



**DETERMINATION OF BASELINE CONDITIONS FOR  
INTRODUCED MARINE SPECIES IN NEARSHORE WATERS  
OF THE ISLAND OF KAHOʻOLAWA, HAWAII**

February 1998

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INTRODUCED MARINE SPECIES IN NEARSHORE WATERS  
OF THE ISLAND OF KAHO‘OLAWA, HAWAII**

PREPARED FOR THE KAHO‘OLAWA ISLAND RESERVE COMMISSION

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## EXECUTIVE SUMMARY

A survey of the marine macroalgae and invertebrates in the intertidal and subtidal zones was conducted at seven sites around Kaho'olawe Island from January 12 to 14, 1998. A total of 298 species were observed or collected, including 152 taxa in the intertidal and 193 in the subtidal. Most of these are new reports for Kaho'olawe and include only 35 species previously reported, which were mostly reef corals and macroalgae.

No introduced macroalgae or invertebrates occurred at these sites, which included the full variety of marine habitats that are present on Kaho'olawe. This indicates that the benthic marine community around Kaho'olawe has not been invaded by alien species, despite the island's proximity to the Maui where blooms of introduced alga have been a major ecological problem. This undisturbed condition is unique for the Hawaiian Islands, which routinely have been inhabited by a number of alien species, especially in harbor areas. Boat traffic to the island is likely to increase substantially during ordnance cleanup and with expanded use of the island, and measures should be taken to prevent species introductions on Kaho'olawe and preserve the quality of this unique marine resource.

## INTRODUCTION

Public use of the Island of Kaho'olawe has been restricted from the general public for more than 55 years, since the beginning of military operations on the island at the start of World War II. The use of the island as a Navy bombing range from the early 1950's to 1990 minimized the accessibility of nearshore waters to fishing and other normal human-related activities. It is possible that because of the relative isolation of Kaho'olawe, its marine biota has more undisturbed by direct human influences than any location in the main Hawaiian Islands, in contrast to the extreme disturbance of the island itself by bombing and overgrazing by feral goats.

This formerly relatively inaccessible island has been subject to increasing usage that is likely to continue during and after ordnance is removed from the island. Boat traffic to Kaho'olawe resulting from cleanup efforts and subsequent island usage will increase the likelihood of introduction of nonindigenous marine organisms that could invade the habitats of native marine biota. Surveys of other areas in the Hawaiian Islands from Hawai'i to Midway have shown that a substantial proportion of the resident marine biota is composed of introduced species. For example, a recent extensive survey in Pearl Harbor (Coles et al., 1997) found over 20% of the species sampled to be introduced or cryptogenic. Nonindigenous species in many places other than Hawai'i have had highly disruptive impacts on the marine communities of their destination, and a national commission has ranked aquatic species introductions with over-fishing and marine pollution as an area of principal concern for the world's oceans (National Research Council, 1995).

Introductions of nonindigenous marine species into new receptor areas have undoubtedly been occurring since at least the first major European explorations for routes to Asia began in the fifteenth century. Transport of invasive species has occurred with fouling and boring organisms that were attached to or boring within wooden ship hulls, or associated with ship's ballast. Other species introductions, both planned and unplanned, have resulted from the transport and culture of food organisms, such as oysters, which often brought species which were living on or in the shells of the cultured organisms to new areas. Since the middle of the nineteenth century, many species transported and introduced in such a manner flourished even when the cultured organism failed to become established. However, the last quarter of the twentieth century has produced an explosion in the frequency and seriousness of introductions of aquatic nonindigenous species that have radically altered the ecology of the communities of the receptor area at the expense of native species (Ruiz, et al, 1997). Introduced species can rapidly monopolize energy resources, act as voracious predators, overcome endemic species by their rapid growth and reproduction unrestricted by predator controls, or impart parasites and diseases that can be passed to humans through the food chain or by direct exposure.

Very little is known about the present status of marine species in the waters of Kaho'olawe, and less still about the status of species introductions in the island's nearshore environment. The available information is derived from five studies (Kawamoto et al, 1981; DLNR, 1972, 1993; Brock and Bailey-Brock, 1993, 1998; Cox et al., 1993) which focused mainly on the algal, reef coral and reef fish

components of the biotic community. These studies provide little information about resident non-coral, benthic invertebrate or algal populations that can be used in evaluating species introductions.

Primary embarkation points for boats traveling to Kaho'olawe are likely to be Ma'alaea and Kihei Harbors on south Maui. Since the 1980's the introduced red alga *Hypnea musciformis* and other algae have undergone massive blooms along the south Maui coast, often resulting in extensive deposits of dead and rotting algae on the shoreline and subtidal areas (Hodgson, 1994; Hodges, 1996). *Hypnea musciformis* was not listed by DLNR (1993) as being on their Kaho'olawe transects in 1992, but no more recent information on the presence or absence of this nuisance species is available. The possible introduction of this or other marine introductions to Kaho'olawe is a matter of concern.

This report describes the results of a three day sampling of marine invertebrates and macroalgae in the intertidal and subtidal zones at seven sites on Kaho'olawe Island. The study assesses the present condition of the marine biota of Kaho'olawe Island to determine baseline conditions prior to a period of increased traffic to the island which may promote introductions of nuisance or nonindigenous species. Such introductions may lead to unalterable changes in the marine community. Basic knowledge of the present communities and condition in nearshore Kaho'olawe waters is critical for making management decisions for protecting and perpetuating what may be one of the last pristine marine environments that remain in the main Hawaiian Islands.

## METHODS

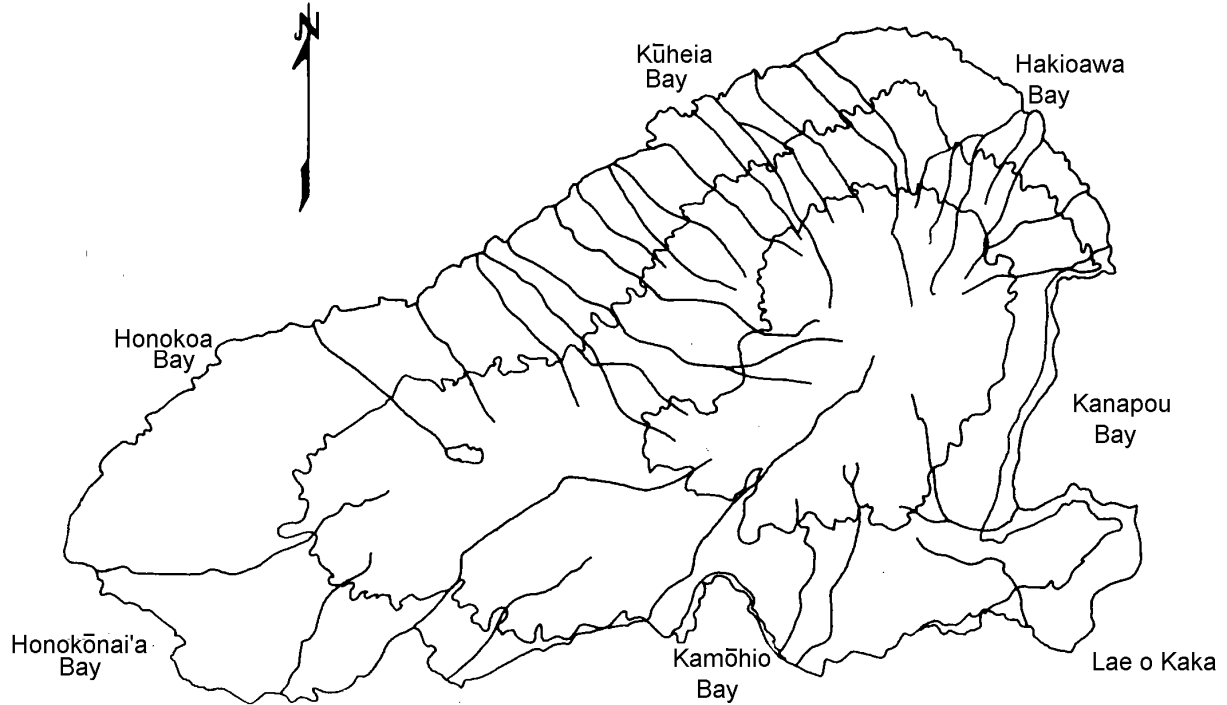
Surveys of intertidal and subtidal offshore at seven areas around Kaho'olawe were made on January 12 to 14, 1998. Sites surveyed (Figure 1) were at Hakioawa and Kamohio Bays on January 12, Kuheia and Honokonai'a Bays on January 13, and Kanapou Bay, Lae o Kaka (Kaka Point) and Honokoa Bay on January 14. Surveys were made of the subtidal zone at all sites and of the intertidal at all sites except Lae o Kaka. Two pairs of investigators made observations, with one team observing and sampling macroinvertebrates and the other team concentrating on macroalgae. Species observed as present were noted on underwater paper and samples of substratum and organisms not easily identified in the field were collected, preserved in 70% ethanol and returned to the laboratory for identification. Subtidal sampling was conducted at depths from approximately 5 to 30 m using Scuba on dives approximately 50 minutes long. Samples in both the intertidal and subtidal were taken on a haphazard basis with the intention of obtaining as large a variety of organisms as possible

## STATION DESCRIPTIONS

Site 1. Hakioawa Bay. Surveyed 12Jan98. The northwest- southeast aligned shoreline of this bay is a broad, brown sand beach enclosed by rocky headlands formed by ridges of eroding soft lava rock. At the center of the beach is an intermittently flowing stream that deposits substantial quantities of fine brown terrigenous silt on the beach and offshore. Loose lava boulders and cobbles are abundant above and below the intertidal zone and are the major intertidal habitat on either side of the beach. Further north and south toward the headlands the intertidal zone becomes a more

solid basalt substratum with a developed intertidal bench supporting abundant macroalgae and intertidal invertebrates.

## Kaho'olawe



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Figure 1. Locations of Kaho'olawe sampling sites

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Subtidally, a sand bed containing a high proportion of fine red-brown silt derived from shoreline runoff extends offshore in the central area of the bay. Wave suspension of the fine particles from this silty sand causes highly turbid conditions with chocolate brown water next to the shoreline. Despite these seemingly unfavorable conditions, coral reefs extend from the headlands nearby, rising from approximately 15 m depth on either side of the sand bed. Coral coverage on these reefs is surprisingly high and diverse. Total coral cover on the reef southeast of the sand bed was subjectively estimated at 70-80%, in good agreement with quantitative estimates made by Cox et al. (1993) of 62-68% at 3 and 10 m depth.

Site 2. Kamohio Bay. Surveyed 12Jan98. This is one of two prominent bays that occur along the southern shoreline of the island. Both bays are unprotected, deep indentations in the sheer coastline, whose walls rise approximately 100 m directly from the shore. There is no prominent intertidal zone or beach along the shore of this bay, but rather a narrow bench 1-2 m wide that extends intermittently along the cliffs and is highly impacted by ocean waves under all conditions.

The cliffs show brown stains indicating the locations of periodic large waterfalls of turbid water during major storms when the nearshore water can become opaque brown, and a large terrigenous silt plain spreads seaward from the base of the shore. However, water transparency along this south coast at the time of the survey was high, with underwater visibility of 25+ m.

