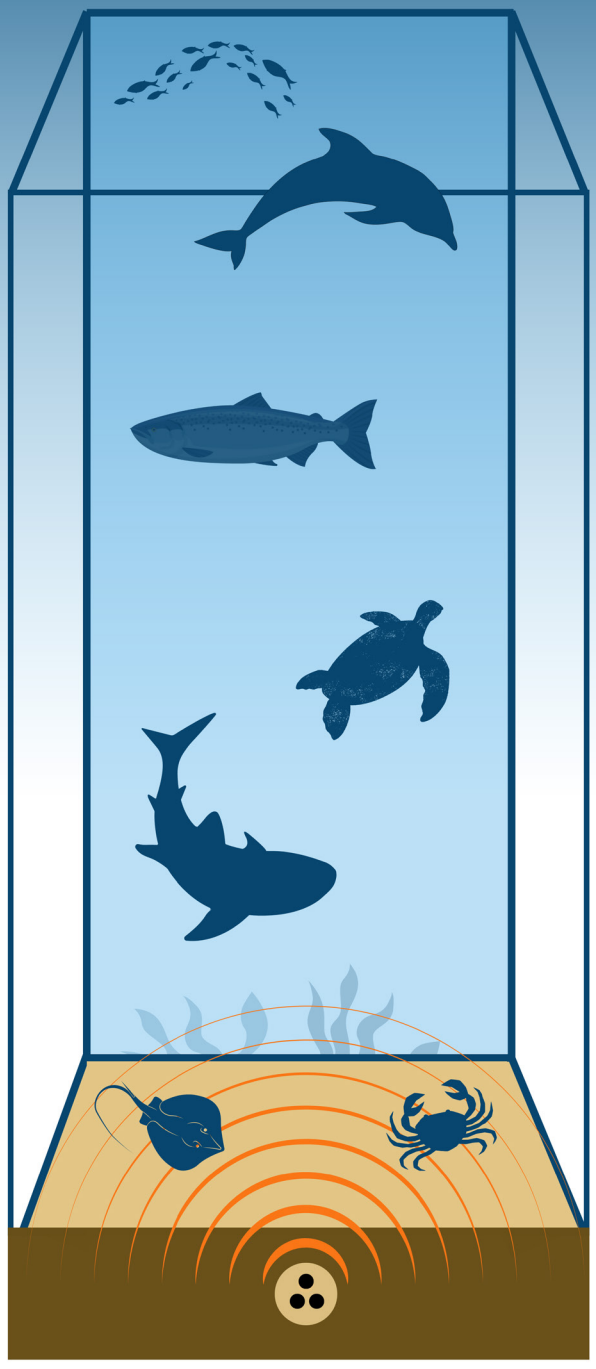
Environmental Studies

Electromagnetic Fields (EMF)

& Marine Life



Naturally occurring background electric and magnetic fields are found throughout the oceans and vary in strength over time depending on location. The ocean's ambient magnetic field, which is used for marine navigation, is influenced by Earth's magnetic field, geological features, ocean currents, human activities, and the activity of marine organisms. The importance of electromagnetic fields (EMFs) in the ecology of many species highlights the importance of understanding how changes in these fields from human activities may impact these animals' natural behaviors and habitats.

Electrosensitive and Magnetosensitive Fish

Many marine mammals, sea turtles, and salmon, are sensitive to magnetic fields, which help them orient themselves during long migratory journeys. Other species, such as sharks, rays, lampreys, and sturgeons, possess electroreceptor organs that allow them to detect weak electric fields in their environment, aiding them in navigation, communication, and prey detection.

Human-made Structures & EMF

Human-made structures, such as sunken metals ships, metal debris, corrosion protection systems, and telecommunication and transmission cables, emit electromagnetic fields which interact with the background EMF in the ocean. Additionally, vessels and marine machinery operating in the ocean can also contribute to localized EMF effects.

To learn more about the California Offshore Wind Programmatic Environmental Impact Statement, scan here:

For more information, visit BOEM.gov/California

Research and Publications

Offshore wind farms have components that may alter background EMF, including alternating current (AC) or direct current (DC) submarine cables and corrosion protection systems. BOEM has funded research that examines how marine animals may respond to benthic submarine cables. The research conducted to date has not found that EMF from submarine cables causes significant impacts to regional populations of electromagnetic-sensitive species. A list of BOEM publications include:

Evaluating the effects of DC electromagnetic fields on migratory fish in San Francisco Bay:

Assessment of Potential Impact of Electromagnetic Fields from Undersea Cable on Migratory Fish Behavior, Period Covering January 2014 - June 2016 (2016)

Assessing effects for electromagnetic fields on marine fishes:

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

Available information on electro- and magnetosensitivity of marine organisms, including elasmobranchs (sharks and rays) and other fish species, marine mammals, sea turtles, and invertebrates:

Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species (2011)

Field measurements and modeling of electromagnetic fields (EMF) from high voltage direct current (HVDC) cables and field observations of response to the fields by the American Lobster and Little Skate Under Fates and Effects:

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

Summarizing the current knowledge about the effects of EMF on fish for use in National Environmental Policy Act assessments:

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

Comparing distribution of marine life on and around cables that are both electrified and dormant:

Renewable Energy in situ Power Cable Observation (2016)

Observing the response of rock crabs to an underwater power cable:

Supplemental Data Regarding the Behavioral Response of Rock Crabs to the EMF of Subsea Cables and Potential Impact to Fisheries (2023)