

ASSESSEMENT OF NONINDIGENOUS SPECIES ON CORAL REEFS IN THE HAWAIIAN ISLANDS, WITH EMPHASIS ON INTRODUCED INVERTEBRATES

COVER

Introduced and cryptogenic marine invertebrates that occur on Hawaiian coral reefs. Top row, left to right: Orange Keyhole Sponge *Mycale armata* Thiel, Grey Encrusting Sponge *Gelliodes fibrosa* (Wilson), Christmas Tree Hydroid *Pennaria disticha* (Goldfuss); Second row: Snowflake Coral *Carijoa riisei* (Duchassaing & Michelotti), Upside-down Jellyfish *Cassiopea andromeda* Light, Branching Bryozoan *Schizoporella* cf. *errata* (Waters); Third row: Featherduster Worm *Sabellastarte spectabilis* (Grube), Slender Tubeworm *Salmacina dysteri* (Huxley), Philippine Mantis Shrimp *Gonodactylaceus falcatus* (Forsskål).

ASSESSEMENT OF NONINDIGENOUS SPECIES ON CORAL REEFS IN THE HAWAIIAN ISLANDS, WITH EMPHASIS ON INTRODUCED INVERTEBRATES

Final report prepared for the Hawai'i Coral Reef Initiative

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EXECUTIVE SUMMARY

Coral reefs on the islands of Kaua'i, Moloka'i, Maui, Hawai'i and O'ahu were surveyed for the presence and impact of marine nonindigenous and cryptogenic species (NIS) using a rapid assessment method that standardized search effort for approximately 312 m² at each site. A total of 41 sites were surveyed by three investigators for a total of approximately 120 hours search time on the five islands. Algae, invertebrate, and fish taxa were identified on site or returned to laboratory for identity confirmation. Only 26 NIS, comprised of three species of algae, 19 invertebrates, and four fishes were recorded from a total of 486 total taxa on the entire study, and 17 of the NIS occurred at only one or two sites. The most NIS that occurred at any site was six, and 21 of the sites had less than three. If the three species of fish that were introduced in the 1950s and known to occur throughout Hawai'i are excluded, over half the sites had less than two NIS.

The numbers of NIS occurring at each site were compared with values measured or assigned to a number of factors that may influence the spreading and proliferation of introduced marine species. These factors included distances from harbors, boat launching ramps, stream mouths and shorelines, and subjective ranking values on a scale of 1 to 5 for shoreline urbanization, artificial surfaces in the water, reef condition, and the degree to which sites were isolated from the open ocean (non-exposure). The number of total native taxa at each site determined from the reef assessments was also included as a predictor variable, on the basis that high species richness could act to limit the establishment of introduced species. A best subsets regression model explained over 65% of the variance in NIS from two predictor variables: non-exposure, number of native taxa and their interaction. Most of the variance was explained by a highly significant relationship of NIS with non-exposure to open ocean conditions, i.e. NIS increased going from open coastlines to embayments and semi-protected harbors. A highly significant interaction between ocean non-exposure and native species richness suggested that higher species diversity may act to restrict NIS occurrence in embayments and semi-enclosed environments where they are most likely to establish themselves.

Due to the relatively low frequency of occurrence and few invertebrate NIS found on these surveys, no eradication or control management efforts are recommended at this time. However, two introduced species encountered in the surveys, the Orange Keyhole Sponge, *Mycale armata* Thiele, and the Snowflake Octocoral, *Carijoa riisei* (Duchassaing & Michelotti), appear to be increasing in both abundance and distribution on some coral reef areas. These species should be considered invasive, monitored and research conducted to obtain basic biological and ecological information that may be utilized in their control. Other management efforts should focus on preventing the initial introduction of nonindigenous marine species into Hawaiian waters and their transport among the islands, and in preserving the integrity of coral reef species richness, especially in semi-enclosed embayments and other areas most likely to be the first locations to be colonized by introduced species.

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I. INTRODUCTION

Introductions of nonindigenous or exotic species invasions, largely resulting from shipping activities, into harbors, ports, and other coastal ecosystems have been apparently been escalating around the world for the last 30 years, sometimes with serious negative consequences (See Carlton 1985, Carlton and Geller 1993, Ruiz et al. 1997, and Bax et al. 2001 for reviews). Introduced species can rapidly monopolize energy resources, act as voracious predators, overcome endemic species, or transmit parasites and diseases that can be passed to humans through the food chain or direct exposure. Because of these potential negative effects, marine species invasions have been ranked among the most serious potential perturbations of marine ecosystems (Carlton 1994).

Most surveys of nonindigenous species and studies of their impacts have been conducted in temperate marine and estuarine systems. However, because of research that has been underway at Bishop Museum for over six years and studies that have been conducted on invasive algae by researchers in the University of Hawaii Botany Department, more is known about introduced marine organisms in Hawai'i than any other tropical area. Previous studies on marine invertebrates and general nonindigenous species in Hawai'i have focused primarily on harbors and embayments (Coles et al. 1997, Coles et al. 1998, Coles et al. 1999a, Coles et al. 1999b) partly because of funding availability and partly due to the likelihood of introductions occurring initially in harbors by organisms from ballast water or hull fouling. However, a few nonindigenous species surveys have been conducted in coral reef areas in the Hawaiian Islands (Coles et al. 1998, DeFelice, et al. 1998b, 2002) and Johnston Atoll (Coles et al. 2001) which can be compared to the results obtained for harbors and embayments.

Table 1 summarizes the results that have been previously obtained from nonindigenous species surveys in the Hawaiian Islands and Johnston Atoll. Studies in Pearl Harbor and the five commercial harbors of south and west Oʻahu have shown the harbor biota to include approximately 100 nonindigenous or cryptogenic (neither demonstrably nonindigenous nor native) taxa, comprising 17 to 23% of the total numbers of taxa identified in each study. A similar number of 116 nonindigenous or cryptogenic species have been determined for Kaneʻohe Bay, equaling an introduced component of around 14% of the total number of taxa. By contrast, the three surveys on ocean-exposed reefs around the island of Kahoʻolawe, Midway, and Johnston Atolls by the same investigators found only 3 to 10 nonindigenous or cryptogenic species among 300 to >660 taxa identified, for an introduced component of only about 1%.

Table 1. Numbers of marine nonindigenous (N), cryptogenic (C) and total species determined from Hawai'i and Johnston Atoll.

			Total	Total	%	
Location	(N)	(C)	N + C	Species	N + C	Source
Hawaiian Islands						
Oʻahu, Pearl Harbor	69	26	95	419	23.0	Coles et al 1997, 1999a
O'ahu, South Shore						
Commercial Harbors	73	27	100	585	17.0	Coles et al 1999b
Kane'ohe Bay	82	34	116	617	14.5	Coles et al 2002
Kaho'olawe	3	0	3	298	1.0	Coles et al. 1998
Midway	4	0	4	444	1.5	DeFelice et al. 1998
Johnston Atoll	5	5	10	668	1.5	Coles et al. 2001
French Frigate Shoals	2	0	2	617	0.3	DeFelice et al. 2002

The nonindigenous and cryptogenic (NIS) taxa sighted or sampled on these six comprehensive studies included most major phyla or classes of invertebrates ranging from 15 annelid taxa to 31 crustaceans, mostly amphipods. Most invertebrate NIS are filter-feeding, fouling organisms which are prone to vessel attachment and transport and thrive in the eutrophic condition of harbors and embayments, and few have been detected on the exposed coral reefs that had been previously surveyed. However, Kane'ohe Bay, as a semi-enclosed, estuarine embayment, shows characteristics of both harbor and coral reef conditions, has a greater number of introduced species than the harbors and is one of the areas in Hawaiian waters most impacted by alien invasive algae (Russell 1983, Russell 1992, Rodgers and Cox 1999, Woo et al. 1999, Smith et al. 2003). Elsewhere, no introduced algae or invertebrates were detected at seven reef locations around the island of Kaho'olawe (Coles et al. 1998), where the only nonindigenous organisms found were the three species of fishes purposely introduced in the 1950s (Brock 1960, Randall 1987). Similarly, the only nonindigenous species found at Midway Atoll (DeFelice et al. 1998b) were two bryozoans and the barnacle Chthamalus proteus Dando and Southward first reported in the Pacific on O'ahu in 1996 (Southward et al. 1998), and one introduced fish. Only two introduced invertebrates were recorded for a total of over 500 identified species at French Frigate Shoals from the 1998 NOWRAMP surveys of the Northwestern Hawaiian Islands (DeFelice et al. 2002).

These findings suggest that, in general, two principal factors may determine the presence and degree of invasiveness of most nonindigenous species in Hawai'i and in tropical areas. The first factor is isolation from likely sources of NIS. Kahoʻolawe does not have any of the invasive macroalgae that have inundated the west and south coasts of nearby Maui, possibly due to restriction of visitors and boat traffic for over 60 years that helped isolate the island from both accidental and purposeful introductions. Likewise, the isolation of Midway, French Frigate Shoals and Johnston Atoll has probably helped to limit marine introductions, despite the fact that a small harbor at Midway was used for receiving supplies up to the mid 1990s, and that a docking facility at Johnston frequently received barge traffic from Honolulu.

A second set of factors that may act to limit introductions, especially invertebrates, on open ocean-exposed coral reef areas are the characteristics of the reef environment and the generally higher diversity of the native reef community. The oligotrophic conditions that generally pertain to reef areas probably do not provide sufficient suspended organic matter or plankton to support many of the filter feeding invertebrates that prevail among the nonindigenous organisms in Hawai'i. Also, the greater native species richness on ocean-exposed coral reefs may act to limit recruitment, growth, and reproduction of NIS below what might occur in the less biologically diverse communities of harbors or estuaries. Decreased species invasions with higher diversity systems in tropical regions has also been noted for surveys of ports on Australia's North Queensland coast (Hewitt et al. 1998, Hoedt et al. 2000, 2001), Guam (Paulay et al. 2002), and American Samoa (Coles et al. 2003) where species richness is substantially higher than in Hawai'i.

The available information indicating that few introduced invertebrate species occur on Hawaiian coral reefs has been based on limited data, mostly for sites remote from probable sources of NIS introduction. No systematic invertebrate surveys have been conducted on coral reefs in Hawai'i near harbors other than in Kane'ohe Bay and Waikiki. The need thus existed for a comprehensive survey of the presence of nonindigenous invertebrates on Hawai'i's coral reefs throughout the main Hawaiian Islands. The objectives of the present project were to determine whether nonindigenous marine invertebrates are present in significant numbers by species or abundance on coral reefs in the main Hawaiian Islands, to assess the impact and potential threat to native reef species, to evaluate the influence of potential causative factors in promoting or resisting invasions of reefs by nonindigenous species, and to determine the need, if any, for management procedures that would deal with introduced species as a source of reef disturbance.

II. METHODS

The methods used in biological sampling programs vary with the research questions being asked and require decisions pertaining to levels of effort directed toward two primary objectives. The first is to determine as completely as possible the total community species composition occurring at the sampling site. The second is to quantify the abundance or relative abundance of the various community components in an attempt to determine the numeric distribution of numbers of individuals or areal coverage of the various component species. These two objectives are somewhat opposing, especially where time is limited when sampling underwater. Most studies on coral reefs have focused on algal, coral, or fish assemblages and have utilized some variation of linear or belt transects, or, in the case of coral and algae, measurements with quadrats, either sampled once or repeatedly on permanently marked sections of reef surface. The power and efficacy of sampling coral coverage in Hawai'i have been reviewed by Brown et al. (in press). These approaches provide various levels of quantification and resolution that may enable time series analysis, but the area sampled must necessarily be small, and such studies sometimes also include "swim-arounds" on larger reef areas to detect species that are not encountered on the fixed transects or quadrats.

The purpose of the present study was to determine the presence and impact of nonindigenous (introduced) marine species on Hawai'i's coral reefs. Anticipating that these species were likely to be low in abundance, our approach was focused on examining large areas and on as many habitats as could be done within the time frame of scuba dives in water of intermediate depths of 10-20 m up to three times per day. In order to facilitate a comparable search effort among islands and sites within islands, we developed a standardized method that could be replicated on every survey. This approach utilized a variation on the belt transect and timed search methods that was modified to provide both a standardized search area, estimates of probability of encounter and a sufficiently large search area to assure that most species occurring at the site had been encountered and noted. Where feasible the locations of surveyed sites were at or near sites established by the Hawai'i Coral Reef Assessment and Monitoring Program (CRAMP) in order to provide further information on areas that will be periodically resurveyed for coral and fish abundance (Brown et al. in press).

Field Techniques

After recording the position by GPS of the reef to be surveyed, a 50-m transect line was used to delineate a triangular area within which observations were made during the first 30 minutes of the survey. The starting point for the transect line was established haphazardly and the line was laid along the reef parallel to the shore for 25 m, then turned at a right angle for the remaining 25 m, with the resulting triangular area established by the line thus approximating 312 m². Two observers (SLC and FK) swam in tandem along the line, noting and recording the first occurrence of all invertebrates, fishes and identifiable macroalgae occurring along a swath up to 2 m on either side of the transect within time periods of 5, 10, and 15 minutes from the start time of the transect. The next 15 minutes were spent recording organisms that occurred in the 312 m²

triangular area delineated by the legs of the transect line. Finally, 15 minutes were spent making observations outside of the triangle and recording all taxa not previously observed. In addition to the observations made by these two observers, on Kaua'i, Moloka'i, Maui, and Hawai'i a third diver (PAR) searched crevices and microhabitats throughout the triangular area, identifying small and cryptic organisms not observed by the first two divers on their roving searches. All organisms identifiable in the field were recorded on underwater paper, and samples of organisms were retained for identification in the laboratory where necessary.

Identified organisms were entered on spreadsheets coded 1 to 3 according to the 5 minute period in which they were first encountered in the first 15 minutes, or 4 if they were first encountered later inside or outside of the triangle. In the event that the organism was recorded at different times by the different observers, the first encounter was assigned priority. Status of the species as nonindigenous, cryptogenic or native was assigned according to their designation in Carlton and Eldredge (in prep.) and the Checklist of the Marine Invertebrates of the Hawaiian Islands (http://www2.bishopmuseum.org/HBS/invert/list_home.htm). (Species of uncertain identity but suspected to be introduced were collected and returned to the laboratory for identification and/or verification by taxonomic experts.

Precautionary Measures

It is a major objective of this study and all those associated with introductions of marine species that the processes of observation and sampling will not further spread introduced or invasive species beyond those locations where they already occur. To minimize the likelihood of this happening we have adopted the following procedures and recommend that they be used as a precaution in future such studies.

- 1. If a series of surveys involves sampling in areas of likely higher probability of occurrence of introduced marine species (i.e. harbors, enclosed embayments or shorelines) on the same day that surveys are to be made on coral reefs, the offshore reef areas should be surveyed first and the areas of higher probability of introduced species occurrence surveyed last. This will help to prevent the inadvertent transfer of introduced organisms that may be unknowingly acquired during the earlier survey to a coral reef habitat.
- 2. After surveying or sampling in an area of likely higher probability of occurrence of introduced marine species, all dive gear, sampling equipment and items used in transfer of any collected species of should be, at a minimum, soaked in fresh water and preferably washed in detergent before use on a subsequent day.
- 3. Precautions should be taken to assure that introduced organisms that have been collected are not dropped in a boat or in areas outside of their collecting area. If such organisms are inadvertently spilled in a boat, the boat should be thoroughly washed at the end of the dive day and any organisms in the washings isolated and collected for land disposal after assuring that they are not viable.

Variables Influencing Introductions

A number of both natural and anthropogenic influences have the potential to influence introduction, redistribution, and proliferation of nonindigenous marine species, and some of these were evaluated as part of this study (Tables 2 and 3). Hawaiian harbors have a large complement of introduced species (Coles et al. 1997, Coles et al. 1999a, Coles et al. 1999b) and proximity to harbors may increase the probability of introduced species occurrence. Similarly, small boats and their users may inadvertently transfer introduced species, so proximity to boat ramps may also be a factor in their spread. Studies in estuaries of O'ahu (Englund et al. 2000) have shown a high incidence of introduced species, so proximity to stream mouths was also considered a candidate for influencing introductions. Also frequent flooding and sedimentation from streams may result in a stressed environment more conducive to establishment of introduced species. Some introduced species, especially alien algae and the invertebrates that occur with them, are most abundant along or near shorelines. The distances of these four parameters from each site was measured using GIS based maps (Figures 1-5) and the range of values for each are shown in Table 3. Other potential determining factors considered were the amounts of artificial substrate in the water or along the shoreline, the degree to which the adjacent land area was urbanized, the degree to which the surveyed area was isolated from the open ocean, i.e. non-exposed, and the general condition of the coral reef itself, again on the assumption that a disturbed reef was more susceptible to introductions and invasions. The condition of these four factors was evaluated on site on a scale of 1 to 5 by the criteria in Table 3. Finally, based on the observations from previous studies that numbers of introduced species were inversely correlated with the numbers of non-introduced species, and that the ratio of NIS to native species tends to decrease going from enclosed to more exposed areas in Hawaiian harbors and embayments (Coles et al. 1997, Coles et al. 1998, 1999a, 1999b, 2002a, 2002b), the numbers of total native taxa at each site were included in analyses testing for relationships between numbers of NIS and predictor variables.

Table 2. Factors considered potentially important in influencing NIS, their range of determined or estimated values and sign of anticipated correlation with number of NIS.

Potential Determining Factor	Type	Range	Expected NIS Effect
Harbor Distance (km)	Measured	0.3-71	-
Ramp Distance (km)	II .	0.2-27	-
Stream Distance (km)	II	0.3-26	-
Shore Distance (km)	II	0.1-4.7	-
Non-NIS Species Richness	II	42-138	-
Artificial Substrate	Estimated	1-5	+
Urbanization	II .	1-5	+
Non-Exposure	II	1-5	+
Reef Condition	II	1-5	+

Table 3. Description of characteristics for each category of index values.

		stics for each category of index values.
Index	Value	Parameter
Artificial substrate	1	No modification of shoreline or artificial structure in water.
	2	<25% of shoreline hardening no structure in the water.
	3	26-50% shoreline hardening or structures in the water (piers or dock).
	4	51-75% shoreline hardening.
	5	Shoreline >75% modified or hardened.
Urbanization	1	Remote: No habitation or shoreline development in view.
	2	Rural: 1 to 5 houses or buildings, no shoreline development.
	3	Residential: 6 to 30 houses or buildings, some development at or near shoreline.
	4	Urbanized: >30 houses or buildings, shoreline high development.
	5	Industrialized, commercial shoreline usage and development.
Ocean non-exposure	1	Open ocean.
	2	Semi-exposed coastline.
	3	Embayment.
	4	Semi-enclosed harbor.
	5	Highly enclosed harbor with narrow access.
Reef Condition	1	Excellent: >50%.
	2	Good: 25%>Coral Cover<50%, macroalgae rare.
	3	Fair: 10%>Coral Cover<25%, some algae present.
	4	Poor: 5%>Coral Cover.<10%, algae common to abundant.
	5	Highly degraded: Coral Cover.<5%: High sedimentation.

IV. RESULTS

Station Locations and Characteristics

The locations, dates of sampling, depths, latitude-longitude and UTM coordinates of the sites surveyed are shown in Table 4, and the site locations are shown on the maps in Figures 1-5. A total of 41 sites on five islands were surveyed using the rapid assessment technique, and another three sites on Oʻahu were inspected using random searches. Twenty four of the 41 rapid assessment sites coincided with Hawaiʻi Coral Reef Assessment and Monitoring Program (CRAMP) sites and eight of the ten surveys on Hawaiʻi were made at West Hawaiʻi Aquarium Project (WHAP) sites.

The characteristics of the sites are described in Appendix A, which indicates that the stations encompassed a wide range of environmental conditions and proximity to anthropogenic influences on each island. The sites ranged from 100 m to 4.7 km from the shoreline and from 300 m to 26 km from the nearest stream mouth. Harbor distances ranged from 300 m to 71 km and boat launching ramps from 200 m to 27 km. The frequency histograms for the four subjectively evaluated indices potentially influencing the occurrence of introduced species are shown in Figure 6, which shows that most of the sites (18-25) were in the lowest index category 1 for artificial substrata, reef condition, and ocean exposure, i.e. most sites were in the category considered least likely to promote NIS for these indices. For the urbanization index, over half of the values were in categories 3 to 5, or greater than 6 houses or buildings visible on the shoreline.

Numbers of NIS and Total Taxa

All taxa identified at the 41 sites surveyed are listed in Appendix B, and the numbers of total taxa recorded at each station are shown in Figure 7. A total of 486 taxa were identified for the surveys overall, ranging from maximum of 151 taxa occurring at one station on Hawai'i to a minimum of 40 taxa at one station on Moloka'i. Of these, only 26 were cryptogenic or introduced species, approximately 5% of the total taxa identified. Most of these NIS, listed in Table 5 were infrequently observed. The most commonly seen were the introduced fishes *roi* (*Cephalopholis argus* Wooster) and and *ta'ape* (*Lutjanus kasmira* (Forsskål)) the cryptogenic conical hoof shell *Hipponix australis* Lamarck, a didemnid ascidian *Didemnum candidum?* Savigny, the introduced sponges *Mycale armata?* Thiele, and *Gelloides fibrosa* (Wilson), and the introduced featherduster worm *Sabellastarte spectabilis* (Grube). The remaining 15 species occurred at only 1-2 sites, or less than 5% of the total sites surveyed.

The number of NIS recorded at each site for each island surveyed is listed in Table 6 and their distributions shown in Figure 8. A maximum of six NIS occurred at one site each at Port Allen Harbor Reef, Kaua'i, Kane'ohe Bay, O'ahu, and Mala Wharf, Maui, and five NIS occurred at the other Kane'ohe Bay site, one site on Kaua'i, and one on Hawai'i. The distributions of numbers of

Table 4. Locations, dates, depths, coordinates and corresponding CRAMP sites for stations sampled.

l alon d		, , , , , , , , , , , , , , , , , , , ,	,		WGS8	34 Latitu	de N	Longi	itude V	J	Old Haw	aiian UTM	Zone	CRAMP
Island	Station	Location	GPS Code	Depth (m)	Deg	Min	Sec	Deg	Min		Northing	Easting	4	Site
Kauaʻi	KARA1	Marriot Hotel Reef	KAUMAR	2.5-6	21	57	36.3	159	21		2428309	463442	4	<u> </u>
	KARA2	Beach House Reef	KAULAW	1-1.5	21	53	5.9	159	28	45.5	2420030	450543	4	KAHOA10
	KARA3	Hoʻai Bay	KAUOH1	7.5-10.5	21	52	48.7	159	28	28.3	2419501	450976	4	KAHOA03
	KARA4	Hoʻai Bay	KAUOH2	2.5-3.0	21	52	53.4	159	28	34.2	2419645	450808	4	
	KARA5	Port Allen Harbor	KAUPA2	7.5-10.5	21	54	3.5	159	35	49.5	2421844	438324	4	
	KARA6	"Tiger's"	KAUPAK	9.0-11.0	21	55	45.5	159	39	11.5	2425000	432542	4	
	KARA7	Nomilu Pond	KAUPAL	7.5-9.0	21	53	13.7	159	31	58.8	2420289	444938	4	
	KARA8	Kukui'ula	KAUKUK	6.5-7.5	21	53	8.4	159	29	16.8	2420111	449588	4	
Molokaʻi	MORA1	Puko'o Nearshore	MOLPUK	1-6	21	4	18.8	156	48	6.1	2331542	728403	4	
	MORA2	Pala'au	MOLPAL	10	21	5	30.4	157	6	38.7	2333332	696257	4	MOPAL10
	MORA3	Hale o Lono Reef	MOLHLR	9-12	21	5	1.4	157	14	57.7	2332276	681864	4	
	MORA4	Pukoʻo Offshore	MOLPU2	1-3	21	3	55.8	156	47	38.4	2330846	729213	4	
	MORA5	Kamalo	M0LKAM	3-17	21	2	40.6	156	54	1.1	2328384	718194	4	MOKMO10
	MORA6	Kamiloloa	MOLKAM	5-7	21	4	18.2	157	0	9.7	2331249	707513	4	MOKMA10
	MORA7	Kaunakakai Reef	MOLKAR	7-10	21	4	59.6	157	2	34.9	2332470	703306	4	MOKAK01
	MORA8	Hotel Molokai	MOLHOT	0.25-1	21	4	28.7	156	59	49.7	2331580	708087	4	
Maui	MARA1	Kahekili	MAKAH	1.5-5	20	56	22.2	156	41	45.8	2317037	739595	4	MAKAH03
	MARA2	Olowalu	MAOLO	2.5-3	20	48	42.2	156	36	51.4	2303012	748313	4	MAOLO03
	MARA3	Papaula Pt.	MAPAO	9-12	20	55	39.3	156	25	44.0	2316141	767413	4	MAPAP10
	MARA4	Honolua Bay	MAHONW	2.5-8.5	21	1	8.9	156	38	33.2	2325937	745031	4	MAHON03
	MARA5	Puamana	MAPUA	3-3.5	20	51	29.9	156	40	8.4	2308087	742540	4	MAPUA03
	MARA6	Mala Wharf	MAMALA	3-9	20	53	23.2	156	41	26.8	2311539	740223	4	
	MARA7	Ma'alaea Reef	MAMARF	2.5-5.5	20	47	31.6	156	30	45.8	2301000	758921	4	MAMAA03
	MARA8	Kanahena Bay	MAKANA	3-8	20	37	14.9	156	26	30.8	2282144	766598	4	MAKAB03
	MARA9	Molokini Crater	MAMOLC	7-8.5	20	38	5.3	156	29	57.6	2283601	760585	4	MAMOL07

Table 4. (cont.)

					WGS8	4 Latitud	de N	Long	itude V	/	Old Hawa	aiian UTM	Zone	CRAMP
Island	Station	Location	GPS Code	Depth (m)	Deg	Min	Sec	Deg	Min	Sec	Northing	Easting	4	Site
Hawaiʻi	HARA1	Kawaihae Reef	KAWAIR	4-9	20	1	55.5	155	50	9.4	2217417	203308	5	HAKAW03
	HARA2	Puako	PUAKO	6-9	19	58	23.2	155	51	4.4	2210912	201597	5	
	HARA3	Anaeho'omalu	ANAIHO	8.5-9	19	57	21.9	155	52	8.4	2209058	199703	5	
	HARA4	Keawaiki	KEAWAI	12-14	19	53	39	155	54	45.4	2202278	195016	5	
	HARA5	Kualani Point	KUALAN	9.5-10.5	19	33	5.7	155	57	54.2	2164428	188858	5	
	HARA6	Red Hill	REDHIL	5.5-13.5	19	30	28.8	155	57	19.5	2159583	189787	5	HANEN10
	HARA7	North Keauhou	NKEAHO	6-6.5	19	34	17.8	155	58	20.2	2166659	188138	5	HALAA10
	HARA8	South Oneo Bay	ONEOBY	8-9	19	38	4.8	155	59	44.7	2173687	185796	5	
	HARA9	Papawai Bay	PAPAWA	7-13.5	19	39	0.6	156	1	33.4	2173903	811897	5	
	HARA10	Leleiwi Bay	LELELI	6.5-10	19	44	14.4	155	1	16.5	2183547	288181	5	HALEL03
Oʻahu	OARA1	K-Bay Waiahole	KBAY1	1.0-5	21	28	35.2	157	49	55.0	2375190	621013	4	OAKAA02
	OARA2	K-Bay He'eia	KBAY2	0.5-6	21	26	48	157	48	37.0	2371911	623283	4	OAHEE02
	OARA3	Nanakuli Point	OANANA	4-5	21	22	20.3	158	8	32.1	2363456	588926	4	OAKPI03
	OARA4	Kahe	OAKAHE	3-4	21	21	34.1	158	8	6.1	2362040	589682	4	OAKPO03
	OARA5	Pupukea	OAPUPU	1-6	21	38	46.6	158	3	54.2	2393826	596748	4	OAPUP04
	OARA6	Hanauma Bay	OAHANA	5-7	21	16	6.4	157	41	43.5	2352278	635351	4	OAHAN03
	OAHT	Haleiwa Trench	OAHALE	4-25	21	35	37.4	158	6	37.4	2387982	592090	4	
	OAMW	Mahi Wreck	MAHI	6-28	21	24	47.4	158	11	43.8	2368296	583092	4	
	OAZM	Waianae Z Module	WAIARF	18-20	21	24	55.8	158	11	31.2	2368556	583454	4	

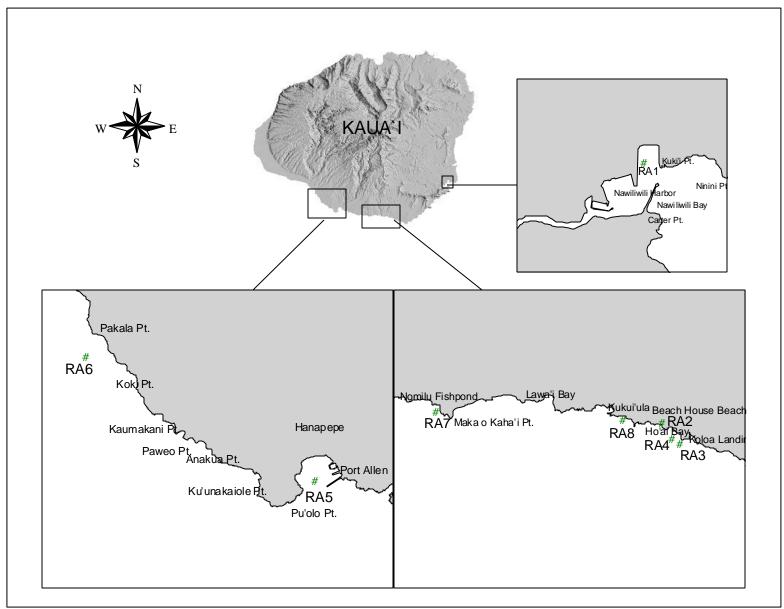


Figure 1. Kaua'i HCRI coral reef stations.

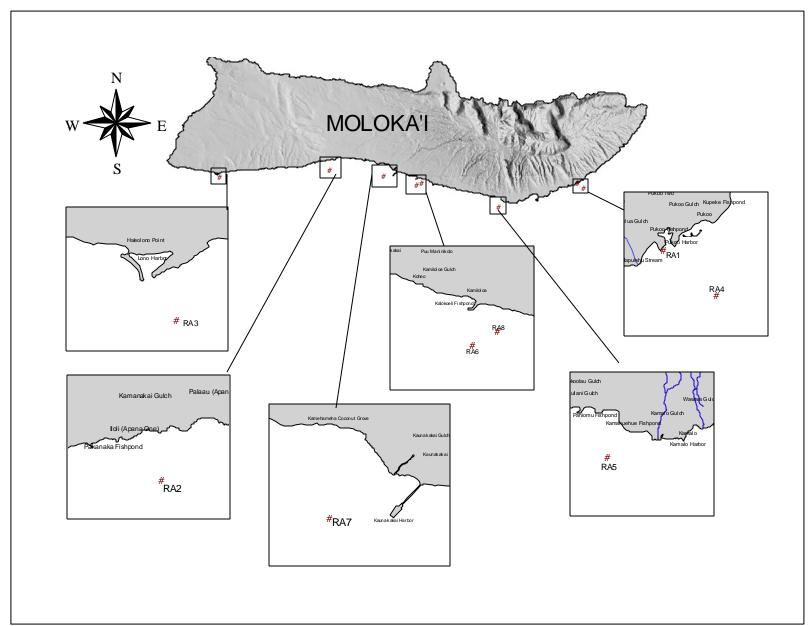


Figure 2. Moloka'i HCRI coral reef stations.

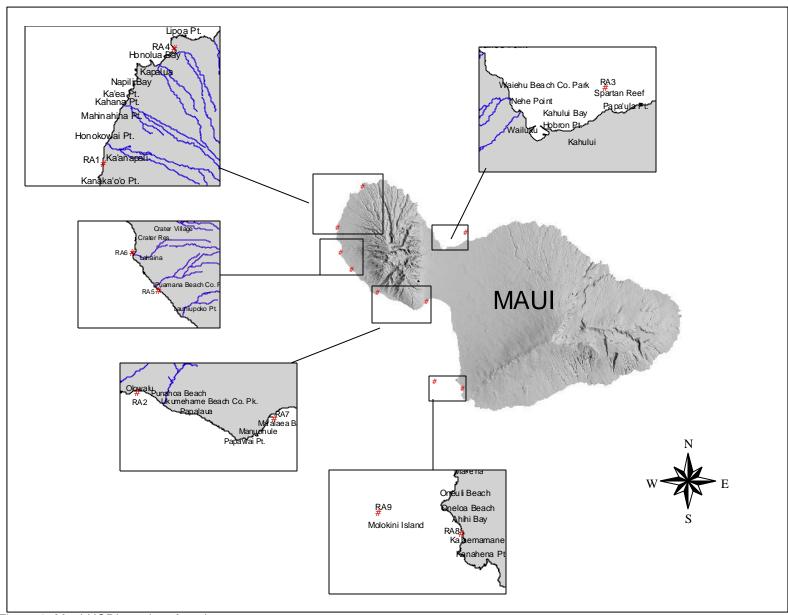


Figure 3. Maui HCRI coral reef stations.

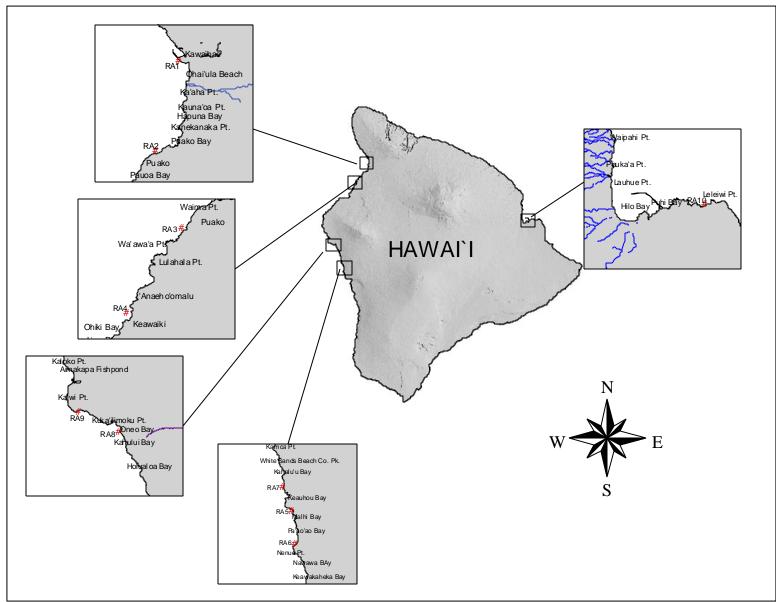


Figure 4. Hawai'i HCRI coral reef stations.

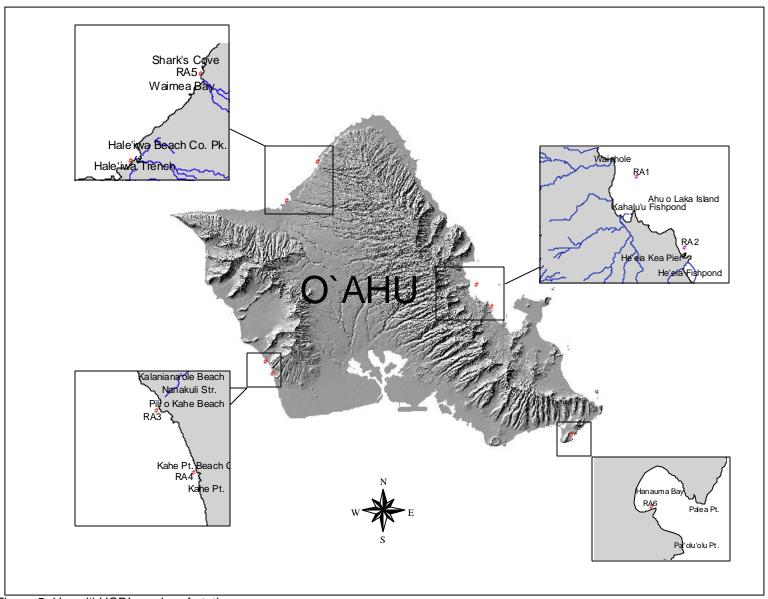


Figure 5. Hawai'i HCRI coral reef stations.

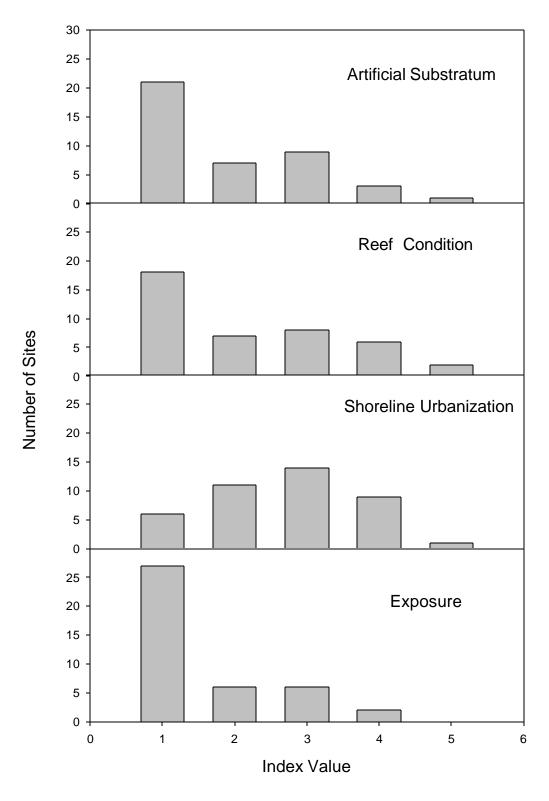


Figure 6. Frequency histograms of estimated categories of factors potentially affecting NIS presence.

