THE NEARSHORE FISH ASSEMBLAGE OF SANTA CATALINA ISLAND

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ABSTRACT

The nearshore fish assemblage of Santa Catalina Island was monitored from 1996 to 1998 as part of the Ocean Resource Enhancement Hatchery Program (OREHP), California Department of Fish and Game. A stratified random design was used to sample fishes with overnight gill nets, set bimonthly from April-October. Fishes were surveyed on the East and West End of Catalina Island and in Catalina Harbor. Concomitant with this survey, seven coastal sites from Santa Barbara to Newport were surveyed as a comparison. Despite the proximity of the island to the mainland, an analysis of diversity, abundance, richness, and biomass of the nearshore fishes found Catalina Island's ichthyofauna to be functionally different from that of the mainland. This survey technique also found an increase in community importance for elasmobranchs based upon abundance and biomass; our results suggest that other sampling techniques are inadequate for estimating the importance of these large predatory and elusive fishes in nearshore communities.

Keywords: Santa Catalina Island, Southern California Bight, diversity, richness, biomass, elasmobranchs, nocturnal assemblage, gill nets.

INTRODUCTION

The nearshore habitat at Santa Catalina Island is characterized by steep rocky-reefs which drop off precipitously to a sand bottom. These reefs are present on both buttresses and coves that encircle the island. They support a vibrant rocky-reef community, which is highlighted by the cyclical and seasonal presence of *Macrocystis pyrifera*. While the southern California coast is dominated by soft bottom habitats broken up by rocky headlands, the shallow (<15 m) neritic environment of Catalina is dominated by rocky-reef habitat. The ecological and commercial import of this environment is great. Its relatively warm, tranquil and clear waters make this island very attractive for various user groups. The island has been fished intensively by sport fishers, targeting *Seriola lalandi*, *Sphyraena argentea*, *Atractoscion nobilis*, and *Paralabrax clathratus* for nearly a century (Collyer and Young 1953; Read 1992). The relatively mild marine environment found especially on the mainland side attracts many recreational SCUBA and skin divers. It is not surprising that the scientific community uses this island extensively for various studies most of which are centered on the isthmus and its marine reserve. This coupled with the proximity to the coast and accessibility from the harbors and marinas in Los Angeles and Orange counties as well as the facilities on the island makes Catalina of extreme importance to commercial and scientific communities.

Despite a rich history of scientific study, quantitative surveys of the entire shallow subtidal ichthyofauna are sparse. Allen et al. (1992) surveyed the cryptic and conspicuous fishes using 1-m^2 rotenone stations concomitant with visual SCUBA transects of Santa Catalina Island from October 1984 to October 1985. They report 22 acanthopterygians from 13 families. In a comparison of tropical, cold- and warm-temperate habitats Hobson (1994) lists 34 acanthopterygians from 15 families at Catalina. These fishes were surveyed by visual counts. However, Hobson's list does not include the clinid *Paraclinus integripinnis,* the syngnathid *Cosmocampus arctus*, the cottid *Ruscarius craeseri*, the blenniid *Hypsoblennius sp.*, and the gobieosocid *Rimicola eigenmanni* reported by Allen et al. (1992). Hobson et al. (1981) also include another acanthopterygian, the atherinopsid *Atherinops affinis* as one of their study fishes at Catalina but it is not mentioned in later work (Hobson 1994).Two true ichthyologists' favorites *Neoclinus blanchardi* (Clinidae) and the *Chaetopterus* tube chaenopsid *Chaenopsis alepidota* can be found at Catalina (Hubbs 1953; Stephens et al. 1989). Other tropicals are rumored to reside on the nearshore reefs at Catalina but only a third pomacentrid, *Azurina hirundo* (Lea and McAlary 1994) is reported in the literature. Inclusively this total comprises 44 species of acanthopterygians in 20 families surveyed in the shallow nearshore environment. Due to space, not addressed here are the extensive museum collections of Catalina Island (H. J. Walker pers. comm.; R. Feeney pers. comm.). Other than Allen et al. (1992) and Hobson (1994), Catalina has largely been ignored by qualitative and quantitative surveys of its nearshore ichthyofauna.

