

NORTHWESTERN HAWAIIAN ISLANDS BENTHIC COMMUNITY ASSESSMENT, OCTOBER 2000



**SUBMITTED TO:
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
NATION CENTERS FOR COASTAL OCEAN SCIENCE
CENTER FOR COASTAL MONITORING AND ASSESSMENT
219 FORT JOHNSON ROAD
CHARLESTON, SOUTH CAROLINA 29412**

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May 2002

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INTRODUCTION

The Northwestern Hawaiian Islands was sampled during October 2000 (Figure 1). One aspect of this study was benthic community characterization, which was accomplished via sample collection by National Oceanic and Atmospheric Administration (NOAA) personnel and laboratory and data analysis by Barry A. Vittor & Associates, Inc. (BVA). Sampling devices varied during the field collections. Density, diversity and evenness could only be calculated at stations sampled with a Young dredge (area = 0.04 m²). Data tables containing “N/A” represents values that could not be calculated or was not provided to BVA by NOAA.

METHODS

Sample Collection and Handling

A Young dredge (area = 0.04 m²) was used to collect bottom samples at nine of 63 station locations (two replicate samples were taken at some stations while others contained only one sample) throughout Northwestern Hawaiian Islands. Samples were fixed in 10% formalin. The preserved samples were transported to BVA'S laboratory in Mobile, Alabama.

Macroinfaunal Sample Analysis

In the laboratory of BVA, benthic samples were inventoried, rinsed gently through a 0.5 mm mesh sieve to remove preservatives and sediment, stained with Rose Bengal, and stored in 70% isopropanol solution until processing. Sample material (sediment, detritus, organisms) was placed in white enamel trays for sorting under Wild M-5A dissecting microscopes. All macroinvertebrates were carefully removed with forceps and placed in labelled glass vials containing 70% isopropanol. Each vial represented a major taxonomic group (*e.g.* Polychaeta, Mollusca, Arthropoda). All sorted macroinvertebrates were identified to the lowest practical identification level (LPIL), which in most cases was to species level unless the specimen was a juvenile, damaged, or otherwise unidentifiable. The number of individuals of each taxon, excluding fragments,

was recorded. A voucher collection was prepared, composed of representative individuals of each species not previously encountered in samples from the region.

DATA ANALYSIS

All data generated as a result of laboratory analysis of macroinfauna samples were first coded on data sheets. Enumeration data were entered for each species according to station and replicate. These data were reduced to a data summary report for each station, which included a taxonomic species list and benthic community parameters information. Archive data files of species identification and enumeration were prepared.

The Quality Assurance/Quality Control (QA/QC) reports for the Northwestern Hawaiian Islands samples are given in Appendices A1 and A2.

Assemblage Structure

Several numerical indices were chosen for analysis and interpretation of the macroinfaunal data. Selection was based primarily on the ability of the index to provide a meaningful summary of data, as well as the applicability of the index to the characterization of the benthic community. Infaunal abundance is reported as the total number of individuals per station and the total number of individuals per square meter (= density). Taxa richness is reported as the total number of taxa represented in a given station collection.

Taxa diversity, which is often related to the ecological stability and environmental "quality" of the benthos, was estimated by the Shannon-Weaver Index (Pielou, 1966), according to the following formula:

$$H' = - \sum_{i=1}^S p_i (\ln p_i)$$

where, S = the number of taxa in the sample,

i = the i 'th taxon in the sample, and

p_i = the number of individuals of the i 'th taxon divided by the total number of individuals in the sample.

Taxa diversity was calculated using \ln , however taxa diversity may also be calculated using \log_2 . Both methods for calculating taxa diversity are common in scientific literature. The taxa diversity calculated in this report using \ln , can be converted to \log_2 by multiplying the taxa diversity by 1.44270.

Taxa diversity within a given community is dependent upon the number of taxa present (taxa richness) and the distribution of all individuals among those taxa (equitability or evenness). In order to quantify and compare faunal equitability to taxa diversity for a given area, Pielou's Index J' (Pielou, 1966) was calculated as $J' = H'/\ln S$, where $\ln S = H'_{\max}$, or the maximum possible diversity, when all taxa are represented by the same number of individuals; thus, $J' = H' / H'_{\max}$.

HABITAT CHARACTERISTICS

Water quality data for 12 of the 63 stations are presented in Table 1. Sediment data for the Northwestern Hawaiian Islands stations was not provided to BVA.

BENTHIC COMMUNITY CHARACTERIZATION

Faunal Composition, Abundance, and Community Structure

Table 2 provides a complete phylogenetic listing for all strata as well as data on taxa abundance and strata occurrence. Microsoft™ Excel spreadsheets are being provided separately to NOAA which include: raw data on taxa abundance and density by station, a complete taxonomic listing with strata abundance and occurrence and QA/QC comments, a major taxa table with overall taxa abundance, and an assemblage parameter table including data on mean number of taxa, mean density, taxa diversity and taxa evenness by station and stratum.

A total of 5,400 organisms, representing 300 taxa, were identified from the 63 stations (Table 3). Polychaetes were the most numerous organisms present representing 47% of the total assemblage, followed in abundance by malacostracans (29%) and

gastropods (7%). Polychaetes represented 39% of the total number of taxa followed by malacostracans (30%), and gastropods (18%)(Table 3). The percentage abundance of the major taxa at the 63 stations is given in Table 4 and Figure 2.

The dominant taxa collected from the stations were the polychaete, *Pionosyllis* sp. Q, the polychaete family, Saccocirridae (LPIL), the malacostracans, *Elasmopus* (LPIL) and *Leptochelia dubia* representing 5.5%, 5.0%, 4.2%, and 4.0% of the total number of individuals, respectively (Table 2). *Pionosyllis* sp. Q were the most widely distributed taxa being found at 51% of the stations. The distribution of taxa representing > 10% of the total assemblage at each station is given in Table 5.

Station abundance and taxa data are summarized for the 63 stations in Table 6. Mean density per station (where applicable) ranged from 125.0 organisms·m² (SD = 106.1) at Station FFS D1 to 6500.0 organisms·m² (SD = 0.0) at Station FFS15 (Table 6; Figure 3). The mean number of taxa per station ranged from 0.0 taxa per replicate at several stations to 39 taxa per replicate (SD = 21.2) at Station PH E9 (Table 6; Figure 4).

Taxa diversity and evenness (where applicable) for the Northwestern Hawaiian Islands stations are given in Table 6 and Figures 5 and 6. Taxa diversity (H') varied considerably and ranged from 0.19 at Station Midway 3 to 2.97 at Station FFS E3 (Table 6; Figure 5). Taxa evenness (J') also exhibited considerable variation and ranged from 0.28 at Station Midway 3 to 0.92 at Stations FFS D1 (Table 6; Figure 6).

LITERATURE CITED

Pielou, E.C. 1966. The measurement of diversity in different types of biological collections. *Journal of Theoretical Biology* 13:131-144.

Table 1. Summary of location and water quality data for the Northwestern Hawaiian Islands stations, October 2000.

Station ID	Latitude	Longitude	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved		Salinity (ppt)
						Oxygen (mg/l)		
FFS D1	23.646000	166.171250	N/A	N/A	N/A	N/A	N/A	N/A
FFS E2	23.784300	166.206833	N/A	N/A	N/A	N/A	N/A	N/A
FFS E3	23.787350	166.208600	Surface	0	28	54.8	4.9	36.2
			Bottom	2.3	36.2	54.8	5.03	36.2
FFS E4	23.788833	166.211550	N/A	N/A	N/A	N/A	N/A	N/A
FFS I15	23.857983	166.210600	N/A	N/A	N/A	N/A	N/A	N/A
FFS I16	23.852167	166.220933	N/A	N/A	N/A	N/A	N/A	N/A
FFS I3	23.867133	166.287883	Surface	0	4.05	54.6	4.05	36.1
			Bottom	6.15	27	54.6	4.26	36.1
FFS I4	23.867133	166.287883	Surface	0	27.2	54.5	5.04	36
			Bottom	2.75	27.1	54.6	5.18	36.1
FFS I5	23.867950	166.289583	Surface	0	27.4	54.3	5.47	35.9
			Bottom	3.21	27.2	54.2	5.43	36
FFS I8	23.871517	166.280767	N/A	N/A	N/A	N/A	N/A	N/A
FFS P6	23.744383	166.079350	N/A	N/A	N/A	N/A	N/A	N/A
FFS R4	23.773200	166.174267	N/A	N/A	N/A	N/A	N/A	N/A
FFS S10	23.639017	166.152917	N/A	N/A	N/A	N/A	N/A	N/A
FFS S7	23.671050	166.085733	Surface	0	28.2	54.8	4.43	36.2
			Bottom	6.2	28	54.8	4.35	36.2
FFS T15	23.642183	166.173783	N/A	N/A	N/A	N/A	N/A	N/A
FFS T19	23.632717	166.124417	N/A	N/A	N/A	N/A	N/A	N/A
FFS T23	23.830750	166.830750	N/A	N/A	N/A	N/A	N/A	N/A
FFS T27	23.848450	166.286917	N/A	N/A	N/A	N/A	N/A	N/A
FFS T31	23.771333	166.262283	N/A	N/A	N/A	N/A	N/A	N/A
FFS T33	23.775317	166.205717	N/A	N/A	N/A	N/A	N/A	N/A
FFS T35	23.788700	166.181433	N/A	N/A	N/A	N/A	N/A	N/A
FFS T39	23.709267	166.202467	N/A	N/A	N/A	N/A	N/A	N/A
FFS T41	23.691350	166.159583	N/A	N/A	N/A	N/A	N/A	N/A
Gardner Pinnade 1	24.998617	167.999783	N/A	N/A	N/A	N/A	N/A	N/A
Gardner Pinnade 2	24.999550	167.997533	N/A	N/A	N/A	N/A	N/A	N/A
Kure G10	28.388633	178.302017	N/A	N/A	N/A	N/A	N/A	N/A
Kure G18	28.447467	178.306383	N/A	N/A	N/A	N/A	N/A	N/A
Kure P15	28.392400	178.318167	Surface	0	25.9	54.5	5.34	36
			Bottom	4.15	25.1	54.5	5.15	36

Table 1. Continued:

