

BOEM

Bureau of Ocean Energy
Management

OFFICE OF ENVIRONMENT

Pacific Office • Camarillo, CA

Understanding the Potential Effects of Offshore Wind Development to Fishes, Essential Fish Habitat, and Fisheries

Donna M. Schroeder

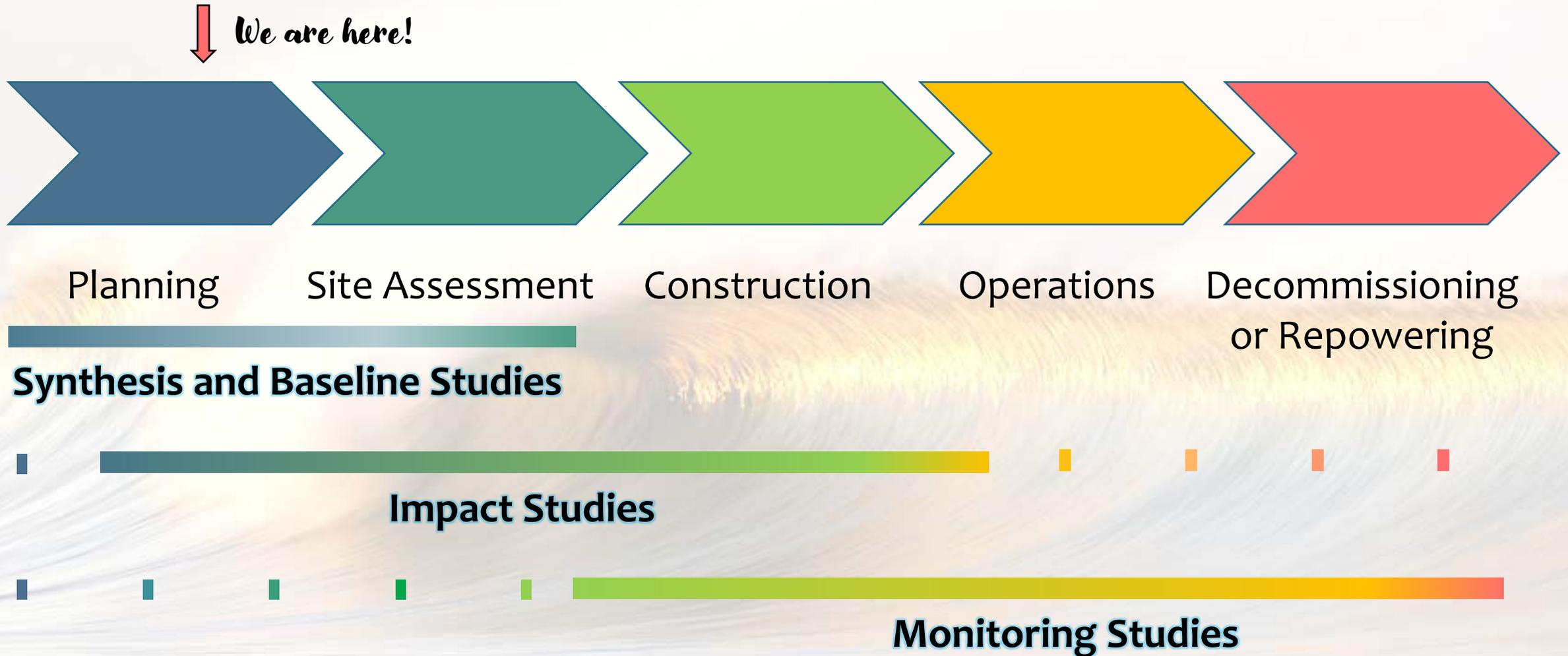
West Coast Renewable Energy Science Exchange, March 11, 2020

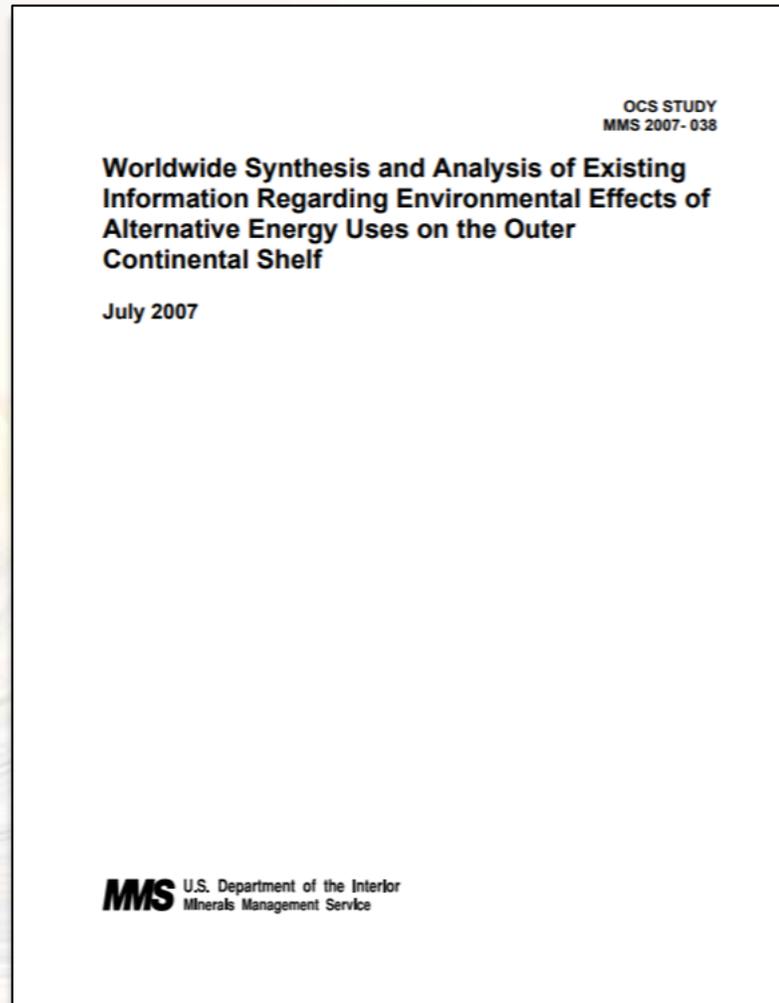


Outline:

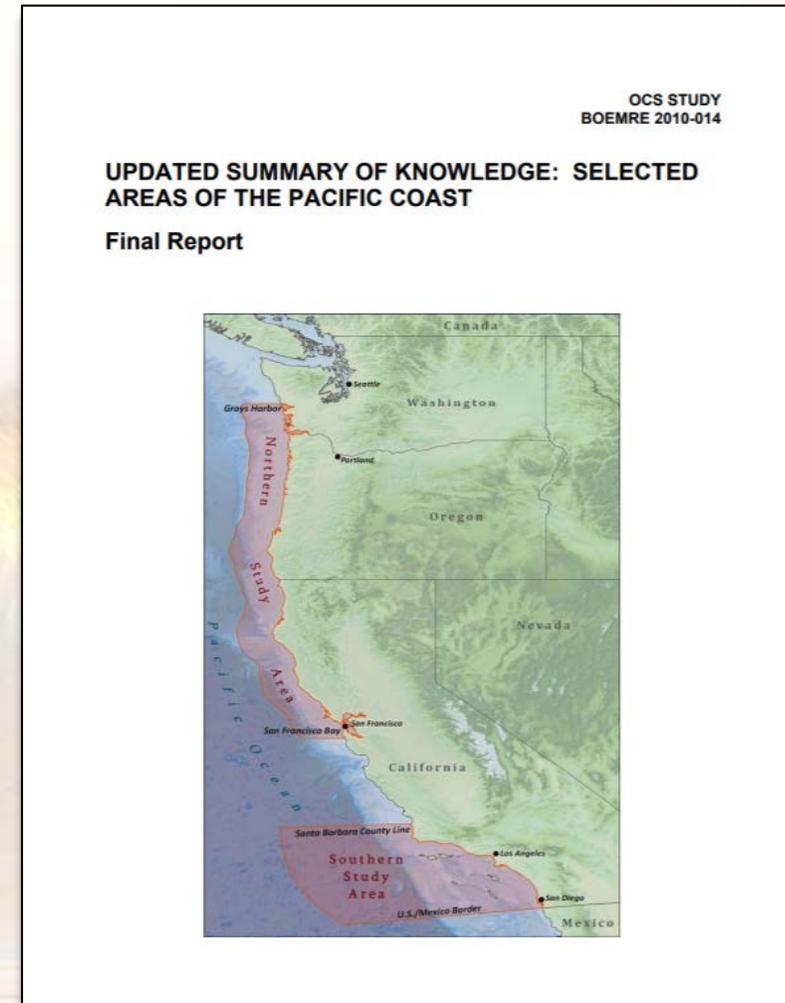
- Overview of a Project Life Cycle and Approach to Studies
- Examples of Completed or Ongoing Studies of Different Types
- Where to Find Information

Type of Study in Relation to Project Life Cycle



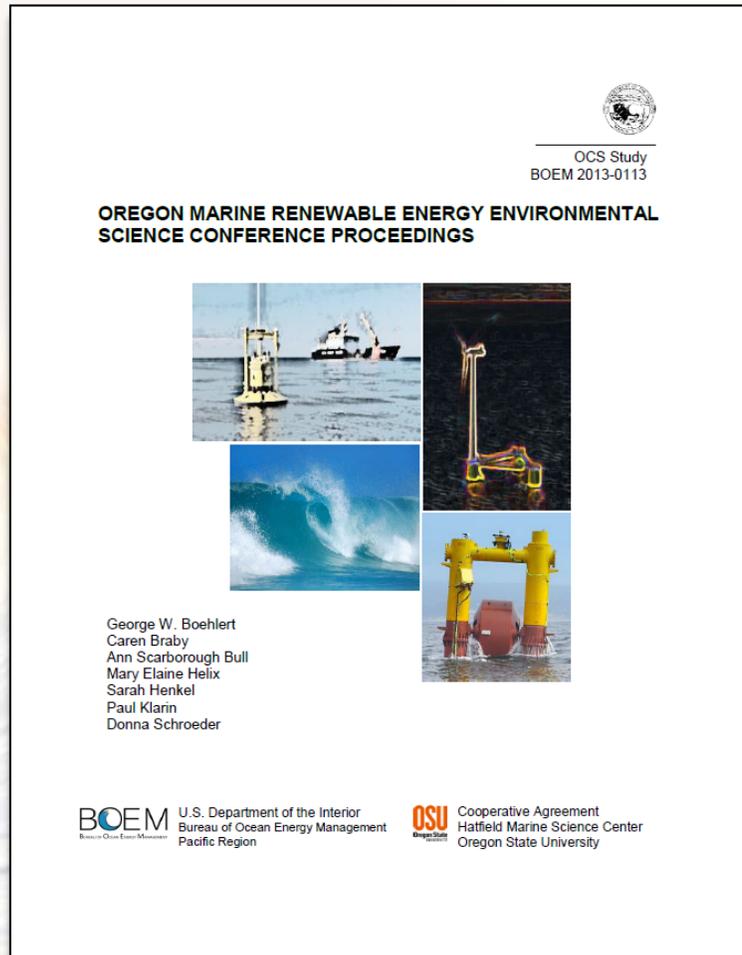


<https://epis.boem.gov/final%20reports/4325.pdf>



<https://epis.boem.gov/final%20reports/4955.pdf>

2012 Oregon Marine Renewable Environmental Science Conference



<https://espis.boem.gov/final%20reports/5255.pdf>

Baseline gaps (Fishes)

- Seafloor characterization
- Identification of ecological hotspots
- Distribution non-commercial species

Impact assessment gaps (Fishes)

- Electromagnetic fields (EMFs)
Sharks and rays, salmon, sturgeon, crustaceans
- Artificial reef effects/Fish aggregating devices (FADs)

Important monitoring concepts (Fishes)

- Endangered species
- EMF and Acoustic environment
- Artificial reef effects/Fish attraction devices (FADs)
- Importance of partnerships and existing programs
- Data sharing and clearinghouse
- Shifting baselines

Baseline Gap - Seafloor Characterization

Baseline gaps

- Seafloor characterization
- Identification of ecological hotspots

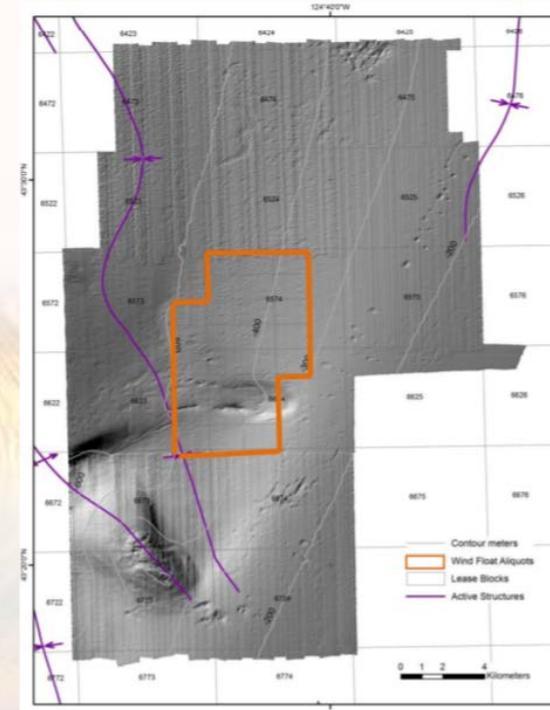
Oregon OCS Seafloor Mapping: Selected Lease Blocks Relevant to Renewable Energy

Donna M. Schroeder, Project Officer
Bureau of Ocean Energy Management
Pacific Region

Guy R. Cochrane, Principle Investigator
U.S. Geological Survey
Pacific Coastal and Marine Science Center



Untrakdrover



https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/OR/2015-09-30_Schroeder_ORSciEx_seafloor_mapping.pdf

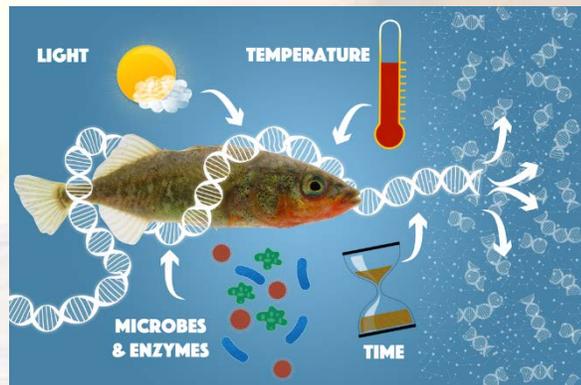
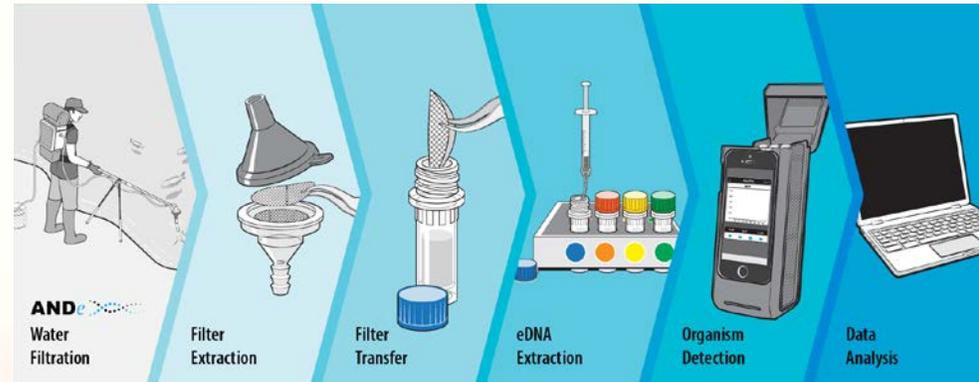
Coming soon!

