

Cordell Bank  
National Marine Sanctuary  
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## CRUISE REPORT

VESSEL: NOAA R/V Fulmar

PROJECT DATES: May 7, 2007 – May 14, 2007

PROJECT: CHARACTERIZATION OF SOFT BOTTOM BIOLOGICAL  
COMMUNITIES AND HABITATS OF CORDELL BANK  
NATIONAL MARINE SANCTUARY

### RATIONALE:

Cordell Bank National Marine Sanctuary (CBNMS) is best known for Cordell Bank, a high relief rocky feature situated near the continental shelf break. However, Cordell Bank only occupies approximately five percent of the total area of the Sanctuary. The remaining habitat is primarily unconsolidated soft bottom. This cruise was undertaken to describe the soft bottom biological communities and habitats of CBNMS. A video camera mounted to an aluminum frame (camera sled) was towed behind the research vessel to provide images of the bottom.

### ITINERARY

May 3 Camera sled was installed and tested on the R/V Fulmar in Monterey.

May 7 Fulmar transited from Monterey to Bodega Harbor. Computers and video analysis equipment was installed in the ship's science lab.

May 8 Completed five video transects at stations 398, 369, 399, 460 and 614. Weather conditions were excellent with clear skies, docile seas (2-3 foot swells) and light winds (less than 5 knots) all day. Stations most distant from Bodega Harbor were sampled on this day due to the extremely favorable weather conditions.

- May 9 Completed six video transects at stations 562, 535, 595, 625, 626 and 685. Favorable weather conditions were encountered (wind: < 5 knots, swell: 4ft).
- May 10 Departure from Bodega Harbor was delayed because of a faulty generator. The morning was spent performing routine maintenance on the engines and investigating the generator problem. Ship's crew devised a work-around for the failed generator and left port at 13:25 PDT. One video transect was completed at station 558. During deployment, the tow cable jumped the sheave and the case of the cable was abraded. The ship's mate coated the abraded area with silicone marine sealant and wrapped the cable with electrical tape. This repair seemed adequate because the camera worked nominally for the remainder of the cruise. During deployment winds were 18 knots swell was 4 to 6 feet. Operations were terminated following this transect due to high winds.
- May 11 Completed five transects at stations 740, 706, 672, 793, and 738. Weather conditions were marginal on this day. We attempted to occupy station 591 but swell was too high (approximately 7 feet) and winds were 16 knots. A Decision was then made to work close to shore. Weather at station 740 was wind 12 knots and swell 3 to 6 feet.
- May 12 Departed Bodega Harbor at 07:20 in the morning and headed for station 806. Upon arrival the winds were 18 knots so a decision was made to cancel operations for the day because of weather.
- May 13 Operations cancelled because of reported high winds and seas. The 5 a.m. NOAA/NODC Bodega Buoy report stated winds were 20 knots with gusts to 27. Swells were 10 feet at 9 second intervals. The Fulmar did not leave port.
- May 14 Cruise demobilization day at Bodega Bay. Removed camera sled, cable and USGS winch from vessel.

#### SCIENTIFIC GOALS AND OBJECTIVES

Data collected during this cruise will contribute to a baseline characterization of the soft bottom region of CBNMS.

#### EDUCATION GOALS AND OBJECTIVES

Jennifer Stock (CBNMS education and outreach coordinator) and Dai Owen (Teacher at Marin Academy school) participated in the cruise on May 10<sup>th</sup> and 11<sup>th</sup>. Jennifer and Dai intend to develop classroom materials based on the video footage collected during this cruise.

## METHODS

The camera sled was modeled after the design of Hank Chezar of the U.S. Geological Survey in Menlo Park, CA. The system's equipment was taken from a Deep Ocean Engineering HD2 Remotely Operated Vehicle (ROV). The camera, lights and electronics were all stock HD2 components which were mounted to an aluminum frame 136 cm long, 44 cm wide, and 52 cm high. A Deep Ocean Engineering video camera with zoom and tilt capability provided oblique down-looking images of the seafloor which were recorded on a Sony mini-DV digital tape recorder. Two Deep Sea Power and Light 250 W tungsten/halogen lights illuminated the field of view. Paired lasers, mounted on either side of the camera housing and set 10 cm apart, provided a visual reference for sizing objects in the field of view. The sled was attached to an umbilical cable which was spooled on a hydraulic winch. During survey operations, the sled was towed behind the R/V Fulmar at a speed of approximately one knot. The winch operator had a view of the video display, which enabled him to pay out the amount of cable which would maintain the sled approximately one meter above the bottom.

