

CIP GENERATION PROJECT
2009 COMMUNITY BENEFITS PROGRAM
REEF FISH MONITORING PROJECT
YEAR 1 RESULTS

Prepared For:

Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Prepared By:

Richard Brock, Ph.D.
Environmental Assessment, LLC
1232 Lunalilo Home Road
Honolulu, Hawaii 96825

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EXECUTIVE SUMMARY

With the proposed development of a electrical generating facility at Campbell Industrial Park at Barbers Point, an environmental monitoring program to follow changes in coral reef fish communities in the Barbers Point - Kahe Point area was initiated. This document is the first annual report for this effort covering the period from December 2007 through November 2008 and represents the preconstruction baseline prior to development of the generating facility. On a quarterly basis, this study monitors the status of coral reef fish communities at sixteen permanently marked sites offshore of Barbers Point on the southeast to Nanakuli Beach Park about 7.9 km to the northwest. These monitoring stations are all in waters from 5 to 12 m in depth.

Because of Hawaiian Electric Company's construction/operation of the generating station at Kahe Point as well as the developments at West Beach and Barbers Point Harbor, long-term marine environmental data covering the status of fish and coral communities are available commencing from the mid-1970's up to present. The most comprehensive of those efforts occurred with the HECO program in support of the Kahe Generating facility at Kahe Point. The HECO monitoring program documented changes that occurred to marine communities following three major storm events: the January 1980 event, Hurricane Iwa in November 1982 and Hurricane Iniki in September 1992 all of which severely impacted coral reef communities in the area. These studies demonstrated the impact of those storm events and not the operation of the Kahe facility as the major source of impact to marine communities of the Kahe area.

In the present study there were no statistically-significant changes in the mean number of fish species, mean number of individual fish censused or in the mean standing crop per transect among the five 2007-2008 survey periods, thus demonstrating stability in these communities. All species of fishes censused in the present study have been assigned to one of five feeding guilds (or trophic categories): herbivores (species feeding on algae), planktivores (species that feed on zooplankton up in the water column), omnivores (species that feed on both algae and small animals), coral feeders which are a specialized group feeding on coral tissue or mucous, and carnivores which are species feeding on smaller fishes and invertebrates living on the coral reef. Of the 122 species of fishes encountered in the five 2007-2008 surveys, nineteen species are herbivores, eleven are planktivores, eight are omnivores, seven are coral feeders and 77 are carnivores. Fifteen of the sixteen monitored locations are established on natural substratum where 83% of the fish standing crop is comprised of herbivores and carnivores. However, at one station established on the Kahe Generating Station warm-water discharge, herbivores are largely replaced by planktivores but carnivores remain important as elsewhere. The reasons for this shift in dominance is due to the thermally-elevated discharge creating a unidirectional current and the high degree of shelter space afforded by the steel and armor rock covering the discharge pipe.

This study was undertaken to follow changes in coral reef fish communities as part of the environmental monitoring program related to the development of the CIP electrical generation facility and the data collected in this first year represent the preconstruction baseline. The sixteen stations geographically fall into four groups along the 7.9 km of coastline; on the southeast are four stations offshore of future generation plant at Campbell Industrial Park (station nos. 1-4), three stations seaward of Ko'Olina Resort (nos. 5-7), five stations fronting the Kahe generation facility (nos. 8-12) and three stations north of Kahe Point (13-15). Statistical analysis of the fish community parameters measured in this study (i.e., number of species, number of individuals and standing crop) found that the diversity of fish species is significantly greatest at the three Ko'Olina stations over those in the other three groups. Although not statistically significant, the Ko'Olina stations also had the greatest mean number of fishes

counted and highest mean estimated biomass in 2007-2008. These three measures were least at the four stations offshore of Campbell Industrial Park and these differences are attributed to better benthic community development offshore of Ko'Olina than elsewhere. The data from stations offshore of Kahe and from those to the north were between the Ko'Olina and Campbell Industrial Park means. The above analysis excluded data from station 16 (the Kahe discharge pipe) because it is a man-made structure and not comprised of natural substratum as present at all other stations. However, to better understand the differences among the sixteen stations, the three fish community measures (mean number of species per transect, mean number of individuals per transect and mean estimated biomass per transect) were statistically examined comparing all stations. Two findings emerge: (1) the Kahe discharge pipe station had the greatest mean number of fish species, individuals (significantly greater) and standing crop (significantly greater) over all other stations and (2) the means for all parameters from all other stations were not statistically separable. Thus the development in the fish communities at the fifteen stations situated on natural substratum monitored in this study pales relative to that found on the man-made Kahe discharge.

Seven of the permanently marked monitoring stations in this study have been used in earlier HECO studies and the methods used herein are similar, allowing comparative analysis of the data. Comparing old fish community data (1976-1984) to present (2007-2008) data finds that there are no statistically significant differences in the annual mean number of fish species or annual mean number of individual fish censused per transect despite the imposition of three major storm events in 1980, 1982 and 1992 suggesting that the fish communities have to some extent recovered from these disturbances. These early storm events impacted marine communities offshore of the Barbers - Kahe Point areas. These impacts were probably greatest on the coral communities which are the source of much of the natural local topographical relief creating shelter for fishes. If disturbance to the coral community occurs frequently and corals are known to be slow-growing, they are unable to contribute much to the local topography upon which many fish species depend thus keeping the fish community at an earlier point is community succession. The early studies demonstrated the large impact that these storms had at the time on corals as well as the movement of sand away from the Kahe area leaving much near-barren limestone that is present today and is scoured by small wave events keeping benthic community development to a minimum. This has resulted in a relatively poor development of the fish communities at many of the Kahe sample sites which continues to today. Where topographical relief and benthic communities are well-developed, the fish communities are likewise better developed. Given the long-term data set spanning 32 years and the apparent lack of strong significant changes occurring to fish communities with the three early storm events which is probably due to some level of recovery, suggests that the variation seen in the measures of the fish community used in this study will continue to fluctuate at a similar magnitude in future monitoring events as this program moves forward. Furthermore, the analysis of the 2007-2008 data suggest that benthic community development/topographic complexity creating shelter for fishes remain the overriding factors determining the degree of development in fish communities at the stations monitored in this study. Since these factors were heavily impacted by the early storm events many years ago (as documented by HECO), the present findings will probably continue much the same in future years of this study.

INTRODUCTION

1. Purpose

Hawaiian Electric Company, Inc. (hereafter HECO) has proposed to construct a new generating station on vacant portions of its existing Barbers Point Tank Farm in Campbell Industrial Park (CIP) on the island of O'ahu. This generating facility is being constructed in light of the fact that there is an urgent need for new generating capacity on the island. Initially, the generating station would consist of a single 110 MW Siemens-Westinghouse combustion turbine (CT) and two single 2 MW capacity black-start diesel engine generators. The proposed system will be fueled using biofuels which assists in fulfilling the State's goals of energy security and sustainability. However, alternative fuels (e.g., diesel, naphtha, etc.) may be used if biofuels are unavailable. The system will be designed to accept a second generation unit and would only be constructed if and when it is needed to meet system requirements. It is expected that the proposed generation system will be used to help meet peak load periods on the island's system which normally occur between 5:00 pm and 9:00 pm on weekdays. Thus the system would be started and run about 200 days per year; additional run times would be required periodically for maintenance and testing purposes or to meet unusual system load requirements (as when another generating unit trips off line or is out of service for unscheduled maintenance or repair).

The single CT generation unit would utilize approximately 600 gpm of water which would be used for water injection into the CT for air pollution control, equipment cooling, plant washdown, landscape irrigation and domestic use by operating personnel. Disposal of used water would be via injection wells on the project site. Thus, unlike the nearby Kahe Generating Station where seawater is used for cooling in the plant and discharged back into the marine environment, the new CIP plant will not discharge cooling water into the nearby ocean thus precluding or reducing potential environmental impacts to the marine environment.

As part of the environmental monitoring program for the proposed CIP Generating Station, it was suggested that a coral reef fish monitoring program be put in place to track the changes that may occur with fish populations offshore of the proposed plant at Barbers Point. The data presented herein were collected in 2008 and represent the preconstruction baseline; data from 2009 are being collected during the construction of the generating facility. Because HECO had such a monitoring plan in place offshore of its Kahe power plant in the 1970's and 1980's, the present study has included a reassessment of some of those locations which should provide information on the changes that have occurred to fish communities in the Barbers Point - Kahe Point area over the last 30 years. This study addresses the question, "What are the changes in the coral reef fish community structure that occur through time in the Barbers Point - Kahe Point area?" Community structure is defined as the diversity of species, their abundance and biomass

as well as their place in the food web of the coral reef. This document addresses this question and represents the first annual report covers the baseline conditions and is issued in support of this program.

2. Natural Events and Impacts to Hawaii's Coral Reefs

Past dogma has perpetuated the concept that coral reefs and their fish communities exist in stable environments which have resulted in the high diversity of species that is often seen in these systems. More recent data has shown that the environment in which coral reefs exist is dynamic, i.e., undergoing constant change, thus the organisms are subjected to a variety of stresses, resulting in shifts in community structure and abundance of species (Grassle 1973, Connell 1978, Dollar and Tribble 1993). Indeed, the concept that "intermediate levels of disturbance" may result in higher diversity has been demonstrated in a number of studies of coral communities (Connell 1978, Dollar 1982, Grigg 1983). Benign environments result in final successional stages of coral community development with low species diversity where one or a few species dominate. This decrease in species diversity is found also with the coral-associated fish communities. Stability in coral species populations has been recently viewed as ever-changing in time and space, where species diverge by genetic drift due to isolation or converge by hybridization, producing constant change which has been described as reticulate evolution (Veron 1995).

Stochastic processes create a nonequilibrium situation in coral reef communities. A major causal mechanism of stochastic events is the occurrence of occasional storms, which have been shown to be the single most important factor influencing the structure, diversity, and abundance of coral communities in Hawaii (Dollar 1982, Grigg 1983, Dollar and Tribble 1993). Coral reefs have been described as "temporally varying mosaics" (Bak and Luckhurst 1980) in which the coral community undergoes a continual cycle of disturbance or removal and recovery or renewal. The effects of severe disturbance that drive this cycle have been documented for specific reef areas. The removal or destructive phase due to large storm events has been recorded in the Caribbean (Ball *et al.* 1967, Perkins and Enos 1968, Stoddart 1969, 1974, Woodley *et al.* 1981) and in the Pacific (Blumenstock *et al.* 1961, Cooper 1966, Dollar 1982, Dollar and Tribble 1993, Done *et al.* 1991, Harmelin-Vivien and Laboute 1986, Maragos *et al.* 1973, Ogg and Koslow 1978).

Following the impact of large storm events that disrupt the coral and fish communities is a period of regrowth. This period has received less study because the recovery of most coral communities is a slow process and because having pre-storm study sites where post-storm sampling can be done is rare (Dollar and Tribble 1993). Corals are relatively slow-growing and long-lived, thus the successional processes on most reefs take place on a scale of years to decades (Grigg and Maragos 1974).

In exposed locations in Hawaii, storm waves keep coral communities at an early point in succession (Dollar 1982, Grigg 1983, Dollar and Tribble 1993). Under such situations, coral

colonies never attain any significant size and growth forms are usually prostrate, thus reducing their exposure to wave energy. Since much of the development in the associated fish community is related to the topographical complexity of the substratum (Risk 1972) and much of this complexity is directly due to the growth of corals, fish community development is usually reduced where coral communities are poorly developed and shelter space is lacking. Besides topographical complexity providing shelter habitat for fishes, the highly variable shelter created by coral communities serves a wide range of invertebrate and algal communities which may be forage for many fish species. Thus the development of coral reef fish communities is often directly linked to the degree of development of coral communities and factors that negatively affect the coral community frequently will have a similar negative impact to the fish community.

In general, many corals in Hawaii have relatively slow growth rates, and many species produce annual growth bands much like the large conifers of temperate forests (Knutson *et al.* 1972). The large hemispherical colonies of *Porites lobata* do this, accreting about a centimeter per year in radial diameter. In Hawaii, *P. lobata* colonies may attain diameters in excess of 4 m, thus large colonies may be more than 150 years in age. Under these circumstances, significant storm events do not have to occur with much frequency to have a strong influence on the successional state and development of coral communities where this species occurs.

Since 1980, three major storm events have created large surf that has impacted Hawaii's reefs over levels that normally occur. The January 1980 storm brought waves which attained heights of at least 6 m, from a south-southwest direction to the islands (Dollar 1982) thus impacting the Barbers Point - Kahe Point region. The next major storm event was Hurricane Iwa, which struck the islands in November 1982. Again, storm waves which attained estimated heights of 9 m, impacted the south and west shores of all islands (Coles and Fukuda 1984). The most recent major storm event was Hurricane Iniki, which passed over Kauai on 11 September 1992 with sustained winds of 144 mph. It also created large surf that again impacted the south and west shores of Oahu with storm generated surf arriving from a SSE direction. On the south shore of Oahu, wave heights were estimated to reach 8 m (personal observations).

3. HECO's Environmental Monitoring Program: A Synopsis of Impacts from the Construction and Operation of the Kahe Facility (1970's-1980's)

As part of the permit conditions allowing the discharge of thermally-elevated cooling water into the marine environment at Kahe Point, HECO was required to monitor the status of the coral, algae and fish communities in the waters fronting and in the vicinity of the plant. The findings from these early monitoring efforts provide an excellent overview of the environmental changes that occurred in the Kahe Point area prior to the three storm events occurring in 1980, 1982 and 1992 as well as subsequent to the January 1980 and November 1982 events. Studies on coral coverage showed a significant decrease of 7% between 1973 to 1975 and an additional 13% from 1975 to 1977. These decreases were significantly correlated with proximity to the Kahe plant thermal discharge but the analyses did not determine whether the disturbance associated with outfall construction or operation was the definitive factor producing the mortality. In

contrast to the increased mortality, settlement and growth of coral recruits increased with proximity to the outfall subsequent to beginning its operation which suggests that outfall construction rather than its operation was the major factor in producing the mortality. Fish populations throughout the study area showed no changes except on the marginal reefs to the northeast of the outfall where both the numbers of species and individuals censused decreased following the commencement of outfall operations. However, the number of intertidal species on the rocky shoreline increased in the areas of thermal impingement (Coles *et al.* 1985a).

In 1978 the analysis of all reef fish population data collected since the beginning of outfall operation in December 1976 indicated that fish populations were being displaced from the immediate vicinity of the outfall (Coles 1979). These changes pale relative to the impact of the January 1980 "Kona" storm generated extreme surf on the south and western shores of the islands. The Kahe study area was heavily impacted by waves at that time. Subsequent survey work found that the storm was responsible for reductions in coral coverage, fish populations and the redistribution of beach sand that were all much greater than the subtle changes which had occurred in these parameters over the previous seven years (Coles *et al.* 1981).

During 1981 the generating capacity of the Kahe Station was increased by the addition of Unit 6 to a total of 638 MW which increased the cooling water flow to 645 MGD, a 33% increase above the flow rate for Units 1 to 5. With this change came a reduction in the surface plume area to about one-half while the area of benthic thermal impingement nearly doubled, but was restricted primarily on offshore sand areas. A result of these changes was a moderation in coral coverage declines seen previously but coral reef fish populations continued to decline probably in response to the decrease in reef habitat produced by the 1980 storm (Coles *et al.* 1982).

In November 1982, Hurricane Iwa struck the Hawaiian Islands with the greatest destruction occurring on Kauai. On Oahu, damage was greatest on the northwest coastline which included the Kahe Point area. Waves and winds were substantially greater than seen in the January 1980 event with waves heights estimated at 30 feet (Noda 1983). As described in Coles *et al.* (1985a, page 16):

"Surprisingly, coral communities in shallow water areas appeared relatively undisturbed by hurricane wave turbulence. However, reefs further offshore at depths of 20 feet or more appeared to have been substantially destroyed by the force of breaking waves. Measurements of reef coral coverage and fish populations just prior to the hurricane had indicated stable populations compared to the previous year, indicating that damage had resulted from the catastrophic forces released by the hurricane. A further observation of interest was that sand along the reef front had been swept away by the hurricane's waves, exposing reef pavement and rubble that had been buried by up to five feet of sand."

The 1983 monitoring investigations verified the preliminary conclusions that had been determined shortly after Hurricane Iwa occurred. Quantitative estimates indicated substantial reductions in coral, algal and fish communities corresponding to locations where hurricane

wave forces had been greatest. Due to removal of sand from shallow areas and the extreme cutting back of beaches that had occurred during the hurricane, sand entrainment through the Kahe Station was substantially less in 1983 than during previous years. A study of coral recolonization in the area indicated a positive influence of the Kahe outfall in the re-establishing of reef corals on denuded reef surfaces."

Coles and Fukuda (1984) noted the net significant decrease in coverage of 18.7% between 1979-1980 due to the January 1980 storm as measured at the Kahe permanent monitoring stations. Hurricane Iwa contributed a further significant decline of coral offshore of the Kahe facility; in 1982-83 the net change in coral coverage decreased 5.4%. The greater decline in coverage with the 1980 storm relative to Hurricane Iwa was probably related to two facts: (1) since the wave energy of the January 1980 event was less than the 1982 hurricane, the impact of that energy was probably released at shallower depths where coral coverage had been high and (2) Hurricane Iwa occurred just two years after the January 1980 storm event leaving little time for significant coral recovery to occur.

4. The Impact of Hurricane Iniki

As noted above, Hurricane Iniki struck the Hawaiian Islands in September 1992 with high waves impacting the south and west shores of all islands. Fifty-four days following Hurricane Iniki, a qualitative survey was carried out to determine the extent of damage to coral communities in the vicinity of Hawaiian Electric Company's generating facility at Kahe Point (Brock 1992a). Fourteen of the more than 38 permanently marked monitoring stations were visited. With respect to coral damage, two general findings emerged: (1) that damage due to storm waves to corals was minimal and was primarily restricted to the cauliflower coral *Pocillopora meandrina*. The reasons for this restricted damage was related to the branching nature of this species as well as the fact that this coral frequently colonizes the tops of high points on hard bottom (i.e., limestone ridges and boulders). In these locations, cauliflower corals have relatively greater exposure to wave energy impinging on the bottom than would coral colonies situated down in depressions. The second finding was that the greatest damage to corals occurred at those stations situated in areas with greatest exposure to wave forces impinging from the SSE direction which was consistent with the direction of Hurricane Iniki's storm waves. Finally, the field survey noted that a considerable amount of sand was removed by the storm at some stations with a net result of a greater amount of hard substratum previously covered by sand was now exposed and available for benthic recruitment. Only one station examined in the study showed evidence of net deposition of loose materials (i.e., coral rubble and broken live pieces) while at all other stations, sand, broken live corals and rubble were not present and assumed to have been advected to deeper water seaward and outside of the study area (Brock 1992a). These findings were similar to those noted in Mamala Bay, southeast of Kahe study area (Brock 1996).

As noted above, HECO carried out environmental surveys following the January 1980 storm and Hurricane Iwa in 1982. Several interesting facts emerge in comparing the findings following the 1980 storm to those from the post-Hurricane Iniki study; the January 1980 event had a much

greater impact to the Kahe coral communities relative to Hurricane Iniki, (2) it caused considerable deposition of sand at many stations which in some cases caused burial of corals and (3) it was responsible for significant abrasion of many corals which was not obvious following Hurricane Iniki. The finger coral, *Porites compressa*, was present at many of monitoring stations in 1980 and by the time of the post-Iniki survey, this species contributed little to the coverage estimates at sampled stations. Because of its relatively delicate skeletal structure, *P. compressa* is prone to damage by storm surge (Dollar 1982) and the storms since 1980 have probably contributed to the decline of this species at many Kahe Point locations (Brock 1992a).

The energy from the high amplitude, short period waves generated by all three storm events (January 1980, November 1982 and September 1992) was dissipated in deeper water thus coral communities in these deeper areas were potentially exposed greater impact (see Dollar 1982, Walsh 1983). As noted by Coles and Fukuda (1984) fully 90 percent of the coral coverage offshore of the Kahe generating facility was at depths of 10 m or more prior to the January storm. These deeper water coral communities apparently received much of the damage in 1980 and again in 1982 with much of that damage occurring to the finger coral, *Porites compressa*. Brock (1992b) examining marine communities southeast of the Barbers Point Deep Draft Harbor two weeks after Hurricane Iniki, found considerable damage to corals below 13 m and the damage was greatest in areas exposed to a SSE swell. Coral communities inshore of this or those protected from a direct SSE swell direction, appeared to have suffered little impact. His observations included the disappearance of a large amount of loose coral rubble in the 12 to 22 m depth range where rubble that had accumulated intermittently along the base of a submarine cliff disappeared. Individual estimated volumes were in excess of 2,000 m³ over linear distances of 30-50 m and this material was not found within diving depths (here from shore to 30 m). This is a testament as to the power of such a storm.

As noted by Brock (1992a, page 5):

"The two storms preceding Hurricane Iniki produced opposite impacts subtidally with respect to the movement of sand offshore of the Kahe facility. The January 1980 storm resulted in the deposition of sand over many reef areas, thus burying or scouring benthic communities. In contrast, Hurricane Iwa resulted in 3 to 5 feet of sand being removed along the seaward edge of the reef exposing coral reef framework that had been formerly covered. Coles and Fukuda (1983) noted '...sand which had been deposited by the Kahe outfall and swept on to the reefs by previous storms was completely removed from along the entire reef front. The substratum available in the area is now similar to the conditions when marine monitoring began in 1973...'. It appears that Hurricane Iniki also removed sand from the area seaward of the forereef but to a much lesser extent than in the November 1982 event (i.e., up to 0.75 m in 1992 versus up to 1.5 m in 1982); perhaps the sand had not returned before the 11 September 1992 storm."

The three strong storms commencing in January 1980 and ending 12 years later with Hurricane Iniki documented tremendous change to the bottom communities in the Barbers Point - Kahe Point area. These changes to the benthic communities also created a negative impact to the

resident fish communities which has been documented elsewhere in Hawaii (Walsh 1983). Thus knowledge of the past environmental history can lead to a better understanding of the biological resources present in the area today. It is against this environmental history that the present study is assessed below.

METHODS

The fish communities at sixteen permanently marked sites are monitored on a quarterly schedule. These sixteen sites are located in the Barbers Point to Nanakuli area on the west coast of Oahu (see below). The monitoring of fish communities is carried out using a visual census method. The sampling protocol occurs in the following sequence: on arrival at a given station, the individual conducting the visual fish census enters the water and carries out the visual census over a 50 m long by 4 m wide corridor run parallel to shore. (Only station 16, which is located on the HECO discharge, runs perpendicular to shore). All fishes within this area to the water's surface are counted. Data collected include the species, numbers of individuals and an estimate of the length of each individual fish counted. The length data are later converted to standing crop estimates using linear regression techniques. The single diver equipped with SCUBA, transect line, slate and pencil enters the water, counts and notes all fishes in the prescribed area (method modified from Brock 1954). The 50 m transect line is paid out as the census progresses, thereby avoiding any previous underwater activity in the area which could frighten wary fishes. The length data are used in making estimates of biomass for each species present coupling the length data with species-specific regression coefficients (Ricker, 1975, Brock and Norris 1989)

Fish abundance and diversity is often related to small-scale topographical relief over short linear distances. A long transect may bisect a number of topographical features (e.g., cross coral mounds, sand flats and algal beds), thus sampling more than one community and obscuring distinctive features of individual communities. To alleviate this problem, a relatively short transect (50 m in length) has proven adequate in sampling many Hawaiian benthic communities. In addition, the transect length used by Coles *et al.* (1985a) was also 50 m thus making the present counts collected under this program comparable to the earlier data collected by HECO.

Besides frightening wary fishes, other problems with the visual census technique include the underestimation of cryptic species such as moray eels (family Muraenidae) and nocturnal species, e.g. squirrelfishes (family Holocentridae), aweoweos or bigeyes (family Priacanthidae), etc. This problem is compounded in areas of high relief and coral coverage affording numerous shelter sites. Species lists and abundance estimates are more accurate for areas of low relief, although some fishes with cryptic habits or protective coloration (e.g., the nohus, family Scorpaenidae; the flatfishes, family Bothidae) might still be missed. Obviously, the effectiveness of the visual census technique is reduced in turbid water and species of fishes which move quickly and/or are very numerous may be difficult to count and to estimate individual sizes. Additionally, bias related to the experience of the diver conducting counts should be considered in making any comparison between surveys. In spite of these drawbacks, the visual census technique probably provides the most accurate nondestructive method available for the

assessment of diurnally-active fishes (Brock 1982).

In the analysis of the data, all fishes encountered were classified as to their primary foraging behavior as a means to better understand the trophic relationships in the fish communities. These functional groups are carnivores which includes all fishes feeding on other coral reef animals (fish and invertebrates) greater than zooplankton in size, planktivores which are species that feed primarily on zooplankton and detritus in the watercolumn, herbivores which are species feeding primarily on algae, omnivores which are usually small species that feed on a combination of algae and benthic animals and the coral feeders which are a specialized group of fishes that feed on coral polyps and mucous. The determination of which species were in each feeding guild utilized the findings of Hiatt and Strasburg (1960), Hobson (1974) and Brock *et al.* (1979). Primarily nonparametric statistical procedures are used thus avoiding the requirements for normality in the data, etc. that are necessary in parametric statistical analyses.

RESULTS AND DISCUSSION

1. Station Locations

To assess the status of coral reef fish communities in the Kahe-Barbers Point area, sixteen permanently marked stations were established. These stations are spread along 7.9 km (4.9 miles) of coastline fronting the proposed CIP Generating Station at Barbers Point on the southeast to the south boundary of the Nanakuli Beach Park on the northwest and their locations are shown in Figure 1. The locations of eight of these stations are new and the remainder are stations established by the HECO environmental monitoring program in the 1970's. Four stations are located offshore of Campbell Industrial Park at Barbers Point in waters from 7 to about 10 m in depth. These stations (Station nos. 1 - 4, Table 1) monitor the status of fish communities in closest proximity to the CIP Generation site and are located to the southeast of the Barbers Point Harbor entrance channel. Two stations are located northwest of the Barbers Point Harbor entrance channel fronting the Ko'Oolina Resort and Paradise Cove area (Station nos. 5 and 6, Table 1). Again the water depths at these two stations is from 7 to 9 m. Coles *et al.* (1985) monitored fish community structure at seven stations fronting and adjacent to the Hawaiian Electric Company's Kahe Generation Station. These seven stations are also monitored in the present study (here numbered as Station nos. 7 through 13 in Table 1) to obtain information on the status of these fish communities today but also to compare the fish community structure today to what was present at these locations more than 25 years ago. These stations are in water ranging from 5 m to 12 m in depth.

The old Hawaiian Electric environmental monitoring program also monitored a control station offshore of Nanakuli (Coles *et al.* 1985a) which has also been added to the stations monitored under the present program (here Station 14, Table 1). A second control station (Station 15, Table 1) approximately 70 m north of Station 14 has been established for the present monitoring program. Finally Station 16 was established on the Kahe discharge pipe directly offshore of the generating facility in water from 5 to 7 m in depth.

As noted above, the locations of all stations are shown in Figure 1. The “start point” for each station is marked using 90 cm long nylon cable ties and small subsurface floats that are tied to the substratum in proximity to the start point for each transect. Because of high public use by dive tour operators and individuals SCUBA diving from shore fronting the Kahe Generating Station, Stations 7 - 12 as well as Station 16 have not been marked but rely on prominent natural points on the local substratum. Past experience in permanently marking biological monitoring stations in “high use” areas results in divers removing materials of anthropogenic origin thus destroying and negating this method for relocation of stations. Low cost modern global positioning systems (GPS) can put the diver/monitor within a few feet of any known point. The GPS waypoints for each of the 16 stations sampled in this study are given in Table 1.

2. The 2007-2008 Data

Fish transect data have been collected on five occasions commencing on 27 December 2007. In 2008, transect work was carried out on 4 April, 30 May, 19 August and on 25 November. As noted above, sixteen stations are routinely sampled in this study and all data are presented in Appendix 1. In the first survey, twelve of the sixteen stations were sampled; missing were stations 4 (East 4), 5 and 6 (Ko’olina 1 and 2) and 16 (HECO discharge pipe). The second survey carried out on 4 April only missed one site, station 16 (the HECO discharge pipe) and by the third survey on 30 May 2008 all sixteen sites were sampled. The HECO thermally-elevated discharge (station 16) was added as a monitoring station because of the well-developed fish community present at that location. Because station 16 is unusual with a highly developed community on a man-made structure, it is treated separately in many of the analyses below. In total, 122 species of fishes were censused in these first five surveys and these are given in Appendix 1.

Table 2 presents a summary of the 2007-2008 data given in Appendix 1. Drawing from some of these data and excluding station 16, we may ask the question, “Are there any statistically significant differences among the mean number of fish species seen per transect, the mean number of individual fish censused per transect or the mean estimated total standing crop (in grams) among the five 2007-2008 sample periods?” To address this question two nonparametric tests were used: the Kruskal-Wallis analysis of variance (ANOVA) and the Student-Newman-Kuels (SNK) Test. The Kruskal-Wallis ANOVA is able to demonstrate statistically significant differences among parameter means (by date) but cannot show where those differences are. The SNK Test is used to group related sample means and separate those means that are significantly different from one another. The results of these analyses are given in Table 3. Referring to Table 3, the Kruskal-Wallis ANOVA noted no statistically significant differences exist among the means for each of the five sample dates for the number of fish species per transect, the number of individual fish censused per transect or for the total estimated fish standing crop per transect.

Station 16 established on the terminus of the Kahe Generating Station discharge pipe is discussed separately because it is a man-made structure deployed in an area of sand bottom and

having a $3,193.5 \text{ m}^3 \times 10^3/\text{day}$ discharge at its terminus. The topographical relief afforded by the steel and basalt rock substratum is considerably more attractive to many fishes than the nearby surrounding natural reefs and the discharge of thermally-elevated water serves to attract many fishes. These features result in an enhancement of the local fish community making the structure of the fish community very different than that of any other of the fifteen natural reef sites sampled in this study. Thus as noted above, the results of fish censuses undertaken at station 16 are discussed separately.

The fishes censused in the five recent December 2007 - November 2008 surveys were assigned to one of five trophic categories or feeding guilds. As noted above, these are herbivores (species that feed on algae), planktivores or species that feed up in the water column on zooplankton, omnivores that feed both on plant material as well as small animals, coral feeders which are a specialized group feeding on coral tissue and mucous, and the carnivores which are species feeding on fishes and invertebrates found on coral reefs. Of the 122 species of fishes encountered in the December 2007 through November 2008 surveys, 19 species (or 16% of the total) are herbivores, 11 species (9%) are planktivores, 8 species (7%) are omnivores, 7 species (6%) are coral feeders and the remainder or 77 species (62%) are classed as carnivores. The assignment of fish species to the five trophic categories are given in Appendix 1 for species encountered on each transect and survey date. Table 4 summarizes the feeding guild information by survey date providing the mean percent contribution by weight of each trophic category for stations in two groups; the first group includes stations 1 through 15 (natural substratum) and the second group considers only station 16 (the Kahe outfall station). Although the data in Table 4 are in summary form, two facts emerge, (1) that the majority (here 83%) of the weight of fishes censused at the first fifteen stations is comprised of herbivores and carnivores and (2) the importance of herbivores is largely replaced by planktivores at the Kahe outfall station (station 16) but carnivores remain important as they are elsewhere. The large volume of thermally-elevated water ($3193.5 \text{ m}^3 \times 10^3/\text{day}$) is probably serving both as a source of food (entrained particles that have passed through the plant) as well as a warm and strong unidirectional current serving to attract and hold planktivorous species that naturally orient into the current seeking food. In addition and as mentioned above, the steel and armor rock superstructure that cover the discharge pipe provide habitat shelter and for some species a substratum for spawning. A considerable part of the planktivore biomass at station 16 is comprised of two sergeant major or mamo species (*Abudefduf abdominalis* and the recently recognized *Abudefduf vaigiensis*) both of which not only feed in the discharge plume and environs, but also lay demersal eggs on the rocky substratum. These two species dominate the planktivore biomass at this site making up 67% of the planktivore biomass in the May survey, 93% of it in the August survey and 77% of the estimated planktivore biomass present in the November 2008 survey.

3. Differences in Fish Community Structure in the Study Area

This study was undertaken to follow changes in coral reef fish communities as part of the environmental monitoring program related to the development of the CIP generation facility. Sixteen sites spread along 7.9 km of coastline are monitored (Figure 1); referring to Figure 1,

these sites geographically fall into four groups: on the southeast are four stations offshore of Campbell Industrial Park and the future generation plant (station nos. 1-4 or East 1 through 4), three stations seaward of Ko'Olina Resort (station nos. 5-7 or Ko'Olina 1 and 2 as well as HECO 1D), five stations fronting the Kahe generation facility (station nos. 8-12 or HECO 5B, 7B, 7C, 7D, and 7E) and three stations to the north of Kahe Point (station nos. 13-15 or HECO 10C, Nanakuli 1 and 2). Because station 16 (the Kahe discharge pipe) is a man-made structure and not natural substratum like the other fifteen monitored sites, it is excluded from the present analysis.

The question, "Are there any statistically significant differences among the mean number of fish species per transect, the mean number of individual fish per transect or the mean estimated standing crop (in g/m²) per transect among the four above geographic groups of stations established on natural substratum and sampled in the 2007-08 period?" can be answered again using the Kruskal-Wallis ANOVA and the SNK Test. The results of these statistical procedures are given in Table 5. As noted previously, the Kruskal-Wallis ANOVA can discern whether means differ significantly but cannot separate those that are thus the SNK Test is used to demonstrate which means differ significantly from the others. In the case of the mean number of fish species per transect in each of the four geographic areas, the ANOVA noted a significant difference exists and the SNK Test demonstrated that the three stations offshore of Ko'Olina have a significantly greater number of fish species than found at any of the other three station groups all of which are related. Coral community development (coverage) appears to be greater at the three Ko'Olina stations than found at any of the transect sites and may be responsible for the greater diversity of species present there. However, the ANOVA and the SNK Test failed to find any statistically significant differences with the mean number of individual fish per transect among the four groups of stations (Table 5 part 2). Finally, the Kruskal-Wallis ANOVA did find statistically significant differences in the mean estimated standing crop of fishes per transect among the four station groups but the SNK Test failed to find any significant separation suggesting that the means are not significantly different (Table 5 part 3).