**September 9, 2020 Science Exchange Seminar:
Overview of BOEM-funded Research about Benthic Habitats on the West Coast
Lisa Gilbane, Biologist, BOEM**

Baseline Gap - Distribution Non-commercial Species

- Baseline gaps**
- Distribution non-commercial species
 - Identification of ecological hotspots

Environmental DNA (eDNA)



Endangered Species Detections



Citizen Science



Difficult to Sample Habitats

Baseline Studies - Marine Biodiversity Observation Network

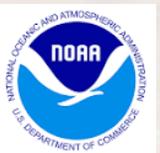


<http://sbc.marinebon.org/>

“Whales to Microbes”

Goals:

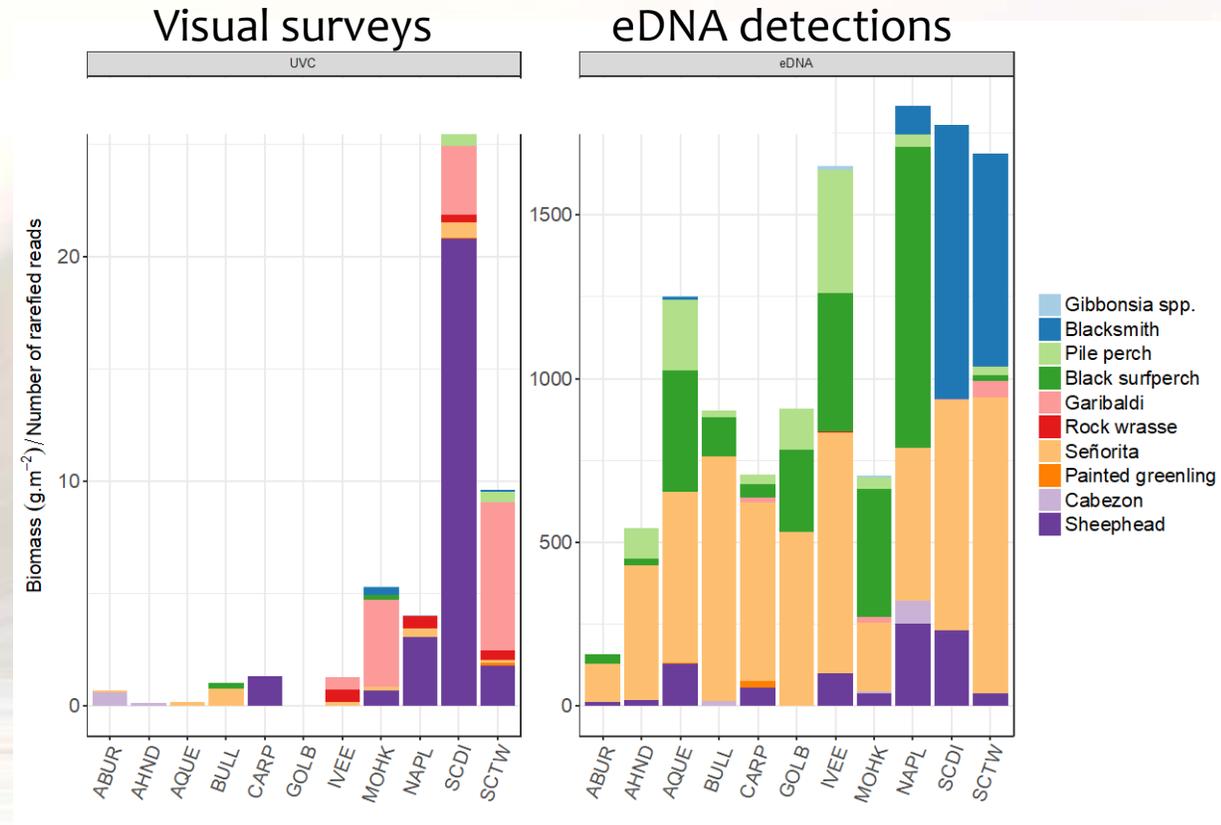
1. Integrate biodiversity data to enable inferences about regional biodiversity
2. Develop advanced methods using imagery and genomics for monitoring biodiversity
3. Implement a tradeoff framework that optimizes allocation of sampling effort



Baseline Studies - Marine Biodiversity Observation Network



Comparing Visual Surveys and eDNA Detections in Temperate Rocky Reef Communities

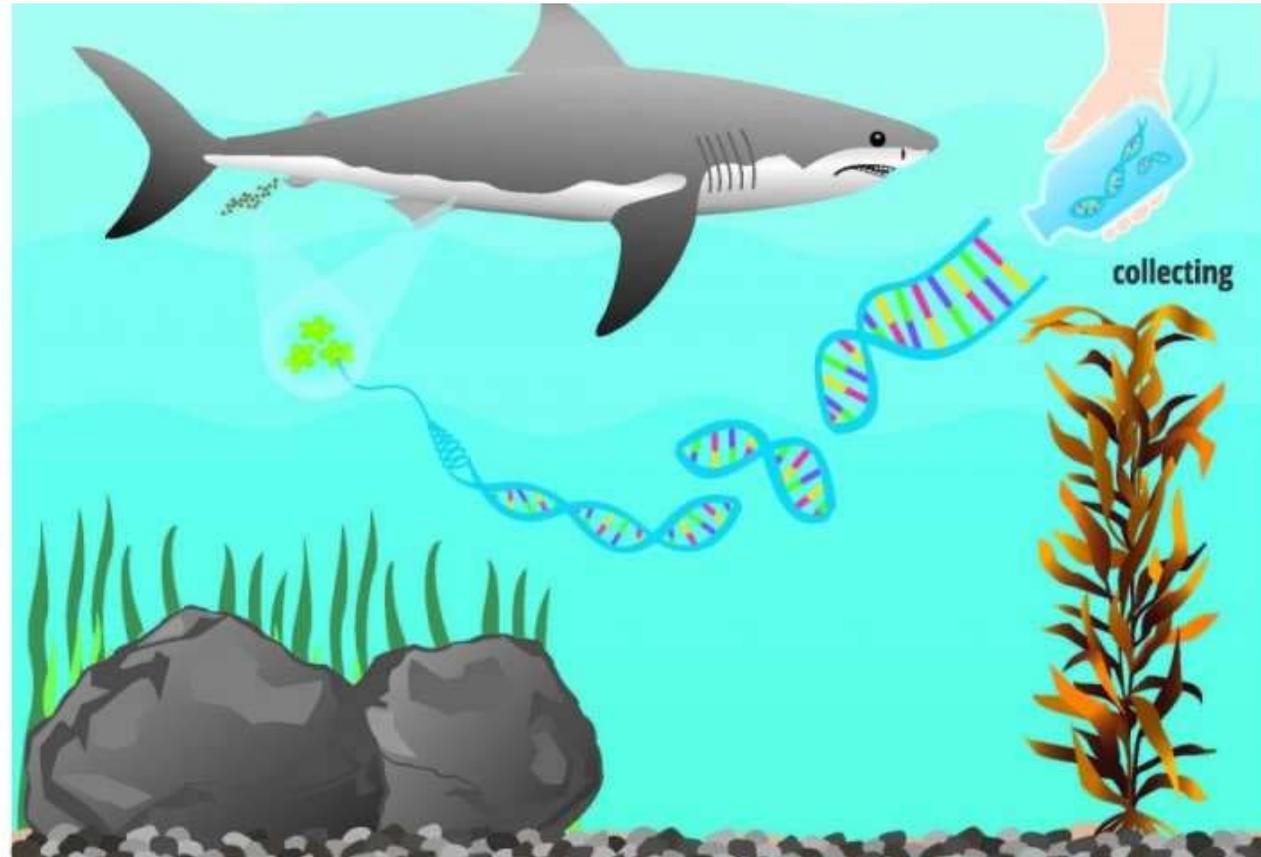


Baseline Studies - Marine Biodiversity Observation Network



Detecting Southern California's White Sharks With Environmental DNA

Kevin D. Lafferty^{1,2*}, Kasey C. Benesh³, Andrew R. Mahon³, Christopher L. Jerde² and Christopher G. Lowe⁴



Impact Assessment

Effects versus Impacts

Effects – “something happened”

Impacts – describe changes with

Intensity

Spatial extent

Duration (time)

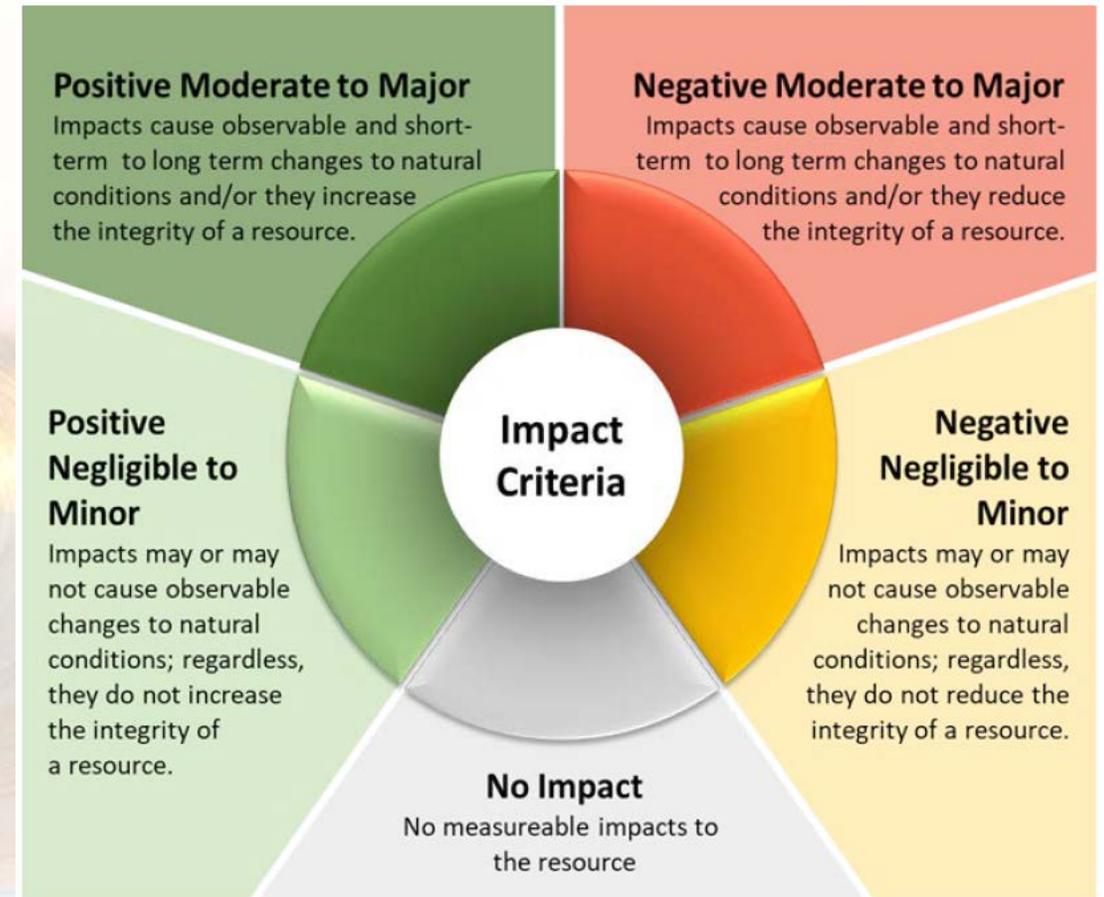
Potential descriptions:

e.g. Artificial Reef Effect from Wind Turbines

Minor/negligible positive impacts to Pacific groundfish at a regional scale for operational phase

e.g. Space-Use Conflicts during Cable Installation

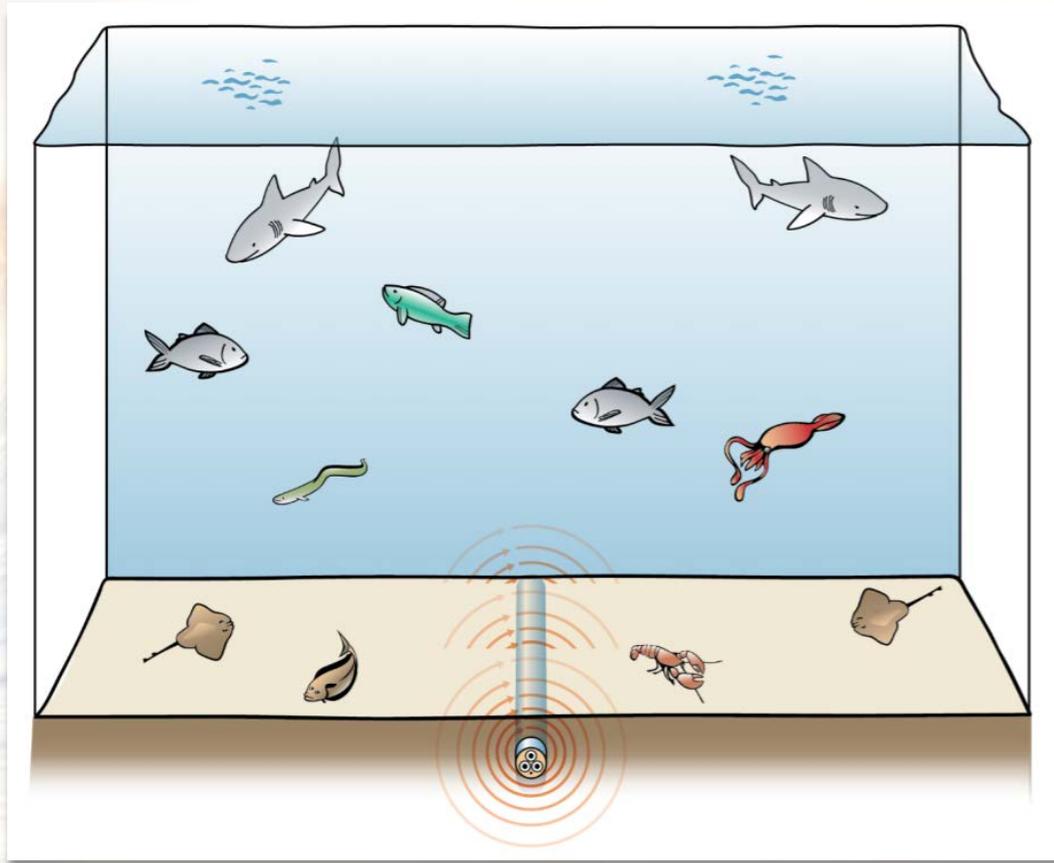
Moderate negative impact to Dungeness Crab fishery at the local scale for duration of cable installation phase



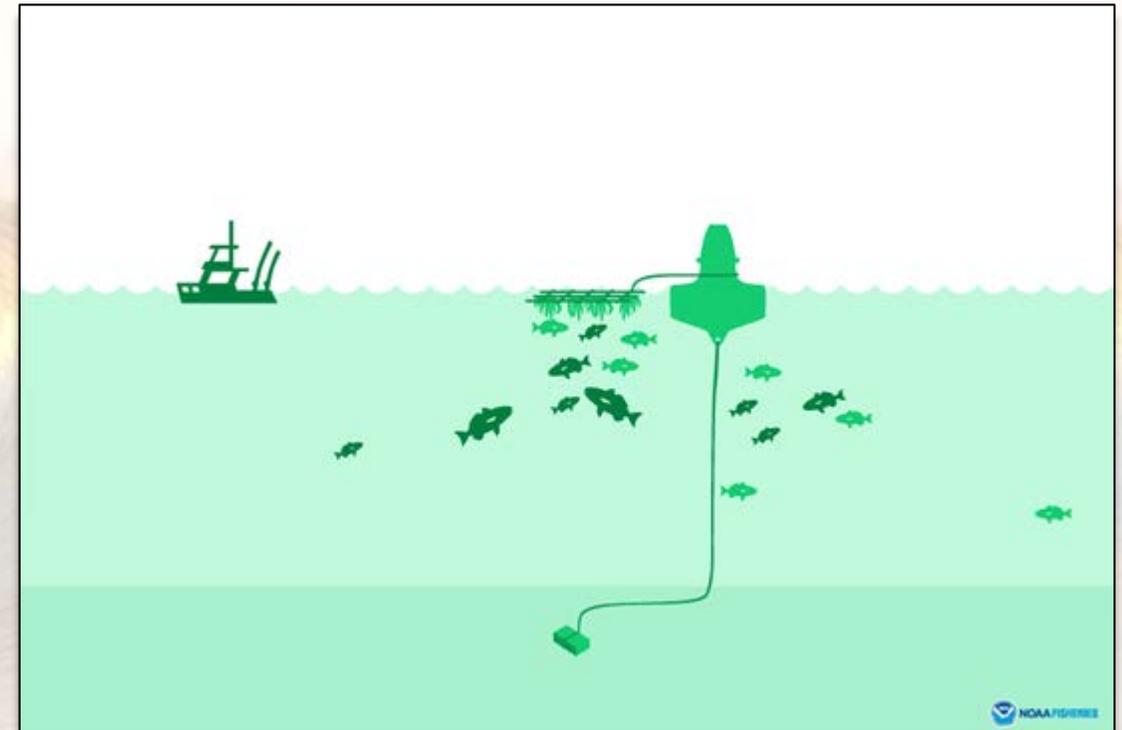
Impact Assessment Gaps

- Electromagnetic fields (EMFs)

Sharks and rays, salmon, sturgeon, crustaceans



- Artificial reef effect/Fish Aggregating Device



Impact Assessment gaps

- Electromagnetic fields (EMF)

BOEM-funded Studies

Effects Of EMF From Undersea Power Cables On Elasmobranchs And Other Marine Species (2011)

Current Ability to Assess Impacts of Electromagnetic Fields Associated with Marine and Hydrokinetic Technologies on Marine Fishes in Hawaii (2015)

Renewable Energy in situ Power Cable Observation (2016)

Assessment of Potential Impact of Electromagnetic Fields from Undersea Cables on Migratory Fish Behavior (2016)

Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables (2018)

Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England (2019)

Potential Impacts of Submarine Power Cables on Crab Harvest (ongoing)

<https://www.boem.gov/environment/environmental-studies/renewable-energy-research-completed-studies>

Effects Of EMF From Undersea Power Cables On Elasmobranchs And Other Marine Species

OCS Study
BOEMRE 2011-09

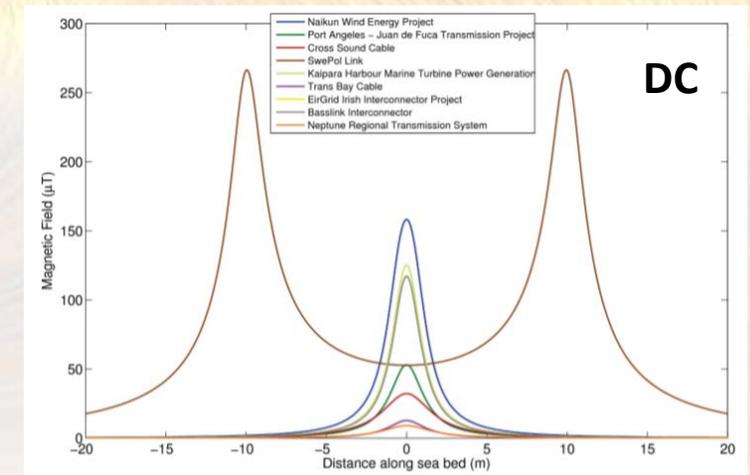
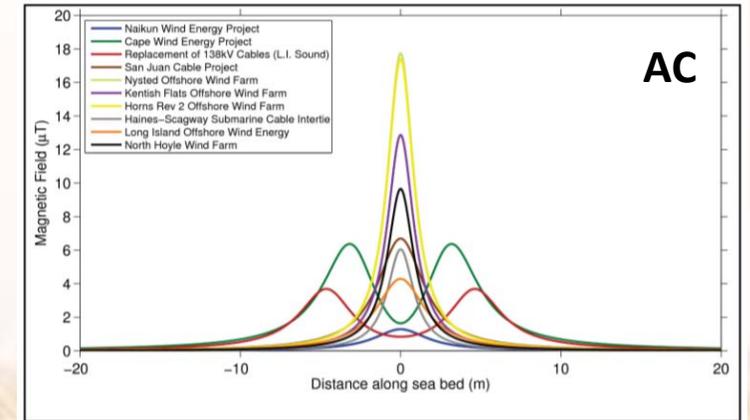
EFFECTS OF EMFs FROM UNDERSEA POWER CABLES ON ELASMOBRANCHS AND OTHER MARINE SPECIES
Final Report



