

THE SOUTHERN CALIFORNIA JACK MACKEREL FISHERY,  
AND THE AGE AND LENGTH COMPOSITION OF THE CATCH  
FOR THE 1972-73 THROUGH 1983-84 SEASONS

by

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## INTRODUCTION

Jack mackerel, *Trachurus symmetricus*, has been an economically important species for the southern California purse seine fleet since 1947. Canneries started packing it as a substitute for Pacific mackerel, *Scomber japonicus*, and sardines, *Sardinops sagax*, during the collapse of the sardine population and the decline of the Pacific mackerel population in the late 1940's. Jack mackerel are taken by this fleet from waters near shore along the coast between Point Conception and the Mexican border, around islands in the Southern California Bight, and in some years, offshore at Tanner and Cortez banks. Schools of mackerel are sometimes species specific, but often consist of a mixture of jack mackerel, Pacific mackerel, and at times sardines. The jack mackerel caught in the purse seine fishery are primarily small, young fish which are canned at Terminal Island and Port Hueneme for human consumption and pet food.

Jack mackerel from the purse seine fleet have been sampled by the California Department of Fish and Game (CDFG) at the Terminal Island canneries since 1947. They are measured to study length frequency; their sex is recorded, and otoliths are removed for age determination. Since 1966, they have also been weighed, and gonadal maturity has been recorded. The validity of otolith age determinations for this population was explored by Knaggs and Sunada (1974), and the maturation and growth were examined by Wine and Knaggs (1975). The results of the length frequency and age studies for the 1947-48 to 1971-72 fishing seasons have been presented in a series of marine resources technical reports published by the Department of Fish and Game: Knaggs (1974a); Knaggs (1974b); Knaggs and Barnett (1975); Fleming and Knaggs (1977).

This report updates the information presented in those technical reports. It describes variations in factors affecting the jack mackerel purse seine fishery in the 1972-73 through 1983-84 seasons, and the age and length composition of jack mackerel from that period. For the purpose of this report, a season extends from August 1 to July 31 of the following calendar year. There is no closed season on jack mackerel fishing, and the species is often available year-round.

## THE HISTORY OF THE FISHERY

Fluctuations in the volume of jack mackerel landings from the purse seine fishery are not necessarily indications of fluctuations in the population size. Analysis of the relative abundance of jack mackerel must take into consideration the effects of such variable factors as the economics of the fishery and the availability of the species. These fish are sold almost exclusively to the canneries, so processor orders limit the volume of the landings (MacCall and Stauffer 1983). The price paid to the fisherman by the canneries may affect landings (Figure 1), especially if there are more valuable species available.

The southern California purse seine fleet maximizes profits by fishing for a variety of pelagic schooling fish, shifting effort between these species as availability, marketability, and open fishing seasons allow. In all but three years

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between 1966 and 1983, northern anchovy, *Engraulis mordax*, has topped both jack and Pacific mackerel in pounds landed (Klingbeil 1984). Anchovy are fished by the same boats but with smaller mesh nets than jack mackerel, so boats are not likely to fish for both anchovy and jack mackerel in the same trip. Anchovy are not in direct competition with jack mackerel at the canneries because anchovy are reduced to fish meal. Anchovy do not command as high a price per ton as jack mackerel, but boats may shift their fishing effort between anchovy and jack mackerel when availability or marketability changes, or when commercial fishing seasons close. Anchovy fishing in southern California opens on September 15 and is limited by a quota on reduction landings. Through 1978, it closed on May 15, or as soon as the quota was filled. Since 1979, the season closure date has been June 30, and anchovy fishing has also been closed in February and March for the spawning season. Other species such as Pacific bonito, *Sarda chiliensis*, and bluefin tuna, *Thunnus thynnus*, become available to the purse seine fleet at times, and the fishermen shift their effort for weeks or months to these more profitable species.

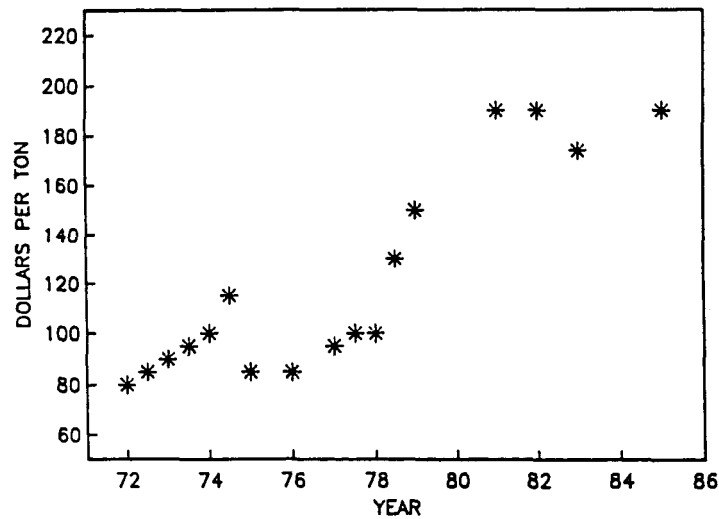


FIGURE 1. Price paid to fishermen for southern California jack mackerel in dollars per ton.

Although Pacific and jack mackerel command the same price at the canneries, Pacific mackerel availability impacts jack mackerel landings through competition for limited markets. Pacific mackerel are often more available near shore than jack mackerel, making Pacific mackerel a more profitable target. In 1982 a cannery even expressed a preference for Pacific mackerel over jack mackerel and allowed larger daily boat limits for loads of pure Pacific mackerel. This reduced the fishing effort on jack mackerel in that season.

Regulations on Pacific mackerel, in addition to the availability of the species, have affected jack mackerel landings at times. Throughout the 1950's and early '60's, jack mackerel were more abundant than Pacific mackerel. In the mid-1960's the Pacific mackerel fishery collapsed. Virtually no Pacific mackerel were caught for the next ten years. In response to the reduced Pacific mackerel biomass, a moratorium on that species went into effect in August 1970. To minimize the negative impact a recovering Pacific mackerel population might have on the jack mackerel fishery, it allowed a mixed load tolerance of up to 18 percent Pacific mackerel in loads of jack mackerel. By 1977 the percentage of Pacific mackerel in mixed catches exceeded this limit and began to seriously interfere with the landing of jack mackerel (Klingbeil 1983). When the spawning biomass was assessed at over 10,000 tons in 1978, the moratorium was lifted, and a quota system on Pacific mackerel was implemented. When a season's quota was filled, "interseason" regulations took effect, which restricted the percentage of Pacific mackerel that could be landed with jack mackerel until fishing on the next season's quota began.

#### THE FISHERY, 1972-73 THROUGH 1983-84 SEASONS

Factors affecting the jack mackerel landings varied during the 1972-73 through 1983-84 seasons. This review of factors for that period is based on the Reviews of the Pelagic Wet-Fisheries for 1972 through 1984 in the Cal COFI Reports (volumes XVIII- XXVI).

The 1972-73 season started with high landings of jack mackerel in August and September, followed by a shift in fishing effort to Pacific bonito, and bluefin tuna, which were available in a warm water influx during the fall of 1972. Bad weather from late December through March greatly reduced the jack mackerel catch during those months, and fish were available only sporadically in June and July (Table 1).

Jack mackerel landings during the 1973-74 season hit the lowest level since the 1954-55 season, due perhaps to increased fuel costs, poor weather, and readily available anchovy, bluefin tuna and bonito. In January 1974, the largest cannery taking jack mackerel at Terminal Island burned down, substantially reducing daily mackerel orders for the fleet.

In the 1974-75 season, the availability of anchovy, bluefin tuna and bonito again diverted effort from mackerel. High fuel costs and the scarcity of jack mackerel near shore, along with reduced cannery orders resulting from the burned cannery, contributed to this season's low jack mackerel landings. They were only slightly higher than the previous season's.

The 1975-76 season showed an increased availability of jack mackerel near shore, good weather, and increased cannery orders. As a result, landings for the season were higher than in the previous season in spite of a lower price paid to fishermen.