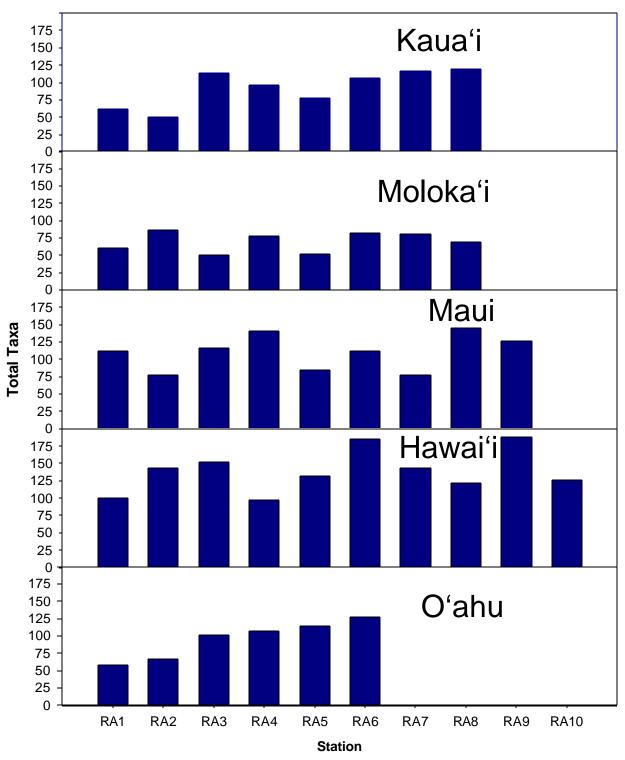


Figure 7. Distributions of total taxa with sites on each island surveyed.

Table 5. Nonindigenous and cryptogenic species frequencies of occurrence at all sites.

Taxa	Species	Status	No. Sites	Frequency
RHODOPHYTA	Acanthophora spicifera	Introduced	7	17.1%
	Hypnea musciformis	Introduced	1	2.4%
	Kappaphycus alvarezii	Introduced	2	4.9%
PORIFERA	Mycale armata?	Introduced	5	12.2%
	Sigmadocia caerulea?	Introduced	1	2.4%
	Gelloides fibrosa?	Introduced	1	2.4%
HYDROZOA	Dynamena crisoides	Cryptogenic	1	2.4%
	Pennaria disticha	Introduced	5	12.2%
	Plumularia floridana	Cryptogenic	2	4.9%
	Plumularia strictocarpa	Cryptogenic	1	2.4%
ANTHOZOA	Carijoa riisei	Introduced	1	2.4%
	Sarcothelia n. sp.	Cryptogenic	1	2.4%
SCYPHOZOA	Cassiopea andromeda	Introduced	1	2.4%
POLYCHAETA	Chaetopterus sp.	Cryptogenic	1	2.4%
	Sabellastarte spectabilis	Introduced	5	12.2%
	Salmacina dysteri	Introduced	1	2.4%
GASTROPODA	Hipponix australis	Cryptogenic	17	41.5%
BIVALVIA	Crassostrea gigas?	Introduced	1	2.4%
	Anomia nobilis	Introduced	2	4.9%
BRYOZOA	Schizoporella cf. errata	Introduced	1	2.4%
ASCIDIACEA	Didemnum candidum?	Cryptogenic	14	34.1%
	Phallusia nigra	Introduced	1	2.4%
OSTEICHTHYES	Lutjanus fulvus	Introduced	3	7.3%
	Lutjanus kasmira	Introduced	10	24.4%
	Centropyge loricula	Cryptogenic	1	2.4%
	Cephalopholis argus	Introduced	23	56.1%
	Total NIS	26	41	
	Total Taxa	486		
	% NIS	5.3%		

Table 6. NIS species recorded at all sites.

Island	Genus_Species	Author_Date	Status	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9
Kauaʻi	Mycale armata?	Thiele, 1903	Introduced	Х			-	-		-		
	Gelloides fibrosa?	Wison, 1925)	Introduced	Х								
	Dynamena crisoides	Lamaroux, 1824	Cryptogenic					х				
	Pennaria disticha	(Goldfuss, 1820)	Introduced	х		Х		Х				
	Chaetopterus sp.		Cryptogenic	х								
	Sabellastarte spectabilis	(Grube, 1878)	Introduced	х				Х				
	Salmacina dysteri	(Huxley, 1855)	Introduced				х					
	Hipponix australis	(Lamarck, 1819)	Cryptogenic			Х	Х			Х	Х	
	Schizoporella cf. errata	(Waters, 1878)	Introduced						Х			
	Didemnum candidum?	Savigny, 1816	Introduced		Х	х	х	х	Х	Х	Х	
	Lutjanus kasmira	(Forsskål, 1775)	Introduced			х		х		х		
	Cephalopholis argus	Bloch & Schneider, 1801	Introduced				Х	Х			Х	
			Total NIS	5	1	4	4	6	2	3	3	
Moloka'i	Acanthophora spicifera	(Vahl) Børgesen	Introduced	х			Х				X	
	Cassiopea andromeda	Light, 1914	Introduced	х								
	Hipponix australis	(Lamarck, 1819)	Cryptogenic						Х			
	Didemnum candidum?		Introduced	x	Х				Х		Х	
	Cephalopholis argus	Bloch & Schneider, 1801	Introduced		Х	Х				Х		
			Total NIS	3	2	1	1	0	2	1	2	
Maui	Hypnea musciformis	(Wulfen) J.V.Lamour.	Introduced							х		
	Acanthophora spicifera	(Vahl) Børgesen	Introduced	х		х				х		
	Hipponix australis	(Lamarck, 1819)	Cryptogenic	х			х	х	х			
	Mycale armata?	Thiele, 1903	Introduced						х	х		
	Pennaria disticha	(Goldfuss, 1820)	Introduced						х			
	Sarcothelia n. sp.		Cryptogenic			х						
	Carijoa riisei	(Duchassaing & Michelotti, 1860)	Introduced						х			
	Crassostrea gigas?	(Thunberg, 1793)	Introduced							х		
	Didemnum candidum?	Savigny, 1816	Introduced?	х		х						
	Cephalopholis argus	(Bloch, 1788)	Introduced	Х		х	х		х		х	
	Lutjanus kasmira	(Quoy & Gaimard, 1825)	Introduced				х					
	Lutjanus fulvus	(Forster, 1801)	Introduced						Х			
			Total NIS	4	0	4	3	1	6	4	1	3

Table 6. (cont.)

Island	Genus_Species	Author_Date	Status	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Hawai'i	Pennaria disticha	(Goldfuss, 1820)	Introduced	Х									
	Plumularia floridana	(Nutting, 1905)	Cryptogenic	Х					х				
	Plumularia strictocarpa	Pictect, 1893	Cryptogenic						Х				
	Sabellastarte spectabilis	(Grube, 1878)	Introduced		х								
	Hipponix australis	(Lamarck, 1819)	Cryptogenic		х	х	х	х	х	Х	Х	Х	
	Lutjanus fulvus	(Forster, 1801)	Introduced		х								
	Lutjanus kasmira	(Forsskål, 1775)	Introduced		х			х	х	Х			
	Cephalopholis argus	Bloch and Schneider, 1801	Introduced	x	х	х	х	х	х	Х	Х	Х	х
			Total NIS	3	5	2	2	3	5	3	2	2	1
Oʻahu	Acanthophora spicifera	(Vahl) Børgesen	Introduced			Х							
	Kappaphycus alvarezii	(Doty) Doty	Introduced	x	х								
	Mycale armata?	Thiele, 1903	Introduced	x	х								
	Sigmadocia caerulea?	Hechtel, 1965	Introduced					х					
	Sabellastarte spectabilis	(Grube, 1878)	Introduced	x	х								
	Anomia nobilis	Reeve, 1859	Introduced	x	х								
	Phallusia nigra	Savigny, 1816	Introduced		х								
	Didemnum cf. candidum	Savigny, 1816	Cryptogenic	x									
	Lutjanus kasmira	(Forsskål, 1775)	Introduced						х				
	Centropyge Ioricula	(Günther, 1873)	Cryptogenic		Х								
	Cephalopholis argus	Bloch and Schneider, 1801	Introduced						Х				
			Total NIS	5	6	1	0	1	2				

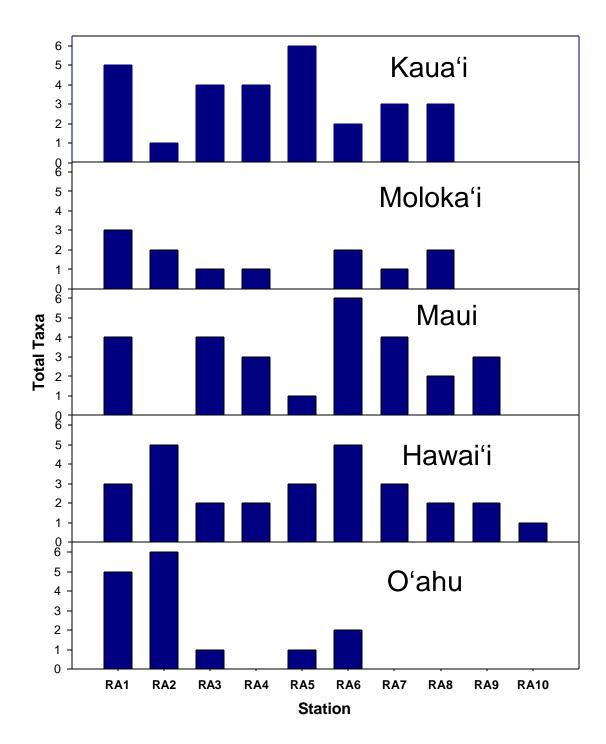


Figure 8. Distributions of numbers of NIS with sites on each island surveyed.

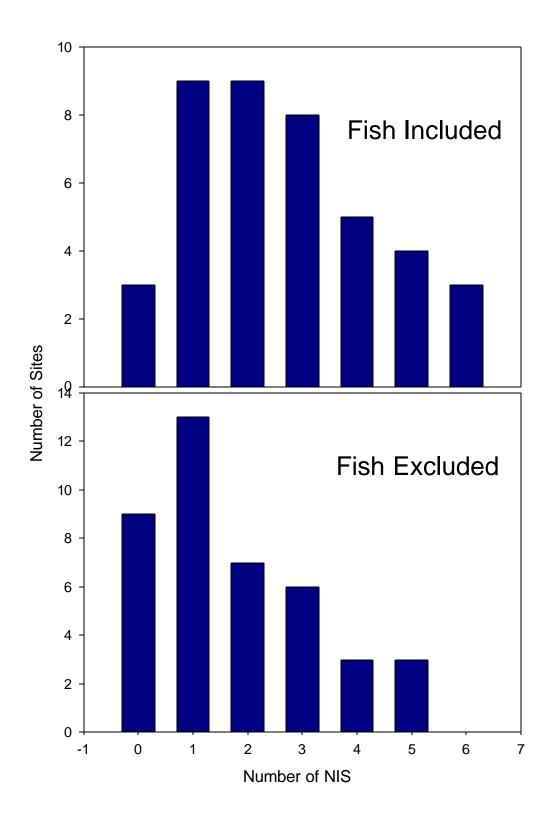


Figure 9. Histograms of numbers of NIS at all sites with fish data included and excluded.

NIS for combined sites is shown in Figure 9, which indicates that, for the full data set, 21 of the 41 sites, or more than 50% of the total, had fewer than three NIS. Many of these were sites where the introduced fishes *Lutjanus kasmira*, *Lutjanus fulvus* (Forster), and *Cephalophlis argus* occurred. These three species were intentionally introduced in the 1950s, are already known to be widespread throughout the main Hawaiian Islands, and have the capacity for their own movement to new areas independent of man-related factors. When these fishes are excluded from the results (Figure 9) 22 of the 41 sites had less than 2 NIS.

Relationships of NIS with Environmental and Anthropogenic Factors

The data in Appendix B includes all identifications made at all the sites. However, at seven sites on neighbor islands (KARA1, KARA57, MORA3, MORA7, MARA7, HARA1 & HARA10) and all O'ahu sites, one of the field team (PAR) did not make rapid assessment observations. Therefore, in order to have data based on consistent effort throughout the study, the data from this observer at the other sites were not included in analyses of relationships between numbers of NIS and the factors in Table 7. Similarly, since some reef fishes are less permanent residents of reef and three of the four NIS from this group were purposely introduced, these were also excluded from analyses of relationships with determining factors. These exclusions resulted in the total number of taxa used in regression analysis being reduced to 208 from the 315 (excluding fish) reported by all three observers. However, the list of algae and invertebrate NIS (Table 5) was reduced by only three species, cryptogenic *Hipponix australis* that occurred at 20 sites, and the introduced polychaetes *Salmacina dysteri* (Huxley), and *Schizoporella australis* (Grube), both of which occurred at only one site each.

Using these data, best subsets regression analysis (Minitab®) was calculated to identify the bestfitting regression model explaining numbers of NIS that could be constructed using the station factor values in Table 6. The initial model with the most explanatory power (adjusted $R^2 = 0.52$) included the three predictor variables exposure, ramp distance, and native species richness (NSR) in their order of variance explained. These three predictor variables and all of their possible two-way interactions were then used in a best subsets regression analysis to identify the most logical model that included interaction (i.e. if an interaction term was included in the model, the variables used to calculate the interaction term were also included). This best regression model accounted for 67.2% of the variance explained and included as significant factors ocean exposure, NSR and their interaction (Table 8), and their relationship with numbers of NIS is illustrated graphically in Figure 10. A highly significant positive relationship (p<0.001) was found between numbers of NIS and non-exposure to open ocean conditions, i.e. NIS increased significantly going from semi-enclosed locations to open coastlines. Contrary to the expected relationship, NIS increased slightly but significantly with increasing NSR. relationship appears to be primarily due to values of 1-2 NIS that occurred at five open ocean sites with 55 to 90 native species (Figure 10). However, more significantly, the relationship between NIS and the non-exposure-NSR interaction was negative. This suggests that in more

Table 7. Matrix of predictor variable values used in best subsets regression analysis for values of NIS at 41 reef sites.

-	Harbor	Ramp	Shore	Stream	Art. Substr.	Reef Health	Urbanization	Nonexposure	NSR.	NIS
Sta. No.	Dist (km)	Distance	Dist (km)	Dist (km)	Index	Index	Index	Index	(w/o Fish)	
KARA1	1.2	1.5	0.3	0.3	4	3	3	3	27	5
KARA2	12.7	1.7	0.1	1.1	2	4	4	2	21	0
KARA3	13.1	2.1	0.2	0.5	1	2	3	1	23	2
KARA4	13.4	1.9	0.2	0.7	1	2	3	1	25	0
KARA5	0.6	0.7	0.4	0.7	4	5	2	4	29	3
KARA6	8.5	8.6	0.6	0.7	2	5	2	1	38	0
KARA7	3.9	4.0	0.1	3.1	1	3	1	1	30	0
KARA8	11.9	0.6	0.1	2.0	3	3	4	1	32	0
MORA1	0.3	0.3	0.1	0.4	3	4	3	2	18	2
MORA2	8.4	8.4	1.4	8.3	1	1	2	1	25	0
MORA3	0.6	22.7	0.5	23.1	3	1	3	1	11	0
MORA4	1.2	26.9	1.0	1.3	3	3	3	1	31	1
MORA5	12.0	15.3	1.5	1.7	2	1	4	1	13	0
MORA6	3.6	5.3	1.6	5.3	3	1	4	1	31	0
MORA7	1.1	1.5	1.4	1.5	3	1	3	1	26	0
MORA8	4.1	4.3	0.6	4.6	3	4	4	1	37	1
MARA1	32.3	6.0	0.1	1.6	1	2	4	2	32	2
MARA2	12.4	12.5	0.2	1.9	2	3	2	2	31	0
MARA3	6.2	6.3	1.6	2.7	1	1	1	1	48	2
MARA4	27.4	17.7	0.1	0.4	1	1	1	3	37	0
MARA5	21.1	5.3	0.1	0.5	1	3	2	1	32	0
MARA6	25.7	0.2	0.2	0.3	5	2	3	4	31	4
MARA7	0.3	0.4	0.3	10.4	3	4	4	3	47	4
MARA8	20.6	20.8	0.1	26.0	1	1	2	2	37	0
MARA9	17.7	17.9	4.6	23.0	1	1	1	1	22	0
HARA1	1.8	1.5	0.4	1.8	4	1	2	1	37	1
HARA2	8.2	7.9	0.2	5.4	2	1	3	1	35	1
HARA3	10.9	10.6	0.3	8.0	1	1	2	1	36	0
HARA4	18.8	18.5	0.5	16.4	1	1	2	1	21	0
HARA5	68.5	16.2	0.2	9.2	1	1	1	1	31	0
HARA6	71.0	18.9	0.1	12.0	1	1	2	1	37	0
HARA7	64.3	14.1	0.2	6.8	1	1	4	1	33	0
HARA8	57.4	7.4	0.2	1.2	2	1	5	2	25	0
HARA9	53.5	3.9	0.1	4.7	1	1	1	1	31	0
HARA10	8.8	8.9	0.1	8.0	1	2	3	1	35	0
OARA1	4.4	4.5	1.1	1.4	1	3	4	3	24	5
OARA2	0.3	0.5	0.3	0.7	2	4	3	3	27	5
OARA3	6.2	6.1	0.1	0.3	1	4	3	1	32	1
OARA4	3.4	3.3	0.1	3.2	3	3	3	1	34	0
OARA5	7.5	7.6	0.1	0.6	1	2	3	1	34	1
OARA6	5.4	5.6	0.1	5.8	1	2	2	3	30	0

Table 8. Relationships determined between numbers of NIS and predictor variables by best subsets linear regression analysis.

			Expected		% Variance
Potential Determining Factor	Type	Range	NIS Effect	Result	Explained
Nonexposure	Estimated	1-5	+	+ p<0.001	45.3
Species Richness (NSR)	Measured	42-138	-	+ p<0.030	8.0
Nonexposure-SR Interaction				- p<0.001	13.9
Full Model				p<0.001	67.2

NIS =3.81*Nonexposure + 0.049*Species Richness - 0.040*Interaction - 4.19

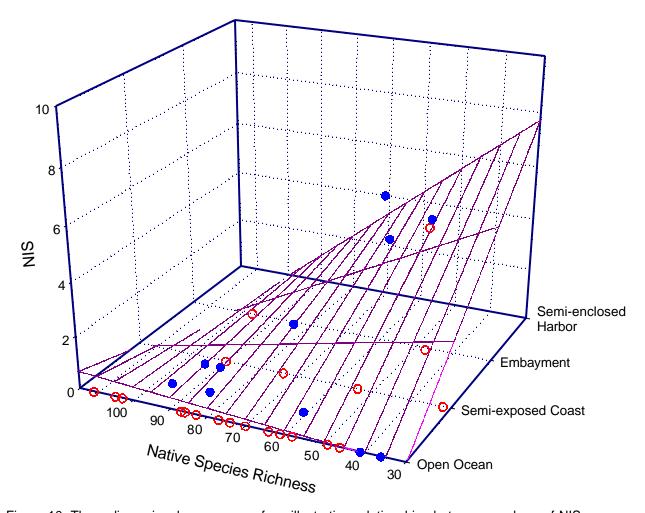


Figure 10. Three dimensional response surface illustrating relationships between numbers of NIS species, ocean exposure of the sites surveyed and native species richness (fish excluded). Blue solid dots indicate values above the response surface, red open circles indicate values below.

enclosed environments such as embayments and semi-exposed coastlines, fewer NIS occurred in locations with higher NSR than would otherwise be the case, and that this effect becomes more important with restriction from open ocean exposure.

V. DISCUSSION

The results support previous findings in the Hawaiian Islands, American Samoa, and Guam which have indicated that relatively few introduced marine invertebrates occur on open ocean coral reefs, especially compared to enclosed harbors and disturbed embayments. In contrast to the approximately 100 NIS that have been recorded for O'ahu's harbors and Kane'ohe Bay, the present study found a total of only 26 species, which included three algae and four fish, at 41 reef sites throughout the main Hawaiian islands, with a maximum of only six NIS at any one site. By comparison, observations within the harbors at these neighbor islands coinciding with the time of the reef surveys and made by the same investigators (Coles et al, in prep.) found NIS to range from lows of 6-8 in the relatively open and exposed harbors of Kawaihae, Hawai'i, Kaunakakai and Hale o Lono, Moloka'i, to highs of 18-24 NIS in the enclosed harbors of Nawiliwili, Kaua'i, Kahului, Maui, and Hilo, Hawai'i. Moreover, in contrast to the usual circumstances in harbors where invertebrate NIS are usually among the most common or dominant species, this was not case at any reef site on the present survey. The algae Acanthophora spicifera (Vahl) Boerg was abundant at Puko'o and at the Hotel Moloka'i site on Moloka'i, at Kahekili Beach Park, Papa'ula Point and Ma'alaea Reef on Maui and at one Kane'ohe Bay site. Another alga Kappaphycus cf. alvarezii (Doty) Doty was abundant at the two Kane'ohe Bay sites and the ta'ape, Lutjanus kasmira, was abundant at 10 sites throughout the survey. However, the only invertebrate NIS that was abundant at any site was the octocoral Carijoa riisei (Duchassaing & Michelotti) at Mala Wharf, Maui, where it occurred on the under sides of concrete posts and metal sheet pilings of the collapsed dock. All other invertebrate NIS were rare at any site and usually consisted of a single or few individuals or colonies in cryptic locations in the recesses of the reefs.

Some sites near harbors or boat ramps were among those having the maximum numbers of NIS, suggesting some influence of proximity to harbors and boat ramps that could act as sources or vectors for spreading of NIS. However, this pattern did not hold for the full array of sites, and some stations near harbors or boat ramps also showed NIS values among the lowest that occurred. This indicates that if these potential sources of NIS are important in their spreading and proliferation, that their influence is not consistent nor does it extend very far from their points of origin, since many sites within a few hundred meters showed few or no NIS and none exceeded a total of six species. Other factors considered likely candidates for propagating or supporting NIS, i.e. proximity to shorelines or streams mouths, presence of manmade structures in the water, development or alteration of the shoreline, and apparent declines in reef condition that would suggest environmental disturbance, all showed no significant relationship with the numbers of NIS that occurred.

The most clearly defined relationship between the low numbers of NIS that occurred and any predictor variable was with the degree to which the sites were enclosed or isolated from the open

ocean, which alone accounted for 45% of the variance in NIS numbers. This finding agrees with observations in harbors and embayments on Oʻahu (Coles et al. 1997, Coles et al. 1998, 1999a, 1999b, 2002a, 2002b), which have found decreasing numbers of NIS in the more ocean-exposed areas of the respective study areas, corresponding with increasing species richness. These relationships were even more apparent in a recent study of NIS and total species richness on Tutuila, American Samoa (Coles et al. 2003), where NIS ranged from 5-17 in the semi-enclosed inner Pago Pago Harbor to 1-3 NIS on reefs distant from the harbor. By comparison, total taxa at the inner harbor sites were 102-185, and 403-449 on reef sites outside the harbor.

Contrary to the anticipated relationship of decreasing NIS with increasing native species richness, the results indicate a weak but significant positive relationship that is apparently primarily due to a number of cases of 1-2 NIS that occurred with higher numbers of total taxa at some open ocean sites. However, values of 5-6 NIS with low numbers of total taxa that occurred in embayments and a semi-enclosed harbor resulted in a highly significant interaction between ocean non-exposure and native species richness. This suggests that high species richness of the native population may provide some resistance to successful recruitment and/or survival of introduced species in those areas most susceptible to NIS invasion, i. e. embayments and semi-exposed environments.

Previous studies (Coles et al. 1999b, 2002a, Coles and Eldredge 2002) have concluded that coral reef systems may be more resistant to nonindigenous species introductions and disruptions of native populations and that greater species diversity and higher endemism of native biota in reef systems offer fewer opportunities for successful proliferation of new arrivals than is the case for lower diversity temperate areas (Hutchings et al. 2002, Paulay et al. 2002). In temperate waters increased species richness of sessile organisms has been empirically determined to significantly decrease invasion success in coastal New England habitats (Stachowicz et al. 1999). However, Hewitt (2002) did not find a significant relationship between species richness and decreased invasion success for eight port surveys in tropical to temperate waters around Australia, although invasion success was found to decrease significantly with latitude along with a linear but nonsignificant increase in species richness. The results from the present and previous surveys of nonindigenous species in Hawai'i indicate that overall, few introduced marine invertebrates have successfully penetrated Hawai'i's coral reefs, and even fewer are considered invasive, i. e. monopolizing habitats or displacing native species. For those few NIS that were found on reefs in this study, if these circumstances can be extrapolated to more generalized conditions, the results suggest that the relationships between native species diversity and nonindigenous species can be complex and depend primarily on the degree to which the reef or habitat is unrestricted from open ocean circulation, and secondarily to the species richness of the native biota.

VI. MANAGEMENT CONSIDERATIONS

The findings of this study are encouraging in that they do not indicate widespread occurrence or abundance of introduced marine invertebrates comparable to the proliferation and sometimes ecologically devastating impacts that have occurred on Hawaiian coral reefs from invasive marine algae (Brostoff 1989, Russell 1992, Rogers and Cox 1999, Woo et al. 1999, Smith et al. 2002). No NIS invertebrate found in this study, with the exception of *Carijoa riisei* on artificial surfaces at the collapsed Mala Wharf, was common or dominant, a maximum of only six introduced invertebrates was found at any site, and twelve of the sixteen NIS invertebrates occurred at only 1 or 2 sites. No management effort in terms of control or eradication of established populations at reefs surveyed for this study is therefore indicated.

These results should not, however, be interpreted to indicate that the potential for such invasions does not exist. Certain NIS invertebrates have already become established and their occurrences, although patchy in distribution, are problematical, with localized invasive proliferations on or near coral reefs. Three invertebrates considered invasive on Hawaiian coral reefs were discussed in Coles and Eldredge (2002) and two of these, the Philippine Mantis Shrimp *Gonodactylaceus falcatus* (Forsskål) and the Snowflake Coral Carijoa riisei occur in reef areas. *Gonodactylaceus falcatus* is common in Kane'ohe Bay (Coles et al 2003a) where it has displaced the native shrimp *Pseudosquilla ciliata* (Fabricuis) from coral rubble habitats (Kinzie 1968) and it also occurs at Waikiki (Coles et al. 2002b). *Gonodactylaceus falcatus* was not observed on neighbor islands in the present surveys, but its cryptic habit of residing in burrows makes it difficult to detect with rapid assessments, so it its occurrence cannot be discounted without studies targeted toward this species.

Coles and Eldredge (2002) concluded that the octocoral Carijoa riisei appeared to be "a relatively benign introduction that is occupying previously underutilized habitat and producing no recognized negative on the overall reef community" but with the caveat that its "rapid proliferation...suggests that equally fast growing and far more damaging introductions could occur at any time". Since that time of that writing, sufficient information has come available to warrant revising the status of C. riisei to an invasive species with potentially serious consequences environmentally and economically. We now know that C. riisei can occur in high densities from the intertidal zone (Coles et al. 2002b) to over 100 m deep in environments where reduced light and moderate current provide optimal growth conditions. It occurs under ledges and in caves at many reef sites throughout the main Hawaiian Islands and overgrows black coral beds off Maui between 75 and 100 m (Grigg 2003) that may be important sources of reproduction for black corals harvested in shallow water. Other observations suggest that C. riisei, which was first reported in Hawai'i in Pearl Harbor in 1972 (Evans et al. 1974, Devaney and Eldredge 1977) is highly fecund and has a rapid growth rate (S. Kahng, pers. comm.), and it continues to proliferate and spread. For example, many colonies were recently observed for the first time on the headwall between the thermal discharge pipes for the Kahe Power Station at a location which has been inspected annually for over 30 years (SLC, pers. obs.). It appears that, of the over 300 known marine NIS that have reached Hawai'i, this species is the most widespread and potentially

invasive invertebrate to Hawai'i's coral reefs, and further studies are needed to determine its genetic relationships, mechanisms of reproduction and spawning, growth rates, environmental constraints, and other information that may be utilized in its management and control.

Another introduced species that, based on observations made during the course of this study, should be considered for invasive status, is the Orange Keyhole Sponge *Mycale armata*. This sponge was observed at five of the 41 sites in the present study, but at all sites other than in Kane'ohe Bay it was a minor component of the sessile benthos and appeared neither abundant nor invasive. However, in Kane'ohe Bay and especially on reefs on or near Coconut Island, this sponge has become abundant and is growing at a sufficient rate to overgrow the dominant corals *Porites compressa* and *Montipora capitata* (cover photo). This may be a localized situation that could be due to elevated nutrient and particulate concentrations in the water that increase sponge growth. A study should be conducted to monitor the growth of this sponge and its competitive impact on corals in various parts of Kane'ohe Bay, and this species should be "red flagged" and watched for as a potential invasive on reefs elsewhere, especially on those close to harbors where it is often a dominant component of the harbor biota.

It is clear from efforts that have been conducted in Hawai'i and elsewhere that, unless nonindigenous marine species are detected soon after their introduction, cleanup and eradication programs have limited if any chance for successful removal of invasive species. Management efforts should therefore focus on stopping introductions at their sources, i.e. prevention of aquaculture or aquarium releases both accidental and intentional, and control of vessel ballast water and hull fouling. It is worth noting that the introduced algae and fishes that are considered among the most troublesome and invasive NIS largely consist of species that were purposely introduced for aquaculture or fisheries enhancement purposes, and such efforts should be severely scrutinized before they are permitted. Although ballast water is considered the main vector for movement of nonindigenous species worldwide, Hawai'i, with its reliance on imported goods, is a net exporter of ballast water, and hull fouling is a more likely pathway for movement NIS both into and among the Islands (Godwin and Eldredge 2001, Godwin 2003). Godwin and Eldredge (2004) have determined that 112 species, including 50 NIS already established in Hawaii and nine new, occurred on the hulls of 35 vessels from both outside Hawaii and moving between the Hawaiian Islands. This indicates that ample opportunities for new introductions still exist and efforts should be made to minimize establishment and propagation of new NIS through adoption and implementation of the Aquatic Invasive Species (AIS) Management Plan for the State of Hawai'i (DLNR/DAR 2003).

Finally it appears from the results of the present study that efforts to maintain the integrity and species diversity of reef communities may also help to promote resistance to establishment of introduced species, especially in restricted or semi-enclosed embayments which are most vulnerable to perturbations and stresses related to man's activities. It is probably no accident that Kane'ohe Bay, with its history of environmental abuses (Smith et al. 1973, 1981, Coles et al. 2002a) has comparable numbers of introduced and invasive species as most harbors that have been surveyed in Hawai'i. Continued efforts to control land runoff, eliminate sewage and other

discharges, and control overfishing on Hawaii's coral reefs may have the added benefit of helping control the establishment and propagation of introduced and invasive species in areas where they do not presently occur.

VII. REFERENCES

- Bax, N., J. T. Carlton, A. Mathews-Amos, R. L. Haedrich, F. G. Howarth, J. E. Purcell, J. E. Rieser, and A. Gray. 2001. Conserving marine diversity through the control of biological invasions. Conserv. Biol. 451:145-176.
- Brock, V. E. 1960. The introduction of aquatic animals into Hawaiian waters. Int. Rev. Ges. Hydrobiol. 45: 463-480.
- Brostoff, W. N. 1989. *Avrainvillea amadelpha* (Codiales, Chlorophyta) from Oahu, Hawai'i. Pac. Sci. 43:166-169.
- Brown, E., E. F. Cox, P. Jokiel, K. Rodgers, W. Smith, B. Tissot, S. L. Coles, and J. Hultquist. In press. Development of benthic sampling methods for the Coral Reef Assessment and Monitoring Program (CRAMP) in Hawai'i. Pac. Sci.
- Carlton, J. T. 1985. Transoceanic and interoceanic dispersal of coastal marine organisms: the biology of ballast water. Ocean. Mar. Biol. Ann.I Rev. 23:313-371.
- Carlton, J. T. 1994. Biological invasions and biodiversity in the sea: the ecological and human impacts of nonindigenous marine and estuarine organisms. Pages 5 11 in.

 Nonindigenous Estuarine and Marine Organisms (NEMO), Proceedings of the Conference and Workshop. Government Printing Office No. 0208-C-04., Seattle, Washington.
- Carlton, J. T. and J. B. Geller. 1993. Ecological roulette: the global transport of nonindigenous marine organisms. Science 261:78-82.
- Carlton, J. T. and L. G. Eldredge. In prep. Marine bioinvasions of Hawai'i: the introduced and cryptogenic marine and brackish water invertebrates of the Hawaiian Archipelago. Bishop Museum, Honolulu.
- Coles, S. L., R. C. DeFelice, L. G. Eldredge, and J. T. Carlton. 1997. Biodiversity of marine communities in Pearl Harbor, Oahu, Hawaii with observations on introduced species. Bishop Museum, Tech. Rep. No. 10, Honolulu.
- Coles, S. L., R. C. DeFelice, J. E. Smith, and L. G. Eldredge. 1998. Determination of baseline conditions for introduced marine species in nearshore waters of the island of Kaho'olawe, Hawaii. Bishop Museum, Tech. Rep. No. 14, Honolulu.
- Coles, S. L., R. C. DeFelice, L. G. Eldredge, and J. T. Carlton. 1999a. Historical and recent introductions to non-indigenous marine species into Pearl Harbor, Oahu, Hawaiian Islands. Mar. Biol. 135: 1247-158.
- Coles, S. L., R. C. DeFelice, and L. G. Eldredge. 1999b. Nonindigenous marine species introductions in the harbors of the south and west shores of Oahu, Hawaii. Bishop Museum, Tech. Rep. No. 15, Honolulu.
- Coles, S. L., R. C. DeFelice, and D. Minton. 2001. Marine species survey of Johnston Atoll June 2000. U.S. Fish and Wildlife Service, Pacific Islands Area Office, Bishop Museum Tech. Rep. 19, Honolulu.
- Coles, S. L. and L. G. Eldredge. 2002. Nonindigenous species introductions on coral reefs: a need for information. Pac. Sci. 56: 191-209.
- Coles, S. L., R. C. DeFelice, and L. G. Eldredge. 2002a. Nonindigenous species in Kan'eohe Bay, Oahu, Hawai`i. Bishop Museum, Tech. Rep. No. 24, Honolulu.

- Coles, S. L., R. C. DeFelice, and L. G. Eldredge. 2002b. Nonindigenous marine species introductions at Waikiki and Hawai'i Kai, O'ahu, Hawai'i. Bishop Museum Tech. Rep. No. 25, Honolulu.
- Coles, S. L., P. R. Reath, P. A. Skelton, V. Bonito, R. C. DeFelice, and L. Basch. 2003.

 Introduced marine species in Pago Pago Harbor, Fagatele Bay and the National Park

 Coast, American Samoa. Bishop Museum Tech. Rep. No. 26, Honolulu.
- Department of Land and Natural Resources, Division of Aqatic Resources. 2003. Aquatic Invasive Species (AIS) Management Plan for the State of Hawai'i. Report prepared for the State of Hawai'i.
- DeFelice, R. C., S. L. Coles, D. Muir, and L. G. Eldredge. 1998. Investigation of the marine communities of Midway Harbor and adjacent lagoon, Midway Atoll, Northwestern Hawaiian Islands. Bishop Museum, Hawaiii Biological Survey Contr. No. 1998-014, Honolulu.
- DeFelice, R., D. Minton, and S. Godwin. 2002. Records of shallow -water marine invertebrates from French Frigate Shoals, Northwestern Hawaiian Islands with a note on nonindigenous species. Bishop Museum Tech. Rep. 23, Bishop Museum, Honolulu.
- Devaney, D. M. and L. G. Eldredge 1977. Subclass Octocorallia. p. 119-129 *in* D. M. Devaney and L. G. Eldredge, ed. Reef and Shore Fauna of Hawai`i. Section 1: Protozoa through Ctenophora. Bishop Museum Press, Honolulu.
- Englund, R. A. 2000. Nonindigenous freshwater and estuarine species introductions and their potential to affect sportfishing in the lower stream and estuarine regions of the south and west shores of Oʻahu, Hawaiʻi. Bishop Museum Tech. Rep. No. 17, Honolulu
- Evans, E. C., III, N. L. Buske, J. G. Grovhoug, E. B. Guinther, P. L. Jokiel, D. T. O. Kam, E. A. Kay, T. J. Peeling, and S. V. Smith. 1974. Pearl Harbor Biological Survey Final Report. Naval Undersea Center (NUC, Rep. No. NUC TN 1128, San Diego.
- Godwin, L. S. 2003. Hull fouling of maritime vessels as a pathway for marine species invasions to the Hawaiian Islands. Biofouling 19 (Supplement):123-131.
- Godwin, L. S. and L. G. Eldredge. 2001. South Oahu Marine Invasions Shipping Study (SOMISS). Bishop Museum Tech. Rep. No. 20, Honolulu.
- Godwin, L. S. and L. G. Eldredge. 2004. The assessment of hull fouling as a mechanisms for the introduction and dispersal of marine introduced species in the main Hawaiian Islands.

 Bishop Museum Tech. Rep. No. xx, Honolulu.
- Grigg, R. W. 2003. Invasion of a deep black coral bed by an alien species *Carijoa riisei*, off Maui, Hawaii. Coral Reefs 22:121-122.
- Hewitt, C. L., M. L. Campbell, K. M. Moore, N. B. Murfet, and B. Robertson. 1998. Introduced species survey. Port of Hay Point, Queensland. CSIRO Centre for Research on Introduced Marine Pests to Ports Corporation of Queensland, Unpublished Report, Brisbane.
- Hoedt, F. E., J. H. Choat, J. Collins, and J. J. Cruz. 2000. Mourilyan Harbour and Abbot Point surveys: port marine baseline surveys and surveys for introduced marine pests. School of Marine Sciences and Aquaculture, James Cook University to Ports Corporation of Queensland, Brisbane.

