

State of California
Resources Agency
Department of Fish and Game

LIBRARY
Moss Landing Marine Laboratories
P. O. Box 223
Moss Landing, Calif. 95039

**STATUS OF THE SPAWNING BIOMASS
OF THE PACIFIC SARDINE, 1978-79**

by

Richard A. Klingbeil

**MARINE RESOURCES
Administrative Report No. 79-1**

January 1979

STATUS OF THE SPAWNING BIOMASS^{1/}
OF THE PACIFIC SARDINE, 1978-79^{1/}

by

Richard A. Klingbeil^{2/}

ABSTRACT

State law requires that the population of Pacific sardines, *Sardinops sagax caeruleus*, must reach a minimum spawning biomass of 20,000 short tons before initiation of a fishery. Data from ichthyoplankton surveys, the anchovy live bait fishery, sea survey cruises, and the jack mackerel purse seine fishery are analyzed for evidence of an increase in population size. Presently, the spawning biomass of the northern stock of sardines remains far below 20,000 tons.

^{1/} Marine Resources, Administrative Report No. 79-1
January 1979.

^{2/} Marine Resources Region, 350 Golden Shore, Long Beach, California
90802.

STATUS OF THE SPAWNING BIOMASS
OF THE PACIFIC SARDINE, 1978-79

RECOMMENDATIONS

This report is presented in response to State legislation requiring that the California Department of Fish and Game annually assess the status of the spawning population of the northern stock of Pacific sardines, *Sardinops sagax caeruleus*. Once the spawning population reaches 20,000 short tons, the Department will allow a fishery of 1,000 tons per year.

As of January 1979, the spawning population of northern stocks of Pacific sardines is far below 20,000 short tons. The Department recommends that restrictions concerning incidental catches remain in force and no fishery be initiated in 1979.

INTRODUCTION

This is the fifth annual report concerning the status of the sardine spawning biomass. It is similar to previous reports (Klingbeil, 1975, 1976, 1977, and 1978) in that no direct estimates of spawning biomass are calculated, but four separate sources of data are discussed as they relate to possible increases in the spawning biomass of Pacific sardines. Klingbeil (1975) summarized historical landings by port and described legislation enacted for the purpose of reducing fishing pressure on sardines.

ICHTHYOPLANKTON DATA

Published estimates of sardine spawning biomass from egg and larval data are not available since 1969, although ichthyoplankton surveys have been conducted in 1972, 1975, and 1978. However, the relatively few sardine eggs and larvae collected during these years (Paul Smith,

National Marine Fisheries Service, La Jolla, pers. commun.) suggest the sardine biomass has remained at extremely low levels during the entire period.

The 1978 survey, which was modified to allow for a timely calculation of northern anchovy, *Engraulis mordax*, spawning biomass, did offer a ray of hope for the resurgence of the Pacific sardine. Sardine eggs and larvae were encountered in "substantial" numbers at two widely separated nearshore stations off Newport Beach and just south of Ensenada (Paul Smith, pers. commun.). Although these were rare and isolated events, they may possibly signal a small increase in spawning biomass since sardine eggs and larvae have been virtually non-existent in ichthyoplankton tows since 1969. More important these occurrences may point to a relatively minor success in spawning during 1978, with the possibility of a significant increase in biomass during 1979.

LIVE BAIT FISHERY DATA

Klingbeil (1976) briefly describes the nature of historical data collection from the southern California live bait fishery. This fishery operates primarily in nearshore waters, and historically both adult and juvenile sardines have been caught incidental to fishing for anchovies.

During the summer of 1978, live bait fishing logs, which were previously turned in on a voluntary basis, became mandatory with the implementation of the Pacific Fisheries Management Council's anchovy management plan. This resulted in a more frequent and complete record of the fishery's catches and activities.

The log data during 1978 indicate that juvenile sardines, primarily in trace quantities, occurred in live bait catches off San Diego, Oceanside, Newport Beach, Redondo Beach, Port Hueneme, and Oxnard.