Summarizing the results as given in Table 5, several largely non-significant trends are apparent. First, the diversity of fish species, the numbers of fishes counted and their estimated biomass are greatest at the three Ko'Olina stations (station nos. 5-7) and are least at the four stations offshore of Campbell Industrial Park (station nos. 1-4). The development of benthic communities including corals is greater at Ko'Olina than found offshore of Campbell Industrial Park where the topographical complexity which often serves as shelter for fishes is probably the least among the four station groups. Benthic community development which includes the development of corals and topographical complexity are probably less at the Kahe (station nos. 8-12) and the North group (station nos. 13-15) of stations relative to Ko'Olina but greater than found offshore of Campbell Industrial Park. Finally both the mean number of individual fishes censused per transect and the mean estimated biomass of fishes per transect were both greater at the north group of stations (station nos. 13-15) relative to the Kahe stations (station nos. 8-12) but with the mean number of fish species per transect, the Kahe group of stations had more (Kahe = 23 species/transect versus North = 21 species/transect).

The final statistical analysis of the 2007-2008 fish census data examined the mean number of fish species per transect, the mean number of individual fish per transect and the mean fish biomass per transect (in g/m²) examining each of the sixteen stations again using the Kruskal-Wallis ANOVA and the SNK Test. In this analysis, the question is “Are there any statistically significant differences between the mean number of fish species per transect, the mean number of individual fish per transect or the mean estimated standing crop among the 16 stations sampled in 2007-2008?” and the results are given in Table 6. Referring to Table 6, two simple facts emerge: (1) the Kahe discharge pipe station has the greatest mean number of fish species, individuals (significantly greater) and standing crop (significantly greater) over all other stations and (2) the means from all of the other fifteen stations are all related due to overlap in the SNK Test results (for the mean number of species and individuals) or due to no significant differences (for biomass).

4. Fishery Resources

Appendix 1 provides a list of all fish species seen over the five 2007-2008 surveys. Among these are both species that are sought-after by commercial, subsistence and recreational fishers as well as species that are usually not. In the usually sought-after group of species, most of the individual fishes encountered on the transects were juveniles but occasionally adult individual fishes were seen. Among the species seen include a number of small schools of the mackerel scad or opelu (*Decapterus macarellus*) especially around stations fronting the Kahe Generating facility in the December 2007 survey and scattered through the various stations and sample dates were seen adults of the moano kea (*Parupeneus cyclostomus*), omilu (*Caranx melampygus*), smaller individuals (papiro) of the barred jack (*Carangoides ferdau*), lemon spot jack (*C. orthogrammus*), ulua aukea (*Caranx ignobilis*), pa’opa’o (*Gnathanodon speciosus*). Adults of other species seen include the lai (*Scomberoides lysan*), uku (*Aprion virescens*), wahanui (*Aphareus furca*), the introduced ta’ape (*Lutjanus kasmira*) especially at stations 13 and 16 and to’au (*Lutjanus fulvus*), weke (*Mulloidichthys flavolineatus*), weke’ula (*M. vanicolensis*), munu (*Parupeneus insularis*), moano (*P. multifasciatus*), malu (*P. pleurostigma*) kumu (*P. porphyreus*), nenu (*Kyphosus sandwicensis*), a’awa (*Bodianus bilunulatus*), kupoupou (*Cheilio inermis*), po’ou (*Oxycheilinus unifasciatus*), laenihi (*Iniistius umbrilatus*), the parrotfishes or uhus (*Scarus rubroviolaceus*, *S. psittacus*, *S. sordidus*, *S. perspicillatus*, *Calotomus carolinus*), the surgeonfishes including paku’iku’i (*Acanthurus achilles*), palani (*A. dussumieri*), maikoiko (*A. leucoparicus*), ma’i’i’i (*A. nigrofuscus*), maiko (*A. nigroris*), na’ena’e (*A. olivaceus*), manini (*A. triostegus*), pualu (*A. xanthopterus* and *A. blochii*), kole (*Ctenochaetus strigosus*), kala lolo (*Naso brevirostris*), kala holo (*N. hexacanthus*), umaumalei (*N. lituratus*), kala (*N. unicornis*), paki’i (*Bothus pantherinus*), humuhumu ele’ele (*Melichthys niger*), humuhumu hi’ukole (*M. vidua*) and the loulou (*Aluterus scriptus*). Besides these species as adults, juveniles of these and other species (e.g., the mu - *Monotaxis grandoculis*) were seen. Many of the adult individual fishes in the highly sought-after group were seen at varying distances away from the actual census areas, thus do not appear in the station counts (Appendix 1).

Perhaps the most consistent location for finding many of the sought-after fish species both as

adults and as juveniles is on the armor rock and steel protective cover for the Kahe plant warm-water discharge (station 16). Because of the high degree of shelter afforded by the armor rock as well as the well-developed coral community present on it and also due to the outfall (discharge), many species congregate there. Among these are many mamo (two species recognized, the Hawaiian mamo - *Abudefduf abdominalis* and the recently recognized species *Abudefduf vaigiensis*). Under the cover of the rocks are seen menpachi (*Myripristes amaneus*), aweoweo (*Priacanthus cruentatus*) and 'upapalu (*Apogon kallopterus*). In the December 2007 survey an estimated 200 grey mullet or ama'ama (*Mugil cephalus*) were encountered at station 13. These fish had an average estimated length of 33 cm (~13 inches) contributing an estimated weight of 97.7 kilograms (215 lbs) to the standing crop at this station.

Many species other than fish are caught and consumed by people; among these are specific algae and a number of invertebrates. Some individuals are interested in the collection of shells and when these usually cryptic species are seen at a station, they are so noted. Two species of molluscs have been seen on several occasions in the 2007-2008 surveys; these are the tiger cowry (*Cypraea tigris*) and the triton shell (*Charonia tritonis*). A species important in the making of fishing lures is the pearl oyster or pa (*Pinctado margaritifera*) which is protected by law and is commonly seen at many of the survey sites. The octopus or he'e (*Octopus cyanea*) was occasionally encountered at some of the stations. Individual he'e ranged from less than a pound in weight up to an estimated four pounds. The sought-after alga, limu kohu (*Asparagopsis taxiformis*) is seasonally common at many of the stations sampled in this study.

5. Standing Crops

Coral reefs function as relatively closed systems and thus in the pristine situation may represent the accumulation of carbon over a considerable period of time (Johannes *et al.* 1972). Some of this carbon is tied up in the living biomass of the reef of which fishes are only a part. Goldman and Talbot (1975) have suggested that a reasonable maximum biomass of coral reef fishes is approximately 200 g/m² (or 2,000 kg/ha). Space and cover are important agents governing the distribution of coral reef fishes (Sale 1977). Similarly the standing crop of fishes on a reef is correlated with the degree of vertical relief of the substratum (Risk 1972). Studies conducted on coral reefs in Hawaii and elsewhere have estimated fish standing crops to range from 20 to 200 g/m² (Brock 1954, Goldman and Talbot 1975, Brock *et al.* 1979). Eliminating the direct impact of man due to fishing pressure and/or pollution, the variation in standing crop appears to be related to the variation in the local topographical complexity of the substratum which is governed, in part, by the degree of development in the coral community. Thus habitats with high structural complexity affording considerable shelter space usually harbor a greater estimated standing crop of coral reef fish; conversely, transects conducted in structurally simple habitats (e.g., sand flats) usually result in lower estimated standing crops (0.2 to 20 g/m²). Ongoing studies (Brock and Norris 1989) suggest that with the manipulation (increasing) of habitat space or food resources (Brock 1987), local fish standing crops may approach 2,000 g/m². Thus under certain circumstances, coral reefs may be able to support much larger standing crops of fishes than previously realized.

High standing crops (i.e., above 200 g/m²) were encountered during every survey at several stations. In the 27 December 2007 survey at station 9 where the estimated standing crop was 290 g/m², the opelu (*Decapterus macarellus*) made up 89% of this total at that location. Opelu are a coastal neritic species meaning that they school and move freely through the coastal waters which is very different than many coral reef fish species that have much smaller areas in which they forage. Similarly at station 13 where the standing crop was estimated to be 594 g/m², the school of grey mullet or ama'ama (*Mugil cephalus*) described above comprised 82% of the total biomass. Again, ama'ama are usually seasonal in their appearance in coastal waters and travel over large areas of Hawaii's waters. In the 4 April 2008 survey at station 2, a school of 60 adult na'ena'e (*Acanthurus olivaceus*) swam through the census area bringing the total estimated biomass to 238 g/m² and these fish comprised 84% of the total weight present at this station. The 30 May 2008 survey noted a high standing crop at station 16 (358 g/m²) where the mamo (*Abudefduf abdominalis* and *A. viagiensis*) made up 29% of the total and the kala lolo (*Naso brevirostris*) added 13% to the total estimated weight at this station. On 19 August 2008 at station 16 the estimated biomass was 396 g/m² and again, the mamo comprised 51% of the total and a school of opelu passed through the census area and contributed 22% to the standing crop present at this station. Finally in the 25 November 2008 survey at station 16 where the estimated standing crop was 225 g/m², the two mamo species again comprised 38% of the biomass present at that time.

6. Comparative Analysis of Early HECO Biological Data to the 2007-2008 Data

As noted above, HECO's environmental monitoring program for the Kahe Generating facility started in the 1970's, monitoring many of the same locations that are monitored today fronting the plant. These data are given in Coles *et al.* (1985b) and in a summary table (Table 33) in Coles *et al.* (1985a). Fish transect data from seven stations sampled in the 1976-1984 period fronting the Kahe Generating facility have been compared to the 2007-2008 data collected from those same sites. The sites include station 7 (old #1-D started in 1979), station 8 (old #5-B started in 1976), station 10 (old #7-C started in 1976), station 11 (old #7-D started in 1976), station 12 (old #7-E started in 1980), station 13 (old #10-C started in 1979) and station 14 (old Nanakuli control started in 1979). In this analysis, the annual means for the number of fish species and number of fish individuals encountered over those seven station in common are compared addressing the question, "Are there any statistically significant differences among the annual mean number of fish species or annual mean number of individual fish censused per transect over the 1979-1984 and 2007-2008 periods?" Again, to address this question two nonparametric tests were used: the Kruskal-Wallis analysis of variance (ANOVA) and the Student-Newman-Kuels (SNK) Test where the Kruskal-Wallis ANOVA is used to demonstrate statistically significant differences among parameter means (by date) but cannot show where those differences are and the SNK Test is used to group related sample means and separate those means that are significantly different from one another.

The results of these analyses are given in Table 7 and referring to this table we find that there are no significant differences among either of the annual means for the number of fish species

seen per transect or the number of individual fish censused per transect despite the imposition of three major storm events. With respect to the annual mean number of species seen per transect, we find the greatest annual means occurring prior to the January 1980 storm event and the lowest mean (1983) occurring following Hurricane Iwa in 1982. With the annual mean number of individual fish seen per transect, the highest means occur with the recent (2007-2008) surveys and the lowest following Hurricane Iwa (1983) but the order among the dates does not parallel that for the fish species (Table 7). Thus not all species of fish were impacted to the same degree with the occurrence of these two early high wave events. Fish standing crop information was not readily available for Stations 7, 8, 10, 11, 12, 13 or 14 in the early (1976-1984) HECO dataset except for 1984 thus was not included in the above (Table 7) analysis. However, the nonparametric Wilcoxon Two-Sample Test was used to examine the mean estimated standing crop of fishes in 1984 at the above seven stations comparing this mean to the mean estimated biomass at these stations in the 2007-2008 dataset. Despite the mean estimated standing crop (here 45 g/m²) being greater in 2007-08 than in 1984 (26 g/m²), the Wilcoxon test failed to find any statistically significant differences ($p > 0.25$, n.s., where a $p > 0.05$ signifies significance) in the estimated standing crop at these seven stations sampled 22 years apart. Again the standing crop statistical results support those found with the mean number of fish species or the mean number of individual fish censused per transect (Table 7). In summary, there are no statistically significant differences among the annual mean number of fish species or individuals censused utilizing data that span a 32-year period (1976-2008) at seven monitoring stations fronting the Kahe Generating facility despite the imposition of three major storm events. These data suggest that the fish communities have to some extent recovered from these disturbances.

7. Federally Protected Species

When encountered during field work, federally protected species are noted. Five species that are encountered (or heard underwater) around the high Hawaiian Islands are the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*), the spinner porpoise (*Stenella longirostris*), the Hawaiian monk seal (*Monachus schauinslandi*) and present seasonally, the humpback whale (*Megaptera novaeangliae*).

Because of low population numbers, the Hawaiian green sea turtle was given protection under the federal Endangered Species Act in the mid-1970's. Green turtles as adults are known to forage and rest in the shallow waters around the main Hawaiian Islands. Reproduction in the Hawaiian population occurs primarily during the summer months in the Northwest Hawaiian Islands with adults migrating during the early summer to these isolated atolls and returning in the late summer or early fall. In the main Hawaiian Islands, green turtles rest along ledges, caves or around large coral mounds in coastal waters usually from 15 to 20 m in depth during the day. Under the cover of darkness, turtles will travel inshore to shallow subtidal and intertidal habitats for foraging on algae or limu. (Balazs *et al.* 1987). The normal range of these daily movements between resting and foraging areas is about one kilometer (Balazs 1980, Balazs *et al.* 1987). In general appropriate algal forage for these turtles is found in shallow waters inshore of the resting areas. Selectivity of algal species consumed by Hawaiian green turtles appears to vary with the

locality of sampling, but stomach content data show *Acanthophora spicifera* (an introduced species) and *Amansia glomerata* to quantitatively be the most important (Balazs *et al.* 1987); the preferences may be due to the ubiquitous distribution of these algal species.

The Hawaiian green turtle population has rebounded under the more than 30 years of federal protection afforded to it such that today, green turtles are commonly seen in the waters fronting most beaches around the islands. In contrast, the hawksbill turtle is much less common and much less is known about its biology in Hawaiian waters. Hawksbill turtles do not attain the size of green turtles in Hawaiian waters, nest on very small and isolated beaches around the main islands and are omnivorous in their feeding habitats. In the waters surveyed under the present study, no hawksbill turtles have been seen by us.

Green turtles were seen on four of the five surveys. All turtles seen were juveniles (i.e., having a carapace length estimated to be less than 75 cm). Some turtles were sleeping while others seen were actively swimming. There is a depression in the limestone at station 8 where green turtles often rest and in the 25 November 2008 survey six green turtles were found resting on the bottom in a depression just seaward of station 5.

For many years, Hawaiian monk seals were not seen very often around the main Hawaiian Islands but the population was located in the Northwest Hawaiian Islands and over time the population numbers have declined. Despite this, in recent years an increasing number of Hawaiian monk seals are now seen on the beaches around the main islands with the occasional female giving birth on island beaches. The reason(s) for these changes in the population are unknown but the result is monk seals are now occasionally seen while carrying out environmental surveys around the main islands. On the 30 May 2008 survey an adult male monk seal approached the vessel while at anchor at station 14. This seal carried a tag (not readable at distance) and it swam around the vessel and subsequently left heading towards the shoreline. This seal has not been seen subsequently.

It should be noted that the endangered humpback whale is known to frequent island waters in their annual migrations to Hawaiian wintering grounds. They normally arrive in island waters about December and depart by April. In general their distribution in Hawaii appears to be limited to the 180 m (100 fathom) isobath and in shallower waters (Nitta and Naughton 1989). Whales were seen well seaward of the Barbers Point - Kahe Point study area and their songs could be heard underwater during the 27 December 2007 survey.

Spinner porpoises are occasionally seen in the Kahe Point area and were first encountered there in this study on the 30 May 2008 survey where three pods were seen each having about 35 individuals present. Hawaiian spinner porpoises are known to rest in shallow bays during the day and at night move offshore to feed on midwater fishes and squids that rise to the surface to forage.

8. Long-Term Perspective on the Barbers Point-Kahe Point Fish Communities

As noted and documented above, the three early storm events (1980, 1982 and 1992) all impacted marine communities offshore of the Barbers Point - Kahe Point areas. These impacts were probably greatest on the coral communities which due to their sessile nature, must withstand the wave forces impinging on them or perish. Corals are relatively slow-growing and depending on the species, individual colonies may live for a considerable time and in doing so create habitat for fishes and other reef species. If disturbance to the coral community is relatively frequent, surviving corals probably do not contribute much to the three-dimensional structure of the habitat, thus keeping the fish community development in an earlier successional stage than it might otherwise be. Storms not only directly impact the living resources but also the geological status of reef areas. As noted by the early HECO studies, considerable sand movement occurred with the first two major storms such that today much of the area west of the Kahe facility's ocean outfall is now nearly devoid of sand leaving a near-featureless hard bottom that is scoured with passing small wave events which retards benthic and fish community development. A similar situation exists east of the Barbers Point Harbor entrance channel where considerable hard (limestone) substratum is present with much of it having poor benthic community development. This again results in a poorly developed resident fish community which is what we see in much of the area today and did so thirty years ago (personal observations). Thus the measures of fish community development used here (the diversity of species and numbers of individuals present as well as the standing crop) do not suggest well-developed resident fish communities at many of the sample sites. However where topographical complexity is greater and benthic communities are better developed, the resulting fish communities are well-developed. This is best illustrated at station 16 (the HECO warm water discharge) where despite high use which includes snorkel/dive tours as well as spear fishermen, the fish community remains relatively well-developed. The high degree of development in the resident fish communities on the Kahe discharge structure lend further support to the lack of negative impact due to the operation of the discharge.

Given the long-term extant data set spanning 32 years and the apparent lack of strong significant changes occurring with the three early (1980, 1982 and 1992) storm events (which is probably due to some level of recovery in the intervening period), suggests that the variation seen in the measures of the fish community used here will continue to fluctuate at a similar magnitude in future monitoring events as this program moves forward. The 32 years of well-documented environmental history for the Barbers Point - Kahe Point area (completed largely by the HECO environmental program), provides much of the explanation to the degree of development of resident fish communities we encounter in the area today.

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TABLE 1. Latitude and Longitude waypoints (in decimal minutes) for each of the sixteen permanently marked fish monitoring stations utilized in this study (GPS waypoints courtesy of the Environmental Department, HECO). Note that the first survey carried out on 27 December 2007 did not sample station numbers 5, 6, 7 and 16. The second survey on 4 April 2008 missed station 16 while surveys carried out on 30 May, 19 August and 25 November 2008 sampled all sites.

Station No.	Station Area Name	Latitude	Longitude	Remarks
1	East 1	21°18.237' N	158°07.024'W	New- offshore CIP
2	East 2	21°18.452'N	158°07.152'W	New - offshore CIP
3	East 3	21°18.558'N	158°07.239'W	New - offshore CIP
4	East 4	21°18.406'N	158°07.285'W	New - offshore CIP
5	Ko'Olina 1	21°19.724'N	158°07.581'W	New - offshore Ko'Olina
6	Ko'Olina 2	21°19.904'N	158°07.693'W	New - offshore Ko'Olina
7	HECO station 1D	21°20.763'N	158°07.773'W	Old HECO station
8	HECO station 5B	21°21.145'N	158°07.819'W	Old HECO station
9	HECO station 7B	21°21.239'N	158°07.855'W	Old HECO station
10	HECO station 7C	21°21.255'N	158°07.881'W	Old HECO station
11	HECO station 7D	21°21.268'N	158°07.893'W	Old HECO station
12	HECO station 7E	21°21.272'N	158°07.977'W	Old HECO station
13	HECO station 10C	21°21.522'N	158°07.925'W	Old HECO station
14	Nanakuli Control 1	21°22.329'N	158°08.440'W	Old HECO station
15	Nanakuli Control 2	21°22.353'N	158°08.462'W	New control station
16	On Outfall	21°21.193'N	158°07.869'W	New north side of outfall

TABLE 2. Summary of the fish censuses carried out at sixteen locations on five surveys over the December 2007 - November 2008 period. The percent of the total biomass is that assigned to each of five trophic categories: herbivores, planktivores, omnivores, carnivores and coral feeders is also given. Note that these percentages are rounded to the nearest whole number.

Sample Date	Transect No.	No. Species	No. Individuals	Biomass g/m ²	% Total biomass (g)				
					Herb.	Plankt.	Omni	Carni	CF
27Dec07	1	12	69	15	18		1	51	30
	2	19	155	143	87			9	4
	3	30	189	41	28		6	51	15
	4	Not sampled							
	5	Not sampled							
	6	Not sampled							
	7	28	306	92	40		40	19	1
	8	25	241	43	51	7	3	39	
	9	23	259	290	6	1	1	92	
	10	17	261	154		9	3	88	
	11	13	23	104	6		5	82	7
	12	34	581	63	21	1	24	51	3
	13	31	580	594	85	3	1	11	
	14	18	124	7	23	2	3	72	
	15	23	164	94	51		8	40	1
	16	Not sampled							
04Apr08	1	10	129	8		1	1	59	39
	2	25	333	238	89		1	9	1
	3	18	146	21	38		7	54	1
	4	25	270	116	57		3	37	3
	5	34	307	146	81	2	2	13	2
	6	31	292	164	67	1	2	29	1
	7	21	365	158	14		75	11	
	8	27	499	29	26	5	4	64	1
	9	17	75	74	25	1	1	73	
	10	11	117	8	42	1	5	52	
	11	6	21	4		1	2	97	
	12	25	390	31		1	15	79	5
	13	26	401	62	3	15	7	70	5
	14	12	260	14	1	1		98	
	15	17	214	129	83		1	15	1
	16	Not sampled							

TABLE 2. Continued.

Sample Date	Transect No.	No. Species	No. Individuals	Biomass g/m ²	% Total biomass (g)				CF
					Herb.	Plankt.	Omni	Carni	
30May08	1	12	77	9		1	17	82	
	2	21	220	64	65			34	1
	3	22	136	37	24		9	62	4
	4	30	293	49	28	1	23	45	3
	5	30	250	84	73		5	20	2
	6	32	265	132	77	1	7	14	1
	7	24	292	94	21		53	25	1
	8	26	412	75	70	9	1	20	
	9	21	152	95	21	67	1	11	
	10	21	167	55	60	14	3	23	
	11	12	81	21	35	2	37	26	
	12	25	453	14		4	28	60	8
	13	24	263	24	5	11	18	66	
	14	26	188	20	9		1	67	23
	15	13	80	34	69		3	26	2
	16	42	1205	358	8	43	2	47	
19Aug08	1	19	155	13	1		9	90	
	2	20	280	120	85		2	13	
	3	23	231	40	27		5	66	2
	4	26	415	108	43	8	6	43	
	5	24	227	69	67		9	22	2
	6	35	302	165	79	1	6	14	
	7	24	213	65	9		56	35	
	8	27	463	39	49	1	2	47	
	9	23	235	34	56	4	6	34	
	10	39	201	33	9	1	5	85	
	11	32	126	41	1	2	23	57	17
	12	23	514	33	19	2	13	56	10
	13	21	385	63	45	16	4	35	
	14	19	192	8	4	1		95	
	15	15	104	16	44	1	2	47	6
	16	37	1023	396	3	55	1	41	

TABLE 2. Continued.

Sample Date	Transect No.	No. Species	No. Individuals	Biomass g/m ²	% Total biomass (g)				
					Herb.	Plankt.	Omni	Carni	CF
25Nov08	1	6	20	2			6	53	40
	2	10	41	4	21		6	73	
	3	21	100	12	47	3	3	46	1
	4	20	165	79	54		1	45	
	5	31	289	91	81		1	17	1
	6	36	263	189	82	2	4	10	2
	7	31	394	60	37		36	27	
	8	33	147	29	49	6	1	43	1
	9	25	374	171	14	1		85	
	10	31	364	62	45	4	2	49	
	11	9	52	18	44	1	2	53	
	12	31	426	19	17	6	30	38	9
	13	32	931	155	20	57	4	18	1
	14	19	170	15	38		1	61	
	15	24	234	171	91		2	7	
	16	40	1017	225	10	49	1	39	1

TABLE 3. Results of the Kruskal-Wallis ANOVA and the Student-Neuman-Kuels (SNK) Test addressing the question, “Are there any statistically significant differences among the mean number of fish species seen per transect, the mean number of individual fish censused per transect or the mean estimated total standing crop (in g/m²) per transect for the first 15 stations among the five 2007-2008 sample periods?” The Kruskal-Wallis result is given as a “p” value at the top of the entry where (p>0.05 or less for significance). The SNK Test is used to separate means that are significantly different from one another. In the body of the table are given the sample date and mean for a given parameter on that date. Letters are used to show differences with the SNK Test; letters with the same designation show means and sample dates that are related and changes in letter designation show where significant differences exist. Overlaps in the letters indicate a lack of significant differences and in such cases, only the extremes may be significantly different.

1. Mean Number of Fish Species Per Transect (p>0.71, n.s.)

Date	(n)	Mean	SNK Grouping
Aug 08	15	24.7	A
Nov 08	15	23.9	A
Dec 07	12	22.8	A
May 08	15	22.6	A
Apr 08	15	20.3	A

Interpretation: There are no significant differences among the mean number of species found per transect over the five sample periods.

2. Mean Number of Individual Fish Per Transect (p>0.90, n.s.)

Date	(n)	Mean	SNK Grouping
Aug 08	15	270	A
Nov 08	15	265	A
Apr 08	15	255	A
Dec 07	12	246	A
May 08	15	222	A

Interpretation: There are no significant differences among the mean number of individual fish counted per transect over the five sample periods.

TABLE 3. Continued.

3. Mean Total Standing Crop of Fish Per Transect (g) ($p>0.83$, n.s.)

Date	(n)	Mean Total Biomass (g)	SNK Grouping
Dec 07	12	17,636	A
Apr 08	15	15,984	A
Nov 08	15	14,174	A
Aug 08	15	10,883	A
May 08	15	10,531	A

Interpretation: Despite the range in the estimated total standing crop per station over the five sample dates, there are no significant differences.

TABLE 4. Percent contribution based on estimated biomass for each of five feeding guilds of fishes as determined across all fifteen natural substratum stations sampled over five survey dates in Part A. In Part B is given the same information for station 16 (Kahe outfall pipe) which was sampled commencing with the 30 May 2008 survey. In the body of the table are given the percent contribution by weight to each trophic category. Note that the December 2007 survey did not sample three of the fifteen stations. Data summarized from Table 2.

PART A: Stations 1 - 15:

Mean Percent by Weight						
Date	(n)	Herbivore	Planktivore	Omnivore	Coral Feeder	Carnivore
27Dec07	12	35	2	8	5	50
04Apr08	15	35	2	8	4	51
30May08	15	37	7	14	3	39
19Aug08	15	36	2	10	3	49
25Nov08	15	43	5	6	4	42
Grand Means		37	4	9	4	46

PART B: Station 16 (Outfall Pipe) Only:

Mean Percent by Weight						
Date	(n)	Herbivore	Planktivore	Omnivore	Coral Feeder	Carnivore
30May08	1	8	43	2		47
19Aug08	1	3	55	1		41
25Nov08	1	10	49	1	1	39
Grand Means		8	49	1	0.3	42

TABLE 5. Results of the Kruskal-Wallis ANOVA and the Student-Neuman-Kuels (SNK) Test addressing the question, "Are there any statistically significant differences among the mean number of fish species per transect, the mean number of individual fish per transect or the mean estimated standing crop (in g/m²) per transect among the four geographic groups of stations established on natural substratum and sampled in the 2007-2008 period?" The four groups of transects are CIP (station nos. 1-4), Ko'Olina (station nos. 5-7), Kahe (station nos. 8-12) and North (station nos. 13-15). The Kruskal-Wallis result is given as a "p" value at the top of the entry where (p>0.05 or less for significance). The SNK Test is used to separate means that are significantly different from one another. In the body of the table are given the four geographically-related groups of stations and parameter means per transect for each of those groups. Letters are used to show differences with the SNK Test; letters with the same designation show means and station groups that are related and changes in letter designation show where significant differences exist. Overlaps in the letters indicate a lack of significant differences and in such cases, only the extremes may be significantly different.

1. Mean Number of Fish Species Per Transect by Station Group (p>0.004, Significant).

Station Group	(n)	Mean	SNK
			Grouping
Ko'Olina	12	29.4	A
Kahe	25	23.0	B
North	15	21.3	B
CIP	20	19.9	B

Interpretation: The mean number of fish species per transect at Ko'Olina stations is significantly greater than at any of the other station groups which are all related over the first five sample periods.

2. Mean Number of Individual Fish Per Transect by Station Group (p>0.09, n.s.)

Station Group	(n)	Mean	SNK
			Grouping
Ko'Olina	12	288	A
North	15	286	A
Kahe	25	265	A
CIP	20	187	A

Interpretation: Neither the Kruskal-Wallis ANOVA nor the SNK Test found any statistically significant differences in the mean number of individual fish censused per transect among the four station groups.

TABLE 5. Continued.

3. Mean Standing Crop of Fishes (in g/m²) Per Transect by Station Group (p>0.01, Significant)

Station Group	(n)	SNK	
		Mean	Grouping
Ko'Olina	12	118	A
North	15	94	A
Kahe	25	62	A
CIP	20	61	A

Interpretation: Despite the Kruskal-Wallis ANOVA finding a significant differences among station groups, the SNK Test failed to do so suggesting that the mean estimated fish standing crop per transect in a station group does not differ significantly among the four station groups.

TABLE 6. Results of the Kruskal-Wallis ANOVA and the Student-Neuman-Kuels (SNK) Test addressing the question, “Are there any statistically significant differences among the mean number of fish species per transect, the mean number of individual fish per transect or the mean estimated standing crop (in g/m²) per transect seen among the sixteen stations established and sampled over five periods in 2007-2008?” The Kruskal-Wallis result is given as a “p” value at the top of the entry (where p>0.05 or less for significance). The SNK Test is used to separate means that are significantly different from one another. In the body of the table are given the stations, the number of times each was sampled (n) and parameter means per transect for each. Letters are used to show differences with the SNK Test; letters with the same designation show means and station groups that are related and changes in letter designation show where significant differences exist. Overlaps in the letters indicate a lack of significant differences and in such cases, only the extremes may be significantly different.

1. Mean Number of Fish Species Per Station in 2007-08 (p>0.0001, Significant)

Station Group	(n)	Mean	SNK Grouping
#16 (Pipe)	3	40	A
#6 (Ko’Olina 2)	4	34	A B
#5 (Ko’Olina 1)	4	30	B C
#12 (HECO 7E)	5	28	B C
#8 (HECO 5B)	5	28	B C
#13 (HECO 10C)	5	27	B C
#4 (East 4)	5	26	B C D
#7 (HECO 1D)	4	25	B C D
#10 (HECO 7C)	5	24	B C D
#3 (East 3)	5	23	B C D E
#9 (HECO 7B)	5	22	B C D E
#2 (East 2)	5	19	C D E
#14 (Nana-1)	5	19	C D E
#15 (Nana-2)	5	18	C D E
#11 (HECO 7D)	5	14	D E
#1 (East 1)	5	12	E

Interpretation: Despite the Kruskal-Wallis ANOVA finding significant differences in the mean number of fish species per transect across the sixteen stations, these differences were obscured due to overlap in the SNK Test results. The Kahe Discharge Pipe had the greatest abundance of fish species; the mean number of species found at each station is directly related to the topographical complexity present which affords shelter to fishes.

TABLE 6. Continued.

2. Mean Number of Individual Fish Censused Per Station in 2007-08 ($p > 0.0001$, Significant)

Station Group	(n)	Mean	SNK Grouping
#16 (Pipe)	3	1,082	A
#13 (HECO 10C)	5	512	B
#12 (HECO 7E)	5	473	B C
#8 (HECO 5B)	5	352	B C D
#7 (HECO 1D)	5	316	C D E
#4 (East 4)	5	290	C D E F
#6 (Ko'Olina 2)	4	281	C D E F
#5 (Ko'Olina 1)	4	268	C D E F
#10 (HECO 7C)	5	222	D E F
#9 (HECO 7B)	5	219	D E F
#2 (East 2)	5	206	D E F
#14 (Nana-1)	5	187	D E F
#3 (East 3)	5	160	D E F
#15 (Nana-2)	5	159	D E F
#1 (East 1)	5	90	E F
#11 (HECO 7D)	5	61	F

Interpretation: The Kruskal-Wallis ANOVA noted statistically significant differences in the mean number of individual fish censused among the 16 transects over the five surveys in 2007-08. However, the SNK Test found only two clearly-obvious statistically significant stations (i.e., without overlap); these were with station 16 (Kahe discharge pipe) having significantly more individual fishes present than any other and station 11 (HECO 7D) where the number of individual fish censused was significantly less than all other stations.

(TABLE 6 Continued on next page)

TABLE 6. Continued.

3. Mean Estimated Fish Standing Crop (g/m²) by Station in 2007-08 (p>0.0001, Significant)

Station Group	(n)	Mean (g/m ²)	SNK Grouping
#16 (Pipe)	3	326	A
#13 (HECO 10C)	5	180	B
#6 (Ko'Oolina 2)	4	162	B
#9 (HECO 7B)	5	133	B
#2 (East 2)	5	114	B
#5 (Ko'Oolina 1)	4	98	B
#7 (HECO 1D)	4	94	B
#15 (Nana-2)	5	89	B
#4 (East 4)	5	89	B
#10 (HECO 7C)	5	62	B
#8 (HECO 5B)	5	43	B
#11 (HECO 7D)	5	38	B
#12 (HECO 7E)	5	32	B
#3 (East 3)	5	30	B
#14 (Nana-1)	5	13	B
#1 (East 1)	5	10	B

Interpretation: Only one station (Kahe Discharge) had a statistically greater estimated standing crop of fishes present than found at any of the other fifteen stations whose estimated standing crops are all related (i.e., having no statistical differences).

TABLE 7. Results of the Kruskal-Wallis ANOVA and the Student-Neuman-Kuels (SNK) Test addressing the question, “Are there any statistically significant differences among the annual mean number of fish species seen per transect or the annual mean number of individual fish censused per transect among seven stations sampled in common over eleven years encompassing a 31-year period (i.e., 1976-1984 and 2007-2008 sample periods)?” The Kruskal-Wallis result is given as a “p” value at the top of the entry where ($p > 0.05$ or less for significance). The SNK Test is used to separate means that are significantly different from one another. In the body of the table are given the sample date and mean for a given parameter on that date. Letters are used to show differences with the SNK Test; letters with the same designation show means and sample dates that are related and changes in letter designation show where significant differences exist. Overlaps in the letters indicate a lack of significant differences and in such cases, only the extremes may be significantly different.

