

APPENDIX M

DEMERSAL FISH AND MACROINVERTEBRATE COMMUNITY DATA

2023 RHMP Fish Community Summary Tables and Metrics

Scientific Name	Common Name	Predator?	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay										Total Abundance per Taxa	% of Total Abundance	Frequency of Trawl Capture (%)
			B23-12064	B23-12060	B23-12022	B23-12023	B23-12024	North				Central				South				
								B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884			
<i>Paralabrax nebulifer</i>	barred sand bass	Yes	1	1	0	2	2	0	0	1	2	1	0	4	3	1	1	19	2.9	73.3
<i>Myliobatis californica</i>	bat ray	Yes	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.2	6.7
<i>Hypsoblennius gentilis</i>	bay blenny	No	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0.3	6.7
<i>Syngnathus leptorhynchus</i>	bay pipefish	No	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.2	6.7
<i>Cheilotrema saturnum</i>	black croaker	No	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	3	0.5	20.0
<i>Embiotoca jacksoni</i>	black perch	No	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.6	13.3
<i>Paralichthys californicus</i>	California halibut	Yes	0	0	0	0	3	0	6	3	10	1	3	2	4	4	2	38	5.9	66.7
<i>Synodus lucioceps</i>	California lizardfish	No	0	2	5	0	0	4	2	1	6	0	0	0	0	0	0	20	3.1	40.0
<i>Symphurus atricaudus</i>	California tonguefish	No	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	6	0.9	13.3
<i>Anchoa compressa</i>	deepbody anchovy	No	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.2	6.7
<i>Pleuronichthys guttulatus</i>	diamond turbot	No	2	0	0	0	0	0	1	0	0	1	0	1	0	1	0	6	0.9	33.3
<i>Xystreurys liolepis</i>	fantail sole	No	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.2	6.7
<i>Heterostichus rostratus</i>	giant kelpfish	No	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.8	13.3
<i>Heterodontus francisci</i>	horn shark	Yes	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.2	6.7
<i>Paralabrax clathratus</i>	kelp bass	Yes	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.5	6.7
<i>Syngnathus californiensis</i>	kelp pipefish	No	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0.3	6.7
Sygnathidae	pipefish (unidentified)	No	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.2	6.7
<i>Seriphus politus</i>	queenfish	No	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6	0.9	6.7
<i>Urobatis halleri</i>	round stingray	No	0	0	0	0	9	0	1	0	0	2	4	18	5	0	1	40	6.2	46.7
<i>Cymatogaster aggregata</i>	shiner perch	No	16	12	0	22	0	0	0	0	0	0	0	0	0	0	0	50	7.7	20.0
<i>Rhinobatos productus</i>	shovelnose guitarfish	No	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.2	6.7
<i>Anchoa delicatissima</i>	slough anchovy	No	0	0	0	1	4	0	0	0	0	14	339	0	2	0	0	360	55.7	33.3
<i>Citharichthys stigmaeus</i>	speckled sanddab	No	0	0	4	0	0	1	0	0	0	0	0	0	0	0	0	5	0.8	13.3
<i>Porichthys myriaster</i>	specklefin midshipman	No	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0.3	6.7
<i>Paralabrax maculatofasciatus</i>	spotted sand bass	Yes	0	0	0	3	0	0	9	5	2	0	0	6	1	1	1	28	4.3	53.3
<i>Pleuronichthys ritteri</i>	spotted turbot	No	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	3	0.5	20.0
<i>Phanerodon furcatus</i>	white seaperch	No	31	4	0	0	0	0	0	0	0	0	0	0	0	0	0	35	5.4	13.3
<i>Umbrina roncador</i>	yellowfin croaker	No	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0.3	13.3
Total Abundance			55	23	9	34	19	7	24	12	32	21	348	34	15	7	6	646	--	--
Region Means			55	23	21			19				105				7				

Table M-2. 2023 RHMP Demersal Fish Biomass (kg)

