

SEASONAL AND GEOGRAPHIC CHARACTERISTICS OF FISHERY RESOURCES

California Current Region--V. Northern Anchovy

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The resource of the northern anchovy, *Engraulis mordax*, off the coasts of California and Baja California has been estimated to have grown from 640,000 tons in 1951 to a spawning biomass fluctuating between 5 and 8 million tons since 1962 (Smith, MS). (Estimates from various sources, 1940-41 to 1965, were compiled by Messersmith in 1969--Table 2.) The growth has been attributed, in part, to the anchovy's occupation of the niche left empty by the Pacific sardine during its decline. In 1966, Ahlstrom depicted this phenomenon in comparing the relative abundance and distribution of the larvae of the two species for 1954 and 1962 (Figs. 1 and 2). Data from fossil scales, presented by Soutar (1967) and Soutar and Isaacs (1969), offer an alternate explanation to the anchovy's filling the sardine's niche. They imply that fluctuations in the populations of these two species may have been independent of one another in different periods over the last 2,000 years.

In 1964, the California Cooperative Oceanic Fisheries Investigations (CalCOFI) Committee proposed to the California Marine Research (MRC) Committee that a 200,000-ton harvest be allowed for reduction purposes on the hypothesis that a fishery for this species might help to restore the sardine resource; once restored, proper management could maintain a balance between the two resources. This was detailed by Messersmith in 1969.

Seasonal and Geographic Distribution

Two sources of information are available on the seasonal and geographic distribution of the anchovy population. One is a tagging study in 1966-69: the California Department of Fish and Game (CF&G) tagged anchovies from San Francisco, California, to Ensenada,

Baja California, to determine their migratory habits and to obtain estimates of their population size and mortality rates (Haugen, Messersmith and Wickwire, 1969). Recoveries of tags indicated northerly movement during late summer and southerly movement during the winter. The data were insufficient to determine the sizes of the population mortality rates, or total distribution, because of the low level of the reduction fishery during that period of the study and lack of catch statistics south of Ensenada.

Vrooman and Smith (MS), using serological data, estimated the same movements in a central subpopulation of the anchovy between Pt. Conception, California, and Cedros Island, off Baja California. This subpopulation is included in the area depicted by Haugen, et al. (1969) for their tagging work.

The second source are the data of the CalCOFI, which show the seasonal and geographic distributions of anchovy larvae, cruise by cruise, for 1951-65 (Kramer and Ahlstrom, 1968), and in summaries for eggs and larvae for 1951-60 (Figs. 3 and 4) over the full range of the investigations.

Summarized data can be used to predict the times and locations of adult fish spawning as described by Kramer and Smith (1970a) in the first report in this series, where the organizations, area of investigations, and treatment of the data were presented.

Unlike our previous reports, which used either all eggs or all larvae for the summaries (Kramer and Smith, 1970a, b, c, d), we are using both for the anchovy; for the larvae, we are using the 5-mm size only, the most abundant in the plankton hauls.

