

**THE STATUS OF THE
CALIFORNIA BARRACUDA RESOURCE
AND ITS MANAGEMENT**



by

Donald L. Schultze

**MARINE RESOURCES
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ABSTRACT

The California barracuda, *Sphyræna argentea*, has been fished commercially for over 70 years. Peak landings were made during the early 1920's and have since declined to an incidental level. The present interest in barracuda centers around its desirability as a game species.

Recent estimates of barracuda abundance indicate the population is at a low level and in need of increased management efforts.

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HISTORY OF THE FISHERY

Commercial Fishery

The commercial barracuda fishery can be divided into three major periods. From 1916 to 1930 the fishery rose to a peak and then began to decline. From 1931 to 1950 the fishery fluctuated at a lower level, and from 1951 to the present the fishery has steadily declined to its present state (Heimann and Carlisle, 1970) (Table 1, Figure 1).

Records concerning fishing operations prior to 1916 are vague but one purse seiner caught barracuda off southern California as early as 1893. Two additional purse seiners were built at Los Angeles between 1895 and 1898 but remained in southern California waters only a few years. Purse seine fishing on a large scale began during the period 1915-1917. Nine seiners were built at Los Angeles during this period, and they fished locally for barracuda, white seabass, yellowtail, mackerel, and bluefin tuna. Landings of barracuda peaked at over 8 million lbs in 1920. In 1921 and 1922 relatively poor bluefin fishing and unsuccessful marketing of canned yellowtail caused a decline in the number of seiners in the fishery from approximately 125 boats to 65 (Skogsberg, 1925). The decline in the fleet and reduction in demand for canned barracuda (fish cake) contributed to a decline in the catch during the late 1920's. The catch averaged 5,901,281 lbs per year for the 15 years 1916 through 1930.

The amounts of fish landed by the different segments of the commercial fishery during these early years was summarized by Skogsberg (1925) as follows, "The small boats, i.e., the gill net and roundhaul boats

