Introduction

As part of an ecosystem based management approach, thirteen Sanctuary Ecologically Significant Areas (SESA's) have been identified within Monterey Bay National Marine Sanctuary (MBNMS; http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html). These special areas encompass remarkable, representative and/or sensitive marine habitats, communities and ecological processes. They will be focal areas for facilitating research to better understand natural and human-caused variation, as well as for resource protection.

SESA's will support the following management needs:

1. Detailed information on focal areas improves our ability to adaptively manage these important resources, and serve as test cases for other areas within MBNMS. This information also prepares staff for engaging on upcoming management processes such as the NMFS 5-yr Review of Groundfish Essential Fish Habitat, as well as anticipating future potential issues including offshore energy development, offshore aquaculture, oil spills, shipping lanes, noise or climate change.

2. Targeting research and monitoring efforts in focal areas and coordinating with the scientific community. Findings from focal areas may be extrapolated to other areas within MBNMS, guiding future management decisions and policy.

3. Applied spatial management tools (such as SESAs) are needed to effectively measure and evaluate protection levels in high value habitat in preparation for upcoming management plan review processes.

Available data for each SESA have been summarized into Quick Look Reports, which include site descriptions, resource management issues, living marine resources, historic and ongoing research and monitoring, science needs, maps, imagery, and selected publications. The purpose of these Quick Look Reports is to provide summary information to our potential partners and organizations, particularly in the research community, with which MBNMS can collaborate to address information needs.
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).

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

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/seca/.
## Living Marine Resources & Uses

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

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-sponges† (Porifera), e.g., Farrea occa, vase, mound, foliose, barrel, upright, and branching</td>
<td></td>
</tr>
<tr>
<td>-black corals† (Antipatharia)</td>
<td></td>
</tr>
<tr>
<td>-anemones (Actiniaria), e.g., sand anemones, pompom (Liponema brevicornis), white-plumed (Metrinia sp.), swimming anemone</td>
<td></td>
</tr>
<tr>
<td>-soft corals† (Alcyonacea), e.g., Heteropolypus ritteri, gorgonians, Paragorgia sp., Primnoidea, Isididae, Plexaurida</td>
<td></td>
</tr>
<tr>
<td>-sea pens† (Pennatulacea), e.g., Funiculina spp., plumed sea pens, orange sea pens, Umbellula lindahli (Subselliflorae), Anthoptilidae, Antiopathidae, Halipteridae</td>
<td></td>
</tr>
<tr>
<td>-sea slug (Pleurobranchaea californica)</td>
<td></td>
</tr>
<tr>
<td>-octopi (Cephalopoda)</td>
<td></td>
</tr>
<tr>
<td>-spot prawns (Pandalus platyceros), hermit crabs, Cancer sp.</td>
<td></td>
</tr>
<tr>
<td>-brachiopods† (Brachiopoda)</td>
<td></td>
</tr>
<tr>
<td>-sea lilies (Crinoidea), e.g., Florometra serrissima</td>
<td></td>
</tr>
<tr>
<td>-sea stars (Asteroidea), e.g., sunflower star (Pycnopodia sp. or Rathbunaster sp.), sand star (Luidia sp.)</td>
<td></td>
</tr>
<tr>
<td>-basket stars, brittle stars (Ophiuroidea)</td>
<td></td>
</tr>
<tr>
<td>-fragile pink urchin (Allocentrotus fragile)</td>
<td></td>
</tr>
<tr>
<td>-sea cucumbers (Holothuroidea), Psolus sp. (Bianchi 2011; CSUMB/MBNMS videos and stills; MBARI VARS imagery)</td>
<td></td>
</tr>
<tr>
<td>-Pacific Loon (Gavia pacifica)</td>
<td></td>
</tr>
<tr>
<td>-Clark’s Grebe (Aechmophorus clarkia), Western Grebe (A. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Northern Fulmar (Fulmarus glacialis)</td>
<td></td>
</tr>
<tr>
<td>-Buller’s Shearwater (Puffinus bulleri), Pink-footed Shearwater* (P. creatopus), Sooty Shearwater (P. griseus)</td>
<td></td>
</tr>
<tr>
<td>-Herring Gull (Larus argentatus), Western Gull (L. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Knife-billed Hummingbird (Chlorostilbon mellisugus)</td>
<td></td>
</tr>
<tr>
<td>-California Gull (Larus californicus), Western Gull (L. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Common Murre (Uria aalge)</td>
<td></td>
</tr>
<tr>
<td>-Cassin’s Auklet† (Ptychoramphus aleuticus)</td>
<td></td>
</tr>
<tr>
<td>-Rhinoceros Auklet (Cerorhinea monocerata) (Ainley et al. 2012)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fishes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-Filetail Catshark (Parmaturus xaniurus)</td>
<td></td>
</tr>
<tr>
<td>-Sandpaper Skate (Bathyraja kincaidii), Longnose Skate (Raja rhina)</td>
<td></td>
</tr>
<tr>
<td>-Pacific Hake (Merluccius productus)</td>
<td></td>
</tr>
<tr>
<td>-rockfishes (Sebastes spp.), e.g., Stripetail, Greenstriped, Splitnose</td>
<td></td>
</tr>
<tr>
<td>-Shortspine Thornyhead (Sebastolobus alascanus)</td>
<td></td>
</tr>
<tr>
<td>-poachers (Agonidae)</td>
<td></td>
</tr>
<tr>
<td>-Blackbelly Eelpout (Lycodes pacificus)</td>
<td></td>
</tr>
<tr>
<td>-Rex Sole (Glyptocephalus zachirus), Dover sole (Microstomus pacificus)</td>
<td></td>
</tr>
<tr>
<td>(Bizzarro et al. 2003; CSUMB/MBNMS videos and stills; MBARI VARS Imagery)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marine birds</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-Pacific Loon (Gavia pacifica)</td>
<td></td>
</tr>
<tr>
<td>-Clark’s Grebe (Aechmophorus clarkia), Western Grebe (A. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Northern Fulmar (Fulmarus glacialis)</td>
<td></td>
</tr>
<tr>
<td>-Buller’s Shearwater (Puffinus bulleri), Pink-footed Shearwater* (P. creatopus), Sooty Shearwater (P. griseus)</td>
<td></td>
</tr>
<tr>
<td>-Herring Gull (Larus argentatus), Western Gull (L. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Knife-billed Hummingbird (Chlorostilbon mellisugus)</td>
<td></td>
</tr>
<tr>
<td>-California Gull (Larus californicus), Western Gull (L. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Common Murre (Uria aalge)</td>
<td></td>
</tr>
<tr>
<td>-Cassin’s Auklet† (Ptychoramphus aleuticus)</td>
<td></td>
</tr>
<tr>
<td>-Rhinoceros Auklet (Cerorhinea monocerata) (Ainley et al. 2012)</td>
<td></td>
</tr>
</tbody>
</table>
Marine mammals

- blue whale¹ (Balaenoptera musculus)
- humpback whale¹ (Megaptera novaeangliae)
- gray whale (Eschrichtius robustus)
- dolphins (Odontoceti), e.g., Northern right-whale dolphin (Lissodelphis borealis), Risso’s dolphin (Grampus griseus), Pacific white-sided dolphin (Lagenorhynchus obliquidens), Dall’s porpoise (Phocoenoides dalli)
- seals (Phocidae), e.g., harbor seal (Phoca vitulina), Northern elephant seal (Mirounga angustirostris), Northern fur seal (Callorhinus ursinus), Pacific white-sided dolphin (Lagenorhynchus obliquidens)
- sea lions (Otariinae), e.g., Stellar sea lion² (Eumetopias jubatus), California sea lion (Zalophus californianus)

Marine reptiles

- leatherback sea turtle¹ (Dermochelys coriacea) (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.sanctuarysimon.org/projects/project_info.php?projectID=100170

http://sanctuarysimon.org/projects/100155/cfimt-wind-to-whales

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)

Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)

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

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)
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)
Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

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
- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf
- What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
- How do HABs affect local species populations?

Impacts on Whales from Human Uses
- 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

• 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

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

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

• CSUMB/MBNMS camera sled and ROV (http://sep.csumb.edu/ifame/scid/)
• SIMoN Photo Library (http://sanctuarysimon.org/photos/index.php)

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/](http://sanctuarymonitoring.org/maps/sesa/).

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


For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html


Description

SESA 5 contains a mixture of hard (19%) and soft bottom on the outer shelf and shelf break off Davenport and the head of Cabrillo Canyon (south central portion); and covers a broad depth range (83-964 m). This SESA has the second highest habitat richness (11 habitats) and habitat diversity (index = 6.13). A few corals and brachiopod beds have been observed in this SESA; data on abundance and distribution of structure-forming invertebrates is limited. Richness and diversity of the benthic fish fauna appears to be intermediate based on benthic trawls in and around this SESA. The waters over this SESA is highly productive (in an upwelling zone), is a hotspot for krill, and a foraging hotspot for a variety of predators (e.g., leatherback sea turtle, Ashy Storm-Petrel, Sooty Shearwater, harbor porpoise). Surveys to characterize benthic habitats and communities (using camera sled, submersibles, and ROVs) have occurred on the shelf and shelf break. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 5 has been used as commercial fishing grounds and also contains proposed demersal fishes conservation area.

- 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
- Leatherback sea turtle critical habitat
- Green Sturgeon critical habitat

Figure 1. The location of SESA 5 and twelve additional SEASAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 5. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; orange=commercial benthic fixed gear dominant use. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sea/.
## Living Marine Resources & Uses

Table 1. Species known to occur within SESA 5: Shelf off Davenport/Cabrillo Canyon.

| Invertebrates | -black corals† (Antipatharia)  
| -anemones (Actiniaria), e.g., *Metridium* sp.  
| -soft corals† (Alcyonacea), e.g., *Plexauridae*  
| -octopi (Cephalopoda)  
| -krill (Euphausiacea)  
| -brachiopods† (Brachiopoda)  
| -sea lilies (Crinoidea)  
| -sunflower star (*Pycnopodia* sp. or *Rathbunaster* sp.)  
| -basket stars, brittle stars (Ophiuroidea), e.g., *Ophiocoma* sp.  
| -sea cucumbers (Holothuroidea)  
| (CSUMB/MBNMS videos, stills; NMFS West Coast Bottom Trawl Groundfish Survey) |

| Fishes | -skates (Rajidae)  
| -rockfishes (*Sebastes* spp.), e.g., Halfbanded, Cowcod*, Flag, Pygmy, Rosy, Yellowtail, Starry, Greenstriped, Canary*, Boccacio*  
| -Kelp Greenling (*Hexagrammos decagrammus*)  
| -Lingcod (*Ophiodon elongatus*)  
| -combfish (*Zaniolepis* sp.)  
| -sculpins (Cottidae)  
| -poachers (Agonidae)  
| -Pink Seaperch (*Zalembius rosaceus*)  
| -Blackeye Goby (*Rhinogobiops nicholsii*)  
| -flatfishes (Pleuronectiformes)  
| (CSUMB/MBNMS videos, stills; Laidig et al. 2009) |

| Marine birds | -Pacific Loon (*Gavia pacifica*)  
| -Clark’s Grebe (*Aechmophorus clarkia*), Western Grebe (*A. occidentalis*)  
| -Northern Fulmar (*Fulmarus glacialis*)  
| -Pink-footed Shearwater* (*Puffinus creatopus*), Sooty Shearwater (*P. griseus*)  
| -Ashy Storm-Petrel* (*Oceanodroma homochroa*)  
| -California Brown Pelican (*Pelecanus occidentalis californicus*)  
| -Red-necked Phalarope (*Phalaropus lobatus*)  
| -California Gull (*Larus californicus*), Western Gull (*L. occidentalis*)  
| -Common Murre (*Uria aalge*)  
| -Cassin’s Auklet* (*Ptychoramphus aleuticus*)  
| -Rhinoceros Auklet (*Cerorhinea monocerata*)  
| (Ainley et al. 2012) |

| Marine mammals | -blue whale*† (*Balaenoptera musculus*)  
| -humpback whale*† (*Megaptera novaeangliae*)  
| -gray whale (*Eschrichtius robustus*)  
| -dolphins (Odontoceti), e.g., Risso’s dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall’s porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*)  
| -seals (Phocidae), e.g., harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*)  
| -sea lions (*Otarinae*), e.g., Stellar sea lion*² (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*)  
| (NOAA, 2003) |

| Marine reptiles | -leatherback sea turtle*† (*Dermochelys coriacea*) (NOAA, 2003) |