Station ID	Latitude	Longitude		Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/l)	Salinity (ppt)
Kure P20	28.423383	178.342033		N/A	N/A	N/A	N/A	N/A
Kure P6	28.392800	178.348467	Surface	0	25.3	54.4	4.62	36
			Bottom	5	25.3	54.4	4.75	36
Kure P7	28.399183	178.340300		N/A	N/A	N/A	N/A	N/A
Kure P9	28.391800	178.338317		N/A	N/A	N/A	N/A	N/A
Kure T55	28.396667	178.366667		N/A	N/A	N/A	N/A	N/A
Lay 3	25.772667	171.742433	Surface	0	27	54.5	4.71	35.9
Lay T101	25.775833	171.743750		N/A	N/A	N/A	N/A	N/A
Lay T97	25.764983	171.751633		N/A	N/A	N/A	N/A	N/A
Maro 15	25.458517	170.598783	Surface	0	27	54.4	4.61	36
			Bottom	30	26.9	54.7	4.61	36.1
Maro 3	25.445283	170.642367	Surface	0	26.6	54.5	4.36	36
			Bottom	3	26.6	54.5	4.8	36
Midway 1	28.203450	177.373383		N/A	N/A	N/A	N/A	N/A
Midway 2	28.208633	177.365800		N/A	N/A	N/A	N/A	N/A
Midway 3	28.217300	177.369217		N/A	N/A	N/A	N/A	N/A
Midway 4	28.215500	177.386967		N/A	N/A	N/A	N/A	N/A
Midway L2	28.277417	177.367983		N/A	N/A	N/A	N/A	N/A
Midway L3	28.228767	177.319450		N/A	N/A	N/A	N/A	N/A
Necker 1	23.055617	161.926883		N/A	N/A	N/A	N/A	N/A
Necker 2	23.579800	164.702017		N/A	N/A	N/A	N/A	N/A
Necker 3	23.575083	164.704900		N/A	N/A	N/A	N/A	N/A
Nihoa 1	23.063667	161.916917		N/A	N/A	N/A	N/A	N/A
Nihoa 2	23.063667	161.916667		N/A	N/A	N/A	N/A	N/A
PH 17	27.763967	175.946983		N/A	N/A	N/A	N/A	N/A
PH E10	27.924850	175.737500		N/A	N/A	N/A	N/A	N/A
PH E24	27.790917	175.818600		N/A	N/A	N/A	N/A	N/A
PH E25	27.790267	175.814283		N/A	N/A	N/A	N/A	N/A
PH E9	27.866200	175.739633		N/A	N/A	N/A	N/A	N/A
PH L09	27.830217	175.896550		N/A	N/A	N/A	N/A	N/A
PH M03	27.828067	175.872983	Surface	0	26.8	53.6	4.09	35.4
			Bottom	20	26.6	53.7	4.32	35.4
PH M13	27.876333	175.826600	Surface	0	26.5	54.2	3.83	35.8
PH T85	27.865000	175.792750		N/A	N/A	N/A	N/A	N/A

ot in field notes provided to BVA

Table 2. Abundance and distribution of benthic macroinfaunal taxa for the Northwestern Hawaiian Islands stations, October 2000.

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Pionosyllis</i> sp. Q	Ann	Poly	298	5.52	5.52	32	51
Saccocirridae (LPIL)	Ann	Poly	272	5.04	10.56	15	24
<i>Elasmopus</i> (LPIL)	Art	Mala	229	4.24	14.80	11	17
<i>Leptochelia dubia</i>	Art	Mala	220	4.07	18.87	18	29
<i>Mesochaetopterus sagittarius</i>	Ann	Poly	215	3.98	22.85	4	6
Rhynchochoela (LPIL)	Rhy	-	204	3.78	26.63	44	70
Tubificidae (LPIL)	Ann	Olig	201	3.72	30.35	31	49
<i>Rissoella longispira</i>	Mol	Gast	176	3.26	33.61	3	5
<i>Syllis</i> sp. E	Ann	Poly	162	3.00	36.61	25	40
<i>Paraeurythoe</i> (LPIL)	Ann	Poly	160	2.96	39.57	26	41
<i>Syllis cornuta</i>	Ann	Poly	121	2.24	41.81	22	35
<i>Eriopisella sechellensis</i>	Art	Mala	114	2.11	43.93	18	29
<i>Pisone africana</i>	Ann	Poly	104	1.93	45.85	21	33
<i>Rissoina ambigua</i>	Mol	Gast	104	1.93	47.78	9	14
Enchytraeidae (LPIL)	Ann	Olig	98	1.81	49.59	23	37
<i>Nereimyra</i> sp. C	Ann	Poly	86	1.59	51.19	16	25
<i>Elasmopus piikoi</i>	Art	Mala	82	1.52	52.70	8	13
<i>Eriopisa</i> (LPIL)	Art	Mala	74	1.37	54.07	6	10
<i>Angeliara</i> (LPIL)	Art	Mala	72	1.33	55.41	9	14
Cirratulidae (LPIL)	Ann	Poly	69	1.28	56.69	6	10
<i>Melita pahuwai</i>	Art	Mala	66	1.22	57.91	7	11
<i>Protodorvillea</i> sp. A	Ann	Poly	62	1.15	59.06	15	24
<i>Hodometrica prolaxa</i>	Art	Mala	56	1.04	60.09	2	3
<i>Acteocina sinensis</i>	Mol	Gast	56	1.04	61.13	9	14
<i>Seba ekepuu</i>	Art	Mala	55	1.02	62.15	13	21
<i>Armandia intermedia</i>	Ann	Poly	54	1.00	63.15	14	22
Chaetopteridae (LPIL)	Ann	Poly	54	1.00	64.15	6	10
<i>Sphaerosyllis sublaevis</i>	Ann	Poly	54	1.00	65.15	13	21
<i>Questa</i> sp. B	Ann	Poly	51	0.94	66.09	13	21
<i>Caecum septimentum</i>	Mol	Gast	51	0.94	67.04	4	6
<i>Eriopisa hamakua</i>	Art	Mala	50	0.93	67.96	2	3
<i>Erichthonius brasiliensis</i>	Art	Mala	47	0.87	68.83	5	8
<i>Nematonereis unicornis</i>	Ann	Poly	45	0.83	69.67	13	21
Archiannelida (LPIL)	Ann	Poly	43	0.80	70.46	10	16
<i>Maera</i> sp. L	Art	Mala	42	0.78	71.24	6	10
<i>Phyllochaetopterus socialis</i>	Ann	Poly	40	0.74	71.98	1	2
Capitellidae (LPIL)	Ann	Poly	37	0.69	72.67	12	19
<i>Hawainira peleae</i>	Art	Mala	35	0.65	73.31	6	10
<i>Typosyllis</i> sp. O	Ann	Poly	34	0.63	73.94	11	17
<i>Pionosyllis</i> sp. R	Ann	Poly	32	0.59	74.54	7	11
Actiniaria (LPIL)	Cni	Anth	32	0.59	75.13	10	16
<i>Semele</i> sp. C	Mol	Biva	32	0.59	75.72	1	2
Maldanidae (LPIL)	Ann	Poly	31	0.57	76.30	5	8
<i>Exogone</i> (LPIL)	Ann	Poly	28	0.52	76.81	2	3
<i>Dentatisyllis</i> sp. B	Ann	Poly	27	0.50	77.31	7	11
Phyllodocidae (LPIL)	Ann	Poly	27	0.50	77.81	8	13
Bivalvia (LPIL)	Mol	Biva	25	0.46	78.28	11	17
<i>Sphaerosyllis centroamericana</i>	Ann	Poly	24	0.44	78.72	7	11
<i>Paraphoxus</i> sp. B	Art	Mala	24	0.44	79.17	3	5
<i>Zeuxo maledivensis</i>	Art	Mala	23	0.43	79.59	2	3
Hesionidae (LPIL)	Ann	Poly	22	0.41	80.00	6	10
<i>Polyopthalmus pictus</i>	Ann	Poly	22	0.41	80.41	10	16
Spionidae (LPIL)	Ann	Poly	22	0.41	80.81	10	16
<i>Maera</i> sp. O	Art	Mala	22	0.41	81.22	2	3
<i>Leucothoe hyhelia</i>	Art	Mala	21	0.39	81.61	8	13
Questidae (LPIL)	Ann	Poly	20	0.37	81.98	8	13
Melitidae (LPIL)	Art	Mala	20	0.37	82.35	8	13

Table 2. Continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Metacirrolana</i> sp. A	Art	Mala	20	0.37	82.72	6	10
Phyllodoce (LPIL)	Ann	Poly	19	0.35	83.07	7	11
<i>Planaxis labiosa</i>	Mol	Gast	19	0.35	83.43	2	3
<i>Questa</i> sp. A	Ann	Poly	18	0.33	83.76	4	6
<i>Balanoglossus</i> (LPIL)	Hem	Ente	17	0.31	84.07	4	6
<i>Metacirrolana</i> sp. B	Art	Mala	16	0.30	84.37	4	6
<i>Typosyllis</i> sp. N	Ann	Poly	15	0.28	84.65	5	8
<i>Tellina robusta</i>	Mol	Biva	15	0.28	84.93	4	6
<i>Eriopisa</i> sp. F	Art	Mala	14	0.26	85.19	3	5
<i>Acteocina</i> (LPIL)	Mol	Gast	14	0.26	85.44	2	3
<i>Syllis</i> (LPIL)	Ann	Poly	13	0.24	85.69	4	6
<i>Coelocarcinus foliatus</i>	Art	Mala	13	0.24	85.93	4	6
<i>Jassa</i> sp. A	Art	Mala	13	0.24	86.17	3	5
<i>Ervillea sandwicensis</i>	Mol	Biva	13	0.24	86.41	6	10
<i>Dorvillea</i> sp. F	Ann	Poly	12	0.22	86.63	2	3
<i>Leptanthura</i> sp. A	Art	Mala	12	0.22	86.85	8	13
Lucinidae (LPIL)	Mol	Biva	12	0.22	87.07	5	8
Paraonidae (LPIL)	Ann	Poly	11	0.20	87.28	6	10
<i>Jaeropsis</i> sp. A	Art	Mala	11	0.20	87.48	5	8
Semelidae (LPIL)	Mol	Biva	11	0.20	87.69	7	11
Gastropoda (LPIL)	Mol	Gast	11	0.20	87.89	8	13
<i>Aonides</i> sp. A	Ann	Poly	10	0.19	88.07	4	6
<i>Spio filicornis</i>	Ann	Poly	10	0.19	88.26	6	10
<i>Maera</i> (LPIL)	Art	Mala	10	0.19	88.44	6	10
<i>Maera</i> sp. M	Art	Mala	10	0.19	88.63	2	3
<i>Tellina</i> (LPIL)	Mol	Biva	10	0.19	88.81	1	2
<i>Philine</i> (LPIL)	Mol	Gast	10	0.19	89.00	3	5
<i>Rhinoclavis sinensis</i>	Mol	Gast	10	0.19	89.19	3	5
<i>Vexillum</i> sp. A	Mol	Gast	10	0.19	89.37	5	8
<i>Chone</i> (LPIL)	Ann	Poly	9	0.17	89.54	1	2
<i>Pisionidens indica</i>	Ann	Poly	9	0.17	89.70	4	6
Spionidae Genus J	Ann	Poly	9	0.17	89.87	4	6
Aoridae (LPIL)	Art	Mala	9	0.17	90.04	5	8
<i>Gammaropsis pokipoki</i>	Art	Mala	9	0.17	90.20	2	3
Rissoellidae (LPIL)	Mol	Gast	9	0.17	90.37	1	2
<i>Galathowenia</i> sp. C	Ann	Poly	8	0.15	90.52	2	3
Syllidae (LPIL)	Ann	Poly	8	0.15	90.67	7	11
Terebellidae (LPIL)	Ann	Poly	8	0.15	90.81	4	6
Ingolfiellidae Genus A	Art	Mala	8	0.15	90.96	4	6
Veneridae (LPIL)	Mol	Biva	8	0.15	91.11	3	5
Cerithiidae (LPIL)	Mol	Gast	8	0.15	91.26	4	6
<i>Fabricia</i> sp. A	Ann	Poly	7	0.13	91.39	1	2
<i>Mediomastus</i> (LPIL)	Ann	Poly	7	0.13	91.52	5	8
<i>Scoletoma dentata</i>	Ann	Poly	7	0.13	91.65	3	5
Amphipoda (LPIL)	Art	Mala	7	0.13	91.78	5	8
<i>Aoroides columbiae</i>	Art	Mala	7	0.13	91.91	4	6
<i>Leptocheilia</i> (LPIL)	Art	Mala	7	0.13	92.04	4	6
<i>Processa</i> sp. B	Art	Mala	7	0.13	92.17	3	5
<i>Cerithium</i> (LPIL)	Mol	Gast	7	0.13	92.30	1	2
<i>Aphelochaeta</i> (LPIL)	Ann	Poly	6	0.11	92.41	2	3
<i>Capitella capitata</i>	Ann	Poly	6	0.11	92.52	3	5
<i>Nereis</i> (LPIL)	Ann	Poly	6	0.11	92.63	4	6
<i>Polygordius</i> (LPIL)	Ann	Poly	6	0.11	92.74	3	5
<i>Typosyllis</i> sp. P	Ann	Poly	6	0.11	92.85	4	6
<i>Colanthura</i> sp. B	Art	Mala	6	0.11	92.96	4	6
<i>Lembos</i> (LPIL)	Art	Mala	6	0.11	93.07	5	8
<i>Turbonilla</i> sp. AI	Mol	Gast	6	0.11	93.19	3	5
Goniadidae (LPIL)	Ann	Poly	5	0.09	93.28	4	6
<i>Nereis pelagica</i>	Ann	Poly	5	0.09	93.37	1	2
<i>Streblospio benedicti</i>	Ann	Poly	5	0.09	93.46	3	5