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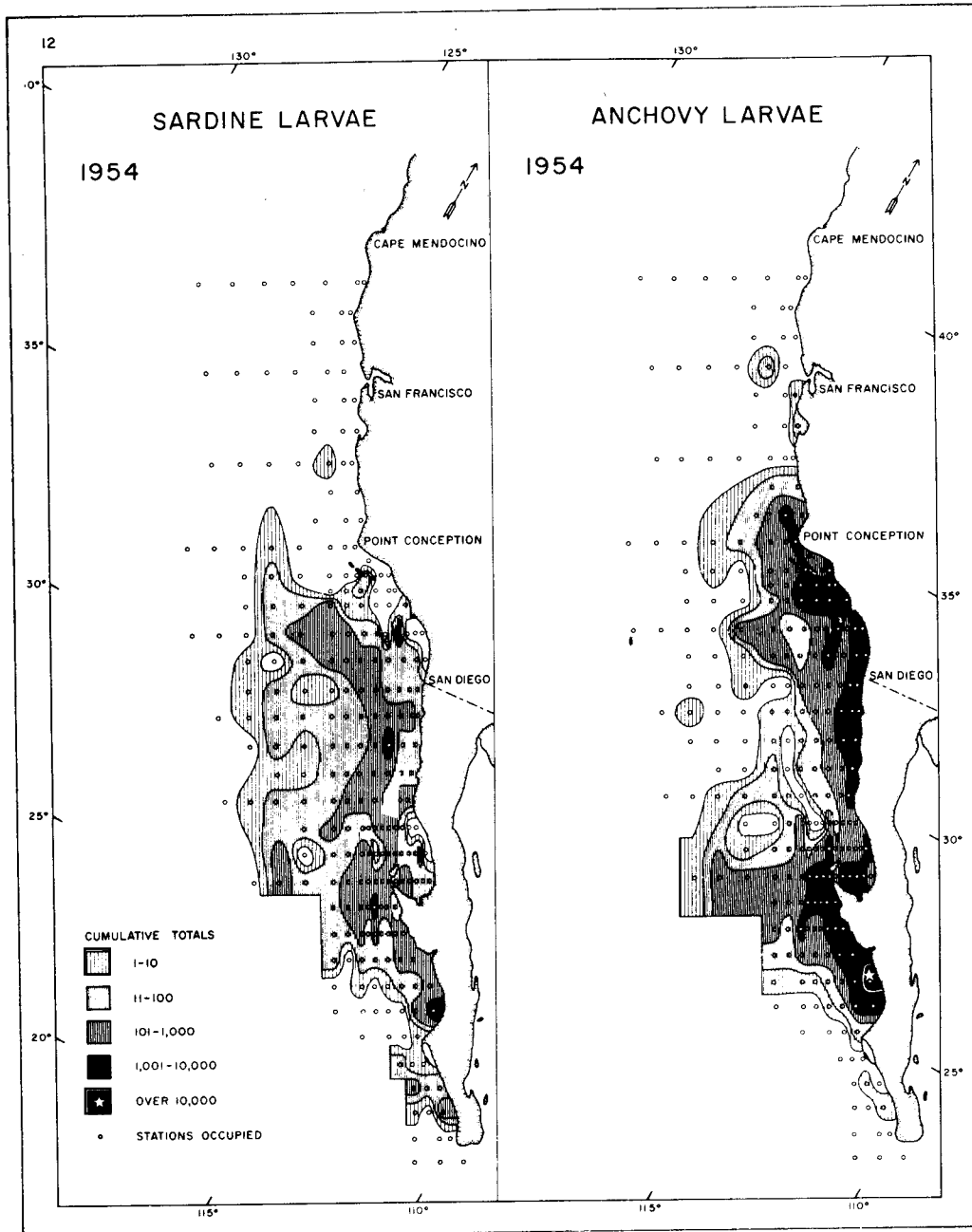


Fig. 1 - Distribution and relative abundance of sardine and anchovy larvae in 1954 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). (Fig. 2 of Ahlstrom, 1966.)

