

**THE STATUS OF
THE MARKET CRAB RESOURCE
AND ITS MANAGEMENT**



by

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ABSTRACT

The market crab (*Cancer magister*) resource off California is undergoing heavy pressure and appears to be near full exportation. The fisheries in the San Francisco and Central California areas are at low levels of abundance but the population off Eureka and Crescent City appears relatively healthy.

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HISTORY OF THE FISHERY

Commercial

The market crab (*Cancer magister*) in California is fished from Avila to the Oregon border. The fishery off San Francisco has existed for over 100 years. Prior to the 1944-45 season, the fishery was centered around San Francisco.

A small fishery developed in the Morro Bay-Avila area in 1947. It reached a peak of 434,000 pounds in the 1950-51 season, continued good through the 1950's but declined sharply in the 1961-62 season. The fishery has never recovered and landings now amount to only a few thousand pounds per season.

The small fishery around Monterey reached peaks of 498,200 and 558,312 pounds in the 1927-28 and 1938 seasons respectively. It continued on a small scale through the 1940's and 1950's, and has followed the same downward pattern as Morro Bay. Like Morro Bay, the Monterey area has never recovered and landings have recently amounted generally to only a few thousand pounds per season.

The fishery expanded in the Eureka-Crescent City area as World War II ended. Introduction of the more efficient crab trap, which replaced the hoop net in the early 1940's, also influenced the landings. Since the 1945-46 season, the average statewide production has been 10.5 million