Special Status Species: Endangered*, Threatened*, Birds of Conservation Concern*, Overfished*; Biogenic habitat†

---

For more information - [http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html](http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html)

Updated: 5/3/2016
Diverse or productive communities:

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

Migration, breeding, or foraging areas:

- Ashy Storm-Petrel (ESI, Environmental Sensitivity Index)
- harbor porpoise (ESI)
- 75% in leatherback sea turtle principal foraging area
- 100% in leatherback sea turtle NMFS critical habitat and 10% in leatherback sea turtle hotspot
- harbor porpoise (ESI) to the NE of area (depending on boundaries)
- 100% in Sooty Shearwater (IBA, Important Bird Area)

Research

SIMoN projects:

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)

http://sanctuarysimon.org/projects/100155/center-for-integrated-marine-technologies%3a-wind-to-whales

Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)

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

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)

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)

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Updated: 5/3/2016

For more information - http://montereybay.noaa.gov/resourcepro/ebmi/seso.html
Monitoring stations and/or data collection instruments:

- 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)
- CSUMB shelf characterization 2007-2011

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery
- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf
- What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
- How do HABs affect local species populations?

Impacts on Whales from Human Uses
- 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
- What is the geographic distribution of human activities that influence the condition of Sanctuary resources? Are there hot spots?

Water Quality Integrated Analyses
- Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.
SESAs Interactive Map: [http://sanctuarysimon.org/maps/sesa](http://sanctuarysimon.org/maps/sesa)

Publically Available Imagery

- CSUMB/MBNMS camera sled and ROV ([http://sep.csumb.edu/ifame/scid/](http://sep.csumb.edu/ifame/scid/))

Figure 3. Sunflower star (*Pycnopodia* sp. or *Rathbunaster* sp.). Credit: IFAME/CSUMB/MBNMS ([http://sep.csumb.edu/ifame/scid/](http://sep.csumb.edu/ifame/scid/)).

Figure 4. Brachiopods (Phylum Brachiopoda). Credit: IFAME/CSUMB/MBNMS ([http://sep.csumb.edu/ifame/scid/](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/](http://sanctuarymonitoring.org/maps/sesa/).

<table>
<thead>
<tr>
<th>SESA</th>
<th>Habitat diversity (H’)</th>
<th>Hard substrate (%)</th>
<th>Primary habitat</th>
<th>Corals &amp; sponges</th>
<th>Demersal fishes</th>
<th>Marine birds</th>
<th>Upwelling zone (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5.43</td>
<td>8%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-high</td>
<td>yes-high</td>
<td>yes-high</td>
<td>yes-50%</td>
</tr>
<tr>
<td>5</td>
<td>6.13</td>
<td>19%</td>
<td>Slope 1 Soft Canyon</td>
<td>yes-high</td>
<td>yes-med</td>
<td>yes-med</td>
<td>yes-100%</td>
</tr>
<tr>
<td>6</td>
<td>6.62</td>
<td>13%</td>
<td>Shelf Break Soft Canyon</td>
<td>yes-high</td>
<td>yes-low</td>
<td>yes-med</td>
<td>no</td>
</tr>
<tr>
<td>7</td>
<td>3.52</td>
<td>9%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-med</td>
<td>yes-high</td>
<td>yes-med</td>
<td>no</td>
</tr>
<tr>
<td>8</td>
<td>5.32</td>
<td>33%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-med</td>
<td>yes-med</td>
<td>yes-high</td>
<td>no</td>
</tr>
<tr>
<td>9</td>
<td>2.34</td>
<td>5%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-high</td>
<td>yes-high</td>
<td>yes-low</td>
<td>no</td>
</tr>
<tr>
<td>10</td>
<td>3.23</td>
<td>1%</td>
<td>Rise Soft Canyon</td>
<td>yes-med</td>
<td>not sampled</td>
<td>yes-low</td>
<td>no</td>
</tr>
<tr>
<td>11</td>
<td>1.56</td>
<td>16%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-med</td>
<td>yes-high</td>
<td>yes-low</td>
<td>no</td>
</tr>
<tr>
<td>12</td>
<td>4.17</td>
<td>32%</td>
<td>Shelf Hard</td>
<td>yes-med</td>
<td>yes-high</td>
<td>yes-med</td>
<td>yes-50%</td>
</tr>
<tr>
<td>13</td>
<td>2.00</td>
<td>0%</td>
<td>Slope 2 Soft Canyon</td>
<td>yes-low</td>
<td>not sampled</td>
<td>yes-low</td>
<td>no</td>
</tr>
<tr>
<td>14</td>
<td>2.41</td>
<td>0%</td>
<td>Slope 1 Soft Canyon</td>
<td>yes-med</td>
<td>yes-high</td>
<td>yes-med</td>
<td>yes-50%</td>
</tr>
<tr>
<td>15</td>
<td>5.31</td>
<td>18%</td>
<td>Shelf Break Soft Canyon</td>
<td>yes-med</td>
<td>yes-med</td>
<td>yes-med</td>
<td>yes-25%</td>
</tr>
<tr>
<td>16</td>
<td>3.12</td>
<td>73%</td>
<td>Slope 2 Hard</td>
<td>yes-high</td>
<td>yes-high</td>
<td>yes-low</td>
<td>no</td>
</tr>
</tbody>
</table>
Selected Publications


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).

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 1. The location of SESA 6 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.
## Living Marine Resources & Uses

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Invertebrates</strong></td>
<td>- sponges† (Porifera)</td>
</tr>
<tr>
<td></td>
<td>- hydroids (Hydrozoa)</td>
</tr>
<tr>
<td></td>
<td>- white-plumed anemone (Metridium sp.)</td>
</tr>
<tr>
<td></td>
<td>- soft corals† (Alcyonacea), e.g., Clavularia sp., Heteropolypus ritteri</td>
</tr>
<tr>
<td></td>
<td>- Paragorgia sp., Plexauridae</td>
</tr>
<tr>
<td></td>
<td>- Swiftia spp., Primnoidea, Isidella sp.</td>
</tr>
<tr>
<td></td>
<td>- stony corals† (Scleractinia), e.g., Caryophyllina sp.</td>
</tr>
<tr>
<td></td>
<td>- sea pens† (Pennatulacea), e.g., Halipteridae, Virgulariidae</td>
</tr>
<tr>
<td></td>
<td>- sea slugs (Gastropoda), e.g., Tochuina tetraquetra, Pleurobranchaea</td>
</tr>
<tr>
<td></td>
<td>californica</td>
</tr>
<tr>
<td></td>
<td>- octopi (Cephalopoda)</td>
</tr>
<tr>
<td></td>
<td>- brachiopods† (Brachiopoda)</td>
</tr>
<tr>
<td></td>
<td>- sea lilies (Crinoidea), e.g., Psathyrometra fragilis</td>
</tr>
<tr>
<td></td>
<td>- sea stars (Asteroidea), e.g., sun flower star (Pycnopodia sp. or</td>
</tr>
<tr>
<td></td>
<td>Rathbunaster sp.), Mediaster aequalis, sand star (Luidia sp.)</td>
</tr>
<tr>
<td></td>
<td>- basket stars and brittle stars (Ophiuroidea)</td>
</tr>
<tr>
<td></td>
<td>- fragile sea urchin (Allocentrotus fragilis)</td>
</tr>
<tr>
<td></td>
<td>- sea cucumbers (Holothuroidea)</td>
</tr>
<tr>
<td></td>
<td>(CSUMB/MBNMS videos and stills; MBARI VARS imagery; NMFS West Coast</td>
</tr>
<tr>
<td></td>
<td>Bottom Trawl Groundfish Survey)</td>
</tr>
<tr>
<td><strong>Fishes</strong></td>
<td>- Spotted Ratfish (Hydrolagus colliei)</td>
</tr>
<tr>
<td></td>
<td>- skates (Rajidae)</td>
</tr>
<tr>
<td></td>
<td>- rockfishes (Sebastes spp.), e.g., Greenstriped, Yelloweye⁴, Darkblotched⁴, Canary⁴, Vermilion, Splitnose, Halfbanded, Aurora</td>
</tr>
<tr>
<td></td>
<td>- Longspine Thornyhead (Sebastolobus altivelis)</td>
</tr>
<tr>
<td></td>
<td>- Sablefish (Anoplopoma fimbria)</td>
</tr>
<tr>
<td></td>
<td>- Lingcod (Ophiodon elongatus)</td>
</tr>
<tr>
<td></td>
<td>- Petrale Sole⁴ (Eopsetta jordani)</td>
</tr>
<tr>
<td></td>
<td>- Dover Sole (Microstomus pacificus)</td>
</tr>
<tr>
<td></td>
<td>- English Sole (Parophrys vetulus)</td>
</tr>
<tr>
<td></td>
<td>(CSUMB/MBNMS videos, stills; MBNMS 2013)</td>
</tr>
</tbody>
</table>
### Marine birds

- Pacific Loon (*Gavia pacifica*)
- Clark’s Grebe (*Aechmophorus clarkia*), Western Grebe (*A. occidentalis*)
- Black-footed Albatross*³* (*Phoebastria nigripes*)
- Northern Fulmar (*Fulmarus glacialis*)
- Buller’s Shearwater (*Puffinus bulleri*), Pink-footed Shearwater*³* (*P. creatopus*),
  Sooty Shearwater (*P. griseus*)
- Ashy Storm-Petrel*³* (*Oceanodroma homochroa*)
- California Brown Pelican (*Pelecanus occidentalis californicus*)
- California Gull (*Larus californicus*), Heermann’s Gull (*L. heermanni*), Western Gull (*L. occidentalis*),
  Sabine’s Gull (*Xema sabinii*)
- Black-legged Kittiwake (*Rissa tridactyla*)
- Common Murre (*Uria aalge*)
- Cassin’s Auklet*³* (*Ptychoramphus aleuticus*)
- Rhinoceros Auklet (*Cerorhinca monocerata*)

(Ainley et al. 2012)

### Marine mammals

- blue whale*¹* (*Balaenoptera musculus*)
- humpback whale*¹* (*Megaptera novaeangliae*)
- gray whale (*Eschrichtius robustus*)
- dolphins (Odontoceti), e.g., Northern right-whale dolphin (*Lissodelphis borealis*),
  Risso’s dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*),
  Dall’s porpoise (*Phocoenoides dalli*)

Marine mammals list continued:

- seals (Phocidae), e.g., harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*)
- sea lions (Otariinae), e.g., Stellar sea lion*²* (*Eumetopias jubatus*),
  California sea lion (*Zalophus californianus*)

(NOAA, 2003)

### Marine reptiles

- leatherback sea turtle*¹* (*Dermochelys coriacea*) (NOAA, 2003)

Special Status Species: Endangered*¹*, Threatened*²*, Birds of Conservation Concern*³*, Overfished*⁴*;
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/100155/center-for-integrated-marine-technologies%3awind-to-whales

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)

Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)

Deepwater Demersal Fishes and Habitats (1992-current)

In-situ Measurements of Turbidity Currents in the Monterey Submarine Canyon (2002-03)


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)

Pattern and Dynamics of Benthic Soft Sediment Faunal Communities (1994-current)

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)

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-

Tagging of Pacific Predators (TOPP) (2000-current)

Tracking Black-footed Albatross Movements and Conservation (2004-08)

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Updated: 5/3/2016

For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
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


- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf


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

Habitat Characterization of the Continental Slope


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

Human Health - Harmful Algal Blooms


- How do HABs affect local species populations?

