



The Marine Fauna of the Coast of Northern Kona, Hawaii

**An Inventory of Fishes and Invertebrates
Recorded During Summer, 1972**

Julie H. Brock and Richard E. Brock

April 1974

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by

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Sea Grant Advisory Report

UNIHI-SEAGRANT-AR-74-02

April 1974



This report is published under Grant No. 04-3-158-29, NOAA Office of Sea Grant, Department of Commerce in conjunction with the Hawaii Cooperative Fishery Unit, U.S. Bureau of Sport Fisheries and Wildlife (Contract No. 14-16-001-4896) administered under the direction of Dr. John Maciolek and the Planning Department of the County of Hawaii. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notations that may appear hereon.



ABSTRACT

A survey of the marine animals of the Kona coast of the island of Hawaii was undertaken during the summer of 1972 in conjunction with a similar study of the coastal ponds. The shoreline and subtidal waters to a depth of 30 feet (10 m) were surveyed at 16 stations from Makalawena in the north to Waialua near South Point. In total, 163 species of invertebrates and 137 species of fish were recorded from three well-defined habitats: the tidepools, the subtidal waters that receive freshwater runoff from the land, and the true marine subtidal areas. It was not possible to make thorough collections at each station in all three habitats. Consequently the sampling effort varied at each station so the results are not directly comparable. Fish surveys were only made at six of the 16 stations.

Some stations examined are exceptional in their faunal diversity (abundance of species) for both fishes and invertebrates. The subtidal zone with freshwater influence occurring over geologically young lava rock is unique to this island and associated with it is a discrete group of fishes and invertebrates which characterize this habitat. Representative coelenterates, polychaetes, and mollusks can be described as indicator organisms for this low salinity environment. Greatest species diversities are found in the truly marine areas.

This report is the first attempt to biologically examine some of the remote marine areas of the Kona coast. The information presented here should be useful to other biologists and for environmental planning by county officials.

Recommendations are made for the conservation or preservation of five stations (4, 7, 8, 9, 11) that have either a unique marine fauna or other biological and cultural attributes that are not found elsewhere. Further investigations of these regions are essential for a better understanding of the pristine marine communities present, especially in view of the lack of human disturbance that has occurred along the remote sections of this coast in contrast to many shoreline areas of the Hawaiian Islands.

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INTRODUCTION

During the summer of 1972 a group of University of Hawaii Zoology faculty and students surveyed the aquatic coastal resources of the Kona coast on the island of Hawaii. This survey was conducted (a) to inventory the biota of the mixohaline pond systems occurring along this coast (under the direction of Dr. J. Maciolek, Hawaii Cooperative Fishery Unit) and (b) to survey the near-shore marine resources as time permitted in the area between Mahukona and Kailua-Kona. This report constitutes the results of the marine resources survey.

Over the last few years, information on the marine resources of the Kona coast has been accumulating. However, relative to the size of the area under consideration (94 miles of coastline), these data leave many gaps in the available information on the biota. Some of the information is in the form of ecological surveys published by Doty *et al.* for Kealakekua Bay (1968) and Honaunau Bay (1969). Ebert (1971) presented a quantitative analysis of the sea urchin fauna of Kealakekua and Honaunau Bays. Some information is available in the form of environmental impact statements and county reports. Kikuchi and Belshé (1971) examined some of the mixohaline ponds along this coast and Key *et al.* (1971a, 1971b) conducted two surveys of both nearshore and pond biota of the Anaehoomalu area. Maciolek and Brock (1974) analyzed the biota of more than 300 coastal ponds and a study by Brock (in preparation) is limited to the fishes of these ponds. Holthuis (1973) has described new species of crustaceans from these ponds and has applied the term "anchialine" (derived from the Greek word *anchialos*, meaning near the sea) to characterize these coastal ponds which lack surface connections with the ocean but do contain saline waters and exhibit tidal oscillations. Recent work by Hobson (1972) observed the behavior of the fishes in Kealakekua Bay. Earlier publications that cannot be omitted when considering the ecology and systematics of the invertebrate fauna of the Hawaiian coasts include work by Edmondson (1933) and investigations of the sponge fauna of the island of Hawaii by de Laubenfels (1951).

Some commercial development of this coastline has already occurred in several areas and is at present expanding. Urban expansion invariably brings biological change so steps are being taken to survey and delineate areas of high natural value, both culturally and biologically, so that they may be set aside as parks or reserves.

This report is a checklist of the marine animals inhabiting the Kona coast between Mahukona and Waialua (Figure 1). The survey was undertaken to aid county officials in determining areas of natural consequence and to provide environmentalists and biologists who may work on this coastline with some baseline data in the future.

The list of species is by no means complete; it represents the collecting effort of the survey team at discrete stations along the coast. Within these stations, collecting effort varied due to a lack of time, personnel, or equipment and has resulted in a more complete sampling at some stations than at others. The value of this report lies in the fact that many of the survey stations have never been visited before by trained biologists; hence, the list of species constitutes only a first approximation of the fauna.

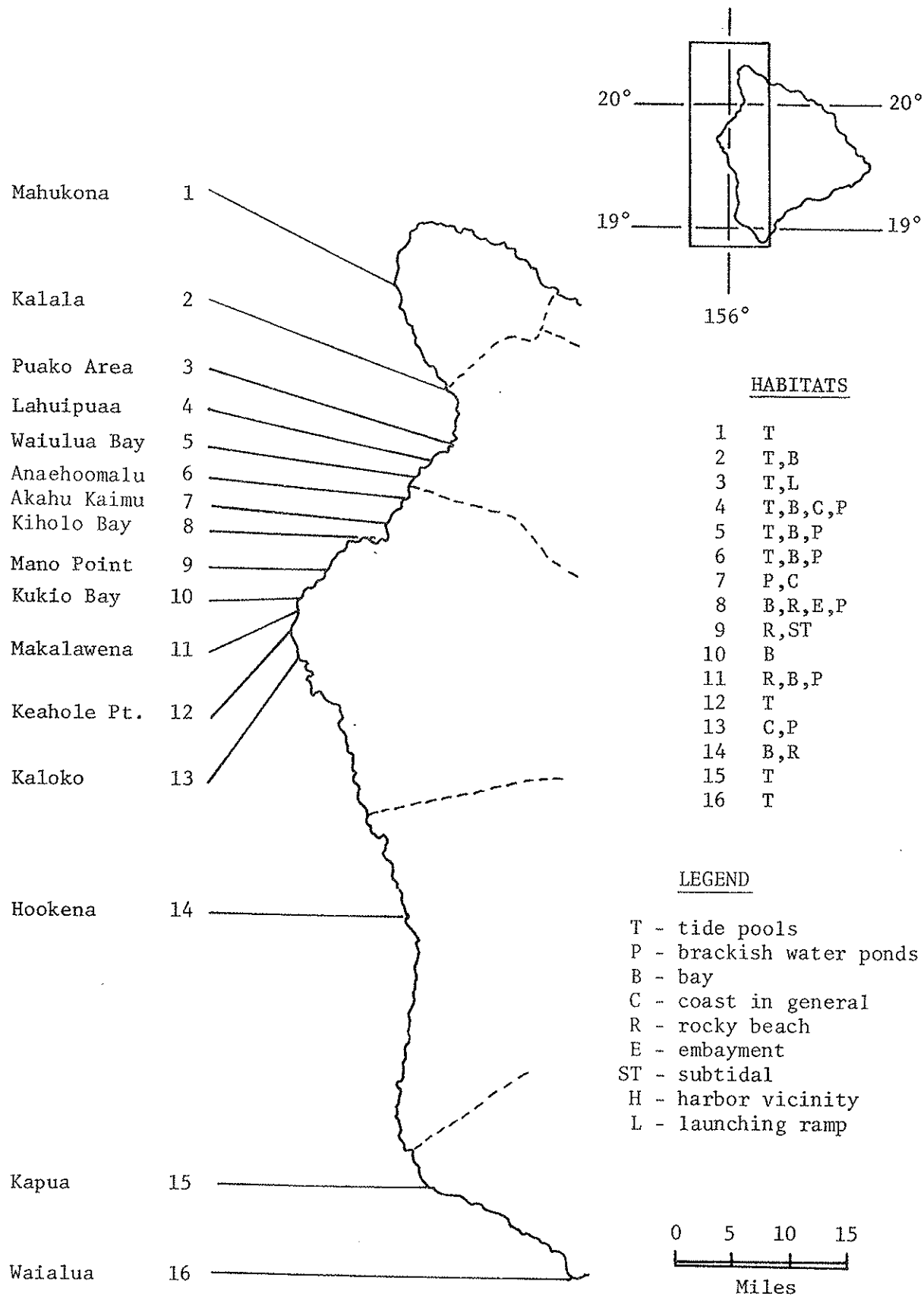


Figure 1. Location of collecting stations on the Kona, Hawaii coast.