With the exception of the silt plain, most of the bottom of the bay at depths greater than 15 m is white calcareous sand mixed with boulders and cobbles. Nearer the shoreline at depths less than 10 m the substratum is hard and calcareous with little relief, except for the surfaces of boulders which have been flung into the shallows by waves or have broken from the shore. Coral coverage is moderate, estimated by Cox et al. (1993) as 8% at 3 m and 38% at 10 m, reflecting the high turbulence that corals are exposed to in this environment. At the shore the bottom rises vertically from about 3 m and supports a variety of sessile organisms that can adhere to the bottom in this turbulent zone.

Site 3. Kuheia Bay. Surveyed 13Jan98. The shoreline of this small bay faces to the northwest, directly exposing it to winter swells and surf. It is similar to, although smaller than, Hakioawa Bay, with a central sand area and reefs extending from headlands that enclose the bay, and it also receives substantial sediment runoff that increases water turbidity and is a source of stress to reef corals. However, because of the more enclosed nature of this bay, the beach at its head appears to be somewhat less impacted by large ocean waves than at Hakioawa. The beach intertidal zone is composed of large cobbles of smooth basalt mixed with brown, silty sand. To either side of the beach are basalt bluffs and benches that extend to the headlands and provide tidepools and other habitats that support a high abundance and variety of intertidal organisms.

Offshore, coral reefs occur to either side of the silty sand bed. The reef to the northeast rises from about 8 m depth and was estimated at a total coral cover of 30-50%, compared to 62-68% at 3 and 10 m (Cox, et al., 1993) and 37% (Division of Aquatic Resources, 1993). As at Hakioawa, nonliving reef surfaces were coated with fine terrigenous silt, and water turbidity was the highest observed during the survey. Despite this stress, the reef supports a substantial coral coverage composed of a variety of species.

Site 4. Honokainaia Bay. Surveyed 13Jan98. This bay is near the most western end of the island and faces directly west. Although its location might make the bay highly subject to impact from winter northwest swells, a long shoal area that extends for at least 2 km westward offshore of Lae o Kealaikahiki provides protection from these waves. Therefore, the bay was relatively calm during the survey, even at the time of a large winter swell.

Most of the bay's substratum is medium to fine calcareous sand that, unlike bays on the north side of the island, shows no sign of mixture with brown silt from land runoff. The only stream reaching the bay is small and intermittent, and the general appearance of the shoreline is typical of leeward coastlines in the Hawaiian Islands, with a 200 m long, broad white sand beach bordered by rocky basalt headlands. The intertidal area, which was surveyed on the east side of the bay, is



composed of loose basalt and calcareous boulders lying on a broad intertidal bench that supports a community of organisms generally less abundant than those found in bays on the north side of the island.

Offshore, the reef on the east side of the bay rises from the sand bed at about 6 m depth or greater. This area was estimated to have total coral coverage of 20-30 % near the reef base, comparable to 9 and 25% total cover estimated by Cox et al. (1993) at 3 and 10 m, respectively.

Site 5. Kanapou Bay. Surveyed 14Jan98. This is the largest bay on Kaho'olawe , stretching over 4.5 km between rocky headlands on the east side of the island. Most of the bay is enclosed by sheer cliffs except for a brown sand beach about 0.5 km long that lies in a pocket at the bay's southern end. The bottom directly off the beach is soft brown sand with a high terrigenous silt component, and the intertidal zone was the only one on our survey that did not have numerous boulders or cobbles at the beach line. Large boulders do occur, however, in the supratidal zone, increasing from the center of the beach to its north and south margins. Because of the position of the bay in the direct line of currents and wind driven waves from the Alenuihaha and Alalakeiki Channels, the beach receives a great deal of flotsam and debris. Fishing nets and floats, driftwood, general floating garbage and plastic that came to rest on the beach extend to well above the normal high tide zone. The beach is bisected by a intermittently flowing stream which appeared to range as wide as 10 m during high flow and contained thick layers of red-brown clay at the time of the survey.

The offshore area approximately 1 km north of the center of the beach was surveyed from 5 to 25 m depth. The site was adjacent to a sheer wall and the underwater relief was high, from vertical near the shore to about a 30% grade offshore. Coral coverage throughout the area is high and diverse, estimated to average 75%. Although water clarity at the time of the survey was very good, with underwater visibility of around 30 m, a thin coating of silt on rocks and nonliving coral surfaces indicated that the area is subject to periodic silt-laden runoff.

Site 6. Lae o Kaka (Kaka Point). Surveyed 14Jan98. This small point is the southeastern most projection of the island and it lies at the eastern end of the cliffs that form the island's south shore. A shoreline shelf that lies outside of the uplifted shoreline forms the point and provides a substantial habitat for intertidal and subtidal algae. Below the shelf the subtidal zone is quite vertical to 5 to 10 m depth, where a more gradually sloping bottom supports large basalt boulders and abundant reef corals. Intermittently along this wall occur ledges and caves up to 10 m deep and high, which provide habitats for numerous cryptic organisms not normally occurring at such shallow depths. Because the point is remote from stream runoff, there was no indication of sedimentation from island runoff, and water clarity was high with 30 m visibility.

Site 7. Honokoa Bay. Surveyed 14Jan98. This site is very similar to Kuheia Bay, lying along the northeast-southwest coastline and directly exposed to north Pacific winter swells. It is a small cove with a 50 m long cobble-pebble beach surrounded by basalt boulders and volcanic

headlands about 25 m high in the east and west sides of the cove. Possibly because the eastern headland projects well out into the ocean and may provide some protection from large waves, the cove appears to be calmer than Kuheia Bay, and relatively little macroalgae was found growing in the intertidal zone. A substantial intermittent stream reaches the bay, but this appears to introduce less silt because the stream drains a less erosive part of the island.

As at Hokioawa and Kuheia, reefs project seaward from the cove's headlands and support substantial coral growth. On the northeast side of the bay the reef rises from about 12 m depth as a nearly vertical wall to about 6 m where relief becomes more gradual into the shallows. At depths of 10 m or greater coral cover was estimated to total about 40%, although total coverage quantitatively estimated by Cox et al. (1993) was only about 10% at both 3 and 10 m. Sand outside of the reef was a mix of white calcareous and brown terrigenous fine to medium sand. However, the terrigenous component appeared to be less than at the other sites along the north and east shores, and no silt deposits were found on the reef surface.

## RESULTS AND RECOMMENDATIONS

A total of 298 species or higher taxa were identified for the seven sampling sites, with 152 of these occurring at intertidal stations and 193 at subtidal stations. A list of all species encountered is in Appendix B and the species found at each intertidal and subtidal station are listed in Appendices B and C

Results are summarized by major taxa in Table 1, along with the numbers of these species that were reported by previous Kaho'olawe surveys (Kawamoto et al, 1981; DLNR, 1972, 1993; Brock and Bailey-Brock, 1993, 1998; Cox et al., 1993). Two hundred forty eight of the 298 taxa found were new reports for Kaho'olawe. Only the cnidaria (mostly reef corals), the echinoderms and the macroalgae had a substantial number of taxa in the present study that had been previously reported. Previous reports for these ranged from 68% of the present species for the cnidaria to 20% for the macroalgae.

Table 1. Number of taxa found at sampling stations (Number of same species previously reported)

Taxa	Intertidal	Subtidal	Overall
Macroalgae	66(9)	25 (6)	81 (13)
Porifera	1 (0)	13 (0)	13 (0)
Cnidaria	3 (2)	31 (21)	32 (21)
Polychaeta	7 (0)	13 (0)	17 (0)
Amphipoda	24 (0)	34 (0)	45 (0)
Isopoda	2 (0)	8 (0)	8 (0)
Tanaidacea	4 (0)	6 (0)	6 (0)
Cumacea	0 (0)	1 (0)	1 (0)
Cirrepedia	1 (0)	3 (0)	4 (0)
Decapoda	7 (0)	12 (0)	15 (0)
Insecta	0 (0)	2 (0)	2 (0)

Mollusca	29 (1)	27 (1)	53 (1)
Ectoprocta	1 (0)	5 (0)	5 (0)
Echinodermata	6 (3)	12 (5)	15 ((5)
Urochordata	0 (0)	1 (0)	1 (0)
Total	152 (13)	193 (34)	298 (35)

The taxonomic groups with the most taxa present were the macroalgae, cnidarians, amphipods, other crustaceans, molluscs and echinoderms. Macroalgae and molluscs had the highest numbers of species in the intertidal, while cnidarians, amphipods and molluscs had the greatest numbers of taxa offshore. The intertidal community was composed of organisms typical of a Hawaiian shoreline exposed to high wave energy, with very abundant algal mats, neritid, patellid and thaid gastropods, and small bivalves. Offshore the community was typically a flourishing coral reef with high coverage of reef corals, despite the high sediment loads that these areas have apparently encountered, which have left a substantial sediment coating on nonliving reef surfaces in bays on the north and east coasts.

Of the total 152 intertidal taxa found, 61 to 76 taxa were present at each of Hakioawa, Kuheia, Honokonai'a and Honokoa Bays (Appendix B), suggesting a relatively even distribution of species among these sites. No survey was made of the intertidal at Lae o Kaka, and only macroalgae were sampled at Kamohio and Kanapou Bays. The community at the four intertidal sites where systematic sampling was conducted was found to be especially rich, with high abundances of larger specimens of *Nerita picea* (*pipipi*), *Cellana exarata*, and *C. melanostoma* (*opihii*) than are usually found on Hawaiian shores accessible to the public.

The offshore sites (Appendix D) each had from 42 to 72 of the total 193 taxa found, with the greatest number of taxa collected or observed at Honokonai'a Bay, followed by Kanapou Bay and Lae o Kaka. These were oceanic sites on the south and west shores that are normally unexposed to the sedimentation stress that affects bays on the north and east shores of Kaho'olawe, so a higher diversity and abundance of reef corals and associated organisms might be expected. However, 42 to 60 taxa occurred at Hakioawa, Kuheia and Honokoa Bays, where water turbidity was high and sedimentation has been substantial. Species abundance among these sites was highest at Hakioawa Bay, which also had the most apparent source of sediment-laden runoff at the center of the beach a few hundred meters west of the offshore survey site. Coral coverage and diversity was particularly impressive at this site, with 12 species of coral found and total coverage estimated at 70 to 80 %.

No introduced macroalgal or invertebrate species occurred among the 298 taxa that were identified from this study. An isopod collected at the Hakioawa and Honokonai'a Bay sites (tentatively identified as *Dynamenella* sp.) closely resembles *Dynamenella benedicti* (Richardson) previously reported only from the San Francisco area (Miller, 1968). Therefore, this single species may be considered a candidate for introduced status, but this remains to be verified. The only introduced animal organisms sighted on the surveys were reef fishes, the snappers *Lutjanus kasmira* (Forsk.) (*ta'ape*), *Lutjanus fulvus* (Bloch and Schneider) (*to'au*) and the grouper *Cephalopholis argus* (Bloch and Schneider) (*roi*). These were present at most of the offshore stations.

Conspicuous by their absence at Kaho'olawe were massive blooms of the introduced algae *Hypnea musciformis* or other macroalgae such as *Ulva* and *Cladophora* that have undergone uncontrolled growth along the Maui coast (Hodgson, 1994; Hodges, 1996) and continue to be a nuisance there. Neither *Hypnea* nor *Ulva* occurred at any of the Kaho'olawe sites, and the three *Cladophora* species that were present were a relatively small component of the total algal community. *Acanthophora spicifera*, another introduced macroalga which has become dominant in many intertidal environments throughout Hawai'i, also was not found on these surveys, although it was previously reported to occur in 1992 on Kaho'olawe at Maka'ala'e Point (I. Abbott, unpublished report).