Impacts on Whales from Human Uses


- 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


- 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


- Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.
SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

- CSUMB/MBNMS camera sled and ROV (http://sep.csumb.edu/ifame/scid/)
- SIMoN Photo Library (http://sanctuarysimon.org/photos/index.php)

Figure 3. Fragile pink urchin (*Strongylocentrotus fragilis*), Sandpaper Skate (*Bathyraja interrupta*). Credit: IfAME/MBNMS/MARE/TNC (http://www.sanctuarysimon.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/esa/](http://sanctuarymonitoring.org/maps/esa/).

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


Nearby studies:


Description

SESA 7 covers a range of deep benthic habitats (700-1,600 m) including a mix of hard (9%) and soft bottom on the south-eastern side of Smooth Ridge and fairly steep habitat along the western wall of Monterey Canyon. This SESA has intermediate levels of habitat diversity (index =3.52) and habitat richness (7 habitats). The benthic habitats and communities have been repeatedly surveyed (MBARI ROV) around the MARS observatory and associated submerged cable (western side of the SESA). Structure-forming invertebrates observed during these surveys include chemosynthetic communities, soft corals and gorgonians, crinoids, and brachiopods. Richness and diversity of the benthic fish fauna appears to be medium-high on Smooth Ridge based on benthic trawl surveys; however trawl survey effort in the SESA is low. The water over this SESA is highly productive, a hotspot for krill, and a foraging hotspot for Sooty Shearwater and marine mammals (e.g., Dall's porpoise, dolphins, sea lions, blue whale, humpback whale). This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 7 has been heavily used as commercial fishing grounds. Fishing methods with footprints include bottom trawling, bottom longline, pot/trap, and hook-and-line gear.

- Commercial benthic fixed gear
- Commercial bottom trawl
- Essential Fish Habitat (EFH) Conservation Area
- Recreational fishing
- Wildlife viewing
- Leatherback sea turtle critical habitat
- MBARI cable node

Figure 1. The location of SESA 7 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 7. Grey border=SESA boundary; light orange border=EFH Conservation Area; orange=commercial benthic fixed gear dominant use. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.
Living Marine Resources & Uses

Table 1. Species known to occur within SESA 7: Eastern Smooth Ridge & MARS Cable.

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th>Fishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- anemones (Actiniaria)</td>
<td>- Pacific Hagfish (<em>Eptatretus stoutii</em>)</td>
</tr>
<tr>
<td>- soft corals† (Alcyonacea), e.g.,</td>
<td>- Filetail Cat Shark (<em>Parmaturus xaniurus</em>)</td>
</tr>
<tr>
<td><em>Heteropolypus ritteri</em></td>
<td>- California Slickhead (<em>Apleocephalus tenebrosus</em>)</td>
</tr>
<tr>
<td>- sea pens† (Pennatulacea), e.g.,</td>
<td>- Pacific Flatnose (<em>Antimora microlepis</em>)</td>
</tr>
<tr>
<td><em>Anthoptilum grandiflorum, Halipteris</em></td>
<td>- Hundred-fathom Codling (<em>Physiculus rastrelliger</em>)</td>
</tr>
<tr>
<td><em>Funiculina</em> sp., <em>Pennatula</em></td>
<td>- Longspine Thornyhead (<em>Sebastolobus altvelis</em>)</td>
</tr>
<tr>
<td><em>californica</em>, <em>Umbellula</em></td>
<td>- Blacktail Snaillfish (<em>Careproctus melanurus</em>)</td>
</tr>
<tr>
<td><em>lindahi</em>, also Virgulariidae</td>
<td>- Twoline Eelpout (<em>Bothrocara bruneum</em>)</td>
</tr>
<tr>
<td>- sea slugs (Nudibranchia), e.g.,</td>
<td>- eelpout (<em>Lycenchelys</em> sp.)</td>
</tr>
<tr>
<td><em>Tritonia diomedea</em></td>
<td>(MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)</td>
</tr>
<tr>
<td>- sea snails (Gastropoda)</td>
<td><em>Found nearby:</em></td>
</tr>
<tr>
<td>- crabs (Decapoda), e.g., longhorn</td>
<td>- Sablefish (<em>Anoplopoma fimbria</em>)</td>
</tr>
<tr>
<td>decorator crab (<em>Chorilia longipes</em>)</td>
<td>- Dover Sole (<em>Microstomus pacificus</em>)</td>
</tr>
<tr>
<td>- grooved tanner crab (<em>Chionoecetes</em></td>
<td>(MBNMS 2013; Vetter et al. 1994)</td>
</tr>
<tr>
<td><em>tanneri</em>)</td>
<td><em>Marine birds</em></td>
</tr>
<tr>
<td>- brachiopods† (Brachiopoda)</td>
<td>- Pacific Loon (<em>Gavia pacifica</em>)</td>
</tr>
<tr>
<td>- sea lilies (Crinoidea)</td>
<td>- Black-footed Albatross² (<em>Phoebastria nigripes</em>)</td>
</tr>
<tr>
<td>- brittle stars (Ophiuroidea)</td>
<td>- Northern Fulmar (<em>Fulmarus glacialis</em>)</td>
</tr>
<tr>
<td>- <em>Asteronyx</em> sp.</td>
<td>- Buller’s Shearwater (<em>Puffinus bulleri</em>), Pink-footed Shearwater²</td>
</tr>
<tr>
<td>(MBARI VARS imagery)</td>
<td>(<em>P. creatopus</em>), Sooty Shearwater (<em>P. griseus</em>)</td>
</tr>
<tr>
<td></td>
<td>- California Brown Pelican (<em>Pelecanus occidentalis californicus</em>)</td>
</tr>
<tr>
<td></td>
<td>- Red Phalarope (<em>Phalaropus fulicarius</em>)</td>
</tr>
<tr>
<td></td>
<td>- California Gull (<em>Larus californicus</em>), Heermann’s Gull (*L.</td>
</tr>
<tr>
<td></td>
<td>heermanni*), Western Gull (<em>L. occidentalis</em>)</td>
</tr>
<tr>
<td></td>
<td>- Black-legged Kittiwake (<em>Rissa tridactyla</em>)</td>
</tr>
<tr>
<td></td>
<td>- Common Murre (<em>Uria aalge</em>)</td>
</tr>
<tr>
<td></td>
<td>- Rhinoceros Auklet (<em>Cerorhinea monocerata</em>)</td>
</tr>
<tr>
<td></td>
<td>- Cassin’s Auklet² (<em>Ptychoramphus aleuticus</em>)</td>
</tr>
</tbody>
</table>
Marine mammals

- blue whale¹ (Balaenoptera musculus)
- humpback whale¹ (Megaptera novaeangliae)
- gray whale (Eschrichtius robustus)
- dolphins (Odontoceti), e.g., Northern right-whale dolphin (Lissodelphis borealis), Risso’s dolphin (Grampus griseus), Pacific white-sided dolphin (Lagenorhynchus obliquidens), Dall’s porpoise (Phocoenoides dalli)
- seals (Phocidae), e.g., harbor seal (Phoca vitulina), Northern elephant seal (Mirounga angustirostris)
- sea lions (Otarinae), e.g., Steller sea lion² (Eumetopias jubatus), California sea lion (Zalophus californianus)

(NOAA, 2003)

Marine reptiles

- leatherback sea turtle¹ (Dermochelys coriacea) (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:

- Dall’s porpoise, dolphins, sea lions (ESI, Environmental Sensitivity Index); blue whale and humpback whale (ESI)
- 100% in leatherback sea turtle NMFS critical habitat
- 100% in Sooty Shearwater (IBA, Important Bird Area)

Research

SIMoN projects:

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)

MBARI Time Series (MBTS) Program (1992-current)

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

Potential Impacts of the Monterey Accelerated Research System (MARS) Cable on the Seabed and Benthic Faunal Assemblages (2003-current)

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
Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
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:

- CIMT survey tracklines (historic)
- NMFS West Coast Bottom Trawl Groundfish Survey
- MBARI MARS observatory

Equipment linked to MARS node:

- CTD, seafloor seismometer
- DEIMOS echo sounder
- ORCA Eye-in-the-Sea
- FOCE experiment (ocean acidification)
- benthic rover (deep-sea carbon cycling)
- deep-sea ESP (molecular ID)
- ALOHA mooring (vertical profiles of water column)

MBNMS research:

- CTD profile (NOAA Ship Shimada, 2015)

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery
- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Slope:
- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
- How do HABs affect local species populations?
Impacts on Whales from Human Uses


• 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


• 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


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

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery


• MARS Observatory Photo Gallery (http://www3.mbari.org/mars/science/biology_photo_gallery/MARSPhotoGallery.htm)


Figure 3. White-spine sea cucumber, (*Apostichopus leukothele*) at Smooth Ridge. Credit: MBARI (http://www.mbari.org/benthic-fauna-800m/).
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/.

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


Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html


Nearby studies:


Sanctuary Ecologically Significant Area (SESA)

SESA 8: Offshore Monterey Peninsula

Description

SESA 8 covers a mix of hard (33%) and soft bottom in outer shelf, shelf break, and slope habitats (111-1,706 m) off of the Monterey Peninsula. This SESA is westward of the Portuguese Ledge State Marine Conservation Area (SMCA) and includes a part of Monterey Canyon known as the San Gregorio meander. This SESA has the 4th highest habitat diversity (index = 5.32) and intermediate habitat richness (7 habitats). Surveys to characterize benthic habitats and communities have occurred over on the shelf (using camera sled and submersibles) and in canyon habitats (using ROV). There are hundreds of records of structure-forming invertebrates – crinoids, soft corals and gorgonians, sponges, stony corals, brachiopods, chemosynthetic communities and black corals – from ROV surveys. Other types of research in the SESA include benthic and mid-water trawl surveys, oceanographic monitoring, 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). This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 8 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: Portuguese Ledge SMCA
- Commercial benthic fixed gear
- Rockfish Conservation Area (trawl)
- Essential Fish Habitat (EFH) Conservation Area

- Recreational fishing
- Wildlife viewing
- Lost fishing gear recovered
- Leatherback sea turtle critical habitat
Figure 2. Close-up map of SESA 8. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; light blue=State MPA; orange=commercial benthic fixed gear dominant use. Source: SESAs Interactive Map, [http://sanctuarymonitoring.org/maps/sesa/](http://sanctuarymonitoring.org/maps/sesa/).