MATERIALS AND METHODS

Emphasis in the Kona coast survey was on the mixohaline ponds (brackish pond systems). Time allowed for the establishment of only 16 sampling stations (see Figure 1 for the location of these stations and Appendix A for a description of each). Of these 16 stations, minor collecting effort (due to the lack of time or high surf) was undertaken at Stations 1, 3, 10, 12, 14, 15, and 16. The collection methods at these stations generally consisted of the sampling of a few tidepools for large mobile invertebrates and the turning over of rocks for sessile forms. Thus, these stations represent the intertidal fauna only.

When the conditions permitted more extensive sampling, the methods were as follows:

Fishes: Records of fishes were noted on a plastic slate while swimming in the water and attempting to sample as many different habitats as possible in the area. Semi-quantitative estimates were made of the abundance of different species; i.e., Abundant = more than 20 individuals seen, Common = 10 to 20 individuals, Few = 2 to 9 individuals, and Rare = only 1 individual seen. Only at Stations 4, 6-D, 7, 8, 9, and 11 was this done. The surveys vertically sampled from the intertidal to about 30 feet (10 m) in depth at these six stations. The method of the enumeration of fishes has inherent observer errors in it. As with the invertebrates, small, nocturnal, and cryptic fishes were undoubtedly missed.

Invertebrates: At heavily sampled stations (2, 3, 4, 6-D, 7, 8, 9, 11, 13), large benthic invertebrates such as corals, sea urchins, and holothurians were recorded on a plastic slate while swimming from shore and as many different habitats as possible were sampled. Again, the area sampled from the shoreline to a maximum depth of about 30 feet (10 m). Small invertebrates were collected from representative habitats and preserved for later laboratory examination. The invertebrates recorded were mostly conspicuous, diurnal organisms; the cryptic and rare species were probably overlooked.

The results of the collecting effort are presented in Appendices B, C, and D. Only fishes seen in the nearshore marine environment are listed in Appendix D; however, invertebrates occurring in both the more marine coastal ponds with direct connections to the sea and salinities above 10 percent and the adjacent shoreline are reported. The arrangement of fishes in Appendix D according to family, specific, and some Hawaiian names is mostly according to Gosline and Brock (1960).



Figure 2. Exposed rocky coast and tidepools of Akahu Kaimu.

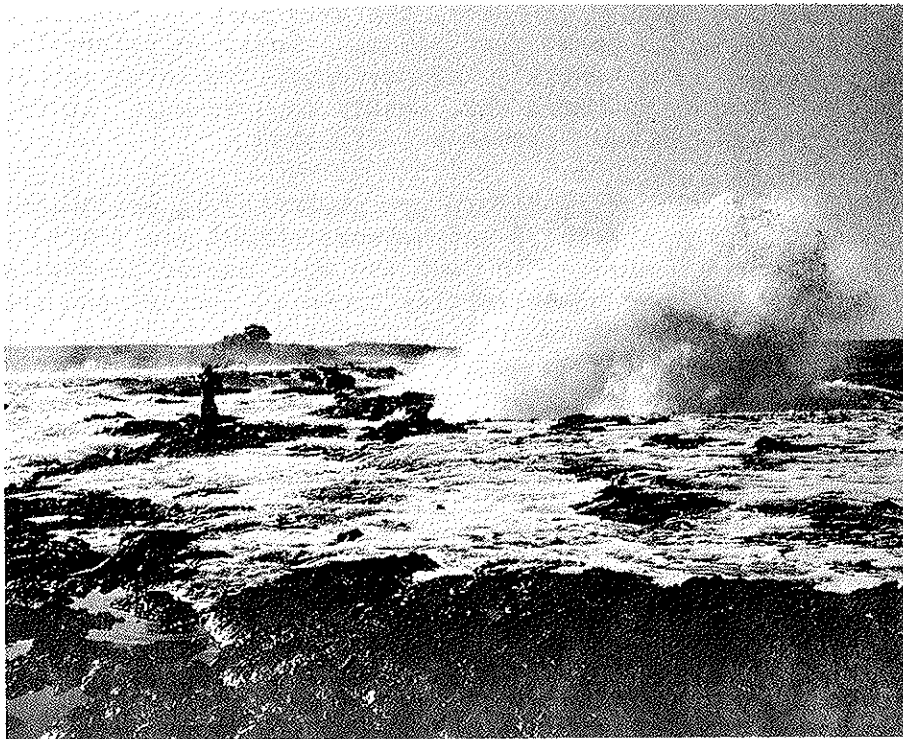


Figure 3. Big surf near Keahole Point.

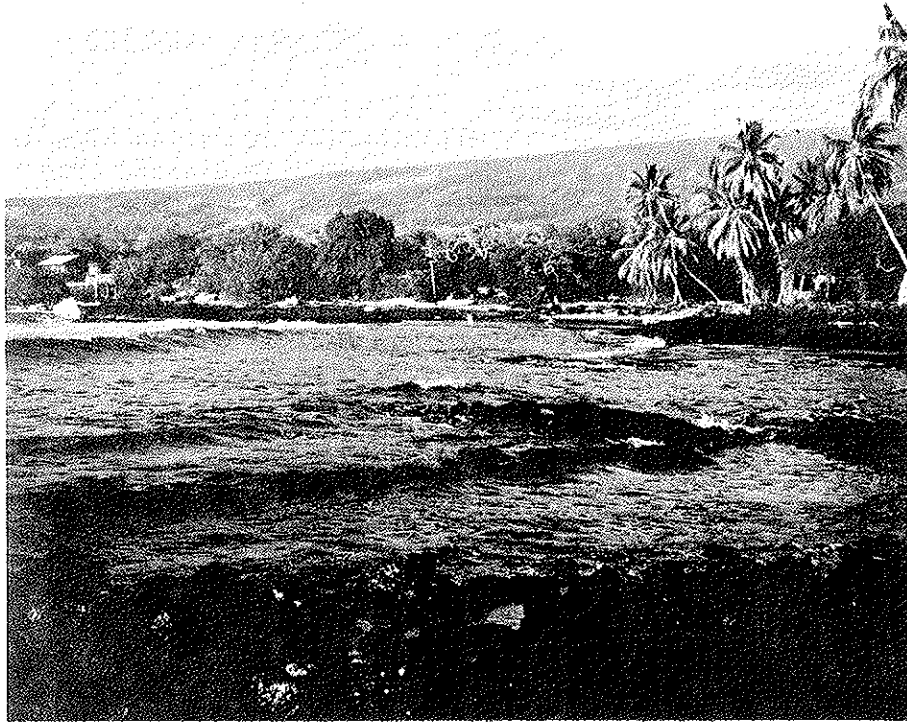


Figure 4. Kiholo Bay.



Figure 5. Black sand beach near Mano Point.

