

Sanctuary Ecologically Significant Area (SESA)

SESA 6: Offshore Santa Cruz

Description

SESA 6 covers a wide range of benthic habitats including a mix of hard (13%) and soft bottom in shelf, shelf break, and slope depth zones (89-1,262 m). This SESA includes the head of a small, unnamed canyon to the west of Soquel Canyon and a portion of the western wall of Monterey Canyon. This SESA has the highest habitat diversity (index = 6.62) and high habitat richness (10 habitats). Surveys to characterize benthic habitats and communities (using camera sled, submersibles, and ROVs) have occurred over hard and mixed substrate in the shelf and shelf break depth zones, and in canyon habitats (e.g., canyon head, wall, and floor). There are thousands of records of structure-forming invertebrates – soft corals and gorgonians, brachiopods, crinoids, stony corals, sponges, and chemosynthetic communities – from these surveys. Other types of research in the SESA include seafloor processes, oceanographic monitoring stations, and seabird and mammals surveys. The water over this SESA is highly productive, a hotspot for krill, and a foraging hotspot for leatherback sea turtle, Ashy Storm-Petrel, Sooty Shearwater, and marine mammals (e.g., Dall's porpoise, dolphins, sea lions, blue whale, humpback whale). SESA 6 is located to the west of Soquel Canyon State Marine Conservation Area (SMCA). This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

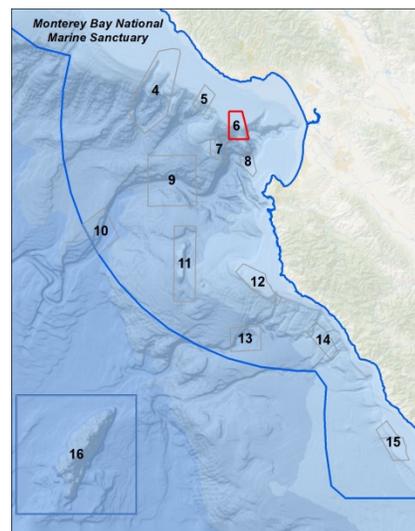


Figure 1. The location of SESA 6 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Resource Management Issues

SESA 6 has been heavily used as commercial fishing grounds. Fishing methods with footprints include bottom trawling, bottom longline, pot/trap, and hook-and-line gear. The area also contains demersal fishes conservation area.

- Adjacent to State MPA: Soquel Canyon SMCA
- Commercial benthic fixed gear
- Commercial bottom trawl
- Rockfish Conservation Area (trawl)
- Essential Fish Habitat (EFH) Conservation Area
- EFH bottom trawl closure proposed (2013)
- Recreational fishing
- Wildlife viewing
- Lost shipping containers
- Active landslide area
- Lost fishing gear recovered
- Leatherback sea turtle critical habitat
- Green sturgeon critical habitat



Figure 2. Close-up map of SESA 6. Grey border=SESA boundary (left); yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; orange=commercial benthic fixed gear dominant use; light blue border=State MPA(right). Source: SESAs Interactive Map, <http://sanctuarymonitoring.org/maps/sesa/>.

Living Marine Resources & Uses

Table 1. Species known to occur within SESA 6: Offshore Santa Cruz.

