Connections on the San Francisco Bay and the Greater Farallones National Marine Sanctuary

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Objective

• Write a white paper on the connections between the San Francisco Bay and Greater Farallones National Marine Sanctuary
  • Introduction
  • Chapters: Symposium Topics
  • Overall threats
  • Conclusion
  • Advisory council recommendations summaries in the conclusion
Wildlife

Cetaceans

Harbor Porpoises
Wildlife

Harbor Porpoises

Bottlenose Dolphins

Cetaceans
Wildlife

Cetaceans

Harbor Porpoises

Bottlenose Dolphins

Grey Whales
Wildlife

Cetaceans

Harbor Porpoises
Bottlenose Dolphins
Grey Whales
Humpback Whales
Cetacean sightings between the San Francisco Bay and Gulf of the Farallones
Wildlife

Pinnipeds

Harbor Seals

California Sea Lions
Wildlife

Sea Birds

Common Murres

Brandt’s Cormorant

Surf Scoter

Western Gulls
Wildlife Threats

- Pollution
- Domoic Acid
- Sea level rise
- Marine heat waves
- Ship Strikes
- Habitat alteration
- Shifting prey populations
Oceanography

Cartoon conceptual model

*tidal mixing of waters in SF Bay*
Oceanography

- River Plumes
  - Transports:
    - Freshwater
    - Nutrients
    - Pollutants
    - Plankton
    - Sediment
    - Etc
  - Preliminary results from Dr. Piero Mazzini showed the plume leaving the bay and traveling north.
• Nutrients and Phytoplankton
  • Gulf of the Farallones is a productivity hot spot
• Nutrient Sources:
  • Coastal Upwelling
  • Outflow from the San Francisco Bay
• There is very few studies on nutrient/productivity in the Gulf of the Farallones and San Francisco Bay outflow.
Oceanography

- Ocean Acidification (OA)
  - Negatively effects calcifying organisms
  - Two sources of OA are upwelling and atmospheric sources.
  - OA is hard to measure
Oceanography Threats

- Harmful Algal Blooms
- Stratification
- Climate Change
Human Activities

• Vessel Traffic and Ship Strikes
  • Monitored using Marine Monitor (M2)
  • Results showed vessels (barges and ferries) traveled over 15 knots (the voluntary speed limit in the bay).
  • High migration zones outside of the bay within the sanctuary
Human Activities

- Fishing
  - 40% of Salmon caught in Oregon is from the Sacramento River
- Invasive Species/ Fouling
  - Come via ballast water or attached to ships
  - Push out native species
  - Alter habitats
Human Activities

Threats

- Climate Change (Anthropogenic)
- Invasive Species
- Vessel Noise
- Ship Strikes
- Pollution
Overall Threats

Ship Strikes

Pollution

Climate Change

- Anthropogenic
- Marine Heat Waves
- Domoic Acid
- Sea level rise
- Habitat alteration
- Shifting prey populations
- Harmful Algal Blooms
- Stratification
Sanctuary to Bay voluntary vessel speed reduction to eliminate ship strikes

Need for additional research on connections between the bay and GFNMS.

Coating Strategies for ships to reduce fouling

Sanctuary Expansion to close the exclusion zone and into the San Francisco Bay (Important habitat for Humpback Whales)
Sanctuary Advisory Council Discussions and Recommendations