1. Mean Number of Fish Species Per Transect ($p > 0.17$, n.s.)

Year	(n)	Mean	SNK Grouping
1976	3	29.0	A
1977	3	26.0	A
1979	6	24.3	A
1978	3	24.0	A
2008	7	23.6	A
1984	7	23.4	A
1980	6	23.2	A
2007	6	23.0	A
1981	6	19.2	A
1982	6	17.7	A
1983	6	15.8	A

Interpretation: There are no significant differences among the mean number of species found per transect at these seven stations among the eleven years of sampling. Note that the highest annual means occur before the January 1980 storm event and the lowest follow that period as well as after the November 1982 hurricane.

(Table 7 Continued on Next Page)

TABLE 7. Continued.

2. Mean Number of Individual Fish Per Transect ($p > 0.28$, n.s.)

Year	(n)	Mean	SNK Grouping
2008	7	303.1	A
2007	6	301.7	A
1980	6	250.3	A
1976	3	201.7	A
1979	6	195.0	A
1981	6	173.2	A
1978	3	169.0	A
1977	3	163.0	A
1984	7	150.0	A
1982	6	141.0	A
1983	6	85.8	A

Interpretation: There are no significant differences among the mean number of individual fish censused per transect at these seven stations among the eleven years of sampling. Note that the hierarchy of annual mean number of individual fish censused does not parallel that for the annual mean number of species counted at these stations. In other words, the impact of the two storm events (1980 and 1982) produced a different result with respect to the number of individual fish and the number of species counted.

FIGURE 1. Map showing the southwest coastline of Oahu from the Barbers Point Harbor on the southeast to Nanakuli Beach Park 7.9 km to the northwest. The approximate locations of each of the sixteen permanently marked 50-m long transect stations monitored in this study are numbered. All stations except station 16 have an orientation that parallels the coastline. Station 16 is established on the terminus of the Kahe Generating facility ocean warm-water outfall and thus has an orientation that is perpendicular to the shoreline. Map courtesy of the Environmental Department, HECO.



APPENDIX 1. Results of fish censuses carried out on each of five surveys carried out on 27 December 2007, 4 April 2008, 30 May 2008, 19 August 2008 and 25 November 2008 that comprise the data set for the first annual report. In the body of the table are given the list of fish species seen at each station, the trophic or feeding guild category for each species (where C=carnivore, H=herbivore, O=omnivore, P=planktivore and CF=coral feeder), the station number (here 1 through 16) as well as station name, the number of individuals of each species censused as well as the biomass (in grams) for each. Also given for each of the five trophic categories is a summary of the total number of individual fishes, the total standing crop and the percent of the total standing crop. Note that the total standing crop is given in grams and the area censused at each station is 200 m² except for station 11 (old HECO Station 7-D) which the census area is 10.5 m long and 4 m wide or 42 m². Biomass estimates for each species are based on species-specific regression coefficients using linear regression techniques (Ricker 1975, Brock and Norris 1989).

27 DECEMBER 2007 FIELD DATA

27-Dec-07		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT	
C	Gymnothorax meleagris	1	EAST - 1	1	73.651				
C	Plectroglyphidodon johnstonianus	1	EAST - 1	1	0.862				
C	Plectroglyphidodon imparipennis	1	EAST - 1	2	1.724				
C	Paracirrhites arcatus	1	EAST - 1	3	24.353				
C	Thalassoma duperrey	1	EAST - 1	11	301.295				
C	Thalassoma duperrey	1	EAST - 1	23	256.755				
C	Thalassoma duperrey	1	EAST - 1	4	219.796				
C	Stethojulis balteata	1	EAST - 1	7	250.344				
C	Halichoeres ornatus	1	EAST - 1	1	16.451				
C	Rhinecanthus rectangulus	1	EAST - 1	3	257.620				
C	Rhinecanthus rectangulus	1	EAST - 1	1	144.650	57	1547.499	50.5	
CF	Chaetodon quadrimaculatus	1	EAST - 1	1	25.304				
CF	Cantherhines dumerili	1	EAST - 1	3	903.981	4	929.285	30.3	
H	Acanthurus olivaceus	1	EAST - 1	1	563.170	1	563.170	18.4	
O	Canthigaster jactator	1	EAST - 1	7	24.935	7	24.935	0.8	
				69	3064.8888	69	3064.8888	100.0	
C	Gymnothorax meleagris	2	EAST - 2	1	44.696				
C	Cephalopholis argus	2	EAST - 2	1	638.289				
C	Cephalopholis argus	2	EAST - 2	1	471.730				
C	Plectroglyphidodon imparipennis	2	EAST - 2	3	2.586				
C	Thalassoma duperrey	2	EAST - 2	8	219.124				
C	Thalassoma duperrey	2	EAST - 2	2	194.104				
C	Thalassoma duperrey	2	EAST - 2	9	494.540				
C	Thalassoma duperrey	2	EAST - 2	13	145.122				
C	Coris venusta	2	EAST - 2	1	23.637				
C	Coris gaimard	2	EAST - 2	1	22.072				
C	Stethojulis balteata	2	EAST - 2	2	71.527				
C	Halichoeres ornatus	2	EAST - 2	2	71.087				
C	Halichoeres ornatus	2	EAST - 2	1	16.451				
C	Halichoeres ornatus	2	EAST - 2	1	25.137				
C	Rhinecanthus rectangulus	2	EAST - 2	3	257.620	49	2697.720	9.4	
CF	Chaetodon unimaculatus	2	EAST - 2	2	50.608				
CF	Chaetodon ornatus	2	EAST - 2	2	138.004				
CF	Cantherhines dumerili	2	EAST - 2	2	884.759	6	1073.371	3.7	
H	Scarus sordidus	2	EAST - 2	1	35.995				
H	Acanthurus triostegus	2	EAST - 2	16	1600.228				
H	Acanthurus nigrofasciatus	2	EAST - 2	2	47.794				
H	Acanthurus nigrofasciatus	2	EAST - 2	30	426.382				
H	Acanthurus olivaceus	2	EAST - 2	15	11649.072				
H	Acanthurus olivaceus	2	EAST - 2	16	9010.724				
H	Acanthurus blochii	2	EAST - 2	1	453.594				
H	Acanthurus blochii	2	EAST - 2	4	1322.680				
H	Acanthurus blochii	2	EAST - 2	3	293.929	88	24840.397	86.7	
O	Canthigaster jactator	2	EAST - 2	6	21.373	6	21.373	0.1	
P	Chromis vanderbilti	2	EAST - 2	6	1.895	6	1.895	0.0	
				155	28634.757	155	28634.757	100.0	
C	Gymnothorax eurostus	3	EAST - 3	1	38.536				
C	Cephalopholis argus	3	EAST - 3	1	336.423				
C	Cephalopholis argus	3	EAST - 3	1	1077.128				
C	Cephalopholis argus	3	EAST - 3	1	638.289				
C	Lutjanus fulvus	3	EAST - 3	1	104.244				
C	Parupeneus multifasciatus	3	EAST - 3	1	54.399				
C	Parupeneus multifasciatus	3	EAST - 3	1	27.117				
C	Parupeneus multifasciatus	3	EAST - 3	1	235.748				
C	Parupeneus cyclostomus	3	EAST - 3	1	88.571				
C	Plectroglyphidodon johnstonianus	3	EAST - 3	7	12.053				
C	Paracirrhites arcatus	3	EAST - 3	4	32.470				
C	Labroides phillipinus	3	EAST - 3	3	1.883				
C	Pseudochelinus octotaenia	3	EAST - 3	1	14.409				
C	Thalassoma duperrey	3	EAST - 3	1	97.052				
C	Thalassoma duperrey	3	EAST - 3	5	136.952				
C	Thalassoma duperrey	3	EAST - 3	9	494.540				
C	Gomphosus varius	3	EAST - 3	4	90.404				
C	Coris gaimard	3	EAST - 3	1	139.132				
C	Macropharyngodon geoffroy	3	EAST - 3	2	37.257				
C	Halichoeres ornatus	3	EAST - 3	4	100.548				
C	Halichoeres ornatus	3	EAST - 3	1	16.451				
C	Zanclus cornutus	3	EAST - 3	2	109.797				
C	Sufflamen bursa	3	EAST - 3	4	343.494	57	4226.897	51.1	
CF	Chaetodon ornatissimus	3	EAST - 3	2	138.004				
CF	Chaetodon multicinctus	3	EAST - 3	6	78.180				
CF	Cantherhines dumerili	3	EAST - 3	2	389.955				
CF	Cantherhines dumerili	3	EAST - 3	1	623.684	11	1229.823	14.9	
H	Calotomus carolinus	3	EAST - 3	1	131.686				
H	Scarus sordidus	3	EAST - 3	1	140.006				
H	Scarus sordidus	3	EAST - 3	1	76.013				
H	Scarus psittacus	3	EAST - 3	3	43.843				
H	Scarus rubroviolaceus	3	EAST - 3	1	43.918				
H	Scarus rubroviolaceus	3	EAST - 3	1	85.395				
H	Acanthurus nigrofasciatus	3	EAST - 3	17	241.616				
H	Acanthurus nigrofasciatus	3	EAST - 3	47	1123.161				
H	Ctenochaetus strigosus	3	EAST - 3	1	7.576				
H	Ctenochaetus strigosus	3	EAST - 3	3	80.532				
H	Naso lituratus	3	EAST - 3	1	205.988				
H	Naso lituratus	3	EAST - 3	1	127.734	78	2307.468	27.9	
O	Stegastes fasciatus	3	EAST - 3	19	280.501				
O	Melichthys vidua	3	EAST - 3	1	199.030				
O	Canthigaster jactator	3	EAST - 3	7	24.935	27	504.466	6.1	
P	Chromis vanderbilti	3	EAST - 3	16	5.054	16	5.054	0.1	
				189	8273.708	189	8273.708	100	

		27-Dec-07									
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT			
C	Myrpristis amaenus	7	KAHE 1-D	9	381.629						
C	Aulostomus chinensis	7	KAHE 1-D	1	88.501						
C	Parupeneus multifasciatus	7	KAHE 1-D	1	54.399						
C	Forcipiger flavissimus	7	KAHE 1-D	1	9.150						
C	Plectroglyphidodon johnstonianus	7	KAHE 1-D	4	6.887						
C	Paracirrhites forsteri	7	KAHE 1-D	1	39.647						
C	Cirrhlus pinnulatus	7	KAHE 1-D	1	44.589						
C	Labroides phthirophagus	7	KAHE 1-D	1	0.628						
C	Thalassoma duperrey	7	KAHE 1-D	17	465.638						
C	Thalassoma duperrey	7	KAHE 1-D	15	824.233						
C	Thalassoma duperrey	7	KAHE 1-D	5	485.260						
C	Thalassoma ballieui	7	KAHE 1-D	1	167.526						
C	Gomphosus varius	7	KAHE 1-D	7	158.207						
C	Zanclus cornutus	7	KAHE 1-D	2	109.797						
C	Rhinecanthus rectangulus	7	KAHE 1-D	2	171.747						
C	Sufflamen bursa	7	KAHE 1-D	6	515.240	74	3523.078	19.2			
CF	Chaetodon quadrimaculatus	7	KAHE 1-D	6	85.336						
CF	Chaetodon multicinctus	7	KAHE 1-D	4	52.120						
CF	Exallias brevis	7	KAHE 1-D	1	49.345	11	186.801	1.0			
H	Scarus psittacus	7	KAHE 1-D	5	396.340						
H	Scarus psittacus	7	KAHE 1-D	3	434.819						
H	Scarus psittacus	7	KAHE 1-D	8	302.981						
H	Scarus rubroviolaceus	7	KAHE 1-D	1	2267.962						
H	Acanthurus triostegus	7	KAHE 1-D	1	46.315						
H	Acanthurus nigrofuscus	7	KAHE 1-D	66	1577.205						
H	Acanthurus olivaceus	7	KAHE 1-D	7	656.382						
H	Acanthurus olivaceus	7	KAHE 1-D	19	902.062						
H	Ctenochaetus strigosus	7	KAHE 1-D	5	329.325						
H	Ctenochaetus strigosus	7	KAHE 1-D	12	322.127						
H	Zebbrasoma flavescens	7	KAHE 1-D	1	1.688	128	7237.2062	39.5			
O	Stegastes fasciatus	7	KAHE 1-D	12	311.763						
O	Melichthys niger	7	KAHE 1-D	43	7023.426						
O	Canthigaster jactator	7	KAHE 1-D	3	10.686	58	7345.875	40.1			
P	Chromis vanderbilii	7	KAHE 1-D	35	11.056	35	11.056	0.1			
				306	18304.016	306	18304.016	100			
C	Parupeneus multifasciatus	8	KAHE 5-B	2	192.163						
C	Parupeneus multifasciatus	8	KAHE 5-B	5	271.997						
C	Plectroglyphidodon imparipennis	8	KAHE 5-B	3	2.586						
C	Paracirrhites arcatus	8	KAHE 5-B	5	40.588						
C	Cirrhitops fasciatus	8	KAHE 5-B	1	8.225						
C	Thalassoma duperrey	8	KAHE 5-B	10	273.905						
C	Thalassoma duperrey	8	KAHE 5-B	8	776.416						
C	Thalassoma duperrey	8	KAHE 5-B	10	549.489						
C	Gomphosus varius	8	KAHE 5-B	3	186.087						
C	Gomphosus varius	8	KAHE 5-B	3	67.803						
C	Macropharyngodon geoffroy	8	KAHE 5-B	2	11.496						
C	Halichoeres ornatus	8	KAHE 5-B	2	32.901						
C	Zanclus cornutus	8	KAHE 5-B	2	109.797						
C	Rhinecanthus rectangulus	8	KAHE 5-B	3	257.620						
C	Sufflamen bursa	8	KAHE 5-B	6	515.240						
C	Arothron hispidus	8	KAHE 5-B	1	42.098	66	3338.411	38.4			
CF	Chaetodon quadrimaculatus	8	KAHE 5-B	2	28.445	2	28.445	0.3			
H	Scarus psittacus	8	KAHE 5-B	1	37.873						
H	Acanthurus triostegus	8	KAHE 5-B	1	46.315						
H	Acanthurus nigrofuscus	8	KAHE 5-B	53	1266.543						
H	Acanthurus nigrofuscus	8	KAHE 5-B	20	284.255						
H	Acanthurus olivaceus	8	KAHE 5-B	3	1689.511						
H	Acanthurus olivaceus	8	KAHE 5-B	4	654.066						
H	Naso lituratus	8	KAHE 5-B	1	448.942	83	4427.504	50.9			
O	Melichthys vidua	8	KAHE 5-B	1	199.030						
O	Cantherhines sandwichiensis	8	KAHE 5-B	1	82.051						
O	Canthigaster jactator	8	KAHE 5-B	1	3.562	3	284.643	3.3			
P	Chaetodon miliaris	8	KAHE 5-B	1	12.498						
P	Abudefduf abdominalis	8	KAHE 5-B	2	62.665						
P	Chromis vanderbilii	8	KAHE 5-B	77	24.324						
P	Naso brevirostris	8	KAHE 5-B	7	513.506	87	612.992	7.1			
				241	8691.9961	241	8691.9961	100			
C	Decapterus macarellus	9	KAHE 7-B	65	31286.525						
C	Decapterus macarellus	9	KAHE 7-B	105	20121.519						
C	Mulloidops flavolineatus	9	KAHE 7-B	1	269.341						
C	Parupeneus multifasciatus	9	KAHE 7-B	1	11.052						
C	Parupeneus multifasciatus	9	KAHE 7-B	1	235.748						
C	Paracirrhites arcatus	9	KAHE 7-B	2	16.235						
C	Cheilinus bimaculatus	9	KAHE 7-B	3	12.296						
C	Cheilinus bimaculatus	9	KAHE 7-B	2	38.735						
C	Pseudochelinus octotaenia	9	KAHE 7-B	1	14.409						
C	Pseudochelinus tetrataenia	9	KAHE 7-B	1	4.001						
C	Thalassoma duperrey	9	KAHE 7-B	4	219.796						
C	Thalassoma duperrey	9	KAHE 7-B	1	97.052						
C	Thalassoma duperrey	9	KAHE 7-B	1	3.151						
C	Stethojulis balteata	9	KAHE 7-B	4	18.005						
C	Halichoeres ornatus	9	KAHE 7-B	1	9.524						
C	Zanclus cornutus	9	KAHE 7-B	1	54.899						
C	Sufflamen bursa	9	KAHE 7-B	5	429.367						
C	Sufflamen bursa	9	KAHE 7-B	3	433.949	202	53253.600	91.7			
CF	Chaetodon multicinctus	9	KAHE 7-B	2	13.313						
CF	Cantherhines dumerili	9	KAHE 7-B	1	117.961						
CF	Cantherhines dumeril	9	KAHE 7-B	1	65.104	4	196.378	0.3			
H	Scarus sordidus	9	KAHE 7-B	1	775.068						
H	Acanthurus triostegus	9	KAHE 7-B	4	185.260						
H	Acanthurus nigrofuscus	9	KAHE 7-B	3	71.691						
H	Acanthurus olivaceus	9	KAHE 7-B	10	2516.671	18	3648.691	6.3			
O	Melichthys vidua	9	KAHE 7-B	1	199.030						
O	Canthigaster coronata	9	KAHE 7-B	1	7.591						
O	Canthigaster jactator	9	KAHE 7-B	3	10.686	5	217.307	0.4			
P	Chromis vanderbilii	9	KAHE 7-B	24	7.581						
P	Naso brevirostris	9	KAHE 7-B	6	738.708	30	746.290	1.3			
				259	58062.265	259	58062.265	100			

27-Dec-07		NO.		NO.		GROUP	GROUP
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	BIOMASS	PERCENT
C	Gymnothorax meleagris	10	KAHE 7 -C	1	233.915		
C	Uropterygius tigrinus	10	KAHE 7 -C	1	52.216		
C	Decapterus macarellus	10	KAHE 7 -C	120	22996.021		
C	Decapterus macarellus	10	KAHE 7 -C	17	837.556		
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	96.081		
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	155.422		
C	Parupeneus multifasciatus	10	KAHE 7 -C	3	33.155		
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	54.399		
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	340.443		
C	Plectroglyphidodon johnstonianus	10	KAHE 7 -C	1	1.722		
C	Paracirrhites arcatus	10	KAHE 7 -C	3	24.353		
C	Cheilinus bimaculatus	10	KAHE 7 -C	3	12.296		
C	Cheilinus bimaculatus	10	KAHE 7 -C	1	19.367		
C	Cheilinus bimaculatus	10	KAHE 7 -C	1	9.634		
C	Thalassoma duperrey	10	KAHE 7 -C	3	164.847		
C	Thalassoma duperrey	10	KAHE 7 -C	1	11.163		
C	Thalassoma duperrey	10	KAHE 7 -C	3	3.852		
C	Thalassoma duperrey	10	KAHE 7 -C	1	27.390		
C	Thalassoma duperrey	10	KAHE 7 -C	2	194.104		
C	Coris gaimard	10	KAHE 7 -C	1	215.884		
C	Coris gaimard	10	KAHE 7 -C	1	83.785		
C	Zanclus cornutus	10	KAHE 7 -C	1	54.899		
C	Sufflamen bursa	10	KAHE 7 -C	1	85.873		
C	Sufflamen bursa	10	KAHE 7 -C	4	578.598		
O	Balistes polylepis	10	KAHE 7 -C	1	623.454	174	26910.432
O	Melichthys vidua	10	KAHE 7 -C	4	796.120		87.6
O	Canthigaster coronata	10	KAHE 7 -C	2	27.302		
O	Canthigaster coronata	10	KAHE 7 -C	4	30.364		
O	Canthigaster jactator	10	KAHE 7 -C	5	17.810		
O	Canthigaster jactator	10	KAHE 7 -C	1	2.205	16	873.802
P	Chromis vanderbilti	10	KAHE 7 -C	61	19.269		2.8
P	Naso brevirostris	10	KAHE 7 -C	5	1947.112		
P	Naso brevirostris	10	KAHE 7 -C	5	953.720	71	2920.101
				261	30704.335	261	30704.335
							100
C	Fistularia commersoni	11	KAHE 7 -D	1	253.559		
C	Parupeneus cyclostomus	11	KAHE 7 -D	2	880.904		
C	Plectroglyphidodon johnstonianus	11	KAHE 7 -D	1	0.862		
C	Cheilio inermis	11	KAHE 7 -D	1	965.720		
C	Cheilinus bimaculatus	11	KAHE 7 -D	1	9.634		
C	Cheilinus bimaculatus	11	KAHE 7 -D	4	16.395		
C	Cheilinus bimaculatus	11	KAHE 7 -D	1	19.367		
C	Coris ballieui	11	KAHE 7 -D	1	2.257		
C	Sufflamen bursa	11	KAHE 7 -D	2	289.299		
C	Sufflamen bursa	11	KAHE 7 -D	1	85.873		
C	Balistes polylepis	11	KAHE 7 -D	1	1050.178	16	3574.048
CF	Cantherhines dumerili	11	KAHE 7 -D	1	301.327	1	301.327
H	Acanthurus olivaceus	11	KAHE 7 -D	1	261.667	1	261.667
O	Melichthys vidua	11	KAHE 7 -D	1	199.030		6.0
O	Canthigaster coronata	11	KAHE 7 -D	2	27.302		
O	Canthigaster jactator	11	KAHE 7 -D	2	7.124	5	233.456
				23	4370.4982	23	4370.4982
							100
C	Fistularia commersoni	12	KAHE 7 -E	1	130.634		
C	Caranx melampygus	12	KAHE 7 -E	1	1814.3696		
C	Parupeneus multifasciatus	12	KAHE 7 -E	3	163.198		
C	Parupeneus multifasciatus	12	KAHE 7 -E	18	488.098		
C	Parupeneus multifasciatus	12	KAHE 7 -E	1	96.081		
C	Parupeneus cyclostomus	12	KAHE 7 -E	1	1266.895		
C	Plectroglyphidodon johnstonianus	12	KAHE 7 -E	2	1.724		
C	Paracirrhites arcatus	12	KAHE 7 -E	4	32.470		
C	Cheilinus bimaculatus	12	KAHE 7 -E	4	16.395		
C	Cheilinus bimaculatus	12	KAHE 7 -E	3	58.102		
C	Pseudocheilinus octotaenia	12	KAHE 7 -E	3	43.227		
C	Novaculichthys taeniourus	12	KAHE 7 -E	1	31.593		
C	Thalassoma duperrey	12	KAHE 7 -E	9	246.514		
C	Thalassoma duperrey	12	KAHE 7 -E	10	549.489		
C	Thalassoma duperrey	12	KAHE 7 -E	1	97.052		
C	Coris venusta	12	KAHE 7 -E	1	86.864		
C	Coris venusta	12	KAHE 7 -E	1	23.637		
C	Macropharyngodon geoffroy	12	KAHE 7 -E	7	76.852		
C	Halichoeres ornatus	12	KAHE 7 -E	3	49.352		
C	Zanclus cornutus	12	KAHE 7 -E	2	109.797		
C	Sufflamen bursa	12	KAHE 7 -E	1	144.650		
C	Sufflamen bursa	12	KAHE 7 -E	5	429.367		
C	Balistes polylepis	12	KAHE 7 -E	1	461.252	83	6417.6124
CF	Chaetodon multicinctus	12	KAHE 7 -E	6	39.939		51.1
CF	Pervagor melanocephalus	12	KAHE 7 -E	1	9.751		
CF	Cantherhines dumerili	12	KAHE 7 -E	1	65.104		
CF	Cantherhines dumerili	12	KAHE 7 -E	1	194.977	9	309.772
H	Calotomus carolinus	12	KAHE 7 -E	1	13.463		2.5
H	Scarus sordidus	12	KAHE 7 -E	4	14.121		
H	Scarus psittacus	12	KAHE 7 -E	5	73.072		
H	Acanthurus triostegus	12	KAHE 7 -E	2	92.630		
H	Acanthurus nigrofasciatus	12	KAHE 7 -E	18	135.443		
H	Acanthurus olivaceus	12	KAHE 7 -E	7	79.253		
H	Acanthurus olivaceus	12	KAHE 7 -E	3	1689.511		
H	Acanthurus dussumieri	12	KAHE 7 -E	2	5.226		
H	Zebrasoma flavescens	12	KAHE 7 -E	2	106.560		
H	Naso lituratus	12	KAHE 7 -E	1	36.343		
H	Naso unicornis	12	KAHE 7 -E	1	389.422	46	2635.044
O	Melichthys niger	12	KAHE 7 -E	15	2450.032		21.0
O	Melichthys vidua	12	KAHE 7 -E	3	597.090		
O	Canthigaster jactator	12	KAHE 7 -E	5	11.026	23	3058.149
P	Chromis vanderbilti	12	KAHE 7 -E	410	129.516		24.4
P	Chromis hanui	12	KAHE 7 -E	10	7.466	420	136.982
				581	12557.558	581	12557.558
							100

		27-Dec-07		NO.		NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS			
C	Aulostomus chinensis	13	KAHE 10	1	210.618			
C	Lutjanus kasmira	13	KAHE 10	36	3958.513			
C	Lutjanus kasmira	13	KAHE 10	13	3992.126			
C	Parupeneus multifasciatus	13	KAHE 10	3	288.244			
C	Parupeneus multifasciatus	13	KAHE 10	6	932.534			
C	Parupeneus multifasciatus	13	KAHE 10	3	163.198			
C	Parupeneus multifasciatus	13	KAHE 10	1	340.443			
C	Parupeneus cyclostomus	13	KAHE 10	1	143.716			
C	Plectroglyphidodon johnstonianus	13	KAHE 10	2	1.724			
C	Paracirrhites arcatus	13	KAHE 10	3	24.353			
C	Thalassoma duperrey	13	KAHE 10	24	657.371			
C	Thalassoma duperrey	13	KAHE 10	10	970.520			
C	Thalassoma duperrey	13	KAHE 10	19	1044.029			
C	Coris gaimard	13	KAHE 10	1	83.786			
C	Stethojulis balteata	13	KAHE 10	4	143.054			
C	Macropharyngodon geoffroy	13	KAHE 10	1	18.629			
C	Zanclus cornutus	13	KAHE 10	1	54.899			
C	Sufflamen bursa	13	KAHE 10	3	257.620	132	13285.38	11.2
H	Mugil cephalus	13	KAHE 10	200	97665.023			
H	Calotomus carolinus	13	KAHE 10	1	13.463			
H	Scarus psittacus	13	KAHE 10	5	73.072			
H	Scarus rubroviolaceus	13	KAHE 10	1	18.635			
H	Acanthurus triostegus	13	KAHE 10	2	34.333			
H	Acanthurus triostegus	13	KAHE 10	4	185.260			
H	Acanthurus leucopareus	13	KAHE 10	1	66.740			
H	Acanthurus nigrofusus	13	KAHE 10	10	238.970			
H	Acanthurus nigrofusus	13	KAHE 10	5	71.084			
H	Acanthurus olivaceus	13	KAHE 10	10	1635.164			
H	Acanthurus dussumieri	13	KAHE 10	5	44.090			
H	Acanthurus blochii	13	KAHE 10	5	61.235			
H	Acanthurus blochii	13	KAHE 10	2	195.953			
H	Naso lituratus	13	KAHE 10	1	205.988			
H	Naso lituratus	13	KAHE 10	1	127.734	253	100635.73	84.7
O	Stegastes fasciatus	13	KAHE 10	9	233.822			
O	Melichthys niger	13	KAHE 10	5	816.677			
O	Melichthys vidua	13	KAHE 10	2	398.060			
O	Canthigaster jactator	13	KAHE 10	5	17.810	21	1465.370	1.2
P	Dascyllus albisella	13	KAHE 10	37	114.267			
P	Abudefduf abdominalis	13	KAHE 10	100	3133.258			
P	Chromis vanderbilii	13	KAHE 10	27	8.529			
P	Chromis ovalis	13	KAHE 10	10	115.597	174	3371.651	2.8
				580	118760.12	580	118760.12	100
C	Parupeneus multifasciatus	14	Nanakuli 1	2	108.799			
C	Parupeneus multifasciatus	14	Nanakuli 1	1	11.052			
C	Parupeneus multifasciatus	14	Nanakuli 1	1	96.081			
C	Parupeneus cyclostomus	14	Nanakuli 1	1	24.795			
C	Plectroglyphidodon johnstonianus	14	Nanakuli 1	2	1.724			
C	Plectroglyphidodon imparipennis	14	Nanakuli 1	3	2.586			
C	Paracirrhites arcatus	14	Nanakuli 1	1	8.118			
C	Cirrhilaps fasciatus	14	Nanakuli 1	1	8.225			
C	Thalassoma duperrey	14	Nanakuli 1	3	164.847			
C	Thalassoma duperrey	14	Nanakuli 1	11	122.796			
C	Thalassoma duperrey	14	Nanakuli 1	2	54.781			
C	Thalassoma duperrey	14	Nanakuli 1	2	194.104			
C	Coris venusta	14	Nanakuli 1	1	23.637			
C	Stethojulis balteata	14	Nanakuli 1	2	71.527			
C	Macropharyngodon geoffroy	14	Nanakuli 1	1	18.629			
C	Halichoeres ornatus	14	Nanakuli 1	3	49.352			
C	Ostracion meleagris	14	Nanakuli 1	1	6.763	38	967.815	72.4
H	Acanthurus nigrofusus	14	Nanakuli 1	2	28.425			
H	Acanthurus nigrofusus	14	Nanakuli 1	10	238.970			
H	Acanthurus blochii	14	Nanakuli 1	6	42.524	18	309.920	23.2
O	Stegastes fasciatus	14	Nanakuli 1	1	7.392			
O	Canthigaster jactator	14	Nanakuli 1	7	24.835			
O	Canthigaster rivulata	14	Nanakuli 1	1	7.591	9	39.918	3.0
P	Chromis vanderbilii	14	Nanakuli 1	59	18.638	59	18.638	1.4
				124	1336.2906	124	1336.2906	100.0
C	Gymnothorax flavimarginatus	15	Nanakuli 2	1	4082.3316			
C	Gymnothorax meleagris	15	Nanakuli 2	1	73.651			
C	Lutjanus kasmira	15	Nanakuli 2	1	307.087			
C	Parupeneus multifasciatus	15	Nanakuli 2	1	96.081			
C	Parupeneus multifasciatus	15	Nanakuli 2	1	235.748			
C	Parupeneus multifasciatus	15	Nanakuli 2	2	108.799			
C	Thalassoma duperrey	15	Nanakuli 2	21	575.200			
C	Thalassoma duperrey	15	Nanakuli 2	2	194.104			
C	Thalassoma duperrey	15	Nanakuli 2	16	879.182			
C	Gomphosus varius	15	Nanakuli 2	3	67.803			
C	Coris gaimard	15	Nanakuli 2	1	83.786			
C	Stethojulis balteata	15	Nanakuli 2	8	286.107			
C	Halichoeres ornatus	15	Nanakuli 2	1	16.451			
C	Zanclus cornutus	15	Nanakuli 2	1	104.158			
C	Rhinecanthus rectangulus	15	Nanakuli 2	1	85.873			
C	Sufflamen bursa	15	Nanakuli 2	4	343.494	65	7539.8552	40.0
CF	Chaetodon ornatissimus	15	Nanakuli 2	2	138.004	2	138.004	0.7
H	Acanthurus leucopareus	15	Nanakuli 2	19	2521.306			
H	Acanthurus nigrofusus	15	Nanakuli 2	18	430.147			
H	Acanthurus nigrofusus	15	Nanakuli 2	8	60.197			
H	Acanthurus nigroris	15	Nanakuli 2	3	22.574			
H	Acanthurus olivaceus	15	Nanakuli 2	2	1553.210			
H	Acanthurus olivaceus	15	Nanakuli 2	14	3663.339			
H	Acanthurus dussumieri	15	Nanakuli 2	2	334.432			
H	Acanthurus blochii	15	Nanakuli 2	10	979.763			
H	Ctenochaetus strigosus	15	Nanakuli 2	1	26.844	77	8591.811	50.8
O	Stegastes fasciatus	15	Nanakuli 2	8	118.106			
O	Melichthys niger	15	Nanakuli 2	9	1470.019			
O	Canthigaster jactator	15	Nanakuli 2	3	10.686	20	1598.812	8.5
				164	18868.482	164	18868.482	100.0

