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Technical Report 32

SUMMER CENSUS OF THE REEF-FISH COMMUNITY OF WATERS ADJACENT TO PU'UHONUA O HŌNAUNAU NATIONAL HISTORICAL PARK SUMMERS, 1974-1978

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ABSTRACT

Fish censuses were made in three habitat types in Hōnaunau Bay and adjoining Alahaka Bay, Hawai'i, during the summers of 1974 to 1978. The habitats were an inshore Boulder Zone, a current-swept Drop-off Zone, and a luxuriant Coral-rich Zone. SCUBA-assisted observations and a standardized transecting method with 50-m segmented lines were employed. The number of individuals of each species observed was recorded during a minimum of three transects per site per year. Reconnaissance dives were also conducted to further qualitatively assess the fish population in Hōnaunau Bay.

A total of 126 species was observed along the transects and 37 additional species were seen on reconnaissance dives. The average number of species distributed along transects were 54 for the Boulder Zone, 60 for the Coral-rich Zone, and 60 for the Drop-off Zone. The Shannon-Weiner diversity index and the number of species observed each year remained fairly constant for each transect. The species make-up was qualitatively similar for all transects but quantitative differences were evident. The Drop-off Zone was characterized by plankton pickers and wandering predators, the Boulder Zone by an increased number of herbivores while the Coral-rich Zone appeared intermediate. Kole (Cteno-chaetus strigosus [Bennett]); Yellow Tang (Zebrasoma flavescens [Bennett]); Lavender Tang (Acanthurus nigrofuscus [Forskal]); Pebbled Butterfly Fish (Chaetodon multicinctus Garrett); and three Damsel Fish (Chromis spp.) were the dominant fish at all sites.

Hōnaunau Bay appears to be recovering from previously documented human exploitation. One unnamed species, two species described during the course of the study, one new Hawaiian record, and several very rare Hawaiian species were found to be residents in Hōnaunau Bay.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

INTRODUCTION

The crystalline blue waters of the Pacific Ocean lie off the coast of the Pu'uhonua o Hōnaunau National Historical Park (Fig. 1). Two bays, Hōnaunau and Alahaka, and a dividing promontory, Pu'uhonua Point, provide a diverse array of marine habitats. Rocks swept by currents and waves, the vacillating conditions of tidepools, quiet protected inshore gardens of lush coral, and precipitous drop-offs all occur within this small area. Because this fascinating underwater world is easily accessible from shore, it has been the subject of various studies. Doty (1969) summarized most of the biological information for Hōnaunau Bay. In that study he pointed out that the quality of this community was being degraded as a result of human influence. Detrimental influences range from trash and waste disposal along the shore to exploitation of the coral, mollusks, fish, and crustaceans within the Bay. He stated that the fish community was still rich but that a dramatic increase in fish populations was evident just a short distance away from human habitation; lobster and crab populations showed an even more striking increase in abundance. Doty proposed that the waters surrounding Pu'uhonua o Hōnaunau be set aside as a marine refuge. Evaluation of the idea of a marine conservation district for the Hōnaunau Bay area was part of the object of an additional study by Kimmerer and Durbin (1975). Hobson (1974) provided an extensive description of the feeding habits of most of the inshore fishes from Alahaka Bay north to Keawekāheka Point. In an earlier study Hobson (1972) reported changes in fish activity occurring at sunrise and sunset within these waters.

Previous studies have used a variety of methodologies which preclude accurate comparison of data to determine changes that may be occurring in the fish community. Because of increasing urbanization, the intensified use of Hōnaunau Bay as a boat launching and anchoring site and increased utilization of the Bay's marine resources may be causing continual stress to the fish community; therefore, an inventory of fish species and a determination of any annual changes of fish abundance and community structure was initiated in selected habitats. This study is the result of a survey conducted within three habitats during the summers of 1974 through 1978 (Table 1). Additional qualitative data on the resident fish community was obtained during reconnaissance dives in habitats not included within the transect sites. It should be pointed out that the sites and techniques utilized in this study may not have been the best in terms of detecting any changes in the abundance of some fish species more commonly sought after by sport, subsistence, or commercial fishermen. Those fishes include large Parrot Fish (Scaridae); Menpachi (Myripristis berndti Jordan and Evermann); 'Aweoweo (Priacanthus cruentatus [Lacepede]); 'Aholehole (Kuhlia sandvicensis [Steindachner]); Weke (Mulloidichthys spp.); Akule (Trachiurops crumenophthalmus [Bloch]); 'Opelu (Decapterus pinnulatus [Eydoux & Souleyet]); and possibly others.

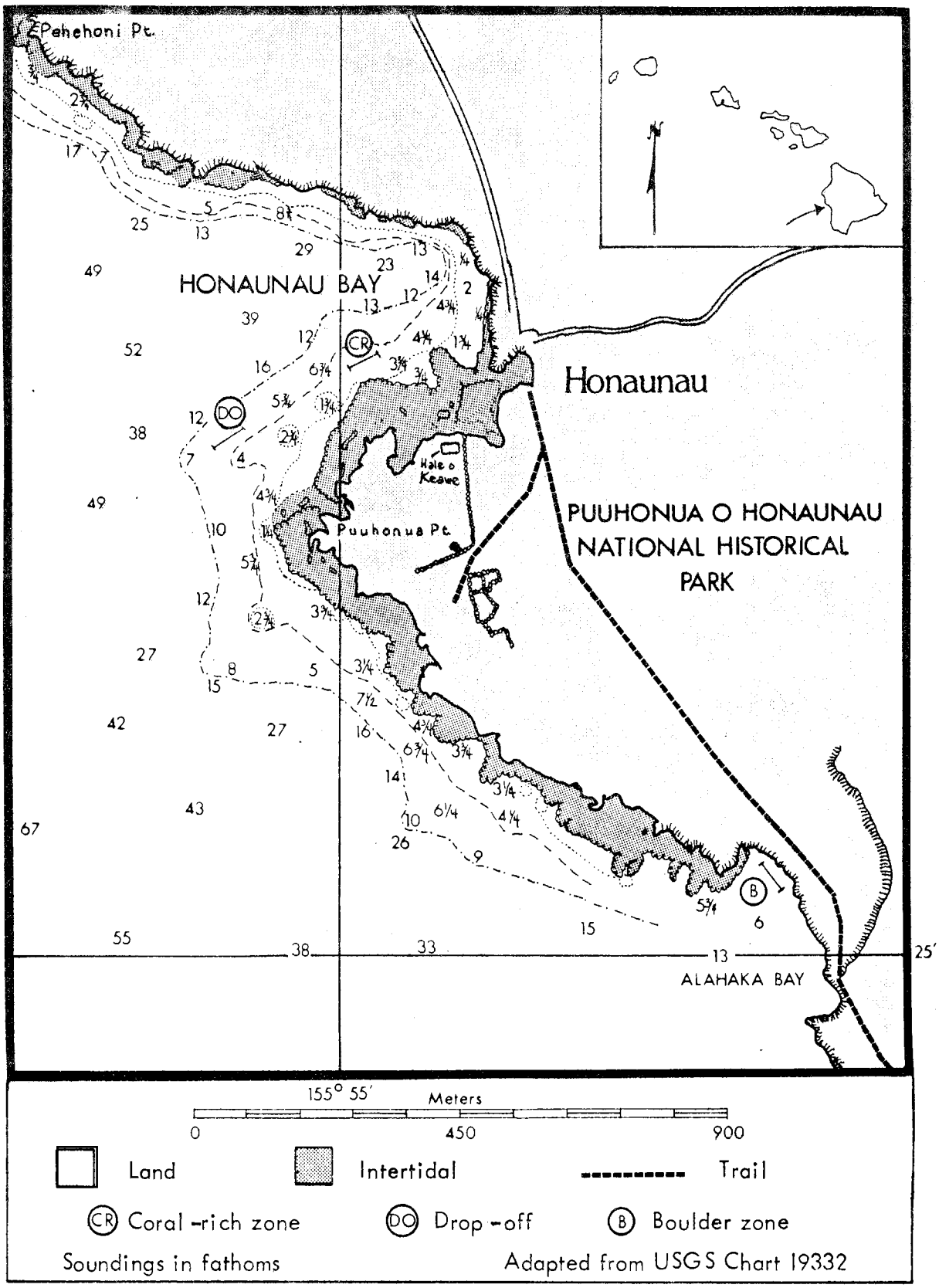

FIGURE 1. Transect sites in waters off Pu'uhonua o Hōnaunau National Historical Park.

MATERIALS AND METHODS

Underwater observations were made by divers using SCUBA, and for consistency, all transect counts were made between 9:00 AM and 5:00 PM. The times of drastic changes in community structure that do occur during the crepuscular (twilight) periods (Hobson 1972) were avoided. However, tidepool, fishing, and underwater reconnaissance observations did include the evening crepuscular periods.

Transect Technique

Fishes were censused with a refinement of the transect method suggested by Brock (1954). The problems of obtaining reliable quantitative data using this technique were discussed by Taylor and Nolan (1979); the modifications which they suggested for improved data collection were utilized in this study.

A 50-m long, 3/16-inch diameter polypropylene line marked with waterproof tape at 5-m intervals was installed in each habitat zone by tying both ends to coral protuberances and tucking intermittent points of the line beneath rocks and coral branches so that it lay flat. The line remained in place for the duration of the study each year.

At the beginning of the first sampling run, the observer attached a cork float to each 5-m point along the line with a stainless steel halibut snap and a 1-m length of line. This resulted in the 50-m line being divided into ten 5-m segments (Fig. 2). The diver then waited at the beginning of the line for five minutes before starting to census fish. The activity of the diver installing the floats had no lasting observable effect on fishes in the vicinity of the line. The floats remained on the line during each year's observations.

Fishes within 5 m of the line were recorded with No. 2 pencils on pre-printed data sheets of underwater Ascot Paper (Voit, Inc.). By providing reference points for the estimation of the 5-m distance to the sides, the cork floats divided the area along the line into twenty 25-m^2 quadrats (Fig. 2). Numbers of individuals of all species are recorded by quadrat. Full details of this method are given in Taylor and Nolan (1979).

Sampling Sites

The transect lines were established in three habitat zones:

1. A Boulder Zone located along the inner shoreline of Alahaka Bay at 2-4 m depth, characterized by large basalt boulders dotted with various algae and corals (mainly *Pocillopora meandrina*);

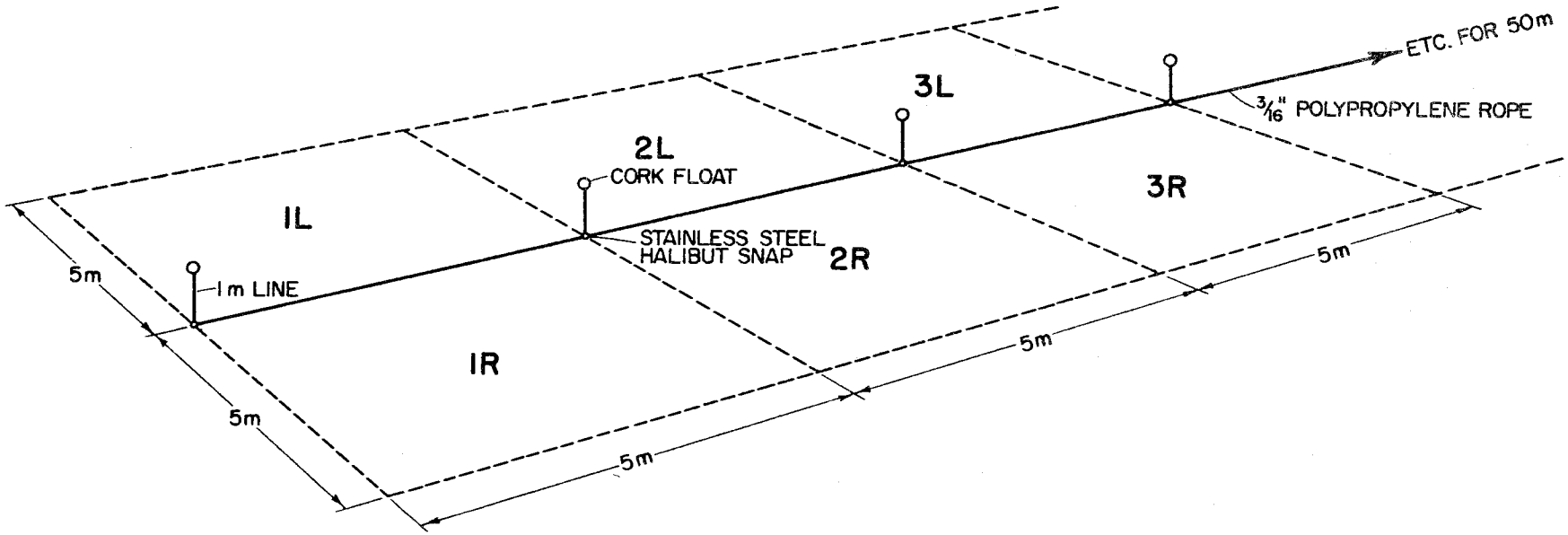

FIGURE 2. Schematic plan of segmented transect line used in fish survey.