Table 2. Continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Typosyllis hawaiiensis</i>	Ann	Poly	5	0.09	93.56	1	2
<i>Amphilochus likelike</i>	Art	Mala	5	0.09	93.65	2	3
Corophiidae (LPIL)	Art	Mala	5	0.09	93.74	5	8
<i>Hyale</i> sp. D	Art	Mala	5	0.09	93.83	2	3
<i>Melita</i> (LPIL)	Art	Mala	5	0.09	93.93	2	3
Pyramidellidae (LPIL)	Mol	Gast	5	0.09	94.02	3	5
Rissoidae (LPIL)	Mol	Gast	5	0.09	94.11	4	6
Rissoidae Genus B	Mol	Gast	5	0.09	94.20	1	2
<i>Tubulanus</i> (LPIL)	Rhy	Anop	5	0.09	94.30	2	3
<i>Microphthalmus</i> (LPIL)	Ann	Poly	4	0.07	94.37	2	3
<i>Nereimyra</i> (LPIL)	Ann	Poly	4	0.07	94.44	1	2
Polynoidae (LPIL)	Ann	Poly	4	0.07	94.52	1	2
<i>Synelmis</i> sp. F	Ann	Poly	4	0.07	94.59	4	6
<i>Amakusanthura</i> sp. A	Art	Mala	4	0.07	94.67	3	5
<i>Apanthura</i> sp. G	Art	Mala	4	0.07	94.74	2	3
<i>Jaeropsis</i> (LPIL)	Art	Mala	4	0.07	94.81	2	3
<i>Microcerberus</i> sp. A	Art	Mala	4	0.07	94.89	2	3
Paguridae (LPIL)	Art	Mala	4	0.07	94.96	1	2
<i>Pontogeneia pacifica</i>	Art	Mala	4	0.07	95.04	1	2
<i>Synapseudes</i> sp. A	Art	Mala	4	0.07	95.11	2	3
Crassatellidae Genus A	Mol	Biva	4	0.07	95.19	4	6
Veneridae Genus B	Mol	Biva	4	0.07	95.26	3	5
Trochidae Genus E	Mol	Gast	4	0.07	95.33	1	2
Vitrinellidae (LPIL)	Mol	Gast	4	0.07	95.41	2	3
<i>Aonides oxycephala</i>	Ann	Poly	3	0.06	95.46	2	3
<i>Axiothella</i> sp. B	Ann	Poly	3	0.06	95.52	1	2
Chaetopteridae Genus B	Ann	Poly	3	0.06	95.57	2	3
<i>Nereis arenaceodontata</i>	Ann	Poly	3	0.06	95.63	3	5
<i>Notomastus</i> (LPIL)	Ann	Poly	3	0.06	95.69	2	3
Orbiniidae (LPIL)	Ann	Poly	3	0.06	95.74	3	5
<i>Parapionosyllis</i> sp. E	Ann	Poly	3	0.06	95.80	3	5
<i>Pionosyllis</i> sp. S	Ann	Poly	3	0.06	95.85	3	5
Sabellidae (LPIL)	Ann	Poly	3	0.06	95.91	3	5
<i>Sphaerosyllis</i> (LPIL)	Ann	Poly	3	0.06	95.96	1	2
<i>Typosyllis hyalina</i>	Ann	Poly	3	0.06	96.02	2	3
<i>Alpheus</i> (LPIL)	Art	Mala	3	0.06	96.07	1	2
Decapoda (LPIL)	Art	Mala	3	0.06	96.13	3	5
Genus T Anthuridae Genus T	Art	Mala	3	0.06	96.19	3	5
<i>Maera</i> sp. N	Art	Mala	3	0.06	96.24	2	3
<i>Nuuanu amikai</i>	Art	Mala	3	0.06	96.30	2	3
Asciacea (LPIL)	Cho	Asci	3	0.06	96.35	3	5
Ophiuroidea (LPIL)	Ech	Ophi	3	0.06	96.41	2	3
<i>Cardita</i> sp. A	Mol	Biva	3	0.06	96.46	3	5
<i>Alvania</i> sp. I	Mol	Gast	3	0.06	96.52	1	2
<i>Turbonilla</i> (LPIL)	Mol	Gast	3	0.06	96.57	3	5
Sipuncula (LPIL)	Sip	-	3	0.06	96.63	2	3
Oligochaeta (LPIL)	Ann	Olig	2	0.04	96.67	2	3
<i>Cirriformia</i> sp. G	Ann	Poly	2	0.04	96.70	2	3
<i>Dasybranchus lumbricoides</i>	Ann	Poly	2	0.04	96.74	2	3
<i>Ehlersia ferrugina</i>	Ann	Poly	2	0.04	96.78	1	2
Eunicidae (LPIL)	Ann	Poly	2	0.04	96.81	2	3
<i>Hesionura</i> sp. C	Ann	Poly	2	0.04	96.85	1	2
<i>Laonice cirrata</i>	Ann	Poly	2	0.04	96.89	2	3
<i>Onuphis</i> (LPIL)	Ann	Poly	2	0.04	96.93	1	2
<i>Paleanotus</i> (LPIL)	Ann	Poly	2	0.04	96.96	1	2
<i>Parapionosyllis</i> sp. F	Ann	Poly	2	0.04	97.00	1	2
<i>Prionospio</i> (LPIL)	Ann	Poly	2	0.04	97.04	2	3
<i>Schistomeringos rudolphi</i>	Ann	Poly	2	0.04	97.07	1	2
<i>Scoletepis</i> (LPIL)	Ann	Poly	2	0.04	97.11	1	2
<i>Scoletoma</i> (LPIL)	Ann	Poly	2	0.04	97.15	2	3