Scientific Name	Common Name	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay										Total Biomass per Taxa	% of Total Biomass
		B23-12064	B23-12060	B23-12022	B23-12023	B23-12024	North				Central				South			
							B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884		
<i>Paralabrax nebulifer</i>	barred sand bass	0.015	0.029	0	0.081	0.119	0	0	0.051	0.121	0.039	0	0.333	0.154	0.062	0.046	1.05	2.76
<i>Myliobatis californica</i>	bat ray	0	0	0	0	0	0	0	0	0	0	0	3.77	0	0	0	3.77	9.91
<i>Hypsoblennius gentilis</i>	bay blenny	0	0	0	0.031	0	0	0	0	0	0	0	0	0	0	0	0.031	0.08
<i>Syngnathus leptorhynchus</i>	bay pipefish	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0.001	0.003
<i>Cheilotrema saturnum</i>	black croaker	0	0	0	0	0	0	0.256	0	0	0.175	0	0	0	0	0.140	0.571	1.50
<i>Embiotoca jacksoni</i>	black perch	0.101	0.094	0	0	0	0	0	0	0	0	0	0	0	0	0	0.195	0.51
<i>Paralichthys californicus</i>	California halibut	0	0	0	0	0.188	0	0.320	1.09	1.90	0.016	0.123	0.048	0.119	0.222	0.076	4.10	10.8
<i>Synodus lucioceps</i>	California lizardfish	0	0.022	0.041	0	0	0.071	0.052	0.011	0.104	0	0	0	0	0	0	0.301	0.79
<i>Symphurus atricaudus</i>	California tonguefish	0	0	0	0	0	0	0	0.008	0.017	0	0	0	0	0	0	0.025	0.07
<i>Anchoa compressa</i>	deepbody anchovy	0	0	0	0	0	0	0	0	0	0	0.012	0	0	0	0	0.012	0.03
<i>Pleuronichthys guttulatus</i>	diamond turbot	0.308	0	0	0	0	0	0.210	0	0	0.101	0	0.203	0	0.031	0	0.853	2.24
<i>Xystreureys liolepis</i>	fantail sole	0	0	0	0	0	0	NR	0	0	0	0	0	0	0	0	NR	NR
<i>Heterostichus rostratus</i>	giant kelpfish	0.003	0.034	0	0	0	0	0	0	0	0	0	0	0	0	0	0.037	0.10
<i>Heterodontus francisci</i>	horn shark	0	0	0	0	0	0	0	0	4.31	0	0	0	0	0	0	4.31	11.3
<i>Paralabrax clathratus</i>	kelp bass	0	0	0	0.121	0	0	0	0	0	0	0	0	0	0	0	0.121	0.32
<i>Syngnathus californiensis</i>	kelp pipefish	0	0	0	0	0	0.015	0	0	0	0	0	0	0	0	0	0.015	0.04
Sygnathidae	pipefish (unidentified)	0	0	0	0	NR	0	0	0	0	0	0	0	0	0	0	NR	NR
<i>Seriphus politus</i>	queenfish	0	0	0	0	0	0	0	0	0.198	0	0	0	0	0	0	0.198	0.52
<i>Urobatis halleri</i>	round stingray	0	0	0	0	1.88	0	0.527	0	0	0.740	0.470	3.82	1.39	0	0.240	9.06	23.8
<i>Cymatogaster aggregata</i>	shiner perch	0.210	0.265	0	0.125	0	0	0	0	0	0	0	0	0	0	0	0.600	1.58
<i>Rhinobatos productus</i>	shovelnose guitarfish	0	0	0	0	0	0	0	0	0	0	0	0.628	0	0	0	0.628	1.65
<i>Anchoa delicatissima</i>	slough anchovy	0	0	0	0.002	0.005	0	0	0	0	0.027	0.532	0	0.006	0	0	0.572	1.50
<i>Citharichthys stigmatheus</i>	speckled sanddab	0	0	0.038	0	0	0.007	0	0	0	0	0	0	0	0	0	0.045	0.12
<i>Porichthys myriaster</i>	specklefin midshipman	0	0	0	0	0	0	0.517	0	0	0	0	0	0	0	0	0.517	1.36
<i>Paralabrax maculatofasciatus</i>	spotted sand bass	0	0	0	1.30	0	0	2.94	1.37	0.815	0	0	1.77	0.184	0.360	0.260	9.01	23.7
<i>Pleuronichthys ritteri</i>	spotted turbot	0	0	0	0	0	0	0.040	0	0.038	0	0.073	0	0	0	0	0.151	0.40
<i>Phanerodon furcatus</i>	white seaperch	1.31	0.473	0	0	0	0	0	0	0	0	0	0	0	0	0	1.78	4.69
<i>Umbrina roncadore</i>	yellowfin croaker	0	0	0	0	0	0	0	0	0	0.049	0	0.053	0	0	0	0.102	0.27
Total Biomass		1.95	0.92	0.08	1.66	2.19	0.09	4.87	2.54	7.50	1.15	1.21	10.6	1.85	0.68	0.76	38.1	--
Region Means		1.95	0.92	1.31			3.75				3.71				0.72			

Notes:
NR= not recorded. One pipefish (unidentified) from Station B23-12024 and one fantail sole from B23-12019 were lost before they were weighed and therefore are not accounted for in this table.