4 APRIL 2008 FIELD DATA

04-Apr-08			NO.		NO.		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	GROUP PERCENT
C	Plectroglyphidodon imparipennis	1	EAST - 1	1	0.862			
C	Cheilinus bimaculatus	1	EAST - 1	1	137.009			
C	Cheilinus bimaculatus	1	EAST - 1	2	0.576			
C	Cheilinus bimaculatus	1	EAST - 1	1	34.952			
C	Thalassoma duperrey	1	EAST - 1	18	56.710			
C	Thalassoma duperrey	1	EAST - 1	31	11.234			
C	Thalassoma duperrey	1	EAST - 1	6	164.343			
C	Thalassoma duperrey	1	EAST - 1	4	219.796			
C	Thalassoma duperrey	1	EAST - 1	9	100.469			
C	Coris venusta	1	EAST - 1	1	2.554			
C	Stethojulis balteata	1	EAST - 1	15	6.715			
C	Stethojulis balteata	1	EAST - 1	3	12.003			
C	Rhinecanthus rectangulus	1	EAST - 1	1	45.382			
C	Rhinecanthus rectangulus	1	EAST - 1	2	171.747	95	964.333	59.4
CF	Cantherhines dumeril	1	EAST - 1	1	442.380			
CF	Cantherhines dumeril	1	EAST - 1	1	194.977	2	637.357	39.3
O	Canthigaster jactator	1	EAST - 1	4	14.248	4	14.248	0.9
P	Chromis vanderbilli	1	EAST - 1	21	6.634			
P	Chromis ovalis	1	EAST - 1	7	0.658	28	7.292	0.4
				129	1623.2298	129	1623.2298	100.0
C	Cephalopholis argus	2	EAST - 2	1	471.730			
C	Cephalopholis argus	2	EAST - 2	1	336.423			
C	Cephalopholis argus	2	EAST - 2	1	1077.128			
C	Parupeneus multifasciatus	2	EAST - 2	1	3.119			
C	Plectroglyphidodon johnstonianus	2	EAST - 2	3	9.090			
C	Plectroglyphidodon imparipennis	2	EAST - 2	2	1.724			
C	Paracirrhites arcatus	2	EAST - 2	3	24.353			
C	Thalassoma duperrey	2	EAST - 2	14	769.284			
C	Thalassoma duperrey	2	EAST - 2	9	100.469			
C	Thalassoma duperrey	2	EAST - 2	11	301.295			
C	Thalassoma duperrey	2	EAST - 2	3	291.156			
C	Gomphosus varius	2	EAST - 2	1	62.029			
C	Gomphosus varius	2	EAST - 2	4	44.166			
C	Coris gaimard	2	EAST - 2	3	66.215			
C	Stethojulis balteata	2	EAST - 2	7	250.344			
C	Macropharyngodon geoffroy	2	EAST - 2	1	10.979			
C	Halichoeres ornatus	2	EAST - 2	1	4.408			
C	Halichoeres ornatus	2	EAST - 2	2	32.901			
C	Halichoeres ornatus	2	EAST - 2	4	100.548			
C	Rhinecanthus rectangulus	2	EAST - 2	2	171.747			
C	Rhinecanthus rectangulus	2	EAST - 2	2	289.299	76	4418.406	9.3
CF	Chaetodon unimaculatus	2	EAST - 2	2	50.608			
CF	Chaetodon quadrimaculatus	2	EAST - 2	2	50.608			
CF	Cantherhines dumeril	2	EAST - 2	1	301.327	5	402.543	0.8
H	Scarus sordidus	2	EAST - 2	1	76.013			
H	Scarus sordidus	2	EAST - 2	1	3.530			
H	Scarus sordidus	2	EAST - 2	2	71.990			
H	Scarus rubroviolaceus	2	EAST - 2	1	18.635			
H	Acanthurus nigrofasciatus	2	EAST - 2	14	105.345			
H	Acanthurus nigrofasciatus	2	EAST - 2	70	1672.793			
H	Acanthurus olivaceus	2	EAST - 2	47	36500.424			
H	Acanthurus olivaceus	2	EAST - 2	13	3401.672			
H	Acanthurus blochii	2	EAST - 2	2	311.165			
H	Acanthurus blochii	2	EAST - 2	1	330.670			
H	Zebrasoma flavescens	2	EAST - 2	1	53.280	153	42545.517	89.3
O	Stegastes fasciolatus	2	EAST - 2	1	14.763			
O	Melichthys vidua	2	EAST - 2	1	199.030			
O	Canthigaster jactator	2	EAST - 2	5	17.810	7	231.604	0.5
P	Chromis vanderbilli	2	EAST - 2	92	29.062	92	29.062	0.1
				333	47627.132	333	47627.132	100
C	Parupeneus multifasciatus	3	EAST - 3	1	155.422			
C	Parupeneus multifasciatus	3	EAST - 3	3	288.244			
C	Parupeneus multifasciatus	3	EAST - 3	1	54.399			
C	Plectroglyphidodon johnstonianus	3	EAST - 3	4	6.887			
C	Paracirrhites forsteri	3	EAST - 3	1	16.345			
C	Thalassoma duperrey	3	EAST - 3	4	388.208			
C	Thalassoma duperrey	3	EAST - 3	10	549.489			
C	Thalassoma duperrey	3	EAST - 3	6	66.980			
C	Thalassoma duperrey	3	EAST - 3	10	273.905			
C	Gomphosus varius	3	EAST - 3	3	33.125			
C	Gomphosus varius	3	EAST - 3	2	78.789			
C	Coris gaimard	3	EAST - 3	1	83.786			
C	Coris gaimard	3	EAST - 3	2	44.143			
C	Stethojulis balteata	3	EAST - 3	1	35.763			
C	Halichoeres ornatus	3	EAST - 3	1	16.451			
C	Sufflamen bursa	3	EAST - 3	2	171.747	52	2263.683	54.5
CF	Chaetodon multicinctus	3	EAST - 3	4	52.120	4	52.120	1.3
H	Scarus sordidus	3	EAST - 3	1	76.013			
H	Scarus rubroviolaceus	3	EAST - 3	1	85.395			
H	Scarus rubroviolaceus	3	EAST - 3	2	59.000			
H	Acanthurus nigrofasciatus	3	EAST - 3	50	1194.852			
H	Acanthurus nigrofasciatus	3	EAST - 3	5	71.064			
H	Ctenochaetus strigosus	3	EAST - 3	1	43.423			
H	Ctenochaetus strigosus	3	EAST - 3	1	26.844	61	1556.591	37.5
O	Stegastes fasciolatus	3	EAST - 3	8	118.106			
O	Melichthys niger	3	EAST - 3	1	163.335			
O	Canthigaster jactator	3	EAST - 3	1	2.205	10	283.647	6.8
P	Chromis vanderbilli	3	EAST - 3	19	6.002	19	6.002	0.1
				127	4156.041	127	4156.041	100.0

		04-Apr-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	BIOMASS	PERCENT		
C	Gymnothorax flavimarginatus	4	EAST - 4	1	5443.109						
C	Cephalopholis argus	4	EAST - 4	1	638.289						
C	Apogon kallopterus	4	EAST - 4	3	42.870						
C	Parupeneus pleurostigma	4	EAST - 4	2	26.508						
C	Plectroglyphidodon johnstonianus	4	EAST - 4	2	6.060						
C	Paracirrhites forsteri	4	EAST - 4	1	39.647						
C	Bodianus bilunulatus	4	EAST - 4	1	1141.374						
C	Pseudocheilinus tetrataenia	4	EAST - 4	1	4.001						
C	Thalassoma duperrey	4	EAST - 4	5	274.744						
C	Thalassoma duperrey	4	EAST - 4	8	219.124						
C	Thalassoma duperrey	4	EAST - 4	7	78.143						
C	Thalassoma duperrey	4	EAST - 4	9	28.355						
C	Coris venusta	4	EAST - 4	2	96.760						
C	Coris venusta	4	EAST - 4	2	5.109						
C	Coris gaimard	4	EAST - 4	2	44.143						
C	Coris gaimard	4	EAST - 4	1	83.786						
C	Stethojulis balteata	4	EAST - 4	2	71.527						
C	Halichoeres ornatissimus	4	EAST - 4	1	16.451						
C	Rhinecanthus rectangulus	4	EAST - 4	1	45.362						
C	Rhinecanthus rectangulus	4	EAST - 4	4	343.494	56	8648.854		37.4		
CF	Cantherhines dumerill	4	EAST - 4	2	602.654	2	602.654		2.6		
H	Acanthurus nigrofuscus	4	EAST - 4	19	454.044						
H	Acanthurus nigrofuscus	4	EAST - 4	15	213.191						
H	Acanthurus olivaceus	4	EAST - 4	14	10872.467						
H	Acanthurus olivaceus	4	EAST - 4	2	1126.341						
H	Acanthurus dussumieri	4	EAST - 4	1	584.355						
H	Acanthurus blochii	4	EAST - 4	1	12.247	52	13242.644		57.2		
O	Stegastes fasciolatus	4	EAST - 4	4	29.568						
O	Melichthys niger	4	EAST - 4	1	163.335						
O	Melichthys vidua	4	EAST - 4	2	398.080						
O	Canthigaster jactator	4	EAST - 4	2	7.124						
O	Canthigaster jactator	4	EAST - 4	4	8.821	13	606.909		2.6		
P	Chromis vanderbilti	4	EAST - 4	142	44.857						
P	Chromis ovals	4	EAST - 4	5	0.470	147	45.326		0.2		
				270	23146.387	270	23146.387		100.0		
C	Parupeneus multifasciatus	5	Ko Olina 1	1	96.081						
C	Parupeneus multifasciatus	5	Ko Olina 1	1	340.443						
C	Parupeneus multifasciatus	5	Ko Olina 1	3	707.245						
C	Parupeneus bifasciatus	5	Ko Olina 1	1	176.008						
C	Parupeneus bifasciatus	5	Ko Olina 1	1	394.355						
C	Parupeneus cyclostomus	5	Ko Olina 1	2	177.143						
C	Forcipiger flavissimus	5	Ko Olina 1	1	9.150						
C	Plectroglyphidodon johnstonianus	5	Ko Olina 1	1	1.722						
C	Paracirrhites forsteri	5	Ko Olina 1	1	16.345						
C	Cirrhites pinnulatus	5	Ko Olina 1	1	90.860						
C	Cirrhites pinnulatus	5	Ko Olina 1	1	162.539						
C	Labroides phthiophagus	5	Ko Olina 1	2	1.255						
C	Thalassoma duperrey	5	Ko Olina 1	4	388.208						
C	Thalassoma duperrey	5	Ko Olina 1	5	274.744						
C	Thalassoma duperrey	5	Ko Olina 1	1	27.390						
C	Thalassoma ballieui	5	Ko Olina 1	1	255.151						
C	Gomphosus varius	5	Ko Olina 1	4	90.404						
C	Stethojulis balteata	5	Ko Olina 1	2	71.527						
C	Anampses curvier	5	Ko Olina 1	1	188.316						
C	Sufflamen bursa	5	Ko Olina 1	1	144.650						
C	Sufflamen bursa	5	Ko Olina 1	2	171.747	37	3786.283		13.0		
CF	Chaetodon unimaculatus	5	Ko Olina 1	4	101.217						
CF	Chaetodon ornatissimus	5	Ko Olina 1	2	273.782						
CF	Chaetodon quadrimaculatus	5	Ko Olina 1	2	50.608						
CF	Chaetodon multicinctus	5	Ko Olina 1	4	52.120	12	477.728		1.6		
H	Calotomus carolinus	5	Ko Olina 1	1	72.282						
H	Scarus sordidus	5	Ko Olina 1	4	304.053						
H	Scarus rubroviolaceus	5	Ko Olina 1	1	673.753						
H	Scarus rubroviolaceus	5	Ko Olina 1	1	147.025						
H	Acanthurus triostegus	5	Ko Olina 1	3	138.945						
H	Acanthurus triostegus	5	Ko Olina 1	3	300.043						
H	Acanthurus leucopareius	5	Ko Olina 1	3	1693.100						
H	Acanthurus leucopareius	5	Ko Olina 1	13	1725.104						
H	Acanthurus leucopareius	5	Ko Olina 1	8	1861.402						
H	Acanthurus nigrofuscus	5	Ko Olina 1	10	542.525						
H	Acanthurus nigrofuscus	5	Ko Olina 1	20	741.605						
H	Acanthurus nigrofuscus	5	Ko Olina 1	14	334.559						
H	Acanthurus olivaceus	5	Ko Olina 1	3	1689.511						
H	Acanthurus olivaceus	5	Ko Olina 1	10	2616.671						
H	Acanthurus dussumieri	5	Ko Olina 1	2	653.188						
H	Acanthurus blochii	5	Ko Olina 1	7	685.834						
H	Ctenochaetus strigosus	5	Ko Olina 1	40	5285.350						
H	Ctenochaetus strigosus	5	Ko Olina 1	4	107.376						
H	Ctenochaetus strigosus	5	Ko Olina 1	60	3951.898						
H	Zebрасoma flavescens	5	Ko Olina 1	1	53.280	208	23577.504		80.8		
O	Stegastes fasciolatus	5	Ko Olina 1	14	206.685						
O	Melichthys niger	5	Ko Olina 1	3	490.006						
O	Canthigaster jactator	5	Ko Olina 1	13	28.668	30	725.360		2.5		
P	Abudefduf abdominalis	5	Ko Olina 1	19	595.319						
P	Chromis verater	5	Ko Olina 1	1	19.939	20	615.258		2.1		
				307	29182.133	307	29182.133		100.0		

		04-Apr-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	BIOMASS	PERCENT		
C	Aulostomus chinensis	6	Ko Olina 2	1	68.534						
C	Cephalopholis argus	6	Ko Olina 2	1	336.423						
C	Mulloidies vanicolensis	6	Ko Olina 2	19	6296.125						
C	Parupeneus multifasciatus	6	Ko Olina 2	6	326.396						
C	Parupeneus multifasciatus	6	Ko Olina 2	2	310.845						
C	Chaetodon lunula	6	Ko Olina 2	1	35.994						
C	Plectroglyphidodon johnstonianus	6	Ko Olina 2	3	5.165						
C	Plectroglyphidodon imparipennis	6	Ko Olina 2	2	1.724						
C	Cirrhitus pinnulatus	6	Ko Olina 2	1	90.860						
C	Labroides phthirophagus	6	Ko Olina 2	2	1.255						
C	Thalassoma duperrey	6	Ko Olina 2	8	89.306						
C	Thalassoma duperrey	6	Ko Olina 2	9	494.540						
C	Thalassoma duperrey	6	Ko Olina 2	13	356.076						
C	Thalassoma duperrey	6	Ko Olina 2	1	97.052						
C	Gomphosus varius	6	Ko Olina 2	4	44.166						
C	Coris gaimard	6	Ko Olina 2	1	83.786						
C	Coris gaimard	6	Ko Olina 2	1	45.990						
C	Halichoeres ornatissimus	6	Ko Olina 2	1	16.451						
C	Zanclus cornutus	6	Ko Olina 2	2	109.797						
C	Sufflamen bursa	6	Ko Olina 2	3	433.949						
C	Sufflamen bursa	6	Ko Olina 2	1	85.873	82	9330.309		28.5		
CF	Chaetodon ornatissimus	6	Ko Olina 2	3	410.674						
CF	Chaetodon multicinctus	6	Ko Olina 2	2	26.060	5	436.734		1.3		
H	Calotomus carolinus	6	Ko Olina 2	1	34.690						
H	Scarus sordidus	6	Ko Olina 2	1	76.013						
H	Scarus psittacus	6	Ko Olina 2	9	131.529						
H	Scarus rubroviolaceus	6	Ko Olina 2	1	2721.554						
H	Scarus rubroviolaceus	6	Ko Olina 2	1	43.918						
H	Acanthurus triostegus	6	Ko Olina 2	1	46.315						
H	Acanthurus leucopareius	6	Ko Olina 2	1	66.740						
H	Acanthurus nigrofusus	6	Ko Olina 2	1	102.474						
H	Acanthurus nigrofusus	6	Ko Olina 2	91	2174.631						
H	Acanthurus olivaceus	6	Ko Olina 2	13	3401.672						
H	Acanthurus olivaceus	6	Ko Olina 2	2	11.465						
H	Acanthurus olivaceus	6	Ko Olina 2	15	5898.149						
H	Acanthurus olivaceus	6	Ko Olina 2	3	2329.814						
H	Acanthurus blochii	6	Ko Olina 2	5	283.496						
H	Acanthurus blochii	6	Ko Olina 2	2	311.165						
H	Ctenochaetus strigosus	6	Ko Olina 2	5	329.325						
H	Ctenochaetus strigosus	6	Ko Olina 2	29	3831.879						
H	Zebbrasoma flavescens	6	Ko Olina 2	4	213.120	185	22007.950		67.2		
O	Melichthys niger	6	Ko Olina 2	4	653.342						
O	Canthigaster jactator	6	Ko Olina 2	7	15.437	11	668.779		2.0		
P	Abudefduf abdominalis	6	Ko Olina 2	9	281.993	9	281.993		0.9		
				292	32725.765	292	32725.765		100.0		
C	Parupeneus multifasciatus	7	KAHE 1-D	1	340.443						
C	Parupeneus multifasciatus	7	KAHE 1-D	1	155.422						
C	Parupeneus multifasciatus	7	KAHE 1-D	1	54.399						
C	Parupeneus multifasciatus	7	KAHE 1-D	2	54.233						
C	Plectroglyphidodon imparipennis	7	KAHE 1-D	1	0.862						
C	Cirrhitus pinnulatus	7	KAHE 1-D	1	90.860						
C	Labroides phthirophagus	7	KAHE 1-D	2	1.255						
C	Thalassoma duperrey	7	KAHE 1-D	10	970.520						
C	Thalassoma duperrey	7	KAHE 1-D	7	384.642						
C	Thalassoma duperrey	7	KAHE 1-D	13	356.076						
C	Thalassoma ballieui	7	KAHE 1-D	1	167.526						
C	Gomphosus varius	7	KAHE 1-D	12	271.212						
C	Gomphosus varius	7	KAHE 1-D	3	12.069						
C	Stethojulis balteata	7	KAHE 1-D	3	107.290						
C	Zanclus cornutus	7	KAHE 1-D	1	54.899						
C	Rhinecanthus rectangulus	7	KAHE 1-D	1	45.362						
C	Rhinecanthus rectangulus	7	KAHE 1-D	1	85.873						
C	Sufflamen bursa	7	KAHE 1-D	5	429.367	66	3582.311		11.4		
CF	Chaetodon multicinctus	7	KAHE 1-D	4	52.120	4	52.120		0.2		
H	Calotomus carolinus	7	KAHE 1-D	1	34.690						
H	Scarus psittacus	7	KAHE 1-D	21	306.900						
H	Scarus psittacus	7	KAHE 1-D	2	75.745						
H	Acanthurus triostegus	7	KAHE 1-D	2	92.630						
H	Acanthurus nigrofusus	7	KAHE 1-D	5	271.262						
H	Acanthurus nigrofusus	7	KAHE 1-D	55	1314.337						
H	Acanthurus nigrofusus	7	KAHE 1-D	10	142.127						
H	Acanthurus olivaceus	7	KAHE 1-D	13	617.201						
H	Acanthurus olivaceus	7	KAHE 1-D	4	375.075						
H	Acanthurus olivaceus	7	KAHE 1-D	15	296.150						
H	Acanthurus olivaceus	7	KAHE 1-D	4	22.930						
H	Ctenochaetus strigosus	7	KAHE 1-D	5	134.220						
H	Ctenochaetus strigosus	7	KAHE 1-D	10	658.650	147	4341.917		13.8		
O	Melichthys niger	7	KAHE 1-D	143	23356.975						
O	Melichthys vidua	7	KAHE 1-D	1	199.030						
O	Canthigaster jactator	7	KAHE 1-D	4	8.821	148	23564.826		74.7		
				365	31541.174	365	31541.174		100		

GROUP	SPECIES	04-Apr-08		NO. INDIV.	NO. BIOMASS	NO. INDIV.	NO. BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Parupeneus multifasciatus	8	KAHE 5 -B	1	96.081			
C	Parupeneus multifasciatus	8	KAHE 5 -B	2	471.496			
C	Plectroglyphidodon johnstonianus	8	KAHE 5 -B	5	8.609			
C	Plectroglyphidodon imparipennis	8	KAHE 5 -B	3	2.586			
C	Paracirrhites arcatus	8	KAHE 5 -B	4	32.470			
C	Paracirrhites forsteri	8	KAHE 5 -B	1	16.345			
C	Cirrhitoops fasciatus	8	KAHE 5 -B	1	3.750			
C	Labroides phthirophagus	8	KAHE 5 -B	1	0.628			
C	Thalassoma duperrey	8	KAHE 5 -B	12	328.686			
C	Thalassoma duperrey	8	KAHE 5 -B	6	329.693			
C	Thalassoma duperrey	8	KAHE 5 -B	12	1164.624			
C	Gomphosus varius	8	KAHE 5 -B	1	4.023			
C	Gomphosus varius	8	KAHE 5 -B	2	124.058			
C	Coris venusta	8	KAHE 5 -B	2	47.273			
C	Coris venusta	8	KAHE 5 -B	1	2.554			
C	Coris venusta	8	KAHE 5 -B	4	193.521			
C	Coris gaimard	8	KAHE 5 -B	2	167.572			
C	Stethojulis balteata	8	KAHE 5 -B	2	28.818			
C	Macropharyngodon geoffroy	8	KAHE 5 -B	1	18.629			
C	Halichoeres ornatissimus	8	KAHE 5 -B	2	50.274			
C	Zanclus cornutus	8	KAHE 5 -B	2	109.797			
C	Rhinecanthus rectangulus	8	KAHE 5 -B	2	171.747			
C	Sufflamen bursa	8	KAHE 5 -B	3	257.620			
C	Sufflamen bursa	8	KAHE 5 -B	1	144.650	73	3775.505	64.1
CF	Pervagor melanocephalus	8	KAHE 5 -B	2	49.865	2	49.865	0.8
H	Acanthurus triostegus	8	KAHE 5 -B	2	200.029			
H	Acanthurus nigrofuscus	8	KAHE 5 -B	15	813.787			
H	Acanthurus nigrofuscus	8	KAHE 5 -B	19	454.044			
H	Acanthurus blochii	8	KAHE 5 -B	1	97.976	37	1565.836	26.6
O	Stegastes fasciatus	8	KAHE 5 -B	1	14.763			
O	Melichthys vidua	8	KAHE 5 -B	1	199.030			
O	Canthigaster jactator	8	KAHE 5 -B	3	6.616	5	220.409	3.7
P	Chromis vanderbilii	8	KAHE 5 -B	376	118.775			
P	Chromis ovalis	8	KAHE 5 -B	4	0.376			
P	Naso brevirostris	8	KAHE 5 -B	1	123.118			
P	Naso brevirostris	8	KAHE 5 -B	1	38.924	382	281.194	4.8
				499	5892.8084	499	5892.8084	100.0
C	Aprion virescens	9	KAHE 7 -B	1	907.185			
C	Aprion virescens	9	KAHE 7 -B	1	1360.777			
C	Mulloides flavolineatus	9	KAHE 7 -B	12	7422.607			
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	340.443			
C	Chellinus bimaculatus	9	KAHE 7 -B	2	8.197			
C	Thalassoma duperrey	9	KAHE 7 -B	1	0.362			
C	Thalassoma duperrey	9	KAHE 7 -B	1	97.052			
C	Gomphosus varius	9	KAHE 7 -B	1	62.029			
C	Macropharyngodon geoffroy	9	KAHE 7 -B	1	5.748			
C	Sufflamen bursa	9	KAHE 7 -B	2	289.299			
C	Sufflamen bursa	9	KAHE 7 -B	4	343.494	27	10837.193	73.2
H	Acanthurus nigrofuscus	9	KAHE 7 -B	2	108.505			
H	Acanthurus nigrofuscus	9	KAHE 7 -B	2	47.794			
H	Acanthurus olivaceus	9	KAHE 7 -B	4	2252.681			
H	Acanthurus olivaceus	9	KAHE 7 -B	1	163.516			
H	Acanthurus olivaceus	9	KAHE 7 -B	4	1046.668			
H	Naso unicornis	9	KAHE 7 -B	1	73.358	14	3692.523	24.9
O	Cantherhines sandwichiensis	9	KAHE 7 -B	1	196.136			
O	Canthigaster jactator	9	KAHE 7 -B	1	2.205	2	198.341	1.3
P	Dascyllus albisella	9	KAHE 7 -B	3	9.265			
P	Chromis vanderbilii	9	KAHE 7 -B	5	1.579			
P	Chromis ovalis	9	KAHE 7 -B	23	2.161			
P	Naso brevirostris	9	KAHE 7 -B	1	73.358	33	86.364	0.6
				75	14814.421	76	14814.421	100.0
C	Paracirrhites arcatus	10	KAHE 7 -C	1	8.118			
C	Chellinus bimaculatus	10	KAHE 7 -C	2	8.197			
C	Thalassoma duperrey	10	KAHE 7 -C	15	47.258			
C	Thalassoma duperrey	10	KAHE 7 -C	14	5.073			
C	Sufflamen bursa	10	KAHE 7 -C	9	772.861	41	841.507	51.4
H	Acanthurus triostegus	10	KAHE 7 -C	1	46.315			
H	Acanthurus olivaceus	10	KAHE 7 -C	2	523.334			
H	Naso unicornis	10	KAHE 7 -C	1	123.118	4	692.767	42.3
O	Cantherhines sandwichiensis	10	KAHE 7 -C	1	82.051			
O	Canthigaster jactator	10	KAHE 7 -C	2	4.411	3	86.462	5.3
P	Chromis vanderbilii	10	KAHE 7 -C	43	13.583			
P	Chromis ovalis	10	KAHE 7 -C	26	2.443	69	16.027	1.0
				117	1636.763	117	1636.763	100.0

		04-Apr-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	BIOMASS	PERCENT		
C	Plectroglyphidodon johnstonianus	11	KAHE 7 - D	1	1.722						
C	Thalassoma duperrey	11	KAHE 7 - D	4	1.450						
C	Sufflamen bursa	11	KAHE 7 - D	2	171.747	7	174.918		96.6		
O	Canthigaster jactator	11	KAHE 7 - D	1	3.562	1	3.562		2.0		
P	Chromis vanderbilii	11	KAHE 7 - D	6	1.895						
P	Chromis ovalis	11	KAHE 7 - D	7	0.658	13	2.553		1.4		
				21	181.03348	21	181.03348		100.0		
C	Gymnothorax undulatus	12	KAHE 7 - E	1	2721.554						
C	Gymnomuraena zebra	12	KAHE 7 - E	1	158.787						
C	Parupeneus pleurostigma	12	KAHE 7 - E	4	53.016						
C	Parupeneus multifasciatus	12	KAHE 7 - E	6	326.396						
C	Parupeneus multifasciatus	12	KAHE 7 - E	10	271.166						
C	Parupeneus multifasciatus	12	KAHE 7 - E	4	44.206						
C	Plectroglyphidodon johnstonianus	12	KAHE 7 - E	2	3.444						
C	Paracirrhites arcatus	12	KAHE 7 - E	6	48.705						
C	Cheilinus bimaculatus	12	KAHE 7 - E	3	12.296						
C	Cheilinus bimaculatus	12	KAHE 7 - E	2	38.735						
C	Pseudocheilinus octotaenia	12	KAHE 7 - E	1	14.409						
C	Pseudocheilinus tetrataenia	12	KAHE 7 - E	1	4.001						
C	Thalassoma duperrey	12	KAHE 7 - E	6	164.343						
C	Thalassoma duperrey	12	KAHE 7 - E	5	274.744						
C	Coris gaimard	12	KAHE 7 - E	1	2.257						
C	Pseudojuloides cerasinus	12	KAHE 7 - E	14	44.108						
C	Stethojulis balteata	12	KAHE 7 - E	4	57.636						
C	Zanclus cornutus	12	KAHE 7 - E	1	54.899						
C	Sufflamen bursa	12	KAHE 7 - E	1	144.650						
C	Sufflamen bursa	12	KAHE 7 - E	5	429.367						
C	Sufflamen fraenatus	12	KAHE 7 - E	1	85.873	79	4954.592		78.7		
CF	Chaetodon multicinctus	12	KAHE 7 - E	4	26.626						
CF	Cantherhines dumerilii	12	KAHE 7 - E	1	301.327	5	327.953		5.2		
H	Scarus rubroviolaceus	12	KAHE 7 - E	1	5.566	1	5.566		0.1		
O	Melichthys niger	12	KAHE 7 - E	3	490.006						
O	Melichthys vidua	12	KAHE 7 - E	2	398.060						
O	Canthigaster coronata	12	KAHE 7 - E	2	15.182						
O	Canthigaster jactator	12	KAHE 7 - E	8	17.642	15	920.890		14.6		
P	Chromis vanderbilii	12	KAHE 7 - E	263	83.079						
P	Chromis ovalis	12	KAHE 7 - E	27	2.537	290	85.617		1.4		
				390	6294.6181	390	6294.6181		100		
C	Lutjanus kasmira	13	KAHE 10	37	4068.472						
C	Parupeneus pleurostigma	13	KAHE 10	1	98.248						
C	Parupeneus multifasciatus	13	KAHE 10	3	163.198						
C	Parupeneus multifasciatus	13	KAHE 10	2	310.845						
C	Paracirrhites arcatus	13	KAHE 10	2	16.235						
C	Paracirrhites forsteri	13	KAHE 10	1	39.647						
C	Cheilio inermis	13	KAHE 10	1	965.720						
C	Cheilinus bimaculatus	13	KAHE 10	1	4.099						
C	Thalassoma duperrey	13	KAHE 10	16	879.182						
C	Thalassoma duperrey	13	KAHE 10	5	55.816						
C	Thalassoma duperrey	13	KAHE 10	10	970.520						
C	Thalassoma duperrey	13	KAHE 10	8	219.124						
C	Gomphosus varius	13	KAHE 10	1	22.601						
C	Stethojulis balteata	13	KAHE 10	7	100.863						
C	Sufflamen bursa	13	KAHE 10	7	601.114						
C	Sufflamen fraenatus	13	KAHE 10	1	85.873	103	8601.556		69.9		
CF	Chaetodon multicinctus	13	KAHE 10	2	26.060						
CF	Cantherhines dumerilii	13	KAHE 10	1	623.684	3	649.744		5.3		
H	Acanthurus leucopareus	13	KAHE 10	1	66.740						
H	Acanthurus nigrofasciatus	13	KAHE 10	6	143.382						
H	Acanthurus olivaceus	13	KAHE 10	1	47.477						
H	Acanthurus blochii	13	KAHE 10	2	58.060						
H	Acanthurus blochii	13	KAHE 10	2	113.398	12	429.058		3.5		
O	Stegastes fasciatus	13	KAHE 10	2	29.526						
O	Melichthys niger	13	KAHE 10	1	163.335						
O	Melichthys vidua	13	KAHE 10	3	597.090						
O	Canthigaster jactator	13	KAHE 10	4	14.248	10	804.200		6.5		
P	Dascyllus albisella	13	KAHE 10	24	74.119						
P	Abudefduf abdominalis	13	KAHE 10	52	1629.294						
P	Chromis vanderbilii	13	KAHE 10	139	43.909						
P	Chromis ovalis	13	KAHE 10	47	4.417						
P	Chromis ovalis	13	KAHE 10	11	65.249	273	1816.989		14.8		
				401	12301.547	401	12301.547		100		
C	Plectroglyphidodon johnstonianus	14	Nanakuli 1	4	6.887						
C	Plectroglyphidodon imparipennis	14	Nanakuli 1	4	3.448						
C	Thalassoma duperrey	14	Nanakuli 1	31	849.105						
C	Thalassoma duperrey	14	Nanakuli 1	20	63.011						
C	Thalassoma duperrey	14	Nanakuli 1	23	8.335						
C	Thalassoma duperrey	14	Nanakuli 1	13	145.122						
C	Thalassoma duperrey	14	Nanakuli 1	8	439.591						
C	Coris venusta	14	Nanakuli 1	2	5.109						
C	Coris venusta	14	Nanakuli 1	1	48.380						
C	Pseudojuloides cerasinus	14	Nanakuli 1	3	9.452						
C	Stethojulis balteata	14	Nanakuli 1	13	52.015						
C	Stethojulis balteata	14	Nanakuli 1	25	894.084						
C	Macropharyngodon geoffroy	14	Nanakuli 1	3	17.244						
C	Rhinecanthus rectangulus	14	Nanakuli 1	2	171.747	152	2713.530		98.3		
H	Scarus sordidus	14	Nanakuli 1	4	14.121	4	14.121		0.5		
O	Canthigaster jactator	14	Nanakuli 1	3	6.616	3	6.616		0.2		
P	Chromis vanderbilii	14	Nanakuli 1	79	24.955						
P	Chromis ovalis	14	Nanakuli 1	22	2.068	101	27.023		1.0		
				260	2761.2897	260	2761.2897		100.0		

		04-Apr-08									
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT			
C	Cephalopholis argus	15	Nanakuli 2	1	1077.128						
C	Thalassoma duperrey	15	Nanakuli 2	1	97.052						
C	Thalassoma duperrey	15	Nanakuli 2	28	766.933						
C	Thalassoma duperrey	15	Nanakuli 2	16	879.182						
C	Gomphosus varius	15	Nanakuli 2	2	45.202						
C	Gomphosus varius	15	Nanakuli 2	3	33.125						
C	Stethojulis balteata	15	Nanakuli 2	10	357.634						
C	Rhinecanthus rectangulus	15	Nanakuli 2	2	171.747						
C	Sufflamen bursa	15	Nanakuli 2	1	85.873						
C	Sufflamen bursa	15	Nanakuli 2	1	144.650						
C	Sufflamen fraenatus	15	Nanakuli 2	1	224.794	66	3883.320	15.0			
CF	Chaetodon multicinctus	15	Nanakuli 2	4	26.626						
CF	Cantherhines dumerili	15	Nanakuli 2	1	301.327	5	327.953	1.3			
H	Acanthurus triostegus	15	Nanakuli 2	1	100.014						
H	Acanthurus leucopareius	15	Nanakuli 2	28	6514.907						
H	Acanthurus leucopareius	15	Nanakuli 2	18	2388.606						
H	Acanthurus nigrofuscus	15	Nanakuli 2	9	488.272						
H	Acanthurus nigrofuscus	15	Nanakuli 2	54	1290.440						
H	Acanthurus olivaceus	15	Nanakuli 2	8	6212.838						
H	Acanthurus olivaceus	15	Nanakuli 2	4	2252.681						
H	Acanthurus blochii	15	Nanakuli 2	4	1322.680						
H	Acanthurus blochii	15	Nanakuli 2	9	881.787	135	21452.225	82.9			
O	Stegastes fasciolatus	15	Nanakuli 2	2	29.526						
O	Melichthys niger	15	Nanakuli 2	1	163.335						
O	Canthigaster jactator	15	Nanakuli 2	5	17.810	8	210.672	0.8			
				214	25874.169	214	25874.169	100			

