



Wave-Energy Devices Might Affect the Natural Environment: *Scientists plan research to better understand effects*

Harnessing the energy of waves is a developing field. There are still many areas within the wave-energy industry that require further research, including potential effects on the environment. The Pacific Marine Energy Center (PMEC) test sites will allow researchers to monitor and better understand any effects so that informed decisions about marine energy development can be made.

The environmental effects are unique to each wave-energy device, due to variations in size, material, operation, and placement. Further, the cumulative effects of a commercial installation of many devices may be greater than those of only a few devices being tested.

Below is a short description of the types of effects researchers are currently investigating. Actual research results can be found at nmmrec.oregonstate.edu/, under the Publications tab.

Physical structures in the water **attract marine life**; this is known as the **fish aggregation device** effect. Small fish use the structure for protection from predators and feed on **fouling organisms** such as algae, anemones, and mussels that live on them. Ultimately, this newly formed community could attract predatory species. A similar

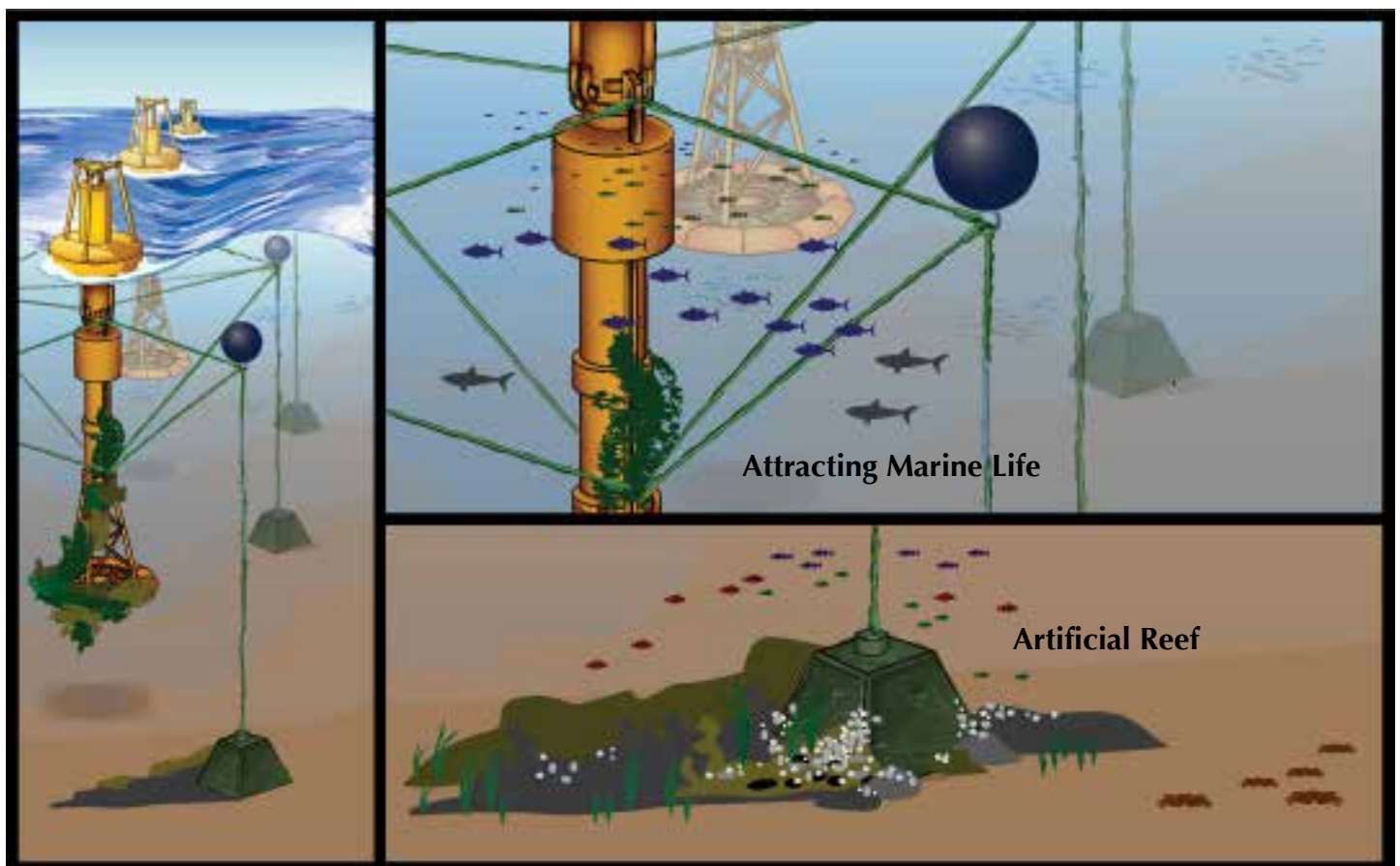
effect will be seen with the anchoring devices on the seabed creating new habitat, or an **artificial reef**.

Seabirds and bats might be attracted to the structures, their lights, and even the prey that are attracted to devices, which could increase the chance for collisions with them.

