

KELP FOREST ARRAY

A state-of-the-art undersea research facility aimed at understanding climate change and human impacts on nearshore kelp forests

Increasing ocean and coastal pressures from ocean acidification and hypoxia events require long-term monitoring methods to document and understand how a currently healthy ecosystem responds to potentially harmful processes, such as climate change and other human-induced change, in relation to natural variability. Current monitoring practices are limited in both their resolution and longevity of baseline data sets.

Through innovative science, leading-edge translation of data and interactive outreach, the Kelp Forest Array (KFA) helps to foster a strong understanding of variability in real-time in the undersea environment.

The Center for Ocean Solutions and its collaborators have developed the Kelp Forest Array (KFA)—an underwater cabled platform that enables real-time gathering of oceanographic data such as water temperature, current speed and direction, dissolved oxygen concentration, salinity and acidification (pH). The array's data communication and power supply allow the capabilities of a traditional land-based research lab to be located in the natural ocean environment, yielding more true-to-life results from a suite of climate and oceanographic instrumentation. The KFA aims to change the way scientists, decisionmakers and the general public interact with their ocean environment.

The Kelp Forest Array project team aims to:

- Provide a tool to study kelp forest ecosystems and coastal dynamics for the oceanographic community.
- Equip decisionmakers with knowledge they need to make decisions that lead to long-term health of the ocean.
- Catalyze human connections with their ocean environment to garner widespread societal support for ocean metrics and what they tell us.

WHO WE ARE

The Center for Ocean Solutions is a collaboration among the Stanford Woods Institute for the Environment and Hopkins Marine Station, the Monterey Bay Aquarium, and the Monterey Bay Aquarium Research Institute.

The Center's mission is to work towards solving the major problems facing the ocean and prepare leaders to take on these challenges.



WHAT WE DO

We bridge the gap between research and decisionmakers and identify pathways to solutions within science, technology and policy for solving major ocean challenges.



Early career science fellow Jamie Dunckley conducting underwater research using the KFA . Located just offshore in Monterey Bay, the KFA monitors changing conditions in the coastal kelp environment. (Flickr Creative Commons)

HOW WE DEVELOP SOLUTIONS:

Kelp Forest Array

Expansion of real-time monitoring capabilities

The KFA can now measure ocean pH and dissolved oxygen to record wide, and potentially harmful, variation in the coastal ocean environment. We have installed an underwater web-camera to monitor and survey species abundance. The KFA also measures real-time ocean water column currents, temperature, salinity, chlorophyll concentration, hypoxia event monitoring and includes streaming video. In the near future the KFA will offer ecological acoustic imaging, hydrophone and tracking of acoustically tagged species.

Collaborative short-term experiments

Upcoming field seasons include continued collaboration with the Monterey Bay Aquarium Research Institute's free-ocean carbon dioxide enrichment experiment to study the effects of increased carbon dioxide concentrations in seawater on marine animals, as well as experiments to understand the structure of hypoxia events and their impact on local species.

Long-term engagement with decisionmakers

Through our ocean monitoring tool, we hope to ease the difficulty of measuring changes in the ocean over the long term, and facilitate conversation between coastal ocean research experts and California resource managers to implement the best protection and monitoring of our local coastal systems.

KFA AT A GLANCE

Real-time data collection of

- Water column current
- Temperature
- Salinity
- Chlorophyll concentration
- pH
- Dissolved oxygen

Other KFA Capabilities

- Live-streaming video and data
- Underwater power and Ethernet for short-term experiments
- Adaptive higher resolution sampling from shore during hypoxia and ocean acidification events
- Interactive updating of ocean conditions to public via online communication tools
- Measurement of backscatter/visibility

OUR COLLABORATORS

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