U.S. Department of the Interior
Bureau of Ocean Energy Management, Regulation and Enforcement
Pacific OCS Region

Objectives

- Alternating current (AC):
intra-array cables
- Direct current (DC):
transmission cable to
shore (high-voltage)
- Review of evidence of
species' sensitivity to
electric and/or magnetic
fields

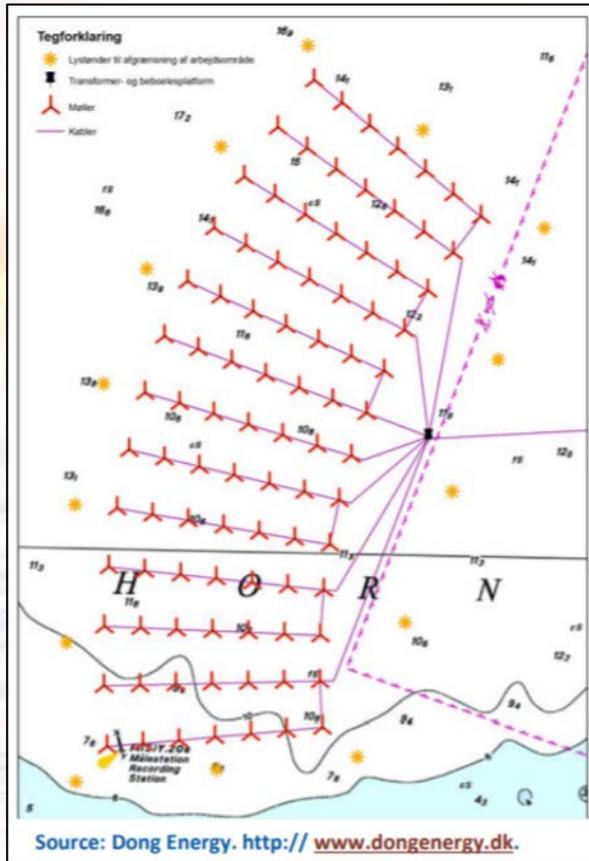


<https://epis.boem.gov/final%20reports/5115.pdf>

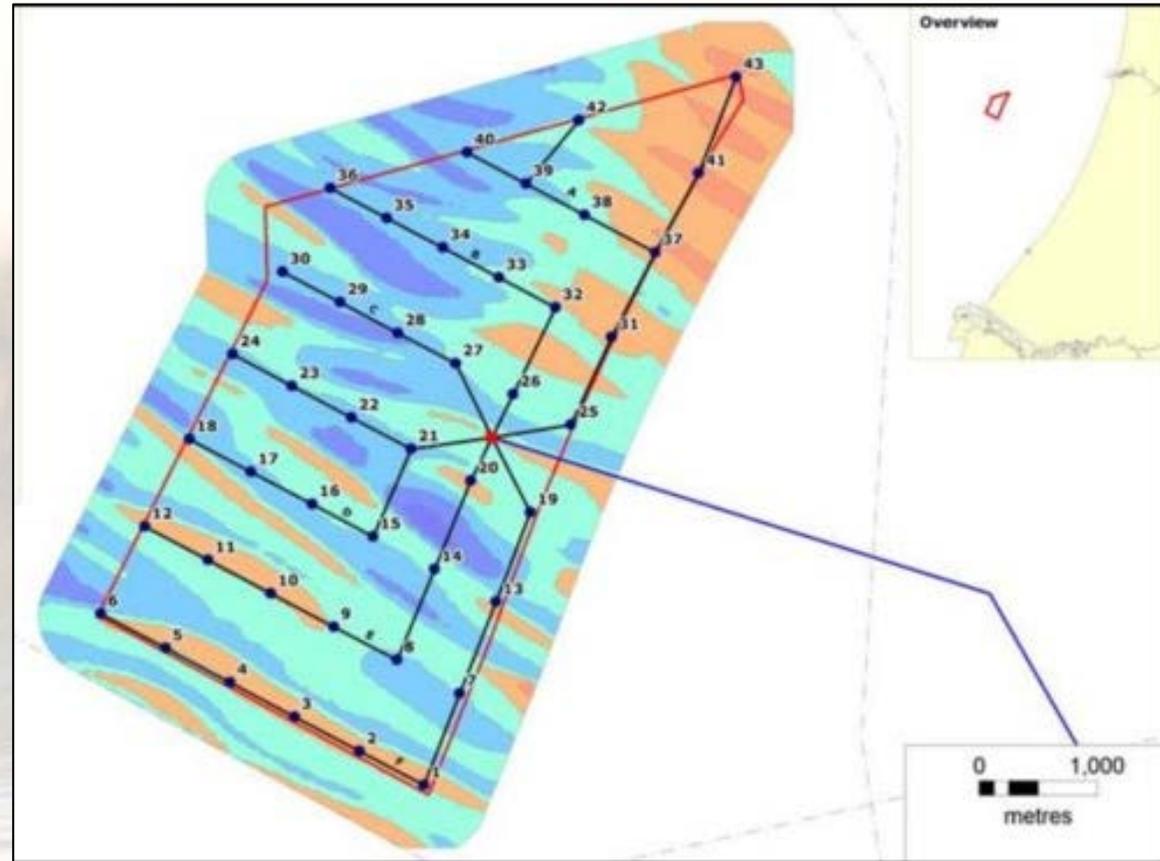
Effects Of EMF From Undersea Power Cables On Elasmobranchs And Other Marine Species

Examples of offshore wind farm cable layout

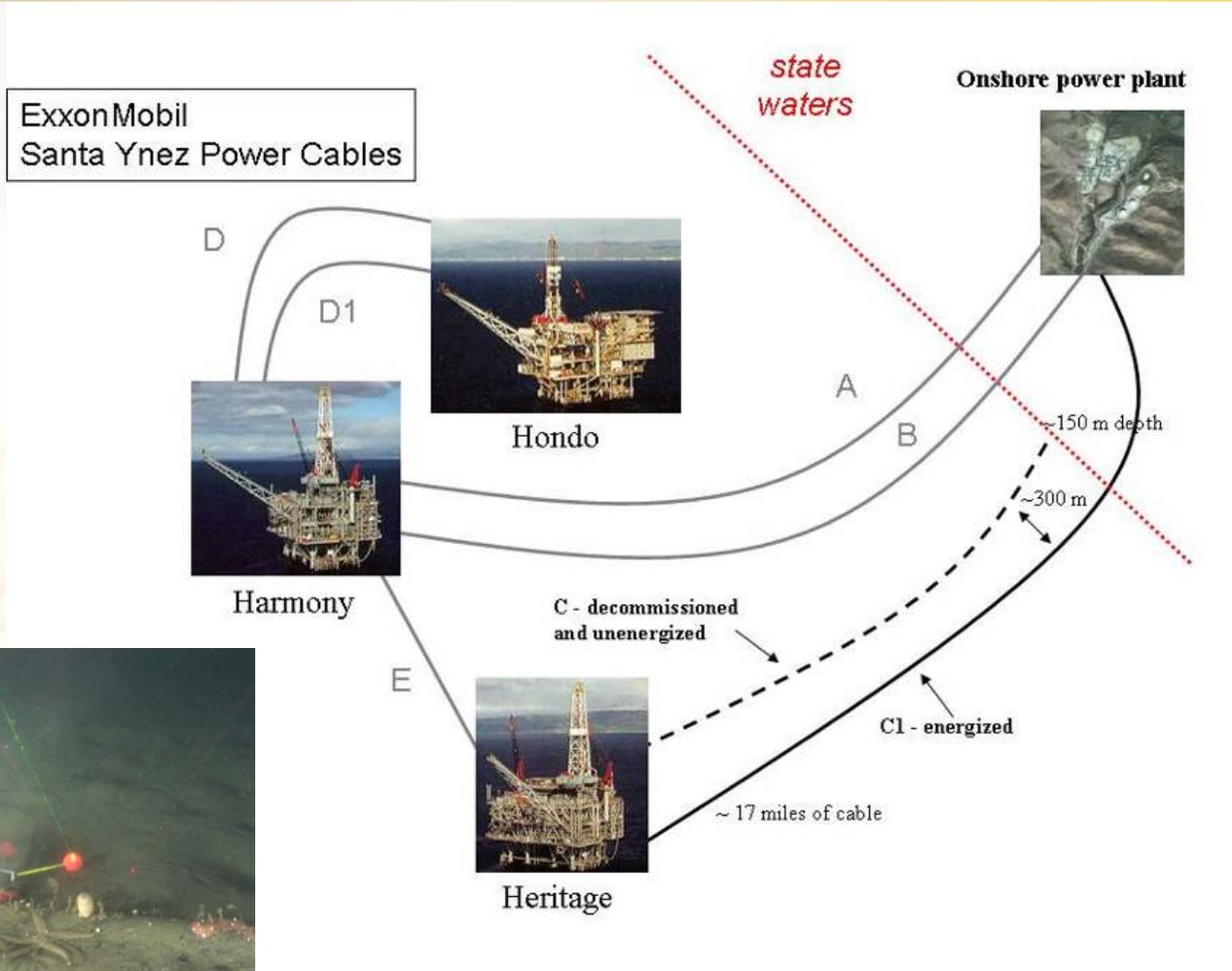
Horns Rev (Denmark)



Luchterduinen (Netherlands)



Renewable Energy *in situ* Power Cable Observation



<https://espis.boem.gov/final%20reports/5520.pdf>

Objectives

- Measure the strength, spatial extent, and variability of EMFs along both energized and unenergized **35-kV AC cables**
- Determine attraction/repulsion of fish and macroinvertebrates to the EMF from the power cables

Some key findings

- EMF models consistent with field measurements
- No significant difference between cable types
- Negligible impact (local scale)

Assessment of Potential Impact of Electromagnetic Fields from Undersea Cables on Migratory Fish Behavior



Objectives

- Trans Bay **400-MW high voltage DC cable**
- Compare animal movements using biotelemetry before/after installation/energized Trans Bay cable
- Green Sturgeon, migrating adults (Southern DPS threatened species)
- Chinook Salmon, out-migrating juveniles

Some key findings

- Green sturgeon: negligible impacts
- Chinook Salmon: mixed minor/negligible impacts to behavior

<https://www.boem.gov/2016-041/>

Assessment of Potential Impact of Electromagnetic Fields from Undersea Cables on Migratory Fish Behavior

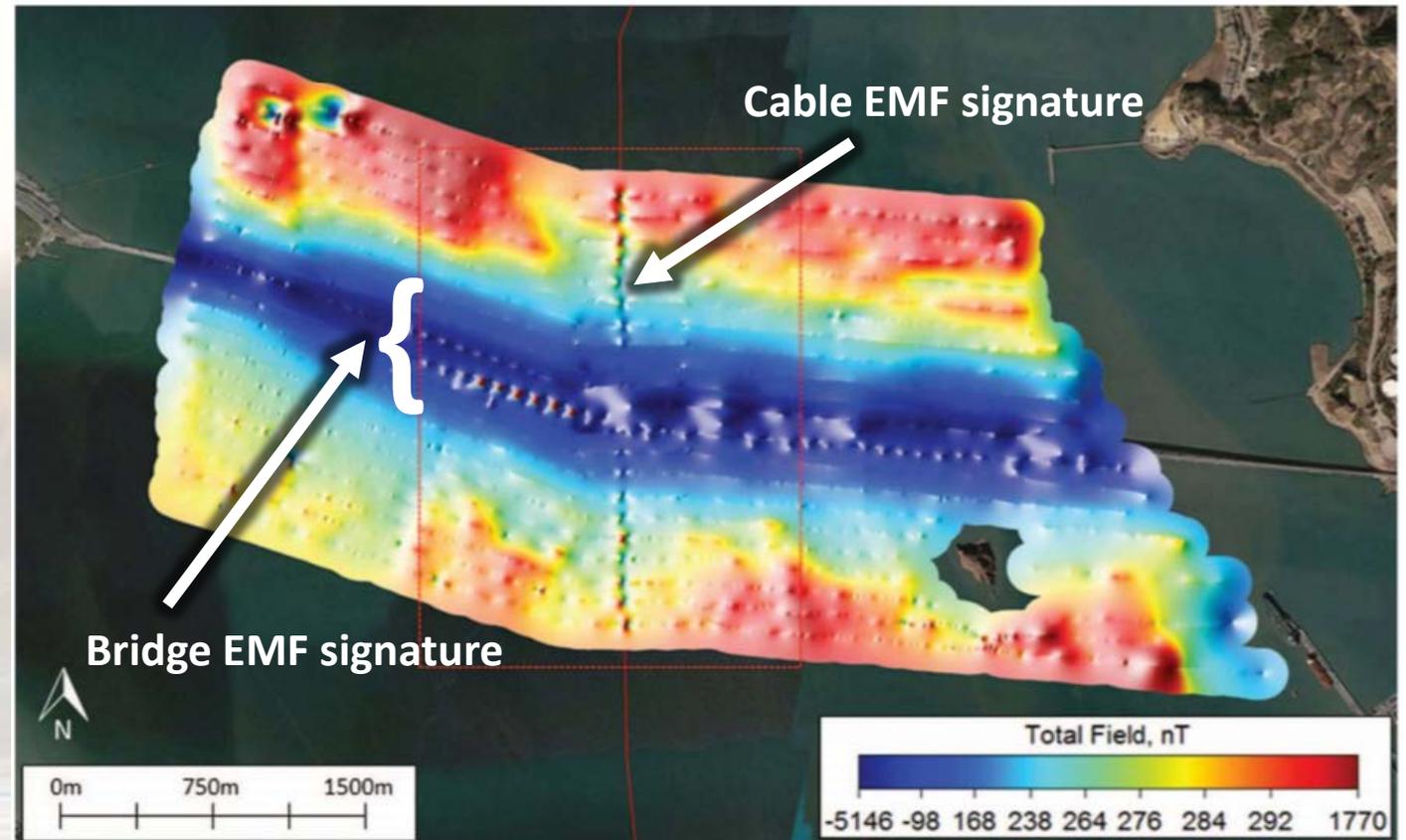
RESEARCH ARTICLE

Chinook salmon and green sturgeon migrate through San Francisco Estuary despite large distortions in the local magnetic field produced by bridges

A. Peter Klimley^{1*}, Megan T. Wyman¹, Robert Kavet²

Bridge EMF signature at least an order of magnitude greater than EMF signature of Trans Bay 400-MV HVDC cable

EMF field changes do not prevent migratory behavior

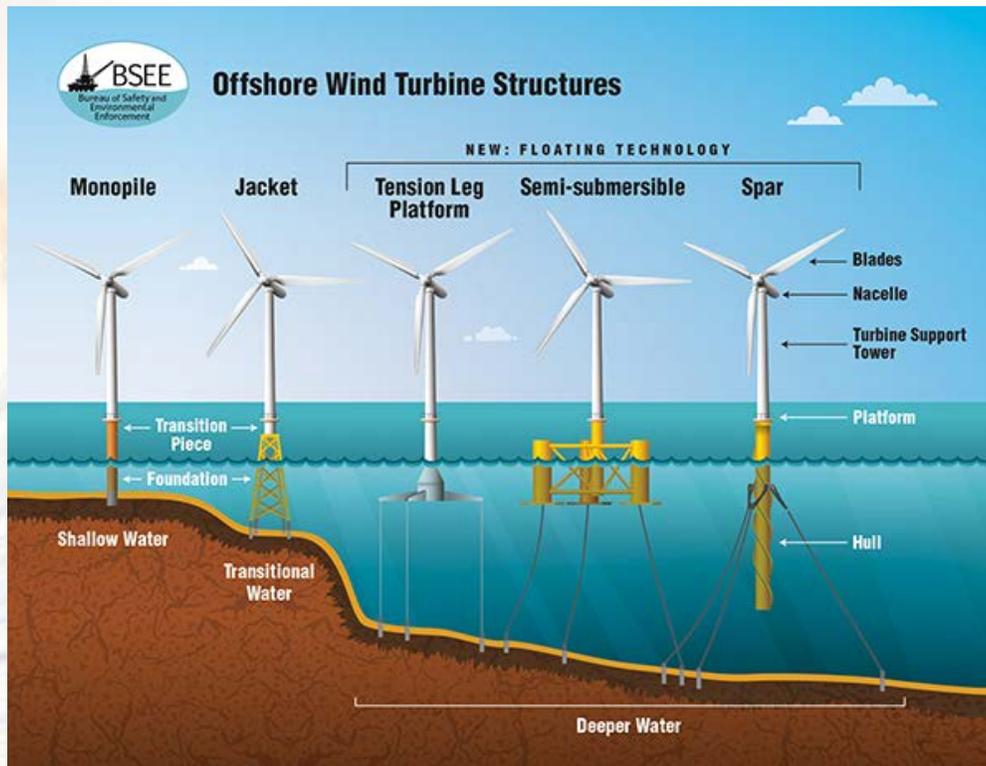


Impact Studies – Artificial Reef Effects/FADs

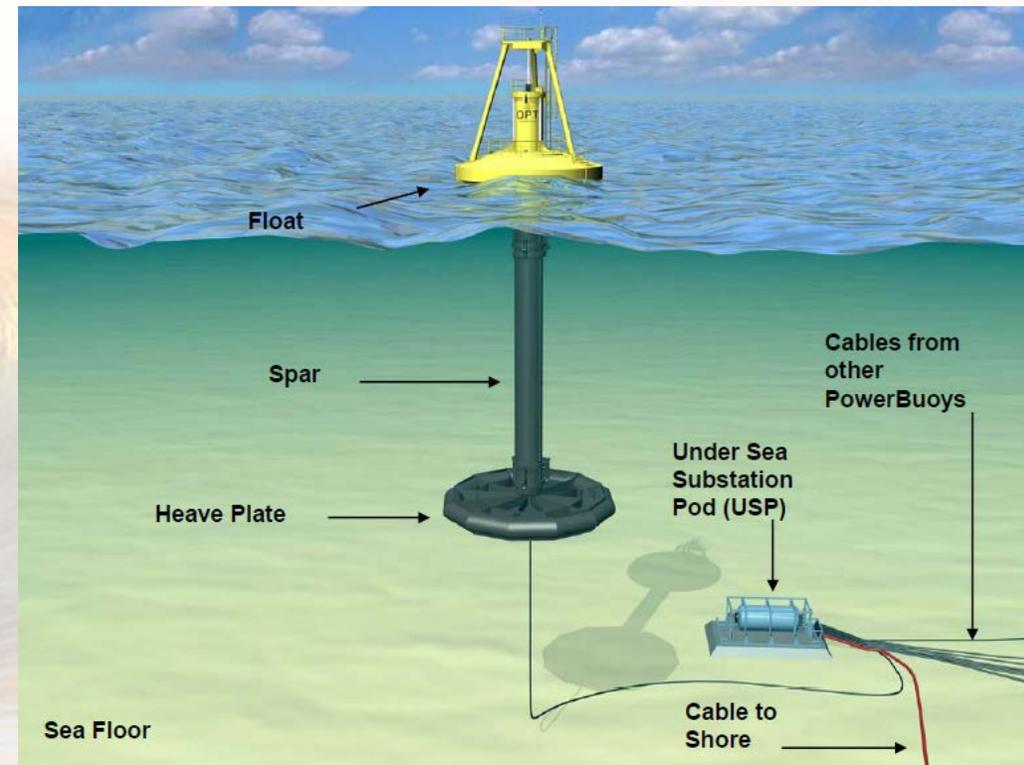
Impact Assessment gaps

- Artificial reef effects/Fish aggregating devices (FADs)

