

COUNTRY: MEXICO

Project Title:

IMECOCAL (Investigaciones Mexicanas de la Corriente de California)

Source of Information:

Dr. Tim Baumgartner and Dr Daniel Loyasa, March 2004

National Representative/Contact

Dr. Tim Baumgartner
CICESE, Biological Oceanography Dept.
Apdo Postal 2372
Ensendada, B.C.
22830 México

tbaumgar@cicese.mx
Tel: +52 646 174-5983
Fax: +52 646 175-2158

Project Description:

A program of ocean monitoring in the southern region of the California Current—off Baja California, MEXICO—has been underway since autumn, 1997. It is modelled after the CalCOFI program (California Cooperative Oceanic Fisheries Investigation, see Note) covering the region off southern and central California to the north. Establishing a program of regular observations for the Mexican sector provides the extended coverage needed to match the scales of scientific sampling and analysis to the natural scales of variability in the California Current. It will also provide information relevant to understanding the behavior of transboundary pelagic resources inhabiting both the waters off Mexico and the United States. This program is known as Investigaciones Mexicanas de la Corriente de California (IMECOCAL).

The long-term goal of IMECOCAL is to improve our capability to predict the response of the pelagic ecosystem to regional and global climate change, as well as to the combined effects of harvesting practices by Mexico and the United States.

The IMECOCAL program has been conducting ocean monitoring cruises every three months since October, 1997. The IMECOCAL observations are scheduled in collaboration with the CalCOFI program. The IMECOCAL survey design is based on the original CalCOFI Basic Station Plan. The cruises cover a subset of the original CalCOFI grid, with stations spaced 20 nautical miles apart extending a maximum distance of 220 nautical miles offshore on the two long central lines and roughly 120 nautical miles on the other lines. The distance between lines is 40 nautical miles.

The core sampling activities of IMECOCAL cruises include routine CTD casts to 1000m depth. There are also sensors to measure dissolved oxygen and fluorescence profiles to complement the CTD data. Water samples are taken from the surface to 200m at standard depths, using 5-litre Niskin bottles mounted on the CTD sampling rosette system. The water is used to analyse the concentrations of dissolved oxygen, inorganic nutrients and chlorophyll. At each station, standard oblique bongo tows are made to capture macrozooplankton, including the ichthyoplankton (fish eggs and larvae). Vertical CalVET tows are also made at each station for quantitative collection of fish eggs through a depth of 70m. Casts for *in situ* measurements of primary productivity, as well as measurements profiling photosynthetic radiation are carried out daily at the mid-day stations. Continuous underway sampling of surface temperature and salinity, as well as continuous ADCP profiling for mapping the currents in the upper 200 metres is done. A CUFES system (Continuous Underway Fish Egg Sampler) was installed on the R/V *Francisco de Ulloa* and has been operational since January, 2000.

In addition to the monitoring cruises, IMECOCAL maintains sea level pressure gauges at Guadalupe Island, about 280km offshore at 29°N, and at a coastal location at San Quintin (about 31°N). The location of Guadalupe Island provides a unique opportunity to continuously measure the mean flow of the California Current, in a way not available at any other place along the West Coast of North America. These paired instruments permit us to monitor the sea surface pressure gradient between the island and the coastal stations to provide a measure of the mean flow in the upper ocean associated with the California Current. They have been operating since January 1999 and we would like to maintain them for at least ten years to provide continuous measurements from which to develop a long-term climatology of the flow across the main axis of the California Current in this region.

The IMECOCAL research program also includes the retrospective analyses of available paleoecological records from near coastal sites off southern Baja California. These provide a regional historical context of interdecadal to centennial variability as seen of the past 500 to 1500 years to compare to records collected off southern California.

Website:

<http://imecocal.cicese.mx/>

System Type Studied:

Southern region of the California Current—off Baja California, Mexico

Target Organisms:

Zooplankton, ichthyoplankton and pelagic fish

Key Questions, Hypotheses and Issues:

1. What is the response of the pelagic ecosystem to regional and global climate change, as well as to the combined effects of harvesting practices by Mexico and the United States and can this response be predicted?
2. What are the characteristics of the spawning habitats of small pelagic species of fish populations? How can we enhance our understanding of space-time changes in distributions, abundances and production of the small pelagic fish populations in relation to environmental variability?
3. How can collaboration between IMECOCAL and CalCOFI in the employment of the CUFES system increase understanding of the response of the transboundary population of the Pacific sardine to climate change and address the combined effects of harvesting by México and the U.S.

Participating Institutions:

There are five Mexican academic institutions participating in IMECOCAL:

CICESE (Centro de Investigación Científica y de Educación Superior de Ensenada)

UABC (Universidad Autónoma de Baja California, in Ensenada)

CICIMAR (Centro Interdisciplinario de Ciencias Marinas, in La Paz)

UNAM (Universidad Nacional Autónoma de México, in México City)

CIBNOR (Centro de Investigaciones Biológicas del Noroeste, in La Paz).

The government agency participating is:

INP/SEGARPA (Department of Agriculture, Livestock, Rural Development, Fisheries and Nutrition).

Number of scientists and fte: 40 scientists

Duration: 1998 onwards

Funding Agency:

CONACYT (Consejo Nacional de Ciencia y Tecnología)

IAI (Inter-American Institute for Global Change Research)

Note:

The CalCOFI program began in 1951 with extensive monthly, and then quarterly cruises which covered the region from northern California to the tip of the Baja California peninsula. With the few exceptions (lines greater than 500 nautical miles) the original CalCOFI station pattern extends roughly from 300 to 350 nautical miles offshore. Between the early 1970s and the early 1980s the timing and coverage of the surveys became somewhat sporadic creating large gaps in the data series due to changing strategies and goals. Integration and analysis of the accumulated data plus the very large El Niño of 1982-83 finally brought on the realization that significant ecosystem changes over interannual time scales could not be sampled without systematic yearly cruises. Consequently, the present design of the CalCOFI surveys consists of quarterly cruises (normally in January, April, July and October) covering the region from the U.S.-Mexican border north to just above Point Conception. This strategy maintains a sampling frequency able to capture the temporal variability critical to describing biophysical response down to interannual-scale climate forcing but compromises knowledge of spatial variability over the system by severely reducing the active area of the sampling grid.

Awareness of the importance of multi-decadal variability has been steadily increasing since the 1980s, accompanied by the realization that not only temporal changes in abundance and productivity are important, but that there are significant latitudinal shifts in the ranges of ecologically and commercially important species. Recognizing the complexity of space-time variability over decadal and longer time scales made it increasingly clear that the reduced CalCOFI sampling design does not adequately describe the fundamental changes in physical and biological structure in which significant spatial variability is embedded within the temporal variability. The IMECOCAL program was initiated to improve our understanding of the overall response of the pelagic ecosystem of the California Current to regional and basin-scale climate change by extending the latitudinal scope of sampling. It also has the practical purpose of tracking ecosystem changes that impact the abundance and productivity of small pelagic fish species off Baja California that are important resources for México.