

# CLIMATE CHANGE BRINGS NEW THREATS TO OUR MARINE ECOSYSTEM



Photography of coast by BK Richards.

The coastal waters between Cambria in San Luis Obispo County and Point Conception in Santa Barbara County boast a stunning diverse marine ecosystem. This ocean region is home to kelp forests, gray whale migration routes, and one of the most sustainable fisheries in the country. Yet major threats leave this delicate ecosystem hanging in the balance, including the threats posed by climate change. That is why Sierra Club is working with local partners to permanently protect this area and promote management practices based on the best available science to preserve our unique marine environment.

## Warmer Waters

While many of the impacts of climate change on our oceans are still unknown, we do know that the ocean has been absorbing between 80 and 90 percent of the heat added to the atmosphere. According to the International Panel on Climate Change, the average temperature of the global ocean has already increased significantly at 3,000 meters depth and below. [1]

As surface waters warm throughout the planet, many species may begin to shift their range northward. Favorable temperatures and high nutrient concentrations have made the waters off San Luis Obispo some of the most productive in the world: teeming with marine life from sole, to tuna, to crabs. We need to understand more about how warming will impact the diversity and abundance of marine life that currently inhabit California's central coast.

## Ocean Acidification

One of the most serious climate impacts for local fisheries is ocean acidification, which describes a decrease in the pH of ocean water as a result of

dissolved carbon dioxide. Even modest increases in acidity – similar to levels already found in some West Coast and Alaskan waters – can dissolve shell-forming plankton that supply much of the food for young salmon, pollock, halibut and other marine life.

Marine biologist and Fishermen's News contributor Peter McDougall warns that "...a major concern to researchers and fishermen alike is the vulnerability of the base of the ocean food chain." [2]

## Dead zones have begun creeping up along the West Coast

While agricultural runoff is one the most well-known causes of ocean dead zones, there may be new, additional causes emerging. Since 2002, the coast of Oregon has experienced an annual dead zone the size of Rhode Island without any ties to agricultural runoff. The cause? Climate change-induced winds off the coast, which throw the regional nutrient upwelling into hyper-drive and create hypoxic conditions. [3] These conditions— warmer water temperatures and nutrient upwellings – are common along much of the West Coast, including here in the central coast.



Photography of dead fish by Heal the Bay on Flickr.



Photography of Morro Bay on left by Gary Robertshaw. Photo on right by NOAA (National Ocean Service).

## More intense storms

Getting caught in a sudden storm at sea can be more than inconvenient. It can be deadly. Warming in the Pacific Ocean is predicted to increase the severity of coastal storms and winter storm seasons. Fishermen and ports are at risk of being hammered by increasingly frequent and intense coastal storms. [4] The records from offshore monitoring buoys indicate that the storm waves along the central and northern California coast are already gradually increasing in size.

## National Marine Sanctuary can help plan for an uncertain future

We've already begun to see some of the impacts of climate change along the West Coast of the United States. However, the truth of the matter is, we still don't know exactly how the changing climate will impact marine ecosystems and fisheries.

National marine sanctuaries are among the top priority for national research dollars. Monterey Bay National Marine Sanctuary provides research funding opportu-

nities for approximately 25 marine science facilities; these facilities employed almost 2,000 people in 2004 with a combined budget of more than \$200 million. [5] By focusing research dollars along the central coast, we can better understand and prepare for climate change impacts on our community.

Sanctuary research programs ensure proper management of the area's marine resources by identifying scientific information gaps, fostering collaborations to study issues, and interpreting research for decision makers. Better understanding of how climate change will impact the central coast will allow fishery managers to apply the best available science to their decision making, rather than relying on past experiences and patterns which may not hold true under climate change. California's sanctuaries have benefited from the state-of-the-art Sanctuary Integrated Monitoring Network (SIMoN), which allows managers to understand changes to the sanctuary ecosystem as a whole.

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For more information about the threats of offshore oil, and our campaign to create a central coast sanctuary, visit <http://sierraclubcalifornia.org/campaigns/resilient-habitats/the-campaign/central-coast-nms/>.

[1] Spain, Glen H. "Global Climate Change and the Fishing Industry: What it means and how we can adapt." Pacific Coast Federation of Fishermen's Alliances: Fishermen's News of March, 2007. <<http://www.pcffa.org/fn-mar07.htm>>.

[2] McDougall, Peter. "Ocean Acidification Erodes Your Future: Oyster Crisis Could Spread to Other Fisheries." Pacific Coast Federations of Fishermen's Associations: Fishermen's News: February 2010. <<http://www.pcffa.org/fn-feb10.htm>>.

[3] Juncosa, Barbara. "Climate change may be sparking new and bigger 'dead zones.'" Scientific American: October 2008. <<http://www.scientificamerican.com/article.cfm?id=climate-change-dead-zones>>.

[4] Spain, Glen H. "Global Climate Change and the Fishing Industry: What it means and how we can adapt." Pacific Coast Federation of Fishermen's Alliances: Fishermen's News of March, 2007. <<http://www.pcffa.org/fn-mar07.htm>>.

[5] Office of National Marine Sanctuaries, National Oceanic and Atmospheric Administration. "National Marine Sanctuaries Socioeconomic Factsheet." 2011: <<http://sanctuaries.noaa.gov/science/socioeconomic>>.