30 MAY 2008 FIELD DATA

		30-May-08									
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	BIOMASS	GROUP BIOMASS	GROUP PERCENT		
C	Plectroglyphidodon johnstonianus	1	EAST - 1	3	2.59						
C	Plectroglyphidodon imparipennis	1	EAST - 1	3	2.59						
C	Paracirrhites arcatus	1	EAST - 1	2	16.24						
C	Thalassoma duperrey	1	EAST - 1	3	9.45						
C	Thalassoma duperrey	1	EAST - 1	7	2.54						
C	Thalassoma duperrey	1	EAST - 1	4	388.21						
C	Thalassoma duperrey	1	EAST - 1	1	11.16						
C	Thalassoma duperrey	1	EAST - 1	3	82.17						
C	Thalassoma duperrey	1	EAST - 1	8	439.59						
C	Coris gaimard	1	EAST - 1	1	8.57						
C	Stethojulis balteata	1	EAST - 1	5	20.01						
C	Stethojulis balteata	1	EAST - 1	3	43.23						
C	Rhinecanthus rectangulus	1	EAST - 1	1	85.87						
C	Rhinecanthus rectangulus	1	EAST - 1	1	144.65						
C	Sufflamen fraenatus	1	EAST - 1	1	224.79	46	1481.65	82.6			
O	Melichthys vidua	1	EAST - 1	1	296.24						
O	Canthigaster jactator	1	EAST - 1	2	7.12	3	303.36	16.9			
P	Chromis vanderbilii	1	EAST - 1	27	8.53						
P	Chromis ovalis	1	EAST - 1	1	0.75	28	9.28	0.5			
				77	1794.2837	77	1794.2837	100			
C	Echidna zebra	2	EAST - 2	1	754.49						
C	Cephalopholis argus	2	EAST - 2	1	1077.13						
C	Parupeneus cyclostomus	2	EAST - 2	2	49.59						
C	Plectroglyphidodon johnstonianus	2	EAST - 2	3	5.17						
C	Plectroglyphidodon imparipennis	2	EAST - 2	4	3.45						
C	Paracirrhites arcatus	2	EAST - 2	1	8.12						
C	Pseudocheilinus octotaenia	2	EAST - 2	1	35.76						
C	Thalassoma duperrey	2	EAST - 2	13	145.12						
C	Thalassoma duperrey	2	EAST - 2	9	246.51						
C	Thalassoma duperrey	2	EAST - 2	11	34.66						
C	Thalassoma duperrey	2	EAST - 2	7	384.64						
C	Gomphosus varius	2	EAST - 2	1	11.04						
C	Coris gaimard	2	EAST - 2	1	45.99						
C	Pseudojuloides cerasinus	2	EAST - 2	1	27.39						
C	Stethojulis balteata	2	EAST - 2	3	107.29						
C	Halichoeres ornatissimus	2	EAST - 2	2	19.05						
C	Halichoeres ornatissimus	2	EAST - 2	1	16.45						
C	Rhinecanthus rectangulus	2	EAST - 2	3	433.95						
C	Sufflamen fraenatus	2	EAST - 2	2	922.50	67	4328.30	34.0			
CF	Chaetodon quadrimaculatus	2	EAST - 2	2	50.61	2	50.61	0.4			
H	Acanthurus nigrofuscus	2	EAST - 2	20	477.94						
H	Acanthurus nigrofuscus	2	EAST - 2	26	369.53						
H	Acanthurus nigrofuscus	2	EAST - 2	11	82.77						
H	Acanthurus olivaceus	2	EAST - 2	1	393.21						
H	Acanthurus olivaceus	2	EAST - 2	9	6989.44	67	8312.90	65.2			
O	Canthigaster jactator	2	EAST - 2	7	24.93	7	24.93	0.2			
P	Chromis vanderbilii	2	EAST - 2	64	20.22						
P	Chromis ovalis	2	EAST - 2	13	9.71	77	29.92	0.2			
				220	12746.665	220	12746.665	100			
C	Cephalopholis argus	3	EAST - 3	1	336.42						
C	Cephalopholis argus	3	EAST - 3	2	1276.58						
C	Parupeneus cyclostomus	3	EAST - 3	1	88.57						
C	Plectroglyphidodon johnstonianus	3	EAST - 3	5	8.61						
C	Plectroglyphidodon johnstonianus	3	EAST - 3	4	3.45						
C	Paracirrhites arcatus	3	EAST - 3	4	32.47						
C	Paracirrhites forsteri	3	EAST - 3	1	39.65						
C	Pseudocheilinus octotaenia	3	EAST - 3	1	35.76						
C	Pseudocheilinus octotaenia	3	EAST - 3	1	14.41						
C	Thalassoma duperrey	3	EAST - 3	11	301.30						
C	Thalassoma duperrey	3	EAST - 3	7	384.64						
C	Thalassoma duperrey	3	EAST - 3	3	291.16						
C	Thalassoma duperrey	3	EAST - 3	7	78.14						
C	Gomphosus varius	3	EAST - 3	1	22.60						
C	Gomphosus varius	3	EAST - 3	1	11.04						
C	Stethojulis balteata	3	EAST - 3	4	57.64						
C	Stethojulis balteata	3	EAST - 3	1	72.39						
C	Macropharyngodon geoffroy	3	EAST - 3	1	10.98						
C	Halichoeres ornatissimus	3	EAST - 3	1	16.45						
C	Sufflamen bursa	3	EAST - 3	3	257.62						
C	Diodon holocanthus	3	EAST - 3	1	1208.51	61	4548.38	61.9			
CF	Chaetodon unimaculatus	3	EAST - 3	2	50.61						
CF	Chaetodon ornatissimus	3	EAST - 3	2	273.78	4	324.39	4.4			
H	Acanthurus nigrofuscus	3	EAST - 3	29	412.17						
H	Acanthurus nigrofuscus	3	EAST - 3	23	549.63						
H	Acanthurus olivaceus	3	EAST - 3	1	776.60						
H	Zebriasoma flavescens	3	EAST - 3	1	53.28	54	1791.69	24.4			
O	Stegastes fasciolatus	3	EAST - 3	10	147.63						
O	Melichthys niger	3	EAST - 3	2	326.67						
O	Melichthys vidua	3	EAST - 3	1	199.03						
O	Canthigaster jactator	3	EAST - 3	4	14.25	17	687.58	9.4			
				136	7352.04	136	7352.04	100			

GROUP	SPECIES	30-May-08		NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Gymnomuraena zebra	4	EAST - 4	1	129.08			
C	Malacanthus hoedti	4	EAST - 4	1	0.31			
C	Parupeneus pleurostigma	4	EAST - 4	3	91.31			
C	Parupeneus pleurostigma	4	EAST - 4	1	4.11			
C	Parupeneus multifasciatus	4	EAST - 4	1	11.05			
C	Parupeneus multifasciatus	4	EAST - 4	1	27.12			
C	Plectroglyphidodon johnstonianus	4	EAST - 4	4	6.89			
C	Plectroglyphidodon imparipennis	4	EAST - 4	1	0.86			
C	Paracirrhites arcatus	4	EAST - 4	5	40.59			
C	Paracirrhites forsteri	4	EAST - 4	1	16.35			
C	Bodianus bitunulatus	4	EAST - 4	1	648.58			
C	Labroides phthirophagus	4	EAST - 4	2	1.26			
C	Pseudocheilinus octotaenia	4	EAST - 4	3	107.29			
C	Thalassoma duperrey	4	EAST - 4	18	493.03			
C	Thalassoma duperrey	4	EAST - 4	2	194.10			
C	Thalassoma duperrey	4	EAST - 4	19	212.10			
C	Thalassoma duperrey	4	EAST - 4	17	934.13			
C	Coris venusta	4	EAST - 4	6	56.32			
C	Coris gaimard	4	EAST - 4	3	25.70			
C	Coris gaimard	4	EAST - 4	1	819.52			
C	Coris gaimard	4	EAST - 4	1	45.99			
C	Pseudojuloides cerasinus	4	EAST - 4	2	6.30			
C	Stethojulis balteata	4	EAST - 4	6	86.45			
C	Anampses chrysocephalus	4	EAST - 4	1	2.63			
C	Halichoeres ornatus	4	EAST - 4	1	16.45			
C	Rhinecanthus rectangulus	4	EAST - 4	3	433.95	105	4411.47	45.1
CF	Chaetodon ornatissimus	4	EAST - 4	2	138.00			
CF	Cantherhines dumerilii	4	EAST - 4	1	194.98	3	332.98	3.4
H	Acanthurus nigrofasciatus	4	EAST - 4	4	95.59			
H	Acanthurus nigrofasciatus	4	EAST - 4	12	90.30			
H	Acanthurus nigrofasciatus	4	EAST - 4	13	184.77			
H	Acanthurus olivaceus	4	EAST - 4	3	2329.81			
H	Acanthurus dussumieri	4	EAST - 4	1	8.82	33	2709.28	27.7
O	Stegastes fasciatus	4	EAST - 4	3	44.29			
O	Melichthys niger	4	EAST - 4	11	1796.69			
O	Melichthys vidua	4	EAST - 4	2	398.06			
O	Canthigaster jactator	4	EAST - 4	8	28.50	24	2267.54	23.2
P	Chromis vanderbilii	4	EAST - 4	86	27.17			
P	Chromis ovalis	4	EAST - 4	42	31.36	128	58.53	0.6
				293	9779.7917	293	9779.7917	100
C	Monotaxis grandoculis	5	Ko Olina 1	1	34.79			
C	Monotaxis grandoculis	5	Ko Olina 1	2	1342.23			
C	Parupeneus multifasciatus	5	Ko Olina 1	1	155.42			
C	Parupeneus bifasciatus	5	Ko Olina 1	1	107.31			
C	Plectroglyphidodon johnstonianus	5	Ko Olina 1	5	8.61			
C	Paracirrhites arcatus	5	Ko Olina 1	1	8.12			
C	Paracirrhites forsteri	5	Ko Olina 1	1	39.65			
C	Labroides phthirophagus	5	Ko Olina 1	1	0.63			
C	Thalassoma duperrey	5	Ko Olina 1	1	97.05			
C	Thalassoma duperrey	5	Ko Olina 1	9	246.51			
C	Thalassoma duperrey	5	Ko Olina 1	4	44.65			
C	Thalassoma duperrey	5	Ko Olina 1	9	494.54			
C	Gomphosus varius	5	Ko Olina 1	1	11.04			
C	Gomphosus varius	5	Ko Olina 1	3	67.80			
C	Gomphosus varius	5	Ko Olina 1	2	124.06			
C	Stethojulis balteata	5	Ko Olina 1	1	35.76			
C	Sufflamen bursa	5	Ko Olina 1	6	515.24	49	3333.42	19.9
CF	Chaetodon unimaculatus	5	Ko Olina 1	2	50.61			
CF	Chaetodon ornatissimus	5	Ko Olina 1	2	273.78			
CF	Chaetodon multicinctus	5	Ko Olina 1	8	104.24	12	428.63	2.6
H	Caletomus carolinus	5	Ko Olina 1	1	72.28			
H	Scarus sordidus	5	Ko Olina 1	1	775.07			
H	Scarus sordidus	5	Ko Olina 1	2	469.30			
H	Scarus psittacus	5	Ko Olina 1	2	158.54			
H	Scarus psittacus	5	Ko Olina 1	1	37.87			
H	Scarus rubroviolaceus	5	Ko Olina 1	1	18.63			
H	Scarus rubroviolaceus	5	Ko Olina 1	1	85.39			
H	Cirripectes variolosus	5	Ko Olina 1	1	7.25			
H	Acanthurus leucopareius	5	Ko Olina 1	1	66.74			
H	Acanthurus leucopareius	5	Ko Olina 1	1	132.70			
H	Acanthurus nigrofasciatus	5	Ko Olina 1	33	788.60			
H	Acanthurus nigrofasciatus	5	Ko Olina 1	10	142.13			
H	Acanthurus olivaceus	5	Ko Olina 1	2	1126.34			
H	Acanthurus olivaceus	5	Ko Olina 1	14	3663.34			
H	Acanthurus olivaceus	5	Ko Olina 1	1	776.60			
H	Acanthurus blochii	5	Ko Olina 1	1	97.98			
H	Ctenochaetus strigosus	5	Ko Olina 1	15	402.66			
H	Ctenochaetus strigosus	5	Ko Olina 1	6	395.19			
H	Ctenochaetus strigosus	5	Ko Olina 1	59	2561.96			
H	Naso lituratus	5	Ko Olina 1	2	411.98	155	12190.55	72.8
O	Stegastes fasciatus	5	Ko Olina 1	11	162.40			
O	Melichthys niger	5	Ko Olina 1	2	326.67			
O	Cantherhines sandwichiensis	5	Ko Olina 1	1	277.18			
O	Canthigaster jactator	5	Ko Olina 1	5	17.81	19	784.05	4.7
P	Chromis vanderbilii	5	Ko Olina 1	15	4.74	15	4.74	0.03
				250	16741.391	250	16741.391	100

		30-May-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT			
C	Cephalopholis argus	6	Ko Olina 2	1	638.29						
C	Cephalopholis argus	6	Ko Olina 2	1	336.42						
C	Parupeneus multifasciatus	6	Ko Olina 2	1	235.75						
C	Parupeneus multifasciatus	6	Ko Olina 2	4	384.33						
C	Forcipiger flavissimus	6	Ko Olina 2	1	9.15						
C	Plectroglyphidodon imparipennis	6	Ko Olina 2	1	0.86						
C	Labroides phthirophagus	6	Ko Olina 2	3	1.88						
C	Thalassoma duperrey	6	Ko Olina 2	4	44.65						
C	Thalassoma duperrey	6	Ko Olina 2	12	328.69						
C	Thalassoma duperrey	6	Ko Olina 2	2	194.10						
C	Thalassoma duperrey	6	Ko Olina 2	11	604.44						
C	Gomphosus varius	6	Ko Olina 2	2	45.20						
C	Gomphosus varius	6	Ko Olina 2	1	39.39						
C	Coris gaimard	6	Ko Olina 2	1	8.57						
C	Coris gaimard	6	Ko Olina 2	1	139.13						
C	Stethojulis baiteata	6	Ko Olina 2	3	107.29						
C	Halichoeres ornatissimus	6	Ko Olina 2	3	49.35						
C	Zanclus cornutus	6	Ko Olina 2	2	109.80						
C	Sufflamen bursa	6	Ko Olina 2	5	429.37	59	3706.66	14.0			
CF	Chaetodon unimaculatus	6	Ko Olina 2	2	50.61						
CF	Chaetodon ornatissimus	6	Ko Olina 2	2	273.78						
CF	Chaetodon quadrimaculatus	6	Ko Olina 2	2	50.61						
CF	Chaetodon multicinctus	6	Ko Olina 2	2	26.06	8	401.06	1.5			
H	Calotomus carolinus	6	Ko Olina 2	1	339.30						
H	Scarus sordidus	6	Ko Olina 2	1	544.57						
H	Scarus psittacus	6	Ko Olina 2	3	43.84						
H	Scarus psittacus	6	Ko Olina 2	4	317.07						
H	Scarus psittacus	6	Ko Olina 2	10	378.73						
H	Scarus psittacus	6	Ko Olina 2	2	482.85						
H	Acanthurus triostegus	6	Ko Olina 2	9	900.13						
H	Acanthurus triostegus	6	Ko Olina 2	3	138.95						
H	Acanthurus leucopareius	6	Ko Olina 2	4	110.06						
H	Acanthurus leucopareius	6	Ko Olina 2	10	1327.00						
H	Acanthurus leucopareius	6	Ko Olina 2	3	200.22						
H	Acanthurus nigrofuscus	6	Ko Olina 2	27	645.22						
H	Acanthurus nigroris	6	Ko Olina 2	2	204.95						
H	Acanthurus olivaceus	6	Ko Olina 2	14	7884.38						
H	Acanthurus olivaceus	6	Ko Olina 2	4	1046.67						
H	Acanthurus blochii	6	Ko Olina 2	1	232.24						
H	Acanthurus blochii	6	Ko Olina 2	10	290.30						
H	Acanthurus blochii	6	Ko Olina 2	4	391.91						
H	Ctenochaetus strigosus	6	Ko Olina 2	28	3699.74						
H	Ctenochaetus strigosus	6	Ko Olina 2	12	790.38						
H	Ctenochaetus strigosus	6	Ko Olina 2	3	80.53						
H	Zebbrasoma flavescens	6	Ko Olina 2	4	213.12	159	20262.16	76.6			
O	Stegastes fasciolatus	6	Ko Olina 2	4	59.05						
O	Melichthys niger	6	Ko Olina 2	7	1736.22						
O	Canthigaster jactator	6	Ko Olina 2	4	14.25	15	1809.52	6.8			
P	Abudefduf abdominalis	6	Ko Olina 2	8	250.66						
P	Chromis vanderbilii	6	Ko Olina 2	16	5.05	24	255.71	1.0			
				265	26435.119	265	26435.119	100			
C	Parupeneus multifasciatus	7	KAHE 1-D	1	54.40						
C	Parupeneus multifasciatus	7	KAHE 1-D	2	54.23						
C	Plectroglyphidodon johnstonianus	7	KAHE 1-D	4	6.89						
C	Plectroglyphidodon imparipennis	7	KAHE 1-D	2	1.72						
C	Labroides phthirophagus	7	KAHE 1-D	1	0.63						
C	Thalassoma duperrey	7	KAHE 1-D	11	1067.57						
C	Thalassoma duperrey	7	KAHE 1-D	5	485.26						
C	Thalassoma duperrey	7	KAHE 1-D	10	273.90						
C	Thalassoma duperrey	7	KAHE 1-D	17	934.13						
C	Thalassoma duperrey	7	KAHE 1-D	9	100.47						
C	Thalassoma ballieui	7	KAHE 1-D	1	167.53						
C	Thalassoma ballieui	7	KAHE 1-D	2	205.22						
C	Gomphosus varius	7	KAHE 1-D	3	186.09						
C	Gomphosus varius	7	KAHE 1-D	5	113.00						
C	Gomphosus varius	7	KAHE 1-D	4	44.17						
C	Stethojulis baiteata	7	KAHE 1-D	10	357.63						
C	Zanclus cornutus	7	KAHE 1-D	2	109.80						
C	Rhinecanthus rectangulus	7	KAHE 1-D	2	171.75						
C	Sufflamen bursa	7	KAHE 1-D	3	257.62	94	4592.01	24.5			
CF	Chaetodon ornatissimus	7	KAHE 1-D	2	138.00						
CF	Chaetodon multicinctus	7	KAHE 1-D	4	52.12	6	190.12	1.0			
H	Scarus psittacus	7	KAHE 1-D	12	454.47						
H	Scarus psittacus	7	KAHE 1-D	1	79.27						
H	Acanthurus triostegus	7	KAHE 1-D	16	741.04						
H	Acanthurus nigrofuscus	7	KAHE 1-D	39	931.98						
H	Acanthurus olivaceus	7	KAHE 1-D	4	654.07						
H	Acanthurus olivaceus	7	KAHE 1-D	13	617.20						
H	Ctenochaetus strigosus	7	KAHE 1-D	18	483.19	103	3961.22	21.1			
O	Stegastes fasciolatus	7	KAHE 1-D	5	73.82						
O	Melichthys niger	7	KAHE 1-D	59	9636.79						
O	Melichthys vidua	7	KAHE 1-D	1	199.03						
O	Cantherhines sandwichiensis	7	KAHE 1-D	1	82.05						
O	Canthigaster jactator	7	KAHE 1-D	4	14.25	70	10005.94	53.3			
P	Chromis vanderbilii	7	KAHE 1-D	19	6.00	19	6.00	0.03			
				292	18755.298	292	18755.298	100			

		30-May-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	BIOMASS	PERCENT		
C	Myripristis amaenus	8	KAHE 5 -B	1	140.81						
C	Parupeneus multifasciatus	8	KAHE 5 -B	2	22.10						
C	Parupeneus multifasciatus	8	KAHE 5 -B	2	471.50						
C	Plectroglyphidodon johnstonianus	8	KAHE 5 -B	2	1.72						
C	Plectroglyphidodon imparipennis	8	KAHE 5 -B	1	0.85						
C	Paracirrhites arcatus	8	KAHE 5 -B	3	24.35						
C	Paracirrhites forsteri	8	KAHE 5 -B	1	39.65						
C	Labroides phthirophagus	8	KAHE 5 -B	1	0.63						
C	Thalassoma duperrey	8	KAHE 5 -B	15	167.45						
C	Thalassoma duperrey	8	KAHE 5 -B	7	384.64						
C	Thalassoma duperrey	8	KAHE 5 -B	7	191.73						
C	Thalassoma duperrey	8	KAHE 5 -B	1	97.05						
C	Gomphosus varius	8	KAHE 5 -B	1	22.60						
C	Gomphosus varius	8	KAHE 5 -B	3	186.09						
C	Stethojulis balteata	8	KAHE 5 -B	2	71.53						
C	Halichoeres ornatus	8	KAHE 5 -B	2	32.90						
C	Zanclus cornutus	8	KAHE 5 -B	1	104.16						
C	Rhinocanthus rectangulus	8	KAHE 5 -B	3	257.62						
C	Sufflamen bursa	8	KAHE 5 -B	1	85.87						
C	Arothron hispidus	8	KAHE 5 -B	1	657.78	57	2961.04		19.64		
H	Acanthurus nigrofasciatus	8	KAHE 5 -B	64	1529.41						
H	Acanthurus olivaceus	8	KAHE 5 -B	5	3883.02						
H	Acanthurus olivaceus	8	KAHE 5 -B	5	1966.05						
H	Zebrasoma veliferum	8	KAHE 5 -B	1	299.32						
H	Zebrasoma veliferum	8	KAHE 5 -B	1	146.23						
H	Naso lituratus	8	KAHE 5 -B	3	934.84						
H	Naso lituratus	8	KAHE 5 -B	2	1244.71						
H	Naso unicornis	8	KAHE 5 -B	1	525.26	82	10528.84		69.84		
O	Stegastes fasciatus	8	KAHE 5 -B	5	73.82						
O	Cantherhines sandwichiensis	8	KAHE 5 -B	1	82.05						
O	Canthigaster jactator	8	KAHE 5 -B	3	10.69	9	166.55		1.10		
P	Chromis vanderbilti	8	KAHE 5 -B	248	78.34						
P	Chromis ovalis	8	KAHE 5 -B	9	6.72						
P	Naso brevirostris	8	KAHE 5 -B	7	1335.21	264	1420.27		9.42		
				412	15076.703	412	15076.703		100		
C	Parupeneus pleurostigma	9	KAHE 7 -B	2	60.88						
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	54.40						
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	155.42						
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	27.12						
C	Paracirrhites arcatus	9	KAHE 7 -B	1	3.45						
C	Labroides phthirophagus	9	KAHE 7 -B	1	0.63						
C	Chelinus bimaculatus	9	KAHE 7 -B	1	4.10						
C	Thalassoma duperrey	9	KAHE 7 -B	3	291.16						
C	Thalassoma duperrey	9	KAHE 7 -B	9	246.51						
C	Thalassoma duperrey	9	KAHE 7 -B	8	439.59						
C	Coris venusta	9	KAHE 7 -B	23	0.69						
C	Coris gaimard	9	KAHE 7 -B	4	88.29						
C	Stethojulis balteata	9	KAHE 7 -B	4	143.05						
C	Macropharyngodon geoffroy	9	KAHE 7 -B	3	17.24						
C	Zanclus cornutus	9	KAHE 7 -B	1	104.16						
C	Sufflamen bursa	9	KAHE 7 -B	5	429.37	68	2066.04		10.89		
H	Scarus sordidus	9	KAHE 7 -B	1	1427.57						
H	Scarus sordidus	9	KAHE 7 -B	2	27.46						
H	Acanthurus olivaceus	9	KAHE 7 -B	2	1553.21						
H	Naso lituratus	9	KAHE 7 -B	3	934.84	8	3943.08		20.79		
O	Melichthys vidua	9	KAHE 7 -B	1	199.03						
O	Canthigaster jactator	9	KAHE 7 -B	1	3.56	2	202.59		1.07		
P	Dascyllus albisella	9	KAHE 7 -B	1	0.08						
P	Dascyllus albisella	9	KAHE 7 -B	4	12.35						
P	Chromis vanderbilti	9	KAHE 7 -B	35	11.06						
P	Chromis hanui	9	KAHE 7 -B	1	0.75						
P	Naso brevirostris	9	KAHE 7 -B	4	2101.03						
P	Naso brevirostris	9	KAHE 7 -B	23	8956.72						
P	Naso brevirostris	9	KAHE 7 -B	6	1672.24	74	12754.23		67.25		
				152	18965.944	152	18965.944		100		
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	235.75						
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	6.26						
C	Chaetodon fremblii	10	KAHE 7 -C	1	6.61						
C	Plectroglyphidodon johnstonianus	10	KAHE 7 -C	1	0.86						
C	Paracirrhites arcatus	10	KAHE 7 -C	4	32.47						
C	Chelio inermis	10	KAHE 7 -C	1	618.55						
C	Labroides phthirophagus	10	KAHE 7 -C	1	0.63						
C	Thalassoma duperrey	10	KAHE 7 -C	7	384.64						
C	Thalassoma duperrey	10	KAHE 7 -C	1	97.05						
C	Thalassoma duperrey	10	KAHE 7 -C	9	246.51						
C	Thalassoma duperrey	10	KAHE 7 -C	5	15.75						
C	Coris venusta	10	KAHE 7 -C	1	9.39						
C	Coris venusta	10	KAHE 7 -C	1	48.38						
C	Coris gaimard	10	KAHE 7 -C	1	318.06						
C	Stethojulis balteata	10	KAHE 7 -C	3	107.29						
C	Zanclus cornutus	10	KAHE 7 -C	1	54.90						
C	Sufflamen fraenatus	10	KAHE 7 -C	4	343.49	43	2526.60		23.10		
H	Acanthurus triostegus	10	KAHE 7 -C	9	900.13						
H	Acanthurus olivaceus	10	KAHE 7 -C	4	2252.68						
H	Acanthurus olivaceus	10	KAHE 7 -C	4	3108.42						
H	Naso lituratus	10	KAHE 7 -C	1	311.61	18	6570.84		60.07		
O	Melichthys vidua	10	KAHE 7 -C	1	199.03						
O	Cantherhines sandwichiensis	10	KAHE 7 -C	1	82.05						
O	Canthigaster jactator	10	KAHE 7 -C	1	3.56	3	284.64		2.60		
P	Chromis vanderbilti	10	KAHE 7 -C	92	29.06						
P	Chromis hanui	10	KAHE 7 -C	3	2.24						
P	Naso brevirostris	10	KAHE 7 -C	8	1525.95	103	1557.25		14.24		
				167	10939.339	167	10939.339		100		

		30-May-08		NO.		NO.		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	GROUP	PERCENT
C	Parupeneus multifasciatus	11	KAHE 7 -D	1	3.12				
C	Plectroglyphidodon johnstonianus	11	KAHE 7 -D	3	2.59				
C	Paracirrhites arcatus	11	KAHE 7 -D	2	6.89				
C	Thalassoma duperrey	11	KAHE 7 -D	3	33.49				
C	Thalassoma duperrey	11	KAHE 7 -D	4	12.60				
C	Plagiotremus ewaensis	11	KAHE 7 -D	2	1.90				
C	Sufflamen bursa	11	KAHE 7 -D	2	171.75	17	232.34	26.31	
H	Naso lituratus	11	KAHE 7 -D	1	311.61	1	311.61	35.28	
O	Melichthys vidua	11	KAHE 7 -D	1	296.24				
O	Canthigaster coronata	11	KAHE 7 -D	2	15.18				
O	Canthigaster jactator	11	KAHE 7 -D	3	10.69	6	322.11	36.47	
P	Chromis vanderbilii	11	KAHE 7 -D	53	16.74				
P	Chromis ovalis	11	KAHE 7 -D	4	0.38	57	17.12	1.94	
				81	883.17907	81	883.17907	100	
C	Fistularia commersoni	12	KAHE 7 - E	2	29.88				
C	Parupeneus pleurostigma	12	KAHE 7 - E	4	53.02				
C	Parupeneus multifasciatus	12	KAHE 7 - E	1	155.42				
C	Parupeneus multifasciatus	12	KAHE 7 - E	5	55.26				
C	Forcipiger flavissimus	12	KAHE 7 - E	2	18.30				
C	Chaetodon fremblii	12	KAHE 7 - E	1	6.61				
C	Plectroglyphidodon johnstonianus	12	KAHE 7 - E	3	2.59				
C	Paracirrhites arcatus	12	KAHE 7 - E	1	8.12				
C	Cheilinus bimaculatus	12	KAHE 7 - E	4	77.47				
C	Pseudocheilinus tetrataenia	12	KAHE 7 - E	1	4.00				
C	Thalassoma duperrey	12	KAHE 7 - E	5	55.82				
C	Thalassoma duperrey	12	KAHE 7 - E	3	164.85				
C	Thalassoma duperrey	12	KAHE 7 - E	1	97.05				
C	Thalassoma duperrey	12	KAHE 7 - E	5	136.95				
C	Coris venusta	12	KAHE 7 - E	3	7.66				
C	Coris venusta	12	KAHE 7 - E	8	75.10				
C	Pseudojuloides cerasinus	12	KAHE 7 - E	2	22.33				
C	Pseudojuloides cerasinus	12	KAHE 7 - E	8	25.20				
C	Stethojulis balteata	12	KAHE 7 - E	1	72.39				
C	Stethojulis balteata	12	KAHE 7 - E	5	72.04				
C	Macropharyngodon geoffroy	12	KAHE 7 - E	2	11.50				
C	Zanclus cornutus	12	KAHE 7 - E	1	54.90				
C	Sufflamen bursa	12	KAHE 7 - E	5	429.37	73	1635.82	59.89	
CF	Chaetodon multicinctus	12	KAHE 7 - E	2	13.31				
CF	Cantherhines dumerili	12	KAHE 7 - E	1	194.98	3	208.29	7.63	
H	Ctenochaetus strigosus	12	KAHE 7 - E	4	3.49	4	3.49	0.13	
O	Melichthys niger	12	KAHE 7 - E	1	163.34				
O	Melichthys vidua	12	KAHE 7 - E	3	597.09				
O	Canthigaster jactator	12	KAHE 7 - E	4	14.25	8	774.67	28.36	
P	Chaetodon miliaris	12	KAHE 7 - E	3	2.65				
P	Chromis vanderbilii	12	KAHE 7 - E	327	103.30				
P	Chromis ovalis	12	KAHE 7 - E	35	3.29	365	109.24	4.00	
				453	2731.5082	453	2731.5082	100	
C	Myripristis amaenus	13	KAHE 10	2	84.81				
C	Aulostomus chinensis	13	KAHE 10	1	88.50				
C	Parupeneus multifasciatus	13	KAHE 10	4	621.69				
C	Parupeneus multifasciatus	13	KAHE 10	1	27.12				
C	Plectroglyphidodon imparipennis	13	KAHE 10	1	0.86				
C	Paracirrhites arcatus	13	KAHE 10	1	8.12				
C	Paracirrhites forsteri	13	KAHE 10	1	39.65				
C	Labroides phthiophagus	13	KAHE 10	1	0.63				
C	Pseudocheilinus octotaenia	13	KAHE 10	1	14.41				
C	Thalassoma duperrey	13	KAHE 10	9	246.51				
C	Thalassoma duperrey	13	KAHE 10	13	714.34				
C	Thalassoma duperrey	13	KAHE 10	7	679.36				
C	Thalassoma duperrey	13	KAHE 10	8	89.31				
C	Coris gaimard	13	KAHE 10	1	8.57				
C	Coris gaimard	13	KAHE 10	1	22.07				
C	Stethojulis balteata	13	KAHE 10	3	43.23				
C	Macropharyngodon geoffroy	13	KAHE 10	2	11.50				
C	Sufflamen bursa	13	KAHE 10	6	515.24	63	3215.90	65.93	
CF	Chaetodon multicinctus	13	KAHE 10	2	13.31	2	13.31	0.27	
H	Acanthurus triostegus	13	KAHE 10	1	46.32				
H	Acanthurus nigrofusus	13	KAHE 10	4	95.59				
H	Acanthurus olivaceus	13	KAHE 10	2	94.95	7	236.86	4.86	
O	Stegastes fasciolatus	13	KAHE 10	5	73.82				
O	Melichthys vidua	13	KAHE 10	4	796.12				
O	Canthigaster jactator	13	KAHE 10	3	10.69	12	880.62	18.05	
P	Dascyllus albisella	13	KAHE 10	27	83.38				
P	Abudefduf abdominalis	13	KAHE 10	12	375.99				
P	Chromis vanderbilii	13	KAHE 10	81	25.59				
P	Chromis ovalis	13	KAHE 10	52	4.89				
P	Chromis ovalis	13	KAHE 10	7	41.52	179	531.37	10.89	
				263	4878.0607	263	4878.0607	100	

		30-May-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT	
C	Parupeneus pleurostigma	14	Nanakuli 1	4	121.75						
C	Parupeneus multifasciatus	14	Nanakuli 1	2	22.10						
C	Parupeneus multifasciatus	14	Nanakuli 1	2	54.23						
C	Parupeneus cyclostomus	14	Nanakuli 1	1	10.05						
C	Plectroglyphidodon johnstonianus	14	Nanakuli 1	3	2.59						
C	Plectroglyphidodon imparipennis	14	Nanakuli 1	5	4.31						
C	Cheilio inermis	14	Nanakuli 1	1	130.28						
C	Pseudocheilinus octotaenia	14	Nanakuli 1	1	14.41						
C	Thalassoma duperrey	14	Nanakuli 1	3	291.16						
C	Thalassoma duperrey	14	Nanakuli 1	15	410.86						
C	Thalassoma duperrey	14	Nanakuli 1	6	329.69						
C	Thalassoma duperrey	14	Nanakuli 1	19	212.10						
C	Gomphosus varius	14	Nanakuli 1	1	11.04						
C	Coris gaimard	14	Nanakuli 1	3	25.70						
C	Coris gaimard	14	Nanakuli 1	3	66.21						
C	Stethojulis balteata	14	Nanakuli 1	14	500.69						
C	Halichoeres ornatissimus	14	Nanakuli 1	2	32.90						
C	Rhinecanthus rectangulus	14	Nanakuli 1	2	289.30						
C	Sufflamen bursa	14	Nanakuli 1	2	171.75	89	2701.12			67.05	
CF	Chaetodon ornatissimus	14	Nanakuli 1	2	273.78						
CF	Chaetodon multicinctus	14	Nanakuli 1	2	1.65						
CF	Cantherhines dumerili	14	Nanakuli 1	1	442.38						
CF	Cantherhines dumerili	14	Nanakuli 1	1	194.98	6	912.79			22.66	
H	Calotomus carolinus	14	Nanakuli 1	1	131.69						
H	Scarus sordidus	14	Nanakuli 1	1	76.01						
H	Scarus psittacus	14	Nanakuli 1	2	75.75						
H	Scarus psittacus	14	Nanakuli 1	4	58.46						
H	Acanthurus nigrofuscus	14	Nanakuli 1	1	23.90	9	365.80			9.08	
O	Stegastes fasciolatus	14	Nanakuli 1	1	7.39						
O	Canthigaster coronata	14	Nanakuli 1	1	7.59						
O	Canthigaster jactator	14	Nanakuli 1	3	10.69	5	25.67			0.64	
P	Chromis vanderbilti	14	Nanakuli 1	72	22.74						
P	Chromis ovalis	14	Nanakuli 1	7	0.66	79	23.40			0.58	
				188	4028.7808	188	4028.7808			100	
C	Parupeneus multifasciatus	15	Nanakuli 2	1	235.75						
C	Parupeneus multifasciatus	15	Nanakuli 2	1	54.40						
C	Cirrhitops fasciatus	15	Nanakuli 2	1	3.75						
C	Thalassoma duperrey	15	Nanakuli 2	6	164.34						
C	Thalassoma duperrey	15	Nanakuli 2	9	494.54						
C	Thalassoma duperrey	15	Nanakuli 2	5	485.26						
C	Gomphosus varius	15	Nanakuli 2	1	22.60						
C	Stethojulis balteata	15	Nanakuli 2	8	286.11	32	1746.75			25.50	
CF	Chaetodon ornatissimus	15	Nanakuli 2	2	138.00	2	138.00			2.01	
H	Scarus psittacus	15	Nanakuli 2	5	73.07						
H	Acanthurus leucopareius	15	Nanakuli 2	1	232.68						
H	Acanthurus nigrofuscus	15	Nanakuli 2	16	382.35						
H	Acanthurus nigrofuscus	15	Nanakuli 2	12	170.55						
H	Acanthurus olivaceus	15	Nanakuli 2	5	3883.02	39	4741.68			69.21	
O	Stegastes fasciolatus	15	Nanakuli 2	1	7.39						
O	Melichthys vidua	15	Nanakuli 2	1	199.03						
O	Canthigaster jactator	15	Nanakuli 2	5	17.81	7	224.23			3.27	
				80	6850.6608	80	6850.6608			100	