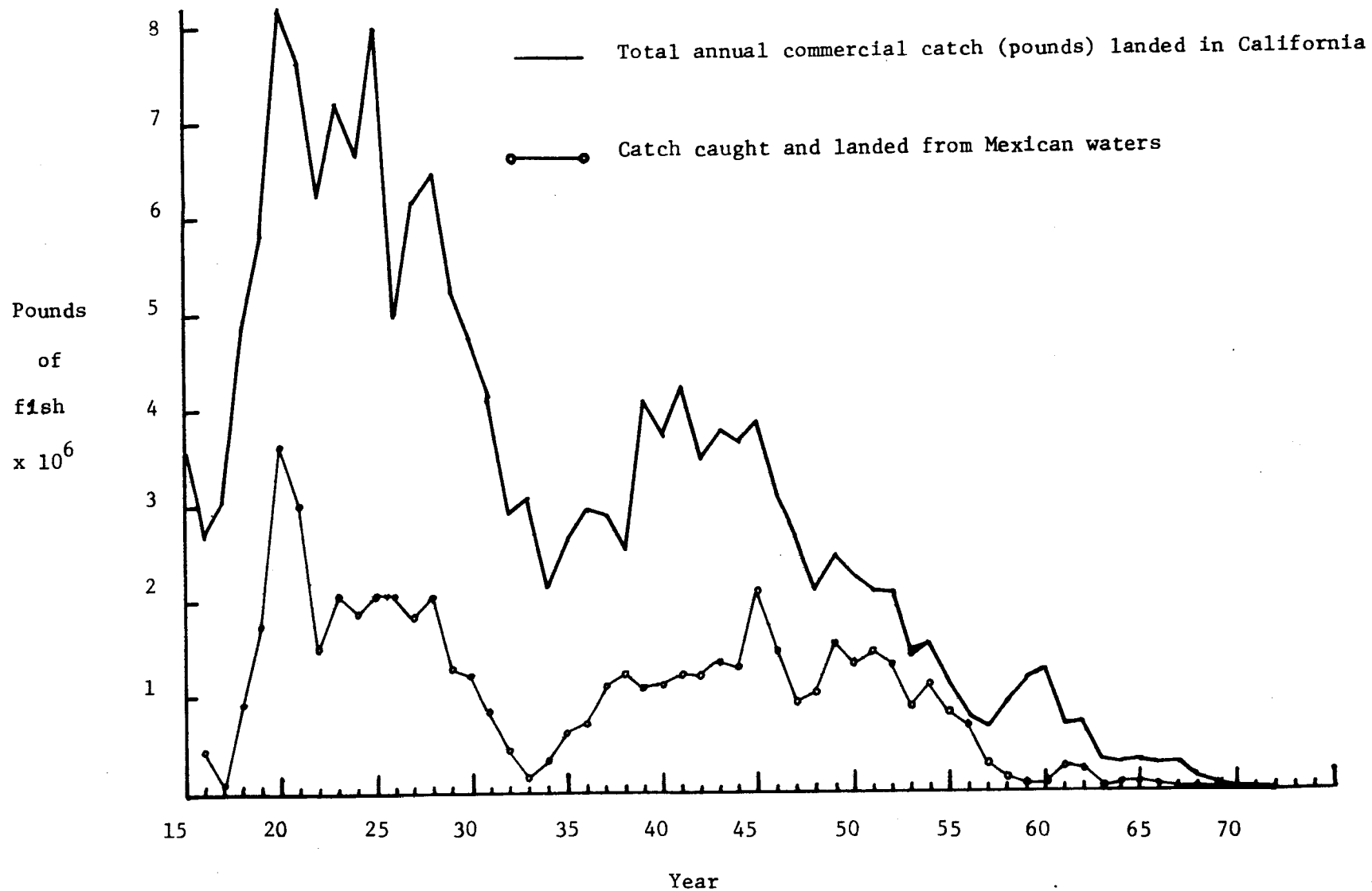


Figure 1. Commercial landings of barracuda 1916-1972.

can furnish the fresh fish markets at San Pedro with a rich supply of barracuda only from the middle of May to the middle of August.

Furthermore, they depend almost entirely upon local waters for their catches. During the remainder of the year the markets depend upon the purse seiners for their supply of this fish. The barracuda landed during the purse seine period are largely of Mexican origin." About 10% of the barracuda landed each year during the early 1920's were canned, the remainder was handled at the fresh fish market where barracuda was the most important species landed.

Landings fluctuated rather undramatically for the 20 years 1931 through 1950 and averaged 3,139,946 lbs per year. From 1927-1940 purse seining for barracuda in California waters was restricted during the peak spawning months. From 1940 to the present, all purse seining for barracuda in California waters has been prohibited.

Beginning in 1951 the commercial catch declined steadily to an all time low of 17,264 lbs in 1971. The average commercial catch per year of barracuda for the 20 years 1951 through 1971 was 785,543 lbs. In 1950, 345 boats landed barracuda while in 1971 there were only 30 (Figure 2).

Most fishing effort is expended south of Point Conception within a few miles of the mainland or at the offshore islands. A majority of boats landing more than a ton of barracuda a year between 1960 and 1970 (representing between 67 and 96% of the total catch) were gill net, troll, or live bait boats 30-40 ft in length. Most were built during or before the 1940's. A common change in fishing gear in recent years is the addition of set-type gill nets which capture a variety of species. Today barracuda are seldom fished for exclusively but are caught and landed principally by gill net fishermen seeking white seabass.