2. A Drop-off Zone located about 100 m off Pu'uhonua Point at 15 m depth, adjacent to an abrupt drop to greater depths and generally overgrown with Porites compressa and P. lobata interspersed with sand patches and basaltic pavement and boulders;

3. A Coral-rich Zone located about 50-100 m off the south shore of Hōnaunau Bay at 5-10 m depth, characterized by a dominant bottom cover (80-100%) of various sized heads of Porites lobata with some fingerlike P. compressa.

These habitat zones are further described in Hobson (1974) and their locations are shown in Figure 1.

The areas were selected for their distinctiveness and because their fish faunas have been well-delineated, thus facilitating the intended monitoring of changes in fish abundances and community structure. Transect sites were relocated each year with a high degree of confidence since topographical "landmarks" were recognizable. Three to five repetitions of each transect were made annually during July 1975, 1976, 1977, and 1978 by six observers (Table 1).

Reconnaissance dives were conducted in a variety of habitats that were not included in the transect sites. These habitats included: (1) the steep coral-covered (Porites compressa, P. lobata, Psammocora verilli) drop-off near the apex of Hōnaunau Bay that begins at 3-5 m depth and ends at 20-40 m; (2) the shallow inshore pebble area near the head of Hōnaunau Bay; (3) the face and rubble base at a sheer drop-off of 2-5 m that is present along most of the shoreline; and (4) the sand and coral-sand interface at the base of the steep offshore drop-off. Additional fish species and newly settled larvae of some reef fishes were often recorded from the tidepools that filled the depressions in the shoreline pāhoehoe lava. A few species were also recorded during a twilight hukilau conducted by men of the fishing village.

Calculations

The mean annual frequency of each species at each site was determined by dividing the total sightings of the species by the number of transects made each year at each site. A rank was assigned on the basis of the frequency. An abundance index (A.I.) was also determined in order to compensate for differences in the total fish seen on a transect when comparing transects between sites. A species abundance index is the total annual frequency divided by the sum of the annual frequencies for all species recorded for a particular transect and multiplied by 100.

$$A.\ I. = \frac{\text{Total Annual Frequency of Species}}{\Sigma\ \text{Annual Frequencies of All Species}} \times 100$$

The Shannon-Weiner Index of Species Diversity (H'), a measure of community "evenness," was computed for each transect site for each year (Pielou 1975). The formula is $H' = -\Sigma p_i \log_{10} p_i$, where p_i is the proportion of any particular (i th) species. This index was calculated for the mean species values for each year's transects and for the four-year mean values for each habitat.

A measure of equitability, J', is also given. This value is a ratio of the calculated diversity (H') to the maximum diversity (H'_{max}) value the community could have with the same number of species. Pielou (1975) indicates that the valid use of this value is dependent on knowing the entire species composition of the community, an assumption which may not be met in this study because cryptic or occasional species may have been missed.

RESULTS

The fish fauna of Hōnaunau Bay proved to be extremely rich; about one-fourth of the species known from Hawaiian waters were seen during this survey. One hundred twenty-six species representing 26 families of fish were observed on the three transect sites (Tables 2 & 3); eight additional families and 37 additional species were seen during reconnaissance dives (Table 7). Although the transect habitats appeared to be quite distinct, there were many similarities in species composition. Nearly one-half (61) of the species found on the transects were common to all sites; 17 of these were seen at every site in every year (Tables 3 & 4). In addition, the Drop-off and Coral-rich zones shared slightly more species in common than other combinations of sites. About the same number of species were unique to each habitat (Tables 3 & 5). Lists of dominant species at the sites were also very similar (Table 6). The most obvious difference between sites for dominant species was the lack of Damsel Fish (Chromis spp.) in the Boulder Zone. These and other planktivores were very abundant (highly ranked) at the other two sites. Kole (Ctenochaetus strigosus [Bennett]) and Yellow Tang (Zebrasoma flavescens [Bennett]) were the most abundant species found at the sites in nearly every year. The ranking within the 10 most dominant species at each site remained fairly constant throughout the survey, particularly for the most frequently encountered species in the Boulder Zone (Table 6). There is also a surprising constancy in the ranking of many of the less common species found, although their overall frequency often changed considerably (Table 2).

The ranking of dominant species (Table 6) remained relatively stable throughout the four years of sampling in each habitat. In general, the major fluctuations in rank appeared to involve small schooling planktivores, particularly Damsel Fish. Their presence in the Drop-off and Coral-rich zones greatly contributed to rank changes. Planktivores were conspicuously absent from the shallow Boulder Zone. This absence is discussed below.

The five most dominant members of the Boulder Zone also were found to be among the dominant fishes in all habitats in practically every year. Three of these--the Kole, Lavender Tang (Acanthurus nigrofuscus [Forskal]), and Yellow Tang--are herbivorous Acanthurids; the Saddle Back Wrasse (Thalassoma duperrey) is a generalist carnivore; and the Pebbled Butterfly Fish (Chaetodon multicinctus Garrett) is a coral-eating specialist (Jones 1968; Hobson 1974).

The richness of Hōnaunau's fish fauna was further illustrated by the fish observed on reconnaissance dives (Table 7). Three previously undescribed species were found. One of these, Liopropoma sp. nov., was only the fourth known specimen to be found in Hawai'i. It was caught near the apex of Hōnaunau Bay in 10 m of water beneath a Porites lobata head. A second, recently described species, Anthias ventralis (Yellow Fancy Bass) (Randall 1979) (Fig. 3), was represented by four individuals, two of which were seen during the three last years of the survey hovering over the same spot, 20 m deep along a steep drop-off. Another recently described species, Anthias bicolor (Bicolor Fancy Bass) (Randall 1979), was occasionally observed along the coral-sand ecotone at the Bay apex in 18-30 m of water. Other rare species included a Black Spotted Balloon Fish (Arothron nigropunctatus) (first sighting in Hawai'i) and juvenile Whitley's Box Fish (Ostracion whitleyi Fowler) and Reticulated Butterfly Fish (Chaetodon reticulatus Cuvier and Valenciennes) which were occasionally seen along the north side of Hōnaunau Bay at about 5 m depth. Also, a single Tinker's Butterfly Fish (Chaetodon tinkeri Schultz), a small colony of Flame Wrasse (Cirrhilabrus jordani Snyder), and a colony of Dark Chromis (Chromis leucurus Gilbert) were observed between 20 and 40 m depth along a sand-coral ecotone. A single shark, White-tipped Reef Shark (Triaenodon obesus [Ruppell]), was spotted once near the submerged caves inshore from the Drop-off transect. Four manta rays, Manta alfredi (Krefft), passed near us in a spectacular flight at twilight during one dive.

Further similarities between the transects were evident in the diversity values (Table 8). Overall, the Coral-rich Zone was the most diverse ($H' = 2.8503$, $J' = 4.5539$), and the Boulder Zone was the least diverse ($H' = 2.6958$, $J' = 4.4773$), although yearly differences in order occur.

Changes in diversity and number of species showed generally parallel trends with a gradual annual increase in each habitat and a slight decrease in 1978. The total number of fish observed on each transect followed similar trends. The number of species seen in each habitat each year, the overall average, and the total species observed on each transect were similar between sites although the Boulder Zone was constantly lower than the other zones.

Values for equitability (J') were somewhat variable within habitats as was ranking of equitability between habitats. However, overall, the Coral-rich Zone had the greatest value and the Boulder Zone the least.

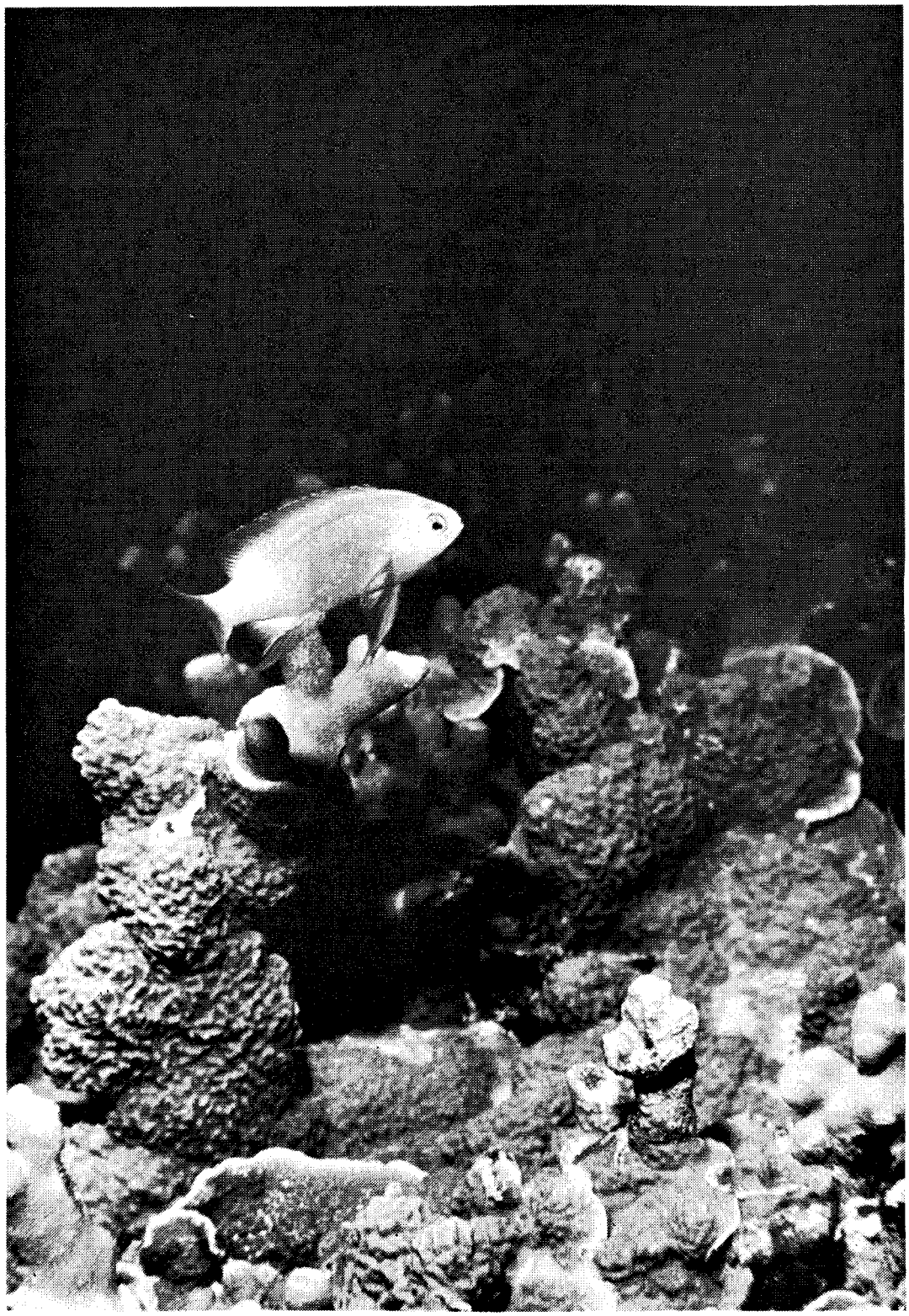

FIGURE 3. Anthias ventralis, a recently described species resident in Hōnaunau Bay.

