



Marine Biology (Fish and Birds)

Environmental Studies Program (ESP) Division of Environmental Sciences

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Environmental Studies Program

Develops and oversees applied scientific studies required for making responsible decisions for managing energy and marine mineral resources on the U.S. Outer Continental Shelf



Applied Science for Informed Decisions on Ocean Energy

Outline

<u>Fish Research</u>

- Information Needs
- Example Fish Studies
 - Beaufort Sea Fish Surveys
 - Pacific Oil Platform Studies

Future Directions for Fish Research

<u>Avian Research</u>

- Information Needs
- Example Bird Studies
 - Red Knot Tracking Study
 - High Definition Imagery Pilot Study

Future Directions for Avian Research

BOEM Information Needs for Fish

Reef Effects

Noise (installation, Operation)

Electromagnetic Fields

Changes in Abundance/Distribution

Arctic Fish Research

- Important subsistence fisheries.
- Sensitive to Climate Change.
- Relatively little known about Arctic fish ecology.



Beaufort Sea Fish Surveys

- Frozen most of the year (30 - 60 mile near shore open in summer)
- Major oil and gas reserves

 Very little known about fish ecology



Beaufort Sea Marine Fish Surveys

 Survey conducted in 2008 and 2011

 First systematic survey of the Beaufort Sea

 Provide valuable baseline data



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Surprises: Bering Sea Species

Snow crab (Chionocetes opilio) Pollock (Theragra chalcogramma) Pacific Cod (Gadus macrocephalus)





Size Distribution

 90% of the fish were less than 4 inches and 1/10 oz.



 Any fish over a foot in size was considered gigantic.



Biogeography





Very large Isopods Central Beaufort Sea

Small clear shelled scallop Eastern Beaufort Sea

Surveys of Fish Living Around Oil and Gas Platforms in the Pacific Ocean

 23 oil and gas platforms off the coast of California in Federal water

Finite lifespan

 Can be left in place, toppled, or totally removed. Impacts to fish?



Oil and Gas Platforms as the Basis for Artificial Reefs

- Create structure for invertebrates to attach
- Bottom of platform contains a "shell mound" of dislodged invertebrates

Habitat for fish





Oil and Gas Platforms Provide Nursery Habitat

- Mid-water of the platforms provide nursery habitat for enormous numbers of juvenile fish.
 - Plentiful food supply (plankton).

- Few predators.





Support Overfished Species

 Platforms can serve as de facto protected areas (fishing difficult and sometimes restricted).

 Significantly higher number of adult fish around platforms than natural reefs.

Platforms produce more larvae than natural reefs.



Boccacio an overfished species.

		EQUIVALENT HABITAT (hectares)		
		Platform Gail	Aver	age Natural Reef
Bocaccio	Adult Density	1 1	equivalent to	55
	Potential Larval Production	1		72
Cowcod	Adult Density	1		24
	Potential Larval Production	1		26

Love et al. 2005

Possible Future Directions for Fish Research

 Continued collection of baseline information in the arctic (under ice).

 Examination of potential impacts of renewable energy development on fish.

 Research on the impacts of sound in the aquatic environment.

BOEM Avian Information Needs

Spill Impacts

Displacement/Attraction

Barrier Effects

Collision Mortality

Migration of the Red Knot

Migrates long distances

2/3 the size of a city pigeon

 Dependency upon horseshoe crab eggs

Concern that wind energy development may impact this species



Geo-Locator Tags

- Determine location based on the time of sunrise and sunset.
- Cost about \$150.
- Tags need to be recovered to obtain data.





Niles, L.J., Burger, J., Porter, R.R., Dey, A.D., Minton, C.D.T., Gonzalez, P.M., Baker, A.J., Fox, J.W. & Gordon, C. 2010. First results using light level geolocators to track Red Knots in the Western Hemisphere show rapid and long intercontinental flights and new details of migration pathways. *Wader Study Group Bull.* 117(2): XX–XX.

Do Red Knots Fly Over Federal Waters in the Atlantic?

 Flew 8,000 km in six days.
From the Brazil/ Uruguay border to the North Carolina Coast



Will Red Knots be able to Avoid Offshore Wind Facilities?

 Flew more than 500 km to avoid tropical storm Danny



Pilot Study of Aerial High-Definition Surveys for Seabirds, Marine Mammals and Sea Turtles



Pilot Study of Aerial High-Definition Surveys for Seabirds, Marine Mammals and Sea Turtles



Loggerhead Sea Turtle 450 meters 1cm resolution



Immature Northern Gannet 1000 meters 3cm resolution

Possible Future Directions for Avian Research

Closer look at migratory bird species

Development of the "Best Bird Map"

 Moving innovative sampling methods from pilot studies to practice

Questions?

Rock Scallop on an oil platform leg