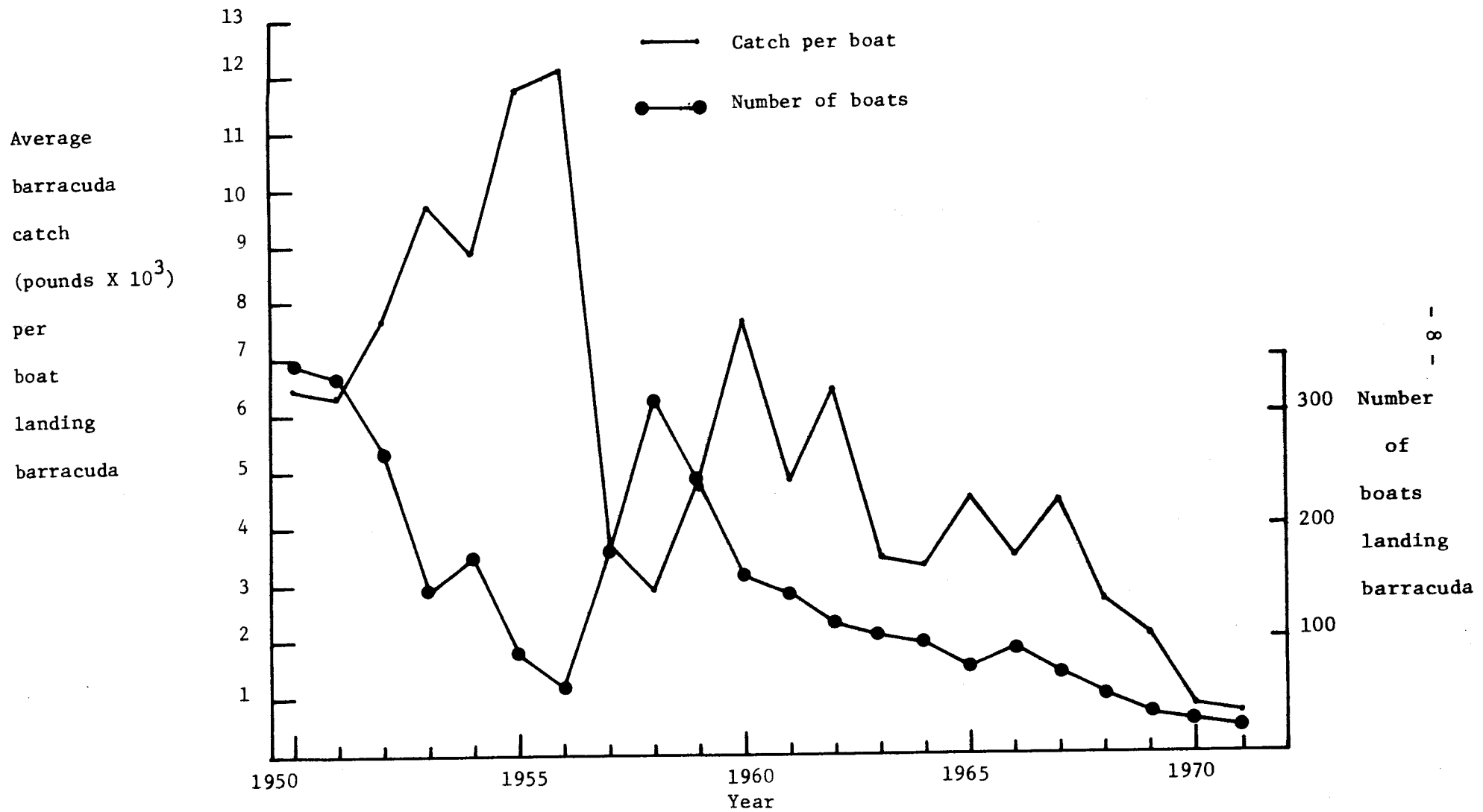


Figure 2. Commercial catch per boat and number of boats.

Historically the fishing grounds off Mexico extended from Point Santo Tomas to Magdalena Bay in 3 to 25 fathoms of water. In recent years, fewer barracuda have been caught in Mexican waters as the total catch has declined (Figure 1). Little is known about the catch made by Mexican fishermen in their own waters.

Commercial landings in recent years have been made principally during the months of April, May, June and July. This corresponds to the time of year when barracuda are most abundant in southern California waters.

Measurements of commercially caught barracuda are obtained at the fresh fish markets. Sampling at the markets during 1958, 1959 and 1960 showed an increase in the average size of fish in the catch from 779.4 mm TL in 1958, to 845.8 mm TL in 1960. This may have been due to the decline in troll boats and an increase in gill net fishing which selects larger sizes (Pinkas, 1966). Five, six and seven-year old fish predominated in the commercial fishery during this period. Because of the small commercial landings and a personnel shortage, almost no data were collected from the markets during the past several years.

Recreational Fishery

Photographs and newspaper accounts of sportfishing activities in the mid 1920's and early 1930's frequently depict large catches of "scooters", attesting to the early popularity of barracuda as a game fish. Sportfishing records, gathered from partyboats between 1936 and 1940, revealed that barracuda were the most numerous fish taken and the sport catch often equaled or exceeded commercial landings in poundage. Interest in marine sportfishing grew, and in the post World War II era, sportsmen caught between 70 and 90% of the barracuda taken (Frey, 1971). This remains true today; almost all segments of the southern California sport fleet seek barracuda when they are available.