▷ large amount of infrastructure in the upper 30m + of water column ◁



Examples of Offshore Wind Turbines



Example of Wave Energy Conversion Device

OPT POWERBUOY



Evaluating the Potential for Marine and Hydrokinetic Devices to Act as Artificial Reefs or Fish Aggregating Devices

US West Coast

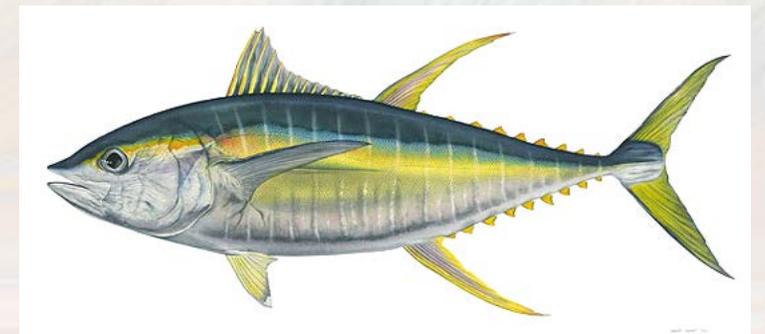
Albacore tuna: No evidence of potential FAD effect, but more information would be useful



NOAA

Hawai'i

Yellowfin tuna et al.: possible moderate local impact for project duration



CA SEA GRANT








H. T. HARVEY & ASSOCIATES
Ecological Consultants

FINAL TECHNICAL REPORT

Evaluating the Potential for Marine and Hydrokinetic Devices to Act as Artificial Reefs or Fish Aggregating Devices

Based on Analysis of Surrogates in Tropical, Subtropical, and Temperate U.S. West Coast and Hawaiian Coastal Waters

Award No. DE-EE0006389
Project Period (04:14 – 03:15)

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Environmental Studies Program Report
OCS Study BOEM 2015-021

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Energy Efficiency and Renewable Energy**
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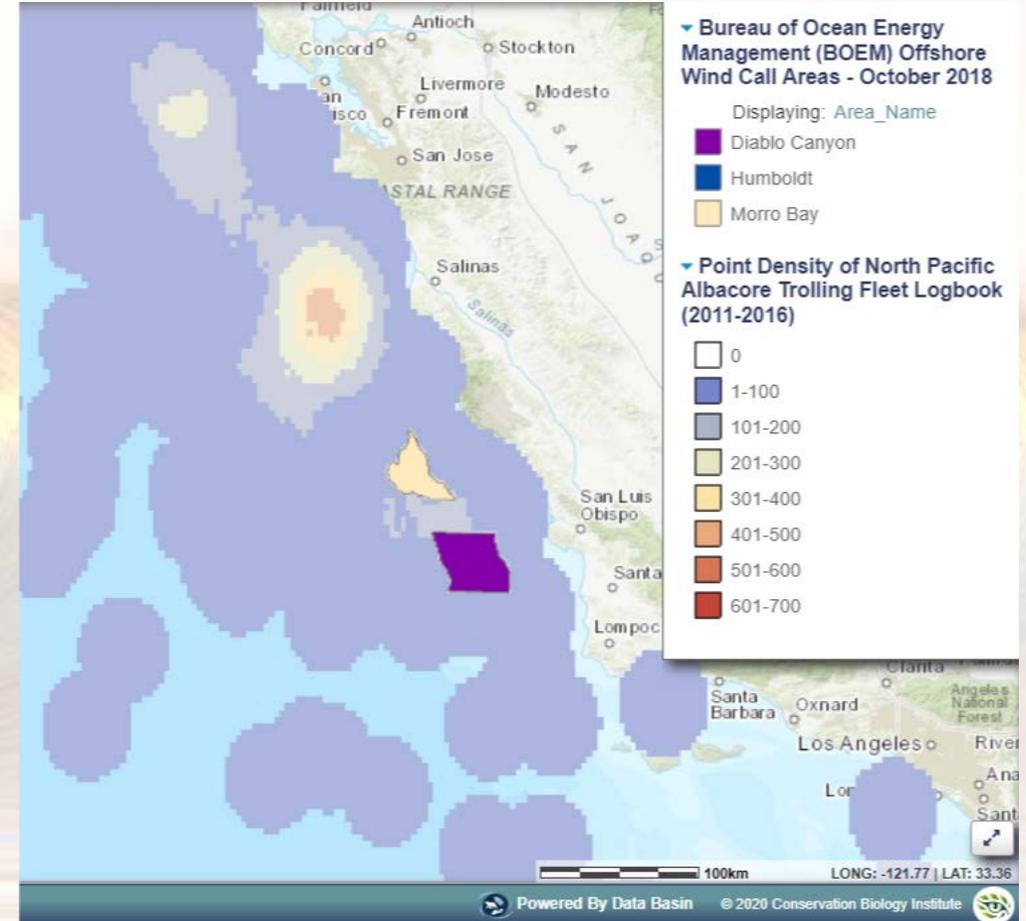
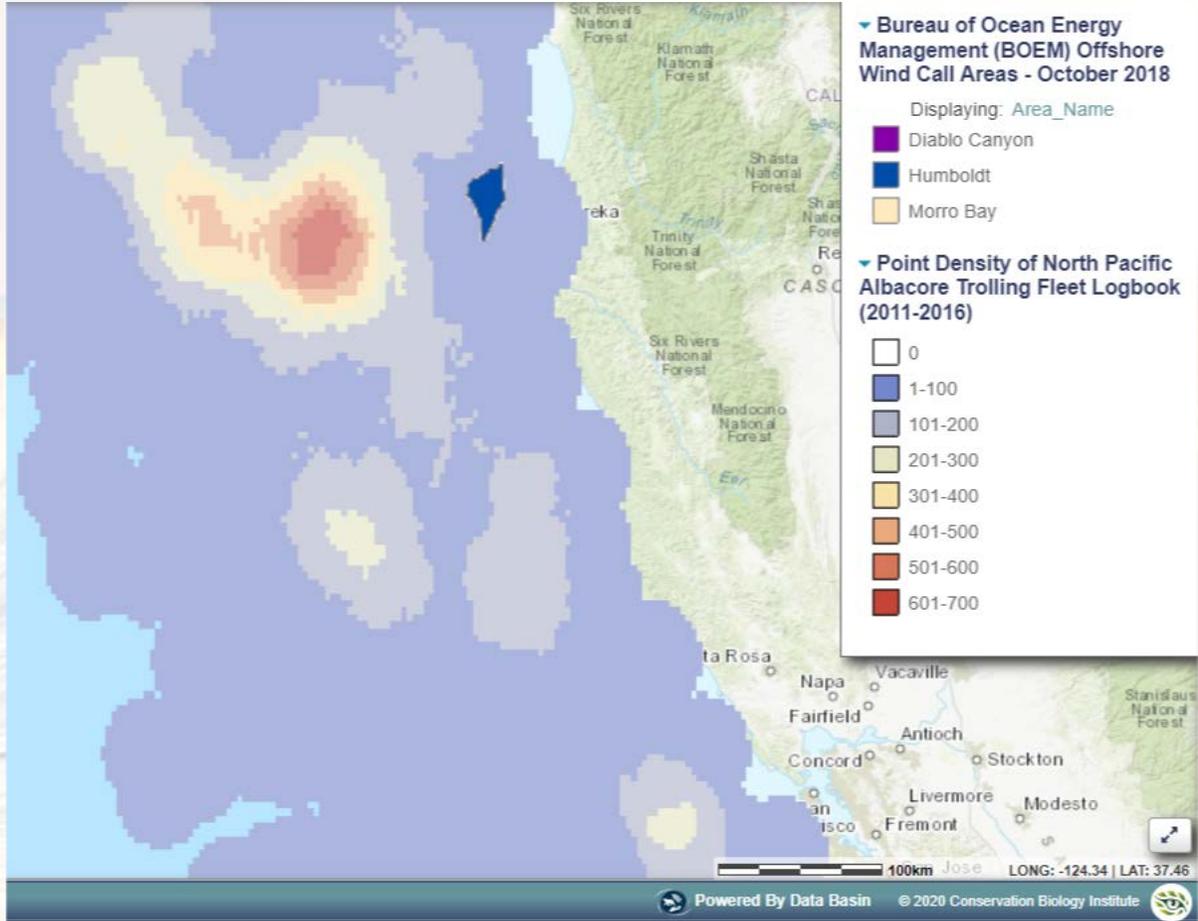
12 May 2015

983 University Ave, Bldg D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

<https://www.boem.gov/2015-021/>

Fisheries – CDFW Logbook Data for Albacore Tuna

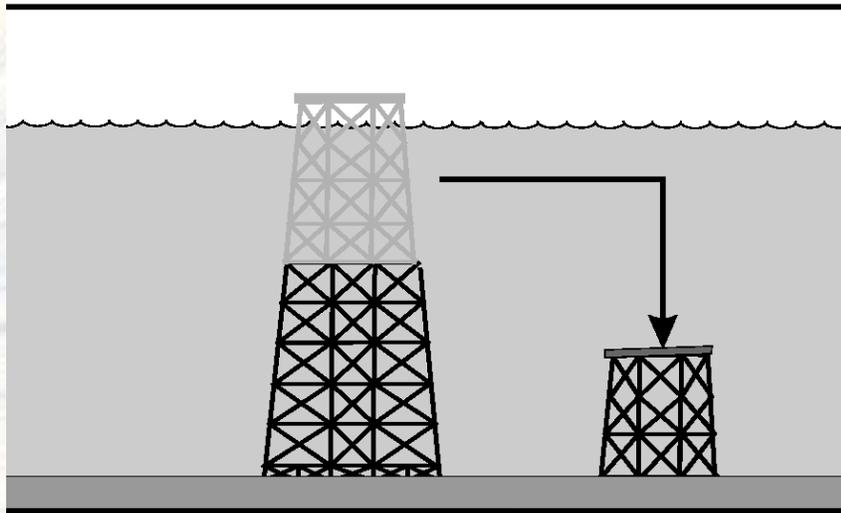
Point Density of North Pacific Albacore Trolling Fleet Logbook (2011-2016)



Impact Studies – Artificial Reef Effects

Lessons Learned From Decommissioning Studies of Offshore Oil and Gas Platforms

SCOTT GIETLER



BOEM Bureau of Ocean Energy Management

BSEE Bureau of Safety and Environmental Enforcement

Selected BOEM & BSEE-Funded Research Informing Oil & Gas Decommissioning Offshore California

DECEMBER 2019

Workshops & Synthesis Studies.....	PAGE 1
Platform Ecology Studies: Fish	PAGE 2
Platform Ecology Studies: Biota Other Than Fish	PAGE 5
Shell Mound Studies	PAGE 7
Air Quality Study	PAGE 8
Decommissioning Technology & Cost Studies	PAGE 8

Workshops & Synthesis Studies

Completed (1998) — Proceedings: Public Workshop, Decommissioning and Removal of Oil and Gas Facilities Offshore California: Recent Experiences and Future Deepwater Challenges, September 1997

This two-day workshop addressed research, technology, and socio-economic impacts and disposition issues for decommissioning projects offshore California. The proceedings include plenary addresses; sessions on technical, environmental, and disposition studies, and agency lessons learned; position papers from stakeholder groups; and appendices about regulatory framework, environmental review process, platform schematics, and decommissioning decision trees for onshore and offshore facilities.

Report (MMS 98-0023): <https://esis.boem.gov/final%20reports/3503.pdf>



Completed (2001) — The Politics, Economics, and Ecology of Decommissioning Offshore Oil and Gas Structures

This study by the University of California, Santa Barbara identified costs and benefits of various options to decommission platforms in the Southern California Bight, described the history of California's artificial reef program, and characterized the political and ecological factors that have contributed to the policy debate over rigs-to-reefs as an alternative to complete removal of platforms. The report includes a case study of rigs-to-reef programs in the Gulf of Mexico.

Report (MMS 2001-006): <https://esis.boem.gov/final%20reports/3505.pdf>



PAGE 1 OF 10

<https://www.boem.gov/Selected-BOEM-BSEE-Research-Decommissioning-CA/>

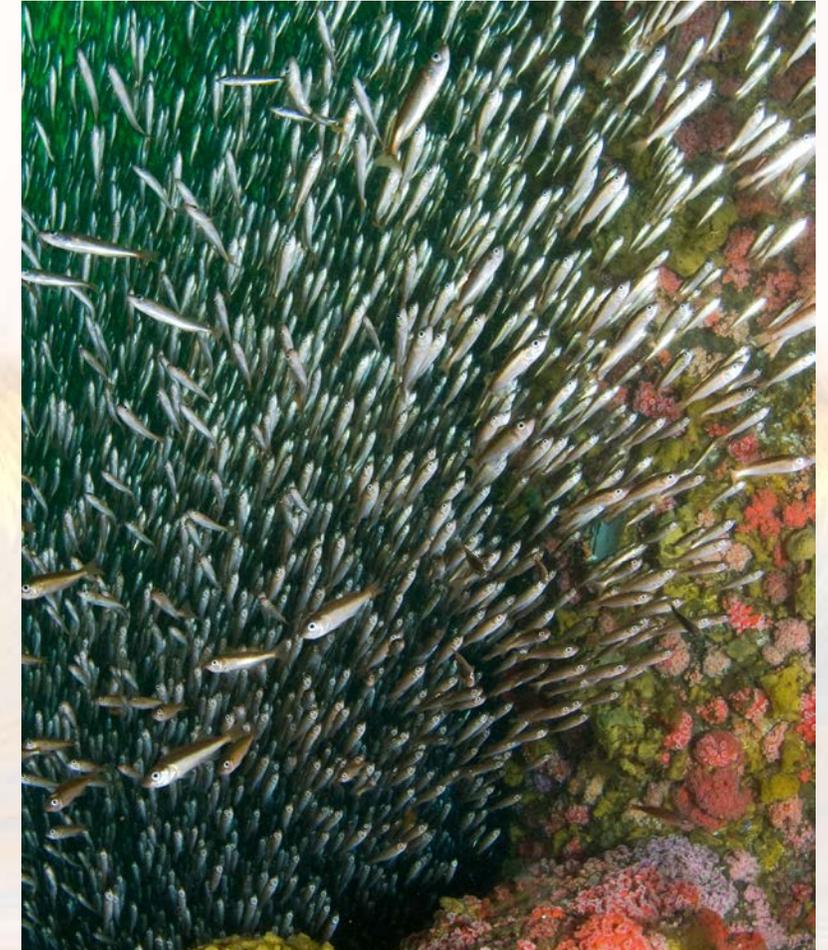
Impact Studies – Artificial Reef Effects

Oil platforms off California are among the most productive marine fish habitats globally

Jeremy T. Claisse^{a,1}, Daniel J. Pondella II^a, Milton Love^b, Laurel A. Zahn^a, Chelsea M. Williams^a, Jonathan P. Williams^a, and Ann S. Bull^c

^aVantuna Research Group, Department of Biology, Occidental College, Los Angeles, CA 90041; ^bMarine Science Institute, University of California, Santa Barbara, CA 93106; and ^cPacific Region, Environmental Sciences Section, Bureau of Ocean Energy Management, Camarillo, CA 93010

Edited by David W. Schindler, University of Alberta, Edmonton, Canada, and approved September 22, 2014 (received for review June 20, 2014)