Jack mackerel continued to be available near shore in the 1976-77 season. In February, the cannery destroyed by fire in 1974 reopened, and another cannery began processing jack mackerel for the first time. Jack mackerel availability was up, while anchovy and bluefin tuna availabilities were down, concentrating effort on jack mackerel. In addition, the southern California fleet was encouraged to take more jack mackerel because of possible future allocations of underutilized species to foreign fleets, resulting in the highest jack mackerel landings in 12 years. Catches might have been even higher if not for the presence of Pacific mackerel in excess of the allowed 18 percent, mixed with the jack mackerel schools in May. Emergency legislation was passed in June which increased the allowable percentage of Pacific mackerel to 40 percent by weight, and allowed pure loads of Pacific mackerel of 3 tons or less.

Depressed market conditions from August through October of 1977 reduced the cannery orders and slowed the harvest of mackerel until November in the 1977-78 season. A 5,000-ton Pacific mackerel quota was set in January, and daily limits were imposed on boats landing high percentages of Pacific mackerel. The quota was filled by March 10, after which mixed mackerel landings could not contain more than 18 percent Pacific mackerel by weight. A dispute between boat owners, fishermen's unions, aerial spotters, and canneries stopped fishing from April to early July, reducing catches; however, this was also the period of restricted Pacific mackerel harvest after the quota was met, and both species were reportedly unavailable for most of this period. As a result, the jack mackerel catch was down from the previous season's high landings. Urgency legislation was passed allowing Pacific mackerel fishing to resume on July 10 until the revised quota was filled on September 18 under new tolerance limits (pure loads up to 3 tons and larger loads up to 50 percent Pacific mackerel by number).

Jack mackerel were highly available in the fall of 1978, and landings were excellent through December, but dropped much lower for the rest of the 1978-79 season. Pacific mackerel fishing opened on October 1, 1978. Jack mackerel catches may have been reduced by a shift in effort towards Pacific mackerel, which was more available near shore. Changes in the regulations allowed larger loads of "pure" (more than 50 percent) Pacific mackerel after January 22, and as the noticeably abundant 1978 Pacific mackerel year class was recruited to the fishery the Pacific mackerel catch increased. Availability of anchovies in the spring diverted effort from both jack and Pacific mackerel until June when the anchovy fishery closed. Effort then returned to Pacific and jack mackerel until July 20, when the Pacific mackerel quota was filled.

In the 1979-80 season, jack mackerel slipped from dominating total mackerel landings, to composing less than one third of the catch. After the Pacific mackerel quota was filled in late July 1979, fishing on both species virtually stopped until the new Pacific mackerel quota opened in October (Klingbeil 1983). Landings continued to be low for a few weeks as effort was directed towards tuna. Jack mackerel did not dominate total mackerel landings until after early February, when catch restrictions went into effect on Pacific mackerel. Pacific mackerel regulations were again modified after the quota was

filled in May 1980. A new season starting date of July 1 was established for the Pacific mackerel quota, and the incidental catch rate was increased.

Pacific mackerel again dominated jack mackerel in the 1980-81 season landings. Fishing for anchovy, bluefin tuna and bonito diverted some fishing effort away from mackerel. The Pacific mackerel quota opened on July 1 and was filled by September 19. Pacific mackerel fishing was reopened on January 20, 1981, after the biomass estimate was reevaluated, and remained open and unrestricted for approximately one month until the new quota was reached. The shift in dominance from jack to Pacific mackerel in spite of restrictions must be attributed to the increased population of the species and its availability.

The 1981-82 season was again led by Pacific mackerel. The Pacific mackerel quota opened on July 1 with Pacific mackerel dominating the catch through January. Cannery limits on orders restricted landings during the winter. The quota on Pacific mackerel was filled on March 6, and "interseason" restrictions of 50 percent incidental catch in loads greater than 3 tons went into effect. Catches were over half jack mackerel from February through June, but Pacific mackerel still dominated the landings for the season.

Landings were led alternately by jack and Pacific mackerel throughout the 1982-83 season. Jack mackerel was more available than Pacific mackerel in the summer and fall of 1982; however in November, one cannery established higher daily limits for boats delivering pure Pacific mackerel, and Pacific mackerel began to dominate the catch. Bad weather kept catches down in February and March of 1983. In April, the weather improved and landings picked up. Jack mackerel returned to dominate the catch for the month of April; however, the Pacific mackerel quota was not met until June 23, 1983, and Pacific mackerel finished the season strong, with higher total landings than jack mackerel.

The 1983-84 season was an unusual one because it occurred during a major El Nino. Jack mackerel became largely unavailable off southern California during August and remained so through December. Pacific mackerel were caught in August and September but had disappeared from southern California by late October. The fleet moved up to Monterey where 62 percent of December's Pacific mackerel was caught. The jack mackerel catch was better off central California as well. Fish landed in Monterey are not included in the tables that follow; however, some boats caught fish in the Monterey area and returned to unload at Terminal Island, and those fish are included in the southern California landings. Fishing activity remained centered around Monterey until late January when Pacific mackerel became available off the Santa Barbara Channel Islands. Jack mackerel were still unavailable off southern California and made it hard to meet "interseason" restrictions of no more than 50 percent Pacific mackerel after the quota was met in early February. The Pacific mackerel quota was reopened for about a week in April, in May, and in June primarily to alleviate financial hardship to the fishermen due to the scarcity of jack mackerel. While the specific effects of El Nino on mackerel are not known, the 1983 event

did alter the availability of jack and Pacific mackerel off southern and central California.

In summary, the factors effecting jack mackerel landings fell into four general categories: i) availability of other species; ii) availability near shore; iii) weather; and iv) market conditions. The effort directed toward jack mackerel was reduced in some seasons by the availability of the following species: bonito and bluefin tuna in 1972, 1973, 1974 and 1980; anchovy in 1973, 1974, 1977 and 1980; and Pacific mackerel from 1977 through 1983. Increased fuel cost in 1973 and 1974 seasons kept boats nearer shore where jack mackerel were not available. (Good availability nearshore produced high landings of jack mackerel in the 1975 and 1976 seasons). Several months of bad weather slowed the jack mackerel catch in the 1972 and 1982 seasons. Depressed market conditions in the 1977 season reduced cannery orders for jack mackerel. Catches of jack mackerel were greatly reduced during the 1983 El Nino because both jack and Pacific mackerel were unavailable in southern California.

## METHODS

Jack mackerel landed in southern California, between Point Conception and the Mexican border, were sampled at the Terminal Island canneries by CDFG. Two sampling plans were used during the 1972 to 1984 period. From 1972-73 through 1977-78 a stratified random sampling plan was used. A stratum consisted of 5,000 tons (4,500 MT) of jack mackerel, based on estimated landings. Forty random samples were taken per stratum. A list of random numbers was prepared and sequenced in advance; as the cumulative tonnage of landings met or exceeded each of these numbers, the boat unloading was sampled, even if that meant more than one sample was taken from some boatloads. Samples consisted of approximately 5 pounds (2.27 kg) of jack mackerel, to the nearest fish. Each fish in a sample was weighed to the nearest gram, measured to the nearest millimeter fork length (FL), and had its otoliths removed for age determination (Fleming and Knaggs 1977).

Historically, jack mackerel, Pacific mackerel and sardines have often been caught together in mixed schools. The stratified sampling plan, however, was developed for the single species jack mackerel fishery which occurred during the late 1960's and early 1970's when Pacific mackerel and sardines were rare. The plan was modified in 1978 when Pacific mackerel landings increased to more than 10 percent of the total catch. The modified plan was used from the 1978-79 through the 1983-84 season. Boatloads to be sampled were still chosen randomly within a stratum; however, the stratum now consisted of 5,000 tons of "mixed mackerel" with varying percentages of jack mackerel, Pacific mackerel, and sardines. When a boatload was selected for sampling, each mackerel species estimated to constitute at least 5 percent of the load was sampled, and sardines were sampled if they comprised at least 1 percent of the load. Therefore, the number of jack mackerel samples in a stratum varied, and the probability of sampling a boatload was no longer proportional to the weight of jack mackerel landed.