CONCLUSION

Although the fish fauna observed during this study was extremely diverse, it previously had been degraded by human influence (Doty 1969). We were unable to detect further degradation within the sites studied during the four years of this study; however, we did not make a quantitative comparison of the Pu'uhonua o Hōnaunau area with marine environments isolated from human influence as Doty did. Although season, site, and transect method differences prevent an accurate quantitative comparison with Doty's results, we did find some qualitative differences. Doty reported 98 species from Hōnaunau Bay compared to our total of 163. His transects covered 12,330 m^2 (685 X 18 m) while ours were 500 m^2 (50 X 10 m). He reported an average of 1833 fish or 0.149 fish/m^2 on a transect that was near our Coral-rich Zone, while we found an average of 665.2 fish or 1.33 fish/m^2 (Table 8). Possibly there has been a dramatic increase in fish density since 1969. Doty reported a mean of about 49 species for four replicates of this transect while we found an average of 60.5 species during 15 replicates. Reasons for these differences are not apparent but may reflect a decreased dependency on the species found on these transects for subsistence, changes in species preferences by fishermen, reduced popularity of spearfishing, or differences between observers and in methodology. Our subjective impression was that there were many more game or food fish in the Hōnaunau area than off more populated islands, such as O'ahu; however, there seemed to be much less than in nearby but more isolated areas. Doty mentioned that corals were being removed from Hōnaunau Bay for commercial sale. We did not see evidence of this practice. The steel transect cables thought to be from Doty's study were nearly enveloped by coral growth, indicating that extensive changes can occur within the five years between these studies.

Kimmerer and Durbin (1975) indicated relative abundance for three generalized habitats--Inshore, Mid-reef, and Outer-reef--but because their sites were different from ours it is difficult to make direct comparisons. However, in general, the species reported by them to be most common were similar to those we observed, although there were differences in rank. The top three species in both studies, Kole, Yellow Tang, and a Damsel Fish species, were similar in their Outer-reef and Mid-reef and our Drop-off and Coral-rich zones. Lavender Tang replaced Damsel Fish in their Inshore and our Boulder zones. These four species are detritus, filamentous algae, plankton, and filamentous algae eaters, respectively (Jones 1968).

In general the three fish communities surveyed during our study were quite similar. The communities were mainly distinguishable in terms of relative percentages of particular species. The Boulder Zone had fewer plankton eaters than the other two zones. Lavender Tang play a greater role in the Boulder habitat than in the other two zones. The shallowness and/or lack of coral cover in the Boulder Zone may allow an increase in algae growth but a restriction in the amount of plankton, thus favoring reversal of the frequency of fishes utilizing these resources.

The species reported to be unique to individual habitats (Table 5) helped to characterize the habitats although most of these species were found in extremely low numbers. Roaming predators were predominantly in the Drop-off Zone and absent in the Boulder Zone. The presence of these predators may be related to the presence of higher numbers of small potential prey, e.g., Damsel Fish species that feed on plankton in the water column. Since all fish passing over the transect were recorded, the greater depth at the Drop-off Zone would also increase the chances of sighting roaming predators. Their absence in the Boulder Zone may be related to avoidance of divers on their part. Another possibility is that these predators may be more prevalent in shallow water during their crepuscular feeding peaks (Hobson 1972) and, therefore, would not show up on mid-day surveys. Increased fishing pressure near shore may also be affecting their presence. Three of the unique species are thought to be characteristic of the zones they were observed in. The Spotted Tang (Acanthurus guttatus Bloch and Schneider) is typical of surgy inshore areas similar to that found within a few meters of the Boulder Zone. Thompson's Butterfly Fish (Hemitaurichthys thompsoni Fowler) (Drop-off Zone) is a schooling, planktivorous Chaetodontid (Hobson 1974) that we have frequently seen in similar habitats along the Kona, Hawai'i, coast. Black Trigger Fish (Melichthys niger [Bloch]) (Coral-rich Zone) often hover above the reef but, when approached by divers, retreat to coral cavities, particularly those in Porites lobata. The water depth and abundance of that coral species may account for Melichthys' abundance in the Coral-rich Zone.

The wealth of habitats and luxuriant fish community occupying those areas within the marine environment adjacent to Pu'uhonua o Hōnaunau National Historical Park was a resource that was important to the aboriginal Hawaiians. The maintenance of this resource in as pristine a condition as possible will help visitors to this site understand the relationship between Hawaiians and the marine environment. An understanding of the fish community is one aspect of that relationship. The presence of three previously undescribed species and others that are rarely encountered in Hawaiian waters is an indication of the high scientific value of these easily accessible reefs. All means to protect Hōnaunau Bay and its surrounding environment from degradation should be implemented.

A complete list of fishes observed during this survey and their Hawaiian names is included in Appendix I.

ACKNOWLEDGMENTS

We would like to thank C. W. Smith for his extensive help and encouragement during this project. B. Carlson, W. Walsh, and F. Sutherland participated in the transecting. J. Cooper, K. C. Miller, and C. Schaeffer acted as safety divers. Ms. Miller also prepared the transect site map, and Mrs. R. Naftel typed the original manuscript. The assistance of these people is greatly appreciated. We would also like to thank those who critically reviewed this manuscript.

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TABLE 1. Collection dates, participants, and sea conditions at transect sites.

Date	Observers	Wave Conditions	°C Temp.	Underwater Zone Visibility (m)		
				Boulder	Drop-off	Coral-rich
1975 July 10-13	Frank Sutherland Leighton Taylor	--	--	24	--	29
1976 July 1-3	Gerald Ludwig Leighton Taylor William Walsh	Mild	26	25	40	30
1977 July 10-12	Daryl Imose Gerald Ludwig	Mild	26	20	25	25
1978 July 20-25	Bruce Carlson Daryl Imose Gerald Ludwig	Mild to Rough	26	17	18	27

TABLE 2. Fish species observed on marine transects at Pu'uhonua o Hōnaunau National Historical Park.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
BOULDER ZONE															
ACANTHURIDAE															
Acanthurus achilles	9	1.51	9.2	15	0.63	4.2	31	0.35	3.3	29	0.45	3.7	17	0.70	5.3
A. guttatus	22	0.25	1.5	--	---	---	34	0.29	2.7	32	0.41	3.3	29	0.36	2.7
A. glaucopareius	--	---	---	34	0.12	0.8	--	---	---	--	---	---	67	0.03	0.2
A. nigrofuscus	2	23.04	141.0	2	15.71	104.6	2	11.62	108.3	2	16.53	134.7	2	16.02	121.1
A. nigroris	37	0.08	0.5	6	0.61	4.0	10	2.87	26.7	40	0.16	1.3	15	0.94	7.1
A. leucopareius	8	2.04	12.5	13	0.69	4.6	--	---	---	36	0.25	2.0	17	0.70	5.3
A. olivaceus	--	---	---	51	0.03	0.2	26	0.54	5.0	34	0.35	2.7	36	0.21	1.6
A. thompsoni	--	---	---	--	---	---	30	0.46	4.3	--	---	---	43	0.12	0.9
A. triostegus	20	0.45	2.8	21	0.42	2.8	47	0.10	0.3	--	---	---	35	0.22	1.7
Ctenochaetus strigosus	1	30.94	189.3	1	28.83	192.6	1	21.71	202.3	1	19.85	161.7	1	24.80	187.5
C. hawaiiensis	28	0.21	1.3	--	---	---	--	---	---	21	0.70	5.7	38	0.20	1.5
Naso brevirostris	--	---	---	51	0.03	0.2	--	---	---	--	---	---	72	0.01	0.1
N. lituratus	16	0.57	0.35	24	0.27	1.8	16	1.32	12.3	21	0.70	5.7	19	0.67	5.1
N. unicornis	--	---	---	51	0.03	0.2	--	---	---	--	---	---	72	0.01	0.1
Zebrasoma flavescens	3	10.05	61.5	3	11.74	78.2	3	10.63	99.0	3	12.24	99.7	3	10.87	82.2
Zanclus cornutus	22	0.25	1.5	38	0.09	0.6	28	0.50	4.7	19	0.82	6.7	28	0.38	2.9
AULOSTOMIDAE															
Aulostoma chinensis	--	---	---	31	0.18	1.2	17	1.15	10.7	24	0.58	4.7	24	0.46	3.5
EALISTIDAE															
Melichthys vidua	--	---	---	--	---	---	48	0.08	0.7	--	---	---	72	0.01	0.1
Rhinecanthus rectangulus	--	---	---	--	---	---	48	0.08	0.7	--	---	---	72	0.01	0.1
Sufflamen bursa	22	0.25	1.5	38	0.09	0.6	20	0.93	8.7	13	1.23	10.0	20	0.57	4.3

ELENNIIDAE															
Cirripectus variolosus	42	0.05	0.3	--	---	---	42	0.18	1.7	38	0.21	1.7	47	0.09	0.7
Exallias brevis	28	0.21	1.3	38	0.09	0.6	48	0.08	0.7	40	0.16	1.3	43	0.12	0.9
Plagiotremus goslinei	--	---	---	34	0.12	0.8	--	---	---	--	---	---	60	0.04	0.3
CANTHIGASTERIDAE															
Canthigaster amboinensis	33	0.13	0.8	20	0.45	3.0	--	---	---	36	0.25	2.0	36	0.21	1.6
C. jactator	15	0.62	3.8	11	1.26	8.4	11	2.04	19.0	9	2.21	18.0	11	1.52	11.5
CHAETODONTIDAE															
Chaetodon auriga	--	---	---	--	---	---	38	0.21	2.0	--	---	---	57	0.05	0.4
C. fremblii	--	---	---	30	0.20	1.3	54	0.03	0.3	49	0.09	0.7	47	0.09	0.7
C. lineolatus	--	---	---	--	---	---	42	0.18	1.7	--	---	---	60	0.04	0.3
C. lunula	33	0.13	0.8	23	0.33	2.2	38	0.21	2.0	53	0.04	0.3	39	0.19	1.4
C. miliaris	--	---	---	--	---	---	42	0.18	1.7	--	---	---	60	0.04	0.3
C. multicinctus	7	2.53	15.5	6	5.96	39.8	5	9.05	84.3	4	6.87	56.0	5	6.02	45.5
C. ornatissimus	32	0.16	1.0	13	0.69	4.6	19	1.04	9.7	11	1.72	14.0	16	0.86	6.5
C. quadrimaculatus	12	1.22	7.5	21	0.42	2.8	12	1.82	17.0	21	0.70	5.7	13	0.99	7.5
C. unimaculatus	13	0.90	5.5	--	---	---	36	0.25	2.3	17	0.98	8.0	24	0.46	3.5
Forcipiger flavissimus	11	1.27	7.8	12	0.78	5.2	12	1.82	17.0	16	1.02	8.3	12	1.18	8.9
F. longirostris	--	---	---	--	---	---	--	---	---	49	0.09	0.7	70	0.02	0.1
CIRRHITIDAE															
Cirrhitops fasciatus	22	0.25	1.5	25	0.24	1.6	34	0.29	2.7	29	0.45	3.7	31	0.29	2.2
Paracirrhites arcatus	4	6.70	41.0	5	6.66	44.4	6	6.01	56.0	6	5.12	41.7	6	5.99	45.3
P. forsteri	--	---	---	51	0.03	0.2	32	0.32	3.0	--	---	---	51	0.08	0.7
FISTULARIIDAE															
Fistularia petimba	--	---	---	43	0.06	0.4	48	0.08	0.7	49	0.09	0.7	60	0.04	0.3