### Living Marine Resources & Uses

Table 1. Species known to occur within SESA 8: Offshore Monterey Peninsula.

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-sponges† (Porifera), e.g., Asbestopluma sp.; also flat, foliose, and barrel sponges</td>
<td></td>
</tr>
<tr>
<td>-anemones (Actiniaria), e.g., Metridium farcimen, Stomphia coccinea</td>
<td></td>
</tr>
<tr>
<td>-black coral† (Antipatharia)</td>
<td></td>
</tr>
<tr>
<td>-stony coral† (Scleractinia), e.g., Caryophyllina sp.</td>
<td></td>
</tr>
<tr>
<td>-soft corals† (Alcyonacea), e.g., Anthomastus ritteri; gorgonians, e.g., Swiftia sp., Paragorgia sp.</td>
<td></td>
</tr>
<tr>
<td>-sea pens† (Pennatulacea), e.g., Umbellula lindahl, Subelliflorae</td>
<td></td>
</tr>
<tr>
<td>-octopi (Cephalopoda)</td>
<td></td>
</tr>
<tr>
<td>-California spot prawn (Pandalus platyceros)</td>
<td></td>
</tr>
<tr>
<td>-brachiopods† (Brachiopoda), e.g., Laqueus californicus</td>
<td></td>
</tr>
<tr>
<td>-sea lilies (Crinoidea), e.g., Florometra serratissima</td>
<td></td>
</tr>
<tr>
<td>-sea stars (Asteroidea), e.g., Mediaster aequalis</td>
<td></td>
</tr>
<tr>
<td>-brittle stars (Ophiuroidea)</td>
<td></td>
</tr>
<tr>
<td>(CSUMB/MBNMS videos and stills; Graiff 2008; MBARI VARS imagery)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fishes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-skates (Rajidae)</td>
<td></td>
</tr>
<tr>
<td>-rockfishes (Scorpaenidae), e.g., Pygmy, Cowcod⁴, Halfbanded</td>
<td></td>
</tr>
<tr>
<td>-Lingcod (Ophiodon elongatus)</td>
<td></td>
</tr>
<tr>
<td>-Pink Seaperch (Zalembius rosaceus)</td>
<td></td>
</tr>
<tr>
<td>(CSUMB/MBNMS videos and stills; MBARI VARS imagery)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marine birds</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-Pacific Loon (Gavia pacifica)</td>
<td></td>
</tr>
<tr>
<td>-Black-footed Albatross⁴ (Phoebastria nigripes)</td>
<td></td>
</tr>
<tr>
<td>-Northern Fulmar (Fulmarus glacialis)</td>
<td></td>
</tr>
<tr>
<td>-Buller’s Shearwater (Puffinus bulleri), Pink-footed Shearwater⁴ (P. creatopus), Sooty Shearwater (P. griseus)</td>
<td></td>
</tr>
<tr>
<td>-Ashy Storm-Petrel⁴ (Oceanodroma homochroa)</td>
<td></td>
</tr>
<tr>
<td>-California Brown Pelican (Pelecanus occidentalis californicus)</td>
<td></td>
</tr>
<tr>
<td>-Red-necked Phalarope (Phalaropus lobatus), Red Phalarope (P. fulicarius)</td>
<td></td>
</tr>
<tr>
<td>-California Gull (Larus californicus), Heermann’s Gull (L. heermanni), Western Gull (L. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>-Black-legged Kittiwake (Rissa tridactyla)</td>
<td></td>
</tr>
<tr>
<td>-Common Murre (Uria aalge)</td>
<td></td>
</tr>
<tr>
<td>-Cassin’s Auklet³ (Ptychoramphus aleuticus)</td>
<td></td>
</tr>
<tr>
<td>-Rhinoceros Auklet (Cerorhinea monocerata)</td>
<td></td>
</tr>
<tr>
<td>-Clark’s Grebe (Aechmophorus clarkia), Western Grebe (A. occidentalis)</td>
<td></td>
</tr>
<tr>
<td>(Ainley et al. 2012)</td>
<td></td>
</tr>
</tbody>
</table>
Marine mammals

- blue whale\(^1\) (*Balaenoptera musculus*)
- humpback whale\(^1\) (*Megaptera novaeangliae*)
- gray whale (*Eschrichtius robustus*)
- dolphins (Odontoceti), e.g., Northern right-whale dolphin (*Lissodelphis borealis*), Risso's dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall's porpoise (*Phocoenoides dalli*)
- seals (Phocidae), e.g., harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*)
- sea lions (*Otariinae*), e.g., Stellar sea lion\(^2\) (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*)

Marine reptiles

- leatherback sea turtle\(^1\) (*Dermochelys coriacea*)

Special Status Species:
- Endangered\(^1\), Threatened\(^2\), Birds of Conservation Concern\(^3\), Overfished\(^4\);
- 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)
- 10% 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)


CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-2007)

In-situ Measurements of Turbidity Currents in the Monterey Submarine Canyon (2002-03)

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

Monitoring whales by Cascadia Research Collective (1991-current)

Seafloor Mapping in Monterey Bay, Cordell Bank, and Gulf of the Farallones National Marine Sanctuaries (2004-current)

**For more information -** [http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html](http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html)
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-
Tagging of Pacific Predators (TOPP) (2000-current)
http://sanctuarymonitoring.org/projects/100137/tagging-of-pacific-predators-%28topp%29
Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
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:

CIMT survey tracklines (historic)
NMFS groundfish trawl stations (limited)
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
Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf
What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope
What are the distribution and abundance of organisms and habitats on the continental slope?
How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
How do HABs affect local species populations?
Impacts on Whales from Human Uses
• 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
• 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
• Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery
• CSUMB/MBNMS camera sled and ROV (http://sep.csumb.edu/ifame/scid/)

Figure 3. Lingcod (Ophiodon elongatus).
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/.

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


Nearby Studies:


**SESA 9: Deep Monterey Canyon**

**Description**

SESA 9 covers deep (1,133-2,939 m) benthic habitats in an offshore portion of Monterey Canyon and the surrounding soft-bottom slope 2 habitat. Some large patches of hard bottom (5% of total SESA) in areas with steep canyon walls adds to the habitat richness (4 habitats) and habitat diversity (index =2.34) of this SESA. There are hundreds of records of structure-forming invertebrates - chemosynthetic communities, crinoids, black corals, soft corals and gorgonians, sponges, and, brachiopods - from ROV surveys of benthic habitats and communities. Other types of research in this SESA include mid-water trawl surveys, oceanographic monitoring, and the lost shipping container study. The water over this SESA has relatively low primary productivity and there are no known foraging hotspots. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

**Resource Management Issues**

SESA 9 boundaries are over the main channel of Monterey submarine canyon, and contain whale falls and cold seep communities that researchers are studying. They are also investigating the ecological impact of a shipping container lost at sea in 2004.

- Commercial bottom trawl
- Fish Habitat (EFH) Conservation Area
- EFH bottom trawl closure proposed (2013)
- Recreational fishing
- Commercial shipping lane
- Wildlife viewing
- Leatherback sea turtle critical habitat

---

Figure 1. The location of SESA 9 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 9. Grey border=SESA boundary; light orange border=EFH Conservation Area; red border=dominant commercial shipping lane. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.
Living Marine Resources & Uses

Table 1. Species known to occur within SESA 9: Deep Monterey Canyon.

<table>
<thead>
<tr>
<th>Invertebrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>sponge† (Porifera), e.g., Farrea sp.</td>
</tr>
<tr>
<td>black corals† (Antipatharia), e.g., Bathypathes sp.</td>
</tr>
<tr>
<td>Venus flytrap anemone (Actinoscyphia sp.)</td>
</tr>
<tr>
<td>soft corals† (Alcyonacea), e.g., Acanella sp., Primnoidae sp.; gorgonians, e.g., Swiftia kofoidi, Paragorgia sp., Chrysogorgia sp.</td>
</tr>
<tr>
<td>sea pen† (Pennatulacea), e.g., Pennatula californica, Phosphorea californica, Umbellula lindahli, Distichoptilum sp., Kophochelemnidae (Subselliflorae), Funiculina sp., Virgulariidae, Anthoptilidae</td>
</tr>
<tr>
<td>sea snails (Neptunea sp.)</td>
</tr>
<tr>
<td>lithodid crabs (Lithodidae)</td>
</tr>
<tr>
<td>brachiopods† (Brachiopoda)</td>
</tr>
<tr>
<td>sea lilies (Crinoidea)</td>
</tr>
<tr>
<td>sea stars (Asteroidea)</td>
</tr>
<tr>
<td>sea cucumbers (Holothuroidea)</td>
</tr>
</tbody>
</table>

(CSUMB/MBNMS videos, stills; MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)

whale fall community species:
- nemertean
- polychaete worms
- sipunculids
- echinoderms (brittle stars, sea urchins, sea cucumbers)

(Goffredi et al. 2004)

species near sunken shipping container:
- siphonophore (Siphonophora)
- tube anemone (Cerianthidae), anemones (Actiniaria), e.g., Venus flytrap anemone (Actinoscyphia aurelia), pompon anemone (Liponema brevicorne)
- soft corals† (Alcyonacea), e.g., Gersemia juliepackardae, Clavularia sp.; gorgonians, e.g., sea fans and sea whips (Halipiteris sp.)
- sea pen† (Pennatulacea), e.g., droopy sea pen (Umbellula sp.), Pennatula sp.
- octopi (Cephalopoda)
- sea snails (Gastropoda), e.g., topsnail (Calliostoma sp.)
- ribbon worms (nemerteans)
- polychaete worms
- tubeworms (Serpulidae)
- sipunculids
- crabs (Decapoda), e.g., Oregon hair crab (Paralomis sp.), tanner crab (Chionoecetes sp.), lithodid crab (Neolithodes diomeda), hermit crab (Paguroidea)
- bigeye shrimp (Pandalopsis ampla)
- squat lobster (Galatheidae)
- sea stars (Asteroidea), e.g., cushion stars, sun star, brittle stars (Ophiuroidea)
- sea urchins (Strongylometrotus fragilis)
- sea cucumbers, (Taylor et al. 2014)
**Fishes**
- grenadier (*Coryphaenoides* sp.)
- Pacific Flatnose (*Antimora microlepis*)
- Thornyhead Rockfish (*Sebastolobus* sp.)
- Sablefish (*Anoplopoma fimbria*)
- snailfish (Liparidae)
- eelpout (*Lycodapus* sp.)
- Deepsea Sole (*Embassichthys bathybius*)
  (Taylor et al. 2014)

*Found nearby:*
- thornyheads (*Sebastolobus* spp.), e.g., *S. altivelis*
- Sablefish (*Anoplopoma fimbria*)
  (MBNMS 2013)

**Marine birds**
- Black-footed Albatrossª (*Phoebastria nigripes*)
- Northern Fulmar (*Fulmarus glacialis*)
- Buller’s Shearwater (*Puffinus bulleri*), Pink-footed Shearwaterª (*P. creatopus*)
- Black Storm-Petrel (*Oceanodroma melanias*)
- California Brown Pelican (*Pelecanus occidentalis californicus*)
- California Gull (*Larus californicus*), Western Gull (*L. occidentalis*)
- Common Murre (*Uria aalge*)
- Cassin’s Auklet³ (*Ptychoramphus aleuticus*)
- Rhinoceros Auklet (*Cerorhinea monocerata*)
  (Ainley et al. 2012)