BIOLOGICAL CHARACTERISTICS OF THE AREAS SURVEYED

To facilitate description of the distribution of marine organisms found on the Kona coast, the shoreline has been arbitrarily divided into habitat zones. The invertebrates are grouped according to the habitat in which they occur (Appendix C) and the fishes recorded from various zones have been consolidated into one table (Appendix D).

The major zones are shown below.

INTERTIDAL ZONE		Shore between the highest and lowest tides
	A	Zone where freshwater may or may not be present (includes brackish water ponds)
SUBTIDAL ZONE		
	B	Zone of normal marine condi- tions

Figure 6. Schematic representation of the nearshore marine environment.

The intertidal zone is bounded vertically by the highest tidepools down to the level of the lowest low tides. It therefore includes the tidepools.

A characteristic feature of much of the nearshore marine environment of the island of Hawaii is the presence of a freshwater lens. The porosity of the geologically young lava rock permits water to percolate through it and lie on top of the denser seawater. At the land-water interface, the freshwater runs out and may considerably dilute the waters of the nearshore region (subtidal A zone to a depth of 3 feet or 1 m). The coastal ponds with connections to the sea receive both freshwater and seawater and contain many marine organisms which are therefore included in this subtidal A zone. The subtidal A zone may be reduced or absent if the coastal and submarine topography is steep (vertically) rather than a gentle slope and if the water table is reduced in the area.

The subtidal B zone, in areas with little or no freshwater influence, extends from the lower limit of the intertidal to below the sampling depths of this report. In areas where freshwater is mixing in the shallows, the subtidal B zone begins at the lower limit of this region of mixing.

The Intertidal Fauna

On many parts of the Kona coast the intertidal (tidepool) zone is subject to heavy surf which permits frequent flushing of the pools. The flushing provides a ready food and oxygen supply for the biota. Overall, the invertebrate fauna of the intertidal is diverse: conspicuous are mollusks, crustaceans, echinoderms, and cnidarians including some corals. Where wave action is strong, dominant organisms include the sea urchins *Echinometra mathaei*, *E. olonga*, *Cologocentrotus atratus*, and the mollusks *Cellana* spp. (opihi), *Littorina* spp., *Nerita picea* (pipipi) and the attached, spiral-coiling vermetid snails.

In the more protected tidepools corals, sea cucumbers, rock oysters (*Isognomon* spp.), hermit crabs, encrusting sponges, tube worms (*Spirorbis* spp.), and brittle stars occur. In all, 68 species of invertebrates have been identified from this habitat.

The fishes characteristic of this zone are for the most part juveniles of many species which as adults are found in adjoining deeper water, e.g., the manini, *Acanthurus triostegus sandvicensis* (Randall, 1961), the kupipi (*Abudefduf sordidus*), the alaihi (*Adioryx lacteoguttatus*), several species of butterflyfishes (Family Chaetodontidae), and the aholehole (*Kuhlia sandvicensis*). Occurring as adults in this zone are a goby (*Bathygobius fuscus*), a blenny (*Istiblennius zebra*), and a moray eel (*Gymnothorax pictus*). The fishes of this zone were not sampled as those in the tidal zone.

The Fauna of the Subtidal A Zone

This is an interesting region which, as previously mentioned, may be absent entirely or change in range according to seasonal rainfall and drought or with the tides. Organisms characteristic of this habitat are those able to withstand dilution by freshwater for long periods of time (euryhaline).

The light blue encrusting alcyonarian, *Sarcothelia edmondsoni*, is an indicator of the above conditions. In some areas it forms a distinct horizontal band, below which exists normal saline conditions where the corals predominate. A blue mat of this feathery animal was encountered at only two collecting stations (Kiholo Bay and Kaloko) where it dominated the substratum to a depth of 5 to 6 feet (2 m). This species has been recorded in Kealakekua Bay (Doty *et al.*, 1968) and Honaunau Bay (Doty *et al.*, 1969), was seen in abundance by the authors in Kailua Bay and Mahaiula on the Kona coast, and was present in collections from Hilo Bay. All of these areas receive freshwater runoff.

Other marine invertebrates that can be described as indicators of freshwater influx include the polychaetes *Protula atypha*, *Eurythoe complanata* (also found in high salinity fishponds), and *Janua knightjonesi*. Amongst the mollusks, the attached bivalves, *Isognomon californicum*, *I. perna* and *Brachidontes crebristriatus*, are indicators of the tidal A zone and are also found in the higher salinity fishponds (above 10 percent) adjoining the sea.

As a group, the echinoderms are the least tolerant of freshwater and are absent from the fishponds. Whereas the crustacea (shrimps, etc.), some of

which are physiologically able to withstand salinity changes, are common, e.g., the opaeoehaa, *Macrobrachium grandimanus*, *Alpheus crassimanus*, and several species of crabs and amphipods.

The fishes of this zone are not diverse. Common to both high salinity fishponds (greater than 10 percent) open to the sea and the adjoining subtidal A habitat are the ama'ama (*Mugil cephalus*), the aholehole (*Kuhlia sandvicensis*), the alaihi (*Adioryx lacteoguttatus*), the kupipi (*Abudefduf sordidus*), the hinalea (*Thalassoma duperryi*), the omaka (*Stethojulis balteatus*), the manini (*Acanthurus triostegus sandvicensis*), and a goby (*Bathygobius fuscus*). Also in the subtidal A zone are the puhi-paka (*Gymnothorax flavimarginatus*), the omilu (*Caranx melampygus*), the nenu (*Kyphosus cirrascens*), the weke (*Mulloidichthys samoensis*), the mamo (*Abudefduf abdominalis*), the pomacentrid (*Abudefduf imparipennis*), and the surgeonfish (*Acanthurus nigrofuscus*).

The Fauna of the Subtidal B Zone

Many invertebrates found in the intertidal also occur in the subtidal with abundances being greater in the latter zone. The region was dominated, at least visually, by corals; other invertebrates tend to be hidden on or within the corals or in the surrounding sandy areas. However, the greatest diversity of invertebrates was found in this zone (95 species positively identified). Most of the fishes noted in Appendix D (137 species) were found in this habitat.

DISCUSSION AND CONCLUSIONS

For the present discussion, areas with little sampling effort and/or those restricted only to tidepools (Stations 1, 5, 6-A, 12, 14, 15, 16) will be omitted. The organisms found in the survey of these areas are, however, included in Appendices B and C for the sake of completeness. It should be noted that, to more accurately assess the marine biota of all the study areas and therefore be able to draw more succinct conclusions, a much more in-depth study would be needed. The number of species at each station partially reflected the sampling effort; this is especially applicable to the invertebrates collected. This problem is, in part, overcome by the fact that the sampling of fish was somewhat more constant and that any judgment on the natural value of a sampling station is based on the diversity of the species present, their abundance, and the "wariness" or "tameness" of the fishes there--all factors considered relative to the other stations.

The abundance and diversity of the marine organisms present at a collecting site reflect the degree of human activity or its absence. Stations in close proximity to human activities (Stations 3, 6-C, 6-D) clearly show a decrease in species diversity (as well as a noticeable wariness on the part of the fishes towards man) relative to those that are remote (Stations 4, 7, 8, 9, 11). During the summer there was action by landowners to remove the beachrock in Anaehoomalu Bay, a private beach (Station 6-C), for the convenience of swimmers. Due to a much more intensive sampling effort than time permitted at other stations, a diverse invertebrate fauna (44 species) was collected here which significantly added to the findings by Key *et al.* (1971a, 1971b). Station 3 (Puako Area) yielded only 22 invertebrate species. This station which included the boat ramp area had a large amount of suspended material in the water and a muddy bottom littered with human refuse. In Station 6-D, 27 species of invertebrates and 36 species of fishes were recorded. The invertebrate sampling was not as intensive as that for fish and the abundance of any one species was low. Probably not only fishing pressure but also the effect of freshwater runoff from the fishponds and the poor clarity of the water have influenced the biota.