The nearshore rocky-reef ichthyofauna of the mainland Southern California Bight has been intensively studied for nearly three decades (for review please see Cross and

Allen 1993). Due to its three-dimensional complexity various seines and trawls used to sample soft bottom habitats are inadequate for sampling this environment. It is not surprising that the preferred method for studying this habitat is by visual transects and cinetransects conducted on SCUBA (e.g., Ebeling et al. 1980; Stephens and Zerba 1981; Larson and DeMartini 1984; Stephens et al. 1984). In general these survey techniques are conducted during the day while crepuscular and nocturnal fish assemblages have been ignored with few exceptions (Ebeling and Bray 1976; Hobson et al. 1981). As in any fishery technique, visual transects and cinetransects are biased and known to underestimate or represent inaccurately the density of fishes in this rocky-reef environment (DeMartini and Roberts 1982; Davis and Anderson 1989). However, what should be of greater concern is not the under representation of particular species by a technique, but not recording the presence of species actually present.

Beginning in August 1996, we began monitoring the ichthyofauna in southern California at ten localities from Santa Barbara to Newport by overnight gill net sets to assess the Ocean Resource Enhancement Hatchery Program (OREHP) for the California Department of Fish and Game including three stations at Catalina Island. Data from these surveys provide us with a comprehensive comparison between Catalina and the mainland.

MATERIALS AND METHODS

From August 1996 to June 1998, sampling with horizontal gill nets was conducted in the months of April, June, August, and October. Two types of nets were employed. Type 1 nets are 45.7 m in length and 2.4 m in depth, consisting of six, 7.62 m panels of three different mesh sizes (two each of 25.4, 38.2, and 50.8-mm square mesh). Type 2 nets have the same dimensions with two panels of 63.5, 76.2, 88.9-mm square mesh. Six type 1 and three type 2 nets were deployed at two Catalina stations and six coastal stations in the late afternoon (1600-1800 hrs) and retrieved the following morning (0730-1000 hrs), approximately 12 to 16 hours later. These stations are the East End Catalina (Long Point-Church Rock), West End Catalina (West Cove-Little Harbor), Santa Barbara (Santa Barbara Point-Goleta Point), Ventura (Rincon Point-Pierpont Bay), Malibu (Point Dume to Venice), Palos Verdes (Flat Rock-Point Fermin, Seal Beach (Belmont Shores-Seal Beach), and Newport Beach (Newport-Laguna). At two embayment sites, Catalina Harbor and Marina del Rey only six type 1 nets were set. Marina del Rey was not sampled in April 1996. At the open coast locations nets were set perpendicular to the coastline according to a stratified random design. Stations were chosen at random from 1 km blocks of coastline using a random number table (Rohlf and Sokal 1981) and nets were set equidistant from each other within each block in sand/rock or reef/kelp habitat. For the first year (August 1996 to June 1997) of the survey Type 1 nets were set in water 5 to 14 m (MLLW) in depth and type 2 nets in 14 to 20 m in depth. Since then all nets were set in 5 to 14 m of water. At Marina del Rey three nets were set in Mother's Beach and three nets were set south of the U. S. Coast Guard facility proximate to the east jetty. In Catalina Harbor three nets were set next to Ballast Point and three nets by the seaplane ramp. Marina del Rey, Cat Harbor and Seal Beach all have sand or sand-mud bottoms. At all other stations nets were set on or immediately adjacent to reefs. All captured fish were identified to species, measured to the nearest millimeter, and the total biomass for each taxon was recorded with a Pesola hanging scale.

This database is stored electronically in Borland's Paradox 7.0. Descriptive statistics and basic queries were run in Excel 7.0 including the *t*-tests for testing for differences between two diversity indices (Zar 1996). All other statistics were run in Stat Soft's STATISTICA for Windows (release 5.1). The F-test for difference between two regression coefficients (Sokal and Rohlf 1995) was calculated using the results from an analysis of variance from the STATISTICA multiple regression package.