Table M-3. 2023 RHMP Demersal Fish Biodiversity Metrics

Biological Metric	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay									
						North				Central				South	
						B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884
Taxa Richness	6	6	2	7	5	3	9	5	8	7	5	8	5	4	5
Abundance	55	23	9	34	19	7	24	12	32	21	348	34	15	7	6
Biomass (kg)	1.95	0.92	0.08	1.66	2.19	0.09	4.87	2.54	7.50	1.15	1.21	10.6	1.85	0.68	0.76
Shannon-Wiener Diversity Index	1.15	1.39	0.69	1.25	1.37	0.96	1.79	1.42	1.81	1.22	0.15	1.48	1.49	1.15	1.56
Pielou's Evenness Index	0.64	0.78	0.99	0.64	0.85	0.87	0.81	0.88	0.87	0.63	0.09	0.71	0.93	0.83	0.97
% Dominance Top Taxa	56.4	52.2	55.6	64.7	47.4	57.1	37.5	41.7	31.3	66.7	97.4	52.9	33.3	57.1	33.3
% Dominance Top 3 Taxa	90.9	82.6	100	82.4	84.2	100	70.8	83.3	68.8	81.0	99.4	82.4	80.0	85.7	66.7
% Biomass Top Taxa	67.3	51.6	51.9	78.2	85.7	76.3	60.5	54.1	57.5	64.5	44.0	35.9	75.0	53.3	34.1
% Biomass Top 3 Taxa	93.9	90.7	100	93.1	99.8	100	82.0	99.3	93.6	88.6	93.0	88.1	93.3	95.4	84.0
% Top Predator Taxa	16.7	16.7	0.0	42.9	40.0	0.0	22.2	60.0	50.0	28.6	20.0	50.0	60.0	75.0	60.0
% Top Predator Individuals	1.8	4.3	0.0	23.5	26.3	0.0	62.5	75.0	46.9	9.5	0.9	38.2	53.3	85.7	66.7

**Table M-4. 2023 RHMP Demersal Fish Ecological Indices,
All Harbors Combined**

Scientific Name	Common Name	% of Total Abundance	Frequency of Trawl Capture (%)	% of Total Biomass	Ecological Index
<i>Paralabrax nebulifer</i>	barred sand bass	2.9	73.3	2.8	418
<i>Myliobatis californica</i>	bat ray	0.2	6.7	9.9	67
<i>Hypsoblennius gentilis</i>	bay blenny	0.3	6.7	0.1	3
<i>Syngnathus leptorhynchus</i>	bay pipefish	0.2	6.7	0.0	1
<i>Cheilotrema saturnum</i>	black croaker	0.5	20.0	1.5	39
<i>Embiotoca jacksoni</i>	black perch	0.6	13.3	0.5	15
<i>Paralichthys californicus</i>	California halibut	5.9	66.7	10.8	1111
<i>Synodus lucioceps</i>	California lizardfish	3.1	40.0	0.8	155
<i>Symphurus atricaudus</i>	California tonguefish	0.9	13.3	0.1	13
<i>Anchoa compressa</i>	deepbody anchovy	0.2	6.7	0.03	1
<i>Pleuronichthys guttulatus</i>	diamond turbot	0.9	33.3	2.2	106
<i>Xystreurus liolepis</i>	fantail sole	0.2	6.7	0.0	1
<i>Heterostichus rostratus</i>	giant kelpfish	0.8	13.3	0.1	12
<i>Heterodontus francisci</i>	horn shark	0.2	6.7	11.3	77
<i>Paralabrax clathratus</i>	kelp bass	0.5	6.7	0.3	5
<i>Syngnathus californiensis</i>	kelp pipefish	0.3	6.7	0.04	2
Syngnathidae	pipefish (unidentified)	0.2	6.7	0.0	1
<i>Seriphus politus</i>	queenfish	0.9	6.7	0.5	10
<i>Urobatis halleri</i>	round stingray	6.2	46.7	23.8	1400
<i>Cymatogaster aggregata</i>	shiner perch	7.7	20.0	1.6	186
<i>Rhinobatos productus</i>	shovelnose guitarfish	0.2	6.7	1.7	12
<i>Anchoa delicatissima</i>	slough anchovy	55.7	33.3	1.5	1908
<i>Citharichthys stigmaeus</i>	speckled sanddab	0.8	13.3	0.1	12
<i>Porichthys myriaster</i>	specklefin midshipman	0.3	6.7	1.4	11
<i>Paralabrax maculatofasciatus</i>	spotted sand bass	4.3	53.3	23.7	1493
<i>Pleuronichthys ritteri</i>	spotted turbot	0.5	20.0	0.4	17
<i>Phanerodon furcatus</i>	white seaperch	5.4	13.3	4.7	135
<i>Umbrina roncadore</i>	yellowfin croaker	0.3	13.3	0.3	8

