Living substrates in Alaska: distribution, abundance and species associations

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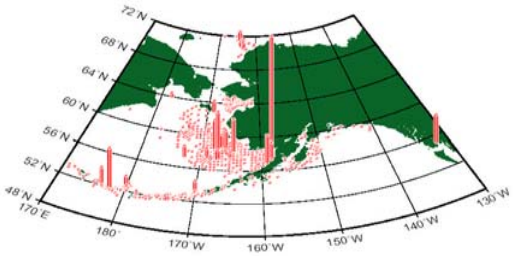
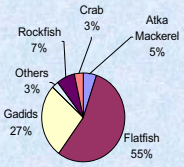
NATIONAL MARINE FISHERIES SERVICE



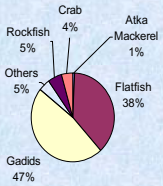
Relative abundance of bryozoans based on CPUE in NMFS trawl surveys (1975-2000).



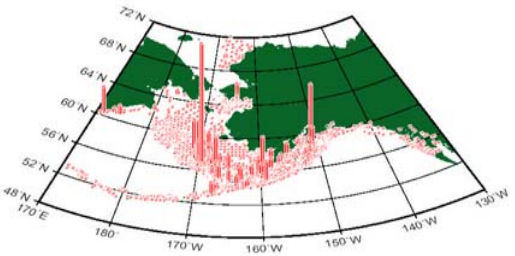
Catch associated with bryozoans.

Introduction

"Living substrates" have been identified as important marine habitat and are susceptible to impacts from fishing activities. In the Gulf of Alaska and Bering Sea, little is known about the distribution of deepwater living substrates such as, sponges (Phylum Porifera), sea anemones (Order Actiniaria), sea whips and sea pens (Order Pennatulacea), ascidians (Class Ascidiacea), and bryozoans (Phylum Bryozoa). In order to facilitate management practices that minimize fishery impacts to these living substrates, distributional maps were created based on National Marine Fisheries Service (NMFS) trawl survey data from 1975 through 2000. Additionally, broad-scale associations between commercially important species and living substrates were determined by analyzing the catch composition in hauls containing living substrates.



Catch associated with anemones.



Relative abundance of anemones based on CPUE in NMFS trawl surveys (1975-2000).

List of taxonomic or common names and frequency of occurrence of invertebrates in NMFS trawl surveys, 1975 – 2000.

Name	Frequency of Occurrence			
	Aleutians	Bering Sea	Gulf of Alaska	Total
Phylum Bryozoa (Ectoprocta)				
Bryozoan (phylum)	158	620	57	835
Cellepora ventricosa		21		21
Escharopsis sarsi	1	25	4	30
Eucratea loricata	31	42	23	96
Flustra serrulata	52	149	13	214
Microporina articulata	1			1
Myriozoum subgracile	3		4	7
Porella compressa	15	10	1	26
Rhamphostomella costata	8	34	1	43
Total	269	901	103	1273
Phylum Porifera (Sponges)				
Aphrocallistes vastus	97	29	253	379
Brain sponge	9		5	14
Cat-o-nine-tails sponge	41			41
Club sponge	94		21	115
Firm yellow green sponge	16		2	18
Hairy lemon sponge			9	9
Halichondria cf. sitiens	145		22	167
Halichondria panicea	81	94	79	254
Halichondria sitiens	65		22	87
Hexactinellida (class)	44	17	51	112
Hylonema sp.	83		12	95
Leucandra heathi	6		1	7
Leucosolenia blanca	84	4	28	116
Mushroom sponge	3		4	7
Mycale bellabellensis	7		12	19
Mycale loveni	159	8	174	341
Myxilla incrustans	16	1	87	104
Neon yellow vase sponge			2	2
Neosperiopsis rigida	29		1	30
Orange ball sponge	5		1	6
Orange encrusting sponge			2	2
Orange sponge	5		6	11
Phakellia cribrosa			13	13
Polymastia pachymastia	7		3	10
Polymastia sp.	138		94	232
Porifera (phylum)	974	2083	1457	4514
Rhabdocalyptus sp.	19	15	31	65
Soft green sponge	13	1	23	37
Staghorn sponge	12		7	19
Stone sponge	51		17	68
Stylissa sp.	5		4	9
Syringella amphiscula	72			72
Tethya sp.	198	1	80	279
Vase sponge	24		10	34
Yellow bowl sponge	58		16	74
Total	2560	2253	2549	7362

Distribution

In general, the five groups of living substrates were observed along the continental shelf and upper slope in varying densities. Sponges, anemones, and ascidians were observed about seven times more often than bryozoans and sea whips and sea pens. Catch per unit effort (CPUE) of sponges was greatest along the Aleutian Archipelago, while CPUE of ascidians and bryozoans was greatest in the Bering Sea. Large CPUEs of sea anemones, sea pens and sea whips were observed in both the Bering Sea and Gulf of Alaska.

Juvenile rockfish (*Sebastes* sp.) take cover in this bed of living substrates consisting of anemones, sponges, and hydrocoral.

Species Associations

The assemblage of fish and crab species caught in association with particular living substrates varied. Flatfish were most commonly associated with ascidians and bryozoans. Gadids (cod and pollock) were most commonly caught with sea anemones, sea pens and sea whips. Rockfish and Atka mackerel were most commonly caught with sponges. Crab were most common in hauls that contained sea anemones and ascidians. Sponge habitat supported the most diverse crab and fish assemblages.

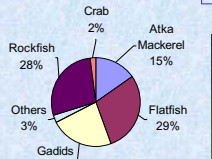
List of taxonomic or common names and frequency of occurrence of invertebrates in NMFS trawl surveys, 1975 – 2000.