A towed video system was chosen to conduct surveys of the low relief region of CBNMS because it allows comparatively rapid surveying of low relief areas. Manned submersibles and ROVs have much higher operating overhead and provide only marginally superior data in low relief areas.

The sampling design called for numerous relatively short (50 minute) transects. Multiple short transects were deemed preferable to a few long transects because they provide greater spatial coverage and greater independence of observations. Sampling strata were 2 km x 2 km blocks. Within each block a 50 minute transect was run. Blocks were chosen to provide data from regions that had not been sampled on the 2004 camera sled cruise (AR0402) at CBNMS.

During a transect, video observations were annotated by a team of three biologists. The research team took observations using audio recording, a text-based event recorder and hand-written notebook (Anderson et. al In Press, Anglin 2007). Bottom type, bottom relief, and the presence of major fish and invertebrate taxa were recorded at one minute intervals. Refer to Appendix A for lists of biotic and abiotic codes used with the event recorder.

## RESULTS

Seventeen transects were completed in three full days and one partial day at sea (Table 1, Figure 1). Two scheduled sea days were lost to bad weather and one-half day was lost to a maintenance issue with the vessel.

Observations were consistent with those made in 2004 (cruise AR0402), which revealed that the continental shelf habitat within Cordell Bank National Marine Sanctuary is primarily low relief bioturbated soft sediment.

Transects ranged in depth from 61 to 118 meters (Table 1). Sea whips (*Halipteris californica*) were the most frequently observed taxon on 12 of 17 transects and they were observed on all transects. Brittle stars (Ophiurida) occurred frequently on transects 5

through 12 but were much less common in the offshore (transects 1-3) and nearshore (transects 13-17) regions of the sanctuary (Figure 2). Other commonly occurring taxa were various species of flatfish, anemones living in the sediment and the sand star *Luidia foliata* (Table 2).

While there is a great deal of uniformity in habitat and biota of the continental shelf region of CBNMS, some variability among transects was noted. A pattern in sediment texture was evident in that sediments appear to be finer in the offshore, deeper waters. Additionally, two of the transects (398 and 369) were proximate to Cordell Bank and had regions of low relief rock and cobble. Rockfish species commonly associated with this habitat type such as greenstriped rockfish (*Sebastes elongatus*), greenspotted rockfish (*S. chlorostictus*) and canary rockfish (*S. pinniger*) were seen on these two transects and account for the relatively high frequency of occurrence for ‘rockfish’ (Table 2, Figure 2). Gorgonians and metridium (*Metridium giganteum*), which generally require hard substrate, were common at 398 and 369 but rarely observed on the other transects (Table 2). The transect nearest to shore (793; outside CBNMS boundary) had notably coarser sediment and appeared much less bioturbated (fewer mounds and burrows) than sediment observed in the offshore areas. White brittle stars buried in the sediment were the dominant taxon at station 793 (Table 2) and were rarely identified in other locations. Sea whips were observed much less frequently at station 793 than at the other sampled locations (Figure 2).

#### SCIENTIFIC PERSONNEL

Name	Date On	Date Off	Position	Organization
Dan Howard	5/07	5/14	Superintendent	CBNMS
Dale Roberts	5/07	5/14	Chief Scientist	CBNMS
Diana Watters	5/08	5/08	Biologist	NMFS
Jamie Hall	5/08	5/09	Biologist	FMSA
Shannon Lyday	5/08	5/10	Biologist	FMSA
Bob Lea	5/09	5/11	Biologist	CAS
Sage Tezak	5/11	5/13	Biologist	FMSA
Jenny Stock	5/10	5/11	Education & Outreach	Coordinator CBNMS
Dai Owen	5/10	5/11	Teacher	Marin Academy

#### Key to Abbreviations:

CBNMS..... Cordell Bank National Marine Sanctuary  
 CAS.....California Academy of Sciences  
 FMSA.....Farallones Marine Sanctuary Association  
 NMFS ..... National Marine Fisheries Service

## DISPOSITION OF DATA:

Data are housed at the Cordell Bank NMS office, 1 Bear Valley Road, Point Reyes, CA.