Estimates of the species composition of the catch were made as boats unloaded at Terminal Island. Two methods were used.<sup>1</sup> The first method was used on about 36 percent of the boats by Wildlife Protection personnel from CDFG, who sampled mixed mackerel landings to enforce Pacific mackerel regulations. They recorded the number of fish and the combined weight of each species per 30 pound sample. Samples were taken at a rate of one sample for approximately ten tons of landings. CDFG biologists, who carried out the biological sampling program, used a second system. They made a visual estimate of the species composition during the unloading process for about 75 percent the boatloads. Estimates of the percent of each species by weight in the catch were made with at least one of these methods for 80 percent of the mixed species boatloads after 1975. Jack mackerel landings were calculated on a monthly basis by applying the proportional species composition of the observed landings to the total mixed mackerel landings for southern California (weighed samples were used whenever available), (Table 1).

Numbers of fish landed for each season were calculated by month, as in Knaggs (1974a) for the 1947-48 to 1956-57 seasons, instead of by stratum, as in Fleming and Knaggs (1977) for the 1967-68 to 1971-72 seasons, because landings by stratum were not available for all of this period, and because the 5,000 ton stratum was no longer a consistent unit of jack mackerel landings. Monthly average weights by year class of sampled fish were applied to the total pounds landed for the month to calculate the approximate number of fish landed. During months with no sampling, the average weight of fish by year class for fish sampled during that season was applied.

Age determinations were made on whole otoliths by CDFG biologists under a cooperative National Marine Fisheries Service (NMFS)/CDFG program with procedures described by Knaggs and Sunada (1974). Numbers of otolith pairs read for each of the 1972-73 to 1983-84 seasons ranged between 922 and 3293 (Tables 2-13).

The estimated numbers of jack mackerel by length group (Tables 14 and 15), and the numbers and pounds by age group (Tables 16 and 17), were calculated for each month with computer programs. Monthly values were summed to give season totals. To be consistent with reports from previous years, a season starting date of August 1st was used for all tables in this report. This groups fish together by year class within the season, and is consistent with the way ages were analyzed in the previous report, Fleming and Knaggs (1977).

The landings by age-group for year classes from Fleming and Knaggs (1977) were expanded for the 1967-68 through 1971-72 seasons to include all

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<sup>1</sup>Patricia Wolf, unpublished. State of California Department of Fish and Game, Field and Laboratory Sampling Methods for Pacific Mackerel, Jack Mackerel, Sardine and Anchovy. California Department of Fish and Game, Pelagic Fisheries, Long Beach, CA. October, 1987.

southern California landings between Point Conception and the Mexican border, instead of only Terminal Island landings (Tables 18 and 19). This makes the time series of landings from 1947-48 to 1983-84 consistent in landing area, simplifying comparison of year class estimates from different seasons.

#### AGE COMPOSITION

The jack mackerel population has exhibited wide variations in the relative strength of different year classes in the fishery. In the 1940's and '50's, year classes were either strongly or weakly represented in the fishery. Strongly represented jack mackerel year classes occurred in 1947, 1952, and 1958 (Figure 2). Each of these year classes contributed over 250 million fish, and the 1958 year class, with over 400 million fish, was the most abundant year class recorded in the history of the fishery. Fish from each of these strongly represented year classes contributed significantly to the fishery for five or more fishing seasons. These three strong year classes were separated by strings of four or five weakly represented year classes which contributed between 40 million and 150 million fish to the fishery. The extremely strong 1958 year class was followed by two relatively strong year classes in 1959 and 1960. Both of these year classes contributed about 250 million fish apiece to the fishery. These were followed by five moderately represented year classes in 1961 through 1965, each contributing only about 100 million to 160 million fish. Another group of relatively strong year classes, 1966 through 1970, each contributed about 200 million fish or more, with 1967 and 1970 being the strongest. However, since the 1966 to 1970 year classes were caught mainly as young-of-the-year and one-year-olds, they produced only moderate landing weights (Table 19).

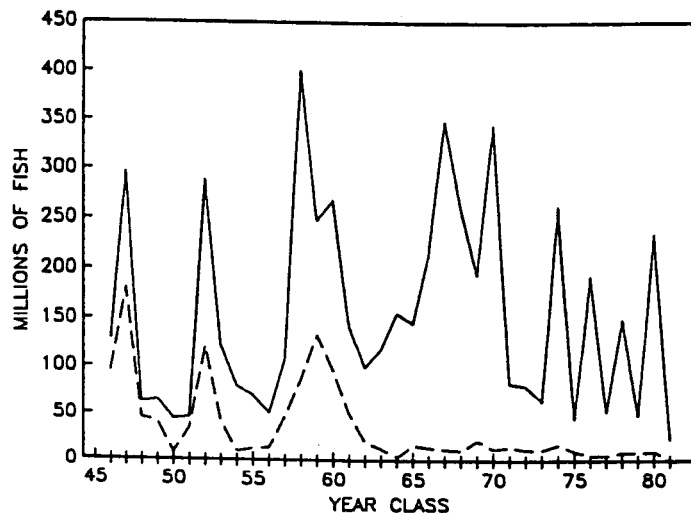


FIGURE 2. Total jack mackerel by year class from southern California landings for the 1947-48 to 1983-84 seasons are indicated by the solid line. Fish caught at ages older than 2 are indicated by the dashed line.

The seasons updated by this report, 1972-1983, can be separated into three types based on the age composition of the catch. The catch was not dominated by a single year class, but was spread among young-of-the-year to three-year-old fish for three seasons, 1972-73 through 1974-75 (Table 16). This was followed by eight seasons, 1975-76 to 1982-83, during which single year classes in the one- to three-year-old range dominated each season's landings (Tables 16 and 17). The final season occurred during the major El Niño in 1983; jack mackerel were scarce in southern California, and the catch was divided between two and three-year-old fish.

The 1973-74 and 1974-75 seasons had the lowest season's landings since 1954-55, apparently due to poor year classes in 1971 to 1973 which provided less than 90 million fish apiece to the fishery (Figure 2).

The 1974 to 1981 period is marked by a series of alternating strong and weak year classes (Figure 2). The 1974, 1976, 1978, and 1980 year classes were relatively strong, each contributing over 150 million fish and more than 60 million pounds to the fishery, while 1975, 1977, 1979 and 1981 each contributed less than 60 million fish and less than 25 million pounds (Tables 18 and 19). Each of the strong year classes dominated the fishery for two years, as one- and two-year-olds.

A scarcity of fish in southern California during the 1983 El Niño, along with weak year classes in 1981 and 1982, led to record low landings in the 1983-84 season (Table 17). The 1980 year class remained dominant in this season.

The most noticeable change in the age composition of the jack mackerel landings has been a marked decrease in the average age since the 1940's and 50's (Figure 2). In the 1939 to 1961 year classes, fish of age 3 and older accounted for 45 percent of the fish caught, whereas from the 1962 year class on, they have composed less than 10 percent of the fishery.

#### LITERATURE CITED

- Bedford, D., S. Crooke, T. Jow, R. Klingbeil, R. Read, J. Spratt, and R. Warner. 1982. Review of some California fisheries for 1980 and 1981. CalCOFI Rep 23:8-14.
- Bedford, D., T. Jow, R. Klingbeil, R. Read, J. Spratt, and R. Warner. 1983. Review of some California fisheries for 1982. CalCOFI Rep 24:6-10.
- Fleming, E. R., and E. H. Knaggs. 1977. The southern California jack mackerel fishery and age, length and sex composition of the catch for the 1967-68 through 1971-72 seasons. Calif. Dep. Fish and Game, Mar Res Tech Rep 37:1-44.