- Hoedt, F. E., J. H. Choat, J. Collins, and J. J. Cruz. 2001. Port of Lucinda surveys: port marine baseline surveys and surveys for introduced marine pests. School of Marine Sciences and Aquaculture, James Cook University to Ports Corporation of Queensland, Brisbane.
- Hutchings, P. A., R. W. Hilliard, and S. L. Coles. 2002. Species introductions and potential for marine pest invasions into tropical marine communities, with special reference to the Indo-Pacific. Pac. Sci. 56:223-233.
- Kinzie, R. A., III. 1968. The ecology of the replacement of *Pseudosquilla ciliata* by *Gonodactylus falcatus* (Crustacea: Stomatopoda) recently introduced into the Hawaiian Islands. Pac. Sci. 22: 465-475.
- Kinzie, R. A., III. 1984. Aloha also means goodbye: a cryptogenic stomatopod in Hawaii. Pac. Sci. 38: 298-311.
- Paulay, G., L. Kirkendale, G. Lambert, and C. Meyer. 2002. Anthropogenic biotic interchange in a coral reef ecosystem: a case study from Guam. Pac. Sci. 56:403-421.
- Randall, J. E. 1987. Introductions of marine fishes to the Hawaiian Islands. Bull. Mar. Sci. 41: 490-502.
- Rodgers, S. K. and E. F. Cox. 1999. Rate of spread of introduced Rhodophytes *Kappaphycus alvarezzii*, *Kappaphycus striatum*, and *Gracilaria salicornia* and their current distributions in Kane'ohe Bay, O'ahu, Hawai'i. Pac. Sci. 53: 232-241.
- Ruiz, G. M., J. T. Carlton., E. D. Grosholz, and A. H. Hines. 1997. Global invasions of marine and estuarine habitats by non-indigenous species: mechanisms, extent and consequences. Am. Zool 31:621-632.
- Russell, D. J. 1983. Ecology of the red seaweed *Eucheuma striatum* Schmitz on Coconut Island, Oahu, Hawaii. Pac. Sci. 37: 87-107.
- Russell, D. J. 1992. The ecological invasion of Hawaiian reefs by two marine red algae, Acanthophora spicifera (Vahl) Boerg. and Hypnea musciformis (Wulfen) J. Ag., and their association with two native species, Laurencia nidifica J. Ag. and Hypnea cervicornis J. Ag. ICES Mar. Sci. Symp. 194: 110-125.
- Smith, J. E., C. M. Hunter, and C. M. Smith. 2002. Distribution and reproductive characteristics of nonindigenous and invasive marine algae in the Hawaiian Islands. Pac. Sci. 53:299-315.
- Smith, S. V., K. E. Chave, and D. T. O. Kam. 1973. Atlas of Kane`ohe Bay: a reef ecosystem under stress. University of Hawai`i, Sea Grant Program, UHIHI-SEAGRANT-TR-72-01, Honolulu.
- Smith, S. V., W. J. Kimmerer, E. A. Laws, R. E. Brock, and T. W. Walsh. 1981. Kaneohe Bay Sewage Diversion Experiment: perspectives on ecosystem responses to nutritional perturbation. Pac. Sci. 35:279-402
- Southward, A. J., R. S. Burton, S. L. Coles, P. R. Dando, R. DeFelice, J. Hoover, E. Parnel, T. Yamaguchi, and W. A. Newman. 1998. Invasion of Hawaiian inner shores by an Atlantic barnacle. Mar. Ecol. Prog. Ser. 165: 119-126.
- Stachowicz, J. J., R. B. Whitlatch, and R. W. Osman. 1999. Species diversity and invasion resistance in a marine ecosystem. Science 286:1577-1579.
- Woo, M., C. M. Smith, and W. Smith. 1999. Ecological interactions and impacts of invasive Kappaphycus striatum in Kane`ohe Bay, a tropical reef. Pages 186-191 in J. Pederson, editor. Marine Bioinvasions. MIT Sea Grant Program, Cambridge, Mass.

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APPENDIX A

Rapid Assessment Site Descriptions for Kaua'i, Moloka'i, Maui, Hawai'i and O'ahu

Kaua'i

Station KARA1. <u>Marriott Hotel Reef</u>, near Nawiliwili Harbor entrance. 11-Nov-02 (Latitude 21°57'36.3", Longitude 159°21'14.6"). Nearest harbor pier:1.0 km. Nearest boat ramp: 1.5 km. Depth 2.5-6 m.

100 m east of jetty which forms east side of Nawiliwili docking area. Substratum consisted of wave disturbed reef with little relief and moderate patchy coral cover mostly of *Porites lobata* and *Pocillopora meandrina* and abundant algae in 2.5 to 5 m depth. Deeper areas >5 m along western side have greater relief with ledges and grooves providing habitat for diverse fishes and coral cover of ca. 50%. High exposure to tradewind generated waves caused limited visibility of around 5 m.

Station KARA2. <u>Beach House Reef.</u> 12-Nov-02 (Latitude 21°53'5.9", Longitude 159°28'45.5) Nearest harbor pier:13.1 km. Nearest boat ramp: 2.1 km. Depth 1-1.5 m.

Shallow high energy reef about 1.5 m deep just inside the surf line east of Kukui'ula small boat harbor. Substratum is consolidated limestone pavement and rubble with sparse (ca. 5%) and patchy coverage of corals and thin growth of algae, mostly of a small iridescent species of *Dictyota*. Reef is highly exposed to wave turbulence subject to sand scour from surrounding sandy area. Conditions during survey were turbulent from north Pacific swell with visibility of 6-8 m.

Station KARA3. <u>Hoʻai Bay 1</u>. 12-Nov-02. (Latitude 21°52'48.7", Longitude 159°28'28.3"). Nearest harbor pier: 13.5 km. Nearest boat ramp: 2.3 km. Depth.7.5-10 m

Substratum is a mostly smooth, boulder-strewn reef pavement surrounded by sandy areas, with moderate coral cover primarily of scattered *Pocillopora meandrina* and intermittent 1-2 m² area cracks in reef. Large limestone outcrops are interspersed and form high relief with flat tops which provide surfaces where most coral cover occurs. Bottom depth ranged 7.5 to 10.5 m depth with abundant coral cover and high relief providing habitat for abundant and diverse fish and macroinvertebrates. Conditions calm and water clear with visibility of ca. 20 m.

Station KARA4. <u>Hoʻai Bay 2</u>. 12-Nov-02. (Latitude 21°52'53.4", Longitude 159°28'34.2"). Nearest harbor pier: 13.6 km. Nearest boat ramp: 2.2 km. Depth 2.5-3 m

Gently sloping, flat, algal dominated limestone bottom, boulder–strewn and cracked, with low coral cover of 5-10%, mostly of *Pocillopora meandrina* and intermittent outcrops with *Porites lobata*. Conditions calm and water clear with visibility of ca. 20 m.

Station KARA5. <u>Port Allen Harbor Entrance</u>. 13-Nov-02. (Latitude 21°54'3.5", Longitude 159°35'49.9"). Nearest harbor pier: 0.6 km. Nearest boat ramp: 0.7 km. Depth 7.5-10 m.

Limestone reef located at the base of a reef just inside of the harbor entrance ranging from area surveyed at reef base in 7.5-10.5 depth to top of reef in ca. 5 m. Bottom is mostly loosely consolidated cobble to boulder-size coral rubble surrounded by sand and cobble. All surfaces were covered by a thin coating of fine sand/silt, and hard surfaces were dominated by an abundant growth of *Sargassum* cf. *echinocarpum* algae. Coral coverage was low, ca. 1-5% with a few large colonies of *Porites lobata*. In shallower areas <5 m depth coral cover was higher at

around 25% with less sediment. Turbulent conditions and sediment-laden water from Hanapepe stream cause low visibility limited to ca. 5 m.

Station KARA6 "<u>Tigers</u>", ca. 1 km outside Pakala's Plantation. 14-Nov-02. (Latitude 21°55'45.5", Longitude 159°39'11.5"). Nearest harbor pier: 8.3 km. Nearest boat ramp: 8.4 km. Depth 9-11 m

Bottom consolidated limestone platform with little relief surrounded by coarse sand. Major bottom cover was abundant macroalgae with sparse, small low-lying corals and total cover of 2-5%. Area is apparently influenced by sediment from small boat harbor construction on shore and from Olekele Sugar Mill outflow. These and turbulent conditions caused moderately reduced visibility of 10-15 m.

Station KARA7. Nomilu Pond. 14-Nov-02. (Latitude 21°53'13.7", Longitude 159°31'58.8"). Nearest harbor pier: 7.3 km. Nearest boat ramp: 4.5 km. Depth 75.-9 m.

Site is ca. 200 m off red sandstone bluff near Nomilu Fishpond in a semi-sheltered embayment. Bottom is consolidated limestone pavement with low relief, algal cover dominated by *Melamansia glomerata* and widely spaced corals of ca. 5-10% coverage. Conditions quite calm and visibility ca. 20 m.

Station KARA8. <u>Kukuiʻula</u>. 14-Nov-02. (Latitude 21°53'8.4", Longitude 159°29'16.8"). Nearest harbor pier: 12.0 km. Nearest boat ramp: 0.7 km. Depth 6.5-7.5 m.

Ca. 150 m from shoreline on flat consolidated limestone bench reef with light sand coating, sparse macroalgae and coral cover of ca. 5-10%, with abundant and diverse fish fauna. Conditions calm and clear with visibility. Conditions calm and water clear with visibility of ca. 20 m.

Moloka'i

Station MORA1. <u>Puko'o Nearshore</u>. 27-Jan-03 (Latitude 21°04'18.8", Longitude 156°48'16.1"). Nearest harbor pier:0.3 km. Nearest boat ramp: 0.3 km. Depth 0.5-2 m. Visibility poor, ca. 1-3 m Heavily silted reef flat with muddy/sandy bottom adjacent to stream that empties onto reef flat next to a fishpond. Coral cover ca. 10–25% dominated by *Montipora capitata*, *Porites compressa*, and *Porites lobata* along the reef edge above a sludgy sand. Abundant *Acanthophora spicifera* and *Halimeda* sp. on loose rubble and non-coral reef surfaces.

Station MORA2 <u>Pala'au</u>. 28-Jan-03 (Latitude 21°05'30.4", Longitude 157°06'38.7") Nearest harbor pier: 8.4 km. Nearest boat ramp: 8.4 km. Depth 3-7 m. Visibility very good, ca. 15 m. Flourishing reef area with high coral cover (ca. 70 - 90%) mainly composed of *Porites compressa*, *Porites lobata*, and *Montipora capitata*. Topography mostly level except for deep cut channels through the reef with coarse sand bottoms. Abundant turf algae and some crustose coralline algae

Station MORA3. <u>Hale o Lono Reef</u> 28-Jan-03 (Latitude 21°05'1.4", Longitude 157°14'57.7"). Nearest harbor pier: 0.6 km. Nearest boat ramp: 22.7 km. Depth 6-8 m. Visibility excellent ca. 20 m.

Forereef directly outside of Hale o Lono Harbor with high coral cover of 60-80%, mainly composed of *Porites lobata* and *Montipora capitata*. Little vertical relief except along the edges of sand-filled channels extending ca. 2 m below reef. Substratum mostly consolidated without much loose rubble. Abundant *Asparogopsis taxiformis* observed in one small areas and introduced *Cephalopholis argus* found primarily along the edges of sand patches and along channels where the greatest relief occurred.

Station MORA4. <u>Puko'o Offshore</u>. 29-Jan-03 (Latitude 21°03'55.8", Longitude 156°47'38.4"). Nearest harbor pier: 1.2 km. Nearest boat ramp: 1.2 km. Depth 0.5-1 m. Visibility poor, ca. 3-5 m. Shallow reef, heavily wave disturbed and scoured, located just inside of a "blue hole" and dominated by macroalgae. Coral cover was variable ca. 5-20%, composed of small *Porites compressa* and *Pocillopora damicornis* heads, and vertical relief was <1m. Fair amount of moderate sized coral rubble occurred with high turf and macroalgal cover (including *Turbinaria ornata*), and some sand patches, This is the type locality of *Porites pukoensis*, and some colonies were photographed at the edge of the blue hole, which had the best coral coverage, largest colonies, and relatively high species diversity in the area. Coral coverage increased slightly in breaker zone where some rubble lined channels added relief.

Station MORA5. <u>Kamalo</u>. 29-Jan-03 (Latitude 21°02'40.6", Longitude 156°54'1.1") Nearest harbor pier: 12.0 km. Nearest boat ramp 15.3 km. Depth 3-6 m. Visibility poor, ca. 1-3 m Flourishing forereef with high coral coverage bordered on the shoreward side by a deep blue hole extending to 21 m depth with sides virtually a monospecific stand of *Montipora capitata*. Coral cover on reef top was patchy but mostly between 50–80% coverage and composed mainly of *P. lobata*, *P. compressa*, and *M. capitata*. Strong ground swell caused sand suspension and low visibility that is apparently atypical for this site.

Station MORA6 Kamiloloa 30-Jan-03 (Latitude 21°04'18.2", Longitude 157°00'9.7"). Nearest harbor pier: 3.6 km. Nearest boat ramp: 5.3 km. Depth 6-7 m. Visibility intermediate, ca. 5-6 m Flat forereef area bisected by shallow sand channels and intermittent dead coral heads. Coral cover was sparse, ca. 5% of small *Pocillopora, Porites* and *Montipora* colonies, and *Halimeda* algae turf algae holding sediments abundant, with much of reef sand covered.

Station MORA7. <u>Kaunakakai Reef</u>. 30-Jan-03 (Latitude 21°04'59.6", Longitude 157°02'34.9"). Nearest harbor pier: 1.1 km. Nearest boat ramp: 1.5 km. Depth 7-10 m. Visibility excellent ca. 25 m

Forereef on western side of channel to Kaunakakai Harbor. Coral cover lush and abundant, with ca. 80% cover mainly composed of stands of *Porites compressa*, *Porites lobata*, and *Montipora capitata*. Relief was generally low except for 2–3 m deep channels, usually more than 5 m wide with sandy bottoms and some rubble. Highest diversity of fish relative to other Moloka'i sites, and

this was the only site where the Hawaiian endemic soft coral *Sinularia molokensis* was found in two medium sized patches.

Station MORA8. <u>Hotel Moloka'i</u>. 31-Jan-03 (Latitude 21°04'28.7", Longitude 156°59'48.7"). Nearest harbor pier: 4.1 km. Nearest boat ramp: 4.3 km. Depth 0.2-1 m. Visibility intermediate, ca. 5 m

Very shallow reef flat inside of wave breaker line, with ca. 10-15% coral cover interspersed among sand channels with coarse sediment and coral rubble beds. Abundant macroalgae on dead reef rubble and abundant alpheid burrows visible in coarse sand.

Maui

Station MARA1. <u>Kehekili Beach Park</u>. 29-Mar-03. (Latitude 20°56'22.2", Longitude 156°41'45.8) Nearest harbor pier 32.3 km. Nearest boat ramp 6.0 km. Depth 1.5-5 m. Visibility high (ca. 15 m) Shallow reef in semi-exposed embayment about 50 m off heavily used beach area with high (ca. 50%) coral cover dominated by *Porites* and *Montipora* species. However, macroalgae was also abundant, especially introduced *Acanthophora spicifera*, which was greatest near the shoreline but also occurred to the reef edge, along with red turf algae.

Station MARA2. Olowalu. 30-Mar-03 (Latitude 20°48'42.2", Longitude 156°36'45.5) Nearest harbor pier: 12.4 km. Nearest boat ramp: 12.5 km. Depth 2.5-3.0 m. Visibility poor (ca. 5 m) Degraded reef with occasional grooves in midst of black sand with numerous dead corals and calcareous substratum coated with fine sediment and fine turf, but still with moderate coral coverage among of ca. 30% dominated by outcrops and heads of *Porites lobata* and *Porites evermanni* up to 2 m in diameter and patches of *Sarcothelia edmondsoni* soft coral.

Station MARA3. <u>Papa'ula Point</u>, outside of Spartan Reef. 31-Mar-03. (Latitude 20°55'39.3", Longitude 156°25'44.9"). Nearest harbor pier: 6.2 km. Nearest boat ramp: 6.3 km. Depth 9-12 m. Visibility high ca. 15 m

Very flat reef surface with intersecting channels providing the only relief, bottom characteristic of reef subject to high swell turbulence. Coral coverage high and dominated by encrusting *Montipora flabellata* and *Porites lobata*, with total coral coverage of 80-90%. Non-coral reef surfaces support abundant and diverse macroalgae, includinge *Acanthophora spicifera* and *Turbinaria ornata*.

Station MARA4. <u>Honolua Bay</u>. 1-Apr-03. (Latitude 21°01'8.9", Longitude 156°38'334.2"). Nearest harbor pier: 27.4 km. Nearest boat ramp: 17.1 km. Depth 2.5-8.5 m. Visibility excellent, ca. 20 m. Coral reef in excellent condition in semi-enclosed embayment which provides shelter from open ocean swell turbulence but is well mixed with oceanic seawater. High abundance and diversity of corals and reef fishes found despite high tourist usage, as indicated by more than five large boats and over 50 snorkelers observed in the vicinity of the reef during two hours. Coral coverage totaled ca. 50-60 % of available substratum and was dominated by *Porites lobata* and *Porites*

evermanni. Macroalgae on non-coral reef surfaces dominated by *Turbinaria ornata* and *Melamansia glomerata*.

Station MARA5. <u>Puamana</u>. 1-Apr-03. (Latitude 20°51'29.9", Longitude 156°40'8.4"). Nearest harbor pier: 21.0 km. Nearest boat ramp: 5.3 km. Depth 3-3.5 m. Visibility very poor, ca. 2 m Highly disturbed reef subject to turbulent conditions and sediment-laden water from south Pacific swells, resulting in very turbid water and marginal coral conditions with low coral coverage of only ca. 1-5%, mostly *Porites lobata*. Heavy cover of large variety of macroalgae.

Station MARA6. Mala Wharf. 1-Apr-03. (Latitude 20°53'23.2", Longitude 156°41'26.8"). Nearest harbor pier: 27.2 km. Nearest boat ramp: 0.2 km. Depth 3-9 m. Visibility excellent, ca. 30 m. Collapsed dock area in vicinity of reef provides numerous iron projections, concrete beams and other hard surfaces, providing high relief and substratum for development of abundant and diverse hard coral cover and reef fishes. Introduced octocoral *Carijoa riisei* was abundant on under surfaces of beams.

Station MARA7. <u>Ma'alaea Reef</u> 2-Apr-03. (Latitude 20°47'31.6", Longitude 156°30'45.8"). Nearest harbor pier: 0.3 km. Nearest boat ramp: 0.4 km. Depth 2.5-5.5 m. Visibility intermediate 5-6 m

Degraded and disturbed reef near <u>Ma'alaea</u> Harbor entrance dominated by macroalgae, especially very abundant introduced *Acanthophora spicifera*. Reef highly impacted by south swells and sediment scour and deposition, with low coral coverage of ca. 10%, mostly *Pocillopora meandrina* and *Porites lobata*

Station MARA8. <u>Kanahena Bay</u> 3-Apr-03. (Latitude 20°38'5.3", Longitude 156°29'57.6"). Nearest harbor pier: 20.6 km. Nearest boat ramp: 20.8 km. Depth 3-8 m. Visibility good, ca. 15-20 m. Patchy reef that is subject to moderate swell within semi-enclosed embayment. Reefs are intermittent among sand patches and have 50-75% coral cover, mostly composed of *Porites lobata* and *Porites evermanni* growing in clumps up to 5-10 m total diameter, but also abundant *Montipora capitata, Montipora patula,* and *Pocillopora meandrina*. Moderate alga coverage on non-coral reef surfaces most composed of calcareous species.

Station MARA9. <u>Molokini Crater</u> 3-Apr-03. (Latitude 20°37'14.9", Longitude 156°26'30.8"). Nearest harbor pier: 17.7 km. Nearest boat ramp: 17.8 km Depth 7-8.5 m. Visibility excellent, ca. 30 m.

Remote reef in apparently natural state, despite frequent visits and high usage by snorkelers and scuba divers. Protection on south side by crater rim and north by Maui has restricted long period wave turbulence and promoted high coral growth. Coral coverage is ca. 75-90%, dominated equally by *Porites lobata, Porites evermanni, Montipora capitata*, and *Montipora patula*. High reef fish abundance and diversity, very little macroalgae.

Hawai'i

Station HARA1. <u>Kawaihae Reef</u>. 23-Jun-03. (Latitude 20°01'55.5", Longitude 155°50'09.4") Nearest harbor pier 1.8 km. Nearest boat ramp 1.5 km. Depth 4-9 m. Visibility excellent, ca. 25+ m.

Flourishing reef with well developed spur and groove system just seaward of Kawaihae Harbor breakwater. High coral coverage of ca. 65-75% dominated by *Porites lobata, Porites evermanni,* and *Porites compressa*, with abundant and diverse fish and few macroalgae.

Station HARA2. <u>Puako</u>. 24-Jun-03 (Latitude 19°58'23.2", Longitude 155°51'04.4") Nearest harbor pier: 8.2 km. Nearest boat ramp: 7.9 km. Depth 6-9 m. Visibility excellent, ca. 25 m.

Pristine reef with very abundant coral dominated by three species of *Porites* totaling up to 90% cover, high relief from cliffs and channels, abundant fish, few macroalgae.

Station HARA3. 'Anaeho'omalu. 24-Jun-03. (Latitude 19°57'2.2", Longitude 155°52'08.4"). Nearest harbor pier: 10.9 km. Nearest boat ramp: 10.6 km. Depth 8.5-9 m. Visibility excellent, ca. 25 m.

Similar to HARA1 and HARA2, with very high coral cover and high relief from buttresses and channels.

Station HARA4. <u>Keawaiki</u>. 24-Jun-03.. (Latitude 19°53'39.0", Longitude 155°54'45.4"). Nearest harbor pier: 18.8 km. Nearest boat ramp: 18.5 km. Depth 12-14 m. Visibility excellent, 25+ m. High coral cover, around 75%, mostly of *Porites compressa* with some *P. lobata* and *P. evermanni*. Relief intermediate.

Station HARA5. <u>Kualani Point</u>. 25-Jun-03. (Latitude 19°33'05.7", Longitude 155°57'54.2"). Nearest harbor pier: 68.5 km. Nearest boat ramp: 16.2 km. Depth 9.5-10.5 m. Visibility excellent, 25+ m.

Intermediate coral coverage of ca. 50%, mostly of *Porites lobata* and *P. evermanni*, with abundant coral rubble strewn in channels among large coral outcrops.

Station HARA6 Red Hill. 25-Jun-03. (Latitude 19°30'28.8", Longitude 155°57'19.5"). Nearest harbor pier: 71.0 km. Nearest boat ramp 18.9 km. Depth 5.5-13.5 m. Visibility excellent 25+ m. Reef outside point descending from 5 to 10 m depth, out side of which drops-off to 13.5 m with numerous ledges and channels along edge. Upper reef dominated by *Pocillopora meandrina*, lower portion by *Porites lobata, P. evermanni,* and *P. compressa*. Surgy but clear conditions, abundant and diverse fish population.

Station HARA7. North Keauhou. 26-Jun-03. (Latitude 19°34'17.8", Longitude 155°58'20.2"). Nearest harbor pier: 64.3 km. Nearest boat ramp 14.1 km. Depth 6-6.5. m. Visibility poor, 5-6 m Intermediate coral cover (30-50%) dominated by *Porites lobata and P. evermanni* with moderate development of channels and ridges.

Station HARA8. <u>South Oneo Bay.</u> 26-Jun-03. (Latitude 19°38'04.8", Longitude 156°01'33.4"). Nearest harbor pier: 57.4 km. Nearest boat ramp: 7.4 km. Depth 8-9 m. Visibility good, ca. 15-20 m.

Reef in central section of a highly used bay with high degree of shoreline development. High coral cover of ca. 50% dominated by *Porites Iobata*, *P, evermanni*, and *P. compressa*, intermediate development of relief and channels.

Station HARA9. <u>Papawai Bay</u>. 26-Jun-03. (Latitude 19°39'00.6", Longitude 156°01'33.4"). Nearest harbor pier: 53.5 km. Nearest boat ramp: 3.9 km Depth 7-13.5 m. Visibility excellent, ca. 30 m.

North side of bay with a steep fringing reef showing signs of storm damage with abundant coral rubble in cobble to boulder size ranges. Coral cover 30-50% dominated by *Pocillopora meandrina* and abundant and diverse fish.

Station HARA10. <u>Leleiwi Bay</u>. 28-Jun-03. (Latitude 19°44'14.3", Longitude 155°01'16.5"). Nearest harbor pier: 8.8 km. Nearest boat ramp: 8.9 km Depth 6.5-10 m. Visibility excellent, ca. 30 m. Reef in excellent condition just offshore of Leleiwi Beach Park. Intermediate coral coverage of ca. 50% with high diversity and abundant fish

O'ahu

Station OARA1. <u>Kane'ohe Bay, Waiahole Reef</u> 11-June-03. (Latitude 21°28' 35.2", Longitude 157°49' 55.0"). Nearest harbor pier 4.4 km. Nearest boat ramp 4.5 km. Depth 1.0-5 m. Visibility poor, ca. 5 m.

Along patch reef in central bay from reef edge at 1 m to slope at 5 m. Coral cover dominated by *Porites compressa* from high coverage of ca. 60% on reef slope to ca. 20% along reef edge. Brisk tradewinds generating small waves which stirred up sediment, increasing turbidity.

Station OARA2. <u>Kane'ohe Bay, He'eia Reef</u>. 11-June-03 (Latitude 21°26' 48.0", Longitude 157°48' 37.0") Nearest harbor pier 0.3 km. Nearest boat ramp: 0.5 km. Depth.5-6.0 m. Visibility poor, ca. 5 m.

Patch reef adjacent to He'eia Harbor channel with depths ranging 0.5 to 3 m from reef flat to mid reef slope. Moderate coral cover of *Porites compressa* and abundant *Dictyosphaeria cavernosa* on reef flat and slope.

Station OARA3. Nanakuli Point. 13 Aug-03. (Latitude 21°22' 20.3", Longitude 158°08' 32.1"). Nearest harbor pier: 6.2 km. Nearest boat ramp: 6.1 km. Depth 4-5 m. Visibility good, ca. 10 m. Nearshore reef in marginal condition interspersed with sand channels subjected to frequent ground swell turbulence and sand scour. Moderate coral cover of ca. 20% dominated by Porites lobata and Pocillopora meandrina; algae moderately abundant.

Station OARA4. <u>Kahe Beach Park</u>. 13 Aug-03. (Latitude 21°21' 34.1", Longitude 158°08' 6.1"). Nearest harbor pier: 3.4 km. Nearest boat ramp: 3.3 km. Depth 3-4 m. Visibility good, ca. 20 m. Reef edge next to large sand bed which was highly impacted by Hurricane *Iniki* in 1992 but has undergone rapid recovery to coral cover of ca. 35%. Diverse coral assemblage dominated by *Porites Iobata, P. evermanni,* and *Pocillopora meandrina*. Reef fish abundant and diverse, algae coverage low.

Station OARA5. <u>Pupukea Beach Park</u>. 17-Sep-03. (Latitude 21°38' 46.6", Longitude 158°03' 52.4"). Nearest harbor pier: 7.5 km. Nearest boat ramp: 7.6 km. Depth 1-6 m. Visibility excellent, ca. 25 m.

Heavily scoured reef that is subjected to yearly high wave turbulence from North Pacific swells but supports moderate abundance of mostly encrusting corals dominated by *Porites* and *Montipora* species and a few *Pocillopora meandrina* colonies. Most of the reef surface is covered with a fine turf algae coated with fine sand. Outer edged of site has a vertical wall to ca. 6 m depth with caves and overhangs which provide habitat for abundant reef fishes.

Station OARA6. <u>Hanauma Bay</u> 21-Oct-03. (Latitude 21°16' 6.4", Longitude 157°41' 43.5"). Nearest harbor pier 5.4 km. Nearest boat ramp: 5.6 km. Depth 5-7 m. Visibility excellent, ca. 25 m

Shallow reef in excellent condition located near southwestern side of the bay adjacent to large central sand bed. High coral coverage of ca. 70% dominated by large colonies of *Porites lobata* and *P. evermanni*. Reef fishes very diverse and abundant, with macroalgae rare.

APPENDIX B

Native, Nonindigenous and Cryptogenic Taxa Recorded on Rapid Assessment Surveys at 41 Coral Reef Sites on the Islands of Kaua'i, O'ahu, Moloka'i, Maui and Hawai'i, November 2002-October 2003.

Kingdom: BACTERIA	TDIA										
Phylum: CYANOBACT			^_								
	OSCILLATOR			n\ Ham							
L	ngbya majus	RA1		RA3		RA5	DA6	RA7	RA8	DΛΩ	RA10
	Kauai	Х	X	Х	11/14	Х	IVAU	X	1170	11/13	1111
	Oahu	X	X	X	х	X	х	111		1111	1111
	Molokai	^	X	^	X	X	^	X		1111	1111
	Maui	Х	X	Х	X	X		^	Х	X	
	Hawaii	X	X	^	X	X	х	х	X	^	X
Family	PHORMIDIA		^		^	^	^	^	^		^
	ymploca hydr		2 Gom	ont							
•,	,pcoay a.	RA1		RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			0						1111	
	Oahu							1111		1111	1111
	Molokai				х					1111	HH
	Maui			х	•						1111
	Hawaii		х	X				х			
Kingdom: PROTOCTISTA	Hawan		^	^				^			
Phylum: CHLOROPHY	/TA										
•	CAULERPAC	FAF									
	aulerpa racem		Forssk	rål) Ag	ardh						
•		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai										HIII
	Oahu							1111		1111	1111
	Molokai									1111	HH
	Maui				х						1111
	Hawaii										х
C	aulerpa serrui	lata (F	orsskå	ål) Aga	rdh						
				RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu							1111		1111	1111
	Molokai		х							1111	HH
	Maui										1111
	Hawaii		х								
C	aulerpa sertu	larloid	es (Gn	nelin) l	Howe						
				RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai						Х		1111	1111	1111
	Oahu							1111		1111	1111
	Molokai									1111	1111
	Maui				х				Х		1111
	Hawaii										
C	aulerpa taxifo	lia (Va	hl) Ag	ardh							
	•	RÀ1		RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu						Х	1111		1111	1111
	Molokai									1111	1111
	Maui										1111
	Hawaii										
Family:	CLADOPHOR	RALES									
	ladophora sp.										
			RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu				Х					1111	1111
	Molokai									1111	1111
	Maui		Х						Х		1111
	Hawaii	Х			Х						
M	icrodictyon s	р.									
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								4111	1111	1111
	Oahu				Х			1111		4111	1111
	Molokai									1111	1111
	Maui										1111
	Hawaii										

Family: CODIA										
Codium	edule Silva									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
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Oa	ahu						1111	1111	1111	1111
Mo	olokai								1111	1111
Ma	aui									1111
Ha	awaii									
Codium	reediae Silva									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
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	ahu						1111	1111	1111	1111
	olokai								1111	1111
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Family: DASY										
		-1-1-								
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	ahu		Х	Х			1111	1111	1111	1111
	olokai					Х		Х	1111	
Ma	aui	Х	Х		Х	Х	Х	Х		
	awaii		Х		Х	Х			Х	
Family: HALIM	IEDACEAE									
Halimeda	a discoidea D	ecaisr)	ne .							
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka	nuai					Х	Х	1111	1111	1111
Oa	ahu						1111	1111	1111	11111
Mo	olokai								1111	1111
Ma		х	х							HH
	awaii									
	incrassata (Ellie 8	Solar	der) I	amour	OUV				
Hammede	RA1				RA5		RA7	RA8	PΔQ	RA10
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()										
	ahu						1111			
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Mo Ma Ha Halimeda Ka Oa	olokai aui awaii a <i>opuntia?(</i> L RA1 auai				JX RA5		RA7 x	x	RA9	RA10
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Mo Ma Halimeda Ka Oa Ma Halimeda Ka Oa Mo Ma Family: SIPHO Dictyosp Ka Oa Ma	olokai aui awaii a opuntia?(L RA1 auai ahu blokai x awaii asp. RA1 auai ahu blokai awaii bNOCLADACE chaeria caveri ahu aluai ahu clokai awaii awaii awaii awaii awaii awaii awaii awaii awaii	X X X RA2	RA3 x RA3 Forssk RA3 x	RA4 x RA4 at ål) Bø RA4 x	RA5 X X X X RA5	x RA6	RA7 x iiiii x x RA7	X RA8 X X RA8	RA9	RA10
Mo Ma Halimeda Ka Oa Ma Halimeda Ka Oa Mo Ma Family: SIPHO Dictyosp Ka Oa Ma	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii NOCLADACE chaeria caveri RA1 auai ahu blokai x auai ahu chaeria verslu awaii	RA2 x x RA2 EAE nosa (I RA2 x	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 aål) Bø RA4 x	RA5 X X X RA5 X RA5	RA6	RA7 x x RA7 iiiii	RA8	RA9	RA10 x
Mo Ma Halimeda Ka Oa Ma Halimeda Ka Oa Mo Ma Family: SIPHO Dictyosp Ka Oa Ma	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii NOCLADACE chaeria caveri RA1 auai ahu blokai x auai ahu chaeria verslu awaii	RA2 x x RA2 EAE nosa (I RA2 x	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 aål) Bø RA4 x	RA5 X X X X RA5	RA6	RA7 x iiiii x x RA7	RA8	RA9	RA10
Ma Ma Halimeda Ma Ma Halimeda Ka Oa Ma Ma Family: SIPHO Dictyosp Ka Oa Ma Ma Dictyosp	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii NOCLADACE chaeria caveri RA1 auai ahu blokai x auai ahu chaeria verslu awaii	RA2 x x RA2 EAE nosa (I RA2 x	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 aål) Bø RA4 x	RA5 X X X RA5 X RA5	RA6	RA7 x x RA7 iiiii	RA8	RA9	RA10 x
Mo Ma Halimeda Ka Oa Ma Halimeda Ka Oa Mo Ma Ha Family: SIPHO Dictyosp Ka Oa Ma Halimeda Ma Halimeda Ma Halimeda Ma Halimeda Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii NOCLADACE chaeria caveri RA1 auai ahu blokai x auai ahu x blokai x auai ahu x auai	RA2 x x RA2 EAE nosa (I RA2 x	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 aål) Bø RA4 x	RA5 X X X RA5 X RA5	RA6	RA7 x x RA7 iiiii	RA8	RA9	RA10 x
Ma Ma Halimeda Ka Oa Ma Halimeda Ka Oa Ma Family: SIPHO Dictyosp Ka Oa Ma Dictyosp	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii NOCLADACE chaeria caveri RA1 auai ahu x olokai x awaii ahu x	RA2 x x RA2 EAE nosa (I RA2 x yysii W RA2	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 aål) Bø RA4 x	RA5 X X X RA5 X RA5	RA6	RA7 x iiiii x x RA7 iiiii RA7	RA8	RA9	RA10 x
Ma Ma Halimeda Ka Oa Ma Halimeda Ka Oa Ma Family: SIPHO Dictyosp Ka Oa Ma Ha Dictyosp	olokai aui awaii a opuntia? (L RA1 auai ahu olokai x awaii asp. RA1 auai ahu olokai awaii awaii awaii awaii awaii ahu x clokai aui awaii ahu x clokai x aui ahu x	RA2 x x RA2 EAE nosa (I RA2 x yysii W RA2	RA3 x RA3 Forssk RA3 x /eber E	RA4 x RA4 Aål) Bø RA4 x Bosse RA4	RA5 X X X RA5 X RA5	RA6	RA7 x iiiii x x RA7 iiiii RA7	RA8	RA9	RA10 x

Family: ULV	ACEAE										
Ulva fa	sciata D		D.4.0	D.4.0	D 4 4	D.4.5	D 4 0	D 4 7	D 4 0	D 4 0	D 4 4 0
(Kauai Oahu Molokai Maui Hawaii	RA1	RA2	x x	KA4	RA5	KA6	RA7	$\Pi\Pi$	RA9	RA10
<i>Ulva</i> sp											
,	Vousi	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
· ·	Kauai Oahu Molokai Maui			x							
	Hawaii	۸.									
Family: VAL Valoni a		1 ⊏									
	•	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
(Kauai Oahu Molokai Maui Hawaii				x			1111	x		
	aria veni	tricosa	(Agai	rdh) Ol	sen &	West					
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
(Kauai Oahu Molokai Maui	Х	Х		X X			X	x		
Phylum: PHAEOPHYTA	Hawaii			Х							
Family: DIC1	TYOTACE	AE									
Dictyo	ta sp.	RA1	DAG	DAO	RA4	DAE	RA6	RA7	RA8	RA9	DA10
1	Kauai	KAI	KAZ	X	KA4	KAS	X	KA/	KAO	KA9	KATU
I	Oahu Molokai Maui	X X		x	X X			x	x		
	Hawaii	х.	X	0.147				01			X
Dotyell	la hawaii	ensis? RA1	עסty) RA2	RA3	I nwr.) I RA4	wome RA5	rsiey & RA6	RA7	I ey RA8	RA9	RA10
(Kauai Oahu Molokai Maui Hawaii I sp.						X	1111	x		
,	Vousi	RA1	RA2	RA3	RA4	RA5		RA7	RA8		
 	Kauai Oahu Molokai Maui Hawaii	\ _		X			Х	1111			
Family: PHA <i>Hvdro</i> d	clathrus d		tus (A	gardh)	Howe)					
-							RA6	RA7	RA8	RA9	RA10
(Kauai Oahu Molokai Maui Hawaii			x				1111			
Family: SAR	GASSEA										
Sargas	sum pol				RA4	RA5	RA6	RA7	RA8	RAG	RA10
	Kauai Oahu	IVAT	NA2	IVAS	NA4	Х	X			11/13	
ĺ	Molokai Maui Hawaii			х				х			