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
BOULDER ZONE (con't.)															
HOLOCENTRIDAE															
Adioryx microstomus	--	---	---	43	0.06	0.4	--	---	---	--	---	---	72	0.01	0.1
A. spinifer	--	---	---	51	0.03	0.2	--	---	---	--	---	---	72	0.01	0.1
LABRIDAE															
Anampses chrysocephalus	42	0.05	0.3	43	0.06	0.4	--	---	---	--	---	---	70	0.02	0.1
A. cuvier	--	---	---	--	---	---	54	0.03	0.3	--	---	---	72	0.01	0.1
Cheilinus rhodochrous	--	---	---	--	---	---	--	---	---	49	0.09	3.7	47	0.09	0.7
Cheilio inermis	--	---	---	--	---	---	--	---	---	35	0.28	2.3	53	0.07	0.5
Coris gaimardi	--	---	---	28	0.21	1.4	25	0.57	5.3	32	0.41	3.3	31	0.29	2.2
C. venusta	--	---	---	43	0.06	0.4	38	0.21	2.0	--	---	---	53	0.07	0.5
Gomphosus varius	18	0.49	3.0	25	0.24	1.6	17	1.15	10.7	26	0.53	4.3	20	0.57	4.3
Halichoeres ornatissimus	17	0.53	3.3	8	3.30	22.0	21	0.89	8.3	13	1.23	10.0	10	1.56	11.8
Labroides phthirophagus	20	0.45	2.8	25	0.24	1.6	24	0.72	6.7	29	0.45	3.7	27	0.43	3.3
Pseudocheilinus evanidus	42	0.05	0.3	--	---	---	--	---	---	--	---	---	72	0.01	0.1
P. octotaenia	--	---	---	38	0.09	0.6	23	0.78	7.3	26	0.53	4.3	30	0.33	2.5
P. tetrataenia	37	0.08	0.5	--	---	---	--	---	---	40	0.16	1.3	57	0.05	0.4
Stethojulis balteata	18	0.49	3.0	9	1.56	10.4	9	2.97	27.7	8	2.33	19.0	9	1.72	13.0
Thalassoma duperrey	5	6.05	37.0	4	9.07	60.4	4	9.37	87.3	5	6.17	50.3	4	7.60	57.5
T. fuscum	--	---	---	43	0.06	0.4	--	---	---	--	---	---	72	0.01	0.1
MONACANTHIDAE															
Cantherhines dumerili	37	0.08	0.5	--	---	---	--	---	---	--	---	---	72	0.01	0.1
C. sandwichiensis	22	0.25	1.5	--	---	---	--	---	---	45	0.12	1.0	51	0.08	0.6
Pervagor melanocephalus	28	0.21	1.3	18	0.54	3.6	38	2.10	2.0	17	0.98	8.0	24	0.46	3.5
P. spilosoma	--	---	---	28	0.21	1.4	15	1.53	14.3	40	0.16	1.3	22	0.48	3.6

MULLIDAE															
Mulloidichthys pflugeri	--	---	---	43	0.06	0.3	--	---	---	--	---	---	72	0.01	0.1
M. vanicolensis	--	---	---	51	0.03	0.2	48	0.08	0.7	19	0.82	6.7	39	0.19	1.4
Parupeneus bifasciatus	42	0.05	0.3	43	0.06	0.4	--	---	---	13	1.23	10.0	31	0.29	2.2
P. chryserydros	42	0.05	0.3	34	0.12	0.8	--	---	---	24	0.58	4.7	42	0.17	1.3
P. multifasciatus	31	0.20	1.2	19	0.48	3.2	14	1.75	16.3	12	1.60	13.0	14	0.97	7.3
P. porphyreus	--	---	---	--	---	---	32	0.32	3.0	45	0.12	1.0	46	0.11	0.8
OSTRACIIDAE															
Cstracion meleagris	22	0.25	1.5	51	0.03	0.2	--	---	---	45	0.12	1.0	47	0.09	0.7
POMACANTHIDAE															
Centropyge potteri	--	---	---	--	---	---	28	0.50	4.7	--	---	---	43	0.12	0.9
POMACENTRIDAE															
Abudefduf abdominalis	37	0.08	0.5	32	0.15	1.0	--	---	---	--	---	---	53	0.07	0.5
A. sindonis	37	0.08	0.5	--	---	---	--	---	---	--	---	---	72	0.01	0.1
Chromis agilis	--	---	---	34	0.12	0.8	42	0.18	1.7	28	0.49	4.0	39	0.19	1.4
C. hanui	--	---	---	51	0.03	0.2	22	0.86	8.0	38	0.21	1.7	34	0.24	1.8
C. ovalis	--	---	---	51	0.03	0.2	--	---	---	--	---	---	72	0.01	0.1
C. vanderbilti	14	0.82	5.0	17	0.57	3.8	26	0.54	5.0	--	---	---	22	0.48	3.6
C. verator	--	---	---	51	0.03	0.2	46	0.11	1.0	--	---	---	67	0.03	0.2
Dascyllus albisella	--	---	---	--	---	---	36	0.25	2.3	--	---	---	53	0.07	0.5
Eupomacentrus fasciolatus	6	4.22	25.8	7	3.66	24.4	7	5.76	53.7	7	4.51	36.7	7	4.38	33.1
Plectroglyphidodon johnstonianus	10	1.36	8.3	9	1.56	10.4	8	4.62	43.0	10	2.00	16.3	8	2.34	17.7
SCARIDAE															
Scarops rubroviolaceus	33	0.13	0.8	--	---	---	--	---	---	--	---	---	60	0.04	0.3
Scarus perspicillatus	42	0.05	0.3	--	---	---	--	---	---	--	---	---	72	0.01	0.1
S. sordidus	33	0.13	0.8	38	0.09	0.6	--	---	---	--	---	---	60	0.04	0.3
Scarus sp.	--	---	---	32	0.15	1.0	54	0.03	0.3	--	---	---	57	0.05	0.4

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
BOULDER ZONE (con't.)															
TETRAODONTIDAE															
Arothron hispidus	--	---	---	--	---	---	--	---	---	40	0.16	1.3	60	0.04	0.3
A. meleagris	--	---	---	43	0.06	0.4	48	0.08	0.7	--	---	---	72	0.01	0.1
DROP-OFF ZONE															
ACANTHURIDAE															
Acanthurus achilles	12	1.23	6.0	36	0.16	1.4	38	0.28	3.3	--	---	---	33	0.28	2.5
A. nigrofuscus	3	10.02	48.8	3	7.60	65.0	5	7.45	87.0	4	8.17	85.7	4	8.04	71.5
A. nigroris	30	0.16	0.8	15	0.94	8.0	12	1.69	19.7	24	0.58	6.0	16	0.90	8.0
A. leucopareius	--	---	---	38	0.09	0.8	--	---	---	--	---	---	62	0.03	0.3
A. olivaceus	30	0.16	0.8	42	0.07	0.6	--	---	---	38	0.26	2.7	46	0.10	0.9
A. thompsoni	--	---	---	55	0.02	0.2	31	0.45	5.3	28	0.48	5.0	34	0.24	2.1
A. triostegus	37	0.10	0.5	--	---	---	--	---	---	49	0.07	0.7	62	0.03	0.3
Ctenochaetus strigosus	1	25.01	121.8	2	21.60	184.8	1	17.50	204.3	2	15.66	164.3	1	18.16	167.8
C. hawaiiensis	40	0.06	0.3	29	0.33	2.8	27	0.63	7.3	28	0.48	5.0	28	0.39	3.9
Naso brevirostris	--	---	---	47	0.05	0.4	--	---	---	--	---	---	73	0.01	0.1
N. hexacanthus	37	0.10	0.5	23	0.44	3.8	22	0.69	8.0	28	0.48	5.0	25	0.45	4.0
N. lituratus	17	0.99	4.8	21	0.51	4.4	30	0.49	5.7	20	0.86	9.0	22	0.64	5.7
Zebrasoma flavescens	4	10.02	48.8	4	61.5 0	52.6	2	12.82	149.7	3	12.20	128.0	3	96.50	85.9
Zanclus cornutus	--	---	---	37	0.14	1.2	55	0.03	0.3	39	0.22	2.3	46	0.10	0.9
AULOSTOMIDAE															
Aulostoma chinensis	--	---	---	42	0.07	0.6	34	0.34	4.0	40	0.16	1.7	42	0.15	1.3

BALISTIDAE														
Melichthys niger	49	0.04	0.2	--	---	---	--	---	---	--	---	---	--	---	---
M. vidua	--	---	---	--	---	---	51	0.09	1.0	37	0.29	3.0	46	0.10	0.9
Sufflamen bursa	15	1.03	5.0	17	0.87	7.4	17	1.03	12.0	18	0.95	10.0	16	0.90	8.0
Xanthichthys mento	--	---	---	34	0.23	2.0	32	0.43	5.0	22	0.64	6.7	30	0.34	3.0
BLENNIIDAE															
Cirripectus variolosus	--	---	---	55	0.02	0.2	48	0.11	1.3	--	---	---	62	0.03	0.3
Exallias brevis	40	0.06	0.3	38	0.09	0.8	--	---	---	--	---	---	62	0.03	0.3
Plagiotremus goslinei	--	---	---	--	---	---	55	0.03	0.3	53	0.03	0.3	49	0.09	0.8
BOTHIDAE															
Bothus pantherinus	40	0.06	0.3	--	---	---	--	---	---	--	---	---	73	0.01	0.1
CANTHIGASTERIDAE															
Canthigaster amboinensis	--	---	---	--	---	---	--	---	---	53	0.03	0.3	73	0.01	0.1
C. coronata	--	---	---	--	---	---	47	0.15	1.7	--	---	---	62	0.03	0.3
C. epilampra	--	---	---	55	0.02	0.2	--	---	---	--	---	---	73	0.01	0.1
C. jactator	30	0.16	0.8	25	0.37	3.2	25	0.66	7.7	28	0.48	5.0	27	0.43	3.8
C. rivulata	--	---	---	55	0.02	0.2	--	---	---	--	---	---	73	0.01	0.1
CARANGIDAE															
Carangoides ferdau	--	---	---	--	---	---	48	0.11	0.1	--	---	---	73	0.01	0.1
Caranx sp.	--	---	---	--	---	---	--	---	---	49	0.07	0.7	73	0.01	0.1
Seriola dumerili	--	---	---	--	---	---	53	0.06	0.7	--	---	---	73	0.01	0.1
CHAETODONTIDAE															
Chaetodon auriga	--	---	---	--	---	---	40	0.23	2.7	--	---	---	55	0.06	0.5
C. fremblii	--	---	---	55	0.02	0.2	48	0.11	1.3	40	0.16	1.7	51	0.08	0.7
C. lunula	--	---	---	--	---	---	36	0.32	3.7	53	0.03	0.3	49	0.09	0.8
C. miliaris	--	---	---	--	---	---	22	0.69	8.0	--	---	---	39	0.18	1.6