RESULTS

A total of 20,038 (12,807 kg) fish including 98 species from 47 families (AFS 1991) were collected during this survey (Table 1). At Catalina Island we surveyed 67 species from 32 families for a total of 6,225 (5,348 kg) individuals. The seven mainland locations produced 95 species from 45 families and 13,813 (7,459 kg) fishes. *Caulolatilus princeps*, *Gymnothorax mordax* and *Seriola lalandi* were collected only at Catalina. Thirty-one species collected at the mainland were not collected at Catalina Island. For the two embayments, we collected 47 species in Catalina Harbor and 35 species in Marina del Rey (Table 1). At Catalina *Heterodontus francicscanus* was the most abundant species at 24.34% of the island's catch and was first in biomass at 31.75% of the wet weight. *Heterodontus franciscanus* was followed in abundance by *Mustelus henlei* at 12.93% of the total catch and 24.65% of the biomass. *Umbrina roncador* was the third most abundant fish at Catalina Island, first for the mainland stations and the overall most abundant fish for the entire survey. Six of the top ten most abundant species at the coastal stations are sciaenids (Table 1). Only one other sciaenid, *Seriphus politus* was found in the top ten rank of abundance for Catalina. Rocky-reef fishes *Girella nigricans*, *Paralabrax clathratus*, *Anisotremus davidsonii*, and *Xenistius californiensis* were ranked in the top ten at Catalina but not at the mainland. This change in the relative ranks between the mainland and island is significant. A comparison of the top 25 species at Catalina Island and their relative rank by abundance with the mainland found the assemblages to not be correlated (Kendall's $\tau = 0.227$, $p = 0.112$). However, a comparison of the 63 species we surveyed at Catalina versus their relative rank of abundance on the mainland found the two assemblages to be highly correlated (Kendall's $\tau = 0.405$, $p < 0.0001$). For Marina del Rey and Catalina Harbor only 25 species co-occurred (Table 1) and their abundance was not significantly correlated (Kendall's $\tau = 0.573$,

Table 1. Fishes are ranked according to their abundance at Catalina Island or the mainland. Biomass, wet weights in kilograms, for each taxon and the rank of biomass are also provided.