GROUP	SPECIES	30-May-08		NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Myripristis amaenus	16	Kahe PIPE	13	2888.92			
C	Aulostomus chinensis	16	Kahe PIPE	1	88.50			
C	Cephalopholis argus	16	Kahe PIPE	1	1077.13			
C	Cephalopholis argus	16	Kahe PIPE	1	471.73			
C	Cephalopholis argus	16	Kahe PIPE	1	1355.30			
C	Decapterus macarellus	16	Kahe PIPE	55	7165.35			
C	Lutjanus kasmira	16	Kahe PIPE	33	6291.35			
C	Mulloides vanicolensis	16	Kahe PIPE	19	2817.16			
C	Parupeneus pleurostigma	16	Kahe PIPE	2	451.26			
C	Parupeneus multifasciatus	16	Kahe PIPE	2	471.50			
C	Parupeneus bifasciatus	16	Kahe PIPE	5	1971.77			
C	Chaetodon fremblii	16	Kahe PIPE	1	20.91			
C	Chaetodon lunula	16	Kahe PIPE	1	35.99			
C	Paracirrhites arcatus	16	Kahe PIPE	8	130.79			
C	Paracirrhites forsteri	16	Kahe PIPE	1	39.65			
C	Labroides phthiophagus	16	Kahe PIPE	4	2.51			
C	Thalassoma duperrey	16	Kahe PIPE	46	2527.65			
C	Thalassoma duperrey	16	Kahe PIPE	3	33.49			
C	Thalassoma duperrey	16	Kahe PIPE	25	2426.30			
C	Thalassoma duperrey	16	Kahe PIPE	26	712.15			
C	Thalassoma purpureum	16	Kahe PIPE	1	373.77			
C	Thalassoma fuscum	16	Kahe PIPE	1	109.22			
C	Gomphosus varius	16	Kahe PIPE	1	39.39			
C	Gomphosus varius	16	Kahe PIPE	1	4.02			
C	Stethojulis balteata	16	Kahe PIPE	2	71.53			
C	Macropharyngodon geoffroy	16	Kahe PIPE	4	327.80			
C	Macropharyngodon geoffroy	16	Kahe PIPE	6	111.77			
C	Halichoeres ornatissimus	16	Kahe PIPE	4	100.55			
C	Zanclus cornutus	16	Kahe PIPE	4	416.63			
C	Sufflamen bursa	16	Kahe PIPE	1	85.87			
C	Alutera scripta	16	Kahe PIPE	1	775.76	274	33395.72	46.62
CF	Chaetodon multicinctus	16	Kahe PIPE	2	26.06			
CF	Exallias brevis	16	Kahe PIPE	1	49.35			
CF	Pervagor melanocephalus	16	Kahe PIPE	1	9.75	4	85.16	0.12
H	Scarus sordidus	16	Kahe PIPE	1	1427.57			
H	Scarus sordidus	16	Kahe PIPE	9	1260.05			
H	Scarus sordidus	16	Kahe PIPE	3	1101.06			
H	Acanthurus nigrofusus	16	Kahe PIPE	12	286.76			
H	Ctenochaetus strigosus	16	Kahe PIPE	11	295.28			
H	Ctenochaetus strigosus	16	Kahe PIPE	5	329.32			
H	Naso lituratus	16	Kahe PIPE	2	897.88	43	5597.94	7.81
O	Stegastes fasciolatus	16	Kahe PIPE	6	155.88			
O	Melichthys niger	16	Kahe PIPE	8	1306.68			
O	Melichthys vidua	16	Kahe PIPE	1	199.03			
O	Canthigaster jactator	16	Kahe PIPE	4	14.25	19	1675.84	2.34
P	Chaetodon miliaris	16	Kahe PIPE	4	84.67			
P	Dascyllus albisella	16	Kahe PIPE	6	18.53			
P	Abudefduf abdominalis	16	Kahe PIPE	664	20804.83			
P	Chromis vanderbilii	16	Kahe PIPE	98	30.96			
P	Chromis ovalis	16	Kahe PIPE	27	160.16			
P	Naso hexacanthus	16	Kahe PIPE	6	233.55			
P	Naso brevirostris	16	Kahe PIPE	25	4768.60			
P	Naso brevirostris	16	Kahe PIPE	28	2054.02			
P	Naso brevirostris	16	Kahe PIPE	7	2725.96	865	30881.27	43.11
				1205	71635.937	1205	71635.937	100

19 AUGUST 2008 FIELD DATA

GROUP	SPECIES	19-Aug-08		NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Plectroglyphidodon johnstonianus	1	EAST - 1	2	1.72			
C	Plectroglyphidodon imparipennis	1	EAST - 1	1	0.86			
C	Paracirrhites arcatus	1	EAST - 1	1	8.12			
C	Cheilinus bimaculatus	1	EAST - 1	2	8.20			
C	Thalassoma duperrey	1	EAST - 1	4	388.21			
C	Thalassoma duperrey	1	EAST - 1	13	40.96			
C	Thalassoma duperrey	1	EAST - 1	16	438.25			
C	Thalassoma duperrey	1	EAST - 1	23	256.75			
C	Thalassoma duperrey	1	EAST - 1	8	439.59			
C	Coris venusta	1	EAST - 1	2	18.77			
C	Coris venusta	1	EAST - 1	2	47.27			
C	Coris gaimard	1	EAST - 1	1	8.57			
C	Pseudojuloides cerasinus	1	EAST - 1	2	6.30			
C	Stethojulis balteata	1	EAST - 1	12	172.91			
C	Stethojulis balteata	1	EAST - 1	13	52.01			
C	Halichoeres ornatissimus	1	EAST - 1	2	8.82			
C	Bathygobius fuscus	1	EAST - 1	1	1.19			
C	Rhinecanthus rectangulus	1	EAST - 1	3	433.95			
C	Rhinecanthus rectangulus	1	EAST - 1	1	85.87	109	2418.32	90.1
H	Scarus sordidus	1	EAST - 1	1	3.53			
H	Scarus sordidus	1	EAST - 1	3	4.04			
H	Acanthurus dussumieri	1	EAST - 1	1	1.10			
H	Ctenochaetus strigosus	1	EAST - 1	2	6.18	7	14.85	0.6
O	Melichthys vidua	1	EAST - 1	1	199.03			
O	Canthigaster jactator	1	EAST - 1	6	21.37			
O	Canthigaster jactator	1	EAST - 1	3	22.77	10	243.18	9.1
P	Dascyllus albisella	1	EAST - 1	2	0.16			
P	Chromis vanderbilti	1	EAST - 1	27	8.53	29	8.69	0.3
				155	2685.0361	155	2685.0361	100.0
C	Parupeneus multifasciatus	2	EAST - 2	1	27.12			
C	Parupeneus multifasciatus	2	EAST - 2	1	235.75			
C	Plectroglyphidodon johnstonianus	2	EAST - 2	7	6.03			
C	Plectroglyphidodon imparipennis	2	EAST - 2	5	4.31			
C	Paracirrhites arcatus	2	EAST - 2	2	32.70			
C	Paracirrhites arcatus	2	EAST - 2	1	8.12			
C	Thalassoma duperrey	2	EAST - 2	16	438.25			
C	Thalassoma duperrey	2	EAST - 2	7	78.14			
C	Thalassoma duperrey	2	EAST - 2	12	659.39			
C	Thalassoma duperrey	2	EAST - 2	6	582.31			
C	Gomphosus varius	2	EAST - 2	1	22.60			
C	Gomphosus varius	2	EAST - 2	2	22.08			
C	Stethojulis balteata	2	EAST - 2	2	71.53			
C	Stethojulis balteata	2	EAST - 2	8	32.01			
C	Stethojulis balteata	2	EAST - 2	10	144.09			
C	Halichoeres ornatissimus	2	EAST - 2	2	19.05			
C	Rhinecanthus rectangulus	2	EAST - 2	1	85.87			
C	Rhinecanthus rectangulus	2	EAST - 2	2	289.30			
C	Sufflamen bursa	2	EAST - 2	1	85.87			
C	Sufflamen fraenatus	2	EAST - 2	1	329.34	88	3173.85	13.2
H	Centropyge potteri	2	EAST - 2	1	4.98			
H	Acanthurus nigrofuscus	2	EAST - 2	34	812.50			
H	Acanthurus nigrofuscus	2	EAST - 2	23	173.07			
H	Acanthurus olivaceus	2	EAST - 2	9	5068.53			
H	Acanthurus olivaceus	2	EAST - 2	7	40.13			
H	Acanthurus olivaceus	2	EAST - 2	14	10872.47			
H	Acanthurus blochii	2	EAST - 2	2	311.17			
H	Acanthurus blochii	2	EAST - 2	4	3135.24	94	20418.08	85.2
O	Stegastes fasciolatus	2	EAST - 2	1	14.76			
O	Melichthys vidua	2	EAST - 2	1	296.24			
O	Canthigaster coronata	2	EAST - 2	1	3.56			
O	Canthigaster jactator	2	EAST - 2	4	14.25			
O	Canthigaster jactator	2	EAST - 2	3	22.77	10	351.58	1.5
P	Chromis vanderbilti	2	EAST - 2	88	27.80	88	27.80	0.1
				280	23971.32	280	23971.32	100.0

GROUP	SPECIES	19-Aug-08		NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Cephalopholis argus	3	EAST - 3	1	471.73			
C	Parupeneus multifasciatus	3	EAST - 3	1	96.08			
C	Parupeneus cyclostomus	3	EAST - 3	1	88.57			
C	Plectroglyphidodon johnstonianus	3	EAST - 3	14	24.11			
C	Paracirrhites arcatus	3	EAST - 3	4	32.47			
C	Labroides phthirophagus	3	EAST - 3	2	1.26			
C	Thalassoma duperrey	3	EAST - 3	6	582.31			
C	Thalassoma duperrey	3	EAST - 3	20	547.81			
C	Thalassoma duperrey	3	EAST - 3	34	1868.26			
C	Thalassoma duperrey	3	EAST - 3	12	133.96			
C	Thalassoma duperrey	3	EAST - 3	2	6.30			
C	Gomphosus varius	3	EAST - 3	1	62.03			
C	Gomphosus varius	3	EAST - 3	1	22.60			
C	Coris gaimard	3	EAST - 3	1	139.13			
C	Coris gaimard	3	EAST - 3	1	2.26			
C	Pseudojuloides cerasinus	3	EAST - 3	1	27.39			
C	Stethojulis balteata	3	EAST - 3	9	321.87			
C	Halichoeres ornatus	3	EAST - 3	3	75.41			
C	Sufflamen bursa	3	EAST - 3	4	343.49			
C	Sufflamen fraenatus	3	EAST - 3	2	449.59	120	5296.63	65.7
CF	Chaetodon ornatissimus	3	EAST - 3	2	138.00			
CF	Chaetodon multicinctus	3	EAST - 3	2	26.06	4	164.06	2.0
H	Scarus psittacus	3	EAST - 3	3	43.84			
H	Scarus psittacus	3	EAST - 3	1	37.87			
H	Scarus psittacus	3	EAST - 3	1	144.94			
H	Scarus rubroviolaceus	3	EAST - 3	1	147.03			
H	Scarus rubroviolaceus	3	EAST - 3	1	346.50			
H	Acanthurus nigrofasciatus	3	EAST - 3	44	1051.47			
H	Acanthurus nigrofasciatus	3	EAST - 3	25	355.32			
H	Acanthurus nigrofasciatus	3	EAST - 3	7	52.67			
H	Ctenochaetus strigosus	3	EAST - 3	1	3.09			
H	Ctenochaetus strigosus	3	EAST - 3	1	0.87	85	2183.60	27.1
O	Stegastes fasciatus	3	EAST - 3	13	191.92			
O	Melichthys vidua	3	EAST - 3	1	199.03			
O	Canthigaster jactator	3	EAST - 3	7	24.93			
O	Canthigaster jactator	3	EAST - 3	1	2.21	22	418.09	5.2
				231	8062.3899	231	8062.3899	100.0
C	Gymnothorax flavimarginatus	4	EAST - 4	1	4535.92			
C	Parupeneus multifasciatus	4	EAST - 4	1	11.05			
C	Parupeneus multifasciatus	4	EAST - 4	1	27.12			
C	Paracirrhites arcatus	4	EAST - 4	1	16.35			
C	Paracirrhites arcatus	4	EAST - 4	3	24.35			
C	Paracirrhites forsteri	4	EAST - 4	1	39.65			
C	Bodianus bilunulatus	4	EAST - 4	1	1462.82			
C	Cheilinus bimaculatus	4	EAST - 4	3	58.10			
C	Cheilinus bimaculatus	4	EAST - 4	3	12.30			
C	Thalassoma duperrey	4	EAST - 4	11	34.66			
C	Thalassoma duperrey	4	EAST - 4	18	493.03			
C	Thalassoma duperrey	4	EAST - 4	15	824.23			
C	Thalassoma duperrey	4	EAST - 4	3	291.16			
C	Thalassoma duperrey	4	EAST - 4	16	178.61			
C	Coris gaimard	4	EAST - 4	4	183.96			
C	Pseudojuloides cerasinus	4	EAST - 4	1	11.16			
C	Stethojulis balteata	4	EAST - 4	4	143.05			
C	Macropharyngodon geoffroy	4	EAST - 4	3	7.49			
C	Halichoeres ornatissimus	4	EAST - 4	5	47.62			
C	Halichoeres ornatissimus	4	EAST - 4	1	25.14			
C	Rhinecanthus rectangulus	4	EAST - 4	1	85.87			
C	Rhinecanthus rectangulus	4	EAST - 4	2	289.30			
C	Sufflamen fraenatus	4	EAST - 4	2	449.59	101	9252.52	42.9
H	Calotomus carolinus	4	EAST - 4	1	34.69			
H	Acanthurus triostegus	4	EAST - 4	4	400.06			
H	Acanthurus nigrofasciatus	4	EAST - 4	11	262.87			
H	Acanthurus nigrofasciatus	4	EAST - 4	17	127.92			
H	Acanthurus olivaceus	4	EAST - 4	5	3883.02			
H	Acanthurus olivaceus	4	EAST - 4	7	3942.19			
H	Acanthurus olivaceus	4	EAST - 4	4	22.93			
H	Acanthurus dussumieri	4	EAST - 4	1	564.35			
H	Ctenochaetus strigosus	4	EAST - 4	1	0.87	51	9238.90	42.8
O	Stegastes fasciatus	4	EAST - 4	2	29.53			
O	Melichthys niger	4	EAST - 4	4	653.34			
O	Melichthys vidua	4	EAST - 4	2	592.48			
O	Canthigaster jactator	4	EAST - 4	5	17.81	13	1293.16	6.0
P	Chromis vanderbilti	4	EAST - 4	238	75.18			
P	Chromis ovalis	4	EAST - 4	3	4.37			
P	Naso brevirostris	4	EAST - 4	9	1716.70	250	1796.24	8.3
				415	21580.824	415	21580.824	100.0

GROUP	SPECIES	19-Aug-08		NO.	NO.	GROUP	GROUP
		TRN	NAME	INDIV.	BIOMASS	BIOMASS	PERCENT
C	Parupeneus multifasciatus	5	Ko Olina 1	1	96.08		
C	Plectroglyphidodon johnstonianus	5	Ko Olina 1	11	18.94		
C	Paracirrhites arcatus	5	Ko Olina 1	2	16.24		
C	Cirrhitus pinnulatus	5	Ko Olina 1	1	90.86		
C	Thalassoma duperrey	5	Ko Olina 1	13	356.08		
C	Thalassoma duperrey	5	Ko Olina 1	4	44.65		
C	Thalassoma duperrey	5	Ko Olina 1	15	824.23		
C	Thalassoma duperrey	5	Ko Olina 1	5	485.26		
C	Gomphosus varius	5	Ko Olina 1	4	90.40		
C	Stethojulis balteata	5	Ko Olina 1	9	321.87		
C	Halichoeres ornatus	5	Ko Olina 1	1	25.14		
C	Sufflamen bursa	5	Ko Olina 1	1	144.65		
C	Sufflamen bursa	5	Ko Olina 1	6	515.24		
C	Ostracion meleagris	5	Ko Olina 1	2	27.50	75	3057.14
CF	Chaetodon unimaculatus	5	Ko Olina 1	2	50.61		22.1
CF	Chaetodon ornatissimus	5	Ko Olina 1	2	138.00		
CF	Chaetodon multicinctus	5	Ko Olina 1	4	52.12	8	240.73
H	Scarus psittacus	5	Ko Olina 1	1	144.94		1.7
H	Scarus psittacus	5	Ko Olina 1	2	158.54		
H	Scarus rubroviolaceus	5	Ko Olina 1	1	43.92		
H	Scarus rubroviolaceus	5	Ko Olina 1	1	147.03		
H	Acanthurus nigrofusus	5	Ko Olina 1	44	1051.47		
H	Acanthurus olivaceus	5	Ko Olina 1	4	1046.67		
H	Acanthurus olivaceus	5	Ko Olina 1	4	2252.68		
H	Acanthurus blochii	5	Ko Olina 1	4	391.91		
H	Acanthurus blochii	5	Ko Olina 1	4	226.80		
H	Ctenochaetus strigosus	5	Ko Olina 1	41	2700.46		
H	Ctenochaetus strigosus	5	Ko Olina 1	6	792.80		
H	Ctenochaetus strigosus	5	Ko Olina 1	12	322.13	124	9279.33
O	Stegastes fasciatus	5	Ko Olina 1	7	103.34		67.2
O	Melichthys niger	5	Ko Olina 1	5	816.68		
O	Canthigaster sandwicensis	5	Ko Olina 1	2	263.15		
O	Canthigaster jactator	5	Ko Olina 1	5	17.81	19	1200.98
P	Abudefduf abdominalis	5	Ko Olina 1	1	31.33	1	31.33
				227	13809.516	227	13809.516
							100.0
C	Gymnothorax flavimarginatus	6	Ko Olina 2	1	390.17		
C	Parupeneus multifasciatus	6	Ko Olina 2	3	163.20		
C	Parupeneus multifasciatus	6	Ko Olina 2	2	54.23		
C	Chaetodon auriga	6	Ko Olina 2	2	96.78		
C	Plectroglyphidodon johnstonianus	6	Ko Olina 2	8	13.77		
C	Cirrhitus pinnulatus	6	Ko Olina 2	1	162.54		
C	Labroides phthiophagus	6	Ko Olina 2	1	0.63		
C	Thalassoma duperrey	6	Ko Olina 2	17	934.13		
C	Thalassoma duperrey	6	Ko Olina 2	7	679.36		
C	Thalassoma duperrey	6	Ko Olina 2	13	356.08		
C	Thalassoma duperrey	6	Ko Olina 2	4	44.65		
C	Gomphosus varius	6	Ko Olina 2	1	39.39		
C	Gomphosus varius	6	Ko Olina 2	1	22.60		
C	Coris gaimard	6	Ko Olina 2	1	449.84		
C	Stethojulis balteata	6	Ko Olina 2	3	107.29		
C	Macropharyngodon geoffroy	6	Ko Olina 2	2	37.26		
C	Halichoeres ornatus	6	Ko Olina 2	2	50.27		
C	Halichoeres ornatus	6	Ko Olina 2	2	32.90		
C	Zanclus cornutus	6	Ko Olina 2	1	104.16		
C	Sufflamen bursa	6	Ko Olina 2	1	85.87		
C	Sufflamen bursa	6	Ko Olina 2	2	289.30		
C	Sufflamen fraenatus	6	Ko Olina 2	1	461.25	76	4575.68
CF	Chaetodon unimaculatus	6	Ko Olina 2	2	50.61		13.9
CF	Chaetodon quadrimaculatus	6	Ko Olina 2	2	50.61		
CF	Chaetodon multicinctus	6	Ko Olina 2	4	52.12	8	153.34
H	Scarus psittacus	6	Ko Olina 2	1	554.69		0.5
H	Scarus psittacus	6	Ko Olina 2	2	482.85		
H	Scarus psittacus	6	Ko Olina 2	6	475.61		
H	Scarus psittacus	6	Ko Olina 2	10	378.73		
H	Scarus psittacus	6	Ko Olina 2	4	58.46		
H	Scarus rubroviolaceus	6	Ko Olina 2	1	147.03		
H	Acanthurus triostegus	6	Ko Olina 2	1	17.17		
H	Acanthurus triostegus	6	Ko Olina 2	6	600.09		
H	Acanthurus triostegus	6	Ko Olina 2	10	463.15		
H	Acanthurus triostegus	6	Ko Olina 2	1	0.39		
H	Acanthurus leucopareius	6	Ko Olina 2	8	1861.40		
H	Acanthurus leucopareius	6	Ko Olina 2	4	530.80		
H	Acanthurus nigrofusus	6	Ko Olina 2	51	1218.75		
H	Acanthurus nigroris	6	Ko Olina 2	2	108.50		
H	Acanthurus olivaceus	6	Ko Olina 2	23	12952.92		
H	Acanthurus olivaceus	6	Ko Olina 2	2	523.33		
H	Acanthurus olivaceus	6	Ko Olina 2	3	490.55		
H	Acanthurus blochii	6	Ko Olina 2	2	195.95		
H	Acanthurus blochii	6	Ko Olina 2	6	933.50		
H	Acanthurus blochii	6	Ko Olina 2	1	232.24		
H	Ctenochaetus strigosus	6	Ko Olina 2	9	7.84		
H	Ctenochaetus strigosus	6	Ko Olina 2	13	1717.74		
H	Ctenochaetus strigosus	6	Ko Olina 2	3	197.59		
H	Zebrasoma flavescens	6	Ko Olina 2	5	266.40		
H	Naso lituratus	6	Ko Olina 2	2	897.88		
H	Naso lituratus	6	Ko Olina 2	1	622.36	177	25935.91
O	Stegastes fasciatus	6	Ko Olina 2	6	88.58		78.6
O	Melichthys niger	6	Ko Olina 2	8	1306.68		
O	Melichthys vidua	6	Ko Olina 2	3	597.09		
O	Canthigaster jactator	6	Ko Olina 2	9	32.06		
O	Canthigaster jactator	6	Ko Olina 2	6	13.23		
O	Canthigaster amboinensis	6	Ko Olina 2	1	25.30	33	2062.94
P	Abudefduf abdominalis	6	Ko Olina 2	8	250.66	8	250.66
				302	32978.533	302	32978.533
							100.0

GROUP	SPECIES	19-Aug-08		NO.		NO.	GROUP	GROUP
		TRN	NAME	INDIV.	BIOMASS			
C	Aulostomus chinensis	7	KAHE 1-D	1	12.84			
C	Parupeneus multifasciatus	7	KAHE 1-D	2	192.16			
C	Chaetodon lunula	7	KAHE 1-D	2	71.99			
C	Plectroglyphidodon johnstonianus	7	KAHE 1-D	7	12.05			
C	Plectroglyphidodon imparipennis	7	KAHE 1-D	3	2.59			
C	Labroides phthirophagus	7	KAHE 1-D	2	1.26			
C	Thalassoma duperrey	7	KAHE 1-D	15	1455.78			
C	Thalassoma duperrey	7	KAHE 1-D	15	824.23			
C	Thalassoma duperrey	7	KAHE 1-D	13	356.08			
C	Thalassoma duperrey	7	KAHE 1-D	3	33.49			
C	Thalassoma ballieui	7	KAHE 1-D	1	102.61			
C	Gomphosus varius	7	KAHE 1-D	2	22.08			
C	Gomphosus varius	7	KAHE 1-D	4	90.40			
C	Coris gaimard	7	KAHE 1-D	1	22.07			
C	Stethojulis balteata	7	KAHE 1-D	4	143.05			
C	Zanclus cornutus	7	KAHE 1-D	2	109.80			
C	Rhinecanthus rectangulus	7	KAHE 1-D	1	85.87			
C	Sufflamen bursa	7	KAHE 1-D	1	85.87			
C	Diodon holocanthus	7	KAHE 1-D	1	908.34	80	4532.57	35.0
H	Centropyge pottieri	7	KAHE 1-D	1	7.48			
H	Cirripectes variolosus	7	KAHE 1-D	1	7.25			
H	Acanthurus nigrofasciatus	7	KAHE 1-D	35	836.40			
H	Acanthurus nigrofasciatus	7	KAHE 1-D	10	142.13			
H	Ctenochaetus strigosus	7	KAHE 1-D	5	134.22			
H	Zebrafish	7	KAHE 1-D	1	1.69			
H	Zebrafish	7	KAHE 1-D	2	33.06	55	1162.22	9.0
O	Stegastes fasciatus	7	KAHE 1-D	15	221.45			
O	Melichthys niger	7	KAHE 1-D	43	7023.43			
O	Canthigaster jactator	7	KAHE 1-D	5	17.81	63	7262.68	56.0
P	Chromis vanderbilti	7	KAHE 1-D	15	4.74	15	4.74	0.04
				213	12962.209	213	12962.209	100.0
C	Myripristis amaenus	8	KAHE 5-B	3	127.21			
C	Fistularia commersoni	8	KAHE 5-B	1	75.23			
C	Decapterus macarellus	8	KAHE 5-B	1	269.34			
C	Parupeneus pleurostigma	8	KAHE 5-B	1	58.01			
C	Parupeneus multifasciatus	8	KAHE 5-B	4	108.47			
C	Parupeneus multifasciatus	8	KAHE 5-B	5	272.00			
C	Parupeneus multifasciatus	8	KAHE 5-B	3	288.24			
C	Plectroglyphidodon johnstonianus	8	KAHE 5-B	6	10.33			
C	Plectroglyphidodon imparipennis	8	KAHE 5-B	3	2.59			
C	Paracirrhites arcatus	8	KAHE 5-B	9	73.08			
C	Cirripectes fasciatus	8	KAHE 5-B	1	8.23			
C	Labroides phthirophagus	8	KAHE 5-B	2	1.26			
C	Thalassoma duperrey	8	KAHE 5-B	8	219.12			
C	Thalassoma duperrey	8	KAHE 5-B	7	191.73			
C	Thalassoma duperrey	8	KAHE 5-B	8	89.31			
C	Thalassoma duperrey	8	KAHE 5-B	5	274.74			
C	Thalassoma duperrey	8	KAHE 5-B	6	582.31			
C	Coris venusta	8	KAHE 5-B	3	28.16			
C	Coris venusta	8	KAHE 5-B	1	23.64			
C	Stethojulis balteata	8	KAHE 5-B	2	71.53			
C	Macropharyngodon geoffroy	8	KAHE 5-B	1	10.98			
C	Halichoeres omatissimus	8	KAHE 5-B	1	25.14			
C	Halichoeres omatissimus	8	KAHE 5-B	3	28.57			
C	Plagiotremus ewaensis	8	KAHE 5-B	1	0.95			
C	Zanclus cornutus	8	KAHE 5-B	3	312.47			
C	Rhinecanthus rectangulus	8	KAHE 5-B	1	144.85			
C	Rhinecanthus rectangulus	8	KAHE 5-B	3	257.62			
C	Sufflamen bursa	8	KAHE 5-B	2	171.75	94	3726.63	47.4
CF	Chaetodon multicinctus	8	KAHE 5-B	2	13.31	2	13.31	0.2
H	Scarus sordidus	8	KAHE 5-B	1	13.73			
H	Acanthurus triostegus	8	KAHE 5-B	1	46.32			
H	Acanthurus nigrofasciatus	8	KAHE 5-B	6	325.51			
H	Acanthurus nigrofasciatus	8	KAHE 5-B	24	573.53			
H	Acanthurus nigrofasciatus	8	KAHE 5-B	13	97.82			
H	Acanthurus olivaceus	8	KAHE 5-B	5	2815.85	50	3872.76	49.2
O	Stegastes fasciatus	8	KAHE 5-B	10	147.63			
O	Canthigaster jactator	8	KAHE 5-B	3	10.69	13	158.32	2.0
P	Chromis vanderbilti	8	KAHE 5-B	304	96.03	304	96.03	1.2
				463	7667.0495	463	7667.0495	100.0
C	Aulostomus chinensis	9	KAHE 7-B	1	88.50			
C	Parupeneus pleurostigma	9	KAHE 7-B	1	30.44			
C	Parupeneus pleurostigma	9	KAHE 7-B	9	522.07			
C	Parupeneus multifasciatus	9	KAHE 7-B	1	340.44			
C	Paracirrhites arcatus	9	KAHE 7-B	1	8.12			
C	Chelinus bimaculatus	9	KAHE 7-B	1	4.10			
C	Chelinus bimaculatus	9	KAHE 7-B	1	19.37			
C	Thalassoma duperrey	9	KAHE 7-B	4	219.80			
C	Thalassoma duperrey	9	KAHE 7-B	5	136.95			
C	Thalassoma duperrey	9	KAHE 7-B	3	33.49			
C	Thalassoma duperrey	9	KAHE 7-B	4	388.21			
C	Coris gaimard	9	KAHE 7-B	3	251.36			
C	Halichoeres omatissimus	9	KAHE 7-B	1	4.41			
C	Sufflamen bursa	9	KAHE 7-B	3	257.82			
C	Ostracion meleagris	9	KAHE 7-B	1	6.76	39	2311.64	33.8
CF	Chaetodon multicinctus	9	KAHE 7-B	2	1.65	2	1.65	0.02
H	Scarus psittacus	9	KAHE 7-B	1	375.61			
H	Acanthurus triostegus	9	KAHE 7-B	9	900.13			
H	Acanthurus nigrofasciatus	9	KAHE 7-B	1	7.52			
H	Acanthurus nigrofasciatus	9	KAHE 7-B	1	54.25			
H	Acanthurus nigrofasciatus	9	KAHE 7-B	2	47.79			
H	Acanthurus olivaceus	9	KAHE 7-B	3	1689.51			
H	Acanthurus olivaceus	9	KAHE 7-B	2	786.42			
H	Ctenochaetus strigosus	9	KAHE 7-B	3	2.61	22	3883.85	56.4
O	Melichthys vidua	9	KAHE 7-B	1	188.03			
O	Cantherhines sandwichiensis	9	KAHE 7-B	1	196.14			
O	Canthigaster coronata	9	KAHE 7-B	1	7.59			
O	Canthigaster jactator	9	KAHE 7-B	2	7.12	5	409.88	6.0
P	Dascyllus albisella	9	KAHE 7-B	1	0.08			
P	Dascyllus albisella	9	KAHE 7-B	6	18.53			
P	Chromis vanderbilti	9	KAHE 7-B	159	50.23			
P	Naso brevirostris	9	KAHE 7-B	1	190.74	167	259.58	3.8
				235	6846.6023	235	6846.6023	100.0