These results may be compared with other recent studies of the occurrence and impact of introduced species in Hawaiian waters. An extensive survey in Pearl Harbor determined 96 known or suspected introduced species among 434 taxa, or about 22% of the total taxa found (Coles, et al, 1997). A brief survey at the remote atoll of Midway, at the western end of the Hawaiian chain found an introduced octocoral, barnacle and bryozoan to be common components of the fouling community on hard surfaces in the Midway Harbor and lagoon (DeFelice, et al, 1998). Similar results have been found for Honolulu Harbor (Coles, et al, in prep.) and for preliminary surveys of other harbors in the main Hawaiian islands (DeFelice, in prep.). The numbers of introduced species for these studies will increase as analyses and identifications are completed, but these preliminary results emphasize the uniqueness of Kaho'olawe in not having a single introduced species found among a total of 298 taxa identified.

The marine biological communities at Kaho'olawe, despite considerable stress that has been imposed by uncontrolled sedimentation and runoff from denuded land areas, are in a remarkably pristine state that represent a rare management opportunity for Hawai'i. The shoreline and intertidal areas have been minimally impacted by human collecting and are in a near natural condition that can only be perpetuated by controlled access and/or resource management. Continuation of efforts to restore vegetation to the Kaho'olawe hillsides and valleys will produce improved offshore water quality and assure that reef corals and associated organisms continue to thrive and spread to areas that have been most highly impacted by sedimentation.

The importance of these issues and the significance of long term sustainability within a Hawaiian cultural context has been addressed in the comprehensive Kaho'olawe Ocean Management Plan (Kaho'olawe Island Reserve Commission, 1997). However, this plan did not consider the potential impact that introductions of invasive species might have on the island's marine ecosystem under long term use. Since access to the island will undoubtedly increase during ordnance cleanup, and post-cleanup visitors may number up to 100 at any time, the potential exists for introduction of alien marine organisms which could drastically alter the present undisturbed condition.

Such introductions could result from four principal causes, listed here in order of likely occurrence: 1) Fouling organisms adhering to the bottom of boats, ships or barges; 2) Organisms accidentally transported within craft, on equipment or on the persons visiting the island; 3) Larval stages of organisms transported with the ballast water of large vessels and released in the islands vicinity; 4) Transport of

organisms intended for culture and intentionally or unintentionally released in the islands waters, or organisms inadvertently transported along with organisms to be cultured.

Of these 3) and 4) are unlikely to be a significant source of marine introductions to Kaho'olawe. Water is not used for ballasting on craft of less than 100 feet long, and it is likely that any barges or large craft going to Kaho'olawe will be transporting equipment or supplies and therefore would not carry ballast water that might be released. The management plan provides no provisions for introduction of organisms to be cultured on Kaho'olawe, so no release of organisms from aquaculture, intentional or otherwise, should occur.

The remaining two vectors will be of different degree of potential importance during the cleanup and post-cleanup phases. During cleanup transport of barges and large craft with hull fouling could be the most significant source of marine invasions unless precautions are taken to prevent transport of organisms by this means. During post-cleanup, the large numbers of visitors could result in introductions, even though the probability of an introduction per visitor might be small. However, either vector is a major consideration during either phase.

Management recommendations to prevent introductions of invasive marine species to Kaho'olawe are as follows:

1. All craft visiting Kaho'olawe shall have undergone recent hull cleaning and shall have an inspection of the hull either in drydock or by divers experienced in examining underwater structures for fouling and other surface living organisms. Such inspections shall be done at the beginning of vessel's tour of visits to Kaho'olawe and periodically at two week intervals.
2. The inboard areas of craft going to Kaho'olawe shall be inspected at the beginning of each visit to assure that no algae, benthic invertebrate or other marine organisms are accidentally carried to the island. Likewise all equipment to be offloaded to the island will be so inspected and the personal gear of all visitors will be recently washed and determined to be free of any marine organism.
3. Any craft, vessel or barge entering Kaho'olawe large enough to contain ballast water will be prohibited from discharging ballast any closer than 10 miles from the island. All systems will be checked prior to entering Kaho'olawe waters to assure that ballast cannot be accidentally released.
4. No live aquatic organisms shall be transported to Kaho'olawe for the purpose of cultivation or any other reason.

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APPENDIX A

MACROALGAL AND INVERTEBRATES COLLECTED  
OR OBSERVED ON KAHO'OLAWA SURVEYS  
JANUARY 12-14, 1998

\* Designates species previously collected or observed at Kaho'olawe

## Appendix A

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
Cyanophyta	<i>Lyngbia</i>	<i>majuscula</i>	Gomont		1		
	<i>Phormidium</i>	<i>crosbyanum</i>				1	
	Unident.	sp.				1	
Cyanophyta	Total				1	2	3
Chlorophyta	<i>Boodlea</i>	<i>composita</i>	(Harv.) Brand		1	1	1
	<i>Bomatella</i>	<i>sphaerica</i>	(Zanardi) Solms-Laubach		1		
	<i>Caulerpa</i>	<i>racemosa*</i>	(Forsk.) J.Ag.		1	1	
	<i>Caulerpa</i>	<i>serrulata*</i>	(Forsk.) J.Ag.		1		
	<i>Caulerpa</i>	<i>taxifolia*</i>	(Vahl) C. Ag.		1	1	
	<i>Caulerpa</i>	<i>webbiana</i>	Montagne		1		
	<i>Chaetomorpha</i>	sp.			1		
	<i>Cladophora</i>	<i>laetivirens</i>	Kutz		1		
	<i>Cladophora</i>	<i>sericea</i>	Kutz		1		
	<i>Cladophora</i>	<i>socialis</i>	Kutz		1		
	<i>Cladophoropsis</i>	<i>membranacea</i>	Gilbert		1		
	<i>Codium</i>	<i>edule</i>	Silva	<i>Wawae'iole</i>	1		
	<i>Dictyosphaeria</i>	<i>cavernosa*</i>	Forsk.) Boergesen		1		
	<i>Dictyosphaeria</i>	<i>versluysii</i>	Weber-van Bosse		1		
	<i>Halimeda</i>	<i>opuntia*</i>	(Linnaeus) Lamouroux			1	
	<i>Halimeda</i>	sp.				1	
	<i>Microdictyon</i>	<i>setchellianum</i>	Howe		1		
	<i>Microdictyon</i>	<i>japonicum</i>	Stechell		1		
	<i>Neomeris</i>	<i>annulata*</i>	Dickie		1		
	<i>Neomeris</i>	<i>vannbosseae</i>	Howe		1		
	<i>Siphonocladus</i>	<i>tropicus</i>	(Crouan) J. Ag.			1	
	<i>Valonia</i>	<i>trabeculata</i>	Egerod		1		
	<i>Ventricaria</i>	<i>ventricosa*</i>				1	
Chlorophyta	Total				19	7	23
Phaeophyta	<i>Chnoospora</i>	<i>minima</i>	(Hering) Papenfus		1		
	<i>Colpomenia</i>	<i>sinuosa</i>	(Roth) Derb. And Sol.	<i>Puha</i>	1		
	<i>Dictyopteris</i>	<i>plagiogramma</i>	(Montagne) Vickers	<i>Lipoa</i>		1	
	<i>Dictyota</i>	<i>acutiloba</i>	J. Ag.	<i>Alani</i>	1		
	<i>Dictyota</i>	<i>divaricata*</i>	Lamouroux	<i>Alani</i>	1		
	<i>Dictyota</i>	<i>friabilis*</i>	Setchell	<i>Alani</i>	1	1	
	<i>Hincksia</i>	<i>breviarticulata</i>	(J.Ag.) Silva	<i>Hulu'ilio</i>	1		
	<i>Lobophora</i>	<i>variegata</i>	(Lam.) Womersley			1	
	<i>Padina</i>	<i>japonica</i>	Boergesen			1	
	<i>Padina</i>	sp.			1	1	
	<i>Sargassum</i>	<i>echinocarpum</i>	J.Ag.	<i>Kala</i>	1		
	<i>Sargassum</i>	<i>obtusifolium</i>	J.Ag.	<i>Kala</i>	1		
	<i>Sargassum</i>	<i>polyphyllum</i>	J.Ag.	<i>Kala</i>	1		
	<i>Sphacelaria</i>	<i>novaehollandiae</i>			1		
	<i>Sphacelaria</i>	<i>rigidula</i>	Kutz		1		
	<i>Turbinaria</i>	<i>ornata</i>	J.Ag.		1		
Phaeophyta	Total				13	5	16
Rhodophyta	<i>Acanthophora</i>	<i>pacifica</i>	(Setch.) Kraft			1	
	<i>Actinotricia</i>	<i>fragilis*</i>	(Forrsk.) Borg.			1	
	<i>Asparagopsis</i>	<i>taxiformis</i>	(Del.) Coll. and Harv.	<i>Kohu</i>	1		
	<i>Botryocladia</i>	<i>skottsbergii</i>	(Borg) Levr.		1		
	<i>Centroceras</i>	sp.			1		
	<i>Ceramium</i>	<i>aduncum</i>	Nakamura		1		
	<i>Ceramium</i>	<i>clerionense</i>	Setch. and Gard.		1		
	<i>Ceramium</i>	<i>codii</i>			1		
	<i>Ceramium</i>	<i>dumosertum</i>			1	1	
	<i>Ceramium</i>	<i>hanaese</i>			1		
	<i>Champia</i>	<i>parvula</i>	(C. Ag.) Harv.		1		
	<i>Dasya</i>	<i>iridescens</i>			1		
	<i>Falkenbergia</i> (alternate form of <i>Asparagopsis</i> )				1		
	<i>Galaxaura</i>	<i>fasciculata</i>			1		
	<i>Galaxaura</i>	<i>marginata</i>			1	1	
	<i>Galaxaura</i>	<i>rugosa*</i>	(Solander) Lamour.		1		
	<i>Gelidiella</i>	<i>machrisiana</i>	Dawson		1		
	<i>Gelidiopsis</i>	<i>intricata</i>	(C. Ag.) Vickers		1		
	<i>Gelidiopsis</i>	sp.			1		