Catalina Species	Abund.	Wt. (kg)	Rank	**Mainland** Species	Abund.	Wt. (kg)	Rank
*Heterodontus francisanus**	1515	1697.7	1	*Umbrina roncador**	1196	251.8	10
*Mustelus henlei**	805	1318.0	2	*Genyonemus lineatus**	974	108.3	19
*Umbrina roncador**	711	168.6	5	*Menticirrhus undulatus**	928	438.5	4
*Seriphus politus**	505	56.0	12	*Cheilotrema saturnum**	705	175.0	13
*Girella nigricans**	306	144.2	7	*Seriphus politus**	683	62.8	23
*Paralabrax clathratus**	273	64.6	11	*Hyperprosopon argenteum*	604	32.8	36
*Anisotremus davidsonii**	264	149.2	6	*Myliobatis californica**	594	1161.5	1
*Xenistius californiensis**	173	16.6	26	*Sardinops sagax**	535	40.1	32
*Myliobatis californica**	160	393.5	4	*Atractoscion nobilis**	467	246.4	11
*Urolophus halleri**	124	54.2	13	*Scomber japonicus**	464	167.7	14
*Scorpaena guttata**	123	28.7	18	*Phanerodon furcatus**	438	45.4	30
*Trachurus symmetricus**	112	28.6	19	*Paralabrax clathratus*	416	135.4	17
*Hyperprosopon argenteum**	99	4.7	38	*Cephaloscyllium ventriosum*	397	704.1	2
*Squatina californica**	78	505.7	3	*Embiotoca jacksoni**	336	65.1	22
*Paralichthys californicus**	77	75.8	10	*Girella nigricans*	335	216.3	12
*Phanerodon furcatus**	73	5.7	36	*Platyrhinoidis triseriata*	316	137.6	16
*Sphyraena argentea**	69	53.2	14	*Anisotremus davidsonii**	312	141.6	15
*Medialuna californiensis**	66	21.9	22	*Atherinopsis californiensis**	284	58.6	25
*Mustelus californicus**	65	123.1	8	*Scorpaena guttata*	273	61.6	24
*Chromis punctipinnis**	59	4.6	39	*Halichoeres semicinctus*	267	43.6	31
*Semicossyphus pulcher**	58	20.0	23	*Xenistius californiensis**	247	21.4	38
*Platyrhinoidis triseriata**	56	23.7	21	*Triakis semifasciata**	230	520.0	3
*Halichoeres semicinctus**	39	5.4	37	*Mustelus henlei**	230	391.2	5
*Hypsypops rubicundus**	38	10.2	30	*Heterodontus francisanus**	229	347.0	8
*Scomber japonicus**	35	13.9	27	*Paralabrax nebulifer**	211	53.2	28
*Atherinopsis californiensis**	29	7.1	35	*Mustelus californicus**	206	384.2	6
*Hermosilla azurea**	28	17.8	24	*Paralichthys californicus**	171	95.2	20
*Menticirrhus undulatus**	26	16.7	25	*Medialuna californiensis*	150	50.7	29
*Atractoscion nobilis**	25	26.8	20	*Rhacochilus toxotes*	139	54.6	27
*Embiotoca jacksoni**	23	2.9	43	*Squalus acanthius*	119	352.2	7
*Sardinops sagax**	20	3.6	41	*Rhacochilus vacca**	114	38.9	33
*Rhinobatis productus**	19	30.1	17	*Porichthys myriaster**	99	36.3	34
*Cephaloscyllium ventriosum**	19	51.6	15	*Sphyraena argentea**	86	56.9	26
*Triakis semifasciata**	15	87.7	9	*Sebastes atrovirens*	83	17.5	43
*Sarda chiliensis**	15	7.9	33	*Chromis punctipinnis*	83	7.3	49
Cheilotrema saturnum	15	7.4	34	*Hypsyspops rubicundus*	72	26.0	37
Citharichthys sordidus	14	0.5	55	*Squatina californica*	50	293.6	9
*Paralabrax nebulifer**	12	4.1	40	*Pleuronichthys ritteri**	50	6.6	51
*Brachyistius frenatus**	12	0.9	49	*Alosa sapidissima**	48	8.9	45
*Mugil cephalus**	7	9.7	31	*Urolophus halleri**	45	19.1	41
Pleuronichthys coenosus	6	0.7	52	*Brachyistius frenatus*	45	2.3	59
*Heterostichus rostratus**	6	0.7	54	*Rhinobatis productus*	43	117.7	18
Xystreurys liolepis	5	2.5	44	*Leptocottus armatus*	36	3.8	55
*Porichthys myriaster**	5	3.3	42	*Hermosilla azurea*	35	20.2	40
Gymnothorax mordax	5	11.6	29	*Semicossyphus pulcher*	30	13.9	44
Sebastes atrovirens	4	0.9	48	*Sebastes rastrelliger*	30	7.2	50

Table 1. Continued.