Remote and/or areas of restricted access (Stations 4, 7, 8, 9, 11) have typically undisturbed marine habitats. As noted above, Stations 4, 7, and 9 lacked much freshwater influx at the time of sampling and the fauna is representative of exposed marine coastlines. From our observations, these three areas are excellent examples of this type of habitat and deserve further sampling and consideration for preservation. Station 9 (Mano Point) probably represents the richest shallow water fish fauna observed by the second author in more than 15 years of diving in the Hawaiian Islands. The intertidal zone of this station also indicated the lack of human interference by the abundance of opihi (*Cellana* spp.).

Stations 8 (Kiholo Bay) and 11 (Makalawena) also deserve further study. Both have freshwater influencing the nearshore portions (subtidal A zone, above) and are good examples of this habitat. This habitat type with brackish waters occurring over a geologically young lava substratum appears to be unique to the island of Hawaii. The adjoining fishpond (Opaepala) at Makalawena is an important shorebird habitat; if this is preserved, consideration should be given to doing the same with the adjacent marine area.

Stations 2 (Kalala) and 10 (Kukio Bay) are rich in invertebrates; however, further sampling is needed in these areas before any assessment can be made.

The invertebrate surveys at Stations 6-B (Anaehoomalu fishponds) and 13 (Kaloko) in the mixohaline ponds showed that Kaloko Pond is more diverse than the Anaehoomalu ponds, probably because of a more direct connection to the sea at Kaloko. The nearshore marine area adjacent to Kaloko Pond (Station 13) is not rich in macro-invertebrates (relative to other areas) until a depth of 10 to 15 feet (3 m) is attained due to the overlying freshwater lens. However below 3 m there is extensive growth of corals and diversity of coral species.

All of the sampling stations are unique in one or more ways and this short survey has attempted to indicate this; however, a much more rigorous sampling program is needed in order to access the marine fauna of the entire Kona, Hawaii coastline.

ACKNOWLEDGMENTS

Equipment and transportation were provided by the Hawaii Cooperative Fishery Unit, U.S. Bureau of Sport Fisheries and Wildlife (Contract No. 14-16-001-4896) administered under the direction of Dr. J. Maciolek. Financial support came also through the Sea Grant Program, University of Hawaii. The Marine Option Program, University of Hawaii, provided student help for the duration of summer (E. Katahira, C. Guthier and R. Fujii).

Housing facilities were arranged by Mr. E. Sheppard (Hawaii Preparatory Academy) and Mr. B. Machado (Hookena). Mr. R. Chase and Mr. S. Fuke assisted in the land access arrangements.

We are most grateful to the following landowners and estate managers who allowed the survey team access to the coast through their properties. These include W. Akau, D. Carlsmith, N. Carlson, F. Duerr, H. Greenwell, D. Haserot, R. Rittmeister, G. Schatthauer and M. Waddups.

Acknowledgments are made to the following specialists at the University of Hawaii and at the Hawaii Institute of Marine Biology who helped in identification of invertebrates: Dr. and Mrs. A.H. Banner (alpheid shrimps); Dr. E.A. Kay (mollusks); Dr. M.G. Hadfield (vermetid mollusks); Dr. J. Maragos (corals); Mr. H. Snider (hermit crabs) and Mr. T. Gosliner (Opisthobranch mollusks). Dr. Alan J. Kohn of the University of Washington kindly read the manuscript.

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APPENDICES

APPENDIX A: General Description of the Areas and the Type of Fauna Sampled

Below is a short physical description of the 16 areas sampled. The location of these areas is shown in Figure 1.

1. Mahukona (Latitude 20°11'10")

Invertebrate sampling was undertaken in a few tidepools along the exposed, open, rocky coastline.

2. Kalala (Latitude 20°6'7.5")

Invertebrates were sampled both in tidepools occurring on this rocky coastline and in the ocean out to a 25-foot (8 m) depth. The sampling areas included an exposed headland and a small protected bay. Corals were abundant in the deeper areas.

3. Puako Area (Latitude 19°58'33"; 19°57'15")

Sampling of invertebrates was performed subtidally to a depth of 15 feet (5 m) at the Puako Boat Ramp (Latitude 19°58'33") and also in the tidepools just south of Kapunalau Point (Latitude 19°57'15"). The boat ramp area is partially protected from high seas. The substratum was heavily silted and water clarity and coral growth was poor in this area.

4. Lahuipuaa (Latitude 19°56'45")

This exposed rocky coastline abruptly drops off into deep, clear water (20+ m). Invertebrates and fishes were sampled along this sharp drop from the tidepools to depths of 30 feet (10 m).

5. Waiulua Bay (Latitude 19°55'45")

Waiulua Bay is small and well protected, bordered by a high a'a flow (Kaniku lava flow) to the north and to the south by a coral and lava rock beach. Intertidal invertebrate sampling was conducted at this station. The coastal ponds of this area proved to be very diverse biologically, hence, most effort was put into the sampling of these. Reported here are the invertebrates collected from both the higher salinity ponds and the adjoining bay to 3 feet (1 m) in depth. The fishes of the ponds are covered by Brock (in preparation).

6. Anaehoomalu Bay (Latitude 19°55'10")

The bay (Station 6-D), beachrock bench (Station 6-C), Kuualii and Kahapapa fishponds (Station 6-B) as well as the small tidepools north of the fishponds (Station 6-A) were extensively sampled for both fishes and invertebrates. Sampling depths within the bay extended from the sandy shoreline to over 20 feet (6 m) in depth. The effects of freshwater flushing out from the fishpond system via a makaha is evident south of the outlet. The substratum in this area is principally sand and rubble. The coral is sparse relative to other stations and is present as large heads. The invertebrate and fish fauna is not particularly rich; this may be due to the high turbidity and lack of coral cover. To the north of the sandy bay (off Anaehoomalu Point) the substratum is chiefly volcanic rock with much coral. This area was not sampled but on a quick inspection appeared biologically rich.

The invertebrates of the beachrock were extensively sampled as well as those of the fishponds. The beachrock was found to harbor a diverse community of invertebrates which is contrary to the few species reported by Key *et al.* (1971a, 1971b).

7. Akahu Kaimu (Latitude 19°54'22.5")

A wave cut lava bench provides the shoreline of this area. The area sampled (for both fishes and invertebrates) ranged from the shore to a 20 foot (6 m) depth on an extensive underwater bench. The substratum is chiefly hard basalt with good coral growth and diverse fauna.

8. Kiholo Bay (Latitude 19°51'30")

Kiholo Bay is quite turbid and has a sand-lava beach at its head. It is bordered on the north by an old, principally marine fishpond (Wainanalii) and to the south by a lava bench system. Fishes and invertebrates were sampled in Wainanalii pond, the bay, and the southern edge of the bay. Fishes were noted in the bay to a depth of 20 feet (6 m), invertebrate sampling was restricted to less than 6 feet (2 m) in depth. The substratum of the bay is composed of hard basalt with little coral evident in the shallows (in part due to the large amount of freshwater runoff and high turbidity). The shallows were rich in invertebrate fauna (other than corals) but fishes were not plentiful until about 15 feet (3 m) in depth.

9. Mano Point (Latitude 19°51'00")

The shoreline of this area consists of an extensive lava rock bench several feet above sea level dropping vertically into 15 feet (3 m) of water. A large subtidal bench covered with coral ranging from 15 to 25 feet in depth fronts the shoreline. Both fishes and invertebrates were sampled from the highest tidepools to a depth of about 30 feet (10 m). The water is very clear and, although the rock bench receives considerable wave action, the tidepools and rock faces were covered with invertebrates and algae. The fish fauna of this area was the richest in species diversity seen along the entire Kona coast.

10. Kukio Bay (Latitude 19°49'19")

Kukio Bay has a sandy beach fronted by some beachrock development. A rich invertebrate fauna was sampled on the beachrock and adjacent tidepools. Only a limited amount of time was available for study in this area.