**Marine mammals**
- dolphins (Odontoceti), e.g., Northern right-whale dolphin (*Lissodelphis borealis*), Risso’s dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall’s porpoise (*Phocoenoides dalli*)
- seals (Phocidae), e.g., harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*)
- Northern fur seal (*Callorhinus ursinus*)
- sea lions (Otarinae), e.g., Stellar sea lionª (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*)
  (NOAA, 2003)

**Marine reptiles**
- leatherback sea turtle¹ (*Dermochelys coriacea*) (NOAA, 2003)

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

Diverse or productive communities:
- low primary productivity
- low krill production

Migration, breeding, or foraging areas:
- 100% in leatherback sea turtle NMFS critical habitat
Research

SIMoN projects:

Abyssal Fauna associated with a whale fall in Monterey Canyon (2002-current)
California El Niños (1991-current)
http://sanctuarymonitoring.org/projects/100144/california-el-ni%10s
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)
Ecological Assessment of a Lost Shipping Container in the MBNMS (2011-current)
MBARI Time Series (MBTS) Program (1992-current)
http://sanctuarymonitoring.org/projects/100190/mbari-time-series-%28mbts%29-program
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
Monterey Bay Microbial Observatory (2004-08)
http://sanctuarymonitoring.org/projects/100236/monterey-bay-microbial-observatory-------
Ocean observing in the Monterey Bay National Marine Sanctuary: CalCOFI and the MBARI time series (1988-current)
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 (SPASH) (2004-current)
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)
Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Monitoring stations and/or data collection instruments:

- NMFS mid-water trawl stations
- MBARI M2 buoy (removed in 2011)
- NMFS West Coast Bottom Trawl Groundfish Survey

Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
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


- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Slope


- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms


- How do HABs affect local species populations?

Impacts on Whales from Human Uses


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

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

- SIMoN Photo Library (http://sanctuarysimon.org/photos/index.php)

Figure 3. Sea pen, (Phosphorea californica). Credit: NOAA/MBARI (http://sanctuarysimon.org/photos/index.php).

Figure 4. Two large crabs (Lithodidae) dining on Neptunea sp. Credit: NOAA/MBARI (http://sanctuarysimon.org/photos/index.php).
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/](http://sanctuarymonitoring.org/maps/sesa/).

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


http://ccma.nos.noaa.gov/ecosystems/sanctuaries/california/html/birds/


Nearby studies:


Sanctuary Ecologically Significant Area (SESA)

SESA 10: Very Deep Monterey Canyon

Description

SESA 10 includes the deepest section of Monterey Canyon inside MBNMS boundaries and the surrounding soft bottom slope 2 and rise (2,761-3,276 m). Hard substrate is very rare at these depths (only 1% of SESA); it occurs in both slope 2 and rise depths, which adds to the habitat richness (7 habitats) and habitat diversity (index =3.23) of this SESA. Very little research has occurred in this SESA. There are a few records of structure-forming invertebrates from MBARI ROV surveys. The water over this SESA has relatively low primary productivity and there are no known foraging hotspots although leatherback sea turtles have been spotted. This SESA is located within MBNMS, and research activities may require a permit ([http://montereybay.noaa.gov/resourcepro/permit/permits need.html](http://montereybay.noaa.gov/resourcepro/permit/permits_need.html)).

Resource Management Issues

SESA 10 is located in the deepest part of the Monterey submarine canyon within MBNMS. Little biological characterization has been done within this SESA expect for some MBARI ROV surveys.

- Adjacent to Essential Fish Habitat (EFH) Conservation Area
- Commercial shipping lane
- Leatherback sea turtle critical habitat

Figure 1. The location of SESA 10 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 10. Grey border=SESA boundary; light orange border=EFH Conservation Area; red border=dominant commercial shipping lane. Dark grey border-MBNMS boundary. Source: SESAs Interactive Map, [http://sanctuarymonitoring.org/maps/sesa/](http://sanctuarymonitoring.org/maps/sesa/).
## Living Marine Resources & Uses

### Table 1. Species known to occur within SESA 10: Very Deep Monterey Canyon

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th>-soft corals† (Alcyonacea)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-sea pens† (Pennatulacea)</td>
</tr>
<tr>
<td></td>
<td>-sea lilies (Crinoidea)</td>
</tr>
<tr>
<td></td>
<td>-deep sea crabs (Decapoda)</td>
</tr>
<tr>
<td>(MBARI VARS imagery)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fishes</th>
<th>Not Sampled</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Marine birds</th>
<th>-Northern Fulmar <em>(Fulmarus glacialis)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-Leach’s Storm-Petrel <em>(Oceanodroma leucorhoa)</em></td>
</tr>
<tr>
<td></td>
<td>-California Gull <em>(Larus californicus)</em></td>
</tr>
<tr>
<td></td>
<td>-Common Murre <em>(Uria aalge)</em></td>
</tr>
<tr>
<td></td>
<td>-Cassin’s Auklet² <em>(Ptychoramphus aleuticus)</em></td>
</tr>
<tr>
<td></td>
<td>-Rhinoceros Auklet <em>(Cerorhinea monocerata)</em></td>
</tr>
<tr>
<td>(Ainley et al. 2012)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marine mammals</th>
<th>-humpback whale¹ <em>(Megaptera novaeangliae)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-dolphin (Odontoceti), e.g., Northern right-whale dolphin <em>(Lissodelphis borealis)</em>, Pacific white-sided dolphin <em>(Lagenorhynchus obliquidens)</em></td>
</tr>
<tr>
<td></td>
<td>-seals (Phocidae), e.g., harbor seal <em>(Phoca vitulina)</em>, Northern elephant seal <em>(Mirounga angustirostris)</em></td>
</tr>
<tr>
<td></td>
<td>-Northern fur seal <em>(Callorhinus ursinus)</em></td>
</tr>
<tr>
<td>(NOAA, 2003)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marine reptiles</th>
<th>-leatherback sea turtle¹ <em>(Dermochelys coriacea)</em> (NOAA, 2003)</th>
</tr>
</thead>
</table>

Special Status Species: Endangered¹; Birds of Conservation Concern²; Biogenic habitat†

Diverse or productive communities:
- low primary productivity
- low krill production

Migration, breeding, or foraging areas:
- 20% in leatherback sea turtle NMFS critical habitat

## Research

### SIMoN projects:

- Sea Turtle Restoration Project: Leatherback Watch Program (2010-current) [http://sanctuarymonitoring.org/projects/100395/sea-turtle-restoration-project%3a-leatherback-watch-program](http://sanctuarymonitoring.org/projects/100395/sea-turtle-restoration-project%3a-leatherback-watch-program)
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)

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Nearby:
Midwater Trawl Pre-recruit Survey (1983-current)
http://sanctuarymonitoring.org/projects/100118/midwater-trawl-pre-recruit-survey

Stations and/or data collection instruments: None

MBNMS research:
- CTD profile (NOAA Ship Shimada, 2015)

Science Needs & Research Questions

Habitat Characterization of the Continental Slope
- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?
- What is the vulnerability of different continental slope habitats and living marine resources, and are some continental slope habitats able to recover from disturbance at different rates than others?

Human Health - Harmful Algal Blooms
- How do HABs affect local species populations?

Impacts on Whales from Human Uses
- What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?
- What are the environmental and prey characteristics that lead to foraging aggregations that may leave whales vulnerable to disturbance by recreational ocean users?

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

SESAs Interactive Map: http://sanctuarysimon.org/maps/esa
Publically Available Imagery: little to none


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/.

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


Nearby Studies:

Description

SESA 11 includes a large rocky feature, Sur Ridge, and the surrounding area on Sur Slope. Though it includes a wide depth range (817-1,569 m), this SESA has low habitat richness (2 habitats) and habitat diversity (index =1.56) because it includes hard (16%) and soft substrate in only one depth zone (slope 2). Recent cruise research expeditions have contributed to geologic and oceanographic surveys, and biological characterization. Groundfish trawl surveys on the soft bottom surrounding Sur Ridge have captured a few structure-forming invertebrates (sea pen, gorgonians, black and soft corals) and a fish fauna of intermediate richness (mean=13.5 species) and diversity (mean index=1.53). Water upwelled at Point Sur is likely to be advected through this SESA. The water over this SESA has relatively low primary productivity and has low likelihood of being a krill hot spot. The eastern side of the SESA is part of a marine mammal foraging hotspot. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

Commercial and recreational human activities can be beneficial or harmful depending on rate and disturbance type, e.g., benthic trawling, vessel traffic, dredging.

- NPS cable
- Commercial bottom trawling
- Essential Fish Habitat (EFH) Conservation Area
- Commercial shipping lane
- Recreational fishing
- Wildlife viewing
- Coral restoration
- EFH bottom trawl closure proposed (2013)
- Leatherback sea turtle critical habitat
- Ocean acidification
# Living Marine Resources & Uses

## Table 1. Species known to occur within SESA 11: Sur Ridge

| Invertebrates | - sponges† (Porifera)  
|               | - black corals† (Antipatharia)  
|               | - stony corals† (Scleractinia)  
|               | - soft corals† (gorgonians), e.g., bubble gum and bamboo  
|               | - sea pens† (Pennatulacea), e.g., Virgulariidae, Anthoptilidae  
|               | - sea slugs (Nudibranchia)  
|               | - cold seep clams (Vesicomyida)  
|               | - octopi (Cephalopoda)  
|               | - red galatheid crabs, squat lobsters (Galantheidae)  
|               | - sea stars (Asteroidea)  
|               | - brittle stars (Ophiuroidea)  
|               | - deep-sea fragile urchin (*Strongylocentrotus fragilis*)  
|               | (NMFS West Coast Bottom Trawl Groundfish Surveys)  
|                       | For complete list see “Sur Ridge Taxonomic Guide,” Burton and Kuhnz (In Prep.)  
| Fishes | - Shortspine Thornyhead (*Sebastolobus alascanus*)  
|        | - Blob Sculpin (*Psychrolutes phricitus*)  
|        | For complete list see “Sur Ridge Taxonomic Guide,” Burton and Kuhnz (In Prep.)  
| Marine birds | - Buller’s Shearwater (*Puffinus bulleri*)  
|              | - California Brown Pelican (*Pelecanus occidentalis californicus*)  
|              | - Western Gull (*Larus occidentalis*)  
|              | - Black-legged Kittiwake (*Rissa tridactyla*)  
|              | - Common Murre (*Uria aalge*)  
|              | - Rhinoceros Auklet (*Cerorhinea monocerata*)  
|              | (Ainley et al. 2012)  
| Marine mammals | - blue whale¹ (*Balaenoptera musculus*)  
|              | - humpback whale¹ (*Megaptera novaeangliae*)  
|              | - dolphins (Odonteceti), e.g., Risso’s dolphin (*Grampus griseus*),  
|              |   Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall’s porpoise (*Phocoenoides dalli*)  
|              | - Northern elephant seal (*Mirounga angustirostris*)  
|              | - sea lions (Otarinae), e.g., Stellar sea lion² (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*)  
|              | (NOAA, 2003)  
| Marine reptiles | - leatherback sea turtle¹ (*Dermochelys coriacea*) (NOAA, 2003)  

Special Status Species: Endangered¹, Threatened²;  
Biogenic habitat†

### Diverse or productive communities:
- low primary productivity  
- marine mammal foraging hotspot

### Migration, breeding, or foraging areas:
- Dall’s porpoise, sea lions, dolphins, blue whale, and humpback whale (ESI, Environmental Sensitivity Index)  
- 100% in leatherback sea turtle NMFS critical habitat

For more information - [http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html](http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html)

Updated: 5/3/2016
Research

SIMoN projects:

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)
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)
Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)
usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Monitoring stations and/or data collection instruments:
   • NMFS West Coast Bottom Trawl Groundfish Survey

MBNMS research:
   • CTD profile (NOAA Ship Shimada, 2015)
   • Mid-water fish trawl (NOAA Ship Shimada, 2015)
   • Coral transplant experiments (MBARI, 2015)
   • Biological characterization (MBARI ROV surveys, 2013 and 2014)

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery
   • Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Slope
   • What are the distribution and abundance of organisms and habitats on the continental slope?
   • How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
   • How do HABs affect local species populations?

