, the locations of stations previously surveyed. Station locations are shown in Figure 4, and the dates, coordinates, and depths of the stations are in Table 1. Station 3, surveyed in 1996, was not resurveyed because of warnings from the Hawai’i State Department of Health that diving in Walker Bay could be hazardous to divers having full body exposure to the water in the bay. The 1996 West Loch Stations 4 and 5 could not be resurveyed at the same locations because water at these sites was too shallow to access by boat and/or too turbid to see the bottom, so new Stations 4A and 5A were established 600-750 m SE of the original locations. Access to the 1996 Station 6 adjacent to Drydock 4 was restricted in 2008 by U.S. Navy security, so an adjacent site 6A about 300 m southeast of the original site was surveyed. The 1996 Station 9 was at the head of Middle Loch, on the surface of the floating drydock Machinist, which was moved to Guam in 1999. Therefore, collections and observations were made at Station 9A, about 60 m northeast of the original location. The pier where Station 10 was surveyed in 1996 was occupied at the time of sampling in 2008, so sampling was conducted on the nearest available pier at Station 10A, about 140 m northwest of the original location. Finally, although the location of Station 12 was the same in 2008 as in 1996, the habitat was greatly altered by the construction of the Ford Island Bridge, which was completed in 1997.

Sampling at each station in 2007-8 was conducted by S. L. Coles, who conducted the 1996 surveys with R. C. DeFelice, and by H. Bolick. Observations and collections were conducted in a similar manner as in 1996, although the quantities of material sampled were less than in 1996 and collections cannot be considered as comprehensive as in 1996. Sampling consisted of collecting fouling organisms growing on hard surfaces from the intertidal zone to the bottom,
which ranged in depth from 0.5 to 8 m. Collections were made by SLC from as large a variety of habitats as possible while using scuba. Both organisms and the substrata on which they were growing were collected, retained in a 500 nm mesh net, relaxed by adding magnesium sulfate on site and then returned to the laboratory where they were preserved in 70% ethanol until sorting and identification of organisms. Investigators also recorded on underwater paper the algae, invertebrates and fishes that were identifiable on site at each station and photographed organisms using digital cameras. Sponges collected were photographed in the laboratory and notes on color and texture recorded before they were preserved in 70% ethanol and sent to the sponge taxonomic expert.

In order to compare changes in biotic conditions in Pearl Harbor over the past decade with a similar harbor and estuarine area on O'ahu, six stations were resurveyed in Honolulu Harbor and Ke'e hí Lagoon that were previously surveyed in 1997 (Coles et al. 1999b). Three stations were selected from the 15 sites that were surveyed in Honolulu Harbor and three of the six sites that were surveyed in Ke'e hí Lagoon. Station locations are shown in Figure 5 and site information summarized in Table 1. One of the Honolulu Harbor sites was on a reef area that exists between Piers 29 and 30, one was on Pier 40 near the Pier 41 drydock, and one was on the slope from the shore along Sand Island Park. The Ke'e hí Lagoon sites were on the Ke'e hí Marina floating docks, on a barge wreck along the west seaplane channel, and in the mangrove area at the outlet of Moanalua-Kaliihi Streams. These six stations therefore duplicated the full variety of environments that were sampled in Pearl Harbor.

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

All organisms identified from the field study were entered on an Access database relational with 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 in Pearl Harbor.

The Sorenson's Index of 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. Calculation of the similarity measures and cluster analysis were performed using the Multi-Variate Statistical Package, ver. 2.1 (Kovach 1993).
Table 1. Station locations, depths, sampling dates and coordinates in decimal degrees and UTM Nad83 Zone 4N for sites surveyed in Pearl Harbor, Honolulu Harbor and Ke‘ehi Lagoon.

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<th>Location</th>
<th>Depth (m)</th>
<th>Date</th>
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<th>Longitude</th>
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RESULTS

A. Station Site Descriptions

Pearl Harbor

PH 1. (Latitude 21°19.468'N, Longitude 157°58.218'W). North side of entrance channel to Pearl Harbor, adjacent to a now unused discharge pipeline from the Iroquois Point sewage treatment plant. This station is the most exposed to oceanic conditions, with many characteristics of a coral reef environment. A shallow shoreline bench about 0.5 m deep lies along a calcareous sand beach and rises from the adjacent channel of about 10 m depth. The primary substrata are consolidated calcareous submerged beach rock, reef with minimal coverage of live corals, and intermittent coral boulders and cobbles. The site is frequently exposed to short period waves generated by northeast trade winds and shows characteristics of a windward reef environment. It also is directly exposed to large storm waves from the south generated by local Kona storms. A variety of reef fish are present. Benthic fauna are dominated by sponges, tunicates, bryozoans and macroalgae, with a few reef corals. Biota characteristic of both harbor and reef environments occur at this site, reflecting its transition between the two environments.

PH 2. (Latitude 21°20.636'N, Longitude 157°58.497'W). North side of West Loch entrance channel about 600 m SE of Keka’a Point, on the western shore of Waipi’o Peninsula. The substratum is consolidated limestone, within medium to fine calcareous white sand areas on the shore and channel sides of the hard substrata. Bottom depths range from 6 m outside of the hard substratum to 1-3 m inshore. Many abandoned wooden pilings provide habitat for wood borers and fouling organisms. Since the site was first surveyed in 1996 a monoculture of the invasive introduced algae Gracilaria salicornia, which was not noted at this site in 1996, has developed and now covers virtually 100% of the bottom. This is one of the few sites within the harbor where reef corals occurred in 1996. A single colony of Porites compressa at about 2.5 m depth that was approximately 15 cm in diameter in 1996 (Coles 1999) has maintained its growth above the Gracilaria and was approximately 0.75 X 1.5 m in diameter in January 2008. Small Leptastrea purpurea colonies also occur in shallow areas, but Pocillopora damicornis, which were relatively abundant in 1996, were not found in 2007-8, probably having been overgrown by Gracilaria.

PH 3. (Latitude 21°21.802'N, Longitude 157°58.555'W). Walker Bay. In the 1996 study this site was surveyed in 0.5 m depth near the shoreline of Walker Bay, on the west shore of Waipi’o Peninsula, about half way up West Loch. The water was highly turbid and sediment laden and the substratum was fine-grained silt and mud sediment, with abundant mangroves along a calcareous shoreline bench. Macrofauna growing in and on sponges occurred only on mangrove roots and on debris in shallow water offshore, and the principal macrofauna was Crassostrea virginica oysters abundant on mangrove prop roots. Due to warnings of potentially health-hazardous conditions in Walker Bay from the Hawai’i Department of Health, this site was not resurveyed in the present study.

PH 4A. (Latitude 21°21.521'N, Longitude 158°00.801'W). West Loch South. The 1996 location for this site was 100 m offshore of the mangroves near the western part of West Loch, near the Pearl Harbor National Wildlife Refuge. The substratum was the remains of a metal hull of boat wreck covered with a heavy
growth of oysters and sponges in 0.5-1.0 m. Because of extremely high water turbidity at the time of the present survey sampling for this site was moved ca. 775 m southeast of the 1996 location to an emergent fossil reef platform that provides a hard surface supporting abundant sponges, barnacles and the invasive introduced algae *Acanthophora spicifera* and *Gracilaria salicornia*.

**PH 5A.** (Latitude 21°22.240’N, Longitude 158°00.485’W). *West Loch North.* The 1996 PH 5 site was in a mangrove area at the head of West Loch near the mouth of Waikele stream, with a substratum of mostly deep, soft, mud-silt sediments and intermittent sponges. The water was highly turbid and sediment laden and depth was 0.5 m. Large *Crassostrea virginica* oysters were very abundant on mangrove prop roots, and numerous shells of apparently recently dead Japanese little-neck clam *Venerupis (Ruditapes) phillippinarum* were found in the sediments. Water depth was at the time of the 2008 survey too shallow to reach this site by boat, and the mud was too soft and deep to be able to reach it on foot. Consequently, the location of sampling for this site was moved ca. 615 m southeast of the original location, where only a very few macroinvertebrates and one alga, *Acanthophora spicifera* occurred on or under mangrove prop roots at ca. 1 m depth on a mud bottom.

**PH 6A.** (Latitude 21°20.624’N, Longitude 157°57.927’W). *Hospital Point South.* Due to security restrictions that prevented re-sampling at the 1996 Drydock Number 4 site, sampling and observations were made approximately 200 m southeast from the original location. The substrata for both locations are concrete pilings and a calcareous bench and slope ranging from 1 m depth to a flat fine sand bottom at 6 m. Macrofauna at 6A was a dense coverage of a suspension feeding fouling community on the pier pilings, especially chaetopterid polychaete worms and sponges, bryozoans and tunicates, and the introduced octocoral *Carijoa* aff. *riisei*.

**PH 7.** (Latitude 21°21.477’N, Longitude 157°58.412’W). *Waipio Peninsula along the Middle Loch Channel across from Ford Island.* This shallow bench is approximately 10 m wide, and at the edge of the bench depth increases to 2-3 m to a flat, coarse sand bottom with abundant coral rubble. The shallower area is densely covered with *Gracilaria salicornia*, which forms a habitat for numerous native and introduced macroinvertebrates. Density and thallus length of the *Gracilaria* have increased noticeably since 1996 survey, creating a near monoculture on the bottom. However, the coral *Leptastrea purpurea*, which did occur here in 1996 has also increased in abundance, with numerous colonies up to 5 cm in diameter occurring where hard substratum is still available.

**PH 8.** (Latitude 21°22.493’N, Longitude 157°58.661’W). *West side of Waiawa Peninsula at the former Pan American Clipper Landing Dock.* The substrata sampled was concrete and wood pilings offshore of the dock down to 5 m depth. This site had the greatest number of reef fishes noted at any site within the harbor, including abundant large *Acanthurus blochi* and *Kuhlia sandvicensis*. The introduced algae *Gracilaria salicornia* was noted to be very abundant in shallow water along the shoreline.

**PH 9A.** (Latitude 21°23.179’N, Longitude 157°59.468’W). *Head of Middle Loch in the vicinity of the former location of the floating dry-dock USS Machinist.* The dry-dock was brought to Pearl Harbor from the Philippines in 1992 and transferred to Guam in 1999. In 1996 samples were taken from the steel hull of the *Machinist* itself, from the shallow subtidal to the bottom of the hull at 8 m depth, and from nearby
wooden pilings from the intertidal to 4 m depth. Because the USS Machinist was moved from Pearl Harbor in 1999, 2008 samples and observations were taken within 100 m of its former location from the nearest stationary hard surface, which was a marker buoy with concrete pilings and adjacent wooden pilings that were highly eroded from shipworm feeding.

**PH 10A.** (Latitude 21°21.359′N, Longitude 157°57.131′W). Southeast Loch Dock. Because of ship activity at the 1996 site adjacent to Pearl Harbor Navy Shipyard in Southeast Loch, the site was moved to a docking basin just west of the 1996 Dock B-2 1 site. Both sites are in the vicinity of Navy and industrial operations, where considerable ship traffic, hull cleaning and ship maintenance occurs. Despite this high industrial use of the area, a very abundant fouling fauna was noted on all hard surfaces present. Sampling was conducted from and observations made among the wooden and concrete dock pilings from the shallow subtidal down to 6 m.

**PH 11.** (Latitude 21°21.541′N, Longitude 157°57.830′W). Southeast Loch Entrance. Observations were made along the pier pilings on the east side of the South Channel, near north side of the entrance to Southeast Loch. Samples were taken from 0.5 to 5 m depth. Although a few Pocillopora damicornis and Leptastrea purpurea reef corals were found at this site in 1996, none were found in January 2007 on any of the hard surfaces sampled, which were dominated by abundant fouling organisms, many of them introduced.

**PH 12.** (Latitude 21°22.139′N, Longitude 157°56.941′W). Northeast Ford Island The original site was northeast of Ford Island and the USS Arizona Memorial and just northwest of Mokunui Island, near the present Ford Island bridge terminus. In 1996 the substratum at this site was clay compacted to the consistency of soft rock but still capable of being broken apart by hand, and outcroppings of calcareous beach rock and reef. The concrete buttresses of the Ford Island Bridge now provide ample hard substratum for abundant fouling, especially for a variety of sponges, and the bottom in 2008 was covered with abundant Gracilaria salicornia invasive algae.

**PH 13.** (Latitude 21°22.137′N, Longitude 157°57.736′W). Utah Memorial. On the northwest side of Ford Island, on concrete dock pilings and on the surface of the USS Utah at the memorial along the north channel into East Loch. A highly diverse invertebrate fauna was noted, including abundant specimens of Pocillopora damicornis corals, the jewel box bivalve Chama sp. and the hoof shell Hipponix imbricatus.

**PH 14.** (Latitude 21°23.218′N, Longitude 157°57.632′W). HECO Discharge. Along the sheet piling separating the intake and discharge zones for cooling water from the Hawaiian Electric Waiau Generating Station at the head of East Loch. Samples were taken from the discharge side from the sheet piling from the intertidal to the base of the piling at 2 m, from about 100 m beyond the thermal effluent discharge point to the outfall, where the temperature is approximately 5°C above ambient. Sponges dominate the benthos, especially in the vicinity of the outfall, where the substratum is largely a massive sponge “reef” that covers the entire bottom along the sheet piling side of the discharge. Other organisms abundant along the sheet piling are dense populations of the anemone Aiptastia puchella, hydroids and bryozoans.
PH 15. (Latitude 21°22.321'N, Longitude 157°56.182'W). *Rainbow Bay Marina, at the northeast head of East Loch.* Sampling was done from the surfaces of floating buoys and dock floats of the Marina’s piers and docks, which are dominated by a dense cover of a variety of sponges. Offshore the substratum is a shallow, gently sloping intertidal to subtidal zone composed of calcareous rock and rubble with a thin sediment cover, and soft sediments dominating further offshore. Both substrata were dominated in 1996 by a moderately heavy growth of fine filamentous green algae (cf. *Chlorodesmis* sp.) and intermittent patches of high coverage of the branching leafy green macroalga *Caulerpa sertularioides*, but in 2008 the dominant benthic cover is patchy to dense mats of the invasive algae *Gracilaria salicornia*.

**Honolulu Harbor-Ke'ehi Lagoon**

HH 8. (Latitude 21° 18.660'N, Longitude 157° 52.419'W). *Pier 29-30.* This site lies between Piers 29 and 30 along the Kapalama Channel, and it represents a relatively natural environment compared to other areas in Honolulu Harbor. Although the structure of area was formed from dredging a channel through a former reef flat, it has the appearance of reef slope outside of a narrow fringing reef that extends about 5 m from the shoreline. This 1-2 m deep flat area is rubble strewn and quite barren, but 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 slopes to nearly 10 m (depth where the bottom levels off to a fine silt substratum. Observations and sampling were also done just northwest of this site along Pier 30, where the concrete pilings of the pier and the reef substratum below have heavy fouling and abundant sponges with a heavy silt coating.

HH 11. (Latitude 21° 19.033'N, Longitude 157° 52.936'W). *Pier 40-41.* Sampling for this station was done in 1997 from the surface of the main dry-dock operating in Honolulu Harbor, located at the end of Pier 41. Sampling for the present study was made across the basin from Pier 41, on the concrete surfaces along the side and front of Pier 40, which provides a habitat for numerous corals, sponges and large tunicates.

HH 14. (Latitude 21° 18.140'N, Longitude 157° 52.165'W). *Sand Island Park.* Located at the border of Anuenue Fisheries Center and Sand Island Park, near the beginning of the harbor entrance channel. The substratum is a steep slope dredged from the reef and small boulders 1-2 m in diameter extending down 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.

KL 18. (Latitude 21° 19.183'N, Longitude 157° 53.663'W). *Marina Docks.* Keehi Lagoon Marina floating docks located midway between Honolulu Harbor’s Kalihi Channel and the mouths of Kalihi and Moanalua Streams. The dock surfaces are very heavily fouled and are anchored in 3 m of turbid water over a muddy sediment bottom.

KL 19. (Latitude 21° 19.087'N, Longitude 157° 54.446'W). *Barge Wreck.* Located midway along the reef side of the Lagoon Drive seaplane runway, the site is an iron barge hull stranded on the reef edge. Depth on the runway side of the barge was 4.5 m (and decreased to 1 m on the reef side of the barge. The hull had only moderate fouling in 1997 with a heavy sediment coating, and the bottom substratum was fine sand to silt. In 2008 the barge surface was heavily fouled, especially with sponges and tunicates.
KL 20. (Latitude 21° 19.910’N, Longitude 157° 53.586’W). Stream Mouth. 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 depth.

**B. Biota Observations and Collections**

This study identified a total of 298 taxa observed or collected from the 14 stations sampled in Pearl Harbor and 195 taxa from the six stations in Honolulu Harbor and Ke‘ehi Lagoon. These are listed and compared with previous reports from those locations in Appendix A and listed by station in Appendices B and C. The result of the Sorenson’s similarity analysis for the results from all locations are shown in Figure 6 with the total numbers of taxa identified from each station, and the numbers of taxa found at each station are summarized on the maps in Figure 7.

![Dendrograph of Sorensen similarities and numbers of taxa for all sites sampled in Pearl Harbor, Honolulu Harbor and Ke‘ehi Lagoon.](image)

Figure 6. Dendrograph of Sorensen similarities and numbers of taxa for all sites sampled in Pearl Harbor, Honolulu Harbor and Ke‘ehi Lagoon.
Figure 7. Distributions of numbers of taxa identified at Pearl and Honolulu Harbors and Ke'ehi Lagoon.
Both figures indicate that the distributions of the numbers of taxa are determined by proximity of the site to harbor mouths and oceanic conditions, and that number of taxa decrease as conditions become more isolated and water circulation becomes more stagnant. Six station clusters are indicated in the dendrogram in Figure 6 that are associated with numbers of taxa and the position of the sites within the harbors or Ke'ehi Lagoon. Cluster A consists of the three stations with the lowest taxa numbers that were in highly turbid mangrove areas in West Loch, Pearl Harbor or at the mouth of Moanalua Stream in Ke'ehi Lagoon. By contrast, Cluster F consists of the three stations with the highest numbers of taxa closest to harbor entrances at Pearl Harbor and Honolulu. All three of these sites showed characteristics of reef environments, with many reef corals and reef fishes that did not occur at most interior sites more remote from the open ocean, and the environment at these three stations can be considered transitional from ocean reefs to more typical harbor conditions. Clusters B and C consist of three stations each, with intermediate numbers of taxa, and Cluster B including sites from Waipio and Waiawa Peninsulas and the Wa'au Power Station outfall at the head of East Loch. Cluster C included two other East Loch stations at Rainbow Bay Marina and the Ford Island Bridge and one station at the head of Middle Loch. Cluster D is the largest and is composed of the remaining stations in Pearl Harbor, from the tip of Waipi'o Peninsula, Navy pier areas along the entrance to East Loch, and the USS Utah memorial on the northwest side of Ford Island. This cluster also included the station at the wrecked barge in Ke'ehi Lagoon, and may be considered the most representative of fouling communities associated with piers and hard surfaces in the harbors. Cluster E included stations near the Honolulu Harbor drydock and at the Ke'ehi Lagoon Marine, with similar substrata and environments as Cluster D, but most sites with slightly fewer taxa than in Cluster D.

Although Pearl Harbor was thoroughly sampled in two major studies in the 1971-72 and again in 1996 at many or all of the present sites, and collections in the harbor date back to the beginning of the 20th century, a substantial number of newly reported genera or species were identified from the present study. Likewise, the six sites in Honolulu Harbor and Ke'ehi Lagoon produced many new reports that were not recorded from 20 harbor or lagoon sites in the previous comprehensive sampling in 1997 or from previous studies. These newly reported genera are summarized for each station and all sites combined in Figure 8. Overall, 75, or about 25% of the 298 taxa identified by the present study for Pearl Harbor were new reports for genera or species, and 41 or about 20% of the 195 total were new for Honolulu Harbor-Ke'ehi Lagoon. The most new reports, by number or percent of total were near the entrances for both harbors, i.e. 24 (30.4%) at Station 1 in Pearl Harbor, and 18 (21.2%) at Honolulu Harbor Station 8, corresponding to sites of highest species numbers and transitional coral reef environments. In Pearl Harbor, the second and third lowest (2, 11.1% and 3, 11.5%) new reports occurred at the West Loch sites that had the fewest total taxa, and in Honolulu Harbor-Ke'ehi lagoon this occurred at KL20 (1, 5.3%), the site of fewest total taxa for the entire study.
Figure 8. Total taxa and numbers of new genera or species found in Pearl and Honolulu Harbors and Keʻehi Lagoon.
A substantial portion of the total taxa identified in the study are considered introduced or cryptogenic (i.e. of uncertain origin but with some introduced characteristics) for Hawai‘i per the checklist developed by Carlton and Eldredge (2009). Previously unreported genera or species of sponges, hydroids, polychaetes and ascidians not designated by Carlton and Eldredge were also tentatively assigned cryptogenic status after consultation with taxonomic experts for those respective groups. Overall, 95 (32%) of the 298 taxa identified for all sites in Pearl Harbor are designated introduced or cryptogenic genera or species, and 68 (35%) of the 195 taxa from the six sites in Honolulu Harbor and Ke‘ehi Lagoon. Figure 9 shows the distributions of introduced and cryptogenic species and their proportion of total reports for all the stations. Percent introduced or cryptogenic species ranged 29 to 65% of total taxa for individual stations in Pearl Harbor and from 18 to 59% for stations in Honolulu Harbor-Ke‘ehi Lagoon. These values for individual stations were greater than overall means because many introduced and cryptogenic species were more widely distributed throughout the harbors than many of the native species. This is reflected by the low percent values near harbor entrances at Station 1 in Pearl Harbor and Station 14 in Honolulu Harbor, compared to the high values in the mangrove areas at Stations 4A and 5A, and in the vicinity of the Navy shipyard at Stations 10A, 11 and 12. Similarly, the highest percent component of total taxa that were introduced or cryptogenic in Honolulu Harbor-Ke‘ehi Lagoon occurred at in the mangrove area at Ke‘ehi Station 20, and at Ke‘ehi Stations 18 and 19, relatively isolated from oceanic circulation and having fewer total taxa than at Honolulu Harbor stations.

The previous survey of 15 stations in Pearl Harbor in 1996 (Coles et al. 1997) identified 96 genera or species considered to be introduced or cryptogenic, and a similar study in 1997 identified 90 at 20 stations in Honolulu Harbor-Ke‘ehi Lagoon (Coles et al 1999b). In Pearl Harbor 37 introduced or cryptogenic genera or species were not previously found in the 1996 survey, 33 were not previously found in Honolulu Harbor-Ke‘ehi Lagoon. Of those 17 genera or species, mostly sponges, were new reports for Hawai‘i, with eleven found in Pearl Harbor and eleven in Honolulu Harbor-Ke‘ehi Lagoon (Table 2).

Of the 95 introduced or cryptogenic genera or species found in Pearl Harbor and the 68 in Honolulu Harbor-Ke‘ehi Lagoon, seven are considered invasive, i.e. potentially alter the character of the environment in the introduction location and/or threaten the survival or propogation of native species through uncontrolled competition. The two most problematic of these are the red algae Acanthophora spicifera (Figure 10a) and Gracilaria salicornia (Figure 10b), and these were a focus of the present study that is described in the following Section C. The other invasive species are the Red Mangrove Rhizophora mangle (Figure 10c), the Orange Keyhole Sponge Mycale grandis (Figure 10d), the Snowflake Coral Carijoa aff. rizii (Figure 10e), the Caribbean Barnacle Chthamalus proteus (Figure 10f), and the Asian Stomatopod Gonodactylaceus falcatus.

The distribution of these species among the stations in both harbor areas is shown in Figure 11. Rhizophora mangle occurred at ten sites and was the dominant habitat former at all interior locations where the shorelines have not been hardened by construction of piers or seawalls. It also co-occurred
Figure 9. Numbers of introduced or cryptogenic genera or species and percent of total taxa observed or collected in Pearl and Honolulu Harbors and Ke‘ehi Lagoon.
Table 2. New genera and species reports for Hawai‘i identified from Pearl Harbor, Honolulu Harbor and Ke‘ehi Lagoon.

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<td>Ridley, 1884</td>
<td>Cryptogenic</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORIFERA</td>
<td>lotrochota purpurea</td>
<td>(Bowerbank, 1875)</td>
<td>Cryptogenic</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORIFERA</td>
<td>Raspalia (Clathridiodendron) darwinensis</td>
<td>Hooper, 1991</td>
<td>Cryptogenic</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORIFERA</td>
<td>Scopalina sp.</td>
<td></td>
<td>Cryptogenic</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNIDARIA</td>
<td>Clyta cf. gracilis</td>
<td>(M. Sars, 1850)</td>
<td>Cryptogenic</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNIDARIA</td>
<td>Halopteris plagiocampa</td>
<td>(Pictet, 1893)</td>
<td>Cryptogenic</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANNELIDA</td>
<td>Oenone fulgida</td>
<td>Savigny, 1818</td>
<td>Cryptogenic</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOLLUSCA</td>
<td>Zafru cf. hervieri</td>
<td>(Pace, 1903),</td>
<td>Cryptogenic</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHORDATA</td>
<td>Diplosoma cf. spongiforme</td>
<td>(Giard, 1872)</td>
<td>Cryptogenic</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHORDATA</td>
<td>Polycarpa cryptocarpa</td>
<td>(Sluiter, 1885)</td>
<td>Cryptogenic</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
with many of the other invasive species, such as *Mycale grandis*, which was present to common at ten stations throughout Pearl Harbor and two in Honolulu Harbor-Ke’ehi Lagoon. *Chthamalus proteus* occurred on hard surfaces in the intertidal zone at 11 sites in Pearl Harbor and two in Ke’ehi Lagoon. *Caricola aff. riisei* occurred at four sites in Pearl Harbor, at the entrance and along the main channel to the Ford Island Bridge in East Loch. *Gonodactylaceus falcatus* was found at only one site along the east side of Waipi’o Peninsula in Pearl Harbor, but it is undoubtedly more common, based on its cryptic nature and numerous reports from previous studies in the harbors.

Figure 10. Invasive species in Pearl Harbor. a: Dense mat of *Gracilaria salicornia* with sea cucumber *Opheodesoma spectabilis* at PH Sta. 12; b: *Acanthophora spicifera* at PH Sta. 9A; c: *Rhizophora mangle* at PH Sta. 5A; d: *Mycale grandis* at PH Sta. 11; e: *Caricola aff. riisei* at PH Sta. 1; f: *Chthamalus proteus* with *Crassostrea* sp. at PH Sta. 8.
Figure 11. Locations of invasive introduced species in Pearl Harbor, Honolulu Harbor and Keʻehi Lagoon.
C. Introduced Invasive Algae

Table 3 compares the stations where the introduced invasive algae *Gracilaria salicornia* and *Acanthophora spicifera* occurred at Pearl Harbor collection sites in 1996 and 2007-8, and Table 4 for collection sites in Honolulu Harbor and Ke’ehi Lagoon in 1997 and 2008. The “A” station designations in Table 3 indicate sites where, for various reasons, the collection site in 2007-8 did not exactly correspond to 1996, but was located nearby (Figure 4). The results indicate that both *Gracilaria* and *Acanthophora* were substantially more widespread in Pearl Harbor and Ke’ehi Lagoon in 2007-8 than ten years earlier. *G. salicornia* was recorded 1996 only at Station 7 along Wai‘i’o Peninsula, Station 8 at the Pan Am Landing and Station 15 at the Rainbow Bay Marina dock. In 2007-8 *Gracilaria* was also found at Station 1 near the harbor entrance, Stations 2 and 4A in West Loch, 9A at the head of Middle Loch, and 12A northeast of Ford Island. Although it was not recorded at the Rainbow Bay Marina dock station, it was abundant on the bottom nearby.

*Acanthophora spicifera* was not recorded anywhere on the 1996 Pearl Harbor collection surveys, but did occur in 2007-8 at Stations 4A and 5A in West Loch, Station 7 along Wai‘i’o Peninsula, Station 13 at the Utah Memorial northwest of Ford Island and Station 14 along the HECO discharge sheet piling.

Table 3. Introduced algae observed at Pearl Harbor collection sites in 1996 and 2007-2008.

<table>
<thead>
<tr>
<th>Algal Species</th>
<th>1</th>
<th>2</th>
<th>4A</th>
<th>5A</th>
<th>7</th>
<th>8</th>
<th>9A</th>
<th>12A</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gracilaria salicornia</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Acanthophora spicifera</em></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

*Gracilaria salicornia* was not found at any of the 22 Honolulu Harbor or Ke’ehi Lagoon collection sites in 1997 but was abundant at Station 19 in Ke’ehi Lagoon in 2008. *Acanthophora spicifera* occurred at Station 14 by Sand Island Park in both 1997 and 2008.

Table 4. Introduced algae observed at Honolulu Harbor and Ke’ehi Lagoon collection sites in 1997 and 2008.

<table>
<thead>
<tr>
<th>Algal Species</th>
<th>KL14</th>
<th>KL19</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gracilaria salicornia</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Acanthophora spicifera</em></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

In order to obtain a more comprehensive view of distributions of these invasive algae, a series of snorkeling surveys were made in 2007-8 along the shorelines of Pearl Harbor and on shallow areas of Ke’ehi Lagoon. For these, trained observers made observations of algae relative abundance approximately every 50 m while swimming along the shoreline or being towed slowly while using a manta board. A Garmin 76 GPS was used to mark the locations of algal abundance observation, and these coordinates were later downloaded and mapped using ArcMap 9.1 software. The relative abundances of *Gracilaria salicornia* and *Acanthophora spicifera* were recorded corresponding to the following criteria:
• Category O: not present
• Category 1: present in low abundance, patchy
• Category 2: abundant and forming mats
• Category 3: dense cover, thick 3 dimensional mats may resemble "tumbleweeds"

Figure 12 shows the results of these observations in Pearl Harbor for Gracilaria salicornia and Figure 13 for Acanthophora spicifera. Figure 14 summarizes the total number of observations for each of the four categories for both species. The data include all locations in Pearl Harbor where the shoreline could be accessed and observations could be made. This excluded militarily secure areas, areas where the shoreline has been altered to vertical concrete walls or piers, areas where bottom depths exceed the zone of algal growth, areas where the shoreline is mostly stands of the red mangrove Rhizophora mangle, areas where high water turbidity prevents sufficient light on the bottom to support algal growth, or areas where shallow depths prevented approaching the shoreline from offshore. Therefore it was not feasible to make observations at the heads of West Middle and East Lochs, along much of the main channel, or anywhere on the east side of the harbor from Hospital Point to Rainbow Bay Marina, including the entire shipyard area in Southeast Loch.

For those areas that were accessible, a total of 1215 observations were made in Pearl Harbor, with 876 or 72% of the locations showing Gracilaria salicornia to be present in categories 1 to 3. Figure 14 shows the frequencies in each category for both Gracilaria and Acanthophora. For Gracilaria, the most observations (34%) were in the maximum abundance Category 3, well exceeding the number of observations with no algae (8.3%), and followed by 23.6% for Category 2 and 14.4% in Category 1. Figure 14 shows that category distributions were patchy, with areas of highest abundance often separated by areas of no occurrence along much of West Loch, the Waipiʻo and Waiawa Peninsulas and the west shore of Ford island. Virtually all sections of the harbor where observations could be taken had substantial cover of Gracilaria except along the north and east shores of East Loch and along the east side of the main channel entrance where wave turbulence probably inhibits Gracilaria recruitment and growth.

The distributions and summary of category values for Acanthophora spicifera (Figures 13 and 14) indicates that it is much less wide spread and abundant than Gracilaria in Pearl Harbor. Of the 1215 observations, 972 (80%) had no Acanthophora, and 149 (12.3%) were in Category 2, followed by 78 (6.4%) in Category 2 and only 16 (1.3%) in Category 3. Although the two algae often co-occurred, Acanthophora was frequently found in areas where high water turbidity and muddy sediments excluded Gracilaria, such as an in the most inner reaches of West and Middle Lochs. For example, at collection Station 5A turbidity was so high that visibility was less than 0.25 m, but A. spicifera was among the few organisms growing among mangrove roots at ca. 1.5 m depth, indicating the tolerance to light low and the durability of this hardy introduced species. Since comprehensive surveys for introduced algae were not done in 1996, it is not possible to definitively know how much the extensive coverage of Gracilaria salicornia and Acanthophora spicifera found on the recent surveys occurred at that time. However, it is highly probable that coverage and abundance of these two invasive species has increased greatly in the last decade. Of the 15 stations where observations and collections were made in 1996, only two had
Figure 13. Distribution of Acanthophora spicifera in Pearl Harbor determined from snorkeling surveys, 2007-2008.
Figure 14. Frequencies of occurrence of *Gracilaria salicornia* and *Acanthophora spicifera* in the four abundance categories for the 1215 observations made in Pearl Harbor.

*Gracilaria* and none had *Acanthophora*, and *Gracilaria* was relatively abundant in 1996 only at Station 2 along Waipi'o Peninsula and station 8 near the Pan Am Clipper landing at Waiawa Peninsula.

Invasive algae surveys were also conducted in Ke'ehi Lagoon 2008 using the same technique as used in Pearl Harbor. A total of 768 observations were made on the reef area seaward of the northwest seaplane runway and on the reef outside of the lagoon east of the Honolulu International Airport Reef Runway. The distributions by category for the two algae species is shown in Figures 15 and 16 and the frequencies by category in Figure 17. In contrast to the pattern found for Pearl Harbor, *Acanthophora spicifera* dominated *Gracilaria salicornia* at Ke'ehi Lagoon sites. For *Gracilaria* 443 (57.7%) of the 768 observations had no algae, 207 (26.9%) were Category 1, 104 (13.5%) Category 2 and only 14 (1.8%) were in Category 3. All *Gracilaria* observed were on the inner lagoon reef or on the landward side of the outer reef, with abundance decreasing to zero going seaward. By contrast *Acanthophora* was present at
439 (56%) of the 778 sites and increased in abundance going seaward on the outer reef, where it occurred at all locations. These distributions are clearly related to the propensity of *A. spicifera* to proliferate on high energy reefs subject to wave turbulence, while *G. salicornia* does not recruit or grow well under such conditions.

**D. Reef Corals**

Reef corals occurring at the 14 stations in Pearl Harbor were recorded and photographed as part of the observation and sampling protocol used on the diving surveys in the harbors, similar to the methodology followed on the 1996 Legacy Project surveys (Coles et al. 1997). In addition, searches for corals were made while snorkeling in conjunction with surveys for invasive algae throughout the perimeter of much of
Pearl Harbor. Whenever a live coral was encountered its species was noted, its GPS coordinates were recorded with a Garmin 76 carried by the snorkeler in a waterproof bag, and the coral was usually digitally photographed. GPS points were later downloaded to a computer and mapped using ArcMap 9.1 GIS software.

The species of corals that were found at any of the 14 observation and sampling sites surveyed in both 1996 and in 2007-2008 in Pearl Harbor are listed in Table 5.


<table>
<thead>
<tr>
<th>Coral Species</th>
<th>1</th>
<th>2</th>
<th>7</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pocillopora damicornis</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><em>Pocillopora meandrina</em></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Montipora capitata</em></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Montipora patula</em></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Porites compressa</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Leptastrea purpurea</em></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

By comparison the corals that were observed on the six stations surveys in Honolulu Harbor and Ke’ehi Lagoon in 2008 are compared with corals found at those sites in 1997 in Table 6.

Table 6. Corals observed on Honolulu Harbor and Ke’ehi Lagoon collection sites in both 1996 and 2008.

<table>
<thead>
<tr>
<th>Coral Species</th>
<th>8</th>
<th>11</th>
<th>14</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pocillopora damicornis</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Pocillopora meandrina</em></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><em>Montipora capitata</em></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><em>Montipora patula</em></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><em>Porites compressa</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Porites lobata/lutea</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Pavona varians</em></td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Leptastrea purpurea</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Both harbor areas show similar numbers of coral species and species compositions at most of the same sites during both sampling years. Pearl Harbor Station 1, near the harbor’s entrance had the most species of any site in Pearl Harbor, with three species in 1996 and four in 2008. Station 2, near the entrance to West Loch had the only *Porites compressa* found on the 1996 surveys (Figure 18), as well as many colonies of *Pocillopora damicornis*. The colony of *P. compressa* found at Station 2 in 1996 had grown substantially by 2008 (Figure 19), but the *Pocillopora damicornis* that were abundant at this site in 1996 (Coles 1999) were not found in 2008, apparently having been overgrown and killed by the invasive *Gracilaria salicornia* algae that covers the bottom at this site at depths shallower than where the *P. compressa* colony occurs.
The distribution of corals found at collection sites in 1996 are shown in Figure 20 and in Figure 21 for 2007-8, which also shows the species and locations of corals found on snorkeling surveys in 2007-8. Although it is not possible to rigorously compare the findings between the two sampling periods because the 2007-8 results include snorkeling survey observations, it is clear that reef corals in 2007-8 are far more common and widely distributed than indicated by the 1996 collection survey. The most common and widespread species is _Leptastrea purpurea_, a hardy coral that was especially common in 2008 along the east shores of Waipi’o and Waiawa Peninsulas and the west shore of Ford Island, along the main channel into Middle and East Lochs. However, virtually all of these corals were less than 5-10 cm in diameter (Figure 22). Brock (2007) also reported in 2007 small colonies of _L. purpurea_ in the vicinity of Rainbow Bay Marina and along the west shore of Ford Island, southwest of the present study’s Station 13. The second most common species was _Pocillopora damicornis_, which increased in numbers from Ford Island and Waipi’o Peninsula along the Main Channel toward the harbor entrance and also occurred in West Loch, where relatively large colonies of up to 0.5 m in diameter were found (Figure 23). A small colony of _P. damicornis_ was also found by Brock (2007) on a sheet piling near the HECO discharge on surveys in 2001-2007. _Pocillopora meandrina_ occurred in the present study at only two locations near the harbor entrance, at Station 1 where it was found in 1996 and at one site across the channel closer to the entrance (Figure 24). _Montipora capitata_ (Figure 25) occurred at one location in West Loch and another near Station 7 east of Waipi’o Peninsula, where a single colony of _Montipora patula_ was also found.

The most significant finding from the snorkeling surveys for the present study was the discovery of four relatively large (ca 10-’5 m diameter) _Porites compressa_ reefs (Figures 26-29) located well into West Loch along the west side of the channel. This is the furthest into West Loch that corals have been found, despite conditions that are hardly hospitable to coral survival and growth, i.e. highly turbid water, a bottom otherwise composed of fine silt sediments and abundant growth of invasive algae _Gracilaria salicornia_.

Also, the _Porites compressa_ on these reefs have moderate to abundant growths of the invasive sponge _Mycale grandis_, which has had a negative competitive impact on corals in Kāne’ohe Bay, O’ahu (Coles and Bolick 2007), and another competing sponge tentatively identified as _Hymeniacidon_ sp. Nonetheless, these _Porites_ reefs are apparently surviving these challenging environmental conditions and have apparently been growing for decades, if not centuries, judging from the size of the reefs.

The patterns of coral distribution shown for the six stations resurveyed in Honolulu Harbor and Ke’ehi Lagoon indicate that more species were found there than on the present surveys in Pearl Harbor, and that little change has occurred since the last survey in 1997. Some species, e.g. _Pavona varians_ and _Leptastrea purpurea_, had differences between 1997 and 2008, but these were rare and cryptic and could have been missed during either survey. The finding of _L. purpurea_ at Station 19 marks the first report for reef coral in Ke’ehi Lagoon.
Figure 18. *Porites compressa* coral at Station 2, West Loch Channel at 4 m depth, April 1996.

Figure 19. Same *Porites compressa* colony at Station 2, January 2008.
Figure 22. *Leptastrea purpurea* colony ca. 5 cm diameter near Waipi'o Peninsula June 12, 2008.

Figure 23. *Pocillopora damicornis* colony ca. 0.5 m diameter near West Loch entrance, November 27, 2007.
Figure 24. *Pocillopora meandrina* colony ca 0.5 m diameter near harbor entrance June 12, 2008.

Figure 25. *Montipora capitata* colony in West Loch November 27, 2007.
Figure 26. *Porites* Reef 1 in West Loch November 27, 2007.

Figure 27. *Porites* Reef 2 in West Loch November 27, 2007 with heavy growth of *Mycale grandis* sponge.
Figure 28. *Porites* Reef 3 in West Loch November 27, 2007.

Figure 29. *Porites* Reef 4 in West Loch November 27, 2007 with growth of *Hymeniacidon* sp. sponge (tentative identification).
IV. DISCUSSION

Pearl Harbor is the major U.S. Navy base and shipyard in the Pacific Ocean between the west coast of the United States and the territory of Guam and has been an active port of call for Navy ships for nearly a century. Foreign ships have been coming to Honolulu Harbor for over 200 years since European arrival in Hawaiʻi. Thus there has been ample opportunity for introduced marine species to reach these Hawaiian ports, and this was reflected by the relatively large component of introduced and cryptogenic species that were determined in the two previous studies in the harbors for surveys conducted in 1996 and 1997 (Coles et al. 1997, 1999a, 1999b). These studies each found approximately 100 introduced or cryptogenic species comprising 17-22% of the total biota identified. This is substantially less than the 359 introduced and cryptogenic species that were identified at that time in San Francisco Bay (Cohen and Carlton 1998), but much more than the 46 introduced and cryptogens found in Guam's Apr Harbor (Paulay et al. 2002) or the 26 that were found in Pago Pago Harbor, American Samoa (Coles et al. 2003).