## References:

Anderson, T. J., G. R. Cochrane, D. A. Roberts, H. Chezar and G. Hatcher. In press. A systematic real-time method to characterize seafloor habitats and benthic macro-organisms: Habitat mapping with a side-scan sonar and towed camera-sled. In: Proceedings of Geohab, H.G. Greene, and B. Todd (eds.).

Anglin, L. 2007. Use of a towed camera sled for benthic characterization and monitoring in the sanctuary. Monterey Bay National Marine Sanctuary (draft). 24pp.

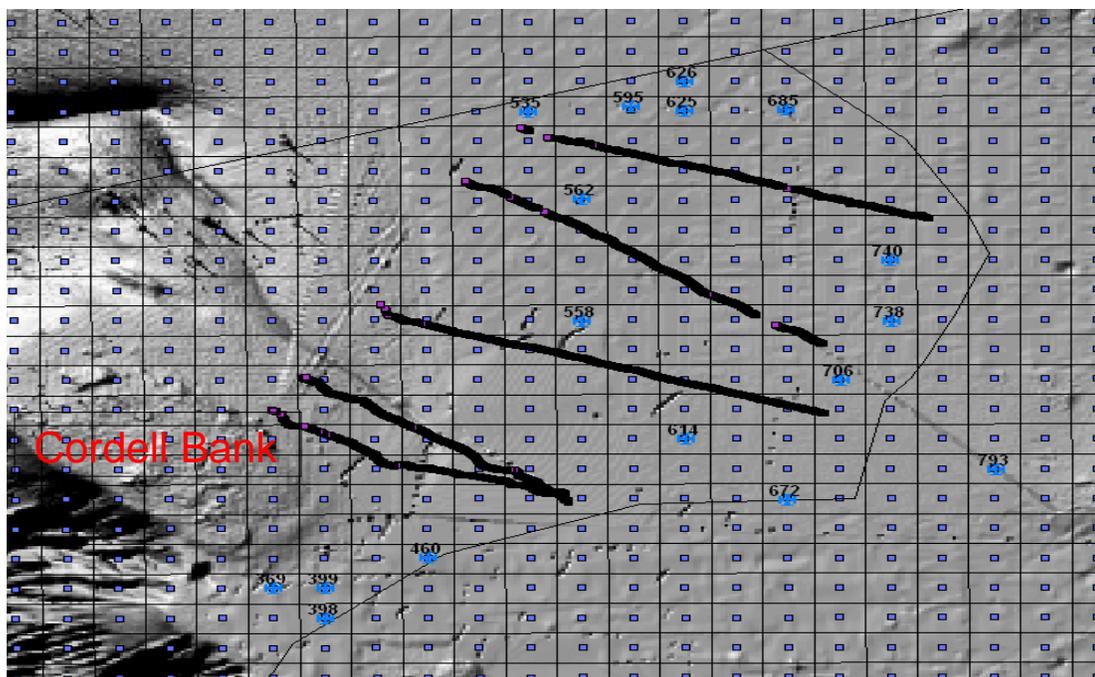


Figure 1. Video transects locations. Blue symbols with station numbers represent locations of center points of 50 minute transects run during this cruise. Black lines represent transects occupied on a companion cruise (AR0402) fielded in April of 2004.