Catalina Species	Abund.	Wt. (kg)	Rank	Mainland Species	Abund.	Wt. (kg)	Rank
Rhacochilus toxotes	3	1.5	46	*Hypsopsetta guttulata**	29	7.3	48
*Porichthys notatus**	3	1.6	45	*Anchoa compressa**	28	0.4	77
Pleuronichthys ritteri	3	0.4	56	*Mugil cephalus**	23	33.0	35
Galeorhinus zyopterus	3	36.2	16	*Sebastes serriceps*	23	3.8	56
Stereolepis gigas	2	9.1	32	*Sebastes auriculatus*	23	3.6	59
Pleuronichthys verticalis	2	0.2	61	*Hypsurus caryi*	22	2.5	58
*Pleuronichthys decurrens**	2	0.1	62	*Roncador stearnsii**	19	8.6	46
*Hippoglossina stomata**	2	0.1	65	*Trachurus symmetricus*	19	2.8	57
Seriola lalandi	1	1.2	47	*Porichthys notatus*	17	7.4	47
Sebastes serriceps	1	0.1	63	*Citharichthys stigmaeus*	15	0.2	80
Sebastes serranoides	1	0.2	60	*Scorpaenichthys marmoratus*	14	6.0	53
Sebastes rastrelliger	1	0.3	57	*Heterostichus rostratus*	14	1.9	61
*Rhacochilus vacca**	1	0.2	59	*Amphisticus argenteum*	13	1.5	64
Raja inornata	1	0.7	53	*Engraulis mordax*	12	0.1	83
*Paralabrax maculatofasciatus**	1	0.8	51	*Citharichthys sordidus*	11	0.2	82
Leiocottus hirundo	1	0.1	66	*Galeorhinus zyopterus*	10	18.5	42
Gymnura marmorata	1	12.0	28	*Pleuronichthys verticalis*	10	1.6	62
*Genyonemus lineatus**	1	0.8	50	*Notorynchus cepedianus*	9	71.8	21
Engraulis mordax	1	0.0	67	*Sebastes carnatus*	9	1.4	65
Citharichthys xanthostigma	1	0.1	64	*Citharichthys xanthostigma*	9	0.9	68
*Caulolatilus princeps**	1	0.2	58	*Pleuronichthys decurrens*	8	0.9	69
				Pleuronichthys coenosus	8	0.9	70
				Raja binoculata	6	5.6	54
				Cypselurus californicus	5	1.9	60
				*Cymatogaster aggregatta**	5	0.2	81
				Xystreurys liolepis	4	0.9	71
				Gymnura marmorata	3	6.2	52
				*Paralabrax maculatofasciatus**	3	1.6	63
				Sebastes serranoides	3	0.5	76
				Pleuronectes vetulus	3	0.4	78
				Hippoglossina stomata	3	0.3	79
				*Peprillus simillimus**	3	0.1	85
				Symphurus atricauda	3	0.1	86
				Alopias vulpinus	2	21.3	39
				Merluccius productus	2	0.5	75
				Chilara taylori	2	0.1	84
				Oxylebius pictus	2	0.1	88
				*Atherinops affinis**	2	0.1	92
				Syngnathus leptorhynchus	2	0.0	96
				Raja inornata	1	1.0	66
				Raja rhina	1	1.0	67
				Hydrolagus colliei	1	0.7	72
				Sarda chiliensis	1	0.6	73
				*Strongylura exilis**	1	0.6	74
				Synodus lucioceps	1	0.1	87
				Otophidion scrippsae	1	0.1	93
				Leiocottus hirundo	1	0.1	94
				Embiotoca lateralis	1	0.0	95
				*Stereolepis gigas***	1		

*Fishes collected in Marina del Rey and Catalina Harbor.
**No weight recorded, fish returned live (300 mm SL).

p = 0.147). Relative ranks of species biomass between 64 Catalina fish representatives and those of the mainland, as well as the top 25 species, found the assemblages to be highly correlated (Kendall's τ = 0.573, p < 0.0001; Kendall's τ = 0.406, p < 0.004, respectively).

Shannon Weiner indices (H') for species diversity based on abundance were 2.83 for Catalina and 3.58 for the mainland (Table 2). The significantly higher mainland H' values ($t_{0.001[\infty]}$ = -39.880; p < 0.001) are in part driven by the high richness found at Malibu, Newport, and Palos Verdes (richness = 61, 63 and 64; H' = 3.43, 3.39 and 3.36, respectively) and high diversity at the Ventura station (H' = 3.14). Over all stations H' = 3.54. H' based upon biomass is 2.31 for Catalina and 3.27 for the mainland (Table 2) and coastal values are significantly greater ($t_{0.001[\infty]}$ = 39.201; p < 0.001). Values for abundance and biomass were not normally distributed for the mainland and Catalina due to high skewness and kurtosis. However, they were normally distributed when log transformed. In order to examine the functional relationship between abundance and biomass for the mainland and Catalina regressions of log-log plots (not shown) found these two parameters to be significantly correlated in both data sets (r = 0.859, p < 0.001; r = 0.830, p < 0.001, respectively). While both regression lines have similar slopes (Catalina m = 1.036, mainland m = 1.123) they are significantly different (F_s = 4.835, p < 0.001). Catch per unit effort (CPUE) varied between study sites. Catalina Harbor had the highest CPUE at 50 fish/net and Santa Barbara was the lowest (16 fish/net). Average monthly CPUE for the mainland (mean = 29.05 fish/net, S.D. = 7.95) was not significantly different (Student's *t*, p = 0.70) than CPUE for all stations at Catalina (mean = 32.42 fish/net S.D. = 7.67). Between all stations catch was not significantly different (Kruskal-Wallis, p = 0.3209). Seasonally CPUE between Catalina and the mainland locations is fairly similar, with more fishes caught in summer than spring or fall.