	C								
	Sargassum sp.		RA2	DAO	D / /	DAE	RA6	RA7	RA8 RA9 RA10
	Kauai	KAI	KAZ	KAS	KA4	KAS	KAO	KA/	NAO NAS NAIU
	Oahu			Х		х	х	1111	
	Molokai		Х		х				
	Maui								1111
	Hawaii								
	Turbinaria orna								
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA9 RA10
	Kauai								
	Oahu	Х				Х			
	Molokai Maui	v	v	v	X			v	X
	Maui Hawaii	Х	Х	Х	Х	х	х	X X	1.1.1.1
Phylum: RHODOPH						^	^	^	
	Turf algae								
	· 3	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA9 RA10
	Kauai								
	Oahu					Х	X	3111	
	Molokai								
	Maui								x
	Hawaii	. x		Х				Х	X X
	unid. Coralline	_	DAG	DAG	D 1 4	DAE	DAG	DAZ	DAO DAO DA40
	Kouoi	RA1	KA2	RA3	KA4	снл	RA6	RA7	RA8 RA9 RA10
	Kauai Oahu							1111	
	Molokai								
	Maui	Х	х	Х				Х	
	Hawaii			~					
Fam	ily: BONNEMAIS	ONIA	CEAE						
	Asparagopsis t			elile) T	revisa	n			
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA9 RA10
	Kauai								
	Oahu							1111	
	Molokai	Х			Х			.,	X
	Maui Hawaii	X		Х		Х		X	х !!!!
Fam	nawaii nily: CERAMIACE	Σ ΔE						Х	Х
ı am	Melanamansia		rata?(Agard	h) Nori	ris			
		RA1		RA3			RA6	RA7	RA8 RA9 RA10
	Kauai	Х						Х	
	Oahu			X			X	3111	
	Molokai	Х	Х					Х	
	Maui				Χ	Χ			1111
	Hawaii	Χ	/\A/16-	\ 1.1					
	Spyridia filame	ntosa RA1		en) Har RA3		RΔ5	RA6	RA7	RA8 RA9 RA10
	Kauai	17/1	INAL	INAO	11/14	IVAJ	IVAU	17/1	INTO INTO INTO
	Oahu							1111	
	Molokai								
	Maui		х					х	1111
	Hawaii								
	Wrangelia peni								
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA9 RA10
	Kauai								
	Oahu Molokai							1111	
	Maui			х					111111
	Hawaii			٨					1111
Fam	nily: CORALLINA	CEAE							
. 3111	Hydrolithon bre		<i>ium</i> (F	oslie)	Foslie				
	•					RA5	RA6	RA7	RA8 RA9 RA10
	Kauai								
	Oahu								
	Molokai								
	Maui								1111
	Hawaii								

Hydrolithon on	kodes RA1	(Heyo	drich) F RA3		e & W		ling RA7 RA8 RA9 RA10
Kauai Oahu	v	X	v	X	X	v	X
Molokai	Х	X X	Х	X X	X X	X X	X X
Maui		Х	Х	Х			x x !!!!
Hawaii <i>Hydrolithon</i> sp	Х	Х	Х	Х	Х	Х	x x x x
Пушопшопър	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							x
Oahu Molokai	х			х			x
Maui	^	Х		^			A
Hawaii							
<i>Jania</i> sp.	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	IXAT	INAZ	INAS	IXA4	INAG	X	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
Oahu							
Molokai Maui	х						X
Hawaii	^						X 1111
Mesophyllums	p.						
Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu							
Molokai							
Maui Hawaii		Х					
Porolithon gard	dineri (Foslie) Fosli	e			
· ·	RA1		RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu	.,	.,	.,				
Molokai	Х	Х	Х				
Maui					Χ		x !!!!
Hawaii	X	Λ.Γ.	Х	Х			x x x
Family: CRYPTONEI Desmia hornen	viiACE. nanni l	AE L yngb \	/e				
	RA1			RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							x
Maui			Х		Χ		1111
Hawaii Family: DELESSERI	۸۵۵۸۵						
Martensia frag							
_	RA1	RÁ2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu			х			Х	
Molokai	Х		^			х	
Maui			Х				x !!!!!
Hawaii Family: FLORIDEOP	UVCE/	\ =					
Gibsmithia hav			У				
			RA3	RA4	RA5		RA7 RA8 RA9 RA10
Kauai Oahu			х	х		Х	X
Molokai			^	^			
Maui			Х				
Hawaii Family: GALAXAURA	Χ Δ <u>СΕ</u> ΔΕ	Х					
Galaxaura acui			rs				
			RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							
Maui							
Hawaii		Χ	Х	Χ			x

Galaxaura rug	iosa (El	llis & S	oland	er) Lan	nourou	IX					
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai						Х					
Oahu							1111	1111			
Molokai			.,	.,					1111	1111	
Maui			Х	Х			Х			1111	
Hawaii											
<i>Galaxaura</i> sp.		RA2	PΔ3	PΔΛ	PA5	PA6	PA7	PΔS	PΔQ	Ρ Δ10	
Kauai	IXAI	IVAZ	IVAS	11/14	IVAJ	IVAU	IXAI	1111		!!!!	
Oahu					Х		1111	1111	1111		
Molokai	Х				~				1111	HH	
Maui										1111	
Hawaii	Х										
Scinaia horme											
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai											
Oahu							1111	1111			
Molokai			.,						1111		
Maui Hawaii			Х							1111	
Family: HALYMENIA	ΔCEΔE										
Grateloupia fi		Lamou	roux)	Agardi	h						
		RA2				RA6	RA7	RA8	RA9	RA10	
Kauai								1111	1111	1111	
Oahu							1111	1111	1111	1111	
Molokai									$\{\{\}\}\}$	1111	
Maui							Х			1111	
Hawaii			1.7.11								
Halymenia for					DAG	DAG	D 4 7	DAG	DAO	D 4 4 0	
Kauai	RAT	RA2	RA3	KA4	RAS	RAb	RA/	KA8	KA9	RA10	
Kauai Oahu				х				1111	1111		
Molokai				^					1111	1111	
Maui					х		Х			1111	
Hawaii											
Halymenia sp.											
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai						Х					
Oahu								1111			
Molokai									1111		
Maui Hawaii		.,			.,						
	(aroon	X ich)			Х					Х	
<i>Halymenia</i> sp.		RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai	10/11	10.12	10.0	10.1	10.00	10.00	X	1111		1111	
Oahu								1111	1111	1111	
Molokai									1111	1111	
Maui										1111	
Hawaii											
Family: HYPNEACE	AE										
Hypnea cervi	cornis (Agardi	ı) How	e DA4	D.4.E	D 4 C	D 4 7	D 4 0	D 4 0	D 4 4 0	
Kauai	KAT	RA2	RA3	KA4	KAS	KAb	KA/	KA8	KA9	RATU	
Oahu				х			1111				
Molokai				^					1111	1111	
Maui											
Hawaii											
Hypnea musc											Introduced
		RA2			RA5	RA6	RA7				
Kauai											
Oahu							1111	1111			
Molokai									1111		
Maui							Х			1111	
Hawaii											

Family: LIAGORACE	AE							
<i>Liagora</i> sp.	544	D 4 0	D 4 0	5.4.	- · -	D 4.0	D D D D D	
14	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10	
Kauai								
Oahu Malakai				.,				
Molokai Maui				Х			X	
Hawaii							1.1.1.1	
Trichogloea re	auionii	(Mont	'anna'	Kützin	ď			
Trichogicea re	-	•			-	PA6	RA7 RA8 RA9 RA10	
Kauai	IXAT	INAZ	INAS	IXA4	INAS	INAU	KAI KAO KAS KATO	
Oahu				Х				
Molokai				^				
Maui			Х					
Hawaii			^					
Family: NEMASTOM	ATACE	EAE						
Predaea weldii			ott					
				RA4	RA5	RA6	RA7 RA8 RA9 RA10	
Kauai								
Oahu								
Molokai							1111111	
Maui				Х				
Hawaii								
Family: PEYSONNE	LIACE	AΕ						
Peyssonnelia r								
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10	
Kauai					Х	Х		
Oahu								
Molokai		Х						
Maui							1111	
Hawaii								
Family: RHIZOPHYL				0:1				
Portieria horne					DAG	DAC	DA7 DA0 DA0 DA40	
Kauai		KA2	RA3	KA4	KAS	KAb	RA7 RA8 RA9 RA10	
	Х							
Oahu Molokai								
Maui					х		111111	
Hawaii					^		1111	
Family: RHODOMEL	ACEAE	=						
Acanthophora			hl) Bø	raesen	1		Introduce	b
7.00.7.0.0						RA6		_
Kauai								
Oahu			х					
Molokai	X			Х			x	
Maui	Х		Х				x	
Hawaii								
Laurencia nidit	fica Ag	jardh						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10	
Kauai								
Oahu		Х						
Molokai							1111111	
Maui	Х		Х				iiii	
Hawaii		_						
Family: RHODYMEN			2araaa	on\la	vrina			
Botryocladia s	RA1	eryn (E R∆2	P∆2 اصد	RA1	RAF	RA6	RA7 RA8 RA9 RA10	
Kauai	IVA I	11/14	IVAO	11/14	IVAJ	IVAU	KAI KAO KAS KATU	
Oahu								
Molokai							111111	
Maui			Х					
Hawaii			•					
Dasya iridesce	ns (Sc	hlech)	Millar	& Abb	ott			
,						RA6	RA7 RA8 RA9 RA10	
Kauai								
Oahu								
Oahu Molokai								

Hawaii

Porife	<i>era</i> sp. (red	l encru	usting))							
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu							1111	1111		
	Molokai				Х						
	Maui										
	Hawaii										
Porifo	e <i>ra</i> sp. (slir	nv nu	rnle er	ocrueti	ina)						
1 Office	<i>a</i> a sp. (siii				RA4	DAE	DA6	RA7	DΛΩ	Β۸α	RA10
	Maria:	IXAT	INAZ	IVAS	IXA4	INAS	INAU	IXAI	INAO	IVAS	IXATU
	Kauai								1111		
	Oahu							1111	1111		
	Molokai	Х									
	Maui										
	Hawaii										
Porife	<i>era</i> sp. (sm										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu							1111	1111		
	Molokai										1111
	Maui		х						Х		1111
	Hawaii										
Porife	era sp. (vel	low er	crusti	na)							
1 01110	ла эр. (уст			Ο,	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	10/11	10,12	10.00	10/14	10.10	Х	10,0	1111	10,10	10110
	Oahu						^	11111	1111		
								1111	1111		
	Molokai										
	Maui									Х	1111
01 04104054	Hawaii										
Class: CALCAREA											
Order: CLATHRI		_									
Family: LEI											
Leuce	etta solida	Schm	nidt, 18	62							
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu	Х						1111	1111		
	Molokai									1111	1111
	Maui										iiii -
	Hawaii										
Leuce	etta sp.										
	ottu op.	R _Δ 1	RA2	RΔ3	RA4	R ₄ 5	RA6	RA7	RA8	RA9	R Δ10
	Kauai	IXXI	11/12	IVAG	11/17	IVAG	IVAO	13/37	!!!!	11/13	!!!!
	Oahu							1000	1111		
	Molokai										
	Maui									.,	r r r i
OI DEMOODONO	Hawaii			Х				Х		Х	
Class: DEMOSPONG											
Order: DICTYOC											
Family: SP					056						
Spon	gia oceani										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu			Х				-1111	1111		
	Molokai										
	Maui									Х	1111
	Hawaii						х			Х	
Order: HADROM											
Family: CH		DAE									
	drosia chu		de Lau	ibenfe	ls. 193	6					
		RA1			RA4		RA6	RA7	RA8	RA9	RA10
	Kauai		X	, .0		, .	Х		1111	, .,	
	Oahu		^				^	1111	1111		
	Molokai				х						1111
	Maui	х	х		X				Х		
	Hawaii	^	^		^		х		^	х	
	· iavvaii						^			^	