Using less intensive sampling than was done in 1996 and 1997, the present study identified 298 taxa from observations and collections at 14 sites in Pearl Harbor and 195 taxa from six sites in Honolulu Harbor-Keʻehi Lagoon. Numbers of taxa per station generally increased with approach to the harbor mouths, reflecting the influence of open ocean circulation that favors the development of benthic and fish communities that included species found in both harbor and coral reef environments. This pattern was also found in the previous studies of the harbors, in Kāneʻohe Bay, Oʻahu Hawaiʻi (Coles et al 2002) and at Pago Pago Harbor, American Samoa (Coles et al 2003). Of the total taxa identified, 32% were introduced or cryptogenic genera or species in Pearl Harbor and 36% in Honolulu Harbor-Keʻehi Lagoon. Although these introduced or cryptogenic percentages are higher than were determined in the previous studies, they do not reliably indicate that their proportions of the total biota are significantly higher than 10 years ago in either harbor area, since fewer total taxa were identified from observations and collections than in either previous study. The results suggest, however, that introduced and cryptogens occur frequently and are widely distributed among most stations in both harbors, especially since their proportions of the total taxa identified at most stations substantially exceeded the means for the two harbor areas.

The 1996 survey of Pearl Harbor identified 166 taxa not previously reported in the harbor and the 1997 survey of Honolulu Harbor-Keʻehi Lagoon identified 190 that had not been reported in those areas. The present study added 75 taxa for Pearl Harbor and 41 for Honolulu Harbor-Keʻehi Lagoon. These increases are largely due to focus in the present study on sponges (Porifera), hyroids (Hydrozoa) and tunicates (Ascidacea) that were identified by taxonomic experts not available for the earlier studies. Most of the new reports for the present harbor areas were previously known in Hawaiʻi and only 17 genera or species are new reports for the Hawaiian Islands. These have been tentatively designated cryptogenic species, in consultation with taxonomists familiar with their worldwide distributions.

The 1996 survey of Pearl Harbor identified 96 introduced or cryptogenic species (Coles et al 1997) later revised to 95 species (Coles et al 1999a) and 69 were identified in the 1997 survey of Honolulu Harbor-Keʻehi Lagoon (Coles et al 1999b). The present study increases the number not previously reported in
Pearl Harbor by 37 and by 33 in Honolulu Harbor-Ke'ehi Lagoon. The 17 new reports that are designated cryptogenic consist of eight sponges, three hydroids, two polychaete worms, two mollusks and two tunicates. Most of these are organisms with limited planktonic residence times that are likely to have been introduced through anthropogenic means, possibly as hull fouling. However, it is quite possible that they have been present in the harbors for a long time and that they have now been identified because of the additional taxonomic attention that was directed to these groups in the present study. The amount of new attention given to any taxonomic group can significantly influence the numbers of species and new reports for a location and therefore the estimates of cryptogenic taxa based on those new reports.

Most of the total 135 introduced or cryptogenic species found in either Pearl Harbor or Honolulu Harbor-Ke'ehi Lagoon in this study are considered noninvasive and, although widespread in the harbors, do not proliferate to a point that they exclude native species or invade marine environments outside of the quiescent conditions in harbors or enclosed embayments. However, one flowering plant, two red algae, one sponge, one octocoral, one barnacle and one stomatopod found on the study are considered invasive and have altered some nearshore ecosystems with various levels of resource monopolization and competition with native organisms in these harbor areas and elsewhere in Hawai‘i. It should be noted, however, that the consideration of an introduced species as noninvasive can change any time, since it takes at least a decade for a species to show invasive characteristics after it has been introduced. For example, neither Hawai‘i’s most invasive invertebrate Carijoo aff. riisei was considered invasive at the time of the of the last Pearl Harbor study, and it has since become recognized to threaten Hawai‘i’s Clack Coral industry and appears to be continuing to proliferate through the Main Hawaiian Islands (Grigg 2003, 2004).

Of the invasive species found in the present study, the Red Mangrove Rhizophora mangle is the most conspicuous in Pearl Harbor and Ke‘ehi Lagoon, occurring along most interior shorelines that have not been altered or hardened by pier or jetty construction. This species is native to the western Atlantic and Caribbean and was introduced from Florida to southwestern Moloka‘i in 1902 by the American Sugar Company to stabilize mudflats and as a source of honey flora (MacCaughey 1917; Wester, 1981). It was first observed on O‘ahu in 1922 in a Kalihi fishpond as a single plant planted “many years ago” (Wester, 1981) and in flourishing condition at the time of the 1922 observation. It is not known whether it spread naturally from that location near the present study’s Station KL20 to Pearl Harbor, or if it was introduced by further unrecorded plantings, but by 1946 it was established at the heads of all three lochs in Pearl Harbor (Fosberg 1948; Chimner et al. 2006). Unlike most of the world, where mangroves are considered to provide valuable habitat and shoreline protection, in Hawai‘i R. mangle is considered an invasive pest that reduces habitat for endangered aquatic birds and native species, overgrows fish ponds, and substantially alters natural shorelines (Allen, 1998, Chimner et al. 2006). Chimner et al. (2006) found that mangroves were expanding from 1977-2001 at an average rate of 2.3-3.4% year in areas where they occur on O‘ahu, and that approximately 70% (102 hectares) of all mangroves on Oahu in 2001 occurred in Pearl Harbor.

The orange keyhole sponge Mycale grandis was first reported in Hawai‘i (as Mycale armata) at 12 sites in Pearl Harbor in the 1996 survey (.Coles et al. 1997, 1999a). It has since been found in virtually all of Hawai‘i’s harbors (Coles et al. 1999b, 2004) and is a highly invasive competitor with native corals in
Kāne’ohe Bay (Coles and Bolick 2007a, 2007b). In the present study it occurred at 12 of the 14 sites in Pearl Harbor and two sites in Ke’ehi Lagoon. Moreover, it is apparently competing with *Porites compressa* on the reefs reefs that were first discovered in West Loch in the present study (Figures 28-31), similar to Kāne’ohe Bay where this sponge dominates corals on some reefs in the south bay and was determined to be increasing its coverage by up to of 12% per year (Coles and Bolick 2007a, 2007b). The original species name used in Hawai‘i for this sponge of *Mycale armata* is a junior synonym of *Mycale grandis* (Hadju, pers. comm.), which has a natural distribution is from the Great Barrier Reef to the Red Sea, and it probably was introduced here sometime after the 1960s. It’s distinctive morphology and bright color is almost certain assurance that it would have been noted by previous sponge taxonomists working in Hawai‘i, and that it is therefore a recent introduction that is having an invasive impact on native Hawaiian corals tant their habitat.

The snowflake octocoral *Carijoa* aff. *riisei* occurred at four stations in Pearl Harbor in the present study and was reported at eight sites in the 1996 survey of Pearl Harbor. It was not seen at any of the present study’s Honolulu Harbor-Ke’ehi lagoon sites, but it was reported at nine of the 15 sites surveyed in Honolulu Harbor in 1997, including the present study’s Stations HH8 and HH14. The first documented report of *Carijoa* aff. *riisei* was from Pearl Harbor in 1972 as *Telesto riisei* (Evans et al. 1974, Devaney and Eldredge 1977, Coles and Eldredge 2002) and it was later reported from coral reef sites around O‘ahu from Koko Head to Hale‘iwa and in harbors throughout the Hawaiian Islands (Coles et al. 2004). It commonly occurs in caves and under ledges along O‘ahu’s north shore and has been reported by sport divers in offshore areas around most of the main Hawaiian Islands (Kahng 2006). It was originally believed to be the Caribbean species *Carijoa riisei* based on taxonomic characteristics, but recent genomic analysis has shown that it is genetically distinct from Caribbean *Carijoa*, and results suggest that there have been multiple introductions from various Pacific locations (Conception et al. Ms in review). Previous considered by Coles and Eldredge (2002) to be “a relatively benign introduction occupying previously underutilized habitat” in harbors, under ledges and in caves along reef slopes, more recent information indicates *Carijoa* to be the most invasive introduced invertebrate with the most serious ecological and economic impact that occurs in Hawai‘i (Grigg 2003, 2004, Kahng and Grigg 2005). It continues to be reported at new sites on reefs throughout the Hawaiian Islands, but it is at depths of 80-100 m in the channel between Maui and Lana‘i that it is having its greatest impact by overgrowing black coral trees (*Antipatharia* sp.) which provide a source of larval replenishment for black corals that are harvested in shallow depths for jewelry production. Black coral colonies up to 4 m tall in the affected depths are usually completely covered and killed by the *Carijoa* octocoral, which is highly fecund and grows rapidly in reduced light (Kahng et al. 2008). However, in the area of the present study it as yet appears to be a relatively minor component of the total fouling communities that inhabit the harbors.

The Caribbean barnacle *Cthamalus proteus* that was recorded at 11 Pearl Harbor stations and one Honolulu site in the present study was also recorded at 11 Pearl Harbor sites in 1996 and six Honolulu Harbor-Ke’ehi Lagoon sites in 1997. *C proteus* is native to the western Atlantic from the Caribbean to Brazil and is the best documented invertebrate introduction to Hawaiian waters (Southward et al. 1998, Zardus and Hadfield 2005, Zabin et al. 2007). It was first recorded in Kāne‘ohe Bay in 1995 (Hoover 1998) and later in Pearl Harbor in 1996 (Coles et al. 1997, 1999a), and was not present on O‘ahu when a comprehensive barnacle survey was done around the island in 1972-73 (Matsuda 1973). It now occurs in
extremely high densities (e.g. Figure 10f) in many enclosed harbors and embayments throughout the main Hawaiian Islands and has been recorded as far west as Midway (DeFelice et al 1997) at the end of the Northwestern Hawaiian Island and in Guam (Southward 1998). Although apparently it does not compete with or exclude any native Hawaiian species in its high intertidal habitat, it clearly alters the character of this environment where it occurs.

Although the Asian stomatopod Gonodactylaceus falcatus was observed at only one station in this study it is highly cryptic and undoubtedly is more widespread in the harbors, having been reported at five Pearl Harbor sites in 1996 and 14 of 20 sites in Honolulu Harbor-Ke’eki lagoon in 1997. It is also a well documented introduction to Hawai’i, having first been reported by Kinzie (1968) as not having occurred here before 1954 and possibly having come from the Philippines on concrete barges at the end of World War II. It is considered invasive (Coles and Eldredge 2002) based on its exclusion of smaller and less aggressive native stomatopod species from their normal coral rubble habitats. It is abundant and frequently found in Kāne’ohe Bay, where it was found at all 21 stations sampled from coral rubble (Coles et al 2002).

The two most problematic invasive introduced species found in this study were the red algae Acanthophora spicifera and Gracilaria salicornia. A. spicifera occurred at seven Pearl Harbor sites and one Honolulu Harbor site. In 1996 it was found at only two sites in Pearl and was not found in Honolulu Harbor-Ke’eki lagoon in 1997. This species was the first introduced algae reported in Hawai’i, believed by Doty (1961) to have arrived on a barge brought to Pearl Harbor prior to 1950. It is now the most widespread introduced algae in the Hawaiian Islands and abundant from Hawai’i to Kaua’i (Smith et al 2002). It also is probably the most tolerant algal species in Hawai’i to extreme environmental conditions, as witnessed by its survival in the most turbid sections of West Loch in Pearl Harbor where no other macroalgae and few invertebrate species were found in the present study. It appears to be continuing to spread in the tropical Pacific, having recently been first reported at Majuro Atoll in Micronesia (Tsuda et al. 2008). Its distributions as determined by the snorkeling surveys in the present study reflects its wide range of environmental tolerance, since it showed its maximal coverages in both interior and outer areas of Pearl Harbor and Ke’eki Lagoon.

Gracilaria salicornia is the most invasive species encountered in the present study and has shown a dramatic increase in Pearl Harbor since the last major survey in 1996. Its increased occurrence from three collection stations in 1996 to seven in 2007 is verified by the widespread occurrence and high abundance that was determined from snorkeling surveys throughout Pearl Harbor. It occurred for 72% of the over 1200 observations made throughout the harbor and it was in the highest abundance category for 34% of the observations. Often these areas had “tumbleweeds” of Gracilaria up to 0.5 m in diameter that were free to drift along the bottom and further spread the algae, at others locations the algae occurred in dense mats that virtually covered the bottom. This algae was not found in Honolulu Harbor or Ke’eki Lagoon in 1997 but did occur at one Ke’eki Lagoon station in 2008, and snorkeling surveys also showed high coverage in the inner lagoon outside of the seaplane runway and medium abundance along the outer lagoon. Although not generally as abundant as in Pearl Harbor, Gracilaria in Ke’eki Lagoon has still increased enough in the last decade to represent a phase shift in the biotope dominating organism.
This increasing dominance of nearshore environments by *Gracilaria* reflects the pattern that has occurred island wide on O‘ahu in the last three decades since it was introduced to Waikīkī in 1971 and to Kāne‘ohe Bay in 1978. It was found to rapidly increase its range along the south O‘ahu shoreline westward to Ala Moana Park and eastward to Diamond Head and Hawai‘i Kai between 2000 and 2002 (Smith et al. 2004). By 2000 it was found throughout Kāne‘ohe Bay (Rodgers and Cox 1999, Smith et al. 2002) and was found to have a continuous population at the south end of Kualoa Park in North Kāne‘ohe Bay in 2002 (Smith et al. 2004).

Attempts to remove this invasive alga in areas where it has become dominant have met with little success. In 2002 a collaboration that initially involved 62 volunteers began to remove *Gracilaria* from the reef and channels off Waikīkī. Five events between 2002 and April 200 removed over 20,000 kg of the algae (Smith et al. 2004). This effort continued until November 2006, eventually involving a total of >2500 volunteers and removed >120,000 kg (C. Hunter, pers. comm.). Unfortunately, the recovery and growth rate of this alga exceeded this concerted effort and *Gracilaria* still monopolizes the benthos off Waikīkī, with little visible decrease in its abundance. A subsequent effort has focused on using a mechanical device, the “Supersucker”, to remove *Gracilaria* and species of *Kappaphycus* from reefs in Kāne‘ohe Bay (Conklin et al. 2008). This device requires only a small group of trained operators and is efficient in removing large quantities of algae and epiphytic introduced invertebrates, reducing algal cover from 65% to 15% on two test sites, with continued decrease in algal cover following removal at two test sites. However, given the magnitude and extent of the coverage that has been determined along south O‘ahu shores and now in Pearl Harbor, it is unlikely that this removal method could provide a long-range cost-effective solution.

On a more positive note, reef corals have apparently continued settlement and growth that was noted in the 1996 Legacy study (Coles et al. 1997, Coles 1999) and earlier by Brock (1994). The first comprehensive survey of the biota of Pearl Harbor was conducted in the early 1970s and sampled at 10 sites throughout the main channel, East and Middle Lochs and as far into West Loch as Station 2 of the present study. From that study Grovhoug noted in 1971-72 (in Evans et al 1974) that “stony corals were conspicuously absent from all biostations”. About 20 years later Brock (1994) first reported small colonies of *Leptastrea purpurea* corals from the west shore of Ford Island in 1993, and the 1996 Legacy study (Coles et al. 1997, 1999a) found the five coral species at the eight locations shown in Figure 22, which corresponded to the sites of eight of the ten stations surveyed by the Evans (1974) study.

Although similar species occurrences were recorded at the collection stations in the present study as in 1996 (Table 5), the snorkeling surveys showed a wider ranging distribution and greater abundance of corals in the harbor than anticipated (Figure 23). Also, Smith (2002) reported eight coral species to occur at five of the Evans (1974) sites and eleven species from a 2005 survey throughout the perimeter of much of the harbor (Smith et al. 2006). No information is provided on the distribution of these eleven species, and they include five (*Montipora flabellata, Leptoseris incrustans, Pavona varians, Porites lobata, Psammocora explanata*) that were not found on the present snorkeling surveys. Corals appear to be most common along the main channel leading into East and Middle Lochs and around Ford Island. Coral colonization in this area has even been noted recently in the news media, which reported hard coral
growing on the USS Arizona where none had been found during the most recent survey of the memorial ship in 1990 (Kakaesako 2009).

The single *Porites compressa* colony found in West Loch in 1996 has continued to grow and may achieve the size of a small reef if it continues to survive (Figure 21), and four large *Porites* reefs were found for the first time in the present study to occur well into West Loch. Smith et al (2006) also noted the presence of large (>100 cm diameter) *Porites compressa* colonies in West Loch in 2002 that they estimated were more than 50 years old. However, these corals had been overgrown by *Gracilaria salicornia* by the time of their 2005 survey. The location indicated for these *Porites* reefs on their site map in Smith (2006) appears to have been 250-500 m toward the West Loch entrance from the four large *Porites* reefs found on the present study. This suggests that *Porites compressa* reefs in West Loch were more extensive in the past, but those remaining are in jeopardy of being eliminated, either by the orange keyhole sponge *Mycale grandis*, or more likely by the continued proliferation of *Gracilaria salicornia*.

Overall the historical trends suggest that, despite previous reports to the contrary, that reef corals were present in Pearl Harbor prior to 1970. Their abundance and distribution range appear to have been increasing in the last 30 years due to increased water quality, but they face a continued threat from competition from introduced invasive species. Brock (2007) also noted a decline in coverage of the *Leptastrea purpurea* occurring along the west shore of Ford Island in 2001-2007 after due to competition from *Gracilaria*. Similarly, the group of *Pocillopora damicornis* colonies growing in shallower water in 1996 near the *P. compressa* shown in Figure 21 were not found in 2007, apparently having been overgrown by the *Gracilaria* mat that covers the bottom at that site.

In summary, the present study indicates that introduced species are still a major component of the total biota of Pearl Harbor, similar to or greater than was determined in the 1996 Legacy Study. Most of the species found were previously reported in the harbor either by the 1996 or by previous surveys. The relatively few newly found species designated cryptogenic may represent actual new introductions or be an artifact of greater focus on these taxonomic groups in the present study. A similar pattern was found for the stations surveyed in Honolulu Harbor-Ke‘ehi Lagoon, supporting the latter conclusion. However the disturbing proliferation and increasing dominance of the introduced algae *Gracilaria salicornia* and *Acanthphora spicifera* in Pearl Harbor and Ke‘ehi Lagoon is an unfortunate finding that reflects the steady spread of these invasive species around O‘ahu and ultimately, probably throughout the Main Hawaiian Islands. This is particularly unfortunate to be occurring in Pearl Harbor, where an apparent colonization of corals and incipient development of conditions that might support the development or restoral of coral reefs may be prevented by the domination of shallow depth by these highly invasive algae.
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Star Bulletin Feb, 17, 2009
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ACKNOWLEDGEMENTS

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Taxonomic expertise for identifying organisms was provided by the following individuals, and their efforts and contributions to this project are gratefully acknowledged.

Sponges: Professor Barbara Calcinaï and Ms. Manuela Gaspardo, Polytechnic University of Marche, Ancona Italy.

Hydroids: Dr. Dale Calder, Royal Ontario Museum.

Tanaids, Isopods and Amphipods: Professor Les Watling, University of Hawai‘i.

Ostracodes: Dr. Louis Kornicker, U.S. National Museum of Natural History

Molluscs: Ms. Regie Kawamoto, Bishop Museum.

Polychaetes: Ms. Holly Bolick, Bishop Museum and Professor Julie Bailey-Brock, University of Hawai‘i.

Ascidians: Dr. Gretchen Lambert, California State University at Fullerton
APPENDIX A

Station Records for Organisms Collected or Observed in Pearl Harbor in 2007-2008
(Origin: I=Introduced, C=Cryptogenic, Blank Native)
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Total Polychaetes: 50 11 15 7 9 13 9 11 16 12 9 10 19 7 16

MOLLUSCA     Anomia nobilis       | Reeve, 1859 | I | x |     | x  | x  |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Aplysidae und. sp.  |             |   |   |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Atys debilis        | Pease, 1860 |   |   |     |     |     |   |   |   | x |   |   |   |   |   |   |   |
MOLLUSCA     Bakis spp.          |             |   |   |     |     |     |   |   |   | x |   |   |   |   |   |   |   |   |
MOLLUSCA     Cerithium zebraun   | Kiener, 1841 | 2 |   |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Chama cf. fibula    | Reeve, 1846 | C | x |     |     |     |   |   |   |   | x |   |   |   |   |   |   |
MOLLUSCA     Chama fibula        | Reeve, 1846 | C |   |     |     |     |   | x |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Chama iostoma       | Conrad, 1837 |   | x | x | x |   |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Chama sp.           |             | x |   | x  |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Conus eugrammatus   | Bartsch and Rehder, 1943 |   |   | x  |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Crassostrea sp.     |             | I | x |     | x  |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Crassostrea virginalis | (Gmelin, 1791) | I | x |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Crepidula aculeata  | (Gmelin, 1791) | I |   |     | x  | x  | x  | x  | x  | x  |   |   |   |   |   |   |   |
MOLLUSCA     Crucibula spinosum  | (Sowerby, 1824) | I |   |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Ctena bella         | (Conrad, 1837) |   | x  |   |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Cuspidaria hawaiensis | Dall, Bartsch, and Rehder, 1938 |   |   | x  | x  | x  | x  | x  | x  |   |   |   |   |   |   |   |
MOLLUSCA     Cuspidaria sp.      |             |   |   | x  |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Cymbialium sp.      |             |   |   | x  |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Cypraea sp.         |             |   |   | x  |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Dendostrea sandivicensis | (Sowerby, 1871) |   |   | x  | x  | x  | x  | x  | x  |   |   |   |   |   |   |   |
MOLLUSCA     Diodora ?ruppellii  | (Sowerby, 1834) | I | x |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Diodora octogona    | (Reeve, 1860) | x |   |     |     |     |   |   |   |   |   |   |   |   |   |   |   |
MOLLUSCA     Diodora sp.         |             | x |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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APPENDIX B

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APPENDIX D

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<td>Native</td>
<td>x</td>
<td>x</td>
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<td>Chlorophyta</td>
<td>Dictyota sp.</td>
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<tr>
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<td>Neomeris sp.</td>
<td></td>
<td>Native</td>
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<tr>
<td>Chlorophyta</td>
<td>Padina sp.</td>
<td></td>
<td>Native</td>
<td>x</td>
<td></td>
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<td>Chlorophyta</td>
<td>Ulva lactuca</td>
<td>Linn.</td>
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<td></td>
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<td>Rhodophyta</td>
<td>Amanstia glomerata</td>
<td>C.Agardh</td>
<td>Native</td>
<td></td>
<td></td>
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<td></td>
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<td>Gracilaria salicornia</td>
<td>(C. Agardh) Dawson</td>
<td>Introduced</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Linnaeus, 1758</td>
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<td>PORIFERA</td>
<td>?Haliclona (Soestella) coerulea</td>
<td>Hechtel, 1965</td>
<td>Introduced</td>
<td>x</td>
<td></td>
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<td>?Stylinos sp.</td>
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<td></td>
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<td>?Tedania sp.</td>
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<td>Biernna fistulosa</td>
<td>(Topsent, 1897)</td>
<td>Cryptogetic</td>
<td>x</td>
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<td>Chelonaplysilla violacea</td>
<td>(Lendenfeld, 1883)</td>
<td>Native</td>
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<td>Dysidea arenaria</td>
<td>(Schmidt, 1862)</td>
<td>Introduced</td>
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<td></td>
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<td>Hechtel, 1965</td>
<td>Introduced</td>
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<td>Ridley, 1884</td>
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<td>Iotrochota purpurea</td>
<td>(Bowerbank, 1875)</td>
<td>Cryptogetic</td>
<td>x</td>
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<td>Iotrochota sp.</td>
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<td>de Laubenfels, 1935</td>
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<td>Gray, 1867</td>
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<td>Mycale (Zygomycraceae) parishi</td>
<td>(Bowerbank, 1875)</td>
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<td>x</td>
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<td>Raspailia (Clathriodendron) darwinensis</td>
<td>Hooper, 1991</td>
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<td>(Duchassaing &amp; Michelotti, 1864)</td>
<td>Introduced</td>
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<td>(Duchassaing &amp; Michelotti, 1864)</td>
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<td>(M. Sars, 1850)</td>
<td>Cryptogetic</td>
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<td>Cyphastrea ocellina</td>
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<td></td>
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<td></td>
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<td>(Pictet, 1893)</td>
<td>Cryptogetic</td>
<td>x</td>
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<td>(Goldfuss, 1820)</td>
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<td>(Linnaeus, 1758)</td>
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<td></td>
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<td>x</td>
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<td>Branchiomma nigromaculata</td>
<td>(Baird, 1865)</td>
<td>Cryptogenic</td>
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<td>Eunicia antennata</td>
<td>(Savigny, 1820)</td>
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<td>Loimia medusa</td>
<td>(Savigny, 1818)</td>
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<td>Schmarda, 1861</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td></td>
<td></td>
<td>x</td>
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<td>Holly, 1935</td>
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<td>Pomatoleios kraussii</td>
<td>Baird, 1865</td>
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APPENDIX E

Introduced or Cryptogenic Species Collected in Honolulu Harbor or Ke'ehi Lagoon in 2007-2008
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Total Taxa: 195
Cryptogenic: 21
Introduced: 47
Intr+Crypto: 68

% NIS: 34.9% 32.1% 40.4% 18.2% 54.9% 50.0% 58.8%
APPENDIX F

Genera and Species not Previously Reported in Honolulu Harbor or Ke'ehi Lagoon
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<td>Echidna nebulosa</td>
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<td>13.7%</td>
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APPENDIX G

Listing of Marine or Estuarine Organisms Collected or Observed in Pearl Harbor
from all Available Sources, Including Present Study
Legacy Project - Species Report

KINGDOM: MONERA

Phylum: CYANOPHYCOTA
Class: CYANOPHYCEAE
Order: NOSTOCALES
Family: OSCILLATORIAEACE
Genus: Lyngbya
Lyngbya sp.
1996 Legacy Project (Coles et al., 1997)
Lyngbya majuscula (Dillwyn) Harv. Ex Gomont
2007 Ref - Brock, 2007
Genus: Phormidium
Phormidium crosbyanum
1982 Spec - BPBM-AL 523155 E shore of entrance; reef at Fort Kamehameha.

KINGDOM: PROTISTA

Phylum: CHRYSONHYTA
Class: CHRYSONPHYCEAE
Genus: Chrysonephos
Chrysonephos lewisi (Taylor, 1951)
1972 Ref - Long, 1974
Phylum: BACILLARIOPHYTA
Class: BACILLARIOPHYCEAE
Order: CENTRALES
Family: CHAETOCERACEAE
Genus: Chaetoceros
Chaetoceros sp.
1978 Ref - Grovhoug, 1979
Family: COSCINODISCACEAE
Genus: Coscinodiscus
Coscinodiscus sp.
1973 Ref - Evans et al., 1974
Family: MELOSIRACEAE
Genus: Melosira
Melosira sp.
1978 Ref - Grovhoug, 1979
Family: THALASSIOSIRACEAE
Genus: Skeletonema
Skeletonema sp.
1978 Ref - Grovhoug, 1979
Order: PENNALES
Unidentified Pennales
1978 Ref - Grovhoug, 1979
Family: DIATOMACEAE
Genus: Thalassionema
Thalassionema sp.
1978 Ref - Grovhoug, 1979
Legacy Project - Species Report (Cont.)

Family: NAVICULACEAE
Genus: Navicula
Navicula sp.
1978 Ref - Grovhoug, 1979

Family: NITZSCHIACEAE
Genus: Nitzschia
Nitzschia sp.
1978 Ref - Grovhoug, 1979

Phylum: CHLOROPHYCOTA
Family: Derbesiaceae
Genus: Derbesia
Derbesia tenuissima
2007 Ref - Brock, 2007 (Moris & De Notaris) Crouan & Crouan
Recorded as Derbesia tenuissima.

Class: CHLOROPHYCEAE
Order: ULOTRICHALES
Family: ULVACEAE
Genus: Enteromorpha
Enteromorpha intestinalis ((Linnaeus) Link, 1820)
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: Ulva
Ulva sp.
1943 Ref - Hutchins, 1949

Ulva fasciata Delile, 1813
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Ulva lactuca Linnaeus, 1753 Indigenous. Hawaiian name(s): kohu/ lipehe.
1973 Ref - Evans et al., 1974

Ulva reticulata Forsskål, 1775
1973 Ref - Evans et al., 1974
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: CLADOPHORALES
Family: CLADOPHORACEAE
Genus: Chaetomorpha
Chaetomorpha indica Kützing
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: Cladophora
Cladophora sp. Indigenous.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)
2007 This Project

Cladophora fascicularis (Mertens)
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: CAULERPALES
Family: CAULERPACEAE
Genus: Caulerpa
Caulerpa racemosa (Forsskal) J. Agardh, 1872
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Caulerpa sertularioides (Gmelin) Howe, 1905
Unknown Spec - BPBM-AL 515478 Middle Loch.
1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

1996  Legacy Project (Coles et al., 1997)

*Caulerpa verticillata*  J. Agardh, 1847

   1973  Ref - Evans et al., 1974

**Family: CODIACEAE**

**Genus: Chlorodesmis**

*C. caespitosa*  J. Agardh

   1996  Legacy Project (Coles et al., 1997)

**Genus: Codium**

*C. arabicum*  Kützing, 1856

   1979  Ref - AECOS, 1979  Off Pearl Harbor.

*C. dichotomum*  (Hudson, 1762)


*C. edule*  Silva, 1952

   1993  Ref - Brock, 1994
   1994  Ref - Brock, 1995

*C. reedieae*  Silva, in Egerod, 1952

   1979  Ref - AECOS, 1979  Off Pearl Harbor.

**Genus: Halimeda**

*H. discoidea*  Decaisne, 1842

   1979  Ref - AECOS, 1979  Off Pearl Harbor.

**Order: Siphonocladales**

**Family: Siphonocladales**

**Genus: Cladophoropsis**

*Cladophoropsis luxurians*  Gilbert, 1962

   1979  Ref - AECOS, 1979  Off Pearl Harbor.

**Family: Valoniacae**

**Genus: Boodleia**

*Boodleia composeda*  ((Harvey & Hooker) Brand, 1905)

   Unknown  Spec - BPBM-AL 92645
   1996  Legacy Project (Coles et al., 1997)

*Boodleia hiloenae*  (Pilsbury & Vanatta, 1908)

   1973  Ref - Evans et al., 1974

**Genus: Dictyosphaeria**

*Dictyosphaeria versluaeii*  Weber-van Bosse, 1905  Indigenous

   1996  Legacy Project (Coles et al., 1997)

**Phylum: Pyrophytaphyta**

**Class: Dinophyceae**

**Order: Prorocentrales**

**Family: Prorocentraceae**

**Genus: Prorocentrum**

*Prorocentrum gracile*  Schott

   1973  Ref - Evans et al., 1974

**Order: Dinophysiales**

**Family: Dinophysialae**

**Genus: Dinophysis**

*Dinophysis sp.?*  Ref - Grovhoug, 1979

*Dinophysis caudatum*  (Kent)

   1973  Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Order: PERIDINIALES
Family: CERATIACEAE
Genus: Ceratium
Ceratium ferka (Ehrenberg)
1973 Ref - Evans et al., 1974

Family: GONYAULACEAE
Genus: Gonyaulax
Gonyaulax minutum Michener
1973 Ref - Evans et al., 1974

Family: GYMNOPODIACEAE
Genus: Cochlodinium
Cochlodinium catenatum Okamura
1973 Ref - Evans et al., 1974

Family: NOCTILUCACEAE
Genus: Noctiluca
Noctiluca minuta (McCarty & Kofoed)
1973 Ref - Evans et al., 1974

Family: PERIDINIALES
Genus: Peridinium
Peridinium crassipes (Kofoed)
1973 Ref - Evans et al., 1974

Family: POLYKRIKACEAE
Genus: Polykrikos
Polykrikos schwartzi (Butschli)
1973 Ref - Evans et al., 1974

Phylum: PHAEOPHYCOPHYTA
Class: PHAEOPHYCEAE
Order: ECTOCARPALES
Family: RALFSIACEAE
Genus: Ralfsia
Ralfsia occidentalis Hollenberg
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: DICHTYOTALES
Family: DICHTYOTACEAE
Genus: Dictyota
Dictyota sp. Indigenous.
2007 This Project

Dictyota sp.? Indigenous.
1978 Ref - Grovhoug, 1979 Recorded as Dictyocha.

Dictyota acutiloba J. Agardh, 1848
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Dictyota bartayresii Lamouroux
2007 Ref - Brock, 2007

Dictyota divaricata Lamouroux, 1809
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: Lobophora
Lobophora variegata (Lamouroux) Indigenous.
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)
2008 This Project
Legacy Project - Species Report (Cont.)

Genus: *Padina*  
*Padina sp.*  Indigenous.  
2008  This Project

*Padina japonica*  Boergesen  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

*Padina pavonica*  (Linnaeus, 1758)  

Order: FUCALES  
Family: SARGASSACEAE  
Genus: *Sargassum*  
*Sargassum echinocarpum*  J. Agardh  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

*Sargassum obtusifolium*  J. Agardh  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

*Sargassum polyphyllum*  J. Agardh  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

Order: SCYTOSIPHONALES  
Family: SCYTOSIPHONACEAE  
Genus: *Colpomenia*  
*Colpomenia sinuosa*  (Roth)  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

Genus: *Hydroclathrus*  
*Hydroclathrus clathratus*  (C. Agardh)  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

Phylum: RHODOPHYCOTA  
Family: GELIDIACEAE  
Genus: *Gelidium*  
*Gelidium sp.*  Legacy Project (Coles et al., 1997)  
1996

*Gelidium arenaria*  Kylin  
1996  Legacy Project (Coles et al., 1997)

*Gelidium pusillum*  (Stackhouse) Lejolis, 1863  
1996  Legacy Project (Coles et al., 1997)

Family: PEYSONNIELIACEAE  
Genus: *Peyssonnelia*  
*Peyssonnelia sp.*  Legacy Project (Coles et al., 1997)  
1996

Class: RHODOPHYCEAE  
Order: NEMALIALES  
Family: BONNEMAISONIACEAE  
Genus: *Asparagopsis*  
*Asparagopsis taxiformis*  (Delile)  
1979  Ref - AECOS, 1979  Off Pearl Harbor.

Family: GELIDIELLACEAE  
Genus: *Gelidiella*  
*Gelidiella sp.*  Indigenous.  
1982  Spec - BPBM-AL 585470  E shore of entrance; reef at Fort Kamehameha.  
2007  This Project

*Gelidiella sp. 1*  
1996  Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

*Gelidiella* sp. 2  
1996 Legacy Project (Coles et al., 1997)

*Gelidiella myrocladia*  
(Borgesen) Feldmann & Hamel, 1934  
1996 Legacy Project (Coles et al., 1997)

Order: GIGARTINALES
Family: GRACILARIACEAE
Genus: *Gracilaria*
*Gracilaria bursapastoris* (Gmelin)  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

*Gracilaria coronopifolia* J. Agardh, 1852  
1978 Spec - BPBM-AL 561794 Reef flat between W end of the Reef Runway & entrance to Pearl Harbor;  
1978 Spec - BPBM-AL 561795 opposite the National Guard hanger area.

*Gracilaria lichenoides* Linnaeus  
1979 Ref - AECOS, 1979 opposite the National Guard hanger area. Off Pearl Harbor.

*Gracilaria parvispora* Abbott, 1985  
1978 Spec - BPBM-AL 562094 Reef flat between W end of the Reef Runway & entrance to Pearl Harbor;  

*Gracilaria salicornia* (Agardh) Dawson  
Introduced. Common name(s): Gorilla Ogo.  
1996 Legacy Project (Coles et al., 1997)  
2006 Ref - Smith et al., 2006  
2007 Ref - Brock, 2007  
2007 This Project  
2008 This Project

Family: HYPNEACEAE
Genus: *Hypnea*
*Hypnea cervicornis* J. Agardh  
1973 Ref - Evans et al., 1974  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

*Hypnea spinella* (C. Agardh) Kutzling, 1849  
1996 Legacy Project (Coles et al., 1997)

*Hypnea valentiae* (Turner) Montagne, 1841  
1996 Legacy Project (Coles et al., 1997)

Family: PLOCAMIACEAE
Genus: *Plocamium*
*Plocamium sandvicense* J. Agardh  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: CRYPTONEMIALES
Family: CORALLINACEAE
Genus: *Amphiroa*
*Amphiroa fragilissima* (Linnaeus)  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Corallina*
*Corallina sp.*  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Jania*
*Jania sp.*  
1979 Ref - AECOS, 1979 Off Pearl Harbor.
Legacy Project - Species Report (Cont.)

Genus: *Lithothamnium*
*Lithothamnium byssoides*
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Porolithon*
*Porolithon onkodes* (Heydrich) Foslie, 1909
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)

Family: CRYPTONEMIACEAE
Genus: *Halymenia*
*Halymenia formosa* Harvey
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Family: RHIZOPHYLLIDACEAE
Genus: *Chondrococcus*
*Chondrococcus homemanni* (Harvey)
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: RHODYMENIALES
Family: CHAMPIACEAE
Genus: *Champia*
*Champia parvula* (C. Agardh)
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)

Family: RHODYMENIACEAE
Genus: *Coelothrix*
*Coelothrix irregularis* (Harv.) Børjesen
2007 Ref - Brock, 2007

*Coelothrix irregularis* (Harvey)
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Order: CERAMIALES
Family: CERAMIACEAE
Genus: *Aglaothamnion*
*Aglaothamnion sp. 1*
1996 Legacy Project (Coles et al., 1997)

*Aglaothamnion sp. 2*
1996 Legacy Project (Coles et al., 1997)

Genus: *Anotricium*
*Anotricium sp.*
1996 Legacy Project (Coles et al., 1997)

*Anotricium secundum* Caormaci, Funari & Pizzuto
1996 Legacy Project (Coles et al., 1997)

Genus: *Centroceras*
*Centroceras clavulatum* (C. Agardh)
1973 Ref - Evans et al., 1974
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)

Genus: *Centrocerus*
*Centrocerus sp.*
1996 Legacy Project (Coles et al., 1997)

Genus: *Ceramium*
*Ceramium sp.*
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

*Cerium* sp. 1
1996 Legacy Project (Coles et al., 1997)

*Cerium* sp. 2
1996 Legacy Project (Coles et al., 1997)

*Cerium clarionense* Setchell and Gardner, 1930
1996 Legacy Project (Coles et al., 1997)

Genus: *Griffithsia*

*Griffithsia* sp.
1973 Ref - Evans et al., 1974 Recorded as Griffithsia.

*Griffithsia heteromorpha* Kützing, 1863
1996 Legacy Project (Coles et al., 1997)

Genus: *Spyridia*

*Spyridia* sp. Indigenous.
2007 This Project

*Spyridia filamentosa* (Wulfen)
1973 Ref - Evans et al., 1974
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Tolypiocladia*

*Tolypiocladia* sp.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)

*Tolypiocladia glomerulata* (C. Agardh) Schmitz, 1897
1996 Legacy Project (Coles et al., 1997)

Family: RHODOMELACEAE

Genus: *Acanthophora*

*Acanthophora spicifera* (Vahl, 1802) Introduced. Common name(s): Spiny Seaweed; Hawaiian name(s): 'o'opu-
hue.

1961 Ref - Doty, 1961
1973 Ref - Evans et al., 1974
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 Ref - Brock, 2007
2007 This Project
2008 This Project

Genus: *Laurencia*

*Laurencia brachyclados* Pilger 1996 Legacy Project (Coles et al., 1997)

*Laurencia nidifica* J. Agardh
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Polysiphonia*

*Polysiphonia* sp.
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)

*Polysiphonia mollis* J. Hooker & Harvey in Harvey, 1847
Unknown Spec - BPBM-AL 189658
Legacy Project - Species Report (Cont.)

Unknown Spec - BPBM-AL 189659 West Loch.

**Polysiphonia scopulorum** (Harvey) Hollenberg, 1968
1996 Legacy Project (Coles et al., 1997)

**Polysiphonia subtilissima** Montagne
1973 Ref - Evans et al., 1974

Phylum: PROTOZOA
Class: GRANULORETICULOSEA
Order: FORAMINIFERIDA

Unidentified Foraminiferida
1978 Ref - Grovhoug, 1979
1982 Spec - BPBM-A 174
2008 This Project

Pearl Harbor dredge spoil dumping site.

Family: AMPHISTEGINIDAE
Genus: Amphistegina

Amphistegina lessonii d'Orbigny, 1826

**Amphistegina lobifera** Larsen, 1976

Class: CILIATEA
Family: FOLLICULINIDAE
Genus: Parafofolliculina

**Parafofolliculina violacea** Giard, 1888
1975 Ref - Grovhoug, 1976

KINGDOM: PLANTAE

Phylum: BRYOPHYTA
Class: HEPATICOPSIDA
Order: JUNGERMANNIALES
Family: MASTIGOPHORACEAE
Genus: Mastigophora

*Mastigophora* sp.

Phylum: MAGNOLIOPHYTA
Class: MAGNOLIOPSIDA
Order: ROSALES
Family: LEGUMINOSAE
Genus: Lathyrus

*Lathyrus* sp.
1933 Spec - BPBM-MO 205313 Ford Island. Catalogue XIV.

Order: CORNALES
Family: RHIZOPHORACEAE
Genus: Rhizophora

**Rhizophora mangle** Linnaeus Introduced. Common name(s): Red Mangrove.
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007
2007 This Project
2008 This Project
Legacy Project - Species Report (Cont.)

KINGDOM: ANIMALIA

Phylum: PORIFERA

Unidentified Porifera

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<td>Ref - AECOS, 1979</td>
<td>orange.</td>
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<tr>
<td>1979</td>
<td>Ref - AECOS, 1979</td>
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<td>1982</td>
<td>Spec - BPBM-C 437</td>
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Family: CRAMBEIDAE

Genus: Monanchora


2008 This Project

Family: DESMACIDIDAE

Genus: Iotrochota

Iotrochota sp. Indigenous. Common name(s): Black Staining Sponge.

2007 This Project

2008 This Project

Iotrochota purpurea (Bowerbank, 1875) New record for Hawaii. Cryptogenic.

2008 This Project

Family: PETROSIIDAE

Genus: Petrosia

Petrosia sp. Indigenous.