Table 2. Continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Scyphoproctus djiboutiensis</i>	Ann	Poly	2	0.04	97.19	2	3
<i>Spio</i> (LPIL)	Ann	Poly	2	0.04	97.22	2	3
<i>Typosyllis variegata</i>	Ann	Poly	2	0.04	97.26	2	3
Alpheidae (LPIL)	Art	Mala	2	0.04	97.30	1	2
<i>Alpheus</i> sp. G	Art	Mala	2	0.04	97.33	1	2
Anthuridae (LPIL)	Art	Mala	2	0.04	97.37	1	2
<i>Atylus</i> sp. A	Art	Mala	2	0.04	97.41	1	2
<i>Colanthur</i> (LPIL)	Art	Mala	2	0.04	97.44	1	2
<i>Deutella</i> sp. B	Art	Mala	2	0.04	97.48	1	2
<i>Ebalia</i> (LPIL)	Art	Mala	2	0.04	97.52	1	2
<i>Kraussia integra</i>	Art	Mala	2	0.04	97.56	2	3
<i>Kupellonura</i> sp. B	Art	Mala	2	0.04	97.59	1	2
<i>Metacirolana</i> (LPIL)	Art	Mala	2	0.04	97.63	2	3
<i>Ogyrides</i> (LPIL)	Art	Mala	2	0.04	97.67	2	3
<i>Pagurus</i> (LPIL)	Art	Mala	2	0.04	97.70	2	3
<i>Paraphoxus</i> (LPIL)	Art	Mala	2	0.04	97.74	2	3
Stomatopoda (LPIL)	Art	Mala	2	0.04	97.78	2	3
Bryozoa (LPIL)	Bry	-	2	0.04	97.81	2	3
Echinoidea (LPIL)	Ech	Echi	2	0.04	97.85	2	3
Apodida Family A	Ech	Holo	2	0.04	97.89	1	2
<i>Kellia</i> sp. A	Mol	Biva	2	0.04	97.93	1	2
<i>Musculus</i> sp. B	Mol	Biva	2	0.04	97.96	1	2
Semelidae Genus A	Mol	Biva	2	0.04	98.00	1	2
<i>Tellina perna</i>	Mol	Biva	2	0.04	98.04	2	3
<i>Atys semistriata</i>	Mol	Gast	2	0.04	98.07	1	2
Epitoniidae (LPIL)	Mol	Gast	2	0.04	98.11	2	3
<i>Melanella</i> sp. F	Mol	Gast	2	0.04	98.15	2	3
<i>Nerita</i> sp. A	Mol	Gast	2	0.04	98.19	2	3
<i>Tricolia variabilis</i>	Mol	Gast	2	0.04	98.22	1	2
Trochidae (LPIL)	Mol	Gast	2	0.04	98.26	2	3
Trochidae Genus F	Mol	Gast	2	0.04	98.30	1	2
<i>Arabella iricolor</i>	Ann	Poly	1	0.02	98.31	1	2
<i>Caulleriella</i> sp. R	Ann	Poly	1	0.02	98.33	1	2
<i>Cirriformia crassicola</i>	Ann	Poly	1	0.02	98.35	1	2
<i>Dentatisyllis</i> sp. E	Ann	Poly	1	0.02	98.37	1	2
<i>Eteone</i> sp. C	Ann	Poly	1	0.02	98.39	1	2
<i>Eunice</i> (LPIL)	Ann	Poly	1	0.02	98.41	1	2
<i>Eunice vittata</i>	Ann	Poly	1	0.02	98.43	1	2
<i>Exogone</i> sp. S	Ann	Poly	1	0.02	98.44	1	2
<i>Exogone</i> sp. T	Ann	Poly	1	0.02	98.46	1	2
Genus G Syllidae Genus G	Ann	Poly	1	0.02	98.48	1	2
Glyceridae (LPIL)	Ann	Poly	1	0.02	98.50	1	2
<i>Grubeosyllis</i> sp. A	Ann	Poly	1	0.02	98.52	1	2
<i>Hesione splendida</i>	Ann	Poly	1	0.02	98.54	1	2
<i>Lysidice ninetta</i>	Ann	Poly	1	0.02	98.56	1	2
<i>Mediomastus</i> sp. A	Ann	Poly	1	0.02	98.57	1	2
<i>Mooreonuphis</i> sp. G	Ann	Poly	1	0.02	98.59	1	2
<i>Mooreonuphis</i> sp. H	Ann	Poly	1	0.02	98.61	1	2
<i>Nereis</i> sp. G	Ann	Poly	1	0.02	98.63	1	2
Onuphidae (LPIL)	Ann	Poly	1	0.02	98.65	1	2
<i>Opisthosyllis brunnea</i>	Ann	Poly	1	0.02	98.67	1	2
Oweniidae (LPIL)	Ann	Poly	1	0.02	98.69	1	2
<i>Parapionosyllis</i> (LPIL)	Ann	Poly	1	0.02	98.70	1	2
<i>Phyllochaetopterus verrilli</i>	Ann	Poly	1	0.02	98.72	1	2
<i>Pionosyllis</i> (LPIL)	Ann	Poly	1	0.02	98.74	1	2
<i>Poecilochaetus</i> sp. C	Ann	Poly	1	0.02	98.76	1	2
<i>Potamilla</i> (LPIL)	Ann	Poly	1	0.02	98.78	1	2
<i>Pygospio muscularis</i>	Ann	Poly	1	0.02	98.80	1	2
<i>Scyphoproctus</i> (LPIL)	Ann	Poly	1	0.02	98.81	1	2
<i>Streptosyllis</i> sp. E	Ann	Poly	1	0.02	98.83	1	2
<i>Syllis</i> sp. F	Ann	Poly	1	0.02	98.85	1	2

Table 2. Continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Synelmis</i> sp. G	Ann	Poly	1	0.02	98.87	1	2
<i>Apseudes intermedius</i>	Art	Mala	1	0.02	98.89	1	2
<i>Apseudomorpha</i> sp. A	Art	Mala	1	0.02	98.91	1	2
<i>Apseudomorpha</i> sp. B	Art	Mala	1	0.02	98.93	1	2
Atyidae (LPIL)	Art	Mala	1	0.02	98.94	1	2
<i>Atylus</i> (LPIL)	Art	Mala	1	0.02	98.96	1	2
Callianassidae Genus D	Art	Mala	1	0.02	98.98	1	2
<i>Carpias</i> (LPIL)	Art	Mala	1	0.02	99.00	1	2
<i>Carpias</i> sp. B	Art	Mala	1	0.02	99.02	1	2
<i>Ceradocus</i> sp. D	Art	Mala	1	0.02	99.04	1	2
<i>Cymadusa hawaiiensis</i>	Art	Mala	1	0.02	99.06	1	2
<i>Erichthonius</i> (LPIL)	Art	Mala	1	0.02	99.07	1	2
<i>Eriopisella</i> (LPIL)	Art	Mala	1	0.02	99.09	1	2
<i>Gammaropsis</i> sp. J	Art	Mala	1	0.02	99.11	1	2
<i>Hyale</i> (LPIL)	Art	Mala	1	0.02	99.13	1	2
Jaeropsidae (LPIL)	Art	Mala	1	0.02	99.15	1	2
<i>Joeropsis</i> (LPIL)	Art	Mala	1	0.02	99.17	1	2
<i>Lysianassa ewa</i>	Art	Mala	1	0.02	99.19	1	2
Oedicerotidae (LPIL)	Art	Mala	1	0.02	99.20	1	2
<i>Palinnotus alaniphias</i>	Art	Mala	1	0.02	99.22	1	2
Phoxocephalidae (LPIL)	Art	Mala	1	0.02	99.24	1	2
Portunidae (LPIL)	Art	Mala	1	0.02	99.26	1	2
<i>Pseudoleptocheilia</i> sp. B	Art	Mala	1	0.02	99.28	1	2
<i>Sinelobus stanfordi</i>	Art	Mala	1	0.02	99.30	1	2
Tanaidacea (LPIL)	Art	Mala	1	0.02	99.31	1	2
Ostracoda (LPIL)	Art	Ostr	1	0.02	99.33	1	2
Branchiostoma (LPIL)	Cho	Lept	1	0.02	99.35	1	2
Holothuroidea (LPIL)	Ech	Holo	1	0.02	99.37	1	2
Hemichordata (LPIL)	Hem	-	1	0.02	99.39	1	2
<i>Arca</i> (LPIL)	Mol	Biva	1	0.02	99.41	1	2
<i>Crenella</i> sp. B	Mol	Biva	1	0.02	99.43	1	2
<i>Limopsis</i> sp. C	Mol	Biva	1	0.02	99.44	1	2
<i>Lucina</i> (LPIL)	Mol	Ostr	1	0.02	99.46	1	2
<i>Macoma</i> sp. F	Mol	Biva	1	0.02	99.48	1	2
Montacutidae Genus B	Mol	Biva	1	0.02	99.50	1	2
<i>Semele</i> (LPIL)	Mol	Biva	1	0.02	99.52	1	2
Tellinidae (LPIL)	Mol	Biva	1	0.02	99.54	1	2
Arminidae Genus A	Mol	Gast	1	0.02	99.56	1	2
<i>Atys</i> (LPIL)	Mol	Gast	1	0.02	99.57	1	2
<i>Capulus</i> sp. A	Mol	Gast	1	0.02	99.59	1	2
<i>Cerithium</i> sp. B	Mol	Gast	1	0.02	99.61	1	2
Columbellidae (LPIL)	Mol	Gast	1	0.02	99.63	1	2
<i>Conus pertusus</i>	Mol	Gast	1	0.02	99.65	1	2
<i>Cyclostremiscus</i> sp. C	Mol	Gast	1	0.02	99.67	1	2
<i>Dentimargo</i> sp. A	Mol	Gast	1	0.02	99.69	1	2
<i>Doridella</i> sp. A	Mol	Gast	1	0.02	99.70	1	2
<i>Doridium</i> sp. A	Mol	Gast	1	0.02	99.72	1	2
<i>Epitonium</i> sp. D	Mol	Gast	1	0.02	99.74	1	2
<i>Marginella</i> (LPIL)	Mol	Gast	1	0.02	99.76	1	2
Marginellidae Genus A	Mol	Gast	1	0.02	99.78	1	2
<i>Mitra</i> sp. F	Mol	Gast	1	0.02	99.80	1	2
Naticidae (LPIL)	Mol	Gast	1	0.02	99.81	1	2
Nudibranchia (LPIL)	Mol	Gast	1	0.02	99.83	1	2
<i>Odostomia</i> sp. P	Mol	Gast	1	0.02	99.85	1	2
Philinidae (LPIL)	Mol	Gast	1	0.02	99.87	1	2
<i>Pyramidella</i> (LPIL)	Mol	Gast	1	0.02	99.89	1	2
<i>Pyramidella</i> sp. A	Mol	Gast	1	0.02	99.91	1	2
<i>Strombiformis</i> (LPIL)	Mol	Gast	1	0.02	99.93	1	2

Table 2. Continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
<i>Terebra</i> (LPIL)	Mol	Gast	1	0.02	99.94	1	2
<i>Terebra peasei</i>	Mol	Gast	1	0.02	99.96	1	2
Turridae (LPIL)	Mol	Gast	1	0.02	99.98	1	2
Turridae Genus O	Mol	Gast	1	0.02	100.00	1	2

Taxa Key

Ann = Annelida	Bry = Bryozoa	Ech = Echinodermata	Mol = Mollusca
Olig = Oligochaeta		Echi = Echinoidea	Biva = Bivalvia
Poly = Polychaeta	Cho = Chordata	Holo = Holothuroidea	Gast = Gastropoda
	Asci = Ascidiacea	Ophi = Ophiuroidea	
Art = Arthropoda	Lept = Leptocardia		Rhy = Rhynchocoela
Mala = Malacostraca		Hem = Hemichordata	Anop = Anopla
Ostr = Ostracoda	Cni = Cnidaria	Ente = Enteropneusta	
	Anth = Anthozoa		Sip = Sipuncula

Table 3. Summary of overall abundance of major benthic macrofaunal taxonomic groups for the Northwestern Hawaiian Island stations, October 2000.

Taxa	Total No. Taxa	% Total	Total No. Individuals	% Total
Annelida				
Oligochaeta	3	1.0	301	5.6
Polychaeta	117	39.0	2,558	47.4
Mollusca				
Bivalvia	23	7.7	153	2.8
Gastropoda	53	17.7	559	10.4
Arthropoda				
Malacostraca	90	30.0	1,552	28.7
Ostracoda	1	0.3	1	0.0
Echinodermata				
Echinoidea	1	0.3	2	0.0
Holothuroidea	2	0.7	3	0.1
Ophiuroidea	1	0.3	3	0.1
Rhynchocoela				
Anopla	1	0.3	5	0.1
Rhynchocoela (LPIL)	1	0.3	204	3.8
Other Taxa	7	2.3	59	1.1
Total	300		5,400	

Table 4. Summary of abundance of major benthic macrofaunal taxonomic groups by station for the Northwestern Hawaiian Islands stations, October 2000.