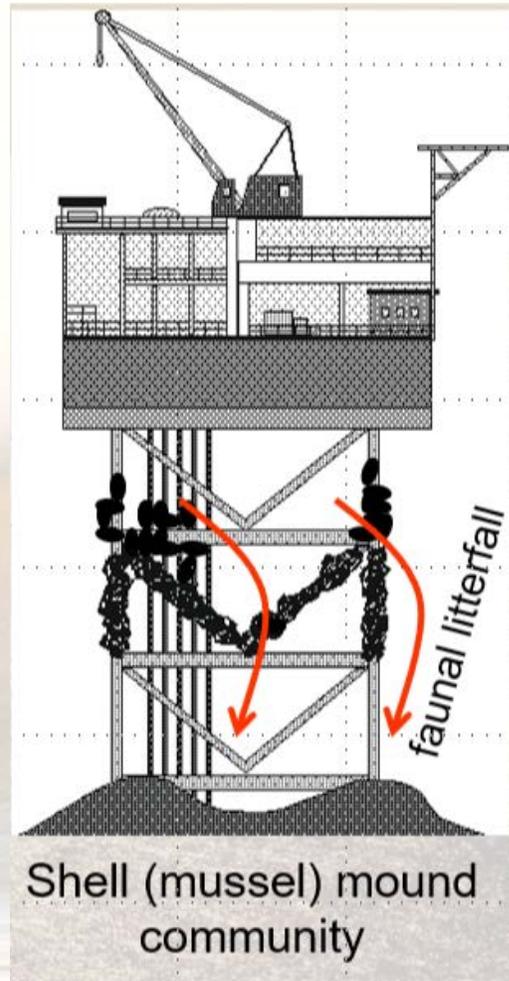
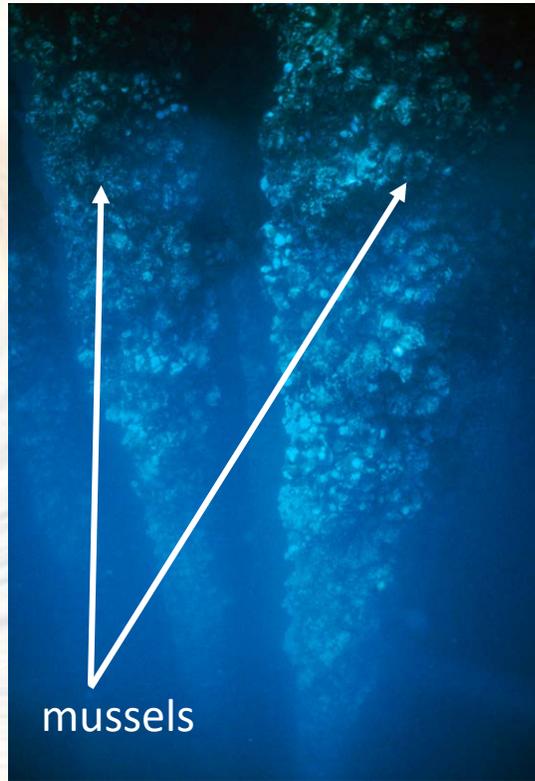


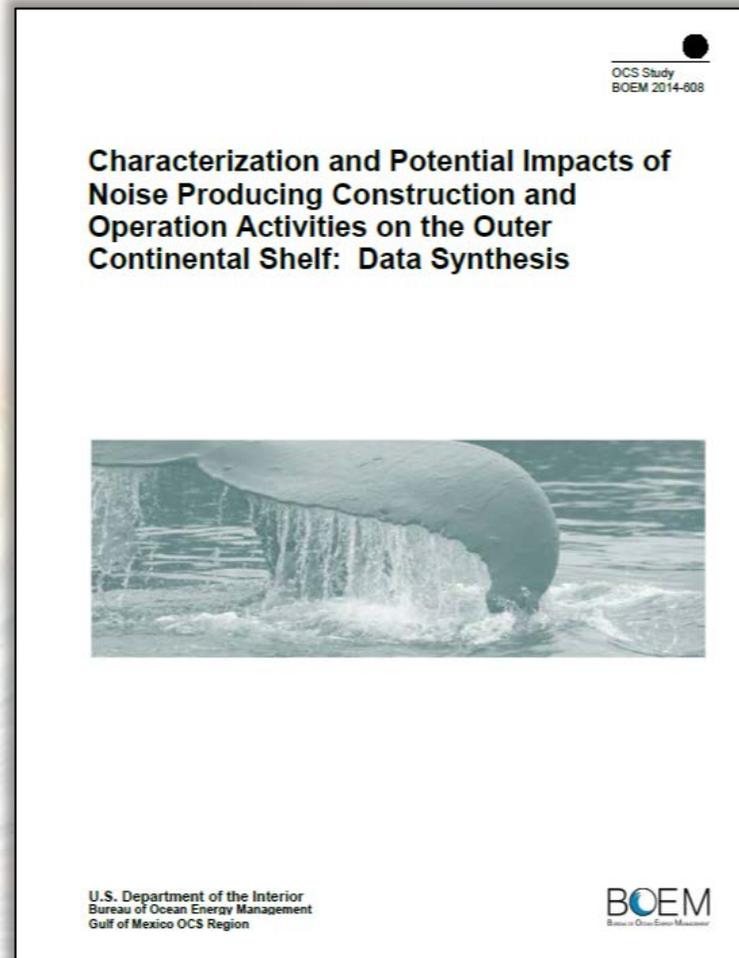
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“We found that oil and gas platforms off the coast of California have the highest secondary fish production per unit area of seafloor of any marine habitat that has been studied, about an order of magnitude higher than fish communities from other marine ecosystems.”

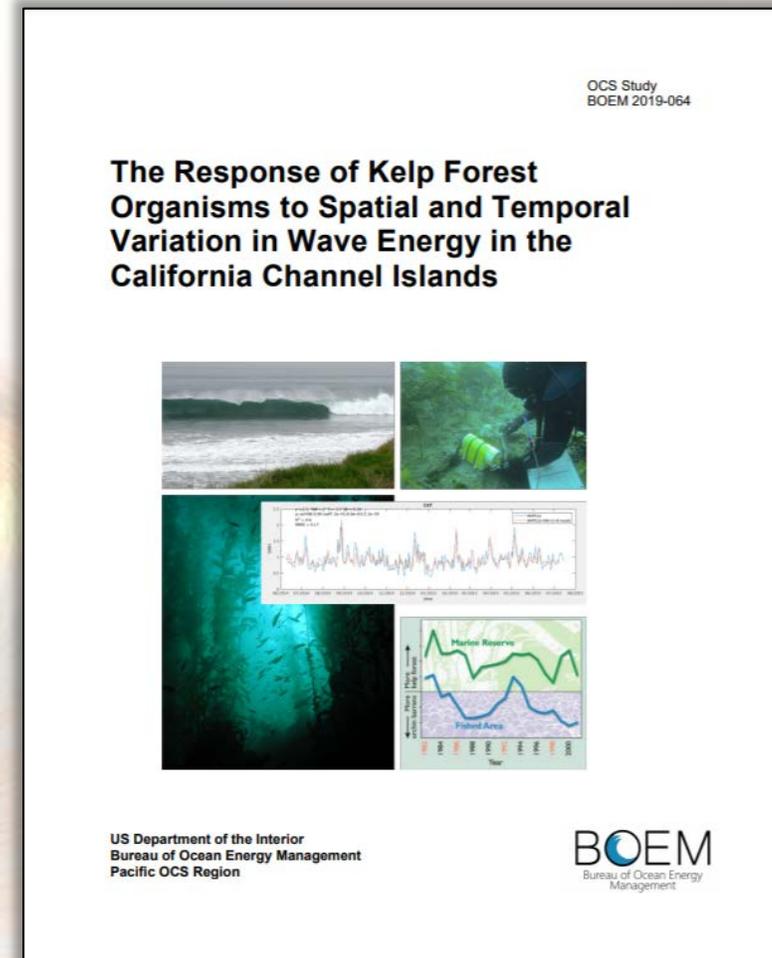
Impact Studies – Artificial Reef Effects

Key finding: A shell mound community forms on the seafloor





<https://espis.boem.gov/final%20reports/5413.pdf>



https://espis.boem.gov/final%20reports/BOEM_2019-064.pdf

Baseline data

- Fishing grounds, other space use
- Socioeconomic information
- Port infrastructure

Potential Impacts

- Space-Use Conflicts, Offshore
- Space-Use Conflicts, Ports
- Safety issues/Nautical risks
- Effects to harvested species, including bycatch
- *Lessons learned from Conventional Energy*

Monitoring

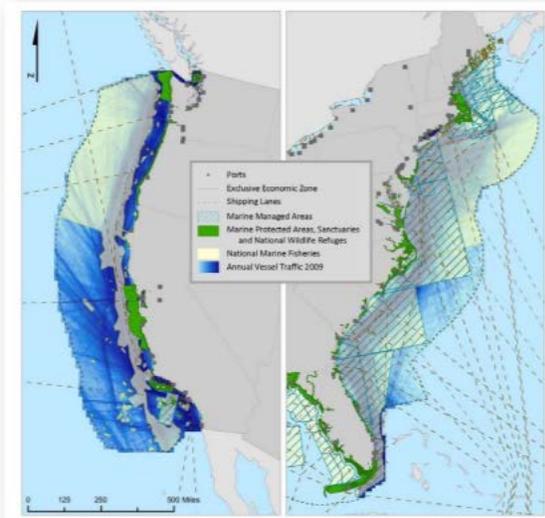
- Socioeconomic Indicators
- Space-use indicators
- *de facto* Marine Protected Area effect
- Gear entanglement and/or loss
- Safety concerns

- Importance of partnerships and existing programs
- Data sharing and clearinghouse
- Shifting baselines

Fisheries – Space-Use Conflicts

OCS Study
BOEM 2012-083

Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures



U.S. Department of the Interior
Bureau of Ocean Energy Management

Pacific Northwest Commercial Fisheries, Gear Types, and Locations*

Fishery	Gear Type	Washington	Oregon	Charter
Tuna	Mobile (troll/pole, hook and line)	Generally near surface, 30-40 nm or more from shore	Generally near surface, 30 nm or more from shore at 50-100 up to 500-2,000 fathoms	Out to 20-50 nm (within a 70 – 80 mile radius of port)
Salmon	Mobile (troll, hook and line)	10-180 fathoms from Canada to Oregon border	Breakers to 200 fathoms; sometimes up to 650 fathoms	Breakers to 50 fathoms; 20+/- nm to high spots
Crab	Fixed (pot)	0-10 fathoms up to 90-100 fathoms; mostly sandy or mud bottom; important tribal issues here - only southernmost 38 miles open to all	Breakers to 130 fathoms and up to 700 in some years; around tops of canyons, high spots	Often inside of bays and estuaries; in the ocean out to 20-70 fathoms
Shrimp	Mobile (trawl)	30-150 fathoms; muddy, flat, soft bottom	30-150 fathoms; 90 percent in 60-140 fathoms; muddy, soft, flat bottom	n/a
Groundfish	Mobile (bottom and midwater trawl, hook and line)	Surf to 700 fathoms; midwater trawl generally at 1,000 fathoms, but nets are not this deep	Breakers to 400 -700 fathoms; 1,200f for midwater, but nets are not this deep.	Bottom fishing very important; within 5 nm or 40 fathoms (within 30 mile radius of port); look for reefs and high spots
Black Cod	Mobile (trawl); Fixed (pots, long line)	100-500 fathoms; depends on time of year	100-500/650 fathoms	See above for black cod as well
Halibut	Fixed (long line)	90-100 fathoms	22 nm at 100-125 fathoms	Very valuable fishery; within 40 – 100 fathoms; focus on sand or gravel habitat
Spot Prawns	Fixed (pot)	85-120/130 fathoms, Washington to California; primarily hard bottom at around 100 fathoms		n/a

Source: Guided conversations with stakeholders conducted for this study

nm = nautical miles

* Bottom trawling is not currently allowed outside of 700 fathoms in the entire West Coast Exclusive Economic Zone. This relatively new regulation is intended to protect essential fish habitat.

<https://espis.boem.gov/final%20reports/5203.pdf>



Fisheries – NOAA Pacific Regional Ocean Uses Atlas

OCS Study
BOEM 2015-014

THE PACIFIC REGIONAL OCEAN USES ATLAS

Data and tools for understanding ocean space use
in Washington, Oregon and Hawaii

Authors:

Mimi D'Iorio
Hugo Selbie
Charles Wahle
Jordan Gass

June 2015

Prepared under BOEM-NOAA Interagency Agreement
M12PG00029

By

National Oceanic and Atmospheric Administration
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Monterey, CA 93940

This project was funded by the U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS region, through an Interagency Agreement with the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.



1

Participatory Mapping

Industry/Military Sector

- Commercial Shipping
- Ocean Dumping
- Mariculture
- Military Operations
- Mining and Mineral Extraction
- Renewable Energy
- Underwater Pipelines
- Underwater Transmission Cables

Extractive Sector

- Commercial Fishing with Benthic Fixed Gear
- Commercial Fishing with Benthic Mobile Gear
- Commercial Pelagic Fishing
- Commercial Seaweed Harvest
- Recreational Fishing from Boats for Benthic Species
- Recreational Fishing from Boats for Pelagic Species
- Subsistence Fishing and Harvest

Non-Extractive Sector

- Cruise Ships
- Cultural Use Areas
- Motorized Boating
- Permanent Research Areas
- Sailing
- Wildlife Viewing at Sea

<https://www.boem.gov/2015-014/>

Fisheries – NOAA Pacific Regional Ocean Uses Atlas

Commercial Fishing with Benthic Mobile Gear



JOHN RAE

THE OREGON OCEAN USES ATLAS



Commercial Fishing with Benthic Mobile Gear

Includes:

Gear Types: The use of rod and reel, trolling, trawling, dredging, and other mobile gear
Fisheries: Benthic fishes and mobile invertebrates (Groundfish, Pink Shrimp, Rockfish, Lingcod, Cabazon, Scallops and Squid)

Excludes:

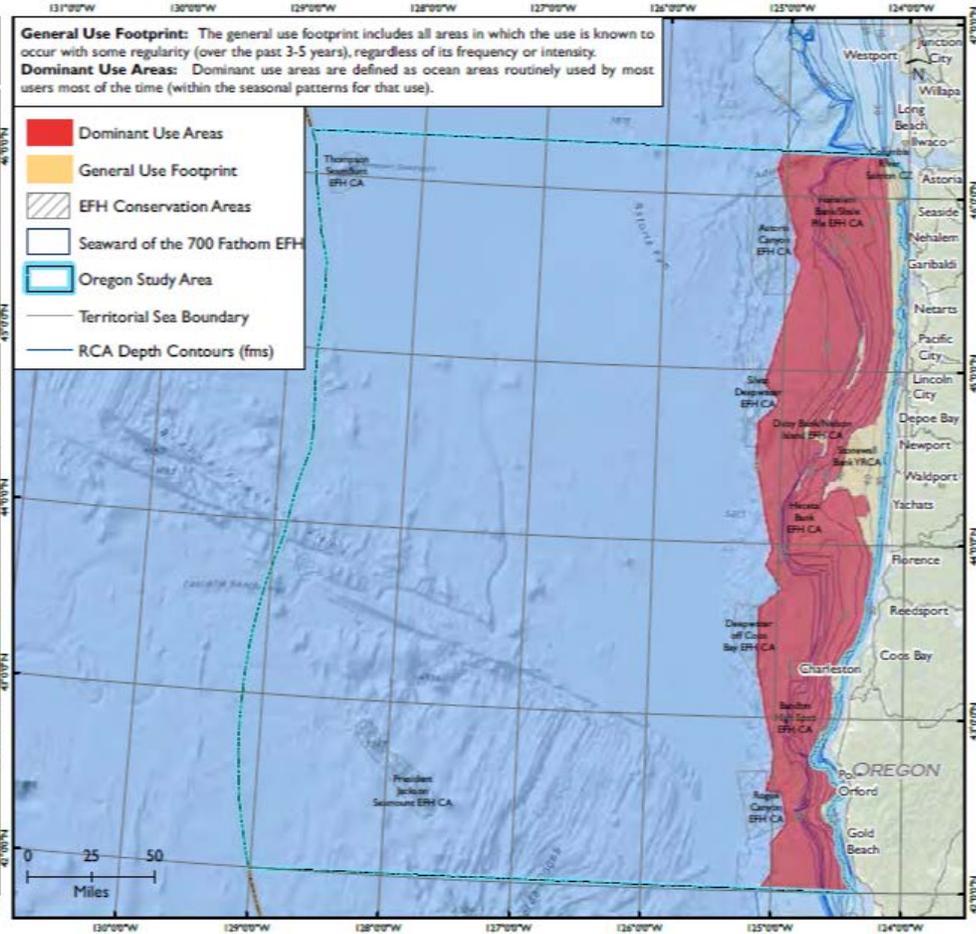
All other forms of Fishing

Use Notes:

Since 2006, bottom trawling has been prohibited seaward of 700 fathoms because of this area's designation as a Groundfish Essential Fish Habitat (EFH) Conservation Area. Additional closures such as the Rockfish Conservation Areas have been in place since 2002. The main benthic mobile gear types used are hook and line (Rockfish, Lingcod and Cabazon) and trawls (Groundfish). Most hook and line fishing occurs 1 – 3 NM offshore. Trawling is very intensive on the entire upper continental slope. Trawlers run up to 60 miles out to fish and are not limited by proximity to harbors. Groundfish and Pink Shrimp are the main benthic mobile gear fisheries. Groundfish are fished commercially and recreationally May 1 – September 30, inside 30 fathoms. Almost all Pink Shrimp (90%) are caught at 30 – 160 fathoms on muddy bottoms. There is a dinglebar gear fishery for Lingcod that yields up to 400 lbs at a depth of around 20 – 30 fathoms, although currently Lingcod are more often caught using a hook and line. The commercial Lingcod fishery is seasonally regulated. Other fisheries in the study region include Scallops (caught at 10 – 70 fathoms) and Squid (Humboldt: at 70 – 700 fathoms and Market at 10 – 100 fathoms by trawling).

General Use Footprint: The general use footprint includes all areas in which the use is known to occur with some regularity (over the past 3-5 years), regardless of its frequency or intensity.
Dominant Use Areas: Dominant use areas are defined as ocean areas routinely used by most users most of the time (within the seasonal patterns for that use).