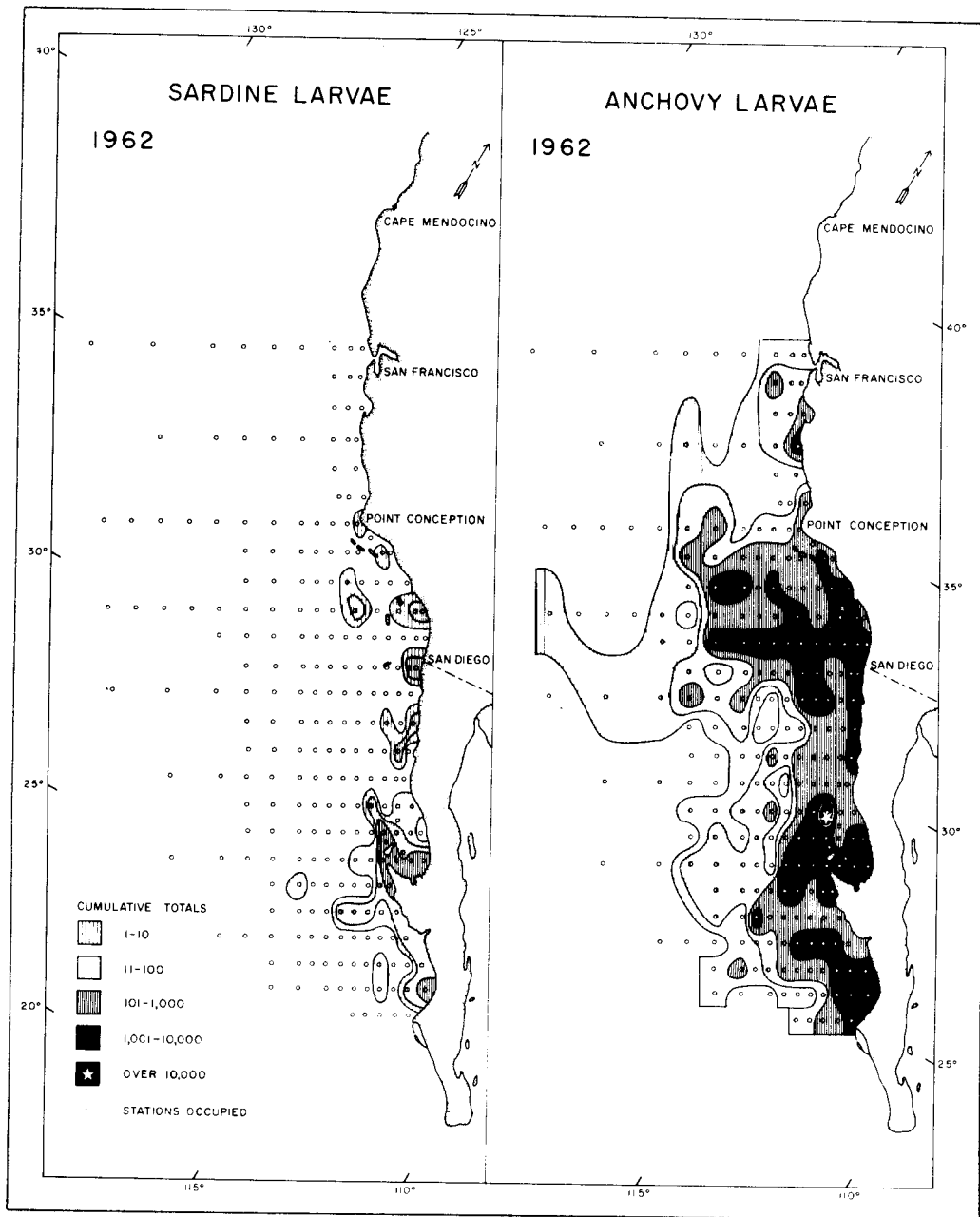


Fig. 2 - Distribution and relative abundance of sardine and anchovy larvae in 1962 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). (Fig. 3 of Ahlstrom, 1966.)