- Klingbeil, R. A. 1977a. Review of the pelagic wet fisheries for 1976 with notes on the history of these fisheries. CalCOFI Rep 20:6-9.
- Klingbeil, R. A. 1977b. Review of the pelagic wet fisheries for 1977. CalCOFI Rep 20:10-12.
- Klingbeil, R. A. 1983. Pacific mackerel: A resurgent resource and fishery of the California current. CalCOFI Reports 24: 35-45.
- Klingbeil, R. A. 1984. Review of some California fisheries for 1983. CalCOFI Rep 25:7-15.
- Klingbeil, R. A. 1985. Review of some California fisheries for 1984. CalCOFI Rep 26:9-16.
- Klingbeil, R. A., J. S. Sunada and J. D. Spratt. 1980. Review of the pelagic wet fisheries for 1978 and 1979. CalCOFI Rep 21:8-11.
- Knaggs, E. H. 1974a. The southern California jack mackerel fishery and age composition of the catch for the 1947-48 through 1956-57 seasons. Calif. Dep. Fish and Game, Mar Res Tech Rep 22:1-47.
- Knaggs, E. H. 1974b. The southern California jack mackerel fishery and age composition of the catch for the 1957-58 through 1961-62 seasons. Calif. Dep. Fish and Game, Mar Res Tech Rep 24:1-25.
- Knaggs, E. H., and J. S. Sunada. 1974. Validity of otolith age determinations for jack mackerel, *Trachurus symmetricus*, from the Southern California Bight area. Calif. Dep. Fish and Game, Mar Res Tech Rep 21:1-11.
- Knaggs, E. H., and P. A. Barnett. 1975. The southern California jack mackerel fishery and age composition of the catch for the 1962-63 through 1966-67 seasons. Calif. Dep. Fish and Game, Mar Res Tech Rep 28:1-28.
- Lehtonen, P. 1976. Review of the pelagic wet-fisheries for 1974. CalCOFI Rep 18:21-22.
- MacCall, A. D., and G. D. Stauffer. 1983. Biology and fishery potential of jack mackerel (*Trachurus symmetricus*). CalCOFI Rep 24:46-56.
- Sunada, J. S. 1977. Review of the pelagic wet-fisheries for 1975. CalCOFI Rep 19:19-20.
- Wine, V. L., and E. H. Knaggs. 1975. Maturation and growth of jack mackerel, *Trachurus symmetricus*. Calif. Dep. Fish and Game, Mar Res Tech Rep 32:1-26.
- Wine, V. L. 1976. Review of the pelagic wet-fisheries for 1973. CalCOFI Rep 18:19-20.

TABLE 1. Southern California jack mackerel landings in thousands of pounds.

Month	Season												
	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	
August	988	1786	4501	1422	4596	4010	12712	3224	3800	1664	5142	2028	
September	13416	224	638	6245	2296	2224	8615	758	4403	1258	8495	1	
October	642	3135	3412	8221	1695	3331	9641	1808	6861	513	6154	141	
November	2146	1167	3339	4902	3111	10078	6784	6059	2933	1450	2074	502	
December	981	259	366	7705	3117	5372	1763	3428	6499	2131	387	223	
January	253	1279	427	6260	7967	2885	910	5286	2720	3404	2300	1306	
February	425	1582	2851	6102	5106	2570	795	1620	3644	7266	893	358	
March	473	199	848	4503	8144	6492	1217	936	6364	7191	753	1358	
April	690	949	827	2936	13944	3925	2955	1684	6653	4006	9956	2737	
May	1444	3115	1194	2761	6625	658	2846	2547	2011	1534	8893	3777	
June	6843	629	1237	2576	11717	650	889	1224	383	2757	3855	1107	
July	3429	5426	860	4820	11664	11267	10410	6655	1769	9417	4148	198	
Totals	40630	19750	20500	58453	79982	53462	59537	35229	48040	42591	53050	13736	

TABLE 2. Length frequencies for 1972-73 season by 5 mm groups.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
130	8	8								
135	11	11								
140	20	20								
145	15	15								
150	13	13								
155	9	9								
160	6	6								
165	9	9								
170	23	23								
175	22	22								
180	32	32								
185	39	38	1							
190	40	38	2							
195	43	36	7							
200	79	64	14	1						
205	131	92	33	6						
210	164	73	83	8						
215	191	58	114	19						
220	166	19	115	30	2					
225	162	7	118	37						
230	144	3	92	49						
235	129		66	54	9					
240	114		46	64	4					
245	134		35	87	12					
250	105		14	76	14	1				
255	126		9	93	22	2				
260	126		7	94	24	1				
265	131		3	85	40	3				
270	98			53	43	2				
275	91		1	41	44	5				
280	87			20	58	9				
285	50			8	37	5				
290	40			7	27	6				
295	18			2	11	5				
300	17				9	7	1			
305	16				7	9				
310	6				2	3	1			
315	1					1				
320	3					1	1	1		
325	3				1	1	1			
330	1						1			
335	1						1			
340	1							1		
Total	2625	596	760	834	366	61	6	2	0	0
Mean FL	235	193	226	252	275	291	323	332	0	0

TABLE 3. Length frequencies for 1973-74 season by 5 mm groups.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
130										
135	3	3								
140	4	4								
145	4	4								
150	8	8								
155	18	18								
160	26	26								
165	39	38	1							
170	33	33								
175	41	35	6							
180	55	47	8							
185	53	43	10							
190	48	34	14							
195	42	23	19							
200	43	12	29	2						
205	55	17	34	4						
210	45	13	27	5						
215	87	12	56	19						
220	73	11	48	14						
225	61	5	39	17						
230	45	1	33	10	1					
235	35	1	23	11						
240	48		20	27	1					
245	34		8	23	3					
250	32		5	21	6					
255	22			18	4					
260	29		4	16	8	1				
265	44			19	24	1				
270	37		1	17	18	1				
275	26			10	15		1			
280	22			2	18	2				
285	15			2	10	3				
290	17				16	1				
295	11				5	6				
300	18				4	10	4			
305	11					10	1			
310	8					4	3	1		
315	12					5	4	3		
320	11					5	5	1		
325	17					3	11	3		
330	4						2	2		
335	4					1	2	1		
340	1								1	
345	3							3		
350										
355										
360										
365										
370	1						1			
375										
<b>Total</b>	<b>1245</b>	<b>388</b>	<b>385</b>	<b>237</b>	<b>133</b>	<b>53</b>	<b>34</b>	<b>14</b>	<b>1</b>	<b>0</b>
<b>Mean FL</b>	<b>226</b>	<b>183</b>	<b>218</b>	<b>246</b>	<b>276</b>	<b>305</b>	<b>321</b>	<b>329</b>	<b>340</b>	<b>0</b>

TABLE 4. Length frequencies for 1974-75 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
130										
135										
140										
145										
150										
155										
160	2	2								
165	4	4								
170	5	5								
175	17	17								
180	34	34								
185	33	33								
190	19	19								
195	25	25								
200	17	16		1						
205	15	8	6	1						
210	22	7	13	1		1				
215	26		21	5						
220	22		13	9						
225	65		36	29						
230	76		23	52	1					
235	108		14	85	9					
240	108		13	84	11					
245	95		6	76	13					
250	39		2	31	5	1				
255	29			17	12					
260	28			14	13	1				
265	14			6	7	1				
270	12			2	10					
275	12			1	10	1				
280	7				3	3	1			
285	9				4	5				
290	9				1	8				
295	13				3	9	1			
300	16				1	11	4			
305	9					8	1			
310	8					5	3			
315	10				1	4	5			
320	8					2	5	1		
325	3						3			
330	1							1		
335	1								1	
340										
345										
350										
355										
360										
365										
370										
375										



TABLE 4. Continued.

mm FL	Total sampled	0	I	II	Age groups III IV		V	VI	VII	VIII
380										
385	1							1		
<b>Total</b>	<b>922</b>	<b>170</b>	<b>148</b>	<b>413</b>	<b>104</b>	<b>60</b>	<b>23</b>	<b>3</b>	<b>1</b>	<b>0</b>
<b>Mean FL</b>	<b>237</b>	<b>189</b>	<b>227</b>	<b>241</b>	<b>261</b>	<b>297</b>	<b>313</b>	<b>346</b>	<b>335</b>	<b>0</b>