2008 This Project

Family: PHORIOSPONGIIDAE

Genus: Strongylacidon


2008 This Project

Class: CALCAREA

Order: LEUCETTIDA

Family: LEUCASCIDAE

Genus: Leucetta

Leucetta solida de Laubenfels, 1950 Indigenous.

2008 This Project

Order: LEUCOSENSILEIDAE

Family: LEUCOSENSILEIDAE

Genus: Leucotida

Leucotida n. sp. Known only from Hawaii.

1996 Legacy Project (Coles et al., 1997)

Order: SYCETTIDA

Family: HETEROPIIDAE

Genus: Heteropia

Heteropia glomerosa (Bowerbank, 1873) Cryptogenic.

1996 Legacy Project (Coles et al., 1997)

Family: SYCETTIDA

Genus: Sycon

Sycon sp. Off Pearl Harbor.

1972 Ref - Long, 1974
## Legacy Project - Species Report (Cont.)

**Class:** DEMOSPONGIAE  
**Order:** DICTYOCERATIDA  
**Family:** SPONGIIDAE

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<td>Hyatella</td>
<td>Hyatella intestinalis Lamarck, 1814</td>
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<td>Spongia oceania de Laubenfels, 1950</td>
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**Order:** DENDROCERATIDA  
**Family:** APLYSELLIDAE

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<th>Reference(s)</th>
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<td>Aplysilla</td>
<td>Aplysilla cf. rosea Barrois, 1876</td>
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<td>1996</td>
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<td>Chelonaplysilla violacea</td>
<td>Lendenfeld, 1883 Indigenous.</td>
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<td>2007</td>
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**Family:** DICTYODERILLIDAE

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<td>Legacy Project</td>
<td>1996</td>
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<td>Dendrilla</td>
<td>Dendrilla cactus (Selenka, 1867)</td>
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<td>(Schmidt, 1862)</td>
<td>1993</td>
<td>Introduce. Common name(s): Acquistaive Sponge.</td>
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Legacy Project - Species Report (Cont.)

Genus: *Euryspongia*

*Euryspongia lobata*

- 1993: Ref - Brock, 1994
- 1994: Ref - Brock, 1995

Order: HAPLOSCLERIDA
Family: CALLYSPONGIIDAE

Genus: *Callyspongia*

*Callyspongia diffusa* (Ridley, 1884)

- 1993: Ref - Brock, 1994
- 1994: Ref - Brock, 1995
- 1996: Legacy Project (Coles et al., 1997)

Family: CHALINIDAE

Genus: *Cladocroce*

*Cladocroce burapha* Putchakarn, de Weerdt, Sonchaeng & van Soest, 2004  New record for Hawaii.

Cryptogenic.

- 2007: This Project
- 2008: This Project

Genus: *Toxiclona*

*Toxiclona n. sp.* Known only from Hawaii.

- 1996: Legacy Project (Coles et al., 1997)

Family: HALICLONIDAE

Genus: *Gellius*

*Gellius n. sp.*

- 1996: Legacy Project (Coles et al., 1997)

Genus: *Haliclona*

*Haliclona sp.* Indigenous.

- 2007: This Project

*Haliclona (Reniera) sp. 1* Indigenous.

- 2008: This Project

*Haliclona (Reniera) sp. 2* Indigenous.

- 2008: This Project

*Haliclona (Soestella) caerulea* (Hechtel, 1965) Introduced.

- 1996: Legacy Project (Coles et al., 1997)
- 2007: This Project
- 2008: This Project

*Haliclona aquaeducta* Schmidt, 1862

- 2007: Ref - Brock, 2007

Family: NIPHATIDAE

Genus: *Gelliodes*

*Gelliodes sp.* Indigenous.

- 2008: This Project

*Gelliodes fibrosa* (Wilson) Introduced.

- 1996: Legacy Project (Coles et al., 1997)
- 2008: This Project

Order: POECILOSCLERIDA

Family: ADOCIIIDAE

Unidentified Adociiidae n. gen. n. sp.

- 1996: Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Genus: *Pellina*
*Pellina eusiphonia* Ridley, 1884
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Genus: *Toxodocia*
*Toxodocia violacea* de Laubenfels, 1950
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Family: AMPHILECTIDAE
Genus: *Biemna*
*Biemna fistulosa* Topsent, 1897 Cryptogenic. Common name(s): Tubular Biemna.
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

Family: Coelosphaeridae
Genus: *Lissodendoryx*
*Lissodendoryx (Lissodendoryx) similis* New record for Hawaii. Cryptogenic.
2008 This Project

Family: Hymedesmiidae
Genus: *Hamigera*
2007 This Project

Family: MICROCIONIDAE
Genus: *Clathria*
*Clathria sp.* Indigenous. Common name(s): Vermilion Clathria.
2008 This Project

*Clathria (Microciona) n. sp.* Known only from Hawaii.
1996 Legacy Project (Coles et al., 1997)

*Clathria (Microciona) maunaloa* de Laubenfels, 1951
1993 Ref - Brock, 1994 Recorded as Microciona maunaloa.
1994 Ref - Brock, 1995 Recorded as Microciona maunaloa.
2007 Ref - Brock, 2007 Recorded as Microciona maunaloa.

Family: MYCALIDAE
Genus: *Mycate*
*Mycate sp.* Cryptogenic.
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975

*Mycate (Carmia) cecilia* (de Laubenfels, 1936) Introduced.
1973 Ref - Evans et al., 1974 Recorded as Mycate sp.
1973 Ref - McCain, 1974 Recorded as Mycate cecilia.
1973 Ref - McCain, 1975 Recorded as Mycate cecilia.
1993 Ref - Brock, 1994 Recorded as Mycate cecilia.
1994 Ref - Brock, 1995 Recorded as Mycate cecilia.
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007 Recorded as Mycate cecilia.
2008 This Project

*Mycate (Carmia) contarenae* sensu de Laubenfels, 1951
1996 Legacy Project (Coles et al., 1997)

*Mycate (Carmia) maunakea* de Laubenfels, 1936 Known only from Hawaii.
1996 Legacy Project (Coles et al., 1997)

*Mycate (Mycate) grandis* Gray, 1867 Introduced. Common name(s): Orange Keyhole Sponge.
1996 Legacy Project (Coles et al., 1997) Recorded as Mycate armata
2007 Ref - Brock, 2007 Recorded as Mycate armata.
<table>
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<th>Year</th>
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</table>

**Mycace (Zygomycale) parishii**

- **Bowerbank, 1875**
- **Introduced.**
- 1947 Ref - de Laubenfels, 1950 Recorded as *Zygomycale parishii*.
- 1973 Ref - McCain, 1974 Recorded as *Zygomycale parishii*.
- 1973 Ref - McCain, 1975 Recorded as *Zygomycale parishii*.
- 1993 Ref - Brock, 1994 Recorded as *Zygomycale parishii*.
- 1994 Ref - Brock, 1995 Recorded as *Zygomycale parishii*.
- 1996 Legacy Project (Coles et al., 1997) Recorded as *Zygomycale parishii*.
- 2007 Ref - Brock, 2007 Recorded as *Zygomycale parishii*.
- 2008 This Project |

**Mycace phyllophia**

- **Hentschel, 1911**
- **New record for Hawaii.**
- **Cryptogenic.**
- 2008 This Project |

**Genus: Styloids**

**Styloids sp.**

- **Indigenous.**
- **Common name(s):** Orange Styloids.
- 2008 This Project |

**Family: MYXILLIDAE**

**Genus: Tedania**

**Tedania (Tedania) ignis**

- **(Duchassaing & Michelotti, 1864)**
- **Cryptogenic.**
- **Common name(s):** Fire Sponge.

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<th>Year</th>
<th>Event/Reference</th>
<th>Notes</th>
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| 1973 | Ref - McCain, 1974 | Recorded as *Tedania ignis*.
| 1973 | Ref - McCain, 1975 | Recorded as *Tedania ignis*.
| 1993 | Ref - Brock, 1994 | Recorded as *Tedania ignis*.
| 1994 | Ref - Brock, 1995 | Recorded as *Tedania ignis*.
| 2007 | Ref - Brock, 2007 | Recorded as *Tedania ignis*.
| 2007 | This Project |       |
| 2008 | This Project |       |

**Tedania macroactyla**

- **(Lamarck, 1814)**
- **Cryptogenic.**

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<tr>
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**Tedania reticulata**

- **Thiele, 1903**
- 1996 Legacy Project (Coles et al., 1997) |

**Family: PHORBASIDAE**

**Genus: Damiriana**

**Damiriana hawaiiiana**

- **de Laubenfels, 1951**

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<th>Year</th>
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<td>1994</td>
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**Family: RASPAILIIDAE**

**Genus: Echinodictyum**

**Echinodictyum asperum**

- **Ridley and Dendy, 1886**
- **Cryptogenic.**
- 1996 Legacy Project (Coles et al., 1997) |

**Genus: Phycopsis**

**Phycopsis aculeata**

- **(Wilson)**

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<tr>
<th>Year</th>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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**Genus: Raspailia**

**Raspailia (Clathriodendron) darwinesis**

- **Hooper, 1991**
- **New record for Hawaii.**
- **Indigenous.**

- 2008 This Project |
Legacy Project - Species Report (Cont.)

Order: HALICHDNDRIDA
Family: HALICHDNDRIDAE

Genus: Amorphinopsis
Amorphinopsis n. sp. Known only from Hawaii.
1996 Legacy Project (Coles et al., 1997)

Genus: Cｉｃａｌｙｐｔａ
Cｉｃａｌｙｐｔａ sp. Cryptogenic.
2008 This Project

Cｉｃａｌｙｐｔａ sp. 1 Indigenous.
2008 This Project

Genus: Halichondria
Halichondria sp. Indigenous.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
2007 Ref - Brock, 2007

Halichondria coerulea Bergquist, 1967 Cryptogenic.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
2007 Ref - Brock, 2007

Halichondria dura Lundgren, 1897
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Halichondria melanadocia de Laubenfels, 1936 Introduced.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007

Genus: Topsentia
Topsentia sp. Indigenous.
2008 This Project

Topsentia cf. halichondrioides Dendy, 1905 Cryptogenic.
1996 Legacy Project (Coles et al., 1997)

Topsentia dura Lindgren, 1897 Recorded as Halichondria dura.
2007 Ref - Brock, 2007

2007 This Project
2008 This Project

Family: HYMENIACIDONIDAE

Genus: Hymeniacidon
Hymeniacidon sp. 1973 Ref - Evans et al., 1974

Order: HADROMERIDA
Family: CLIONIDAE

Genus: Cliona
Cliona sp. Introduced.
1996 Legacy Project (Coles et al., 1997)

Cliona vastifica Hancock, 1849
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
Legacy Project - Species Report (Cont.)

Family: SPIRASTRELLIDAE
Genus: Spirastrella
Spirastrella coccinea (Duchassaing & Michelotti, 1864)
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Family: SUBERITIDAE
Genus: Prosuberites
Prosuberites oleteira de Laubenfels, 1957 Known only from Hawaii.
1996 Legacy Project (Coles et al., 1997)

Genus: Pseudosuberites
Pseudosuberites sp. Indigenous.
2008 This Project

Genus: Suberites
Suberites aurantiacus (Duchassaing & Michelotti, 1864) Introduced.
1948 Spec - BPBM-C 201
1978 Ref - Growhous, 1979 Recorded as Terpios zeteki.
1993 Ref - Brock, 1994 Recorded as Terpios zeteki.
1994 Ref - Brock, 1995 Recorded as Terpios zeteki.
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007 Recorded as Terpios zeteki.
2007 This Project
2008 This Project

Genus: Terpios
Terpios granulosa Bergquist, 1967
1993 Ref - Brock, 1994 Recorded as Terpios granuloma.
1994 Ref - Brock, 1995 Recorded as Terpios granuloma.

Order: CHORISTIDA
Family: CHONDROSIIIDAE
Genus: Chondrosia
Chondrosia chucalla de Laubenfels, 1936
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
2007 Ref - Brock, 2007

Family: STELLETTIDAE
Genus: Stelletta
Stelletta n. sp. (cf. purpurea) Ridley Known only from Hawaii.
1996 Legacy Project (Coles et al., 1997)

Phylum: CNIDARIA
Unidentified Cnidaria
1996 Legacy Project (Coles et al., 1997)

Family: AGARICIDIADAE
Genus: Leptoseris
Leptoseris incrustans (Quelch, 1886)
2006 Ref - Smith et al., 2006

Genus: Pavona
Pavona varians Verrill, 1864 Indigenous. Common name(s): Corrugated Coral.
2006 Ref - Smith et al., 2006

Family: SIDERASTREIDAE
Genus: Psammocora
Psammocora explanulata Van der Horst, 1922
2006 Ref - Smith et al., 2006
Legacy Project - Species Report (Cont.)

Class: HYDROZOA

Unidentified Hydrozoa
1982 Spec - BPBM-D 753 Off Pearl Harbor.
1983 Spec - BPBM-D 971 Mamala Bay; Pearl Harbor disposal site.
1987 Ref - Brewer & Assoc., 1987
1996 Legacy Project (Coles et al., 1997)

Order: HYDROIDA

Unidentified Hydroidea
1948 Spec - BPBM-D 283
1950 Spec - BPBM-D 307
1950 Spec - BPBM-D 308

Family: BOUGAINVILLIIDAE

Unidentified Bougainvilliiidae
2007 This Project
2008 This Project

Genus: Garveia
Garveia humilis (McCray, 1856) Cryptogenic.
1975 Ref - Grovhoug, 1976

Family: CAMPANULARIIDAE

Unidentified Campanulariiidae
2008 This Project

Genus: Clytia
2007 This Project
2008 This Project

Clytia hemisphaerica (Linnaeus, 1767) Introduced.
1978 Ref - Grovhoug, 1979

Clytia latitheca Millard and Bouillon, 1973 Cryptogenic.
2008 This Project

Genus: Obelia
Obelia sp.

Obelia bidentata? Introduced.
1978 Ref - Grovhoug, 1979

Obelia dichotoma (Linnaeus, 1758) Introduced.
1975 Ref - Grovhoug, 1976
1978 Ref - Grovhoug, 1979
2007 This Project
2008 This Project

Family: CLAVIDAE

Genus: Coryndendrium
2008 This Project

Genus: Turritopsis
Turritopsis nutricula (McCray, 1856) Introduced.
1975 Ref - Grovhoug, 1976

Family: HALECIIIDAE

Genus: Haleciun
Haleciun sp.
2008 This Project

Indigenous.
Legacy Project - Species Report (Cont.)

**Halecium sp.?** Indigenous.
1948 Spec - BPBM-D 288 Drydock #2.

**Family: PENNARIIDAE**

**Genus: Pennaria**

**Pennaria disticha** (Goldfuss, 1820) Introduced. Common name(s): Christmas Tree

**Hydroid.**

1929 Spec - BPBM-D 183
1943 Ref - Hutchins, 1949 Recorded as Pennaria sp..
1944 Spec - BPBM-D 250 Off Pearl Harbor.
1948 Spec - BPBM-D 289 Drydock #4.
1973 Ref - Evans et al., 1974 Recorded as Pennaria tiarella McCrady.
1978 Ref - Grovhoug, 1979 Recorded as Halocordyile disticha.
1993 Ref - Brock, 1994 Recorded as Halocordyile disticha.
1994 Ref - Brock, 1995 Recorded as Halocordyile disticha.
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007 Recorded as Halocardyile disticha.
2008 This Project

**Family: PLUMULARIIDAE**

**Unidentified Plumulariidae**

1948 Spec - BPBM-D 290 Drydock #4.

**Genus: Plumularia**

**Plumularia goodiei?** Nutting, 1900


**Family: TUBULARIIDAE**

**Genus: Tubularia**

**Tubularia sp.**

1978 Ref - Grovhoug, 1979

**Class: SCYPHOZOA**

**Unidentified Scyphozoan**

1929 Spec - BPBM-D 240
1982 Spec - BPBM-D 751 Off Pearl Harbor.

**Order: SEMAEOSTOMEAE**

**Family: ULMARIDAE**

**Genus: Aurelia**

**Aurelia labiata?** Chamisso & Eysenhardt, 1820

1973 Ref - Evans et al., 1974 Recorded as Balanus labiata.

**Order: RHIZOSTOMEAE**

**Family: CASSIOPEIDAE**

**Genus: Cassiopea**

**Cassiopea medusa** Light, 1914 Introduced.

1941 Ref - Doty, 1961

**Family: MASTIGIIDAE**

**Genus: Phyllophicha**

**Phyllophicha punctata** von Lendenfeld, 1884 Introduced.

1941 Ref - Doty, 1961 Recorded as Cotylorhizoides pacificus.
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979

**Class: ANTHOZOA**

**Unidentified Anthozoa**

1937 Spec - BPBM-D 227
1948 Spec - BPBM-D 291 Drydock #4.
Legacy Project - Species Report (Cont.)

Genus: *Actiniaria*  
*Actiniaria* Indigenous.  
2008 This Project

Order: TELESTACEA  
Family: TELESTIDAE  
Genus: *Carioja*  
*Carijoa aff. risiei* Duchassaing & Michelotti, 1860 Introduced. Common name(s):

Snowflake Coral.  
1972 Spec - BPBM-D 454 Near channel buoy #11. Identified by Rees.  
1973 Ref - Evans et al., 1974 Recorded as Telesto risiei.  
1974 Ref - Cuttress, 1977 Recorded as Telesto risiei.  
1978 Ref - Grovhougl, 1979 Recorded as Telesto risiei.  
1986 Ref - Lenihan, 1990 Recorded as Telesto risiei.  
1993 Ref - Brock, 1994 Recorded as Telesto risiei.  
1994 Ref - Brock, 1995 Recorded as Telesto risiei.  
1996 Legacy Project (Coles et al., 1997)  
2007 Ref - Brock, 2007 Recorded as Telesto risiei.  
2008 This Project

Order: ALCYONACEA  
Family: ALCYONIIDAE  
Genus: *Anthomastus*  
*Bayer*  

Order: GORGONACEA  
Unidentified Gorgonacea  
1950 Spec - BPBM-D 309  
1950 Spec - BPBM-D 310  
1982 Spec - BPBM-D 752 Off Pearl Harbor.

Order: ZOANTHIDEA  
Family: ZOANTHIDAE  
Genus: *Protopalythoa*  
*Protopalythoa sp.* Indigenous.  
2008 This Project

Genus: *Zoanthus*  
*Zoanthus pacificus* Walsh & Bowers, 1971  
1993 Ref - Brock, 1994  
1994 Ref - Brock, 1995  
2007 Ref - Brock, 2007

*Zoanthus sp. (white)* Indigenous. Common name(s): White Zoanthid.  
2007 This Project  
2008 This Project

Order: ACTINIAPIA  
Family: ACTINIIDAE  
Genus: *Cladactella*  
*Cladactella sp.*  
1973 Ref - Evans et al., 1974  
*Cladactella mannii?* (Verrill, 1899)  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Family: AIPHTASIIDAE  
Genus: *Aiptasia*  
*Aiptasia pulchella* Carlsgren, 1943 Indigenous. Common name(s): Glass Anemone.  
1978 Ref - Grovhougl, 1979
### Legacy Project - Species Report (Cont.)

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**Family: DIADUMENIDAE**

**Genus: Diadumene**

- *Diadumene leucolena* (Verrill, 1866) Introduced.
  - 1977 Ref - Cuttress, 1977

**Family: HORMATHIIDAE**

**Genus: Calliactis**

- *Calliactis polypus?* (Forsskål, 1775)
  - 1973 Ref - Evans et al., 1974

**Family: ISOPHELLIIDAE**

**Genus: Epipheilla**

- *Epipheilla humilis* (Verrill, 1928)
  - 1973 Ref - Evans et al., 1974

**Family: STOICHACTIONIDAE**

**Genus: Antheopsis**

- *Antheopsis papillosa* (Kwientiewski, 1898)
  - 1973 Ref - Evans et al., 1974 Recorded as Radianthus cookei (Verrill 1928).

**Order: SCLERACTINIA**

**Family: ACROPORIDAE**

**Genus: Montipora**

- *Montipora sp.*

- *Montipora capitata* (Dana, 1846) Indigenous. Common name(s): Rice Coral.
  - 2006 Ref - Smith et al., 2006
  - 2008 This Project

- *Montipora flabellata* Studer, 1902
  - 2006 Ref - Smith et al., 2006

  - 1996 Legacy Project (Coles et al., 1997)
  - 2006 Ref - Smith et al., 2006

**Family: DENDROPHYLLIDAE**

**Genus: Tubastrea**

- *Tubastrea sp.*

**Family: FAVIIDAE**

**Genus: Leptastrea**

- *Leptastrea purpurea* Dana, 1846 Indigenous. Common name(s): Crust Coral.
  - 1993 Ref - Brock, 1994
  - 1994 Ref - Brock, 1995
  - 1996 Legacy Project (Coles et al., 1997)
  - 2006 Ref - Smith et al., 2006
  - 2007 Ref - Brock, 2007
  - 2008 This Project
Legacy Project - Species Report (Cont.)

Family: FUNGIDAE
Genus: Fungia
ko’akohe; hu’ahu’a
Common name(s): mushroom coral; Hawaiian name(s): akai.

Fungia sp.
Unknown Spec - BPBM-SC 399

Family: POCILLOPORIDAE
Genus: Pocillopora
Pocillopora damicornis Linnaeus, 1758 Indigenous. Common name(s): Lace Coral; Hawaiian name(s): ʻako ʻako a.
Pocillopora ligulata Dana, 1846 Indigenous. Common name(s): Cauliflower Coral.
Pocillopora meandrina Dana, 1846 Indigenous. Common name(s): Cauliflower Coral.

Family: PORITIDAE
Genus: Porites
Porites compressa Dana, 1846 Indigenous. Common name(s): Finger Coral; Hawaiian name(s): ʻako ʻako a.

Family: PORITIDAE
Genus: Porites
Porites compressa Dana, 1846 Indigenous. Common name(s): Lobe Coral.

Phylum: CTENOPHORA
Class: TENTACULATA
Order: CYDIPPIDA
Family: PLEUROBRACHIIDAE
Genus: Pleurobranchia
Pleurobranchia sp.
1972 Ref - Long, 1974 Off Pearl Harbor. Recorded as Pocillopora cespitosa
laysanensis Vaughan.
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2008 This Project

Phylum: PLATYHELMINTHES
Unidentified Platyhelminthes
1996 Legacy Project (Coles et al., 1997)

Class: TURBELLARIA
Order: POLYCLADIDA
Family: PLANOCERIDAE
Genus: Planocera
Planocera sp.
1973 Ref - Evans et al., 1974

Class: CESTODA
Genus: Tylocephalum
Tylocephalum sp.
1965 Ref - Rifkin & Cheng, 1968
Legacy Project - Species Report (Cont.)

Phylum: NEMATODA
  Unidentified Nematoda
  1996  Legacy Project (Coles et al., 1997)

Phylum: ANNELIDA
Class: POLYCHAETA

Unidentified Polychaeta
  1982  Spec - BPBM-R 1584  Pearl Harbor dredge spoil dumping site.
  1982  Spec - BPBM-R 1585  Off Pearl Harbor; dredge spoil dumping site.
  1982  Spec - BPBM-R 1586  Off Pearl Harbor; dredge spoil dumping site.

Family: AMPHINOMIDAE
Unidentified Amphinomidae
  1978  Ref - Grovhough, 1979

Genus: Eurythoe
  Eurythoe complanata  (Pallas, 1776)  Indigenous.
  1973  Ref - Evans et al., 1974
  1979  Ref - AECOS, 1979  Off Pearl Harbor.
  1996  Legacy Project (Coles et al., 1997)
  2008  This Project

Family: APHRODITIDAE
Unidentified Aphroditidae
  1978  Ref - Grovhough, 1979

Family: ARABELLIDAE
Genus: Arabella
  Arabella sp.
    1973  Ref - Evans et al., 1974
    1996  Legacy Project (Coles et al., 1997)
  Arabella iridescens  Treadwell, 1906
    1973  Ref - Evans et al., 1974

Family: CAPITELLIIDAE
Unidentified Capitellidae
  1978  Ref - Grovhough, 1979
  1996  Legacy Project (Coles et al., 1997)

Genus: Dasylbranchus
  Dasylbranchus lumbricooides  Grube, 1878
    1973  Ref - Evans et al., 1974

Family: CHAETOPTERIDAE
Unidentified Chaetopteridae
  1978  Ref - Grovhough, 1979
  1996  Legacy Project (Coles et al., 1997)
  2007  This Project
  2008  This Project

Genus: Chaetopterus
  Chaetopterus sp.  (Renier, 1804)  Cryptogenic. Common name(s): Parchment Worm.
    1993  Ref - Brock, 1994  Recorded as C. variopedus.
    1994  Ref - Brock, 1995  Recorded as C. variopedus.
    1996  Legacy Project (Coles et al., 1997)
    2008  This Project

  Chaetopterus variopedatus  Renier, 1804
    2007  Ref - Brock, 2007


## Legacy Project - Species Report (Cont.)

**Genus: Phyllochaetopterus**

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<td>Treadwell, 1943</td>
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<td>1979</td>
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**Family: CIRRATULIDAE**

**Unidentified Cirratulidae**

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**Genus: Cirratulus**

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**Genus: Cirriformia**

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**Cirriformia hawaiensis**

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**Family: COSSURIDAE**

**Unidentified Cossuridae**

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**Family: DORVILLEIDAE**

**Unidentified Dorvilleidae**

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**Genus: Dorvillea**

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**Genus: Schistomerinos**

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**Family: EUNICIDAE**

**Unidentified Eunicidae**

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**Genus: Eunice**

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**Eunice antennata**

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## Legacy Project - Species Report (Cont.)

**Eunice australis** Quatrefages, 1865

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**Eunice cariboea** (Grube, 1856) Indigenous.

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**Eunice filamentosa** Grube, 1856

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**Eunice vittata** (Delle Chiaje, 1828)

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### Genus: Lysidice

**Lysidice ninetta** Audoin & Milne Edwards, 1833

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### Genus: Marphysa

**Marphysa sp.** Indigenous.

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**Marphysa corallina** Kinberg, 1865 Indigenous.

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**Marphysa sanguinea** (Montagu, 1815)

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### Genus: Nematonepis

**Nematonepis unicornis** Schmarda, 1861 Indigenous.

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### Genus: Palola

**Palola sicilensis** Borradaile, 1898

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### Genus: Paramphysa

**Paramphysa sp.**

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### Family: GLYCERIDAE

### Genus: Glycera

**Glycera tesselata** Grube, 1863

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### Family: HESIONIDAE

### Unidentified Hesionidae

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### Genus: Syllidia

**Syllidia armata** Quatrefages, 1865

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Legacy Project - Species Report (Cont.)

Family: LUMBRINERIDAE
Unidentified Lumbrineridae
  1973  Ref - Evans et al., 1974
  1973  Ref - McCain, 1974
  1973  Ref - McCain, 1975
  2008  This Project

Genus: Lumbrineris
Lumbrineris sp.
  1996  Legacy Project (Coles et al., 1997)

Lumbrineris dentata  Hartmann-Schroder, 1965  Indigenous.
  2008  This Project

Family: LYSARETIDAE
Genus: Oenone
Oenone fulgida  (Savigny)  Cryptogenic.
  1973  Ref - Evans et al., 1974

Family: NEREIDIDAE
Unidentified Nereididae
  1931  Spec - BPBM-R.1488
  1978  Ref - Grothoug, 1979  Recorded as Nereididae.
  1996  Legacy Project (Coles et al., 1997)
  2007  This Project
  2008  This Project

Genus: Ceratonereis
Ceratonereis sp.
  1973  Ref - Evans et al., 1974

Genus: Laeonereis
Laeonereis sp.
  1973  Ref - Evans et al., 1974
  1973  Ref - McCain, 1974
  1973  Ref - McCain, 1975

Genus: Leonnates
Leonnates sp.
  1973  Ref - McCain, 1974
  1973  Ref - McCain, 1975

Genus: Micronereis
Micronereis sp.
  1973  Ref - Evans et al., 1974

Genus: Nereis
Nereis sp.
  1973  Ref - Evans et al., 1974
  1987  Ref - Brewer & Assoc., 1987

Nereis sp. 1
  1973  Ref - McCain, 1974  Recorded as Nereis sp. 1.
  1973  Ref - McCain, 1976  Recorded as Nereis sp. 1.

Nereis sp. 2
  1973  Ref - McCain, 1974  Recorded as Nereis sp. 2.
  1973  Ref - McCain, 1975  Recorded as Nereis sp. 2.

Nereis arenacoeoentata  Moore, 1903  Introduced.
  1973  Ref - Evans et al., 1974  Recorded as Nereis (Neanthes) caudata (Delle Chiaje).

Nereis corallina  Kinberg, 1866
Legacy Project - Species Report (Cont.)

Genus: *Perinereis*
*Perinereis* sp.
1929 Spec - BPBM-R 1502 Identified by G. Tien.
1973 Ref - Evans et al., 1974
1987 Ref - Brewer & Assoc., 1987

*Perinereis cultifera floridana* Iwajima, 1972
1973 Ref - Evans et al., 1974 Recorded as *Perinereis cultifera*.

Genus: *Platynereis*
*Platynereis* sp.
1973 Ref - Evans et al., 1974

Family: ONUPHIDAE
Genus: *Diopatra*
*Diopatra* sp.
1973 Ref - Evans et al., 1974

Family: OPHELIIDAE
Unidentified *Opheliidae*
1978 Ref - Grovhouga, 1979

Genus: *Armandia*
*Armandia* sp.
1996 Legacy Project (Coles et al., 1997)

Family: ORBINIIDAE
Unidentified *Orbinsiidae*
1973 Ref - Evans et al., 1974
1978 Ref - Grovhouga, 1979

Family: PARAONIDAE
Unidentified *Paraonidae*
1978 Ref - Grovhouga, 1979

Family: PHYLLODOCIDAE
Unidentified *Phyllodocidae*
1978 Ref - Grovhouga, 1979
2007 This Project
2008 This Project

Genus: *Eulalia*
*Eulalia* sp.
1996 Legacy Project (Coles et al., 1997)

*Eulalia sanguinea* Oersted, 1843
1966 Ref - Hartman, 1966
1996 Legacy Project (Coles et al., 1997)

Genus: *Eumida*
*Eumida sanguinea* (Oested, 1843)
1966 Ref - Hartman, 1966

Unidentified *Eumida*
1996 Legacy Project (Coles et al., 1997)

Genus: *Phyllocele*
*Phyllocele* sp.
1996 Legacy Project (Coles et al., 1997)

Family: POLYNODAE
Unidentified *Polynoidae*
1996 Legacy Project (Coles et al., 1997)
### Legacy Project - Species Report (Cont.)

**Genus: Hololepidella**  
*Hololepidella nigropunctata*  
(Horst, 1915)  
1972 Spec - BPBM-R 563 Harbor entrance, from buoy "1". Identified by D.M. Devaney.

**Genus: Iphione**  
*Iphione muricata*  
(Savigny, 1818)  
1973 Ref - Evans et al., 1974

**Genus: Paralepidonotus**  
*Paralepidonotus ampulliferus*  
(Grube, 1878)  
1973 Ref - Evans et al., 1974  
1996 Legacy Project (Coles et al., 1997)

**Family: SABELLARIIDAE**

Unidentified Sabellariidae  
1978 Ref - Grovhoug, 1979

**Family: SABELLIDAE**

Unidentified Sabellidae  
1978 Ref - Grovhoug, 1979  
1979 Ref - AECOS, 1979 Off Pearl Harbor.  
2007 This Project  
2008 This Project

**Genus: Amphiglena**  
*Amphiglena sp.*  
Cryptogenic.  
2008 This Project

*Amphiglena mediterranea*  
(Leydig, 1851)  
Cryptogenic.  
2008 This Project

**Genus: Branchiomma**  
*Branchiomma nigromaculata*  
(Baird, 1865)  
Cryptogenic.  
1975 Ref - Grovhoug, 1976 Recorded as Branchiomma cingulata.  
1976 Ref - Cooke et al., 1980 Recorded as B. cingulata.  
1996 Legacy Project (Coles et al., 1997)  
2007 Ref - Brock, 2007  
2007 This Project  
2008 This Project

**Genus: Demonax**  
*Demonax sp.*  
Indigenous.  
2008 This Project

*Demonax leucaspis*  
(Kinberg, 1867)  
1975 Ref - Grovhoug, 1976  
1976 Ref - Cooke et al., 1980

**Genus: Potamethus**  
*Potamethus sp.*  
Indigenous.  
2008 This Project

**Genus: Potamilla**  
*Potamilla sp.*  
Indigenous.  
1996 Legacy Project (Coles et al., 1997)  
2007 This Project  
2008 This Project
**Legacy Project - Species Report (Cont.)**

**Genus: Sabella**

*Sabella sp.*
1973 Ref - Evans et al., 1974

**Genus: Sabellastarte**

*Sabellastarte indica* (Savigny, 1818) Indigenous.

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*Sabellastarte spectabilis* (Grube, 1878) Introduced. Common name(s): Feather Duster Worm.

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**Family: SERPULIDAE**

**Unidentified Serpulidae**

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**Genus: Ficopomatus**

*Ficopomatus enigmaticus* (Fauvel, 1923) Introduced.

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**Genus: Hydrodides**

*Hydrodides sp.* Indigenous.

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<td>1987</td>
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*Hydrodides brachycantha* Rioja, 1941 Introduced.

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*Hydrodides crucigera* (Morch, 1863) Introduced.

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*Hydrodides dirampha* (Morch, 1863) Introduced.

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<td>1935</td>
<td>Ref - Edmondson, 1944</td>
<td>Recorded as H. lunulifera (Claparede, 1868).</td>
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<td>Year</td>
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<td>Ref - Ingram, 1937</td>
<td>Recorded as H. lunalifera.</td>
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**Hydroides elegans** *(Haswell, 1883)* Introduced.

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**Hydroides sanctaeccrucis** *Morch, 1863* Off Pearl Harbor.

**Hydroides uncinata** *Phillipe, 1844*

**Genus: Neodexiospira**

**Neodexiospira foraminosa** *(Moore & Bush, 1904)* Introduced.
Legacy Project - Species Report (Cont.)

Genus: *Pileolaria*
*Pileolaria militaris* Claparede, 1868  Introduced.
2008  This Project

*Pileolaria semimilitaris* Vine, 1972
1975  Ref - Grovhoug, 1976

Genus: *Pomatoleios*
*Pomatoleios kraussii* (Baird, 1865)  Introduced.
1976  Ref - Grovhoug & Rastetter, 1980
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995
1996  Legacy Project (Coles et al., 1997)
2007  Ref - Brock, 2007
2008  This Project

Genus: *Salmacina*
*Salmacina dysteri* Huxley, 1855  Introduced. Common name(s): Sea Frost.
1972  Ref - Long, 1974
1986  Ref - Lenihan, 1990
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995
1996  Legacy Project (Coles et al., 1997)
2007  Ref - Brock, 2007
2007  This Project
2008  This Project

Genus: *Serpula*
*Serpula sp.* Indigenous.
2008  This Project

*Serpula vermicularis* Linnaeus, 1767  Cryptogenic.
1938  Ref - Straughan, 1969
1940  Ref - Straughan, 1969
1948  Ref - Straughan, 1969
1996  Legacy Project (Coles et al., 1997)
2007  Ref - Brock, 2007
2007  This Project
2008  This Project

Genus: *Simplicaria*
1996  Legacy Project (Coles et al., 1997)
2008  This Project

Genus: *Spirobranchus*
*Spirobranchus tricornis* Morch, 1863  Off Pearl Harbor.
1972  Ref - Long, 1974

Genus: *Sporobis*
*Sporobis sp.*
1973  Ref - Evans et al., 1974
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995

Genus: *Vermiliopsis*
*Vermiliopsis torquata* Treadwell, 1943  Identified by D. Straughan.
1937  Spec - BPBM-R 1317

Family: SPINTHERIDAE

Genus: *Spinther*
1976  Ref - Grovhoug & Rastetter, 1980
Legacy Project - Species Report (Cont.)

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**Family: SPIONIDAE**

**Unidentified Spionidae**
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

**Genus: Polydora**
  - 1966 Ref - Hartman, 1966

**Genus: Streblospio**
- *Streblospio benedicti* Webster, 1879 Introduced.
  - 1987 Ref - Ward, 1987

**Family: SPIRORBIDAE**

**Unidentified Spirorbidae**
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

**Family: SYLLIDAE**

**Unidentified Syllidae**
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)
- 2007 This Project
- 2008 This Project

**Genus: Autolytus**
- *Autolytus sp.*
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Branchiosyllis**
- *Branchiosyllis exilis* Gravier, 1900
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Brania**
- *Brania rhopalophora* Ehlers, 1897
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Exogone**
- *Exogone verugera* Claparède, 1869
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Haplosyllis**
- *Haplosyllis spongicola* Grube, 1855
  - 1973 Ref - Evans et al., 1974 Recorded as Syllis spongicola.
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Langerhansia**
- *Langerhansia cornuta* Rathke, 1843
  - 1973 Ref - Evans et al., 1974 Recorded as Syllis cornuta.
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Myriandia**
- *Myriandia crassicirrata* 1996 Legacy Project (Coles et al., 1997)

**Genus: Opisthosphylis**
- *Opisthosphylis sp.*
  - 1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Genus: *Syllis*
*Syllis sp.*
1973 Ref - Evans et al., 1974

*Syllis gracilis*
1996 Legacy Project (Coles et al., 1997)

*Typosyllis variégata* (Grube, 1860)
1973 Ref - Evans et al., 1974 Recorded as *Syllis variégata*.

Genus: *Trypanosyllis*
*Trypanosyllis sp.* Indigenous.
2008 This Project

*Trypanosyllis zebra* (Grube, 1860)
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Genus: *Typosyllis*
*Typosyllis sp.*
1996 Legacy Project (Coles et al., 1997)

*Typosyllis hawaiensis* Hartmann-Schröder, 1965
1996 Legacy Project (Coles et al., 1997)

*Typosyllis hyalina* (Grube, 1863)
1996 Legacy Project (Coles et al., 1997)

*Typosyllis prolifera* 1996 Legacy Project (Coles et al., 1997)

Family: TEREBBELLIDAE

Unidentified Terebellidae
1978 Ref - Grovhoug, 1979
2007 This Project
2008 This Project

Genus: *Loimia*
*Loimia medusa* (Savigny, 1818) Indigenous. Common name(s): Medusa Spaghett Worm; Hawaiian name(s): kauna‘oa.
2007 This Project
2008 This Project

Genus: *Thelepus*
*Thelepus setosus* (Quatrefages, 1865) Indigenous.
1973 Ref - Evans et al., 1974
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 Ref - Brock, 2007
2007 This Project

Class: Oligochaeta
Order: Hychnobdellida
Family: Piscicolidae

Unidentified Piscicolidae
1973 Ref - Evans et al., 1974

Phylum: Mollusca

Unidentified Mollusca
1914 Spec - BPBM-MO 65001 Ford Island. Catalogue V.
1917 Spec - BPBM-MO 18 Off Pearl Harbor.
1922 Spec - BPBM-MO 37
Legacy Project - Species Report (Cont.)

1934 Spec - BPBM-MO 205582 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205581 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205584 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205585 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205586 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205587 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205588 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205591 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205592 Dredge. Catalogue XIV.
1947 Spec - BPBM-MO 41 Bottom of ship Jacona.
1947 Spec - BPBM-MO 42 Bottom of ship Jacona.
1947 Spec - BPBM-MO 47 Bottom of ship Jacona.
1947 Spec - BPBM-MO 61 Drydock, hull of ship Jacona.
1948 Spec - BPBM-MO 44 Drydock.
1948 Spec - BPBM-MO 59 Hull of Barge YC-1024, Dry Dock #3.
1950 Spec - BPBM-MO 5 Power House intake tunnel.

Family: APLYSIIDAE
Unidentified Aplysiidae
2008 This Project

Genus: Tambja
Tambja morosa (Bergh, 1877) Indigenous. Common name(s): Gloomy Nudibranch.
2008 This Project

Family:CUSPIDARIIDAE
Genus: Cuspidaria
Cuspidaria sp. Indigenous.
2008 This Project

Cuspidaria hawaiensis Dall, Bartsch, and Rehder, 1938 Indigenous. Common name(s): Noble Vermilid.
2007 This Project
2008 This Project

Family: MESODESMATIDAE
Genus: Rochefortina
Rochefortina sandvichensis Hayami & Kase, 1993 Indigenous.
2008 This Project

Class: GASTROPoda
Family: CAECIDAE
Genus: Caecum
Caecum septimentum de Folin, 1867
1996 Legacy Project (Coles et al., 1997)

Family: CEPHALASPIDAE
Unidentified Cephalaspidae
1996 Legacy Project (Coles et al., 1997)

Family: DIALIDAE
Genus: Cerithidium
Cerithidium perparvulum (Watson, 1886)
1973 Ref - Evans et al., 1974 Recorded as Obtortio perparvulum.
1996 Legacy Project (Coles et al., 1997)

Genus: Dia
Dia semistrirata
1973 Ref - Evans et al., 1974 Recorded as Dia varia.

Dia varia A. Adams, 1861
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Family: EATONIELLIDAE
Genus: Eatoniiella
Eatoniiella sp.
1996 Legacy Project (Coles et al., 1997)

Order: ARCHAEOGASTROPODA
Family: FISSURELLIDAE
Unidentified Fissurellidae
2008 This Project

Genus: Diodora
Diodora sp.
Indigenous.
2008 This Project

Diodora granifera
(Pease, 1861) Hawaiian name(s): `opiihi.
Unknown Spec - BPBM-MO 225792 Opposite Ford Island on Railroad Wharf on Peninsula.
Catalogue XVI.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Diodora octagona
(Reeve, 1850) Indigenous. Common name(s): Sea Frost.
2008 This Project

Diodora octogona
Reeve, 1850
1996 Legacy Project (Coles et al., 1997)

Diodora rupepelli
(Sowerby, 1834) Introduced.
1962 Ref - Kay, 1979
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Family: NERITIDAE
Genus: Nerita
Nerita sp.
1932 Spec - BPBM-MO 199261 Catalogue XIV.

