

## NATIONAL MARINE FISHERIES SERVICE

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## INTRODUCTION

We noted in the Minerals Management Service's Environmental Study Plan for FY 1988 that additional emphasis will be placed on fisheries studies. We applaud this approach and anticipate the prospect of more frequent interchanges between our agencies. We also appreciate the opportunity to participate in this meeting and to describe some of our activities in the southwestern United States.

Fisheries and environmental databases of the National Marine Fisheries Service (NMFS) are extremely varied in structure and form: from handwritten logs to scientific publications to computer-based data sets. In this overview, we will emphasize several databases actively maintained by the National Marine Fisheries Service and other fisheries-oriented agencies on the west coast.

Our intention is to provide a brief sketch of: 1) our agency and its mission; 2) the data sets we have collected and maintained in support of our work; and 3) an opening to what we hope will be a broader discussion of our respective roles in this business of resource management. We were asked specifically to describe the California Cooperative Fisheries Investigations (CalCOFI) data collections. We will also attempt to convey a broader perspective on our involvement in the management of **living** marine resources in the southwestern U.S.

## THE MISSION OF THE NMFS

The National Marine Fisheries Service is part of the National Oceanic and Atmospheric Administration (NOAA), under the Department of Commerce. In California and the western Pacific, we maintain four research laboratories, collectively referred to as the Southwest Fisheries Center, and four regional offices, collectively referred to as the Southwest Region. In conducting our field work, we employ two NOAA research vessels.

There are five major components to our mission, which is to provide information for the management of living marine resources. These components are:

- Manage the harvest of fish and shellfish within the 200 fishery conservation zone.
- Grant permits for the incidental take of marine mammals.
- Ensure the recovery of endangered marine species and promote the protection of marine habitats.
- Promote the development of latent fisheries resources.
- Conduct research for better methods of determining stock productivity and the impacts of regulation on both man and fish.

There are no easy recipes for achieving these objectives. In fact, there is the potential for controversy in every area in which we are involved. For this reason, the agency is organized such that the analysis of problems (the realm of the research labs) is separate from the implementation of solutions (the realm of the regional offices).

Regional offices in the southwest are located in Terminal Island, Santa Rosa and San Diego, California and Honolulu, Hawaii. These offices access a variety of information sources in order to:

- Monitor harvests and issue regulations for managed fisheries and identified marine habitats.
- Issue permits to kill or capture marine mammals.
- Manage the fisherman's loan fund and assistance programs.
- Publish fish market news.

The regional offices are a good source of data on the fishing industry, particularly econometric information and environmental issues.

We also maintain research laboratories in La Jolla, Tiburon, Monterey and Honolulu. Their purpose is to generate information and options for the management of exploited populations. To do that, we must consider the ability of a given population to sustain harvest. We must also consider the influence of climatic events and the magnitude of natural variability of population size. Within the laboratories, the research is organized into four major areas:

- Coastal fish populations.
- Marine mammals, both coastal and high seas.
- Large pelagic fishes, tuna and billfishes.
- Insular fish populations.

Many of our data collections are conducted to answer specific research questions. Others, however, are attempts at large-scale integrations of physical and biological processes over extended time periods; one of these is the CalCOFI program.

#### DATA COLLECTION

The California Cooperative Oceanic Fisheries Investigations (CalCOFI) was established in response to concern over the decline in California sardine landings. Landings dropped from 600,000 tons annually in the 1930s and 1940s to 100,000 tons in 1949, landings virtually disappeared in the early 1950s. At that time, the major unknown was the relative influence of man and the environment on the sardine population. Eventually it was concluded that overfishing changed the demography of the sardine population and reduced its ability to weather environmental regimes which were adverse to good recruitment.

CalCOFI is a consortium of three marine research agencies, all operating in California. These agencies and their contributions to CalCOFI are:

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*Carr & Hewitt: Fisheries and Environmental Databases of the  
National Marine Fisheries Service*

- California Department of Fish and Game (CDF&G), which monitors the catches of adult fish and conducts juvenile fish surveys.
- Scripps Institution of Oceanography (SIO), which describes the physical environment and monitors phytoplankton and zooplankton distribution and abundance.
- National Marine Fisheries Service (NMFS), which describes the production of pelagic fish eggs and larvae.

Each of these agencies has a unique history and charter. It is remarkable that in 1949, they were able to agree that an understanding of the large-scale processes at work in the California Current was essential to their respective objectives; that such an undertaking would require their combined resources in a cooperative effort; and that this was the only way to avoid another tragedy like the sudden decline of the sardine population. This cooperation has lasted for four decades.

Thus, the reproduction, early survival, growth, recruitment, and harvest of fish populations were, and continue to be, described in relation to their biological and physical environments. This became known as the "oceanographic approach" to fisheries research. CalCOFI cruises were conducted monthly from 1949 through 1960, then quarterly through 1966, and again monthly every three years through 1981. In recent years, cruises have been conducted on a quarterly basis. There have been over 300 cruises since 1949.

Output from the CalCOFI program includes:

- Data Reports. Thirty-five data reports have been published by CDF&G describing the results of their trawl surveys for juvenile fish. Over 300 data reports have been published by SIO describing the physical, chemical and biological data collected on CalCOFI survey cruises; these reports are now published within three months of the completion of a cruise. The data include measurements of various nutrients, plant pigment, phytoplankton and zooplankton biomass, salinity, temperature, water clarity, and several other observed as well as derived variables. These data, as well as NMFS collections of fish eggs, and larvae, are also available in a digitized format.
- Atlases. Thirty atlases have been published under the CalCOFI name. These atlases graphically depict many of the data sets in a standard format. Topics range from geostrophic flow to primary production to flatfish larvae.
- CalCOFI Reports. Twenty-seven volumes of CalCOFI reports, containing over 700 peer-reviewed publications, have been published to date. This regional journal has gained a worldwide readership due to the quality of submissions and the global interest in eastern boundary currents as centers of intense and highly variable biological productivity.