## Appendix A (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
	<i>Gelidium</i>	sp.			1		
	<i>Gibsmithia</i>	<i>hawaiiensis</i> *	Doty		1		
	<i>Grateloupia</i>	<i>phuquoensis</i>	Tanaka and Pham			1	
	<i>Haliptilon</i>	<i>subulatum</i>				1	
	<i>Haloplegma</i>	<i>duperreyi</i>	Montagne		1		
	<i>Hydrolithon</i>	<i>breviclavium</i> *	(Foslie) Foslie		1		
	<i>Hypnea</i>	<i>pannosa</i>	J. Ag.		1	1	
	<i>Jania</i>	<i>mcarthroidia</i>	Lamouroux		1	1	
	<i>Laurencia</i>	<i>crustiformans</i>	Abbott		1		
	<i>Laurencia</i>	<i>mcdermidiae</i>	Abbott		1		
	<i>Laurencia</i>	<i>yamadana</i>	Howe		1		
	<i>Laurencia</i>	sp.?			1		
	<i>Melanamansia</i>	<i>demellyi</i>			1	1	
	<i>Melanamansia</i>	<i>glomerulata</i>			1		
	<i>Polysiphonia</i>	<i>scroplorum</i>	Hollenberg		1		
	<i>Polysiphonia</i>	sp.			1		
	<i>Portieria</i>	<i>hornemanni</i>			1		
	<i>Spyridia</i>	<i>filamentosa</i>	(Wulf.) Harvey		1	1	
	<i>Taenioma</i>	<i>purpusillum</i>	J. Ag.			1	
	<i>Trichleocarpa</i>	<i>fragilis</i>			1		
Rhodophyta	Total				34	11	39
Porifera	<i>Batzella</i>	sp.				1	
	<i>Cacospongia</i>	sp.				1	
	<i>Clathria (Microciona)</i>	sp.				1	
	<i>Erylus</i>	<i>proximus</i>	de Laubenfels, 1952			1	
	<i>Hippospongia</i>	<i>metachromia</i>	Bergquist, 1967			1	
	<i>Hippospongia</i>	sp.				1	
	<i>Leiodermatium</i>	n. sp.				1	
	<i>Leiosella</i>	sp.				1	
	<i>Lucetta</i>	sp.				1	
	<i>Plakortis</i>	sp.				1	
	<i>Sphaciospongia</i>	<i>vagabunda</i>	(Ridley, 1884)			1	
	<i>Spongia</i>	<i>oceania</i>	Bergquist, 1979			1	
	<i>Tethya</i>	<i>diploderma</i>	Schram, 1992		1	1	
Porifera	Total				1	13	13
Hydozoa	<i>Lytocarpus</i>	? <i>philippinus</i>				1	
	<i>Sertularia</i>	sp.				1	
	<i>Solanderia</i>	<i>misakinensis</i>	(Inaba, 1892)			1	
Hydozoa	Total					3	3
Anthozoa	<i>Acabaria</i>	<i>bicolor</i>	(Nutting, 1908)			1	
	<i>Aiptasia</i>	<i>pulchella</i>	Carlgren, 1943			1	
	<i>Antipathes</i>	sp.				1	
	<i>Cirripathes</i>	sp.				1	
	<i>Balanophyllia</i>	sp.				1	
	<i>Coscinaraea</i>	<i>wellsi</i> *	Veron & Picon, 1979			1	
	<i>Cyphastrea</i>	<i>ocellina</i> *	Dana, 1846	<i>`ako`ako`a</i>		1	
	<i>Fungia</i>	<i>scutaria</i> *	Lamarck, 1801	<i>`ako`ako`akohe</i>		1	
	<i>Leptastrea</i>	<i>bottae</i> *	(Milne-Edwards & Haime, 1850)			1	
	<i>Leptastrea</i>	<i>purpurea</i> *	Dana, 1846	<i>`ako`ako`a</i>		1	
	<i>Leptoseria</i>	<i>incrustans</i> *	(Quelch, 1886)			1	
	<i>Leptoseria</i>	sp.				1	
	<i>Montipora</i>	<i>flabellata</i> *	Studer, 1901			1	
	<i>Montipora</i>	<i>patula</i> *	Verrill, 1864			1	
	<i>Montipora</i>	<i>verrucosa</i> *	(Lamarck, 1816)	<i>`ako`ako`a</i>		1	
	<i>Palythoa</i>	<i>tuberculosa</i> *	(Esper, 1791)		1		
	<i>Pavona</i>	<i>duerdeni</i> *	Vaughan, 1907			1	
	<i>Pavona</i>	<i>varians</i> *	Verrill, 1864	<i>`ako`ako`a</i>		1	
	<i>Pocillopora</i>	<i>damicornis</i> *	Linnaeus, 1758	<i>`ako`ako`a</i>		1	
	<i>Pocillopora</i>	<i>eydouxii</i> *	Milne-Edwards & Haime, 1860			1	
	<i>Pocillopora</i>	<i>meandrina</i> *	Dana, 1846	<i>`ako`ako`a</i>	1	1	
	<i>Porites</i>	<i>compressa</i> *	Dana, 1847	<i>`ako`ako`a</i>		1	
	<i>Porites</i>	<i>lobata</i> *	Dana, 1846	<i>`ako`ako`a</i>	1	1	
	<i>Porites (Synaraea)</i>	<i>rus</i> *	Forsskal, 1775			1	
	<i>Psammocora</i>	<i>nierstrazi</i> *	Van der Horst, 1922			1	
	<i>Psammocora</i>	sp.				1	

## Appendix A (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
	<i>Psammocora</i>	<i>verrilli</i> *	Vaughan, 1907			1	
	<i>Zoanthus</i>	sp.				1	
Anthozoa	Total				3	28	29
Polychaeta	<i>Dorvillea</i>	sp.				1	
	<i>Eunice</i>	<i>cariboea</i>	Kinberg, 1865		1	1	
	<i>Eurythoe</i>	<i>complanata</i>	Pallas, 1766	<i>'aha huluhulu</i>	1		
	<i>Glycera</i>	<i>tessalata</i>	Treadwell, 1906			1	
	<i>Haplosyllis</i>	<i>spongicola</i>	Hartman-Schroder, 1965			1	
	<i>Iphione</i>	<i>muricata</i>	Savigny, 1818		1		
	<i>Perinereis</i>	<i>nigropunctata</i>	Horst, 1889		1		
	<i>Phyllodoce</i>	sp.				1	
	<i>Phyllodoce (Anaitides)</i>	<i>madeirensis</i>	Langerhans, 1880			1	
	<i>Polyopthalmus</i>	<i>pictus</i>	Holly, 1935			1	
	<i>Sabellastarte</i>	<i>sanctijosephi</i>	Gravier, 1906		1		
	<i>Spirobranchus</i>	sp.	Morch, 1863			1	
	<i>Thelepus</i>	<i>setosus</i>	Quatrefages, 1865		1		
	<i>Thormora</i>	<i>atrata</i>	Treadwell, 1940			1	
	<i>Trypanosyllis</i>	<i>zebra</i>	Grube, 1860		1	1	
	<i>Typosyllis</i>	sp.				1	
	<i>Unident</i>	sp.				1	
Polychaeta	Total				7	12	17
Amphipoda	<i>Amphilocus</i>	<i>kailua</i>	Barnard, 1970		1		
	<i>Amphilocus</i>	<i>likelike</i>	Barnard, 1969			1	
	<i>Amphilocus</i>	<i>menehune</i>	Barnard, 1970			1	
	<i>Ampithoe</i>	<i>akuolaka</i>	Barnard, 1970			1	
	<i>Ampithoe</i>	<i>ramondi</i>	Audouin, 1826		1	1	
	<i>Ampithoe</i>	<i>waialua</i>	Barnard, 1970		1	1	
	<i>Ampithoe (Pleonexes)</i>	<i>poipu</i>	Barnard, 1970		1		
	<i>Anamixis</i>	<i>stebbingi</i>	Walker, 1904		1		
	<i>Caprellid</i>	sp.				1	
	<i>Chevalia</i>	<i>aviculae</i>	Walker, 1904		1	1	
	<i>Colomastix</i>	<i>kapiolani</i>	Barnard, 1970			1	
	<i>Colomastix</i>	<i>pusilla</i>	Grube, 1864			1	
	<i>Cymadusa</i>	<i>hawaiiensis</i>	(Schellenberg, 1938)		1		
	<i>Elasmopus</i>	<i>ecuadorensis</i>	Schellenberg, 1938			1	
		<i>hawaiiensis</i>					
	<i>Elasmopus</i>	<i>hooheno</i>	Barnard, 1970			1	
	<i>Elasmopus</i>	<i>molokai</i>	Barnard, 1970		1		
	<i>Elasmopus</i>	<i>piikoi</i>	Barnard, 1970		1		
	<i>Elasmopus</i>	<i>spinidactylus</i>	Chevreaux, 1908		1		
	<i>Eursiroides</i>	<i>diplonyx</i>	Walker, 1904			1	
	<i>Gammaropsis</i>	<i>alamoana</i>	Barnard, 1970		1	1	
	<i>Gammaropsis</i>	<i>atlantica</i>	Stebbing, 1888		1	1	
	<i>Gammaropsis</i>	<i>haleiwa</i>	Barnard, 1970			1	
	<i>Gammaropsis</i>	<i>kaumaka</i>	Barnard, 1970			1	
	<i>Gammaropsis</i>	<i>pali</i>	Barnard, 1970			1	
	<i>Gammaropsis</i>	<i>pokipoki</i>	Barnard, 1970		1		
	<i>Hyale</i>	<i>ayeli</i>	Barnard, 1970		1		
	<i>Hyale</i>	<i>honoluluensis</i>	Schellenberg, 1938		1		
	<i>Hyale</i>	<i>laie</i>	Barnard, 1970		1	1	
	<i>Ischyrocerus</i>	<i>kapu</i>	Barnard, 1970			1	
	<i>Lembos</i>	<i>macromanus</i>	Shoemaker, 1925		1	1	
	<i>Lembos</i>	<i>waipio</i>	Barnard, 1970			1	
	<i>Leucothoe</i>	<i>hyhelia</i>	Barnard, 1965			1	
	<i>Leucothoe</i>	<i>lihue</i>	Barnard, 1970			1	
	<i>Leucothoides</i>	<i>pottsi</i>	Shoemaker, 1933		1	1	
	<i>Maera</i>	<i>insignis</i>	(Chevreaux, 1901)		1		
	<i>Maera</i>	<i>pacifica</i>	(Schellenberg, 1938)			1	
	<i>Maera</i>	<i>quadrimana</i>	(Dana, 1853)		1	1	
	<i>Paragrubia</i>	<i>vorax</i>	Chevreaux, 1901		1	1	
	<i>Photis</i>	<i>aina</i>	Barnard, 1970			1	
	<i>Photis</i>	<i>kapapa</i>	Barnard, 1970			1	
	<i>Podoceros</i>	<i>braziliensis</i>	Dana, 1853			1	
	<i>Podoceros</i>	<i>talegus lawai</i>	Barnard, 1970		1	1	