Catch-Recreational

Records of total catch were not maintained during the formative years of the southern California sport fishery. Records of the partyboat landings of barracuda are available from 1936-1940 and from 1947 to the present, (Figure 3).

After a peak harvest of 677,449 barracuda in 1947, the partyboat catch declined to 87,603 fish in 1956. A marked warming of ocean waters in 1957 set the stage for a phenomenal recovery, culminating in a record catch of 1.2 million fish in 1959. Although few data are available, thousands of barracuda also were taken aboard private vessels (Frey, 1971).

Following the warm water years, the water cooled and the sport-catch declined. In 1966 the catch rose to nearly 0.9 million fish making this the second best year on record. This increase in catch appears to have been caused by favorable water temperature and increased effort. After 1966, landings again declined and then fluctuated around 0.4 million fish per year. In 1971 partyboat landings of barracuda declined to 50,474. This was largely due to a regulation enacted in March, 1971 which prohibits keeping fish shorter than 28 inches; and the chilliest pre-season water temperatures since 1932. Preliminary indications are that partyboat landings for 1972 will be close to 36,000 fish, the lowest catch on record.

Sport fishermen aboard partyboats and private boats fish for barracuda in the relatively shallow waters of the continental shelf in depths from the surface down to 15 or 20 fathoms. Most fishing occurs from May to September, when favorable surface temperatures range between 62 and 70 F (Pinkas, 1966).

In addition to the partyboat data, during 1963, 1964 and 1965 the Department estimated the sportfishing catch and effort from piers and jetties, private boats and the shoreline. The partyboat catch averaged

□ Total annual partyboat catch (number of fish) landed in California

— Average sea surface temperature for six months, January to June (Scripps Pier, La Jolla)