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Family: SPIRASTRELLIDAE
       Spheciospongia vagabunda (Ridley, 1884)
                     RA1 RA2 RA3 RA4 RA5 RA6
                                                    RA7 RA8 RA9 RA10
                                                Х
                                                     Х
             Oahu
             Molokai
                                                X
             Maui
                                           х
             Hawaii
                                           Х
Order: HAPLOSCLERIDA
   Family: CALLYSPONGIIDAE
       Callyspongia sp.?
                     RA1 RA2 RA3 RA4 RA5 RA6
                                                    RA7 RA8 RA9 RA10
             Kauai
                                                Х
             Oahu
             Molokai
             Maui
             Hawaii
    Family: CHALINIDAE
       Sigmadocia caerulea? Hechtel, 1965
                                                                             Introduced
                     RA1 RA2 RA3 RA4 RA5 RA6
                                                   RA7 RA8 RA9 RA10
             Kauai
             Oahu
                                           Х
             Molokai
             Maui
             Hawaii
    Family: NIPHATIDAE
        Gelliodes fibrosa? (Wilson, 1925)
                                                                             Introduced
                     RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
             Kauai
                      Х
             Oahu
             Molokai
             Maui
             Hawaii
Order: LITHISTIDA
   Family: AZORICIDAE
       Leiodermatium sp.
                     RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
             Kauai
             Oahu
             Molokai
             Maui
             Hawaii
                                                Х
Order: POECILOSCLERIDA
   Family: ANCHINOIDAE
       Phorbas sp.? (orange encrusting)
                     RA1 RA2 RA3 RA4 RA5 RA6
                                                   RA7 RA8 RA9 RA10
             Kauai
             Oahu
                                      Х
             Molokai
                                      х
                                                х
             Maui
                                                                x | | |
             Hawaii
   Family: MICROCIONIDAE
        Ćlathria sp. (red)
                     RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
             Kauai
             Oahu
             Molokai
             Maui
             Hawaii
    Family: MYCALIDAE
       Mycale armata? Thiele, 1903
                                                                             Introduced
                     RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
             Kauai
                      Х
             Oahu
                      х
             Molokai
             Maui
                                                     Х
```

Hawaii

<i>Stylinos</i> sp.											
Kauai Oahu Moloka Maui	ai	RA2	RA3	RA4	RA5	RA6	RA7			RA10	
Hawaii Family: RASPAILIII									Х		
Hamigera sp.		DAG	DAO	DA4	DΛE	DAG	RA7	DΛO	DΛΩ	DA10	
Kauai Oahu Moloka Maui Hawaii	ai	NA2	KAJ	IVA4	X	KAU			 	1111	
Phylum: CTENOPHORA											
unid. Ctenop		DAO	DΛ2	DA1	DΛE	D/V6	RA7	DΛQ	DΛΩ	DA10	
Kauai Oahu Moloka Maui Hawaii	ai	NAZ	KAS	IVA4	KAJ	KAU			$ \cdot \cdot $		
Phylum: CNIDARIA Class: HYDROZOA											
unid. Hydroz	oa										
Kauai Oahu Moloka Maui		RA2	RA3	RA4	RA5	RA6 x	RA7	RA8		RA10	
Hawaii				х	х		х		х	1111	
Order: HYDROIDA											
Family: AGALOPH	ENIIDAE	Ē									
Gymnangium				DA1	DΛE	D/V6	RA7	DΛQ	DΛΩ	DA10	
Kauai Oahu Moloka Maui		KAZ	KAS	KA4	KAS	KAO		KA0			
Hawaii Maararhynah		nina K	irobon	nauar	1072	Х					
Macrorhynch		RA2				RA6	RA7	RA8	RA9	RA10	
Kauai Oahu Moloka Maui Hawaii			x				1111	111			
Family: HALOCOR	DYLIDA										
Pennaria dist					RA5	RA6	RA7	RA8	RA9	RA10	Introduced
Kauai Oahu Moloka Maui Hawaii Family PLUMULAR	x ai x		x		x	Х					
Plumularia flo	oridana										Cryptogenic
Kauai Oahu Moloka	RA1				RA5	RA6	RA7	RA8	$ \cdot \cdot $	RA10	-
Maui Hawaii	х					х				1111	

Plumularia stric	ctocarp	a Pic	tect, 1	893							Cryptogenic
					RA5	RA6	RA7	RA8	RA9	RA10	
Kauai								1111	1111		
Oahu							1111	1111	1111	1111	
Molokai									1111	1111	
									1111	1111	
Maui										1111	
Hawaii						Х					
Family: SERTULARII	DAE										
Sertularia sp.											
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai								1111	1111	1111	
Oahu							1111	1111	1111	1111	
Molokai							Х		1111	1111	
Maui										HH	
Hawaii											
Dynamena cris	inidas	Lamo	IIIOIIV	1824							Cryptogenic
Dynamena ens					D A E	DVC	D A 7	ДΛО	DAO	D 1 1 0	Oryptogerne
Vausi	KAI	KAZ	KAS	RA4		RA6	KAI	RA8		KAIU	
Kauai					Х						
Oahu							1111	1111			
Molokai									1111	1111	
Maui										1111	
Hawaii											
Class: SCYPHOZOA											
Order: RHIZOSTOMEAE											
Family: CASSIOPEID)AF										
Cassiopea and	romeda	l iah	1914	ı							Introduced
Oussiopea ariai					R ₄ 5	RA6	R ₄ 7	RA8	RΔQ	R Δ10	IIII oaaoca
Kauai	IXAI	11/12	IVAG	11/17	IVAO	11/10	14/4/			1111	
Oahu							1111	1111		1111	
Molokai	Х								1111		
Maui										1111	
Hawaii											
Class: STICHODACTYIDAE											
Order: ALCYONACEA											
Family: ALCYONIIDA	ŀΕ										
Sinularia molo	kaiensi	is Vers	eveldt	t, 1983							
					RA5	RA6	RA7	RA8	RA9	RA10	
Kauai			_			_		1111	1111	1111	
Oahu							1111	1111	1111	iiii	
Molokai							X		1111	1111	
Maui							^		1111	1111	
										1111	
Hawaii											
Family: XENIIDAE											
Sarcothelia edr											
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai	Х	Χ	Х	Х	Х	Х	Х	1111	1111	1111	
Oahu					Х		-1111	1111	1111	1111	
Molokai		Х							1111	1111	
Maui		X	Х		х					1111	
Hawaii					X	Х	х	Х	Х		
Sarcothelia n. s	sp.										Cryptogenic
Gai Cotriena II. S		RA2	RΔ3	RA4	R ₄ 5	RA6	RA7	RA8	RΔQ	RA10	Oryptogerne
Kauai	IVAT	11/14	IVAS	11/14	IVAS	NΛU	1.77	11/70	11/13	1.7.10	
Nauai Oahu							1111	1111	1111	1111	
							1111	1111	1111	1111	
Molokai									1111		
Maui			Х							1111	
Hawaii											
Class: ANTHOZOA											
Order: GORGONACEA											
Family: MELITHAEID)AE										
Acabaria bicol		ing, 19	80								
				RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai										10000	
									1111	1111	
Oahu							1111				
Oahu							1111				
Oahu Molokai							1111				
Oahu							1111		x		

Order: SCLERAG	_										
Famil <u>y</u> : SID											
Psam	mocora s	p. RA1	PA2	RA3	PΔ1	PA5	RA6	RA7	RA8	PΔQ	RA10
	Kauai	IXAT	INAZ	INAS	IXA4	INAJ	X	IXAI	INAO	INAS	IXAIU
	Oahu							1111	1111	1111	1111
	Molokai									1111	
	Maui										1111
Peam	Hawaii <i>mocora s</i>	tollata	Varrill	1864							
ı saiii	illocora s		RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								$\{ \} \}$	$\{ \{ \} \} \}$	1111
	Oahu					Χ			1111		
	Molokai			.,		.,			Х	1111	
	Maui Hawaii	х	Х	Х		Х		х			X
Family: AC								^			^
	pora capi		ana, 1	846)							
	-	RA1	RA2	RÁ3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	Χ		Х	Х	Χ	Х	Х			
	Oahu	X	X	.,	X	X	X		1111		
	Molokai Maui	X X	X X	X X	X X	X X	X X	X X	X X	X	
	Hawaii	X	X	X	X	X	X	X	X	X	X
Monti	pora flabe										
·		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	Χ	Х		Х	Χ	Х	Х			
	Oahu			Х	Х	Х	Х	1111	1111		
	Molokai Maui	х	X X	X X	X X	X X		X X	х	X	
	Hawaii	X	^	^	^	^	Х	X	^	^	
Monti	pora patu	<i>la</i> Ver	rill, 186	64							
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	Х	Х	Х	Х	Х	Х	Х			
	Oahu	.,	.,	X	X	X	X		1111		1111
	Molokai Maui	X X	X X	X X	X X	X X	X X	X X	X X	X	
	Hawaii	X	X	X	X	X	X	X	X	X	X
Monti	pora sp.										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai										
	Oahu Molokai			v				1111	1111		
	Maui			Х							
	Hawaii										
Family: AG	ARICIIDAI										
Lepto	seris incr										
	Vaus!	RA1	RA2	RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai Oahu				Х			1111			
	Molokai					Х				1111	
	Maui					,					
	Hawaii						Х		Χ		
Pavoi	na duerde	ni Vau	ıghan,	1907							
	Kousi		RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai Oahu	Х		х	х	х	х	1111	1111	1111	
	Molokai		Х	X	X	X	X	Х			1111
	Maui	Х	Х	Х	Х	Х	Х	-	Х		1111
	Hawaii	Х	. X	Х		Х		Х	Х		х
Pavoi	na explan					D 4 =	D 4 6	D 4 =	D 4 0	D 4 6	D 4 4 0
	Kauci	KA1	RA2	каз	KA4	KA5	RA6	RA7	RA8	KA9	RA10
	Kauai Oahu							1111			
	Molokai										
	Maui										пii
	Hawaii					X					

Pavona n	naldiven	ısis (0	Gardir	er, 190	05)						
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka						Х					
Oa								1111			
	lokai									111	
Ma											1111
	waii				Х						
Pavona v					D 4 4	D 4 5	D 4 0	D 4 7	D 4 0	D 4 0	D 4 4 0
14		RA1	RA2	_	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka		Х		Х	Х	Х		Х			
Oa				Х	Х	Х	X		1111		
	lokai		Х	Х		X	X	Х		111	
Ma		Х	Х	Х	Х	Х	Х		Х	Х	1111
	waii	X	X	Х	X	Х	Х	Х	Х	Х	Х
Family: DENDF				- 4000							
Tupastra						DAG	DAC	D 4 7	DAG	D 4 0	D 4 4 0
V ₀	-	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka								1111		111	
Oa								1111		111	1111
	lokai									1.1.1	
Ma			.,	.,	.,		.,	.,			1111
	waii ^=		Х	Х	Х		Х	Х			
Family: FAVIID		ina (I	Jana	10/6\							
Сурпази		•		RA3	D / /	DAE	RA6	DAZ	DAO	RA9	DA40
Ka		RA1	KAZ	KAS	KA4	KAS	KAO	RA7	RA8	KAS	RA10
Na Oa		v	v				х	1111		111	
	lokai	Х	Х				X	1111		111	
Ma										111	1111
	ui waii	х					х				· · · · ·
Leptastre			2 Klur	zingor	1970		X				Х
Lepiasire				RA3		DAE	RA6	RA7	RA8	RA9	RA10
Ka	-	KAI	KAZ	KAS	KA4	KAS	KAO	KAI	KAO	KAS	KAIU
Na Oa								1111		111	
	lokai							1111		-111	
Ma											
	ui waii	х									1111
Leptastre)ana '	1846							
Lopiasac		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka				X	Х	X	10.00	X	11111	1 1 1	1111
Oa				X	X	X	х	1111		-111	
	lokai		Х	^	^	X	^	X		-111	
Ma		Х	X	X	Х	X	х	X	х		iiii
	waii	X	Х	X			X	X	X	Х	Х
Leptastre				~				^			
,	•	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka	uai			X		-	-		Ш	111	HHÌ
Oa	hu							1111	11111	111	1111
	lokai									111	HH
Ma											1111
	waii										
Family: FUNGI											
Éungia se		_ama	rck, 18	301							
•		RA1	RÁ2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Ka	uai	Х		Х			Х	Х	11111	111	1111
Oa	hu	Х	Х					1111	11111	111	1111
	lokai		Х							411	1111
Ma	ui				X	х					1111
	waii	х	Х	X		Х	х	х		Х	х
Family: POCIL	LOPORI										
Pocillopo			is (Lin	naeus,	1758)						
•		RA1		RA3			RA6	RA7	RA8	RA9	RA10
Ka	uai	Х	Χ				х		11111	+++	1111
Oa	hu	Х	Х				Х	1111	11111	+111	1111
Mo	lokai	Х			X		X		Х	111	1111
Ma	ui		Χ	X	Χ	Χ	Х				1111
Ha	waii		Χ	X	X		Х				Х

- "											
Pocillopora		Milne I					DAZ	DAO	DAO	D 4 4 0	
Kaua		KAZ	X	KA4 X	X	X	RA7 x	RA8	KA9	RA10	
Oah			X	X	X	X	1111				
Molo	kai	х			Х	Х		Х	1111	1111	
Maui	Х	Х	X	х		х	х	х	Х	1111	
_ Haw		_ x	Х		Χ	Χ	Χ	Χ	Х	Х	
Pocillopora				D A 4	DAG	DAC	D 4 7	DAO	DAO	D 4 4 0	
Kaua		RA2	RA3	KA4	RA5	KAb	KA/	RA8	RA9	RA10	
Oah							1111				
Molo								X	1111	1111	
Maui										1111	
Haw											
Pocillopora					D.4.5	D.4.0	D 4 7	D.4.0	D.4.0	D 4 4 0	
Va	RA1			RA4			RA7	RA8	RA9	RA10	
Kaua Oahi		Х	X X	X X	X X	X X	X	-1111		1111	
Molo		х	X	X	X	X	X	X			
Maui		X	X	X	X	X	X	X	Х	1111	
Haw	aii x	х	Х	Х	Х	Χ	Χ	Х	Х	х	
Pocillopora	•										
17	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kaua Oahi								1111	1111	1111	
Molo					х		1111	1111			
Maui					^						
Haw	aii										
Family: PORITID	AΕ										
Porites (Sy	naraea) r	us (For	sskål,	1775)							
14		ŘA2	RA3	RA4	RA5			RA8	RA9	RA10	
Kaua Oahi					.,	Х	X				
Molo					Х		1111	1111			
Maui				Х							
Haw		х			Х	Х	Х		Х		
Porites con	npressa [Dana, 1	846								
14	RA1		RA3	RA4		RA6	RA7	RA8	RA9	RA10	
Kaua		Х			Х	X	Х				
Oah Molo		X X	X X	х		Х	X	X			
Maui		X	X	X	Х		^	X	Х		
Haw		X	X	X	X		х	X		Х	
Porites eve											
		RA2			RA5	RA6	RA7	RA8	RA9	RA10	
Kaua			Х	Х	X	.,	Х				
Oah Molo		v	v	Х	X	Х				1111	
Maui		Х	Х	х	Х	х	X X	X X	X		
Haw		х	Х	X	Х	^	X	X	X	X	
Porites lob		, 1846									
	RA1				RA5	RA6	RA7	RA8	RA9	RA10	
Kaua		Х	Х	Х	X	X	Х				
Oah		.,	.,	X	X	X	-	1111	1111	1111	
Molo Maui		X X	X X	X X	X X	X X	X X	X X	X	1111	
Haw		X	X	X	X	X	X	X	X	X	
Order: TELESTACEA	- •					-	-	-		-	
Family: TELEST											
Carijoa riis						D 4 6	D 4 =	D 4 0	D 4 6	DA46	Introduced
Kaua		RA2	RA3	KA4	KA5	KA6	KA7			RA10	
Naua Oahi							1111	1111		1111	
Molo								1111		1111	
Maui						Х				1111	
Haw	aii										

Order: ZOANTHIDEA										
Family: ZOANTHID/	λE									
Palythoa caes	<i>ia</i> Dana	a, 1848								
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai	Х	Х	Х	Х		Х	Х	1111	1111	
Oahu			Х	Х		Х	-1111		1111	
Molokai		Х				Х	Х	Х	1111	
Maui		Х	Х	Х	Х			Х		
Hawaii	Х	Х	Х		Х	Х	Х	Х	Х	Х
Protopalythoa	sp.									
, ,		RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai								1111	1111	
Oahu							1111		1111	1111
Molokai									1111	1111
Maui										iiii -
Hawaii						х				
Zoanthus pac	ificus W	lalsh 8	Rowe	ers 19	71					
Zountinus puo		RA2				RA6	RA7	RA8	RA9	RA10
Kauai	X	11/12	11/10	11/14	11/10	11/10	14/4/	1111	!!!!	!!!!
Oahu	^						1111		1111	
									1111	
Molokai									1111	
Maui										1111
Hawaii										
Zoanthus sp.	D 4 4	D.4.0	D 4 0	D 4 4	D.4.5	D 4 0	D 4 7	D.4.0	D 4 0	D 4 4 0
	RA1	RA2	RA3	RA4	RA5	RA6	RA7		RA9	RA10
Kauai							Х			
Oahu					Х		1111			
Molokai									1111	
Maui										
Hawaii										
Zoanthus sp. ((pink)									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai	Х		Х	Х			Х		1111	
Oahu					Х		-1111		1111	
Molokai				Х					1111	
Maui										
Hawaii										
Phylum: PLATYHELMINTHES										
Class: TURBELLARIA										
Order: POLYCLADIDA										
Family: PSEUDOCE	ROTID	AE								
Pericelis hym			1974							
				RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai								1111	1111	
Oahu							1111		1111	
Molokai				Х					1111	1111
Maui				^						
Hawaii										
Pseudobicero	cen									
rseudobicero		RA2	DVS	DA4	DAE	DVC	D A 7	DΛO	DAO	D 1 1 0
V-··-:	IXAT	INAZ	IVAS	INA4	IVAO	IVAO	IVAI	RA8	RA9	RA10
Kauai										
Oahu Malakai							a raid	er i i	1111	1111
Molokai									1111	
Maui										riii
Hawaii		_				Х				
Pseudoceros						D 4 6	D 4 =	D 4 6	D 4 6	D 4 4 0
12	KA1	RA2	RA3	KA4	KA5	RA6	KA/	RA8	RA9	KA10
Kauai						Х				
Oahu										
Molokai									1111	
Maui										
Hawaii										

Phylum: ANNELIDA Class: POLYCHAETA Family: AMPHIN		(D-II)	470	6)							
Eurythoe c			RA3		RA5	RA6	RA7	RA8	RA9	RA10	
Kaua Oahi Molo Maui Haw Family: CHAETC	ai J kai kai PPTERIDAE					X	1111	1111			
Chaetopter		DAG	RA3	D A 4	DAE	DAG	DAZ	DAO	DAO	D 4 4 0	Cryptogenic
Kaua Oahi Molo Maui Haw Family: EUNICID <i>Eunic</i> e sp.	ai x J kai	KAZ	KAS	KA4	KAS	KAO		RA8	$\{ \{ \} \} \}$	RA10	
Lumcesp.	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kaua Oahi Molo Maui Haw	ai u kai aii		x				Х				
Family: SABELL Sabellasta i		silie (C	trubo 1	1070\							Introduced
Sapellastal			RA3		RA5	RA6	RA7	RA8	RA9	RA10	miroduced
Kaua Oah Molc Maui Haw	ai x u x kai	x	10.10		X	10.10		1111			
Family: SERPUL		^									
Salmacina Kaua Oahi	dysteri (H o RA1 ai		1855) RA3	RA4 x	RA5	RA6	RA7	RA8	RA9	RA10	Introduced
Molo Maui Haw											
Spirobranc							D 4 7	DAG	DAO	D 4 4 0	
Kaua Oahi Molo Maui Haw	ai J kai X	X	RA3	X X X	X X X	X X X X	X X	X X	X	RATO	
unid. Serpu	ılidae										
Kaua Oahi Molo Maui Family: TERERE	ai u kai aii	RA2	RA3	RA4	RA5	RA6	RA7 X	$\{ $	RA9	RA10	
Family: TEREBE Loimia me d		gny, 1	818)								
	RA1		RA3	RA4	-			RA8	RA9	RA10	
Kaua Oahi Molo Maui	ı kai	x		х	Х	x x	X 				
Haw	aii								Х		

Tereb	ellid sp.										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai						Χ	Х			
	Oahu Molokai								1111		
	Maui	Х									
	Hawaii										
Phylum: ARTHROPODA											
Class: MALACOSTRA Order: DECAPO											
Family: ALF											
	us deute	ropus I	Hilgen	dorf, 1	878						
-		ŘA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai Oahu							1111			
	Molokai	Х	х			Х	х	1111	1111		Ш
	Maui	^	Х	Х	Х	X	^		Х	х	iii.
	Hawaii		Х	Х	Χ	Χ	Χ	Χ	Χ		
Alphe	us lottini				D 4 4	DAG	DAC	D 4 7	DAO		1440
	Kauai	RA1	KAZ	RA3	KA4	RA5	RA6	RA7	RA8	RA9 R	ATU
	Oahu							1111			
	Molokai									11111	Ш
	Maui								Χ	Х	111
Alpho	Hawaii eus sp.		Х	Х			Х	Х	Х		
Alphe	us sp.	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai					-	_		++++	$\Pi \Pi \Pi \Pi$	Ш
	Oahu										Ш
	Molokai Maui								Х	1111	
	Hawaii									1	111
Family: CA		SIDAE									
	lianassa l	orrad									
	Kaua!	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai Oahu							1111			
	Molokai									11111	Ш
	Maui			Х						1	Ш
Family CA	Hawaii	_									
Family: CA Carni	KPILIIDAI lius mac u		l innae	us. 17	58)						
ош. р						RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai								1111		
	Oahu Molokai								1111		
	Maui						х			11111	
	Hawaii						~				
Family: CR	YPTOCHI	RIDAE									
Нараі	ocarcinu	s mars	upialis	Stimp	son, 1	859	D 4 0	D 4 7	D 4 0	D 4 0 D	
	Kauai	KAT	KAZ	RA3	KA4	KAS	KAb	KA/	KA8	RA9 R	ATU
	Oahu	Х	Х					1111	1111	11111	Ш
	Molokai								Х		Ш
	Maui			Х						1	111
Family: DIC	Hawaii GENIDAI	=		Х							
	nus argus		ter, 19	82							
	_				RA4	RA5	RA6	RA7	RA8	RA9 R	A10
	Kauai										
	Oahu Molokai							1111	1111		1 i i i 1 i i i
	Maui	Х			х		х				
	Hawaii		Х		X						

Calcinus elegal							
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai				Х			x
Oahu							
Molokai							
Maui	Х						1111
Hawaii						Х	
Calcinus guam	ensis\						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai				Х			
Maui		Х		Х	Х	Х	x x
Hawaii			х				
Calcinus haiga	e Woo	ster. 1					
- · · · · · · · · · · · · · · · · · · ·		RA2		RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							1111111111111
Oahu							
Molokai							
Maui							
Hawaii			х		Х	Х	х х
Calcinus hazlet	ti Haid	ı & Mc		lin. 198		^	X X
Outomas mazica		RA2	RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10/11	10,12	10,10	10/14	10.00	10,10	
Oahu							
Molokai							
Maui							111111
Hawaii			Х				1111
	/Dans	Jali 40					
Calcinus latens	RA1		RA3	DA4	DAE	RA6	RA7 RA8 RA9 RA10
Vousi	KAI	KAZ	KAS	RA4	KAS	KAO	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai							1111111
Maui							1111
Hawaii							
							X
Calcinus laurer						D.4.0	
Calcinus laurer				ghlin, 1 RA4		RA6	x RA7 RA8 RA9 RA10
Calcinus laurer Kauai						RA6	
Calcinus laurer Kauai Oahu		ŘA2			RA5		
Calcinus laurer Kauai Oahu Molokai						x	RA7 RA8 RA9 RA10
Calcinus lauren Kauai Oahu Molokai Maui		ŘA2 x	RA3	RA4	RA5	x x	RA7 RA8 RA9 RA10
Calcinus laurer Kauai Oahu Molokai Maui Hawaii		ŘA2			RA5	x	RA7 RA8 RA9 RA10
Calcinus lauren Kauai Oahu Molokai Maui	RA1	X x	RA3 x	RA4	X X	X X X	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp.		ŘA2 x	RA3	RA4	RA5	x x	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp.	RA1	X x	RA3 x	RA4	X X	X X X	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu	RA1	X x	RA3 x	RA4 x RA4	X X	X X X	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp.	RA1	X x	RA3 x	RA4 x RA4	X X	X X X	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu	RA1	X x	RA3 x	RA4 x RA4	X X	X X X	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii	RA1	RA2 x x RA2	x RA3	X RA4 X	X X	x x x RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui	RA1	RA2 x x RA2	x RA3 x	X RA4 X	X X	x x x RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st	RA1	RA2 x x RA2	x RA3 x x pst, 18	X RA4 X	x x RA5	x x x RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii	RA1 RA1	RA2 x x RA2	x RA3 x x pst, 18	x RA4 x RA4 x	x x RA5	x x x RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st	RA1 RA1	RA2 x x RA2	x RA3 x RA3 x ost, 18 RA3	x RA4 x RA4 x	x x RA5	x x x RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st	RA1 RA1	RA2 x x RA2	x RA3 x RA3 x ost, 18 RA3	x RA4 x RA4 x	x x RA5	x x x RA6	RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu	RA1 RA1	RA2 x x RA2	x RA3 x RA3 x ost, 18 RA3	x RA4 x RA4 x	x x RA5	x x x RA6	RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 RA1 rigatu: RA1	RA2 x x RA2 s (Hert	x RA3 x x sost, 18 RA3 x	x RA4 x 04) RA4	x x RA5	x x x RA6	RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Maui Molokai Maui	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x x RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x x x x x x x x x x x x x x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x x RA6	RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x x x x x x x x x x x x x x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Calcinus sang	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Dardanus sang	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x Sost, 18 RA3 x	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Maui Molokai Maui Molokai Maui Molokai Maui Molokai Maui	RA1 RA1 rigatus RA1	RA2 x x RA2 s (Heri	x RA3 x RA3 x Pegen RA3	x RA4 x 04) RA4	RA5 x x RA5	x x RA6 x RA6	RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Hawaii Dardanus sang	RA1 rigatus RA1 uinoca RA1	KA2 x x RA2 s (Herb RA2	x RA3 x Sost, 18 RA3 x Degenor RA3	x RA4 x 04) RA4	RA5 X RA5 RA5	X X RA6 X RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Hawaii Dardanus sang	RA1 rigatus RA1 uinoca RA1	KA2 x x RA2 s (Herb RA2	x RA3 x Sost, 18 RA3 x Degenor RA3	x RA4 x 04) RA4 er, 192 RA4	RA5 X RA5 RA5	X X RA6 X RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Dardanus sang	RA1 rigatus RA1 uinoca RA1	KA2 x x RA2 s (Herb RA2	x RA3 x Sost, 18 RA3 x Degenor RA3	x RA4 x 04) RA4 er, 192 RA4	RA5 X RA5 RA5	X X RA6 X RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Dardanus sang	RA1 rigatus RA1 uinoca RA1	KA2 x x RA2 s (Herb RA2	x RA3 x Sost, 18 RA3 x Degenor RA3	x RA4 x 04) RA4 er, 192 RA4	RA5 X RA5 RA5	X X RA6 X RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x x
Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Calcinus sp. Kauai Oahu Molokai Maui Hawaii Ciliopagurus st. Kauai Oahu Molokai Maui Hawaii Dardanus sang Kauai Oahu Molokai Maui Hawaii Dardanus sp. Kauai Oahu Molokai Maui Hawaii Dardanus sp. Kauai Oahu Molokai Maui Hawaii Hawaii Dardanus sp.	RA1 rigatus RA1 uinoca RA1	KA2 x x RA2 s (Herb RA2	x RA3 x Sost, 18 RA3 x Degenor RA3	x RA4 x 04) RA4 er, 192 RA4	RA5 X RA5 RA5	X X RA6 X RA6	RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x x x RA7 RA8 RA9 RA10 x x x x

	ae						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu	Х		Х	Х			
Molokai							1111111
Maui							1111
Hawaii unid. hermit cr	ah					Х	Х
unia. nemit ci	RA1	RA2	RA3	R A A	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10/11	10,12	10.00	10.14	10.00	10.00	
Oahu							
Molokai							
Maui	Х					Х	x
Hawaii							
Family: GRAPSIDAE							
Percnon planis							
12	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai							
Maui							111111
Hawaii		х					1111
Family: HIPPOLYTIC)AF	^					
Saron marmor		livier.	1811)				
	RA1		RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai				Х		Х	
Maui							1111
Hawaii						Х	X
Family: MAJIDAE							
unid. Majidae	RA1	RA2	RA3	R A A	R ₄ 5	RA6	RA7 RA8 RA9 RA10
Kauai	IVAI	11/12	11/13	14/44	11/10	11/10	I I I I I I I I I I I I I I I I I I I
Oahu							
Molokai							1111111
Maui							
							1111
Hawaii							1111
Hawaii Family: PALAEMONI	,			,			1111
Hawaii	epressa	(Stim	pson,	1860)	DAG	DAG	
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i>	,	(Stim		1860)	RA5	RA6	RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai	epressa	(Stim	pson,	1860)	RA5	RA6	
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai Oahu	epressa	(Stim	pson,	1860)	RA5	RA6	RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai Oahu Molokai	epressa	(Stim	pson,	1860)	RA5	RA6	
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai Oahu	epressa	(Stim	pson,	1860)	RA5	RA6	
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai Oahu Molokai Maui	epressa RA1	(Stim RA2	pson,	1860) RA4	RA5	RA6	
Hawaii Family: PALAEMONI <i>Harpiliopsis de</i> Kauai Oahu Molokai Maui Hawaii	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui	epressa RA1 AE arcticus	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii	epressa RA1 AE arcticus RA1	(Stim RA2 ×	pson, RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Molokai Maui Hawaii Family: STENOPOD	PPRESSA RA1 AE Arcticus RA1	x x s (Lunc RA2	PSON, RA3 d, 1793 RA3	1860) RA4 x			x
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii	PPRESSA RA1 AE Arcticus RA1	x x (Lunc RA2	PSON, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Molokai Maui Hawaii Family: STENOPOD	epressa RA1 AE arcticus RA1 IDAE idus (C	x x (Lunc RA2	npson, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Molokai Maui Hawaii Family: STENOPOD Stenopus hisp	epressa RA1 AE arcticus RA1 IDAE idus (C	x x (Lunc RA2	npson, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii	PPRESSA RA1 AE Arcticus RA1 IDAE Idus (C	x x (Lunc RA2	npson, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii	PPRESSA RA1 AE Arcticus RA1 IDAE Idus (C	x x (Lunc RA2	npson, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii	AE AE Arcticus RA1	x x (Lunc RA2	npson, RA3 d, 1793 RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Family: TRAPEZIIDA	AE AE Arcticus RA1 IDAE idus (C RA1 x	x (Lunc RA2	npson, RA3 II, 1793 RA3 1811) RA3	x x x x x x	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii	AE AE ARCTICUS RA1	x (Lunc RA2)	npson, RA3 I, 1793 RA3 1811) RA3	x (1) RA4 x RA4	RA5	RA6	X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Family: TRAPEZIIDA Trapezia digita	AE AE Arcticus RA1 IDAE idus (C RA1 x	x (Lunc RA2)	npson, RA3 II, 1793 RA3 1811) RA3	x (1) RA4 x RA4	RA5	RA6	X RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Maui Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Family: TRAPEZIIDA	AE AE ARCTICUS RA1	x (Lunc RA2)	npson, RA3 I, 1793 RA3 1811) RA3	x (1) RA4 x RA4	RA5	RA6	X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Family: TRAPEZIIDA Trapezia digita Kauai	AE AE ARCTICUS RA1	x (Lunc RA2)	npson, RA3 I, 1793 RA3 1811) RA3	x (1) RA4 x RA4	RA5	RA6	X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Hawaii Family: PALAEMONI Harpiliopsis de Kauai Oahu Molokai Hawaii Family: SCYLLARID. Paribacus anta Kauai Oahu Molokai Maui Hawaii Family: STENOPOD Stenopus hisp Kauai Oahu Molokai Maui Hawaii Family: TRAPEZIIDA Trapezia digita Kauai Oahu	AE AE ARCTICUS RA1	x (Lunc RA2)	npson, RA3 I, 1793 RA3 1811) RA3	x (1) RA4 x RA4	RA5	RA6	X RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10

		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu							1111	1111	1111	
	Molokai									1111	1111
	Maui			Х		Х	х		Х	х	1111
	Hawaii			Х			Х	х	Х		
Trape	zia flavop	unctat	a Evd		Soule	et. 184	42				
		RA1				RA5		RA7	RA8	RA9	RA10
	Kauai								1111		1111
	Oahu							1111		1111	1111
	Molokai						х			1111	HH
	Maui						X		Х		HH
	Hawaii						X	Х			
Trans	zia interm	odia N	liore 1	1886			^	^			
Парс	zia iriteriri				R ₄	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	14/41	11/12	11/10	14/14	11/10	11/10	IXA	1111	1111	1111
	Oahu							1111	1111		
	Molokai										
	Maui					Х	Х		Х		
	Hawaii		v	V		^		v	^		
Trans			Х	Х			Х	Х			
паре	<i>zia</i> sp.	RA1	DAG	RA3	D A A	DAE	RA6	RA7	RA8	DAG	RA10
	Kauai	KAI	KAZ	KAS	KA4	KAS	KAU	KA1	KAO	KAS	KAIU
									1111		
	Oahu						Х		1111		1111
	Molokai									1111	
	Maui										1111
_	Hawaii			Х		_			Х		
Trape	zia tigrina						D.4.0	D. 4 -		D 4 0	D 4 4 0
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai						Х	Х			
	Oahu				Х				1111		
	Molokai						Х			1111	
	Maui			Х		Х	Х	Х		Х	1111
	Hawaii		Х	Х	Х	Х	· ·		· ·		
						^	Х		Х		
Family: XA							X		X		
	NTHIDAE i us areola i		Ine Ed	lwards	s, 1834)			X		
	ius areolai		Ine Ed	lwards	s, 1834			RA7	RA8	RA9	RA10
			Ine Ed	lwards	s, 1834)		RA7 x		RA9	RA10
	ius areolai		Ine Ed	lwards	s, 1834)			RA8	RA9	RA10
	ius areolat Kauai		Ine Ed	lwards	s, 1834)		Х	RA8	RA9	RA10
	i us areola t Kauai Oahu		Ine Ed	lwards	s, 1834)		Х	RA8	RA9	RA10
Pilodi	Kauai Cahu Molokai Maui Hawaii	RA1	Ine Ed	lwards RA3	s , 1834 RA4)		Х	RA8	RA9	RA10
Pilodi	Kauai Cahu Molokai Maui Hawaii	RA1	Ine Ed	lwards RA3	s , 1834 RA4)		Х	RA8	RA9	RA10
Pilodi	ius areolat Kauai Oahu Molokai Maui	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352))	RA6	Х	RA8		RA10
Pilodi	Kauai Cahu Molokai Maui Hawaii	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8		
Pilodi	Kauai Cahu Oahu Molokai Maui Hawaii doliomera	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8		
Pilodi	Kauai Oahu Molokai Maui Hawaii Molomera Kauai	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8		
Pilodi	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8		
Pilodi	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8	RA9	
Pilodi Pseud	Kauai Oahu Molokai Maui Hawaii Hali Kauai Oahu Molokai Maui Hawaii	RA1	Ine Ed RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8	RA9	
Pilodi Pseud Order: STOMAT	Kauai Oahu Molokai Maui Hawaii Hali Hauaii Hali Hali Hawaii Hawaii Hawaii	RA1 specia RA1	ilne Ed RA2 RA2 DSa (D RA2	lwards RA3 ana, 18	s , 1834 RA4 352)) RA5	RA6	X 	RA8	RA9	
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii Oahu Hawaii OPODA EUDOSQU	RA1 specio RA1	ilne Ed RA2 DSA (D RA2	lwards RA3 ana, 18 RA3	5, 1834 RA4 352) RA4) RA5	RA6	X 	RA8	RA9	
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii Hali Hauaii Hali Hali Hawaii Hawaii Hawaii	SPECIO SPECIO RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	x RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii OPODA EUDOSQU	SPECIO SPECIO RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	x RA7	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii OPODA EUDOSQU Kauai	SPECIO SPECIO RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii Hawaii OPODA EUDOSQU dosquilla o	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii Oahu Hawaii OPDA EUDOSQU dosquilla o Kauai Oahu Molokai	SPECIO SPECIO RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT Family: PSI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Maui Maui Maui Maui Maui Maui Ma	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMATI Family: PSI Pseud	Kauai Oahu Molokai Maui Hawaii Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii Hawaii	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMATI Family: PSI Pseud Class: MAXILLOPOD	Kauai Oahu Molokai Maui Hawaii Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii Hawaii	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMATi Family: PSi Pseud Class: MAXILLOPOD. Order: THORAC	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii OHOOSQU Hawaii Maui Hawaii	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Gohu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU Kauai Oahu Molokai Maui Hawaii OHODA EUDOSQU Hawaii Oahu Molokai Maui Hawaii A	specio RA1 JILLIDA ciliata RA1	ilne Ed RA2 DSa (D RA2 RA2	lwards RA3 ana, 18 RA3	352) RA4) RA5 RA5	RA6	X RA7 	RA8	RA9 x	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii OHOOSQU Hawaii Maui Hawaii	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii A	specio RA1 JILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4) RA5 RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii A ICA LANIDAE us sp.	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii doliomera Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPODA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii A ICA LANIDAE us sp. Kauai Oahu	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Goliomera Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPDA EUDOSQU Gosquilla o Kauai Oahu Molokai Maui Hawaii A ICA LANIDAE us sp. Kauai Oahu Molokai	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPDDA EUDOSQU dosquilla o Kauai Oahu Molokai Maui Hawaii A ICA LANIDAE IUS Sp. Kauai Oahu Molokai Maui Hawaii A LANIDAE IUS Sp. Kauai Oahu Molokai Maui Molokai Maui Maui Hawaii A	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10
Pilodi Pseud Order: STOMAT: Family: PSI Pseud Class: MAXILLOPOD. Order: THORAC Family: BAI	Kauai Oahu Molokai Maui Hawaii Goliomera Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii OPDA EUDOSQU Gosquilla o Kauai Oahu Molokai Maui Hawaii A ICA LANIDAE us sp. Kauai Oahu Molokai	specio RA1 UILLIDA ciliata RA1	ine Ed RA2 Ssa (D RA2 RA2 RE?(Fabi	lwards RA3 ana, 18 RA3 ricius, RA3	352) RA4 RA4 372) RA4	RA5	RA6 RA6 X RA6	RA7	RA8	RA9	RA10

Trapezia ferruginea Latreille, 1825

Phylum: MOLLUSCA Class: GASTROPODA Order: ARCHAEO Family: Trans	CHIDAE (EN	CYCLINA								
Gibbuia	a marmorea			D A A	DAE	DVC	D / 7	DΛO	DΛΩ	DA40
(N N	KA Kauai Dahu Molokai Maui Hawaii	x x	KAS	KA4	KAS	KAO		 		
	s intextus k	liener. 18	850							
		1 RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
(Kauai Dahu Molokai x	[1111			
	Maui									1111
	Hawaii	X	Σ, Χ	Х	Χ		Х	Х	Х	
Family: TURE	SINIDAE (TU S andwicens									
Turbos		13 1 Case	•	RA4	RA5	RA6	RA7	RA8	RA9	RA10
ŀ	Kauai		10.0		10.0	10.0				
	Dahu						1111	1111	$ \cdot \cdot $	
	Molokai								1111	
	Maui Jawaii	.,							.,	1111
Order: BASOMMA	Hawaii TOPHORA	Х							Х	
Family: SIPH										
Siphon	aria norma	is Gould	, 1846							
		1 RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai									
n N	Dahu Molokai Maui Hawaii						1111	1111		
Order: NEOTAEN										
Family: CASS										
Casma	ria erinaceu					DVC	D / 7	DΛO	DΛΩ	D \ 1 \
L	K <i>⊦</i> Kauai	1 RA2	KAS	KA4	KAS	KAb	KA/	RA8	KA9	RA10
	Nauai Dahu						1111			
	Molokai								1111	HH
N	Maui							Χ		
	Hawaii		4750)							
Cassis	cornuta (Li	nnaeus , 1 RA2		PΔ1	PA5	PA6	PΔ7	RA8	PΔQ	RA10
ŀ	Kauai	11 11/12	11/10	1777	11/10	11/10	IVAI			
	Oahu						1111	1111	1111	1111
	Molokai								$\{ \{ \{ \} \} \} \}$	
	Maui 									1111
Family: CER	Hawaii ITHIIDAE					Х				
	um echinatu	ım Houb	rick. 19	992						
		1 RA2			RA5	RA6	RA7	RA8	RA9	RA10
	Kauai									
	Oahu Malalai									
	Molokai Maui x	,		х	х	х		х	X	1 1 1 1 1 1 1 1 1
	Hawaii	X	Х	X	X	X	х	X	X	
	lavis sinen:	sis (Gme	lin, 179	91)						
		1 RA2	RA3	RA4	RA5	RA6		RA8	RA9	RA10
	Kauai Dahu						X	1111	1111	1111
	Janu Molokai						1111			
	Maui							Х		iiii.
L L	-lawaii									

Family: CYPRAEIDAI	E					
Cypraea caputs						
12	RA1 RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu Malaksi						
Molokai Maui						X
Hawaii					х	1111
Cypraea granul	lata Pease	1863			^	
eypraea grana			RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu						
Molokai						1111111
Maui						1111
Hawaii				Х		
Cypraea helvol						
12	RA1 RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu					.,	
Molokai					Х	1111111
Maui Hawaii						1111
Cypraea isabeli	la Linnaque	1758				
Oypraca isabeli			RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai					X	
Oahu			х		•	
Molokai						
Maui				Х		x
Hawaii				X		X
Cypraea macul						
	RA1 RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu Malakai						
Molokai Maui						111111
Hawaii					х	1111
Cypraea maurit	iana Linna	aus 175	S.		^	X
Oypraca maurit	RA1 RA2			RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu						
Molokai						1111111
Maui						1111
Hawaii						X
Cypraea scurra			.	.	.	D D
IZ!	RA1 RA2	2 RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						
Oahu Malakai						
Molokai Maui						111111
Hawaii	х					1111
Cypraea teres		1				
Gyp. 404 10100 1			RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	- <u>-</u>			-	-	
Oahu						
Molokai					Х	1111111
Maui						1111
Hawaii						
Cypraea tigris l			D	D	D	DAT DAG DAG DAG
Varia!	RA1 RA2	KA3	KA4	KA5	KA6	RA7 RA8 RA9 RA10
Kauai						
Oahu Molokai						
Maui	х					
Mawaii	^					1111

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Family: HIPPONICIDAE
   Hipponix (Cochlear) imbricatus Gould, 1846
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
                       X
                                                  х
                                                       х
   Hipponix australis (Lamarck, 1819)
                                                                         Cryptogenic
                 RA1 RA2 RA3 RA4
                                      RA5
                                          RA6
                                                RA7
                                                     RA8
                                                          RA9 RA10
         Kauai
                             Х
                                  Х
                                                  Х
         Oahu
         Molokai
                                            Х
         Maui
                                            х
                                  Х
                                       х
         Hawaii
                                  Х
                                       Х
                                            Х
Family: PERSONIDAE
   Distorsiosp.
                 RA1 RA2 RA3 RA4 RA5
                                                RA7 RA8
                                                           RA9 RA10
                                          RA6
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
Family: RANELLIDAE (CYMATIINAE)
   Cymatium (Cymatium) nicobaricum (Röding, 1798)
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
                             Х
    Cymatium sp.
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
Family: STROMBIDAE
    Strombus maculatus Sowerby, 1842
                 RA1 RA2 RA3 RA4 RA5 RA6
                                               RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
Family: TONNIDAE
    Tonna perdix (Linnaeus, 1758)
                 RA1 RA2 RA3 RA4 RA5 RA6
                                               RA7 RA8
                                                          RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
         Hawaii
Family: VERMETIDAE
   Dendropoma gregaria Hadfield & Kay, 1972
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
                       Х
         Hawaii
                       Х
                                                 Х
                                                       Х
   Petaloconchus keenae Hadfield & Kay, 1972
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8
                                                          RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
                                                       Х
                             Х
         Hawaii
                       Х
                                                       Х
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Serpulorbis variabilis Hadfield & Kay, 1972

Order: NEOGAS Family: BU Bucci		RA1 x x x x	RA2 x x x x x	RA3 x x x x	RA4 x x x x x	RA5	RA6 x x x	RA7 x x x x	RA8	x x	RA10
Prode	Kauai Oahu Molokai Maui Hawaii ttia iostom					14.0	x				
Fiodo	ılıa 103l0111				RA4	RA5	RA6	RA7	RA8	RA9	RA10
Family: CO	Kauai Oahu Molokai Maui Hawaii LUMBELLI	x									
Mitrel	<i>la</i> sp.	D / 1	DAG	DAG	RA4	DAE	DAG	DAZ	DAO	DAO	RA10
Family: CO	Kauai Oahu Molokai Maui Hawaii NIDAE	RA1	RA2	RAS	KA4	каз	RA6 x	RA7	RA8	KA9	KA10
	s abbrevia										
	Kauai Oahu Molokai Maui Hawaii	x	RA2		RA4 x	RA5	RA6	RA7	RA8	RA9	RA10
Conus	s chaldaeu		ding, 1 RA2		PΔ1	PA5	RA6	RA7	RA8	RA9	RA10
Conve	Kauai Oahu Molokai Maui Hawaii				NA4	KAS	NAU		$\{ \{ \{ \} \} \}$	X	
Conus	Kauai Oahu Molokai		RA2		RA4	RA5	RA6		RA8		
	Maui Hawaii					Х					1111
Conus	Hawaii s ebraeus										
	Kauai Oahu Molokai Maui Hawaii		x		RA4	RA5	RA6	RA7 x	$\{ $	RA9	RA10
Conus	s flavidus				RA4	RA5	RA6	RA7	RAR	RAG	RA10
	Kauai Oahu Molokai Maui Hawaii		х	x x	10.4	10.0	x x	x x x	$\{ \{ \} \} \}$	x x	
Conus	s <i>imperiali</i> Kauai				RA4	RA5	RA6	RA7	RA8		
	Oahu								1111		

Molokai Maui			х		11111111
Hawaii Conus leopardus (Röding,		5.4	54-	540	X
RA1 RA2 Kauai Oahu Molokai Maui Hawaii	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Conus litoglyphus Hwass, RA1 RA2	1792 RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui	10.10		10.10	10.0	
Hawaii Conus lividus Hwass, 1792	Х			Х	Х
RA1 RA2 Kauai Oahu		RA4 x	RA5	RA6 x	RA7 RA8 RA9 RA10 x
Molokai Maui Hawaii Conus marmoreus Linnaeu	X 12. 1759	•	x	x x	x
RA1 RA2			RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui					X
Hawaii Conus miles Linnaeus, 175	8				
RA1 RA2 Kauai Oahu Molokai Maui	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Hawaii Conus moreleti Crosse, 18	X 58			Х	х х
•	RA3	RA4	-	RA6	RA7 RA8 RA9 RA10 x
Hawaii	Х		X X		1111
Conus pulicarius Hwass, 1 RA1 RA2 Kauai		RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu Molokai Maui					x
Hawaii Conus rattus Hwass, 1792			Х		
RA1 RA2 Kauai	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu Molokai Maui		x			
Hawaii Conus sp.	Х			Х	Х
RA1 RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii	x	x	x x	x	x

Conus sponsa	lis Hwa	ass, 17	92				
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai				Х			x
Oahu							
Molokai							1111111
Maui			.,	Х	.,		, , , , ,
Hawaii Conus striatus	Linna	oue 17	X 758		Х		X X
Conus striatus	RA1		RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10/11	10,12	10.0	10.17	10.00	10.00	
Oahu							
Molokai						Х	
Maui							1111
Hawaii							
Family: CORALLIOP							
Coralliophila v					- · -	D.4.0	D D D D D
Kaua!	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							!!!!!!!!
Maui			Х	Х	Х		х
Hawaii		Х	X	X	X	Х	X X
Quoyula madr	eporarı						
•	RA1		RA3			RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai						Х	
Maui			Х				x
Hawaii	IID A E					Х	X X X
Family: FASCIOLAR Latirus nodatu		din 17	01)				
Latirus riodata	RA1		RA3	R ₄	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	IVAI	IVAZ	IVAS	11/14	IVAJ	IVAU	X
Oahu			х				Î
Molokai							
Maui							1111
Hawaii							X
Family: HARPIDAE							
<i>Harpa</i> sp. juv <i>.</i>	544	D 4 0	D 4 0	5	- · -	D.4.0	D D D D D
Kaua!	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							
Maui							
Hawaii			х				x
Family: MITRIDAE (C	YLIND	ROMIT	RINAE	()			
Pterygia crenu	lata (G	melin,	1791)				
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Malakai							
Molokai							1111111
Maui Hawaii							X
Family: MITRIDAE (II	MBRICA	ARIINA	F)				^
Imbricaria oliv				. 1821)		
						RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai							
Maui							1111
Hawaii Family: MITRIDAE (N	/ITDINI/	\ E \			Х		
Mitra (Mitra) m			1759	3			
mua (mua) III			RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai	,		0		0	X	
Oahu							
Molokai							1111111
Maui							1111
Hawaii							

Mitra (Mitra) stic	ctica (Link, 1	807)							
	Kauai Oahu	RA1	RA2	RA3	RA4	RA5	RA6	RA7 x		7 9	RA10
	Molokai Maui							1111	''''	Н	
	Hawaii										
Mitra (Nebularia		e scens RA2				RA6	RA7	RA8 RA	49	RA10
	Kauai		10.12	10.0		10.10	10.0				
	Oahu Molokai							1111	111111	Ш	
	Maui								1.1	11	
	Hawaii			Х							
Mitras	p.	Ρ Δ1	RA2	PΛ3	PΔ1	PA5	PA6	RA7	RA8 RA	ΔΩ	RA10
	Kauai	IXAT	INAZ	IVAS	IXA4	INAG	IXAU	IXAI	INAO IN	18	
	Oahu							$\{ $	111111	Ш	
	Molokai Maui								11	11	
	Hawaii					х					
Family: TEF	REBRIDAE	=		244							
Hastu	la penicila	nta (HI RA1	nas, 10 RA2		RA4	RA5	RA6	RA7	RA8 RA	49	RA10
	Kauai			0							
	Oahu Molokai							1111	111111	Ш	
	Maui)	Κ΄	
	Hawaii										
Hastu	la strigilat		naeus, RA2			PA5	RA6	RA7	PAR P	ΔΩ	RA10
	Kauai	IXAT	INAZ	IVAS	IXA4	INAG	X	IXAI	INAO IN	18	
	Oahu							$\{ $	111111		
	Molokai Maui								- 11	11	
	Hawaii										
Terebi	ra macula					D.4.5	D.4.0	D 4 7	D.4.0. D.		D 4 4 0
	Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA	19	RA10
	Oahu							1111	111111	П	
	Molokai								- 11	Н	
	Maui Hawaii						х				1111
Family: THA	AIDIDAE										
Drupa	(Drupa) n		ı Rödir RA2			PA5	RA6	Ρ Δ7	RA8 RA	ΔΩ	RA10
	Kauai	13/3/1	11/12	Х	Х	11/10	11/10	13/3/			
	Oahu								111111	Ш	
	Molokai Maui								i i	11	
	Hawaii						х				
Drupa	(Drupa) r		(Linnae RA2			RA5	DAG	D A 7	DAO D	۸.	D A 4 O
	Kauai	KAI	KAZ	KAS	X X	скя	KAO	KAI	RA8 RA	19	KAIU
	Oahu							$\{ $	111111	Ш	
	Molokai Maui								- 11	11	
	Hawaii						Х				
Drupa	(Ricinella						D.4.0	D 4 7	D.4.0. D.		D 4 4 0
	Kauai	RA1	KA2	RA3	KA4	KA5	RA6	RA7	KAS R	49	RA10
	Oahu							$\{ $		H	
	Molokai Moui	v			X				- 11	Н	
	Maui Hawaii	Х			Х		х				

<i>Drupa</i> sp.	DΛ1	RA2	DΛ2	D A A	RA5	DΛ6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai	KAT	KAZ	KAS	X X	KAS	KAU	RAI RAO RAY RATU
Maui Hawaii					х		x
Drupella elata							
Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu Molokai							
Maui Hawaii	Х		X X	X X	X X		x
Drupella ochro			ville, 1	832)			
Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu Molokai Maui							
Hawaii Morula granul a	ata (Du	clos, 1	832)				X
Kauai	RÀ1	RA2	RÁ3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Nauai Oahu Molokai Maui Hawaii						x	
Morula sp.							
Kauai	RA1	RA2 x	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu		^					
Molokai Maui							
Hawaii							Х
<i>Morula uva</i> (R		1798) RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10711	10.02	10.00	1014	10.00	10.10	
Oahu Molokai							
Maui							
Hawaii Family: TURRIDAE (MANGE	LIINAE	Ξ)				х х
Macteola sege	esta?(C	henu,	1850)	D A 4	DAG	DAC	DA7 DA0 DA0 DA40
Kauai	KAI	RA2	KAS	KA4	KAS	RA6	RA7 RA8 RA9 RA10
Oahu Molokai							
Maui		Х					1111111
Hawaii Order: SACOGLOSSA							
Family: PLAKOBRA	NCHIDA	AΕ					
Plakobranchus	s ocella	atus va R Δ ク	n Has RA२	selt, 18	8 24 RA5	RAA	RA7 RA8 RA9 RA10
Kauai	IVAI	IVAZ	11/10	11/14	11/10	11/10	
Oahu Molokai		Х			х		x
Maui					^		^
Hawaii Order: NUDIBRANCHIA							
Family: CHROMODO			<u>.</u>	4			
Glossodoris ru		ginata RA2				RA6	RA7 RA8 RA9 RA10
Kauai		,	0	,	0	Х	
Oahu Molokai							
Maui							
Hawaii							

Family: DORIDIDAE <i>Halgerda terra</i>				lohns	on 10	82	
riaigei da terrai							RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai							
Maui							
_ Hawaii		_			Х		X
Family: HEXABRANG Hexabranchus			/Dünn	AII 9 I 4	ouokar	4 1021	١
riexabianchus	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai		Х					
Oahu Malaksi							
Molokai Maui							111111
Hawaii							
Family: PHYLLIDIID	٩E						
<i>Phyllidia</i> sp.	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10/11	10.12	10.00	10.	10.00	10.0	
Oahu							
Molokai Maui						Х	111111
Hawaii							1111
Phyllidia varice	osa La	marck,	, 1801				
Kauai	RA1	RA2	RA3	RA4	-	RA6 x	RA7 RA8 RA9 RA10
Oahu					Х	X	
Molokai						Х	HHHHH
Maui					.,	.,	1111
Hawaii Phyllidiella pus	stulosa	(Cuvi	er. 180	14)	Х	Х	
i nymaicha pac					RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai			х				
Maui			^				
Hawaii					Χ		
Class: BIVALVIA Family: ANOMIIDAE							
Anomia nobilis							Introduced
V	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu	х	х					
Molokai	^	^					
Maui							1111
Hawaii Family: ARCIDAE (Al		=\					
Arca ventricos	a Lam	- <i>₁</i> arck, 1	819				
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai	Х					Х	
Maui	Х				Х		x x x
Hawaii Barbatia divari	cata S	X owerb	X v 1833	X	Х		x x x
Darbatia divari					RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai							
Maui	х					х	1111
Hawaii		х	Х		X	X	x x
<i>Barbatia</i> sp.	D / 1	DAG	DAG	D //	D A F	DAG	RA7 RA8 RA9 RA10
Kauai	KAI	RΑΖ	KAS	KA4 X	САЛ	KAO	NAI NAO NAS NATU
Oahu							
Molokai Maui							
Hawaii							1.1.1

Family: CARDIIDAE							
Trachycardium					- · -	D.4.0	B B B B
14	RA1	RA2	RA3	RA4	RA5		RA7 RA8 RA9 RA10
Kauai						Х	
Oahu							
Molokai							111111
Maui Hawaii							X 1111
Family: GASTROCH	V E VIID	۸E					Х
Gastrochaena		AL					
Gastiochaenas		PA2	PΔ3	PΔΛ	PA5	PA6	RA7 RA8 RA9 RA10
Kauai	IVAI	11/12	11/10	11/14	11/10	11/10	
Oahu							
Molokai						х	
Maui			х		Х		
Hawaii			х			Х	x x
Family: ISOGNOMOI	VIDAE						
İsognomon per	na (Li	nnaeu	s, 1767	7)			
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu		Х	Х				
Molokai							X
Maui	Х					Х	X
Hawaii							
Family: MYTILIDAE	vobvio.		(Cons	ad 404	27\		
Brachidontes of						PA6	RA7 RA8 RA9 RA10
Kauai	IXAI	IVAZ	IVAS	11/14	IVAJ	IVAU	
Oahu							
Molokai						Х	
Maui							
Hawaii							
Septifer bryana	ae (Pils	bry, 19	921)				
				RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai						X	
Oahu							
Molokai							
Maui							1111
Hawaii							
Family: OSTREIDAE Crassostrea gig		Chunh	ora 17	'03\			Introduced
Ci assosii ea gi				RA4	RA5	RA6	
Kauai	10/11	10,12	10.0	10.1	10.00	10.00	
Oahu							
Molokai							
Maui							x !!!!
Hawaii							
Dendostrea sa							
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu		Х					
Molokai	Х						111111
Maui Hawaii							iiii
unid.Ostreidae							
uniu.Ostreiuae	RΔ1	RA2	R _A 3	R ₄	R ₄ 5	RA6	RA7 RA8 RA9 RA10
Kauai		,	, .0		, .0	, .0	
Oahu							
Molokai							11111111
Maui						Χ	x
Hawaii							
unid.Ostreidae		•	_	_	_	_	
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu							
Molokai Maui	.,						i i i i i i i i i i i i i i i i i i i
Maui Hawaii	Х						1.1.1.1
i iawali							

	amily: PECTIN	NIDAE									
	Chlamys i	irregularis				D 4 F	DAG	D 4 7	D 4 0	D 4 0	D 4 4 0
	Kau		RA2	RA3	KA4	RA5	RAb	KA/	RA8	RA9	RA10
	Oal							1111	1111		
		lokai								11111	
	Mai										
	ום amily: PINNID=	waii AF	Х								
		nna saccat	a (Linn	aeus, 1	1758)						
		RA1	RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kau				Х						
	Oal Mo	nu Iokai						1111			111
	Mai										111
		waii		Х							
ļ	amily: PSAMN		/ /D:I-		2041						
	Grammate	omya kana R A 1	RA2			RA5	RA6	RA7	RA8	RA9	RA10
	Kau		10.02	10.10	1017	10.0	10,10	10/1/			
	Oal							++++	$\{ \ \ \ \ $	11111	
		lokai								1111	
	Mai Hav	uı waii								i	111
1	amily: PTERII										
	,	margaritife									
	17-		RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kaı Oal			х	х	х		X	1111		
		lokai x		^	^	^	Х				
	Mai	ui x			Х		Χ	Χ	Х		111
1		waii							Х		Х
ļ	amily: SPOND Spondylu	s violaces	ens La	marck	1819						
	Оролаула	RA1				RA5	RA6	RA7	RA8	RA9	RA10
	Kau			Х	Х			Х			
	Oal								1111		
	Mai	lokai ui									
							x		x	X	
	Ha\	waii	х	х	Х	Х	X X	x	X X	X X	x
	amily: TELLIN	IDAE			x	x		x			х
	amily: TELLIN	IDAE <i>ucigera</i> La	marck,	1818			х		Х	Х	
!	Family: TELLIN Tellina cr o	IDAE ucigera La RA1		1818			х	x RA7			
	amily: TELLIN	IDAE ucigera La RA1 uai	marck,	1818			х		Х	Х	
1	Family: TELLIN Tellina cr o Kau Oal Mo	IDAE ucigera La RA1 uai hu lokai	marck,	1818			х		X RA8	Х	
1	Family: TELLIN Tellina c ri Kau Oal Mo Mai	IDAE <i>ucigera</i> La RA1 uai hu lokai ui	marck,	1818			х		Х	Х	
1	Family: TELLIN Tellina c ri Kau Oal Moi Mai Hav	IDAE <i>ucigera</i> La RA1 uai hu lokai ui waii	marck, RA2	1818 RA3			х		X RA8	Х	
	Family: TELLIN Tellina c ri Kau Oal Moi Mai Hav	IDAE ucigera La RA1 uai hu lokai ui waii eobinata Lii	marck, RA2	1818 RA3	RA4	RA5	X RA6	RA7	X RA8	Х	RA10
	Family: TELLIN Tellina cro Kau Oal Moi Mai Has Tellina sc	IDAE ucigera Lai RA1 uai hu lokai ui waii cobinata Lii RA1	marck, RA2	1818 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
	Family: TELLIN Tellina cro Kau Oal Moi Mai Hav Tellina sc Kau Oal	IDAE ucigera Lai uai hu lokai ui waii vobinata Lii RA1	marck, RA2	1818 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
	Family: TELLIN Tellina cro Kau Oal Moi Mai Hav Tellina sc Kau Oal	IDAE ucigera La RA1 uai hu lokai ui waii robinata Li uai hu lokai	marck, RA2	1818 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
	Family: TELLIN Tellina cri Kau Oal Moi Mai Hav Tellina sc Kau Oal Moi Mai	IDAE ucigera La RA1 uai hu lokai ui waii robinata Lii uai hu lokai ui waii	marck, RA2	1818 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
Class: POI	Family: TELLIN Tellina cri Kau Oal Moi Mai Tellina sc Kau Oal Moi Au Tellina sc	IDAE ucigera La RA1 uai hu lokai ui waii robinata Lii uai hu lokai ui waii	marck, RA2	1818 RA3 , 1758 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Hau Tellina sc Kau Oal Moi Moi Moi Moi Cal	IDAE ucigera La RA1 uai hu lokai waii cobinata Li RA1 uai hu lokai ui waii ka	marck, RA2	1818 RA3 , 1758 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Mar Tellina sc Kau Oal Moi Moi Mar Hav 2YPLACOPHOF: CHITONIDA	IDAE ucigera La RA1 uai hu lokai ui waii RA1 uai hu lokai ui waii RA1 uai robinata Lii RA1 uai rokai rokai vaii RA	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3	RA4	RA5	X RA6	RA7	X RA8	X RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Mar Tellina sc Kau Oal Moi Moi Moi Moi Family: CHITONIDA Family: CHITONIDA	IDAE ucigera La RA1 uai hu lokai ui waii RA1 uai hu lokai ui waii RA1 uai hu lokai ui waii RA NIDAE iton petalon RA1	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3 ×	RA4 RA4	RA5	x RA6	RA7 RA7 x	x RA8	RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Mar Tellina sc Kau Oal Moi Mar Hav YPLACOPHOF : CHITONIDA Family: CHITON Ischnochii Kau	IDAE ucigera La RA1 uai hu lokai ui waii RA1 uai hu lokai ui waii RA1 uai hu lokai ui waii RA NIDAE iton petalo uai	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3 ×	RA4 RA4	RA5	x RA6	RA7 RA7 x	x RA8	RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Mar Tellina sc Kau Oal Moi Mar Hav YPLACOPHOF : CHITONIDA Family: CHITON Ischnochi Kau Oal	IDAE ucigera La RA1 uai hu lokai ui waii RA1 uai hu lokai tui waii RA1 ui waii RA IDAE iton petaloi ui ui lokai tui RA1	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3 ×	RA4 RA4	RA5	x RA6	RA7 RA7 x	x RA8	RA9	RA10
Class: POI Order	Family: TELLIN Tellina cro Kau Oal Moi Mar Tellina sc Kau Oal Moi Mar Hav YPLACOPHOF : CHITONIDA Family: CHITON Ischnochi Kau Oal	IDAE ucigera La RA1 uai hu lokai ui waii robinata Li RA1 uai hu lokai ui waii RA IDAE iton petalo uai hu lokai	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3 ×	RA4 RA4	RA5	x RA6	RA7 RA7 x	x RA8	RA9	RA10
Class: POI Order	Family: TELLIN Tellina cri Kau Oal Moi Mai Tellina sc Kau Oal Moi Mai Hav YPLACOPHOF : CHITONIDA Family: CHITON Ischnochi Moi Mai	IDAE ucigera La RA1 uai hu lokai ui waii robinata Li RA1 uai hu lokai ui waii RA IDAE iton petalo uai hu lokai	marck, RA2 nnaeus RA2	1818 RA3 , 1758 RA3 ×	RA4 RA4	RA5	x RA6	RA7 RA7 x	x RA8	RA9	RA10

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Class: CEPHALOPODA
       Order: OCTOPODA
           Family: OCTOPODIDAE
               Octopus cyanea Gray, 1849
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                                                  Х
                     Oahu
                                                   Х
                     Molokai
                     Maui
                                                   Х
                                                                  Х
                     Hawaii
Phylum: ECTOPROCTA
   Class: GYMNOLAEMATA
       Order: CHEILOSTOMATA
           Family: SCHIZOPORELLIDAE
               Schizoporella errata? (Waters, 1878)
                                                                                    Introduced
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                                                        Х
                     Oahu
                     Molokai
                     Maui
                     Hawaii
   Class: STENOLAEMATA
       Order: CYCLOSTOMATA
           Family: CRISINIDAE
               Crisina radians? (Lamarck, 1816)
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                                        Х
                                                        Χ
                     Oahu
                     Molokai
                     Maui
                     Hawaii
                                        Х
                                                        X
           Family: LICHENOPORIDAE
               Disporella violacea (Canu & Bassler, 1927)
                            RA1 RA2 RA3 RA4 RA5 RA6
                                                           RA7 RA8 RA9 RA10
                                                        х
                     Oahu
                     Molokai
                     Maui
                     Hawaii
                                   Х
Phylum: ECHINODERMATA
   Class: ASTEROIDEA
       Order: VALVATIDA
           Family: ACANTHASTERIDAE
               Acanthaster planci Linnaeus, 1758
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                                        Χ
                                                  Х
                     Oahu
                     Molokai
                     Maui
                    Hawaii
                                                        Х
                                                             Х
           Family: OPHIDIASTERIDAE
               Linckia guildingi Gray, 1840
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                     Oahu
                     Molokai
                     Maui
                                                   Х
                     Hawaii
               Linckia multifora (Lamarck, 1816)
                            RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
                     Kauai
                                   Х
                     Oahu
                     Molokai
                     Maui
```

