

Part I

REPORTS, REVIEW, AND PUBLICATIONS

REPORT OF THE CALCOFI COMMITTEE

A Year of Loss

The Marine Life Research Group (MLRG) and CalCOFI community received a major blow with the loss of MLRG Director Michael Mullin, who died on 19 December 2000, and Mia Tegner, Research Marine Biologist, who drowned in a diving accident on 7 January 2001. This issue of *CalCOFI Reports* is dedicated to Professor Mullin, who was a loyal and wise leader of the CalCOFI program for many years. Next year's issue of *CalCOFI Reports* will feature a symposium on abalone, one of Mia Tegner's specialties, and will be dedicated to her. This year we also lost the founding coordinator of CalCOFI, Professor Garth I. Murphy, who died on 5 May 2001.

CalCOFI Atlas 34

CalCOFI Atlas 34, entitled *Distributional Atlas of Fish Larvae and Eggs in the Southern California Bight Region: 1951–1998*, was published and distributed in March 2001. This atlas summarizes the distribution and abundance of 160 ichthyoplankton taxa collected in oblique plankton net tows on CalCOFI survey cruises from 1951 to 1998 in the Southern California Bight (SCB) region, the area encompassed by CalCOFI surveys since 1985. The atlas presents areal and temporal (seasonal, annual, and decadal) changes in occurrence and abundance of larval fish taxa in a format that permits the reader to interpret, in general terms, the effects that fisheries and ocean climate may have had during 1951–98. This is the third atlas summarizing CalCOFI ichthyoplankton data. CalCOFI Atlases 31 and 32 presented distributional summaries for all taxa taken on surveys that covered the greater CalCOFI sampling area extending from northern California to Cabo San Lucas, Mexico, during 1951–84.

Sardine Migration Model

The rapid recovery of Pacific sardine, now ranging from Baja California to Alaska, has caused us to reexamine working hypotheses, particularly those associated with population dynamics. While the mixing of the southern and northern sardine stocks may be too complete to support genetic separation, managing the species as one stock may be deleterious. The analyses of basic

population dynamics, as well as feeding and genetic studies, have been based on sardine taken largely within 20 miles of the coast. Most of the reappraisal stems from the preeminence of sardine spawning off the central California coast north of our current CalCOFI pattern, as measured by David Checkley's egg pump, as well as from adult sardine collected outside of the CalCOFI pattern by a cooperative Russian cruise.

Pacific sardine population parameters are being re-examined by Paul Smith and Nancy Lo in light of the finding that the principal portion of the population has not been available to the fishery. This has required revising the size and age composition of the "virgin" stock as related to two principal habitats. The southerly sardine population has an affinity for nearshore habitats and matures at a younger age and smaller size than the northerly population. Since body size is a principal feature of migration, the researchers have selected a migration model originally devised for hake to reproduce the major features of the recovering sardine population. This study is being geared to the revision of sardine management models to be introduced within two years.

Survivors' Habitat

CalCOFI oceanographic and ichthyoplankton data have been used to characterize larval fish survivors' habitat. Paul Smith, Elizabeth Logerwell, and Shannon Cass-Calay have continued this work by investigating the causes for large variations in the sizes of pelagic fish populations in and around the California Current complex. Distribution of early life stages can provide practical information on the size of the adult spawning stock with enough precision for the fishery-independent component of stock assessment. The size of the adult stock and the production and survival of the spawn they produce is independent of the recruitment from that year's reproductive effort. Anchovy and hake growth rate studies by John Butler and associates have shown that growth of larval and juvenile stages is quite variable and that faster-growing individuals are better represented as survivors. Logerwell and Smith have concentrated on horizontal mesoscale features (anticyclonic eddies) on the high seas; these features appear to retain larvae and enhance growth and survival. Cass-Calay has concentrated

on small-scale layers of food aggregations, which are associated with the faster growth rates of deeper-living hake larvae.

Coastal Pelagic Species Management

The California Department of Fish and Game (CDFG) and the National Marine Fisheries Service (NMFS) are extensively involved in assessing and managing the coastal pelagic species fishery through the Pacific Fisheries Management Council (PFMC). Quarterly CalCOFI ichthyoplankton samples continue to play an important role in the annual assessment of Pacific sardine and Pacific mackerel; the PFMC uses these assessments to recommend harvest guidelines for the West Coast fishery. Additional northern stations, crucial for sardine assessments, were sampled during RV *Jordan* cruise 0104. Sardine egg data collected during the April cruise are used to estimate spawning biomass and spawning area. The latest sardine and mackerel biomass estimates and resulting harvest guidelines are summarized in the Review of Some California Fisheries section of this volume.