Nerita picea
(Recluz, 1841) Indigenous. Common name(s): Black Nerite; Hawaiian name(s): pipipi kai;
pipipi; pipipi; pipipi.
1912 Spec - BPBM-MO 64253 Catalogue V.
1912 Spec - BPBM-MO 64264 Catalogue V.
1923 Spec - BPBM-MO 228140 Along shore near Railroad Wharf opposite Ford Island.
Catalogue XVI.
1930 Spec - BPBM-MO 195621 Catalogue XIV.
1930 Spec - BPBM-MO 195622 Pearl Locks, Peninsular. Catalogue XIV.
1930 Spec - BPBM-MO 195623 Pearl Locks, Peninsular. Catalogue XIV.
1930 Spec - BPBM-MO 195624 Pearl Locks, Peninsular. Catalogue XIV.
1932 Spec - BPBM-MO 198798 Fishpond wall on Eastern side of Pearl City Peninsula.
Catalogue XIV.
1932 Spec - BPBM-MO 198800 Fishpond wall on Eastern side of Pearl City Peninsula.
Catalogue XIV.
1932 Spec - BPBM-MO 198801 Pearl City Peninsula, shore along Cobb's place. Catalogue XIV.
2008 This Project

Genus: Theodoxus
Theodoxus cariosa
Gray Known only from Hawaii.
1912 Spec - BPBM-MO 64294 Catalogue V.
Theodoxus kanaka
Pilsbry
1912 Spec - BPBM-MO 64313 Catalogue V.
Theodoxus neglectus
Pease, 1861
1932 Spec - BPBM-MO 198799 Fishpond wall on Eastern side of Pearl City Peninsula.
Catalogue XIV.
1932 Spec - BPBM-MO 198802 Pearl City Peninsula, shore along Cobb's place. Catalogue XIV.

Family: PATELLIDAE
Genus: Cellana
Cellana sp.
1934 Spec - BPBM-MO 205577 Dredge. Catalogue XIV.

Hawaiian name(s): ka‘ala; koʻele; ʻopiihi kapuaʻi lio.
Family: PHASIANELLIDAE
Genus: Tricola
Tricola variabilis (Pease, 1861) Hawaiian name(s): pupu kanaloa.

Family: PHENACOLEPADIDAE
Genus: Phenacolepas

Family: SCISSERTELLIDAE
Genus: Scissurella
Scissurella sp. 1973 Ref - Evans et al., 1974

Family: SKENEIDAE
Genus: Lophocaelias
Lophocaelias minutissimus (Pilsbry, 1921) Off Pearl Harbor. Recorded as Cyclostremiscus minutissimus (Pilsbry, 1921).

Family: STOMATELLIDAE
Genus: Syncera
Syncera giffardi Dall
Unknown Spec - BPBM-MO 65725 Pearl City. Catalogue V.

Family: TROCHIDAE
Genus: Danilia
Danilia euceliformis (Nomura & Hatai, 1940) Off Fort Kamehameha. Catalogue XV.
1961 Spec - BPBM-MO 217634

Genus: Euchelus
Euchelus gemmatus Gould, 1845
1973 Ref - Evans et al., 1974

Genus: Tholotia
Tholotia subangulata (Pease, 1861) Recorded as Alcyna lineata Pease, 1861. MCZ 31724.
1917 Ref - Pilsbry, 1917

Genus: Trochus
Trochus sp. 1934 Spec - BPBM-MO 205576 Dredge. Catalogue XIV.
Trochus histrio 1934 Spec - BPBM-MO 205576 Dredge. Catalogue XIV.
1973 Ref - Evans et al., 1974
Trochus intextus Kiener, 1850 Hawaiian name(s): pupu o Ha`upu; ha`upu; haupu; ʻokole ʻoi ʻoi; pupu o Haupu.

Unknown Spec - BPBM-MO 200688 Catalogue XIV.
Unknown Spec - BPBM-MO 227198 Catalogue XVI.
1918 Spec - BPBM-MO 198674 Catalogue XIV.
1918 Spec - BPBM-MO 198675 Catalogue XIV.
1923 Spec - BPBM-MO 227202 Catalogue XVI.
1924 Spec - BPBM-MO 240750 Catalogue XVII.
1930 Spec - BPBM-MO 195331 Pearl Locks Peninsula, makai face of little pier just mauka of Dr. Whitney's place. Catalogue XIV.

1932 Spec - BPBM-MO 198940 Eastside of Pearl City Peninsula. Catalogue XIV.
1932 Spec - BPBM-MO 198941 Peninsula; Railroad Wharf. Catalogue XIV.
1932 Spec - BPBM-MO 198942 End of Waipio Peninsula. Catalogue XIV.
1932 Spec - BPBM-MO 200036 Pearl Harbor channel. Catalogue XIV.
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Family: TURBINIDAE
Genus: Leptothyra
Leptothyra candida  (Pease, 1861) Hawaiian name(s): Kahelelani eilaula; Kahelelani `okala.
1996 Legacy Project (Coles et al., 1997)

Genus: Turbo
Turbo chrysostomus
Unknown Spec - BPBM-MO 200698 Catalogue XIV.
Turbo sandwicensis  (Menke, 1846) Hawaiian name(s): Sundial shell; Hawaiian name(s):
pupu puki.
1906 Spec - BPBM-MO 217662 Off Fort Kamehameha. Catalogue XV.

Genus: Heliacus
Heliacus sp. 1973 Ref - Evans et al., 1974

Genus: Philippia
Philippia sp. 1973 Ref - Evans et al., 1974

Order: MESOGASTROPODA
Family: ARCHITECTONICIDAE
Genus: Architectonica
Architectonica sp. 1934 Spec - BPBM-MO 205570 Dredge. Catalogue XIV.
Architectonica perspectiva  (Linnaeus, 1758) Common name(s): Sundial shell; Hawaiian name(s):
pupu puki.
1906 Spec - BPBM-MO 217662 Off Fort Kamehameha. Catalogue XV.

Genus: Barleeiidae
Barleeia sp. Unknown Spec - BPBM-MO 230902 Pearl City. Catalogue XVI.

Family: BARLEEIIDAE
Genus: Barleeia

Family: BURSIDAE
Genus: Bursa
Bursa cruentata  (Sowerby, 1841) Hawaiian name(s): Kamehameha reef. Catalogue XVI.
1950 Spec - BPBM-MO 233988 Fort Kamehameha reef. Catalogue XVI.
Bursa granularis  (Röding, 1798) Hawaiian name(s): Pearl City Peninsula, Railroad Wharf. Catalogue XIV.
1932 Spec - BPBM-MO 199149 Reef off Fort Kamehameha. Catalogue XIV.

Family: CALYPTRAEIDAE
Genus: Crepidula
Crepidula sp. 1932 Spec - BPBM-MO 200164 Waipio Peninsula, end. Catalogue XIV.
1932 Spec - BPBM-MO 200185 Pearl Island. Catalogue XIV.
1932 Spec - BPBM-MO 201516 Pearl City Peninsula, Railroad Wharf. Catalogue XIV.
2007 Ref - Brock, 2007 Recorded as Crepidula sp.
Crepidula aculeata  (Gmelin, 1791) Hawaiian name(s): Hoof Shell.
Unknown Spec - BPBM-MO 64006 Catalogue V.
Unknown Spec - BPBM-MO 64798 Ford Island. Catalogue V.
1915 Spec - BPBM-MO 231366 Ford Island. Catalogue XVI.
1923 Spec - BPBM-MO 231368 At Railroad Wharf, opposite Ford Island, Peninsula. Catalogue XVI.
1950 Spec - BPBM-MO 231370 Fort Kamehameha reef. Catalogue XVI.
1972 Ref - Long, 1974
1973 Ref - Evans et al., 1974
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**Genus: Crucibulum**

**Crucibulum spinosum** (Sowerby, 1824) Indigenous.

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<tr>
<td>1950</td>
<td>Spec - BPBM-MO 231372  Fort Kamehameha. Catalogue XVI.</td>
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<td>Spec - BPBM-MO 76      Reef at Fort Kamehameha.</td>
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<td>1972</td>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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<td>1993</td>
<td>Ref - Brock, 1994     Recorded as Calyptraea spinosum.</td>
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<td>Ref - Brock, 1995     Recorded as Calyptraea spinosum.</td>
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<td>Legacy Project (Coles et al., 1997)</td>
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<td>2007</td>
<td>This Project</td>
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**Family: CAPULIDAE**

**Genus: Capulus**

**Capulus bicaudatus** Pease

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<td>1922</td>
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**Family: CASSIDIDAE**

**Genus: Casmaria**

**Casmaria vibex**

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<td>Spec - BPBM-MO 218262  Off Fort Kamehameha. Catalogue XV.</td>
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<td>1961</td>
<td>Spec - BPBM-MO 218263  Off Fort Kamehameha. Catalogue XV.</td>
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**Genus: Cassis**

**Cassis vider**

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<td>Spec - BPBM-MO 200430  Channel entrance, seaward. Catalogue XIV.</td>
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**Genus: Phalium**

**Phalium (Semicassis) umbilicatum** (Pease, 1861)

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<td>Spec - BPBM-MO 218248  Off Fort Kamehameha. Catalogue XV.</td>
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<td>Spec - BPBM-MO 218249  Off Fort Kamehameha. Catalogue XV.</td>
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**Family: CERITHIIDAE**

**Unidentified Cerithiidae**

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<td>Spec - BPBM-MO 229571  Dredged in entrance channel to Pearl Harbor. Catalogue XVI.</td>
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**Genus: Bittium**

**Bittium impendens** (Hedley, 1899)

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**Bittium mantii** Dall

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**Bittium parcum** (Gould, 1861)

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<td>Ref - Evans et al., 1974</td>
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<tr>
<td>1996</td>
<td>Legacy Project (Coles et al., 1997)</td>
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**Bittium zebrum** (Kiener, 1841)

<table>
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Legacy Project - Species Report (Cont.)

1996  Legacy Project (Coles et al., 1997)

Genus: Cerithiopsis

Cerithiopsis sp. A
1973  Ref - Evans et al., 1974  Recorded as Cerithiopsis sp. A.
1996  Legacy Project (Coles et al., 1997)

Cerithiopsis sp. B
1973  Ref - Evans et al., 1974  Recorded as Cerithiopsis sp. B.

Cerithiopsis acaria sp.
  Unknown  Spec - BPBM-MO 65649  Catalogue V.

Cerithiopsis acaria sp.?
1934  Spec - BPBM-MO 205561  Dredge.  Catalogue XIV.

Genus: Cerithium

Cerithium articulatus
1961  Spec - BPBM-MO 217761  Off Fort Kamehameha?.  Catalogue XV.

Cerithium diminutum  Phil.
  Unknown  Spec - BPBM-MO 63339  Ford Island.  Catalogue V.

Cerithium locticum  Pease
  Unknown  Spec - BPBM-MO 63176  Catalogue V.
  Unknown  Spec - BPBM-MO 63229  Ford Island.  Catalogue V.

Cerithium matukense  Watson, 1886
1982  Spec - BPBM-MO 207403  Catalogue XIV.

Cerithium nesioticum  Pilsbry & Vanatta, 1905  Hawaiian name(s): pupu maka`aha; maka`aha.
1973  Ref - Evans et al., 1974

Cerithium zebrum  Kiener, 1841  Indigenous.
2008  This Project

Genus: Finella

Finella pupoides  A. Adams, 1860
  Unknown  Spec - BPBM-MO 229372  Catalogue XVI.
  1996  Legacy Project (Coles et al., 1997)

Genus: Rhinoclavis

Rhinoclavis fasciata  Bruguiere
1961  Spec - BPBM-MO 217848  Off Fort Kamehameha.  Catalogue XV.
1961  Spec - BPBM-MO 217849  Off Fort Kamehameha?.  Catalogue XV.

Family: Cerithiopsidae

Unidentified Cerithiopsidae
  Unknown  Spec - BPBM-MO 230301  Catalogue XVI.

Family: Cyomatidae

Genus: Cymatium

Cymatium sp.  Indigenous.
1934  Spec - BPBM-MO 205568  Dredge.  Catalogue XIV.
1934  Spec - BPBM-MO 205569  Dredge.  Catalogue XIV.
1973  Ref - Evans et al., 1974
2008  This Project

Cymatium aquatile  Reeve, 1844
1927  Spec - BPBM-MO 240863  Entrance Channel.  Catalogue XVII.
1936  Spec - BPBM-MO 240862  Reef off Fort Kamehameha.  Catalogue XVII.
1961  Spec - BPBM-MO 218307  Off Fort Kamehameha.  Catalogue XV.

Cymatium gemmatum  Reeve, 1844
  Unknown  Spec - BPBM-MO 249233  Catalogue XVII.
  1927  Spec - BPBM-MO 69  Naval Station.
Legacy Project - Species Report (Cont.)

1928 Spec - BPBM-MO 240865 Reef off Fort Kamehamea. Catalogue XVII.
1936 Spec - BPBM-MO 233927 Reef at Fort Kamehamea. Catalogue XVI.
1996 Legacy Project (Coles et al., 1997)

*Cymatium intermedius* Pease, 1869

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<td>BPBM-MO 240868</td>
<td>Entrance Channel off Fort Kamehamea. Catalogue XVII.</td>
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<tr>
<td>1936</td>
<td>BPBM-MO 233764</td>
<td>Reefs at Fort Kamehamea. Catalogue XVI.</td>
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<td>1996</td>
<td>BPBM-MO 240867</td>
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<td>BPBM-MO 2040872</td>
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Catalogue XVII.

1996 Legacy Project (Coles et al., 1997)

*Cymatium muricinum* Röding, 1798

Hawaiian name(s): pupu ʻ ole kiwi; naunau; ʻ anaunau.

<table>
<thead>
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<th>Year</th>
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<td>BPBM-MO 233908</td>
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<td>BPBM-MO 233913</td>
<td>Ewa side, near entrance. Catalogue XVI.</td>
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<td>1927</td>
<td>BPBM-MO 233974</td>
<td>Naval Station. Catalogue XVI.</td>
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<td>1932</td>
<td>BPBM-MO 198709</td>
<td>Naval Station, Hospital Pt. Catalogue XIV.</td>
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<td>1932</td>
<td>BPBM-MO 198710</td>
<td>Railroad Wharf. Catalogue XIV.</td>
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<td>1932</td>
<td>BPBM-MO 198711</td>
<td>Watertown. Catalogue XIV.</td>
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<td>1932</td>
<td>BPBM-MO 198712</td>
<td>Pearl Harbor channel, at Watertown. Catalogue XIV.</td>
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<td>1936</td>
<td>BPBM-MO 233919</td>
<td>Reefs at Fort Kamehamea. Catalogue XVI.</td>
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*Cymatium nicobaricum* (Röding, 1798)

<table>
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<td>1932</td>
<td>BPBM-MO 199158</td>
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<td>1961</td>
<td>BPBM-MO 218320</td>
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<td>BPBM-MO 2040859</td>
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*Cymatium pileare* Linnaeus, 1758

Pearl Harbor entrance Channel, off Fort Kamehamea.

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<th>Year</th>
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<td>BPBM-MO 198726</td>
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*Cymatium rubeculum* (Linnaeus, 1758)

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Catalogue XVII.

1936 Spec - BPBM-MO 70 Reefs at Fort Kamahamea.

1973 Ref - Evans et al., 1974

**Genus: Distorsio**

*Distorsio sp.*

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**Genus: Gyrineum**

*Gyrineum pusillum* Broderip

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<td>1961</td>
<td>BPBM-MO 218370</td>
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**Genus: Triton**

*Triton tuberosus* Lamarck

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**Family:** CYPRAEIDAE  
**Genus:** Cypraea  
**Cypraea sp.**  
- 1934 Spec - BPBM-MO 215701 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215704 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215705 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215706 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215707 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215708 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215709 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215710 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215711 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215712 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215713 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215714 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215715 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215716 Dredging. Catalogue XV.  
- 1934 Spec - BPBM-MO 215717 Dredging. Catalogue XV.  

**Cypraea alisonae**  
- Burgess, 1983  
- 1982 Spec - BPBM-MO 247888 Fort Kamehameha. Catalogue XVII.  

**Cypraea arabica**  
- (Linnaeus, 1758)  

**Cypraea caputerperis**  
- Linnaeus, 1758 Hawaiian name(s): leho kupa; leho maoli.  
- 1932 Spec - BPBM-MO 196399 Fort Kamehameha. Catalogue XIV.  
- 1932 Spec - BPBM-MO 197104 Fort Kamehameha, reef off. Catalogue XIV.  
- 1932 Spec - BPBM-MO 197112 End of Waipio Peninsula. Catalogue XIV.  
- 1939 Spec - BPBM-MO 246606 Pearl City T.H.. Catalogue XVII.  
- 1957 Spec - BPBM-MO 246810 Fort Kaahamahua (Fort Kamehameha). Catalogue XVII.  

**Cypraea carneola**  
- Linnaeus, 1758 Indigenous. Hawaiian name(s): leho pauhu.  
- 1932 Spec - BPBM-MO 197216 Pearl Harbor channel. Catalogue XIV.  

**Cypraea chilenensis**  
- Gray, 1825  
- 1996 Legacy Project (Coles et al., 1997)  

**Cypraea chinensis**  
- Gmelin, 1791  
- 1932 Spec - BPBM-MO 198042 Pearl Harbor channel, Watertown. Catalogue XIV.  

**Cypraea clandestina**  
- Linnaeus, 1767 Introduced.  

**Cypraea cribaria**  
- Linnaeus, 1758 Introduced.  

**Cypraea cylindrica**  
- Born Introduced.  

**Cypraea depressa**  
- Grey, 1825 Introduced.  

**Cypraea fimbriata**  
- Gmelin, 1791  
- 1932 Spec - BPBM-MO 197303 Fort Kamehameha; along edge of channel. Catalogue XIV.  
- 1936 Spec - BPBM-MO 231689 Reefs at Fort Kamehameha. Catalogue XVI.  
- 1957 Spec - BPBM-MO 246764 Fort Kamehameha. Catalogue XVII.  

**Cypraea gastkoni**  
- Reeves, 1846  
- Unknown Spec - BPBM-MO 247840 Pearl City. Catalogue XVII.  

**Cypraea gasparidi**  
- Biraghi & Nicolay, 1993 Introduced.  
<table>
<thead>
<tr>
<th>Species</th>
<th>Linnaeus, Year</th>
<th>Indigenous</th>
<th>Common Name(s)</th>
<th>Hawaiian Name(s)</th>
<th>Description</th>
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<td>Cyprea helvola</td>
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<td>1958</td>
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<td></td>
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<tr>
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<td>Cyprea isabella</td>
<td>1957</td>
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<td>Linnaeus, 1758 - Indigenous. Common name(s): Isabella Cowry; Hawaiian name(s): <code>ula; puleholeho; puleho; puleho holei; puleho kani</code>o; puleholeho; puleho palaoa; puleho leho <code>uala; puleholeho; leho kule</code>e lima; momi ke<code>oke</code>o.</td>
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<td>1932</td>
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<td></td>
<td></td>
<td>Reef at Fort Kamehameha; along edge of channel. Catalogue XIV.</td>
</tr>
<tr>
<td></td>
<td>1936</td>
<td></td>
<td></td>
<td></td>
<td>Reef at Fort Kamehameha. Catalogue XVI.</td>
</tr>
<tr>
<td></td>
<td>1957</td>
<td></td>
<td></td>
<td></td>
<td>Fort Kamehameha. Catalogue XVII.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off Pearl Harbor.</td>
</tr>
<tr>
<td>Cyprea maculifera</td>
<td>1957</td>
<td></td>
<td></td>
<td></td>
<td>Shilder, 1932 - Hawaiian name(s): kuoho; leho; leho kolea.</td>
</tr>
<tr>
<td></td>
<td>1932</td>
<td></td>
<td></td>
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<td>Fort Kaahamahana (Fort Kamehameha). Catalogue XVII.</td>
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<tr>
<td>Cyprea moneta</td>
<td>1960</td>
<td></td>
<td></td>
<td></td>
<td>Linnaeus, 1758 - Hawaiian name(s): leho palaoa; leho puna; leho `uala; lehoholeho.</td>
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<td></td>
<td></td>
<td></td>
<td>At Naval Station. Catalogue XVI.</td>
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<td></td>
<td>Catalogue XVII.</td>
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<td></td>
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<td></td>
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<td></td>
<td>Fort Kamehameha, about 150 ft. S.E. of the Ft. Kam. Wharf. Catalogue XIV.</td>
</tr>
<tr>
<td>Cyprea poraria</td>
<td>1950</td>
<td></td>
<td></td>
<td></td>
<td>Linnaeus, 1758 - Introduced.</td>
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<td></td>
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<tr>
<td>Cyprea reticulata</td>
<td>1916</td>
<td></td>
<td></td>
<td></td>
<td>Martyn - Reef Waikiki of entrance to Pearl Harbor.</td>
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<td></td>
<td>1932</td>
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<td>Reef off Fort Kamehameha. Catalogue XIV.</td>
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<tr>
<td>Cyprea scurra</td>
<td>1932</td>
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<td></td>
<td>Gmelin, 1791 - Kehi Point. Catalogue XIV.</td>
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<tr>
<td>Cyprea semiplota</td>
<td>1926</td>
<td></td>
<td></td>
<td></td>
<td>Mighels, 1845 - Hawaiian name(s): puleholeho.</td>
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<td></td>
<td>1926</td>
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<td></td>
<td></td>
<td>Fort Kamehameha reef. Catalogue XVI.</td>
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<td>1932</td>
<td></td>
<td></td>
<td></td>
<td>Fort Kamehameha reef. Catalogue XVI.</td>
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<tr>
<td></td>
<td>1932</td>
<td></td>
<td></td>
<td></td>
<td>Fort Kamehameha. Catalogue XIV.</td>
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<tr>
<td>Cyprea shilderorum</td>
<td>1932</td>
<td></td>
<td></td>
<td></td>
<td>Linnaeus, 1758 - Pearl Harbor Channel; Watertown. Catalogue XIV.</td>
</tr>
<tr>
<td>Cyprea staphylaea</td>
<td>1939</td>
<td></td>
<td></td>
<td></td>
<td>Linnaeus, 1758 - Pearl City T.H.. Catalogue XVII.</td>
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<tr>
<td></td>
<td>1939</td>
<td></td>
<td></td>
<td></td>
<td>Pearl City T.H.. Catalogue XVII.</td>
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<tr>
<td></td>
<td>1950</td>
<td></td>
<td></td>
<td></td>
<td>Off Pearl Harbor.</td>
</tr>
<tr>
<td>Cyprea sulcidentata</td>
<td>1932</td>
<td></td>
<td></td>
<td></td>
<td>Gray, 1824 - Fort Kamehameha, reef off. Catalogue XIV.</td>
</tr>
<tr>
<td>Cyprea talpa</td>
<td>1928</td>
<td></td>
<td></td>
<td></td>
<td>Linnaeus, 1758 - Reef off Fort Kamehameha, under loose coral blocks. Catalogue XVII.</td>
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<tr>
<td></td>
<td>1932</td>
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<td></td>
<td>Linnaeus, 1758 - Reef off Fort Kamehameha. Catalogue XIV.</td>
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<tr>
<td></td>
<td>1932</td>
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<td></td>
<td>Pearl Harbor channel. Catalogue XIV.</td>
</tr>
<tr>
<td></td>
<td>1936</td>
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<td></td>
<td></td>
<td>Reef at Fort Kamehameha.</td>
</tr>
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</table>
### Legacy Project - Species Report (Cont.)

**Cypraea teres** *Gmelin, 1791*
- 1932 Spec - BPBM-MO 197286 Fort Kamehameha; along edge of channel. Catalogue XIV.
- 1932 Spec - BPBM-MO 198043 Pearl Harbor channel, Watertown. Catalogue XIV.
- 1936 Spec - BPBM-MO 68 Reef at Fort Kamehameha.
- 1954 Spec - BPBM-MO 246850 Fort Kamehameha reef. Catalogue XVII.
- 1957 Spec - BPBM-MO 246865 Fort Kaahamaha (Fort Kamehameha). Catalogue XVII.

**Cypraea tesselata** *Swainson, 1822*
- 1932 Spec - BPBM-MO 197197 Keahi Point. Catalogue XIV.
- 1932 Spec - BPBM-MO 198047 Pearl Harbor channel. Catalogue XIV.

**Family: DIASTOMIDAE**

**Genus: Alaba**
- *Alaba goniocitha* *(A. Adams, 1860)*

**Genus: Alabina**
- *Alabina pearlensis* *Dall* Unknown Spec - BPBM-MO 65635 Catalogue V.

**Genus: Obtortio**
- *Obtortio fulva* *Watson*
- 1973 Ref - Evans et al., 1974

**Family: EULIMIDAE**

**Genus: Balcis**
- *Balcis sp.* Indigenous.
  - 1976 Ref - Cooke et al., 1980
  - 1996 Legacy Project (Coles et al., 1997)
  - 2008 This Project

*Balcis thanumisti* *Pilsbry, 1917*
- 1936 Spec - BPBM-MO 230613 Reef at Fort Kamehameha. Catalogue XVI.

**Genus: Leiostraca**
- *Leiostraca sp.*
  - 1973 Ref - Evans et al., 1974

**Family: HIPPONICIDAE**

**Genus: Amalthea**
- *Amalthea sp.* *(?W.H.)* Whitney's place.
  - 1930 Spec - BPBM-MO 195332 Pearl Locks Peninsula, makai face of little pier just mauka of Dr. Whitney's place.
  - 1932 Spec - BPBM-MO 200163 Catalogue XIV.
  - 1932 Spec - BPBM-MO 200171 Waipio Peninsula, end. Catalogue XIV.
- *Amalthea barbatus* Catalogue XIV.

**Genus: Antisabia**
- *Antisabia foliacea* Unknown Spec - BPBM-MO 209902 Fort Kamehameha Army Housing (S.C.) 910509AS. Catalogue XIV.

**Genus: Hipponix**
- *Hipponix sp.*
  - 1973 Ref - Evans et al., 1974
  - 1996 Legacy Project (Coles et al., 1997)

*Hipponix (Cochlear) imbricatus* *Gould, 1846* Indigenous. Common name(s): Hoof Shell.
- Unknown Spec - BPBM-MO 64817 Catalogue V.

*Hipponix (Pilosabia) pilosus* *(Deshayes, 1832)* Indigenous.
- 2008 This Project

*Hipponix australis*
**Legacy Project - Species Report (Cont.)**

<table>
<thead>
<tr>
<th>Genus</th>
<th>Common name(s)</th>
<th>Hawaiian name(s)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hipponix foliaceus</em> Quoy &amp; Gaimard, 1835</td>
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<tr>
<td>1930 Spec - BPBM-MO 196836</td>
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<td>Peninsular. Catalogue XIV.</td>
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<tr>
<td><em>Hipponix grayanus</em></td>
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<td>1961 Spec - BPBM-MO 217892</td>
<td>Off Fort Kamehameha.</td>
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<td>Catalogue XV.</td>
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<tr>
<td><em>Hipponix imbricatus</em> Gould, 1846</td>
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<tr>
<td>Unknown Spec - BPBM-MO 204603</td>
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<td>Catalogue XIV.</td>
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<tr>
<td>1927 Spec - BPBM-MO 63956</td>
<td>Ford Island.</td>
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<td>Catalogue V.</td>
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<tr>
<td>1949 Spec - BPBM-MO 231301</td>
<td>Fort Kamehameha.</td>
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<td>Catalogue XVI.</td>
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<td>1996 Legacy Project (Coles et al., 1997)</td>
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<tr>
<td><em>Hipponix pilosus</em> (Deshayes, 1832)</td>
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<tr>
<td>1979 Ref - AECOS, 1979</td>
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<tr>
<td>1996 Legacy Project (Coles et al., 1997)</td>
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<tr>
<td><strong>Family: LITTORINIDAE</strong></td>
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<tr>
<td><strong>Genus: Littoraria</strong></td>
<td>Common name(s): Periwinkle; Hawaiian name(s): pupu kola.</td>
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<td></td>
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<tr>
<td><em>Littoraria coccinea</em> (Gmelin, 1791)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1930 Spec - BPBM-MO 196989</td>
<td>Peninsular, Pearl Lochs, N. of Dr. Whitney's place.</td>
<td></td>
<td>Catalogue XIV.</td>
</tr>
<tr>
<td><strong>Littoraria intermedia</strong></td>
<td></td>
<td></td>
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<tr>
<td>1930 Spec - BPBM-MO 196735</td>
<td>S.E. coast of peninsular Pearl Lochs.</td>
<td></td>
<td>Catalogue XIV.</td>
</tr>
<tr>
<td>1930 Spec - BPBM-MO 196745</td>
<td>Pearl Lochs.</td>
<td></td>
<td>Catalogue XIV.</td>
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<tr>
<td><strong>Littoraria pictata</strong> (Wood, 1828)</td>
<td>Indigenous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996 Legacy Project (Coles et al., 1997)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Littoraria scabra</strong> (Linnaeus, 1758) Indigenous</td>
<td>Common name(s): Feather Duster Worm; Hawaiian name(s): kukae kola; pupu kola; kolealea; pipipi kola.</td>
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<tr>
<td>Unknown Spec - BPBM-MO 204655</td>
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<td>Catalogue XIV.</td>
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<td>Unknown Spec - BPBM-MO 63605</td>
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<td>Catalogue V.</td>
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<td>Unknown Spec - BPBM-MO 63606</td>
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<td>Catalogue V.</td>
</tr>
<tr>
<td>Unknown Spec - BPBM-MO 64830</td>
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<td>Catalogue V.</td>
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<td>1915 Spec - BPBM-MO 228535</td>
<td>Ford Island.</td>
<td></td>
<td>Catalogue XVI.</td>
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<tr>
<td>1923 Spec - BPBM-MO 228540</td>
<td>Peninsular; sea wall at Dowsett's Wharf.</td>
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<td>Catalogue XVI.</td>
</tr>
<tr>
<td>1923 Spec - BPBM-MO 228541</td>
<td>Peninsular; along shore near Railroad Wharf.</td>
<td></td>
<td>Catalogue XVI.</td>
</tr>
<tr>
<td>1930 Spec - BPBM-MO 196741</td>
<td>Peninsular Pearl Lochs, North of Dr. Whitney's place.</td>
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<td><strong>Family: MODULIDAE</strong></td>
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<tr>
<td><strong>Genus: Modulus</strong></td>
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<td></td>
<td></td>
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<tr>
<td><em>Modulus sp.</em></td>
<td></td>
<td></td>
<td>Dredge. Catalogue XIV.</td>
</tr>
<tr>
<td>1934 Spec - BPBM-MO 205575</td>
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<tr>
<td><strong>Modulus tectum</strong> Gmelin</td>
<td>Hawaiian name(s): pupu.</td>
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<tr>
<td>1932 Spec - BPBM-MO 199280</td>
<td>Reef off Fort Kamehameha.</td>
<td></td>
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<tr>
<td><strong>Family: NATICIDAE</strong></td>
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<tr>
<td><strong>Genus: Natica</strong></td>
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<td></td>
<td></td>
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<tr>
<td><em>Natica sp.</em></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1961 Spec - BPBM-MO 218130</td>
<td>Off Fort Kamehameha.</td>
<td></td>
<td>Catalogue XV.</td>
</tr>
</tbody>
</table>
### Legacy Project - Species Report (Cont.)

1973  Ref - Evans et al., 1974

**Natica gualteriana** Recluz, 1844  Hawaiian name(s): pupu kui; kio noho one.

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Catalogue</th>
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<td>Spec - BPBM-MO 64034</td>
<td>Catalogue V.</td>
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<td>1932</td>
<td>Spec - BPBM-MO 199329</td>
<td>Reef off Fort Kamehameha. Catalogue XIV.</td>
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<td>1932</td>
<td>Spec - BPBM-MO 199336</td>
<td>Entrance Channel. Catalogue XIV.</td>
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<td>1932</td>
<td>Spec - BPBM-MO 199337</td>
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</tr>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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**Natica tessellata** 1961  Spec - BPBM-MO 218143  Off Fort Kamehameha. Catalogue XV.

**Genus: Polinices**

**Polinices sp.**

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<tr>
<td>1934</td>
<td>Spec - BPBM-MO 205566</td>
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<td>1961</td>
<td>Spec - BPBM-MO 218188</td>
<td>Off Fort Kamehameha. Catalogue XV.</td>
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<tr>
<td>1962</td>
<td>Spec - BPBM-MO 218195</td>
<td>Just Ewa of restricted area. Catalogue XV.</td>
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**Family: RISSOELLIDAE**

**Genus: Rissoella**

**Rissoella sp.** 1973  Ref - Evans et al., 1974

**Family: RISSOIDAE**

**Genus: Cithna**

**Cithna sp.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Catalogue</th>
</tr>
</thead>
</table>

**Genus: Merelina**

**Merelina sp.** 1973  Ref - Evans et al., 1974

**Genus: Parashiela**

**Parashiela beetsi** Ladd, 1966  Off Pearl Harbor.

**Genus: Pusillina**

**Pusillina marmorata** Ponder, 1985  Indigenous.

2008  This Project

**Genus: Rissoina**

**Rissoina ambigu** (Gould, 1849)

<table>
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<th>Year</th>
<th>Location</th>
<th>Catalogue</th>
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<tbody>
<tr>
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<td>Ref - Evans et al., 1974</td>
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**Rissoina cerithiformis** Tryon, 1887  Indigenous.

2008  This Project

**Rissoina miltizona** Tomlin, 1915

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<th>Year</th>
<th>Location</th>
<th>Catalogue</th>
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<tr>
<td>1996</td>
<td>Legacy Project (Coles et al., 1997)</td>
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**Rissoina rhysys** Dalí

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**Rissoina turricula** Pease, 1861

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<th>Catalogue</th>
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<tr>
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<tr>
<td>1996</td>
<td>Legacy Project (Coles et al., 1997)</td>
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**Genus: Schwartzziella**

**Schwartzziella gracilis** (Pease, 1861)  Recorded as Rissoina gracilis.

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<th>Year</th>
<th>Location</th>
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<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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**Genus: Zebina**

**Zebina tridentata** (Michaud, 1830)

<table>
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<tr>
<td>1996</td>
<td>Legacy Project (Coles et al., 1997)</td>
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</table>

### Family: STROMBIDAE

#### Genus: Strombus

- **Strombus dentatus** (Linnaeus, 1758)

- **Strombus helli** Kiener, 1843

- **Strombus maculatus** Sowerby, 1842 Hawaiian name(s): mamiaki; pupu mamiaki; pu iholeho.
  - 1932 Spec - BPBM-MO 199101 Reef off Fort Kamehameha. Catalogue XIV.

### Family: TONNIDAE

#### Genus: Tonna

- **Tonna perdix** Linnaeus, 1758 Hawaiian name(s): pu`oni`oni`o.
  - 1936 Spec - BPBM-MO 240897 Reef off Fort Kamehameha. Catalogue XVII.

### Family: TRIPHORIDAE

#### Genus: Triforis

- **Triforis flammulata** Pease
  - Unknown Spec - BPBM-MO 62886 Ford Island. Catalogue V.

#### Genus: Triphora

- **Triphora (Triphoridae)**
  - 1932 Spec - BPBM-MO 198048 Pearl Harbor entrance channel. Catalogue XIV.
  - 1973 Ref - Evans et al., 1974
  - 1996 Legacy Project (Coles et al., 1997)

#### Genus: Viriola

- **Viriola incisa** Pease, 1861 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.
  - 1936 Spec - BPBM-MO 230149

### Family: VERMETIDAE

#### Unidentified Vermetidae

- Unknown Spec - BPBM-MO 229146 Catalogue XVI.
- Unknown Spec - BPBM-MO 51
- Unknown Spec - BPBM-MO 65695 Catalogue V.
- 1934 Spec - BPBM-MO 205562 Dredge. Catalogue XIV.
- 1978 Ref - Grovhoul, 1979
- 2008 This Project

#### Genus: Dendropoma

- **Dendropoma sp.**
  - 1972 Ref - Long, 1974
  - 1996 Legacy Project (Coles et al., 1997)

- **Dendropoma platypus** Morch, 1861
  - 1973 Ref - Evans et al., 1974
  - 1987 Ref - Brewer & Assoc., 1987

- **Dendropoma psarocephala** Hadfield & Kay, 1972
  - 1975 Ref - Grovhoul, 1976

- **Dendropoma psarocephala?** Hadfield & Kay, 1972
  - 1973 Ref - Evans et al., 1974

#### Genus: Eualetes

- **Eualetes tulipa** (Chenu, 1843) Introduced. Common name(s): Noble Vermid.
  - 1973 Ref - Evans et al., 1974 Recorded as Vermetus ali.
Legacy Project - Species Report (Cont.)

1993 Ref - Brock, 1994 Recorded as Vermetus ali.  
1994 Ref - Brock, 1995 Recorded as Vermetus ali.  
1996 Legacy Project (Coles et al., 1997)  
2007 Ref - Brock, 2007 Recorded as Vermetus ali.  
2007 This Project  
2008 This Project  

Genus: *Petalonchus*  
2007 This Project  
2008 This Project  

Genus: *Serpulorbis*  
2007 This Project  
2008 This Project  

Genus: *Vermetus* Hawaiian name(s): pohokupele; kauno‘a.  
*Vermetus* sp.  
Unknown Spec - BPBM-MO 63578 Catalogue V.  
1973 Ref - Evans et al., 1974  

Family: VITRINELLIDAE  
Genus: *Cyclostremicus*  
*Cyclostremicus sp. A*  
1973 Ref - Evans et al., 1974 Off Pearl Harbor. Recorded as Cyclostremicus sp. A.  

*Cyclostremicus sp. B*  
1973 Ref - Evans et al., 1974 Off Pearl Harbor. Recorded as Cyclostremicus sp. B.  

*Cyclostremicus sp. C*  
1973 Ref - Evans et al., 1974 Off Pearl Harbor. Recorded as Cyclostremicus sp. C.  

*Cyclostremicus sp. D*  
1973 Ref - Evans et al., 1974 Off Pearl Harbor. Recorded as Cyclostremicus sp. D.  

*Cyclostremicus emeryi* Ladd, 1966  

Family: XENOPHORIDAE  
Genus: *Xenophora*  
*Xenophora pallida* Spec - BPBM-MO 217922 Off Fort Kamehameha. Catalogue XV.  
1961  

Order: NEOGASTROPODA  
Family: BUCINIDAE  
Genus: *Cantharus*  
*Cantharus farinosus* (Gould, 1850)  
1973 Ref - Evans et al., 1974  

Genus: *Colubraria*  
*Colubraria obscura* Reeve, 1844 Channel. Catalogue XVII.  
Unknown Spec - BPBM-MO 240920  

Genus: *Engina*  
*Engina sp.*  
1973 Ref - Evans et al., 1974  

Genus: *Prodotia*  
*Prodotia ignea* Gmelin, 1791  
Unknown Spec - BPBM-MO 235895 Catalogue XVI.  
Unknown Spec - BPBM-MO 65702 Catalogue V.  
1928 Spec - BPBM-MO 240939 Reef off Fort Kamehameha. Catalogue XVII.  
1932 Spec - BPBM-MO 199738 Fort Kamehameha, reef off. Catalogue XIV.
### Legacy Project - Species Report (Cont.)

**Prodotia istomus**
- 1932 Spec - BPBM-MO 199731 Fort Kamehameha, reef off. Catalogue XIV.

**Family: COLUMBELLIDAE**

**Genus: Anachis**
- Anachis miser (Sowerby, 1844)
  - 1973 Ref - Evans et al., 1974 Recorded as A. zebra.

**Genus: Columbella**
- Sowerby Hawaiian name(s): pupu Niʻihau.
  - Columbella varians 1932 Spec - BPBM-MO 199827 Fort Kamehameha, reef off. Catalogue XIV.

**Genus: Euplica**
- Euplica varians 1996 Legacy Project (Coles et al., 1997)

**Genus: Mitrella**
- Mitrella margarita Reeve, 1859
  - 1961 Spec - BPBM-MO 221163 Off Fort Kamehameha?. Catalogue XV.

**Genus: Seminella**
- Seminella sp. 1996 Legacy Project (Coles et al., 1997)

**Family: CONIDAE**

**Genus: Conus**
- Conus sp. 1961 Spec - BPBM-MO 220384 Off Fort Kamehameha. Catalogue XV.
- Conus abbreviatus Reeve, 1843
  - 1932 Spec - BPBM-MO 199015 Fort Kamehameha. Catalogue XIV.

**Genus: Conus acutangulus**
- Lamarck, 1810

**Genus: Conus catus**
- Hwass, 1792
  - 1932 Spec - BPBM-MO 198911 Reef off Fort Kamehameha. Catalogue XIV.
  - 1936 Spec - BPBM-MO 238941 Fort Kamehameha. Catalogue XVI.

**Genus: Conus clavus**
- Linnaeus 1929 Spec - BPBM-MO 63 Brought up by dredger operations in entrance to Pearl Harbor.

**Genus: Conus dactylusus**
- Kiener 1929 Spec - BPBM-MO 64 Brought up by dredger operations in entrance to Pearl Harbor.

**Genus: Conus ebraeus**
- Linnaeus, 1758 Hawaiian name(s): ohana o ka pupuʻala; keʻokeʻo;
  - 1932 Spec - BPBM-MO 199614 Fort Kamehameha. Catalogue XIV.