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
DROP-OFF ZONE (con't.)															
CHAETODONTIDAE (con't.)															
C. multicinctus	7	2.46	12.0	6	4.54	38.8	6	6.57	76.7	7	4.96	52.0	7	4.71	41.9
C. ornatissimus	15	1.03	5.0	33	0.26	2.2	21	0.75	8.7	16	1.08	11.3	21	0.66	5.8
C. quadrimaculatus	--	---	---	25	0.37	3.2	36	0.32	3.7	40	0.16	1.7	34	0.24	2.1
C. unimaculatus	30	0.16	0.8	42	0.07	0.6	--	---	---	--	---	---	62	0.03	0.3
Forcipiger flavissimus	22	0.68	3.3	19	0.68	5.8	16	1.11	13.0	17	1.05	11.0	19	0.85	7.6
F. longirostris	19	0.82	4.0	38	0.09	0.8	53	0.06	0.7	--	---	---	41	0.17	1.5
Hemitaurichthys thompsoni	27	0.27	1.3	12	1.40	12.0	22	0.69	8.0	9	2.83	29.7	11	1.34	11.9
CIRRHITIDAE															
Cirrhitops fasciatus	14	1.09	5.3	18	0.79	6.8	19	0.88	10.3	40	0.16	1.7	20	0.68	6.1
Paracirrhites arcatus	20	0.78	3.8	14	1.00	8.6	13	1.65	19.3	14	1.12	11.7	14	1.09	9.7
P. forsteri	40	0.06	0.3	--	---	---	40	0.23	2.7	--	---	---	56	0.04	0.4
DIODONTIDAE															
Diodon hystrix	--	---	---	--	---	---	--	---	---	53	0.03	0.3	73	0.01	0.1
FISTULARIIDAE															
Fistularia petimba	29	0.21	1.0	--	---	---	42	0.20	2.3	--	---	---	51	0.08	0.7
HOLOCENTRIDAE															
Adioryx xantherythrus	--	---	---	47	0.05	0.4	53	0.06	0.7	--	---	---	62	0.03	.03
Myripristis murdjan	--	---	---	--	---	---	55	0.03	0.3	--	---	---	73	0.01	0.1
Myripristis sp.	--	---	---	47	0.05	0.4	--	---	---	45	0.12	1.3	56	0.04	0.4

LABRIDAE															
Anampses chrysocephalus	--	---	---	55	0.02	0.2	--	---	---	--	---	---	73	0.01	0.1
A. cuvier	--	---	---	38	0.09	0.8	--	---	---	--	---	---	62	0.03	0.3
Bodianus bilunulatus	12	0.27	1.3	55	0.02	0.2	46	0.15	1.7	--	---	---	51	0.08	0.7
Cheilinus rhodochrous	36	0.14	0.7	31	0.28	2.4	33	0.37	4.3	26	0.54	5.7	30	0.34	3.0
Coris gaimardi	37	0.10	0.5	29	0.33	2.8	34	0.34	4.0	32	0.45	4.7	32	0.33	2.9
Gomphosus varius	30	0.16	0.8	31	0.28	2.4	43	0.17	2.0	45	0.12	1.3	36	0.19	1.7
Halichoeres ornatissimus	10	2.26	11.0	10	1.99	17.0	9	2.58	30.1	8	2.98	31.3	9	2.36	21.0
Hemipteronotus sp.	--	---	---	47	0.05	0.4	--	---	---	--	---	---	73	0.01	0.1
Labroides phthirophagus	25	0.31	1.5	20	0.56	4.8	18	0.92	10.7	22	0.64	6.7	23	0.62	5.5
Macropharyngodon geoffroyi	40	0.06	0.3	42	0.07	0.6	55	0.03	0.3	59	0.02	0.2	56	0.04	0.4
Pseudocheilinus evanidus	--	---	---	--	---	---	55	0.03	0.3	34	0.38	4.0	73	0.01	0.1
P. octotaenia	13	1.13	5.5	11	1.68	14.4	15	1.17	13.7	13	1.27	13.3	12	1.32	11.7
P. tetrataenia	40	0.06	0.3	27	0.35	3.0	43	0.17	2.0	48	0.10	1.0	36	0.19	1.7
Stethojulis balteata	11	1.64	8.0	13	1.24	10.6	19	0.88	10.3	14	1.12	11.7	13	1.14	10.1
Thalassoma duperrey	6	6.05	21.5	7	4.16	35.6	4	8.08	94.3	5	5.94	62.3	5	5.34	47.5
LUTJANIDAE															
Aphareus furcatus	40	0.06	0.3	47	0.05	0.4	--	---	---	52	0.06	0.6	62	0.03	0.3
Lutjanus fulvus	--	---	---	--	---	---	55	0.03	0.3	--	---	---	73	0.01	0.1
MONACANTHIDAE															
Cantherhines dumerili	25	0.31	1.5	--	---	---	--	---	---	--	---	---	56	0.04	0.4
C. sandwichiensis	25	0.31	1.5	--	---	---	--	---	---	--	---	---	56	0.04	0.4
Pervagor melanocephalus	20	0.78	3.8	27	0.35	3.0	43	0.17	2.0	27	0.51	5.3	28	0.39	3.5
P. spilosoma	--	---	---	42	0.07	0.6	29	0.57	6.7	53	0.03	0.3	39	0.18	1.6
MULLIDAE															
Mulloidichthys vanicolensis	--	---	---	--	---	---	55	0.03	0.3	--	---	---	73	0.01	0.1
Parupeneus bifasciatus	--	---	---	55	0.02	0.2	55	0.03	0.3	21	0.73	7.7	36	0.19	1.7
P. chryserydros	--	---	---	55	0.02	0.2	38	0.28	3.3	45	0.12	1.3	45	0.11	1.0
P. multifasciatus	17	0.99	4.8	22	0.46	4.0	27	0.63	7.3	12	2.13	22.3	15	0.96	8.5

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
DROP-OFF ZONE (con't.)															
MURAENIDAE															
Gymnothorax meleagris	--	---	---	55	0.02	0.2	--	---	---	--	---	---	73	0.01	0.1
MYLIOBATIDAE															
Aetobatus narinari	--	---	---	--	---	---	55	0.03	0.3	--	---	---	73	0.01	0.1
OSTRACIIDAE															
Ostracion meleagris	--	---	---	55	0.02	0.2	55	0.03	0.3	53	0.03	0.3	71	0.02	0.2
POMACANTHIDAE															
Centropyge potteri	9	2.32	11.3	8	2.55	21.8	10	2.03	23.7	11	2.23	23.7	10	2.21	19.7
Holacanthus arcuatus	--	---	---	55	0.02	0.2	--	---	---	49	0.07	0.7	71	0.02	0.2
POMACENTRIDAE															
Chromis agilis	5	6.98	34.0	5	5.19	44.4	8	3.74	43.7	6	5.18	54.3	6	4.89	43.5
C. hanui	8	2.36	11.5	9	2.13	18.2	7	4.99	58.3	10	2.79	29.3	8	3.00	26.7
C. ovalis	--	---	---	55	0.02	0.2	--	---	---	40	0.16	1.7	56	0.04	0.4
C. vanderbilti	2	18.85	91.8	1	26.89	230.0	3	9.88	115.3	1	15.90	167.0	2	17.71	157.6
C. verator	23	0.37	1.8	24	0.40	3.4	25	0.66	7.7	19	0.92	9.7	24	0.57	5.1
Dascyllus albisella	--	---	---	55	0.02	0.2	55	0.03	0.3	--	---	---	73	0.01	0.1
Eupomacentrus fasciolatus	--	---	---	47	0.05	0.4	14	1.22	14.3	34	0.38	4.0	26	0.43	3.8
Plectroglyphidodon johnstonianus	30	0.16	0.8	16	0.91	7.8	11	1.86	21.7	36	0.35	3.7	18	0.89	7.9

SCARIDAE															
Scarops rubroviolaceus	40	0.06	0.3	--	---	---	--	---	---	--	---	---	73	0.01	0.1
Scarus sordidus	23	0.37	1.8	--	---	---	--	---	---	--	---	---	55	0.06	0.5
Scarus sp.	--	---	---	47	0.05	0.4	--	---	---	32	0.45	4.7	44	0.12	1.1
SCORPAENIDAE															
Scorpaenopsis cacopsis	40	0.06	0.3	--	---	---	--	---	---	--	---	---	73	0.01	0.1
SERRANIDAE															
Cephalopholis argus	--	---	---	--	---	---	55	0.03	0.3	40	0.16	0.3	56	0.04	0.1
SPARIDAE															
Monotaxis grandoculis	--	---	---	--	---	---	51	0.09	1.0	--	---	---	73	0.01	0.1
SPHYRAENIDAE															
Sphyraena barracuda	--	---	---	34	0.23	2.0	--	---	---	--	---	---	51	0.08	0.7
SYNODONTIDAE															
Saurida gracilis	--	---	---	47	0.05	0.4	--	---	---	--	---	---	73	0.01	0.1
CORAL-RICH ZONE															
ACANTHURIDAE															
Acanthurus achilles	22	0.38	1.5	--	---	---	31	0.31	3.0	--	---	---	43	0.13	0.9
A. nigrofuscus	13	1.21	4.8	14	0.96	5.6	8	5.23	50.7	6	5.54	42.0	8	3.21	21.8
A. nigroris	--	---	---	18	0.58	3.4	16	0.93	9.0	17	0.78	6.0	18	0.60	4.1
A. leucopareius	22	0.38	1.5	21	0.55	3.2	47	0.07	0.7	36	0.13	1.0	31	0.27	1.8
A. olivaceus	--	---	---	39	0.14	0.8	43	0.10	1.0	--	---	---	46	0.10	0.7
A. thompsoni	--	---	---	25	0.45	2.6	--	---	---	38	0.09	0.7	40	0.15	0.1
A. triostegus	36	0.13	0.5	--	---	---	23	0.44	4.3	51	0.08	0.6	38	0.16	1.1

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
CORAL-RICH ZONE (con't.)															
ACANTHURIDAE (con't.)															
Ctenochaetus strigosus	1	18.87	75.0	3	14.84	86.6	2	15.92	154.3	1	16.97	130.3	1	15.56	105.7
C. hawaiiensis	28	0.25	1.0	59	0.03	0.2	19	0.65	6.3	15	0.87	6.7	23	0.43	2.9
Naso brevirostris	--	---	---	--	---	---	56	0.03	0.3	--	---	---	71	0.01	0.1
N. hexacanthus	47	0.08	0.3	--	---	---	43	0.10	1.0	38	0.09	0.7	58	0.06	0.4
N. lituratus	28	0.25	1.0	28	0.34	2.0	21	0.59	5.7	19	0.69	5.3	21	0.47	3.1
Zebrasoma flavescens	3	14.67	58.3	4	11.10	64.8	1	17.46	169.3	2	15.19	117.0	2	13.90	94.4
Z. veliferum	--	---	---	49	0.07	0.4	37	0.21	2.0	38	0.09	0.7	46	0.10	0.7
Zanclus cornutus	36	0.13	0.5	44	0.10	0.6	--	---	---	--	---	---	62	0.04	0.3
APOGONIDAE															
Apogon snyderi	--	---	---	37	0.21	1.2	--	---	---	--	---	---	62	0.04	0.3
AULOSTOMIDAE															
Aulostoma chinensis	32	0.20	0.8	17	0.82	4.8	26	0.41	4.0	25	0.43	3.3	20	0.49	3.3
BALISTIDAE															
Melichthys niger	32	0.20	0.8	24	0.48	2.8	40	0.13	1.3	38	0.09	0.7	35	0.19	1.3
M. vidua	36	0.13	0.5	44	0.10	0.6	--	---	---	36	0.13	1.0	49	0.09	0.6
Sufflamen bursa	20	0.50	2.0	39	0.14	0.8	32	0.24	2.3	24	0.56	4.3	28	0.31	2.1
Xanthichthys mento	--	---	---	59	0.03	0.2	--	---	---	--	---	---	71	0.01	0.1
BELONIDAE															
Strongylura gigantea	--	---	---	--	---	---	47	0.06	0.6	--	---	---	71	0.01	0.1