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
1	Midway 1	Annelida	10	71.4	20	62.5
		Mollusca	2	14.3	9	28.1
		Arthropoda	1	7.1	1	3.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	7.1	2	6.3
		Total	14		32*	
2	Midway 2	Annelida	0	0.0	0	0.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	0		0	
3	Midway 3	Annelida	1	50.0	2	4.9
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	50.0	39	95.1
		Total	2		41*	
4	Midway 4	Annelida	5	45.5	14	66.7
		Mollusca	3	27.3	3	14.3
		Arthropoda	2	18.2	3	14.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	9.1	1	4.8
		Total	11		21	
5	Midway L2	Annelida	9	34.6	46	43.0
		Mollusca	5	19.2	33	30.8
		Arthropoda	10	38.5	15	14.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	7.7	13	12.1
		Total	26		107	
6	Midway L3	Annelida	11	37.9	58	54.2
		Mollusca	6	20.7	7	6.5
		Arthropoda	11	37.9	32	29.9
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.4	10	9.3
		Total	29		107	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
7	Kure G10	Annelida	14	63.6	75	63.6
		Mollusca	1	4.5	2	1.7
		Arthropoda	5	22.7	31	26.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	9.1	10	8.5
		Total	22		118	
8	Kure G18	Annelida	15	71.4	119	90.8
		Mollusca	2	9.5	4	3.1
		Arthropoda	3	14.3	6	4.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.8	2	1.5
		Total	21		131	
9	Kure G40	Annelida	4	40.0	36	67.9
		Mollusca	3	30.0	3	5.7
		Arthropoda	2	20.0	5	9.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	10.0	9	17.0
		Total	10		53*	
10	Kure N6	Annelida	11	68.8	42	56.8
		Mollusca	0	0.0	0	0.0
		Arthropoda	4	25.0	25	33.8
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	6.3	7	9.5
		Total	16		74	
11	Kure P6	Annelida	20	80.0	147	94.2
		Mollusca	4	16.0	8	5.1
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.0	1	0.6
		Total	25		156	
12	Kure P7	Annelida	8	32.0	23	21.1
		Mollusca	6	24.0	10	9.2
		Arthropoda	10	40.0	71	65.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.0	5	4.6
		Total	25		109	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
13	Kure P9	Annelida	12	46.2	57	76.0
		Mollusca	4	15.4	5	6.7
		Arthropoda	9	34.6	10	13.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.8	3	4.0
		Total	26		75	
14	Kure P15	Annelida	6	35.3	11	10.3
		Mollusca	7	41.2	50	46.7
		Arthropoda	2	11.8	42	39.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	11.8	4	3.7
		Total	17		107*	
15	Kure P20	Annelida	21	80.8	64	86.5
		Mollusca	1	3.8	1	1.4
		Arthropoda	3	11.5	4	5.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.8	5	6.8
		Total	26		74	
16	Kure T43	Annelida	4	36.4	15	18.5
		Mollusca	2	18.2	2	2.5
		Arthropoda	5	45.5	64	79.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	11		81	
17	Kure T55	Annelida	14	63.6	52	73.2
		Mollusca	4	18.2	4	5.6
		Arthropoda	2	9.1	3	4.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	9.1	12	16.9
		Total	22		71	
18	Lay 3	Annelida	12	63.2	120	86.3
		Mollusca	4	21.1	6	4.3
		Arthropoda	2	10.5	2	1.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	5.3	11	7.9
		Total	19		139	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
19	Lay 6	Annelida	0	0.0	0	0.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	0		0	
20	Lay T97	Annelida	4	66.7	4	66.7
		Mollusca	1	16.7	1	16.7
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	16.7	1	16.7
		Total	6		6	
21	Lay T101	Annelida	5	62.5	11	73.3
		Mollusca	1	12.5	1	6.7
		Arthropoda	1	12.5	1	6.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	12.5	2	13.3
		Total	8		15	
22	Nihoa 1	Annelida	11	25.0	36	29.8
		Mollusca	17	38.6	48	39.7
		Arthropoda	14	31.8	31	25.6
		Echinodermata	1	2.3	1	0.8
		Other Taxa	1	2.3	5	4.1
		Total	44		121	
23	GardPinn 1	Annelida	4	50.0	36	90.0
		Mollusca	2	25.0	2	5.0
		Arthropoda	2	25.0	2	5.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	8		40	
24	GarPinn2-1	Annelida	6	40.0	32	74.4
		Mollusca	3	20.0	3	7.0
		Arthropoda	6	40.0	8	18.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	15		43	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
25	Maro 3	Annelida	3	25.0	4	6.7
		Mollusca	4	33.3	33	55.0
		Arthropoda	4	33.3	22	36.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	8.3	1	1.7
		Total	12		60	
26	Maro 15	Annelida	4	19.0	5	3.6
		Mollusca	3	14.3	19	13.9
		Arthropoda	12	57.1	108	78.8
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	9.5	5	3.6
		Total	21		137	
27	Necker 1	Annelida	8	36.4	18	40.9
		Mollusca	3	13.6	3	6.8
		Arthropoda	10	45.5	21	47.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.5	2	4.5
		Total	22		44	
28	Necker 2	Annelida	9	37.5	40	48.2
		Mollusca	7	29.2	7	8.4
		Arthropoda	7	29.2	35	42.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.2	1	1.2
		Total	24		83	
29	Necker 3	Annelida	13	68.4	37	80.4
		Mollusca	4	21.1	5	10.9
		Arthropoda	1	5.3	2	4.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	5.3	2	4.3
		Total	19		46	
30	PH E9	Annelida	44	66.7	535	71.4
		Mollusca	11	16.7	145	19.4
		Arthropoda	6	9.1	61	8.1
		Echinodermata	2	3.0	2	0.3
		Other Taxa	3	4.5	6	0.8
		Total	66		749	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
31	PH E10	Annelida	23	63.9	49	58.3
		Mollusca	3	8.3	4	4.8
		Arthropoda	5	13.9	22	26.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	5	13.9	9	10.7
		Total	36		84	
32	PH E24	Annelida	27	81.8	114	85.1
		Mollusca	2	6.1	11	8.2
		Arthropoda	3	9.1	3	2.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.0	6	4.5
		Total	33		134	
33	PH E25	Annelida	16	66.7	27	23.3
		Mollusca	4	16.7	85	73.3
		Arthropoda	1	4.2	1	0.9
		Echinodermata	0	0.0	0	0.0
		Other Taxa	3	12.5	3	2.6
		Total	24		116	
34	PH 17	Annelida	7	70.0	14	82.4
		Mollusca	0	0.0	0	0.0
		Arthropoda	3	30.0	3	17.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	10		17	
35	PH L04	Annelida	0	0.0	0	0.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	0		0	
36	PH L09	Annelida	0	0.0	0	0.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	0		0	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
37	PH M03	Annelida	9	47.4	24	15.8
		Mollusca	5	26.3	113	74.3
		Arthropoda	4	21.1	13	8.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	5.3	2	1.3
		Total	19			152
38	PH M13	Annelida	2	25.0	2	15.4
		Mollusca	2	25.0	2	15.4
		Arthropoda	2	25.0	3	23.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	25.0	6	46.2
		Total	8			13
39	PH T85	Annelida	16	76.2	23	65.7
		Mollusca	0	0.0	0	0.0
		Arthropoda	4	19.0	11	31.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.8	1	2.9
		Total	21			35
40	FFS D1	Annelida	3	75.0	7	70.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	25.0	3	30.0
		Total	4			10*
41	FFS E2	Annelida	17	41.5	40	17.9
		Mollusca	5	12.2	12	5.4
		Arthropoda	16	39.0	167	74.6
		Echinodermata	2	4.9	4	1.8
		Other Taxa	1	2.4	1	0.4
		Total	41			224
42	FFS E3	Annelida	17	54.8	46	58.2
		Mollusca	2	6.5	2	2.5
		Arthropoda	9	29.0	19	24.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	3	9.7	12	15.2
		Total	31			79*

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
43	FFS E4	Annelida	16	45.7	90	25.1
		Mollusca	2	5.7	17	4.7
		Arthropoda	15	42.9	242	67.6
		Echinodermata	1	2.9	1	0.3
		Other Taxa	1	2.9	8	2.2
		Total	35		358	
44	FFS I3	Annelida	2	33.3	5	50.0
		Mollusca	1	16.7	2	20.0
		Arthropoda	3	50.0	3	30.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	6		10	
45	FFS I4	Annelida	18	62.1	100	53.8
		Mollusca	2	6.9	3	1.6
		Arthropoda	8	27.6	80	43.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.4	3	1.6
		Total	29		186	
46	FFS I5	Annelida	20	51.3	139	53.5
		Mollusca	5	12.8	11	4.2
		Arthropoda	11	28.2	87	33.5
		Echinodermata	0	0.0	0	0.0
		Other Taxa	3	7.7	23	8.8
		Total	39		260*	
47	FFS I8	Annelida	3	50.0	246	98.4
		Mollusca	0	0.0	0	0.0
		Arthropoda	2	33.3	2	0.8
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	16.7	2	0.8
		Total	6		250	
48	FFS I15	Annelida	17	58.6	41	53.9
		Mollusca	2	6.9	6	7.9
		Arthropoda	9	31.0	27	35.5
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.4	2	2.6
		Total	29		76	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
49	FFS I16	Annelida	6	50.0	10	62.5
		Mollusca	2	16.7	2	12.5
		Arthropoda	3	25.0	3	18.8
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	8.3	1	6.3
		Total		12		16
50	FFS P6	Annelida	3	50.0	3	42.9
		Mollusca	1	16.7	1	14.3
		Arthropoda	1	16.7	2	28.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	16.7	1	14.3
		Total		6		7
51	FFS R4	Annelida	13	46.4	30	46.9
		Mollusca	6	21.4	8	12.5
		Arthropoda	8	28.6	23	35.9
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.6	3	4.7
		Total		28		64
52	FFS S7	Annelida	9	81.8	29	80.6
		Mollusca	0	0.0	0	0.0
		Arthropoda	1	9.1	3	8.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	9.1	4	11.1
		Total		11		36*
53	FFS S10	Annelida	2	66.7	5	83.3
		Mollusca	1	33.3	1	16.7
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total		3		6*
54	FFS T15	Annelida	1	100.0	3	100.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total		1		3

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
55	FFS T19	Annelida	10	76.9	61	95.3
		Mollusca	2	15.4	2	3.1
		Arthropoda	1	7.7	1	1.6
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	13		64	
56	FFS T23	Annelida	5	45.5	7	46.7
		Mollusca	2	18.2	3	20.0
		Arthropoda	1	9.1	1	6.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	3	27.3	4	26.7
		Total	11		15	
57	FFS T27	Annelida	6	60.0	10	66.7
		Mollusca	0	0.0	0	0.0
		Arthropoda	3	30.0	4	26.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	10.0	1	6.7
		Total	10		15	
58	FFS T31	Annelida	2	66.7	9	90.0
		Mollusca	1	33.3	1	10.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	3		10	
59	FFS T33	Annelida	2	7.7	5	3.7
		Mollusca	6	23.1	9	6.7
		Arthropoda	17	65.4	117	86.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	3.8	4	3.0
		Total	26		135	
60	FFS T35	Annelida	15	41.7	47	31.3
		Mollusca	3	8.3	3	2.0
		Arthropoda	18	50.0	100	66.7
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	36		150	