## Appendix A (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
	<i>Seba</i>	<i>ekepuu</i>	Barnard, 1970		1	1	
	<i>Stenothoe</i>	<i>valida</i>	Dana, 1853			1	
	<i>Ventojassa</i>	<i>ventosa</i>	Barnard, 1962		1	1	
Amphipoda	Total				24	34	45
Isopoda	<i>?Dynamenella</i>	sp			1	1	
	<i>Carpias (Bagatus)</i>	<i>algicola</i>	(Miller, 1941)		1	1	
	<i>Cirolana</i>	sp.				1	
	<i>Jaeropsis</i>	<i>hawaiiensis</i>	Miller, 1941			1	
	<i>Mesanthura</i>	<i>hieroglyphica</i>	Miller, 1941			1	
	<i>Munna</i>	<i>acarina</i>	Miller, 1941			1	
	<i>Paranthura</i>	<i>ostergaardi</i>	Miller, 1941			1	
	<i>Stenetrium</i>	<i>medipacificum</i>	Miller, 1941			1	
Isopoda	Total				2	8	8
Tanaidacea	<i>Anatanais</i>	<i>insularis</i>	Miller, 1941		1	1	
	<i>Apseudes</i>	<i>tropicalis</i>	Miller, 1941			1	
	<i>Leptocheilia</i>	<i>dubia</i>	Kroyer, 1852		1	1	
	<i>Synapseudes</i>	<i>minutus</i>	Miller 1941		1	1	
	<i>Tanais</i>	<i>vanis</i>	Miller, 1941		1	1	
	<i>Unident.</i>	sp.				1	
Tanaidacea	Total				4	6	6
Cumacea	<i>Unident.</i>	sp.				1	
Cumacea	Total					1	1
Cirripedia	<i>Balanus</i>	sp.	(Conrad, 1837)			1	
	<i>Metabalanus</i>	<i>tanagrae</i>	(Pisbry, 1928)			1	
	<i>Euraphia</i>	<i>hemblii</i>				1	
	<i>Nesochathamalus</i>	<i>intertextus</i>	(Darwin, 1852)		1		
Cirripedia	Total				1	3	4
Decapoda	<i>Alpheus</i>	<i>paralcyone</i>	Edmondson, 1925			1	
	<i>Calcinus</i>	<i>elegans</i>	Lenz, 1901	<i>unauna</i>	1	1	
	<i>Calcinus</i>	<i>laevimanus</i>	Randall, 1839	<i>unauna</i>	1	1	
	<i>Chlorodiella</i>	<i>laevissima</i>	Dana, 1852			1	
	<i>Galathea</i>	<i>spinosorostris</i>	Edmondson, 1925			1	
	<i>Leptodius</i>	<i>sanguineus</i>	Streets, 1877		1		
	<i>Metalpheus</i>	<i>paracrinitus</i>	(Edmondson, 1925)			1	
	<i>Percnon</i>	<i>planissimum</i>	Rathbun, 1906	<i>papa</i>	1		
	<i>Pilumnus</i>	sp.				1	
	<i>Pseudozizus</i>	<i>caystrus</i>	Adams and White, 1849	<i>elekuma</i>	1		
	<i>Pylopaguropsis</i>	<i>keijii</i>	McLaughlin & Haig, 1989			1	
	<i>Schizophrys</i>	<i>hilensis</i>	Rathbun, 1906	<i>papa`i limu</i>		1	
	<i>Stenopus</i>	<i>hispidus</i>	(Olivier, 1811)	<i>`opae huna</i>	1	1	
	<i>Unident.</i>	<i>juv.</i>			1	1	
	<i>Xanthias</i>	<i>canaliculatus</i>	Dai and Yang, 1991			1	
Decapoda	Total				7	12	15
Insecta	<i>?Chironimus</i>	sp.				1	
	<i>Telmatogeton</i>	<i>?japonicus</i>				1	
Insecta	Total					2	2
Gastropoda	<i>Anachis</i>	<i>miser</i>	Sowerby, 1844		1		
	<i>Bittium</i>	<i>parcum</i>	Gould, 1861		1		
	<i>Bittium</i>	<i>zebrum*</i>	Kiener, 1841		1	1	
	<i>Caecum</i>	sp.				1	
	<i>Cellana</i>	<i>melanostoma</i>	Pilsbry, 1891		1		
	<i>Cellana</i>	<i>exarata</i>	Reeve, 1854	<i>`opihii</i>	1		
	<i>Cerithium</i>	<i>columna</i>	Sowerby, 1834			1	
	<i>Cerithium</i>	<i>egenum</i>	Gould, 1849		1		
	<i>Conus</i>	sp.		<i>pupu poniuniu</i>	1		
	<i>Coralliophila</i>	<i>nodosa</i>	A. Adams, 1854			1	
	<i>Cypraea</i>	<i>tigis</i>	Linnaeus, 1758	<i>leho kiko</i>		1	
	<i>Drupa (Drupa)</i>	<i>morum</i>	Roding, 1798	<i>`aha`aha</i>	1	1	
	<i>Drupa (Drupa)</i>	<i>ricina</i>	Linnaeus, 1758	<i>pupu`ole</i>	1	1	
	<i>Heliacus</i>	<i>mighelsi</i>	Philippi, 1853			1	
	<i>Hipponix (Antisabia)</i>	sp.				1	
	<i>Littoraria</i>	<i>pintado</i>	(Wood, 1828)	<i>kukae kolea</i>	1		
	<i>Macteola</i>	<i>segesta</i>	Chenu, 1850	<i>pipipi`akolea ihiloa</i>		1	
	<i>Mastonia</i>	<i>cingulifera</i>	Pease, 1861		1		
	<i>Melampus</i>	<i>castaneus</i>	Muhlfield, 1816	<i>`aoa</i>		1	

## Appendix A (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
	<i>Mitra (Nebularia)</i>	<i>cucumerina</i>	Lamarck, 1811	<i>makaloa</i>		1	
	<i>Mitra (Nebularia)</i>	<i>luctuosa</i>	A. Adams, 1853	<i>pupu`ole</i>	1		
	<i>Mitra (Nebularia)</i>	sp.				1	
	<i>Morula</i>	<i>granulata</i>	Duclos, 1832	<i>maka`awa</i>	1		
	<i>Nerita</i>	<i>picea</i>	Recluz, 1841	<i>pipipi</i>	1	1	
	<i>Nerita</i>	<i>plicata</i>	Linnaeus, 1758	<i>pipipi</i>	1		
	<i>Nerita</i>	<i>polita</i>	Linnaeus, 1758	<i>pipipi</i>		1	
	<i>Nodolittorina</i>	<i>picta</i>	(Philippi, 1846)		1		
	<i>Planaxis</i>	<i>labiosa</i>	A. Adams, 1853		1		
	<i>Purpura</i>	<i>aperta</i>	Blainville, 1832	<i>pupu`awa</i>		1	
	<i>Sabia</i>	<i>conica</i>	Schumacher, 1817			1	
	<i>Siphonaria</i>	<i>normalis</i>	Gould, 1846	<i>`opihi awa</i>	1		
	<i>Smaragdinella</i>	<i>calyculata</i>	Broderip and Sowerby, 1829		1		
	<i>Terebra</i>	sp.		<i>koholua</i>		1	
	<i>Thais</i>	<i>armigera</i>	Link, 1807		1		
	<i>Triphora</i>	<i>coralina</i>	Laseron, 1958			1	
	<i>Unident.</i>	sp.			1		
	<i>Unident.</i>	spp. (4)				1	
	<i>Vermetus</i>	<i>alii</i>	Hadfield and Kay, 1972	<i>pohokupele</i>	1	1	
	<i>Vexilla</i>	<i>fusconigra</i>	Pease, 1860		1		
Gastropoda	Total				23	21	41
Opisthobranchia	<i>Micromelo</i>	<i>guamensis</i>	Quoy and Gaimard, 1825		1		
Opisthobranchia	Total				1		1
Nudibranchia	<i>Fryeria</i>	<i>ruppellii</i>	Bergh, 1889			1	
	<i>Onchidium</i>	<i>verruculatum</i>	Cuvier, 1830		1		
Nudibranchia	Total				1	1	
Bivalvia	<i>Barbatia (Acar)</i>	<i>divaricata</i>	Sowerby, 1833	<i>`olepe papaua</i>		1	
	<i>Brachidontes</i>	<i>crebristriatus</i>	Conrad, 1837	<i>kio nahawele</i>	1		
	<i>Chlamys</i>	<i>coruscans hawaiiensis</i>	Dall, Bartsch, and Rehder, 1938		1		
	<i>Isognomon</i>	<i>?legumen</i>	(Gmelin, 1791)			1	
	<i>Isognomon</i>	<i>incisum</i>	Conrad, 1837		1		
	<i>Isognomon</i>	<i>perna</i>	Linnaeus, 1767		1		
	<i>Isognomon</i>	sp.		<i>nahanawele</i>		1	
	<i>Maetra</i>	<i>thaanumi</i>	Dall, Bartsch, and Rehder, 1938			1	
	<i>Spondylus</i>	sp.				1	
Bivalvia	Total				4	5	10
Ectoprocta	<i>Crisia</i>	<i>circinata</i>	Waters, 1914			1	
	<i>Holoporella</i>	sp.				1	
	<i>Pollaploecium</i>	<i>brevis</i>	Canu and Bassler, 1927		1	1	
	<i>Schizoporella</i>	<i>unicornis</i>	Johnston, 1847			1	
	<i>Unident.</i>	sp.				1	
Ectoprocta	Total				1	5	5
Asteroidea	<i>Mithrodia</i>	<i>fisheri</i>	Holly, 1932	<i>pe`a</i>		1	
Asteroidea	Total					1	1
Echinoidea	<i>Colobocentrotus</i>	<i>atratus</i>	Linnaeus, 1758	<i>ha`ue`ue</i>	1		
	<i>Diadema</i>	<i>setosum</i>	Leske, 1778	<i>pahikaua</i>		1	
	<i>Echinometra</i>	<i>mathaei*</i>	Blainville, 1825	<i>`ina `ele `ele</i>	1	1	
	<i>Echinometra</i>	<i>oblonga</i>	Blainville, 1825	<i>`ina uli</i>	1		
	<i>Echinostrephus</i>	<i>aciculatus*</i>	Agassiz, 1863			1	
	<i>Echinothrix</i>	<i>?calamariis*</i>	Pallas, 1774	<i>wana</i>	1	1	
	<i>Eucidaris</i>	<i>metularia</i>	Agassiz, 1863			1	
	<i>Heterocentrotus</i>	<i>mammilatus*</i>	Linnaeus, 1758	<i>ha`ue`ue</i>		1	
Echinoidea	Total				4	6	8
Holothuroidea	<i>Actinopyga</i>	<i>mauritiana</i>	Quoy and Gaimard, 1833	<i>loli pua</i>	1	1	
	<i>Actinopyga</i>	<i>obesa*</i>	Selenka, 1867			1	
	<i>Holothuria</i>	<i>atra</i>	Jager, 1833	<i>loli koko</i>		1	
	<i>Holothuria</i>	<i>cinerascens</i>	Brandt, 1835	<i>loli pua</i>	1		
Holothuroidea	Total				2	3	4
Ophiuroidea	<i>Ophiactis</i>	sp.		<i>pe`a</i>	1		
	<i>Unident.</i>	spp.			1		
Ophiuroidea	Total				2	0	2

Appendix A (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Intertidal	Subtidal	Total
Urochordata	<i>Didemnum</i>	<i>candidum</i>	Tokioka, 1967		0	1	1
Urochordata	Total				0	1	1
Total Taxa					152	193	298

