

Sanctuary Ecologically Significant Area (SESA)

SESA 4: Año Nuevo and Ascension Canyon

Description

SESA 4 covers a wide range of benthic habitats and features including the shelf (starting at 58 m) and shelf break off Pt. Año Nuevo, the heads of Año Nuevo and Ascension canyons, and the convergence of the canyon axes (at approximately 2,200 m). This SESA has the highest habitat richness (12 habitats) and third highest habitat diversity (index = 5.43). Patches of hard bottom (8% of SESA) are found mostly along the canyon walls. Benthic trawls on the shelf and shelf break have captured a few structure-forming invertebrates and a fish fauna of intermediate richness (mean = 16 species) and diversity (mean index = 1.42). Surveys to characterize benthic habitats and communities (using camera sled, submersibles, and ROVs) have occurred on the shelf and shelf break, and in both canyons. There are hundreds of records of structure-forming invertebrates - such as soft corals (e.g. gorgonians), crinoids, brachiopods, black corals, sponges, and a chemosynthetic community - from these surveys. The water over this SESA is highly productive (in an upwelling zone), a hotspot for krill, and a foraging hotspot for a variety of predators (e.g., leatherback sea turtle, Ashy Storm-Petrel, Sooty Shearwater, and seabirds nesting at Año Nuevo Island). Seabird density is elevated year-round over the canyon heads. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

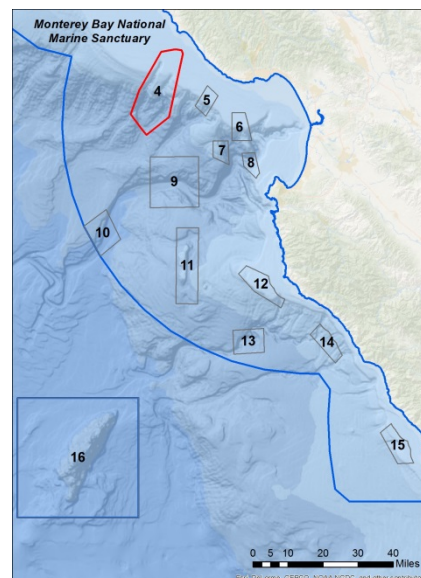


Figure 1. The location of SESA 4 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Resource Management Issues

SESA 4 has been heavily used as commercial fishing grounds and also contains demersal fishes conservation area.

- Adjacent to State MPA: Greyhound Rock 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
- Commercial shipping lane
- Wildlife viewing
- Leatherback sea turtle critical habitat
- Green Sturgeon critical habitat

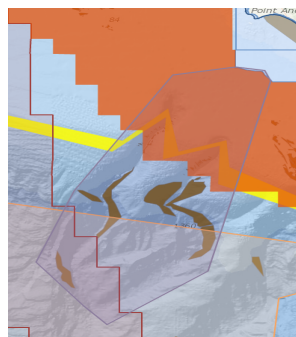


Figure 2. Close-up map of SESA 4. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; orange=Commercial benthic fixed gear dominant use; light blue border=State MPA; red border=Dominant shipping lane. Source: SESAs Interactive Map, <http://sanctuarymonitoring.org/maps/sesa/>.

Living Marine Resources & Uses

Table 1. Species known to occur within SESA 4: Año Nuevo and Ascension Canyon.

| | |
|-----------------------------|--|
| <p>Invertebrates</p> | <ul style="list-style-type: none"> -sponges† (Porifera), e.g., <i>Farrea occa</i>, vase, mound, foliose, barrel, upright, and branching -black corals† (Antipatharia) -anemones (Actiniaria), e.g., sand anemones, pompom (<i>Liponema brevicornis</i>), white-plumed (<i>Metridium</i> sp.), swimming anemone -soft corals† (Alcyonacea), e.g., <i>Heteropolypus ritteri</i>, gorgonians, <i>Paragorgia</i> sp., Primnoidea, Isididae, Plexauridae -sea pens† (Pennatulacea), e.g., <i>Funiculina</i> spp., plumed sea pens, orange sea pens, <i>Umbellula lindahli</i> (Subselliflorae), Anthoptilidae, Antipathidae, Halipteridae -sea slug (<i>Pleurobranchaea californica</i>) -octopi (Cephalopoda) -spot prawns (<i>Pandalus platyceros</i>), hermit crabs, <i>Cancer</i> sp. -brachiopods† (Brachiopoda) -sea lilies (Crinoidea), e.g., <i>Florometra serratissima</i> -sea stars (Asteroidea), e.g., sunflower star (<i>Pycnopodia</i> sp. or <i>Rathbunaster</i> sp.), sand star (<i>Luidia</i> sp.) -basket stars, brittle stars (Ophiuroidea) -fragile pink urchin (<i>Allocentrotus fragile</i>) -sea cucumbers (Holothuroidea), <i>Psolus</i> sp. <p>(Bianchi 2011; 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"> -Filetail Catshark (<i>Parmaturus xanirurus</i>) -Sandpaper Skate (<i>Bathyraja kincaidii</i>), Longnose Skate (<i>Raja rhina</i>) -Pacific Hake (<i>Merluccius productus</i>) -rockfishes (<i>Sebastes</i> spp.), e.g., Stripetail, Greenstriped, Splitnose -Shortspine Thornyhead (<i>Sebastolobus alascanus</i>) -poachers (Agonidae) -Blackbelly Eelpout (<i>Lycodes pacificus</i>) -Rex Sole (<i>Glyptocephalus zachirus</i>), Dover sole (<i>Microstomus pacificus</i>) <p>(Bizzarro et al. 2003; CSUMB/MBNMS videos and stills; MBARI VARS imagery)</p> |
| <p>Marine birds</p> | <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>) -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>) -Brandt's Cormorant (<i>Phalacrocorax penicillatus</i>) -Black Scoter (<i>Melanitta nigra</i>), Surf Scoter (<i>M. perspicillata</i>), White-Winged Scoter (<i>M. fusca</i>) -Red-necked Phalarope (<i>Phalaropus lobatus</i>) -California Gull (<i>Larus californicus</i>), Western Gull (<i>L. occidentalis</i>) -Common Murre (<i>Uria aalge</i>) -Cassin's Auklet³ (<i>Ptychoramphus aleuticus</i>) -Rhinoceros Auklet (<i>Cerorhina monocerata</i>) <p>(Ainley et al. 2012)</p> |