Table 4. Continued:

Station #	Station ID	Phylum	No. of Taxa	% of Total	No. of Individuals *(per 0.04 m ²)	% of Total
61	FFS T39	Annelida	0	0.0	0	0.0
		Mollusca	0	0.0	0	0.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	0		0	
62	FFS T41	Annelida	3	27.3	5	29.4
		Mollusca	0	0.0	0	0.0
		Arthropoda	6	54.5	8	47.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	18.2	4	23.5
		Total	11		17	
63	Nihoa 2	Annelida	7	63.6	12	57.1
		Mollusca	0	0.0	0	0.0
		Arthropoda	3	27.3	3	14.3
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	9.1	6	28.6
		Total	11		21	

Table 5. Continued:

Taxon Name	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Gastropoda																				
<i>Acteocina</i> (LPIL)																				
<i>Acteocina sinensis</i>																				
Gastropoda (LPIL)						20.0														
<i>Rissoella longispira</i>																				
<i>Rissoina ambigua</i>																				
Rhynchocoela																				
Rhynchocoela (LPIL)	30.0											14.3		11.1						13.3

Table 5. Continued:

Taxon Name	59	60	61	62	63
Annelida					
Oligochaeta					
Enchytraeidae (LPIL)					
Tubificidae (LPIL)					
Polychaeta					
<i>Aonides</i> sp. A					
Archiannelida (LPIL)					
<i>Armandia intermedia</i>					
Capitellidae (LPIL)					
Cirratulidae (LPIL)					
Hesionidae (LPIL)					
<i>Mesochaetopterus sagittarius</i>					
<i>Nematonereis unicornis</i>				11.8	
<i>Nereimyra</i> sp. C					
Orbiniidae (LPIL)					
<i>Paraeurythoe</i> (LPIL)					
Phyllodocidae (LPIL)					
<i>Pionosyllis</i> sp. Q					
<i>Pionosyllis</i> sp. R					
<i>Pionosyllis</i> sp. S					
<i>Pisione africana</i>					
<i>Pisionidens indica</i>					
<i>Polygordius</i> (LPIL)					
<i>Protodorvillea</i> sp. A					
<i>Questa</i> sp. A					
<i>Questa</i> sp. B					
Saccocirridae (LPIL)					
<i>Sphaerosyllis sublaevis</i>					
Spionidae (LPIL)					
Syllidae (LPIL)				11.8	
<i>Syllis cornuta</i>					23.8
<i>Syllis</i> sp. E					
<i>Typosyllis</i> sp. O					

Table 5. Continued:

Taxon Name	59	60	61	62	63
Arthropoda					
Malacostraca					
<i>Alpheus</i> sp. G				11.8	
<i>Angeliara</i> (LPIL)					
<i>Atylus</i> sp. A					
Decapoda (LPIL)					
<i>Elasmopus</i> (LPIL)					
<i>Erichthonius brasiliensis</i>					
<i>Eriopisa</i> (LPIL)					
<i>Eriopisa hamakua</i>					
<i>Eriopisella sechellensis</i>		23.3			
<i>Gammaropsis pokipoki</i>					
<i>Hawainira peleae</i>					
<i>Hodometrica prolixa</i>	35.6				
<i>Leptanthura</i> sp. A					
<i>Leptochelia dubia</i>					
Maera (LPIL)					
<i>Maera</i> sp. L					
<i>Maera</i> sp. O	14.8			11.8	
<i>Melita pahuwai</i>					
<i>Metacirolana</i> (LPIL)					
<i>Paraphoxus</i> sp. B					
<i>Seba ekepuu</i>					
Cnidaria					
Anthozoa					
Actiniaria (LPIL)				11.8	
Hemichordata					
Enteropneusta					
<i>Balanoglossus</i> (LPIL)					
Mollusca					
Bivalvia					
Bivalvia (LPIL)					
<i>Kellia</i> sp. A					
Lucinidae (LPIL)					
<i>Semele</i> sp. C					
Semelidae (LPIL)					
<i>Tellina perna</i>					

Table 5. Continued:

Taxon Name	59	60	61	62	63
Gastropoda <i>Acteocina</i> (LPIL) <i>Acteocina sinensis</i> Gastropoda (LPIL) <i>Rissoella longispira</i> <i>Rissoina ambigua</i>					
Rhynchozoa Rhynchozoa (LPIL)				11.8	28.6

Table 6. Continued:

Station #	Station ID	Reps	Taxa	Indvs	Density	Mean No. Taxa	Taxa (SD)	Mean Density	Density (SD)	Total No. Taxa	Total No. Individuals	H' Diversity	J' Evenness
55	FFS T19	1	9	26	N/A	8.0	1.4	N/A	N/A	12	61	N/A	N/A
55	FFS T19	2	7	35	N/A								
56	FFS T23	1	8	10	N/A	6.5	2.1	N/A	N/A	11	15	N/A	N/A
56	FFS T23	2	5	5	N/A								
57	FFS T27	1	4	6	N/A	5.5	2.1	N/A	N/A	10	15	N/A	N/A
57	FFS T27	2	7	9	N/A								
58	FFS T31	1	2	9	N/A	1.5	0.7	N/A	N/A	3	10	N/A	N/A
58	FFS T31	2	1	1	N/A								
59	FFS T33	1	16	91	N/A	15.0	1.4	N/A	N/A	26	135	N/A	N/A
59	FFS T33	2	14	44	N/A								
60	FFS T35	1	23	73	N/A	22.0	1.4	N/A	N/A	36	150	N/A	N/A
60	FFS T35	2	21	77	N/A								
61	FFS T39	1	0	0	N/A	0.0	0.0	N/A	N/A	0	0	N/A	N/A
61	FFS T39	2	0	0	N/A								
62	FFS T41	1	7	9	N/A	6.0	1.4	N/A	N/A	11	17	N/A	N/A
62	FFS T41	2	5	8	N/A								
63	Nihoa 2	1	7	13	N/A	5.5	2.1	N/A	N/A	11	21	N/A	N/A
63	Nihoa 2	2	4	8	N/A								

N/A = Data not available

Figure 1. Station locations for the Northwestern Hawaiian Island stations, October 2000.

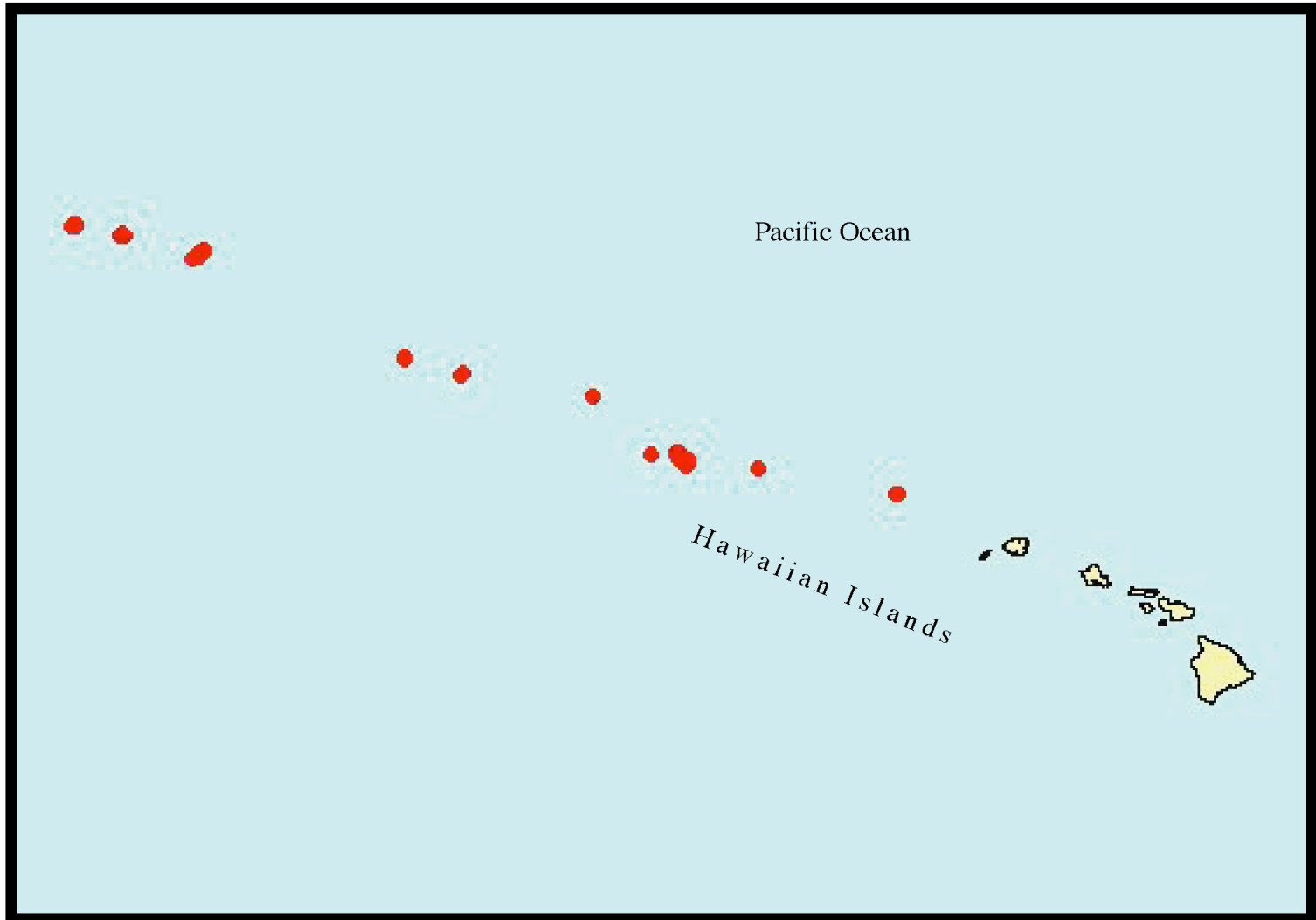


Figure 2. Percent abundance of major taxonomic groups for the Northwestern Hawaiian Islands stations, October 2000.