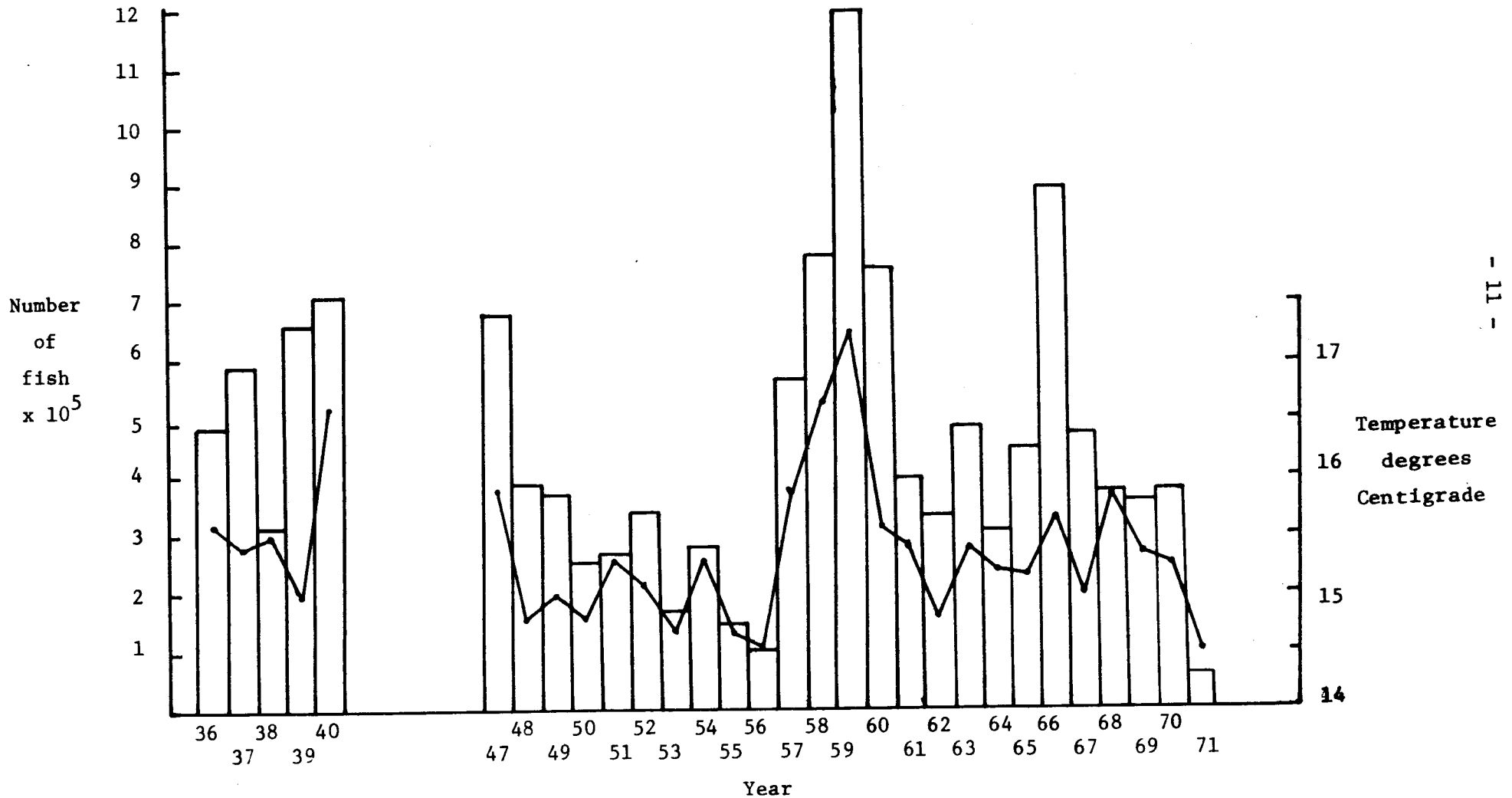


Figure 3. Barracuda partyboat landings and sea surface temperature.

530,688 barracuda, almost 94% of the barracuda catch by all segments combined, while pier and jetty fishermen landed 3% and private boats 2.8% (Pinkas, Oliphant and Haugen, 1968).

Partyboat skippers are required to keep a log of each fishing trip noting number of passengers, hours fished, number of each species of fish caught, etc. The unit of effort derived from these data and used prior to 1960, was called the "angler day" and was equivalent to one full day of angling by one fisherman. Beginning in 1962, anglers and angler hours were used. (Young, 1969).

The number of anglers per year has fluctuated since 1947 with a marked increase in recent years, (Figure 4). The catch per angler reflects fairly accurately the fluctuations in abundance of the barracuda in local waters, although recent catch restrictions have caused an unusually sharp decrease in these values.

Compared to records of the partyboat fishery, the estimated catch of barracuda by other means was insignificant, however, the effort was considerable. A survey conducted in 1962-1964 showed that over 77% of the effort exerted by sportfishermen in southern California waters for all species of fish was by fishermen other than partyboat anglers. Pier and jetty fishermen exerted twice the effort of fishermen aboard private boats or along the shoreline. Catch figures (barracuda/manhour fished) show fishermen aboard private boats were more successful in catching barracuda than were fishermen on piers and jetties (Pinkas et al, 1968). At present an investigation to determine private boat fishing effort in southern California waters is being initiated.

Length frequencies collected aboard partyboats during the barracuda management study (1958-1961) showed a marked decline in the average size of barracuda landed from 787.4 mm TL in 1958 to 666.6 mm TL in 1961. Five and six year old fish dominated the catches in 1958 and 1959, while