| | |
|-----------------|---|
| 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>) -seals (Phocidae), e.g., harbor seal (<i>Phoca vitulina</i>), Northern elephant seal (<i>Mirounga angustirostris</i>) -Northern fur seal (<i>Callorhinus ursinus</i>) -sea lions (Otarinae), 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; Biogenic habitat†

Diverse or productive communities:

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

Migration, breeding, or foraging areas:

- diving gulls and seabirds (ESI, Environmental Sensitivity Index)
- Ashy Storm-Petrel (ESI)
- 25% in leatherback sea turtle principal foraging area
- 100% in leatherback sea turtle NMFS critical habitat
- 80% 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://www.sanctuariesimon.org/projects/project_info.php?projectID=100170

Center for Integrated Marine Technologies: Wind to Whales (1997-2008)

<http://sanctuariesimon.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://sanctuariesimon.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>

Marine Protected Area Monitoring and Shelf Characterization in Monterey Bay National Marine Sanctuary (2007-09)

http://www.sanctuariesimon.org/projects/project_info.php?projectID=100320

Midwater Trawl Pre-recruit Survey (1983-current)

<http://sanctuarymonitoring.org/projects/100118/midwater-trawl-pre-recruit-survey>

Monitoring whales by Cascadia Research Collective (1991-current)

<http://sanctuarymonitoring.org/projects/100152/monitoring-whales-by-cascadia-research-collective>

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/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://sanctuariesimon.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:

- NMFS mid-water trawl stations
- NMFS West Coast Bottom Trawl Groundfish Survey
- Delta submersible, NMFS

MBNMS research:

- CTD profile (NOAA Ship Shimada, 2015)
- CSUMB shelf characterization 2007-2011

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. Pompom anemone (*Liponema brevicornis*).
Credit: IfAME/CSUMB/MBNMS/MARE
(<http://sep.csUMB.edu/ifame/scid/>).



Figure 4. Petrale Sole (*Eopsetta jordani*). 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>
- Ainley D, Spear L, Casey J, Ford RG, Gill T, et al. 2012. Chapter 3: Biogeography of Marine Birds. A Biogeographic Assessment off North/Central California. Retrieved from Center for Coastal Monitoring and Assessment (NCCOS), National Ocean Service. <http://ccma.nos.noaa.gov/ecosystems/sanctuaries/california/html/birds/>
- Airam S, Gaines SS, Caldow C. 2003. Ecological Linkages: Marine and Estuarine Ecosystems of Central and Northern California. NOAA, National Ocean Service, Silver Spring, MD. 1-164.
- Benson SR, Forney KA, Harvey JT, Carretta JV, Dutton PH. 2007. Abundance, Distribution, and Habitat of Leatherback Turtles (*Dermochelys coriacea*) Off California, 1990– 2003. *Fishery Bulletin*, 105(3): 337-347. Available at: http://aquaticcommons.org/8876/1/benson_Fish_Bull_2007.pdf
<http://montereybay.noaa.gov/research/techreports/trbenson2007.html>.
- Bianchi C. 2011. Abundance and Distribution of Megafaunal Invertebrates in NE Pacific Submarine Canyons and Their Ecological Associations with Demersal Fishes. Master of Science Thesis, Washington State University. 68 pp.
- Bizzarro JJ, Field JM, Lea RN, Greene HG, de Marignac J. 2003. Habitat Associations of Upper Slope Rockfishes (Sebastes SPP.) and Co-occurring Demersal Fishes in Ascension Canyon, California. Monterey Bay National Marine Sanctuary Symposium, Sanctuary Currents: 11 pp. <http://montereybay.noaa.gov/research/techreports/trbizz2003.html>
- Brown JA, EJ Burton, S De Beukelaer. 2013. The Natural Resources of Monterey Bay National Marine Sanctuary: A Focus on Federal Waters. Marine Sanctuaries Conservation Series ONMS-13-05. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 264 pp. Available at: <http://montereybay.noaa.gov/research/techreports/trbrown2013.html>
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- Hall RA and Glenn SC. 2011. Internal Tides in Monterey Submarine Canyon. *Journal of Physical Oceanography*, 41(1): 186-204.
- Hartwell IS. 2008. Distribution of DDT and Other Persistent Organic Contaminants in Canyons and on the Continental Shelf off the Central California Coast. *Marine Environmental Research*, 65 (3): 199-217.
- Institute for Applied Marine Ecology and Monterey Bay National Marine Sanctuary. 2011. Characterizing the Deep: Surveys in the Monterey Bay National Marine Sanctuary 2007-2010. 14pp. Available at: <http://montereybay.noaa.gov/research/techreports/trifame2011.html>
- Greene GH, Hicks KR. 1990. Ascension – Monterey Canyon System: History and Development. *Geology and Tectonics of the Central California Coast Region - San Francisco to Monterey*. 229-249.
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McGann M. 2014. Delivery of Terrigenous Material to Submarine Fans: Biological Evidence of Local, Staged, and Full-Canyon Sediment Transport Down the Ascension-Monterey Canyon System. *Geosphere*, 10(6): 1061-1075.

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