**Table M-5. 2023 RHMP Demersal Fish Ecological Indices,
Sorted By Harbor**

Harbor	Scientific Name	Common Name	% of Total Abundance	Frequency of Trawl Capture (%)	% of Total Biomass	Ecological Index
Dana Point Harbor	<i>Embiotoca jacksoni</i>	black perch	5.5	100	5.2	1064
Dana Point Harbor	<i>Pleuronichthys guttulatus</i>	diamond turbot	3.6	100	15.8	1946
Dana Point Harbor	<i>Heterostichus rostratus</i>	giant kelpfish	3.6	100	0.2	379
Dana Point Harbor	<i>Cymatogaster aggregata</i>	shiner perch	29.1	100	10.8	3988
Dana Point Harbor	<i>Paralabrax nebulifer</i>	barred sand bass	1.8	100	0.8	259
Dana Point Harbor	<i>Phanerodon furcatus</i>	white seaperch	56.4	100	67.3	12365
Oceanside Harbor	<i>Paralabrax nebulifer</i>	barred sand bass	4.3	100	3.2	751
Oceanside Harbor	<i>Embiotoca jacksoni</i>	black perch	4.3	100	10.3	1460
Oceanside Harbor	<i>Synodus lucioceps</i>	California lizardfish	8.7	100	2.4	1109
Oceanside Harbor	<i>Heterostichus rostratus</i>	giant kelpfish	13.0	100	3.7	1675
Oceanside Harbor	<i>Cymatogaster aggregata</i>	shiner perch	52.2	100	28.9	8107
Oceanside Harbor	<i>Phanerodon furcatus</i>	white seaperch	17.4	100	51.6	6897
Mission Bay	<i>Paralabrax nebulifer</i>	barred sand bass	6.5	66.7	5.1	770
Mission Bay	<i>Hypsoblennius gentilis</i>	bay blenny	3.2	33.3	0.8	134
Mission Bay	<i>Syngnathus leptorhynchus</i>	bay pipefish	1.6	33.3	0.03	55
Mission Bay	<i>Paralichthys californicus</i>	California halibut	4.8	33.3	4.8	321
Mission Bay	<i>Synodus lucioceps</i>	California lizardfish	8.1	33.3	1.0	304
Mission Bay	<i>Paralabrax clathratus</i>	kelp bass	4.8	33.3	3.1	264
Mission Bay	Syngnathidae	pipefish (unidentified)	1.6	33.3	0.0	54
Mission Bay	<i>Urobatis halleri</i>	round stingray	14.5	33.3	47.8	2078
Mission Bay	<i>Cymatogaster aggregata</i>	shiner perch	35.5	33.3	3.2	1289
Mission Bay	<i>Anchoa delicatissima</i>	slough anchovy	8.1	66.7	0.2	550
Mission Bay	<i>Citharichthys stigmatæus</i>	speckled sanddab	6.5	33.3	1.0	247
Mission Bay	<i>Paralabrax maculatofasciatus</i>	spotted sand bass	4.8	33.3	33.0	1261
North San Diego Bay	<i>Paralabrax nebulifer</i>	barred sand bass	4.0	50.0	1.1	257
North San Diego Bay	<i>Cheilotrema saturnum</i>	black croaker	1.3	25.0	1.7	76
North San Diego Bay	<i>Paralichthys californicus</i>	California halibut	25.3	75.0	22.1	3555
North San Diego Bay	<i>Synodus lucioceps</i>	California lizardfish	17.3	100	1.6	1892