For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
Impacts on Whales from Human Uses
• 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
• 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
• Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.
SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

- SIMoN Photo Library (http://sanctuarysimon.org/photos/index.php)

Figure 3. Snailfish (Liparidae) rests inside of a sponge near the summit of Sur Ridge. Credit: MBARI (http://sanctuarysimon.org/photos/index.php).

Figure 4. Bamboo coral (Isididae) is an upright branching soft coral that acts as a foundation species for other benthic megafauna. Credit: MBARI (http://sanctuarysimon.org/photos/index.php).

Figure 5. Bubblegum coral (Paragorgia arborea) extending out from cliffs into the uprising currents so the colony of polyps can feed. Credit: MBARI (http://sanctuarysimon.org/photos/index.php).
### 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/](http://sanctuarymonitoring.org/maps/sesa/).

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


SESA 12: Sur Platform

Description

SESA 12 covers the southwest side of Sur Platform and is adjacent to the Point Sur State Marine Conservation Area (SMCA). It contains a mix of hard (32%) and soft bottom in the shelf, shelf break and upper slope depth zones and heads of Sur Canyon. This SESA has the second highest habitat richness (11 habitats) and intermediate habitat diversity (index=4.17). Groundfish survey trawls over the shelf and shelf break have captured a few sea pens and a fish fauna of intermediate richness and diversity, but sampling effort is low. Surveys to characterize benthic habitats and communities (using camera sled, submersible, and ROVs) have occurred at many locations in shelf and shelf break habitats. Additional research at this site includes oceanographic monitoring, seabird and mammal surveys, marine debris surveys, and a trawling impact study. The upwelling zone at Point Sur overlaps the southern part of the SESA; upwelled water may be advected northwest through the SESA. Intermediate levels of primary productivity are observed. This SESA includes foraging hotspots for leatherback sea turtle, Ashy Storm-Petrel, and marine mammals (e.g., Dall’s porpoise, dolphins, sea lions, blue whale, humpback whale). Seabird density is greater over Sur Platform compared to the surrounding area. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 12 has been used as commercial fishing grounds and also contains proposed demersal fishes conservation area.

- NPS cable
- Adjacent to State MPA: Point Sur SMCA
- Commercial bottom trawling
- Adjacent to commercial benthic fixed gear
- Rockfish Conservation Area (trawl)
- Essential Fish Habitat (EFH) Conservation Area
- EFH bottom trawl closure proposed (2013)
- Recreational fishing
- Adjacent to commercial shipping lane
- Wildlife viewing
- Leatherback sea turtle critical habitat
- Lost fishing gear survey (2011)
Figure 2. Close-up map of SESA 12. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; orange=commercial benthic fixed gear dominant use; light blue=State MPA; red border=dominant commercial shipping lane. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.

Living Marine Resources & Uses

Table 1. Species known to occur within SESA 12: Sur Platform.

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th>Fishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>-sponges† (Porifera), e.g., barrel, flat, and foliose sponges</td>
<td>-rockfishes (Sebastes spp.), e.g., Blue, Greenstriped, Canary⁴, Boccacio⁣, Olive, Yellowtail, Speckled, Widow, Starry, China</td>
</tr>
<tr>
<td>-pink branching hydrocoral† (Stylaster norvigicus)</td>
<td>-Kelp Greenling (Hexagrammos decagrammus)</td>
</tr>
<tr>
<td>-anemones (Actiniaria), e.g., white-plumed anemone (Metridium farcimen), strawberry anemone (Corynactis californica)</td>
<td>-Lingcod (Ophiodon elongatus)</td>
</tr>
<tr>
<td>-soft corals† (Alyconacea), e.g., gorgonians</td>
<td>-Pink Seaperch (Zalembuis rosaceus)</td>
</tr>
<tr>
<td>-sea pens† (Pennatulacea), e.g., Halipteris californica, Subselliflorae, Pennatulidae, Virgulariidae</td>
<td>-Stripedfin Ronquil (Rathbunella alleni)</td>
</tr>
<tr>
<td>-octopi (Cephalopoda)</td>
<td>-Blackeye Goby (Rhinogobiops nicholsii)</td>
</tr>
<tr>
<td>-crabs, e.g., galatheid crabs (Galatheidae), decorator crab (Loxorhynchus crispatus), cancer crab (Cancer spp.)</td>
<td>-Petrale Sole⁴ (Eopsetta jordani)</td>
</tr>
<tr>
<td>-brachiopods† (Brachiopoda), e.g., Laqueus californicus</td>
<td>-Rex Sole (Glyptocephalus zachirus)</td>
</tr>
<tr>
<td>-sea lilies (Crinoidea), e.g., Florometra serratissima</td>
<td>-Ocean Sunfish (Mola mola)</td>
</tr>
<tr>
<td>-octopi (Cephalopoda), e.g., Halipteris californica, Subselliflorae, Pennatulidae, Virgulariidae</td>
<td>(CSUMB/MBNMS videos, stills; MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)</td>
</tr>
<tr>
<td>-sea stars (Asteroidea), e.g., sunflower star (Pycnopodia sp. or Rathbunaster sp.), vermilion sea star (Mediaster aequalis), sand star (Luidia sp.)</td>
<td>(CSUMB/MBNMS videos, stills; Graiff 2008; MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)</td>
</tr>
<tr>
<td>-basket star (Gorgonocephalus eucnemis)</td>
<td>Within adjacent MPA:</td>
</tr>
<tr>
<td>-sea cucumbers (Holothuroidea)</td>
<td>-rockfishes (Sebastes spp.), e.g., Squarespot, Yellowtail, Boccacio⁣, Halfbanded, Pygmy, Greenstriped, Bank</td>
</tr>
<tr>
<td>-tubeworms (Polychaeta)</td>
<td>(Starr 2006)</td>
</tr>
</tbody>
</table>

(CSUMB/MBNMS video, stills; Graiff 2008; MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey)

Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
### Marine birds

- Northern Fulmar (*Fulmarus glacialis*)
- Sooty Shearwater (*Puffinus griseus*)
- Ashy Storm-Petrel³ (*Oceanodroma homochroa*)
- Brandt’s Cormorant (*Phalacrocorax penicillatus*)
- California Gull (*Larus californicus*), Western Gull (*L. occidentalis*)
- Black-legged Kittiwake (*Rissa tridactyla*)
- Common Murre (*Uria aalge*)
- Cassin’s Auklet³ (*Ptychoramphus aleuticus*)
- Rhinoceros Auklet (*Cerorhinea monocerata*)

(Ainley et al. 2012)

### Marine mammals

- Blue whale¹ (*Balaenoptera musculus*)
- Humpback whale¹ (*Megaptera novaeangliae*)
- Gray whale (*Eschrichtius robustus*)
- Dolphins (Odontoceti), e.g., Risso’s dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall’s porpoise (*Phocoenoides dalli*)
- Northern elephant seal (*Mirounga angustirostris*)
- Sea lions (*Otarinae*), e.g., Stellar sea lion² (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*)

(NOAA, 2003)

### Marine reptiles

- Leatherback sea turtle¹ (*Dermochelys coriacea*)

(NOAA, 2003)

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

Biogenic habitat†

### Diverse or productive communities:

- Moderate primary productivity
- Low krill production
- Marine bird and mammal high diversity

### Migration, breeding, or foraging areas:

- Dall’s porpoise, sea lions, dolphins, blue whale, and humpback whale (ESI, Environmental Sensitivity Index)
- Cassin’s Auklet (ESI)
- 20% in leatherback sea turtle principal foraging area, 100% in leatherback sea turtle NMFS critical habitat

### Research

**SIMoN projects:**

Archival of Midwater and Benthic Survey Data at Moss Landing Marine Laboratories (1972-2013)


CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)


Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)


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

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/100224/structure-of-populations%2c-levels-of-abundance-and-status-of-humpbacks-
%28splash%29

Tracking Black-footed Albatross Movements and Conservation (2004-08)

Tagging of Pacific Predators (TOPP) (2000-current)
http://sanctuarymonitoring.org/projects/100137/tagging-of-pacific-predators-%28topp%29

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

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-

Monitoring stations and/or data collection instruments:

- CDIP buoy (stations 157)
- NMFS West Coast Bottom Trawl Groundfish Survey

MBNMS research:

- CSUMB shelf characterization 2007-2011

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery

- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf

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

Habitat Characterization of the Continental Slope

- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms

- How do HABs affect local species populations?

Impacts on Whales from Human Uses

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

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery
- CSUMB/MBNMS camera sled and ROV (http://sep.csumb.edu/ifame/scid/)

Figure 3: Rockfish (Sebastes sp.) in sponge.
Credit: IfAME/CSUMB/MBNMS (http://sep.csumb.edu/ifame/scid/).

Figure 4. Basket star, (Gorgonocephalus eucnemis).
Credit: IfAME/CSUMB/MBNMS (http://sep.csumb.edu/ifame/scid/).

Figure 5: Sea star (Class Asteroidea).
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/](http://sanctuarymonitoring.org/maps/sesa/).

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


Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html


MBNMS. Collaborative Groundfish Essential Fish Habitat Proposal: Protecting Groundfish essential Fish Habitat While Balancing Fishing Opportunities in Monterey Bay National Marine Sanctuary, South of Año Nuevo. Monterey, California: Monterey Bay National Marine Sanctuary.


Nearby studies:


Description

SESA 13 includes deep section of Sur Canyon and the surrounding soft bottom slope 2 habitat. Though it includes a wide depth range (1,205-1,932 m), it has low habitat richness (2 habitats) and habitat diversity (index =2.0). Very little research has occurred in this SESA; one benthic ROV survey. Water upwelled at Point Sur is likely to be advected through this SESA. The water over this SESA has relatively low primary productivity and has low likelihood of being a krill hot spot and does not overlap with any known foraging hotspots. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 13 boundaries contain unique habitats and communities of the deepest parts of Sur Canyon that need to be better described. Little biological characterization has been done within SESA 13.

- Essential Fish Habitat (EFH) Conservation Area
- Commercial shipping lane
- Recreational fishing
- Leatherback sea turtle critical habitat

Figure 1. The location of SESA 13 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 13. Grey border=SESA boundary; light orange border=EFH Conservation Area; red=dominant commercial shipping lane. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.

Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
Living Marine Resources & Uses

Table 1. Species known to occur within SESA 13: Deep Sur Canyon.