Х

Hawaii

	L <i>inckia</i> sp.										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7 I	RA8	RA9	RA10
	Kauai							1	1111	111	
	Oahu							11111		1111	1111
	Molokai									111	HH
	Maui										Hiii
	Hawaii									v	
Closes ODLII IDa										Х	
Class: OPHIUR											
Order: OPI											
	y: OPHIOCOMI		_								
(Ophiocoma bre										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7 I	RA8	RA9	RA10
	Kauai									111	
	Oahu									1111	
	Molokai									1111	
	Maui				Х						
	Hawaii										
	Ophiocoma der	ntata N	Iuller 8	& Tros	chel. 1	842					
	- p		RA2				RA6	RA7 I	RA8	RA9	RA10
	Kauai	10/11	10,12	10.00	10.17	10.0	X	100	1111	1 1 1	1111
							^			111	
	Oahu									1111	
	Molokai								i	111	
	Maui										1111
	Hawaii										
(Ophiocoma eri	naceus	s Mulle	r & Tr	osche	l, 1842					
		RA1	RA2	RA3	RA4	RA5	RA6	RA7 I	RA8	RA9	RA10
	Kauai		Х		Х			1	1111	1111	
	Oahu							11111		1111	
	Molokai		х				Х			1111	1111
	Maui						~				HH
	Hawaii		х	х	х	х		Х	х		
	Ophiocoma pic	a Mull						^	^		
	ориносоніа ріс	a wuun	כו 	OSCITE	1, 1042	4					
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	Kauai		RA2	RA3	RA4		RA6	RA7	RA8	RA9	RA10
	Kauai							!	RA8	RA9	RA10
	Oahu		RA2	RA3			x	11111	RA8	RA9	RA10
	Oahu Molokai			RA3 x	RA4	RA5	x x	!			RA10
	Oahu Molokai Maui		RA2	RA3 x			X X X	11111	x	x	RA10
	Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x	RA4	RA5	x x	11111			RA10
	Oahu Molokai Maui	RA1	RA2	RA3 x	RA4	RA5	X X X	11111	x	x	RA10
	Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x x	RA4	RA5	X X X	x	X X	x	
	Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x x	RA4	RA5	X X X	x	X X	X	
,	Oahu Molokai Maui Hawaii Ophiocoma sp.	RA1	RA2	RA3 x x	RA4	x RA5	X X X	x	x x x	X	
,	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
,	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
Class: ECHINO	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
Class: ECHINO Order: CID	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x x	RA4	x RA5	X X X	X RA7	x x x	X	
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE	RA1	x RA2	x x x RA3	x RA4	x RA5	X X X	X RA7	x x x	X	
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu	RA1 RA1	x RA2	RA3 X X X RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai	RA1 RA1	x RA2	RA3 X X RA3 RA3	x RA4	x RA5 x	x x x x RA6	X RA7 I	x x RA8	X X RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Maui Hawaii	RA1 RA1 s gigan RA1	RA2 x RA2 tea Ac RA2	RA3 x x x RA3	x RA4 1863 RA4	x RA5 x	x x x RA6	RA7 I	x x RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Maui Hawaii	RA1 RA1 RA1	RA2 x RA2 atea Aq RA2 x amarci	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	x x x RA6	RA7 I	x x RA8	X X RA9 X X	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Maui Hawaii Hawaii	RA1 RA1 RA1	RA2 x RA2 tea Ac RA2	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	x x x RA6	RA7 I	x x RA8 RA8	x x RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Maui Hawaii Eucidaris metu Kauai	RA1 RA1 RA1	RA2 x RA2 atea Aq RA2 x amarci	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	x x x RA6	RA7 I	x x RA8	X X RA9 X X	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Hawaii Eucidaris metu Kauai Oahu	RA1 RA1 RA1	RA2 x RA2 atea Aq RA2 x amarci	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	X X X RA6	RA7 I	x x RA8	X X RA9 X X	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Maui Hawaii Eucidaris metu Kauai Oahu Molokai Maui Hawaii	RA1 RA1 RA1	RA2 x RA2 atea Aq RA2 x amarci	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	x x x RA6	RA7 I	x x RA8	X X X RA9 X X RA9	RA10
Class: ECHINO Order: CID Famil	Oahu Molokai Maui Hawaii Ophiocoma sp. Kauai Oahu Molokai Maui Hawaii IDEA AROIDA y: CIDARIDAE Chondrocidaris Kauai Oahu Molokai Hawaii Eucidaris metu Kauai Oahu	RA1 RA1 RA1	RA2 x RA2 attea Aq RA2 x amarci	RA3 X X X RA3 RA3	x RA4 1863 RA4	x RA5 x	X X X RA6	RA7 I	x x RA8	X X RA9 X X	RA10

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Order: CLYPEASTEROIDA
    Family: CLYPEASTERIDAE
        Clypeaster (Rhaphidoclypus) reticulatus (Linnaeus, 1758)
                      RA1 RA2 RA3 RA4 RA5 RA6 RA7
                                                            RA8 RA9 RA10
              Kauai
              Oahu
              Molokai
              Maui
              Hawaii
Order: DIADEMATOIDA
    Family: DIADEMATIDAE
        Diadema paucispinum Agassiz, 1863
                      RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
              Kauai
              Oahu
              Molokai
              Maui
                                                   Х
              Hawaii
        Echinothrix calamaris (Pallas, 1774)
                      RA1 RA2 RA3 RA4
                                            RA5
                                                 RA6
                                                       RA7 RA8 RA9 RA10
              Kauai
                            Х
                                  Х
                                        Х
                                             Х
                                                  Х
              Oahu
                                  Х
                                        Х
                                             Х
                                                  Х
              Molokai
                             Х
                                        Х
                                                  х
              Maui
                             Х
                                        Х
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                                                                   Х
              Hawaii
                       Х
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                                                              Х
                                                                   Х
                                                                        Х
        Echinothrix diadema (Linnaeus, 1758)
                      RA1 RA2 RA3 RA4
                                            RA5
                                                 RA6
                                                            RA8
                                                                 RA9 RA10
                                                       RA7
              Kauai
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                                  Χ
                                        Χ
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                                                  Х
              Oahu
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                                        Х
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              Molokai
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              Maui
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                       Х
                                  X
              Hawaii
                       Х
                            Х
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                                                                   Х
                                                                        Х
        Tripneustes gratilla (Linnaeus, 1758)
                                            RA5
                      RA1 RA2 RA3 RA4
                                                 RA6
                                                       RA7
                                                            RA8
                                                                 RA9 RA10
              Kauai
                                        Х
                                             х
              Oahu
                                             Х
                                                   Х
              Molokai
                            Х
                                        Х
                                                  Х
                                                        Х
              Maui
                             Х
                                        х
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                                                        Х
              Hawaii
                       Х
                             Х
                                  Х
                                        Х
                                             Х
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Order: ECHINOIDA
    Family: ECHINOMETRIDAE
        Echinometra mathaei (Blainville, 1825)
                      RA1
                           RA2 RA3 RA4
                                            RA5
                                                 RA6
                                                       RA7 RA8 RA9 RA10
              Kauai
                       Х
                                  Х
                                        Χ
                                                   Х
              Oahu
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                       Х
              Molokai
                            Х
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              Maui
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                                                                   Х
              Hawaii
                       Χ
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        Echinometra oblonga (Blainville, 1825)
                           RA2 RA3 RA4
                                           RA5 RA6
                                                       RA7 RA8
                      RA1
                                                                 RA9 RA10
              Kauai
                            Х
              Oahu
                             Х
              Molokai
              Maui
                            Х
                                        Х
                                                        X
                                                              Х
              Hawaii
                                                  Х
        Echinostrephus aciculatus Agassiz, 1863
                      RA1 RA2 RA3 RA4 RA5
                                                 RA6
                                                       RA7 RA8
                                                                 RA9 RA10
              Kauai
                                  Х
                                       Х
                                             Х
                                                  Х
                                                        Х
              Oahu
                                        Х
                                             Х
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              Molokai
                                                  х
              Maui
                                  Х
                                                                   Х
              Hawaii
                                  х
                                                                   Х
        Heterocentrotus mammillatus (Linnaeus, 1758)
                      RA1 RA2 RA3 RA4
                                            RA5
                                                RA6
                                                       RA7
                                                            RA8
                                                                 RA9 RA10
              Kauai
                            Х
                                        Х
              Oahu
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              Molokai
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              Maui
                                        Х
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                       Х
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              Hawaii
                       Х
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Order: SPATANGOIDA										
Family: BRISSIDAE										
Brissus latecal	rinatus	(Lesk	e, 1778	3)						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai										
Oahu							-1111	1111	1111	
Molokai									11111	
Maui										
Hawaii										
Order: TEMNOPLEUROID										
Family: TOXOPNEU										
Pseudoboletia										
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai										
Oahu										
Molokai									11111	
Maui										
Hawaii			Х							
Class: HOLOTHUROIDEA										
Order: ASPIDOCHIROTID										
Family: HOLOTHUR										
Actinopyga ma										
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai								1111	1111	
Oahu		Х			Х			1111		
Molokai										
Maui										
Hawaii						Х			Х	
Actinopyga ob										
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai			Х	Х				1111		
Oahu								1111		
Molokai										
Maui										
Hawaii										
Holothuria (Ha										
	RA1			RA4	RA5		RA7	RA8	RA9	RA10
Kauai		Х	Х		Х	Х				
Oahu						Х	1111			
Molokai				Х				Х	1111	
Maui									Х	
Hawaii									Х	
Holothuria (Ha						D 4 6		D 4 0	D.4.0	D 4 4 0
Kaua!	RA1	RA2	RA3	RA4	RA5	RA6	RA/	RA8	RA9	RA10
Kauai								1111		
Oahu Malakai		Х					1111	1111		
Molokai									1111	
Maui										
Hawaii	4h - 1	- \	: [201 40	007					
Holothuria (Mic						D 4 C	D 4 7	D 4 0	D 4 0	D 4 4 0
Kauai	KAT			KA4	RA5	KAb	KA/	KA8	RA9	RATU
Kauai Oahu		Х	Х	V				1111		
Molokai				X				1111		
				X					1111	
Maui Hawaii	х			Х		X	Х		v	
Hawaii Holothuria (Th		rcial hi	ءم ا داا	son 1	ጸვቦ	Х			Х	
Holoulula (III)					RA5	RA6	RA7	RA8	RA9	RA10
Kauai	13/3/1	11/74	1070	1077	11/10	1070	1.0.7.1			
Oahu							1111	1111		
Molokai						Х				
Maui										
Hawaii										
arran										

Condent ENTEROGONA	Phylum: CHORDATA											
Family: ASCIDIDAE Phallusa Ingra Savigny, 1816 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Cryptogenic RA1 RA2 RA3 RA4 RA5 RA6 R	Class: ASCIDIACEA											
Phallusia nigra Savigny, 1816 R41 R42 R43 R44 R45 R46 R47 R48 R49 R410 R41 R42 R43 R44 R45 R46 R47 R48 R49 R410 R41		E										
RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10			ınv. 18	16								Introduced
Captu	J				RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Molokal Hawaii Family: DiDemnum candidum? (white) Cryptogenic RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Cahu X										1111		
Maui			Х					1111	1111			
Family: Dickminate		u								1111	1111	
Family: DIDEMNIDAE Didemnum candidum? (white Didemnum candidum? (white Didemnum candidum? (white Didemnum candidum? (white Cryptogenic Ra1 Ra2 Ra3 Ra4 Ra5 Ra6 Ra7 Ra8 Ra9 Ra10 Ra1 R											1111	
Didemnum candidumf (white:		AE										
RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10			1? (whi	ite)								Cryptogenic
Cahu		RA1	RA2	ŔA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Molokal x			X	Х	Χ	Х	Х					
Maui								1111				
Hawaii			Х	v			Х		Х	1111		
RA1				Х		v	~		v			
RA1			1			^	^		^			
Cahu		,		RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Molokai x Maui	Kauai								$\{\{\}\}\}$	1111	1111	
Maui		_						1111	1111			
Hawaii		li	Х							1111		
Family: POLYCLINIDAE				v							1111	
RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10				Х								
RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10												
Cahu Molokai Maui Hawaii Class: ACTINOPTERYGII Order: ANGUILLIFORMES Family: MURAENIDAE Gymnomuraena zebra (Shaw, 1797) RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu Molokai Maui X Hawaii Gymnothorax flavimarginatus (Rüppell, 1830) RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu X X X X X X X X X	, .		RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Molokai Maui Hawaii Class: ACTINOPTERYGII Order: ANGUILLIFORMES Family: MURAENIDAE							Х		\Box	1111	1111	
Maui		_						1111	1111			
Hawaii Class: ACTINOPTER/GII Order: ANGUILLIFORMES Family: MURAENIDAE Gymnomuraena zebra (Shaw, 1797) RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu Molokai Maui x Hawaii RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu Augusta August		ıi								1111		
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RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai			gris (Sł	naw &	Nodde	er, 1795	5)					
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Molokai x						Χ						
Maui		.:							1111			
		u						Х		1111		
	Hawaii	x	х			х	х			х	X	

G	ymnothorax r	ueppe	lliae (N	/IcClell	and, 1	845)		
	-					RÁ5	RA6	RA7 RA8 RA9 RA10
	Kauai							
	Oahu							
	Molokai			Х				111111111
	Maui							1111
	Hawaii S <i>ymnothorax</i> s	n						
G	iyiiiilotilorax S	ρ. RA1	RA2	PΔ3	PΔΛ	RA5	PA6	RA7 RA8 RA9 RA10
	Kauai	IXAI	INAZ	IVAS	11/14	IVAJ	IVAU	I I I I I I I I I I I I I I I I I I I
	Oahu			Х				
	Molokai		х	X				
	Maui							
	Hawaii	х	х			х		x x
	OPIFORMES							
•	: SYNODONTI							
S	aurida gracili							
		RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
	Kauai							
	Oahu				Х			
	Molokai Maui							1111111
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s	ynodus derma	atoaen	vs Fov	vler. 19	12			^
_	,					RA5	RA6	RA7 RA8 RA9 RA10
	Kauai							
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	Molokai							1111111
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S	<i>ynodus</i> sp.							
	IZ!	RA1	RA2	RA3		RA5	RA6	RA7 RA8 RA9 RA10
	Kauai		.,	X	X			
	Oahu Molokai		Х	Х	Х			x
	Maui	х	х					X
	Hawaii	^	X					X X
	Hawan		^					X X
Ordon I ODI	HILODMES							
	HIIFORMES	DAE						
	: ANTENNARII I ntennarius co		oni (l	atroille	180/	1)		
7	intermanus co	RA1				RA5	RA6	RA7 RA8 RA9 RA10
	Kauai	1011		Х		10.0	10.00	
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	Molokai							
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IV	lyripristis berr						D.4.0	DA7 DA0 DA0 DA40
	Kaua!	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
	Kauai Oahu						х	X
	Molokai						^	
	Maui							!!!!
	Hawaii	Х	Х	Х	Х			1111
N	lyripristis sp.	^	^	^	^			
	, ,р.	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
	Kauai							
	Oahu							
	Molokai							
	Maui				Χ			х
	Hawaii			Х			Х	x x x

Neon	iphon san	nmara	(Forss	kål, 17	775)						
	•					RA5	RA6	RA7	RA8	RA9	RA10
	Kauai Oahu							1111			
	Molokai Maui										
	Hawaii		х								
Sargo	centron s	sp.									
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai									1111	
	Oahu Molokai							1111	1111		
	Maui										1111
	Hawaii			Х							
Order: SYNGNA											
Family: AU			ia/I inn		47CC)						
Aulos	tomus ch	RA1			RA4	RA5	RA6	RA7	RA8	PΔQ	RA10
	Kauai	IXAT	INAZ	INAS	X	X	INAU	IXA	INAO	11/13	INATO
	Oahu			х	X	X	х	1111	1111	1111	1111
	Molokai									1111	HH
	Maui	Х			х		Х		х		1111
	Hawaii		Х			Х	Х		х	х	Х
Family: FIS	TULARID	AE									
Fistul	aria comi										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			.,	X			X		1111	
	Oahu			Х	Х	Х	Х	1111	1111	1111	1111
	Molokai Maui	v					Х			1111	
	Hawaii	Х								х	X
Fistul	aria petim	nha Ia	cánàda	1803	Ł					^	^
7 10141	aria peari	RA1				RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			0							
	Oahu						х	1111	1111	1111	1111
	Molokai			х			х	х		1111	1111
	Maui										1111
	Hawaii										
Order: SCORPA											
Family: CA				4045							
Carac	anthus ty					RA5	DAG	RA7	RA8	DΛΩ	RA10
	Kauai	KAI	KAZ	KAS	KA4	KAS	KAO	KAI	KAO	KAS	KAIU
	Oahu							1111	1111	1111	
	Molokai									1111	
	Maui									Х	1111
	Hawaii						х			X	
Family: SC	ORPAENI	DAE									
Scorp	aenodes	parvip	innis (Garret	t, 1864	ł) _	_		_	_	
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai										
	Oahu							1111	1111		
	Molokai									1111	
	Maui Hawaii									v	
Sohas	паман stapistes (conior	ta lani	kine 1	0 03					Х	
Ocha	παρισίου					RA5	RA6	RA7	RA8	RA9	RA10
	Kauai									1111	HIII
	Oahu				х			1111	1111	1111	1111
	Molokai									1111	1111
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Taeni	anotus tri						D 4 -	D. 4 -	D	D	D 4 4 5
	I/a!	RA1	RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			Х						1111	1111
	Oahu Molokai							1111	1111		
	Molokai Maui									1111	1111
	Mawaii										
	· ia ii aii										

Order: PERCIFORMES Family: ACANTHURIDAE Acanthurus achilles Shaw, 1803 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu X Molokai Maui Hawaii Х Х Х Х Х Acanthurus blochii (Valenciennes, 1831) RA1 RA2 RA3 RA4 RA5 RA6 RA9 RA10 RA7 RA8 Kauai Х Х Х Х Х Oahu Х Х Х Х Х Molokai Х х х Х Maui Х Х Х Х Hawaii Х Х Acanthurus dussumieri Valenciennes, 1835 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Х Х Х Oahu Molokai Х Х Х Maui Х Х Х Hawaii Х Х Acanthurus guttatus (Bloch & Schneider, 1801) RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Oahu Molokai Maui Hawaii Х Acanthurus leucopareius (Jenkins, 1903) RA1 RA2 RA3 RA4 RA5 RA7 RA8 RA9 RA10 Kauai Х Oahu Χ Molokai X Maui Hawaii Х Х Х X Acanthurus nigricans (Linnaeus, 1758) RA1 RA2 RA3 RA4 RA5 RA7 RA8 RA9 RA10 RA6 Kauai Oahu Molokai Maui x | | | | Hawaii Acanthurus nigrofuscus (Forsskål, 1775) RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Х Х Х Х Х Oahu Х Х Х Х Molokai Х Х Х Х Х Х x | | | Maui Х Х Х Х Hawaii Х X х Х Х х х х Acanthurus nigroris Valenciennes, 1835 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Х Χ Х Х Х Oahu Х Х Molokai Х Х Х Х Maui Х Х Χ Х Hawaii х X х х Х X Х Х Acanthurus olivaceus Bloch & Schneider, 1801 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10 Kauai Х Х Х Χ Х Oahu Х х Molokai Х Х Maui x X Х Х Х

Х

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Hawaii

Acanthurus the	ompso	ni (Fo	vler, 19	923)			
			RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							
Maui							
Hawaii							X
Acanthurus tri			<i>ivicen</i> : RA3				RA7 RA8 RA9 RA10
Kauai	Х	X	Х	11/14	Х	IVAU	X
Oahu	X	Х	X	Х	X	Х	
Molokai	X	Χ		Χ	Χ	Χ	x x
Maui Hawaii	v	х	X X	Х			
Acanthurus xa	X nthopt			ennes.	1835		x x x
			RA3			RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai							
Maui							
Hawaii			Х			Х	Х
Ctenochaetus				,		D.4.0	DA7 DA0 DA0 DA40
Kauai	RA1	RA2	RA3 x	RA4 x	RA5	RA6	RA7 RA8 RA9 RA10
Oahu			^	^		Х	
Molokai							
Maui							1111
Hawaii Ctenochaetus	X	X us (Re	nnott	X 1828\	Х	Х	x x x x
Oteriocnaetus	RA1	RA2			RA5	RA6	RA7 RA8 RA9 RA10
Kauai			Χ	Χ			
Oahu	X	X	Χ	Х	Х	Χ	
Molokai Maui	X X	X X		X X	Х	х	x x x
Hawaii	X	X	Х	X	Х	^	x x x x
Naca annulati				\			
Naso annulatu							
			RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai					RA5	RA6	RA7 RA8 RA9 RA10
						RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui					RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii	ŘA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui	ŘA1 tris (Va	RA2	RA3	RA4 835)	RA5 x		
Kauai Oahu Molokai Maui Hawaii	ŘA1 tris (Va	RA2	RA3	RA4 835)	RA5	RA6	
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu	ŘA1 tris (Va	RA2	RA3	RA4 835)	RA5 x		
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai	ŘA1 tris (Va	RA2	RA3	RA4 835)	RA5 x		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu	ŘA1 tris (Va	RA2	RA3	RA4 835)	RA5 x		
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui	RA1 tris (Va RA1	RA2	RA3 nnes, 1 RA3	RA4 835) RA4	RA5 x		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius	RA1 <i>tris</i> (Va RA1 Randal	RA2	RA3 nnes, 1 RA3	RA4 835) RA4	x RA5		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius	RA1 <i>tris</i> (Va RA1 Randal	RA2	RA3 nnes, 1 RA3	RA4 835) RA4	x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius	RA1 <i>tris</i> (Va RA1 Randal	RA2	RA3 nnes, 1 RA3	RA4 835) RA4	x RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Maui Hawaii	RA1 <i>tris</i> (Va RA1 Randal	RA2	RA3 nnes, 1 RA3	RA4 835) RA4	x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 tris (Va RA1 Randal RA1	RA2	RA3 nnes, 1 RA3 I, 1992 RA3	RA4 (835) RA4 RA4	x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Maui Hawaii	RA1 tris (Va RA1 Randal RA1	lencie RA2	RA3 nnes, 1 RA3 I, 1992 RA3	RA4 835) RA4 RA4	RA5 x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 tris (Va RA1 Randal RA1	lencie RA2	RA3 nnes, 1 RA3 I, 1992 RA3	RA4 835) RA4 RA4	RA5 x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu	RA1 tris (Va RA1 Randal RA1	lencie RA2	RA3 nnes, 1 RA3 I, 1992 RA3	RA4 835) RA4 RA4	RA5 x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso hexacan	RA1 tris (Va RA1 Randal RA1	lencie RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4	RA5 x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu	RA1 tris (Va RA1 Randal RA1	lencie RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4	RA5 x RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x x
Kauai Oahu Molokai Mawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso hexacan	RA1 tris (Va RA1 Randal RA1 thus (B	lenciel RA2 I & Bel RA2 Ileeker RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4 RA4 x	RA5 x RA5 RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x RA7 RA8 RA9 RA10 x
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso lituratus	RA1 tris (Va RA1 Randal RA1 thus (B	lenciel RA2 I & Bel RA2 Ileeker RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3 x x	RA4 835) RA4 RA4 RA4 x	RA5 x RA5 RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso lituratus Kauai	RA1 tris (Va RA1 Randal RA1 thus (B	lenciel RA2 I & Bel RA2 Ileeker RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4 RA4 x er, 180 RA4	RA5 x RA5 RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso lituratus	RA1 tris (Va RA1 Randal RA1 thus (B	lenciel RA2 I & Bel RA2 Ileeker RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4 RA4 x	RA5 x RA5 RA5	RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Naso breviros Kauai Oahu Molokai Maui Hawaii Naso caesius Kauai Oahu Molokai Maui Hawaii Naso hexacan Kauai Oahu Molokai Maui Hawaii Naso lituratus Kauai Oahu	RA1 tris (Va RA1 Randal RA1 thus (B	lenciel RA2 I & Bel RA2 Ileeker RA2	RA3 nnes, 1 RA3 I, 1992 RA3 , 1855) RA3	RA4 835) RA4 RA4 RA4 x er, 180 RA4	RA5 x RA5 RA5 RA5	RA6 RA6 RA6	RA7 RA8 RA9 RA10 x x RA7 RA8 RA9 RA10 x

	Naso unicornis	(Fors	skål, 1	775)							
		RA1		-	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu					Х	Х	1111	1111	1111	1111
	Molokai				Х					1111	1111
	Maui			х	х		х				1111
	Hawaii			,	^		,				
	Zebrasoma flav	escen	s (Ren	nett 1	828)						
	<u> Lobrasoma nav</u>	RA1	RA2	RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	13/31	11/12	Х	11/17	Х	11/10	IXA	1111	1111	1111
	Oahu	.,	.,		.,	X	.,	1111	1111	1111	
		X	Х	Х	X		Х	1111	1111	1111	1111
	Molokai Mari	X			X				.,	1111	1111
	Maui	Χ			Χ				Х	Х	1111
	Hawaii	Χ	X	X	X	Х	Х	Х		Х	Х
	Zebrasoma veli		•	,	,	D.4.5	D 4 0	D 4 7	D 4 0	D 4 0	D 4 4 0
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	
	Oahu	Х	Х				Х			1111	
	Molokai	Х								1111	1111
	Maui					Х					
	Hawaii						Х		Х		Х
Fam	ily: APOGONIDA	Æ									
	Apogon kallopt	terus E	Bleeke i	, 1856							
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai						Х		1111	1111	1111
	Oahu							1111	1111	1111	1111
	Molokai									1111	HH
	Maui										1111
	Hawaii										
	Apogon sp.										
	Apogon sp.	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	14/41	11/12	11/10	11/17	11/10	Х	IXA	1111	1111	1 1 1 1
							^				1 1 1 1
	Oahu								1000	1000	1 1 1 1
	Oahu Malakai				v				1111		
	Molokai				x			1111	1111		
	Molokai Maui				x				1111		
-	Molokai Maui Hawaii				х			1111	1111		
Fam	Molokai Maui Hawaii ily: BLENNIIDAE		i /Eau	dor 10				1111			
Fam	Molokai Maui Hawaii	derbilt			38)	DAF	DAG	DAT	DAO	PAG	PA10
Fam	Molokai Maui Hawaii illy: BLENNIIDAE Cirripectes van			ler, 19 RA3	38)	RA5	RA6	RA7	RA8	RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai	derbilt RA1	RA2	RA3	38)	RA5	RA6	RA7	RA8	RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu	derbilt			38) RA4		RA6	RA7	RA8	RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai	derbilt RA1 x	RA2 x	RA3	38)	RA5	RA6	RA7		RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui	derbilt RA1	RA2	RA3 x	38) RA4	x		1111	x		RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Maui Hawaii	derbilt RA1 x x	X X	RA3	38) RA4		RA6	RA7		RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui	x X X (Kner,	X X X 1868)	RA3 x	38) RA4 x	x x	х	x	x x	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Maui Hawaii <i>Exallias brevis</i>	x X X X (Kner, RA1	X X	RA3 x x RA3	38) RA4 x	x	x RA6	1111	x		RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Maui Hawaii <i>Exallias brevis</i>	x X X (Kner,	X X X 1868)	X X X RA3 X	38) RA4 x RA4	x x RA5	х	x	x x	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Maui Hawaii <i>Exallias brevis</i> Kauai Oahu	x X X X (Kner, RA1	X X X 1868)	RA3 x x RA3	38) RA4 x	x x	x RA6	x	x x	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Hawaii <i>Exallias brevis</i> Kauai Oahu Molokai	x X X X (Kner, RA1	X X X 1868)	RA3 x x RA3 x x	38) RA4 x RA4 x	x x RA5	x RA6	x	x x RA8	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Hawaii <i>Exallias brevis</i> Kauai Oahu Molokai Maui	x X X X (Kner, RA1	X X X 1868)	X X X RA3 X	38) RA4 x RA4	x x RA5	x RA6	x	x x	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii	RA1 X X X (Kner, RA1 X	X X X 1868)	RA3 x x RA3 x x	38) RA4 x RA4 x	x x RA5	x RA6	x	x x RA8	x	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE <i>Cirripectes van</i> Kauai Oahu Molokai Hawaii <i>Exallias brevis</i> Kauai Oahu Molokai Maui	RA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s	RA1 X X (Kner, RA1 X	X X X 1868)	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai	RA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu	RA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii	RA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
Fam	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii	RA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
	Molokai Maui Hawaii Hawaii Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii	KA1 X X (Kner, RA1 X	RA2 x x 1868) RA2	RA3 x RA3 x x x	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii Hawaii ily: CARANGIDA	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x RA3 x x RA3	38) RA4 x RA4 x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9	RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10 x RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Jahu Molokai Maui Hawaii	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii Hawaii ily: CARANGIDA	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10 x RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii Jahu Molokai Maui Hawaii	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10 x RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii Alectis ciliaris (Kauai	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10 x RA10
	Molokai Maui Hawaii ily: BLENNIIDAE Cirripectes van Kauai Oahu Molokai Maui Hawaii Exallias brevis Kauai Oahu Molokai Maui Hawaii Plagiotremus s Kauai Oahu Molokai Maui Hawaii ily: CARANGIDA Alectis ciliaris Kauai Oahu	KA1 X X (Kner, RA1 X P. RA1	RA2 x x 1868) RA2	RA3 x x RA3 x x x RA3	38) RA4 x RA4 x x x	x x RA5 x	x RA6 x	x RA7	x x RA8	x RA9 RA9	RA10 x RA10

Carangoi	ides ferdau						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
	uai					Χ	
	ahu						
Mo	olokai						
Ma							1111
Ha	ıwaii						
Caranx Iu	<i>igubris</i> Poe	y, 1860					
	RA1			RA4	RA5	RA6	RA7 RA8 RA9 RA10
Ka	uai						111111111111
	ahu						
	olokai						
Ma							x
	ıwaii						X
	ıwaıı ıelampygus	Cuvior	1922				
Caranx II		RA2		D A A	RA5	RA6	RA7 RA8 RA9 RA10
I/a		KAZ	KAS	KA4	KAS	KAU	KAI KAO KAS KAIU
	uai						
	ihu .				Х	Х	
	olokai						11111111
Ma							1111
Ha	ıwaii					Х	X
Caranx s	p.						
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Ka	uai						x
Oa	ahu						
Mo	olokai	Х	Х				1111111
Ma	aui						1111
Ha	waii						
Scomber	oides lysan	(Forss	kål. 17	75)			
000111001	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Ka	uai	10/12	10.00	1014	10.00	10.10	
	ahu		Х			Х	
	olokai		^			^	
							111111
Ma							1.1.1.1
	waii	_					
Family: CHAE							
Chaetode	on auriga Fo			D 4 4	- · -		D D. O. D. O. D. (0)
	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
	uai		Х				x
Oa	ahu x	Х				Х	
Mo	olokai x						x
Ma	aui x			Х			x x
Ha	ıwaii	Х	Х			Х	v v v
Chaetode	on ephippiu	m Cuvi	er 183	1			x x x
			.,				x x x
	RA1				RA5	RA6	x x x RA7 RA8 RA9 RA10
Ka	RA1 luai				RA5	RA6	
					RA5	RA6	
Oa	uai ahu	RA2			RA5	RA6	
Oa	uai ahu olokai	RA2			RA5	RA6	
Oa Mo Ma	uai ahu olokai aui	RA2			RA5	RA6	
Oa Mo Ma Ha	uai ahu olokai aui waii	RA2 x	RA3		RA5	RA6	
Oa Mo Ma Ha	uai ahu blokai aui waii o <i>n fremblii</i> E	RA2 x Bennett	RA3	RA4			RA7 RA8 RA9 RA10
Oa Mo Ma Ha Chaetod	uai ahu blokai aui awaii o <i>n fremblii E</i> RA1	RA2 x	RA3	RA4			RA7 RA8 RA9 RA10
Oa Mo Ma Ha Chaetodo Ka	uuai ahu olokai aui awaii o n fremblii E RA1 uuai	RA2 x Bennett	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Oa Mo Ma Ha Chaetodo Ka Oa	luai ahu blokai aui awaii on fremblii E RA1 uaai	RA2 x Bennett	RA3	RA4			RA7 RA8 RA9 RA10
Oa Mo Ma Ha Chaetodo Ka Oa Mo	luai ahu olokai aui awaii o n fremblii E RA1 luai ahu	RA2 x Bennett	RA3	RA4	RA5	RA6 x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Oa Mo Ma Ha Chaetodo Ka Oa Mo Mo	uai ahu blokai aui waii on fremblii E RA1 uai ahu blokai	RA2 x Bennett	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Oa Mo Ha Chaetodo Ca Mo Mo Ma Ha	uai ahu blokai aui awaii on fremblii E RA1 uai ahu blokai aui	RA2 x Bennett RA2	RA3 , 1828 RA3	RA4	RA5	RA6 x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Oa Mo Ha Chaetodo Ca Mo Mo Ma Ha	uai ahu blokai aui awaii on fremblii E RA1 uai ahu blokai aui awaii on kleinii Bl e	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x
Oa Mo Ha Chaetodo Ka Oa Mo Ma Ha Chaetodo	uai ahu blokai aui awaii on fremblii E RA1 uai ahu blokai aui waii on kleinii Blo	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10
Oa Mo Ha Chaetodo Ka Oa Mo Mc Ha Chaetodo Ka	uai ahu blokai aui awaii on fremblii E RA1 auai ahu blokai aui awaii on kleinii Blo RA1 uai	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x
Oa Mo Ha Chaetodo Ka Oa Mo Ha Chaetodo Ka Oa	uuai ahu blokai aui waii on fremblii E RA1 uuai ahu blokai aui waii bon kleinii Blo RA1 uuai	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x
Oa Mo Ha Chaetodo Ka Oa Mo Ha Chaetodo Ka Oa	uuai ahu blokai aui waii on fremblii E RA1 uuai ahu blokai aui waii b on kleinii Bl RA1 uuai ahu	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x
Oa Mo Ha Chaetodo Ka Oa Mo Ha Chaetodo Ka Oa Mo	uuai ahu blokai aui waii on fremblii E RA1 uuai ahu blokai aui waii b on kleinii Bl RA1 uuai ahu	RA2 x Bennett RA2 och, 17	RA3 , 1828 RA3	RA4	RA5 x	RA6 x x	RA7 RA8 RA9 RA10 RA7 RA8 RA9 RA10 x