Name	Frequency of Occurrence			
	Aleutians	Bering Sea	Gulf of Alaska	Total
Order Actiniaria (Sea Anemones)				
Actiniaria (order)	266	3928	1351	5545
Actinauge verrilli		22	89	111
Actinostolidae (family)		2		2
Corallimorphus sp.			1	1
Cribrinopsis fernaldi		6	2	8
Liponema brevicornis	10	110	9	129
Metridium sp.	10	245	279	534
Metridium senile	1	100	81	182
Metridium farcimen (=Metridium giganteum)			2	2
Paractinostola faeculenta		27	15	42
Stomphia didemon			6	6
Stomphia sp.	1	10	27	38
Stomphia coccinea		5		5
Urticina (=Tealia) sp.		231	4	235
Urticina (=Tealia) crassicornis	1	69	9	79
Zoanthus sp.	1			1
Total	290	4755	1875	6920
Order Pennatulacea (Sea Pens and Sea Whips)				
Halipteris (=Pavonaria) finmarchica		8	7	15
Halipteris (=Pavonaria) sp.		2	1	3
Halipteris californica			11	11
Pennatulacea (order)	28	173	298	499
Pilosarcus gurneyi	1		70	71
Stylatula gracile		9	15	24
Stylatula sp.	28	8	101	137
Virgularia sp.	1	21	18	40
Virgulariidae	6	3	37	46
Total	64	224	558	846
Class Ascidiacea (Sea Squirts)				
Ansarocium sp.	9	2		11
Aplidium sp.	63	1019	60	1142
Ascidia paratropa			2	2
Ascidian (class)	155	816	315	1286
Boltenia ovifera	3	735	4	742
Boltenia sp.	2	1015	55	1072
Boltenia villosa			9	9
Bostrylloides sp.			1	1
Chelyosoma orientale		1		1
compound ascidian unidentified	163	247	128	538
cow-eye tunicate (new species a)		5	1	6
Halocynthia aurantium	81	414	63	558
Halocynthia hispidus			15	15
Halocynthia sp.	27	460	49	536
Molgula griffitsii	23	40	11	74
Molgula retortiformis	33	6	49	88
Molgula sp.	1	28	4	33
Styela rustica	54	1323	29	1406
Styela sp.		8		8
Synoicum sp.	14	15	25	54
transparent tunicate (new species b)	5	2		7
Total	633	6136	820	7589

Caveats and Considerations

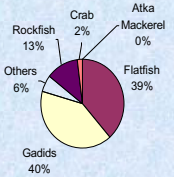
The maps provided here are not comprehensive but provide insight to the large-scale distribution of living substrates. The NMFS trawl survey is mostly designed to catch fish, not sessile invertebrates, and thus does not retain a high percentage of living substrates. Additionally, rough bottom topography precludes trawling in some areas. Therefore, areas with high densities of living substrates may be under-sampled or not sampled at all. The described species associations are not fine-scale but on the scale of a single trawl pass. Other important living substrates include hydroids and coral. Similar work was completed on Alaska corals (Heifetz, J., 2002. Coral in Alaska: distribution, abundance, and species associations. Hydrobiologia 471: 19-28).

This sponge provides refuge for a gravid rockfish.



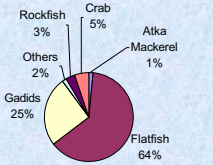
Catch associated with sponges.

Sea whip species are quite variable in size. Above, a Pacific cod cruises over 10-30 cm sea whips, while some sea whips exceed 2 meters, below.



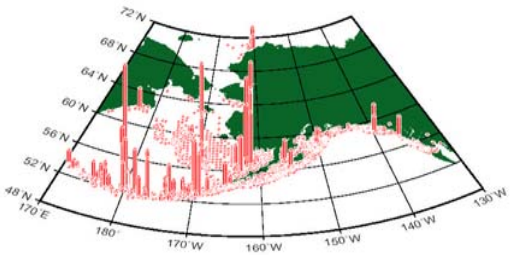
Catch associated with sea pens and sea whips.

Sea pens and sea whips provide vertical structure in relatively low relief habitat.

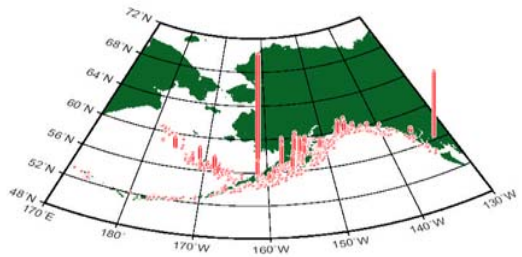


Catch associated with ascidians.

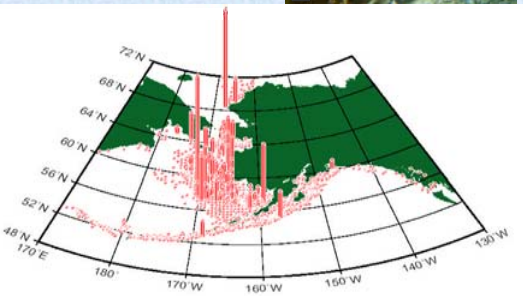
Sea peaches are common ascidians in the Bering Sea.



Relative abundance of sponges based on CPUE in NMFS trawl surveys (1975-2000).



Relative abundance of sea whips and sea pens based on CPUE in NMFS trawl surveys (1975-2000).



Relative abundance of ascidians based on CPUE in NMFS trawl surveys (1975-2000).