North San Diego Bay	<i>Symphurus atricaudus</i>	California tonguefish	8.0	50.0	0.2	408
North San Diego Bay	<i>Pleuronichthys guttulatus</i>	diamond turbot	1.3	25.0	1.4	68
North San Diego Bay	<i>Xystreurus liolepis</i>	fantail sole	1.3	25.0	0.0	33
North San Diego Bay	<i>Heterodontus francisci</i>	horn shark	1.3	25.0	28.7	752
North San Diego Bay	<i>Syngnathus californiensis</i>	kelp pipefish	2.7	25.0	0.1	69
North San Diego Bay	<i>Seriphus politus</i>	queenfish	8.0	25.0	1.3	233
North San Diego Bay	<i>Urobatis halleri</i>	round stingray	1.3	25.0	3.5	121
North San Diego Bay	<i>Citharichthys stigmatæus</i>	speckled sanddab	1.3	25.0	0.05	35
North San Diego Bay	<i>Porichthys myriaster</i>	specklefin midshipman	2.7	25.0	3.4	153
North San Diego Bay	<i>Paralabrax maculatofasciatus</i>	spotted sand bass	21.3	75.0	34.2	4167
North San Diego Bay	<i>Pleuronichthys ritteri</i>	spotted turbot	2.7	50.0	0.5	159
Central San Diego Bay	<i>Paralabrax nebulifer</i>	barred sand bass	1.9	75.0	3.5	409
Central San Diego Bay	<i>Myliobatis californica</i>	bat ray	0.2	25.0	25.4	641
Central San Diego Bay	<i>Cheilotrema saturnum</i>	black croaker	0.2	25.0	1.2	35
Central San Diego Bay	<i>Paralichthys californicus</i>	California halibut	2.4	100	2.1	445
Central San Diego Bay	<i>Anchoa compressa</i>	deepbody anchovy	0.2	25.0	0.1	8
Central San Diego Bay	<i>Pleuronichthys guttulatus</i>	diamond turbot	0.5	50.0	2.0	126
Central San Diego Bay	<i>Urobatis halleri</i>	round stingray	6.9	100	43.3	5020
Central San Diego Bay	<i>Rhinobatos productus</i>	shovelnose guitarfish	0.2	25.0	4.2	112
Central San Diego Bay	<i>Anchoa delicatissima</i>	slough anchovy	84.9	75.0	3.8	6655
Central San Diego Bay	<i>Paralabrax maculatofasciatus</i>	spotted sand bass	1.7	50.0	13.2	743
Central San Diego Bay	<i>Pleuronichthys ritteri</i>	spotted turbot	0.2	25.0	0.5	18
Central San Diego Bay	<i>Umbrina roncadore</i>	yellowfin croaker	0.5	50.0	0.7	58
South San Diego Bay	<i>Paralabrax nebulifer</i>	barred sand bass	15.4	100	7.5	2290
South San Diego Bay	<i>Cheilotrema saturnum</i>	black croaker	7.7	50.0	9.7	872
South San Diego Bay	<i>Paralichthys californicus</i>	California halibut	46.2	100	20.7	6689
South San Diego Bay	<i>Pleuronichthys guttulatus</i>	diamond turbot	7.7	50.0	2.2	492
South San Diego Bay	<i>Urobatis halleri</i>	round stingray	7.7	50.0	16.7	1220
South San Diego Bay	<i>Paralabrax maculatofasciatus</i>	spotted sand bass	15.4	100	43.1	5853