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>-sponges† (Porifera), e.g., Asbestopluma sp., barrel-shaped, large boot, yellow vase</td>
<td></td>
</tr>
<tr>
<td>-stony corals† (Scleractinia), e.g., large cup coral (Desmophyllum sp.)</td>
<td></td>
</tr>
<tr>
<td>-soft corals† (Aclyonacea), e.g., mushroom soft coral (Heteroplypus ritteri),</td>
<td></td>
</tr>
<tr>
<td>gorgonians (Euplexaura marki, Swiftia beringi)</td>
<td></td>
</tr>
<tr>
<td>-sea pens† (Pennatulaceae)</td>
<td></td>
</tr>
<tr>
<td>-Humboldt squid (Dosidicus gigas)</td>
<td></td>
</tr>
<tr>
<td>-feather stars (Crinoidea)</td>
<td></td>
</tr>
<tr>
<td>-sea stars (Asteroidea), e.g., deep-sea sun star (Rathbunaster californicus)</td>
<td></td>
</tr>
<tr>
<td>- sea cucumbers (Holothuroidea)</td>
<td></td>
</tr>
<tr>
<td>(Stierhoff et al. 2011)</td>
<td></td>
</tr>
<tr>
<td><strong>Fishes</strong></td>
<td>Species</td>
</tr>
<tr>
<td>-California Skate (Raja inornata)</td>
<td></td>
</tr>
<tr>
<td>-California Headlightfish (Diaphus theta)</td>
<td></td>
</tr>
<tr>
<td>-rockfishes (Sebastes spp.), e.g., Bank, Aurora, Blackgill</td>
<td></td>
</tr>
<tr>
<td>-Shortspine Thornyhead (Sebastolobus alascanus)</td>
<td></td>
</tr>
<tr>
<td>-Sablefish (Anoplopoma fimbria)</td>
<td></td>
</tr>
<tr>
<td>-Dover Sole (Microstomus pacificus)</td>
<td></td>
</tr>
<tr>
<td>(Stierhoff et al. 2011)</td>
<td></td>
</tr>
<tr>
<td><strong>Marine birds</strong></td>
<td>Species</td>
</tr>
<tr>
<td>-Northern Fulmar (Fulmarus glacialis)</td>
<td></td>
</tr>
<tr>
<td>-Black-legged Kittiwake (Rissa tridactyla)</td>
<td></td>
</tr>
<tr>
<td>-Cassín’s Auklet* (Ptychoramphus aleuticus)</td>
<td></td>
</tr>
<tr>
<td>-Rhinoceros Auklet (Cerorhinea monocerata)</td>
<td></td>
</tr>
<tr>
<td>(Ainley et al. 2012)</td>
<td></td>
</tr>
<tr>
<td><strong>Marine mammals</strong></td>
<td>Species</td>
</tr>
<tr>
<td>-blue whale¹ (Balaenoptera musculus)</td>
<td></td>
</tr>
<tr>
<td>-dolphins (Odontocoel), e.g., Northern right-whale dolphin (Lissodelphis borealis),</td>
<td></td>
</tr>
<tr>
<td>Risso’s dolphin (Grampus griseus), Pacific white-sided dolphin (Lagenorhynchus obliquidens),</td>
<td></td>
</tr>
<tr>
<td>Dall’s porpoise (Phocoenoides dalli)</td>
<td></td>
</tr>
<tr>
<td>-harbor seal (Phoca vitulina)</td>
<td></td>
</tr>
<tr>
<td>-Northern fur seal (Callorhinus ursinus)</td>
<td></td>
</tr>
<tr>
<td>-Steller sea lion² (Eumetopias jubatus)</td>
<td></td>
</tr>
<tr>
<td>(NOAA, 2003)</td>
<td></td>
</tr>
<tr>
<td><strong>Marine reptiles</strong></td>
<td>Species</td>
</tr>
<tr>
<td>-leatherback sea turtle¹ (Dermochelys coriacea) (NOAA, 2003)</td>
<td></td>
</tr>
</tbody>
</table>

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

Diverse or productive communities:
- low primary productivity
- low krill production
- marine mammal high diversity

Migration, breeding, or foraging areas:
- 100% in leatherback sea turtle NMFS critical habitat

For more information - [http://montereybay.noaa.gov/resourcepro/ebmi/respro.html](http://montereybay.noaa.gov/resourcepro/ebmi/respro.html)
Research

SIMoN projects:

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)

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/100224/structure-of-populations%2c-levels-of-abundance-and-status-of-humpbacks-

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)

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Monitoring stations and/or data collection instruments:

- NMFS West Coast Bottom Trawl Groundfish Survey

MBNMS research: None

Science Needs & Research Questions

Habitat Characterization of the Continental Slope
- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
- How do HABs affect local species populations?

Impacts on Whales from Human Uses
- What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?
- What are the environmental and prey characteristics that lead to foraging aggregations that may leave whales vulnerable to disturbance by recreational ocean users?

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

Updated: 5/3/2016
For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html
SESAs Interactive Map: http://sanctuarymonitoring.org/maps/sesa

Publically Available Imagery: None

**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/.

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


Description

SESA 14 includes portions of Partington and Lucia Canyon systems and is adjacent to the Big Creek State Marine Conservation Area (SMCA) and State Marine Reserve (SMR). It contains soft bottom habitat inside and outside canyons between 466-903 m resulting in relatively low habitat richness (4 habitats) and diversity (index=2.41). There has not been much research or monitoring in this SESA; most of the research in this portion of MBNMS is occurring in shallower waters closer to shore. There are a few records of structure-forming invertebrates (e.g., gorgonians, sea pens) from ROV surveys and groundfish trawl surveys, but sampling effort is very limited. The upwelling zone at Point Sur overlaps the northern half of the SESA; upwelled water may be advected through the SESA during the upwelling season. Intermediate levels of primary productivity are observed. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 14 has been used as commercial fishing grounds and also contains proposed demersal fishes conservation area.

- Adjacent to State MPAs: Big Creek SMR and SMCA
- Commercial bottom trawl
- Adjacent to commercial benthic fixed gear
- Essential Fish Habitat (EFH) Conservation Area
- EFH bottom trawl closure proposed (2013)
- Recreational fishing
- Leatherback sea turtle critical habitat

Figure 1. The location of SESA 14 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 14. Grey border=SESA boundary; yellow=Rockfish Conservation Area; orange=commercial benthic fixed gear dominant use; light orange border=EFH Conservation Area; light blue border=State MPA. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.
Table 1. Species known to occur within SESA 14: Partington & Lucia Canyons.

| Invertebrates | -soft corals† (Alcyonacea), e.g., mushroom soft coral (*Heteropopypus ritteri*), gorgonians, *Swiftia* spp., Primnoidae  
|               | -sea pens† (Pennatulacea), e.g., *Umbellula lindahlia*, *Halipiteris californica*  
|               | (MBARI VARS imagery; NMFS West Coast Bottom Trawl Groundfish Survey) |
| Fishes        | Not sampled:  
|               | *Found nearby:*  
|               | -Pacific Hake (*Merluccius productus*)  
|               | -rockfishes (*Sebastes* spp.), e.g., Pygmy, Blue, Copper, Yelloweye², Gopher, Halfbanded, Olive, Rosy, Rosethorn, Squarespot, Greenspotted, Bank, Darkbotched², Vermilion  
|               | -Longspine Thornyhead (*Sebastolobus altivelis*)  
|               | -Sablefish (*Anoplopoma fimbria*)  
|               | -Sharpnose Seaperch (*Phanerodon atriipes*)  
|               | -Señorita (*Oxyjulis californica*)  
|               | -Blackeye Goby (*Rhinogobiops nicholsii*)  
|               | -Rex Sole (*Glyptocephalus zachirus*)  
|               | -Slender Sole (*Lyopsetta exilis*)  
|               | -Dover Sole (*Microstomus pacificus*)  
|               | (MBNMS 2013; adjacent MPA, Yoklavich et al. 2002) |
| Marine birds  | -Northern Fulmar (*Fulmarus glacialis*)  
|               | -California Brown Pelican (*Pelecanus occidentalis californicus*)  
|               | -Brandt’s Cormorant (*Phalacrocorax penicillatus*)  
|               | -California Gull (*Larus californicus*), Western Gull (*L. occidentalis*)  
|               | -Common Murre (*Uria aalge*)  
|               | -Rhinoceros Auklet (*Cerorhinea monocerata*)  
|               | (Ainley et al. 2012) |
| Marine mammals| -humpback whale¹ (*Megaptera novaeangliae*)  
|               | -gray whale (*Eschrichtius robustus*)  
|               | -dolphins (*Odontoceti*), e.g., Northern right-whale dolphin (*Lissodelphis borealis*), Risso’s dolphin (*Grampus griseus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)  
|               | -seals (*Phocidae*), e.g., harbor seal (*Phoca vitulina*), Northern elephant seal (*Mirounga angustirostris*)  
|               | -California sea lion (*Zalophus californianus*)  
|               | (NOAA, 2003) |
| Marine reptiles| -leatherback sea turtle¹ (*Dermochelys coriacea*) (NOAA, 2003) |

Special Status Species: Endangered¹, Overfished²;  
Biogenic habitat†

Diverse or productive communities:  
- moderate primary productivity  
- low krill production  
- marine mammal high diversity

Migration, breeding, or foraging areas:  
- 100% in leatherback sea turtle NMFS critical habitat
Research

SIMoN projects:

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)

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/100224/structure-of-populations%2c-levels-of-abundance-and-status-of-humpbacks-

Tagging of Pacific Predators (TOPP) (2000-current)
  http://sanctuarymonitoring.org/projects/100137/tagging-of-pacific-predators-%20topp%29


Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

Monitoring stations and/or data collection instruments:
  - NMFS West Coast Bottom Trawl Groundfish Survey

MBNMS research: None

Science Needs & Research Questions

Habitat Characterization of the Continental Slope
  - What are the distribution and abundance of organisms and habitats on the continental slope?
  - How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
  - How do HABs affect local species populations?

Impacts on Whales from Human Uses
  - What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?

Landslide Management
  - Where have historic accumulations of slide debris dispersed to, and where might debris be transported within the marine environment in the future?
Socioeconomics and the Human Dimension
- 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
- Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.

SESAs Interactive Map: http://sanctuariesimon.org/maps/seسا

Publically Available Imagery: None
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/.

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


Nearby Studies:


SESA 15: La Cruz Canyon

Description

SESA 15 contains a mixture of hard (18%) and soft bottom in and around the head of La Cruz Canyon. The southern part of the SESA is adjacent to Piedras Blancas State Marine Conservation Area (SMCA). With a depth range (71-422 m) that spans the shelf, shelf break and slope 1 depth zones, this SESA has relatively high habitat richness (10 habitats) and diversity (index = 5.31).

Groundfish survey trawls in shelf and shelf break habitat have captured a couple coral species and a fish fauna of intermediate richness and diversity. Surveys to characterize benthic habitats and communities (using camera sled and ROVs) have occurred at multiple locations in shelf and shelf break habitats. The upwelling zone at Pt. Piedras Blancas overlaps the eastern part of the SESA; upwelled water may be advected through the SESA. Lower levels of primary productivity are observed. This SESA is on the eastern edge of a krill hotspot. Some seabird and mammal surveys in this area. This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 15 encompasses large portions of Rockfish Conservation Area zones and also contains proposed demersal fishes (EFH) conservation area.