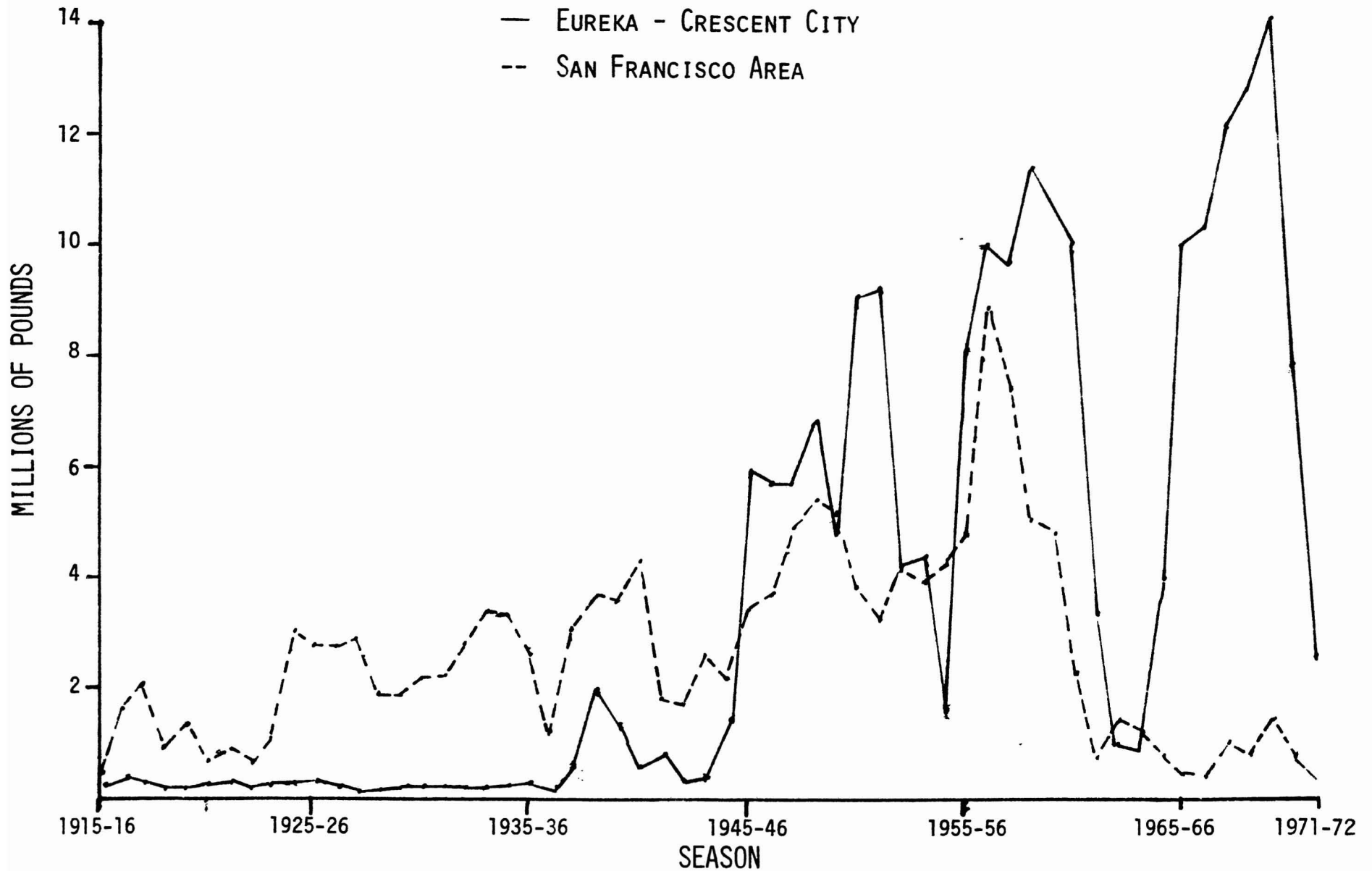


FIGURE 1. Crab landings from the 1915-16 to the 1971-72 season.

pounds, a fourfold increase over the pre-1945 average. Most of the increase was due to the fishery expanding in the northern part of the state.

Principal fishing areas for the past 20 years have been in central California off San Francisco and in northern California off Eureka, Crescent City and Fort Bragg.

San Francisco landings were relatively stable from 1945-46 to 1955-56 (Figure 1). In the 1956-57 season, the fishery reached its peak of 8.9 million pounds. The fishery experienced a severe decline in 1961-62 with landings totaling only 700,000 pounds. The resource remains at low levels of abundance and landings have not exceeded 1.4 million pounds since the 1961-62 decline. Last season (1971-72) the landings reached an all time low of 320,000 pounds.

The Eureka-Crescent City and Fort Bragg fishery increased substantially after 1945. Landings followed the trends of other areas, reaching a peak in the late 1950's and dropping sharply to lows of 900,000 and 800,000 pounds in the 1962-63 and 1963-64 seasons, respectively. Unlike the other areas the fishery began to recover in 1964-65 and record landings of 12.8 to 14.1 million pounds were attained consecutively for the 1968-69 and 1969-70 seasons.

Landings and effort by port have been compiled since the 1950-51 season. In general the number of vessels and number of landings have shown a steady decline in the San Francisco area. Pounds per landing appears to be more closely related to the abundance of crabs (Table 1).

Landing and effort data for the northern California ports of Eureka and Crescent City appear to reflect the abundance of crabs. In general

large season harvests are a result of an increased number of vessels, number of landings and pounds per landing (Table 2). The reverse holds true for the low harvest seasons. Abundance of crabs and economics no doubt influence effort expended.

Recreational

Limited sport fishing for crab does occur in central and northern California. Although there are no good estimates of the sport catch, it is insignificant in relation to the total commercial landings. Most of the effort occurs in bays and harbors such as San Francisco and Humboldt Bays and Crescent City harbor. The bays generally serve as nursery areas for small crabs and very few legal crabs are caught.

REGULATION AND MANAGEMENT

Commercial crab gear is essentially the same throughout California. It consists of a circular reenforced iron rod, stainless wire-meshed trap 3 to 3.5 feet in diameter weighing 60 to 120 pounds. Each trap is set independently on the bottom on a line buoyed to the surface. Law requires that each trap be provided with two 4-inch diameter openings to allow escapement of small crabs. Traps are fished overnight or longer depending on abundance of crabs and weather conditions. The trap was introduced into northern California in 1939 and to central California in 1943. By 1945 most vessels had switched to this type gear. The original commercial gear, the hoop net, is now used only for sport fishing.