<p>Invertebrates</p>	<ul style="list-style-type: none"> -sponges† (Porifera) -hydroids (Hydrozoa) -white-plumed anemone (<i>Metridium</i> sp.) -soft corals† (Alcyonacea), e.g., <i>Clavularia</i> sp., <i>Heteropolypus ritteri</i>, <i>Paragorgia</i> sp., Plexauridae, <i>Swiftia</i> spp., Primnoidae, <i>Isidella</i> sp. -stony corals† (Scleractinia), e.g., <i>Caryophyllina</i> sp. -sea pens† (Pennatulacea), e.g., Halopteridae, Virgulariidae -sea slugs (Gastropoda), e.g., <i>Tochuina tetraquetra</i>, <i>Pleurobranchaea californica</i> -octopi (Cephalopoda) -brachiopods† (Brachiopoda) -sea lilies (Crinoidea), e.g., <i>Psathyrometra fragilis</i> -sea stars (Asteroidea), e.g., sun flower star (<i>Pycnopodia</i> sp. or <i>Rathbunaster</i> sp.), <i>Mediaster aequalis</i>, sand star (<i>Luidia</i> sp.) -basket stars and brittle stars (Ophiuroidea) -fragile sea urchin (<i>Allocentrotus fragilis</i>) -sea cucumbers (Holothuroidea) <p>(CSUMB/MBNMS videos and stills; MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)</p>
<p>Fishes</p>	<ul style="list-style-type: none"> -Spotted Ratfish (<i>Hydrolagus colliei</i>) -skates (Rajidae) -rockfishes (<i>Sebastes</i> spp.), e.g., Greenstriped, Yelloweye⁴, Darkblotched⁴, Canary⁴, Vermilion, Splitnose, Halfbanded, Aurora -Longspine Thornyhead (<i>Sebastolobus altivelis</i>) -Sablefish (<i>Anoplopoma fimbria</i>) -Lingcod (<i>Ophiodon elongatus</i>) -Petrale Sole⁴ (<i>Eopsetta jordani</i>) -Dover Sole (<i>Microstomus pacificus</i>) -English Sole (<i>Parophrys vetulus</i>) <p>(CSUMB/MBNMS videos, stills; MBNMS 2013)</p>

Marine birds	<ul style="list-style-type: none"> -Pacific Loon (<i>Gavia pacifica</i>) -Clark's Grebe (<i>Aechmophorus clarkia</i>), Western Grebe (<i>A. occidentalis</i>) -Black-footed Albatross³ (<i>Phoebastria nigripes</i>) -Northern Fulmar (<i>Fulmarus glacialis</i>) -Buller's Shearwater (<i>Puffinus bulleri</i>), Pink-footed Shearwater³ (<i>P. creatopus</i>), Sooty Shearwater (<i>P. griseus</i>) -Ashy Storm-Petrel³ (<i>Oceanodroma homochroa</i>) -California Brown Pelican (<i>Pelecanus occidentalis californicus</i>) -California Gull (<i>Larus californicus</i>), Heermann's Gull (<i>L. heermanni</i>), Western Gull (<i>L. occidentalis</i>), Sabine's Gull (<i>Xema sabini</i>) -Black-legged Kittiwake (<i>Rissa tridactyla</i>) -Common Murre (<i>Uria aalge</i>) -Cassin's Auklet³ (<i>Ptychoramphus aleuticus</i>) -Rhinceros Auklet (<i>Cerorhinea monocerata</i>) (Ainley et al. 2012)
Marine mammals	<ul style="list-style-type: none"> -blue whale¹ (<i>Balaenoptera musculus</i>) -humpback whale¹ (<i>Megaptera novaeangliae</i>) -gray whale (<i>Eschrichtius robustus</i>) -dolphins (Odontoceti), e.g., Northern right-whale dolphin (<i>Lissodelphis borealis</i>), Risso's dolphin (<i>Grampus griseus</i>), Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>), Dall's porpoise (<i>Phocoenoides dalli</i>) Marine mammals list continued: -seals (Phocidae), e.g., harbor seal (<i>Phoca vitulina</i>), Northern elephant seal (<i>Mirounga angustirostris</i>) -sea lions (Otariinae), e.g., Stellar sea lion² (<i>Eumetopias jubatus</i>), California sea lion (<i>Zalophus californianus</i>) (NOAA, 2003)
Marine reptiles	<ul style="list-style-type: none"> -leatherback sea turtle¹ (<i>Dermochelys coriacea</i>) (NOAA, 2003)

Special Status Species: Endangered¹, Threatened², Birds of Conservation Concern³, Overfished⁴; Biogenic habitat†

Diverse or productive communities:

- high primary productivity
- krill hotspot
- marine bird and mammal high diversity

Migration, breeding, or foraging areas:

- Dall's porpoise, dolphins, sea lions, blue whale and humpback whale (ESI-Environmental Sensitivity Index)
- Ashy Storm-Petrel (ESI)
- 50% in leatherback sea turtle principal foraging area, 100% in leatherback sea turtle NMFS critical habitat
- 100% in Sooty Shearwater (IBA-Important Bird Area)