To examine the co-occurrence of species and the similarity between stations, the abundance of the top 48 fishes (n >30) in the survey were clustered based upon the Pearson's *r* correlation coefficient with complete linkages. These analyses produced two groups of fishes traditionally recognized as a rocky-reef and soft bottom assemblage and the Catalina stations clustered separately from the mainland stations (figures not shown).

DISCUSSION

The analysis of the entire nearshore species assemblage found in this data set at Catalina is correlated with the mainland assemblage (Kendall's τ = 0.405, p < 0.0001). The three species *Caulolatilus princeps*, *Gymnothorax mordax* and *Seriola lalandi*, which were found at Catalina and not found on the mainland, are all known to occur on the mainland. No endemic fish species were found at Catalina. The nearshore fishes found at Catalina are a subset of the mainland assemblage. However, the relative rank of abundance between the top 25 species are not correlated (Kendall's τ = 0.227, p = 0.112). This distinctiveness is certainly driven by an increase in community importance of rocky-reef fishes. For instance, *Heterodontus francise*a*nus*, a fish which is dependent upon rocky-reefs for shelter during the day increases in importance from twenty-fourth on the mainland to first at Catalina. We find a similar increase in community importance for the rocky-reef fishes *Girella nigricans*, *Paralabrax clathratus, Anisotremus davidsonii* and *Xenistius californiensis*. Also, four other rocky-reef fishes, *Medialuna*

Table 2. Here we report the catch data (abundance of fishes), richness, species diversity (H') based upon abundance and biomass. Catch per unit effort can be calculated by dividing abundance by nine (number of nets set) for all stations except Marina del Rey and Catalina Harbor (divide by six nets).

Station	Aug-96	Oct-96	Apr-97	Jun-97	Aug-97	Oct-97	Apr-98	Jun-98	Rich.	H'	H' (Biom.)
Cat Harbor	331	354	246	340	293	321	156	350	47	2.81	2.45
East End	340	443	321	319	290	285	136	288	48	2.33	1.70
West End	226	192	84	251	165	139	120	235	49	2.78	2.37
Catalina Total	897	989	651	910	748	745	412	873	67	2.83	2.31
Malibu	198	138	144	226	220	253	214	151	61	3.43	2.92
Marina del Rey	*	100	286	94	336	112	142	139	35	2.71	2.66
Newport	326	181	200	633	349	238	173	187	63	3.39	2.86
Palos Verdes	163	243	285	563	331	452	180	323	64	3.36	3.22
Santa Barbara	130	166	161	307	232	34	133	143	51	2.98	2.29
Seal Beach	220	301	296	629	534	362	329	584	44	2.47	2.15
Ventura	175	128	172	192	156	280	186	383	50	3.14	2.76
Mainland Total	1212	1257	1544	2644	2158	1731	1357	1910	95	3.58	3.27
Grand Total	2109	2246	2195	3554	2906	2476	1769	2783	98	3.54	3.08

*Station not sampled

californiensis, *Chromis punctipinnis, Semicossyphus pulcher,* and *Hypsypops rubicundus* appear in the top 25 at Catalina but not on the mainland. Alternatively, four (*Umbrina roncador, Genyonemus lineatus, Menticirrhus undulatus, Seriphus politus*) of the top five abundant species on the mainland are sciaenids preferring soft bottom habitats (Allen 1985; Love et al. 1986). While the two assemblages are correlated, this correlation is driven by the ranks of less common fishes in both assemblages. Another indication that the two assemblages are different is that the functional relationship between abundance and biomass is not the same for both locations. The greater slope for the mainland indicates that there are more abundant and larger fishes found at coastal locations versus the island. This may be a bias of the influence of the soft bottom fishes on the mainland or it could reflect lower productivity at Catalina Island.