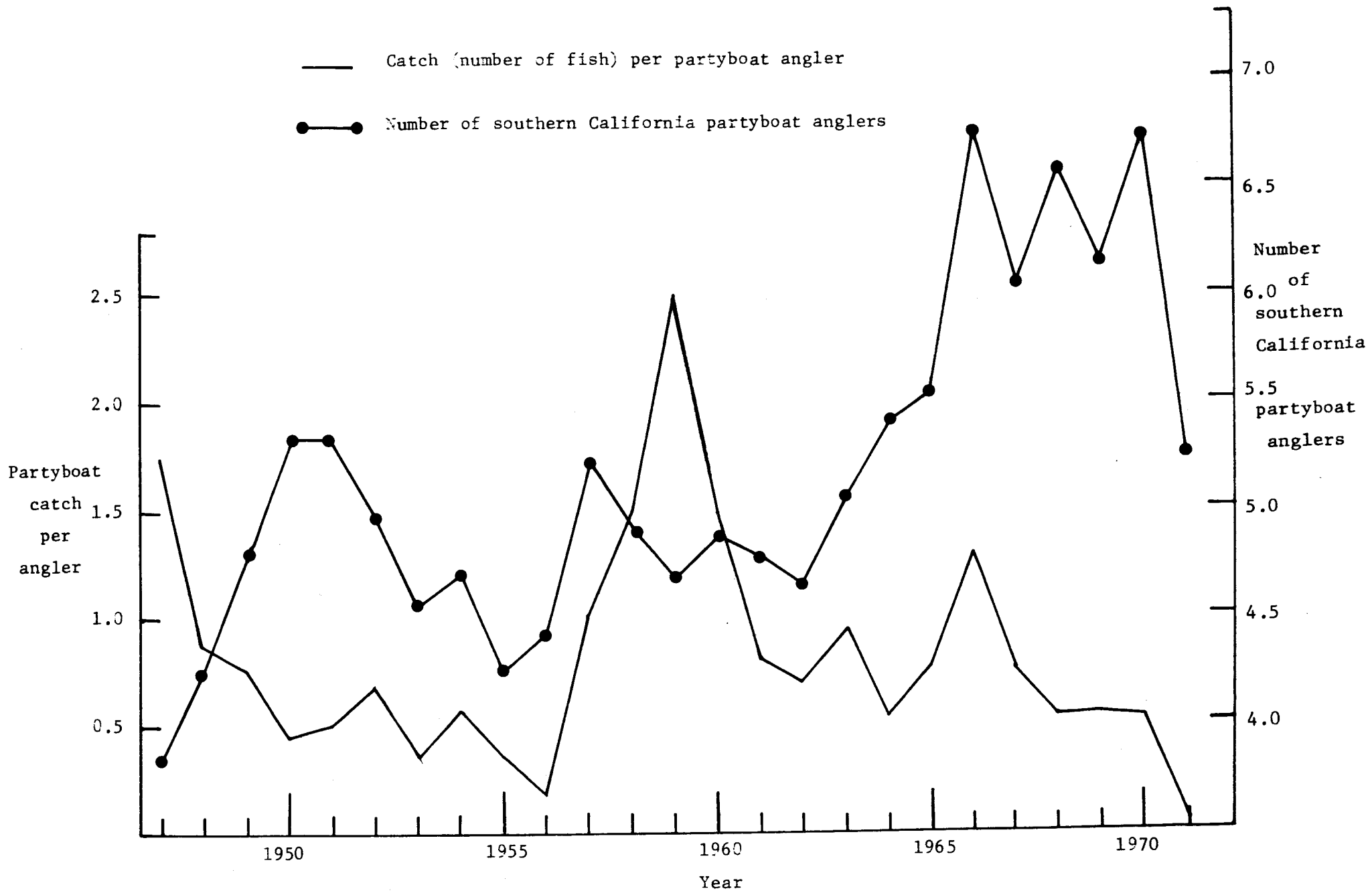


Figure 4. Barracuda partyboat catch per angler and total southern California anglers per year.

in 1960 there was a change to 3 and 4 year old fish (Pinkas, 1966).

Samples obtained in 1971 showed that fish in the partyboat catch averaged 645.4 mm TL in length with 2, 3, and 4 year old fish predominating. In 1972 the average length was 621.1 mm TL with 2, 3 and 4 year old fish predominating. Length frequencies show that barracuda found near islands are larger than fish caught along the mainland coast. In 1970, when two undersized barracuda were allowed in the anglers bag limit, 14% of the barracuda were reported landed from the offshore islands. In 1971, no small barracuda could be retained in the bag and 66% were reported landed from the offshore islands.

BIOLOGICAL KNOWLEDGE

Range

The California barracuda ranges from Prince William Sound, Alaska, (Wilimovsky, 1959, unpublished) to Cape San Lucas, Baja California, but is normally found from Point Conception, California, to Punta Canoas, Baja California. It is a schooling fish and remains relatively close to shore. Young barracuda enter coastal lagoons, bays, and harbors (Pinkas, 1966).

