

## 2. SPOT PRAWN

### Overview of the Fishery

The fishery for spot prawn, *Pandalus platyceros*, originated in the early 1930s in Monterey when prawns were caught incidentally in octopus traps. It was a minor fishery with landings averaging around 2,000 pounds (0.9 metric ton) annually until the early 1970s. In 1974, trawl fishermen fishing out of Santa Barbara caught over 182,000 pounds (83 metric tons) of spot prawn. Trawl landings steadily grew as more fishermen entered the fishery and new areas were explored, reaching a peak of more than 375,500 pounds (170 metric tons) in 1981. Landings fell drastically in the next few years, causing concern among fishermen and Department biologists. A fishery closure was instituted between Point Conception and Point Mugu in southern California during the peak egg-bearing months of November, December and January in 1984. Following the implementation of this closure, trawl landings remained low through 1993, averaging about 54,000 pounds (25 metric tons) and 25 vessels annually. Some of these trawl vessels may have switched to other fisheries such as ridgeback prawn, sea cucumber, and groundfish.

In 1985, a trap fishery targeting spot prawn developed in the Southern California Bight. The trap fishery was concentrated around all of the Channel Islands and along coastal submarine canyons in water depths from 600 to 1,080 feet (183 to 329 meters). Trap fishing was occurring in areas of southern California that the trawl fleet did not have access to because trawling was not allowed within three miles (five kilometers) of the shore. The advent of the trap fishery also meant the start of a live prawn fishery for the Asiatic community locally and overseas. With traps, prawns could be brought on board in excellent condition and kept alive using holding tanks set at optimum water temperatures. Annual landings in the trap fishery grew from 8,800 pounds (four metric tons) in 1985 to over 247,000 pounds (112 metric tons) in 1991. During this period, trapping accounted for 75 percent of statewide landings; and trawling accounted for the remaining 25 percent.

Two years of declining landings in the trap fishery and the continued low landing levels by the trawl fleet led fishermen and biologists once again to address the management of California's spot prawn resource. In 1994, the Fish and Game Commission (Commission), with the support of the trap and trawl fishermen, expanded the November through January trawl closure to include the entire Southern California Bight. The Commission also instituted the first regulations for the trap fishery by requiring a 1-inch by 1-inch (25-millimeters by 25-millimeters) minimum mesh size for traps, limiting the number of traps per vessel to 500, and requiring a November through January fishing closure south of Point Arguello. Following these management measures, the spot prawn fishery underwent significant changes in composition and statewide growth. The spot prawn fishery was now comprised of four fishery components: northern California trawl, northern California trap, southern California trawl, and southern California trap, although

some of the trawl vessels fished in both parts of the state. From 1994 until 1998, statewide landings nearly doubled from 444,000 pounds (201 metric tons) to a historic high of 780,000 pounds (354 metric tons). All of the fishery components showed increases in landings during this period. The northern trawl fishery experienced a 14-fold increase, the southern trawl and northern trap fisheries had a four-fold increase, and the southern trap fishery had almost a two-fold increase.

During this period, more than 50 trawl vessels made landings annually. The primary reasons for this growth in the fisheries were the following: increased market demand, which raised the average ex-vessel price for live prawns from \$6 per pound to \$8; new or increased effort by California and Washington trawl fishermen displaced from other fisheries; changes in gear design, specifically the use of large rollers (rock hopper gear) on the groundline of the trawl nets; and increased availability of the resource due to strong spot prawn recruitment in 1996 and 1997.

The advent of rock hopper gear allowed trawl fishermen to fish previously inaccessible, moderate-relief rocky habitat. Some of these areas had not been trapped before due to lower densities of spot prawn, but trawling was economically feasible. Thus, some of these areas had previously acted as de facto reserves, providing new recruits for adjacent areas traditionally worked by trawl and trap vessels. The use of this gear resulted in new conflicts between the trap and trawl fisheries in some areas.

The 1999 price for live prawns ranged from \$6 to \$10 per pound, whereas dead (heads-on) prawns brought only \$4.50 to \$5.50 per pound. Live prawns accounted for 95 percent of all trap and trawl landings. Trawl fishermen made adjustments in net design and tow duration to increase the survival of captured spot prawns, and they developed onboard refrigeration systems for multi-day trips at sea.

