

## REVIEW OF THE PELAGIC WET FISHERIES FOR 1976 WITH NOTES ON THE HISTORY OF THESE FISHERIES

Commercial wet-fish landings of pelagic species dipped from the 25-year high of 190,075 short tons in 1975 to 159,497 short tons during 1976 (Table 1). The lower anchovy catch was almost wholly responsible for the decrease in landings. Landings for all other species except squid showed increases over 1975. Squid landings decreased for the second straight year.

### Northern Anchovy

Before 1952, anchovy landings in California seldom exceeded a thousand tons. The collapse of the sardine fishery in 1952 resulted in an increase in anchovy landings that were canned for human consumption. The temporary resurgence of the sardine fishery in 1954 and then again in 1958 resulted in corresponding decreases in anchovy landings. Catches remained low until 1966, presumably due to poor market conditions created by low consumer demand for canned anchovies. In 1965 the anchovy reduction fishery began, and landings averaged 73,000 tons/year during the next decade. A record 158,000 tons were landed in 1958; however, landings decreased during 1976 to 124,591.

The 1976 landings of anchovies (Table 1) include a portion of the landings for both the 1975-76 and 1976-77 anchovy reduction seasons (Table 2). Although the 1975-76 seasonal landings of 140,906 tons set a record, the large majority of this tonnage was landed before January 1976. From January 1 to the close of the season, May 15, 52,700 tons were landed, but in only 2 of the 13 weeks of fishing after January were cannery orders met.

In the northern permit area, final landings for the 1975-76 season totaled 5,295 tons. In the southern permit area, landings approached the initial quota of 100,000 tons in January, and the California Fish and Game Commission

granted an additional 50,000 tons. Final landings in the south were a record 135,615 tons. The anchovy price to the fishermen remained fairly stable at \$28/ton in the north and \$30/ton in the south during the winter and spring of 1976.

Sampling for age composition during the winter and spring of 1976 indicated that the anchovy biomass may have declined dramatically in recent years as a result of poor spawns during 1975 and 1974. The 1975 and 1974 year classes made up 4.8 and 9.0% of fish sampled between January 1976 and the end of the season. The 6-year average (1970-1975) of 1- and 2-year-old anchovies sampled during the same time of year is 19.1 and 32.3%.

The 1976-77 anchovy season opened on August 1 in the north and on September 15 in the south. Both fisheries began slowly.

In the northern permit area, anchovies were scarce in fishable concentrations during the first three months of the season, and fishing was seldom good after that period. By December 31 only 3,616 tons had been landed, and only four purse seiners and one lampara boat had made cannery deliveries. Price to the fishermen fluctuated between \$40 and \$42/ton during this period.

In the southern permit area, the season opened amidst a fisherman-aerial spotter dispute over shares and a fisherman-cannery price dispute. Most San Pedro reduction boats spent the last two weeks of September fishing bluefin tuna. Although canneries began receiving anchovies at both Terminal Island and Port Hueneme as early as September 16, fishermen were fishing on an "open ticket" while negotiating a price with canners. San Pedro fishermen closed fishing operations on October 6 while price negotiations continued. Fishing resumed on October 19 when San Pedro boat owners, fishermen, and Terminal Island canners reached agreement on a price of \$39.75/

TABLE 1  
 Landings of Pelagic Wet Fishes in California in Short Tons 1964-76

Year	Pacific sardine	Northern anchovy	Pacific mackerel	Jack mackerel	Pacific herring	Market squid	Total
1964...	6,569	2,488	13,414	44,846	175	8,217	75,709
1965...	962	2,866	3,525	33,333	258	9,310	50,254
1966...	439	31,140	2,315	20,431	121	9,512	63,958
1967...	74	34,805	583	19,090	136	9,801	64,489
1968...	62	15,538	1,567	27,834	179	12,466	57,646
1969...	53	67,639	1,179	25,961	85	10,390	105,307
1970...	221	96,243	311	23,873	158	12,295	133,101
1971...	149	44,853	78	29,941	120	15,756	90,947
1972...	186	69,101	54	25,559	63	10,030	104,993
1973...	76	132,636	28	10,308	1,410	6,031	150,489
1974...	7	82,691	67	12,729	2,630	14,452	112,576
1975...	3	158,510	144	18,390	1,217	11,811	190,075
1976...	27	124,919	317	21,693	2,410	10,131	159,497

TABLE 2  
 Anchovy Landings for Reduction in the Southern and Northern Permit Areas for 1966-67 through 1976-77 in Short Tons

Season	Southern permit area	Northern permit area	Total
1966-67 .....	29,589	8,021	37,610
1967-68 .....	852	5,651	6,503
1968-69 .....	25,314	2,736	28,050
1969-70 .....	81,453	2,020	83,473
1970-71 .....	80,095	657	80,752
1971-72 .....	52,052	1,374	53,426
1972-73 .....	73,167	2,352	75,519
1973-74 .....	109,207	11,380	120,587
1974-75 .....	109,918	6,669	116,587
1975-76 .....	135,615	5,291	140,906
1976-77* .....	101,434	5,007	106,441

\*preliminary

ton. By October 31 only 17,300 tons had been landed compared with 40,000 tons during the same period of the previous season; however, fishing conditions were excellent during November and December, and by December 31 almost 70,000 tons had been landed. The price to the fishermen rose from \$39.75 to \$44.50/ton during this period.