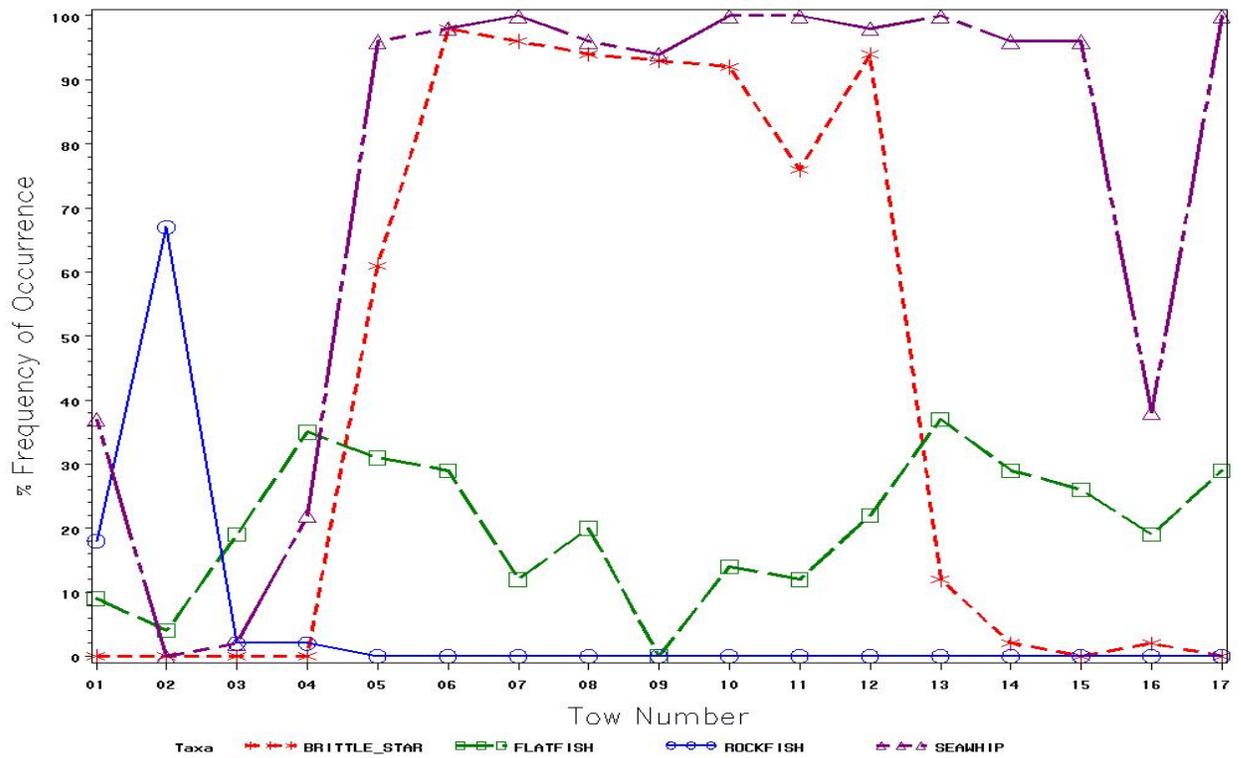


Figure 2. Percent frequency of occurrence of four major taxa observed on each of seventeen camera transects (tows) at CBNMS.

Table 1. Log of video transects completed. To convert times to local (PDT) subtract seven hours.

<i>TOW NUM</i>	<i>STN</i>	<i>LATITUDE (DEG/MIN)</i>	<i>LONGITUDE (DEG/MIN)</i>	<i>DATE (2007)</i>	<i>START DEPTH (meters)</i>	<i>START TIME (UTC)</i>	<i>END TIME (UTC)</i>
1	398	37 55.197	123 22.528	8 May	118	16:21:00	17:16:30
2	369	37 56.274	123 23.899	8 May	116	17:47:20	18:36:28
3	399	37 56.279	123 22.533	8 May	115	18:58:00	19:51:17
4	460	37 57.368	123 19.807	8 May	102	20:58:07	21:49:24
5	614	38 01.710	123 12.989	8 May	109	22:26:55	23:21:20
6	562	38 10.357	123 15.755	9 May	113	15:25:30	16:17:15
7	535	38 13.598	123 17.138	9 May	114	17:02:00	17:53:25
8	595	38 13.604	123 14.396	9 May	102	18:38:00	19:30:00
9	625	38 13.607	123 13.025	9 May	99	20:28:00	21:20:10
10	626	38 14.689	123 13.028	9 May	98	21:48:55	22:37:00
11	685	38 13.612	123 10.283	9 May	93	22:57:55	23:47:47
12	558	38 06.031	123 15.740	10 May	116	22:33:00	23:24:00
13	740	38 08.208	123 07.531	11 May	80	16:00:00	17:52:30
14	706	38 03.880	123 08.892	11 May	84	17:34:50	18:26:25
15	672	38 59.552	123 10.249	11 May	100	19:07:55	19:59:30
16	793	38 00.639	123 04.784	11 May	61	20:36:55	21:29:30
17	738	38 06.044	123 07.527	11 May	80	22:28:55	23:19:00

Table 2. Top three most frequently occurring taxa on each of the seventeen transects.