TABLE 5. Length frequencies for 1975-76 season by 5 mm groups.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
130										
135										
140										
145										
150										
155										
160										
165	1		1							
170	2		2							
175	7		7							
180	7		7							
185	14		14							
190	9		9							
195	26		26							
200	45		45							
205	71		71							
210	143		143							
215	256		254	2						
220	351		345	6						
225	343		325	18						
230	246		211	35						
235	202		144	53	5					
240	143		87	48	8					
245	96		49	44	3					
250	83		32	46	5					
255	78		30	39	8	1				
260	67		16	40	11					
265	56		7	30	15	4				
270	37		4	9	16	8				
275	22			7	13	2				
280	35		3	6	17	8	1			
285	30				15	13	2			
290	39			1	17	20	1			
295	44				19	25				
300	32				9	19	3	1		
305	31			1	8	21	1			
310	13				5	5	3			
315	17				3	10	3	1		
320	6					3	3			
325	11					4	7			
330	7			1	1		4			1
335	5					1	4			
340	1					1				
345	4						1	2		1
350										
355	3					1	1	1		
360										
365	1									1
370	2							2		
375										

TABLE 5. Continued.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
380	1									1
385	1								1	
Total	2588	0	1832	386	178	146	34	7	4	1
Mean FL	238	0	225	249	279	298	320	345	358	380

TABLE 6. Length frequencies for 1976-77 season by 5 mm groups.

mm FL	Total sampled	0	Age groups									
			I	II	III	IV	V	VI	VII	VIII		
130												
135												
140	2	2										
145	1	1										
150	15	15										
155	29	29										
160	32	32										
165	51	51										
170	37	37										
175	42	42										
180	55	55										
185	66	66										
190	58	58										
195	39	39										
200	47	45	2									
205	55	51	4									
210	69	67	2									
215	71	62	9									
220	74	52	22									
225	60	31	29									
230	62	18	41	3								
235	53	9	43	1								
240	32	1	30	1								
245	32	3	24	5								
250	35		22	13								
255	43		20	21	2							
260	88		16	69	3							
265	148		19	125	4							
270	207		21	178	8							
275	222		17	199	6							
280	232		12	205	15							
285	245		13	222	10							
290	216		6	200	10							
295	212		12	183	17							
300	194		8	165	21							
305	158		6	136	16							
310	100		9	84	7							
315	80		3	66	11							
320	49		1	34	12	2						
325	30		4	19	7							
330	17		1	10	5	1						
335	16			6	9	1						
340	5			3	2							
345	3			2		1						
350	3				1	2						
355	2					1	1					
360												
365	1					1						
370												
375	2				1	1						

TABLE 6. Continued.

mm FL	Total sampled	0	I	II	Age groups III IV		V	VI	VII	VIII
380										
385										
390										
395	1						1			
400										
405										
410										
415										
420										
425	1						1			
430										
435										
440										
445										
480	1									1
Total	3293	766	396	1950	167	11	2	0	0	1
Mean FL	264	195	254	289	302	354	375	0	0	481

TABLE 7. Length frequencies for 1977-78 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
130										
135	1	1								
140										
145	3	3								
150	4	4								
155	11	11								
160	14	14								
165	25	25								
170	14	14								
175	13	12	1							
180	10	8	2							
185	25	12	13							
190	27	11	16							
195	34	12	22							
200	47	23	24							
205	42	18	24							
210	43	10	33							
215	59	11	48							
220	82	16	66							
225	117	10	107							
230	231	3	225	3						
235	281	7	273	1						
240	283	6	265	12						
245	240	4	232	4						
250	219	4	196	19						
255	169	1	149	19						
260	101		82	18	1					
265	84		66	18						
270	87		66	20	1					
275	52		34	18						
280	49		21	23	5					
285	37		5	25	7					
290	42		4	29	9					
295	40		2	21	17					
300	67		1	28	35	3				
305	55			13	41	1				
310	63			22	41					
315	49			10	38	1				
320	34			3	26	5				
325	24			3	19	2				
330	25			2	20	3				
335	8				5	3				
340	12				4	7	1			
345	7			1	3	3				
350	5				3	1	1			
355	3				2	1				
360										
365	1						1			
370	1				1					
375										

TABLE 7. Continued.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
380										
385										
390										
395										
400										
405										
410										
415										
420										
425	1							1		
Total	2841	240	1977	312	278	30	3	1	0	0
Mean FL	251	195	242	283	313	331	353	428	0	0

TABLE 8. Length frequencies for 1978-79 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
130										
135										
140										
145										
150	2	2								
155	1	1								
160	3	3								
165	1	1								
170	7	7								
175	13	12	1							
180	16	16								
185	22	22								
190	32	30	2							
195	42	40	2							
200	28	25	3							
205	39	34	5							
210	40	27	13							
215	52	37	15							
220	58	44	13	1						
225	66	42	23	1						
230	81	40	40	1						
235	84	15	65	4						
240	62	6	50	6						
245	88	4	65	19						
250	84	1	55	28						
255	100	1	38	60	1					
260	117		33	81	3					
265	173		33	136	4					
270	240	2	28	205	5					
275	186		6	176	4					
280	158		1	146	11					
285	121		1	111	9					
290	90		8	59	22	1				
295	44		1	34	9					
300	30		1	12	17					
305	23		1	10	10	2				
310	21			9	7	5				
315	22			9	11	2				
320	26			1	11	14				
325	17				11	5	1			
330	19				7	11	1			
335	19				6	12	1			
340	17				5	6	6			
345	13				1	8	4			
350	11				1	2	7	1		
355	6				1	1	3	1		
360	5					2	3			
365	3					1	2			
370	4					2	2			
375										



TABLE 8. Continued.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
380										
385										
390	1						1			
Total	2287	412	503	1109	156	74	31	2	0	0
Mean FL	262	210	246	275	304	333	352	355	0	0

TABLE 9. Length frequencies for 1979-80 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
130										
135	2	2								
140										
145	2	2								
150	10	10								
155	12	12								
160	7	6	1							
165	15	15								
170	7	7								
175	15	11	4							
180	9	7	2							
185	22	13	9							
190	21	16	5							
195	18	12	6							
200	27	15	12							
205	30	23	7							
210	40	21	19							
215	46	24	22							
220	87	25	62							
225	127	26	101							
230	174	10	161	3						
235	240	14	223	3						
240	323	5	308	9	1					
245	286	2	271	13						
250	196	1	180	15						
255	148	2	127	19						
260	90	1	73	16						
265	78	1	59	18						
270	71		48	22	1					
275	47		29	18						
280	38		14	19	5					
285	26		10	13	3					
290	15			11	4					
295	17			9	8					
300	14			5	9					
305	17			5	11	1				
310	14			4	9	1				
315	13				13					
320	9				8	1				
325	13				8	3	2			
330	5				3	2				
335	8				1	4	3			
340	3					1	2			
345	3					1	2			
350	2						2			
355	2									
360	1					1				
365	1					1				
Total	2351	283	1753	202	84	16	13	0	0	0
Mean FL	244	202	244	271	308	334	343	0	0	0

TABLE 10. Length frequencies for 1980-81 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups III IV		V	VI	VII	VIII
130										
135										
140										
145	1	1								
150	2	2								
155	6	6								
160	12	12								
165	26	26								
170	47	47								
175	75	75								
180	99	99								
185	127	127								
190	117	117								
195	115	115								
200	82	77	5							
205	53	49	4							
210	48	39	9							
215	19	9	10							
220	23	12	11							
225	17	3	14							
230	19	1	17	1						
235	26	2	22	2						
240	36	1	30	5						
245	61	1	47	13						
250	68		57	11						
255	86		58	28						
260	92		52	40						
265	93		45	48						
270	108		33	75						
275	100		17	81	2					
280	146		7	134	4	1				
285	145		2	143						
290	177			169	8					
295	126			119	7					
300	79			71	8					
305	50			39	11					
310	27			17	10					
315	11			3	7	1				
320	9			1	3	4	1			
325	7			2	2	3				
330	2				2					
335	3			1	1	1				
340	4					4				
345	6				1	5				
350	5				1	3	1			
355	3						2	1		
360	5					3	2			
365	2					1	1			
370	3					1	2			
375	2						2			