11. Makalawena (Latitude 19°47'45" to 39")

Sampling of both invertebrates and fishes in this area covered two major habitats: sand and a solid limestone substratum. Along the northern section of the coast there is well-developed beachrock and tidepools (receiving freshwater), while a sand beach is present in the southern sector. Corals in the northern area occur at depths of 6 feet (2 m) or more; however, due to the presence of sand in the shallows of the southern portion of the Makalawena study area, prolific coral growth is not seen until a 20 foot (6 m) depth is attained. Moving offshore, these beds of corals in both habitats gently slope out to a depth of about 25 to 30 feet where there is a ledge paralleling the shore. The sampling of fishes encompassed the area out to the ledge and both inshore areas. Invertebrate sampling centered on the northern limestone area with most collecting being restricted to the shallows (less than 5 m).

12. Keahole Point (Latitude 19°43'55")

On the very exposed coastline of Keahole Point, several large tidepools were sampled for sessile invertebrates. The coast of this area is composed of steep cliffs (3 to 5 m in height) dropping abruptly into deep water. The tidepools checked in this area were found on the top of these cliffs and hence could probably be considered as situated in the supra-tidal zone.

13. Kaloko (Latitude 19°41'29")

Kaloko is a natural rocky embayment with a man-made rock wall across part of it forming the near-marine Kaloko fishpond. The fishpond has connections to the ocean via a makaha. Kaloko pond was extensively sampled for invertebrates and fishes (fishes are reported in Brock, in preparation) and invertebrate collections and observations were made out across the rocky bottom of the embayment to a depth of 30 feet (10 m).

Note: At the following three stations, only minor sampling effort was expended due to the lack of time; hence, these collections are not representative of the diversity of organisms that probably exist there.

14. Hookena (Latitude 19°23'7.5")

The tidepools occurring on the extensive lava rock bench just north of Hookena State Park were sampled for invertebrates by day and also by night. Some macro-invertebrates were also recorded from the sandy bay in front of the beach park.

15. Kapua Bay (Latitude 19°08'43")

One small invertebrate collection was made in a tidepool along this rocky exposed coast.

16. Waialua (Latitude 18°58'22.5")

Only one large tidepool was sampled for fishes and invertebrates due to the lack of time.

APPENDIX B. AN INVENTORY OF THE MARINE MACRO-INVERTEBRATES
OF THE KONA, HAWAII COAST

	Makukona	Kalala	Puako area	Laihupuna	Mainua Bay	Anaehoomalu Bay	Rest of bay	Beachrock	Fishponds	Transect	Akahu Kaimu	Kiholo Bay	Mano Point	Kukio Bay	Makalawena	Keahole P.	Kaloko	Hookena	Kapua	Maiailua
	1	2	3	4	5	6a	6b	6c	6d	7	8	9	10	11	12	13	14	15	16	
<i>Phylum Porifera</i> (sponges)																				
<i>Cliona vastifica</i>								X	X	X	X	X	X	X						X
encrusting forms	X	X	X					X	X	X	X	X	X	X						
siliceous with long spicules						X		X			X					X				
<i>Phylum Platyhelminthes</i>																				
Polycladida (marine flat worms)																				
<i>Pseudoceros</i> (<i>P. affinis</i> ?)														X						
Unidentified						X		X					X							
<i>Phylum Nemertea</i> (ribbon worms)																		X		
<i>Taeniocoma cingulatum</i>																				
<i>Phylum Sipunculida</i> (peanut worms)																				
various species bore in coral rocks								X					X							
<i>Phylum Bryozoa</i> (moss animals)																				
erect forms														X						
encrusting forms			X					X		X	X		X							X
<i>Phylum Cnidaria</i>																				
Class Anthozoa (anemones)																				
<i>Aiptasia</i>										X										
<i>Sagartia pugnax</i> (carried by anemone crab <i>Polydectus</i>)						X														
<i>Ceripathes</i>	X																			
brown anemones													X							
<i>Scareothelia edmondsoni</i>											X						X			
<i>Palythoa</i> sp.	X					X			X	X		X	X				X			
Zoanthids						X			X											
<i>Montipora verrucosa</i> --corals	X	X	X						X	X	X		X	X						
<i>M. patula</i> "									X	X			X	X						
<i>Favona varians</i> "	X								X	X			X	X						
<i>Psammocora</i> sp. (<i>stellata</i> ?)--corals									X	X	X		X	X	X	X				
<i>Cyphastrea ocellina</i> "	X					X			X	X	X		X	X	X	X				
<i>Leptastrea bottae</i> "	X					X			X	X			X	X	X	X				
<i>Pocillopora damicornis</i> "			X						X	X	X		X	X	X	X				
<i>P. meandrina</i> "	X		X						X	X	X		X	X	X	X				
<i>P. modumanensis</i> (or <i>eydouxii</i>) "				X					X	X	X		X	X	X	X				
<i>Porites compressa</i> "	X	X	X						X	X	X		X	X	X	X			X	
<i>P. lobata</i> "	X		X						X	X	X		X	X	X	X			X	
<i>Phylum Annelida</i> (segmented worms)																				
Class Polychaeta																				
<i>Polynoidae</i> (scale worms)																				
<i>Lepidonotus havaicus</i>								X		X										
<i>Amphinomidae</i> (fire worms)																				
<i>Eurythoe complanata</i>								X			X	X					X			
<i>Nereidae</i>																				
<i>Nematocastis abiuana</i>										X	X									
<i>P. pulchella</i>								X												

	1	2	3	4	5	6a	6b	6c	6d	7	8	9	10	11	12	13	14	15	16
<i>Spionidae</i>																			
<i>Spiophanes bombyx</i>											X					X			
<i>Chaetopteridae</i>																			
<i>Phyllochaetopterus verrilli</i>												X							X
<i>Sabellariidae</i> (sand grain tube worms)																			
<i>Lygdamis indicus</i>							X	X		X									
<i>Terebellidae</i> (spaghetti worms)																			
<i>Lanice conchilega</i>				X					X				X	X				X	
<i>Nicolea gracilibranchis</i>							X			X			X						
<i>Terebella lapidaria</i>			X									X							
<i>Serpulidae</i> (calcareous tube worms)																			
<i>Vermiliopsis hawaiiensis</i>										X				X					
<i>V. torquata</i>									X	X									
<i>Protula atypa</i>	X		X	X		X		X	X	X	X	X	X	X	X				X
<i>Salmacina dyateri</i>			X					X			X			X					
<i>Spirobranchus giganteus</i>				X															
<i>Spirorbinae</i> (spiral calcareous tube worms)*																			
<i>Protolaeospira translucens</i>									X										
<i>Spirorbis marioni</i>	X	X				X					X	X							X
<i>Pileolaria militaris</i>			X	X		X	X	X	X		X			X				X	X
<i>P. pseudomilitaris</i>			X	X		X	X	X	X		X			X				X	X
<i>P. koehleri</i>	X	X	X	X					X									X	X
<i>Janua pagensteoheri</i>	X											X		X				X	
<i>J. pseudoacorrugata</i>											X							X	
<i>J. foraminosa</i>				X							X	X		X				X	
<i>J. nipponica</i>			X	X	X			X	X	X	X	X	X	X	X	X	X	X	X
<i>J. knightjonesi</i>			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phylum Arthropoda																			
<i>Crustacea</i>																			
Class Cirripedia (barnacles)																			
<i>Chthamalus intertextus</i>										X	X	X			X				
Class Malacostraca																			
<i>Isopoda Lygia</i> sp.																			
Amphipoda, caprellids and other isopods						X		X		X	X					X	X		
DECAPODA = shrimps and crabs																			
NATANTIA (swimmers)																			
<i>Alpheus crassimanus</i> --snapping shrimp					X	X		X			X			X					
<i>A. collumianus medius</i> " "								X			X								
<i>A. deuteropus</i> " "								X			X								
<i>A. paragraeilis</i> " "								X			X								
<i>A. lottini</i> " "														X					
<i>Stenopus hispidus</i> --banded shrimp						X					X				X			X	
<i>Palaemon debilis</i> --glass shrimp											X				X			X	
<i>Palaemonella burnsi</i> " "															X			X	
<i>Macrobrachium grandimanus</i>															X			X	
<i>M. lar</i>				X			X							X				X	
REPANTIA (crawlers)																			
<i>Panulirus penicillatus</i> --spiny lobster				X						X		X							
<i>Periclimenaeus</i>									X										
<i>Calcinus seurati</i> --hermit crabs						X	X				X			X	X			X	
<i>C. laevimanus</i> " "		X			X	X					X			X	X			X	
<i>C. latens</i> " "											X	X		X				X	
<i>Clibanarius zebra</i> " "						X		X			X	X		X				X	
<i>Nucia speciosa</i> --crabs											X								
<i>Haplocarcinus marsupialis</i> --crabs								X				X		X					
<i>Simocarcinus simplex</i> " "											X			X					
<i>Polydectus cupulifer</i> " "						X													
<i>Metapograpsis messor</i> " "											X						X		
<i>Ocypode ceratophthalmus</i> " "								X											
<i>Grapsus grapsus</i> Ama Ama	X	X	X	X	X	X				X	X	X		X	X	X	X	X	X
<i>Trapezia intermedia</i> " "											X			X					
<i>Ranina ranina</i> --Kona crab											X							X	
<i>Carpilius maculatus</i> " "											X							X	
<i>Platypodia eydouwii</i> " "																X			
<i>Lophozozymus intonsus</i> " "							X							X					
<i>Carpilodes rugatus</i> " "											X			X					