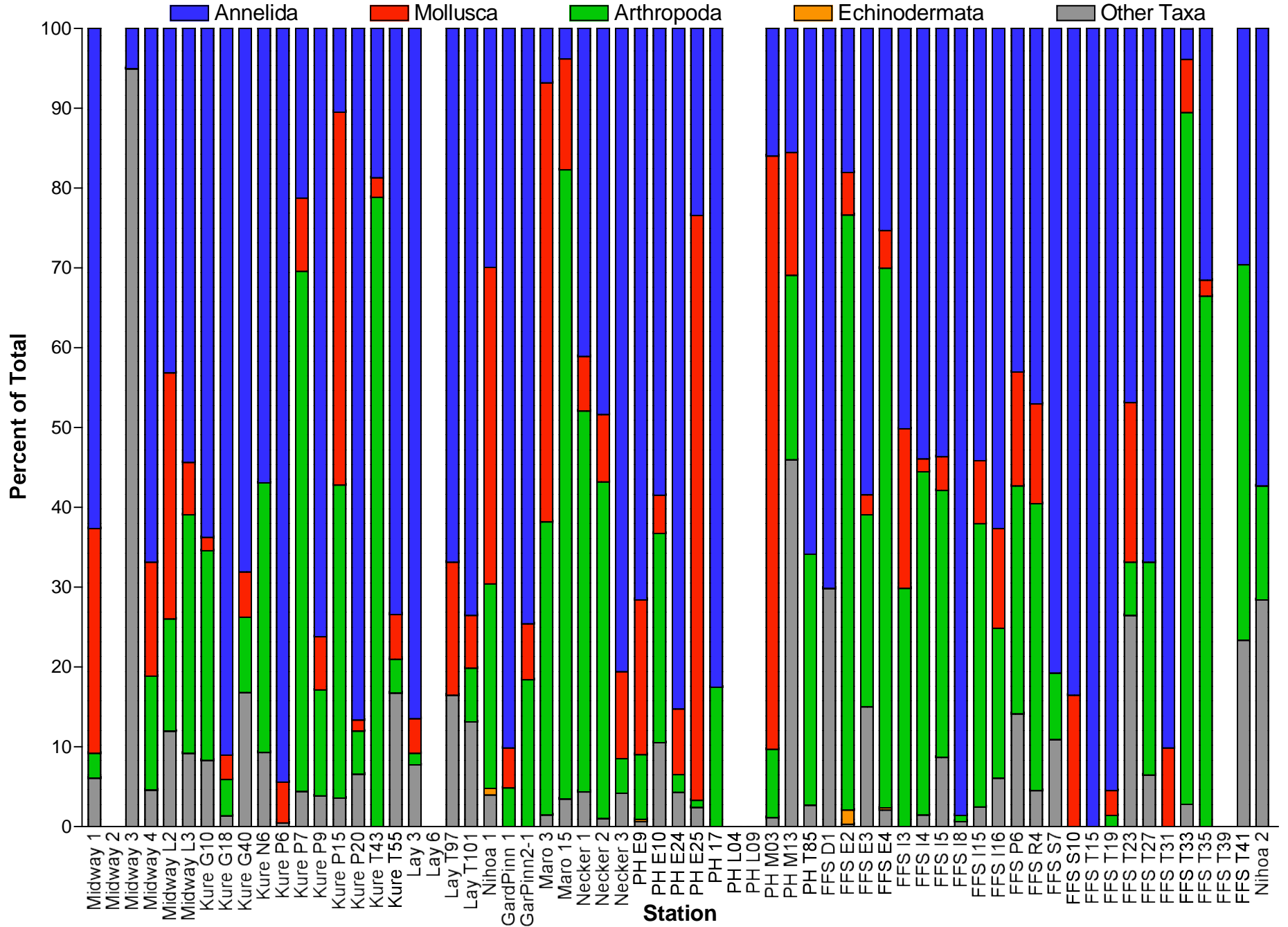


Figure 3. Mean macroinvertebrate density for the Northwestern Hawaiian Islands stations, October 2000.

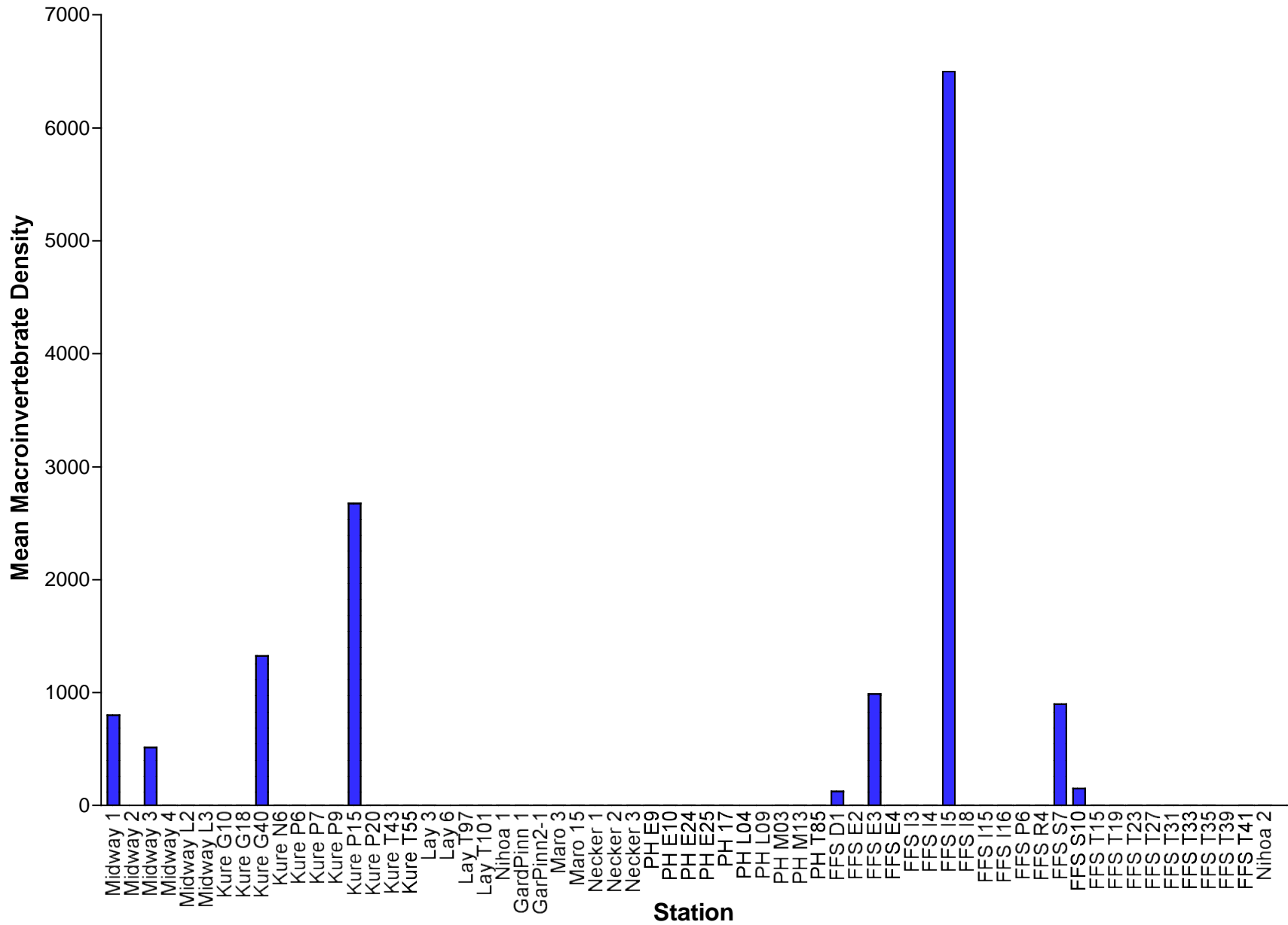


Figure 4. Mean number of taxa per replicate for the Northwestern Hawaiian Islands stations, October 2000.

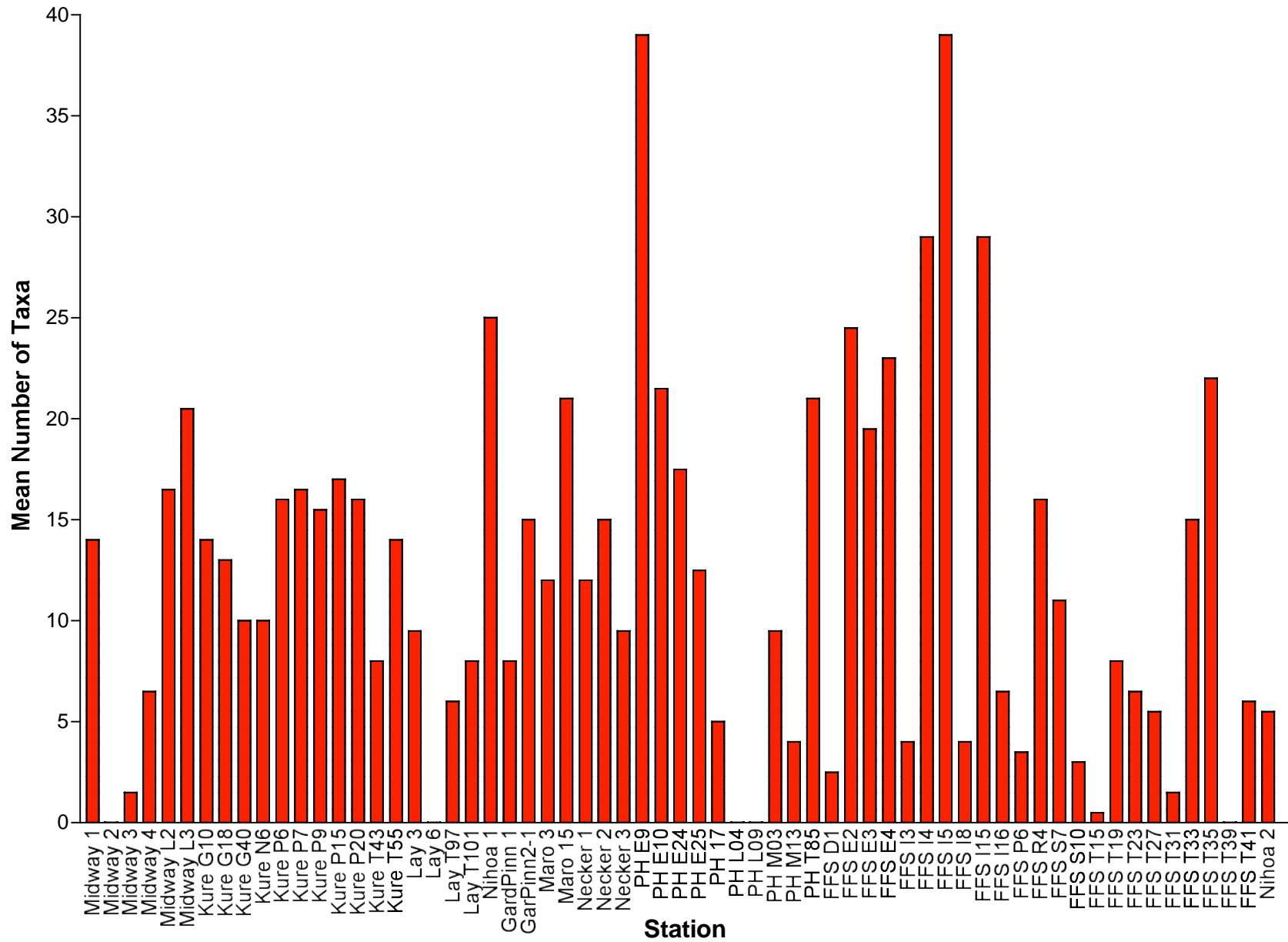


Figure 5. Diversity (H') for the Northwestern Hawaiian Islands stations, October 2000.