BLENNIIDAE															
Cirripectes variolosus	20	0.50	2.0	39	0.14	0.8	32	0.24	2.3	30	0.30	2.3	31	0.27	1.8
Exallias brevis	36	0.13	0.5	44	0.10	0.6	47	0.07	0.7	52	0.04	0.3	52	0.07	0.5
Plagiotremus goslinei	--	---	---	--	---	---	--	---	---	52	0.04	0.3	71	0.01	0.1
CANTHIGASTERIDAE															
Canthigaster epilampra	--	---	---	--	---	---	--	---	---	38	0.09	0.7	71	0.01	0.1
C. jactator	28	0.25	1.0	13	1.06	6.2	17	0.83	8.0	19	0.69	5.3	15	0.74	5.0
CARANGIDAE															
Caranx melampygus	--	---	---	--	---	---	43	0.10	1.0	--	---	---	69	0.03	0.2
Decapterus pinnulatus	--	---	---	39	0.14	0.8	--	---	---	--	---	---	62	0.04	0.3
CHAETODONTIDAE															
Chaetodon auriga	--	---	---	30	0.27	1.6	40	0.13	1.3	--	---	---	44	0.12	0.8
C. lineolatus	--	---	---	--	---	---	56	0.03	0.3	--	---	---	71	0.01	0.1
C. lunula	--	---	---	29	0.31	1.8	--	---	---	27	0.35	2.7	38	0.16	1.1
C. miliaris	--	---	---	--	---	---	40	0.13	1.3	--	---	---	62	0.04	0.3
C. multicinctus	4	10.14	40.3	5	8.33	48.6	4	9.05	87.7	5	10.52	81.0	5	8.94	60.7
C. ornatissimus	8	2.64	10.5	11	1.34	7.8	13	1.06	10.3	13	1.04	8.0	12	1.34	9.1
C. quadrimaculatus	--	---	---	49	0.07	0.4	56	0.03	0.3	32	0.26	2.0	49	0.09	0.6
C. unimaculatus	--	---	---	49	0.07	0.4	--	---	---	--	---	---	71	0.01	0.1
Forcipiger flavissimus	14	1.00	4.0	18	0.58	3.4	15	0.96	9.3	12	1.13	8.7	13	0.96	6.5
F. longirostris	26	0.33	1.3	49	0.07	0.4	20	0.62	6.0	15	0.87	6.7	22	0.44	3.0
CIRRHITIDAE															
Cirrhitops fasciatus	--	---	---	35	0.24	1.4	29	0.34	3.3	32	0.26	2.0	34	0.22	1.5
Cirrhitus pinnulatus	--	---	---	59	0.03	0.2	56	0.03	0.3	--	---	---	71	0.01	0.1
Paracirrhites arcatus	26	0.33	1.3	18	0.59	3.4	14	1.04	10.0	18	0.74	5.7	17	0.68	4.6
P. forsteri	36	0.13	0.5	35	0.24	1.4	38	0.18	1.7	38	0.09	0.7	40	0.15	1.0

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
CORAL-RICH ZONE (con't.)															
FISTULARIIDAE															
Fistularia petimba	47	0.08	0.3	--	---	---	12	1.27	12.3	--	---	---	26	0.37	2.5
HOLOCENTRIDAE															
Adioryx xantherythrus	32	0.20	0.8	--	---	---	--	---	---	--	---	---	71	0.01	0.1
Myripristis kuntee	--	---	---	22	0.52	3.0	--	---	---	--	---	---	40	0.15	1.0
M. murdjan	22	0.38	1.5	49	0.07	0.4	32	0.24	2.3	--	---	---	46	0.10	0.7
Myripristis sp.	--	---	---	--	---	---	--	---	---	38	0.09	0.7	71	0.01	0.1
LABRIDAE															
Anampses chrysocephalus	--	---	---	--	---	---	47	0.07	0.7	--	---	---	71	0.01	0.1
Cheilinus rhodochrous	18	0.58	2.3	26	0.41	2.4	47	0.07	0.7	27	0.35	2.7	27	0.32	2.2
Cheilio inermis	--	---	---	--	---	---	--	---	---	52	0.04	2.3	71	0.01	0.1
Coris gaimardi	--	---	---	39	0.14	0.8	47	0.07	0.7	38	0.09	0.7	58	0.06	0.4
Gomphosus varius	15	0.88	3.5	15	0.89	5.2	29	0.38	3.7	13	1.04	8.0	15	0.74	5.0
Halichoeres ornatissimus	36	0.13	0.5	26	0.41	2.4	23	0.44	4.3	23	0.61	4.7	23	0.43	2.9
Labroides phthirophagus	17	0.75	3.0	15	0.89	5.2	18	0.75	7.3	19	0.69	5.3	17	0.75	5.1
Macropharyngodon geoffroyi	--	---	---	49	0.07	0.4	--	---	---	--	---	---	71	0.01	0.1
Pseudocheilinus octotaenia	18	0.58	2.3	22	0.51	3.0	32	0.24	2.3	25	0.43	3.3	25	0.4	2.7
P. tetrataenia	--	---	---	49	0.07	0.4	30	0.34	3.3	--	---	---	44	0.12	0.8
Stethojulis balteata	28	0.25	1.0	30	0.27	1.6	23	0.44	4.3	35	0.17	1.3	30	0.28	1.9
Thalassoma ballieui	36	0.13	0.5	37	0.21	1.2	56	0.03	0.3	--	---	---	62	0.04	0.3
T. duperrey	5	5.41	21.5	6	6.10	35.6	7	5.64	54.7	7	5.10	39.3	6	5.36	36.4

MONACANTHIDAE															
Cantherhines dumerili	--	---	---	59	0.03	0.2	--	---	---	--	---	---	71	0.01	0.1
Pervagor melanocephalus	47	0.08	0.3	--	---	---	56	0.03	0.3	30	0.30	2.3	35	0.19	1.3
P. spilosoma	16	0.83	3.3	30	0.29	1.6	20	0.62	6.0	38	0.09	0.7	28	0.31	2.1
MULLIDAE															
Mulloidichthys vanicolensis	47	0.08	0.3	--	---	---	38	0.18	1.7	--	---	---	58	0.06	0.4
Parupeneus bifasciatus	--	---	---	59	0.03	0.2	--	---	---	32	0.26	2.0	52	0.07	0.5
P. chryserydros	--	---	---	--	---	---	--	---	---	30	0.30	2.3	52	0.07	0.5
P. multifasciatus	36	0.13	0.5	34	0.26	1.5	43	0.10	1.0	19	0.69	5.3	31	0.27	1.8
MURAENIDAE															
Enchelynassa canina	--	---	---	--	---	---	--	---	---	52	0.04	0.3	71	0.01	0.1
Gymnothorax flavimarginatus	--	---	---	--	---	---	56	0.03	0.3	--	---	---	71	0.01	0.1
G. meleagris	47	0.08	0.3	44	0.10	0.6	--	---	---	--	---	---	62	0.04	0.3
MYLIOBATIDAE															
Aetobatus narinari	--	---	---	--	---	---	56	0.03	0.3	--	---	---	71	0.01	0.1
OSTRACIIDAE															
Ostracion meleagris	47	0.08	0.3	44	0.10	0.6	47	0.07	0.7	38	0.09	0.7	52	0.07	0.5
POMACANTHIDAE															
Centropyge potteri	7	3.77	15.0	9	2.60	15.2	6	6.71	65.0	9	2.08	16.0	7	3.72	25.3

TABLE 2--Continued.

Species	1975 Rank[1]	1975 A.I.[2]	1975 $\bar{N}$[3]	1976 Rank	1976 A.I.	1976 $\bar{N}$	1977 Rank	1977 A.I.	1977 $\bar{N}$	1978 Rank	1978 A.I.	1978 $\bar{N}$	TOTAL Rank	TOTAL A.I.	TOTAL $\bar{N}$
CORAL-RICH ZONE (con't.)															
POMACENTRIDAE															
Abudefduf abdominalis	11	1.59	6.3	10	1.85	10.8	--	---	---	--	---	---	19	0.57	3.9
Chromis acares	36	0.13	0.5	--	---	---	--	---	---	--	---	---	71	0.01	0.1
C. agilis	2	18.62	74.0	2	15.76	92.0	5	6.97	67.7	4	11.03	85.0	3	11.91	80.9
C. hanui	6	4.35	17.3	7	3.02	17.6	9	2.58	25.0	10	1.73	13.3	9	2.49	16.9
C. ovalis	--	---	---	30	0.27	1.6	--	---	---	--	---	---	52	0.07	0.5
C. vanderbilti	10	1.71	6.8	1	16.17	94.4	3	9.59	93.0	3	12.16	93.7	4	10.39	70.6
C. verator	22	0.38	1.5	59	0.03	0.2	26	0.41	4.0	--	---	---	35	0.19	1.3
Dascyllus albisella	--	---	---	49	0.07	0.4	--	---	---	--	---	---	71	0.01	0.1
Eupomacentrus fasciolatus	12	1.51	6.0	12	1.30	7.6	11	1.96	19.0	11	1.47	11.3	11	1.50	10.2
Plectroglyphidodon johnstonianus	9	2.59	10.3	8	2.88	16.8	10	2.40	23.3	8	2.51	19.3	10	2.49	16.9
SCARIDAE															
Scarus sordidus	36	0.13	0.5	--	---	---	47	0.07	0.7	38	0.07	0.7	58	0.06	0.4
Scarus sp.	32	0.20	0.8	--	---	---	46	0.07	0.7	--	---	---	62	0.04	0.3
SERRANIDAE															
Cephalopholis argus	47	0.08	0.3	--	---	---	56	0.03	0.3	--	---	---	71	0.01	0.1
SPARIDAE															
Monotaxis grandoculis	--	---	---	49	0.07	0.4	32	0.24	2.3	--	---	---	49	0.09	0.6

SYNODONTIDAE																
Saurida gracilis	--	---	---	--	---	---	56	0.03	0.3	52	0.04	0.3	71	0.01	0.1
Synodus binotatus	--	---	---	--	---	---	--	---	---	38	0.09	0.7	71	0.01	0.1
TETRAODONTIDAE																
Arothron hispidus	--	---	---	--	---	---	--	---	---	38	0.09	0.7	71	0.01	0.1
A. meleagris	--	---	---	59	0.03	0.2	--	---	---	--	---	---	71	0.01	0.1

[1] Rank is the order of average abundance for each species with the most abundant having the lowest rank.

[2] A.I. = Abundance Index = $\frac{\text{Total Sightings for a Species}}{\text{Total Sightings for All Species}} \times 100$

[3] $\bar{N}$ = $\frac{\text{Total Sightings for a Species}}{\text{Number of Transects}} \times 100$

TABLE 3. Number of species specific to particular transect sites or combinations of sites.

Transect Site(s)	No. of Species
Boulder Only	12
Drop-off Only	15
Coral-rich Only	14
Boulder and Drop-off	5
Boulder and Coral-rich	7
Drop-off and Coral-rich	12
All Sites	61
Total Species	126

TABLE 4. Number of species reoccurring every year at transect sites.

Site	No. of Species
Boulder	26
Drop-off	28
Coral-rich	29
All Sites	17

TABLE 5. Fishes unique to individual transect sites.