2023 RHMP Macroinvertebrate Community Summary Tables and Metrics

Table M-6. 2023 RHMP Macroinvertebrate Abundances

Scientific Name	Common Name	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay										Total Abundance per Taxa	% of Total Abundance	Frequency of Trawl Capture (%)
		B23-12064	B23-12060	B23-12022	B23-12023	B23-12024	North				Central				South				
							B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884			
<i>Acanthoptilum</i> sp	sea pen	0	0	40	0	0	0	35	2	0	0	0	0	0	0	0	77	0.50	20.0
<i>Achelous xantusii</i>	swimming crab	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	18	0.12	6.7
<i>Amathia verticillata</i>	spaghetti bryozoan	0	P	P	P	P	0	0	0	0	0	0	0	0	0	0	P	P	26.7
<i>Ascidella aspersa</i>	solitary tunicate	0	0	0	0	2	0	21	0	0	0	0	0	0	0	0	23	0.15	13.3
<i>Bulla gouldiana</i>	California bubble snail	7	1	3	1	0	0	0	0	1	3	2	12	15	0	0	45	0.29	60.0
<i>Ciona robusta</i>	tunicate	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Dendraster excentricus</i>	Pacific sand dollar	0	0	2215	0	0	0	0	0	0	0	0	0	0	0	0	2215	14.3	6.7
Halichondriidae	sponge	0	0	0	0	0	0	P	0	0	0	0	0	0	0	0	P	P	6.7
<i>Leptopecten latiauratus</i>	kelp scallop	0	0	0	11	0	0	0	0	0	0	0	0	0	1	0	12	0.08	13.3
<i>Molgula ficus</i>	solitary tunicate	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	14	0.09	6.7
<i>Navanax inermis</i>	California aglaja	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Octopus bimaculatus</i>	Verrill's two-spot octopus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.01	6.7
<i>Octopus bimaculoides</i>	California two-spot octopus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Octopus rubescens</i>	red octopus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Panulirus interruptus</i>	California spiny lobster	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	0.03	6.7
<i>Phrontis tiarula</i>	western mud nassa	0	0	0	0	5	0	0	0	0	26	1	0	0	0	1	33	0.21	26.7
<i>Pugettia producta</i>	northern kelp crab	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.02	6.7
<i>Pyromaia tuberculata</i>	tuberculate pear crab	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	4	0.03	20.0
<i>Romaleon jordani</i>	hairy rock crab	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.01	6.7
<i>Sicyonia penicillata</i>	target shrimp	0	13	2	0	0	12975	0	0	4	0	0	0	0	0	0	12994	84.1	26.7
<i>Strongylocentrotus purpuratus</i>	purple urchin	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	0.03	6.7
<i>Suberites</i> sp	sponge	0	0	0	0	0	0	P	P	P	0	0	P	P	0	P	P	P	40.0
<i>Taliepus nuttallii</i>	southern kelp crab	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Tegula aureotincta</i>	gilded tegula	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01	6.7
<i>Tetilla</i> sp	sponge	0	0	0	0	0	0	0	0	0	P	0	0	0	0	P	P	P	13.3
Total Abundance		9	21	2260	23	7	12993	72	3	5	31	3	12	15	2	1	15457	--	--
Region Means		9	21	763			3268				15				2				

Notes:
P = present; indicates colonial species that could not be enumerated

Table M-7. 2023 RHMP Macroinvertebrate Biomass (kg)

Scientific Name	Common Name	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay										Total Biomass per Taxa	% of Total Biomass
							North				Central				South			
		B23-12064	B23-12060	B23-12022	B23-12023	B23-12024	B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884		
<i>Acanthoptilum</i> sp	sea pen	0	0	0.3	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0.5	0.21
<i>Achelous xantusii</i>	swimming crab	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0.4	0.17
<i>Amathia verticillata</i>	spaghetti bryozoan	0	0.2	1.0	0.7	35.2	0	0	0	0	0	0	0	0	0	0	37.1	15.4
<i>Ascidella aspersa</i>	solitary tunicate	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.2	0.08
<i>Bulla gouldiana</i>	California bubble snail	0.2	0.1	0.1	0.1	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0	0	1.0	0.41
<i>Ciona robusta</i>	tunicate	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.04
<i>Dendraster excentricus</i>	Pacific sand dollar	0	0	22.9	0	0	0	0	0	0	0	0	0	0	0	0	22.9	9.48
Halichondriidae	sponge	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.04
<i>Leptopecten latiauratus</i>	kelp scallop	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.2	0.08
<i>Molgula ficus</i>	solitary tunicate	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.04
<i>Navanax inermis</i>	California aglaja	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.04
<i>Octopus bimaculatus</i>	Verrill's two-spot octopus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0.4	0.17
<i>Octopus bimaculoides</i>	California two-spot octopus	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.2	0.08
<i>Octopus rubescens</i>	red octopus	0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0.41
<i>Panulirus interruptus</i>	California spiny lobster	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	1.7	0.70
<i>Phrontis tiarula</i>	western mud nassa	0	0	0	0	0.1	0	0	0	0	0.1	0.1	0	0	0	0.1	0.4	0.17
<i>Pugettia producta</i>	northern kelp crab	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.04
<i>Pyromaia tuberculata</i>	tuberculate pear crab	0	0	0	0	0	0	0.1	0.1	0	0.1	0	0	0	0	0	0.3	0.12
<i>Romaleon jordani</i>	hairy rock crab	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.08
<i>Sicyonia penicillata</i>	target shrimp	0	0.2	0.1	0	0	137	0	0	0.1	0	0	0	0	0	0	138	57.1
<i>Strongylocentrotus purpuratus</i>	purple urchin	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0.04
<i>Suberites</i> sp	sponge	0	0	0	0	0	0	1.9	8.6	4.7	0	0	18.9	1.5	0	0.4	36.0	14.9
<i>Taliepus nuttallii</i>	southern kelp crab	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.04
<i>Tegula aureotincta</i>	gilded tegula	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.04
<i>Tetilla</i> sp	sponge	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.3	0.4	0.17
Total Biomass		0.4	1.9	24.4	2.9	35.4	138	2.5	8.8	4.9	0.4	0.2	19.0	1.6	0.5	0.8	241.5	--
Region Means		0.4	1.9	20.9			38.5				5.3				0.7			