Although the frequency of occurrence was relatively high for some areas in certain months (i.e. San Diego fishermen encountered juvenile sardines on 37 percent of their fishing days during September, 1978), not enough similar historical data exist to allow for comparisons that might suggest an increase in spawning biomass or a relative spawning success during 1978. However, it is the author's opinion that the sardine population has experienced a moderate increase during the past year. This opinion was essentially formed after live bait fishery observation trips during the summer of 1978. On four of six trips, from different ports during June and July, juvenile sardines were observed in trace quantities mixed with the anchovy catches. During the previous 3 summers (1975-77), involving more than 20 observation trips, sardines were observed only once.

SEA SURVEY CRUISES

The intensive, nearshore, mid-water trawl survey for 1978 to assess young-of-the-year anchovy, sardine and Pacific mackerel, *Scomber japonicus*, was not conducted due to breakdowns and subsequent unscheduled overhauls of the R/V "ALASKA".

During 1976 and 1977, sardines were sampled in 2.8 and 2.5 percent respectively of the mid-water trawls. In actual numbers only five sardines were taken in four of the 153 trawl stations conducted in 1976 and 1977.

JACK MACKEREL FISHERY DATA

Sardines that school with jack mackerel, *Trachurus symmetricus*, have historically been observed in jack mackerel landings, primarily as adult fish (2 years old and older).

Sardines were seldom observed in the 1978 and 1977 landings. Fewer than 5 tons are estimated to have been landed with approximately 100,000 tons of jack and Pacific mackerel during these years (Addenda 1 and 2), while an estimated 27 tons were landed with only 22,000 tons of mackerel during 1976 (Addendum 3). This information suggests a continuing decline in the numbers of adult fish and thus the spawning biomass during the most recent years.

SUMMARY AND CONCLUSIONS

Although a direct estimate of the spawning biomass for 1978 was not attempted, all available data suggests that the spawning biomass of the northern stock of sardines has continued its decline during the period 1976 to 1978. The stock is judged to be far below the 20,000 tons required to initiate a harvest. Although some information suggests that the 1978 spawning was relatively more successful than in recent years, the progeny of this spawning will not contribute to the spawning biomass until 1980. Consequently restrictions concerning the intentional fishing and incidental catches of sardines should remain in force.

REFERENCES

- Klingbeil, Richard A. 1975. Status of the spawning biomass of the Pacific sardine, 1974-75. Calif. Dep. Fish Game, Mar. Resour. Adm. Rep. 75-2:1-14.
- _____. 1976. Status of the spawning biomass of the Pacific sardine, 1975-76. Calif. Dep. Fish Game, Mar. Resour. Adm. Rept. 76-4:1-9.
- _____. 1977. Status of the spawning biomass of the Pacific sardine, 1976-77. Calif. Dep. Fish Game, Mar. Resour. Adm. Rept. 77-7:1-6.
- _____. 1978. Status of the spawning biomass of the Pacific sardine, 1977-78. Calif. Dep. Fish Game, Mar. Resour. Adm. Rep. 78-1:1-6.

APPENDUM 1. Estimated Species Composition by Weight (short tons) of Southern California "Mackerel" Landings, 1978 ^{1/}

Month	Total tonnage landed	Proportion of tonnage sampled for species composition ^{2/}	Estimated landings ^{3/}	
			Jack mackerel	Pacific mackerel
January	3,703.6	0.72	1,442.6	2,261.0
February	3,078.7	0.79	1,284.8	1,793.9
March	3,993.5	0.65	3,246.1	747.4
April	2,318.9	0.61	1,962.5	355.3
May	385.7	0.32	328.8	57.0
June	449.2	0.36	325.2	124.0
July	7,295.1	0.74	5,633.4 ^{4/}	1,661.7
August	8,275.6	0.57	6,354.2 ^{4/}	1,921.4
September	5,146.2	0.71	4,307.3 ^{4/}	838.9
October	5,637.4	0.53	4,818.9 ^{4/}	818.5
November	4,079.6	0.48	3,392.0 ^{4/}	687.6
December ^{5/}	1,543.1	0.59	528.9	1,014.2
Totals	45,906.6		33,624.7	12,280.9

^{1/} Includes landings at Terminal Island, San Pedro and Port Hueneme.