This analysis also provides insight into the assemblage found in Catalina's largest embayment-Catalina Harbor. Two fishes, *Mugil cephalus* and *Paralabrax maculatofasciatus*, known to be indigenous to bay and estuaries in the Southern California Bight (Allen 1985; Stephens et al. 1992) are found in Catalina Harbor. However, the fishes found in Catalina Harbor are more similar to the open coast Catalina stations than any other location. In comparison with a coastal embayment, nine of ten species present in Marina del Rey which were not found in Catalina Harbor are known to occur normally in bays and estuaries in southern California. Fishes found in Catalina harbor and not in Marina del Rey are primarily rocky-reef fishes and some deeper soft bottom forms.

While we report a greater richness than previous surveys, we also found higher diversity (H' = 2.83) for the island than did Allen et al. (1992; H' = 2.18) when combining cryptic and conspicuous diurnal fishes in their analysis. The diversity values that were found at each station at Catalina are lower than the values found for the mainland at all stations except for Marina del Rey and Seal Beach (Table 2). Both of these locations are soft bottom habitats as opposed to rocky-reef areas (Malibu, Newport, Palos Verdes, Santa Barbara and Ventura) accounting for the lower H' values. The rocky-reef areas surveyed on the mainland also have higher richness than the Catalina stations and this is contributing to the increased diversity values. The variation in richness and diversity also indicate differences between the mainland and Catalina Island.

Our analysis of the species found in this data set find two distinct assemblages, rocky-reef fishes and soft bottom fishes. The relative importance and role of the acanthopterygians in these two communities has been well established. However, the inclusion of larger predatory elasmobranchs as important components of these communities gives us quite a different perspective when compared to surveys with other techniques (Ebeling and Bray 1976; Stephens et al 1984; Love et al. 1986; Hobson 1994). Not only are these fishes highly abundant, but they account for an inordinate amount of biomass. For biomass the top four fishes at Catalina and eight of the top nine fishes on the mainland are elasmobranchs. While these fishes may have a lower density found by other fishery techniques, as a group they show high vagility especially during nocturnal periods allowing them to forage over large areas. This vagility and biomass distinguishes them, as key predators in the nearshore environment of Catalina Island and the rest of the Southern California Bight.

CONCLUSIONS

We have provided a more complete list of species and their abundance from the nearshore environment of Santa Catalina Island than previously reported. We expect islands to have fewer species when compared to the mainland. However, this was surprising for Catalina due to its seemingly large size and proximity to the mainland. Due to this proximity the assemblage of Catalina fishes is derived from the mainland. There seems to be a functional difference between the mainland and Catalina. The structure of these communities is not the same. Nearly every parameter and analysis, which we examined except catch per unit effort, found the assemblage of fishes of Catalina Island to be different from the mainland. The principal fishes in both locations suggest that the shallow subtidal environment at Catalina is a structurally different habitat than the mainland. This may be reflected in the fact that Catalina appears to have a stronger representation of rocky-reef fishes in it. Certainly care should be taken when extrapolating ecological processes studied at Catalina Island to coastal environments. The other important caveat is the increase in community importance that we have found for elasmobranchs. We report a greater abundance and a proportionally greater amount of biomass for nearshore elasmobranchs than any other southern California study. This suggests that gill nets are highly efficient for sampling mobile and elusive fishes. Trawls and especially diver surveys, the two techniques of choice for sampling this nearshore environment of the Southern California Bight, underestimate the importance of these fishes. A legitimate concern is the underestimation of fishes in coastal surveys. However, a greater concern is the absence of data on abundant predatory fishes, which we find to be abundant and important in our nearshore communities.

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