Forty purse seines and five lampara boats applied for reduction permits in the south for 1976-77 season. By December 31, only two lampara boats and 35 purse seines had made cannery deliveries. Three of these purse seines were operating out of Port Hueneme.

Age composition data collected during the period September through November 1976 support the tenet of spawning failures during 1974 and 1975. One- and two-year-old fish (more accurately—1½- and 2½-year-old) traditionally have accounted for close to 70% of fish sampled during the fall of the year. In the fall of 1976, these age classes accounted for only 31% of the fish sampled.

### ***Pacific Sardine***

Fishing for sardines on the Pacific coast of North America began in 1889. The earliest records of landings in California are for the 1916-17 season, when less than 30,000 tons were landed. The next year a small fishery was initiated in British Columbia, and total sardine landings increased slowly until 1923-24, when about 85,000 tons were landed on the Pacific coast. The tonnage doubled in the 1924-25 season, and in subsequent years the fishery continued to grow, with development of the British Columbia fishery and the rapid expansion of California fisheries. In 1935, sardine fishing began in Washington and Oregon, and in the 1936-37 season approximately 791,000 tons were landed. The fishery remained productive over the next eight years, with landings fluctuating between 500,000 and 680,000 tons. During this period, however, the catch per unit of effort was declining, and the period 1944 to 1947 was accompanied by a sharp drop in landings. During the subsequent three years, the fisheries in British Columbia, Washington, and Oregon were discontinued, although California had increased its landings slightly. Disaster struck the sardine industry in 1952 and 1953, when less than 25,000 tons were landed in California during the 2-year period. By this time, a small Mexican fishery was in operation out of Ensenada, Baja California.

In retrospect, the disaster of the early 1950's marked the end of an era in the history of California fishing. Sardine landings have never again reached the levels of the 1940's, although slight revivals occurred in 1954 and 1958. The fishery continued to decline after the 1958-59 season, and following 1965 the reported catch has never exceeded 500 tons/year in California (Table 1).

By the early 1960's, the sardine was no longer abundant enough to be of much value to the canning and reduction industries. As fishermen and industry turned to substitute species, such as jack mackerel and northern anchovies, fishing pressure on sardines normally would have been expected to subside enough to allow the opportunity for a resurgence of the population. However, fishermen continued to take sardines when and where they could. Although their catches were seldom more than a few tons, the sardine was considered a prime bait fish by sportsmen, with dealers paying \$400 to \$500/ton for them. Thus, when fishermen were unable to catch large amounts of less valuable pelagic species, a few tons of sardines could "make a boat's day."

In 1967, California passed legislation that sought to diminish the fishing pressure on an already badly depleted resource. It provided that no sardines may be taken or possessed on any boat, except that loads or lots of fish may contain 15% or less by weight of sardines. In 1969, new legislation provided for a 250-ton annual quota in addition to the existing incidental catch restriction. In 1973, a sardine management bill was passed that provided for a sardine moratorium until the spawning population reaches 20,000 tons.

The sardine population has been in a depressed state now for close to three decades, and it has been 15 years since the last "sizeable" landings of 25,000 tons during the 1961-62 season. The value of these landings must have seemed paltry compared to the almost 800,000 tons landed during the 1936-37 season.

During 1976, an estimated 14 tons of sardines were caught and landed incidental to other fishing operations (Table 1).

### ***Pacific Mackerel***

For a span of five decades, during the 20th century, Pacific mackerel supported one of California's more important commercial fisheries. Briefly, the cannery fishery began in the mid-1920's. Landings increased rapidly and peaked in 1935, when 73,000 tons were processed. This was followed by a steady decline in the catch, which dipped to 3,750 tons in 1953. During the next 11 years, landings averaged 17,000 tons/year. After 1964 the fishery experienced a rapid decline until, for all practical purposes, it ceased to exist at the beginning of this decade (Table 1). At this time (1970) the California Legislature passed a bill establishing a moratorium on the commercial fishing of Pacific mackerel, limiting catches to only incidentally caught fish. In 1972 this legislation was renewed and included management provisions for the opening of the fishery when the spawning biomass reached 10,000 tons.

During 1976 an estimated 169 tons of Pacific mackerel were caught and landed incidentally to other fishing

operations. This is a minimum estimate and was calculated from observation of only a portion of the incidental landings of Pacific mackerel. The assumption that considerably more Pacific mackerel were landed during 1976 is not a poor one as the frequency of occurrence of these fish in jack mackerel landings was dramatically higher than in more recent years.

Age and length composition data collected during 1976 indicate that the increased catches were the result of a relatively successful spawning during 1974. Although these same data indicate the 1975 spawning season was a failure, they and other data suggest the 1976 spawning season was a dramatic success.