Migration

Barracuda migrate along the coast and their travels also include the offshore islands. There is a distinct northward movement in spring and early summer just prior to the spawning period. In some years groups of barracuda appear off southern California as early as March and at times there is a substantial movement as late as August. The migration southward in the fall is less distinct. The bulk of the fish apparently winter off central Baja California between Cape Colnett and Punta Canoas. Some appear to be residents. Movements north of Point Conception or south of Punta Canoas probably are related to changes in

the environment, the best indicator being water temperature (Pinkas, 1966). For example, barracuda were caught off British Columbia and Alaska during the warm water period of 1957-1960 (Radovich, 1961).

Reproduction

Walford's (1932) life history study of the barracuda showed that all 3-year old barracuda are sexually mature, but only 75% of the 2-year old fish reproduce. Most spawning off southern California occurs in May, June, and July. Ovarian development indicates that barracuda may spawn more than once each season. The number of eggs released increase with age, ranging from an estimated 42,000 for a first spawning to over 484,000 in older fish. The eggs are pelagic and measure 0.047 to 0.063 inch in diameter when first released. Recently hatched larvae are about 0.1 inch long. In 4 to 5 days, they begin to assume juvenile morphological characteristics, particularly the narrow beak-like jaws, and are capable of feeding (Orton, 1955).

Size, Age and Growth

The average 1-year old barracuda is about 13.8 inches long and weighs about 0.3 lb. A 28 inch barracuda weighs about 3 lbs and is 4 to 5 years old. Annuli or growth rings on the scales of a 10 lb, 41 inch long barracuda indicated that it was 11 years old. Landings of fish measuring 44 to 46.5 inches in length indicate a longer life span (Pinkas, 1966).

Status of the Population

The status of the barracuda population is not known in detail at present. Catch data suggest the population is at a very low level. However the catch increased markedly during the warm water years 1957 to 1960 following similar low catches. The number of fish off southern California was estimated to be 1,591,817 in 1958; 2,888,239 in 1959; and 2,156,186 barracuda in 1960 (Pinkas, 1966). Estimates are being made

for 1972 and 1973.

Natural Mortality

Values of the instantaneous total, natural, and fishing mortality coefficients were calculated during the barracuda management studies. The mortality estimates were computed by two different methods and were remarkably uniform, particularly the natural mortality coefficients. Natural mortality coefficients were felt to be close to the actual values found in the population (0.18338 sport fishery and 0.18405 sport and commercial fishery combined) (Pinkas, 1966).

REGULATION AND MANAGEMENT

Various attempts at regulating the barracuda resource have been made. A minimum size limit of 18 inches, enacted in 1915, was changed to 3 lbs in 1918. A 30 inch minimum size limit was recommended in 1932 but never adopted. The current 28 inch limitation, equivalent to 3 lbs, was imposed in 1949. The use of purse seines and other roundhaul nets to take barracuda was prohibited from 1925 to 1927. Seining was again permitted between 1927 and 1940, except during the peak spawning months (May and June). The opening and closing dates frequently were adjusted during this 12 year period. Seines were prohibited in California in 1940; however, this gear can be used in Mexico and the resulting catch may be delivered in California after declaration and inspection. Presently in California waters commercial fishermen are limited to hook and line, and to gill nets with a mesh size of 3.5 inches or larger. Most gill net fishermen today use mesh of 6 to 7 inches.

Sportfishing regulations have included bag limits as well as size limitations; currently the bag limit is 10 fish per day, and no fish under the legal minimum size of 28 inches may be kept.

Prior to March, 1971, sport fishermen were allowed two barracuda per day smaller than the legal size of 28 inches. When fair to good

fishing was in progress a boat carrying 30 passengers could legally retain 60 sublegal barracuda. This undoubtedly occurred on many occasions, as "shorts" could be passed to fellow passengers when ones' own limit of sublegal fish had been obtained. Some would keep the first two fish coming over the side regardless of size to insure a "limit" of barracuda and later if larger fish were landed the smaller barracuda in the sack could be thrown back or passed to a fellow passenger. Pinkas as early as 1964, recommended releasing all fish smaller than 28 inches. In March, 1971, this recommendation was finally enacted into law.

DISCUSSION

Current Knowledge

We know the history of the commercial barracuda fishery has been one of rapid growth and then a slow steady decline to its present state of relative insignificance. We have good historical data on the amount, and location of the commercial catch, the size and capacity of the vessels and the value of landings. Commercial effort data is fragmentary or nonexistent.