^{2/} The large majority of sampling consisted of taking an approximate 30 pound "bucket" sample for each five ton increment during the offloading process. A small part of the tonnage sampled includes "eyeball" estimates of species composition.

^{3/} Estimated landings result from applying simple proportions of the species composition of sampled landings to the total tonnage landed. For San Pedro and Port Hueneme, monthly proportions were used to estimate species composition. At Terminal Island canneries, species composition was usually calculated at weekly or biweekly intervals, depending on the quantity of fish landed and the pattern of fishing activity and then summed to give monthly estimates.

^{4/} These estimates include 560, 839, 112, 671 and 486 tons of reported "jack mackerel" landed at Port Hueneme for the months of July through November, respectively. No sampling for species composition was conducted for these landings.

^{5/} Preliminary figures which do not include any landings that might have occurred at Port Hueneme or San Pedro.

ADDENDUM 2. Estimated Species Composition by Weight (short tons) of Southern California "Mackerel" Landings, 1977 ^{1/}

Month	Total tonnage landed	Proportion of tonnage sampled for species composition ^{2/}	Estimated landings ^{3/}	
			Jack mackerel	Pacific mackerel
January	4,590.2	0.52	4,291.8	298.4
February	2,705.8	0.65	2,619.2	86.6
March	4,615.6	0.45	4,191.0	424.6
April	7,996.5	0.63	7,652.7	343.3
May	3,763.8	0.55	3,421.3	342.5
June	7,857.5	0.55	6,666.2	1,191.3
July	7,423.2	0.69	6,541.4	881.8
August	2,649.8	0.90	2,302.2	344.5
September	1,504.9	0.80	1,290.1	214.8
October	2,255.7	0.62	2,029.0	226.7
November	6,648.9	0.62	5,399.5	1,249.4
December	3,446.4	0.63	3,120.7	325.7
Totals	55,458		49,453.1	5,929.6
				3.6

^{1/} Includes landings at Terminal Island, San Pedro, and Port Hueneme.

^{2/} From January through May sampling for species composition consisted solely of "eyeball" estimates made by port samplers during the offloading process. From June through December the majority of sampling consisted of taking "bucket" sub-samples during the offloading process.

^{3/} Estimated landings result from applying simple proportions of the species composition of sampled landings to the total tonnage landed for each month.

APPENDUM 3. Estimated Species Composition by Weight (short tons) of Southern California "Mackerel" Landings, 1976 ^{1/}

Month	Total tonnage landed	Proportion of tonnage sampled for species composition ^{2/}	Estimated landings ^{3/}	
			Jack mackerel	Pacific mackerel
January	3,135.7	0.55	3,127.0	8.7
February	3,052.8	0.51	3,050.8	2.0
March	2,250.5	0.52	2,246.3	4.2
April	1,469.3	0.50	1,462.2	6.5
May	1,385.1	0.37	1,364.2	19.0
June	1,310.4	0.49	1,259.6	34.4
July	2,405.2	0.70	2,342.1	55.5
August	2,225.0	0.64	2,204.2	20.8
September	1,151.2	0.68	1,146.6	4.6
October	848.3	0.55	838.0	10.3
November	1,166.1	0.63	1,156.8	9.3
December	1,637.1	0.35	1,495.2	141.9
Totals	22,037.3		21,693.0	317.2
				26.5

^{1/} Includes landings at Terminal Island, San Pedro, and Port Hueneme.

^{2/} All sampling for species composition during 1976 consisted of "eyeball" estimates made by port samplers during the offloading process.

^{3/} Estimated landings result from applying simple proportions of the species composition of sampled landings to the total tonnage landed for each month.