Incidental catches of crabs are landed by otter trawlers in northern and central California. Landings amount to only a few thousand pounds per season though trawlers are allowed 500 pounds of crabs per trip during the crab season.

The crab fishery is regulated by seasons to allow harvesting when the crabs are in prime condition. The central California season, from the southern boundary of Mendocino County south, is from the second Tuesday in November to June 30. The northern California season, including Mendocino County north to the Oregon border, opens December 1 and closes July 15.

In the commercial fishery no female crabs may be harvested and male crabs must measure a minimum 6-1/4 inches measured by the shortest distance through the body from one edge of the shell to the other edge of the shell directly in front of the spines.

In the sport fishery female crabs may also be taken provided they measure a minimum 6-1/4 inches.

BIOLOGICAL DATA

The market crab has a reported range from Magdalena Bay, Baja California to Unalaska, Alaska. However, it is considered rare south of Point Conception in California. The species has a definite preference for sandy bottoms but occasionally is found in mud, but rarely in rocky areas. It can be found from the shoreline out to 750 feet, but it is not abundant at depths over 300 feet. Preferred depth range appears to be from 30 to 250 feet.

Total population estimates have never been made. The only indications of its status are obtained from commercial landings and from pre-season research cruises. Fishing pressure is great and the resource appears to be near full exploitation. Fishing mortality on legal male crabs is high, 75 to 80 percent each season.

The general status of the subpopulations is known but the total size is not. Central California populations are at low levels of abundance.

Monterey and Morro Bay have always had relatively small populations and should be considered limited potential fisheries. The San Francisco area, which was once a major area of production for the state, has experienced a decline to low levels of harvest during the last 11 seasons. Now it contributes a small portion to statewide landings. We do not anticipate much change in total take during the 1972-73 season. A strong showing of sub-legal male crabs this season is indication of an improvement for the 1973-74 season. Conditions in northern California have been much better. Although low landing seasons have been encountered, some record or near record seasons have been experienced prior to and after the low seasons. The Eureka-Crescent City area supports the major crab population in California. The landings have been larger than all the others of California combined. Although landings declined considerably last season and the 1972-73 season indicates low landings again, we feel that the fishery will recover in one to two years. This is based upon observations of the abundance of juveniles and the pattern of the fishery in the past.

Tagging experiments have demonstrated little or no intermixing between the subpopulations. Also, ocean tagging has shown that no particular migration patterns are evident. Instead, movement appears to be random, particularly coastal movement. At times an inshore or offshore movement has been observed. Migrations up to 125 miles have been noted, but are generally less than 10 miles. Crab tagging in San Pablo Bay during 1971 and 1972 has yielded very few recoveries but some movements from 25 to 38 miles out to the ocean off San Francisco have been noted. Recent tagging techniques involve the use of a tagging gun with the insertion along the splitting line.

Mating takes place generally in the spring between hard-shelled males and soft-shelled or freshly molted females. The females generally spawn between October and December and carry the eggs under the abdominal flap until they hatch November to February. The number of eggs per female ranges from 1 to 2.5 million.

The newly hatched larvae pass through five zoeal and one megalop stage before metamorphosing into the regular crab form and settling to the bottom as juveniles. Generally, 4 to 5 months are required to complete the larval stages. During this interval, the larvae are part of the zooplankton and are generally found near the surface. Metamorphosis from the megalops to the benthic stage generally occurs from April to June.

Growth is accomplished only by molting, resulting in a saltatory type growth pattern. Prior to reaching maturity, molting occurs frequently. Nine to 10 molts are required to reach maturity which is at a size of about 4 inches and 1 to 1-1/2 years starting at the time of larval release. Eight to 11 molts are completed during the first year after metamorphosis from the larval stage, and approximately 11 to 13 molts are required to reach the legal size of 6-1/4 inches in width. Legal size is generally reached 2.5 to 3.5 years after metamorphosis.