TABLE 10. Continued.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
380	1						1			
385	5						2	2	1	
390	7					3	2	2		
395	2							2		
400										
405	1								1	
410	2							1	1	
415	1								1	
420										
425										
430										
435										
440	1								1	
Total	2390	821	440	1003	67	30	16	8	5	0
Mean FL	249	191	252	285	306	346	370	390	413	0

TABLE 11. Length frequencies for 1981-82 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups		V	VI	VII	VIII
					III	IV				
130										
135										
140										
145	1	1								
150	4	4								
155										
160	1	1								
165										
170										
175	4	4								
180	12	12								
185	9	9								
190	13	13								
195	20	19	1							
200	26	2	24							
205	34		34							
210	91	5	86							
215	130	2	127	1						
220	136	2	134							
225	129		128	1						
230	168		168							
235	179		177	2						
240	209		206	3						
245	219		210	9						
250	173		166	7						
255	153		136	17						
260	113		95	18						
265	75		56	19						
270	49		23	25	1					
275	24		7	16	1					
280	29		4	23	2					
285	27		2	21	4					
290	43		1	31	11					
295	32		1	17	13	1				
300	32			16	15	1				
305	33			10	22	1				
310	33			1	31	1				
315	29			3	24	2				
320	35			1	27	6	1			
325	28				23	4	1			
330	20				15	4	1			
335	17				8	9				
340	10				3	6	1			
345	10				3	7				
350	3				1	1	1			
355	3				1	2				
360	7				2	3	2			
365	1				1					
370										
375	1						1			

TABLE 11. Continued.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
380										
385	4					1	2	1		
390	2						2			
395	1						1			
400	2					1	1			
405	1									1
410										
415	1							1		
420										
425										
430	1						1			
<b>Total</b>	<b>2377</b>	<b>74</b>	<b>1786</b>	<b>241</b>	<b>208</b>	<b>50</b>	<b>15</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>Mean</b>	<b>251</b>	<b>190</b>	<b>239</b>	<b>279</b>	<b>316</b>	<b>338</b>	<b>371</b>	<b>403</b>	<b>408</b>	<b>0</b>
<b>FL</b>										

TABLE 12. Length frequencies for 1982-83 season by 5 mm groups.

mm FL	Total sampled	0	I	II	Age groups					
					III	IV	V	VI	VII	VIII
130										
135										
140										
145										
150										
155										
160										
165										
170										
175	3	3								
180	2	2								
185	4	4								
190	3	3								
195	2	2								
200	1		1							
205	7	3	4							
210	12	4	8							
215	25	5	20							
220	28	7	21							
225	29	5	24							
230	46	4	35	7						
235	36	1	14	21						
240	77	1	24	52						
245	157		18	138	1					
250	235		10	222	3					
255	296		25	266	5					
260	249		11	228	10					
265	215		6	203	6					
270	206		2	187	17					
275	188			174	14					
280	155		1	143	11					
285	113		1	96	16					
290	66			51	15					
295	42			29	13					
300	33			16	15	2				
305	10			5	4	1				
310	5				5					
315	6				5	1				
320	6				4	1		1		
325	2				1	1				
330	3					3				
335	4					2	2			
340	2				1		1			
345	2					1	1			
350	3					1	2			
355										
360	1							1		
365	2					1	1			
370										
375										

TABLE 12. Continued.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
380	1					1				
Total	2277	44	225	1838	146	15	7	2	0	0
Mean FL	264	210	237	266	286	333	348	342	0	0



TABLE 13. Length frequencies for 1983-84 season by 5 mm groups.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
130										
135										
140										
145										
150										
155										
160										
165										
170										
175	1	1								
180	2	1	1							
185	3	1	2							
190	1		1							
195	9	4	5							
200	10	5	5							
205	9	1	8							
210	6		6							
215	14	5	7	2						
220	11		10	1						
225	13		10	3						
230	29		20	9						
235	41	1	17	23						
240	59		20	36	3					
245	31		7	24						
250	41		6	34	1					
255	42		7	33	2					
260	47		1	36	10					
265	45		4	25	16					
270	73			43	30					
275	46		1	28	17					
280	68			28	39	1				
285	47			20	27					
290	34			9	25					
295	39			10	26	1				
300	48			8	37	3				
305	44			11	31	2				
310	25			2	19	4				
315	23				11	12				
320	26			1	16	8	1			
325	25			1	15	8	1			
330	13				3	5	5			
335	9				3	5	1			
340	1						1			
345	2				1	1				
350	2						2			
355										
360	1						1			
365										
370										
375										

TABLE 13. Continued.

mm FL	Total sampled	Age groups								
		0	I	II	III	IV	V	VI	VII	VIII
380										
385	1								1	
390										
395										
400										
405										
410										
415	1									1
<b>Total</b>	<b>942</b>	<b>19</b>	<b>138</b>	<b>387</b>	<b>334</b>	<b>50</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>Mean FL</b>	<b>273</b>	<b>204</b>	<b>231</b>	<b>265</b>	<b>293</b>	<b>320</b>	<b>337</b>	<b>0</b>	<b>386</b>	<b>416</b>

TABLE 14. Length distribution of jack mackerel landed in southern California for 1972 to 1977 seasons. Estimates of the number of fish in thousands by length group.

Length Group	1972		1973		1974		1975		1976		1977	
	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct
130-139	1060	.9	132	.2							68	.1
140-149	1787	1.5	318	.5					172	1.6	124	.1
150-159	1147	1.0	1062	1.8					2595	3.2	674	.5
160-169	791	.7	2677	4.5	406	.7		58 trace	5265	3.2	1854	1.4
170-179	1999	1.7	3221	5.4	1201	2.0		472 .3	4409	2.7	1150	.9
180-189	3359	2.8	5131	8.7	5072	8.5		1098 .6	5810	3.5	1639	1.2
190-199	3670	3.1	4477	7.6	3188	5.3		1854 1.0	4542	2.7	2884	2.1
200-209	8969	7.6	4894	8.3	3062	5.1		6389 3.6	4063	2.5	4471	3.3
210-219	15477	13.1	6277	10.6	3374	5.6		22985 12.9	5444	3.3	4907	3.6
220-229	14662	12.4	6116	10.3	5564	9.3		46576 26.1	5978	3.6	9549	7.1
230-239	12048	10.2	3631	6.1	10923	18.3		37102 20.8	6515	3.9	24188	17.9
240-249	10989	9.3	3813	6.4	11069	18.5		21622 12.1	4800	2.9	25755	19.1
250-259	10154	8.6	2587	4.4	4219	7.1		12340 6.9	16108	9.7	18743	13.9
260-269	11184	9.5	3438	5.8	2834	4.7		8569 4.8	16108	9.7	8536	6.3
270-279	8902	7.5	2850	4.8	2181	3.6		3705 2.1	26415	16.0	6345	4.7
280-289	6674	5.6	1749	2.9	4219	7.1		3772 2.1	25139	15.2	4012	3.0
290-299	2860	2.4	1384	2.3	1500	2.5		4609 2.6	18338	11.1	3793	2.8
300-309	1646	1.4	1621	2.7	1868	3.1		3512 2.0	14005	8.5	5517	4.1
310-319	345	.3	1312	2.2	1180	2.0		1777 1.0	6894	4.2	5192	3.8
320-329	295	.2	1730	2.9	843	1.4		903 .5	3057	1.8	2688	2.0
330-339	84	.1	533	.9	129	.2		664 .4	1384 .8	1491	1.1	
340-349	51 trace		298	.5				253 .1	339 .2	886 .7		
350-359								153 .1	270 trace	384 .3		
360-369								51 trace	69 trace	47 trace		
370-379			43	.1				101 .1	127 .1	44 trace		
380-389					74	.1		101 .1				
390-399									69 trace			
400-409												
410-419												
420-429									35 trace		47 trace	
430-439												
440-449												
450+									69 trace			

TABLE 15. Length distribution of jack mackerel landed in southern California for 1978 to 1983 seasons. Estimates of the number of fish in thousands by length group.