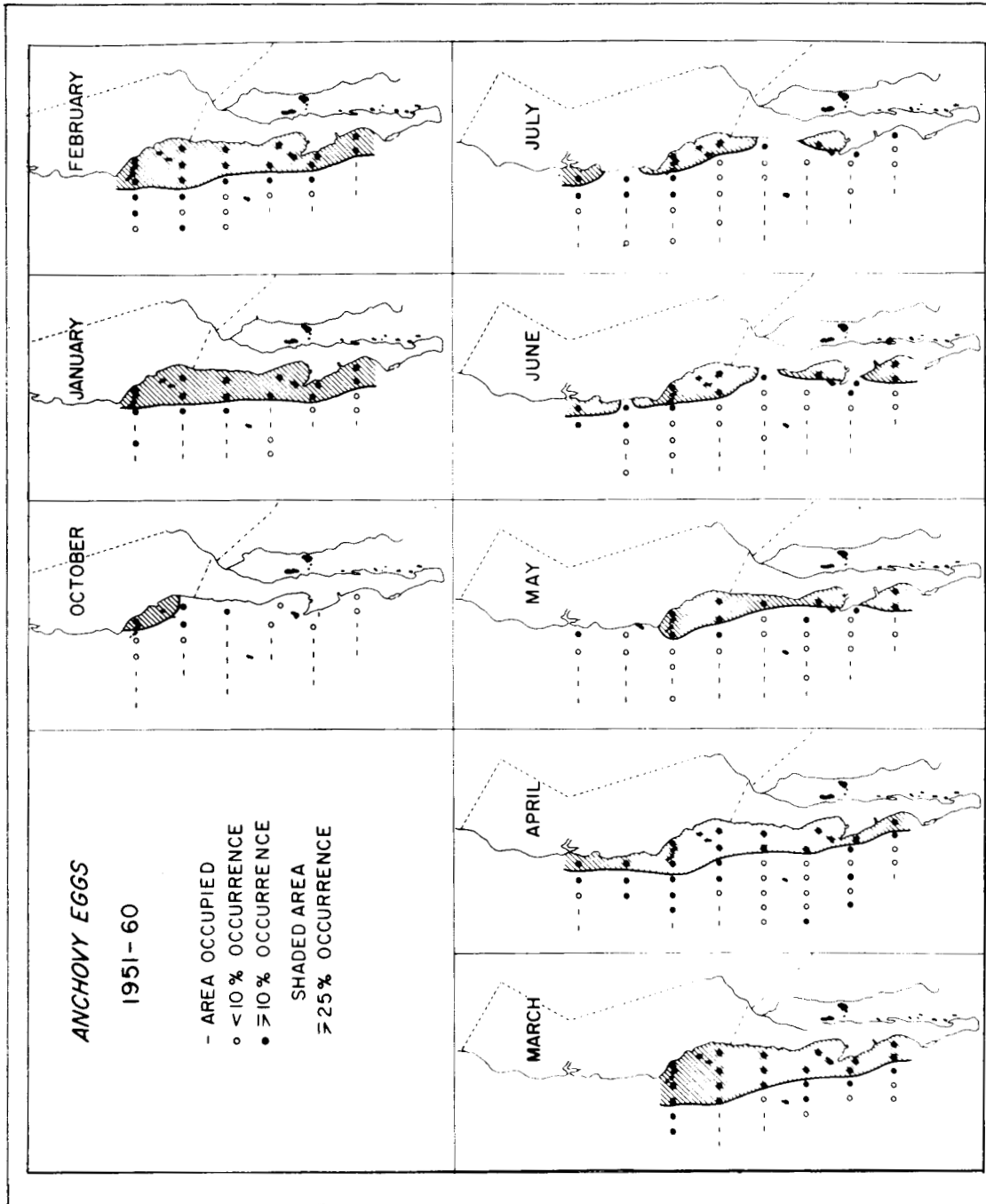


Fig. 3 - Percent occurrence of Anchovy eggs in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