APPENDIX B  
INTERTIDAL MACROALGAL AND INVERTEBRATES LISTED BY COLLECTION SITE  
JANUARY 12-14, 1998

Appendix B

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station							
					1	2	3	4	5	6	7	
Cyanophyta	<i>Lyngbia</i>	<i>majuscula</i>	Gomont									1
Chlorophyta	<i>Boodlea</i>	<i>composita</i>	Brand		1			1				
	<i>Bornatella</i>	<i>sphaerica</i>	(Zanardi) Solms-Laubach				1					1
	<i>Caulerpa</i>	<i>racemosa</i>	(Forsk.) J.Ag.		1		1	1				
	<i>Caulerpa</i>	<i>serrulata</i>	(Forsk.) J.Ag.				1					
	<i>Caulerpa</i>	<i>taxifolia</i>	(Vahl) C. Ag.		1		1	1				1
	<i>Caulerpa</i>	<i>webbiana</i>	Montagne		1			1				
	<i>Chaetomorpha</i>	sp.					1					
	<i>Cladophora</i>	<i>laetivirens</i>	Kutz					1				1
	<i>Cladophora</i>	<i>sericea</i>	Kutz									1
	<i>Cladophora</i>	<i>socialis</i>	Kutz		1						1	
	<i>Cladophoropsis</i>	<i>membranacea</i>	Gilbert					1				
	<i>Codium</i>	<i>edule</i>	Silva	Wawae'iole				1				
	<i>Dictyosphaeria</i>	<i>cavernosa</i>	Forsk.) Boergesen					1	1			
	<i>Dictyosphaeria</i>	<i>versluysii</i>	Weber-vanBosse									
	<i>Microdictyon</i>	<i>setchellianum</i>	Howe									1
	<i>Microdictyon</i>	<i>japonicum</i>	Stechell									1
	<i>Neomeris</i>	<i>annulata</i>	Dickie		1	1	1	1				1
	<i>Neomeris</i>	<i>vannbosseae</i>	Howe		1							1
	<i>Valonia</i>	<i>trabeculata</i>	Egerod		1			1				1
Phaeophyta	<i>Chnoospora</i>	<i>minima</i>	(Hering) Papenfus				1	1	1	1		1
	<i>Colpomenia</i>	<i>sinuosa</i>	(Roth) Derb. And Sol.	<i>Puha</i>								1
	<i>Dictyota</i>	<i>acutiloba</i>	J. Ag.	<i>Alani</i>	1			1				
	<i>Dictyota</i>	<i>divaricata</i>	Lamouroux	<i>Alani</i>	1							
	<i>Dictyota</i>	<i>friabilis</i>	Setchell		1		1	1				1
	<i>Hinckesia</i>	<i>breviarticulata</i>	(J.Ag.) Silva	<i>Hulu'ililo</i>	1	1	1	1	1	1		1
	<i>Padina</i>	sp.			1	1	1	1				1
	<i>Sargassum</i>	<i>echinocarpum</i>	J.Ag.	<i>Kala</i>	1	1						
	<i>Sargassum</i>	<i>obtusifolium</i>	J.Ag.	<i>Kala</i>	1		1	1				1
	<i>Sargassum</i>	<i>polyphyllum</i>	J.Ag.	<i>Kala</i>	1	1		1				
	<i>Sphacelaria</i>	<i>novaeollandiae</i>										1
	<i>Sphacelaria</i>	<i>rigidula</i>	Kutz		1		1	1				
	<i>Sphacelaria</i>	<i>tribuloides</i>			1					1		1
	<i>Turbinaria</i>	<i>ornata</i>	J.Ag.		1	1	1	1				1
Rhodophyta	<i>Asparagopsis</i>	<i>taxiformis</i>	(Del.) Coll. and Harv.	<i>Kohu</i>	1			1				1
	<i>Botryocladia</i>	<i>skottsbergii</i>	(Borg) Levr.		1							1
	<i>Centroceras</i>	sp.					1	1				
	<i>Ceramium</i>	<i>aduncum</i>	Nakamura					1				
	<i>Ceramium</i>	<i>clarionensis</i>	Setch. and Gard.					1				
	<i>Ceramium</i>	<i>codii</i>										1
	<i>Ceramium</i>	<i>dumosertum</i>			1		1	1			1	
	<i>Ceramium</i>	<i>hanaese</i>						1				
	<i>Champia</i>	<i>parvula</i>	(C. Ag.) Harv.		1		1				1	
	<i>Dasya</i>	<i>iridescens</i>			1			1				1
	<i>Falkenbergia</i>	(alternate form of <i>Asparagopsis</i> )			1							
	<i>Galaxaura</i>	<i>fasciculata</i>			1		1					1
	<i>Galaxaura</i>	<i>marginata</i>			1	1	1	1				1
	<i>Galaxaura</i>	<i>rugosa</i>	(Solander) Lamour.		1	1	1					1
	<i>Gelidiella</i>	<i>machrisiana</i>	Dawson					1				
	<i>Gelidiopsis</i>	<i>intrcata</i>	(C. Ag.) Vickers									1
	<i>Gelidiopsis</i>	sp.										1
	<i>Gelidium</i>	sp.										
	<i>Grateloupia</i>	<i>phuquoensis</i>	Tanaka and Pham									1
	<i>Hydrolython</i>	<i>breviclavium</i>	(Foslie) Foslie					1				
	<i>Hypnea</i>	<i>pannosa</i>	J. Ag.						1		1	1
	<i>Jania</i>	<i>mcarthroidia</i>	Lamour.		1	1	1	1	1	1		1
	<i>Laurencia</i>	<i>crustiformans</i>	Abbott					1	1			1
	<i>Laurencia</i>	<i>mcdermidiae</i>	Abbott					1	1			
	<i>Laurencia</i>	<i>yamadana</i>	Howe		1							
	<i>Laurencia</i>	sp.?			1							
	<i>Melanamansia</i>	<i>demellyii</i>			1	1	1	1				1
	<i>Melanamansia</i>	<i>glomerulata</i>	C. Ag.		1							
	<i>Trichleocarpa</i>	<i>fragilis</i>			1	1	1					1

Appendix B (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station							
					1	2	3	4	5	6	7	
Rhodophyta	<i>Polysiphonia</i>	<i>scropulorum</i>	Hollenberg		1			1				
	<i>Polysiphonia</i>	sp.			1							
	<i>Spyridia</i>	<i>filamentosa</i>	(Wulf.) Harvey		1							1
Total Algae					37	12	29	31	4	4		35
Porifera	<i>Tethya</i>	<i>diploderma</i>	Schram, 1992		1							1
Anthozoa	<i>Aiptasia</i>	<i>pulchella</i>	Carlgren, 1943		1							
	<i>Pocillopora</i>	<i>meandrina</i>	Dana, 1846	<i>`ako`ako`a</i>				1				1
	<i>Porites</i>	<i>lobata</i>	Dana, 1846	<i>`ako`ako`a</i>	1							
Total Cnidaria					2			1				1
Polychaeta	<i>Eunice</i>	<i>cariboea</i>	Kinberg, 1865					1				
	<i>Eurythoe</i>	<i>complanata</i>	Pallas, 1766	<i>`aha huluhulu</i>				1				
	<i>Iphione</i>	<i>muricata</i>	Savigny, 1818					1				
	<i>Perinereis</i>	<i>nigropunctata</i>	Horst, 1889					1				
	<i>Sabellastarte</i>	<i>sanctijosephi</i>	Gravie, 1906		1							
	<i>Thelepus</i>	<i>setosus</i>	Quatrefages, 1865		1							
	<i>Trypanosyllis</i>	<i>zebra</i>	Grube, 1860									1
Total Polychaeta					2		2	2				1
Amphipoda	<i>Amphilocus</i>	<i>kailua</i>	Barnard, 1970					1				
	<i>Ampithoe</i>	<i>ramondi</i>	Audouin, 1826					1	1			
	<i>Ampithoe</i>	<i>waialua</i>	Barnard, 1970					1				
	<i>Ampithoe</i>	<i>poipu</i>	Barnard, 1970		1		1	1				
	( <i>Pleonexes</i> )											
	<i>Anamixis</i>	<i>stebbingi</i>	Walker, 1904									1
	<i>Chevalia</i>	<i>aviculae</i>	Walker, 1904					1				
	<i>Cymadusa</i>	<i>hawaiiensis</i>	(Schellenberg, 1938)		1			1				
	<i>Elasmopus</i>	<i>molokai</i>	Barnard, 1970		1							
	<i>Elasmopus</i>	<i>piikoi</i>	Barnard, 1970				1					1
	<i>Elasmopus</i>	<i>spinidactylus</i>	Chevreaux, 1908		1			1				
	<i>Gammaropsis</i>	<i>alamoana</i>	Barnard, 1970				1	1				
	<i>Gammaropsis</i>	<i>atlantica</i>	Stebbing, 1888					1				1
	<i>Gammaropsis</i>	<i>pokipoki</i>	Barnard, 1970				1					
	<i>Hyale</i>	<i>ayeli</i>	Barnard, 1970		1							
	<i>Hyale</i>	<i>honoluluensis</i>	Schellenberg, 1938					1				
	<i>Hyale</i>	<i>laie</i>	Barnard, 1970		1							1
	<i>Lembos</i>	<i>macromanus</i>	Shoemaker, 1925		1		1	1				1
	<i>Leucothoides</i>	<i>pottsi</i>	Shoemaker, 1933									1
	<i>Maera</i>	<i>insignis</i>	(Chevreaux, 1901)		1		1					
	<i>Maera</i>	<i>pacifica</i>	Schellenberg, 1938									1
	<i>Maera</i>	<i>quadrimana</i>	(Dana, 1853)		1							
	<i>Paragrubia</i>	<i>vorax</i>	Chevreaux, 1901		1			1				1
	<i>Podocerus</i>	<i>talegus lawai</i>	Barnard, 1970					1				
	<i>Seba</i>	<i>ekepuu</i>	Barnard, 1970									1
	<i>Ventojassa</i>	<i>ventosa</i>	Barnard, 1962									1
Total Amphipoda					10	0	7	13	0	0		10
Isopoda	<i>Carpias (Bagatus)</i>	<i>algicola</i>	(Miller, 1941)		1		1	1				1
	? <i>Dynamenella</i>	sp.			1							
Total Isopoda					2		1	1				1
Total Tanaidacea					4	0	2	3	0	0		3
Tanaidacea	<i>Anatanais</i>	<i>insularis</i>	Miller, 1941		1							1
	<i>Leptocheilia</i>	<i>dubia</i>	Kroyer, 1852		1		1	1				1
	<i>Synapseudes</i>	<i>minutus</i>	Miller, 1941				1	1				
	<i>Tanais</i>	<i>vanis</i>	Miller, 1941					1				
Decapoda	<i>Calcinus</i>	<i>elegans</i>	Lenz, 1901									1
	<i>Calcinus</i>	<i>laevimanus</i>	Randall, 1839									1
	<i>Leptodius</i>	<i>sanguineus</i>	Streets, 1877				1					
	<i>Nesochathamalus</i>	<i>intertextus</i>	(Darwin, 1852)		1		1	1				1
	<i>Percnon</i>	<i>planissimum</i>	Rathbun, 1906		1		1					
	<i>Pseudozius</i>	<i>caystrus</i>	Adams and White, 1849					1				
	<i>Stenopus</i>	<i>hispidus</i>	Rathbun, 1906					1				
	Unident.	juv.										1
Total Decapoda					2	0	5	1	0	0		3
Gastropoda	<i>Anachis</i>	<i>miser</i>	Sowerby, 1844		1							