Research

SIMoN projects:

- Archival of Midwater and Benthic Survey Data at Moss Landing Marine Laboratories (1972-2013)
<http://sanctuarysimon.org/projects/100170/archival-of-midwater-and-benthic-survey-data-at-moss-landing-marine-laboratories>
- Center for Integrated Marine Technologies: Wind to Whales (1997-2008)
<http://sanctuarysimon.org/projects/100155/center-for-integrated-marine-technologies%3a-wind-to-whales>
- CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)
<http://sanctuarysimon.org/projects/100273/cscape%3a--collaborative-survey-of-cetacean-abundance-and-the-pelagic-ecosystem>
- Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)
<http://sanctuarymonitoring.org/projects/100373/deepwater-characterization-and-baseline-monitoring-in-the-monterey-bay-national-marine-sanctuary>
- Deepwater Demersal Fishes and Habitats (1992-current)
<http://sanctuarysimon.org/projects/100162/deepwater-demersal-fishes-and-habitats>
- In-situ Measurements of Turbidity Currents in the Monterey Submarine Canyon (2002-03)
<http://sanctuarysimon.org/projects/100277/in-situ-measurements-of-turbidity-currents-in-the-monterey-submarine-canyon>
- Long-term Monitoring of Groundfishes in the Monterey Bay National Marine Sanctuary (2003-current)
<http://sanctuarysimon.org/projects/100145/long-term-monitoring-of-groundfishes-in-the-monterey-bay-national-marine-sanctuary>
- Marine Protected Area Monitoring and Shelf Characterization in Monterey Bay National Marine Sanctuary (2007-09)
http://www.sanctuarysimon.org/projects/project_info.php?projectID=100320
- Monitoring whales by Cascadia Research Collective (1991-current)
<http://sanctuarymonitoring.org/projects/100152/monitoring-whales-by-cascadia-research-collective>
- Ocean observing in the Monterey Bay National Marine Sanctuary: CalCOFI and the MBARI time series (1988-current)
<http://sanctuarymonitoring.org/projects/100304/ocean-observing-in-the-monterey-bay-national-marine-sanctuary%3a-calcofi-and-the-mbari-time-series----->
- Pattern and Dynamics of Benthic Soft Sediment Faunal Communities (1994-current)
<http://sanctuarysimon.org/projects/100169/pattern-and-dynamics-of-benthic-soft-sediment-faunal-communities>
- Phytoplankton toxins in critical prey species in the Monterey Bay National Marine Sanctuary (2007)
<http://sanctuarymonitoring.org/projects/100296/phytoplankton-toxins-in-critical-prey-species-in-the-monterey-bay-national-marine-sanctuary>
- Population Dynamics of Sessile Deep-sea Invertebrates in Monterey Bay (1994-current)
<http://sanctuarymonitoring.org/projects/100168/population-dynamics-of-sessile-deep-sea-invertebrates-in-monterey-bay>
- Sea Turtle Restoration Project: Leatherback Watch Program (2010-current)
<http://sanctuarymonitoring.org/projects/100395/sea-turtle-restoration-project%3a-leatherback-watch-program->
- Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) (2004-current)
<http://sanctuarymonitoring.org/projects/100224/structure-of-populations%2c-levels-of-abundance-and-status-of-humpbacks-%28splash%29>
- Tagging of Pacific Predators (TOPP) (2000-current)
<http://sanctuarymonitoring.org/projects/100137/tagging-of-pacific-predators-%28topp%29>
- Tracking Black-footed Albatross Movements and Conservation (2004-08)
<http://sanctuarysimon.org/projects/100305/tracking-black-footed-albatross-movements-and-conservation>
- Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
<http://sanctuarymonitoring.org/projects/100153/underwater-behavior-of-large-whales-using-suction-cup-attached-tags>
- usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)
<http://sanctuarymonitoring.org/projects/100247/usseabed%3a-a-usgs-pacific-coast-offshore-surficial-sediment-data-and-mapping-project>

Monitoring stations and/or data collection instruments:

- MBARI M1 buoy
- CIMT survey tracklines (historic)
- NMFS West Coast Bottom Trawl Groundfish Survey
- Delta submersible, NMFS

MBNMS research:

- CTD profile (NOAA Ship Shimada, 2015)
- Mid-water fish trawl (NOAA Ship Shimada, 2015)

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_extraction_trawling.pdf

- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_characterization.pdf

- What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_characterization_slope.pdf

- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_habs.pdf

- How do HABs affect local species populations?