**Genus: Conus eugrammatus**
- Bartsch and Rehder, 1943 Indigenous.
  - 2008 This Project

**Genus: Conus flavidus**
- Lamarck, 1810
  - 1932 Spec - BPBM-MO 199052 Fort Kamehameha. Catalogue XIV.

**Genus: Conus lividus**
- Hwass, 1792
  - 1932 Spec - BPBM-MO 198981 Fort Kamehameha. Catalogue XIV.

**Genus: Conus marmoreus**
- Linnaeus, 1758 Pearl Harbor channel; entrance, near seaward end. Catalogue XIV.
  - 1932 Spec - BPBM-MO 200269
  - 1936 Spec - BPBM-MO 2
  - 1936 Spec - BPBM-MO 239251

**Genus: Conus miles**
- Linnaeus, 1758 Indigenous. Common name(s): Soldier Cone.
  - 1932 Spec - BPBM-MO 199134 Fort Kamehameha, near outer edge of the reef. Catalogue XIV.
  - 1932 Spec - BPBM-MO 199135 Reef off Fort Kamehameha. Catalogue XIV.
  - 1936 Spec - BPBM-MO 2 Off Fort Kamehameha, on the reef.
  - 1936 Spec - BPBM-MO 239251 Off Fort Kamehameha, on the reef. Catalogue XVI.
Legacy Project - Species Report (Cont.)

**Conus nussatella** Linnaeus, 1758
- 1927 Spec - BPBM-MO 241003 Off Fort Kamehameha, under loose, dead coral. Catalogue XVII.
- 1936 Spec - BPBM-MO 239257 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.
- 1936 Spec - BPBM-MO 62 Reef at Fort Kamehameha.

**Conus penncaccus**
- Unknown Spec - BPBM-MO 239602 Catalogue XVI.
- 1932 Spec - BPBM-MO 199642 Watertown. Catalogue XIV.
- 1932 Spec - BPBM-MO 200257 Fort Kamehameha, reef. Catalogue XIV.

**Conus quercinus** Lightfoot, 1786
- 1932 Spec - BPBM-MO 199691 Pearl Harbor Channel; Watertown. Catalogue XIV.

**Conus rattus** Hwass, 1792
- 1932 Spec - BPBM-MO 199084 Fort Kamehameha. Catalogue XIV.

**Conus sponsalis** Hass in Brugière, 1792
- 1932 Spec - BPBM-MO 199201 Reef off Fort Kamehameha. Catalogue XIV.

**Conus textile** Linnaeus, 1758
- 1915 Spec - BPBM-MO 239129 Reef Waikiki of entrance to Pearl Harbor, under a rock in five feet of water.
- 1936 Spec - BPBM-MO 65 Fort Kamehameha Reef.

**Conus vexillum** Gmelin, 1791
- 1932 Spec - BPBM-MO 199346 Reef off Fort Kamehameha. Catalogue XIV.
- 1932 Spec - BPBM-MO 199347 Fort Kamehameha. Catalogue XIV.

**Conus vitulinus** Hwass, 1792
- 1932 Spec - BPBM-MO 199673 Fort Kamehameha, reef off. Catalogue XIV.
- 1932 Spec - BPBM-MO 199674 Fort Kamehameha. Catalogue XIV.
- 1936 Spec - BPBM-MO 239424 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.
- 1936 Spec - BPBM-MO 52 Reef at Fort Kamehameha.

**Family: CORALLIOPHILOIDAE**

**Genus: Quoyula**

**Quoyula madreporarum** Sowerby, 1834
- 1932 Spec - BPBM-MO 198765 Reef off Fort Kamehameha. Catalogue XIV.

**Family: FASCIOLARIIDAE**

**Genus: Fusinus**

**Fusinus sp.**
- 1934 Spec - BPBM-MO 205567 Dredge. Catalogue XIV.

**Fusinus sandvicensis** Saverly
- 1934 Spec - BPBM-MO 215733 West Lock, Dredging. Catalogue XV.
- 1940 Spec - BPBM-MO 249147 Dredging. Catalogue XVII.

**Genus: Fusolatirus**

**Fusolatirus kuroseanus?**
- 1961 Spec - BPBM-MO 222218 Off Fort Kamehameha. Catalogue XV.

**Genus: Peristernia**

**Peristernia chlorostoma** (Sowerby, 1825) Hawaiian name(s): kolealea.
- Unknown Spec - BPBM-MO 204253 Catalogue XIV.
- Unknown Spec - BPBM-MO 240953 Catalogue XVII.
- 1923 Spec - BPBM-MO 237440 At Railroad Wharf. Catalogue XVI.
- 1923 Spec - BPBM-MO 237442 Near inside entrance to Pearl Harbor. Catalogue XVI.
- 1924 Spec - BPBM-MO 237447 At Naval Station. Catalogue XVI.
- 1932 Spec - BPBM-MO 198883 Fort Kamehameha. Catalogue XIV.
Legacy Project - Species Report (Cont.)

1932 Spec - BPBM-MO 198891 Peninsula; Railroad Wharf. Catalogue XIV.
1932 Spec - BPBM-MO 198892 End of Waipio Peninsula. Catalogue XIV.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Family: MAGILIDAE
Genus: Coralliophila
Coralliophila d'orbignyana Petit
1932 Spec - BPBM-MO 198738 Reef off Fort Kamehameha. Catalogue XIV.
1936 Spec - BPBM-MO 235759 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.

Coralliophila violacea Kiener, 1836
1928 Spec - BPBM-MO 240915 Reef off Fort Kamehameha. Catalogue XVII.
1932 Spec - BPBM-MO 198753 Reef off Fort Kamehameha. Catalogue XIV.

Unidentified Coralliophila erosa (Röding, 1798)
1932 Spec - BPBM-MO 198732 Reef off Fort Kamehameha. Catalogue XIV.

Family: MARGINELLIDAE
Genus: Cystiscus
Cystiscus sp.
1973 Ref - Evans et al., 1974

Genus: Granula
Granula sandwicensis (Pease, 1860) Hawaiian name(s): pupu `aha`aha.
1973 Ref - Evans et al., 1974 Recorded as Kogomea sandwicensis (Pease).

Genus: Marginella
Marginella sp. a-1
Unknown Spec - BPBM-MO 61271 Catalogue V.

Family: MITRIDAE
Genus: Cancilla
Cancilla granatina Lamarck, 1811
1961 Spec - BPBM-MO 219301 Off Fort Kamehameha. Catalogue XV.
1961 Spec - BPBM-MO 219302 Off Fort Kamehameha. Catalogue XV.
1961 Spec - BPBM-MO 219303 Off Fort Kamehameha. Catalogue XV.

Genus: Imbricaria
Imbricaria punctata Swainson, 1821
1961 Spec - BPBM-MO 219471 Off Fort Kamehameha. Catalogue XV.

Genus: Mitra
Mitra sp.
2008 This Project

Mitra assimilis Reeve, 1868
1932 Spec - BPBM-MO 199442 Fort Kamehameha. Catalogue XIV.

Mitra brunnea Pease, 1861
1915 Spec - BPBM-MO 6 Fort Kamahameha.

Mitra litterata Lamarck, 1811
1936 Spec - BPBM-MO 238093 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.

Mitra mitra Linnaeus, 1758

Mitra pellisserpentis Reeve, 1844
1932 Spec - BPBM-MO 199367 Fort Kamehameha. Catalogue XIV.
1932 Spec - BPBM-MO 199470 Fort Kamehameha, reef off. Catalogue XIV.
1936 Spec - BPBM-MO 238107 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.

Mitra ticaonica Reeve, 1844
1932 Spec - BPBM-MO 199503 Fort Kamehameha, reef off. Catalogue XIV.
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<thead>
<tr>
<th>Genus: Neocancilla</th>
<th>Neocancilla walkiakensis</th>
<th>Pilsbry, 1921</th>
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<tr>
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<td>1961 Spec - BPBM-MO 219594</td>
<td>Off Kamehameha. Catalogue XV.</td>
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<thead>
<tr>
<th>Genus: Scabricola</th>
<th>Scabricola newcombii</th>
<th>Pease, 1869</th>
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<tr>
<th>Genus: Subcancilla</th>
<th>Subcancilla flamma</th>
<th>(Quoy &amp; Gaimard, 1833)</th>
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<td>1982 Spec - BPBM-MO 242714</td>
<td>Entrance to west. Catalogue XVII.</td>
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<thead>
<tr>
<th>Genus: Vexillum</th>
<th>Vexillum (Pusia) lautum</th>
<th>(Reeve, 1845)</th>
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<tr>
<td></td>
<td>1932 Spec - BPBM-MO 199456</td>
<td>Fort Kamehameha, reef off. Catalogue XIV.</td>
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<tr>
<th>Genus: Vexillum alveolus</th>
<th>Reeve, 1845</th>
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<td>1938 Spec - BPBM-MO 12</td>
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<th>Genus: Vexillum bellum</th>
<th>Pease, 1860</th>
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<tr>
<th>Genus: Vexillum filistriatum</th>
<th>(Sowerby, 1874)</th>
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<th>Genus: Vexillum pacificum</th>
<th>Reeve</th>
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**Family: MURICIDAE**

<table>
<thead>
<tr>
<th>Genus: Aspella</th>
<th>Aspella producta</th>
<th>(Pease, 1861)</th>
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<tr>
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<td>1932 Spec - BPBM-MO 200760</td>
<td>Fort Kamehameha, reef off. Catalogue XIV.</td>
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<td>1973 Ref - Evans et al., 1974</td>
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<th>Genus: Chicoreus</th>
<th>Chicoreus insularum</th>
<th>(Pilsbry, 1921)</th>
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<tr>
<th>Genus: Drupella</th>
<th>Drupella elata</th>
<th>Blainville, 1832</th>
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<td>1932 Spec - BPBM-MO 198217</td>
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<th>Genus: Morula</th>
<th>Morula sp.</th>
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<td>1932 Spec - BPBM-MO 198193</td>
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<td>1932 Spec - BPBM-MO 198194</td>
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<td>1932 Spec - BPBM-MO 198196</td>
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<td>1932 Spec - BPBM-MO 198197</td>
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<th>Genus: Morula dermosa</th>
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<td>1932 Spec - BPBM-MO 198253</td>
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<td>1932 Spec - BPBM-MO 198254</td>
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<td>1996 Legacy Project (Coles et al., 1997)</td>
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<th>Genus: Morula foliacea</th>
<th>Conrad</th>
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<tr>
<td>1932 Spec - BPBM-MO 198180</td>
<td>Reef off Fort Kamehameha. Catalogue XIV.</td>
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<td>1936 Spec - BPBM-MO 234727</td>
<td>Reefs at Fort Kamehameha. Catalogue XVI.</td>
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<tr>
<th>Genus: Morula granulata</th>
<th>Duclos, 1832</th>
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<tbody>
<tr>
<td>Unknown Spec - BPBM-MO 204188</td>
<td>Hawaiian name(s): pupu maka‘awa; maka‘awa. Fort Kamehameha. Catalogue XIV. May be M. uva.</td>
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Legacy Project - Species Report (Cont.)

<table>
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<tr>
<th>Genus</th>
<th>Specimen Code</th>
<th>Location / Notes</th>
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<tbody>
<tr>
<td>Unknown</td>
<td>Spec-BPBM-MO 62001</td>
<td>Catalogue V.</td>
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<td>1927</td>
<td>Spec-BPBM-MO 234751</td>
<td>Naval Station. Catalogue XVI.</td>
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<td>1927</td>
<td>Spec - BPBM-MO 74</td>
<td>Naval Station.</td>
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<td>1932</td>
<td>Spec-BPBM-MO 198242</td>
<td>Fort Kamehameha. Catalogue XIV. May be M. uva.</td>
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<tr>
<td>1932</td>
<td>Spec-BPBM-MO 198243</td>
<td>Fort Kamehameha. Catalogue XIV. May be M. uva.</td>
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<tr>
<td>1932</td>
<td>Spec - BPBM-MO 198300</td>
<td>End of Waipio Peninsula. Catalogue XIV.</td>
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<tr>
<td>1932</td>
<td>Spec - BPBM-MO 198301</td>
<td>End of Waipio Peninsula. Catalogue XIV.</td>
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<tr>
<td>Morula mitosa?</td>
<td>Spec - BPBM-MO 73</td>
<td>Dall Naval Station.</td>
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<tr>
<td>Morula spinosa</td>
<td>Spec - BPBM-MO 198280</td>
<td>H. and A. Adams, 1853 Fort Kamehameha. Catalogue XIV.</td>
</tr>
<tr>
<td>Morula uva</td>
<td>Spec - BPBM-MO 234787</td>
<td>Röding, 1798 E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.</td>
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<tr>
<td>Morula vexilla</td>
<td>Spec - BPBM-MO 222217</td>
<td>(Kuroda, 1953) Off Fort Kamehameha. Catalogue XV.</td>
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<tr>
<td>Genus: Murex</td>
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<tr>
<td>Murex sandwichensis</td>
<td>Spec - BPBM-MO 198399</td>
<td>Pease Fort Kamehameha, reef off. Catalogue XIV.</td>
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<tr>
<td>Genus: Vitularia</td>
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<tr>
<td>Vitularia miliaris</td>
<td>Spec - BPBM-MO 234532</td>
<td>Gmelin, 1791 Cryptogenic. Reef Waikiki of entrance to Pearl Harbor. Catalogue XVI.</td>
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<tr>
<td>1916</td>
<td>Spec - BPBM-MO 234537</td>
<td>E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.</td>
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<td>1950</td>
<td>Ref - Burgess, 1963</td>
<td>Recorded as Vitularia miliaris</td>
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<td>Family: NASSARIIDAE</td>
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<td>Genus: Nassaarius</td>
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<tr>
<td>Nassaarius crematus</td>
<td>Spec - BPBM-MO 220604</td>
<td>(Hinds, 1844) Off Fort Kamehameha. Catalogue XV.</td>
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<tr>
<td>1961</td>
<td>Spec - BPBM-MO 220606</td>
<td>Off Fort Kamehameha. Catalogue XV.</td>
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<td>Family: NEPTUNEIDAE</td>
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<td>Genus: Caducifer</td>
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<tr>
<td>Caducifer decapitata</td>
<td>Spec - BPBM-MO 235879</td>
<td>Reeve E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.</td>
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<tr>
<td>1936</td>
<td>Spec - BPBM-MO 200762</td>
<td>Fort Kamehameha, reef off. Catalogue XIV.</td>
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<td>Family: PYRAMIDELLIDAE</td>
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<td>Genus: Evalea</td>
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<tr>
<td>Evalea peasei</td>
<td>Spec - BPBM-MO 220604</td>
<td>Dautzenberg &amp; Bouge, 1933 Hawaiian name(s): pupu po’ai.</td>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
<td>Recorded as Odostomia eclecta Pilsbry.</td>
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<tr>
<td>Genus: Herviera</td>
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<tr>
<td>Herviera patricia</td>
<td>Spec - BPBM-MO 200762</td>
<td>Pilsbry, 1918</td>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
<td>Recorded as Odostomia patricia Pilsbry.</td>
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<tr>
<td>Genus: Hinemoa</td>
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<tr>
<td>Hinemoa indica</td>
<td>Spec - BPBM-MO 200762</td>
<td>(Melvill, 1896) Introduced.</td>
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<td>2008</td>
<td>This Project</td>
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<tr>
<td>Genus: Miralda</td>
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<tr>
<td>Miralda paulbartschi</td>
<td>Spec - BPBM-MO 220604</td>
<td>Pilsbry, 1918</td>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
<td>Recorded as Odostomia paulbartschi Pilsbry.</td>
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</table>
**Legacy Project - Species Report (Cont.)**

**Miraclia scopulorum** Watson, 1886
- 1973 Ref - Evans et al., 1974 Recorded as Odostomia scopulorum Watson.

**Genus: Odostomia**

**Odostomia sp.**
- 1943 Spec - BPBM-MO 11 From Railroad Wharf, Peninsular.
- 1973 Ref - Evans et al., 1974

**Odostomia stearnsiella** Pilsbry, 1918
- 1973 Ref - Evans et al., 1974
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Pyramidella**

**Pyramidella sp.**
- 1996 Legacy Project (Coles et al., 1997)

**Pyramidella dolabrata** Linnaeus, 1758

**Pyramidella miralis hawaiiensis** Dall
- 1932 Spec - BPBM-MO 200124 Fort Kamehamea, reef. Catalogue XIV.

**Pyramidella nitida** A. Adams
- Unknown Spec - BPBM-MO 64185 Ford Island. Catalogue V.

**Pyramidella oahuensis** Pilsbry
- 1932 Spec - BPBM-MO 200126 Fort Kamehamea, reef. Catalogue XIV.

**Pyramidella sulcata** A. Adams, 1859 Hawaiian name(s): ppu `ole.
- 1915 Spec - BPBM-MO 64201 Catalogue V.

**Genus: Pyrgulina**

**Pyrgulina oodes** (Watson, 1886) Cryptogenic.
- 1973 Ref - Evans et al., 1974 Recorded as Odostomia oodes Watson.
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Turbonilla**

**Turbonilla sp.**
- 1973 Ref - Evans et al., 1974

**Family: TEREBRIDAE**

**Unidentified Terebridae**
- 1982 Spec - BPBM-MO 246144 Entrance to west. Catalogue XVII.

**Genus: Hastula**

**Hastula matheroniania** Deshayes, 1859

**Hastula nitida** Hinds, 1844

**Hastula penicillata** Hinds, 1844

**Genus: Terebra**

**Duplicaria gould** Deshayes
- Hawaiian name(s): loola; `oi `oi.
- 1915 Spec - BPBM-MO 54 Off entrance, M. 5, l. 1.
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<th>Reference</th>
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<td><em>Terebra sp.</em></td>
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<td><em>Terebra achates</em></td>
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<td><em>Terebra amoena</em></td>
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<tr>
<td><em>Terebra cerithina</em></td>
<td>1961</td>
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<tr>
<td><em>Terebra cerithina?</em></td>
<td>1991</td>
<td>Spec - BPBM-MO 246085</td>
<td>Fort Kamehameha south end</td>
<td>Housing area. Catalogue XVII.</td>
</tr>
<tr>
<td><em>Terebra columnellaris</em></td>
<td>1961</td>
<td>Spec - BPBM-MO 219725</td>
<td>Off Fort Kamehameha.</td>
<td>Catalogue XV.</td>
</tr>
<tr>
<td></td>
<td>1961</td>
<td>Spec - BPBM-MO 221205</td>
<td>Off Fort Kamehameha.</td>
<td>Catalogue XV.</td>
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<tr>
<td></td>
<td>1961</td>
<td>Spec - BPBM-MO 222330</td>
<td>Off Fort Kamehameha.</td>
<td>Catalogue XV.</td>
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<tr>
<td><em>Terebra funiculata</em></td>
<td>1915</td>
<td>Spec - BPBM-MO 19</td>
<td>Dredged off entrance to Pearl Harbor, Map 35, loc. 1.</td>
<td>Catalogue XV.</td>
</tr>
<tr>
<td></td>
<td>1961</td>
<td>Spec - BPBM-MO 219728</td>
<td>Off Fort Kamehameha.</td>
<td>Catalogue XV.</td>
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<tr>
<td><em>Terebra lanta</em></td>
<td>1916</td>
<td>Spec - BPBM-MO 9</td>
<td>Dredged off entrance to Pearl Harbor, Map 34, loc. 1.</td>
<td>Catalogue XV.</td>
</tr>
<tr>
<td></td>
<td>1961</td>
<td>Spec - BPBM-MO 219864</td>
<td>Off Fort Kamehameha.</td>
<td>Catalogue XV.</td>
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<tr>
<td><em>Terebra pertusa</em></td>
<td>1917</td>
<td>Spec - BPBM-MO 29</td>
<td>Off Pearl Harbor.</td>
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<tr>
<td><em>Terebra plumbea</em></td>
<td>1915</td>
<td>Spec - BPBM-MO 7</td>
<td>Dredged off entrance to Pearl Harbor, Map 35, loc. 1.</td>
<td></td>
</tr>
</tbody>
</table>

**Family: THAIDIDAE**

**Genus: Muricodrupa**

*Muricodrupa funicularis*  Wood  
Unknown Spec - BPBM-MO 234516  
Catalogue XVI.

**Genus: Nassa**

*Nassa sp.*  
1934 Spec - BPBM-MO 205582  
Dredge. Catalogue XIV.

*Nassa sertu*  
1932 Spec - BPBM-MO 198407  
Fort Kamehameha, reef off. Catalogue XIV.

**Genus: Pinaxia**

*Pinaxia versicolor*  Gray, 1839  
1936 Spec - BPBM-MO 234832  
E shore of entrance; reef at Fort Kamehameha. Catalogue XVI.

**Genus: Vexilla**

*Vexilla sp.*  
1932 Spec - BPBM-MO 198326  
Fort Kamehameha, reef off. Catalogue XIV.

**Family: TURRIDAE**

**Unidentified Turridades**

1973 Ref - Evans et al., 1974

**Genus: Anacithara**

*Anacithara perfecta*  Kay, 1979  
Unknown Spec - BPBM-MO 9817  
Honouliuli, West Loch. Catalogue I.

**Genus: Carinapex**

*Carinapex sp.*  
1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Genus: Cymatosyrinx
Cymatosyrinx mighelesi Dall
Unknown Spec - BPBM-MO 65654 Catalogue V.

Genus: Etrema
Etrema sp.? 1961 Spec - BPBM-MO 220816 Off Fort Kamehameha. Catalogue XV.

Genus: Gemmula

Genus: Kermia
Kermia sp. 1996 Legacy Project (Coles et al., 1997)

Genus: Lora
Lora sp. a-7 Unknown Spec - BPBM-MO 61097 Catalogue V.

Genus: Philbertia
Philbertia katharia Dall Unknown Spec - BPBM-MO 65696 Catalogue V.
Philbertia lutea Pease Unknown Spec - BPBM-MO 65697 Catalogue V.

Genus: Turris
Turris crispa intricata 1961 Spec - BPBM-MO 220826 Off Fort Kamehameha. Catalogue XV.

Order: CEPHALASPIDEA
Family: ACTEONIDAE
Genus: Pupa

Family: ATYIDAE
Genus: Hamineoa
Hamineoa galba Pease, 1861 1936 Spec - BPBM-MO 13 Fossil near Yacht Club.

Family: BULLIDAE
Genus: Bulla
1961 Spec - BPBM-MO 220488 Off Fort Kamehameha. Catalogue XV.
1996 Legacy Project (Coles et al., 1997)

Family: HAMINEOIDEAE
Genus: Atys
Atys debiliis Pease, 1860 Indigenous. 2008 This Project
Atys kuhnsi Pilsbry, 1917 1996 Legacy Project (Coles et al., 1997)
Atys semistrata Pease, 1860 Recorded as Atys semistrata fordinsulae. 1921 Ref - Pilsbry, 1921
Legacy Project - Species Report (Cont.)

Family: HYDATINIDAE
Genus: Hydatina
       Hydatina amplia (Linnaeus, 1758) Hawaiian name(s): pupu leholohononi`o; pupu lei hala.
       1961 Spec - BPBM-MO 220478 Off Fort Kamehameha. Catalogue XV.

Order: BASOMMATOPHORA
Family: ELLOBIIDAE
Genus: Melampus
       Melampus castaneus Montfort Hawaiian name(s): `aoa.
       1923 Spec - BPBM-MO 1 Near Railroad Wharf.

Family: SIPHONARIIDAE
Genus: Siphonaria
       Siphonaria normalis Gould, 1846 Indigenous. Common name(s): False `opihi; Hawaiian name(s): `opihi awa;
       `opihi maikauil.
       Unknown Spec - BPBM-MO 60569 Catalogue V.
       1973 Ref - Evans et al., 1974
       1973 Ref - McCain, 1974
       1973 Ref - McCain, 1975
       1993 Ref - Brock, 1994
       1994 Ref - Brock, 1995
       1996 Legacy Project (Coles et al., 1997)
       2007 Ref - Brock, 2007
       2007 This Project
       2008 This Project

Genus: Williamia
       Williamia cf. radiata sp. (Pease, 1861) (Coles et al., 1997)
       1996 Legacy Project (Coles et al., 1997)

Order: SACOGLOSSA
Family: CALIPHILLIDAE
Genus: Cyerce
       Cyerce elegans
       1996 Legacy Project (Coles et al., 1997)

Family: JULIIDAE
Genus: Julia
       Julia exquisita Gould, 1862

Order: NOTASPIDEA
Family: UMBRACULIDAE
Genus: Umbraculum
       Umbraculum sp.
       1996 Legacy Project (Coles et al., 1997)

       Umbraculum sinicum (Gmelin, 1791)
       1932 Spec - BPBM-MO 200038 Pearl Harbor channel. Catalogue XIV.
       1932 Spec - BPBM-MO 200039 Fort Kamehameha, reef. Catalogue XIV.

Order: NUDIBRANCHIA
Unidentified Nudibranchia
       1996 Legacy Project (Coles et al., 1997)

Family: DENDRODORIDAE
Genus: Dendrodoris
       Dendrodoris nigra (Stimpson, 1856)
       1975 Ref - Grovhough, 1976

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Legacy Project - Species Report (Cont.)

Family: TETHYIDAE
Genus: Tethya
Tethya sp.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Tethya dipoderma Schmidt, 1870
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Order: CRYPTOBRANCHIA
Family: DORIDAE
Genus: Hypselodoris
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

Family: HEXABRANCHIDAE
Genus: Hexabranchus
Hexabranchus sanguineus (Ruppell & Leuckart, 1831)
1949 Spec - BPBM-MO 209630 Found at Pearl Harbor (#15). Catalogue XIV.
1949 Spec - BPBM-MO 209631 (#16). Catalogue XIV.
1949 Spec - BPBM-MO 209632 From open shore (#17). Catalogue XIV.
1950 Spec - BPBM-MO 209633 (#18). Catalogue XIV.
1950 Spec - BPBM-MO 209634 (#19). Catalogue XIV.
1950 Spec - BPBM-MO 209636 Probably Pearl Harbor (#21). Catalogue XIV.

Order: ARCHAEOPULMONATA
Family: MELAMPODIDAE
Genus: Allochroa
Allochroa bronnni
Unknown Spec - BPBM-MO 10998 Catalogue II.
Unknown Spec - BPBM-MO 64832 Hoai'ai. Catalogue V.

Genus: Laemodonta
Laemodonta octanfracta
Unknown Spec - BPBM-MO 64874 Hoai'ai. Catalogue V.
Unknown Spec - BPBM-MO 64875 Hoai'ai. Catalogue V.
1915 Spec - BPBM-MO 14 Ford Island.
1915 Spec - BPBM-MO 16 Ford Island.
1923 Spec - BPBM-MO 15 Under rocks near Railroad Wharf, opposite Ford Island.
1923 Spec - BPBM-MO 17 Near Railroad Wharf, opposite Ford Island.
1923 Spec - BPBM-MO 67478 Pearl City Peninsula. Catalogue V.
1932 Spec - BPBM-MO 199237 Fort Kamehameha, shore at. Catalogue XIV.
1932 Spec - BPBM-MO 199238 Peninsula, along shore at Cobb's place. Catalogue XIV.
1932 Spec - BPBM-MO 199241 Pearl City Peninsula, near Railroad Wharf, along shore at Cobb's place.

Cobb's place.
1932 Spec - BPBM-MO 199242 Eastern side of Peninsula, Fish Pond wall. Catalogue XIV.

Genus: Plectotrema
Plectotrema sp.
1932 Spec - BPBM-MO 199243 Eastern side of Peninsula, Fish Pond wall. Catalogue XIV.

Class: POLYPLACOPHORA
Order: ISCHNOCHITONIDA
Family: ISCHNOCHITONIDAE
Genus: Ischnochiton
Ischnochiton petalooides Gould Hawaiian name(s): pupu mo' o.
Unknown Spec - BPBM-MO 64604 Ford Island. Catalogue V.
1931 Spec - BPBM-MO 78
1932 Spec - BPBM-MO 199796 Peninsula, Railroad Wharf. Catalogue XIV.
Family: MOPALIIDAE  
**Genus:** Plaxiphora  
*Plaxiphora kamehamehae*  
Ferreira & Bertsch, 1979  
1977  Spec - BPBM-MO 207066  
Fort Kamehameha Beach. Catalogue XIV.  

**Order:** ACANTHOCHITONIDA  
**Family:** ACANTHOCHITONIDAE  
**Genus:** Acanthochiton  
*Acanthochiton viridis* Pease, 1872  
Hawaiian name(s): kuakulu; kuapa’a; pe’elua; pupu pe’elua.  
Unknown  Spec - BPBM-MO 64598  
Ford Island. Catalogue V.  
Unknown  Spec - BPBM-MO 64600  
Ford Island. Catalogue V.  
Unknown  Spec - BPBM-MO 64601  
Ford Island. Catalogue V.  
Unknown  Spec - BPBM-MO 64783  
Ford Island. Catalogue V.  

**Class:** BIVALVIA  
**Unidentified Bivalvia**  
1996  Legacy Project (Coles et al., 1997)  

**Family:** EURYCYNIDAE  
**Unidentified Eurycyridae**  
1996  Legacy Project (Coles et al., 1997)  

**Order:** ARCOIDA  
**Family:** ANOMIIDAE  
**Genus:** Anomia  
*Anomia nobilis*  
Reeve, 1856  
Introduced. Hawaiian name(s): pa; papaua.  
Unknown  Spec - BPBM-MO 60317  
1912  Spec - BPBM-MO 68170  
(Pliocene). Catalogue V.  
1915  Spec - BPBM-MO 20  
Map 35, I.2.  
1915  Ref - Bryan, 1915  
1919  Spec - BPBM-MO 60319  
Drydock. Catalogue V.  
1923  Spec - BPBM-MO 30  
At Railroad Wharf opposite Ford Island, Peninsula.  
1923  Spec - BPBM-MO 67480  
Railroad Wharf, Pearl City Peninsula. Catalogue V.  
1932  Spec - BPBM-MO 200174  
Pearl City Peninsula, end. Catalogue XIV.  
1932  Spec - BPBM-MO 200175  
Pearl Harbor Channel; Watertown. Catalogue XIV.  
1932  Spec - BPBM-MO 201515  
Pearl City Peninsula, Railroad Wharf. Catalogue XIV.  
1935  Ref - Edmondson, 1944  
1936  Ref - Edmondson & Ingram, 1939  
1938  Ref - Dall et al., 1938  
USNM 337554.  
1938  Ref - Dall et al., 1938  
USNM 337552.  
1938  Ref - Dall et al., 1938  
USNM 321285.  
1947  Spec - BPBM-MO 46  
Bottom of barge in dry dock.  
1948  Spec - BPBM-MO 40  
Mobile dry dock in Dry Dock #2.  
1948  Spec - BPBM-MO 48  
Bottom of steel barge.  
1972  Ref - Long, 1974  
1973  Ref - Evans et al., 1974  
1973  Ref - McCain, 1974  
1973  Ref - McCain, 1975  
1978  Ref - Grovhoug, 1979  
1985  Ref - Hurlbut, 1990  
1986  Ref - Lenihan, 1990  
1987  Ref - Brewer & Assoc., 1987  
1996  Legacy Project (Coles et al., 1997)  
2007  Ref - Brock, 2007  
2008  This Project
Legacy Project - Species Report (Cont.)

**Family: ARCADAE**

**Genus: Anadara**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Anadara antiquata</td>
<td>(Linnaeus, 1758) Fossil.</td>
</tr>
<tr>
<td>1923</td>
<td>Spec - BPBM-MO 21 Near Ford Island Wharf in short bluffs.</td>
</tr>
<tr>
<td>1938</td>
<td>Ref - Dall et al., 1938 Recorded as Arca vetula. USNM 36158.</td>
</tr>
</tbody>
</table>

**Genus: Arca**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Arca sp.</td>
<td>Hawaiian name(s): kupukele.</td>
</tr>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
</tr>
</tbody>
</table>

**Arca sp. a-3**

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<thead>
<tr>
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<tbody>
<tr>
<td>Unknown</td>
<td>Spec - BPBM-MO 60151 Catalogue V.</td>
</tr>
</tbody>
</table>

**Genus: Barbaria**

**Barbaria sp.**

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**Barbatia divaricata** Sowerby, 1833

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1959</td>
<td>Spec - BPBM-MO 218776 Off Fort Kamehameha. Catalogue XV.</td>
</tr>
</tbody>
</table>

**Barbatia foliata** Forsskál, 1775 Fossil.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1938</td>
<td>Ref - Dall et al., 1938 Recorded as Barbatia hendersoni. BPBM 351286.</td>
</tr>
<tr>
<td>1950</td>
<td>Spec - BPBM-MO 250728 Ship bottom (with Mytilidae). Catalogue XVII.</td>
</tr>
</tbody>
</table>

**Barbatia nuttingi** (Dall, Bartsch & Rehder, 1938) Indigenous.

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<table>
<thead>
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<tbody>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
</tr>
</tbody>
</table>

**Barbatia tenella** Reeve, 1844

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<table>
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<tbody>
<tr>
<td>1938</td>
<td>Ref - Dall et al., 1938 Off Pearl Harbor. Recorded as Calloarca hua. USNM 427760.</td>
</tr>
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</table>

**Genus: Bentharca**

**Bentharca asperrula** Dall, 1881

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<tbody>
<tr>
<td>1959</td>
<td>Spec - BPBM-MO 221099 Off Pearl Harbor. Catalogue XV.</td>
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</table>

**Family: GLYCYMERIDIDAE**

**Genus: Glycymeris**

**Glycymeris molokaia** Dall, Bartsch & Rehder

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<tr>
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<tbody>
<tr>
<td>1961</td>
<td>Spec - BPBM-MO 218786 Off Fort Kamehameha. Catalogue XV.</td>
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</table>

**Family: GRYPHAIDEAE**

**Genus: Hyotissa**

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<table>
<thead>
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<tbody>
<tr>
<td>Hyotissa hyotis</td>
<td>Linnaeus, 1758 Introduced.</td>
</tr>
<tr>
<td>1950</td>
<td>Ref - Paulay, 1996 USNM 700474.</td>
</tr>
<tr>
<td>1950</td>
<td>Ref - Paulay, 1996 USNM 699996.</td>
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</table>

**Genus: Parahyotissa**

**Parahyotissa numisma** (Lamarck, 1819) Indigenous.

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<tr>
<td>Unknown</td>
<td>Spec - BPBM-MO 60242 Catalogue V.</td>
</tr>
<tr>
<td>1902</td>
<td>Ref - Dall et al., 1938 Recorded as O.thaanami Dall et al., 1938. USNM 335600.</td>
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<tr>
<td>1932</td>
<td>Spec - BPBM-MO 200507 Fort Kamehameha, reef off. Catalogue XIV.</td>
</tr>
<tr>
<td>1935</td>
<td>Ref - Ingram, 1937 Recorded as O. thaanum.</td>
</tr>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974 Recorded as Ostrea hanleyana.</td>
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</table>

**Family: ISOGNOMONIDAE**

**Genus: Isognomon**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Isognomon sp.</td>
<td>Indigenous.</td>
</tr>
<tr>
<td>1934</td>
<td>Spec - BPBM-MO 205583 Dredge. Catalogue XIV.</td>
</tr>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
</tr>
<tr>
<td>1979</td>
<td>Ref - AECOS, 1979 Off Pearl Harbor.</td>
</tr>
<tr>
<td>1986</td>
<td>Ref - Lenihan, 1990</td>
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<tr>
<td>2008</td>
<td>This Project</td>
</tr>
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**Isognomon sp. m-2**

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<tbody>
<tr>
<td>Unknown</td>
<td>Spec - BPBM-MO 60199 Catalogue V.</td>
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### Legacy Project - Species Report (Cont.)

<table>
<thead>
<tr>
<th><strong>Isognomon anomoides</strong></th>
<th>1932 Spec - BPBM-MO 200513</th>
<th>Fort Kamehameha. Catalogue XIV.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isognomon californicum</strong></td>
<td>(Conrad, 1837) Indigenous. 2008 This Project</td>
<td></td>
</tr>
<tr>
<td><strong>Isognomon incisum</strong></td>
<td>Conrad 1936 Spec - BPBM-MO 22 Reef at Fort Kamahameha. 1949 Spec - BPBM-MO 23 Reef at Fort Kamahameha.</td>
<td></td>
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<tr>
<td><strong>Isognomon legumen</strong></td>
<td>(Gmelin, 1791) Indigenous. 1966 Legacy Project (Coles et al., 1997) 2008 This Project</td>
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<tr>
<td><strong>Isognomon perna</strong></td>
<td>(Linnaeus, 1767) Indigenous. Hawaiian name(s): nahaweke. Unidentified Spec - BPBM-MO 60176 Catalogue V. 1920 Ref - Dall et al., 1938 Recorded as Isognomon costellatum. USNM 337484. 1920 Ref - Dall et al., 1938 Recorded as Isognomon costellatum. USNM 428275. 2008 This Project</td>
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**Family: LIMIDAE**

**Genus: Lima**

| **Lima aperta** | Sowerby 1932 Spec - BPBM-MO 200194 Fort Kamehameha; along edge of channel. Catalogue XIV. |

**Questionable ID.**

**Family: MALLEIDAE**

**Genus: Malleus**

| **Malleus daemonicus?** | Reeve, 1858 1950 Spec - BPBM-MO 250727 Ship bottom. Catalogue XVII. |
| **Malleus regula** | (Forsskål, 1775) 1943 Ref - Hutchins, 1949 Recorded as Malleus nuttalli. |

**Family: MYTILIDAE**

**Unidentified Mytilidae**

| 1950 Spec - BPBM-MO 250729 Ship bottom (with BPBM 250728). Catalogue XVII. |

**Genus: Brachidontes**

| **Brachidontes crebristriatus** | (Conrad, 1837) Indigenous. Hawaiian name(s): 'owa'owaka; nahaweplepahikaua; nahawelee ili ili; kio nahawelee. Unmatched 1902 Ref - Dall et al., 1938 USNM 335839. 1920 Ref - Dall et al., 1938 USNM 428391. 1920 Ref - Dall et al., 1938 Recorded as Brachidontes crebristriatus maritimus. USNM 428270. 1921 Ref - Pilsbry, 1921 Recorded as Mytilus crebristatus. 1923 Spec - BPBM-MO 196317 Peninsula; Railroad Wharf. Catalogue XIV. 1938 Ref - Dall et al., 1938 USNM 337445. 1938 Ref - Dall et al., 1938 BPBM 159. 1973 Ref - Evans et al., 1974 Recorded as Hormomya crebristriatus (Conrad). 1996 Legacy Project (Coles et al., 1997) |

**Genus: Lithopaga**

| **Lithopaga fasciola** | Dall, Bartsch & Rehder, 1938 1996 Legacy Project (Coles et al., 1997) |

**Genus: Musculus**

| **Musculus oahuensis** | Dall, Bartsch & Rehder, 1938 1920 Ref - Dall et al., 1938 USNM 484181. |
Legacy Project - Species Report (Cont.)

Genus: *Septifer*
*Septifer bryanae* Pilsbry, 1921

<table>
<thead>
<tr>
<th>Year</th>
<th>Ref</th>
<th>Location</th>
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<tr>
<td>1972</td>
<td>Long</td>
<td>Off Pearl Harbor</td>
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</table>

Family: OSTREIDAE

*Ostreus* (Coles et al., 1979)

1996 Legacy Project
2007 This Project
2008 This Project

Genus: *Crassostrea*

*Crassostrea sp.* Introduced.

1996 Legacy Project (Coles et al., 1997)
2008 This Project

*Crassostrea gigas* (Thunberg, 1793) Introduced.

1938 Ref - Brock, 1960
1939 Ref - Brock, 1994
1994 Ref - Brock, 1995
2007 Ref - Brock, 2007

*Crassostrea retusa* Sowerby, 1871 Fossil.

1899 Spec - BPBM-MO 67990 1/4 mile E. of Waipio Station in Railway cut near Pearl Harbor
30ft. above Tide..

1912 Spec - BPBM-MO 68168 (Pliocene). Catalogue V.
1932 Spec - BPBM-MO 200301 Waipio Peninsula. Catalogue XIV.

*Crassostrea virginica* (Gmelin, 1791) Introduced.

Unknown Spec - BPBM-MO 50
1866 Ref - Kay, 1979
1893 Ref - Kay, 1979
1920 Ref - Edmondson & Wilson, 1940
1962 Ref - Sparks, 1963
1964 Ref - Sakuda, 1964
1965 Ref - Rifkin & Cheng, 1968
1972 Ref - Kawamoto & Sakuda, 1973
1973 Ref - Evans et al., 1974
1987 Ref - AECOS, 1987
1987 Ref - Brewer & Assoc., 1987
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2008 This Project

Genus: *Dendostrea*

*Dendostrea sandvicensis* Sowerby, 1871 Indigenous. Common name(s): Noble Vermitid.

Unknown Spec - BPBM-MO 60225 Catalogue V.
Unknown Spec - BPBM-MO 60226 Catalogue V.
Unknown Spec - BPBM-MO 60228 Catalogue V.
Unknown Spec - BPBM-MO 60231 Catalogue V.
1902 Ref - Dall et al., 1938 Recorded as Ostrea sandvicensis. USNM 335584.
1912 Spec - BPBM-MO 68169 (Pliocene). Catalogue V.
1915 Spec - BPBM-MO 31 Ford Island.
1915 Ref - Bryan, 1915 Recorded as O. rosacea.
1920 Ref - Dall et al., 1938 Recorded as O. kupua Dall et al., 1938. USNM 321289.
1920 Ref - Dall et al., 1938 Recorded as O. kupua Dall et al., 1938. USNM 484156.
1920 Ref - Dall et al., 1938 Recorded as O. kupua Dall et al., 1938. USNM 321284.
1921 Ref - Pilsbry, 1921 Recorded as Ostrea sandvicensis.
1921 Ref - Pilsbry, 1921 Recorded as Ostrea sandvicensis. MCZ 31714.
1923 Spec - BPBM-MO 32 At Railroar Wharf opposite Ford Island, Peninsula.
Legacy Project - Species Report (Cont.)