Records concerning the barracuda partyboat fishery do not cover the time span of commercial records, although data available for these years is more complete. Records of partyboat catch and effort are available. They include number of fish, location of catch, time fishing, and angler counts. Catch per effort values derived from these data are felt to be good indices of abundance. Recent catch limitations have made adjustments necessary in estimations of catch and effort for years 1971-1972.

The range and extent of migration of the barracuda have been determined, but information about the fish in the southern portion of its range is less complete than for the northern range. Excellent information is available about age, growth, fecundity, and sexual maturity.

Good estimates of natural mortality are also available.

Research Needs

In order to obtain a reasonable index of abundance of barracuda stocks a valid unit of effort for the commercial fishery must be developed and refined. The length of, and gear used on, each trip must be determined and market samples of barracuda need to be obtained on a regular basis. If the commercial fishery continues its downward trend, this data may be superfluous.

Partyboat sampling needs to be continued at least at a level of 1972 in order to obtain samples large enough to observe and predict the size and age composition of the population in southern California waters. Due to behavioral size segregation of fish between inshore-offshore areas, future sampling of the sportcatch may require stratification by area. Important to present management is a determination of the mortality rate of small fish caught on hook and line and returned to the water because of the present size regulation. Not available at present is information on the competitive effects of other pelagic species, primarily bonito, and their effects on the catchability of barracuda.

We are utilizing a resource whose range is only partially in southern California waters. Cooperation with Mexico in the exchange of data and management of the California barracuda should be a target for the future. As Mexico expands its fisheries and begins to utilize its marine resources more this will become critical to management of migrating species common to the waters of both countries.

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TABLE 1. Yearly Landings in Pounds - California Barracuda

Year	California waters	South of state	Total pounds
1916	2,226,993	460,360	2,687,362
1917	2,965,368	94,944	3,060,323
1918	3,885,691	951,593	4,837,284
1919	4,038,852	1,786,105	5,824,957
1920	4,585,388	3,615,947	8,201,335
1921	4,588,900	3,036,262	7,625,162
1922	4,721,448	1,528,770	6,250,218
1923	5,135,824	2,064,751	7,200,575
1924	4,733,779	2,394,744	7,128,523
1925	5,976,453	2,059,996	8,036,449
1926	2,945,169	2,077,295	5,022,464
1927	4,355,583	1,844,156	6,199,739
1928	4,385,214	2,067,242	6,452,456
1929	3,925,899	1,302,711	5,228,610
1930	3,513,608	1,250,158	4,763,766
1931	3,336,065	841,473	4,177,538
1932	2,505,101	421,674	2,926,775
1933	2,912,152	160,810	3,072,962
1934	1,801,264	381,558	2,182,822
1935	2,003,947	613,877	2,617,824
1936	2,247,858	729,984	2,977,842
1937	1,799,045	1,139,445	2,938,490
1938	1,260,790	1,269,022	2,529,812
1939	2,967,780	1,124,274	4,092,054
1940	2,545,661	1,169,171	3,714,832
1941	2,971,349	1,230,579	4,201,928
1942	2,243,163	1,211,374	3,454,537
1943	2,382,884	1,392,454	3,775,338
1944	2,317,430	1,330,878	3,648,308
1945	1,744,560	2,128,697	3,873,247
1946	1,637,346	1,469,678	3,107,024
1947	1,695,867	969,878	2,665,745
1948	1,100,081	1,025,656	2,125,737
1949	903,574	1,554,110	2,457,684
1950	890,435	1,367,980	2,258,415
1951	670,015	1,436,913	2,106,928
1952	747,667	1,346,539	2,094,206
1953	565,942	872,904	1,438,846
1954	485,946	1,076,793	1,562,739
1955	322,831	818,128	1,140,959
1956	50,153	702,374	752,527
1957	387,143	295,523	682,666
1958	753,266	161,993	915,259
1959	1,110,409	42,192	1,152,601
1960	1,147,831	81,837	1,229,668
1961	478,362	231,017	709,379
1962	521,769	224,707	746,476
1963	347,354	31,360	378,714
1964	251,025	83,115	334,140
1965	273,003	89,055	362,058
1966	233,319	85,797	319,116
1967	281,224	31,960	313,184
1968	114,534	25,966	140,500
1969	70,833	3,760	74,593
1970	22,508	2,080	24,588
1971	17,256	40	17,296