- Dominant Use Areas
- General Use Footprint
- EFH Conservation Areas
- Seaward of the 700 Fathom EFH
- Oregon Study Area
- Territorial Sea Boundary
- RCA Depth Contours (fms)



Fisheries – NOAA Pacific Regional Ocean Uses Atlas

Commercial Fishing with Benthic Fixed Gear



CDFW

THE OREGON OCEAN USES ATLAS



Commercial Fishing with Benthic Fixed Gear

Includes:

Gear Types: Use of traps, pots, bottom longlines, bottom or anchored gillnets, pound nets, weirs, and other bottom tending gear types

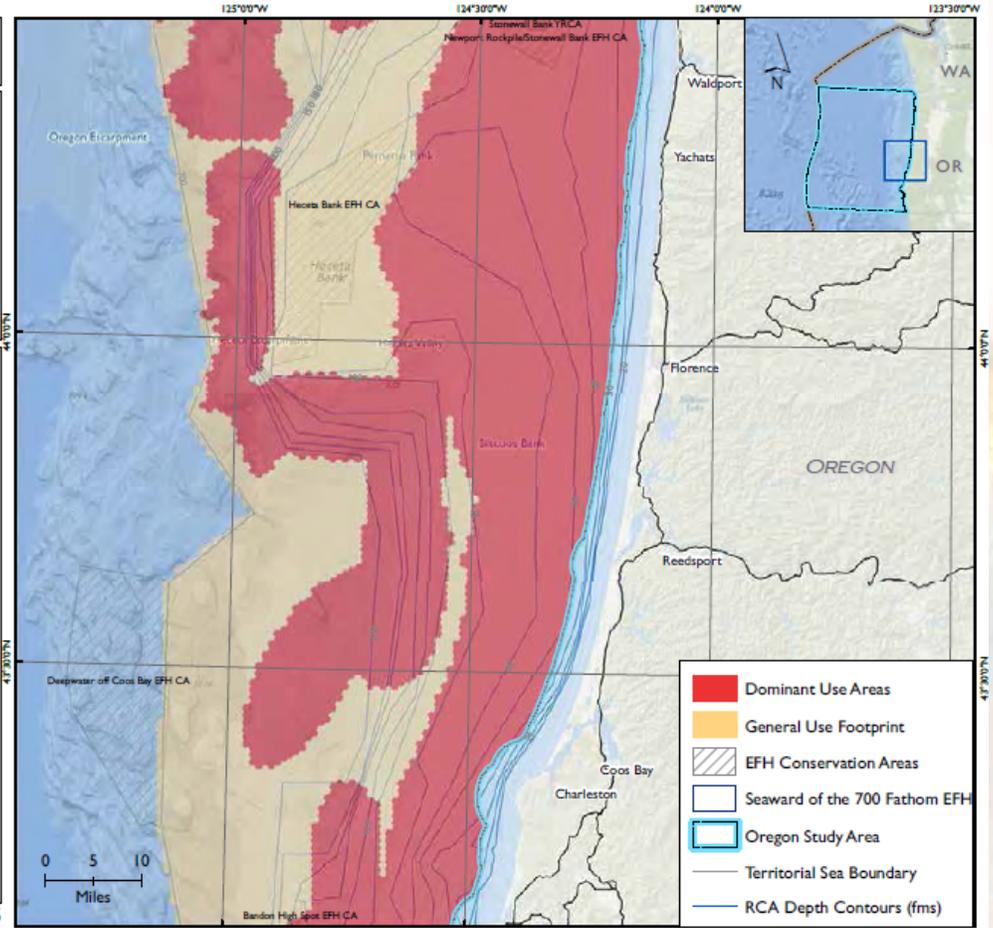
Fisheries: Benthic fishes and invertebrates (Crab, Halibut, Sablefish, and Hagfish)

Excludes:

All other forms of Fishing

Use Notes:

Commercial fishing with benthic fixed gear occurs seasonally. Crabbing occurs December – August. Other species such as Halibut are harvested from spring – fall. Sablefish and Hagfish (or Slime Eel) are harvested year-round. This includes use by fishermen from California and Washington venturing into Oregon waters. Most fishermen fish within a day's travel of their home port to limit fuel costs. Vessels are variable in size; smaller boats tend to stay close to their home ports and larger boats will range coast-wide. Crab boats catch Dungeness Crab (highest value fishery in Oregon) using pots around 1 – 150 fathoms. Most commercial Dungeness Crabbing occurs in the first 8-10 weeks of the season, but the remainder of the season is still very important for local crabbing boats. Occasionally, Box Crab are harvested in Oregon, but markets are extremely limited. Traps and pots are also used for a limited Spot Prawn fishery with just 5 permits issued in Oregon. Benthic long lines with hooks are used in the capture of Halibut and Sablefish. Sablefish are also harvested using long lines with pots and Hagfish are caught exclusively using long lines with fixed barrels.



Page: 2d

Date: 3/11/2015

Fisheries – NOAA Pacific Regional Ocean Uses Atlas

Recreational Fishing from Boats for Pelagic Species



ODFW

THE OREGON OCEAN USES ATLAS



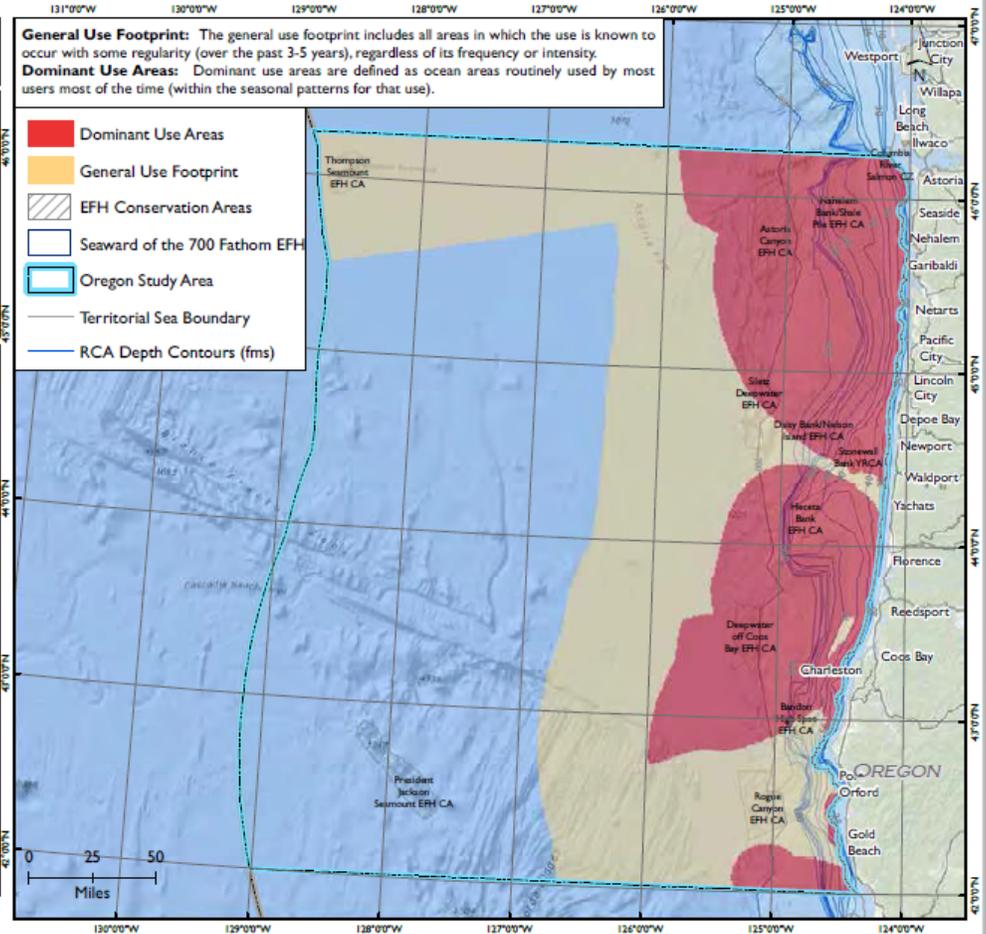
Recreational Fishing from Boats for Pelagic Species

Includes:
 Gear Types: Recreational fishing from head boats, charters, or private boats
 Fisheries: Pelagic species
Excludes:
 Any other boat- or shore-based fishing

Use Notes:
 Recreational pelagic fishing from boats generally occurs within 70 NM out and 15 – 20 NM north and south of major ports. Major ports are: Astoria, Nehalem, Garibaldi, Pacific City, Depoe Bay, Newport, Florence, Reedsport, Charleston, Bandon, Gold Beach, Brookings and Port Orford. Target species include Salmon, Tuna and occasionally Mahi Mahi, Wahoo and Marlin. Salmon season is April – September, with the best fishing in June – September from shore to 100 fathoms. Tuna can be caught year-round but mostly starts with the onset of warm weather out to 100 miles. Every year the ports in Ilwaco and Garibaldi host the 'Oregon Tuna Classic' tournament series in which participants donate their catch to the Oregon Food Bank. The main fishing areas for Salmon and Tuna can vary drastically from year to year and the fishing is largely concentrated by how far fishermen are willing to go from ports. Sport fishermen in small boats fish close to the mouth of Tillamook Bay and north up to Nehalem out to 30 – 40 fathoms; the weather in that area can change quickly, and the boats can run back to the bay with the ocean and not against it in foul weather. The dory fleet catches Salmon and Tuna coast-wide and is not limited to larger ports.

Page: 6a

Date: 3/11/2015



Fisheries – NOAA Pacific Regional Ocean Uses Atlas

Recreational Fishing from Boats for Benthic Species



CNETRALCOASTKAYAKING.COM

THE OREGON OCEAN USES ATLAS



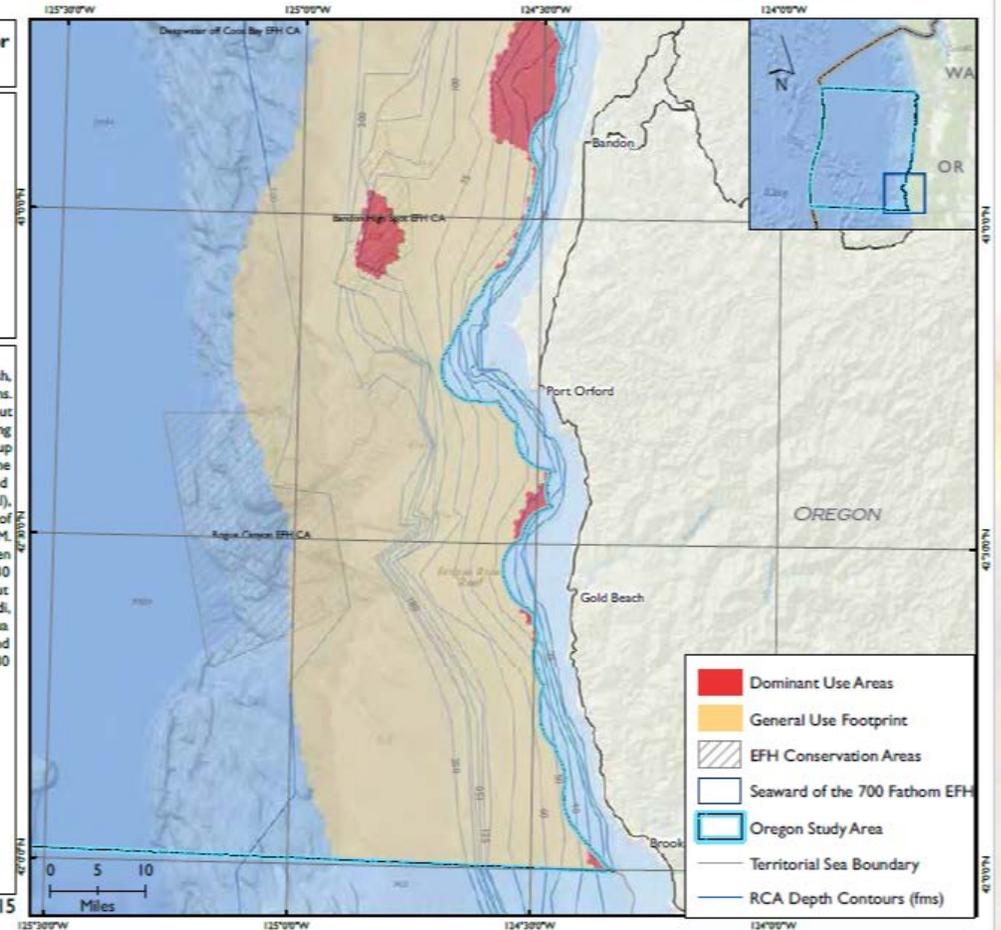
Recreational Fishing from Boats for Benthic Species

Includes:
Gear Types: Recreational fishing from head boats, charters, or private boats
Fisheries: Benthic species including mobile invertebrates (Rockfish, Halibut, and Crab)
Excludes:
Any other boat- or shore-based fishing

Use Notes:
Most recreational benthic fishermen catch Rockfish, Halibut or Crab during the spring and summer seasons. These boats use hook and line for Rockfish or Halibut and traps or pots for Crab. Charter boats targeting Rockfish and Crab will fish in state waters hosting up to 18 people on board. Crab boats will fish up to the breakers. The larger boats are concentrated around Depoe Bay (200 sport boats per day is not unusual), Newport (20 boats) and Garibaldi. Halibut is one of the main species recreationally fished outside 3 NM. When fishing for Halibut and Lingcod, fishermen typically stay within a day's sail of port (around 30 miles). There are some specific areas that Halibut fishers will target such as 'Halibut Hill' off of Garibaldi, 'Bandon High Spot', and 'Chicken Ranch' by Perpetua Bank. Groundfish are fished commercially and recreationally May 1 – September 30, inside 30 fathoms.

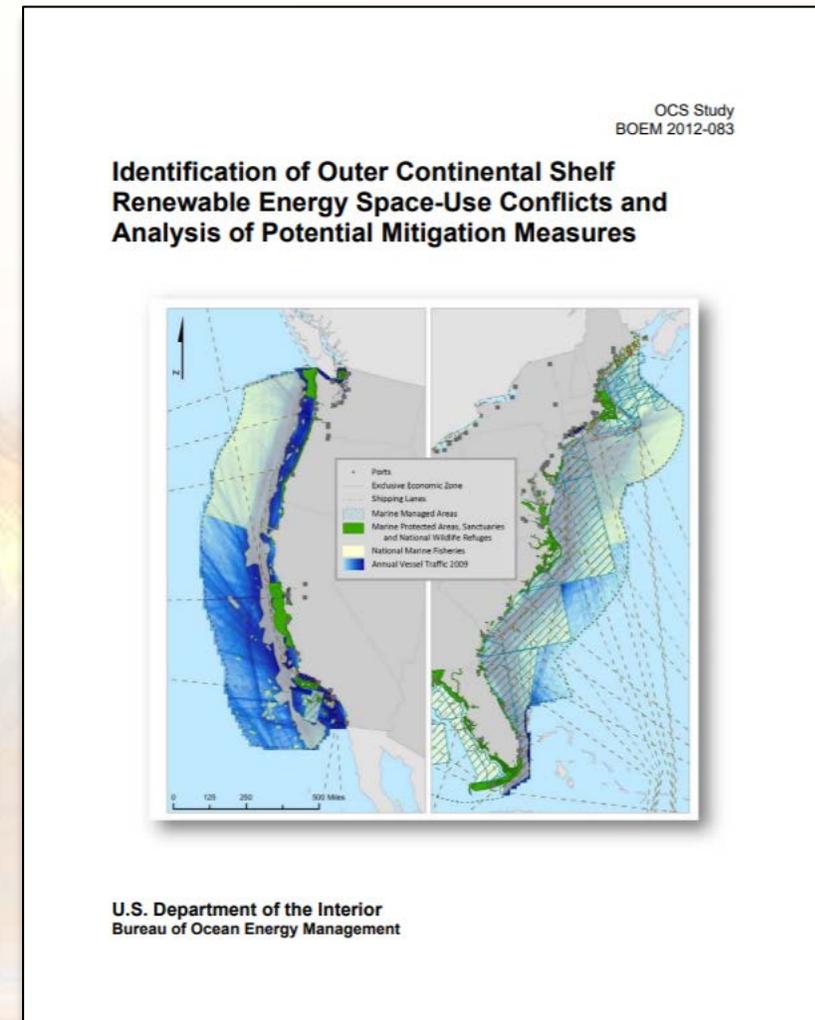
Page: 5e

Date: 3/11/2015



Potential Mitigation Measures

- Siting
 - Large scale – Wind Energy Areas
 - Small scale
 - Turbine arrangement
 - Existing cable corridors
 - Marine vessel traffic corridors
- Cable burial
- Fisheries Liaison
- Compensation
- Other comments on aspects of design
- **Port infrastructure enhancement**
- Consider consequences to marine populations



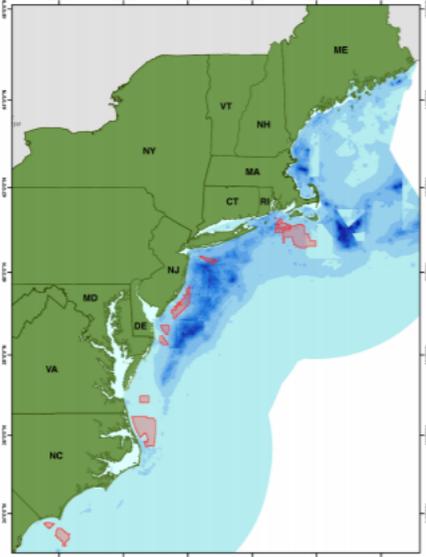
<https://espis.boem.gov/final%20reports/5203.pdf>

Fisheries – Socioeconomic Impacts (East Coast)

OCS Study
BOEM 2017-012

Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fisheries in the U.S. Atlantic

Volume I—Report Narrative



U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

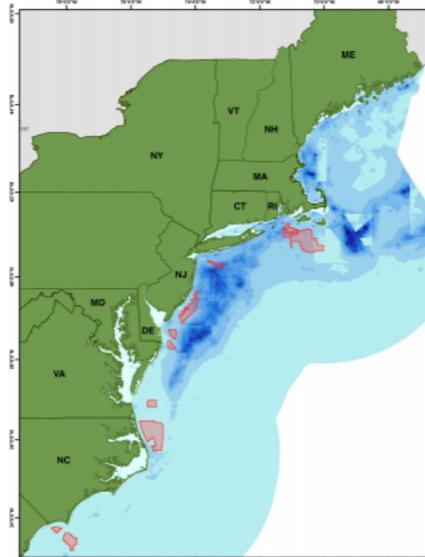


<https://epis.boem.gov/final%20reports/5580.pdf>

OCS Study
BOEM 2017-012

Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fisheries in the U.S. Atlantic