Trapping and trawling cruises have been conducted by the Department's Crab Project personnel for about the past 17 years. In general traps catch more of the larger crabs whereas small meshed trawls catch more of the smaller or juvenile crabs. Average size of legal crabs off Eureka and Crescent City were approximately 11 mm larger than the crabs off San

Francisco in 1972 (Table 3). Juvenile crabs (1972 year class) were virtually absent in the San Francisco area but were very abundant in the Eureka-Crescent City area. Sub-legal male crabs were much more abundant in the San Francisco catches. The lack of females in the Eureka-Crescent City area is probably due to the fact that the cruise was at the beginning of the spawning season, when the females are normally less active feeders.

It is believed that the majority of legal size male crabs (6-1/4 inches) in the fishery are from 3 to 4 years old. Some may attain legal size in about 2 years from the date of larval release which is generally January. Females of the same age range from about 5 to 6-1/4 inches. Both sexes attain sexual maturity at a size of 4 inches when 1 to 1-1/2 years of age.

Natural mortality rates occurring in the crab resource are unknown. Fishing mortality has been estimated from the tagging of legal size crabs. As stated previously, this appears to be at least 75 to 80 percent per season.

DISCUSSION

Better catch statistics are needed in regard to location, effort, and composition of catch. Fishermen are not required to keep logbooks in this fishery and only limited information can be gained through fish landing receipts, interviews, and sampling.

Some of the needs for biological knowledge are as follows:

- (1) The distribution, abundance, and stages of market crab larvae in the ocean and in bays of northern and central California and the resultant recruitment to the fishery.
- (2) Factors causing the continued decline of the crab resource in the San Francisco area.
- (3) Natural mortality rates on all segments of the resource.
- (4) Effects of various types of pollution on crab larvae, juveniles and adults.
- (5) Effect of freshwater runoff on the survival and growth of crab larvae.
- (6) The role of bays, estuaries and river mouths as nursery areas for larvae and juvenile crabs.

Some of the management needs are as follows:

- (1) Consideration of increasing the escape port minimum size from 4 to 4-3/8 inches to permit greater escapement of sub-legal male crabs and female crabs.
- (2) Development of corrodible sections of traps to permit the escapement of crabs caught in lost traps at sea.
- (3) Evaluation of the present 6-1/4 inch minimum size limit on male crabs to see if this could be increased or reduced to increase production and not do any harm to the resource.

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Table 1. Market Crab Landings and Effort - Bodega Bay and San Francisco

| Season | Pounds Landed | Number of Vessels | Number of Landings | Pounds per Landing |
|---------|---------------|-------------------|--------------------|--------------------|
| 1950-51 | 3,793,047 | 217 | 8,532 | 444 |
| 1951-52 | 3,204,793 | 232 | 7,389 | 434 |
| 1952-53 | 4,114,740 | 206 | 7,888 | 522 |
| 1953-54 | 3,888,782 | 227 | 7,813 | 498 |
| 1954-55 | 4,237,786 | 229 | 7,181 | 590 |
| 1955-56 | 4,771,613 | 210 | 6,955 | 686 |
| 1956-57 | 8,919,172 | 195 | 8,568 | 1,041 |
| 1957-58 | 7,391,488 | 197 | 7,915 | 934 |
| 1958-59 | 5,014,214 | 216 | 6,764 | 741 |
| 1959-60 | 4,783,892 | 224 | 6,387 | 749 |
| 1960-61 | 2,303,604 | 224 | 5,302 | 434 |
| 1961-62 | 710,112 | 193 | 2,697 | 263 |
| 1962-63 | 1,429,780 | 190 | 4,334 | 330 |
| 1963-64 | 1,171,363 | 177 | 3,008 | 389 |
| 1964-65 | 759,972 | 144 | 2,258 | 337 |
| 1965-66 | 446,894 | 127 | 1,393 | 321 |
| 1966-67 | 396,467 | 87 | 1,110 | 357 |
| 1967-68 | 1,013,589 | 83 | 1,656 | 612 |
| 1968-69 | 832,824 | 104 | 1,677 | 497 |
| 1969-70 | 1,457,973 | 90 | 2,055 | 709 |
| 1970-71 | 657,298 | 99 | 1,269 | 518 |
| 1971-72 | 319,175 | 74 | 1,012 | 315 |