Appendix B (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station							
					1	2	3	4	5	6	7	
Gastropoda	<i>Bittium</i>	<i>parcum</i>	Gould, 1861				1					
	<i>Bittium</i>	<i>zebrum</i>	Kiener, 1841				1					
	<i>Cellana</i>	<i>exarata</i>	Reeve, 1854		<i>`opihi</i>	1			1			1
	<i>Cellana</i>	<i>melanostoma</i>	Pilsbry, 1891					1				
	<i>Cerithium</i>	<i>egenum</i>	Gould, 1849					1				
	<i>Conus</i>	sp.			<i>pupu poniuniu</i>							1
	<i>Drupa (Drupa)</i>	<i>morum</i>	Roding, 1798		<i>makaloa</i>				1			
	<i>Drupa (Drupa)</i>	<i>ricina</i>	Linnaeus, 1758		<i>pupu`ole</i>	1		1	1			1
	<i>Littoraria</i>	<i>pintado</i>	(Wood, 1828)		<i>kukae kolea</i>	1		1	1			1
	<i>Mastonia</i>	<i>cingulifera</i>	Pease, 1861									1
	<i>Mitra (Nebularia)</i>	<i>luctuosa</i>	A. Adams, 1853		<i>`aha`aha</i>	1						
	<i>Morula</i>	<i>granulata</i>	Duclos, 1832		<i>maka`awa</i>	1		1	1			1
	<i>Nerita</i>	<i>picea</i>	Recluz, 1841		<i>pipipi</i>	1		1	1			1
	<i>Nerita</i>	<i>plicata</i>	Linnaeus, 1758		<i>pipipi</i>			1				
	<i>Nodolittorina</i>	<i>picta</i>	(Philippi, 1846)			1			1			1
	<i>Planaxis</i>	<i>labiosa</i>	A. Adams, 1853		<i>pipipi`akolea ihiloa</i>	1			1			
	<i>Siphonaria</i>	<i>normalis</i>	Gould, 1846		<i>`opihi awa</i>				1			1
	<i>Smaragdinella</i>	<i>calyculata</i>	Broderip and Sowerby, 1829			1						
	<i>Thais</i>	<i>armigera</i>	Link, 1807			1						
	<i>Unident.</i>	sp.						1				
	<i>Vermetus</i>	<i>alii</i>	Hadfield and Kay, 1972		<i>pohokupele</i>	1			1			1
		<i>Vexilla</i>	<i>fusconigra</i>	Pease, 1860		1						
	Opisthobranchia	<i>Micromelo</i>	<i>guamensis</i>	Quoy and Gaimard, 1825				1				
Nudibranchia	<i>Onchidium</i>	<i>verruculatum</i>	Cuvier, 1830				1					
	<i>Brachidontes</i>	<i>crebristriatus</i>	Conrad, 1837	<i>kio nahawele</i>	1							
Bivalvia	<i>Chlamys</i>	<i>coruscans hawaiiensis</i>	Dall, Bartsch, and Rehder, 1938		1							
	<i>Isognomon</i>	<i>incisum</i>	Conrad, 1837				1	1			1	
	<i>Isognomon</i>	<i>perna</i>	Linnaeus, 1767		1		1					
	<i>Ostrea</i>	<i>sandvichensis</i>	Sowerby, 1871	<i>pahikaua</i>							1	
Total Mollusca					16	0	14	11	0	0	12	
Ectoprocta	<i>Pollaploecium</i>	<i>brevis</i>	Canu and Bassler, 1927		1							
Echinoidea	<i>Colobocentrotus</i>	<i>atratus</i>	Linnaeus, 1758	<i>ha`ue`ue</i>				1				
	<i>Echinometra</i>	<i>mathaei</i>	Blainville, 1825	<i>`ina`ele`ele</i>							1	
	<i>Echinometra</i>	<i>oblonga</i>	Blainville, 1825	<i>`ina uli</i>				1				
	<i>Echinothrix</i>	<i>?calamaris</i>	Pallas, 1774	<i>wana</i>							1	
Holothuroidea	<i>Actinopyga</i>	<i>mauritiana</i>	Quoy and Gaimard, 1833	<i>loli pua</i>	1			1				
	<i>Holothuria</i>	<i>cinerascens</i>	Brandt, 1835	<i>loli pua</i>				1				
Total Echinodermata					1	0	1	3	0	0	2	
Total Taxa					76	12	61	66	4	4	69	

APPENDIX C  
SUBTIDAL MACROALGAL AND INVERTEBRATES LISTED BY COLLECTION SITE  
JANUARY 12-14, 1998

## Appendix C

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station															
					1	2	3	4	5	6	7									
Cyanophyta	<i>Phormidium</i>	<i>crobyanum</i>																		1
	Unident.	sp.							1											
Chlorophyta	<i>Caulerpa</i>	<i>taxifolia</i>	(Vahl) C. Ag.			1		1	1											1
	<i>Halimeda</i>	<i>opuntia</i>	(Linnaeus) Lamouroux																	1
	<i>Halimeda</i>	sp.				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Siphonocladus</i>	<i>tropicus</i>	(Crouan) J. Ag.						1											
	<i>Ventricaria</i>	<i>ventricosa</i>				1		1	1											
Phaeophyta	<i>Dictyopteris</i>	<i>plagiogramma</i>	(Montagne) Vickers	<i>Lipoa</i>		1														1
	<i>Dictyota</i>	<i>friabilis</i>	Setchell	<i>Alani</i>		1		1	1											1
	<i>Lobophora</i>	<i>variegata</i>	(Lam.) Womersley			1			1											1
	<i>Padina</i>	<i>japonica</i>	Boergesen																	1
	<i>Padina</i>	sp.				1	1	1	1	1										1
Rhodophyta	<i>Acanthophora</i>	<i>pacifica</i>	(Setch.) Kraft					1						1						1
	<i>Actinotricia</i>	<i>fragilis</i>	(Forrsk.) Borg.							1										1
	<i>Ceramium</i>	<i>dumosertum</i>				1		1	1	1										1
	<i>Galaxaura</i>	<i>marginata</i>				1	1	1	1	1										1
	<i>Gibsmithia</i>	<i>hawaiiensis</i>	Doty											1						
	<i>Halioptilon</i>	<i>subulatum</i>												1						
	<i>Haloplegma</i>	<i>duperreyi</i>	Montagne											1						1
	<i>Hypnea</i>	<i>pannosa</i>	J. Ag.											1						1
	<i>Jania</i>	<i>mcarthroidia</i>	Lamour.			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Melanamansia</i>	<i>demellyi</i>				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Portieria</i>	<i>hornemanni</i>				1	1		1	1	1	1	1	1	1	1	1	1	1	1
	<i>Spyridia</i>	<i>filamentosa</i>	(Wulf.) Harvey											1						
	<i>Taenioma</i>	<i>purpusillum</i>	(J. Ag.) J. Ag.											1						
Total Algae						12	7	9	20	4	13	16								
Porifera	<i>Batzella</i>	sp.																		1
	<i>Cacospongia</i>	sp.																		1
	<i>Clathria (Microciona)</i>	sp.						1						1						1
	<i>Dactylospongia</i>	n. sp.												1						1
	<i>Erylus</i>	<i>proximus</i>	de Laubenfels, 1952											1						
	<i>Hippospongia</i>	<i>metachromia</i>	Bergquist, 1967											1						1
	<i>Hippospongia</i>	sp.												1						
	<i>Leiodermatium</i>	sp.												1						
	<i>Leiosella</i>	sp.																		1
	<i>Lucetta</i>	sp.												1	1	1	1	1	1	1
	<i>Plakortis</i>	sp.												1	1	1	1	1	1	1
	<i>Spheciospongia</i>	<i>vagabunda</i>	(Ridley, 1884)											1	1	1	1	1	1	1
	<i>Spongia</i>	<i>oceania</i>	Bergquist, 1979											1	1	1	1	1	1	1
	<i>Tethya</i>	<i>diploderma</i>	Schram, 1992																	1
Total Porifera														7	2	5	7	9	3	
	<i>Lytocarpus</i>	<i>?philippinus</i>				1			1	1										1
Hydozoa	<i>Sertularia</i>	sp.												1						1
	<i>Solanderia</i>	<i>misakinensis</i>	(Inaba, 1892)																	1
Anthozoa	<i>Acabaria</i>	<i>bicolor</i>	(Nutting, 1908)																	1
	<i>Coscinaraea</i>	<i>wellsi</i>	Veron & Picon, 1979											1						1
	<i>Leptoseris</i>	<i>incrustans</i>	(Quelch, 1886)			1			1	1	1	1	1	1	1	1	1	1	1	1
	<i>Leptoseris</i>	sp.				1														
	<i>Montipora</i>	<i>flabellata</i>	Studer, 1901			1														
	<i>Montipora</i>	<i>patula</i>	Verrill, 1864			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Montipora</i>	<i>verrucosa</i>	(Lamarck, 1816)			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Palythoa</i>	<i>tuberculosa</i>	(Esper, 1791)			1								1						
	<i>Pavona</i>	<i>duerdeni</i>	Vaughan, 1907			1								1	1					
	<i>Pavona</i>	<i>varians</i>	Verrill, 1864			1			1					1	1	1	1	1	1	1
	<i>Pocillopora</i>	<i>damicornis</i>	Linnaeus, 1758																	
	<i>Pocillopora</i>	<i>eydouxii</i>	Milne-Edwards & Haime, 1860																	1
	<i>Pocillopora</i>	<i>meandrina</i>	Dana, 1846			1	1	1	1	1										1
	<i>Porites</i>	<i>compressa</i>	Dana, 1847			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Porites</i>	<i>lobata</i>	Dana, 1846			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	<i>Porites (Synaraea)</i>	<i>rus</i>	Forsskal, 1775																	1
	<i>Zoanthus</i>	sp.																		