Species	A.I.[1]	Species	A.I.
	BOULDER SITE		
Abudefduf sindonis	0.01	Mulloidichthys pflugeri	0.01
Acanthurus glaucopareius	0.03	Naso unicornis	0.01
A. guttatus	0.36	Rhinecanthus rectangulus	0.01
Adioryx microstomus	0.01	Scarus perspicillatus	0.01
A. spinifer	0.01	Thalassoma fuscum	0.01
Chaetodon ephippium	0.01		
Coris venusta	0.07		
	DROP-OFF SITE		
Aphareus furcatus	0.03	Hemipteronotus sp.	0.01
Bodianus bilunulatus	0.08	Hemitaurichthys thompsoni	0.34
Bothus pantherinus	0.01	Holacanthus arcuatus	0.02
Canthigaster coronata	0.03	Lutjanus fulvus	0.01
C. rivulata	0.01	Scorpaenopsis cacopsis	0.01
Carangoides ferdau	0.01	Seriola dumerili	0.01
Caranx sp.	0.01	Sphyraena barracuda	0.08
Diodon hystrix	0.01		
	CORAL-RICH SITE		
Apogon snyderi	0.04	Melichthys niger	0.19
Caranx melampygus	0.03	Mulloidichthys flavolineatus	0.03
Chromis acares	0.01	Myripristis kuntee	0.15
Cirrhitus pinnulatus	0.01	Strongylura gigantea	0.01
Decapterus pinnulatus	0.04	Synodus binotatus	0.01
Enchelynassa canina	0.01	Thalassoma ballieui	0.04
Gymnothorax flavimarginatus	0.01	Zebrasoma veliferum	0.10

[1] A.I. = Abundance Index = $\frac{\text{Total Sightings for a Species x 100}}{\text{Total Sightings for All Species on Same Transect}}$

TABLE 6. The ten dominant fish species on each transect.

Species	1975 Rank[1]	1975 A.I.[2]	1976 Rank	1976 A.I.	1977 Rank	1977 A.I.	1978 Rank	1978 A.I.	Overall Rank	Overall A.I.
BOULDER ZONE										
Ctenochaetus strigosus	1	30.9	1	28.8	1	21.7	1	19.9	1	24.8
Acanthurus nigrofuscus	2	23.04	2	15.7	2	11.6	2	16.5	2	16.0
Zebrasoma flavescens	3	10.1	3	11.7	3	10.6	3	12.2	3	10.9
Thalassoma duperrey	5	6.1	4	9.1	4	9.4	5	6.2	4	7.6
Chaetodon multicinctus	7	2.5	6	6.0	5	9.1	4	6.9	5	6.0
Paracirrhites arcatus	4	6.7	5	6.7	6	6.0	6	5.1	6	6.0
Eupomacentrus fasciolatus	6	4.2	7	3.7	7	5.7	7	4.5	7	4.4
Plectroglyphidodon johnstonianus	10	1.4	8	3.3	8	4.6	10	2.0	8	2.3
Stethojulis balteata			9	1.6	9	3.0	8	2.3	9	1.7
Halichoeres ornatissimus									10	1.6
Acanthurus leucopareius	8	2.0								
A. achilles	9	1.5								
Canthigaster jactator			10	1.3			9	2.2		
Acanthurus nigroris					10	2.9				
DROP-OFF ZONE										
Ctenochaetus strigosus	1	25.0	2	21.6	1	17.5	2	15.7	1	18.9
Chromis vanderbilti	2	18.9	1	26.9	3	9.9	1	15.9	2	17.7
Zebrasoma flavescens	4	10.0	4	6.2	2	12.8	3	12.2	3	9.7
Acanthurus nigrofuscus	3	11.8	3	7.6	5	7.5	4	8.2	4	8.0
Thalassoma duperrey	6	6.1	7	4.2	4	8.1	5	5.9	5	5.3
Chromis agilis	5	7.0	5	5.2	8	3.7	6	5.2	6	4.9
Chaetodon multicinctus	7	2.5	6	4.5	6	6.6	7	5.0	7	4.7
Chromis hanui	8	2.7	9	2.1	7	5.0	10	2.8	8	3.0
Halichoeres ornatissimus	10	2.3	10	2.0	9	2.6	8	3.0	9	2.4
Centropyge potteri	9	2.3	8	2.6	10	2.0			10	2.2
Hemitaurichthys thompsoni							9	2.8		

CORAL-RICH ZONE

Ctenochaetus strigosus	1	18.9	3	14.8	2	15.9	1	16.9	1	15.6
Zebrasoma flavescens	3	14.7	4	11.1	1	17.5	2	15.2	2	13.9
Chromis agilis	2	18.6	2	15.8	5	7.0	4	11.0	3	11.9
C. vanderbilti	10	1.7	1	16.2	3	9.6	3	12.2	4	10.4
Chaetodon multicinctus	4	10.0	5	8.3	4	9.1	5	10.5	5	8.9
Thalassoma duperrey	5	5.4	6	6.1	7	5.6	7	5.1	6	5.4
Centropyge potteri	7	3.8	9	2.6	6	6.7	9	2.1	7	3.7
Acanthurus nigrofuscus					8	5.2	6	5.5	8	3.2
Chromis hanui	6	4.4	7	3.0	9	2.6	10	1.7	9	2.5
Plectroglyphidodon johnstonianus	9	2.6	8	2.9	10	2.4	8	2.5	10	2.5
Chaetodon ornatissimus	8	2.6								
Abudefduf abdominalis			10	1.9						

[1] Rank is the order of average abundance for each species with the most abundant species having the lowest rank.

[2] A.I. = Abundance Index = $\frac{\text{Total Sightings for a Species x 100}}{\text{Total Sightings for All Species on Same Transect}}$

TABLE 7. Fishes observed in Hōnaunau Bay during reconnaissance dives that were not seen on transects.

FAMILY/Species	FAMILY/Species
ACANTHURIDAE	LUTJANIDAE
Acanthurus xanthopterus	Lutjanus kasmira
BLENNIIDAE	MOBULIDAE
Istiblennius gibbifrons	Manta alfredi
I. zebra	MONACANTHIDAE
CHAETODONTIDAE	Cantherhines verecundus
Centropyge loriculus	OSTRACIIDAE
Chaetodon reticulatus	Ostracion whitleyi
C. trifasciatus	PLEURONECTIDAE
C. tinkeri	Samariscus triocellatus
Hemitaurichthys polylepis	POMACENTRIDAE
Heniochus acuminatus	Chromis leucurus
CHANIDAE	Plectroglyphidodon imparipennis
Chanos chanos	
CIRRHITIDAE	
Amblycirrhitus bimacula	

CONGRIDAE

Conger cinereus

GRAMMISTIDAE

Pseudogramma polyacanthus

HOLOCENTRIDAE

Flammeo sammara
Plectrypops lima

KUHLIIDAE

Kuhlia sandvicensis

KYPHOSIDAE

Kyphosus cinerescens

LABRIDAE

Cirrhilabrus jordani
Hemipteronotus niveilatus
Thalassoma lutescens

PRIACANTHIDAE

Priancanthus cruentatus

SCORPAENIDAE

Pterois sphex
Scorpaenopsis brevifrons
Taenianotus triacanthus

SERRANIDAE

Liopropoma sp. nov.
Anthias bicolor
A. ventralis

SYNODONTIDAE

Synodus variegatus

TETRAODONTIDAE

Arothron nigropunctatus

TRIAKIDAE

Triaenodon obesus

TABLE 8. Summary of transect data for Hōnaunau Bay.

Zone	Ave.No. Species	Ave.No. Fishes	Shannon-Weiner Diversity Index (H')	Maximum Diversity Index (H'_{max})	Equitability (J')	Variance	No. of Transects
BOULDER							
1975	47	612.2	2.2946	3.8502	0.5960	0.0033	4
1976	59	664.7	2.4375	4.0775	0.5978	0.0029	5
1977	56	1024.4	2.9294	4.0254	0.7277	0.0015	3
1978	53	812.1	5.8294	3.9703	0.7127	0.0021	3
All Years	88	754.12	2.6958	4.4773	0.6021	0.0029	15
Average	54						
DROP-OFF							
1975	49	500.4	2.5433	3.8918	0.6535	0.0035	4
1976	68	853.8	2.5742	4.2195	0.6101	0.0025	5
1977	65	1164.5	2.9864	4.1744	0.7154	0.0014	3
1978	59	1048.9	2.9317	4.0775	0.7190	0.0015	3
All Years	93	860.7	2.8328	4.5326	0.6250	0.0024	15
Average	60.5						
CORAL-RICH							
1975	53	391.9	2.6840	3.9763	0.6760	0.0041	4
1976	65	580.7	2.7208	4.1744	0.6518	0.0031	5
1977	66	968.4	2.8245	4.1897	0.6742	0.0017	3
1978	57	868.3	2.7287	4.0431	0.6749	0.0017	3
All Years	95	665.2	2.8503	4.5539	0.6259	0.0027	15
Average	60.4						

APPENDIX I. Fish observed during survey of waters off Pu'uhonua o Honaunau National Historical Park (where B = Boulder Zone; C-R = Coral-rich Zone; D-O = Drop-off Zone; and Recon = Reconnaissance dives).

FAMILY/Species	Common Names		Habitat			
	Hawaiian	English	B	D-O	C-R	Recon
ACANTHURIDAE - Tangs or Surgeon Fish						
Acanthurus achilles	Paku'iku'i	Achilles Tang	x	x	x	
A. guttatus		Spotted Tang	x			
A. glaucopareius		Lesson's Tang	x			
A. nigrofuscus		Lavender Tang	x	x	x	
A. nigroris	Maiko	Cuvier's Tang	x	x	x	
A. leucopareius	Maikoiko	Jenkins' Tang	x	x	x	
A. olivaceus	Na'ena'e	Orange-spot Tang	x	x	x	
A. thompsoni		Thompson's Tang	x	x	x	
A. triostegus	Manini	Manini	x	x	x	
A. xanthopterus	Pualu	Yellow-finned Tang				x
Ctenochaetus strigosus	Kole	Yellow-eyed Tang	x	x	x	
C. hawaiiensis		Hawaiian Tang	x	x	x	
Naso brevirostris	Kala	Unicorn Tang	x	x	x	
N. hexacanthus		Six-spined Tang		x	x	
N. lituratus	Umaumalei	Liturate Tang	x	x	x	
N. unicornis	Kala	Large Unicorn Tang	x			
Zebrasoma flavescens	La'ipala	Yellow Tang	x	x	x	
Z. veliferum	'Api	Sail-fin Tang			x	
Zanclus cornutus	Kihikihi	Moorish Idol	x	x	x	
APOGONIDAE - Cardinal fish						
Apogon snyderi	'Upapalu	Snyder's Cardinal Fish			x	
AULOSTOMIDAE - Trumpet Fish						
Aulostoma chinensis	Nunu	Trumpet Fish	x	x	x	

Appendix I--Continued.