Impacts on Whales from Human Uses

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_whale_science.pdf

- What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?

Socioeconomics and the Human Dimension

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_socioeconomics.pdf

- How do we determine the overall impact of multiple human activities (some with negative and some with positive influence) on Sanctuary resources?

Water Quality Integrated Analyses

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_water_quality.pdf

- Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.

SESAs Interactive Map: <http://sanctuariesimon.org/maps/sesa>

Publically Available Imagery

- CSUMB/MBNMS camera sled and ROV (<http://sep.csUMB.edu/ifame/scid/>)
- SIMoN Photo Library (<http://sanctuariesimon.org/photos/index.php>)
- MBARI ROV: Video Annotation and Reference System (<http://www.mbari.org/products/research-software/video-annotation-and-reference-system-vars/>)



Figure 3. Fragile pink urchin (*Strongylocentrotus fragilis*), Sandpaper Skate (*Bathyraja interrupta*).
Credit: IfAME/MBNMS/MARE/TNC
(<http://www.sanctuariesimon.org/photos/index.php>).



Figure 4. Dover Sole (*Microstomus pacificus*).
Credit: IfAME/CSUMB/MBNMS
(<http://sep.csUMB.edu/ifame/scid/>).

SESA Data Layers

Table 2. The 13 SESAs of the MBNMS are comprised of a variety of biological and environmental characteristics that describe unique pelagic and benthic deep sea communities. Listed are a subset of these qualities which include habitat diversity (Shannon-Wiener diversity index); hard substrate area coverage (%); the most common type of habitat; the presence and abundances of corals and sponges, demersal fishes, and marine birds; and the area coverage (%) of upwelling zone within each SESA. Sources: Draft MBNMS report in preparation; SESAs Interactive Map, <http://sanctuarymonitoring.org/maps/sesa/>.

SESA	Habitat diversity (H')	Hard substrate (%)	Primary habitat	Corals & sponges	Demersal fishes	Marine birds	Upwelling zone (%)
4	5.43	8%	Slope 2 soft canyon	yes-high	yes-high	yes-high	yes-50%
5	6.13	19%	Slope 1 Soft Canyon	yes- high	yes-med	yes-med	yes-100%
6	6.62	13%	Shelf Break soft	yes-high	yes-low	yes-med	no
7	3.52	9%	Slope 2 soft canyon	yes-med	yes-high	yes-med	no
8	5.32	33%	Slope 2 soft canyon	yes-med	yes-med	yes-high	no
9	2.34	5%	Slope 2 soft canyon	yes-high	yes-high	yes-low	no
10	3.23	1%	Rise soft canyon	yes-med	not sampled	yes-low	no
11	1.56	16%	Slope 2 soft	yes-med	yes-high	yes-low	no
12	4.17	32%	Shelf hard	yes-med	yes-high	yes-med	yes-50%
13	2.00	0%	Slope 2 soft	yes-low	not sampled	yes-low	no
14	2.41	0%	Slope 1 Soft	yes-med	yes-high	yes-med	yes-50%
15	5.31	18%	Shelf Break soft	yes-med	yes-med	yes-med	yes-25%
16	3.12	73%	Slope 2 hard	yes-high	yes-high	yes-low	no

Selected Publications

- Aiken E, Baruch N, Basset M, Carlson R, Cuzick M, et al., Lindholm J. 2013. Characterization of Demersal Fish Assemblages Within Seven Sanctuary Ecologically Significant Areas in the MBNMS. Poster presentation at Sanctuary Currents Symposium, Seaside, CA. Available at: <http://montereybay.noaa.gov/research/techreports/trmsci4702013.html>
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