Volume II—Appendices



U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs



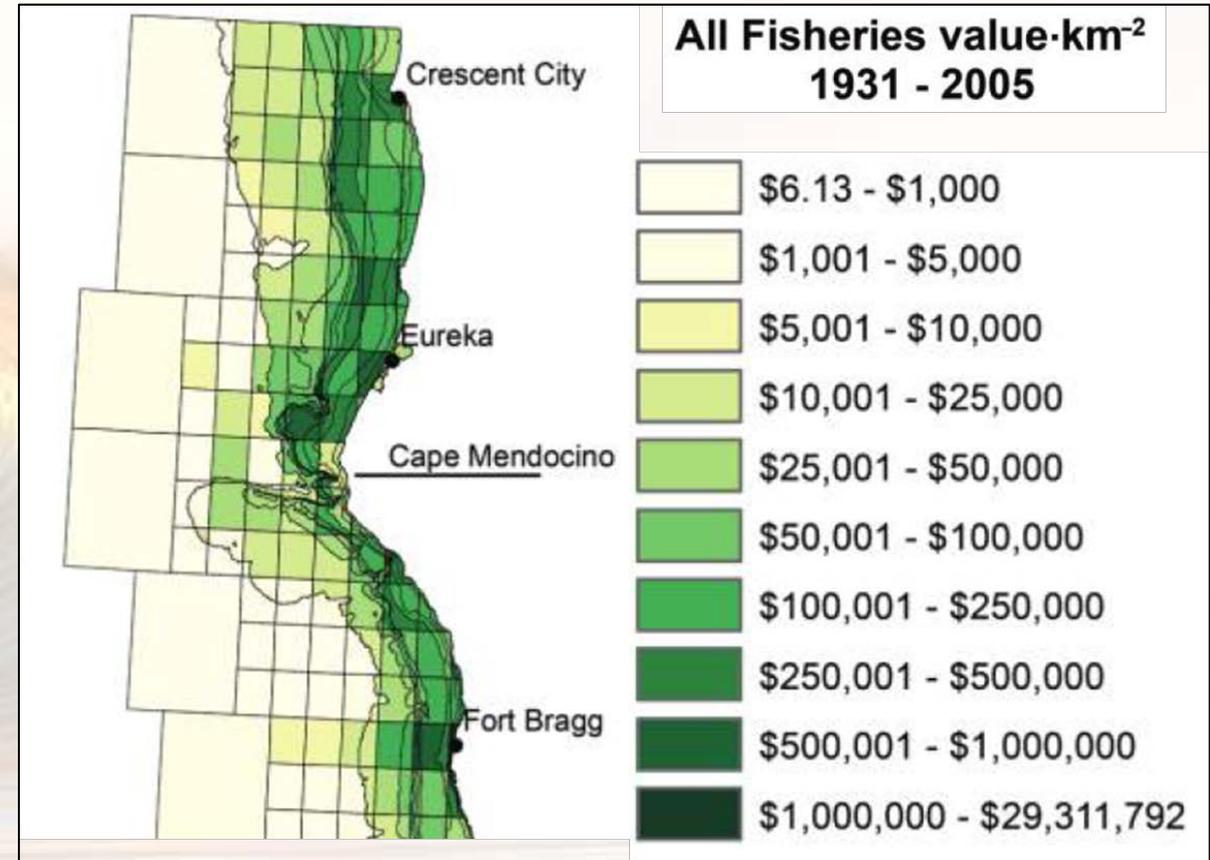
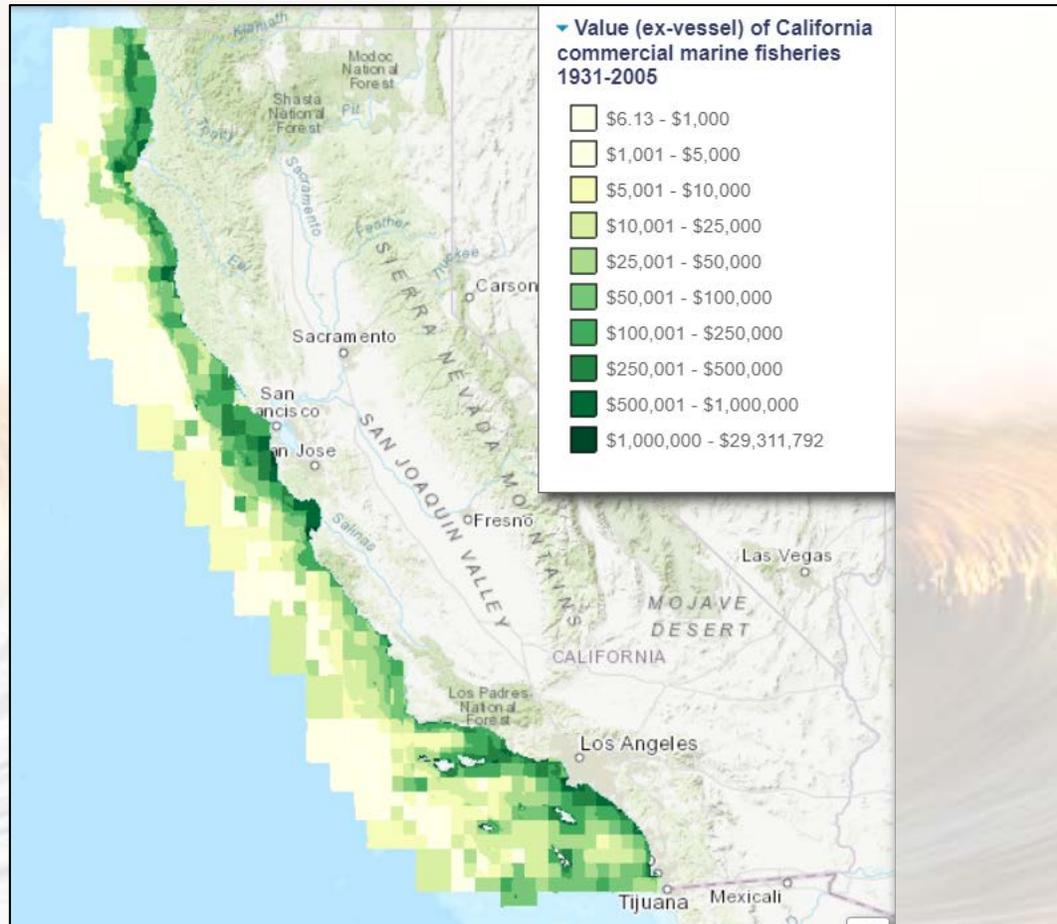
<https://epis.boem.gov/final%20reports/5581.pdf>

External Information and Studies

- **NOAA Fisheries**
 - Federal Fishery Management Plans
 - Essential Fish Habitat
 - Endangered Species Act
- Department of Energy & Labs
- DOI – Bureau of Safety and Env Enforcement
- DOI – US Geological Survey
- DOI – US Fish & Wildlife Service
- DOI – National Park Service
- NOAA – National Centers for Coastal Ocean Science
- NOAA – Ocean Exploration
- NOAA – National Marine Sanctuary Program
- National Space and Atmospheric Administration
- Tribes/Government-to-Government Consultations
- NOAA Sea Grant
 - California (2)
 - Oregon
 - Washington
- **California Dept of Fish and Wildlife (CDFW)**
 - **Landing and Logbook Data**
 - State Fishery Plans and Summaries
- California Energy Commission
- California Ocean Protection Council
- **Oregon Dept of Fish and Wildlife (ODFW)**
 - **Landing data**
 - State Fishery Plans and Summaries
- Local Governments
- Industry
 - Energy Industry
 - Recreational Fishers and Associations
 - Commercial Fishers and Associations
 - Environmental Consulting Businesses
 - Other Maritime Industries
- Academia
- Non-Governmental Organizations
- Public
- *Others*



Fisheries – Socioeconomics



Gridded overlay of total monetary value of commercial fisheries landings, 1931-2005, summarized from the California Department of Fish and Wildlife catch blocks. Adapted from Miller et al. 2017, Can. J. Fish. Aquat. Sci. 74:1732-48.



Fisheries – Summary of Landing Data 1

Ex-vessel value (2019\$) of landings for some California commercial fisheries

	Average Annual Ex-vessel Landings Value (2019\$) 2009-2018*	Statewide Value %	Regional EPC Value %	Local Harbor Value %	Depth (m) or Offshore Range (km) of Potential Fishing Grounds†	Call Area Overlaps with Potential Fishing Grounds?
California Statewide	\$ 216,128,424	100%				
Eureka Port Complex (EPC)	\$ 38,907,766	18%	100%			
Eureka Harbor	\$ 14,762,368	7%	38%	100%		
Dungeness crab	\$ 8,451,701	4%	22%	57%	less than 230 m	No
Sablefish	\$ 1,870,730	< 1%	5%	13%	57 to 1524 m	Yes
Dover Sole	\$ 1,289,162	< 1%	3%	9%	27 to 914 m	Yes
Ocean (pink) shrimp	\$ 661,688	< 1%	2%	4%	73 to 229 m	No
Petrale sole	\$ 547,548	< 1%	1%	4%	18 to 460 m	No
Thornyheads	\$ 494,852	< 1%	1%	3%	26 to 1524+ m	Yes
Albacore tuna	\$ 391,040	< 1%	1%	3%	greater than 55 km offshore	No
Chinook salmon	\$ 306,987	< 1%	< 1%	2%	0 to 46 km offshore	Yes
Night/Surf smelt	\$ 201,904	< 1%	< 1%	1%	surf zone	No
All other species	\$ 546,756	< 1%	1%	4%		
Trinidad Harbor	\$ 2,547,544	1%	7%	100%		
Dungeness crab	\$ 2,514,008	1%	6%	99%	less than 230 m	No
All other species	\$ 33,536	< 1%	< 1%	1%		

* Landing data downloaded from <https://www.wildlife.ca.gov/Fishing/Commercial/Landings> and adjusted to June, 2019 values using the Consumer Price Index Inflation Calculator <https://data.bls.gov/cgi-bin/cpicalc.pl>.

† Depth data obtained from (1) Status of the Fisheries reports at <https://www.wildlife.ca.gov/Conservation/Marine/Status> for Dungeness crab, ocean (pink) shrimp, petrale sole, coonstripe shrimp, Pacific hagfish, and black rockfish, and (2) Miller and Lea 1976. Guide to the Coastal Marine Fishes of California, Calif. Dept. Fish and Game, Fish Bull. No. 157, for sablefish, Dover sole, petrale sole, longspine and shortspine thornyheads, surf smelt, night smelt, and black hagfish. Albacore and Chinook offshore range obtained from Industrial Economics, Inc. 2012. BOEM OCS Study 2012-083. Original data converted to metric units when necessary.



Fisheries – Summary of Landing Data 2

Ex-vessel value (2019\$) of landings for some California commercial fisheries

	Average Annual Ex-vessel Landings Value (2019\$) 2009-2018*	Statewide Value %	Regional EPC Value %	Local Harbor Value %	Depth (m) or Offshore Range (km) of Potential Fishing Grounds†	Call Area Overlaps with Potential Fishing Grounds?
California Statewide	\$ 216,128,424	100%				
Eureka Port Complex (EPC)	\$ 38,907,766	18%	100%			
Crescent City Harbor	\$ 19,511,137	9%	50%	100%		
Dungeness crab	\$ 15,144,538	7%	39%	78%	less than 230 m	No
Ocean (pink) shrimp	\$ 2,716,064	1%	7%	14%	73 to 229 m	No
Sablefish	\$ 410,664	< 1%	1%	2%	57 to 1524 m	Yes
Coonstripe shrimp	\$ 343,493	< 1%	< 1%	2%	less than 185 m	No
Black rockfish	\$ 216,766	< 1%	< 1%	1%	less than 366 m	No
All other species	\$ 679,612	< 1%	2%	3%		
All other locations	\$ 1,483,021	< 1%	4%	100%		
Dungeness crab	\$ 992,994	< 1%	3%	67%	less than 183 m	No
Hagfishes	\$ 348,353	< 1%	< 1%	23%	9 to 732 m, generally less than 549 m	Yes
Chinook salmon	\$ 102,334	< 1%	< 1%	7%	0 to 46 km offshore	Yes
All other species	\$ 39,340	< 1%	< 1%	3%		

Summary

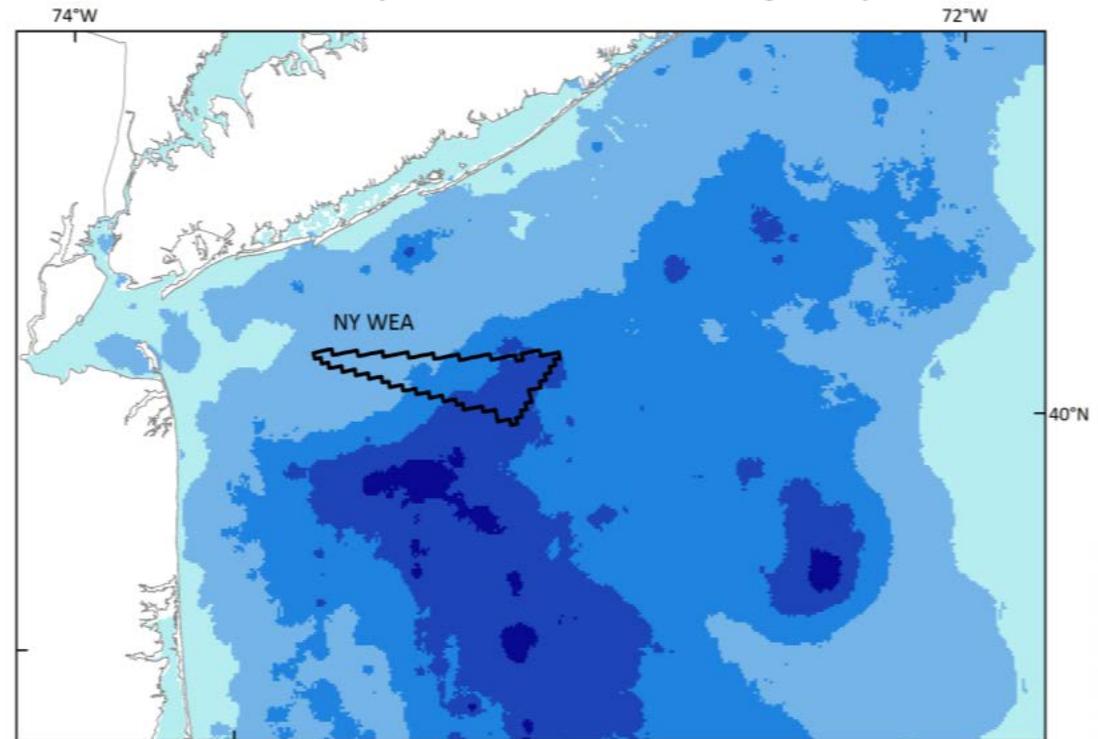
- Eureka Port Complex is an important fishing community
- Dungeness Crab is the most important species harvested
- **Pacific Groundfish Fishery** (Sablefish, Dover Sole, Thornyheads, Hagfishes) has the most overlap with Call Area
- **Eureka Harbor** fishers may experience the highest reduction in fishing grounds
- Further investigation (a) to determine **ability to troll** inside windfarm, and (b) understand potential FAD effect for Albacore tuna

Future - Vessel Monitoring System and Landing Data

Vessel Monitoring Systems (VMS)

Is a general term to describe systems that are used in commercial fishing to allow regulatory agencies to track and monitor the activities of fishing vessels to prevent illegal activities and thus protect the resource which enhances the livelihoods of fishers.

Example from a similar project offshore New York



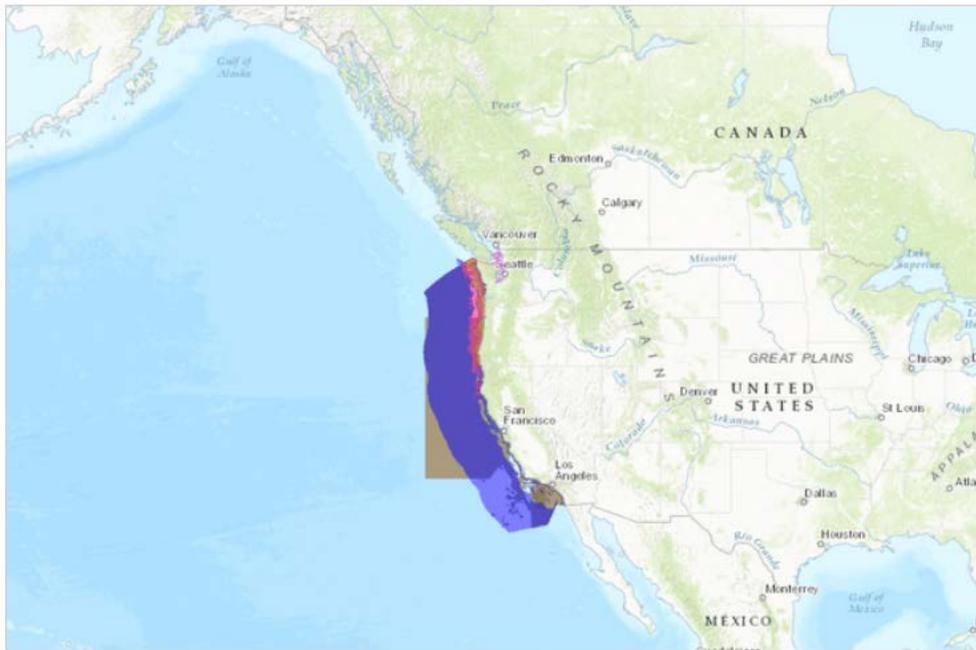


What about the cumulative effects of spatial closures to fishers?

