



Research Brief

Integrated Effects of Wind on Marine Ecosystems



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What is the Upwelling Index?

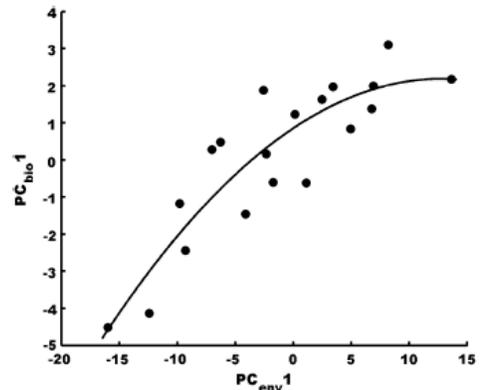
The Upwelling Index is the method traditionally used to calculate the strength of the wind forcing on the ocean in a certain area, thus describing the power of that area's upwelling. However, the Upwelling Index provides a rough approximation because it does not take into account local topography and the marine atmospheric boundary layer, which can both cause significant variability in upwelling amplitude.

What were our methods and conclusions?

We considered both winter and spring/summer modes of upwelling, measured by local wind measurements and sea surface temperature, and compared the results to 15 fish and seabird response variables. We found that intensity and variability of local upwelling were not consistent over the course of the year. We corroborated results of past research by studying the seasonal variability of upwelling using a more precise measurement than the broad-scale upwelling index. We found that in the local ecosystem, the most influential period of upwelling is from January to May, even though it is strongest during summer.

What is the role of winter upwelling in the California Current ecosystem?

This is a matter of debate among scientists today. There is strong evidence that winter upwelling "preconditions," or prepares, the ecosystem for the primary growing season by providing it with cold, nutrient-rich water. It is also possible that winter and early spring upwelling simply allows key species (plankton and forage fish) the time needed to develop further before the foremost period of productivity begins. Regardless of which role winter upwelling plays, its importance is evident.



What is the importance of understanding upwelling?

The scientific framework for an integrated ecosystem-based approach to management is still in the process of being developed, so it is very important to provide evidence to build this framework. Eastern boundary current ecosystems, including the much-studied California Current ecosystem, are extremely important marine regions because of the high occurrence of upwelling, which leads to high productivity. These current systems are essential to the world's fisheries.

Caveat

This study spanned a relatively short amount of time, which could have contributed to the outcome's variability.

-Brief by Marie M. Sydeman

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