If **marine mammals** cannot hear devices, they could collide with them or become **entangled** in mooring cables. Conversely, the presence of wave-energy equipment might cause marine species to **alter migration patterns** or behavior to avoid interaction.

Electromagnetic fields associated with wave-energy equipment could affect **feeding and orientation** of marine species, especially salmon, crab, sturgeon, sharks, and rays. Salmon use the earth's natural magnetic field to navigate through the open ocean back to the coastal area of their spawning grounds. Sharks, skates, and rays have the unique ability to sense the electricity created by prey movements.

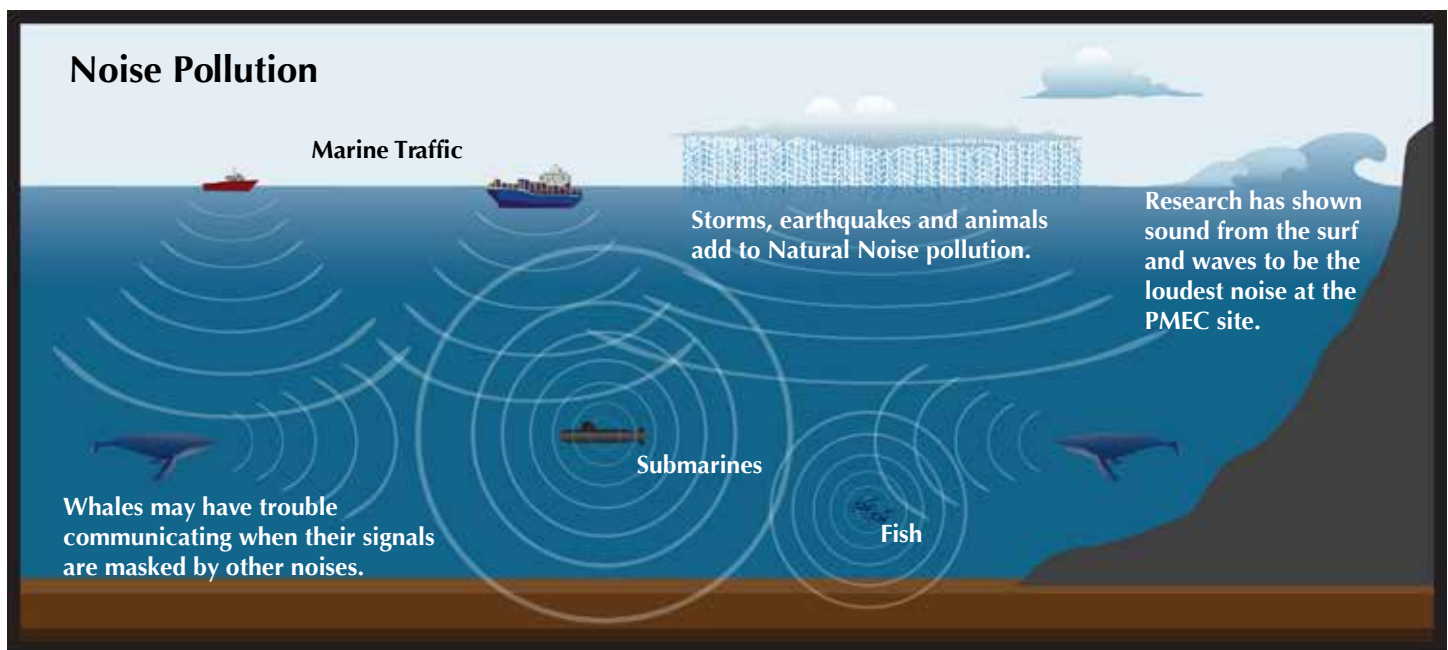
Noise created by wave-energy equipment has the potential to affect marine species by interfering with echolocation and communication.



Wave interaction with the devices may **decrease wave height** or change the **wave angle**. These effects may lead to changes in sediment movement, currents, and the structure of the water column. Changes to circulation and current might affect **larval distribution** and **particle (food) delivery** to filter feeders such as sponges and mussels.

In monitoring these potential effects, it is important to first gain an understanding of the environment before a device is placed in the water. This process, called baseline study, provides scientists with a point of comparison for monitoring while wave-energy devices are in the water. Results of this monitoring will help inform design and placement of future wave-energy device installations.

In Oregon, several federal and state agencies will work together to ensure adequate data is collected. These organizations include: the Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. University researchers throughout the world, including those at Oregon State University, are engaged in data collection to help us understand the potential effects of wave-energy devices.



The environmental effects of wave-energy devices are largely unknown, but scientists, agencies, and developers are working to increase knowledge about their interactions with the marine environment.

Sources of text:

<http://hmsc.oregonstate.edu/sites/default/files/waveenergynoatm92.pdf>

<http://oregonstate.edu/ua/ncs/archives/2013/feb/osu-study-salmon-may-use-magnetic-field-navigational-aid>

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This report was prepared by Oregon Sea Grant under award number NA06OAR4170010 (project number R/CC-11-PD) from the National Oceanic and Atmospheric Administration's National Sea Grant College Program, U.S. Department of Commerce, and by appropriations made by the Oregon State Legislature. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of these funders.

ORESUG-14-001