Chaetodon luni									
	RA1	RA2		RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai	Х		Х	Х	Х		Х		
Oahu						Х	- 1 1 1 1		
Molokai		Х		Х				Х	
Maui		Х		Х		Х		Х	х
Hawaii	Х	Х	Х	Х		Х	Х	Х	x x
Chaetodon lun	ulatus	Quoy	& Gain	nard, 1	825				
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai								1111	
Oahu	Х	Х	Х			Х	1111	1111	
Molokai	Х	Х	Х						
Maui				х		Х			
Hawaii		х							X
Chaetodon mil	iaris Q		Gaima	rd. 18	25				
	RA1		RA3			RA6	RA7	RA8	RA9 RA10
Kauai									
Oahu		х			х	х	11111	1111	
Molokai		^	Х		^	^			
Maui			^			Х			
Hawaii						^			хх
Chaetodon mu	Iticino	tuc Ga	rrott 1	863					х х
Griae (OUOII IIIU)	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kouoi	KAI	KAZ			KAS			KAO	KAS KATU
Kauai			Х	X		X	X	1111	11111111
Oahu				Х	Х	Х	1111	1111	
Molokai			Х				Х		
Maui				Х				Х	1111
Hawaii	Х	X	. х	Х	Х	Х	Х	Х	Х
Chaetodon orn									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai									
Oahu	Х			Х		Х		1111	
Molokai	Х		Х				Х		
Maui	Х	Х		Х		Х		Х	Х
Hawaii	Х	Х	Х	Х		Х	Х	Х	X X
Chaetodon qua	adrima								
Chaetodon qua	adrima RA1	culatu RA2	s Gray RA3	, 1831 RA4	RA5	RA6	RA7	RA8	RA9 RA10
Chaetodon qua Kauai					RA5	RA6	RA7 x	RA8	RA9 RA10
-	RA1		RA3	RA4	RA5	RA6		RA8	RA9 RA10
Kauai	RA1		RA3 x	RA4 x				RA8	RA9 RA10
Kauai Oahu	RA1	RA2	RA3 x	RA4 x				RA8	RA9 RA10
Kauai Oahu Molokai	RA1	RA2	RA3 x x	RA4 x x		x		RA8	RA9 RA10
Kauai Oahu Molokai Maui	RA1 x	X X X	RA3 X X	RA4 x x	x	x x	X 		
Kauai Oahu Molokai Maui Hawaii	RA1 x	RA2 x x x atus B	RA3 X X	RA4	x	x x	X 		
Kauai Oahu Molokai Maui Hawaii	RA1 x x macula	RA2 x x x atus B	RA3 X X X Ioch, 1	RA4	x x	x x x	x x	x	x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni	RA1 x x macula RA1	RA2 x x x atus B	RA3 X X X Ioch, 1	RA4	x x	x x x	x x	x	x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai	RA1 x x macula RA1	RA2 x x x atus B	RA3 X X X X loch, 1 RA3	RA4	x x RA5	x x x RA6	x x	x	x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui	RA1 x x macula RA1	X X X X atus B RA2	RA3 x x x x loch, 1 RA3 x	RA4	x x RA5	x x x RA6	x x RA7	x	x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui	RA1 x x macula RA1	X X X X atus B RA2	RA3 x x x k loch, 1 RA3 x x	RA4	x x RA5	x x x RA6 x	x x RA7	x	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai	RA1 x x macula RA1 x	X X X atus B RA2	RA3	RA4	x x RA5 x	x x x RA6 x	x RA7	x RA8	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii	RA1 x x macula RA1 x	X X X atus B RA2	RA3	RA4	x X RA5 x x yor, 18	x x x RA6 x	x RA7	x RA8	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii	RA1 x x macula RA1 x	X X X atus B RA2 X	RA3 x x x x loch, 1 RA3 x x x x x x x x x x x x x x x x x x x	RA4 x x 787 RA4 x x	x X RA5 x x yor, 18	x x x RA6 x x	x RA7	x RA8	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon unii Kauai Oahu Molokai Maui Hawaii Forcipiger flavi	RA1 x x macula RA1 x	X X X atus B RA2 X	RA3 x x x loch, 1 RA3 x x x x x an & N	RA4 x x 787 RA4 x x 1cGreg RA4	x X RA5 x x yor, 18	x x x RA6 x x	x RA7	x RA8	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon unii Kauai Oahu Molokai Maui Hawaii Forcipiger flavii	RA1 x x macula RA1 x	X X X atus B RA2 X s Jord	RA3 x x x loch, 1 RA3 x x x x x an & N	RA4 x x 787 RA4 x x IcGreg RA4 x	x RA5 x x yor, 189	x x RA6 x x x 98 RA6	x RA7 x x RA7	x RA8	x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai	RA1 x x macula RA1 x	X X X atus B RA2 X	RA3 x x x loch, 1 RA3 x x x x x an & N	RA4 x x 787 RA4 x x 1cGreg RA4 x	x X RA5 x x yor, 18	x x RA6 x x 98 RA6 x	x RA7 x x RA7	x RA8	x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Mawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Maui Maui Maui	X maculi RA1 X issimu RA1	X X X atus B RA2 X s Jord RA2	RA3 x x x loch, 1 RA3 x x x x an & W RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x	X RA5 X yor, 18: RA5 X	x x x RA6 x x 98 RA6 x	x RA7 x x RA7	x RA8	x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Cahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	X maculi RA1 X issimu RA1	X X X X X Atus B RA2 X S Jord RA2 X X	RA3 x x x loch, 1 RA3 x x x x an & M RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x	X RA5 X yor, 18: RA5 X	x x RA6 x x 98 RA6 x	x RA7 x x RA7	x RA8	x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Mawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Maui Maui Maui	X macula RA1 x issimu RA1	RA2 x x atus B RA2 x s Jord RA2 x sis (Bro	RA3 x x x loch, 1 RA3 x x x x an & M RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x et, 178	x RA5 x x yor, 189 RA5 x	x x x RA6 x x 98 RA6 x	x RA7 x x RA7	x RA8	x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Hawaii	X macula RA1 x issimu RA1	RA2 x x atus B RA2 x s Jord RA2 x sis (Bro	RA3 x x x loch, 1 RA3 x x x an & N RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x et, 178	x RA5 x x yor, 189 RA5 x	x x RA6 x x 98 RA6 x	x RA7 x RA7 x	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Cahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	X macula RA1 x issimu RA1	RA2 x x atus B RA2 x s Jord RA2 x sis (Bro	RA3 x x x loch, 1 RA3 x x x an & N RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x et, 178	x RA5 x x yor, 189 RA5 x	x x RA6 x x 98 RA6 x	x RA7 x RA7 x	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Chaetodon unii Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu	X macula RA1 x issimu RA1	RA2 x x atus B RA2 x s Jord RA2 x sis (Bro	RA3 x x x loch, 1 RA3 x x x an & N RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x et, 178	x RA5 x x yor, 189 RA5 x	x x RA6 x x 98 RA6 x	x RA7 x RA7 x	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Chaetodon unii Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai	X macula RA1 x issimu RA1	RA2 x x atus B RA2 x s Jord RA2 x sis (Bro	RA3 x x x loch, 1 RA3 x x x an & N RA3 x	RA4 x x 787 RA4 x x 1cGreg RA4 x x et, 178	x RA5 x x yor, 189 RA5 x	x x RA6 x x 98 RA6 x	x RA7 x RA7 x	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Maui Molokai Maui Molokai	X maculi RA1 X issimu RA1 X girostri	X X X Atus B RA2 X S Jord RA2 X is (Bro RA2	RA3 X X X Ioch, 1 RA3 X X An & N RA3 X x ussone	RA4 x x 787 RA4 x x lcGreg RA4 x x et, 178 RA4	x RA5 x x yor, 189 RA5 x	x x RA6 x x 98 RA6 x x RA6	x RA7 x RA7 x	x RA8 X RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Mawii Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii	X maculi RA1 X issimu RA1 X qirostri RA1	X X X Actus B RA2 X S Jord RA2 X X is (Bro RA2 X X	RA3 X X X Ioch, 1 RA3 X X X An & M RA3 X x usson RA3	RA4 x x 787 RA4 x x IcGreg RA4 x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2)	x x RA6 x x 98 RA6 x	x RA7 x RA7 x	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Maui Molokai Maui Molokai	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X Ioch, 1 RA3 X X X An & M RA3 X USSON RA3 X Bleeke	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x RA7	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Mawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X X Ioch, 1 RA3 X X X An & M RA3 X x usson RA3	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x	x RA8 X RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Mawii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X Ioch, 1 RA3 X X X An & M RA3 X USSON RA3 X Bleeke	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x RA7	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii Kauai Oahu Molokai Maui Hawaii	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X Ioch, 1 RA3 X X X An & M RA3 X USSON RA3 X Bleeke	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x RA7	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X Ioch, 1 RA3 X X X An & M RA3 X USSON RA3 X Bleeke	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x RA7	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10
Kauai Oahu Molokai Maui Hawaii Chaetodon uni Kauai Oahu Molokai Maui Hawaii Forcipiger flavi Kauai Oahu Molokai Maui Hawaii Forcipiger long Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii Hawaii Kauai Oahu Molokai Maui Hawaii	RA1 x maculi RA1 x issimu RA1 x yirostri RA1	RA2 x x atus B RA2 x s Jord RA2 x is (Bro RA2	RA3 X X Ioch, 1 RA3 X X X An & M RA3 X USSON RA3 X Bleeke	RA4 x x 787 RA4 x x IcGreg RA4 x x x et, 178 RA4	x RA5 x yor, 18: RA5 x x 2) RA5	x x RA6 x x 98 RA6 x RA6	x RA7 x RA7 x RA7	x RA8 x RA8	x x RA9 RA10 x x RA9 RA10 x x RA9 RA10

Hemitaurichth						540	D D D D
Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu							
Molokai							
Maui Hawaii							X
Family: CIRRHITIDA	۸E						^
Åmblycirrhitus						D 4 0	D D. O. D. O. D. (0)
Kauai	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Oahu							
Molokai							
Maui Hawaii			Х				1111
Cirrhitus pinni	ulatus (Bloch	& Schi	neider.	1801)		
•	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai			Χ	Χ		.,	x
Oahu Molokai	Х		х			Х	X
Maui			^	х			^
Hawaii		Х				Х	
Paracirrhites a	rcatus	(Cuvie RA2	er, 1829	9) RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	KAI	KAZ	X	X X	X	X	X
Oahu			X	~		X	
Molokai		Χ				Χ	x
Maui Hawaii	X X	х	X X	Х	X X	X X	x x
Paracirrhites f				neide			^ ^ ^
	RA1		RA3		RA5		RA7 RA8 RA9 RA10
Kauai	Х		X	X	.,		x
Oahu Molokai		х	Х	Х	X X	х	
Maui	x	Α		Х	X	X	x
Hawaii	Х	Х	Х	Χ		Х	\mathbf{x} \mathbf{x} \mathbf{x} \mathbf{x}
Family: GOBIIDAE Asterropteryx	saminu	ınctatı	ıs Riin	nell 1	830		
Asterropteryx	RA1			RA4		RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai							x ::::::::
Maui							X
Hawaii							
Gnatholepis a	•	•	,	,	DAG	DAC	DA7 DA0 DA0 DA40
Kauai	RA1	KA2	RA3	RA4	KAS	KAb	RA7 RA8 RA9 RA10
Oahu							
Molokai	Х						
Maui Hawaii							1111
Psilogobius m	ainland	i Bald	win. 19	972			
_					RA5	RA6	RA7 RA8 RA9 RA10
Kauai Oahu							
Molokai							X
Maui							
Hawaii							
Family: KUHLIIDAE Kuhlia sandvi	rensis (Steind	lachne	r 1876	:)		
raina sanavi	RA1	RA2	RA3	RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai							
Oahu Molokai			х				
Maui			^				1111111
Hawaii							

Family: KYPHOSIDA										
Kyphosus bigil										
12	RA1 F	₹A2	RA3		RA5	RA6	RA7	RA8	RA9	RA10
Kauai				Х						
Oahu					Х	Х	1111	1111	1111	
Molokai									1111	
Maui				Х		Х			Х	1111
Hawaii						Х			Х	
Kyphosus cine	rascens	(For	sskål,	1775)						
	RA1 F	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai								1111	1111	
Oahu							1111	1111	1111	
Molokai									1111	
Maui				Х		Х			Х	1111
Hawaii										
Kyphosus sp.										
	RA1 F	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai			Х					1111	1111	1111
Oahu					Х	Х	1111	1111	1111	1111
Molokai									1111	1111
Maui										1111
Hawaii						х			Х	
Kyphosus vaig	iensis (C	Juov	& Gai	mard.	1825)	^			^	
rtyphoodo raig	RA1 F					RA6	RA7	RA8	RA9	RA10
Kauai			11710		10.0	10.00		1111	1111	!!!!
Oahu							1111	1111	1111	
Molokai									1111	1111
Maui										
Hawaii						v				
Family: LABRIDAE						Х				
	,aaaanh	مارره	Dondo	II 40E0	,					
Anampses chry						D 4 0	D 4 7	D 4 0	D 4 0	D 4 4 0
Vaai	RA1 F	KA2	RA3	KA4	RA5	KA6	RA7	RA8	KA9	RA10
Kauai								1111		
Oahu								1111		1111
Molokai									1111	
Maui										1111
Hawaii			_							Х
Anampses cuvi						B 4 6	- · -	D.4.0		D 4 4 0
	RA1 F	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai										
Oahu			Х		Х		1111	1111		
Molokai									1111	
Maui	Х									1111
Hawaii							Х			
Bodianus bilun										
	RA1 F	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai			Х		Х		Х	++++	1111	
Oahu			Х				1111	1111	1111	
Molokai		Χ	Х			Х	Х		1111	1111
Maui	Х		Х			Х			Х	1111
Hawaii										
Cheilio inermis	(Forssk	rål. 1	775)							
	RA1 F			RA4	RA5	RA6	RA7	RA8	RA9	RA10
Kauai								1111	1111	1111
Oahu			х				1111	1111	1111	1111
Molokai			-						Ш	
Maui							х	х	Х	1111
Hawaii						х				
Coris flavovitta	ta (Reni	nett :	1829)							
Jons navovilla	RA1 F	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RΔQ	RA10
Kauai	X	\/\Z	X	11/74	1070	11/10	13/3/			!!!!
Oahu	^		^				1111	1111		
Molokai								X		1111
Maui								^	' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	1111
Hawaii						~	~		X	· · · · ·
⊓awali						Х	Х		Х	Х

Caria maimard	(0		mard	1024\			
Coris gaimard			RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai	10/11	11/12	Х	X	X	10.00	x
Oahu			Χ		Χ		
Molokai				Х			
Maui							x x !!!!!
Hawaii Coris venusta	Vaillan	+ 2 52	uvado	1975	Х		X X
Coris veriusia	RA1		uvaye, RA3		RA5	RA6	RA7 RA8 RA9 RA10
Kauai		X				Х	
Oahu			х		х		
Molokai							
Maui							1111
Hawaii Gomphosus v a	ariue I s	acánào	180 180	11			Х Х
Gomphosus ve	RA1	RA2			RA5	RA6	RA7 RA8 RA9 RA10
Kauai	X	X	Х	Х	Х		
Oahu	х	Х	Х	Х		Х	
Molokai	X	Х		Х	Х		x x
Maui	Х	Х	Х	Х			x x !!!!!
Hawaii	X	X	X	X 4000	X	Х	X X X X
Halichoeres or	RA1		RA3	RA4) RA5	RA6	RA7 RA8 RA9 RA10
Kauai	X	X	X	X	X	X	X
Oahu			Х	Х	Х		
Molokai		х	х				1111111
Maui	X		Χ				x x
Hawaii	х,	Х	X	X		Х	x x x x
Labroides phti	<i>niropha</i> RA1	igus R RA2	andali, RA3	, 1958 RA4	RA5	RA6	RA7 RA8 RA9 RA10
Kauai	X	KAZ	X	X X	X	KAO	X
Oahu	X	Х	^	^	X	Х	
Molokai	X	X	х	х	•	X	
Maui		х	х	х			x x x !!!!
Hawaii	X	Х	X	Х	X	X	. x x x x
Macronharuno						N 197/	
Macropharyng							
Kauai	RA1			RA4		RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai			RA3	RA4	RA5		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui			RA3	RA4	RA5		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x	RA4 x	RA5 x x		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui	RA1	RA2	RA3 x (Lacép	RA4 x pède, 1	X X 801)	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Novaculichthy	RA1	RA2	RA3 x (Lacép RA3	RA4 x	X X 801)		RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x (Lacép	RA4 x pède, 1	X X 801)	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai	RA1	RA2	RA3 x (Lacép RA3	RA4 x pède, 1	X X 801)	RA6	RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui	RA1	RA2	RA3 x (Lacép RA3	RA4 x pède, 1	X X X 801)	RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii	RA1 s taenio RA1	ourus RA2	X (Lacér RA3 X	RA4 x Dède, 1 RA4	x x x 801) RA5	RA6	RA7 RA8 RA9 RA10 x RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui	RA1 s taenio RA1 bimacui	ourus RA2 RA2	X (Lacép RA3 X	RA4 x Dède, 1 RA4	RA5 x x 801) RA5	RA6	RA7 RA8 RA9 RA10 x RA7 RA8 RA9 RA10 x x x x x x
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k	RA1 s taenio RA1 bimacui	ourus RA2 RA2	X (Lacép RA3 X	RA4 x Dède, 1 RA4	RA5 x x 801) RA5	RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii	RA1 s taenio RA1 bimacui	ourus RA2 RA2	X (Lacép RA3 X	RA4 x Dède, 1 RA4	RA5 x x 801) RA5	RA6	RA7 RA8 RA9 RA10 x RA7 RA8 RA9 RA10 x x x x x x
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k	RA1 s taenio RA1 bimacui	ourus RA2 RA2	X (Lacép RA3 X	RA4 x Dède, 1 RA4	RA5 x x 801) RA5	RA6	RA7 RA8 RA9 RA10 x RA7 RA8 RA9 RA10 x x x x x x
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Maui Molokai	RA1 s taenio RA1 bimacui	ourus RA2 RA2	X (Lacép RA3 X	RA4 x Dède, 1 RA4 Siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii	RA1 s taenid RA1 bimacul RA1	ourus RA2 RA2	(Lacér RA3 x Valenc RA3	RA4 x pède, 1 RA4 siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Maui Molokai	s taenid RA1 Simacul RA1	ourus RA2 RA2 latus (RA2	(Lacér RA3 X Valenc RA3	RA4 x Dède, 1 RA4 siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 X	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Maui Molokai Maui Oahu Molokai Maui Oahu Molokai Maui Hawaii	s taenid RA1 Simacul RA1	ourus RA2 RA2 latus (RA2	(Lacér RA3 X Valenc RA3	RA4 x pède, 1 RA4 siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii	s taenid RA1 Simacul RA1	ourus RA2 RA2 latus (RA2	(Lacér RA3 X Valenc RA3	RA4 x Dède, 1 RA4 siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 X	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k	s taenic RA1 Dimacui RA1	ourus RA2 RA2 latus (RA2	(Lacér RA3 X Valenc RA3	RA4 x Dède, 1 RA4 siennes RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 X	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k	s taeniu RA1 Dimacui RA1 RA1	ourus RA2 RA2 latus (RA2	(Lacér RA3 X Valenc RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 X	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	s taenia RA1 bimacui RA1 unifasci RA1	ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 X	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k	s taenia RA1 bimacui RA1 x x x us octo	RA2 ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x x ins, 19	RA5 x x 801) RA5 s, 1840 RA5 X) RA5	RA6 RA6 RA6 X RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Pseudocheilinus t	s taenia RA1 bimacui RA1 unifasci RA1	ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x x ins, 19	RA5 x x 801) RA5 s, 1840 RA5	RA6 RA6 RA6 RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	s taenia RA1 bimacui RA1 x x x us octo	RA2 ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x x ins, 19	RA5 x x 801) RA5 s, 1840 RA5 X) RA5	RA6 RA6 RA6 X RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Oxycheilinus k Kauai Oahu Molokai Maui Hawaii Pseudocheilin Kauai Oahu Molokai Maui Hawaii	s taenia RA1 bimacui RA1 x x x us octo	RA2 ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x x ins, 19	RA5 x x 801) RA5 s, 1840 RA5 X) RA5	RA6 RA6 RA6 RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X
Kauai Oahu Molokai Maui Hawaii Novaculichthy Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Oxycheilinus t Kauai Oahu Molokai Maui Hawaii Pseudocheilinus Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	s taenia RA1 bimacui RA1 x x x us octo	RA2 ourus RA2 latus (RA2 iatus (RA2	(Lacér RA3 X Valenc RA3 Streets RA3	RA4 x pède, 1 RA4 siennes RA4 x x, 1877 RA4 x x ins, 19	RA5 x x 801) RA5 s, 1840 RA5 X) RA5	RA6 RA6 RA6 RA6	RA7 RA8 RA9 RA10 X RA7 RA8 RA9 RA10 X X RA7 RA8 RA9 RA10 X X X X X X X X X X X X X

	u s tetra RA1		Schu RA3	Itz, 196 RA4		RA6	RA7	RA8 RA9	RA10
Kauai Oahu	KAT	KAZ	KAS	KA4	KAS	KAU		HAO KAS	HIII
Molokai Maui	х		х				Х		
Hawaii		Х				х		x	
Pseudojuloide	s ceras RA1			r, 1904 RA4		RA6	RA7	RA8 RA9	RA10
Kauai			10.00		10.10	Х			
Oahu Molokai Maui							1111	11111111	
Hawaii	taata (() S	Coim	ord 10	24\				
Stethojulis bal		RA2		RA4		RA6	RA7	RA8 RA9	RA10
Kauai			Х	Х	Х	Х	Х		1111
Oahu Molokai		v	Х	X	X	Х			
Maui	Х	X X		X X	X X	х	X X	X	
Hawaii		X	х	X	Х		Х	x x	х
Thalassoma ba				uvage RA4			DAZ	DAO DAO	DA40
Kauai	RA1	KAZ X	KA3	KA4	RA5	RA6	RA7	RA8 RA9	RA10
Oahu						Х	++++	111111111	1111
Molokai				Х					
Maui Hawaii		Х	х	Х				Х	1111
Thalassoma du	uperrev	(Quo		imard.	1824)				
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8 RA9	RA10
Kauai	Х	Χ	Х	Х	Х	Х	Х		
Oahu Molokai	X	X	Х	X	X	X	1111		
Maui	X X	X X	х	X X	X X	X X	X X	X	
Hawaii	X	X	X	X	X	X	X	X X	X
Thalassoma lu	taccan							^ ^	^
	lescen	s (Lay	& Ben	nett, 1	839)				^
Kaua!	RA1	s (Lay RA2		nett, 1 RA4	839) RA5	RA6	RA7	RA8 RA9	^ RA10
Kauai Qabu			RA3	nett, 1 RA4		RA6	RA7		
Oahu			& Ben RA3 x	nett, 1 RA4		RA6	RA7		
			RA3	nett, 1 RA4		RA6	RA7		
Oahu Molokai Maui Hawaii	RA1	RA2	RA3 x	RA4	RA5	RA6	RA7		
Oahu Molokai Maui	RA1 urpure	RA2 um (Fo	RA3 x rsskål	RA4 , 1775)	RA5		1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thala ssoma pu	RA1	RA2 um (Fo	RA3 x rsskål	RA4	RA5		RA7		
Oahu Molokai Maui Hawaii	RA1 urpure	RA2 um (Fo	RA3 x rsskål	RA4 , 1775)	RA5		1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pi Kauai Oahu Molokai	RA1 urpure	RA2 um (Fo	RA3 x rsskål RA3	RA4 , 1775)	RA5		1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui	RA1 urpure	RA2 um (Fo	RA3 x rsskål RA3	RA4 , 1775)	RA5		1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii	RA1 urpurei RA1	RA2 ım (Fo RA2	RA3 x r rsskål RA3 x	RA4 , 1775) RA4	RA5	RA6	1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui	RA1 urpurei RA1 uinque	RA2 um (Fo RA2	RA3 x rsskål RA3 x m (Lay	RA4 , 1775) RA4	RA5 RA5	RA6	1111	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu	RA1 urpurei RA1 uinque	RA2 um (Fo RA2	RA3 x rsskål RA3 x m (Lay	RA4 , 1775) RA4	RA5 RA5	RA6	RA7	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu	RA1 urpurei RA1 uinque	RA2 um (Fo RA2 vittatui	RA3 x rsskål RA3 x m (Lay	RA4 , 1775) RA4	RA5 RA5	RA6	RA7	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai	RA1 urpurei RA1 uinque	RA2 um (Fo RA2 vittatui	RA3 x rsskål RA3 x m (Lay	RA4 , 1775) RA4	RA5 RA5	RA6	RA7	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu	RA1 urpurei RA1 uinque	RA2 um (Fo RA2 vittatui	RA3 x rsskål RA3 x m (Lay	RA4 , 1775) RA4	RA5 RA5	RA6	RA7	RA8 RA9	RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai Maui Maui Maui Maui	RA1 urpureu RA1 uinque RA1	RA2 um (Fo RA2 vittatuu RA2	RA3 x rrsskål RA3 x m (Lay RA3	RA4 , 1775) RA4 , & Ber RA4	RA5 RA5 nnett, 1 RA5 x	RA6 839) RA6	RA7	RA8 RA9	RA10 RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai Maui Hawaii Thalassoma tra	RA1 urpureu RA1 uinque RA1	RA2 um (Fo RA2 vittatuu RA2	RA3 x rrsskål RA3 x m (Lay RA3	RA4 , 1775) RA4 , & Ber RA4	RA5 RA5 nnett, 1 RA5 x	RA6	RA7	RA8 RA9	RA10 RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai Maui Hawaii Thalassoma tra	RA1 urpureu RA1 uinque RA1	RA2 um (Fo RA2 vittatuu RA2	RA3 x rrsskål RA3 x m (Lay RA3	RA4 , 1775) RA4 , & Ber RA4	RA5 RA5 nnett, 1 RA5 x	RA6 839) RA6	RA7	RA8 RA9	RA10 RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai Maui Hawaii Thalassoma tra	RA1 urpureu RA1 uinque RA1	RA2 um (Fo RA2 vittatuu RA2	RA3 x rrsskål RA3 x m (Lay RA3	RA4 , 1775) RA4 , & Ber RA4	RA5 RA5 nnett, 1 RA5 x	RA6 839) RA6	RA7	RA8 RA9	RA10 RA10
Oahu Molokai Maui Hawaii Thalassoma pu Kauai Oahu Molokai Maui Hawaii Thalassoma qu Kauai Oahu Molokai Maui Hawaii Thalassoma tra	RA1 urpureu RA1 uinque RA1	RA2 um (Fo RA2 vittatuu RA2	RA3 x rrsskål RA3 x m (Lay RA3	RA4 , 1775) RA4 , & Ber RA4	RA5 RA5 nnett, 1 RA5 x	RA6 839) RA6	RA7	RA8 RA9	RA10 RA10