		19-Aug-08							
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT	
C	Echidna nebulosa	10	KAHE 7 -C	1	231.75				
C	Caranx ignobilis	10	KAHE 7 -C	1	3628.74				
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	472.94				
C	Parupeneus multifasciatus	10	KAHE 7 -C	7	77.36				
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	27.12				
C	Plectroglyphidodon johnstonianus	10	KAHE 7 -C	1	1.72				
C	Plectroglyphidodon imparipennis	10	KAHE 7 -C	2	1.72				
C	Paracirrhites arcatus	10	KAHE 7 -C	2	16.24				
C	Cheilinus bimaculatus	10	KAHE 7 -C	1	19.37				
C	Thalassoma duperrey	10	KAHE 7 -C	1	97.05				
C	Thalassoma duperrey	10	KAHE 7 -C	5	136.95				
C	Thalassoma duperrey	10	KAHE 7 -C	8	89.31				
C	Thalassoma duperrey	10	KAHE 7 -C	13	4.71				
C	Thalassoma duperrey	10	KAHE 7 -C	5	15.75				
C	Coris venusta	10	KAHE 7 -C	4	10.22				
C	Coris venusta	10	KAHE 7 -C	2	47.27				
C	Pseudojuloides cerasinus	10	KAHE 7 -C	4	12.60				
C	Stethojulis balteata	10	KAHE 7 -C	9	129.68				
C	Anampses chrysocephalus	10	KAHE 7 -C	1	2.63				
C	Plagiotremus ewaensis	10	KAHE 7 -C	1	0.95				
C	Sufflamen bursa	10	KAHE 7 -C	7	601.11				
C	Parapercis schauinslandi	10	KAHE 7 -C	1	9.06	78	5634.26	85.5	
CF	Chaetodon multicinctus	10	KAHE 7 -C	2	1.65	2	1.65	0.03	
H	Acanthurus nigrofusus	10	KAHE 7 -C	14	14.61				
H	Acanthurus olivaceus	10	KAHE 7 -C	1	563.17	15	577.78	8.8	
O	Melichthys vidua	10	KAHE 7 -C	1	199.03				
O	Cantherhines sandwichiensis	10	KAHE 7 -C	1	82.05				
O	Canthigaster coronata	10	KAHE 7 -C	1	7.59				
O	Canthigaster coronata	10	KAHE 7 -C	1	46.99				
O	Canthigaster jactator	10	KAHE 7 -C	2	7.12	6	342.79	5.2	
P	Chromis vanderbilti	10	KAHE 7 -C	100	31.59	100	31.59	0.5	
				201	6588.0653	201	6588.0653	100	
C	Gymnothorax flavimarginatus	11	KAHE 7 -D	1	658.42				
C	Parupeneus pleurostigma	11	KAHE 7 -D	3	12.32				
C	Parupeneus multifasciatus	11	KAHE 7 -D	2	6.24				
C	Parupeneus multifasciatus	11	KAHE 7 -D	4	44.21				
C	Plectroglyphidodon johnstonianus	11	KAHE 7 -D	3	2.59				
C	Paracirrhites arcatus	11	KAHE 7 -D	1	8.12				
C	Cirrhitoys fasciatus	11	KAHE 7 -D	1	3.75				
C	Labroides phthiophagus	11	KAHE 7 -D	1	0.63				
C	Thalassoma duperrey	11	KAHE 7 -D	3	9.45				
C	Sufflamen bursa	11	KAHE 7 -D	1	85.87				
C	Sufflamen bursa	11	KAHE 7 -D	1	144.65	21	976.24	56.8	
CF	Chaetodon multicinctus	11	KAHE 7 -D	2	1.65				
CF	Cantherhines dumerili	11	KAHE 7 -D	1	301.33	3	302.98	17.6	
H	Acanthurus nigrofusus	11	KAHE 7 -D	11	11.48				
H	Ctenochaetus strigosus	11	KAHE 7 -D	3	2.61				
H	Zebrasoma flavescens	11	KAHE 7 -D	1	1.69	15	15.78	0.9	
O	Melichthys vidua	11	KAHE 7 -D	1	296.24				
O	Cantherhines sandwichiensis	11	KAHE 7 -D	1	82.05				
O	Canthigaster coronata	11	KAHE 7 -D	1	7.59				
O	Canthigaster jactator	11	KAHE 7 -D	2	2.45				
O	Canthigaster jactator	11	KAHE 7 -D	2	7.12	7	395.46	23.0	
P	Chaetodon miliaris	11	KAHE 7 -D	1	0.88				
P	Dascyllus albisella	11	KAHE 7 -D	2	1.61				
P	Chromis vanderbilti	11	KAHE 7 -D	77	24.32	80	26.82	1.6	
				126	1717.2776	126	1717.2776	100.0	

19-Aug-08		NO.		NO.		GROUP		GROUP
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT
C	Gymnothorax meleagris	12	KAHE 7 - E	1	233.92			
C	Fistularia commersoni	12	KAHE 7 - E	1	24.67			
C	Scorpaenopsis diabolus	12	KAHE 7 - E	1	1120.70			
C	Parupeneus pleurostigma	12	KAHE 7 - E	4	53.02			
C	Parupeneus pleurostigma	12	KAHE 7 - E	4	121.75			
C	Parupeneus multifasciatus	12	KAHE 7 - E	3	81.35			
C	Parupeneus multifasciatus	12	KAHE 7 - E	1	54.40			
C	Parupeneus multifasciatus	12	KAHE 7 - E	4	44.21			
C	Parupeneus multifasciatus	12	KAHE 7 - E	1	155.42			
C	Plectroglyphidodon johnstonianus	12	KAHE 7 - E	4	6.89			
C	Paracirrhites arcatus	12	KAHE 7 - E	4	32.47			
C	Cheilinus bimaculatus	12	KAHE 7 - E	2	38.73			
C	Cheilinus bimaculatus	12	KAHE 7 - E	4	16.39			
C	Pseudocheilinus octotaenia	12	KAHE 7 - E	1	14.41			
C	Pseudocheilinus tetraetania	12	KAHE 7 - E	1	4.00			
C	Thalassoma duperrey	12	KAHE 7 - E	3	164.85			
C	Thalassoma duperrey	12	KAHE 7 - E	1	97.05			
C	Thalassoma duperrey	12	KAHE 7 - E	5	136.95			
C	Thalassoma duperrey	12	KAHE 7 - E	4	44.65			
C	Coris gaimard	12	KAHE 7 - E	1	22.07			
C	Coris bairdii	12	KAHE 7 - E	1	2.26			
C	Pseudojuloides cerasinus	12	KAHE 7 - E	8	25.20			
C	Pseudojuloides cerasinus	12	KAHE 7 - E	7	78.14			
C	Stethojulis baiteata	12	KAHE 7 - E	1	35.76			
C	Macropharyngodon geoffroy	12	KAHE 7 - E	3	55.89			
C	Anampses chrysocephalus	12	KAHE 7 - E	1	0.27			
C	Halichoeres ornatus	12	KAHE 7 - E	2	8.82			
C	Zanclus cornutus	12	KAHE 7 - E	3	312.47			
C	Sufflamen bursa	12	KAHE 7 - E	3	257.62			
C	Sufflamen fraenatus	12	KAHE 7 - E	1	461.25	80	3705.58	55.6
CF	Chaetodon multicinctus	12	KAHE 7 - E	10	66.57			
CF	Chaetodon multicinctus	12	KAHE 7 - E	17	14.05			
CF	Pervagor melanoccephalus	12	KAHE 7 - E	1	5.23			
CF	Cantherhines dumerilii	12	KAHE 7 - E	2	602.65	30	688.50	10.3
H	Calotomus carolinus	12	KAHE 7 - E	1	499.89			
H	Scarus psittacus	12	KAHE 7 - E	1	14.61			
H	Scarus rubroviolaceus	12	KAHE 7 - E	1	5.57			
H	Acanthurus nigrofusus	12	KAHE 7 - E	16	16.70			
H	Acanthurus nigrofusus	12	KAHE 7 - E	18	135.44			
H	Acanthurus olivaceus	12	KAHE 7 - E	1	563.17			
H	Acanthurus olivaceus	12	KAHE 7 - E	1	0.69			
H	Ctenochaetus strigosus	12	KAHE 7 - E	25	21.79			
H	Zebrasoma flavescens	12	KAHE 7 - E	4	6.75			
H	Naso lituratus	12	KAHE 7 - E	2	8.48			
H	Naso unicornis	12	KAHE 7 - E	1	5.44	71	1278.53	19.2
O	Melichthys niger	12	KAHE 7 - E	4	653.34			
O	Melichthys vidua	12	KAHE 7 - E	1	199.03			
O	Canthigaster coronata	12	KAHE 7 - E	1	7.59			
O	Canthigaster jactator	12	KAHE 7 - E	7	24.93	13	884.90	13.3
P	Chromis vanderbilli	12	KAHE 7 - E	295	93.19			
P	Chromis hanui	12	KAHE 7 - E	25	18.67	320	111.85	1.7
				514	6659.3644	514	6669.3644	100.0
C	Adioryx xantherythrus	13	KAHE 10	3	95.02			
C	Fistularia commersoni	13	KAHE 10	1	306.53			
C	Apogon kallopterus	13	KAHE 10	3	68.39			
C	Parupeneus multifasciatus	13	KAHE 10	2	54.23			
C	Parupeneus multifasciatus	13	KAHE 10	2	192.16			
C	Parupeneus multifasciatus	13	KAHE 10	1	155.42			
C	Plectroglyphidodon imparipennis	13	KAHE 10	3	5.17			
C	Plectroglyphidodon imparipennis	13	KAHE 10	3	2.59			
C	Paracirrhites arcatus	13	KAHE 10	1	8.12			
C	Bodianus bitunulatus	13	KAHE 10	1	4.42			
C	Labroides phthiophagus	13	KAHE 10	2	1.26			
C	Thalassoma duperrey	13	KAHE 10	13	714.34			
C	Thalassoma duperrey	13	KAHE 10	10	970.52			
C	Thalassoma duperrey	13	KAHE 10	29	323.73			
C	Thalassoma duperrey	13	KAHE 10	19	520.42			
C	Thalassoma duperrey	13	KAHE 10	22	69.31			
C	Thalassoma fuscum	13	KAHE 10	1	172.64			
C	Thalassoma quinquevittatum	13	KAHE 10	1	109.22			
C	Stethojulis baiteata	13	KAHE 10	3	43.23			
C	Halichoeres ornatus	13	KAHE 10	1	16.45			
C	Halichoeres ornatus	13	KAHE 10	2	19.05			
C	Plagiotremus ewaensis	13	KAHE 10	2	1.90			
C	Sufflamen bursa	13	KAHE 10	4	343.49			
C	Sufflamen fraenatus	13	KAHE 10	1	224.79	130	4422.41	35.1
H	Calotomus carolinus	13	KAHE 10	1	707.00			
H	Scarus rubroviolaceus	13	KAHE 10	1	85.39			
H	Acanthurus nigrofusus	13	KAHE 10	5	37.62			
H	Acanthurus nigrofusus	13	KAHE 10	9	215.07			
H	Acanthurus olivaceus	13	KAHE 10	2	523.33			
H	Acanthurus olivaceus	13	KAHE 10	4	2252.68			
H	Acanthurus blochii	13	KAHE 10	1	3.63			
H	Zebrasoma flavescens	13	KAHE 10	1	53.28			
H	Naso lituratus	13	KAHE 10	2	897.88			
H	Naso lituratus	13	KAHE 10	1	622.36			
H	Naso unicornis	13	KAHE 10	1	278.71	28	5676.96	45.0
O	Stegastes fasciatus	13	KAHE 10	4	59.05			
O	Melichthys vidua	13	KAHE 10	1	296.24			
O	Cantherhines sandwichiensis	13	KAHE 10	1	131.57			
O	Canthigaster coronata	13	KAHE 10	1	7.59	7	494.45	3.9
P	Dascyllus albisella	13	KAHE 10	32	98.83			
P	Abudefduf abdominalis	13	KAHE 10	56	1754.62			
P	Chromis vanderbilli	13	KAHE 10	83	26.22			
P	Chromis ovalis	13	KAHE 10	40	29.87			
P	Chromis ovalis	13	KAHE 10	9	104.04	220	2013.57	16.0
				385	12607.398	385	12607.398	100.0

		19-Aug-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT	
C	Parupeneus multifasciatus	14	Nanakuli 1	1	54.40						
C	Parupeneus multifasciatus	14	Nanakuli 1	2	6.24						
C	Parupeneus multifasciatus	14	Nanakuli 1	4	108.47						
C	Plectroglyphidodon johnstonianus	14	Nanakuli 1	1	1.72						
C	Plectroglyphidodon imparipennis	14	Nanakuli 1	7	6.03						
C	Paracirrhites arcatus	14	Nanakuli 1	1	8.12						
C	Thalassoma duperrey	14	Nanakuli 1	1	54.95						
C	Thalassoma duperrey	14	Nanakuli 1	15	5.44						
C	Thalassoma duperrey	14	Nanakuli 1	24	267.92						
C	Thalassoma duperrey	14	Nanakuli 1	18	493.03						
C	Thalassoma fuscum	14	Nanakuli 1	1	63.55						
C	Pseudojuloides cerasinus	14	Nanakuli 1	5	15.75						
C	Stethojulis balteata	14	Nanakuli 1	8	286.11						
C	Stethojulis balteata	14	Nanakuli 1	12	172.91			100	1544.63		94.5
CF	Chaetodon ornatissimus	14	Nanakuli 1	1	0.98			1	0.98		0.1
H	Scarus psittacus	14	Nanakuli 1	1	14.61						
H	Acanthurus triostegus	14	Nanakuli 1	5	7.85						
H	Acanthurus triostegus	14	Nanakuli 1	24	9.31						
H	Acanthurus leucopareius	14	Nanakuli 1	1	3.25						
H	Acanthurus nigrofuscus	14	Nanakuli 1	15	15.65						
H	Acanthurus olivaceus	14	Nanakuli 1	5	3.46						
H	Acanthurus olivaceus	14	Nanakuli 1	2	11.46						
H	Acanthurus blochii	14	Nanakuli 1	3	4.59						
H	Ctenochaetus strigosus	14	Nanakuli 1	3	2.61			59	72.82		4.5
O	Stegastes fasciolatus	14	Nanakuli 1	4	3.45						
O	Canthigaster jactator	14	Nanakuli 1	1	3.56			5	7.01		0.4
P	Chromis vanderbilti	14	Nanakuli 1	27	8.53			27	8.53		0.5
				192	1633.9663			192	1633.9663		100.0
C	Parupeneus multifasciatus	15	Nanakuli 2	1	27.12						
C	Parupeneus multifasciatus	15	Nanakuli 2	1	3.12						
C	Plectroglyphidodon imparipennis	15	Nanakuli 2	1	0.86						
C	Thalassoma duperrey	15	Nanakuli 2	8	439.59						
C	Thalassoma duperrey	15	Nanakuli 2	12	328.69						
C	Thalassoma duperrey	15	Nanakuli 2	3	291.16						
C	Thalassoma duperrey	15	Nanakuli 2	4	44.65						
C	Gomphosus varius	15	Nanakuli 2	2	22.08						
C	Stethojulis balteata	15	Nanakuli 2	3	107.29						
C	Halichoeres ornatissimus	15	Nanakuli 2	1	25.14						
C	Rhinecanthus rectangulus	15	Nanakuli 2	1	85.87						
C	Sufflamen bursa	15	Nanakuli 2	2	171.75			39	1547.31		47.4
CF	Cantherhines dumerili	15	Nanakuli 2	1	194.98			1	194.98		6.0
H	Scarus psittacus	15	Nanakuli 2	1	14.61						
H	Acanthurus nigrofuscus	15	Nanakuli 2	18	976.54						
H	Acanthurus nigrofuscus	15	Nanakuli 2	17	406.25						
H	Ctenochaetus strigosus	15	Nanakuli 2	6	5.23						
H	Ctenochaetus strigosus	15	Nanakuli 2	1	26.84			43	1429.48		43.8
O	Stegastes fasciolatus	15	Nanakuli 2	3	44.29						
O	Canthigaster jactator	15	Nanakuli 2	3	10.69			6	54.98		1.7
P	Chromis ovalis	15	Nanakuli 2	15	37.65			15	37.65		1.2
				104	3264.3933			104	3264.3933		100.0

GROUP	SPECIES	19-Aug-08		NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Aulostomus chinensis	16	Kahe PIPE	1	52.00			
C	Cephalopholis argus	16	Kahe PIPE	1	1077.13			
C	Cephalopholis argus	16	Kahe PIPE	1	638.29			
C	Decapterus macarellus	16	Kahe PIPE	35	4559.77			
C	Decapterus macarellus	16	Kahe PIPE	47	12659.02			
C	Mulloidides flavolineatus	16	Kahe PIPE	1	618.55			
C	Parupeneus pleurostigma	16	Kahe PIPE	3	174.02			
C	Parupeneus pleurostigma	16	Kahe PIPE	5	152.19			
C	Parupeneus multifasciatus	16	Kahe PIPE	8	2723.54			
C	Parupeneus multifasciatus	16	Kahe PIPE	6	932.53			
C	Parupeneus multifasciatus	16	Kahe PIPE	2	192.16			
C	Parupeneus bifasciatus	16	Kahe PIPE	1	270.20			
C	Forcipiger flavissimus	16	Kahe PIPE	3	27.45			
C	Chaetodon fremblii	16	Kahe PIPE	1	20.91			
C	Paracirrhites arcatus	16	Kahe PIPE	9	73.06			
C	Labroides phthirophagus	16	Kahe PIPE	2	1.26			
C	Thalassoma duperrey	16	Kahe PIPE	28	766.93			
C	Thalassoma duperrey	16	Kahe PIPE	33	3202.72			
C	Thalassoma duperrey	16	Kahe PIPE	33	1813.31			
C	Thalassoma fuscum	16	Kahe PIPE	1	63.55			
C	Thalassoma fuscum	16	Kahe PIPE	1	256.68			
C	Thalassoma fuscum	16	Kahe PIPE	8	873.79			
C	Gomphosus varius	16	Kahe PIPE	1	39.39			
C	Gomphosus varius	16	Kahe PIPE	4	90.40			
C	Coris gaimard	16	Kahe PIPE	1	45.99			
C	Coris gaimard	16	Kahe PIPE	1	8.57			
C	Stethojulis balteata	16	Kahe PIPE	4	143.05			
C	Stethojulis balteata	16	Kahe PIPE	3	217.17			
C	Halichoeres ornatissimus	16	Kahe PIPE	1	25.14			
C	Zanclus cornutus	16	Kahe PIPE	1	104.16			
C	Sufflamen bursa	16	Kahe PIPE	2	171.75	248	31994.69	40.4
CF	Chaetodon multicinctus	16	Kahe PIPE	4	52.12			
CF	Pervagor melanocephalus	16	Kahe PIPE	1	5.23	5	57.35	0.1
H	Acanthurus nigrofuscus	16	Kahe PIPE	1	54.25			
H	Acanthurus nigrofuscus	16	Kahe PIPE	25	597.43			
H	Acanthurus olivaceus	16	Kahe PIPE	1	563.17			
H	Ctenochaetus strigosus	16	Kahe PIPE	5	660.67			
H	Zebrasoma flavescens	16	Kahe PIPE	6	319.68			
H	Naso lituratus	16	Kahe PIPE	1	448.94	39	2644.14	3.3
O	Stegastes fasciolatus	16	Kahe PIPE	3	77.94			
O	Melichthys niger	16	Kahe PIPE	1	163.34			
O	Melichthys vidua	16	Kahe PIPE	2	398.06			
O	Canthigaster jactator	16	Kahe PIPE	7	24.93	13	664.27	0.8
P	Hemitaenichthys thompsoni	16	Kahe PIPE	6	291.68			
P	Chaetodon miliaris	16	Kahe PIPE	4	84.67			
P	Dascyllus albisella	16	Kahe PIPE	6	18.53			
P	Abudefduf abdominalis	16	Kahe PIPE	610	40496.37			
P	Chromis vanderbilti	16	Kahe PIPE	15	4.74			
P	Chromis ovalis	16	Kahe PIPE	55	138.03			
P	Naso brevirostris	16	Kahe PIPE	22	2708.60	718	43742.61	55.3
				1023	79103.063	1023	79103.063	100.0

25 NOVEMBER 2008 FIELD DATA

		25-Nov-08									
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT			
C	Parupeneus multifasciatus	1	EAST - 1	1	27.117						
C	Plectroglyphidodon imparipennis	1	EAST - 1	1	0.862						
C	Thalassoma duperrey	1	EAST - 1	1	97.052						
C	Thalassoma duperrey	1	EAST - 1	3	9.452						
C	Thalassoma duperrey	1	EAST - 1	3	82.171						
C	Thalassoma duperrey	1	EAST - 1	1	11.163						
C	Coris venusta	1	EAST - 1	2	5.109						
C	Coris venusta	1	EAST - 1	1	5.228						
C	Coris venusta	1	EAST - 1	2	18.774	15	256.928	53.3			
CF	Cantherhines dumerili	1	EAST - 1	1	194.977	1	194.977	40.4			
O	Canthigaster jactator	1	EAST - 1	4	30.364	4	30.364	6.3			
				20	482.26931	20	482.26931	100			
C	Plectroglyphidodon johnstonianus	2	EAST - 2	1	1.722						
C	Plectroglyphidodon imparipennis	2	EAST - 2	1	0.862						
C	Thalassoma duperrey	2	EAST - 2	2	109.898						
C	Thalassoma duperrey	2	EAST - 2	3	9.452						
C	Thalassoma duperrey	2	EAST - 2	2	22.327						
C	Thalassoma duperrey	2	EAST - 2	1	97.052						
C	Thalassoma duperrey	2	EAST - 2	7	191.733						
C	Coris venusta	2	EAST - 2	1	23.637						
C	Coris venusta	2	EAST - 2	1	9.387						
C	Stethojulis balteata	2	EAST - 2	1	35.763						
C	Stethojulis balteata	2	EAST - 2	2	28.818						
C	Stethojulis balteata	2	EAST - 2	3	12.003						
C	Halichoeres ornatissimus	2	EAST - 2	1	9.524	26	552.18	73.2			
H	Acanthurus nigrofusus	2	EAST - 2	4	95.588						
H	Acanthurus nigrofusus	2	EAST - 2	3	42.638						
H	Acanthurus olivaceus	2	EAST - 2	1	19.743	8	157.97	20.9			
O	Stegastes fasciolatus	2	EAST - 2	1	7.392						
O	Stegastes fasciolatus	2	EAST - 2	1	14.763						
O	Canthigaster jactator	2	EAST - 2	1	7.591						
O	Canthigaster jactator	2	EAST - 2	4	14.248	7	43.99	5.8			
				41	754.14149	41	754.14149	100			
C	Cephalopholis argus	3	EAST - 3	1	471.730						
C	Parupeneus pleurostigma	3	EAST - 3	1	30.438						
C	Parupeneus multifasciatus	3	EAST - 3	1	54.399						
C	Plectroglyphidodon johnstonianus	3	EAST - 3	3	5.165						
C	Thalassoma duperrey	3	EAST - 3	3	164.847						
C	Thalassoma duperrey	3	EAST - 3	5	55.816						
C	Thalassoma duperrey	3	EAST - 3	2	54.781						
C	Gomphosus varius	3	EAST - 3	2	22.083						
C	Coris venusta	3	EAST - 3	2	96.760						
C	Stethojulis balteata	3	EAST - 3	1	14.409						
C	Stethojulis balteata	3	EAST - 3	2	71.527						
C	Macropharyngodon geoffroy	3	EAST - 3	1	18.629						
C	Halichoeres ornatissimus	3	EAST - 3	1	25.137						
C	Zanclus cornutus	3	EAST - 3	1	54.899	26	1140.62	46.0			
CF	Chaetodon multicinctus	3	EAST - 3	2	26.060	2	26.06	1.1			
H	Scarus sordidus	3	EAST - 3	1	35.995						
H	Scarus sordidus	3	EAST - 3	1	13.731						
H	Scarus psittacus	3	EAST - 3	2	75.745						
H	Acanthurus nigrofusus	3	EAST - 3	13	184.766						
H	Acanthurus nigrofusus	3	EAST - 3	4	30.098						
H	Acanthurus nigrofusus	3	EAST - 3	16	382.353						
H	Acanthurus olivaceus	3	EAST - 3	1	393.210						
H	Acanthurus blochii	3	EAST - 3	1	29.030						
H	Ctenochaetus strigosus	3	EAST - 3	1	7.576						
H	Ctenochaetus strigosus	3	EAST - 3	2	1.743	42	1154.25	46.5			
O	Stegastes fasciolatus	3	EAST - 3	4	59.053						
O	Canthigaster jactator	3	EAST - 3	5	17.810	9	76.86	3.1			
P	Chromis ovalis	3	EAST - 3	9	53.386						
P	Chromis ovalis	3	EAST - 3	12	30.116	21	83.50	3.4			
				100	2481.292	100	2481.292	100			

		25-Nov-08		NO.		NO.		GROUP	GROUP
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS		
C	Cephalopholis argus	4	EAST - 4	2	1276.577				
C	Parupeneus multifasciatus	4	EAST - 4	1	96.081				
C	Parupeneus multifasciatus	4	EAST - 4	1	11.052				
C	Parupeneus multifasciatus	4	EAST - 4	1	54.399				
C	Chaetodon lunula	4	EAST - 4	2	140.601				
C	Plectroglyphidodon johnstonianus	4	EAST - 4	4	6.887				
C	Paracirrhites arcatus	4	EAST - 4	1	8.118				
C	Thalassoma duperrey	4	EAST - 4	8	219.124				
C	Thalassoma duperrey	4	EAST - 4	10	549.489				
C	Thalassoma duperrey	4	EAST - 4	12	133.959				
C	Thalassoma duperrey	4	EAST - 4	1	97.052				
C	Thalassoma duperrey	4	EAST - 4	7	22.054				
C	Coris venusta	4	EAST - 4	2	47.273				
C	Coris venusta	4	EAST - 4	1	48.380				
C	Stethojulis balteata	4	EAST - 4	3	107.290				
C	Halichoeres ornatus	4	EAST - 4	1	9.524				
C	Halichoeres ornatus	4	EAST - 4	1	16.451				
C	Zanclus cornutus	4	EAST - 4	2	208.316				
C	Rhinecanthus rectangulus	4	EAST - 4	1	85.873				
H	Acanthurus triostegus	4	EAST - 4	21	3939.640	82	7078.14		44.6
H	Acanthurus triostegus	4	EAST - 4	2	200.029				
H	Acanthurus nigrofasciatus	4	EAST - 4	22	312.680				
H	Acanthurus nigrofasciatus	4	EAST - 4	29	693.014				
H	Acanthurus nigrofasciatus	4	EAST - 4	2	15.049				
H	Acanthurus olivaceus	4	EAST - 4	9	6989.443				
H	Acanthurus dussumieri	4	EAST - 4	1	326.594	65	8536.809		53.8
O	Stegastes fasciatus	4	EAST - 4	3	22.176				
O	Melichthys niger	4	EAST - 4	1	163.335				
O	Canthigaster coronata	4	EAST - 4	2	15.182				
O	Canthigaster jactator	4	EAST - 4	5	37.955	11	238.648		1.5
P	Chromis vanderbilii	4	EAST - 4	7	2.211	7	2.211		0.014
				165	15855.808	165	15855.808		100
C	Parupeneus multifasciatus	5	Ko Olina 1	1	54.399				
C	Parupeneus multifasciatus	5	Ko Olina 1	1	11.052				
C	Parupeneus multifasciatus	5	Ko Olina 1	1	235.748				
C	Parupeneus multifasciatus	5	Ko Olina 1	1	340.443				
C	Parupeneus bifasciatus	5	Ko Olina 1	1	11.597				
C	Parupeneus bifasciatus	5	Ko Olina 1	2	58.400				
C	Parupeneus bifasciatus	5	Ko Olina 1	2	119.534				
C	Plectroglyphidodon johnstonianus	5	Ko Olina 1	8	13.775				
C	Plectroglyphidodon imparipennis	5	Ko Olina 1	1	0.862				
C	Paracirrhites arcatus	5	Ko Olina 1	2	32.697				
C	Bodianus bilunulatus	5	Ko Olina 1	1	214.669				
C	Labroides phillipphagus	5	Ko Olina 1	1	0.628				
C	Thalassoma duperrey	5	Ko Olina 1	15	167.449				
C	Thalassoma duperrey	5	Ko Olina 1	10	273.905				
C	Thalassoma duperrey	5	Ko Olina 1	7	384.642				
C	Thalassoma duperrey	5	Ko Olina 1	6	582.312				
C	Gomphosus varius	5	Ko Olina 1	1	11.042				
C	Gomphosus varius	5	Ko Olina 1	2	45.202				
C	Coris gaimard	5	Ko Olina 1	1	215.884				
C	Stethojulis balteata	5	Ko Olina 1	4	143.054				
C	Halichoeres ornatus	5	Ko Olina 1	1	25.137				
C	Sufflamen bursa	5	Ko Olina 1	2	171.747	71	3114.176		17.0
CF	Chaetodon unimaculatus	5	Ko Olina 1	3	123.556				
CF	Chaetodon quadrimaculatus	5	Ko Olina 1	2	50.608				
CF	Chaetodon multicinctus	5	Ko Olina 1	2	26.060	7	200.225		1.1
H	Calotomus carolinus	5	Ko Olina 1	1	339.302				
H	Scarus dubius	5	Ko Olina 1	1	144.940				
H	Scarus sordidus	5	Ko Olina 1	7	532.093				
H	Scarus sordidus	5	Ko Olina 1	1	544.568				
H	Scarus sordidus	5	Ko Olina 1	3	107.985				
H	Scarus sordidus	5	Ko Olina 1	2	280.012				
H	Scarus psittacus	5	Ko Olina 1	1	241.425				
H	Scarus rubroviolaceus	5	Ko Olina 1	1	43.918				
H	Cirripectes variolosus	5	Ko Olina 1	2	14.502				
H	Acanthurus triostegus	5	Ko Olina 1	44	4400.627				
H	Acanthurus nigrofasciatus	5	Ko Olina 1	22	1193.554				
H	Acanthurus nigrofasciatus	5	Ko Olina 1	7	52.672				
H	Acanthurus nigrofasciatus	5	Ko Olina 1	40	955.882				
H	Acanthurus olivaceus	5	Ko Olina 1	2	786.420				
H	Acanthurus olivaceus	5	Ko Olina 1	2	1553.210				
H	Acanthurus blochii	5	Ko Olina 1	1	232.240				
H	Acanthurus blochii	5	Ko Olina 1	2	311.165				
H	Acanthurus blochii	5	Ko Olina 1	3	87.090				
H	Ctenochaetus strigosus	5	Ko Olina 1	1	7.576				
H	Ctenochaetus strigosus	5	Ko Olina 1	21	563.722				
H	Ctenochaetus strigosus	5	Ko Olina 1	25	1646.624				
H	Zebrasoma flavescens	5	Ko Olina 1	1	92.869				
H	Zebrasoma flavescens	5	Ko Olina 1	1	53.280				
H	Zebrasoma flavescens	5	Ko Olina 1	1	1.688				
H	Naso lituratus	5	Ko Olina 1	1	622.355	193	14809.720		81.0
O	Stegastes fasciatus	5	Ko Olina 1	9	132.869				
O	Canthigaster jactator	5	Ko Olina 1	9	32.059	18	164.928		0.9
				289	18289.048	289	18289.048		100

		25-Nov-08							
GROUP	SPECIES	TRN	NAME	NO. INDIV.	BIOMASS	NO. INDIV.	GROUP BIOMASS	GROUP PERCENT	
C	Aulostomus chinensis	6	Ko Olina 2	1	88.501				
C	Cephalopholis argus	6	Ko Olina 2	1	336.423				
C	Cephalopholis argus	6	Ko Olina 2	1	1676.504				
C	Parupeneus multifasciatus	6	Ko Olina 2	1	155.422				
C	Parupeneus multifasciatus	6	Ko Olina 2	1	27.117				
C	Parupeneus multifasciatus	6	Ko Olina 2	1	96.081				
C	Plectroglyphidodon imparipennis	6	Ko Olina 2	5	8.609				
C	Paracirrhites arcatus	6	Ko Olina 2	1	16.349				
C	Labroides phthirophagus	6	Ko Olina 2	3	1.883				
C	Thalassoma duperrey	6	Ko Olina 2	4	109.562				
C	Thalassoma duperrey	6	Ko Olina 2	3	164.847				
C	Thalassoma duperrey	6	Ko Olina 2	1	97.052				
C	Thalassoma duperrey	6	Ko Olina 2	4	44.653				
C	Gomphosus varius	6	Ko Olina 2	2	45.202				
C	Gomphosus varius	6	Ko Olina 2	1	62.029				
C	Coris venusta	6	Ko Olina 2	1	9.387				
C	Stethojulis balteata	6	Ko Olina 2	1	72.389				
C	Halichoeres ornatissimus	6	Ko Olina 2	1	16.451				
C	Halichoeres ornatissimus	6	Ko Olina 2	1	25.137				
C	Zanclus cornutus	6	Ko Olina 2	1	104.158				
C	Sufflamen bursa	6	Ko Olina 2	2	171.747				
C	Sufflamen bursa	6	Ko Olina 2	3	433.949				
C	Ostracion meleagris	6	Ko Olina 2	2	13.527	42	3776.977	10.0	
CF	Chaetodon unimaculatus	6	Ko Olina 2	6	151.825				
CF	Chaetodon ornatissimus	6	Ko Olina 2	4	547.565				
CF	Chaetodon quadrimaculatus	6	Ko Olina 2	2	50.608				
CF	Chaetodon multicinctus	6	Ko Olina 2	6	78.180	18	828.179	2.2	
H	Scarus sordidus	6	Ko Olina 2	7	96.116				
H	Scarus psittacus	6	Ko Olina 2	1	1437.463				
H	Scarus rubroviolaceus	6	Ko Olina 2	2	2721.554				
H	Acanthurus triostegus	6	Ko Olina 2	4	400.057				
H	Acanthurus triostegus	6	Ko Olina 2	1	46.315				
H	Acanthurus triostegus	6	Ko Olina 2	4	750.408				
H	Acanthurus leucopareius	6	Ko Olina 2	1	132.700				
H	Acanthurus leucopareius	6	Ko Olina 2	2	465.350				
H	Acanthurus nigrofuscus	6	Ko Olina 2	5	71.064				
H	Acanthurus nigrofuscus	6	Ko Olina 2	6	325.515				
H	Acanthurus nigrofuscus	6	Ko Olina 2	29	693.014				
H	Acanthurus nigrofuscus	6	Ko Olina 2	9	67.721				
H	Acanthurus nigroris	6	Ko Olina 2	1	102.474				
H	Acanthurus olivaceus	6	Ko Olina 2	14	3663.339				
H	Acanthurus olivaceus	6	Ko Olina 2	6	4659.629				
H	Acanthurus olivaceus	6	Ko Olina 2	5	2815.851				
H	Acanthurus blochii	6	Ko Olina 2	10	979.763				
H	Acanthurus blochii	6	Ko Olina 2	1	232.240				
H	Acanthurus blochii	6	Ko Olina 2	2	1567.621				
H	Acanthurus blochii	6	Ko Olina 2	5	145.150				
H	Acanthurus blochii	6	Ko Olina 2	1	155.583				
H	Acanthurus blochii	6	Ko Olina 2	3	1360.782				
H	Ctenochaetus strigosus	6	Ko Olina 2	4	12.351				
H	Ctenochaetus strigosus	6	Ko Olina 2	1	15.198				
H	Ctenochaetus strigosus	6	Ko Olina 2	27	3567.611				
H	Ctenochaetus strigosus	6	Ko Olina 2	1	65.865				
H	Zebbrasoma flavescens	6	Ko Olina 2	7	372.961				
H	Naso lituratus	6	Ko Olina 2	7	2181.299				
H	Naso lituratus	6	Ko Olina 2	3	1867.065	169	30972.060	81.9	
O	Stegastes fasciolatus	6	Ko Olina 2	2	29.526				
O	Stegastes fasciolatus	6	Ko Olina 2	1	0.862				
O	Melichthys niger	6	Ko Olina 2	9	1470.019				
O	Canthigaster jactator	6	Ko Olina 2	6	21.373				
O	Canthigaster rivulata	6	Ko Olina 2	1	3.562	19	1525.343	4.0	
P	Abudefduf abdominalis	6	Ko Olina 2	3	93.998				
P	Abudefduf abdominalis	6	Ko Olina 2	9	597.487				
P	Chromis hanui	6	Ko Olina 2	3	2.240	15	693.725	1.8	
				263	37796.283	263	37796.283	100	