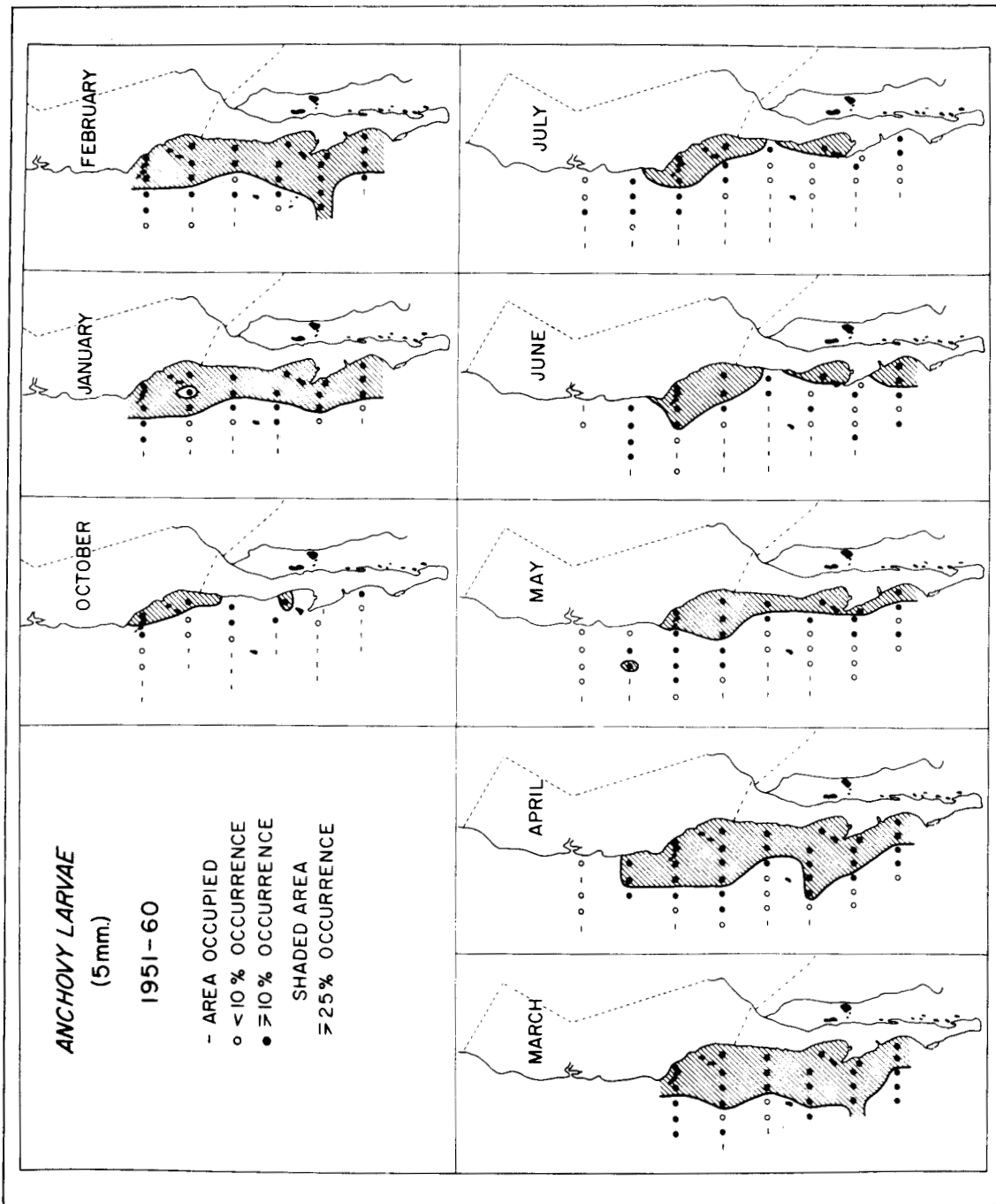


Fig. 4 - Percent occurrence of 5-mm anchovy larvae in 1951-60 on the survey pattern of the California Cooperative Oceanic Fisheries Investigations (CalCOFI). Each circle, line or dot represents a pooled statistical area (see Kramer and Smith, 1970a).

The eggs and larvae show only slight differences in the extent of their distributions in the same month for which each is shown. The major centers of spawning (25% or more occurrences in plankton hauls) are evident first in January from Pt. Conception, California, to Pt. San Juanico, Baja California, and about 50 miles seaward. The north to south extents remain the same through April, with some increase seaward and northward to San Francisco. The southern extent remains the same in May, June, and July, but the northern limit varies between Pt. Conception and San Francisco. By October, the centers are located only off southern California and sometimes southward. The data for August, September, November, and December were insufficient for summarization to show the trends depicted in Figs. 3 and 4.

The Fishery

Until the 1965-66 season, when a reduction fishery was allowed by the California Fish and Game Commission for the northern anchovy in California, the resource had been virtually untapped. Major usage was in commercial landings restricted to canning and in landings for live and dead bait. Total use, including the new fishery for reduction, was summarized by Messersmith (1969) in his

review of the industry through 1967, and by Hardwick (1969) for the fishery through 1968.

Landings for reduction have been strictly limited and controlled by the California Fish and Game Commission to quotas by zones and areas along the California coast with some slight changes from year to year (Messersmith, 1969; Hardwick, 1969). Quota totals were 75,000 tons for each season, 1965 through 1969. The quota total was raised to 100,000 tons for the 1970-71 season. Anchovy landings 1964 through 1969 are shown in Table.

Anchovy landings 1964 through 1969 (source - California Department of Fish and Game)				
Year	Reduction	Other commercial	Live bait	Total
1964	0	2,488	5,191	7,679
1965	170	2,866	6,148	9,184
1966	27,335	3,705	6,691	37,731
1967	32,349	2,455	5,387	40,191
1968	13,795	1,743	7,176	22,714
1969*	65,099	2,533	5,538	73,170

*Preliminary.

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