* See Vine (1972), Vine, Bailey-Brock and Straughan (1972).

	1	2	3	4	5	6a	6b	6c	6d	7	8	9	10	11	12	13	14	15	16
Xanthids (various small species)			X			X	X	X			X	X	X	X		X			
<i>Leptodius sanguineus</i> --crabs											X					X			
<i>Epixanthus</i>																X			
Insecta-collembola							X									X			
<i>Phylum Mollusca</i>																			
Class Gastropoda																			
<i>Prosobranchia</i> (snails with shells)																			
<i>Architectonica</i>						X													
<i>Assiminea nitida</i>							X												
<i>Conus ebraeus</i> --cone shells						X				X			X						
<i>C. imperialis</i> " "		X																	
<i>C. leopardus</i> " "											X								
<i>C. lividus</i> " "									X			X		X					
<i>C. rattus</i> " "										X									
<i>C. pulicarius</i> " "									X	X									
<i>Cypraea caputserpentis</i> --cowries						X		X		X	X	X	X						
<i>C. maculifera</i> " "			X								X	X	X						
<i>C. mauritiana</i> " "				X						X		X	X						
<i>Cymatium pileare</i>											X	X							X
<i>Drupa ricinus</i>		X										X	X						
<i>Morula granulata</i>		X										X							
<i>Melampus parvulus</i>						X							X						
<i>Mitra litterata</i>						X								X					
<i>M. auriculoidea</i>											X								
<i>Melania auriculoidea</i>																			
<i>Melanella</i> or <i>Stylifer</i> or <i>Holthuria atra</i>			X											X					
<i>Hipponix</i> sp.			X								X		X	X					
<i>Littorina pintado</i>		X		X						X	X	X	X	X	X	X	X	X	
<i>Nodilittorina picta</i>		X									X		X	X					
<i>Nerita polita</i>																			X
<i>N. picea</i>		X	X	X		X				X	X	X	X	X	X	X	X	X	
<i>N. plicata</i>				X															
<i>Peasiella tantilla</i>				X															
<i>Trochus histrio</i>								X						X					X
<i>Strombus maculatus</i>						X								X					
<i>Cellana sandvicensis</i> --opihi	X										X	X	X				X		
<i>Cellana</i> spp.											X	X	X						
<i>Siphonaria normalis</i>						X				X	X	X	X	X					
<i>Theodoxus cariosa</i>																X			
<i>Serpulorbis alii</i>		X				X		X	X		X	X							X
<i>Dendropoma</i>										X	X	X	X	X					
Other Vemetids						X				X	X	X	X	X					
<i>Opisthobranchia</i> (snails without shells)																			
<i>Aplysia</i>						X				X				X					
<i>Dolabrifera dolabrifera</i>				X		X								X		X			
<i>Hypselodoris vibrata</i>													X						
<i>Pteraeolidea semperi</i>		X																	
Class Amphineura (coat of mail shells)																			
Chitons																			
<i>Iachnochiton viridis</i>							X				X		X	X					
Class Bivalvia (clams, oysters, etc.)																			
<i>Brachidontes crebristriatus</i> --mussel					X			X			X					X			
<i>Isognomon californicum</i> --rock oyster					X		X				X					X			
<i>I. perna</i> " "	X				X	X	X	X	X	X	X		X	X		X			X
<i>Quadrans palatum</i> " "				X						X									
<i>Ostrea sandvicensis</i> " "								X			X								
<i>Spondylus</i> sp.											X	X							
<i>Teredo parksi</i> --wood borer																	X		
<i>Tellina rugosa</i>																	X		
Class Cephalopoda																			
<i>Octopus</i> sp.				X								X							
<i>Phylum Echinodermata</i>																			
Class Asteroidea (starfish)																			
<i>Acanthaster planci</i> --Crown of thorns				X													X		
<i>Asterope carinifera</i>																			
<i>Linckia</i> sp.													X	X					

	1	2	3	4	5	6a	6b	6c	6d	7	8	9	10	11	12	13	14	15	16
Class Ophiuroidea (brittle stars)																			
<i>Ophiactis savignyi</i>														X					
<i>Ophiocoma erinaceus</i>						X		X		X	X		X	X		X	X		
<i>O. pica</i>																X			
<i>Ophiocoma</i> sp.								X						X					
Class Echinoidea (sea urchins)																			
<i>Echinothrix calamaris</i> --vava		X						X	X				X	X					X
<i>E. diadema</i> "		X		X				X	X	X	X	X	X	X		X			
<i>Tripneustes gratilla</i>		X				X		X	X	X	X	X	X	X		X			
<i>Pseudoboletia indiana</i>										X									X
<i>Colobocentrotus atratus</i>											X	X							
<i>Echinometra mathaei</i>		X	X	X		X	X	X	X	X	X	X	X	X		X			
<i>E. oblonga</i>						X	X	X	X	X	X	X	X	X		X			
<i>Heterocentrotus mammilatus</i> --slate pencil urchin		X		X		X				X	X		X	X		X	X		
<i>Lytechinus verruculatus</i>											X								
Class Holothuroidea (sea cucumbers)																			
<i>Actinopyga mauritiana</i> and <i>A. obesa</i> *				X		X				X			X		X				X
<i>Holothuria atra</i>		X	X	X		X				X			X	X		X			X
<i>Holothuria</i> sp.			X																
<i>Stichopus</i> sp.														X		X			
Phylum Hemichordata																			
<i>Ptychodera flava</i> (acorn worm)																			
Phylum Chordata																			
Tunicata																			
<i>Didemnum candidum</i>								X		X	X	X	X						
<i>Botrylloides</i> sp.										X			X	X					
Other colonial tunicates						X		X		X									
Clear solitary tunicates								X		X									
Total number of species recorded	6	30	22	29	7	40	10	43	27	40	74	45	40	66	10	49	15	8	14

* Both species occur, but are indistinguishable in the field.