Table M-8. 2023 RHMP Macroinvertebrate Biodiversity Metrics

Biological Metric	Dana Point Harbor	Oceanside Harbor	Mission Bay			San Diego Bay									
						North				Central				South	
						B23-12014	B23-12019	B23-12020	B23-12021	B23-12009	B23-12011	B23-12012	B23-12819	B23-12008	B23-12884
Taxa Richness	3	7	5	6	3	2	7	3	3	4	2	2	2	2	3
Abundance	9	21	2260	23	7	12993	72	3	5	31	3	12	15	2	1
Biomass (kg)	0.4	1.9	24.4	2.9	35.4	138	2.5	8.8	4.9	0.4	0.2	19.0	1.6	0.5	0.8
Shannon-Wiener Diversity Index	0.68	1.38	0.11	1.43	0.88	0.01	1.27	1.00	0.82	0.66	0.64	0.21	0.18	0.69	--
Pielou's Evenness Index	0.62	0.71	0.07	0.80	0.80	0.02	0.65	0.91	0.75	0.48	0.92	0.30	0.26	1.00	--

Notes:

-- = Could not be calculated because only one species was observed that could be enumerated

**Table M-9. 2023 RHMP Macroinvertebrate Ecological Indices,
All Harbors Combined**

Scientific Name	Common Name	% of Total Abundance	Frequency of Trawl Capture (%)	% of Total Biomass	Ecological Index
<i>Acanthoptilum</i> sp	sea pen	0.50	20.0	0.21	14
<i>Achelous xantusii</i>	swimming crab	0.12	6.7	0.17	2
<i>Amathia verticillata</i>	spaghetti bryozoan	0.00	26.7	15.4	410
<i>Asciidiella aspersa</i>	solitary tunicate	0.15	13.3	0.08	3.1
<i>Bulla gouldiana</i>	California bubble snail	0.29	60.0	0.41	42
<i>Ciona robusta</i>	tunicate	0.01	6.7	0.04	0.3
<i>Dendraster excentricus</i>	Pacific sand dollar	14.3	6.7	9.48	159
Halichondriidae	sponge	0.00	6.7	0.04	0.3
<i>Leptopecten latiauratus</i>	kelp scallop	0.08	13.3	0.08	2
<i>Molgula ficus</i>	solitary tunicate	0.09	6.7	0.04	1
<i>Navanax inermis</i>	California aglaja	0.01	6.7	0.04	0.3
<i>Octopus bimaculatus</i>	Verrill's two-spot octopus	0.01	6.7	0.17	1
<i>Octopus bimaculoides</i>	California two-spot octopus	0.01	6.7	0.08	1
<i>Octopus rubescens</i>	red octopus	0.01	6.7	0.41	3
<i>Panulirus interruptus</i>	California spiny lobster	0.03	6.7	0.70	5
<i>Phrontis tiarula</i>	western mud nassa	0.21	26.7	0.17	10
<i>Pugettia producta</i>	northern kelp crab	0.02	6.7	0.04	0
<i>Pyromaia tuberculata</i>	tuberculate pear crab	0.03	20.0	0.12	3
<i>Romaleon jordani</i>	hairy rock crab	0.01	6.7	0.08	1
<i>Sicyonia penicillata</i>	target shrimp	84.1	26.7	57.1	3763
<i>Strongylocentrotus purpuratus</i>	purple urchin	0.03	6.7	0.04	0.5
<i>Suberites</i> sp	sponge	0.00	40.0	14.9	596
<i>Taliepus nuttallii</i>	southern kelp crab	0.01	6.7	0.04	0.3
<i>Tegula aureotincta</i>	gilded tegula	0.01	6.7	0.04	0.3
<i>Tetilla</i> sp	sponge	0.00	13.3	0.17	2