In August and September 1976, live-bait fishermen from Oxnard to San Diego were reporting the frequent occurrence of young-of-the-year Pacific mackerel in their catches. In the last 15 years, including 1974 (a relatively successful spawning season), the occurrence of these juveniles mixed incidentally with live-bait catches was considered a rare event. The widespread nature of these occurrences was enough to suggest that the 1976 spawning season was a success. By October the juvenile Pacific mackerel had moved offshore and disappeared from live-bait catches but began occurring frequently in anchovy reduction landings. This was considered as another good sign, as Pacific mackerel have been seen only rarely in anchovy reduction landings. The first quantifiable evidence of a successful spawn was gathered on a California Department of Fish and Game (CDFG) research cruise during November, when juvenile Pacific mackerel were collected in 37% of the midwater trawls. This was the highest trawl success ratio for Pacific mackerel since the inception of CDFG midwater trawl surveys in 1962. By December the 1976 year class was being caught and landed incidentally with jack mackerel at Terminal Island canneries.

Because few Pacific mackerel are known to mature at the age of one year, a sizeable fishery is not expected until 1978.

### ***Jack Mackerel***

Historically, jack mackerel were of minor commercial importance before 1947. During that year a decrease in sardine catches resulted in a rapid expansion of the jack mackerel fishery.

Since its inception the jack mackerel fishery seems to have fluctuated more as a result of market conditions, cannery capacities, and availability of other species than as a result of variations in biomass levels. During the first eight years of the fishery, landings averaged 46,000 tons. Landings dropped off considerably in 1954 and 1958 due to the temporary resurgence of sardines in those years. With the subsequent decline of the sardine, landings increased and averaged 40,000 tons/year from 1960-65.

With the beginning of the anchovy reduction fishery in 1965, landings of jack mackerel decreased and averaged approximately 27,000 tons from 1966 to 1972 (Table 1). A sharp drop in landings was evidenced in 1973 and was mostly attributed to a good local bluefin tuna season and poor weather on offshore banks. In January 1974 the major cannery for jack mackerel was destroyed in a fire, and landings since then have remained relatively low.

During 1976 jack mackerel fishing was termed "excellent" by most fishermen. Although good weather conditions during most of the year played a part, fishermen indicated that it was the increased availability of jack mackerel in nearshore waters that made fishing so good. This year departed from the trend in more recent years which showed an increase in landings from the offshore areas of San Clemente Island and from Cortes and Tanner Banks. Even with reduced cannery capacities, the 1976 landings reached a 4-year high of 22,300 tons (Table 1). Jack mackerel price to the fishermen was stable during most of the year at \$85/ton.

### ***Pacific Herring***

Pacific herring landings have shown three distinct peaks since records of the landings were first tabulated in 1916.

Due to the demand for food during World War I, landings averaged 2,800 tons from 1916 to 1919. In 1948 and from 1951 to 1953 landings averaged 3,800 tons. This peak in landings developed to fill the demand created by the scarcity of sardines off central California, and the majority of these fish were canned for human consumption. From 1973 to 1976, landings averaged 1,900 tons (Table 1). This fishery developed as the result of the demand for herring roe in Japan. In the years between these peaks, landings seldom reached more than a few hundred tons.

During 1976 herring were fished in Tomales Bay and San Francisco Bay under a permit system. The fisheries in both bays were regulated by season closures and quota levels for the different types of gear: purse seines, lampara nets, and gill nets. Limited entry was operative for both fisheries, with drawings held to determine permit holders. Although quotas were set at 3,050 tons for San Francisco Bay and 625 tons for Tomales Bay, the respective landings were only 1,654 tons and 144 tons. The primary reason quotas were not reached was because the major spawning runs were over before fishing began. Approximately 570 tons were landed outside these bays, bringing the total 1976 landings to 2,366 tons.

Sampling for length and sex composition during the 1976 season showed that gill nets caught larger fish and a higher proportion of females than did round haul nets.

### ***Market Squid***

Before 1943 squid landings in California were rarely more than a couple of thousand tons. In 1946, a record of 19,000 tons were landed as a result of an abnormally high demand by various federal and international aid programs. Since 1946, landings have fluctuated between 1,300 tons in 1960 to 16,000 tons in 1971. During the 1950's, landings north of Point Conception dominated the catch. From 1961 to 1972 landings north and south of Point Conception were approximately equal. The average yearly landings during this period were 5,000 tons in the north and 4,500 tons in the south. In 1973 landings

dropped sharply due to low availability of squid in Monterey Bay. Landings increased to over 7,000 tons in the north during 1974, but fewer than 2,500 tons were landed in 1975 (Table 1). Catches in the south during these years, 1973 to 1975, varied less, fluctuating between 5,000 and 8,000 tons.

Monterey squid fishermen experienced another poor season during 1976, as landings reached only 2,511 tons. Landings decreased slightly south of Point Conception for the first time in four years, as approximately 7,620 tons were landed.

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