1932 Spec - BPBM-MO 200209 Pearl City Peninsula, East side. Catalogue XIV.
1932 Spec - BPBM-MO 200508 Peninsula, Railroad Wharf. Catalogue XIV.
1935 Ref - Edmondson, 1944 Recorded as Ostrea sandwichensis.
1936 Ref - Edmondson & Ingram, 1939 Recorded as Ostrea sandwichensis.
1938 Ref - Dall et al., 1938 Recorded as Ostrea sandwichensis. USNM 337472.
1938 Ref - Dall et al., 1938 Recorded as O. kupua. Dall et al., 1938. BPBM 60225.
1972 Ref - Long, 1974 Recorded as O. sandwichensis var. thanaumi.
1973 Ref - Evans et al., 1974 Recorded as Ostrea sandwichensis.
1987 Ref - Brewer & Assoc., 1987 Recorded as Ostrea sandwichensis.
1993 Ref - Brock, 1994 Recorded as Ostrea sandwichensis.
1994 Ref - Brock, 1995 Recorded as Ostrea sandwichensis.
1996 Legacy Project (Coles et al., 1997) Recorded as Ostrea sandwichensis.
2007 Ref - Brock, 2007
2008 This Project

Genus: Lopha
Lopha cristagalli (Linnaeus, 1758) Introduced.
1951 Ref - Paulay, 1996 USNM 699998.

Genus: Nanostrea
Nanostrea exigua Harry, 1985
1985 Ref - Harry, 1985
1996 Ref - Paulay, 1996 USNM 337556.

Genus: Ostrea
Ostrea sp.
1923 Spec - BPBM-MO 241135 Pearl City Peninsula, Railroad Wharf. Catalogue XVII.
1932 Spec - BPBM-MO 198727 Naval Station, Hospital Point. Catalogue XIV.
1932 Spec - BPBM-MO 200186 Peninsula; Railroad Wharf. Catalogue XIV.
1932 Spec - BPBM-MO 201517 Pearl City Peninsula, Railroad Wharf. Catalogue XIV.
1950 Spec - BPBM-MO 57 Pahu, Ship bottom.
1950 Spec - BPBM-MO 58
1972 Ref - Long, 1974 Recorded as Ostrea frons.
1973 Ref - Evans et al., 1974
1986 Ref - Lenihan, 1990
1996 Legacy Project (Coles et al., 1997)

Ostrea cf. hanleyana Sowerby, 1871 Indigenous.
2008 This Project

Ostrea lima Sowerby, 1871 Indigenous.
1972 Ref - Long, 1974 Recorded as O. kavaia Dall et al., 1938.

Ostrea margaritae Pilsbry, 1918
Unknown Spec - BPBM-MO 65691 Catalogue V.

Genus: Saccostrea
Saccostrea cucullata (Born, 1778)
1996 Legacy Project (Coles et al., 1997)

Family: PECTINIDAE

Genus: Anguicostata
Anguicostata lamiarti Sowerby, 1874
1961 Spec - BPBM-MO 218856 Off Fort Kamehameha. Catalogue XV. Questionable ID.

Genus: Chlamys
Chlamys sp.
1934 Spec - BPBM-MO 205571 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205572 Dredge. Catalogue XIV.

Chlamys irregularis Sowerby, 1842 Indigenous.
Unknown Spec - BPBM-MO 60247 Catalogue V.
1923 Spec - BPBM-MO 39 Ford Island Wharf on Peninsula.
## Legacy Project - Species Report (Cont.)

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<td>Spec - BPBM-MO 196278</td>
<td>Pearl Harbor channel, at Watertown. Catalogue XIV.</td>
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<td>1961</td>
<td>Spec - BPBM-MO 218824</td>
<td>Off Fort Kamehameha. Catalogue XV.</td>
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**Genus: Pecten**
- *Pecten n. sp. p-4*
  - Unknown Spec - BPBM-MO 60291
  - Ford Island. Catalogue V. Questionable ID.
- *Pecten n. sp. p-5*
  - Unknown Spec - BPBM-MO 60292
  - Catalogue V. Questionable ID.

**Family: PINNIDAE**
- **Genus: Pinna**
  - *Pinna sp.*
    - 1973 Ref - Evans et al., 1974
  - *Pinna muricata* Linnaeus, 1758
    - 1972 Ref - Long, 1974
    - Off Pearl Harbor.

**Family: PTERIIDAE**
- **Genus: Pinctada**
  - *Pinctada sp.* Indigenous.
    - Unknown Spec - BPBM-MO 45
    - 2007 This Project
  - *Pinctada cumingi* Reeve
    - 1923 Spec - BPBM-MO 196332
    - End of Wipio Peninsula. Catalogue XIV. Questionable ID.
    - 1927 Spec - BPBM-MO 196322
    - Reef off Fort Kamehameha, shallow water, in hole in reef.
    - Catalogue XIV.
  - *Pinctada margaritifera* (Linnaeus, 1758) Indigenous. Common name(s): mother-of-pearl shell;
    - Hawaiian name(s): pa; pa hau.
    - 1915 Ref - Bryan, 1915
    - Recorded as Avicula margaritifera.
    - 1926 Spec - BPBM-MO 208454
    - Shore, rocks east of Mokapu. Catalogue XIV.
    - 1936 Spec - BPBM-MO 24
    - Reef at Fort Kamahameha.
    - 1972 Ref - Long, 1974
    - Off Pearl Harbor.
    - 1973 Ref - Evans et al., 1974
    - 1996 Legacy Project (Coles et al., 1997)
    - 2006 Ref - Smith et al., 2006
  - *Pinctada radiata* (Leach, 1814) Indigenous. Hawaiian name(s): unahi pipi; pipi.
    - Unknown Spec - BPBM-MO 203988
    - Catalogue XIV.
    - Unknown Spec - BPBM-MO 203989
    - Catalogue XIV.
    - Unknown Spec - BPBM-MO 60216
    - Catalogue V.
    - Unknown Spec - BPBM-MO 67565
    - Catalogue V.
    - 1915 Spec - BPBM-MO 25
    - 1915 Ref - Bryan, 1915
    - Recorded as Margaritifera fimbriata.
    - 1917 Spec - BPBM-MO 60222
    - Catalogue V.
    - 1923 Spec - BPBM-MO 196320
    - Waiapio Peninsula, extreme seaward end. Catalogue XIV.
    - 1923 Spec - BPBM-MO 26
    - At Railroad Wharf, Ford Island, Peninsula.
    - 1924 Spec - BPBM-MO 67482
    - Railroad Wharf, Pearl City Peninsula. Catalogue V.
    - 1936 Ref - Edmondson & Ingram, 1939
    - Recorded as P. nebulosa.
    - 1938 Ref - Dall et al., 1938
    - Recorded as P. nebulosa (Conrad, 1837). BPBM 9.
    - 1938 Ref - Dall et al., 1938
    - Recorded as P. nebulosa (Conrad, 1837), USNM 337475.
    - 1939 Ref - Dall et al., 1938
    - Recorded as P. nebulosa (Conrad, 1837). USNM 382878.
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Pteria**
- *Pteria loveni* (Dunker, 1872)
  - 1972 Ref - Long, 1974
  - Off Pearl Harbor. Questionable ID.
Legacy Project - Species Report (Cont.)

Family: SPONDYLIDAE
Genus: Spondylus
Spondylus sp.
- 1950 Spec - BPBM-MO 250726 Ship bottom. Catalogue XVII.
- 1950 Spec - BPBM-MO 53 Bottom of YOG-41 in Dry Dock #2.
- 1973 Ref - Evans et al., 1974

Spondylus sp.?
- 1950 Spec - BPBM-MO 49

Spondylus linguaeefilis Sowerby, 1847

Spondylus linguaeefilis? Sowerby, 1847

Spondylus sparsispinosus
- 1918 Spec - BPBM-MO 28

Spondylus tenebrosus Reeve, 1856
- 2007 Ref - Brock, 2007

Spondylus violacescens Reeve, 1856 Hawaiian name(s): ʻokupe; pupu momi.
Unknown Spec - BPBM-MO 60310 Catalogue V.
- 1932 Spec - BPBM-MO 200223 Fort Kamehameha; along edge of channel. Catalogue XIV.
- 1973 Ref - Evans et al., 1974 Recorded as Spondylus hawaiensis Dall et al., 1938.
- 1993 Ref - Brock, 1994 Recorded as Spondylus tenebrosus.
- 1994 Ref - Brock, 1995 Recorded as Spondylus tenebrosus.

Order: VENEROIDA
Family: CARDIDAE
Genus: Trachycardium
Trachycardium orbis Sowerby, 1833 Hawaiian name(s): ʻolepe kupa; pupu kupa.
- 1920 Ref - Dall et al., 1938 Recorded as T. hawaiensis. USNM 346229.
- 1932 Spec - BPBM-MO 200248 Pearl Harbor Channel; Watertown. Catalogue XIV.

Family: CHAMIDAE
Genus: Chama
Chama sp. Indigenous.
- 1973 Ref - Evans et al., 1974
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

Chama brassica Reeve, 1847 Introduced.
- 1951 Ref - Paulay, 1996 USNM 700006.

Chama cf. fibula Reeve, 1846 Cryptogenic.
- 2008 This Project

Chama elatensis Delsaerdt, 1986 Introduced.
- 1996 Legacy Project (Coles et al., 1997)

Chama fibula Reeve, 1846 Cryptogenic.
- 1920 Ref - Dall et al., 1938 Recorded as C. hendersoni. USNM 341296.
- 1920 Ref - Dall et al., 1938 Recorded as C. hendersoni. USNM 484174.
- 1935 Spec - BPBM-MO 35 Near Yacht Club.
- 1979 Ref - Kay, 1979
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

Chama iostoma Conrad, 1837 Indigenous.
Unknown Spec - BPBM-MO 60395 Catalogue V.
- 1920 Ref - Dall et al., 1938 USNM 484173.
- 1923 Spec - BPBM-MO 36 Near entrance.
- 2007 This Project
Legacy Project - Species Report (Cont.)

2008  This Project

**Chama lazarus**  Linnaeus, 1758  Introduced.
1950  Ref - Paulay, 1996  USNM 699558.
1996  Legacy Project (Coles et al., 1997)

**Chama macerophylla**  Gmelin, 1791
2006  Ref - Smith et al., 2006  Recorded as Chama elatensis.

**Chama pacifica**  Brodrip, 1835  Introduced.
1950  Ref - Paulay, 1996  USNM 699558.
1950  Ref - Paulay, 1996  USNM 699565.
1950  Ref - Paulay, 1996  USNM 699561.
1951  Ref - Paulay, 1996  USNM 699563.
1996  Legacy Project (Coles et al., 1997)

Family: GLOSSIDAE

Genus: *Meiocardia*

**Meiocardia hawaiiana**  Dall, Bartsch & Rehder
1961  Spec - BPBM-MO 218932  Off Fort Kamehameha. Catalogue XV.

Family: KELLIIDAE

Genus: *Lasaea*

**Lasaea hawaiensis**  Dall, Bartsch & Rehder, 1938
1923  Spec - BPBM-MO 240097  Crevices in shore rocks, Peninsula. Catalogue XVI.
1923  Ref - Dall et al., 1938  Recorded as Lasaea hawaiensis. BPBM 3.

Family: LUCINIDAE

Genus: *Ctena*

**Ctena sp.**
1934  Spec - BPBM-MO 205589  Dredge. Catalogue XIV.

**Ctena bella**  (Conrad, 1837)  Indigenous. Hawaiian name(s): `olepe kupe `opiopio.
1920  Ref - Dall et al., 1938  USNM 341291.
1920  Ref - Dall et al., 1938  USNM 428228.
1920  Ref - Dall et al., 1938  USNM 428390.
1923  Spec - BPBM-MO 196300  Peninsula; Railroad Wharf. Catalogue XIV.
1923  Spec - BPBM-MO 33  At Railroad Wharf opposite Ford Island, Peninsula.
1938  Spec - BPBM-MO 34  Near Yacht Club.
1973  Ref - Evans et al., 1974  
1996  Legacy Project (Coles et al., 1997)
2008  This Project

Genus: *Lucina*

**Lucina edentula**  (Linnaeus, 1758)
1961  Spec - BPBM-MO 218798  Off Fort Kamehameha. Catalogue XV.

Genus: *Pillicina*

**Pillicina spaldingi**  (Pilsbry, 1921)
1973  Ref - Evans et al., 1974  
1996  Legacy Project (Coles et al., 1997)

Family: MACTRIDAE

Genus: *Mactra*

**Mactra thanaumi**  Dall, Bartsch & Rehder
1963  Spec - BPBM-MO 221087  Off Pearl Harbor. Catalogue XV.

Family: SEMELIDAE

Genus: *Abra*

**Abra sp. A**  Introduced.
1996  Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Genus: Semele

Semele australis  
Sowerby, 1832
Unknown Spec - BPBM-MO 209617  Catalogue XIV.

Family: TELLINIDAE

Unidentified Tellinidae
1996 Legacy Project (Coles et al., 1997)

Genus: Macoma

Macoma dispar (Conrad, 1837)
Unknown Spec - BPBM-MO 60512  Ford Island. Catalogue V.
1915 Spec - BPBM-MO 27  Ford Island.
1920 Ref - Dall et al., 1938  Recorded as Scissulina dispar. USNM 341298.
1935 Spec - BPBM-MO 3  In a road cut near Yacht Club.
1938 Ref - Dall et al., 1938  Recorded as Scissulina dispar. USNM 337353.
1938 Ref - Dall et al., 1938  Recorded as Scissulina dispar. USNM 33754.

Macoma obliquilineata (Conrad, 1837)
1920 Ref - Dall et al., 1938  Recorded as Jactellina obliquilineata. USNM 331294.

Genus: Pharoanella

Pharoanella variabilis
Unknown Spec - BPBM-MO 64344  Catalogue V. Questionable ID.

Genus: Tellina

Tellina sp.
1934 Spec - BPBM-MO 205593  Dredge. Catalogue XIV.
1961 Spec - BPBM-MO 219133  Off Fort Kamehameha. Catalogue XV.
1996 Legacy Project (Coles et al., 1997)

Tellina sp. A
1996 Legacy Project (Coles et al., 1997)

Tellina sp.?
1934 Spec - BPBM-MO 205579  Dredge. Catalogue XIV.

Tellina (Arcopagia) robusta (Hanley, 1844)
1920 Ref - Dall et al., 1938  Recorded as Pinquettellina robusta. USNM 341229.
1938 Ref - Dall et al., 1938  Recorded as Pinquettellina robusta. USNM 337359.
1973 Ref - Evans et al., 1974  Recorded as Angulus nucella Dall et al., 1938.

Tellina palatam  
Iredale, 1929
Unknown Spec - BPBM-MO 209618  Catalogue XIV.
Unknown Spec - BPBM-MO 60526  Ford Island. Catalogue V.
Unknown Spec - BPBM-MO 60527  Catalogue V.
1902 Ref - Dall et al., 1938  Recorded as Quidnipagus palatum. USNM 335579.
1915 Spec - BPBM-MO 60524  Catalogue V.
1920 Ref - Dall et al., 1938  Recorded as Quidnipagus palatum. USNM 341287.
1924 Spec - BPBM-MO 8  Recorded as Quidnipagus palatum. BPBM.
1927 Spec - BPBM-MO 196248  E. side Pearl City Peninsula. Catalogue XIV.
1930 Spec - BPBM-MO 196571  Pearl Lochs. Catalogue XIV.
1938 Ref - Dall et al., 1938  Recorded as Quidnipagus palatum. BPBM.

Family: TRAPEZIIDAE

Genus: Trapezium

Trapezium sp.
1934 Spec - BPBM-MO 205590  Dredge. Catalogue XIV.

Family: VENERIDAE

Genus: Lioconcha

Lioconcha fasiigata  

2008 This Project
Legacy Project - Species Report (Cont.)

**Liocncha hieroglyphica** (Conrad, 1837)
- Unknown Spec - BPBM-MO 196259 E. side Pearl City Peninsula. Catalogue XIV.
- Unknown Spec - BPBM-MO 204102 Catalogue XIV.
- Unknown Spec - BPBM-MO 209620 Catalogue XIV.
- 1920 Ref - Dall et al., 1938 USNM 42195.
- 1927 Spec - BPBM-MO 196258 E. side Pearl City Peninsula. Catalogue XIV.
- 1930 Spec - BPBM-MO 198449 Pearl Lochs. Catalogue XIV.
- 1938 Ref - Dall et al., 1938 BPBM 165.
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Periglypta**

**Periglypta** sp.
- 1934 Spec - BPBM-MO 205573 Dredge. Catalogue XIV.
- 1934 Spec - BPBM-MO 205574 Dredge. Catalogue XIV.

**Periglypta reticulata** (Linnaeus, 1758)
- Unknown Spec - BPBM-MO 196218 Fort Kamehameha, 100 ft. inland from outer edge of reef.
- Catalogue XIV.
- 1916 Spec - BPBM-MO 209622 Catalogue XIV.
- 1920 Ref - Dall et al., 1938 Recorded as P. edmonsoni. USNM 428286.
- 1938 Ref - Dall et al., 1938 Recorded as P. edmonsoni. BPBM 2016c.

**Genus: Venerus**

**Venerus (Ruditapes) philippinarum** (A. Adams & Reeve) Introduced.
- Unknown Spec - BPBM-MO 209621 Catalogue XIV.
- 1918 Ref - Dall et al., 1938 Recorded as Venerus philippinarum. USNM 337389.
- 1919 Ref - Bryan, 1919 Recorded as Tapes philippinarum. USNM 341293.
- 1920 Ref - Edmondson & Wilson, 1940 Recorded as Tapes philippinarum.
- 1920 Ref - Thanauma, 1921 Recorded as Tapes philippinarum.
- 1924 Spec - BPBM-MO 10 Bought in fish market in Honolulu.
- 1924 Spec - BPBM-MO 67484 Catalogue V.
- 1937 Ref - Edmondson & Wilson, 1940 Recorded as Tapes philippinarum.
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Venus**

**Venus** sp.
- 1934 Spec - BPBM-MO 205578 Dredge. Catalogue XIV.

**Order: MYOIDA**

**Family: GASTROCHAENIDAE**

**Genus: Gastrochaena**

**Gastrochaena gigantea** Spengler, 1783 Hawaiian name(s): `olepe waha nui;.
- Unknown Spec - BPBM-MO 204046 Ford Island. Catalogue XIV.
- Unknown Spec - BPBM-MO 60547 Catalogue V.
- Unknown Spec - BPBM-MO 60548 Ford Island. Catalogue V.
- Unknown Spec - BPBM-MO 60549 Ford Island. Catalogue V.
- Unknown Spec - BPBM-MO 60550 Ford Island. Catalogue V.
- 1915 Spec - BPBM-MO 4 Ford Island.
- 1920 Ref - Dall et al., 1938 Recorded as Roccellaria hawaiiensis. USNM 341293.
- 1938 Ref - Dall et al., 1938 Recorded as Roccellaria hawaiiensis. BPBM 60549.
- 1938 Ref - Dall et al., 1938 Recorded as Roccellaria hawaiiensis. USNM 337310.
- 1938 Ref - Dall et al., 1938 Recorded as Roccellaria hawaiiensis. USNM 361952.

**Genus: Roccellaria**

**Roccellaria** sp.
- 1973 Ref - Evans et al., 1974

**Roccellaria gigantea** Deshayes Hawaiian name(s): `olepe waha nui; pupu olepe waha nui.
- 1923 Spec - BPBM-MO 196238 End of Waipio Peninsula. Catalogue XIV.
Legacy Project - Species Report (Cont.)

1925  Spec - BPBM-MO 196241  Peninsula; Railroad Wharf. Catalogue XIV.
1927  Spec - BPBM-MO 196237  Pearl Harbor channel, off Fort Kamehameha. Catalogue XIV.

Family: HIATELLIDAE

Genus: Hiatella

Hiatella arctica  (Linnaeus, 1767) Introduced.

1973  Ref - Evans et al., 1974  Recorded as Hiatella hawaiiensis Dall et al., 1938.
1973  Ref - McCain, 1974
1976  Ref - Growhough, 1976  Recorded as Hiatella hawaiiensis Dall et al., 1938.
1987  Ref - Brewer & Assoc., 1987  Recorded as Hiatella hawaiiensis Dall et al., 1938.
1996  Legacy Project (Coles et al., 1997)
2008  This Project

Sphenia luticola  (H. & A. Adams, 1854) Introduced.


Family: MYIIDAE

Genus: Sphenia

Sphenia sp. A sp.  Introduced.

1996  Legacy Project (Coles et al., 1997)

Family: PHOLADIDAE

Genus: Martesia

Martesia sp.

1939  Spec - BPBM-MO 205356  Catalogue XIV.

Martesia striata  (Linnaeus, 1758) Introduced. Hawaiian name(s): `olepe makaoa.

Unknown Spec - BPBM-MO 60554  Catalogue V.

1920  Ref - Dall et al., 1938  Recorded as M. hawaiiensis. USNM 4824213.
1920  Ref - Dall et al., 1938  Recorded as M. hawaiiensis. USNM 218042.
1920  Ref - Dall et al., 1938  Recorded as M. hawaiiensis. BPBM 30.
1920  Ref - Dall et al., 1938
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1986  Ref - Lenihan, 1990
1996  Legacy Project (Coles et al., 1997)

Genus: Pholas

Pholas sp.

Unknown Spec - BPBM-MO 67987  Said by Dr. C.M. Cooke to have come from Pearl Harbor.

Catalogue V.

Questionable ID.

Family: TEREDINIDAE

Unidentified Teredinidae

1996  Legacy Project (Coles et al., 1997)

Genus: Bankia

Bankia bipalmaulata  (Lamarck, 1801) Introduced.

1936  Ref - Edmondson, 1942  Recorded as Bankia hawaiiensis.
1976  Ref - Cooke et al., 1980

Genus: Lyrodus

Lyrodus affinis  Deshayes, 1863 Introduced.

1973  Ref - McCain, 1975
1976  Ref - Cooke et al., 1980

Lyrodus pedicillatus  (Quatrefages, 1849) Introduced.

1935  Ref - Edmondson, 1940  Recorded as Bankia hawaiiensis.
1938  Ref - Dall et al., 1938  Recorded as Teredo kauaiensis.
1976  Ref - Cooke et al., 1980

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<td>Teredo sp.</td>
<td>Indigenous.</td>
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Catalogue V.
- 1973 Ref - Evans et al., 1974
- 1986 Ref - Lenihan, 1990
- 2008 This Project

*Teredo bartschi* Clapp, 1923 Introduced.
- 1935 Ref - Edmondson, 1940
- 1935 Ref - Edmondson, 1942
- 1976 Ref - Cooke et al., 1980
- 1996 Legacy Project (Coles et al., 1997)

*Teredo clappi* Bartsch, 1923 Introduced.
- 1923 Ref - Dall et al., 1938
- 1924 Ref - Miller, 1924
- 1976 Ref - Cooke et al., 1980

*Teredo diegensis* Bartsch, 1916
- 1924 Ref - Edmondson, 1940
- 1924 Ref - Edmondson, 1942
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975

*Teredo furcifera* van Martens, 1894 Introduced.
- 1921 Ref - Bartsch, 1921
- 1921 Ref - Dall et al., 1938
- 1921 Ref - Dall et al., 1938
- 1935 Ref - Edmondson, 1942
- 1976 Ref - Cooke et al., 1980

*Teredo oahuensis* Edmondson, 1942
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975

Class: SCAPHOPODA
Order: DENTALIDA
Family: DENTALIIDAE
Genus: Dentalium

*Dentalium sp.*
- 1961 Spec - BPBM-MO 67988

Class: CEPHALOPODA
Order: OCTOPODA
Family: OCTOPODIDAE
Genus: Polypus

*Polypus sp.*
- 1973 Ref - Evans et al., 1974

Phylum: ARTHROPODA

Unidentified Arthropoda
- Unknown Spec - BPBM-S 5962
- Unknown Spec - BPBM-S 5963
- 1948 Spec - BPBM-S 5323
- 1950 Spec - BPBM-S 5628

Class: PYCNOGONIDA

Unidentified Pycnogonida
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975
- 1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

2008 This Project

Order: PANTOPODA
Family: AMMOTHEIDAE
Genus: Achelia
Achelia plicata Dillwyn

Family: ENDEIDAE
Genus: Endeis
Endeis nodosa Hilton, 1942
1973 Ref - Evans et al., 1974
Endeis procura (Loman)
1996 Legacy Project (Coles et al., 1997)

Family: PYCNOGONIDAE
Genus: Anoplodactylus
Anoplodactylus sp.
Anoplodactylus californicus Hall
1996 Legacy Project (Coles et al., 1997)
Anoplodactylus portus Calman
1945 Spec - BPBM-S 7219
1947 Spec - BPBM-S 7227
1948 Spec - BPBM-S 7243
1948 Spec - BPBM-S 8786 Drydock.
1973 Ref - Evans et al., 1974
Anoplodactylus projectus Hilton
1938 Spec - BPBM-S 4702 Identified by Dr. Hilton.
Anoplodactylus pygmnosoma (Heller)
1996 Legacy Project (Coles et al., 1997)

Genus: Pigromeritis
Pigromeritis robustus Calman
Pigromeritis timsanus Calman Introduced.
1996 Legacy Project (Coles et al., 1997)

Class: CRUSTACEA
Unidentified Cirripedia
1931 Spec - BPBM-B 277 Merry Point.
1976 Spec - BPBM-B 587 Off Pearl Harbor; from dredge spoil dumping site.
1982 Spec - BPBM-B 499
1982 Spec - BPBM-B 513 Off Pearl Harbor; from dredge spoil dumping site.

Unidentified Copepoda
1996 Legacy Project (Coles et al., 1997)

Unidentified Ostracoda
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Family: CYLINDROLEBERIDIDAE
Genus: Parasterope
Parasterope sp. Indigenous.
2008 This Project

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Legacy Project - Species Report (Cont.)

Family: CYPRIIDAE
Genus: Paravargula
Paravargula sp. Indigenous.
2007 This Project
2008 This Project

Order: CYCLOPOIDA
Family: SAPPHIRINIDAE
Genus: Copilia
Copilia sp.
1973 Ref - Evans et al., 1974

Order: THORACICA
Family: BALANIDAE
Unidentified Balanidae
1934 Spec - BPBM-MO 205563 Dredge. Catalogue XIV.
1934 Spec - BPBM-MO 205564 Dredge. Catalogue XIV.

Genus: Balanus
Balanus sp. Introduced. Common name(s): Acorn Barnacle.
1973 Ref - Evans et al., 1974
1975 Spec - BPBM-B 565
1976 Ref - Cooke et al., 1980
1986 Ref - Lenihan, 1990
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Balanus amphitrite Darwin Introduced. Common name(s): Acorn Barnacle.
2008 This Project

Balanus amphitrite amphitrite Darwin, 1854 Introduced.
Unknown Spec - BPBM-B 332
1913 Ref - Pilsbry, 1928
1915 Spec - BPBM-B 233 Identified by Pilsbry.
1929 Spec - BPBM-B 270 Weinrich's place.
1929 Spec - BPBM-B 272 Middle Loch.
1931 Spec - BPBM-B 276
1933 Ref - Edmondson, 1933 Recorded as Balanus amphitrite.
1935 Ref - Edmondson & Ingram, 1939 Recorded as Balanus amphitrite.
1935 Ref - Edmondson, 1944 Recorded as B. amphitrite hawaiiensis Broch.
1935 Ref - Ingram, 1937 Recorded as Balanus amphitrite.
1943 Ref - Hutchins, 1949 Recorded as Balanus amphitrite.
1944 Spec - BPBM-B 312 Off Pearl Harbor.
1944 Spec - BPBM-B 313 Off Pearl Harbor.
1944 Spec - BPBM-B 314 Off Pearl Harbor.
1944 Spec - BPBM-B 315 Off Pearl Harbor.
1944 Spec - BPBM-B 316 Off Pearl Harbor.
1944 Spec - BPBM-B 331 Off Pearl Harbor.
1946 Ref - Edmondson, 1946 Recorded as B. amphitrite hawaiiensis.
1948 Ref - Henry & Mclaughlin, 1975:33
1972 Ref - Long, 1974
1973 Ref - Evans et al., 1974 Recorded as B. amphitrite hawaiiensis Broch.
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1987 Ref - Brewer & Assoc., 1987 Recorded as B. amphitrite hawaiiensis Broch.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
## Legacy Project - Species Report (Cont.)

**Balanus amphitrite?**
- **1975** Spec - BPBM-B 568
- **1977** Spec - BPBM-B 615

**Balanus crenatus**
- **1972** Ref - Long, 1974

**Balanus eburneus**
- **1929** Spec - BPBM-B 271
- **1943** Ref - Hutchins, 1949
- **1946** Ref - Edmondson, 1946
- **1948** Spec - BPBM-B 349
- **1950** Spec - BPBM-B 368
- **1972** Ref - Long, 1974
- **1973** Ref - Evans et al., 1974
- **1973** Ref - McCain, 1974
- **1975** Ref - McCain, 1975
- **1975** Spec - BPBM-B 567
- **1975** Ref - Grohough, 1976
- **1975** Ref - Henry & Mclaughlin, 1975

**Balanus reticulatus**
- **1960** Utinomi, 1960

**Balanus tintinnabulum**
- **1915** Ref - Henry & Mclaughlin, 1975:90
- **1948** Ref - Henry & Mclaughlin, 1975
- **1973** Ref - McCain, 1974
- **1975** Ref - Grohough, 1976
- **1996** Legacy Project (Coles et al., 1997)

**Balanus trigonus**
- **1943** Ref - Hutchins, 1949
- **1948** Spec - BPBM-B 345
- **1948** Spec - BPBM-B 350
- **1972** Ref - Long, 1974
- **1973** Ref - Evans et al., 1974

**Genus: Cheloniobia**
- **Cheloniobia sp.**
  - **1973** Ref - Evans et al., 1974

**Family: CTHAMALIDAE**
- **Genus: Chthamalus**
  - **Chthamalus sp.**
    - **1993** Ref - Brock, 1994
    - **1994** Ref - Brock, 1995

**Genus: Chthamalus proteus**
- **1980** Darbo & Southward, 1980

---

**Darwin**
- Introduced. Common name(s): Acorn Barnacle.
- Identified by T.L. Smalley.
- Pearl Harbor? Identified by T.L. Smalley.
- Bruguiere, 1789

**Gould, 1841**
- Introduced. Common name(s): Reticulated Barnacle.
- Station number obtained from specimen cited in this publication.
- Legacy Project (Coles et al., 1997)
- This Project

**Utinomi, 1960**
- Introduced. Common name(s): Reticulated Barnacle.

**Linnaeus, 1758**
- Off Pearl Harbor.

**Darwin, 1854**
- Off Pearl Harbor.
Legacy Project - Species Report (Cont.)

Family: LEPADIDAE
Genus: Lepas
Lepas anatifera Linnaeus, 1758
1943 Ref - Hutchins, 1949
1944 Spec - BPBM-B 330 Off Pearl Harbor.
Lepas anserifera anserifera Linnaeus, 1759
1943 Ref - Hutchins, 1949 Recorded as L. anserifera.

Order: MYSIDACEA
Unidentified Mysidacea
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975

Order: CUMACEA
Unidentified Cumacea
1996 Legacy Project (Coles et al., 1997)

Order: TANAIDACEA
Family: APSEUIDAE
Genus: Apseudes
Apseudes sp. Linnaeus, 1758
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
Apseudes sp. 1
1973 Ref - Evans et al., 1974 Recorded as Apseudes sp. 1.
1978 Ref - Grovhough, 1979 Recorded as Apseudes sp. 1.
Apseudes sp. 2
1973 Ref - Evans et al., 1974 Recorded as Apseudes sp. 2.
1978 Ref - Grovhough, 1979 Recorded as Apseudes sp. 2.
Apseudes sp. A
1996 Legacy Project (Coles et al., 1997)
Apseudes sp. 1 Indigenous.
2007 This Project
Apseudes tropicalis
1996 Legacy Project (Coles et al., 1997)
Genus: Parapseudes
Parapseudes neglectus Indigenous.
1996 Legacy Project (Coles et al., 1997)
Parapause pedispinis Cryptogenic.
1996 Legacy Project (Coles et al., 1997)

Family: PSEUDOZEUXIDAE
Genus: Leptocheilia
Leptocheilia dubia (Kroyer, 1852) Cryptogenic.
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

Family: TANAIDAE
Genus: Anatanais
Anatanais insularis Miller, 1940 Indigenous.
1973 Ref - Evans et al., 1974
### Legacy Project - Species Report (Cont.)

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<td>1978</td>
<td>Ref - Grovhoug, 1979</td>
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<td>Legacy Project (Coles et al., 1997)</td>
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**Order: ISOPODA**

**Family: ANTHURIDAE**

**Genus: Mesanthera**

- **Mesanthera sp. A** Cryptogenic.
  - 1996 Legacy Project (Coles et al., 1997)

- **Mesanthera hieroglyphica** Miller & Menzies, 1952
  - 1973 Ref - Evans et al., 1974
  - 1978 Ref - Grovhoug, 1979

**Family: CIROLANIDAE**

**Unidentified Cirolanidae**

- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975

**Genus: Cirolana**

- **Cirolana sp.**
  - 1973 Ref - Evans et al., 1974

- **Cirolana parva?** Hansen
  - 1978 Ref - Grovhoug, 1979

**Genus: Hansenolana**

- **Hansenolana sphaeroformis** (Hansen)
  - 1973 Ref - Evans et al., 1974

**Family: IDOTEIDAE**

**Genus: Colidotea**

- **Colidotea edmondsoni** Miller, 1940
  - 1973 Ref - Evans et al., 1974

**Family: JAEROPSISIDAE**

**Genus: Jaeropsis**

- **Jaeropsis hawaiensis** Miller, 1941
  - 1927 Ref - Miller, 1941

**Family: JANIRIDAE**

**Genus: Carpia**

- **Carpia sp.**
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Cerpia**

- **Cerpia algicola**
  - 1996 Legacy Project (Coles et al., 1997)

**Genus: Janira**

- **Janira algicola** Miller, 1941
  - 1927 Ref - Miller, 1941

**Family: LIMNORIIDAE**

**Genus: Limnoria**

- **Limnoria sp.**
  - 1973 Ref - Evans et al., 1974
  - 1976 Ref - Cooke et al., 1980
  - 1996 Legacy Project (Coles et al., 1997)

- **Limnoria lignorum**
  - 1996 Legacy Project (Coles et al., 1997)

- **Limnoria tripunctata** Menzies, 1957 Introduced.
  - 1973 Ref - Evans et al., 1974
  - 1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Family: MUNNIDAE
Genus: Munna
  Munna acarina
  1996 Legacy Project (Coles et al., 1997)

Family: SCYPHACIDAE
Genus: Armadillioniscus
  Armadillioniscus litoralis
  1996 Legacy Project (Coles et al., 1997)

Family: SPHAEROMATIDAE
Genus: Dynamenella
  Dynamenella sp.
    1973 Ref - Evans et al., 1974
    1973 Ref - McCain, 1974
    1973 Ref - McCain, 1975
    1978 Ref - Grovhough, 1979

Genus: Exosphaeroma
  Exosphaeroma sp. A sp.
    Cryptogenic.
  1996 Legacy Project (Coles et al., 1997)

Genus: Paracerceis
  Paracerceis sculpa
    (Holmes, 1909) Introduced.
    1968 Ref - Miller, 1968
    1973 Ref - Evans et al., 1974
    1973 Ref - McCain, 1974
    1973 Ref - McCain, 1975
    1978 Ref - Grovhough, 1979

Genus: Sphaeroma
  Sphaeroma walkeri
    (Stebbing, 1905) Introduced.
    1973 Ref - Evans et al., 1974
    1973 Ref - McCain, 1974
    1973 Ref - McCain, 1975

Unidentified Sphaeroma
  1996 Legacy Project (Coles et al., 1997)

Family: STENETRIIDAE
Genus: Stenetrium
  Stenetrium medipacificum
    Miller, 1941 Indigenous.
    1929 Ref - Miller, 1941

Family: TEREDICOLIDAE
Genus: Teredicola
  Teredicola typicus
    Wilson, 1942
    1976 Ref - Cooke et al., 1980

Order: AMPHIPODA

Unidentified Amphipoda
  1979 Ref - AECOS, 1979 Off Pearl Harbor.
    2007 This Project
    2008 This Project

Family: AMPHILOCHIDAE
Genus: Amphilochnus
  Amphilochnus kailua
    Barnard, 1970
    1996 Legacy Project (Coles et al., 1997)
  Amphilochnus likelike
    Barnard, 1970
    1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Genus: *Gitanopsis*
*Gitanopsis pele* Barnard, 1970
1996 Legacy Project (Coles et al., 1997)

Family: AMPITHOIDEAE
Genus: *Ampithoe*
1996 Legacy Project (Coles et al., 1997)

Genus: *Paragrubia*
*Paragrubia vorax* Chevreaux, 1901
1996 Legacy Project (Coles et al., 1997)

Family: AORIDAE
Genus: *Bemlos*
*Bemlos sp.* Indigenous.
1973 Ref - Evans et al., 1974 Recorded as Lembos.

*Bemlos macromanus* Shoemaker, 1925 Indigenous.
1973 Ref - Evans et al., 1974 Recorded as Lembos macromanus.
1978 Ref - Grovhoug, 1979 Recorded as Lembos macromanus.
1996 Legacy Project (Coles et al., 1997)

*Bemlos pualiani* (Barnard, 1970)
1996 Legacy Project (Coles et al., 1997)

*Bemlos waipio* (Barnard, 1970)
1996 Legacy Project (Coles et al., 1997)

Genus: *Grandidierella*
*Grandidierella sp.*
2008 This Project

*Grandidierella bispinosa* Cryptogenic.
1996 Legacy Project (Coles et al., 1997)

*Grandidierella japonica* Introduced.
1996 Legacy Project (Coles et al., 1997)

Family: CAPRELLIDAE
Unidentified Caprellidae
2008 This Project

Genus: *Caprella* Hawaiian name(s): `āmi kai.
*Caprella scabra* Templeton, 1836 Introduced.
1929 Spec - BPBM-S 5251
1929 Spec - BPBM-S 5252
1948 Ref - Edmondson & Mansfield, 1948
1973 Ref - Evans et al., 1974

Genus: *Paracaprella*
*Paracaprella pusilla* Mayer, 1890
1978 Ref - Grovhoug, 1979

Family: COLOMASTIGIDAE
Genus: *Colomastix*
*Colomastix kapiolani* Barnard, 1970 Indigenous.
2008 This Project

1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

*Colomastix pusilla* Grube, 1855 Indigenous.
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

2008 This Project

Family: COROPHIIDAE
Genus: Corophium
Corophium sp. Introduced.
2007 This Project

Corophium baco1 Shoemaker, 1934 Introduced.
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Corophium insidiosum Crawford, 1937 Introduced.
1978 Ref - Grovhoug, 1979
1996 Legacy Project (Coles et al., 1997)

Genus: Ericthonius
Ericthonius sp. This Project

Ericthonius brasilensis (Dana, 1853) Introduced.
1938 Ref - Barnard, 1955 Recorded as Ericthonius brasilensis.
1938 Spec - BPBM-S 5947 Identified by J.L. Barnard.
1973 Ref - Evans et al., 1974 Recorded as Ericthonius brasilensis.
1978 Ref - Grovhoug, 1979 Recorded as Ericthonius brasilensis.
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Genus: Monocorophium
Monocorophium ascherusicum (Costa, 1857) Introduced.
1973 Ref - Evans et al., 1974 Recorded as Corophium ascherusicum.
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Family: GAMMARIDAE
Genus: Elasmopus
Elasmopus sp. Indigenous.
2008 This Project

Elasmopus diplonyx Schellenberg, 1938
1996 Legacy Project (Coles et al., 1997)

Elasmopus ecuadorensis hawaiensis Schellenberg, 1938
1973 Ref - Evans et al., 1974

Elasmopus molokai Barnard, 1970
1996 Legacy Project (Coles et al., 1997)

Elasmopus pectenicrus (Bate, 1862)
1937 Spec - BPBM-S 5993 Identified by J.L. Barnard.
1948 Ref - Barnard, 1970 Recorded as Elasmopus pectenicrus.
1948 Spec - BPBM-S 5994 Identified by J.L. Barnard.
1950 Spec - BPBM-S 5995 Identified by J.L. Barnard.
1950 Spec - BPBM-S 6200 Identified by J.L. Barnard.

Elasmopus piikoi Barnard, 1970
1978 Ref - Grovhoug, 1979
Legacy Project - Species Report (Cont.)