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Family: LETHRINIDAE
   Monotaxis grandoculis (Forsskål, 1775)
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Oahu
         Molokai
         Maui
                                                            x | | |
         Hawaii
                             Х
Family: LUTJANIDAE
   Aphareus furca (Lacépède, 1802)
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Oahu
         Molokai
         Maui
         Hawaii
                                            Х
                                       Х
   Lutjanus fulvus (Forster, 1801)
                                                                         Introduced
                 RA1 RA2 RA3 RA4 RA5
                                           RA6
                                                RA7 RA8
                                                          RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
                                                            x | | |
                                            Х
         Hawaii
   Lutjanus kasmira (Forsskål, 1775)
                                                                         Introduced
                 RA1 RA2 RA3 RA4 RA5 RA6
                                                RA7 RA8 RA9 RA10
                            Χ
                                       Х
                                                  Х
         Oahu
         Molokai
         Maui
                                                            x
         Hawaii
                       Χ
                                            Х
Family: MUGILIDAE
   Mugil cephalus Linnaeus, 1758
                 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
         Kauai
         Oahu
         Molokai
         Maui
                                  Х
         Hawaii
Family: MULLIDAE
   Mulloidichthys flavolineatus (Lacépède, 1801)
                 RA1 RA2 RA3 RA4 RA5
                                           RA6
                                                RA7 RA8 RA9 RA10
         Kauai
                            Χ
         Oahu
                                  Х
                                            Х
         Molokai
         Maui
                                                       Х
                                  Х
                                            Х
         Hawaii
                                            Х
                                                       Х
                                                                 Х
   Mulloidichthys vanicolensis Valenciennes, 1835
                 RA1 RA2 RA3 RA4 RA5 RA6
                                                          RA9 RA10
                                                RA7 RA8
         Kauai
                            Х
                                                  Х
         Oahu
                                       х
                                            Х
         Molokai
         Maui
                                            Х
         Hawaii
                                                       Х
   Parupeneus bifasciatus (Lacépède, 1802)
                 RA1 RA2 RA3 RA4 RA5
                                           RA6
                                                RA7 RA8
         Kauai
                            Х
                                  Х
                                       Х
                                                  Х
         Oahu
                             Х
                                  Х
                                       Х
         Molokai
                                                  Х
         Maui
                                                            x | | | |
         Hawaii
                  X
                            х
                                       Х
                                            Х
                                                  х
                                                            X
                                                                 Х
   Parupeneus cyclostomus (Lacépède, 1801)
                 RA1 RA2 RA3 RA4 RA5
                                          RA6
                                                RA7 RA8 RA9 RA10
         Kauai
         Oahu
                             Х
                                  Х
                                       X
         Molokai
                                                  Х
         Maui
                  Х
                                  Х
         Hawaii
                  Х
```

i ai aponoao n	nultitas	ciatus	Quoy 8	& Gain	nard, 1	824					
•	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10	
Kauai			X	Х	Х	X	X	1111	1111	1111	
Oahu	Х	Х	Х	Х	Х	Х	1111	1111			
Molokai		Х		Х	Х		Х		1111		
Maui		Х		Х		Х		Х	Х	1111	
Hawaii	. X	Х ,	X	X	. X	Х	Х	Х	Х	Х	
Parupeneus p	leurosti	gma (Benne	lt, 183	1)	DAG	D 4 7	DAG	D 4 0	D 4 4 0	
IZ!	RAT	RA2		KA4	RA5	RA6	RA7	RA8	KA9	RA10	
Kauai Oahu			Х		.,	.,	X	1111	1111		
Molokai					Х	Х					
Maui						Х					
Hawaii						^					
Parupeneus p	orphyre	eus (Je	nkins.	1902)							
						RA6	RA7	RA8	RA9	RA10	
Kauai			Х	Х	Х			1111	1111	1111	
Oahu		Х				Х	1111	1111	++++	1111	
Molokai							Х		1111	1111	
Maui				Х		Х				1111	
Hawaii											
Family: POMACAN			40	041							
Apolemichthy	s arcua	tus (G	ray, 18	31)	DAG	DAG	D 4 7	DAG	D 4 0	D 4 4 0	
Kausi	KAT	KA2		KA4	KAS	KAb	RA7	KA8	KA9	RATU	
Kauai Oahu			Х				1000		1111	1111	
Molokai									1111		
Maui										1111	
Hawaii											
Centropyge Io	riculus	(Günt	her, 18	60)							Cryptogenic
,,,					RA5	RA6	RA7	RA8	RA9	RA10	<i>,</i> , ,
Kauai								1111	1111	1111	
Oahu		Х					1111	1111	-1.1111	1111	
Molokai											
Maui											
Maui Hawaii			o s.s	4040							
Maui	otteri Jo	ordan (DA6			1111	PA10	
Maui Hawaii Centropyge p	otteri Jo	ordan (RA3		RA5		RA7		1111	RA10	
Maui Hawaii Centropyge p Kauai	otteri Jo	ordan (RA4		RA6 x	RA7	RA8	1111	RA10	
Maui Hawaii Centropyge p Kauai Oahu	otteri Jo RA1	ordan (RA3 x		RA5		RA7	RA8	1111	RA10	
Maui Hawaii Centropyge p Kauai	otteri Jo RA1	ordan (RA3	RA4	RA5		RA7	RA8	1111	RA10	
Maui Hawaii Centropyge p Kauai Oahu Molokai	otteri Jo RA1	ordan (RA3 x	RA4 x	RA5		RA7	RA8	RA9	RA10	
Maui Hawaii Centropyge p Kauai Oahu Molokai Maui Hawaii Family: POMACENT	otteri Jo RA1 x TRIDAE	ordan 6 RA2	RA3 x x	RA4 x x x	RA5 x	x x	RA7	RA8	RA9		
Maui Hawaii Centropyge p Kauai Oahu Molokai Maui Hawaii	otteri Jo RA1 x TRIDAE domina	ordan 6 RA2	RA3 x x oy & G	X X X X	RA5 x x d, 182	x x 4)	RA7	RA8	RA9	X	
Maui Hawaii Centropyge p o Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf ab	otteri Jo RA1 x TRIDAE domina	ordan 6 RA2	RA3 x x x oy & G RA3	X X X X	RA5 x x d, 182	x x 4)	RA7	RA8	RA9		
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf ab	otteri Jo RA1 X RIDAE domina RA1	ordan (RA2 RA2 lis (Q u RA2	RA3 x x oy & G	RA4 x x x Saimar RA4	RA5 x x x d, 1824 RA5	x x 4) RA6	RA7	RA8	RA9	X	
Maui Hawaii Centropyge po Kauai Oahu Molokai Hawaii Family: POMACENT Abudefduf ab Kauai Oahu	otteri Jo RA1 x TRIDAE domina RA1 x	ordan (RA2 Mis (Qu RA2 x	RA3 x x oy & G RA3 x	RA4 x x x x Saimar RA4 x	RA5 x x d, 182	x x 4)	RA7	RA8	RA9	x RA10	
Maui Hawaii Centropyge po Kauai Oahu Maui Hawaii Family: POMACENT Abudefduf ab Kauai Oahu Molokai	otteri Jo RA1 x TRIDAE domina RA1 x	ordan (RA2 RA2 lis (Q u RA2	RA3 x x x oy & G RA3	RA4 x x x Saimar RA4	RA5 x x x d, 1824 RA5	x x 4) RA6 x	RA7	RA8	RA9	x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui	x RA1 X RIDAE domina RA1	ordan a RA2 lis (Qu RA2 x x	RA3 x x oy & G RA3 x	RA4 x x x x Saimar RA4 x	RA5 x x x d, 1824 RA5	x x 4) RA6	RA7	RA8 X X RA8 	RA9	x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui Hawaii	x RA1 x TRIDAE domina RA1 x	ordan a RA2 lis (Qu RA2 x x	RA3 x x oy & G RA3 x x	X X X Saimar RA4 X	RA5 x x x d, 1824 RA5	x x 4) RA6 x	RA7	RA8	RA9	x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui	x TRIDAE domina RA1 x x	ordan a RA2 Viis (Qu RA2 X X Forssi	RA3 x x coy & G RA3 x x x	RA4 x x x Saimar RA4 x x	RA5 x x d, 182 RA5 x	x x 4) RA6 x x	RA7	RA8 x x RA8 iiiii x x	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui Hawaii	x TRIDAE domina RA1 x x	ordan a RA2 Viis (Qu RA2 X X Forssi	RA3 x x coy & G RA3 x x x	RA4 x x x Saimar RA4 x x	RA5 x x d, 182 RA5 x	x x 4) RA6 x x	RA7	RA8 x x RA8 iiiii x x	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokaii Maui Hawaii Family: POMACENT Abudefduf abu Kauai Oahu Molokaii Maui Hawaii Abudefduf sol	x TRIDAE domina RA1 x x	ordan a RA2 Viis (Qu RA2 X X Forssi	RA3 x x coy & G RA3 x x x	RA4 x x x Saimar RA4 x x	RA5 x x d, 182 RA5 x	x x 4) RA6 x x	RA7	RA8 X X RA8 X RA8	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui Hawaii Abudefduf soo	x RA1 x RIDAE domina RA1 x x	ordan o RA2 Viis (Qu RA2 X X Forssi RA2	RA3 x x coy & G RA3 x x x	RA4 x x x Saimar RA4 x x	RA5 x x d, 182 RA5 x	x x 4) RA6 x x RA6	RA7 RA7 X RA7	RA8 X X RA8 X RA8	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf ab Kauai Oahu Molokai Maui Hawaii Abudefduf solokai Kauai Oahu Molokai Maui Abudefduf solokai Maui Maui Maui Maui Maui Maui Maui Ma	x RA1 x RIDAE domina RA1 x x	ordan o RA2 Viis (Qu RA2 X X Forssi RA2	RA3 x x coy & G RA3 x x x	RA4 x x x Saimar RA4 x x	RA5 x x d, 182 RA5 x	x x 4) RA6 x x RA6	RA7 RA7 X RA7	RA8 X X RA8 X RA8	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokaii Hawaii Family: POMACENT Abudefduf ab Kauai Oahu Molokaii Maui Hawaii Abudefduf soo Kauai Oahu Molokaii Maui Oahu Molokaii Oahu Molokaii Maui Hawaii Hawaii	x RA1 X RIDAE domina RA1 X X	ordan a RA2 lis (Qu RA2 x x Forssi RA2 x	RA3 x x x RA3 x x x x xA RA3	RA4 x x Saimar RA4 x x x	x x d, 182 RA5 x	x x 4) RA6 x x RA6	RA7 RA7 X RA7	RA8 X X RA8 X RA8	RA9	X RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf ab Kauai Oahu Molokai Maui Hawaii Abudefduf solokai Kauai Oahu Molokai Maui Abudefduf solokai Maui Maui Maui Maui Maui Maui Maui Ma	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x coy & G RA3 x x x x xA RA3 x	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x 4) RA6 x x RA6	RA7 RA7 RA7	RA8 X X RA8 X X RA8	RA9 X X RA9	x RA10 x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abo Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf soo Maui Molokai Maui Abudefduf soo	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x coy & G RA3 x x x x xA RA3 x	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x 4) RA6 x x RA6	RA7 RA7 X RA7	RA8 X X RA8 X X RA8	RA9 X X RA9	x RA10 x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abu Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf kaui Hawaii Hawaii	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x coy & G RA3 x x x x xA RA3 x	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x 4) RA6 x x RA6 x	RA7 RA7 RA7 RA7	RA8 X X RA8 X RA8	RA9 X X RA9	x RA10 x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abu Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf val	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x x RA3 x x x xA, 177 RA3	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x 4) RA6 x x RA6	RA7 RA7 RA7	RA8 X X RA8 X RA8	RA9 X X RA9	x RA10 x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abu Kauai Oahu Molokai Maui Hawaii Abudefduf sol Kauai Oahu Molokai Maui Hawaii Abudefduf sol Kauai Oahu Molokai Maui Hawaii Abudefduf val Kauai Oahu Molokai Maui Hawaii Abudefduf val	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x coy & G RA3 x x x x xA RA3 x	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x x RA6 x RA6 x RA6 x	RA7 RA7 RA7 RA7	RA8 X X RA8 X RA8	RA9 X X RA9	x RA10 x RA10	
Maui Hawaii Centropyge po Kauai Oahu Molokai Maui Hawaii Family: POMACENT Abudefduf abu Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf soo Kauai Oahu Molokai Maui Hawaii Abudefduf val	x TRIDAE domina RA1 x x rdidus (RA1	Forssi RA2	RA3 x x x RA3 x x x xA, 177 RA3	RA4 x x Saimar RA4 x x x x x simard,	RA5 x x d, 1826 RA5 x RA5	x x 4) RA6 x x RA6 x	RA7 RA7 RA7 RA7	RA8 X X RA8 X RA8	RA9 X X RA9	x RA10 x RA10	

Chromis agilis									
-	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai Oahu							1111		
Molokai							X		
Maui								Х	1111
Hawaii	X i Dand	X	X	X 44 407	X	Х	Х	Х	x x
Chromis hanu		RA2				RA6	RA7	RA8	RA9 RA10
Kauai	х		Х		Х				
Oahu							1111	1111	
Molokai Maui			х	х			Х	х	x
Hawaii		Х	X	X	х	х	Х	X	X X
Chromis leucu		ert, 19							
IZ!	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai Oahu							1111		
Molokai									11111111
Maui			Х	Х					1111
Hawaii Chromis ovali	c (Stoir	ndaahn	or 100	١٥١					
Cilioniis Ovan	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai						Х		$\{ $	
Oahu		.,		Х					
Molokai Maui		Х		х	х	х	Х	х	11111
Hawaii			Х	^	^	^		X	х
Chromis vande					D.4.5	D.4.0	D 4 7	D.4.0	DAG BA40
Kauai	RA1 x	RA2	RA3 x	RA4 x	RA5 x	RA6 x	RA7 x	RA8	RA9 RA10
Oahu	^		X	X	X	X	1111	1111	
Molokai		Х	Х		Х	Х	Х		
Maui Hawaii	v	v	X X	Х	X X	X X	X X	X X	x
Chromis verate	x er Jord	X Ian & N		912	X	X	X	X	х х
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai	RA1	RA2	RA3 x		RA5	RA6	RA7	RA8	RA9 RA10
Oahu	RA1	RA2			RA5	RA6	RA7	RA8	RA9 RA10
Oahu Molokai Maui	RA1	RA2			RA5	RA6	RA7	RA8	RA9 RA10
Oahu Molokai Maui Hawaii			х		RA5	RA6	RA7	RA8	RA9 RA10
Oahu Molokai Maui		ill, 186	х 3	RA4			1111		x
Oahu Molokai Maui Hawaii	sella G	ill, 186	х 3				RA7	RA8	x
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu	sella G RA1 x	ill, 186	х 3	RA4		RA6	RA7	RA8	x
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai	sella G RA1 x x	i II, 186 RA2	х 3	RA4		RA6 x	RA7	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii	sella G RA1 x x x	ill, 186 RA2 x	x 3 RA3	RA4 RA4 x	RA5	RA6	RA7	RA8	x
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui	sella G RA1 X X X X	ill, 186 RA2 x mparip	x 3 RA3	RA4 RA4 x (Vailla	RA5	RA6 x x	RA7 X X 2 2 4 4 4 4 4 7 7 8 7 8 7 8 7 8 8 8 8 8	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii	sella G RA1 X X X X Modon ii	ill, 186 RA2 x m pa rip RA2	x 3 RA3 RA3 RA3	RA4 x x (Vailla	RA5	RA6	RA7 X X RA75 RA7	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii	sella G RA1 X X X X	ill, 186 RA2 x mparip	x 3 RA3	RA4 RA4 x (Vailla	RA5	RA6 x x	RA7 x x e, 1875 RA7 x	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Molokai	sella G RA1 X X X X Modon ii	ill, 186 RA2 x mparip RA2 x	X 3 RA3 Pennis RA3 X X	RA4 x (Vailla RA4 x x	RA5 int & S RA5	RA6 x x auvag	RA7 x x e, 1875 RA7 x	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphio Kauai Oahu Molokai Maui Maui Maui Maui	sella G RA1 X X X X Modon ii	ill, 186 RA2 x mparip RA2 x	X 3 RA3 Peennis RA3 X X X	RA4 x (Vailla RA4 x x	RA5 int & S RA5 X	RA6 x x auvag RA6 x	RA7 x x e, 1875 RA7 x	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Hawaii Plectroglyphio Kauai Oahu Molokai Maui Hawaii Hawaii Hawaii	sella G RA1 x x x x dodon i RA1 x	ill, 186 RA2 x mparip RA2 x	x 3 RA3 Pennis RA3 X X X	RA4 x (Vailla RA4 x x x	RA5 Int & S RA5 X X	RA6 x x auvag RA6 x	RA7 X X RA7 RA7 RA7	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hauaii Plectroglyphic	sella G RA1 x x x x dodon i RA1 x	ill, 186 RA2 x mparip RA2 x	x 3 RA3 Pennis RA3 X X X	RA4 x (Vailla RA4 x x x	RA5 Int & S RA5 X X er & B	RA6 x x auvag RA6 x	RA7 X x e, 1875 RA7 X	RA8	x RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Hawaii Kauai Kauai Kauai Kauai Kauai Kauai	sella G RA1 x x x dodon ii RA1 x	ill, 186 RA2 x mparip RA2 x x x x chnsto	X 3 RA3 Pennis RA3 X X X X Pinianus RA3 X	RA4 x (Vailla RA4 x x x x s Fowl RA4 x	RA5 Int & S RA5 X X er & B RA5	RA6 x x auvage RA6 x x all, 19:	RA7	RA8 x x	X RA9 RA10 X X RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hauaii Plectroglyphic	sella G RA1 x x x x dodon ii RA1 x	ill, 186 RA2 x mparip RA2 x	X 3 RA3 Pennis RA3 X X X Anianu RA3	RA4 x (Vailla RA4 x x x x s Fowl	RA5 Int & S RA5 X X er & B	RA6 x x auvage RA6 x x all, 19	RA7	RA8 x x	X RA9 RA10 X X RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Maui Molokai Maui Maui	sella G RA1 X X X Iodon ii RA1 X Idodon ju RA1	ill, 186 RA2 x mparin RA2 x cohnsto RA2 x x	X 3 RA3 RA3 X X X Anianu RA3 X X	RA4 x (Vailla RA4 x x s Fowl RA4 x x x	RA5 Int & S RA5 X RA5 RA5 X X X	RA6 x x auvage RA6 x all, 192 RA6 x x	RA7 x x e, 1875 RA7 x :::::::::::::::::::::::::::::::::::	RA8 X X RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	sella G RA1 X X X dodon ii RA1 X	ill, 186 RA2 x mpari RA2 x x cohnsto	X 3 RA3 Pennis RA3 X X X Ponianu RA3 X X X	RA4 x (Vailla RA4 x x x Fowl RA4 x x x x x x x x x x x x x	RA5 Int & S RA5 X RA5 X RA5 X X X X	RA6 x x auvagg RA6 x x all, 192 RA6 x x x	RA7 x x e, 1875 RA7 x HA7 x 24 RA7 x x x	RA8 x x) RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Maui Molokai Maui Maui	sella G RA1 X X X dodon ii RA1 X S dodon ju X X X	ill, 186 RA2 x mparif RA2 x x cohnsto RA2 x x x sindon	X 3 RA3 Pennis RA3 X X X Ponianu RA3 X X X X Is (Jor	RA4 X (Vailla RA4 X X Fowl RA4 X x x s Fowl RA4 X X x dan &	RA5 Int & S RA5 X RA5 RA5 X Everm	RA6 x x auvagg RA6 x x all, 192 RA6 x x ann, 1	RA7 x x e, 1875 RA7 x HA7 x H	RA8 X X X RA8 RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10 X X X
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Oahu Molokai Maui Hawaii	sella G RA1 X X X dodon ii RA1 X	ill, 186 RA2 x mparif RA2 x x cohnsto RA2 x x x sindon	X 3 RA3 Pennis RA3 X X X Ponianu RA3 X X X X Is (Jor	RA4 x (Vailla RA4 x x x Fowl RA4 x x x x x x x x x x x x x	RA5 Int & S RA5 X RA5 RA5 X Everm	RA6 x x auvagg RA6 x x all, 192 RA6 x x ann, 1	RA7 x x e, 1875 RA7 x HA7 x 24 RA7 x x x	RA8 X X RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii	sella G RA1 X X X dodon ii RA1 X S dodon ju X X X	ill, 186 RA2 x mparip RA2 x x cohnsto RA2 x x x sindon RA2 x x	X 3 RA3 Pennis RA3 X X X Ponianu RA3 X X X X Is (Jor	RA4 x (Vailla RA4 x x s Fowl RA4 x x cdan & RA4 x	RA5 Int & S RA5 X RA5 X Everm RA5 X X	RA6 x x auvagg RA6 x x all, 192 RA6 x x ann, 1	RA7 x x e, 1875 RA7 x HA7 x y 24 RA7 x y 903) RA7 x	RA8 X X RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10 X X X
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic	sella G RA1 X X X Iodon ii RA1 X X X X X Iodon s RA1	ill, 186 RA2 x mparip RA2 x x cohnsto RA2 x x x sindon RA2 x	X 3 RA3 RA3 X X X RA3 X X X Sonianus RA3 X X X X X X X X X X X X X X X X X X X	RA4 X (Vailla RA4 X x S Fowl RA4 X x dan & RA4 X	RA5 Int & S RA5 X RA5 X Everm RA5 X X X X	RA6 x x auvage RA6 x all, 199 RA6 x x ann, 1	RA7 x x e, 1875 RA7 x HA7 x y 24 RA7 x y 903) RA7 x x	RA8 X X RA8 X RA8	X RA9 RA10 X X RA9 RA10 X X RA9 RA10
Oahu Molokai Maui Hawaii Dascyllus albi Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii Plectroglyphic Kauai Oahu Molokai Maui Hawaii	sella G RA1 X X X X Idodon ii RA1 X X X X X X X X Idodon si	ill, 186 RA2 x mparip RA2 x x cohnsto RA2 x x x sindon RA2 x x	X 3 RA3 RA3 X X X X Anianu RA3 X X X X Is (Jor	RA4 x (Vailla RA4 x x s Fowl RA4 x x cdan & RA4 x	RA5 Int & S RA5 X RA5 X Everm RA5 X X	RA6 x x auvage RA6 x all, 199 RA6 x x ann, 1	RA7 x x e, 1875 RA7 x HA7 x y 24 RA7 x y 903) RA7 x	RA8 X X RA8	X RA9 RA10 X X RA9 RA10 RA9 RA10 X X X

Stegastes fasc	iolatus	(Oaill	ov. 188	19)					
Grogadico iaco.		RA2		RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai		X		X	X	0	X		
Oahu	Х	х	х	Х	Х	Х	3111	3333	
Molokai		X		X	X		X	X	
Maui	Х		Х	X	X		X		x
Hawaii		Х	Х			Х	Х	Х	X X
Family: PRIACANTH									
Heteropriacant								D 4 0	D.1.0. D.1.10
IZ	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai								1111	
Oahu Molokai									
Maui									1111111
Hawaii						Х			1111
Priacanthus me	eki Je	nkins	1904			^			
i naoanaras m	RA1		RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai	10/11	10,12	11710	10.17	10.00	10.00	10,17	10.0	1010 10110
Oahu					Х		1111	1111	
Molokai									11111111
Maui						Х			1111
Hawaii									
Priacanthus sp									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai									
Oahu								1111	
Molokai	Х								
Maui									1111
Hawaii									
Family: SCARIDAE Calotomus care	olinus	(Valor	cionna	se 192	ω,				
Calolonius Can		•	RA3		•	RA6	RA7	RA8	RA9 RA10
Kauai	IXAT	INAZ	INAS	IXA4	INAS	INAU	IXAI	INAO	INAS INATO
Oahu					х	х	1111	1111	
Molokai									
Maui									1111
Hawaii						Х			x x
Chlorurus pers	picilla								
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai									
Oahu					Х	Χ	1111	1111	
Molokai				.,					
Maui Hawaii		V		Х	v		v		1111
Chlorurus sord	lidus (1	X Foresk	177 ادْ	'5)	Х		Х		Х
Ciliorarus sora			RA3		RA5	RA6	RA7	RA8	RA9 RA10
Kauai					0	0		1 1 1	
Oahu	Х	х				Х	1111	1111	
Molokai	Х	х		х	х		х	х	
Maui	Х	Х		Х				Х	x
Hawaii	Х	Х	Х	Х	Х	Х	Х	Х	x x
Scarus dubius									
	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai									
Oahu			Х				1111	1111	
Molokai									
Maui Hawaii						х		х	X
Scarus psittaci	e Eore	ekål 1	775			X		X	X
Scarus psillaci			RA3	RA4	RA5	RA6	RA7	RA8	RA9 RA10
Kauai	1.77.1	11/12	11/10	11/17	11/10	11/10	X		
Oahu					Х		-ÎH		
Molokai					-				
Maui				Х				Х	х
Hawaii					Χ	Χ	Х		

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Scarus rubroviolaceus Bleeker, 1849
                      RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10
              Kauai
             Oahu
             Molokai
                                       Х
                                            Х
             Maui
                                       Х
                                                             Х
                                                                  Х
             Hawaii
                                            х
                                                                  Х
        Scarus sp.
                      RA1 RA2 RA3 RA4
                                           RA5 RA6
                                                     RA7 RA8 RA9 RA10
             Kauai
             Oahu
             Molokai
             Maui
                                       Х
                                            Х
                                                  Х
                                                             Х
                                                                  x | | | |
             Hawaii
        Scarus sp. (juveniles)
                           RA2 RA3
                                      RA4
                                           RA5
                                                      RA7 RA8 RA9 RA10
             Kauai
             Oahu
                                       Х
                                                  Х
                            Х
             Molokai
                       Х
                            Х
                                       Х
                                            Х
                                                  Х
                                                       Х
                                                            Х
             Maui
                                                                  x | | |
                       Χ
                            Χ
                                  Х
                                            Х
                                                             Х
             Hawaii
                       Х
                            Х
                                  Х
                                                  Х
                                                                       Χ
    Family: SERRANIDAE
        Cephalopholis argus Bloch & Schneider 1801
                                                                            Introduced
                      RA1 RA2 RA3 RA4 RA5
                                                RA6
                                                     RA7
                                                           RA8
                                                                RA9 RA10
             Kauai
                                       Х
                                            Х
             Oahu
             Molokai
                            Х
                                  Х
                                                       Х
             Maui
                                       х
                                                                  Х
                                  Х
             Hawaii
                       Х
                                  Х
                                       Х
                                            Х
                                                  Х
                                                                  X
                                                                       Х
    Family: SPHYRAENIDAE
        Sphyraena helleri Jenkins, 1901
                      RA1 RA2 RA3 RA4 RA5 RA6
                                                      RA7 RA8
                                                                RA9 RA10
             Kauai
             Oahu
             Molokai
             Maui
                                                                  X
             Hawaii
    Family: ZANCLIDAE
        Zanclus cornutus (Linnaeus, 1758)
                      RA1 RA2 RA3 RA4 RA5
                                                     RA7 RA8
                                                                RA9 RA10
                                                RA6
             Kauai
                       Х
                                  х
                                       x
                                                       х
             Oahu
                       Х
                                       Х
             Molokai
                                            Х
             Maui
                                                                  Х
             Hawaii
                                                  х
                                       Х
                            Х
                                  Х
Order: TETRAODONTIFORMES
    Family: BALISTIDAE
        Melichthys niger (Bloch, 1786)
                      RA1 RA2 RA3
                                      RA4
                                           RA5
                                                RA6
                                                      RA7
                                                           RA8
                                                                RA9 RA10
             Kauai
                                                       Х
             Oahu
                                  Х
                                       х
                                                  х
             Molokai
                                  Х
             Maui
                                                                  Х
                            Х
                                                             Х
                       Х
             Hawaii
                       Х
                            Х
                                  Х
                                            Х
                                                  Х
                                                       Х
                                                            Х
                                                                  Х
                                                                       Х
        Melichthys vidua (Solander, 1844)
                      RÀ1 RA2 RA3 RA4
                                          RA5
                                                RA6
                                                                RA9 RA10
                                                      RA7
                                                           RA8
              Kauai
                                  Х
                                       Х
                                            Х
                                                  Х
                                                       Х
             Oahu
                                       Х
                                                  Х
             Molokai
                                  Х
                                                       Х
             Maui
                       Х
                                  Х
                                       х
                                                       Х
                                                            X
                                                                 х
             Hawaii
                       Х
                                  Χ
                            Х
        Rhinecanthus rectangulus (Bloch & Schneider, 1801)
                      RA1 RA2 RA3 RA4 RA5 RA6
                                                      RA7
                                                           RA8 RA9 RA10
             Kauai
                       Х
                            Х
                                  Х
                                                       Х
             Oahu
                                  Х
                                                  х
             Molokai
             Maui
                       Х
                            Х
                                       Х
                                            Х
```

Hawaii

Su	fflamen burs					-					
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			Х	Χ	Х			1111	1111	1111
	Oahu				Χ		Χ		1111	1111	1111
	Molokai		Х							1111	
	Maui						Х		Х	Х	1111
	Hawaii	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
Su	fflamen fraei										
		RA1	RA2	RA3	ŔA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			0		X	X	X	1111	1111	
	Oahu					^	X	1111	1111	1111	
	Molokai						^			1111	1111
	Maui	х			v					\ \ \ \ \	1111
		^			Х					Х	1111
V	Hawaii		<i>-</i>	(D		4004\	Х			Х	Х
Xai	nthichthys a						D 4 0	D 4 7	D 4 0	D 4 0	D 4 4 0
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu								1111		1111
	Molokai									1111	1111
	Maui									Х	1111
	Hawaii		Х							Х	
Family: I	DIODONTIDA	١E									
	odon hystrix		eus. 1	758							
	, ,		RÁ2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu							1111	1111	1111	1111
	Molokai									1111	1111
	Maui										
						.,				.,	
Familia I	Hawaii					Х				Х	
	MONOCANT			47CE\							
Alt	ıterus script				D 4 4	D 4 F	D 4 C	D 4 7	D 4 0	D 4 0	D 4 4 0
	17	RAT	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111		
	Oahu							1111	1111		
	Molokai									1111	1111
	Maui	Х								Х	
	Hawaii										
Ca	ntherhines d										
		RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai								1111	1111	1111
	Oahu			Х	X	Х	X		1111	1111	1111
	Molokai		Х	Х				Х		1111	
	Maui	Х			Х		Х		Х	Х	1111
	Hawaii	Х	Х	Х	Х	Х	Х	Х		Х	Х
Ca	ntherhines s	andw	ichiens	sis (Qu	oy & G	aimar	d, 1824	!)			
		RA1	RA2		ŘA4				RA8	RA9	RA10
	Kauai	х		Х					1111	1111	1111
	Oahu				Х	Х	Х	1111	1111	1111	1111
	Molokai									1111	iiii.
	Maui	х			Х		Х	х		х	1111
	Hawaii	^								^	
Per	rvagor aspri	caudu	s (Holl	ard. 18	54)						
	rugo, uop	RA1		RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			10.0		10.0	10.00		1111	1 17 10	1111
	Oahu				Х	Х		1111	1111	1111	1111
	Molokai				^	^		X			1111
	Maui	v						^			1111
	Mawaii	Х									1111
Da		omo	/I av 9	Donn	44 400	0)					
rei	rvagor spilos		(Lay & RA2				DAG	DAZ	DAG	DAG	DA40
	Kanai	KAT	RAZ	KAS	rx4	CAA	KΑΰ	KA/	RA8	RA9	RA10
	Kauai							400	1111	1111	1111
	Oahu			Х	Х	Х		1111	1111	1111	1111
	Molokai									1111	
	Maui										3 3 3 3 3
	Hawaii				Х						

Ostra	cion mele										
			RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	Х		Х		Х		Х			
	Oahu			Х	Х	Х	Х		1111		1111
	Molokai	Х	Х		Х					1111	
	Maui		Х				Х	Х	Х		1111
Family, TE	Hawaii	JTIDAE	_ X	Х	Х					Х	Х
Family: TE				a 17E	٥١						
Aloui	ron hispid					RA5	PA6	RA7	RA8	RA9	RA10
	Kauai	IVAI	IVAZ	IVAS	11/14	IVAJ	IVAU	IXAI			
	Oahu				Х			1111	1111		
	Molokai									iiii	1111
	Maui										1111
	Hawaii									Х	Х
Aroth	ron melea	agris (E	Bloch 8	& Schn	eider,	1801)					
		RA1	RA2	RA3	RA4	RAŚ	RA6	RA7	RA8	RA9	RA10
	Kauai			Х	Х				1111	1111	1111
	Oahu							1111	1111	1111	
	Molokai									1111	
	Maui							Х	Х		1111
	Hawaii	D 4 4	D 4 0	D 4 0	D 4 4	D.4.5	D 4 C	D 4 7	D 4 0	D 4 0	D 4 4 0
	17	RAT	RA2	RA3	KA4	RA5	RAb	RA7	RA8	KA9	RA10
	Kauai						.,		1111	1111	
	Oahu Molokai						Х	1111	1111	1111	1111
	Maui										
	Hawaii				х		Х	х	Х	х	
Canth	igaster ar	mboine	ensis (Bleeke		5)	^	^	^	^	
	g					RA5	RA6	RA7	RA8	RA9	RA10
	Kauai				х				1111	ШÌ	1111
	Oahu							1111	1111	1111	
	Molokai									1111	1111
	Maui		Х	Х		Х					1111
	Hawaii						Х				Х
Canth	igaster co										
		RA1	RA2		RA4	RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			Х					1111		
	Oahu								1111		
	Molokai									1111	
	Maui Hawaii										1111
Canth	nawan nigaster ej	niləmn	ra (loi	nkine	1003)						
Odridi	nguster e _l					RA5	RA6	RA7	RA8	RA9	RA10
	Kauai			10.00		10.00	10.00			1111	
	Oahu							1111	1111	1111	1111
	Molokai									1111	1111
	Maui										1111
	Hawaii						Χ				
Canth	igaster ja										
		RA1	RA2	RA3		RA5	RA6	RA7	RA8	RA9	RA10
	Kauai	Х		Х	Х	Х	Х	Х			
	Oahu	Х	Х	Х	Х	Х	Х		1111		
	Molokai	X	X	Х	X		Х			1111	
	Maui	Х	Х	Х	Х	Х	Х	X	X	X	1111
Class: REPTILIA	Hawaii	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
Class: REPTILIA Family: CH		۱ =									
	nia myda		120116	1752\							
Grieio	ına nıyud				RA4	RA5	RA6	RA7	RA8	RAG	RA10
	Kauai	1011		, .0	1017	, .0		1011			
	Oahu							1111		1111	1111
	Molokai									ш	1111
	Maui										1111
	Hawaii	Χ						Х			Х

Family: OSTRACIIDAE

APPENDIX C

Details of Additional Surveys and Organisms from Artificial Reefs and Sites Inspected without Using Rapid Assessment Protocol

By request from and with the assistance of staff from the Hawaiii State Department of Land and Natural Resources Division of Aquatic Resources (DLNR/DAR), surveys were made at artificial reef sites at the Mahi wreck site and the Z-module artificial reef site off Maiili Point on leeward Oiahu. Random searches instead of the rapid assessment protocol previously described were used at these sites and at Haleiwa Trench, just west of Haleiwa Harbor. Inspections for NIS were also made at the *moi* grow-out facility off Ewa beach, Oiahu and the "100 Foot Hole" off Waikiki. The characteristics of these sites are as follows:

<u>Haleiwa Trench</u>. 17-Sep-03. (Latitude 21°35′ 37.4″, Longitude 158°06′ 37.4″). Nearest harbor pier: 0.2 km. Nearest boat ramp: 0.2 km. Depth 4-25 m. Visibility moderate, ca 10 m.

Shallow reef dominated by abundant algae drops off to a nearly vertical wall that extends to reef base and sand channel at ca. 25 m depth, with a similar vertical wall about 20 on other side of the channel. Coral cover abundant at ca. 40% and dominated by large colonies of *Porites* and *Montipora* but high impacted by sedimentation with much recent mortality indicated.

Mahi Wreck. 5-Nov-03 (Latitude 21°24' 55.8", Longitude 158°11' 31.2") Nearest harbor pier: 3.6 km. Nearest boat ramp:3.6 km. Depth 7.5-27 m. Visibility excellent, ca 30 m. Wrecked ship sunk to act as artificial reef site in ca 30 m depth surrounded by coarse sand. Metal surface of ship is moderately fouled and provides shelter for high abundance of fish

Waianae Z Module. 5-Nov-03 (Latitude 21°24′ 437.4″, Longitude 158°11′ 43.8″) Nearest harbor pier: 3.2 km. Nearest boat ramp: 3.2 km. Depth 7.5-27 m. Visibility excellent, ca 25 m.

Large concrete abutment dropped on reef surface and surrounding sand to provide three dimensional relief, but lack muck internal recesses to provide shelter and habitat. Surrounded by natural reef of coral cover of ca. 3-50 percent dominated by *Porites lobata* and *Pocillopora meandrina*.

Taxa recorded at these three sites are shown in Appendix Table C1. Only four NIS occurred at Hale'iwa Trench, three on the Mahi Wreck, and only one at the Z Module artificial reef. Total taxa at these sites were 74, 56, and 62 respectively, resulting in a percent composition of NIS of 1.6% to 5.4 %. The most abundant introduced species was *Carijoa riisei* at the Mahi Wreck where it covered much of the interior surfaces of the hull. *Lutjanus kasmira* was also abundant at this site as well as at the Z Module reef. One hydroid, *Halecium sibogae* Billard, which is a new report for Hawaii was observed and collected at the Mahi wreck, and this has been given tentative cryptogenic status. The introduced hydroid *Pennaria disticha* was also common at Hale'iwa Trench.

These preliminary observations suggest that, with the exception of *Carijoa riisei*, which appear to be highly adapted for settlement on metal surfaces under low light, artificial reef surfaces do not appear to support a greater variety or number of NIS than do nearby reef environments. Additional observations on the *moi* pens off Ewa Beach on 9 October 2003 also showed little occurrence of NIS, with only minor growth of *C. riisei* and *Salmacina dysteri* found on an inspection from 10 to 41 m depth. *Salmacina dysteri* was moderately abundant on the reef top in about 24 m depth at the "100 Foot Hole" off Waikiki on 13 January 2004. Despite the abundance of *C. riisei* that virtually covers the inside of the hull of the Y025 wreck less than 0.5 km away, none was found at the "100 Foot Hole".

Appendix Table C1. Taxa recorded at Hale'iwa Trench, Mahi Wreck and Z Module Atificial Reefs, Ma'ili Point.

					Haleʻiwa	Mahi	Z
Taxa	Family	Genus_Species	Author	Status	Trench	WreckN	/lodules
CHLOROPHYTA	HALIMEDACEAE	Halimeda cf. opuntia	(Linnaeus) Lamouroux		X		
	DASYCLADALCEAE	Neomeris annulata	Dickie				Х
PHAEOPHYTA	DICTYOTACEAE	Dictyota acutiloba	E.Y.Dawson		X		
	SARGASSEACEAE	Sargassum polyphyllum	JAgardh		X		
RHODOPHYTA	RHODOMELACEAE	Acanthophora spicifera	(Vahl) Børgesen	Introduced	x		
	BONNEMAISONIACEA	E Asparogopsis taxiformis			x	X	
	GALAXAURACEAE	Galaxaura fastigata			x		
	CORALLINACEAE	Hydrolithon onkodes	(Heydr.) Foslie		X		Х
		Hydrolithon reinboldi			х		
	CERAMIACEAE	Melanamansia glomerata	(Agardh) R.E.Norris		x		
	PEYSONNELIACEAE	Peysonellia rubra	(Montagne) Kützing		х		
	CORALLINACEAE	Porolithon onkodes	(Heydr.) Foslie		х		
PORIFERA	LEUCETTIDAE	Leucetta solida	Schmidt, 1862		х		
HYDROZOA	CORYNIDAE	Corydendrium corrugatun	7Nutting, 1905			Х	
	HALECIIDAE	Halecium sibogae	Billard, 1929	Cryptogenic	;	X	
	HALOCORDYLIDAE	Pennaria disticha	(Goldfuss, 1820)	Introduced	x		
ANTHOZOA	TELESTIDAE	Carijoa riisei	(Duchassaing & Michelotti, 1860)	Introduced		Х	
	XENIIDAE	Sarcothelia edmonsoni	Verrill, 1928		х		
	ACROPORIDAE	Montipora capitata	(Dana, 1846)		X	Х	х
		Montipora flabellata	Studer, 1902		х		
		Montipora patula	Verrill, 1864		х		
	AGARICIIDAE	Pavona duerdeni	Vaughan, 1907		х		
		Pavona varians	Verrill, 1864		х		
	DENDROPHYLLIIDAE	Tubastraea coccinea	Lesson, 1829		х	Х	
	FAVIIDAE	Cyphastrea ocellina	(Dana, 1846)		х		
		Leptastrea inequalis	Klunzinger, 1879		х		
		Leptastrea purpurea	Dana, 1846		х		
	FUNGIIDAE	Fungia scutaria	Lamarck, 1801		x		
	POCILLOPORIDAE	Pocillopora eydouxi	Milne Edwards & Haime, 1849			X	
		Pocillopora meandrina	Dana, 1846		х	Х	х
	PORITIDAE	Porites compressa	Dana, 1846		x	Х	
		Porites evermanni	Vaughan, 1907		х		
		Porites lobata	Dana, 1846		х	Х	х
POLYCHAETA	CHAETOPTERIDAE	Chaetopterus sp.			x		
	TEREBELLIDAE	Loimia medusa	(Savigny, 1818)		x		
	SERPULIDAE	Spirobranchus giganteus	(Grube, 1862)				х
GASTROPODA		Serpulorbis variabilis	Hadfield & Kay, 1972		x		
	CHROMODORIDIDAE	Hypselodoris andersoni	Bertsch & Gosliner, 1989		x		
	PTERAEOLIDIDAE	Pteraeolidia ianthina	(Angas, 1864)			х	
BIVALVIA	OSTREIDAE	Dendostrea sandvicensis	(Sowerby, 1871)			X	х
	SPONDYLIDAE	Spondylus violacescens	Lamarck, 1819				Х
ECTOPROCTA	SERTELLIDAE	Reteporellina denticulata	(Busk, 1884)			X	
ASTEROIDEA	ACANTHASTERIDAE	Acanthastrea planci	Linnaeus, 1758		x		х
OPHIUROIDEA	OPHIOCOMIDAE	Ophiocoma pica	Muller & Troschel, 1842		-	х	٠
		- p prod					

					Haleʻiwa	Mahi	Z
Taxa	Family	Genus_Species	Author_Date	Status	Trench	Wreck	Modules
ECHINOIDEA	CIDARIDAE	Chondrocidaris gigantea	Agassiz, 1863		Х		
	DIADEMATIDAE	Echinothrix calamaris	(Pallas, 1774)			х	Х
	DIADEMATIDAE	Echinothrix diadema	(Linnaeus, 1758)		х	Х	х
	TOXOPNEUSTIDAE	Tripneustes gratilla	(Linnaeus, 1758)		x	Х	x
	ECHINOMETRIDAE	Echinometra mathaei	(Blainville, 1825)		х	Х	
		Heterocentrotus mammillatus	s (Linnaeus, 1758)		х		
HOLOTHUROIDE/	A HOLOTHURIIDAE	Actinopyga mauritiana	(Quoy & Gaimard, 1833)		х		
		Holothuria atra	Jaeger, 1833				x
		Holothuria whitmaei	Bell, 1887		x		
OSTEICHTHYES	HOLOCENTRIDAE	Myripristis sp.					х
	HOLOCENTRIDAE	Sargocentron sp.			х		
	AULOSTOMIDAE	Aulostomus chinensis	(Linnaeus, 1766)		х		х
		Fistularia commersonii	Rüppell, 1836		х		
	PRIACANTHIDAE	Heteropriacanthus cruentatus	s (Lacépède, 1801)			Х	
		Priacanthus meeki	Jenkins, 1904		х		
	CARANGIDAE	Scomberoides lysan	(Forsskål, 1775)				х
	LUTJANIDAE	Lujanus fulvus	(Forster, 1801)	Introduced	x	X	
		Lutjanus kasmira	(Forsskål, 1775)	Introduced		X	x
	LETHRINIDAE	Monotaxis grandoculis	(Forsskål, 1775)		х		х
	MULLIDAE	Mulloidichthys flavolineatus	(Lacépède, 1801)			Х	х
		Mulloidichthys vanicolensis	(Valenciennes, 1831)		х		х
		Parupeneus bifasciatus	(Lacépède, 1802)		х		х
		Parupeneus multifasciatus	(Quoy & Gaimard, 1825)			Х	х
		Parupeneus pleurostigma	(Bennett, 1831)				х
		Parupeneus porphyreus	(Jenkins, 1902)			Х	х
	CHAETODONTIDAE	EChaetodon auriga	Forsskål 1775		х		
		Chaetodon fremblii	Bennett, 1828			Х	х
		Chaetodon kleinii	Bloch, 1790			Х	X
		Chaetodon lunula	(Lacépède, 1803)		х		
		Chaetodon miliaris	Quoy & Gaimard, 1824		х	Х	х
		Chaetodon multicinctus	Garrett, 1863			Х	х
		Chaetodon ornatissimus	Solander, 1831		х		
		Chaetodon quadrimaculatus	Gray, 1831			Х	
		Chaetodon unimaculatus	Bloch, 1787		х		
		Forcipiger flavissimus	Jordan & McGregor, 1898	}		Х	х
		Forcipiger longirostris	(Broussonet, 1782)			Х	
		Hemitaurichthys polylepis	(Bleeker, 1857)				х
	POMACANTHIDAE		Jordan & Metz, 1912		Х		Х
	CIRRHITIDAE	Paracirrhites arcatus	(Cuvier, 1829)			Х	x
		Paracirrhites forsteri	(Bloch & Schneider, 1801)	Х		
	POMACENTRIDAE	Chromis agilis	Smith, 1960			Х	Х
		Chromis hanui	Randall & Swerdloff, 1973	}		Х	Х

					Haleʻiwa	Mahi	Z
Taxa	Family	Genus_Species	Author_Date	Status	Trench	WreckN	/lodules
OSTEICHTHY	ES POMACENTRIDAE	Chromis ovalis	(Steindachner, 1900)			Х	Х
		Dascyllus albisella	Gill 1862			х	X
		Plectroglyphidodon johnstonian	us Fowler & Ball, 1924		x		
		Plectroglyphidodon sindonis	(Jordan & Evermann, 1903)			Х
		Stegastes fasciolatus	(Ogilby, 1889)		x	Х	Х
	SERRANIDAE	Cephalopholis argus	Bloch & Schneide,r 1801	Introduced	x		
	LABRIDAE	Bodianus bilunulatus	(Lacépède, 1802)				Х
		Coris flavovittata	(Bennett, 1829)				Х
		Coris gaimard	(Quoy & Gaimard, 1824)			x	Х
		Coris venusta	Vaillant & Sauvage 1875				Х
		Gomphosus varius	Lacépède, 1801		x	Х	
		Halichoeres ornatissimus	(Garrett, 1863)		x		Х
		Labroides phthirophagus	Randall, 1958		x	Х	Х
		Macropharyngodon geoffroyi	(Quoy & Gaimard, 1824)				Х
		Pseudocheilinus octotaenia	Jenkins, 1901			x	
		Stethojulis balteata	(Quoy & Gaimard, 1824)		X		
		Thalassoma ballieui	(Vaillant & Sauvage, 1875)				Х
		Thalassoma duperrey	(Quoy & Gaimard, 1824)		X	x	Х
	BLENNIDAE	Exallias brevis	(Kner, 1868)			x	
	ACANTHURIDAE	Acanthurus blochii	Valenciennes, 1835		X		
		Acanthurus dussumieri	Valenciennes, 1835		X		
		Acanthurus leucopareius	(Jenkins, 1903)		x		
		Acanthurus nigrofuscus	(Forsskål, 1775)		X	x	Х
		Acanthurus nigroris	Valenciennes, 1835			x	Х
		Acanthurus olivaceus	Bloch & Schneider, 1801				Х
		Acanthurus triostegus	Streets, 1877		x		Х
		Ctenochaetus strigosus	(Bennett, 1828)		X	x	Х
		Naso caesius	Randall & Bell, 1992			x	
		Naso hexacanthus	(Bleeker, 1855)			x	Х
		Naso lituratus	(Forster & Schneider, 1801)		x	Х
		Zebrasoma flavescens	(Bennett, 1828)		X	x	Х
	ZANCLIDAE	Zanclus cornutus	(Linnaeus, 1758)		X	x	Х
	BALISTIDAE	Melichthys vidua	(Solander, 1844)			x	Х
		Sufflamen bursa	(Bloch & Schneider, 1801)		X	x	Х
	OSTRACIIDAE	Ostracion meleagris	Jenkins, 1901			x	Х
	TETRADONTIDAE	Canthigaster amboinensis	(Bleeker, 1865)				Х
		Canthigaster coronata	(Vaillant & Sauvage, 1875)			x	Х
		Canthigaster jactator	(Jenkins, 1901)		X	Х	X
	DIODONTIDAE	Diodon hystrix	Linnaeus, 1758		X	x	Х
				Total Taxa	74	56	62
				Total NIS	4	3	1
				% NIS	5.4%	5.3%	1.6%

APPENDIX D

Organisms Sent to Taxonomic Specialists to Determine Possible New Introductions

Specimens from the following locations were sent to the listed taxonomic specialist to verify identifications or check for possible new introductions:

- Sponges: Ralph DeFelice, Los Angeles County Museum of Natural History. Specimens from Stations KARA2, KARA6, KARA7, KARA8, MORA!, MORA2, MARA4, MARA9.
- Hydrozoans: Dr. Dale Calder, Royal Ontario Museum, Toronto, Canada, specimens from Stations KARA5 determined to be cryptogenic *Dynamena crisoides* Lamaroux, MORA3 to be native *Macrorhynchia philippina* Kirchenpauer, HARA1 to cryptogenic *Plumularia floridana* (Nutting), and HARA6 to be cryptogenic *Plumularia floridana* and *Plumularia strictocarpa* Pictect.
- Gastropods: Anuschka Fauci, Department of Zoology, University of Hawaii. Specimens from Station MARA6 verified to be native *Serpulorbis variabilis* Hadfield & Kay.
- Bryozoans: Chela Zabin, Department of Zoology, University of Hawaii. Specimens from Stations KARARA3, KARA6, HARA2, HARA3, HARA4, HARA6and HARA9 confirmed to be *Crisina radians*? (Lamarck), specimens from KARA6 and HARA2 confirmed to be native *Disporella violacea* (Canu and Basseler), specimens from KARA2 confirmed to be introduced *Schizoporella errata*? (Waters).
- Ascidians: Scott Godwin, Bishop Museum, Department of Natural Sciences. White didemnid from Stations KARA2-KARA8, OARA1, MORA1, MORA2, MORA6, MORA8, MARA1, MARA3, HARA5, HARA6 and HARA8 to be cryptogenic *Didemnum candidum?* as far as can be determined.