The first multidisciplinary symposium on the El Niño phenomenon was sponsored and published by CalCOFI after the intense warm period of 1957-58. Other symposia have examined the facts and fallacies of fishery science, nearshore processes, large-scale aperiodic fluctuations, climatic regimes and trends, sea birds and pinnipeds, and numerous other topics.

In addition to CalCOFI, other databases concerning fisheries and marine mammal populations off the west coast include:

Aerial Surveys: Sightings of fish schools by observer aircraft employed in the purse seine fishery off southern California have been maintained from 1963 to the present. Data include location, species, and an estimate of school weight. Species included in this database are sardine, anchovy, squid, bonita, jack mackerel, Pacific mackerel, and several tuna species.

Albacore: Extensive data sets and analyses are maintained on this species and its fishery. These include: 1) detailed data on the fishery from fishermen log books; 2) migration patterns derived from extensive tagging data; and 3) estimates of population levels and fluctuations prepared by both Japanese and American fisheries agencies.

Coastal Reef Ecosystem: Two sites, one in southern California and one in northern California, have been monitored for over 12 years. Observed changes in the structure of fish, invertebrate and plant communities have been correlated with large-scale climatic regimes. Data are collected by divers and are used to elucidate species diversity, planktonic and benthic communities, and predator-prey relationships. All specimens of plants and animals are identified to species; more than 20 new species of invertebrates have been described from this study.

Rockfishes: Since 1984, several species of rockfish have been collected at sites in the Gulf of the Farallons and in Monterey Bay. The data describe population fluctuations based on juvenile abundances, age and growth curves, parasite burdens, diseases, and fecundity.

Fish Landings: The Fishery Information Network (FIN) is a database established cooperatively by west coast states and NMFS to support the management of coastal fisheries. States provide weekly summaries of commercial fish catches to the Pacific Marine Fisheries Commission, who are under contract to the Council to maintain the database.

Coastal Marine Mammals: Over the last several years, considerable information has been collected on the life history, food habits, and population trends of California seal lions, elephant seals, harbor seals, and harbor porpoises.

Other data include several time series of climatic indicators generated by our laboratory in Monterey, and a five-year survey of the living marine resources of the northwest Hawaiian archipelago conducted by the NMFS laboratory in Honolulu in cooperation with the State of Hawaii and the Fish and Wildlife Service.

#### RESOURCE MANAGEMENT ISSUES

We believe that the research goals of our two agencies are very similar in regards to living marine resources, which are to:

- Determine the impact of exploitation on the abundance and production of biological populations.

We must start with an understanding of these impacts before we can begin to formulate management options. Such an understanding requires knowledge of resident populations, their relationship with predator and prey populations, and their relationship to the physical environment. Obviously, such things cannot be known with certainty and the risks associated with various management options must also be evaluated. Risk analysis requires knowledge of the natural variability of populations and the causes of this variability.

To gain this knowledge, NMFS conducts surveys over large spatial and temporal regimes. Data from these surveys are used to describe: 1) the distribution, reproduction and recruitment of populations; 2) the physical habitats and their seasonal change; and 3) long-term variability and trends. This information is used as a context for specific studies to determine the effects of various management options.

We believe that government agencies are appropriate for conducting this kind of long-term monitoring. They possess the facilities required including ships, labs, and reference collections; they also operate on long-term funding rather than project funding. Accordingly, MMS should fund specific studies which draw on these long-term studies as background information. Meetings like this, convened to exchange information, are required for this division of labor to work. Of equal importance is adequate funding to publish both data and analyses, which should be subject to peer review and disseminated widely.

We propose that new research efforts related to development on the Outer Continental Shelf (OCS) should concentrate on specific studies designed to answer questions regarding proposed management actions. Existing fisheries database, such as described here, are adequate to identify the geographic areas, species of fish and marine mammals, and fisheries that could be affected by development on the OCS. With few exceptions, however, the data we have described do not answer questions regarding what effects the selection of a specific option of exploitation will have on the biological populations at a given site. Unless research is designed to give definitive answers to relevant questions, and within a reasonable time frame, the work is of little value to the decision process.

#### QUESTIONS AND DISCUSSION

**Question (Pershing):** How accurate are the individual locations of animals specified in the individual databases, particularly the CalCOFI databases and the California Fish and Game databases?

**Response (Carr):** Individual sightings of only marine mammals?

**Question (Pershing):** I'm particularly interested in marine mammals. Do you actually have records for the individual sightings?

**Response (Carr):** In the case of marine mammals most of the work is done when they are out of the water and thus there are very specific sites in the Channel Islands. Most, or all, of the population estimates are made when they are on shore. We found it very difficult to do it any other way. We tried doing it with aerial and ship surveys for the harbor porpoise, but it was very difficult.

**Question (Chamberlain):** In your observations of fish schools in southern California, was there an equal effort in all areas or was there bias closer to the airport or to the coast?

**Response (Carr):** I would say there is a great deal of bias. The observers are looking for fish and of course they avoid areas where the fish are not. The bias is primarily in the lack of objectivity.