- Adjacent to State MPA: Piedras Blancas SMCA
- Commercial bottom trawl
- Adjacent to commercial benthic fixed gear
- Rockfish Conservation Area (trawl)
- Adjacent to Essential Fish Habitat (EFH) Conservation Area
- EFH bottom trawl closure proposed (2013)
- Recreational fishing
- Leatherback sea turtle critical habitat

Figure 1. The location of SESA 15 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Figure 2. Close-up map of SESA 15. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; light blue boundary=State MPA; orange=commercial benthic fixed gear dominant use. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/sesa/.
Living Marine Resources & Uses

Table 1. Species known to occur within SESA 15: La Cruz Canyon.

| Invertebrates                  | -sponges† (Porifera), e.g., orange, white sponges  
|                               | -hydroids (Hydrozoa)  
|                               | -stony corals† (Scleractinia), e.g., bean coral (Caryophyllidae)  
|                               | -soft corals† (Alcyonacea), e.g. gorgonians  
|                               | -sea slugs (Gastropoda), e.g., *Pleurobranchaea californica*  
|                               | -octopli (Cephalopoda)  
|                               | -rock crabs (Decapoda)  
|                               | -bryozoa (Gymnolaemata)†  
|                               | -feather stars (Crinoidea)  
|                               | -sea stars (Asteroidea), e.g., *Mediaster* spp., sunflower star (*Pycnopodia* sp. or *Rathbunaster* sp.), sand stars  
|                               | -brittle stars (Ophiuroidea)  
|                               | (CSUMB/MBNMS videos, stills; NMFS West Coast Bottom Trawl Groundfish Survey)  
| Found nearby:                  | -sea pens† (Pennatulacea), e.g., Virgulariidae (NMFS West Coast Bottom Trawl Groundfish Survey)  

| Fishes                        | -Spotted Ratfish (*Hydrolagus colliei*)  
|                               | -rockfishes (*Sebastes* spp.), e.g., Greenstriped, Yelloweye³, Darkblotched³, Boccacio³, Canary³, Cowcod², Vermilion, Rosy  
|                               | -Longspine Thornyhead (*Sebastolobus altivelis*)  
|                               | -Sablefish (*Anoplidae fimbria*)  
|                               | -Kelp Greenling (*Hexagrammos decagrammus*)  
|                               | -Lingcod (*Ophiodon elongatus*)  
|                               | -Petrale Sole³ (*Osetta jordani*) (CSUMB/MBNMS videos, stills: MBNMS 2013)  

| Marine birds                  | -Sooty Shearwater (*Puffinus griseus*)  
|                               | -California Brown Pelican (*Pelecanus occidentalis californicus*),  
|                               | -California Gull (*Larus californicus*),  
|                               | -Black-legged Kittiwake (*Rissa tridactyla*),  
|                               | -Common Murre (*Uria aalge*)  
|                               | -Rhinoceros Auklet (*Cerorhinea monocerata*)  
|                               | -Cassin’s Auklet³ (*Ptychoramphus aleuticus*) (Ainley et al. 2012)  

| Marine mammals                | -gray whale (*Eschrichtius robustus*)  
|                               | -dolphins (Odontoceti), e.g., Risso’s dolphin (*Grampus griseus*),  
|                               | Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Dall’s porpoise (*Phocoenoides dalli*)  
|                               | -California sea lion (*Zalophus californianus*) (NOAA, 2003)  

| Marine reptiles               | -leatherback sea turtle¹ (*Dermochelys coriacea*) (NOAA, 2003)  

Special Status Species: Endangered**, Birds of Conservation Concern², Overfished³;  
Biogenic habitat†
Diverse or productive communities:
- low primary productivity
- moderate krill production
- marine bird high diversity

Migration, breeding, or foraging areas:
- 100% in leatherback sea turtle NMFS critical habitat
- 25% in Sooty Shearwater (IBA, Important Bird Area)

Research

SIMoN projects:

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-07)  

Deepwater Characterization and Baseline Monitoring in the Monterey Bay National Marine Sanctuary (2009-current)  

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

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)  

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)  

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)  

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)  

Monitoring stations and/or data collection instruments:
- NMFS West Coast Bottom Trawl Groundfish Survey

MBNMS research:
- CSUMB shelf characterization 2007-2011
Science Needs & Research Questions

Habitat Characterization of the Continental Shelf
• What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope
• What are the distribution and abundance of organisms and habitats on the continental slope?
• How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms
• How do HABs affect local species populations?

Landslide Management
• Where have historic accumulations of slide debris dispersed to, and where might debris be transported within the marine environment in the future?

Socioeconomics and the Human Dimension
• 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
• Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.
SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

- CSUMB/MBNMS camera sled and ROV (http://sep.csumb.edu/ifame/scid/)

Figure 3. Rosy Rockfish (Sebastes rosaceus) and sponges. Credit: IfAME/CSUMB/MBNMS (http://sep.csumb.edu/ifame/scid/).

Figure 4. Crinoid (Class Crinoidea). 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/.

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


Description

SESA 16 encompasses Davidson Seamount and surrounding soft rise habitat (3,875 m deep). Davidson Seamount, one of the largest seamounts in U.S. coastal waters, is 2,280 m tall with the summit at 1,250 m below the sea surface. Hard bottom seamount habitat comprises 73% of this SESA resulting in relatively low habitat richness (4 habitats) and intermediate habitat diversity (index=3.12). ROV surveys of benthic communities on the seamount have found a wide diversity and abundance of deep sea corals and sponges. The seamount has been the focus of research and monitoring including geology, oceanographic monitoring, fish assemblage studies, and seabird and mammal surveys (both aerial and ship-based). This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

Resource Management Issues

SESA 16 contains Davidson Seamount, a large rocky, extinct underwater volcano that contains a number of well-studied, unique habitats and biological communities.

- Essential Fish Habitat (EFH) Conservation Area
- Recreational Fishing
- Wildlife viewing
- Leatherback sea turtle critical habitat
- Vessel traffic
- Cumulative research collection
- Marine debris/dumping
- Ocean acidification
- Sea temperature rise
- Underwater cables
- Water quality
- Bio-prospecting

Figure 1. The location of SESA 16 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King, MBNMS.

Figure 2. Close-up map of SESA 16. Grey border=SESA boundary; light orange border=EFH Conservation Area; red border=dominant commercial shipping lane. Source: SESAs Interactive Map, http://sanctuarymonitoring.org/maps/ sesa/.
## Living Marine Resources & Uses

### Table 1. Species known to occur within SESA 16: Davidson Seamount.

| Invertebrates               | - sponges† (Porifera)  
|                             | - black corals† (Antipatharia)  
|                             | - stony corals† (Scleractinia)  
|                             | - soft corals† (Alcyonacea)  
|                             | - sea lilies (Crinoidea)  
|                             | (Burton and Lundsten 2008)  

For complete list see “Davidson Seamount Taxonomic Guide”, Burton and Lundsten 2008

| Fishes                        | For complete list see “Davidson Seamount Taxonomic Guide”, Burton and Lundsten 2008

| Marine birds                  | - Laysan Albatross (Phoebastria immutabilis), Black-footed Albatross² (P. nigripes)  
|                             | - Northern Fulmar (Fulmarus glacialis)  
|                             | - Cook’s Petrel (Pterodroma cooki), Stejneger’s Petrel (P. longirostris)  
|                             | - Pink-footed Shearwater (Puffinus creatopus), Sooty Shearwater (P. griseus)  
|                             | - Leach’s Storm-Petrel (Oceanodroma leucorhoa)  
|                             | - Black-bellied Plover (Pulvisalis squatarola)  
|                             | - Least Sandpiper (Calidris minutilla)  
|                             | - Short-billed Dowitcher (Limnodromus griseus)  
|                             | - Red Phalarope (Phalaropus fulicarius), Red-necked Phalarope (P. lobatus)  
|                             | - Long-tailed Jaeger (Stercorarius longicaudus), Pomarine Jaeger (S. pomarina),  
|                             | Parasitic Jaeger (S. parasiticus)  
|                             | - California Gull (Larus californicus), Western Gull (L. occidentalis)  
|                             | - Arctic Tern (Sterna paradisaea)  
|                             | - Cassin’s Auklet² (Ptychoramphus aleuticus)  
|                             | - Xantus’ Murrelet (Synthiloboramphus scrippsi)  
|                             | (Ainley et al. 2012; Benson 2002; Newton and DeVogelaere 2013)

| Marine mammals                | - fin whale† (Balaenoptera physalus)  
|                             | - humpback whale† (Megaptera novaeangliae)  
|                             | - sperm whale (Physter macrocephalus)  
|                             | - killer whale (Orcinus orca)  
|                             | - Pacific white-sided dolphin (Lagenorhynchus obliquidens)  
|                             | - Risso’s dolphin (Grampus griseus)  
|                             | - Northern right-whale dolphin (Lissodelphis borealis)  
|                             | - Dall’s porpoise (Phocoenoides dalli)  
|                             | - California sea lion (Zalophus californianus)  
|                             | - Northern fur seal (Callorhinus ursinus)  
|                             | - Northern elephant seal (Mirounga angustirostris)  
|                             | (Benson 2002; Forney 2002; Newton and DeVogelaere 2013)

| Marine reptiles               | Not sampled

Special Status Species: Endangered†, Birds of Conservation Concern‡; Biogenic habitat†

### Diverse or productive communities:

- low primary productivity
- low krill production
- marine bird and mammal high diversity

### Migration, breeding, or foraging areas: Not sampled
Research

SIMoN projects:

http://sanctuarysimon.org/projects/100114/davidson-seamount%3a-2002-expedition


Davidson Seamount: Ecological Characterization & Habitat Modeling of the Fauna (2008-09)

http://sanctuarymonitoring.org/projects/100381/davidson-seamount%3a-2010-marine-mammal-aerial-surveys-


Monitoring stations and/or data collection instruments:

- MBARI/MBNMS transects and individually marked corals

MBNMS research:

- Seamount exploration and characterization (R/V Western Flyer, 2002 & 2006)
- CTD profile (NOAA Ship Shimada, 2015)
- Mid-water fish trawls (NOAA Ship Shimada, 2015)

Science Needs & Research Questions

Ecological Characterization of Davidson Seamount

- Are there temporal changes in the biologic community living on or near the Davidson Seamount?
- Are there ecological links between the seamount and other habitats of the Sanctuary (e.g., migration pathways and nutrient transport)?

Impacts on Whales from Human Uses

- What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?
- What are the environmental and prey characteristics that lead to foraging aggregations that may leave whales vulnerable to disturbance by recreational ocean users?
Socioeconomics and the Human Dimension

- How do we determine the overall impact of multiple human activities (some with negative and some with positive influence) on Sanctuary resources?
- What is the geographic distribution of human activities that influence the condition of Sanctuary resources? Are there hot spots?

SESAs Interactive Map: http://sanctuarysimon.org/maps/sesa

Publically Available Imagery

- SIMoN Photo Library (http://sanctuarysimon.org/photos/index.php)

Figure 3. Precious coral (Corallium sp.) and basket stars (Gorgonocephalus sp.). Credit: NOAA/MBARI (http://sanctuarysimon.org/photos/index.php).

Figure 4: Black coral (Trissopathes pseudotristicha), primnoid coral (Narella sp.), crinoids (Florometra serratissima), sea spider (Class Pycnogonida), and bryozoans (Phylum Ectoprocta) on the Davidson Seamount at 2669 meters. Credit: NOAA/MBARI (http://sanctuarysimon.org/photos/index.php).
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; SEAs Interactive Map, [http://sanctuarymonitoring.org/maps/sesa/](http://sanctuarymonitoring.org/maps/sesa/).

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


For more information - http://montereybay.noaa.gov/resourcepro/ebmi/sesa.html