Length group	1978		1979		1980		1981		1982		1983	
	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct	Estimate	Pct
130-139			53	.1								
140-149			58	.1	53	trace	37	trace				
150-159	175	.1	618	.7	469	.4	148	.1				
160-169	233	.2	646	.7	2314	2.0	37	trace				
170-179	1146	.9	709	.7	7746	6.6	188	.2	109	.1	25	.1
180-189	2434	2.0	1142	1.2	13763	11.8	1339	1.2	188	.2	108	.4
190-199	4225	3.5	1539	1.6	11530	9.9	1480	1.4	187	.2	252	.9
200-209	3608	3.0	2203	2.3	5395	4.6	2269	2.1	349	.3	420	1.5
210-219	5047	4.1	3447	3.6	2811	2.4	8401	7.8	1771	1.5	548	2.0
220-229	6391	5.2	8154	8.6	1930	1.7	10753	10.0	2467	2.1	764	2.8
230-239	9029	7.4	16754	17.7	1881	1.6	16701	15.5	3882	3.2	2324	8.4
240-249	7809	6.4	25515	26.9	4249	3.6	21389	19.9	12983	10.9	2720	9.9
250-259	9827	8.0	14255	15.0	6515	5.6	15931	14.8	29558	24.7	2384	8.6
260-269	15134	12.4	6981	7.4	8165	7.0	9960	9.3	26850	22.5	2990	10.8
270-279	22729	18.6	4764	5.0	9242	7.9	3288	3.1	19835	16.6	3864	14.0
280-289	14966	12.2	2586	2.7	13531	11.6	2319	2.2	11798	9.9	3269	11.9
290-299	7329	6.0	1249	1.3	15327	13.1	3099	2.9	4801	4.0	2119	7.7
300-309	2743	2.2	1406	1.5	6414	5.5	2538	2.4	2298	1.9	2521	9.1
310-319	2131	1.7	976	1.0	2021	1.7	2386	2.2	687	.6	1224	4.4
320-329	2232	1.8	802	.8	785	.7	2246	2.1	503	.4	1310	4.8
330-339	1989	1.6	494	.5	205	.2	1292	1.2	682	.6	559	2.0
340-349	1529	1.3	305	.3	438	.4	695	.6	208	.2	63	.2
350-359	886	.7	163	.2	559	.5	212	.2	155	.1	53	.2
360-369	406	.3	72	.1	237	.2	269	.3	155	.1	18	.1
370-379	187	.2			218	.2	37	trace				
380-389					427	.4	138	.1	52	trace	18	.1
390-399	44	trace			474	.4	106	.1				
400-409					53	trace	106	.1				
410-419					132	.1	35	trace			18	.1
420-429												
430-439												
440-449												
450+					53	trace	35	trace				

TABLE 16. Age and year class composition of jack mackerel landed in southern California for the 1972-1977 seasons.

Age group	0	I	II	III	IV	V	VI	VII	VIII	IX	
<b>1972-73 Season</b>											
Year class	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	TOTAL
Thousands of fish	26604	33808	36873	17433	3045	288	102	0	0	0	118153
Percent	22.5	28.6	31.2	14.8	2.6	.2	.1	.0	.0	.0	100.0
Thousands of pounds	4604	9646	15002	9123	1911	241	101	0	0	0	40628
Percent	11.3	23.7	36.9	22.5	4.7	.6	.2	.0	.0	.0	100.0
<b>1973-74 Season</b>											
Year class	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	TOTAL
Thousands of fish	17384	18330	11235	6209	2845	2203	1005	85	0	0	59296
Percent	29.3	30.9	18.9	10.5	4.8	3.7	1.7	.1	.0	.0	100.0
Thousands of pounds	2500	4659	4240	3390	2113	1859	907	80	0	0	19748
Percent	12.7	23.6	21.5	17.2	10.7	9.4	4.6	.4	.0	.0	100.0
<b>1974-75 Season</b>											
Year class	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	TOTAL
Thousands of fish	12762	9623	24291	6955	4156	1718	203	55	0	0	59763
Percent	21.4	16.1	40.6	11.6	7.0	2.9	.3	.1	.0	.0	100.0
Thousands of pounds	1959	2657	8178	3223	2846	1388	195	53	0	0	20499
Percent	9.6	13.0	39.9	15.7	13.9	6.8	1.0	.3	.0	.0	100.0
<b>1975-76 Season</b>											
Year class	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	TOTAL
Thousands of fish	0	132469	25752	10188	7857	1793	354	202	51	0	178666
Percent	.0	74.1	14.4	5.7	4.4	1.0	.2	.1	0.0	.0	100.0
Thousands of pounds	0	35484	9980	5551	5253	1473	396	244	74	0	58455
Percent	.0	60.7	17.1	9.5	9.0	2.5	.7	.4	.1	.0	100.0
<b>1976-77 Season</b>											
Year class	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967	TOTAL
Thousands of fish	35276	20309	101160	8006	607	139	0	0	69	0	165566
Percent	21.3	12.3	61.1	4.8	.4	.1	.0	.0	0.0	.0	100.0
Thousands of pounds	5966	8068	59287	5593	704	187	0	0	177	0	79982
Percent	7.5	10.1	74.1	7.0	.9	.2	.0	.0	.2	.0	100.0
<b>1977-78 Season</b>											
Year class	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	TOTAL
Thousands of fish	11767	94044	14883	12695	1396	156	47	0	0	0	134988
Percent	8.7	69.7	11.0	9.4	1.0	.1	0.0	.0	.0	.0	100.0
Thousands of pounds	2171	31750	8205	9791	1282	167	95	0	0	0	53461
Percent	4.1	59.4	15.3	18.3	2.4	.3	.2	.0	.0	.0	100.0

TABLE 17. Age and year class composition of jack mackerel landed in southern California for the 1978-1983 seasons.

Age group	0	I	II	III	IV	V	VI	VII	VIII	IX	
1978-79 Season											
Year Class	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	Total
Thousands of fish	21689	27146	59590	8183	3895	1610	115	0	0	0	122228
Percent	17.7	22.2	48.8	6.7	3.2	1.3	.1	.0	.0	.0	100.0
Thousands of pounds	4924	10165	32576	6102	3750	1890	130	0	0	0	59537
Percent	8.3	17.1	54.7	10.2	6.3	3.2	.2	.0	.0	.0	100.0
1979-80 Season											
Year Class	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	Total
Thousands of fish	10251	72053	8072	3250	654	611	0	0	0	0	94891
Percent	10.8	75.9	8.5	3.4	.7	.6	.0	.0	.0	.0	100.0
Thousands of pounds	2316	25337	3935	2357	627	638	0	0	0	0	35230
Percent	6.6	71.9	11.2	6.7	1.8	1.8	.0	.0	.0	.0	100.0
1980-81 Season											
Year Class	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971	Total
Thousands of fish	43884	18989	47911	3148	1494	901	343	265	0	0	116935
Percent	37.5	16.2	41.0	2.7	1.3	.8	.3	.2	.0	.0	100.0
Thousands of pounds	6732	7421	27834	2230	1565	1221	539	498	0	0	48040
Percent	14.0	15.4	57.9	4.6	3.3	2.5	1.1	1.0	.0	.0	100.0
1981-82 Season											
Year Class	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972	Total
Thousands of fish	3698	83677	9922	7690	1822	519	71	35	0	0	107434
Percent	3.4	77.9	9.2	7.2	1.7	.5	.1	0.0	.0	.0	100.0
Thousands of pounds	586	28427	5174	5837	1716	671	119	62	0	0	42592
Percent	1.4	66.7	12.1	13.7	4.0	1.6	.3	.1	.0	.0	100.0
1982-83 Season											
Year Class	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	Total
Thousands of fish	1616	10140	98608	7427	1144	455	128	0	0	0	119518
Percent	1.4	8.5	82.5	6.2	1.0	.4	.1	.0	.0	.0	100.0
Thousands of pounds	371	3303	43453	4249	1071	478	125	0	0	0	53050
Percent	.7	6.2	81.9	8.0	2.0	.9	.2	.0	.0	.0	100.0
1983-84 Season											
Year Class	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	Total
Thousands of fish	480	4029	11259	10147	1336	282	0	18	0	18	27569
Percent	1.7	14.6	40.8	36.8	4.8	1.0	.0	.1	.0	.1	100.0
Thousands of pounds	117	1249	5044	6015	1009	252	0	21	0	29	13736
Percent	.9	9.1	36.7	43.8	7.3	1.8	.0	.2	.0	.2	100.0

TABLE 18. Numbers of jack mackerel landed in thousands by age group for each year-class from the 1947 through 1983 seasons. Data include all southern California landings for all years.