<i>Tow</i>	<i>Stn</i>	<i>First Taxa</i>	<i>%</i>	<i>Second Taxa</i>	<i>%</i>	<i>Third Taxa</i>	<i>%</i>
01	398	SEA WHIP	37	ROCKFISH	18	GORGONIAN	11
02	369	ROCKFISH	67	GORGONIAN	27	METRIDIUM	27
03	399	FLATFISH	19	TUBEWORM	8	WHITE_URCHIN	8
04	460	FLATFISH	35	SEA WHIP	22	UNKNOWN_FISH	14
05	614	SEA WHIP	96	BRITTLE_STAR	61	FLATFISH	31
06	562	BRITTLE_STAR	98	SEA WHIP	98	FLATFISH	29
07	535	SEA WHIP	100	BRITTLE_STAR	96	FLATFISH	12
08	595	SEA WHIP	96	BRITTLE_STAR	94	ANEMONE	20
09	625	SEA WHIP	94	BRITTLE_STAR	93	ANEMONE	20
10	626	SEA WHIP	100	BRITTLE_STAR	92	ANEMONE	20
11	685	SEA WHIP	100	BRITTLE_STAR	76	ANEMONE	48
12	558	SEA WHIP	98	BRITTLE_STAR	94	FLATFISH	22
13	740	SEA WHIP	100	FLATFISH	37	BRITTLE_STAR	12
14	706	SEA WHIP	96	FLATFISH	29	LUIDIA	8
15	672	SEA WHIP	96	FLATFISH	26	LUIDIA	10
16	793	WHITE_BRITTLE	92	SEA WHIP	38	HYDROID	19
17	738	SEA WHIP	100	FLATFISH	29	ANEMONE	13

## APPENDIX A

**Bottom type and benthic species codes used with the event recorder.  
Modified from Anglin (2007).**

<b>Substrate</b>	<b>Definition</b>
rock	Outcropping of bedrock
boulder	>25.5 cm
cobble	6.5 - 25.5 cm
pebble	<6.5 cm
gravel	0.5 cm - 2.0 cm
sand	Heavier sediment, individual grains visible on impact (0.06 - 2 mm)
mud	Fine sediment, silt, very turbid on impact, includes clay (<0.06 mm)
shell hash	Abundant crushed shells
wall rock	Vertical wall of outcropping bedrock or rock slabs on end

<b>Relief</b>	<b>Definition</b>
high relief	> 60% substratum/relief complexity
moderate relief	30-60%
low relief	5-30%
flat relief	0-5%
bioturbated	>50% of surface area is hummocky with burrows & animal tracks
sand waves	>60 cm
sand ripples	10-60 cm
subtle waveripple	<10 cm

<b>Additional Descriptors</b>	<b>Definition</b>
interface	A rapid change in substrate when not on an observation call
animal track	Imprints from invertebrates or fish in soft sediment
fishing tracks	Tracks unmistakably made from fishing gear such as a trawl net
fishing gear	Pots, line, cable, derelict gear
burrow	Large burrows formed by fish or large invertebrates
mound	Mounds formed from burrowing animals, that are not sand waves
trash	Anthropogenic debris

<b>Species/Taxa</b>		
algae	gorgonian	rosy rockfish
anemone	greenspotted rockfish	sable fish
anemone in sediment	greenstriped rockfish	sand dab
animal track	hagfish	scour
basket star	halfbanded rockfish	sea hare
bivalves	hydroids	sea pen
blackeye goby	incomplete	sea slug
bocaccio	interface	sea star
brachiopod	invertebrates	seawhip
brittle star on sediment	lingcod	sebastomas
burrow	luidea	shark
chondrichthyan egg case	mediaster	skate
combfish	metridium	splitnose rockfish
copper rockfish	midshipman	squarespot rockfish
crab	mollusc egg	squid
crab box	mound	squid egg
crinoid	octopus	starry rockfish
cucumber	other fish	stripetail rockfish
cuskeel	pacific hake	sunstar
dover sole	photo	thornyhead rockfish
drift weed	pink seaperch	trash
dungeness	poacher	tubeworm
eel pout	prawns	urchin
eel-like	pygmy rockfish	vermilion or canary rockfish
encrusted sponge	ratfish	white brittle star in sediment
fishing gear	red anemone	white urchin
fishing tracks	red brittle star in sediment	widow rockfish
flag rockfish	rex or slender sole	yelloweye rockfish
flatfish	rockfish	yellowtail or olive rockfish
gastropod	rockfish<15	yoy<5