**Table M-10. 2023 RHMP Macroinvertebrate Ecological Indices,
Sorted By Harbor**

Harbor	Scientific Name	Common Name	% of Total Abundance	Frequency of Trawl Capture (%)	% of Total Biomass	Ecological Index
Dana Point Harbor	<i>Bulla gouldiana</i>	California bubble snail	77.8	100	50.0	12778
Dana Point Harbor	<i>Navanax inermis</i>	California aglaja	11.1	100	25.0	3611
Dana Point Harbor	<i>Tegula aureotincta</i>	gilded tegula	11.1	100	25.0	3611
Oceanside Harbor	<i>Amathia verticillata</i>	spaghetti bryozoan	0.0	100	10.5	1053
Oceanside Harbor	<i>Bulla gouldiana</i>	California bubble snail	4.8	100	5.3	1003
Oceanside Harbor	<i>Octopus rubescens</i>	red octopus	4.8	100	52.6	5739
Oceanside Harbor	<i>Pugettia producta</i>	northern kelp crab	14.3	100	5.3	1955
Oceanside Harbor	<i>Romaleon jordani</i>	hairy rock crab	9.5	100	10.5	2005
Oceanside Harbor	<i>Sicyonia penicillata</i>	target shrimp	61.9	100	10.5	7243
Oceanside Harbor	<i>Taliepus nuttallii</i>	southern kelp crab	4.8	100	5.3	1003
Mission Bay	<i>Acanthoptilum</i> sp	sea pen	1.7	33.3	0.5	74
Mission Bay	<i>Amathia verticillata</i>	spaghetti bryozoan	0.0	100	58.9	5885
Mission Bay	<i>Ascidella aspersa</i>	solitary tunicate	0.1	33.3	0.2	8
Mission Bay	<i>Bulla gouldiana</i>	California bubble snail	0.2	66.7	0.3	33
Mission Bay	<i>Dendraster excentricus</i>	Pacific sand dollar	96.7	33.3	36.5	4442
Mission Bay	<i>Leptopecten latiauratus</i>	kelp scallop	0.5	33.3	0.2	21
Mission Bay	<i>Octopus bimaculoides</i>	California two-spot octopus	0.0	33.3	0.3	12
Mission Bay	<i>Panulirus interruptus</i>	California spiny lobster	0.2	33.3	2.7	98
Mission Bay	<i>Phrontis tiarula</i>	western mud nassa	0.2	33.3	0.2	13
Mission Bay	<i>Sicyonia penicillata</i>	target shrimp	0.1	33.3	0.2	8
Mission Bay	<i>Strongylocentrotus purpuratus</i>	purple urchin	0.2	33.3	0.2	13
North San Diego Bay	<i>Acanthoptilum</i> sp	sea pen	0.3	50.0	0.1	21
North San Diego Bay	<i>Achelous xantusii</i>	swimming crab	0.1	25.0	0.3	10
North San Diego Bay	<i>Ascidella aspersa</i>	solitary tunicate	0.2	25.0	0.1	6
North San Diego Bay	<i>Bulla gouldiana</i>	California bubble snail	0.01	25.0	0.1	2
North San Diego Bay	<i>Ciona robusta</i>	tunicate	0.01	25.0	0.1	2
North San Diego Bay	Halichondriidae	sponge	0.0	25.0	0.1	2
North San Diego Bay	<i>Molgula ficus</i>	solitary tunicate	0.1	25.0	0.1	4
North San Diego Bay	<i>Pyromaia tuberculata</i>	tuberculate pear crab	0.02	50.0	0.1	7
North San Diego Bay	<i>Sicyonia penicillata</i>	target shrimp	99.3	50.0	89.3	9428
North San Diego Bay	<i>Suberites</i> sp	sponge	0.0	75.0	9.9	740
Central San Diego Bay	<i>Bulla gouldiana</i>	California bubble snail	52.5	100	1.9	5435
Central San Diego Bay	<i>Phrontis tiarula</i>	western mud nassa	44.3	50.0	0.9	2260
Central San Diego Bay	<i>Pyromaia tuberculata</i>	tuberculate pear crab	3.3	25.0	0.5	94
Central San Diego Bay	<i>Suberites</i> sp	sponge	0.0	50.0	96.2	4811
Central San Diego Bay	<i>Tetilla</i> sp	sponge	0.0	25.0	0.5	12
South San Diego Bay	<i>Leptopecten latiauratus</i>	kelp scallop	33.3	25.0	7.7	1026
South San Diego Bay	<i>Octopus bimaculatus</i>	Verrill's two-spot octopus	33.3	25.0	30.8	1603
South San Diego Bay	<i>Phrontis tiarula</i>	western mud nassa	33.3	25.0	7.7	1026
South San Diego Bay	<i>Suberites</i> sp	sponge	0.0	25.0	30.8	769
South San Diego Bay	<i>Tetilla</i> sp	sponge	0.0	25.0	23.1	577