Year-Class	0	I	II	III	IV	V	VI	VII	VIII	Total
1939	--	--	--	--	--	--	--	--	274	274
1940	--	--	--	--	--	--	2759	687	240	927
1941	--	--	--	--	18861	1789	947	362	15	3136
1942	--	--	--	--	1789	2400	2400	562	1402	21772
1943	--	--	--	51104	6674	11968	441	4542	14	59849
1944	--	--	104842	34018	19788	12654	2054	7398	1987	141319
1945	--	61435	24691	43568	15942	6139	29737	0	0	137347
1946	--	26091	83556	102485	45379	33372	0	0	0	129511
1947	5835	1601	1-837	24984	20446	0	0	0	0	296718
1948	159	3329	20309	39088	0	0	0	0	0	61868
1949	1595	13902	20664	28	0	169	4180	1166	1009	65060
1950	1951	8877	2259	1954	9225	17861	6080	3510	0	44048
1951	321	30137	16851	65289	46741	9062	76	11	0	46590
1952	121176	20516	28255	31839	6514	293	1248	0	0	289332
1953	30931	41735	28223	4841	2139	2126	0	0	0	121596
1954	133	5089	5816	5841	5601	156	285	0	0	79207
1955	650	13720	2102	18414	636	171	171	0	0	69638
1956	1159	28566	32930	32085	13355	1995	142	30	0	50697
1957	83780	123615	106246	68367	13249	3900	1844	205	0	108437
1958	1623	21773	89978	100219	31016	2728	312	45	53	401054
1959	15269	92211	65515	76822	18644	1191	143	0	0	247694
1960	7872	36153	48036	43066	6933	697	58	0	0	269795
1961	1658	17964	59613	16560	3620	0	106	0	0	142815
1962	19352	46719	40860	11668	65	799	0	0	0	99521
1963	30511	98845	24458	1008	2331	102	61	0	0	119463
1964	84943	34513	9719	13410	2521	741	0	0	0	157316
1965	95242	31642	75129	9125	4307	92	102	0	0	145847
1966	192957	116629	28452	10133	398	288	1005	85	0	215724
1967	78895	151103	20879	4725	3045	2203	203	55	51	349968
1968	30971	102232	39493	17433	2845	1718	354	202	69	261324
1969	125376	171400	36873	6209	4156	1793	0	0	0	195006
1970	22690	33808	11235	6955	7857	139	0	0	0	345807
1971	17384	18330	24291	10188	607	156	47	0	0	82731
1972	17384	9623	25752	8006	1396	1610	115	0	0	80291
1973	12762	132469	101160	12695	3895	611	343	265	0	64036
1974	0	20309	14883	8183	654	901	71	0	0	263988
1975	35276	94044	59590	3250	1494	519	128	18	0	45001
1976	11767	27146	8072	3148	1822	455	0	0	0	194319
1977	21689	72053	47911	7690	1144	282	0	0	0	52410
1978	10251	18989	9922	7427	1336	0	0	0	0	150769
1979	43684	83677	98608	10147	0	0	0	0	0	47925
1980	3698	1616	4029	0	0	0	0	0	0	236316
1981	0	0	0	0	0	0	0	0	0	25097
1982	0	0	0	0	0	0	0	0	0	5645
1983	480	0	0	0	0	0	0	0	0	480
Total	1152389	1808795	1413620	959710	368740	132722	66939	19621	5132	5927668

TABLE 19. Pounds of jack mackerel landed in thousands by age group for each year-class from the 1947 through 1983 season landings. Include all southern California landings for all years.

Year-Class	0	I	II	III	IV	V	VI	VII	VIII	Total
1939	---	---	---	---	---	---	---	---	414	414
1940	---	---	---	---	---	---	---	863	234	1097
1941	---	---	---	---	---	---	3030	313	24	3367
1942	---	---	---	---	---	17867	876	684	1947	21374
1943	---	---	---	---	---	---	2693	5963	14	49194
1944	---	---	---	---	38744	1780	13897	441	3391	92780
1945	---	1583	21461	57397	11261	12326	2054	11082	0	80655
1946	---	5807	8946	19117	14615	6393	13897	441	0	87634
1947	641	387	32221	22722	11995	6139	36249	0	0	167997
1948	0	911	5557	52215	45379	31734	0	0	0	47163
1949	21	20309	24984	24712	16235	0	0	0	1134	48094
1950	316	13902	10003	18	0	123	3721	3666	0	31749
1951	321	2716	1055	1018	5340	18749	6043	18	0	35280
1952	20490	10247	6720	31961	31082	7867	92	0	0	108459
1953	4918	6283	11276	18282	4481	286	1188	0	0	46674
1954	24	10891	10728	2533	1353	1766	0	0	0	27295
1955	132	12286	2136	2892	4430	109	240	0	0	22225
1956	1822	5374	5210	5210	5210	541	170	45	0	16506
1957	130	5785	11792	15845	8826	5945	141	279	0	48743
1958	10168	26307	39190	36338	9862	3362	1901	0	79	127207
1959	219	5421	32523	49822	21301	2381	299	55	0	112021
1960	2158	23379	20835	40804	12677	980	156	0	0	100989
1961	1059	6123	17721	22710	4809	536	51	0	0	53009
1962	163	3826	13121	7943	2323	0	93	0	0	36038
1963	2373	11328	13121	5751	52	686	0	0	0	33311
1964	3837	23855	9527	521	1546	113	69	0	0	39468
1965	11437	9460	3420	6761	1573	721	0	0	0	33372
1966	13265	6926	11317	5010	3187	144	0	0	0	40030
1967	25555	28031	9334	5561	314	241	101	80	0	70090
1968	10278	16110	8128	2335	1911	1859	907	53	74	41237
1969	4648	22573	13166	9123	2113	1388	195	244	177	53407
1970	16772	36429	15002	3390	2846	1473	396	0	0	75912
1971	3819	9646	4240	3223	5253	187	95	0	0	26463
1972	4604	4659	8178	5551	704	167	130	0	0	23993
1973	2500	2657	9980	5593	1282	1890	539	62	0	24400
1974	1959	35484	59287	9781	3750	638	539	62	29	111539
1975	0	8068	8205	6102	627	1221	119	0	0	24342
1976	5966	31750	32576	2357	1565	671	125	21	---	75031
1977	2171	10165	3935	2230	1716	478	0	---	---	20695
1978	4824	25337	27834	5837	1071	252	---	---	---	65255
1979	2336	7421	5174	4249	1009	---	---	---	---	20189
1980	6732	28427	43453	6015	---	---	---	---	---	84627
1981	586	3303	5044	---	---	---	---	---	---	8933
1982	371	1249	---	---	---	---	---	---	---	1620
1983	117	---	---	---	---	---	---	---	---	117
Totals	166832	460170	570458	525923	277158	131013	75570	25501	7370	2239995