El Niño/La Niña

The 1997–98 El Niño was the strongest ever observed both in the equatorial zone and off California. Ron Lynn and Steven Bograd have completed a manuscript describing the strong variations in transport and water-mass characteristics during the 1997–99 El Niño/La Niña along CalCOFI station line 90. During El Niño, sea-surface temperature and sea level were anomalously high, the coastal zone thermocline was deep, and the inshore countercurrent attained record values of poleward transport. The change to La Niña conditions in early 1998 was abrupt and dramatic, as water temperatures dropped below normal and the California Current greatly strengthened at the expense of the countercurrent. Bograd and Lynn have also described the strong variations in the nutricline and the resulting response of primary and secondary production during the same period along CalCOFI lines 80 and 90. The initial period displayed a depressed nutricline and low productivity and was followed by an abrupt and strong reversal as La Niña became established.

Juvenile Rockfish Survey

The regular CalCOFI ichthyoplankton survey provides information on seasonal production of larvae but little information on spatial patterns of survival later in the pelagic phase. During the summer of 2000, a micro-nekton survey of the Southern California Bight was conducted with a 10 m² multiple opening/closing net and environmental sensing system (MOCNESS). The primary goals of the cruise were to investigate the depth and spatial distributions of target species and to deter-

mine the feasibility of using data on late larvae/pelagic juvenile abundance of rockfishes as a fishery-independent indicator of recruitment and year-class strength. Secondary objectives were to examine similar questions for squid, sardine, and anchovy. Many rockfish larvae cannot be visually identified to species, so molecular genetic techniques are being used to identify the larvae. This approach has given new insights into the depth preferences and survivors' habitat for individual rockfish species. Preliminary results suggest that the MOCNESS is an effective means of sampling the abundance of prerecruit stages of rockfishes. Another cruise is planned for 2001.

SIO Research Highlights

Recent MLRG research highlights include the awarding of a U.S. GLOBEC grant to Mark Ohman and collaborators to continue their retrospective analysis of CalCOFI macrozooplankton samples. The objectives are to understand shifts in zooplankton species assemblages in relation to interdecadal changes in physical properties of the upper ocean and atmosphere. In collaborative work with Ed Brinton, they are also solving for stage-specific mortality rates for the dominant euphausiid species in the California Current system (CCS), to provide regime-specific mortality rates appropriate for ecosystem models.

SIO graduate student Ginger Rebstock completed her dissertation, "Long-Term Changes in the Species Composition of Calanoid Copepods off Southern California." She enumerated copepods from CalCOFI zooplankton samples that were collected from 1951 through 1999, and analyzed low-frequency population fluctuations in the context of interannual to interdecadal climate variability. The study showed species-specific responses to environmental variability, and strong responses to decadal-scale climatic regime shifts in some, but not all, species. She found that in spite of these individual responses and large environmental changes in the CCS, the dominance structure of the calanoid copepods has remained stable over 49 years.

Scripps Institution of Oceanography is reorganizing to reduce its number of research divisions. The MLRG is merging with the Center for Coastal Studies. It is expected that this combined unit will continue to actively participate in the CalCOFI program.

California Marine Legislation

The Marine Region of the CDFG continues to be active in the management of nearshore marine resources in California. In the year 2000, the Marine Life Management Act (MLMA; AB 1241) is the blueprint for how marine resources will be managed in California. Marine Region staff began to implement these new policies, which include science-based management, adap-

tive management, an ecosystem approach, and constituent involvement.

A master team whose task will be to establish a network of marine protected areas (MPAs) in California was established in 2000, as mandated in the Marine Life Protection Act (AB 993). The team has simplified the classification system for MPAs into three categories: reserves, parks, and conservation areas. The team will now begin to select MPAs, with input from all interested groups and the public. CDFG's Marine Region has developed a geographic information system (GIS) laboratory to support this effort.

Abalone Management

The CDFG's Nearshore Invertebrate Program continues its work toward managing and conserving invertebrate resources. The Abalone Recovery and Fishery Management Plan is due to be presented to the state legislature on 1 January 2003. CDFG biologists examined red abalone and red sea urchin populations inside and outside marine protected areas in northern California to determine how fishing affects these resources. The department continued to monitor depleted abalone populations in southern California. This work included joint surveys with the NMFS to investigate white abalone habitats.

Kudos

The seagoing personnel of SIO's MLRG, the Southwest Fisheries Science Center's Fisheries Resources Division, and CDFG's Marine Region all contributed, through dedication and diligence, to the success of CalCOFI's quarterly fieldwork. The Committee thanks the officers and crews of the research vessels that have served us well as platforms for our observations during the past year: the NOAA ship *David Starr Jordan*, the University of California RVs *New Horizon*, *Roger Revelle*, and *Robert Gordon Sproul*, and the CDFG RV *Mako*.

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