APPENDIX C: Invertebrates Arranged According to Habitat Types

COELENTERATA

Intertidal

Aiptasia
Sagartia pugnax
Palythoa
 Zoanthids
Cyphastrea ocellina
Porites lobata

Subtidal A

Sarcothelia edmondsoni

Subtidal B

Aiptasia
Ceripathes
Palythoa
 Zoanthids
Montipora verrucosa
M. patula
Psammocora sp. (*stellata*?)
Cyphastrea ocellina
Leptastrea bottae
Pocillopora damicornis
P. meandrina
P. modumanensis (or *eydouxi*)
Porites compressa
P. lobata

Marphysa sanguinea
Spiophanes bombyx
Mercierella enigmata
Janua knightjonesi
Protula atypha

Subtidal B

Lepidonotus hawaiiensis
Thorma socialis
Eurythoe complanata
Platynereis massiliensis
P. pulchella
Eunice antennata
E. cariboea
Lygdamis indicus
Lanice conchilega
Nicolea gracilibranchis
Terebella lapidaria
Vermiliopsis hawaiiensis
V. torquata
Protula atypha
Salmacina dysteri
Protolaeospira translucens
Spirorbis marioni
Pileolaria militaris
P. pseudomilitaris
P. koehleri
Janua pagenstecheri
J. pseudocorrugata
J. foraminosa
J. turrita
J. nipponica
J. knightjonesi

ANNELIDA

Intertidal

Lanice conchilega
Protula atypha
Spirorbis marioni
Pileolaria pseudomilitaris
P. koehleri
Janua pseudocorrugata
J. knightjonesi

Subtidal A

Eurythoe complanata
Namalycastis abiuma

ARTHROPODA

Intertidal

Lygia
Chthamalus intertextus
Alpheus crassimanus
Palaemon debilis
Palaemonella burnsi
Calcinus seurati
C. laevimanus
C. latens
Clibanarius zebra

Simocarcinus simplex
Polydectus cupulifer
Ocypride ceratophthalmus
Grapsus grapsus
Xanthids (various small species)
Amphipods

Subtidal A

Alpheus crassimanus
Macrobrachium grandimanus
M. lar
Metapograpsus messor
Metapograpsus sp.
Platypodia eydouxii
Thalamita crenata
Epixanthus

Subtidal B

Balanus amphitrite
B. eburneus
Alpheus crassimanus
A. collumianus medius
A. paragracilis
A. lottini
Stenopus hispidus
Panulirus penicillatus
Periclimanæus
Calcinus latens
Hapalocarcinus marsupialis
Simocarcinus simplex
Trapezia intermedia
Ranina ranina
Carpilius maculatus
Lophozozymus intonsus
Carpilodes rugatus
Xanthids (various)
Portunus pubescens

MOLLUSCA

Intertidal

Assiminea nitida
Brachidontes crebristriatus
Cellana sandvicensis
Cellana spp.
Conus ebraeus
C. pulicarius
Cymatium pileare
Cypraea caputserpentis

C. mauritiana
Dendropoma
Dolabrifera dolabrifera
Drupa ricinus
Hipponix sp.
Ischnochiton viridis
Isognomon californicum
I. perna
Littorina pintado
Melampus parvulus
Mitra litterata
Morula granulata
Nerita picea
N. polita
Nodilittorina picta
Peasiella tantilla
Serpulorbis allii and other vermetids
Ostrea sandvicensis
Quandrians palatum
Tellina rugosa
Teredo parksii (in driftwood on the shoreline)

Subtidal A

Assiminea nitida
Melania
Nerita picea (with a marine influence)
Theodoxus cariosa
Brachidontes crebristriatus
Isognomon californicum
I. perna
Tellina rugosa

Subtidal B

Architectonica
Conus ebraeus
C. imperialis
C. leopardus
C. lividus
C. rattus
C. pulicarius
Cypraea caputserpentis
C. maculifera
Hipponix sp.
Hypselodoris vibrata
Melanella or *Stylifer* on (*Holothuria atra*)
Octopus sp.
Pteraeolidea semperi
Spondylus sp.
Strombus maculatus

ECHINODERMATA

Intertidal

Asterope carinifera
Ophiocoma erinaceus
Echinothrix calamaris
E. diadema
Tripneustes gratilla
Cologocentrotus atratus
Echinometra mathaei
E. oblonga
Actinopygia mauritiana
A. obesa
Holothuria atra
H. cinerascens

Subtidal B

Acanthaster planci
Linckia sp.

Ophiactis savignyi
O. pica
Ophiocoma sp.
Echinothrix calamaris
E. diadema
Tripneustes gratilla
Pseudoboletia indiana
Echinometra mathaei
E. oblonga
Heterocentrotus mammillatus
Lytechinus verruculatus
Actinopygia mauritiana
A. obesa
Holothuria atra
H. cinerascens
Holothuria sp.
Stichopus sp.

HEMICHORDATA

Ptychodera flava - in fine sand, subtidal

CHORDATA

Tunicata - intertidal and subtidal. Solitary and colonial forms attached to the undersides of rocks, buoys and floats; and covering pier pilings, etc.

APPENDIX D: Table of Fish Species Recorded from Six
Survey Areas on the Kona, Hawaii Coast.

A = Abundant, C = Common, F = Few, and R = Rare.

Family and Species	Survey Area					
	4	6-D	7	8	9	11
Family Synodontidae - Lizard fishes						
<i>Synodus dermatogenys</i>			R			
Family Muraenidae - Moray eels						
<i>Echidna nebulosa</i>				R		
<i>Gymnothorax pictus</i>	R		R			
<i>G. flavimarginatus</i> (puhi-paka)	R	R	A		R	
<i>G. eurostus</i>	R		C		R	
<i>G. undulatus</i> (puhi-laumilo)	C				R	C
Family Fistulariidae - Cornet fishes						
<i>Fistularia petimba</i>	R		C		C	
Family Aulostomidae - Trumpet fishes						
<i>Aulostomus chinensis</i> (nunu)			R		R	R
Family Holocentridae - Squirrel fishes						
<i>Flammeo sammara</i>	C		C		C	
<i>Adioryx spinifer</i>	R				R	R
<i>A. lacteoguttatus</i> (alaihi)	A	C	A		A	C
<i>A. diadema</i>			C		C	R
<i>Myripristis amaenus amaenus</i> (u'u)	A	C	A	C	C	A
<i>M. murdjan</i> (u'u)	C					
Family Atherinidae - Silversides						
<i>Pranesus insularium</i> (iao)		A			A	
Family Mugilidae - Gray mullets						
<i>Mugil cephalus</i> (ama'ama)		C	C			
<i>Neomyxus chaptalii</i> (uouoa)			R			
Family Serranidae - Groupers						
<i>Cephalopholis argus</i> (roi)	R				R	
Family Kuhliidae - Aholeholes						
<i>Kuhlia sandvicensis</i> (aholehole)	A		C		A	A
Family Priacanthidae - Aweoweos						
<i>Priacanthus cruentatus</i> (aweoweo)	R		C		C	
Family Apogonidae - Cardinal fishes						
<i>Foa brachygramma</i>	R	C	R		R	C
<i>Apogon erythrinus</i>		R	R		R	