Appendix C (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station								
					1	2	3	4	5	6	7		
	<i>Antipathes</i>	sp.										1	
	<i>Balanophyllia</i>	sp.											1
	<i>Cirripathes</i>	sp.								1		1	
	<i>Cyphastrea</i>	<i>ocellina</i>	Dana, 1846	<i>`ako`ako`a</i>	1		1						1
	<i>Fungia</i>	<i>scutaria</i>	Lamarck, 1801	<i>`ako`ako`akohe</i>						1			
	<i>Leptastrea</i>	<i>purpurea</i>	Dana, 1846			1							
	<i>Leptastrea</i>	<i>bottae</i>	(Milne-Edwards & Haime, 1850)	<i>`ako`ako`a</i>						1			
Anthozoa	<i>Psammocora</i>	<i>verrilli</i>	Vaughan, 1907				1						
	<i>Psammocora</i>	<i>nierstrazi</i>	Van der Horst, 1922										1
	<i>Psammocora</i>	sp.								1			
	<i>Tubastrea</i>	<i>coccinea</i>	Lesson, 1831		1								1
Total Cnidara					15	7	11	6	15	14	12		
Polychaeta	<i>Dorvillea</i>	sp.			1								1
	<i>Eunice</i>	<i>cariboea</i>	Kinberg, 1865						1				
	<i>Glycera</i>	<i>tessalata</i>	Treadwell, 1906						1				
	<i>Haplosyllis</i>	<i>spongicola</i>	Hartman-Schroder, 1965			1		1					
	<i>Phyllodoce</i>	sp.								1			
	<i>Phyllodoce (Anaitides)</i>	<i>madeirensis</i>	Langerhans, 1880		1								
	<i>Polyophthalmus</i>	<i>pictus</i>	Holly, 1935					1					
	<i>Sabellastarte</i>	<i>sanctijosephi</i>	Gravier, 1906										
	<i>Spirobranchus</i>	sp.	Morch, 1863							1			
	<i>Thormora</i>	<i>atrata</i>	Treadwell, 1940		1								
	<i>Trypanosyllis</i>	<i>zebra</i>	Grube, 1860		1			1	1				
	<i>Typosyllis</i>	sp.				1				1			
	Unident	sp.						1					
Total Polychaeta					4	2	0	5	5	0	1		
Amphipoda	<i>Amphilocus</i>	<i>likelike</i>	Barnard, 1969										1
	<i>Amphilocus</i>	<i>menehune</i>	Barnard, 1970		1		1	1	1				
	<i>Ampithoe</i>	<i>akuolaka</i>	Barnard, 1970			1							
	<i>Ampithoe</i>	<i>ramondi</i>	Audouin, 1826					1					1
	<i>Ampithoe</i>	<i>waialua</i>	Barnard, 1970					1					
	Caprellid					1				1		1	
	<i>Chevalia</i>	<i>aviculae</i>	Walker, 1904		1	1	1	1					
	<i>Colomastix</i>	<i>kapiolani</i>	Barnard, 1970		1		1						1
	<i>Colomastix</i>	<i>pusilla</i>	Grube, 1864		1								
	<i>Elasmopus</i>	<i>ecuadorensis</i>	Schellenberg, 1938		1					1			
		<i>hawaiiensis</i>											
	<i>Elasmopus</i>	<i>hooheno</i>	Barnard, 1970										1
	<i>Eursiroides</i>	<i>diplonyx</i>	Walker, 1904		1								
	<i>Gammaropsis</i>	<i>alamoana</i>	Barnard, 1970			1	1		1	1			
	<i>Gammaropsis</i>	<i>atlantica</i>	Stebbing, 1888						1	1			
	<i>Gammaropsis</i>	<i>haleiwa</i>	Barnard, 1970		1								
	<i>Gammaropsis</i>	<i>kaumaka</i>	Barnard, 1970		1	1		1					
	<i>Gammaropsis</i>	<i>pali</i>	Barnard, 1970										1
	<i>Hyale</i>	<i>laie</i>	Barnard, 1970					1	1				1
	<i>Ischyrocerus</i>	<i>kapu</i>	Barnard, 1970					1	1				
	<i>Lembos</i>	<i>macromanus</i>	Shoemaker, 1925		1		1						1
	<i>Lembos</i>	<i>waipio</i>	Barnard, 1970		1		1						
	<i>Leucothoe</i>	<i>hyhelia</i>	Barnard, 1965		1				1	1			1
	<i>Leucothoe</i>	<i>lihue</i>	Barnard, 1970							1	1		
	<i>Leucothoides</i>	<i>pottsi</i>	Shoemaker, 1933					1	1				
	<i>Maera</i>	<i>pacifica</i>	(Schellenberg, 1938)						1				
	<i>Maera</i>	<i>quadrimana</i>	(Dana, 1853)				1						1
	<i>Paragrubia</i>	<i>vorax</i>	Chevreaux, 1901				1	1					
	<i>Photis</i>	<i>aina</i>	Barnard, 1970		1								
	<i>Photis</i>	<i>kapapa</i>	Barnard, 1970		1	1	1	1	1				1
	<i>Podoceros</i>	<i>braziliensis</i>	Dana, 1853							1			
	<i>Podoceros</i>	<i>talegus lawai</i>	Barnard, 1970					1					
	<i>Seba</i>	<i>ekepuu</i>	Barnard, 1970						1				1
	<i>Stenothoe</i>	<i>valida</i>	Dana, 1853		1					1			1
	<i>Ventojassa</i>	<i>ventosa</i>	Barnard, 1962							1			
Total Amphipoda					14	7	14	13	9	12	3		

Appendix C (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station								
					1	2	3	4	5	6	7		
	<i>?Dynamenella</i>	<i>sp</i>			1				1				
	<i>Cirolana</i>	<i>sp</i>					1						
	<i>Mesanthura</i>	<i>hieroglyphica</i>	Miller, 1941		1			1					
	<i>Munna</i>	<i>acarina</i>	Miller, 1941					1		1			
	<i>Paranthura</i>	<i>ostergaardi</i>	Miller, 1941					1		1			
Isopoda	<i>Stenetrium</i>	<i>medipacificum</i>	Miller, 1941					1					1
Total Isopoda					2	1	6	1	3	0			1
Tanaidacea	<i>Anatanais</i>	<i>insularis</i>	Miller, 1941					1				1	
	<i>Apseudes</i>	<i>tropicalis</i>	Miller, 1941		1		1		1	1	1		
	<i>Leptocheilia</i>	<i>dubia</i>	Kroyer, 1852		1	1	1	1	1	1	1		1
	<i>Synapseudes</i>	<i>minutus</i>	Miller 1941				1	1					
	<i>Tanais</i>	<i>vanis</i>	Miller, 1941										
	Unident.	<i>sp</i>			1		1						
Total Tanaidacea					3	3	4	1	2	3			2
Cumacea	Unident.	<i>sp.</i>						1					
Decapoda	<i>Alpheus</i>	<i>paralcyone</i>	Edmondson, 1925					1	1	1			
	<i>Balanus</i>	<i>sp.</i>	(Conrad, 1837)	<i>una`oa</i>									
	<i>Calcinus</i>	<i>elegans</i>	Lenz, 1901	<i>unauna</i>			1						
	<i>Calcinus</i>	<i>laevimanus</i>	Randall, 1839	<i>unauna</i>					1				
	<i>Chlorodiella</i>	<i>laevissima</i>	Dana, 1852		1								
	<i>Euraphia</i>	<i>hemblii</i>					1						
	<i>Galathea</i>	<i>spinorosrostris</i>	Edmondson, 1925									1	
	<i>Metabalun</i>	<i>tanagrae</i>	(Pilsbry, 1928)				1						
	<i>Metalpheus</i>	<i>paracrinitus</i>	(Edmondson, 1925)									1	
	<i>Pilumnus</i>	<i>sp.</i>			1								
	<i>Pylopaguropsis</i>	<i>keijii</i>	McLaughlin & Haig, 1989				1						
	<i>Schizophrys</i>	<i>hilensis</i>	Rathbun, 1906	<i>papa`i limu</i>						1			
	<i>Stenopus</i>	<i>hispidus</i>	(Olivier, 1811)	<i>`opae huna</i>									
	Unident.	<i>juv.</i>						1					1
	<i>Xanthias</i>	<i>canaliculatus</i>	Dai and Yang, 1991			1							
Total Decapoda					2	5	2	3	2	2			1
Insecta	<i>?Chironimus</i>	<i>sp.</i>			1					1			
	<i>Telmatogeton</i>	<i>?japonicus</i>			1								
Gastropoda	<i>Bittium</i>	<i>zebrum</i>	Kiener, 1841									1	
	<i>Caecum</i>	<i>sp.</i>							1				
	<i>Cerithium</i>	<i>columna</i>	Sowerby, 1834						1				
	<i>Coralliophila</i>	<i>nodosa</i>	A. Adams, 1854		1								
	<i>Cypraea</i>	<i>tigis</i>	Linnaeus, 1758	<i>leho kiko</i>									1
	<i>Drupa (Drupa)</i>	<i>morum</i>	Röding, 1798	<i>makaloa</i>	1	1							1
	<i>Drupa (Drupa)</i>	<i>ricina</i>	Linnaeus, 1758	<i>pupu`ole</i>			1						
	<i>Heliacus</i>	<i>mighelsi</i>	Philippi, 1853						1				
	<i>Hipponix (Antisabia)</i>	<i>sp.</i>											1
	<i>Macteola</i>	<i>segesta</i>	Chenu, 1850						1				
	<i>Melampus</i>	<i>castaneus</i>	Muhlfeld, 1816	<i>`aoa</i>						1			
	<i>Mitra (Nebularia)</i>	<i>cucumerina</i>	Lamarck, 1811						1				
	<i>Mitra (Nebularia)</i>	<i>sp.</i>							1				
	<i>Nerita</i>	<i>picea</i>	Recluz, 1841	<i>pipipi</i>								1	
	<i>Nerita</i>	<i>polita</i>	Linnaeus, 1758	<i>pipipi</i>								1	
	<i>Purpura</i>	<i>aperta</i>	Blainville, 1832	<i>pupu`awa</i>						1			
	<i>Sabia</i>	<i>conica</i>	Schumacher, 1817							1			
	<i>Terebra</i>	<i>sp.</i>		<i>koholua</i>						1			
	<i>Triphora</i>	<i>coralina</i>	Laserson, 1958									1	
	Unident.	<i>spp. (4)</i>											
	<i>Vermetus</i>	<i>alii</i>	Hadfield and Kay, 1972	<i>pohokupele</i>							1		1
Nudibranchia	<i>Fryeria</i>	<i>ruppellii</i>	Bergh, 1889									1	
Bivalvia	<i>Barbatia (Acar)</i>	<i>divaricata</i>	Sowerby, 1833	<i>`olepe papaua</i>	1	1							
	<i>Brachidontes</i>	<i>crebristriatus</i>	Conrad, 1837	<i>kio nahawele</i>	1					1			
	<i>Isognomon</i>	<i>?legumen</i>	(Gmelin, 1791)							1			
	<i>Isognomon</i>	<i>sp.</i>		<i>nahanawele</i>								1	

Appendix C (Cont.)

Taxa	Genus	Species	Author, Date	Hawaiian Name	Station							
					1	2	3	4	5	5	7	
	<i>Mactra</i>	<i>thaanumi</i>	Dall, Bartsch, and Rehder, 1938					1				
	<i>Spondylus</i>	sp.										1
Total Mollusca					4	3	0	11	9	5	0	
Ectoprocta	<i>Crisia</i>	<i>circinata</i>	Waters, 1914			1						
	<i>Holoporella</i>	sp.			1							
	<i>Pollaploecium</i>	<i>brevis</i>	Canu and Bassler, 1927		1	1	1			1		
	<i>Schizoporella</i>	<i>unicornis</i>	Johnston, 1847					1				
	Unident.	sp.							1			
Total Ectoprocta					2	2	1	1	1	1	0	
Asteroidea	<i>Mithrodia</i>	<i>fisheri</i>	Holly, 1932	<i>pe`a</i>				1				
Echinoidea	<i>Diadema</i>	<i>setosum</i>	Leske, 1778	<i>pahikaua</i>								
	<i>Echinometra</i>	<i>mathaei</i>	Blainville, 1825	<i>`ina `ele`ele</i>				1	1			
	<i>Echinostrephus</i>	<i>aciculatus</i>	Agassiz, 1863						1		1	
	<i>Echinothrix</i>	<i>?calamaris</i>	Pallas, 1774	<i>wana</i>					1			
	<i>Eucidaris</i>	<i>metularia</i>	Agassiz, 1863	<i>ha`ue`ue</i>	1			1				
	<i>Heterocentrotus</i>	<i>mammilatus</i>	Linnaeus, 1758	<i>ha`ue`ue</i>				1		1	1	
Holothuroidea	<i>Actinopyga</i>	<i>mauritiana</i>	Quoy and Gaimard, 1833	<i>loli pua</i>								
	<i>Actinopyga</i>	<i>obesa</i>	Selenka, 1867									
	<i>Holothuria</i>	<i>atra</i>	Jager, 1833	<i>loli koko</i>								
Ophiuroidea	<i>Ophiactis</i>	sp.		<i>pe`a</i>			1					
	Unident.	spp.						1	1		1	
Total Echinodermata					1	1	0	5	4	1	3	
Urochordata	<i>Didemnum</i>	<i>candidum</i>	Tokioka, 1967					1				
Total Taxa					61	45	50	72	62	61	42	