Table 2. Market Crab Landings and Effort - Eureka and Crescent City

| Season | Pounds Landed | Number of Vessels | Number of Landings | Pounds per Landing |
|---------|---------------|-------------------|--------------------|--------------------|
| 1950-51 | 9,027,766 | 171 | 8,368 | 1,079 |
| 1951-52 | 9,253,718 | 191 | 8,751 | 1,057 |
| 1952-53 | 3,817,656 | 161 | 5,854 | 652 |
| 1953-54 | 3,890,370 | 125 | 4,725 | 823 |
| 1954-55 | 1,509,957 | 90 | 3,280 | 460 |
| 1955-56 | 7,964,877 | 115 | 6,996 | 1,138 |
| 1956-57 | 9,891,636 | 107 | 5,863 | 1,687 |
| 1957-58 | 9,103,185 | 135 | 6,053 | 1,504 |
| 1958-59 | 11,719,796 | 164 | 7,730 | 1,516 |
| 1959-60 | 10,105,973 | 184 | 7,312 | 1,382 |
| 1960-61 | 9,626,391 | 193 | 7,231 | 1,331 |
| 1961-62 | 3,109,294 | 172 | 4,589 | 678 |
| 1962-63 | 640,895 | 105 | 2,360 | 272 |
| 1963-64 | 534,536 | 95 | 1,711 | 312 |
| 1964-65 | 3,403,868 | 142 | 3,863 | 881 |
| 1965-66 | 9,155,836 | 144 | 6,664 | 1,374 |
| 1966-67 | 10,076,130 | 155 | 7,536 | 1,337 |
| 1967-68 | 11,213,527 | 157 | 7,255 | 1,546 |
| 1968-69 | 11,728,064 | 166 | 7,352 | 1,595 |
| 1969-70 | 13,474,260 | 212 | 8,562 | 1,574 |
| 1970-71 | 7,198,499 | 213 | 5,491 | 1,311 |
| 1971-72 | 2,541,779 | 180 | 4,049 | 628 |

Table 3. Market Crab Catch, N. B. SCOFIELD Cruises 72-S-7 and 72-S-8

| Area | Dates | Gear | Total Numbers | | | | | Average Size (carapace width in mm) | | | Size Range (carapace width in mm) | | |
|------------------------------|----------------------|-------|---------------|--------------------|-------|-----------|--------|--|----------------|-------|--------------------------------------|----------------|---------|
| | | | Legal ♂ | Sub- legal ♂ | ♀ | Juveniles | Total | Legal ♂ | Sub-legal ♂ | ♀ | Legal ♂ | Sub-legal ♂ | ♀ |
| San Francisco- Bodega Bay | Sept. 11-26 | Traps | 609 | 2,922 | 2,707 | - | 6,238 | 166.9 | 143.2 | 133.3 | 159-196 | 108-158 | 100-181 |
| San Francisco- Bodega Bay | Sept. 11-26 | Trawl | 18 | 434 | 433 | - | 885 | 165.4 | 116.5 | 103.1 | 159-180 | 23-158 | 24-168 |
| Eureka- Crescent City | Oct. 11 - Nov. 14 | Traps | 411 | 120 | 38 | 19* | 588 | 177.7 | 140.1 | 151.8 | 159-198 | 126-158 | 105-164 |
| Eureka- Crescent City | Oct. 11 - Nov. 14 | Trawl | 11 | 12 | 4 | 10,262* | 10,289 | 178.4 | 130.4 | 73.0 | 161-197 | 67-157 | 64-85 |

* Juvenile average size 25 mm, size range 23-38 mm.