Family and Species	4	6-D	7	8	9	11
<i>A. maculiferus</i>	R				C	
<i>A. snyderi</i> (upapalu)	C	C	A	C	A	A
Family Carangidae - Uluas						
<i>Scomberoides sanctipetri</i> (lai)			C		R	
<i>Decapterus pinnulatus</i> (opelu)			A			
<i>Carangoides ferdau</i> (ulua)					R	
<i>Caranx melampygus</i> (omilu)		C	C		R	
Family Lutjanidae - Opakapakas						
<i>Aphareus furcatus</i> (gurutsu)	R				R	C
<i>Aprion virescens</i> (uku)					C	R
<i>Lutjanus kasmira</i>					C	
Family Mullidae - Goatfishes						
<i>Mulloidichthys samoensis</i> (weke)	C	C	C	C	C	C
<i>M. auriflamma</i> (weke-ula)			C		C	
<i>Parupeneus pleurostigma</i> (malu)				R	C	
<i>P. chryserydros</i> (moano kea)	C		C	C	C	R
<i>P. porphyreus</i> (kumu)	C		C	C	R	C
<i>P. multifasciatus</i> (moano)	A	F	A	C	A	C
<i>P. bifasciatus</i> (munu)	R					
Family Sparidae						
<i>Monotaxis grandoculis</i> (mu)	R				C	C
Family Scorpionidae						
<i>Microcanthus strigatus</i>				R	R	
Family Kyphosidae - Rudder fishes						
<i>Kyphosus cinerascens</i> (nenue)	C		C		C	
Family Pomacanthidae						
<i>Holocanthus arcuatus</i>						R
<i>Centropyge potteri</i>	C				R	
Family Chaetodontidae - Butterflyfishes						
<i>Forcipiger flavissimus</i> (lau-wiliwili-nukunuku-oi-oi)			A		A	C
<i>Heniochus acuminatus</i>					R	R
<i>Chaetodon fremblii</i>					R	
<i>C. kleini</i>	R					
<i>C. auriga</i>	C	F	C	C	C	
<i>C. unimaculatus</i>		F	C	R	C	
<i>C. lunula</i>	C		C		C	C
<i>C. trifasciatus</i>	C	C		R	R	
<i>C. ornatissimus</i>	C		A		C	C
<i>C. quadrimaculatus</i>	R		A	C	R	C
<i>C. multicoloratus</i>	C		R		C	C
<i>C. miliaris</i>	C		C	C	C	

Family and Species	4	6-D	7	8	9	11
Family Cirrhitidae - Hawkfishes						
<i>Amblycirrhitus bimacula</i>			R			
<i>Paracirrhitus arcatus</i> (pilikoa)	C		C		C	
<i>P. forsteri</i> (hilu pilikoa)	C	F	A	R	C	C
<i>P. cinctus</i> (pilikoa)	C		C	C	C	C
<i>Cirrhitus pinnulatus</i> (poopaa)	C		C			C
Family Pomacentrida - Damselishes						
<i>Dascyllus albisella</i>	R	F	C	C	C	
<i>Abudefduf abdominalis</i> (mamo)	A	F	A	A	A	A
<i>A. sordidus</i> (kupipi)	C		C	C	A	C
<i>A. imparipennis</i>	C	F	A	A	C	A
<i>Plectroglyphidodon johnstonianus</i>	C		R		R	R
<i>Pomacentrus jenkinsi</i>	A	C	A	A	A	A
<i>Chromis vanderbilti</i>	C	C			C	R
<i>C. ovalis</i>	C	C	C		C	C
<i>C. leucurus</i>	C		C		R	
<i>C. verater</i>					C	
Family Labridae - Wrasses						
<i>Cheilio inermis</i> (kupoupou)			R		R	
<i>Bodianus bilunulatus</i> (a'awa)	C		C		C	C
<i>Labroides phthirophagus</i>	C	R	C	R	C	C
<i>Cheilinus rhodochrous</i> (po'ou)	R		C		C	
<i>Pseudocheilinus octotaenia</i>			R		C	R
<i>Thalassoma duperreyi</i> (hinalea lauwili)	A	C	A	A	A	A
<i>T. purpuraceum</i> (olani)	C		C		C	C
<i>T. ballieui</i> (hinalea lauhine)	C		C	C	C	R
<i>Thalassoma</i> sp.					R	
<i>Gomphosus varius</i> (akilolo)	A	F	C	R	C	R
<i>Coris venusta</i>	R				C	
<i>C. gaimardi</i> (lolo)			R		C	R
<i>Cymolutes leclusei</i>		R	R		R	
<i>Stethojulis balteatus</i> (omaka)	A	C	A	A	A	A
<i>Macropharyngodon geoffroyi</i> (hinalea akilolo)		R		R		
<i>Anampses cuvieri</i> (opule)	C		C		C	C
<i>A. chrysocephalus</i>			R		R	R
Family Scaridae - Parrotfishes						
<i>Calotomus</i> sp.	C		C	R	C	R
<i>Scarus dubius</i>	A		A	C	C	R
<i>S. perspicillatus</i> (uhu)	A		A	C	A	C
<i>S. sordidus</i>	C		A	C	A	C
juvenile scarids	A	A	A	A	A	A
<i>Scarus</i> sp.	C		C		C	C
Family Zanclidae - Moorish idols						
<i>Zanclus cornescens</i> (kihikihi)	C		C	R	C	C

Family and Species	4	6-D	7	8	9	11
Family Acanthuridae - Surgeonfishes						
<i>Acanthurus triostegus sandvicensis</i> (manini)	A	C	A	A	A	A
<i>A. guttatus</i>			A			
<i>A. achilles</i> (pakuikui)	A		C		A	C
<i>A. glaucopareius</i>					C	
<i>A. leucopareius</i> (maikoiko)	C		A			
<i>A. nigrofuscus</i>	C	F	A	A	A	A
<i>A. nigroris</i> (maiko)	C		A	C	A	C
<i>A. olivaceus</i> (naenae)	C		A	A	A	C
<i>A. dussumieri</i> (palani)	C		C	C	A	A
<i>A. xanthopterus</i> (pualu)	R		C			
<i>Ctenochaetus strigosus</i> (kole)	A	F	C	C	A	C
<i>Zebrasoma flavescens</i> (lauipala)	C		C	C	C	C
<i>Z. veliferum</i>	R		C		C	R
<i>Naso hexacanthus</i>	C		C		C	R
<i>N. literatus</i>	C		A	C	A	C
<i>N. brevirostris</i>	C		C		C	C
<i>N. unicornis</i> (kala)	A	R	A	C	A	C
Family Gobiidae - Gobies						
<i>Bathygobius fuscus</i>		C	C	C		C
<i>Kelloggella oligolepsis</i>				C		
Family Blenniidae - Blennies						
<i>Istiblennius</i> sp.			C	C		C
<i>Cirripectus</i> sp.	R		C	C		
<i>Runula goslinei</i>	R	R	R	R	R	
Family Scorpaenidae						
<i>Taenianotus triacanthus</i>					R	
<i>Dendrochirus brachypterus</i>	R		R			
<i>Scorpaenopsis gibbosa</i> (nohu)					R	
<i>Scorpaena coniorta</i>	A		C		C	C
<i>S. ballieui</i>			C		C	C
Family Balistidae - Triggerfishes						
<i>Rhinecanthus rectangulus</i> (humuhumunukunukuapuaa)	C	F	A	C	C	A
<i>R. aculeatus</i> (humuhumunukunukuapuaa)					R	
<i>Melichthys niger</i> (humuhumueleele)	C		C	R	A	C
<i>M. vidua</i> (humuhumuhiukole)					R	C
<i>Sufflamen bursa</i>			R		R	C
<i>S. frenatus</i>			R		R	C
Family Monacanthidae						
<i>Alutera scripta</i> (oili lepa)					R	
<i>Pervagon spilosoma</i> (oiliuwiwi)	R				R	R
<i>Cantherhines dumerili</i>	R				R	R
<i>C. sandwichiensis</i>	R		R		C	R

Family and Species	4	6-D	7	8	9	11
Family Ostraciontidae - Boxfishes						
<i>Ostracion meleagris</i> (moa)	R	R	C	R		R
Family Tetradontidae - Puffers						
<i>Arothron meleagris</i>				R	C	
<i>A. hispidus</i> (o'opuhue)	R					
Family Canthigasteridae - Sharpbacked puffers						
<i>Canthigaster jactator</i>	C		C	R	C	R
<i>C. amboinensis</i> (puuolai)	R		C		R	R
Family Diodontidae - Spiny puffers						
<i>Diodon hystrix</i> (o'opu kawa)	R		R			
Total No. of Species Seen	92	36	100	52	113	79