FAMILY/Species	Common Names		Habitat			
	Hawaiian	English	B	D-O	C-R	Recon
BALISTIDAE - Trigger Fish						
Melichthys niger	Humu humu 'ele'ele	Black Trigger Fish		x	x	
M. vidua	Humu humu hi'ukole	Red-tailed Trigger Fish	x	x	x	
Rhinecanthus rectangulus	Humu humu nuku nuku a pua'a	Pig-nosed Trigger Fish	x			
Sufflamen bursa	Humu humu umauma lei	Green and White Trigger Fish	x	x	x	
Xanthichthys mento		Long-chinned Trigger Fish		x	x	
BELONIDAE - Needle Fish						
Strongylura gigantea	'Aha	Giant Needle Fish			x	
BLENNIIDAE - Comb-toothed Blennies						
Cirripectus variolosus		Common Blenny	x	x	x	
Exallias brevis	Pao'o kauila	Short-bodied Blenny	x	x	x	
Istiblennius gibbifrons		Hump-headed Blenny				x
I. zebra	Pao'o	Rock Skipper				x
Plagiotremus goslinei		Sabre Tooth Blenny	x	x	x	
BOTHIDAE - Left-eyed Flounders						
Bothus pantherinus		Spotted Flounder		x		

CANTHIGASTERIDAE - Sharp-nosed Puffers

Canthigaster amboinensis	Pu'u ola'i	Amboina Puffer	x	x		
C. coronata		Crowned Puffer		x		
C. epilampra	Pu'u ola'i	Rare Kihei Puffer		x	x	
C. jactator		White-spotted Puffer	x	x		
C. rivulata	Pu'u ola'i	Schlegel's Puffer		x		

CARANGIDAE - Jacks

Carangoides ferdau	'Omilu	Forskal's Jack		x		
Caranx melampygus	Blue Ulua	Blue Jack			x	
Caranx sp.				x		
Decapterus pinnulatus	'Opelu	Mackerel Scad			x	
Seriola dumerili	Kahala	Amberjack		x		

CHAETODONTIDAE - Butterfly Fish

Chaetodon auriga	Lau hau	Golden Butterfly Fish	x	x	x	
C. ephippium		Saddleback Butterfly Fish				x
C. fremblii	Lau hau	Blue-lined Butterfly Fish	x	x		
C. lineolatus	Kika kapu	Lined Butterfly Fish	x		x	
C. lunula	Kapu hili	Racoon Butterfly Fish	x	x	x	
C. miliaris		Millet Seed Butterfly Fish	x	x	x	
C. multicinctus		Pebbled Butterfly Fish	x	x	x	
C. ornatissimus	Kika kapu	Ornate Butterfly Fish	x	x	x	
C. quadrimaculatus		Four-spotted Butterfly Fish	x	x	x	
C. reticulatus		Reticulated Butterfly Fish				x
C. tinkeri		Tinker's Butterfly Fish				x

Appendix I--Continued.

FAMILY/Species	Common Names: Hawaiian	Common Names: English	Habitat: B	Habitat: D-O	Habitat: C-R	Habitat: Recon
CHAETODONTIDAE - Butterfly Fish (con't.)						
Chaetodon trifasciatus	Kapu hili	Three-banded Butterfly Fish				x
C. unimaculatus	Lau hau	One-spot Butterfly Fish	x	x	x	
Forcipiger flavissimus	Lau wiliwili nukunuku 'oi'oi	Common Long-nosed Butterfly Fish	x	x	x	
F. longirostris		Rare Long-nosed Butterfly Fish	x	x	x	
Hemitaurichthys polylepis		Pyramid Butterfly Fish				x
H. thompsoni		Thompson's Butterfly Fish		x		
Heniochus acuminatus		Poor Man's Moorish Idol				x
CHANIDAE - Milk Fish						
Chanos chanos	Awa	Milk Fish				x
CIRRHITIDAE - Hawk Fish						
Amblycirrhitus bimacula		Two-spot Hawk Fish				x
Cirrhitops fasciatus	'O'opu kai	Banded Hawk Fish	x	x	x	
Cirrhitus pinnulatus	Po'o pa'a	Hard-headed Hawk Fish		x	x	
Paracirrhites arcatus	Piliko'a	Small Hawk Fish	x	x	x	
P. forsteri	Piliko'a	Forster's Hawk Fish	x	x	x	
CONGRIDAE - Conger Eels						
Conger cinereus	Puhi uha	White Eel				x

DIODONTIDAE - Porcupine Fish						
Diodon hystrix	'O'opu hue	Spiny Puffer		x		
FISTULARIIDAE - Cornet Fish						
Fistularia petimba	Nunu Peke	Cornet Fish	x	x	x	
GRAMMISTIDAE - Soap Fish						
Pseudogramma polyacanthus						x
HOLOCENTRIDAE - Squirrel Fish						
Adioryx microstomus		Small Mouth Squirrel Fish	x			
A. spinifer	'U'u kane pou	Spined Squirrel Fish	x			
A. xantherythrus		Yellow-red Squirrel Fish		x	x	
Flammeo sammara		Blood-spot Squirrel Fish				x
Myripristis kuntee	'U'u	Cuvier's Squirrel Fish			x	
M. murdjan	'U'u	Forskal's Squirrel Fish		x	x	
Myripristis sp.	'U'u			x	x	
Plectrypops lima		Rough-scaled Squirrel Fish				x
KUHLIIDAE - Flag-tail Fish						
Kuhlia sandvicensis	Aholehole	Hawaiian Flag-tail Fish				x
KYPHOSIDAE - Rudder Fish						
Kyphosus cinerescens	Nenue	Rudder Fish				x

Appendix I--Continued.

FAMILY/Species	Common Names		Habitat			
	Hawaiian	English	B	D-O	C-R	Recon
LABRIDAE - Wrasses						
Anampses chrysocephalus		Golden Head Wrasse	x	x	x	
A. cuvier	'Opule	Spotted Wrasse	x	x		
Bodianus bilunulatus	'A'awa	Black-spot Wrasse		x		
Cheilinus rhodochrous	Po'ou	Rose-colored Wrasse	x	x	x	
Cheilio inermis	Kupou	Spindle Wrasse	x		x	
Cirrhilabrus jordani		Flame Wrasse				x
Coris gaimardi	Hinalea 'akilolo	Clown Wrasse	x	x	x	
C. venusta		Elegant Wrasse	x			
Gomphosus varius	Hinalea nuku 'i'iwi	Bird Wrasse	x	x	x	
Halichoeres ornatissimus	Pa'awela	Christmas Tree Wrasse	x	x	x	
Hemipteronotus niveilatus	Lae nihi	White-side Razor Wrasse				x
Hemipteronotus sp.	Lae nihi			x		
Labroides phthirophagus		Cleaner Wrasse	x	x	x	
Macropharyngodon geoffroyi	Hinalea 'akilolo	Geoffroy's Wrasse		x	x	
Pseudocheilinus evanidus		Small Wrasse	x	x		
P. octotaenia		Eight-lined Wrasse	x	x	x	
P. tetrataenia		Four-lined Wrasse	x	x	x	
Stethojulis balteata	Ohua	Green Wrasse	x	x	x	
Thalassoma ballieui	Hinalea luahine	Ballieu's Wrasse			x	
T. duperrey	Hinalea lau wili	Saddle Back Wrasse	x	x	x	
T. fuscum	'Awela	Brown Wrasse	x			x
T. lutescens		Yellow Wrasse				x
LUTJANIDAE - Snappers						
Aphareus furcatus		Fork-tailed Snapper		x		
Lutjanus fulvus	Toau (Tahiti)	Red and Green Snapper		x		
L. kasmira	Taape	Blue-lined Snapper				x

MOBULIDAE - Manta Rays						
Manta alfredi	Hahalua	Alfred's Manta Ray				x
MONACANTHIDAE - File Fish						
Cantherhines dumerili	'O'ilepa	Dumeril's File Fish	x	x	x	
C. sandwichiensis	'O'ilepa	Sandwich Island File Fish	x	x		
C. verecundus		Shy File Fish				x
Pervagor melanocephalus		Black File Fish	x	x	x	
P. spilosoma	'O'ili lepa	Fan Tail File Fish	x	x	x	
MULLIDAE - Goat Fish						
Mulloidichthys flavolineatus	Weke	Samoan Goat Fish			x	
M. pflugeri	Weke 'ula	Pfluger's Goat Fish	x			
M. vanicolensis	Weke	Gold-banded Goat Fish	x	x	x	
Parupeneus bifasciatus	Munu	Two-striped Goat Fish	x	x	x	
P. chryserydros	Moano	Yellow-tailed Goat Fish	x	x	x	
P. multifasciatus	Moano	Red and Black Banded Goat Fish	x	x	x	
P. porphyreus	Kumu	Purplish Goat Fish	x	x		
MURAENIDAE - Moray Eels						
Enchelynassa canina	Puhi kauila	Canine-toothed Moray			x	
Gymnothorax flavimarginatus	Puhi kapa	Yellow-margined Moray			x	
G. meleagris		White-spotted Moray		x	x	
MYLIOBATIDAE - Eagle Rays						
Aetobatus narinari	Hihimanu	Spotted Eagle Ray		x	x	

Appendix I--Continued.

FAMILY/Species	Common Names: Hawaiian	Common Names: English	Habitat: B	Habitat: D-O	Habitat: C-R	Habitat: Recon
OSTRACIIDAE - Box Fishes						
Ostracion meleagris	Pahu	Speckled Box Fish	x	x	x	
O. whitleyi		Whitley's Box Fish				x
PLEURONECTIDAE - Right-eyed Flounders						
Samariscus triocellatus		Three Spot Flounder				x
PRIACANTHIDAE - Big Eyes						
Priacanthus cruentatus	'Aweoweo	Bloody Big Eye				x
POMACANTHIDAE - Angel Fish						
Centropyge loriculus		Flame Angel Fish				x
C. potteri		Potter's Angel Fish	x	x	x	
Holacanthus arcuatus		Black-banded Angel Fish		x		
POMACENTRIDAE - Damsel Fish						
Abudefduf abdominalis	Maomao	Green Damsel Fish	x		x	
Chromis acares (?)					x	
C. agilis		Agile Chromis	x	x	x	
C. hanui		Chocolate Chromis	x	x	x	
C. leucurus		Dark Chromis				x
C. ovalis		Oval Chromis	x	x	x	
C. vanderbilti		Vanderbilt's Chromis	x	x	x	
C. verator		Black Chromis	x	x	x	

Dascyllus albisella	Alo'ilo'i	White-spotted Damsel Fish	x	x	x	
Eupomacentrus fasciolatus		Yellow-eyed Damsel Fish	x	x	x	
Plectroglyphidodon imparipennis		Small Damsel Fish				x
P. johnstonianus		Johnston Island Damsel Fish	x	x	x	
P. sindonis		Sindo's Damsel Fish	x			
SCARIDAE - Parrot Fish						
Scarops rubroviolaceus		Red and Violet Parrot Fish	x	x		
Scarus perspicillatus	Uhu uliuli	Big Blue Parrot Fish	x			
S. sordidus		Sordid Parrot Fish	x	x	x	
Scarus sp.			x	x	x	
SCORPAENIDAE - Scorpion Fish						
Pterois sphex		Lion Fish				x
Scorpaenopsis brevifrons		Short-browed Scorpion Fish				x
S. cacopsis	Nohu	Jenkins' Scorpion Fish		x		
Taenianotus triacanthus		Leaf Fish				x
SERRANIDAE - Groupers						
Cephalopholis argus		Argus Grouper		x	x	
Liopropoma sp. nov.						x
Anthias bicolor		Bicolor Fancy Bass				x
A. ventralis		Yellow Fancy Bass				x
SPARIDAE - Porgys						
Monotaxis grandoculis	Mu	Grand-eyed Porgy		x	x	

Appendix I--Continued.

FAMILY/Species	Common Names		Habitat			
	Hawaiian	English	B	D-O	C-R	Recon
SPHYRAENIDAE - Barracuda						
Sphyraena barracuda	Kaku	Great Barracuda		x		
SYNODONTIDAE - Lizard Fish						
Saurida gracilis	'Ulae	Slender Lizard Fish		x	x	
Synodus binotatus		Two-spot Lizard Fish			x	
S. variegatus	'Ulae	Variegated Lizard Fish				x
TETRAODONTIDAE - Balloon Fish						
Arothron hispidus	'O'opuhue	Spiny Balloon Fish	x		x	
A. meleagris		Speckled Balloon Fish	x		x	
A. nigropunctatus		Black Spotted Balloon Fish				x
TRIAKIDAE - Smooth Dogfish Sharks						
Triaenodon obesus		White-tipped Reef Shark				x