**Elasmopus rapax** (Costa, 1853) Introduced.
- 1948 Ref - Barnard, 1955
- 1948 Spec - BPBM-S 5989 Identified by J.L. Barnard.
- 1948 Spec - BPBM-S 5991 Identified by J.L. Barnard.
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Eriopisa**
**Eriopisa hamakua** Barnard, 1970
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Eriopisella**
**Eriopisella sechellensis upolu**
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Maera**
**Maera sp.** Indigenous.
- 2007 This Project

**Maera kaiulani** Barnard, 1970

**Maera pacifica** Indigenous.
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

**Family: HYALIDAE**
**Genus: Hyale**
**Hyale grandicornis bishopae** Barnard, 1970
- 1996 Legacy Project (Coles et al., 1997)

**Family: ISAEIDAE**
**Genus: Gammaropsis**
**Gammaropsis alamoana** Barnard, 1970
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Photis**
**Photis hawaiiensis** Barnard, 1955 Cryptogenic.
- 2008 This Project

**Photis hawaiiensis** Barnard, 1955
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)

**Family: LEUCOTHOIDAE**
**Genus: Leucothoe**
**Leucothoe sp.**
- 1973 Ref - Evans et al., 1974

**Leucothoe hyhelia** Barnard, 1965 Indigenous.
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)
- 2007 This Project
- 2008 This Project

**Leucothoe tridens** Stebbing, 1888
- 1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

*Paraleucothoe flindersi*  
Stebbing, 1888  
Cryptogenic.  
1996  Legacy Project (Coles et al., 1997)

**Family: LILJEBORGIIIDAE**

**Genus: Liljeborgia**

*Liljeborgia heea*  
Baranard, 1970  
1996  Legacy Project (Coles et al., 1997)

**Family: LYSIANASSIDAE**

**Genus: Lysianassa**

*Lysianassa ewa*  
2008  This Project

**Family: PACHYNIIDAE**

**Unidentified Pachynidae**  
2007  This Project

**Family: PODOCERIDAE**

**Genus: Podocerus**

*Podocerus brasilienis*  
(Dana, 1853)  Introduced.  
Unknown Spec - BPBM-S 5964  Identified by J.L. Barnard.  
1938 Ref - Barnard, 1955  
1938 Spec - BPBM-S 5959  Identified by J.L. Barnard.  
1948 Ref - Barnard, 1955  
1948 Spec - BPBM-S 5958  Identified by J.L. Barnard.  
1948 Spec - BPBM-S 5960  Identified by J.L. Barnard.  
1950 Spec - BPBM-S 5961  Identified by J.L. Barnard.  
1951 Ref - Barnard, 1955  
1973 Ref - Evans et al., 1974  
1978 Ref - Grovhoug, 1979  
1996 Legacy Project (Coles et al., 1997)  
2008 This Project

*Podocerus talegus lawai*  
1996  Legacy Project (Coles et al., 1997)

**Family: STENOITHOIDAE**

**Unidentified Stenothoidae**  
2008  This Project

**Genus: Stenothe**

*Stenothe cattai*  
1950 Spec - BPBM-S 5966  Identified by J.L. Barnard.

*Stenothe gallensis*  
Walker, 1904  Introduced.  
1937 Ref - Barnard, 1955  
1944 Ref - Barnard, 1955  Off Pearl Harbor.  
1948 Spec - BPBM-S 5965  Identified by J.L. Barnard.  
1978 Ref - Grovhoug, 1979  
1996 Legacy Project (Coles et al., 1997)

*Stenothe valida*  
Dana, 1853  Cryptogenic.  
1978 Ref - Grovhoug, 1979  
1996 Legacy Project (Coles et al., 1997)

**Order: DECAPODA**

**Unidentified Caridea**  
1996  Legacy Project (Coles et al., 1997)

**Family: ALPHEIDAE**

**Unidentified Alpheidae**  
1979 Ref - AECOS, 1979  Off Pearl Harbor.  
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

**Genus: Alpheopsis**
**Alpheopsis equalis** Coutiere, 1896
1973 Ref - Evans et al., 1974

**Genus: Alpheus**

**Alpheus sp.**
1973 Ref - Evans et al., 1974
1986 Ref - Lenihan, 1990
1996 Legacy Project (Coles et al., 1997)

**Alpheus sp. 1**
1987 Ref - Brewer & Assoc., 1987 Recorded as Alpheus sp. 1.

**Alpheus brevipes** De Haan, 1849
1996 Legacy Project (Coles et al., 1997)

**Alpheus collumianus** Stimpson, 1860
1996 Legacy Project (Coles et al., 1997)

**Alpheus cassinanus** Heller, 1865
1929 Spec - BPBM-S 8928 Identified by Banner.
1938 Spec - BPBM-S 6442 Identified by A.H. Banner.

**Alpheus diadema** Dana, 1852
1973 Ref - Evans et al., 1974

**Alpheus gracillipes** Stimpson, 1860
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

**Alpheus gracillis simplex** (Banner, 1953)
1973 Ref - Evans et al., 1974

**Alpheus heeia** Banner & Banner, 1974
1973 Ref - Evans et al., 1974

**Alpheus lancelotii** Coutiere, 1905
1973 Ref - Evans et al., 1974

**Alpheus lobidens**
1996 Legacy Project (Coles et al., 1997)

**Alpheus lobidens polyynesica** Banner & Banner, 1974
1973 Ref - Evans et al., 1974

**Alpheus lottini** Guérin, 1829
1996 Legacy Project (Coles et al., 1997)

**Alpheus mackayi** Banner & Banner, 1974
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007

**Alpheus pacificus** Dana, 1852
1947 Spec - BPBM-S 5302
1947 Spec - BPBM-S 5317
1948 Spec - BPBM-S 5337

**Alpheus paracrinus** Miers, 1881
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

**Alpheus paracyclone** Coutiere, 1905
1973 Ref - Evans et al., 1974
### Legacy Project - Species Report (Cont.)

**Alpheus platynugiuculatus**  
(Banner, 1953)  
1973 Ref - Evans et al., 1974

**Alpheus rapacida**  
deMan, 1911  
1973 Ref - Evans et al., 1974  
1978 Ref - Grosvaugh, 1979

**Alpheus rapax**  
Fabricius, 1798  
1973 Ref - Evans et al., 1974

**Genus: Leptalpheus**

**Leptalpheus pacificus**  
Banner & Banner, 1974  
1972 Spec - BPBM-S 8550  
1973 Ref - Evans et al., 1974

**Genus: Metalpheus**

**Metalpheus paragracilis**  
(Coutiere, 1897)  
1996 Legacy Project (Coles et al., 1997)

**Genus: Synalpheus**

**Synalpheus bituberculatus**  
deMan, 1911  
1973 Ref - Evans et al., 1974  
1996 Legacy Project (Coles et al., 1997)

**Synalpheus pachymeris**  
Coutiere, 1905  
1973 Ref - Evans et al., 1974

**Synalpheus paraneomeris**  
Coutiere, 1905  
1996 Legacy Project (Coles et al., 1997)

**Synalpheus streptodactylus**  
Coutiere Indigenous. Common name(s): Snapping Shrimp.  
1973 Ref - Evans et al., 1974  
1996 Legacy Project (Coles et al., 1997)  
2007 This Project

**Synalpheus thai**  
1973 Ref - Evans et al., 1974  
1996 Legacy Project (Coles et al., 1997)  
2007 This Project

**Unidentified Synalpheus**  
1996 Legacy Project (Coles et al., 1997)

**Family: AXIIDAE**

**Genus: Enoplometopus**

**Enoplometopus occidentalis**  
(Randall) Common name(s): Western Lobster; Hawaiian name(s): ʻopae ula.  
1973 Ref - Evans et al., 1974

**Family: CALAPPIDAE**

**Genus: Calappa**

**Calappa galus**  
(Herbst, 1803) Hawaiian name(s): pokipoki; papai pokipoki.  
1979 Ref - AECOS, 1979 Off Pearl Harbor.

**Calappa hepatica**  
(Linnaeus, 1767) Common name(s): Hepatic Box Crab; Hawaiian name(s): pokipoki`au moana; pokipoki kuapa`a; popoki.  
1973 Ref - Evans et al., 1974

**Genus: Cryptosoma**

**Cryptosoma granulosum**  
Alcock  
Unknown Spec - BPBM-S 1500

**Family: CALLIANTHIDAE**

**Genus: Callianassa**

**Callianassa sp.**  
1996 Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

*Callianassa variabilis*
1996  Legacy Project (Coles et al., 1997)

**Family: CHIROSTYLIDAE**

*Unidentified Chirostylidae*
1982  Spec - BPBM-S 10099  Off Pearl Harbor.

**Family: DIOGENIDAE**

*Genus: Calcinus*
*Calcinus latens*  *(Randall, 1839)*
1973  Ref - Evans et al., 1974

**Family: DROMIIDAE**

*Genus: Cryptodromiopsis*
*Cryptodromiopsis tridens*  Borradaile
1950  Spec - BPBM-S 5626

**Family: DYNOMENIDAE**

*Genus: Dynomene*
*Dynomene devaneyi*  Takeda, 1977

**Family: GERONIDAE**

*Genus: Progeryon*
*Progeryon guinotae*  Crozier, 1976
1977  Spec - BPBM-S 10626  3 miles off Pearl Harbor.

**Family: GNATHOPHYLLIDAE**

*Genus: Gnathophyloides*
*Gnathophyloides mammillatus*  *(Edmondson)*
1973  Ref - Evans et al., 1974  Recorded as Gnathophyloides mammalatus.

**Family: GRAPSIDAE**

*Unidentified Grapsidae*
1996  Legacy Project (Coles et al., 1997)

*Genus: Metapogrus*
*Metapogrus thukuhar*  *(Owen, 1839)*
1906  Ref - Rathbun , 1906
1929  Spec - BPBM-S 3157
1931  Spec - BPBM-S 3368  Middle Loch.
1939  Spec - BPBM-S 4427
1948  Spec - BPBM-S 5331
1973  Ref - Evans et al., 1974
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1987  Ref - AECS, 1987
1993  Ref - Brock, 1994  Recorded as M. messor.
1994  Ref - Brock, 1995  Recorded as M. messor.
1996  Legacy Project (Coles et al., 1997)

*Genus: Metapogrus*
*Metapogrus messor*  *(Forskal, 1775)*  Indigenous. Common name(s): Shore Crab.
2007  This Project
2008  This Project

2007  Ref - Brock, 2007
2008  This Project

*Genus: Nanosesarma*
*Nanosesarma minutum*  *(De Man, 1887)*  Introduced.
1996  Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

Genus: *Pachygrapsus*

*Pachygrapsus* sp. Indigenous.

2008 This Project

Genus: *Plagusia*

*Plagusia depressa tuberculata* Lamarck, 1818

1947 Spec - BPBM-S 5306
1973 Ref - Evans et al., 1974 Off Pearl Harbor. Recorded as *Plagusia depressa tuberculata* (Lamarck).

Family: HAPALOCARCINIDAE

Genus: *Hapalocarcinus*

*Hapalocarcinus marsupialis* Stimpson, 1859

1996 Legacy Project (Coles et al., 1997)

Family: HIPPOLYTIIDAE

Genus: *Hippolyisma*

*Hippolyisma* sp.

1948 Spec - BPBM-S 6079

*Hippolyisma vitatta*

1936 Spec - BPBM-S 4222
1947 Spec - BPBM-S 5316
1948 Spec - BPBM-S 5330
1948 Spec - BPBM-S 5338
1948 Spec - BPBM-S 5572

Genus: *Leptodioides*

*Leptodioides exaratus* Milne Edwards

1906 Ref - Rathbun, 1906

*Leptodioides sanguineus* (H. Milne Edwards, 1834)

1973 Ref - Evans et al., 1974

Genus: *Lysmata*

*Lysmata acicula* (Rathbun)

1948 Spec - BPBM-S 5329
1973 Ref - Evans et al., 1974

Genus: *Saron*

*Saron marmoratus* (Olivier, 1811) Hawaiian name(s): ‘opae.

1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Genus: *Spirontocaris*

*Spirontocaris marmoratus*

1950 Spec - BPBM-S 5634

Family: HOMOLIDAE

Genus: *Homola*

*Homola ikedai* Sakai, 1879

1976 Spec - BPBM-S 10637 Entrance to Pearl Harbor; 2.5 miles off Buoy 1.

Genus: *Paromola*

*Paromola japonica* Parisi, 1915

1976 Spec - BPBM-S 10811 Entrance to Pearl Harbor; 2.5 miles off Buoy 1. Identified by Guinot and Forgés,


Family: LEUCOSIIDAE

Genus: *Randallia*

*Randallia distincta* Rathbun

1983 Spec - BPBM-S 11187 Mamala Bay; Pearl Harbor disposal site. Identified by E.H. Chave.
Legacy Project - Species Report (Cont.)

Family: MAJIDAE
Genus: Hyastenus
Hyastenus spinosus
1996 Legacy Project (Coles et al., 1997)

Genus: Schizophroidea
Schizophroidea hilensis Rathbun, 1906
1996 Legacy Project (Coles et al., 1997)

Genus: Schizophrys
Schizophrys aspera H. Milne Edwards, 1834 Introduced.
1950 Spec - BPBM-S 5620
1951 Ref - Edmondson, 1951

Family: OCYPOIDAE
Genus: Macrophthalmus
Macrophthalmus telescopicus (Owen, 1839) Common name(s): Telescope-Eyed Ghost Crab; Hawaiian name(s):
makaʻaloa; ʻaloa; ʻohiki makaloa.
1930 Spec - BPBM-S 3476 Middle Loch.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Genus: Ocypode
Ocypode ceratophthalma (Pallas, 1872) Common name(s): sand crab; Hawaiian name(s): ʻohiki.
1979 Ref - AECOS, 1979

Ocypode laevis Dana
1996 Legacy Project (Coles et al., 1997)

Family: PALAEMONIDAE
Unidentified Palaemonidae
1996 Legacy Project (Coles et al., 1997)

Genus: Brachypraus
Brachypraus biungiuculatus (Lucus, 1846)
1996 Legacy Project (Coles et al., 1997)

Genus: Conchohytes
Conchohytes tridacnae Peters, 1852
1973 Ref - Evans et al., 1974

Genus: Harpiliopsis
Harpiliopsis depressa (Stimpson, 1860)
1996 Legacy Project (Coles et al., 1997)

Genus: Leander
Leander sp.
1973 Ref - Evans et al., 1974

Genus: Macrobrachium
Macrobrachium grandimanus (Randall) Hawaiian name(s): ʻopae ʻoheʻa a.
1922 Spec - BPBM-S 717

Genus: Palaemon
Palaemon debelis Dana, 1852
1934 Spec - BPBM-S 3833

Palaemon dubius Dana, 1852
1906 Ref - Rathbun, 1906

Palaemon pacificus (Simpson)
1996 Legacy Project (Coles et al., 1997)

Palaemon pacificus? (Simpson)
1978 Ref - Grovhoug, 1979
Legacy Project - Species Report (Cont.)

Genus: *Palaemonella*

*Palaemonella* sp.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

*Palaemonella rotumana*
1996 Legacy Project (Coles et al., 1997)

*Palaemonella tenuipes* Dana, 1852
1948 Spec - BPBM-S 5339
1987 Ref - AECOS, 1987 Recorded as *Palaemonella tenuides*.
1996 Legacy Project (Coles et al., 1997)

*Palaemonella tenuipes?* Dana, 1852
1973 Ref - McCain, 1974 Recorded as *Palaemonella tenuides*.
1973 Ref - McCain, 1975 Recorded as *Palaemonella tenuides*.

Family: PALINURIDAE

Genus: *Panulirus*

*Panulirus marginatus* (Quoy & Gaimard, 1825)

*Panulirus penicillatus* (Olivier, 1791)
1973 Ref - Evans et al., 1974

Family: PANDALIDAE

Genus: *Heterocarpus*

*Heterocarpus* sp.

*Heterocarpus ensifer* Milne-Edwards
1983 Spec - BPBM-S 11149 Mamala Bay; Pearl Harbor disposal site. Identified by R.M. Moffitt.

Genus: *Plesionika*

*Plesionika* sp.

*Plesionika alcocki* (Anderson)
1983 Spec - BPBM-S 11150 Mamala Bay; Pearl Harbor disposal site.

Family: PARTHENOPIDAE

Genus: *Parthenope*

*Parthenope* sp.
2008 This Project

*Parthenope steliata* Rathbun, 1906 Off Pearl Harbor dredge spoil site; in vicinity of hard outcrop. Identified by D.M. Devaney.

*Parthenope whitei* (Adams & White)
1973 Ref - Evans et al., 1974

Family: PORTUNIDAE

Unidentified Portunidae
1996 Legacy Project (Coles et al., 1997)

Genus: *Charybdis*

*Charybdis erythroductyla* (Lamarck) Common name(s): Red-Legged Swimming Crab; Hawaiian a ko`ako`a.
1902 Spec - BPBM-S 4991

*Charybdis hellerii* (A. Milne Edwards) Introduced.
1950 Spec - BPBM-S 5622
1950 Ref - Edmondson, 1954

*Charybdis orientalis* Dana, 1852
1902 Spec - BPBM-S 4992
Legacy Project - Species Report (Cont.)

Genus: Libystes
Libystes nitidus
1973 Ref - Evans et al., 1974

Genus: Podophthalmus
Podophthalmus vigil
(Weber, 1795) Common name(s): Long-Eyed Swimming Crab; Hawaiian name(s): mo'ala.
1906 Ref - Rathbun, 1906
1973 Ref - Evans et al., 1974
2006 Ref - Smith et al., 2006

Genus: Portunus
Portunus longispinosus
(Dana, 1852) Recorded as Portunus longispinosus Rathbun.
1973 Ref - Evans et al., 1974
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Portunus sanguinolentus
(Herbst, 1899) Common name(s): Blood-Spotted Swimming Crab; Hawaiian name(s): `ala`eke.
kuhonu; papa`i kauhonu; kuohonu.
1973 Ref - Evans et al., 1974
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
2006 Ref - Smith et al., 2006
2007 Ref - Brock, 2007

Genus: Scylla
Scylla serrata
(Forskål, 1775) Introduced. Common name(s): Serrate Swimming Crab; Samoan Crab; Mangrove Crab; Red Crab.
1987 Ref - Brewer & Assoc., 1987
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)

Genus: Thalamita
Thalamita admete
(Herbst, 1803)
1973 Ref - Evans et al., 1974

Thalamita crenata
(Latreille, 1900)
1973 Ref - Evans et al., 1974
1987 Ref - AECOS, 1987
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006

Thalamita crenata?
Latreille, 1900
1950 Spec - BPBM-S 5621

Thalamita dakini
Generated
2008 This Project

Thalamita edwardsi
Montgomeray, 1931 Indigenous.
1950 Spec - BPBM-S 5619
2007 Ref - Brock, 2007

Thalamita edwardsi?
1948 Spec - BPBM-S 5335

Thalamita integra
Dana, 1852 Indigenous.
1915 Spec - BPBM-S 1590
1916 Spec - BPBM-S 741
1922 Spec - BPBM-S 1597
1922 Spec - BPBM-S 718
Legacy Project - Species Report (Cont.)

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**Thalamita medipacifica**

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**Thalamita quadridens**

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**Unidentified Thalamita**

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**Family: RANINIDAE**

**Genus: Ranina**

**Ranina ranina**

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**Family: SCYLLARIDAE**

**Genus: Parribacus**

**Parribacus antarcticus**

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**Family: SERGESTIDAE**

**Genus: Lucifer**

**Lucifer sp.**

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**Lucifer chacei**

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**Family: STENOPODIDAE**

**Genus: Stenopus**

**Stenopus hispidus**

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**Common name(s):** Antarctic Slipper Lobster; Hawaiian name(s): ula papapa.

**Scyllarides squamosus**

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**Common name(s):** Antarctic Slipper Lobster; Hawaiian name(s): ula papapa.

**Scyllarides**

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**Milne Edwards, 1837**

**Common name(s):** Antarctic Slipper Lobster; Hawaiian name(s): ula papapa.

**Bowman, 1966**

**Indigenous. Common name(s):** Banded Shrimp; Hawaiian name(s): huna.

**Olivier, 1811**

**Indigenous. Common name(s):** Banded Shrimp; Hawaiian name(s): huna.
Family: XANTHIDAE
Unidentified Xanthidae
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1996 Legacy Project (Coles et al., 1997)
2007 This Project

Genus: Atergatopsis
Atergatopsis immigrans (Edmondson, 1962) Introduced.
1950 Ref - Edmondson, 1962 Recorded as Neoliomera immigrans.

Genus: Carpilodes
Carpilodes bellus (Dana, 1852)
1916 Spec - BPBM-S 740
1973 Ref - Evans et al., 1974

Carpilodes ruber A. Milne Edwards, 1865
1906 Ref - Rathbun , 1906

Genus: Chloradiella
Chloradiella laevissima (Dana, 1852)
1973 Ref - Evans et al., 1974

Genus: Etiusus
Etiusus electra (Herbst, 1801)
1937 Spec - BPBM-S 4382
1973 Ref - Evans et al., 1974

Etiusus laevisanus (Randall, 1839)
Unknown Spec - BPBM-S 10394
1906 Ref - Rathbun , 1906
1929 Spec - BPBM-S 3276
1931 Spec - BPBM-S 3342
1931 Spec - BPBM-S 3369 Middle Loch.
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Genus: Glabropilumnus
Glabropilumnus seminudus (Miers, 1884) Introduced.
1950 Spec - BPBM-S 5640 Pearl Harbor drydock.
1950 Ref - Edmondson, 1952 Pearl Harbor drydock.
1962 Ref - Edmondson, 1962
1973 Ref - Evans et al., 1974

Genus: Liocarpilodes
Liocarpilodes binnguis
1996 Legacy Project (Coles et al., 1997)

Liocarpilodes integerrimus (Dana, 1852)
1973 Ref - Evans et al., 1974

Genus: Lophozoozmys
Lophozoozmys sp.
1987 Ref - Brewer & Assoc., 1987

Lophozoozmys dodone (Herbst, 1801)
1973 Ref - Evans et al., 1974

Genus: Madeus
Madeus simplex (A. Milne Edwards, 1873)
1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Genus: Medaeus

Medaeus simplex
- 1929 Spec - BPBM-S 3162

Genus: Neoliomera

Neoliomera immigrans Edmondson, 1962 Introduced.
- 1950 Spec - BPBM-S 5625
- 1962 Ref - Edmondson, 1962

Genus: Neopanope

Neopanope sp.
- 1929 Spec - BPBM-S 3437

Genus: Panopeus

Panopeus herbstii Milne-Edwards Introduced.
- 1947 Spec - BPBM-S 5314

Panopeus lacustris Desbonne, 1867 Introduced.
- 2008 This Project

Panopeus pacificus (Edmondson, 1931) Introduced.
- 1929 Spec - BPBM-S 3280
- 1929 Spec - BPBM-S 3435
- 1929 Ref - Edmondson, 1931
- 1930 Spec - BPBM-S 5298
- 1930 Ref - Edmondson, 1962
- 1947 Spec - BPBM-S 5304 Identified by Edmondson.
- 1948 Spec - BPBM-S 5325
- 1948 Spec - BPBM-S 5333
- 1948 Spec - BPBM-S 5336
- 1948 Spec - BPBM-S 6135
- 1949 Spec - BPBM-S 5578 Middle Loch.
- 1973 Ref - Evans et al., 1974
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975
- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

Genus: Paramedeus

Paramedeus simplex (Milne Edwards, 1873) Legacy Project (Coles et al., 1997)
- 1996 Legacy Project (Coles et al., 1997)

Genus: Phymodius

Phymodius sp. Indigenous.
- 2008 This Project

Phymodius nitidus (Dana, 1852) Indigenous.
- 1929 Spec - BPBM-S 3161
- 1973 Ref - Evans et al., 1974
- 1996 Legacy Project (Coles et al., 1997)
- 2007 This Project
- 2008 This Project

Phymodius ungulatus Milne Edwards, 1834
- 1996 Legacy Project (Coles et al., 1997)

Genus: Pilumnus

Pilumnus longicornis Hilgendorf, 1878
- 1950 Spec - BPBM-S 5624
Legacy Project - Species Report (Cont.)

_Pilumnus minitus_ De Haan, 1833
1996 Legacy Project (Coles et al., 1997)

_Pilumnus oahuensis_ Edmondson, 1931 Introduced. Common name(s): Pilumnid Crab.
1929 Spec - BPBM-S 3279
1929 Spec - BPBM-S 3432
1929 Ref - Edmondson, 1931
1930 Ref - Edmondson, 1962
1931 Spec - BPBM-S 3433
1932 Spec - BPBM-S 3852
1947 Spec - BPBM-S 5303
1948 Spec - BPBM-S 5324
1950 Spec - BPBM-S 5613
1950 Spec - BPBM-S 6131
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1987 Ref - Brewer & Assoc., 1987
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

_Pilumnus taeniola_ Rathbun, 1906 Indigenous.
2008 This Project

Genus: _Platypodia_

_Platypodia eydouxi_ (A. Milne Edwards, 1865)
1916 Spec - BPBM-S 735
1929 Spec - BPBM-S 3156
1931 Spec - BPBM-S 3344
1973 Ref - Evans et al., 1974 Recorded as _Platypodia eydouxi_.
1996 Legacy Project (Coles et al., 1997)

_Platypodia semigranosa_ 1950 Spec - BPBM-S 5638

Unidentified Platypodia
1996 Legacy Project (Coles et al., 1997)

Genus: _Trapezia_

_Trapezia guttata_ Rüppell, 1830

_Trapezia intermedia_ (Miers)
1996 Legacy Project (Coles et al., 1997)

_Trapezia wardi_ Serène, 1970
1996 Legacy Project (Coles et al., 1997)

Genus: _Xanthias_

_Xanthias sp._
1973 Ref - Evans et al., 1974

Order: STOMATOPODA

Family: GONODACTYLIDAE

Genus: _Gonodactylaceus_

_Gonodactylaceus falcatus_ (Forsskål, 1775) Introduced. Common name(s): Snapping Shrimp.
1973 Ref - Evans et al., 1974 Recorded as _Gonodactylus falcatus_.
1987 Ref - AECOS, 1987 Recorded as _Gonodactylus falcatus_.
1993 Ref - Brock, 1995 Recorded as _Gonodactylus aloha_.
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006 Recorded as _Gonodactylaceus mutates_.
2007 Ref - Brock, 2007 Recorded as _Gonodactylus falcatus_.

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Legacy Project - Species Report (Cont.)

2007  This Project

Genus: *Pseudosquilla*  
*Pseudosquilla ciliata* (Fabricius, 1787)  Hawaiian name(s): aloalo.  
1938  Spec - BPBM-S 4567  
1973  Ref - Evans et al., 1974  Recorded as Pseudosquilla ciliata Miers.  
1996  Legacy Project (Coles et al., 1997)

Family: LYSIOSQUILLIDAE  
Genus: *Lysiosquilla*  
*Lysiosquilla maculatus* (Fabricius.)  
1923  Spec - BPBM-S 2522

Genus: *Lysiosquillina*  
*Lysiosquillina maculata* (Fabricuis, 1793)  
2006  Ref - Smith et al., 2006  
2007  Ref - Brock, 2007

Family: SQUILLIDAE  
Genus: *Squilla*  
*Squilla sp.*  
1986  Ref - Lenihan, 1990

Class: INSECTA  
Order: COLLEMBOLA  
Unidentified Collembola  
1996  Legacy Project (Coles et al., 1997)

Phylum: SIPUNCULA  
Class: SIPUNCUILIDA  
Unidentified Sipunculida  
1996  Legacy Project (Coles et al., 1997)

Family: PHASCOLOSOMATIDAE  
Genus: *Phascolosoma*  
*Phascolosoma perlucens* Baird, 1868  
1973  Ref - Evans et al., 1974  Recorded as Phascolosoma dentigerum (Selenka, deMan & Bulo.

*Phascolosoma stephensoni* (Stephen, 1942)  Indigenous.  
2007  This Project

Phylum: BRYOZOA  
Unidentified Bryozoa  
Unknown  Spec - BPBM-K 649  
1975  Spec - BPBM-K 684  
1976  Spec - BPBM-K 661  Hospital Point.  
1976  Ref - Cooke et al., 1980  
2007  This Project

Family: CLEIDOCHASMATIDAE  
Genus: *Diaproeroforma*  
*Diaproeroforma sp.*  Indigenous.  
2008  This Project

Class: GYMNOLAEMATA  
Order: CTENOSTOMATA  
Family: VESICULARIIDAE  
Genus: *Anathia*  
*Anathia sp.*  
1950  Spec - BPBM-K 214  
Legacy Project - Species Report (Cont.)

_Amathia_ sp.?  
1947 Spec - BPBM-K 234

_Amathia distans_  
Busck, 1886 Introduced. Common name(s): Bushy Bryozoan.

1948 Spec - BPBM-K 207
1948 Spec - BPBM-K 210
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

_Amathia distans?_  
Busck, 1886 Introduced. Common name(s): Bushy Bryozoan.

Unknown Spec - BPBM-K 455

_Genus: Bowerbankia_

_Bowerbankia sp._  

_Genus: Zoobotryon_

_Zoobotryon sp._  
1996 Legacy Project (Coles et al., 1997)

_Zoobotryon verticillatum_ (Della Chiaje) Introduced.

1921 Spec - BPBM-K 236
1940 Spec - BPBM-K 233
1940 Spec - BPBM-K 310
1948 Spec - BPBM-K 216
1948 Spec - BPBM-K 346
1975 Spec - BPBM-K 601 Merry Point; off Fuel Pier Array. Identified by J. Grovhoug.
2008 This Project

_Order: CYCLOSTOMATA_

_Family: LICHENOPORIDAE_

_Genus: Lichenopora_

_Lichenopora sp._  
1972 Ref - Long, 1974

_Family: TUBULIPORIDAE_

_Genus: Tubulipora_

_Tubulipora sp._  

_Order: CHEILOSTOMATA_

_Family: AETEIDAE_

_Genus: Aetea_

_Aetea rufopuncta_  
1916 Spec - BPBM-S 736

_Aetea truncata_ (Landsborough, 1852) Introduced.

1975 Ref - Grovhoug, 1976
1996 Legacy Project (Coles et al., 1997)

_Family: BEANIIDAE_

_Genus: Beania_

_Beania discodermiae_ (Ortmann, 1890)  

_Family: BUGULIDAE_

_Genus: Bugula_

_Bugula sp._  
1929 Spec - BPBM-K 232
1978 Ref - Grovhoug, 1979
### Legacy Project - Species Report (Cont.)

1996  Legacy Project (Coles et al., 1997)

**Bugula dentata**  (Lamaroux, 1816) Introduced. Common name(s): Blue Fan Bryozoan.

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**Bugula neritina**  (Linnaeus, 1758)  Introduced. Common name(s): Red Fan Bryozoan.

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<td>1973</td>
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<tr>
<td>2008</td>
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</tbody>
</table>

Family: CELLEPORARIDAE  
Genus: Celleporaria  

**Celleporaria sp.**  Indigenous.

<table>
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<th>Year</th>
<th>Notes</th>
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**Celleporaria costazii**  (Audouin, 1826)

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<th>Year</th>
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<td>2008</td>
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</table>

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Legacy Project - Species Report (Cont.)

Genus: Holoporella

Holoporella sp.

1975 Ref - Grovhoug, 1976
1978 Ref - Grovhoug, 1979

Family: CELLEPORIDAE

Genus: Cellcopora

Cellcopora vagans (Busk, 1855)

1972 Ref - Long, 1974 Recorded as Cellcoporaria vagans.

Family: CRIBRILINIDAE

Genus: Cribrilaria

Cribrilaria radiata (Moll, 1803)


Family: MICROPORELLIDAE

Genus: Microporella

Microporella ciliata (Pallas, 1766)

1972 Ref - Long, 1974

Family: MUCRONELLIDAE

Genus: Parasmitina

Parasmitina sp.

1972 Ref - Long, 1974
1996 Legacy Project (Coles et al., 1997)

Parasmitina spathulata (Smitt, 1873)


Family: RETEPORIDAE

Genus: Reteporella

Reteporella denticulata (Busk, 1884)

1996 Legacy Project (Coles et al., 1997)

Genus: Rhynchozoon

Rhynchozoon sp.


Family: SAVIGNYELLIDAE

Genus: Savignyella

Savignyella lafontii (Audouin, 1826)

1972 Ref - Long, 1974
1996 Legacy Project (Coles et al., 1997)

Family: SCHIZOPORELLIDAE

Genus: Schizoporella

Schizoporella cf. errata (Waters, 1878) Introduced. Common name(s): Erratic Bryozoan.

Unknown Spec - BPBM-K 253
1973 Ref -McCain, 1974 Recorded as Schizoporella sp.
1973 Ref -McCain, 1975 Recorded as Schizoporella sp.
1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project

Schizoporella unicornis (Johnston, 1847) Introduced.

1935 Ref - Edmondson, 1944
1935 Ref - Ingram, 1937
1972 Ref - Long, 1974
1975 Ref - Grovhoug, 1976
1993 Ref - Brock, 1994 Recorded as S. unicorns (Johnston, 1847).
Legacy Project - Species Report (Cont.)

1994 Ref - Brock, 1995 Recorded as S. unicornis (Johnston, 1847).
1996 Legacy Project (Coles et al., 1997)
2007 Ref - Brock, 2007

Unidentified Schizoporella
1996 Legacy Project (Coles et al., 1997)

Family: SCRUPOCELLARIIDAE
Genus: Scrupocellaria
Scrupocellaria sinuosa Canu & Bassler, 1927

Family: STEGANOPORELLIDAE
Genus: Steganoporella
Steganoporella sp.

Family: THALAMOPORELLIDAE
Genus: Thalamoporella
Thalamoporella hawaiiana Soule & Soule, 1970

Family: VITTATICELLIDAE
Genus: Vittaticella
Vittaticella elegans (Busk, 1852)

Family: WATERISPORIDAE
Genus: Waterispora
Waterispora edmondsoni Soule & Soule, 1968 Introduced.
1972 Ref - Long, 1974
1975 Ref - Grovhoug, 1976
1978 Ref - Grovhoug, 1979
1996 Legacy Project (Coles et al., 1997)

Genus: Waterispora
Waterispora edmondsoni Soule and Soule, 1968 Introduced.
2008 This Project

Phylum: ECHINODERMATA
Class: STELLEROIDEA
Order: PLATYASTERIDA
Family: LUIDIIDAE
Genus: Luidia
Luidia hystrix Fisher, 1906 Hawaiian name(s): ia kai; pe’a.
1902 Spec - BPBM-W 1023
1902 Spec - BPBM-W 654

Order: VALVATIDA
Family: GONIASTERIDAE
Genus: Plinthisaster
Plinthisaster ceramoides (Fisher, 1906)

Family: OPHIODIASTERIDAE
Genus: Linckia
Linckia multiflora (Lamarck, 1816)

Family: OREASTERIDAE
Genus: Culcita Hawaiian name(s): pe’a.
Culcita novaeguineae f. arenosa
Unknown Spec - BPBM-W 627
Legacy Project - Species Report (Cont.)

1902 Spec - BPBM-W 1026

*Culcita novaeguineae f. nesiotis* Fisher, 1925

Unknown Spec - BPBM-W 626

Order: FORCIPULATIDA

Family: ASTERIIDAE

Genus: *Distolasterias*

*Distolasterias euplecta* Fisher, 1906


Order: OPHIURIDA

Family: AMPHIURIDAE

Genus: *Amphipholis*

*Amphipholis squamata* (Delle Chiaje, 1829)

1972 Spec - BPBM-W 2480

facility. Identified

1973 Ref - Evans et al., 1974
1979 Ref - AECOS, 1979

Genus: *Opionereis*

*Opionereis porrecta* Lyman

1967 Spec - BPBM-W 2579 Ewa End.

Family: OPHIACTIDAE

Genus: *Histampica*

*Histampica cythera* (A. H. Clark, 1949)


May 1982.

1982 Spec - BPBM-W 3052 Off Pearl Harbor; dredge spoil site. Identified by D.M. Devaney,


Genus: *Ophiactis*

*Ophiactis sp.* May 1982.


*Ophiactis dyscrita* Clark, 1911

1949 Ref - Clark, 1949 USNM 6927.

*Ophiactis modesta* Brock, 1888

1938 Spec - BPBM-W 1031
1942 Ref - Ely, 1942

*Ophiactis savignyi* (Müller & Troschel, 1842) Cryptogenic. Common name(s): Sponge Brittle

Star.

Unknown Spec - BPBM-W 370
1929 Spec - BPBM-W 766
1933 Ref - Edmondson, 1933
1937 Spec - BPBM-W 957
1938 Spec - BPBM-W 965
1939 Spec - BPBM-W 969
1942 Ref - Ely, 1942
1949 Spec - BPBM-W 1180
1949 Ref - Clark, 1949
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1979 Ref - AECOS, 1979 Off Pearl Harbor.
1987 Ref - AECOS, 1987

1996 Legacy Project (Coles et al., 1997)
2007 This Project
2008 This Project
Legacy Project - Species Report (Cont.)

Family: OPHIOCOMIDAE
Genus: Ophiocoma
Ophiocoma erinaceus  Indigenous. Common name(s): Spiny Brittle Star.
  2008  This Project

Ophiocoma sexradia  (Duncan, 1887)
  1973  Ref - Evans et al., 1974

Family: OPHIOTHRICIDAE
Genus: Macrophiothrix
Macrophiothrix demessa  (Lyman)
  1967  Spec - BPBM-W 2580  Ewa End.

Class: ECHINOIDEA
Order: CIDAROIDA
Family: CIDARIDAE
Genus: Eucidaris
Eucidaris metularia  (Lamarck, 1816)  Indigenous. Common name(s): Ten-lined Urchin;

Hawaiian name(s):
  1973  Ref - Evans et al., 1974
  2008  This Project

Order: DIADEMATOIDA
Family: DIADEMATIDAE
Genus: Diadema
Diadema paucispinum  Agassiz, 1863  Indigenous. Common name(s): Long-spined Urchin;

Hawaiian name(s):
  1973  Ref - Evans et al., 1974
  1996  Legacy Project (Coles et al., 1997)

Genus: Echinothrix
Echinothrix calamaris  (Pallas, 1774)  Indigenous. Common name(s): Banded Urchin.
  2006  Ref - Smith et al., 2006
  2008  This Project

  2006  Ref - Smith et al., 2006
  2008  This Project

Order: TEMNOPLEUROIDA
Family: TEMNOPLEURIDAE
Genus: Mespilia
Mespilia globulus  (Linnaeus, 1758)  From boat in dry dock.  Identified by D.M. Devaney.
  1950  Spec - BPBM-W 1200

Family: TOXOPNEUSTIDAE
Genus: Pseudofoleta
Pseudofoleta indiana  (Michelin, 1863)
  1979  Ref - AECOS, 1979  Off Pearl Harbor.

Genus: Tripneustes
Tripneustes gratilla  (Linnaeus, 1758)  Indigenous. Common name(s): Collector Urchin;

Hawaiian name(s):
  1973  Ref - Evans et al., 1974
  1996  Legacy Project (Coles et al., 1997)
  2006  Ref - Smith et al., 2006
  2008  This Project

Order: ECHINOIDA
Family: ECHINOMETRIDAEN
Genus: Echinometra
Echinometra mathaei  (de Blainville, 1825)  Indigenous. Common name(s): Rock-boring Urchin.
  1979  Ref - AECOS, 1979  Off Pearl Harbor.
  1996  Legacy Project (Coles et al., 1997)
Legacy Project - Species Report (Cont.)

2008 This Project

Genus: Heterocentrotus
Hawaiian name(s):

1973 Ref - Evans et al., 1974

Class: HOLOTHUROIDEA
Order: ASPIDOCHIROTIDA
Family: HOLOTHURIIDAE
Genus: Actinopyga
Actinopyga mauritiana (Quoy & Gaimard, 1833)
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006

Genus: Holothuria
Holothuria sp. Indigenous.
2008 This Project

Holothuria (Lessonothuria) pardalis Selenka, 1867 Indigenous. Common name(s): Leopard Sea Cucumber.
2008 This Project

Holothuria atra Jager, 1833
1996 Legacy Project (Coles et al., 1997)

Holothuria impatiens Forsskål, 1775
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Holothuria pervicax (Selenka, 1867)
1973 Ref - Evans et al., 1974

Genus: Labidodemas
Labidodemas semperianum Selenka, 1867 Indigenous. Common name(s): White Sea Cucumber.
2008 This Project

Order: APODIDA
Family: SYNAPTIDAE
Genus: Ophiochaeta
Ophiochaeta spectabilis Fisher, 1907 Indigenous. Common name(s): Conspicuous Sea Cucumber.
1907 Ref - Fisher, 1907 Recorded as Ophiochaeta spectabilis. USNM 21226.
1973 Ref - Evans et al., 1974 Recorded as Ophiochaeta spectabilis.
1987 Ref - AECOS, 1987 Recorded as Ophiochaeta spectabilis.
1993 Ref - Brock, 1994 Recorded as Ophiochaeta spectabilis.
1994 Ref - Brock, 1995 Recorded as Ophiochaeta spectabilis.
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 Ref - Brock, 2007
2007 This Project
2008 This Project

Genus: Polyplectana
Polyplectana kefersteinii (Selenka, 1867) Indigenous. Common name(s): Keferstan’s Sea Cucumber.
2008 This Project

Phylum: CHAETOGNATHA
Class: SAGITTOIDEA
Order: APHAGMOPOPHORA
Family: PTEROSAGITTIDAE
Genus: Pterosagitta
Pterosagitta sp.
1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Family: SAGITTIDAE
Genus: Sagitta
Sagitta sp.
1973  Ref - Evans et al., 1974

Sagitta enflata Grassi, 1883
1978  Ref - Grovhough, 1979

Sagitta regularis Aida, 1897
1978  Ref - Grovhough, 1979

Phylum: CHORDATA
Unidentified Chordata
1921  Spec - BPBM-Y 121
1924  Spec - BPBM-Y 112
1929  Spec - BPBM-Y 128
1929  Spec - BPBM-Y 129
1929  Spec - BPBM-Y 130
1942  Spec - BPBM-Y 111
1947  Spec - BPBM-Y 167
1948  Spec - BPBM-Y 171
1948  Spec - BPBM-Y 172
1948  Spec - BPBM-Y 174
1948  Spec - BPBM-Y 176
1948  Spec - BPBM-Y 177
1948  Spec - BPBM-Y 178

Unidentified Urochordata
1996  Legacy Project (Coles et al., 1997)

Class: ASCIDIACEA
Unidentified Ascidiae
1996  Legacy Project (Coles et al., 1997)

Order: APLOUSOBRANCHIA
Family: CLAVELINIDAE
Genus: Clavelina
Clavelina sp.
1973  Ref - Evans et al., 1974

Family: DIDENMIDAE
Unidentified Didemnidae
1986  Ref - Lenihan, 1990
1996  Legacy Project (Coles et al., 1997)

Genus: Didemnum
Didemnum sp.
1972  Ref - Long, 1974
1985  Ref - Hurbut, 1990

Didemnum candidum Savigny, 1816
2007  Ref - Brock, 2007

Didemnum cf. candidum Savigny, 1816  Introduced. Common name(s): White Didemnid.
1993  Ref - Brock, 1994  Recorded as Didemnum candidum.
1994  Ref - Brock, 1995  Recorded as Didemnum candidum.
2007  This Project
2008  This Project

Didemnum edmonsoni Eldredge, 1966  Indigenous.
1993  Ref - Brock, 1994
Legacy Project - Species Report (Cont.)