25-Nov-08		NO.		NO.		GROUP	GROUP
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS		
C	Parupeneus multifasciatus	7	KAHE 1-D	2	22.103		
C	Parupeneus multifasciatus	7	KAHE 1-D	3	81.350		
C	Parupeneus multifasciatus	7	KAHE 1-D	1	54.399		
C	Parupeneus cyclostomus	7	KAHE 1-D	1	24.795		
C	Plectroglyphidodon johnstonianus	7	KAHE 1-D	4	6.887		
C	Plectroglyphidodon imparipennis	7	KAHE 1-D	1	0.862		
C	Cirrhites pinnulatus	7	KAHE 1-D	1	90.860		
C	Bodianus bilunulatus	7	KAHE 1-D	1	75.644		
C	Labroides phthirophagus	7	KAHE 1-D	3	1.883		
C	Thalassoma duperrey	7	KAHE 1-D	11	301.295		
C	Thalassoma duperrey	7	KAHE 1-D	9	873.468		
C	Thalassoma duperrey	7	KAHE 1-D	3	33.490		
C	Thalassoma duperrey	7	KAHE 1-D	13	714.335		
C	Thalassoma ballieui	7	KAHE 1-D	1	102.610		
C	Thalassoma ballieui	7	KAHE 1-D	3	33.965		
C	Gomphosus varius	7	KAHE 1-D	5	113.005		
C	Gomphosus varius	7	KAHE 1-D	1	62.029		
C	Stethojulis balteata	7	KAHE 1-D	2	71.527		
C	Macropharyngodon geoffroy	7	KAHE 1-D	6	14.974		
C	Macropharyngodon geoffroy	7	KAHE 1-D	1	5.748		
C	Anampses cuvier	7	KAHE 1-D	1	64.378		
C	Halichoeres ornatus	7	KAHE 1-D	2	32.901		
C	Halichoeres ornatus	7	KAHE 1-D	1	25.137		
C	Halichoeres ornatus	7	KAHE 1-D	1	35.543		
C	Zanclus cornutus	7	KAHE 1-D	3	164.696		
C	Rhinacanthus rectangulus	7	KAHE 1-D	1	85.873		
C	Sufflamen bursa	7	KAHE 1-D	4	181.450	85	3275.209
CF	Chaetodon quadrimaculatus	7	KAHE 1-D	1	7.027		
CF	Chaetodon quadrimaculatus	7	KAHE 1-D	1	25.304		
CF	Chaetodon multicinctus	7	KAHE 1-D	2	26.060	4	58.391
H	Scarus sordidus	7	KAHE 1-D	1	140.006		0.5
H	Scarus sordidus	7	KAHE 1-D	1	35.995		
H	Scarus sordidus	7	KAHE 1-D	85	1187.119		
H	Scarus sordidus	7	KAHE 1-D	1	76.013		
H	Scarus psittacus	7	KAHE 1-D	1	79.268		
H	Scarus psittacus	7	KAHE 1-D	3	43.843		
H	Acanthurus nigrofasciatus	7	KAHE 1-D	1	54.252		
H	Acanthurus nigrofasciatus	7	KAHE 1-D	20	150.492		
H	Acanthurus nigrofasciatus	7	KAHE 1-D	33	788.602		
H	Acanthurus nigrofasciatus	7	KAHE 1-D	13	184.766		
H	Acanthurus olivaceus	7	KAHE 1-D	28	317.012		
H	Ctenochaetus strigosus	7	KAHE 1-D	20	303.970		
H	Ctenochaetus strigosus	7	KAHE 1-D	5	329.325		
H	Ctenochaetus strigosus	7	KAHE 1-D	4	30.304		
H	Ctenochaetus strigosus	7	KAHE 1-D	9	241.595		
H	Ctenochaetus strigosus	7	KAHE 1-D	2	264.267		
O	Zoegasoma flavescens	7	KAHE 1-D	4	213.120	231	4419.950
O	Stegastes fasciatus	7	KAHE 1-D	6	88.579		36.6
O	Melichthys niger	7	KAHE 1-D	24	3920.052		
O	Melichthys vidua	7	KAHE 1-D	1	199.030		
O	Cantherhines sandwicensis	7	KAHE 1-D	1	82.051		
O	Canthigaster jactator	7	KAHE 1-D	1	2.205		
O	Canthigaster jactator	7	KAHE 1-D	2	7.124	35	4299.042
P	Chromis vanderbilii	7	KAHE 1-D	39	12.320	39	12.320
				394	12064.911	394	12064.911
							100
C	Fistularia commersoni	8	KAHE 5-B	3	163.247		
C	Mulcoides flavolineatus	8	KAHE 5-B	1	365.209		
C	Parupeneus pleurostigma	8	KAHE 5-B	1	30.438		
C	Parupeneus multifasciatus	8	KAHE 5-B	1	96.081		
C	Parupeneus multifasciatus	8	KAHE 5-B	2	108.799		
C	Parupeneus multifasciatus	8	KAHE 5-B	1	27.117		
C	Parupeneus multifasciatus	8	KAHE 5-B	1	235.748		
C	Parupeneus multifasciatus	8	KAHE 5-B	3	33.155		
C	Parupeneus cyclostomus	8	KAHE 5-B	1	2.813		
C	Chaetodon lunula	8	KAHE 5-B	1	35.994		
C	Plectroglyphidodon imparipennis	8	KAHE 5-B	3	2.586		
C	Paracirrhites arcatus	8	KAHE 5-B	4	32.470		
C	Paracirrhites forsteri	8	KAHE 5-B	1	39.647		
C	Cirrhites fasciatus	8	KAHE 5-B	1	8.225		
C	Labroides phthirophagus	8	KAHE 5-B	1	0.628		
C	Thalassoma duperrey	8	KAHE 5-B	2	194.104		
C	Thalassoma duperrey	8	KAHE 5-B	14	156.286		
C	Thalassoma duperrey	8	KAHE 5-B	1	54.849		
C	Thalassoma duperrey	8	KAHE 5-B	2	54.781		
C	Gomphosus varius	8	KAHE 5-B	1	62.029		
C	Coris gaimard	8	KAHE 5-B	1	45.990		
C	Stethojulis balteata	8	KAHE 5-B	2	71.527		
C	Stethojulis balteata	8	KAHE 5-B	2	28.818		
C	Macropharyngodon geoffroy	8	KAHE 5-B	9	98.809		
C	Halichoeres ornatus	8	KAHE 5-B	1	4.408		
C	Halichoeres ornatus	8	KAHE 5-B	1	25.137		
C	Halichoeres ornatus	8	KAHE 5-B	2	32.901		
C	Plagiotremus ewanensis	8	KAHE 5-B	1	0.952		
C	Zanclus cornutus	8	KAHE 5-B	2	208.316		
C	Rhinacanthus rectangulus	8	KAHE 5-B	1	45.362		
C	Sufflamen bursa	8	KAHE 5-B	1	144.650		
C	Sufflamen bursa	8	KAHE 5-B	1	85.873	69	2497.049
CF	Chaetodon multicinctus	8	KAHE 5-B	4	26.626		43.2
CF	Pervagor melanocephalus	8	KAHE 5-B	1	16.217	5	42.844
H	Calotomus carolinus	8	KAHE 5-B	1	13.463		0.7
H	Scarus sordidus	8	KAHE 5-B	3	41.192		
H	Scarus rubroviolaceus	8	KAHE 5-B	1	10.823		
H	Acanthurus nigrofasciatus	8	KAHE 5-B	15	213.191		
H	Acanthurus nigrofasciatus	8	KAHE 5-B	14	105.345		
H	Acanthurus nigrofasciatus	8	KAHE 5-B	16	382.353		
H	Acanthurus olivaceus	8	KAHE 5-B	2	327.033		
H	Acanthurus olivaceus	8	KAHE 5-B	1	11.322		
H	Acanthurus olivaceus	8	KAHE 5-B	3	1689.511		
H	Ctenochaetus strigosus	8	KAHE 5-B	1	7.576		
H	Ctenochaetus strigosus	8	KAHE 5-B	1	15.198	58	2817.007
O	Stegastes fasciatus	8	KAHE 5-B	4	59.053		48.7
O	Canthigaster jactator	8	KAHE 5-B	6	21.373	10	80.426
P	Chaetodon miliaris	8	KAHE 5-B	1	21.168		1.4
P	Naso brevirostris	8	KAHE 5-B	2	77.849		
P	Naso brevirostris	8	KAHE 5-B	2	246.236	5	345.263
				147	5782.5783	147	5782.5783
							100

GROUP	SPECIES	25-Nov-08		NO. INDIV	BIOMASS	NO. INDIV	GROUP BIOMASS	GROUP PERCENT
		TRN	NAME					
C	Fistularia commersoni	9	KAHE 7 -B	1	37.692			
C	Mulloidies flavolineatus	9	KAHE 7 -B	75	27390.670			
C	Parupeneus pleurostigma	9	KAHE 7 -B	2	116.017			
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	3.119			
C	Parupeneus multifasciatus	9	KAHE 7 -B	2	108.799			
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	96.081			
C	Parupeneus multifasciatus	9	KAHE 7 -B	1	340.443			
C	Parupeneus multifasciatus	9	KAHE 7 -B	5	135.583			
C	Thalassoma duperrey	9	KAHE 7 -B	11	122.796			
C	Thalassoma duperrey	9	KAHE 7 -B	4	109.562			
C	Thalassoma duperrey	9	KAHE 7 -B	1	97.052			
C	Coris gaimard	9	KAHE 7 -B	1	45.990			
C	Halichoeres ornatus	9	KAHE 7 -B	4	38.094			
C	Zanclus cornutus	9	KAHE 7 -B	1	54.899			
C	Sufflamen bursa	9	KAHE 7 -B	3	257.620	113	28954.417	84.8
CF	Chaetodon multicinctus	9	KAHE 7 -B	3	19.970			
CF	Chaetodon multicinctus	9	KAHE 7 -B	3	2.479	6	22.449	0.1
H	Calotomus carolinus	9	KAHE 7 -B	1	34.690			
H	Acanthurus triostegus	9	KAHE 7 -B	1	4.238			
H	Acanthurus leucopareus	9	KAHE 7 -B	1	132.700			
H	Acanthurus nigrofusus	9	KAHE 7 -B	7	52.672			
H	Acanthurus nigrofusus	9	KAHE 7 -B	1	23.897			
H	Acanthurus olivaceus	9	KAHE 7 -B	1	776.605			
H	Acanthurus olivaceus	9	KAHE 7 -B	8	157.946			
H	Acanthurus olivaceus	9	KAHE 7 -B	6	34.395			
H	Acanthurus olivaceus	9	KAHE 7 -B	7	2752.470			
H	Acanthurus olivaceus	9	KAHE 7 -B	10	474.770			
H	Ctenochaetus strigosus	9	KAHE 7 -B	4	30.304			
H	Naso unicornis	9	KAHE 7 -B	1	389.422	48	4864.109	14.3
O	Melichthys vidua	9	KAHE 7 -B	1	124.346			
O	Canthigaster coronata	9	KAHE 7 -B	1	7.591			
O	Canthigaster jactator	9	KAHE 7 -B	3	10.686	5	142.623	0.4
P	Chaetodon millaris	9	KAHE 7 -B	1	21.168			
P	Dascyllus albisella	9	KAHE 7 -B	4	12.353			
P	Chromis vanderbilii	9	KAHE 7 -B	188	59.388			
P	Chromis ovalis	9	KAHE 7 -B	8	47.454			
P	Chromis hanui	9	KAHE 7 -B	1	0.747	202	141.110	0.4
				374	34124.707	374	34124.707	100
C	Adioryx xantherythrus	10	KAHE 7 -C	7	221.712			
C	Aulostomus chinensis	10	KAHE 7 -C	1	19.273			
C	Mulloidies vanicolensis	10	KAHE 7 -C	24	2172.896			
C	Mulloidies vanicolensis	10	KAHE 7 -C	2	662.750			
C	Parupeneus pleurostigma	10	KAHE 7 -C	1	30.438			
C	Parupeneus multifasciatus	10	KAHE 7 -C	2	108.799			
C	Parupeneus multifasciatus	10	KAHE 7 -C	3	288.244			
C	Parupeneus multifasciatus	10	KAHE 7 -C	3	81.350			
C	Parupeneus multifasciatus	10	KAHE 7 -C	1	235.748			
C	Cirrhilabrus fasciatus	10	KAHE 7 -C	1	8.225			
C	Labroides phthiophagus	10	KAHE 7 -C	1	0.628			
C	Pseudocheilinus octotaenia	10	KAHE 7 -C	1	14.409			
C	Thalassoma duperrey	10	KAHE 7 -C	3	164.847			
C	Thalassoma duperrey	10	KAHE 7 -C	5	136.952			
C	Thalassoma duperrey	10	KAHE 7 -C	1	97.052			
C	Thalassoma duperrey	10	KAHE 7 -C	3	33.490			
C	Coris venusta	10	KAHE 7 -C	1	23.637			
C	Coris gaimard	10	KAHE 7 -C	2	636.125			
C	Coris gaimard	10	KAHE 7 -C	1	8.566			
C	Stethojulis balteata	10	KAHE 7 -C	4	143.054			
C	Halichoeres ornatus	10	KAHE 7 -C	3	28.571			
C	Zanclus cornutus	10	KAHE 7 -C	4	219.594			
C	Zanclus cornutus	10	KAHE 7 -C	4	416.632			
C	Sufflamen bursa	10	KAHE 7 -C	3	257.620	81	6010.612	48.6
CF	Chaetodon multicinctus	10	KAHE 7 -C	2	26.060			
CF	Chaetodon multicinctus	10	KAHE 7 -C	2	13.313	4	39.373	0.3
H	Calotomus carolinus	10	KAHE 7 -C	1	72.282			
H	Calotomus carolinus	10	KAHE 7 -C	3	67.070			
H	Scarus rubroviolaceus	10	KAHE 7 -C	1	85.395			
H	Acanthurus triostegus	10	KAHE 7 -C	8	1500.815			
H	Acanthurus nigrofusus	10	KAHE 7 -C	4	56.851			
H	Acanthurus nigrofusus	10	KAHE 7 -C	12	90.295			
H	Acanthurus olivaceus	10	KAHE 7 -C	1	776.605			
H	Acanthurus olivaceus	10	KAHE 7 -C	11	522.247			
H	Acanthurus blochii	10	KAHE 7 -C	1	29.030			
H	Ctenochaetus strigosus	10	KAHE 7 -C	1	3.088			
H	Naso lituratus	10	KAHE 7 -C	2	1244.710			
H	Naso unicornis	10	KAHE 7 -C	2	1050.515	47	5498.903	44.5
O	Stegastes fasciatus	10	KAHE 7 -C	2	29.526			
O	Melichthys vidua	10	KAHE 7 -C	1	199.030			
O	Canthigaster coronata	10	KAHE 7 -C	2	15.182	5	243.738	2.0
P	Dascyllus albisella	10	KAHE 7 -C	8	24.706			
P	Chromis vanderbilii	10	KAHE 7 -C	209	66.021			
P	Naso brevirostris	10	KAHE 7 -C	1	123.118			
P	Naso brevirostris	10	KAHE 7 -C	9	350.320	227	564.166	4.6
				364	12356.792	364	12356.792	100

		25-Nov-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT			
C	Parupeneus multifasciatus	11	KAHE 7 -D	3	33.155						
C	Plectroglyphidodon johnstonianus	11	KAHE 7 -D	3	5.165						
C	Cheilinus bimaculatus	11	KAHE 7 -D	1	19.367						
C	Cheilinus bimaculatus	11	KAHE 7 -D	1	4.099						
C	Thalassoma duperrey	11	KAHE 7 -D	5	55.816						
C	Sufflamen bursa	11	KAHE 7 -D	2	289.299	15	406.902	53.2			
H	Acanthurus olivaceus	11	KAHE 7 -D	11	217.176						
H	Acanthurus olivaceus	11	KAHE 7 -D	2	94.954						
H	Acanthurus olivaceus	11	KAHE 7 -D	4	22.930	17	335.060	43.8			
O	Canthigaster jactator	11	KAHE 7 -D	5	17.810	5	17.810	2.3			
P	Chromis vanderbilti	11	KAHE 7 -D	15	4.738	15	4.738	0.6			
				52	764.51065	52	764.51065	100			
C	Fistularia commersoni	12	KAHE 7 - E	1	75.230						
C	Fistularia commersoni	12	KAHE 7 - E	1	37.692						
C	Parupeneus pleurostigma	12	KAHE 7 - E	1	30.438						
C	Parupeneus multifasciatus	12	KAHE 7 - E	3	33.155						
C	Parupeneus multifasciatus	12	KAHE 7 - E	6	162.699						
C	Parupeneus multifasciatus	12	KAHE 7 - E	1	96.081						
C	Parupeneus multifasciatus	12	KAHE 7 - E	3	33.155						
C	Parupeneus multifasciatus	12	KAHE 7 - E	9	28.071						
C	Forcipiger flavissimus	12	KAHE 7 - E	2	18.300						
C	Plectroglyphidodon johnstonianus	12	KAHE 7 - E	9	7.759						
C	Paracirrhites arcatus	12	KAHE 7 - E	5	17.229						
C	Cheilinus rhodochrous	12	KAHE 7 - E	1	6.922						
C	Cheilinus bimaculatus	12	KAHE 7 - E	6	1.729						
C	Cheilinus bimaculatus	12	KAHE 7 - E	1	4.099						
C	Thalassoma duperrey	12	KAHE 7 - E	3	33.490						
C	Thalassoma duperrey	12	KAHE 7 - E	2	54.781						
C	Thalassoma duperrey	12	KAHE 7 - E	2	109.898						
C	Thalassoma duperrey	12	KAHE 7 - E	1	97.052						
C	Coris gaimard	12	KAHE 7 - E	1	22.072						
C	Coris ballieui	12	KAHE 7 - E	1	4.702						
C	Macropharyngodon geoffroy	12	KAHE 7 - E	14	153.704						
C	Halichoeres ornatissimus	12	KAHE 7 - E	1	16.451						
C	Zanclus cornutus	12	KAHE 7 - E	1	54.899						
C	Sufflamen bursa	12	KAHE 7 - E	4	343.494	79	1443.101	38.3			
CF	Chaetodon multicinctus	12	KAHE 7 - E	10	8.263						
CF	Cantherhines dumerili	12	KAHE 7 - E	1	117.961						
CF	Cantherhines dumerili	12	KAHE 7 - E	1	194.977	12	321.201	8.5			
H	Centropyge potteri	12	KAHE 7 - E	1	1.716						
H	Acanthurus nigrofuscus	12	KAHE 7 - E	31	233.263						
H	Acanthurus nigrofuscus	12	KAHE 7 - E	33	34.440						
H	Acanthurus olivaceus	12	KAHE 7 - E	3	17.197						
H	Ctenochaetus strigosus	12	KAHE 7 - E	31	27.014						
H	Ctenochaetus strigosus	12	KAHE 7 - E	5	15.438						
H	Naso lituratus	12	KAHE 7 - E	3	72.073						
H	Naso lituratus	12	KAHE 7 - E	1	205.988						
H	Naso lituratus	12	KAHE 7 - E	4	16.955						
H	Naso unicornis	12	KAHE 7 - E	1	5.436	113	629.520	16.7			
O	Melichthys niger	12	KAHE 7 - E	2	326.671						
O	Melichthys vidua	12	KAHE 7 - E	4	796.120						
O	Canthigaster coronata	12	KAHE 7 - E	1	7.591						
O	Canthigaster jactator	12	KAHE 7 - E	5	11.026	12	1141.408	30.3			
P	Chaetodon kleini	12	KAHE 7 - E	6	17.134						
P	Chromis vanderbilti	12	KAHE 7 - E	196	61.915						
P	Chromis hanui	12	KAHE 7 - E	2	1.493						
P	Naso brevirostris	12	KAHE 7 - E	5	27.181						
P	Naso brevirostris	12	KAHE 7 - E	1	123.118	210	230.841	6.1			
				426	3766.0719	426	3766.0719	100			

		25-Nov-08											
GROUP	SPECIES	TRN	NAME	NO. INDV.	BIOMASS	NO. INDV.	BIOMASS	GROUP PERCENT					
C	Saurida gracilis	13	KAHE 10	1	51.931								
C	Aulestomus chinensis	13	KAHE 10	1	18.273								
C	Parupeneus pleurostigma	13	KAHE 10	1	88.248								
C	Parupeneus multifasciatus	13	KAHE 10	6	328.386								
C	Parupeneus multifasciatus	13	KAHE 10	4	44.206								
C	Parupeneus multifasciatus	13	KAHE 10	7	872.570								
C	Parupeneus multifasciatus	13	KAHE 10	2	850.880								
C	Parupeneus multifasciatus	13	KAHE 10	2	310.845								
C	Parupeneus cyclostomus	13	KAHE 10	1	24.795								
C	Parupeneus cyclostomus	13	KAHE 10	1	88.571								
C	Parupeneus cyclostomus	13	KAHE 10	1	143.718								
C	Forcipiger flavissimus	13	KAHE 10	2	18.300								
C	Plectroglyphidodon imparipennis	13	KAHE 10	3	2.588								
C	Parasirrhites arcatus	13	KAHE 10	2	18.235								
C	Thalassoma duperrey	13	KAHE 10	14	156.286								
C	Thalassoma duperrey	13	KAHE 10	5	485.260								
C	Thalassoma duperrey	13	KAHE 10	13	356.076								
C	Thalassoma duperrey	13	KAHE 10	13	714.335								
C	Thalassoma lutescens	13	KAHE 10	1	258.676								
C	Thalassoma lutescens	13	KAHE 10	1	63.555								
C	Coris gaimard	13	KAHE 10	1	83.788								
C	Coris gaimard	13	KAHE 10	1	45.990								
C	Otolithojulis balteata	13	KAHE 10	4	143.054								
C	Macropharyngodon geoffroy	13	KAHE 10	1	5.745								
C	Acanthopagrus chrysocephalus	13	KAHE 10	1	98.659								
C	Halichoeres emaltinus	13	KAHE 10	2	19.047								
C	Zenodius cornutus	13	KAHE 10	7	384.290								
C	Sufflamen bursa	13	KAHE 10	4	543.494	102	5654.818	18.3					
CF	Canthiropomus dumeril	13	KAHE 10	1	194.977	1	194.977	0.6					
H	Celetermus carolinus	13	KAHE 10	3	34.690								
H	Acanthurus triostegus	13	KAHE 10	3	27.456								
H	Acanthurus triostegus	13	KAHE 10	2	34.333								
H	Acanthurus nigrofasciatus	13	KAHE 10	8	127.815								
H	Acanthurus nigrofasciatus	13	KAHE 10	3	22.574								
H	Acanthurus olivaceus	13	KAHE 10	9	5608.532								
H	Acanthurus olivaceus	13	KAHE 10	20	326.437								
H	Acanthurus olivaceus	13	KAHE 10	7	332.339								
H	Naso Murus	13	KAHE 10	1	205.688								
H	Naso Murus	13	KAHE 10	2	18.931	57	6097.194	19.7					
O	Stegastes fasciatus	13	KAHE 10	5	73.816								
O	Meuschenia niger	13	KAHE 10	7	1143.345								
O	Canthiropomus sandwicheensis	13	KAHE 10	1	82.051								
O	Canthigaster jactator	13	KAHE 10	3	10.096	18	1308.802	4.2					
P	Desmystus albicinctus	13	KAHE 10	31	95.737								
P	Abudefduf abramineus	13	KAHE 10	550	17232.918								
P	Chromis vanderbilti	13	KAHE 10	118	37.591								
P	Chromis ovalis	13	KAHE 10	54	320.316								
P	Naso brevirostris	13	KAHE 10	1	10.245	755	17696.807	57.2					
				831	30953.696	831	30953.696	100					
C	Fistularia commersoni	14	Nanaku 1	1	75.230								
C	Parupeneus multifasciatus	14	Nanaku 1	1	27.117								
C	Parupeneus multifasciatus	14	Nanaku 1	1	96.081								
C	Parupeneus multifasciatus	14	Nanaku 1	4	217.598								
C	Plectroglyphidodon imparipennis	14	Nanaku 1	2	1.724								
C	Thalassoma duperrey	14	Nanaku 1	1	97.052								
C	Thalassoma duperrey	14	Nanaku 1	18	200.939								
C	Thalassoma duperrey	14	Nanaku 1	3	164.847								
C	Thalassoma duperrey	14	Nanaku 1	5	136.952								
C	Thalassoma lutescens	14	Nanaku 1	1	108.224								
C	Thalassoma trilobatum	14	Nanaku 1	1	109.224								
C	Thalassoma trilobatum	14	Nanaku 1	1	63.555								
C	Otolithojulis balteata	14	Nanaku 1	6	214.580								
C	Otolithojulis balteata	14	Nanaku 1	5	72.045								
C	Rhinocanthus rectangulus	14	Nanaku 1	1	144.850								
C	Rhinocanthus rectangulus	14	Nanaku 1	1	85.873	52	1818.691	60.5					
CF	Chelodactylus multispinus	14	Nanaku 1	2	13.313	2	13.313	0.4					
H	Scarus pinnatus	14	Nanaku 1	27	394.586								
H	Cliniphetus varicosus	14	Nanaku 1	1	7.251								
H	Acanthurus triostegus	14	Nanaku 1	40	420.985								
H	Acanthurus triostegus	14	Nanaku 1	1	17.167								
H	Acanthurus nigrofasciatus	14	Nanaku 1	3	22.574								
H	Acanthurus nigrofasciatus	14	Nanaku 1	5	71.064								
H	Acanthurus olivaceus	14	Nanaku 1	5	98.717								
H	Acanthurus olivaceus	14	Nanaku 1	8	90.575								
H	Acanthurus blochi	14	Nanaku 1	3	21.262								
H	Dienechatus nigrofasciatus	14	Nanaku 1	1	7.578	100	1151.755	38.3					
O	Stegastes fasciatus	14	Nanaku 1	2	14.794								
O	Canthigaster jactator	14	Nanaku 1	1	3.582	3	18.349	6.8					
P	Chromis vanderbilti	14	Nanaku 1	13	4.107	13	4.107	0.1					
				170	3004.2116	170	3004.2116	100					
C	Menidia grandoculis	15	Nanaku 2	1	477.530								
C	Parupeneus multifasciatus	15	Nanaku 2	3	163.198								
C	Parupeneus multifasciatus	15	Nanaku 2	1	96.081								
C	Thalassoma duperrey	15	Nanaku 2	14	158.286								
C	Thalassoma duperrey	15	Nanaku 2	11	301.295								
C	Thalassoma duperrey	15	Nanaku 2	1	97.052								
C	Thalassoma duperrey	15	Nanaku 2	4	218.796								
C	Gomphosus varius	15	Nanaku 2	1	22.601								
C	Gomphosus varius	15	Nanaku 2	1	11.042								
C	Coris gaimard	15	Nanaku 2	2	44.143								
C	Otolithojulis balteata	15	Nanaku 2	1	35.783								
C	Otolithojulis balteata	15	Nanaku 2	1	14.409								
C	Halichoeres emaltinus	15	Nanaku 2	1	16.451								
C	Rhinocanthus rectangulus	15	Nanaku 2	1	144.850								
C	Sufflamen bursa	15	Nanaku 2	7	601.114	50	2401.410	6.9					
CF	Chelodactylus multispinus	15	Nanaku 2	2	13.313	2	13.313	0.0					
H	Celetermus carolinus	15	Nanaku 2	1	13.483								
H	Celetermus carolinus	15	Nanaku 2	1	3318.754								
H	Scarus sordidus	15	Nanaku 2	2	27.462								
H	Scarus rubroviolaceus	15	Nanaku 2	1	1814.370								
H	Scarus rubroviolaceus	15	Nanaku 2	1	2721.554								
H	Acanthurus triostegus	15	Nanaku 2	17	3182.232								
H	Acanthurus leucopareus	15	Nanaku 2	28	8049.556								
H	Acanthurus nigrofasciatus	15	Nanaku 2	18	270.042								
H	Acanthurus nigrofasciatus	15	Nanaku 2	12	286.785								
H	Acanthurus nigrofasciatus	15	Nanaku 2	28	210.689								
H	Acanthurus nigrofasciatus	15	Nanaku 2	8	434.020								
H	Acanthurus nigrofasciatus	15	Nanaku 2	9	8969.413								
H	Acanthurus blochi	15	Nanaku 2	23	2253.455								
H	Acanthurus blochi	15	Nanaku 2	8	3828.751								
H	Dienechatus nigrofasciatus	15	Nanaku 2	9	27.789								
H	Zelassoma flavescens	15	Nanaku 2	4	213.120	169	31448.469	90.9					
O	Stegastes fasciatus	15	Nanaku 2	7	51.744								
O	Meuschenia niger	15	Nanaku 2	3	490.008								
O	Meuschenia niger	15	Nanaku 2	1	198.030								
O	Canthigaster jactator	15	Nanaku 2	2	7.124	13	747.804	2.2					
				234	34611.098	234	34611.098	100					

		25-Nov-08		NO.		NO.		GROUP		GROUP	
GROUP	SPECIES	TRN	NAME	INDIV.	BIOMASS	INDIV.	BIOMASS	INDIV.	BIOMASS	PERCENT	
C	Myripristis amaenus	16	KAHE PIPE	20	2816.171						
C	Aulostomus chinensis	16	KAHE PIPE	1	568.242						
C	Aulostomus chinensis	16	KAHE PIPE	2	177.001						
C	Apogon kallopterus	16	KAHE PIPE	25	854.150						
C	Decapterus macarellus	16	KAHE PIPE	25	3256.977						
C	Mulloidides flavolineatus	16	KAHE PIPE	1	618.551						
C	Mulloidides vanicolensis	16	KAHE PIPE	16	2372.343						
C	Parupeneus pleurostigma	16	KAHE PIPE	1	153.391						
C	Parupeneus multifasciatus	16	KAHE PIPE	1	27.117						
C	Parupeneus multifasciatus	16	KAHE PIPE	2	310.845						
C	Parupeneus multifasciatus	16	KAHE PIPE	3	163.198						
C	Parupeneus cyclostomus	16	KAHE PIPE	1	88.571						
C	Forcipiger flavissimus	16	KAHE PIPE	2	18.300						
C	Chaetodon lunula	16	KAHE PIPE	2	71.988						
C	Plectroglyphidodon johnstonianus	16	KAHE PIPE	5	8.609						
C	Paracirrhites arcatus	16	KAHE PIPE	5	81.743						
C	Cirrhitops fasciatus	16	KAHE PIPE	4	32.900						
C	Labroides phthirophagus	16	KAHE PIPE	5	3.139						
C	Thalassoma duperrey	16	KAHE PIPE	5	136.952						
C	Thalassoma duperrey	16	KAHE PIPE	31	3008.611						
C	Thalassoma duperrey	16	KAHE PIPE	9	100.469						
C	Thalassoma duperrey	16	KAHE PIPE	20	1098.978						
C	Thalassoma duperrey	16	KAHE PIPE	15	410.857						
C	Thalassoma lutescens	16	KAHE PIPE	1	109.224						
C	Gomphosus varius	16	KAHE PIPE	6	135.606						
C	Coris gaimard	16	KAHE PIPE	2	167.572						
C	Stethojulis balteata	16	KAHE PIPE	4	57.636						
C	Macropharyngodon geoffroy	16	KAHE PIPE	1	18.629						
C	Halichoeres ornatissimus	16	KAHE PIPE	1	9.524						
C	Zanclus cornutus	16	KAHE PIPE	8	192.343						
C	Zanclus cornutus	16	KAHE PIPE	2	109.797						
C	Sufflamen bursa	16	KAHE PIPE	2	171.747						
C	Ostracion meleagris	16	KAHE PIPE	1	6.763	229	17357.944			38.6	
CF	Chaetodon multicinctus	16	KAHE PIPE	2	26.060						
CF	Cantherhines dumerili	16	KAHE PIPE	1	301.327	3	327.387			0.7	
H	Calotomus carolinus	16	KAHE PIPE	2	144.565						
H	Acanthurus nigrofuscus	16	KAHE PIPE	21	501.838						
H	Acanthurus nigrofuscus	16	KAHE PIPE	19	1030.797						
H	Acanthurus olivaceus	16	KAHE PIPE	1	261.667						
H	Acanthurus olivaceus	16	KAHE PIPE	2	786.420						
H	Ctenochaetus strigosus	16	KAHE PIPE	9	592.785						
H	Ctenochaetus strigosus	16	KAHE PIPE	9	1189.204	63	4507.275			10.0	
O	Stegastes fasciolatus	16	KAHE PIPE	15	221.448						
O	Melichthys vidua	16	KAHE PIPE	2	398.060						
O	Canthigaster jactator	16	KAHE PIPE	13	46.307	30	665.816			1.5	
P	Chaetodon miliaris	16	KAHE PIPE	12	254.015						
P	Dascyllus albisella	16	KAHE PIPE	12	37.060						
P	Abudefduf abdominalis	16	KAHE PIPE	30	939.977						
P	Abudefduf abdominalis	16	KAHE PIPE	343	16070.203						
P	Chromis vanderbilti	16	KAHE PIPE	58	18.322						
P	Chromis ovalis	16	KAHE PIPE	201	1192.286						
P	Naso brevirostris	16	KAHE PIPE	3	836.121						
P	Naso brevirostris	16	KAHE PIPE	15	583.867						
P	Naso brevirostris	16	KAHE PIPE	18	2216.125	692	22147.977			49.2	
				1017	45006.399	1017	45006.399			100	