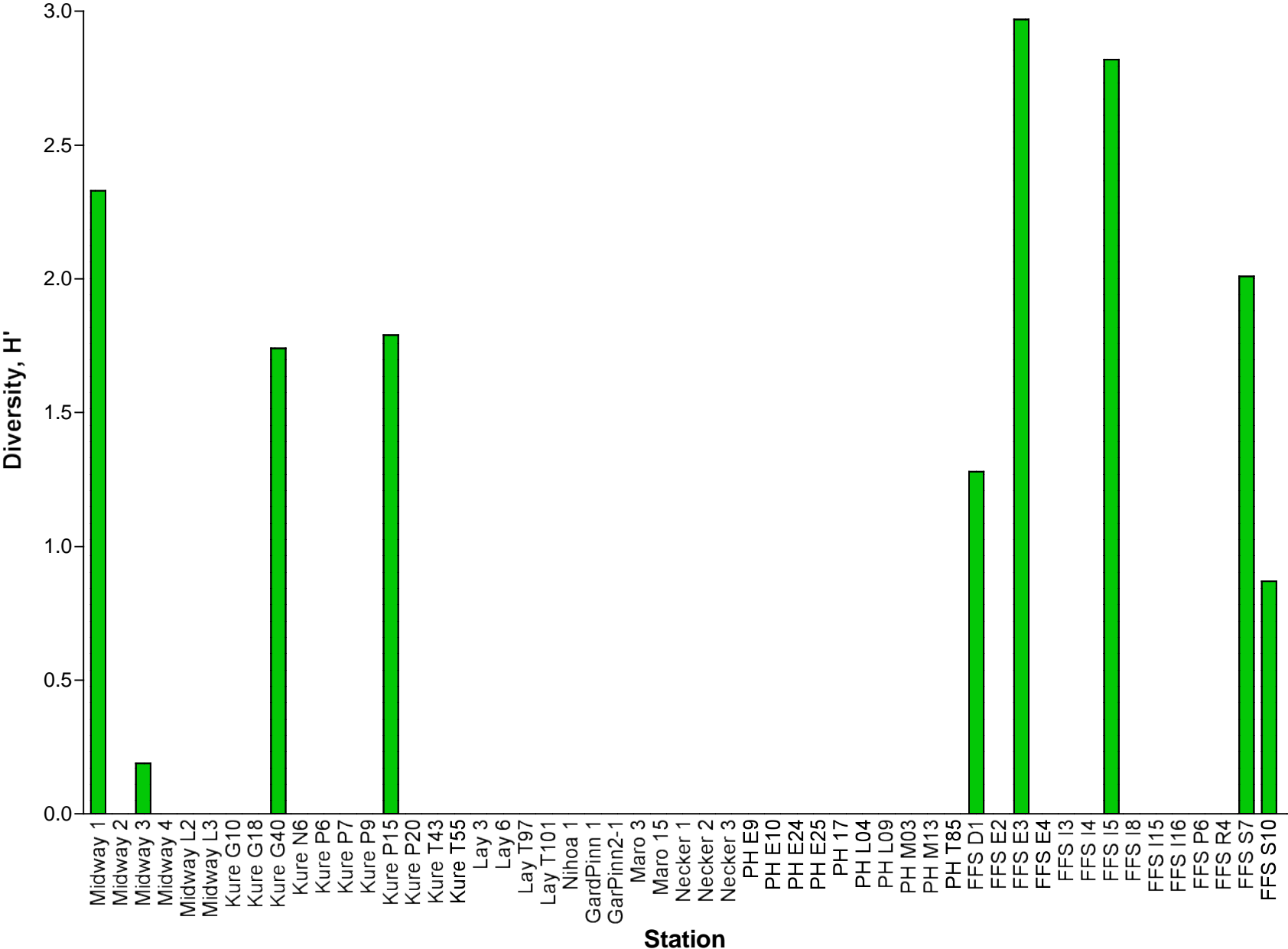
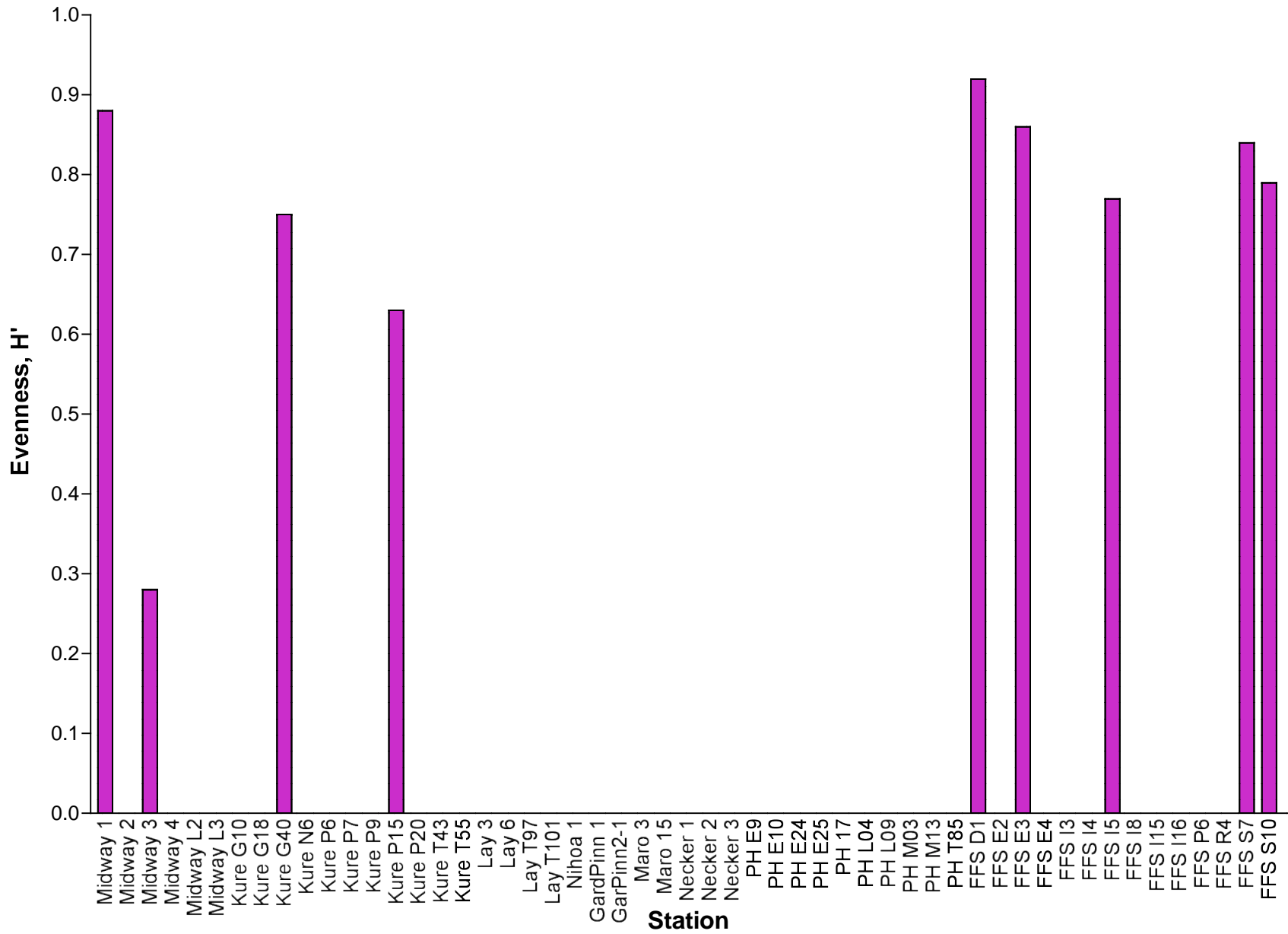


Figure 6. Evenness (J') for the Northwestern Hawaiian Islands stations, October 2000.



APPENDIX

QUALITY ASSURANCE STATEMENT

Client/Project NOAA

Work Assignment Title NWHI- 2000

Work Assignment Number

Task Number DO opt 1-4

Description of Data Set or Deliverable: 106 benthic macroinvertebrate samples collected September-October, 2000; Young Dredge grabs and hand collection by snorkler or scuba.

Description of audit and review activities: Judged accuracy rates were well above standard levels for sorting and taxonomy. Laboratory QC reports were completed. Copies of QC results follow (see attachment.) All taxonomic data were entered into computer and printed. This list was checked for accuracy against original taxonomic data sheets.

Description of outstanding issues or deficiencies which may affect data quality: None

Signature of QA Officer or Reviewer

Date

Signature of Project Manager

Date

QUALITY CONTROL REWORKS

Client/Project NOAA Hawaii-NWHI 2000

Task Number DO opt 1-4

Sorting Results:	Sample #	% Accuracy
	Lay T-97	100%
	Sta 2-1	100%
	Sta 2-2	100%
	Sta 4-1	100%
	FFS-E2-1	100%
	FFS-T31-1	100%
	PH-L09	100%
	FFS-D1-1	100%
	PH17-1	100%
	FFS-T35-2	100%
	FFS-T41-2	100%
	FFS-T16-2	100%

Taxonomy Results:	Sample #	Taxa	% Accuracy
	FFSI 82	Crust./Moll.	100%
	Nihoa 1-1	Crust./Moll.	100%
	Kure T55-2	Crust./Moll.	100%
	Kure P9-1	Crust./Moll.	100%
	Kure N6-2	Crust./Moll.	100%
	FFS-R4-2	Crust./Moll.	100%
	PH-E9-1	Crust./Moll.	99%
	Necker 3-2	Crust./Moll.	100%
	PH M13-2	Crust./Moll.	100%
	Kure P20-1	Crust./Moll.	100%
	FFS E4-2	Crust./Moll.	97%
	Kure P9-2	Crust./Moll.	100%
	MidwayL2-1	Poly./Misc.	100%
	Kure P20-2	Poly./Misc.	98%
	Necker 3-2	Poly./Misc.	100%
	FFS-E4-1	Poly./Misc.	98%
	PH-E24-1	Poly./Misc.	99%
	Lay 3	Poly./Misc.	98%
	Kure T55-1	Poly./Misc.	96%
	E4-2	Poly./Misc.	96%
	Nihoa 1-2	Poly./Misc.	100%
	L2-2	Poly./Misc.	100%

Description of outstanding issues or deficiencies which may affect data quality: None

Signature of QA Officer or Reviewer

Date