1994    Ref - Brock, 1995
2008    This Project

*Didemnum perlucidum* Monniot, 1983    Introduced.
2007    This Project

Genus: *Diplosoma*

*Diplosoma cf. spongiforme* (Giard, 1872)    New record for Hawaii.    Introduced.
2008    This Project

*Diplosoma listerianum* (Milne-Edwards, 1841)    Introduced.
1975    Ref - Grovhoug, 1976
1978    Ref - Grovhoug, 1979
1985    Ref - Hurlbut, 1990
1987    Ref - Brewer & Assoc., 1987
2008    This Project

Genus: *Trididemnum*

*Trididemnum savignyi* (Herdman, 1886)
1975    Ref - Grovhoug, 1976

Family: POLYCLINIDAE

Unidentified Polyclinidae
1947    Spec - BPBM-Y 168
1948    Spec - BPBM-Y 173
1948    Spec - BPBM-Y 175

Genus: *Polyclinum*

*Polyclinum sp.* Indigenous.
1976    Ref - Grovhoug, 1976

*Polyclinum constellatum* Savigny, 1816
1973    Ref - McCain, 1974
1973    Ref - McCain, 1975
1993    Ref - Brock, 1994
1994    Ref - Brock, 1995
1996    Legacy Project (Coles et al., 1997)
2007    Ref - Brock, 2007

*Polyclinum vasculosum* Pizon, 1908
1920    Ref - Tokioka, 1967    USNM 11755.
1972    Ref - Long, 1974

Order: PHLEBOBRANCHIA

Family: ASCIIDIDAE

Genus: *Ascidia*

*Ascidia n. sp.* Known only from Hawaii.
1996    Legacy Project (Coles et al., 1997)

*Ascidia sp.* Indigenous.
1973    Ref - Evans et al., 1974
1973    Ref - McCain, 1974
1973    Ref - McCain, 1975
1996    Legacy Project (Coles et al., 1997)
2008    This Project

*Ascidia sp. B* Introduced.
1996    Legacy Project (Coles et al., 1997)
2008    This Project

*Ascidia interrupta*
1993    Ref - Brock, 1994    Recorded as Ascidia interrupta.
Legacy Project - Species Report (Cont.)

1994  Ref - Brock, 1995  Recorded as Ascidia interrupta.

*Ascidia melanostoma*  
(Sluter, 1885)  
1972  Ref - Long, 1974  
1996  Legacy Project (Coles et al., 1997)

*Ascidia sp. A*  
Introduced.

2007  This Project

*Ascidia sydneiensis*  
(Stimpson, 1855)  Introduced. Common name(s): Yellow-green Sea Squirt.  
1976  Spec - BPBM-Y 244  Pearl Harbor?. Identified by P. Ching.  
1996  Legacy Project (Coles et al., 1997)  
2007  This Project  
2008  This Project

Genus: *Phallusia*  
*Phallusia nigra*  
Savigny, 1816  Introduced. Common name(s): Black Sea Squirt.  
1993  Ref - Brock, 1994  
1994  Ref - Brock, 1995  Recorded as Ascidia nigra.  
1996  Legacy Project (Coles et al., 1997)  
2007  Ref - Brock, 2007  Recorded as Ascidia nigra.  
2007  This Project  
2008  This Project

Family: CIONIDAE  
Genus: *Ciona*  
*Ciona intestinalis*  
(Linnaeus, 1767)  Introduced.  
1975  Ref - Grovhoug, 1976  
1976  Ref - Cooke et al., 1980

Family: PEROPHORIDAE  
Genus: *Perophora*  
*Perophora sp.*  
1975  Ref - Grovhoug, 1976

*Perophora annectens*  
1996  Legacy Project (Coles et al., 1997)

Order: STOLIDOBRANCHIA  
Family: PYURIDAE  
Genus: *Herdmania*  
*Herdmania sp.*  
Indigenous.  
2008  This Project

*Herdmania mauritiana*  
(Drasc, 1884)  Introduced.  
2008  This Project

*Herdmania pallida*  
(Savigny, 1816)  Introduced.  
1973  Ref - Evans et al., 1974  Recorded as Herdmania momus.  
1993  Ref - Brock, 1994  Recorded as Herdmania momus.  
1994  Ref - Brock, 1995  Recorded as Herdmania momus.  
1996  Legacy Project (Coles et al., 1997)  
2007  This Project  
2008  This Project

Genus: *Microcosmus*  
*Microcosmus exasperatus*  
Introduced.  
1996  Legacy Project (Coles et al., 1997)  
2008  This Project
## Legacy Project - Species Report (Cont.)

### Family: STYELIDAE

**Genus: Botrylloides**

**Botrylloides** sp.

- 1996 Legacy Project (Coles et al., 1997)
- 2008 This Project

**Botrylloides** sp. (grey) sp.

- 1973 Ref - McCain, 1974 Recorded as Botrylloides sp. (grey).
- 1973 Ref - McCain, 1975 Recorded as Botrylloides sp. (grey).

**Botrylloides** sp. (red) sp.

- 1973 Ref - McCain, 1974 Recorded as Botrylloides sp. (red).
- 1973 Ref - McCain, 1975 Recorded as Botrylloides sp. (red).

**Botrylloides nigrum**

- 1993 Ref - Brock, 1994
- 1994 Ref - Brock, 1995
- 2007 Ref - Brock, 2007

**Genus: Botryllus**

**Botryllus** sp.

- 1978 Ref - Grovhoug, 1979 Recorded as Botrylloides.
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Cnemidocarpa**

**Cnemidocarpa irene** (Hartmeyer, 1906) Introduced.

- 2008 This Project

**Genus: Polyandrocarpa**

**Polyandrocarpa** sp. A

- 1996 Legacy Project (Coles et al., 1997)

**Polyandrocarpa** sp. B sp.

- 1996 Legacy Project (Coles et al., 1997)

**Polyandrocarpa sagamiensis** Tokioka, 1953 Introduced.

- 2008 This Project

**Polyandrocarpa zooitensis** Van Name, 1931 Introduced.

- 2008 This Project

**Genus: Polycarpa**

**Polycarpa** sp.

- 2008 This Project

**Polycarpa aurita** (Sluiter, 1890) Indigenous.

- 2008 This Project

**Polycarpa cryptocarpa** (Sluiter, 1885) New record for Hawaii. Cryptogenic.

- 2008 This Project

**Genus: Styela**

**Styela** sp.

- 1973 Ref - Evans et al., 1974

**Styela areoleata** Heller, 1878

- 1975 Ref - Grovhoug, 1976

**Styela canopus** Savigny, 1816 Introduced.

- 2007 This Project
- 2008 This Project

**Styela partita** (Stimson, 1852)


- 1975 Ref - Grovhoug, 1976
Legacy Project - Species Report (Cont.)

**Styela partita?**  (Stimson, 1852)
1929  Spec - BPBM-Y 102

**Genus: Symplegma**

**Symplegma sp.**  Tokioka, 1949  Indigenous.
1929  Spec - BPBM-Y 110
1996  Legacy Project (Coles et al., 1997)
2008  This Project

**Symplegma oceania**  Tokioka, 1961  Introduced.
1978  Ref - Grovhoug, 1979  Recorded as Symplegma connectans.
1996  Legacy Project (Coles et al., 1997)

**Symplegma reptans**  Introduced.
1996  Legacy Project (Coles et al., 1997)

**Class: THALIACEA**

**Order: DOLIOLOIDA**

**Family: DOLIOLOIDAE**

**Genus: Dolioum**

**Dolioum sp.**
1973  Ref - Evans et al., 1974

**Class: APPENDICULARIA**

**Order: COPELATA**

**Family: OIKOPLEURIDAE**

**Genus: Oikopleura**

**Oikopleura sp.**
1973  Ref - Evans et al., 1974

**Class: CHONDRICHTHYES**

**Order: LAMNIFORMES**

**Family: CARCHARHINIDAE**

**Genus: Carcharhinus**

**Carcharhinus limbatus**  (Valenciennes, 1841)
1973  Ref - Evans et al., 1974
1978  Ref - Grovhoug, 1979

**Genus: Glyphis**

**Glyphis granifera**  Pease
Unknown  Spec - BPBM-MO 64518  Ford Island. Catalogue V.

**Family: PHYRINIDAE**

**Genus: Sphyrina**

**Sphyrna lewini**  (Griffith & Smith, 1834)
1973  Ref - Evans et al., 1974
1978  Ref - Grovhoug, 1979
1987  Ref - Brewer & Assoc., 1987

**Order: RAJIFORMES**

**Family: MYLIOBATIDAE**

**Genus: Aetobatus**

**Aetobatus nana**  (Loman)
1948  Spec - BPBM-S 8788  Drydock.

**Aetobatus narinari**  (Euprasen, 1790)
1973  Ref - Evans et al., 1974
1978  Ref - Grovhoug, 1979
1987  Ref - Brewer & Assoc., 1987
## Legacy Project - Species Report (Cont.)

**Class:** ACTINOPTERYGIJ  
**Order:** ELOPIFORMES  
**Family:** ALBULIDAE

<table>
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<tr>
<th>Genus</th>
<th>Species</th>
<th>(Linnaeus, 1758)</th>
<th>Reference</th>
<th>Year</th>
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<td>Alburnus</td>
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<td>Ref - Evans et al., 1974</td>
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<td>Alburnus vulpes</td>
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<td>Ref - Evans et al., 1974</td>
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**Family:** ELOPIDAE

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<th>Species</th>
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<td>Elops</td>
<td>Hawaiienisis</td>
<td>Regan, 1909</td>
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**Order:** ANGUILLIFORMES

**Family:** CONGIDAE

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<th>Species</th>
<th>Reference</th>
<th>Year</th>
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<tr>
<td>Conger</td>
<td>C. marginatus</td>
<td>Valenciennes, 1841</td>
<td>Ref - Evans et al., 1974</td>
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<td></td>
<td>C. cirrus</td>
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<td>Ref - Evans et al., 1974</td>
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**Family:** MURAENIDAE

<table>
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<th>Genus</th>
<th>Species</th>
<th>Reference</th>
<th>Year</th>
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<tr>
<td>Gymnotherax</td>
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<td>Gymnotherax sp.</td>
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<td>Ref - AECOS, 1979</td>
<td>Off Pearl Harbor.</td>
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<td></td>
<td>Ref - Lenihan, 1990</td>
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<td>Legacy Project (Coles et al., 1997)</td>
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<tr>
<td>Gymnotherax flavimarginatus</td>
<td></td>
<td>(Rüppell, 1828)</td>
<td>Ref - Evans et al., 1974</td>
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<tr>
<td>Gymnotherax petelli</td>
<td>(Bleeker, 1856)</td>
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<td>Gymnotherax undulatus</td>
<td>(Lacépede, 1803)</td>
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**Order:** CLupeiformes

**Family:** Clupeidae

<table>
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<th>Genus</th>
<th>Species</th>
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<th>Year</th>
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<td>Herklotsichthys</td>
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**Family:** ENGRAULIDAE

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<td>Engraulis purpurea</td>
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**Order:** ELOPIDAE

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| Ref - Au, 1965  | 1961  |
| Spec - BPBM-125806 | 1964  |
| Ref - Evans et al., 1974 | 1973  |
| Ref - Grohough, 1979 | 1978  |
| Ref - Somerton et al., 1993 | 1986  |
| Ref - AECOS, 1987 | 1987  |
| Ref - Brock, 1994 | 1993  |
| Ref - Brock, 1995 | 1994  |

Recorded as Stolephorus purpureus.
Legacy Project - Species Report (Cont.)

**Order: MYCTOPHIFORMES**

**Family: SYNODONTIDAE**

**Genus: Saurida**

*Saurida gracilis* *(Quoy & Gaimard, 1824)*

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*Saurida nebulosa* *(Valenciennes, 1849)*

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**Genus: Synodus**

*Synodus sp.*

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*Synodus variegatus* *(Lacépede, 1803)*

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**Order: GONORYNCHIFORMES**

**Family: CHANIDAE**

**Genus: Chanos**

*Chanos chanos* *(Forsskål, 1775)*

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**Genus: Antennarius**

*Antennarius commersoni* *(Near coral dock.)*

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*Antennarius pictus* *(Shaw & Nodder, 1974)*

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**Genus: Antennatus**

*Antennatus tuberosus* *(Recorded as chironectes Lacepede.)*

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**Order: LOPHIIFORMES**

**Family: ANTENNARIIDAE**

**Genus: Antennarius**

*Antennarius commersoni* *(Near coral dock.)*

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**Genus: Carapus**

*Carapus margaritiferae* *(Rendahl, 1921)*

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**Order: GADIFORMES**

**Family: CARAPODIDAE**

**Genus: Carapus**

*Carapus margaritiferae* *(Rendahl, 1921)*

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**Order: ATERINIFORMES**

**Family: ATERINIDAE**

**Genus: Atherinomorus**

*Atherinomorus insularum* *(Jordan and Evermann, 1903)*

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**Genus: Tylosurus**

*Tylosurus crocodilus* *(Peron & LeSueur, 1821)*

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<td>Ref - Grovhoug, 1979</td>
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Legacy Project - Species Report (Cont.)

Family: CYPRINODONTIDAE

Genus: Fundulus

*Fundulus grandis* Baird & Girard, 1853 Introduced.
- 1905 Ref - Brock, 1960
- 1905 Ref - Maciolek, 1984
- 1907 Ref - Van Dine, 1907
- 1987 Ref - Randall, 1987

Family: HEMIRAMPHIDAE

Genus: Hemiramphus

*Hemiramphus depauperatus* Lay & Bennett, 1839
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979
- 1987 Ref - Brewer & Assoc., 1987

Family: POECILIIDAE

Unidentified Poeciliidae
- 1996 Legacy Project (Coles et al., 1997)

Genus: Gambusia

*Gambusia affinis* (Baird & Girard, 1853) Introduced.
- 1905 Ref - Brock, 1960
- 1905 Ref - Maciolek, 1984
- 1907 Ref - Van Dine, 1907
- 1987 Ref - Randall, 1987

Genus: Poecilia

*Poecilia latipinna* (LeSueur) Introduced.
- 1905 Ref - Brock, 1960 Recorded as Mollienesia latipinna.
- 1905 Ref - Maciolek, 1984 Recorded as Mollienesia latipinna.
- 1907 Ref - Van Dine, 1907 Recorded as Poecilia latipinna.
- 1973 Ref - Evans et al., 1974 Recorded as Poecilia latipinna.

Order: POLYMIXIIIFORMES

Family: HOLOCENIDRAE

Genus: Myripristis

*Myripristis amaena* (Castelnau, 1873) Recorded as Myripristis amaenus.
- 2006 Ref - Smith et al., 2006

*Myripristis berndti* Jordan & Evermann, 1903 Recorded as murdjan (Forsskal).
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979
- 1996 Legacy Project (Coles et al., 1997)

Genus: Neoponichthys

*Neoponichthys samma* (Forsskál, 1775) Recorded as Flammeo samma (Forsskal).
- 1973 Ref - Evans et al., 1974
- 1978 Ref - Grovhoug, 1979

Genus: Sargocentron

*Sargocentron diadema* (Lacepede, 1802) Hawaiian name(s): 'ala 'iihi kalaloa.
- 1996 Spec - BPBM-I 37326 NE side of West Loch channel.

*Sargocentron punctatissimum* (Cuvier in Cuvier and Valenciennes, 1829) Recorded as Adioryx lacteoguttatus.
- 2006 Ref - Smith et al., 2006
- 2006 Ref - Smith et al., 2006

Order: GASTEROSTEIFORMES

Family: AULOSTOMIDAE

Genus: Aulostomus

*Aulostomus chinensis* (Linnaeus, 1766)
- 1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

1996 Legacy Project (Coles et al., 1997)

Family: SYNGNATHIDAE
Genus: Doryrhamphus
Doryrhamphus exsis Kaup, 1856
1996 Legacy Project (Coles et al., 1997)

Genus: Hippocampus
Hippocampus kuda Bleecker, 1852
1924 Spec - BPBM-I 3787 Ref - Brock, 2007
2007

Genus: Micrognathus
Micrognathus edmondseni? (Pietschmann, 1930)
1973 Ref - Evans et al., 1974

Order: SCORPENAIFORMES
Family: SCORPAENIDAE
Genus: Brachirhis
Brachirhis barberi (Eschmeyer & Randall)
1973 Ref - Evans et al., 1974

Genus: Scorpaenopsis
Scorpaenopsis diabolus (Cuvier, 1829)
1973 Ref - Evans et al., 1974 Recorded as S. diabolus (Eschmeyer & Anderson).

Scorpaenopsis gibbosa (Bloch & Snyder, 1801)

Genus: Sebastapistes
Sebastapistes coniorta (Jenkins, 1903)
1973 Ref - Evans et al., 1974 Recorded as Scorpaena coniorta (Jenkins).

Order: PERCIFORMES
Family: ACANTHURIDAE
Genus: Acanthus
Acanthus blochi (Cuvier, 1829) Indigenous. Common name(s): Ringtail Surgeonfish;
Hawaiian name(s): pualu.
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006 Recorded as Acanthus blochii.
2008 This Project

Acanthus dussumieri Cuvier & Valenciennes, 1835 Indigenous. Common name(s): Eyestripe
Surgeonfish;
Hawaiian name(s): palani.
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1986 Ref - Lenihan, 1990
2006 Ref - Smith et al., 2006
2008 This Project

Acanthus guttatus Bloch & Schneider, 1801
1996 Legacy Project (Coles et al., 1997)

Acanthus leucopareius (Jenkins, 1903) Indigenous. Common name(s): Whitebar Surgeonfish;
Hawaiian name(s): māikoko.
2008 This Project

Acanthus mata (Cuvier, 1829)
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1986 Ref - Lenihan, 1990

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Legacy Project - Species Report (Cont.)

*Acanthurus nigrofuscus* (Forsskål, 1775)
- 1996 Legacy Project (Coles et al., 1997)

*Acanthurus olivaceus* (Bloch & Schneider, 1801)
- 1973 Ref - Evans et al., 1974

*Acanthurus triostegus* (Linnaeus, 1758) Indigenous. Common name(s): Convict Tang; Hawaiian name(s): palani.
- 1973 Ref - Evans et al., 1974
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975
- 1996 Legacy Project (Coles et al., 1997)
- 2006 Ref - Smith et al., 2006
- 2007 This Project
- 2008 This Project

*Acanthurus xanthopterus* Cuvier & Valenciennes, 1835
- 1973 Ref - Evans et al., 1974
- 1973 Ref - McCain, 1974
- 1973 Ref - McCain, 1975
- 1978 Ref - Grovhoung, 1979
- 1986 Ref - Lenihan, 1990
- 1993 Ref - Brock, 1994
- 1994 Ref - Brock, 1995
- 1996 Legacy Project (Coles et al., 1997)
- 2006 Ref - Smith et al., 2006

Genus: *Ctenochaetus*

*Ctenochaetus strigosus* (Bennett, 1828)
- 1973 Ref - Evans et al., 1974
- 1996 Legacy Project (Coles et al., 1997)
- 2006 Ref - Smith et al., 2006

Genus: *Naso*

*Naso brevirostris* (Valenciennes, 1835)
- 1978 Ref - Grovhoung, 1979
- 1986 Ref - Lenihan, 1990
- 1996 Legacy Project (Coles et al., 1997)

*Naso lituratus* (Forster and Schneider, 1801)
- 2006 Ref - Smith et al., 2006

*Naso unicornis* (Forsskål, 1775) Indigenous. Common name(s): Bluespine Unicornfish; Hawaiian name(s): kala.
- 1973 Ref - Evans et al., 1974
- 1986 Ref - Lenihan, 1990
- 1994 Ref - Brock, 1995
- 1996 Legacy Project (Coles et al., 1997)
- 2007 This Project

Genus: *Zanclus*

*Zanclus cornutus* (Linnaeus, 1758) Indigenous. Common name(s): Moorish Idol; Hawaiian name(s): kihikihi.
- 1973 Ref - Evans et al., 1974 Recorded as canescens (Linnaeus).
- 1978 Ref - Grovhoung, 1979
- 1993 Ref - Brock, 1994
- 1994 Ref - Brock, 1995
- 1996 Legacy Project (Coles et al., 1997)
- 2006 Ref - Smith et al., 2006
Legacy Project - Species Report (Cont.)

Genus: Zebrasoma
Zebrasoma flavescens (Bennett, 1828) Indigenous. Common name(s): Yellow Tang; Hawaiian name(s): lau-i-pala.

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Zebrasoma veliferum (Bloch, 1797)

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Family: APOGONIDAE

Genus: Apogon
Apogon sp.

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Apogon kalsopterus Bleeker, 1856

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Apogon snyderi Jordan & Evermann, 1903

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Genus: Foä
Foä brachygramma (Jenkins, 1903) Hawaiian name(s): ‘upapalu.

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Family: BLENNIIDAE

Unidentified Blenniidae

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Genus: Cirrhipectus
Cirrhipectus vanderbilti (Fowler, 1938)

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Genus: Entomacrodus
Entomacrodus marmoratus (Bennett, 1928)

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Genus: Exallias
Exallias sp.

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Exallias brevis (Kner, 1868)

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Genus: Omobranchus
Omobranchus elongatus (Peters, 1855)

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Family: CARANGIDAE

Genus: Carangoides
Carangoides gymnostethoides Bleeke, 1852
1973 Ref - Evans et al., 1974

Genus: Caranx
Caranx sp.
1996 Legacy Project (Coles et al., 1997)

Caranx ignobilis (Forsskål, 1775)
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
2006 Ref - Smith et al., 2006

Caranx mate Cuvier & Valenciennes, 1833
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979

Caranx melampygus Cuvier & Valenciennes, 1833
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1986 Ref - Lenihan, 1990
1987 Ref - Brewer & Assoc., 1987
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)

Caranx sexfasciatus Quoy & Gaimard, 1825
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979

Genus: Decapterus
Decapterus macarellus (Cuvier, 1833)
2006 Ref - Smith et al., 2006

Genus: Gnathanodon
Gnathanodon speciosus (Forsskål, 1775) Indigenous. Common name(s): Golden Trevally;
Hawaiian name(s): ulua pa’opa’o.
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2008 This Project

Genus: Scomberoides
Scomberoides laysan (Forsskål, 1775) Recorded as Scrombroides laysan.
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Scomberoides sanct-petri (Cuvier, 1831)
1973 Ref - Evans et al., 1974
Legacy Project - Species Report (Cont.)

Family: Chaetodontidae
Genus: Chaetodon
Chaetodon auriga
Forsskål, 1775
Indigenous. Common name(s): Threadfin Butterflyfish.
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1986 Ref - Lenihan, 1990
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 This Project
2008 This Project

Chaetodon ephippium
Cuvier, 1831
1978 Ref - Grovhoug, 1979
1986 Ref - Lenihan, 1990
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006

Chaetodon lineolatus
Cuvier, 1831
1993 Ref - Brock, 1994

Chaetodon lunula
(Lacépède, 1802)
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1986 Ref - Lenihan, 1990
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006

Chaetodon lunulatus
Quoy and Gaimard, 1825
2006 Ref - Smith et al., 2006

Chaetodon miliaris
Quoy & Gaimard, 1824
1973 Ref - Evans et al., 1974
1978 Ref - Grovhoug, 1979
1996 Legacy Project (Coles et al., 1997)

Genus: Forcipiger
Forcipiger flavissimus
Jordan & McGregor, 1898
1996 Legacy Project (Coles et al., 1997)

Genus: Heniochus
Heniochus diphreutes
Jordan, 1903
1973 Ref - Evans et al., 1974
Recorded as acuminatus (Linnaeus).

Family: Cheilodontidae
Genus: Gonistius
Gonistius vittatus
(Garrett, 1864)
2006 Ref - Smith et al., 2006
Recorded as Cheilodactylus vittatus.

Family: Cichlidae
Genus: Oreochromis
Oreochromis mossambicus
(Peters, 1852)
Introduced.
1973 Ref - Evans et al., 1974
Recorded as Tilapia mossambica (Peters).
1973 Ref - McCain, 1974
Recorded as Tilapia mossambica.
1976 Ref - McCain, 1976
Recorded as Tilapia mossambica.
1987 Ref - AECOS, 1987
Recorded as Sarotherodon mossambica (Peters).
1994 Ref - Brock, 1995
Recorded as Tilapia mossambica (Peters).
1996 Legacy Project (Coles et al., 1997)

Genus: Sarotherodon
Sarotherodon melanopleura
(Rüppell, 1852)
1993 Ref - Brock, 1994
Recorded as Tilapia melanopleura.
Legacy Project - Species Report (Cont.)

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<td>Ref - Brock, 1995</td>
<td>Recorded as Tilapia melanopleura.</td>
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<tr>
<td>1987</td>
<td>Ref - Randall, 1987</td>
<td>Recorded as Tilapia melanotheron.</td>
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<tr>
<td>2006</td>
<td>Ref - Smith et al., 2006</td>
<td>Recorded as Tilapia melanotheron.</td>
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<tr>
<td>2007</td>
<td>Ref - Brock, 2007</td>
<td>Recorded as Tilapia melanotheron.</td>
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</tbody>
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**Family: GOBIIDAE**

**Unidentified Gobiidae**
- 1996 Legacy Project (Coles et al., 1997)

**Genus: Asterropteryx**

**Asterropteryx semipunctatus** (Rüppell, 1821)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
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<tbody>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
<td>Middle Loch; W side of Waiawa Peninsula; near pier (Pan Am Clipper Dock);</td>
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<tr>
<td>1978</td>
<td>Ref - Grovhou, 1979</td>
<td>W side of Middle Loch channel.</td>
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<tr>
<td>1986</td>
<td>Ref - Lenihan, 1990</td>
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<td>1993</td>
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<tr>
<td>1994</td>
<td>Ref - Brock, 1995</td>
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</tr>
<tr>
<td>1996</td>
<td>Spec - BPBM-I 37315</td>
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**Genus: Bathygobius**

**Bathygobius cocosensis** (Bleeker, 1854) *Hawaiian name(s): 'o'opu 'ohune.*

<table>
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<th>Year</th>
<th>Reference</th>
<th>Notes</th>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
<td>Recorded as fuscus (Rüppell).</td>
</tr>
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<td>1986</td>
<td>Ref - Lenihan, 1990</td>
<td>Recorded as B. fuscus (Rüppell).</td>
</tr>
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<td>Ref - Brock, 1994</td>
<td>Recorded as B. fuscus.</td>
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<td>1994</td>
<td>Ref - Brock, 1995</td>
<td>Recorded as B. fuscus.</td>
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<tr>
<td>1996</td>
<td>Spec - BPBM-I 37313</td>
<td>Rainbow Bay Marina; docks and shoreline.</td>
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<tr>
<td>1996</td>
<td>Spec - BPBM-I 37317</td>
<td>Sheet piling in thermal discharge from Hawaiian Electric Company (HECO)</td>
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<tr>
<td>1996</td>
<td>Spec - BPBM-I 37321</td>
<td>Middle Loch; on wooden pilings near U.S.S. &quot;Machinist&quot; Floating Drydock.</td>
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</tbody>
</table>

**Bathygobius cotticeps** (Steindachner, 1880)

<table>
<thead>
<tr>
<th>Year</th>
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<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>1987</td>
<td>Ref - AECOS, 1987</td>
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**Bathygobius fuscus** (Rüppell, 1830)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Ref - Smith et al., 2006</td>
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**Genus: Ctenogobius**

**Ctenogobius tongarevae** (Fowler, 1927)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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</tr>
<tr>
<td>1978</td>
<td>Ref - Grovhou, 1979</td>
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**Genus: Eviota**

**Eviota epiphanes** (Jenkins, 1903)

<table>
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<td>1996</td>
<td>Spec - BPBM-I 37314</td>
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**Genus: Gnatholepis**

**Gnatholepis anjerensis** (Bleeker, 1850)

<table>
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<tr>
<td>1973</td>
<td>Ref - Evans et al., 1974</td>
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<tr>
<td>1978</td>
<td>Ref - Grovhou, 1979</td>
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**Genus: Mugilogobius**

**Mugilogobius cavifrons** (Weber, 1909)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>Notes</th>
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**Mugilogobius parvus** (Oshima, 1919) *Introduced.*
Legacy Project - Species Report (Cont.)

Genus: *Opua*
*Opua nephodes* Jordan, 1925
1973 Ref - Evans et al., 1974
1978 Ref - Grovhough, 1979

Genus: *Oxyurichthys*
*Oxyurichthys lonchotus* (Jenkins, 1903)
1973 Ref - Evans et al., 1974

Genus: *Psilogobius*
*Psilogobius mainlandi* Baldwin, 1972
1986 Ref - Leninhan, 1990
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Family: **KUHLIIDAE**
Genus: *Kuhlia*
*Kuhlia sandvicensis* (Steindachner, 1876) Indigenous. Common name(s): Hawaiian Flagtail;
Hawaiian name(s): âholehole.
1973 Ref - Evans et al., 1974
1973 Ref - McCain, 1974
1973 Ref - McCain, 1975
1978 Ref - Grovhough, 1979
1986 Ref - Leninhan, 1990
1987 Ref - Brewer & Assoc., 1987
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2008 This Project

Family: **KYPHOSIDAE**
Genus: *Kyphosus*
*Kyphosus bigibbus* (Lacèpede, 1802) Recorded as cinerascens (Forsskal).
1973 Ref - Evans et al., 1974

Genus: *Microcanthus*
*Microcanthus strigatus* Cuvier & Valenciennes, 1831
1973 Ref - Evans et al., 1974
1996 Legacy Project (Coles et al., 1997)

Family: **LABRIDAEN**
Genus: *Anampses*
*Anampses cuvieri?* Quoy & Gaimard, 1824
1979 Ref - AECOS, 1979 Off Pearl Harbor.

Genus: *Cheilinus*
*Cheilinus bimaculatus* Valenciennes, 1840
1993 Ref - Brock, 1994
1994 Ref - Brock, 1995

Genus: *Cheilio*
*Cheilio inermis* (Forsskál, 1775)
1973 Ref - Evans et al., 1974
1986 Ref - Leninhan, 1990

Genus: *Coris*
*Coris flavovita* Bennett, 1929
1996 Legacy Project (Coles et al., 1997)

Genus: *Gomphosus*
*Gomphosus varius* Lacèpede, 1801
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
Legacy Project - Species Report (Cont.)

Genus: Labroides

1973  Ref - Evans et al., 1974
1996  Legacy Project (Coles et al., 1997)
2008  This Project

Genus: Oxycelinus

Oxycelinus unifasciatus  (Streets, 1877)
2006  Ref - Smith et al., 2006

Genus: Stethojulis

Stethojulis balteata  (Quoy & Gaimard, 1824)  Indigenous. Common name(s): Belted Wrasse;
Hawaiian name(s): ōmaka.
1973  Ref - Evans et al., 1974  Recorded as balteatus (Quoy and Gaimard).
1978  Ref - Grovhoug, 1979
1996  Legacy Project (Coles et al., 1997)
2007  This Project

Genus: Thalassoma

Thalassoma duperrey  (Quoy & Gaimard, 1824)  Indigenous. Common name(s): Saddle Wrasse;
Hawaiian name(s): hinālea lau-wili.
1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006
2008  This Project

Thalassoma umbrostigma  (Rüppell, 1838)  Off Pearl Harbor.
1979  Ref - AECOS, 1979

Family: Lutjanidae

Genus: Lutjanus

Lutjanus fulvus  (Bloch & Schneider)  Introduced. Common name(s): Blacktail Snapper;
Hawaiian name(s): to’au.
1973  Ref - Evans et al., 1974
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995
1996  Spec - BPBM-I 37323  West Loch; Oyster Reef.
1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006
2007  This Project
2008  This Project

Family: Mugilidae

Genus: Mugil

Mugil cephalus  Linnaeus, 1758
1973  Ref - Evans et al., 1974
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1978  Ref - Grovhough, 1979
1986  Ref - Lenihan, 1990
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995

Genus: Moolgada

Moolgada engeli  (Bleeker, 1858)  Recorded as Vulamugil engeli.
2006  Ref - Smith et al., 2006

Genus: Vulamugil

Vulamugil engli  (Bleeker, 1858)  Recorded as Chelon engli.
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995

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Legacy Project - Species Report (Cont.)

1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006

Family: MULLIDAE
Genus: Mulloidichthys
Mulloidichthys auriflamma  Forsskål, 1775
1973  Ref - Evans et al., 1974

Mulloidichthys flavolineatus  (Lacépède, 1801)
1973  Ref - Evans et al., 1974  Recorded as samoensis (Gunther).
1978  Ref - Grovhoug, 1979  Recorded as samoensis (Gunther).
1986  Ref - Lenihan, 1990  Recorded as M. samoensis (Gunther).
1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006

Mulloidichthys vanicolensis  Valenciennes, 1831  Indigenous. Common name(s): Yellowfin Goatfish;
Hawaiian name(s): weke ‘ula.
1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006

Genus: Parupeneus
Parupeneus bifasciatus  (Lacepède, 1802)
2006  Ref - Smith et al., 2006

Parupeneus cyclostomus  (Lacepède, 1801)
2006  Ref - Smith et al., 2006

Parupeneus multifasciatus  (Quoy and Gaimard, 1825)  Indigenous. Common name(s): Manybar Goatfish; Hawaiian name(s): moana.
2007  This Project

Parupeneus multifasciatus  Quoy & Gaimard, 1824
1996  Legacy Project (Coles et al., 1997)

Parupeneus pleurostigma  (Bennett, 1830)
1973  Ref - Evans et al., 1974
1978  Ref - Grovhoug, 1979

Parupeneus porphyreus  Jenkins, 1903
1973  Ref - Evans et al., 1974
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1978  Ref - Grovhoug, 1979
1986  Ref - Lenihan, 1990
1996  Legacy Project (Coles et al., 1997)
2006  Ref - Smith et al., 2006

Genus: Upeneus
Upeneus arge  Jordan & Evermann, 1903
1973  Ref - Evans et al., 1974
1973  Ref - McCain, 1974
1973  Ref - McCain, 1975
1978  Ref - Grovhoug, 1979
1986  Ref - Lenihan, 1990
1993  Ref - Brock, 1994
1994  Ref - Brock, 1995

Upeneus taeniopterus  (Cuvier, 1829)  Hawaiian name(s): weke pahulu; weke pueo.
1996  Spec - BPBM-I 37325  NE side of West Loch channel.

Upeneus vittatus  (Forsskål, 1775)
1992  Spec - BPBM-I 35395
1993  Spec - BPBM-I 37064
Legacy Project - Species Report (Cont.)

Family: POLYNEMIDAE
Genus: Polydactylus
*Polydactylus sexfilis* (Cuvier & Valenciennes, 1831)
1973 Ref - Evans et al., 1974
1978 Ref - Grovhough, 1979

Family: POMACANTHIDAE
Genus: Pomacanthus
*Pomacanthus imperator* (Bloch, 1787)
2006 Ref - Smith et al., 2006

Family: POMACENTRIDAES
Genus: Abudeufduf
*Abudeufduf abdominales* (Quoy & Gaimard, 1824) Indigenous. Common name(s): Hawaiian Sergeant; Hawaiian name(s): mamo.
1973 Ref - Evans et al., 1974
1978 Ref - Grovhough, 1979
1986 Ref - Lenihan, 1990
1994 Ref - Brock, 1995
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 This Project
2008 This Project

*Abudeufduf sordidus* (Forsskål, 1775)
1973 Ref - Evans et al., 1974
1986 Ref - Lenihan, 1990
2006 Ref - Smith et al., 2006

Genus: Dascyllus
*Dascyllus albicella* Gill, 1862 Indigenous. Common name(s): Hawaiian Dascyllus; Hawaiian name(s): mamo.
1973 Ref - Evans et al., 1974
1978 Ref - Grovhough, 1979
1996 Legacy Project (Coles et al., 1997)
2006 Ref - Smith et al., 2006
2007 Ref - Brock, 2007
2007 This Project
2008 This Project

Family: PRIACANTHIDAE
Genus: Heteropriacanthus
*Heteropriacanthus cruentatus* (Lacepede, 1801)
1973 Ref - Evans et al., 1974 Recorded as Priacanthus cruentatus (Lacepede).
2006 Ref - Smith et al., 2006

Family: SCARIDAE
Genus: Calotomus
*Calotomus carolinus* (Valenciennes in Cuvier and Valenciennes, 1840)
2006 Ref - Smith et al., 2006

*Calotomus spinidens* (Quoy & Gaimard, 1824)
1973 Ref - Evans et al., 1974
1978 Ref - Grovhough, 1979

Genus: Chlorurus
*Chlorurus psittacus* (Forsskål, 1775) NE of Ford Island.
1996 Spec - BPBM-I 37327
2006 Ref - Smith et al., 2006 Recorded as Scarus psittacus.

*Chlorurus sordidus* (Forsskål, 1775) Hawaiian name(s): uhu.
1973 Ref - Evans et al., 1974 Recorded as Scarus sordidus Forsskal.

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### Legacy Project - Species Report (Cont.)

<table>
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<th>Year</th>
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<td>1993</td>
<td>Ref - Brock, 1994</td>
<td>Recorded as Scarus sordidus.</td>
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<tr>
<td>1994</td>
<td>Ref - Brock, 1995</td>
<td>Recorded as Scarus sordidus.</td>
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<tr>
<td>2006</td>
<td>Ref - Smith et al., 2006</td>
<td>Recorded as Scarus sordidus.</td>
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<td>2007</td>
<td>Ref - Brock, 2007</td>
<td>Recorded as Scarus sordidus.</td>
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**Genus: Scarus**

- **Scar sp.**
  - Indigenous. Common name(s): Parrotfish.
  - 1973 Ref - Evans et al., 1974
  - 1986 Ref - Lenihan, 1990
  - 1996 Legacy Project (Coles et al., 1997)
  - 2008 This Project

- **Scarus rubroviolaceus**
  - Bleeker, 1849
  - 2006 Ref - Smith et al., 2006

**Family: Sphyraenidae**

- **Genus: Sphyraena**
  - **Sphyraena barracuda** (Walbaum, 1792)
    - 1973 Ref - Evans et al., 1974
    - 1973 Ref - McCain, 1974
    - 1973 Ref - McCain, 1975
    - 1978 Ref - Grovhoug, 1979
    - 1987 Ref - AECOS, 1987
    - 1993 Ref - Brock, 1994
    - 1994 Ref - Brock, 1995
    - 1996 Legacy Project (Coles et al., 1997)
    - 2006 Ref - Smith et al., 2006

**Family: Bothidae**

- **Genus: Bothus**
  - **Bothus pantherinus** (Rüppell, 1830)
    - 1973 Ref - Evans et al., 1974

**Family: Tetraodontiformes**

- **Order: Diodontidae**
  - **Genus: Diodon**
    - **Diodon holocanthus** Linnaeus, 1758
      - 1973 Ref - Evans et al., 1974
    - **Diodon hystrix** Linnaeus, 1758
      - Indigenous. Common name(s): Spiny Balloonfish.
      - 1973 Ref - Evans et al., 1974
      - 1978 Ref - Grovhoug, 1979
      - 1979 Ref - AECOS, 1979
      - 1996 Legacy Project (Coles et al., 1997)
      - 2006 Ref - Smith et al., 2006
      - 2008 This Project

- **Genus: Pervagor**
  - **Pervagor spilosoma** (Lay & Bennett, 1839)
    - 1973 Ref - Evans et al., 1974

- **Genus: Lactoria**
  - **Lactoria fornasini** (Bianconi, 1846)
    - Legacy Project (Coles et al., 1997)

- **Genus: Ostracion**
  - **Ostracion meleagris** (Shaw and Nodder, 1796)
    - Indigenous. Common name(s): Spotted Boxfish; Hawaiian name(s): moa.
    - 2008 This Project
Legacy Project - Species Report (Cont.)

Ostracion meleagris camurum  (Jenkins, 1901)
  1973  Ref - Evans et al., 1974
  1978  Ref - Grovhoug, 1979
  1996  Legacy Project (Coles et al., 1997)

Family: TETRAODONTIDAE
Genus: Arothron
Arothron sp.
  1949  Spec - BPBM-I 25886
  1996  Spec - BPBM-I 37318  Sheet piling in thermal discharge from Hawaiian Electric
  Company (HECO)

Hawaiian name(s): makimaki.

Arothron hispidus  (Linnaeus, 1758)  Indigenous. Common name(s): Stripebelly Puffer;
Hawaiian name(s):
  ‘o’opu-hue.
  1973  Ref - Evans et al., 1974
  1973  Ref - McCain, 1974
  1973  Ref - McCain, 1975
  1978  Ref - Grovhoug, 1979
  1986  Ref - Lenihan, 1990
  1993  Ref - Brock, 1994
  1994  Ref - Brock, 1995
  1996  Legacy Project (Coles et al., 1997)
  2006  Ref - Smith et al., 2006
  2007  Ref - Brock, 2007
  2007  This Project
  2008  This Project

Genus: Canthigaster
Canthigaster coronata  (Vaillant & Sauvage, 1875)  Canthigaster coronatus (Randall, P.C.).
  1973  Ref - Evans et al., 1974

Canthigaster jactator  (Jenkins, 1901)  Indigenous. Common name(s): Whitespotted Toby.
  1973  Ref - Evans et al., 1974
  2008  This Project

Class: REPTILIA
Family: Cheloniidae
Genus: Chelonia
Chelonia mydas  (Linnaeus, 1758)
  2007  Ref - Brock, 2007

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