West Coast Recreational Fishing Closures, 2015

Uploaded by Eli Harland

Download



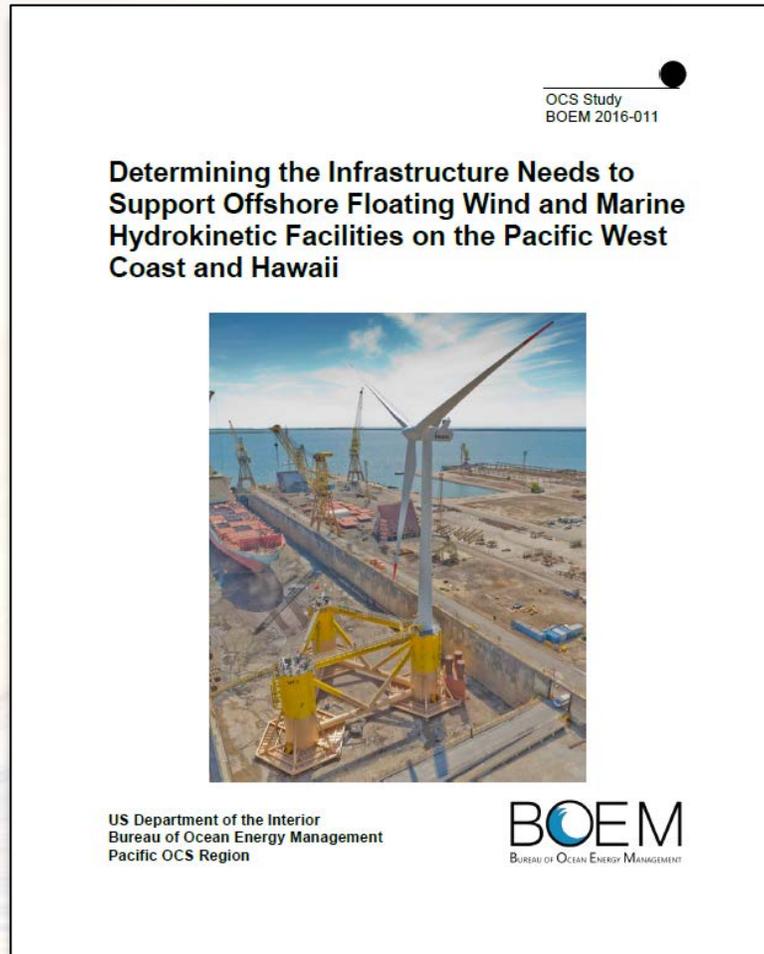
West Coast Commercial Fishing Closures, 2015

Uploaded by Eli Harland

Download



Fisheries – Port Infrastructure



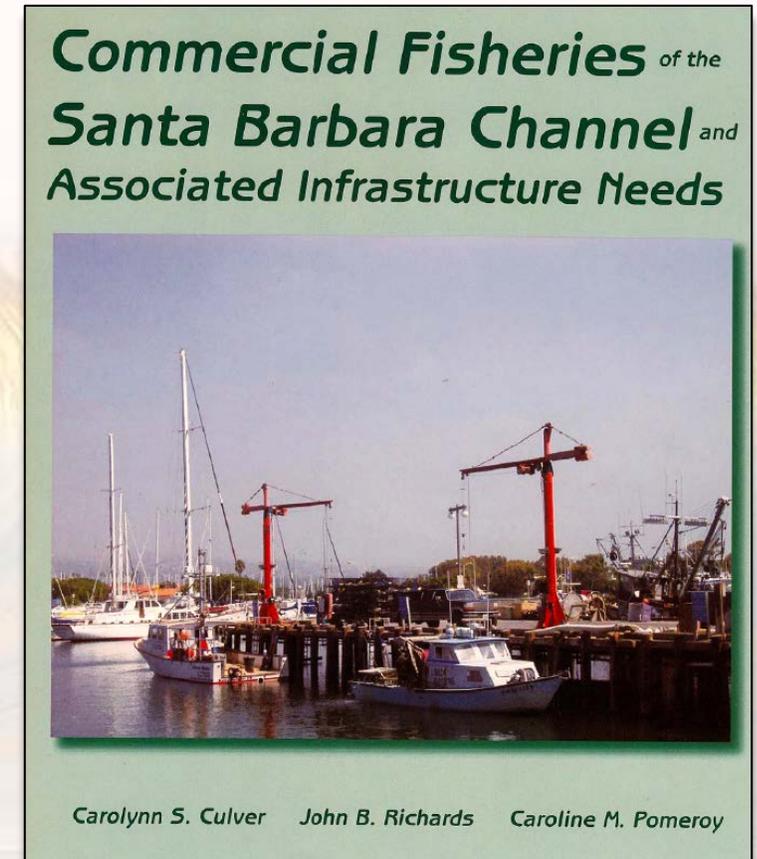
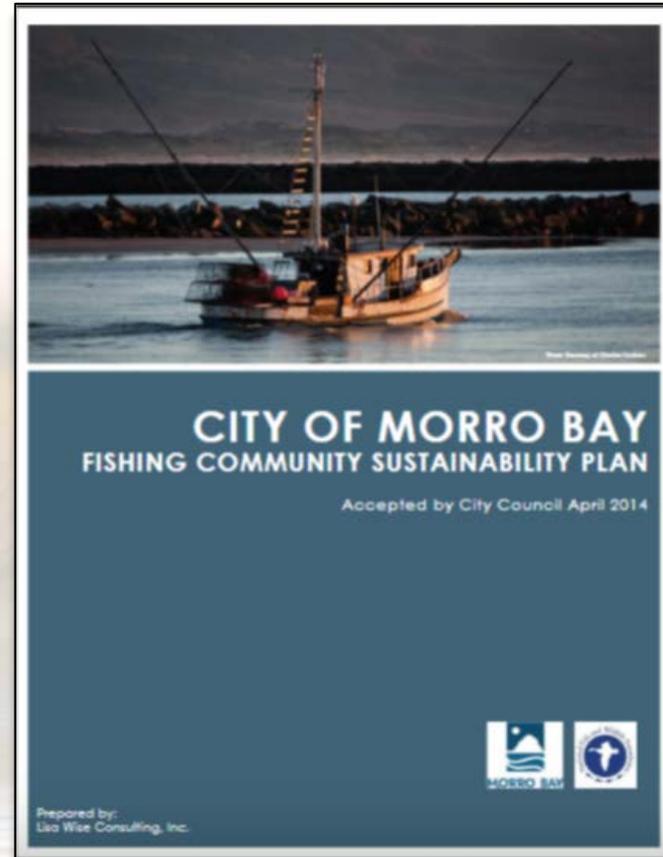
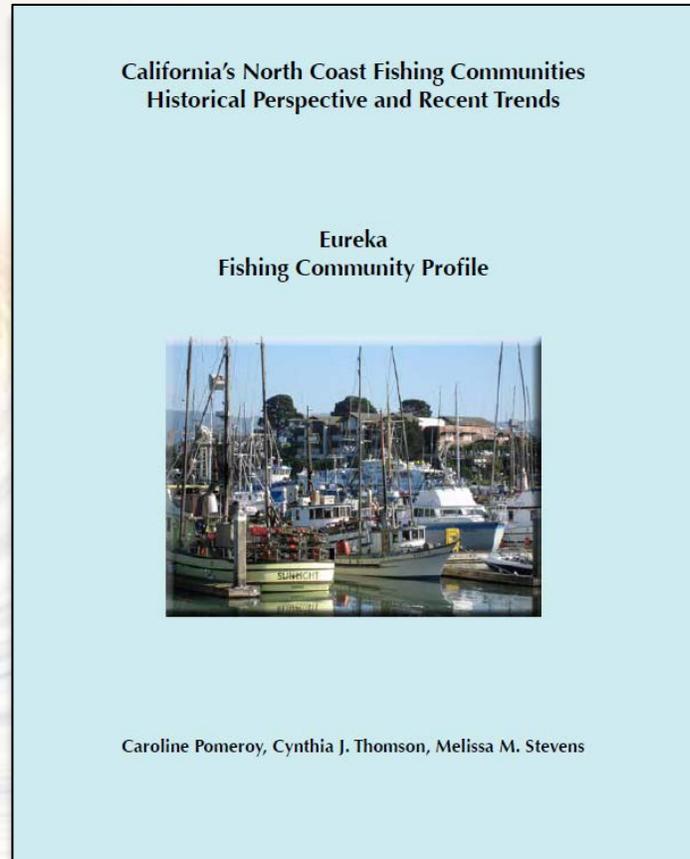
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<https://espis.boem.gov/final%20reports/5508.pdf>

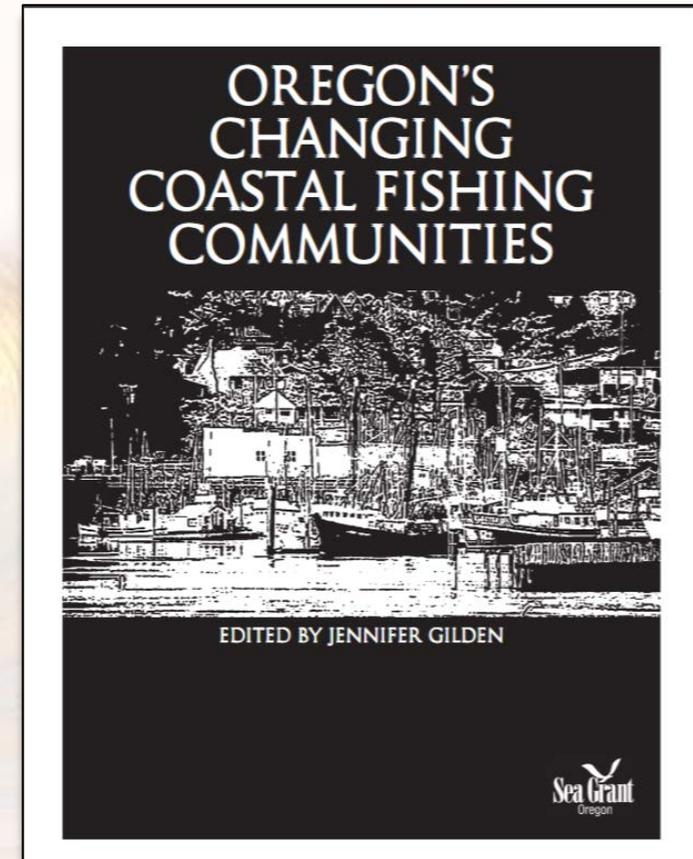
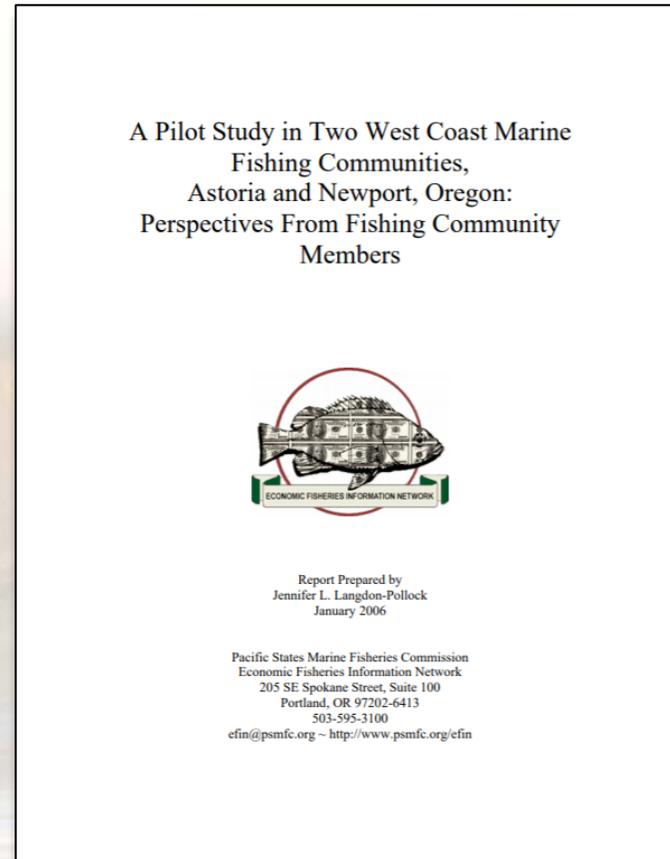
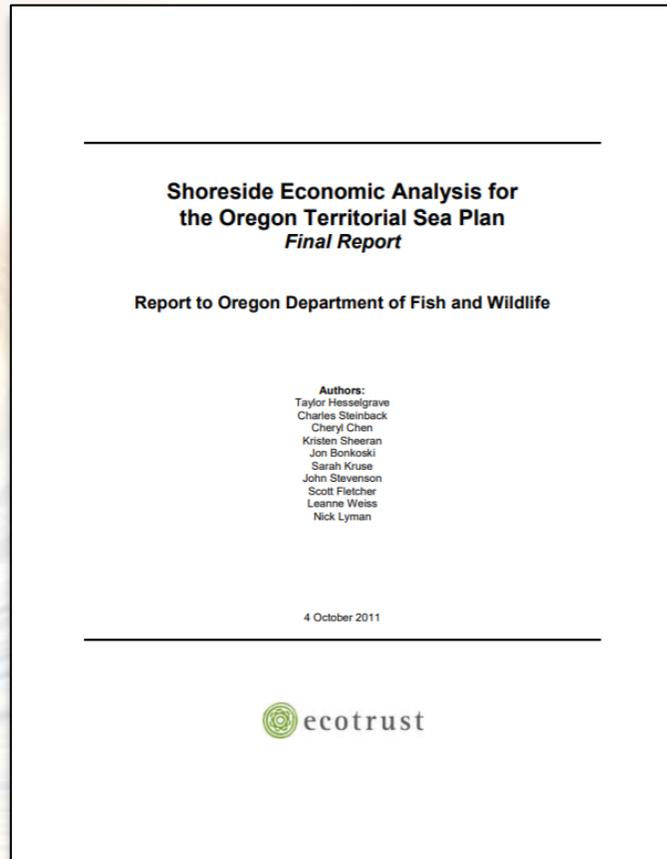
Fisheries – Port Infrastructure

Future work: Build upon existing information on fishing communities and port infrastructure



Fisheries – Port Infrastructure

Future work: Build upon existing information on fishing communities and port infrastructure



Real-time Opportunity for Development Environmental Observations

(RODEO) (AT-14-01) *Ongoing*

<https://www.boem.gov/sites/default/files/documents/environment/environmental-studies/RODEO.pdf>

Block Island Wind Farm
(Rhode Island State waters)



Dennis Schroeder / NREL

Where to Find Data and Maps?

- **California
DataBasin**

<https://caoffshorewind.databasin.org>



- **Oregon**

West Coast Data Portal *in development*

<https://portal.westcoastoceans.org>



- **www.MarineCadastre.gov**



Where to Find BOEM Reports?

Selected BOEM-Funded Research Informing Renewable Energy Offshore California

Selected BOEM-Funded Research Informing Renewable Energy Offshore California
DECEMBER 2019

Information Synthesis & Socioeconomic Studies PAGE 1
Cultural & Archaeological Studies PAGE 3
Biological Studies PAGE 4
Physical Oceanography & Geology Studies PAGE 8

Information Synthesis & Socioeconomic Studies

Completed (2010) — Updated Summary of Knowledge: Selected Areas of the Pacific Coast
This study by Mangi Environmental Group compiled and analyzed information generated after 1977 about the coastal and marine environment from Grays Harbor, Washington to San Francisco Bay, and from Santa Barbara County to the U.S.-Mexico border. It identified early information and data gaps about oceanographic resources and potential impacts of offshore renewable energy development.
Report (BOEMRE 2010-014): <https://espiis.boem.gov/final%20reports/4955.pdf>



Completed (2013) — Oregon Marine Renewable Energy Environmental Science Conference
This conference — coordinated by and held at Oregon State University, Corvallis — brought together an international group (including 40 Oregon specialists) to review existing and ongoing science pertinent to marine renewable energy. This expert group reviewed existing research and prioritized data gaps and needs for baseline conditions, environmental effects, and monitoring studies.
Report (BOEM 2013-0113): <https://espiis.boem.gov/final%20reports/5255.pdf>



Completed (2015) — Pacific Offshore Time Series Wind Resource Analysis
This study by the U.S. Department of Energy/National Renewable Energy Laboratory (NREL) addressed time-series analysis of wind speed data along the coasts of Washington, Oregon, California, and Hawaii, scaled to BOEM's aliquot grid (a unit of leasing). Average wind speed is provided by month, by hours of the day, and for a long-term (17-year) time series. Data are available through Wind Prospector, NREL's web-based GIS application, which provides easy access to wind resource datasets and supports resource assessment and exploration associated with wind development.
Data: <https://maps.nrel.gov/wind-prospector/>



Page 1 of 9

<https://www.boem.gov/Selected-BOEM-Research-Renewable-CA/>

<https://www.boem.gov/Selected-BOEM-Research-Renewable-OR/>

Selected BOEM-Funded Research Informing Renewable Energy Offshore Oregon

Selected BOEM-Funded Research Informing Renewable Energy Offshore Oregon
DECEMBER 2019

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Report (BOEM 2013-0113): <https://espiis.boem.gov/final%20reports/5255.pdf>



Completed (2014) — Industry Feasibility Mapping for the Outer Continental Shelf off the State of Oregon
This study by the U.S. Department of Energy/Pacific Northwest National Laboratory developed maps and other spatially explicit products to identify general areas where it may be technologically and economically feasible to site renewable energy devices on the Oregon Outer Continental Shelf (OCS). It examined the latest industry technologies for offshore wind and wave energy for the Oregon OCS.
Report (BOEM 2014-658): <https://www.boem.gov/2014-658/>



PAGE 1 OF 8



Where to Find BOEM Reports?

Environmental Studies Program Information System (ESPIS)

<https://marinecadastre.gov/espis/#/>

The screenshot displays the ESPIS web application interface. At the top, there is a navigation bar with the ESPIS logo, a search bar containing "ex: Marine Mammals", a "NEAR" search bar containing "ex: Gulf of Mexico", and buttons for "SHARE" and "HELP". Below the navigation bar is a world map showing the Pacific and Atlantic Oceans. The main content area is divided into a filter section on the left and a results section on the right. The filter section includes "FILTER BY:" with three filter categories: "STUDY DATE RANGE" set to "2000 - 2024" with a slider, "STATUS" set to "SHOW ALL", and "REGION" set to "PACIFIC". A "RESET FILTERS" button is located below the filters. The results section shows "WE FOUND 90 RESULTS MATCHING YOUR SEARCH" and a "SORT BY" dropdown menu set to "END DATE NEW". Two "Download" buttons are visible: "Download TXT" and "Download CSV". The first result is titled "Bureau of Ocean Energy Management; Multi-Agency Rocky Intertidal Network" and includes a location pin for "Pacific", a date range of "2019 - 2024", and a "Baseline" icon. The second result is titled "Understanding Biological Connectivity Among Offshore Structures and Natural Reefs".

Thank You

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