The rise in the number of participants, and a 21 percent decline in statewide 1999 landings prompted some spot prawn fishermen to ask for further regulation and the development of restricted access fisheries. An ad-hoc committee of trap and trawl fishermen and Department biologists developed a series of management recommendations for consideration by the Commission. In 2000, the Commission adopted a November through January trawl closure statewide, a May to August closure for the trap fishery north of Point Arguello, and retained the November through January closure for the trap fishery south of Point Arguello. While trap fishermen north of Point Arguello are permitted to catch prawns during the peak egg-bearing season in the winter, they are limited year-round to 300 traps within 3 miles (5 kilometers) of the mainland shore and 500 traps overall. Other regulations adopted by the Commission in 2000 for this fishery included a requirement for bycatch reduction devices on trawl nets, and a one-year observer program for all components of the spot prawn fishery. A control date for the establishment of restricted access trawl and trap fisheries was established, but other work was put on hold until 2001.

In 2001, the Department worked with northern and southern California trap fishermen to develop regulations for a two-tiered restricted access trap fishery.

Qualifying criteria consisted of a minimum number or weight of spot prawn landings utilizing traps during a three-year window period between 1997 and 1999. Tier-1 vessel permits were transferable, and no cap on annual landings was established. Tier-2 vessel permits were not transferable, and restrictions were placed on maximum annual landings, and the maximum allowable number of traps used was 150. The restricted access trap fishery was implemented in April 2002. A restricted access trawl fishery was never developed.

During the 2000-2001 fishing season, the Department conducted a one-year observer program to document bycatch, particularly rockfish in the spot prawn trap and trawl fisheries. Results from the observation of 86 trawl tows and 262 trap strings showed a significantly higher bycatch rate from trawls compared to that of traps. This, along with concerns about potential negative impact to hard bottom habitat, led the Commission to establish regulations in 2003 which prohibited the use of trawl gear for the targeted take of spot prawns.

The Commission also directed the Department to develop a trap permit for some of the trawl fishermen who were affected by the trawl ban. A Tier-3 trap vessel permit was adopted in 2004, with point-based qualifying criteria of spot prawn landings and poundage utilizing trawl nets encompassing a seven-year window period (1994-2001). Only eleven Tier-3 permits were issued, and the majority of the permits have not been used. Most Tier-3 permittees do not have the capital necessary to purchase traps and rig their trawl vessels for trapping.

The 2006 statewide spot prawn trap fishery in California consisted of 30 permits (17 Tier-1, 3 Tier-2, and 10 Tier-3), and 22 of the permittees were active. Annual landings from the trap fishery increased steadily from 2003, the year trawling was prohibited, to 2006, from approximately 167,600 pounds (76 metric tons) to 321,000 pounds (146 metric tons). However, the 2006 harvest levels were well below those of the mid- to late-1990s and appear to be sustainable (Figure 2.1).

Fishing revenue from the 2006 commercial harvest of spot prawn was about \$3.6 million (ex-vessel 2006 dollars). The contribution to total business output, for the State, from this 2006 commercial harvest is estimated to be \$6.9 million. Likewise, total employment and wages from the spot prawn catch is estimated to be the equivalent of 122 jobs and \$3.2 million, respectively.

The spot prawn trap fleet operates from just north of Monterey Bay to southern California. Fewer than six vessels typically fish north of Point Arguello, and regional landings are significantly less than those of the southern California fishery. Spot prawn trap vessels range from 20 to 75 feet (6 to 23 meters) in length. Trap designs are limited either to oval or rectangular-shaped traps of mesh with a minimum inside measurement of 7/8-inch by 7/8-inch (22-millimeters by 22-millimeters). The dimension of the single chamber plastic traps is approximately 2.5-foot by 1.5-foot (0.8-meters by 1.5-meters) while the typical size of the wire traps is 3-foot by 1.5-foot by 1-foot (0.9-meters by 0.5-meters by 0.3-meters) with two chambers. Normally, a fisherman will set multiple trap strings, with 10 to 50 traps

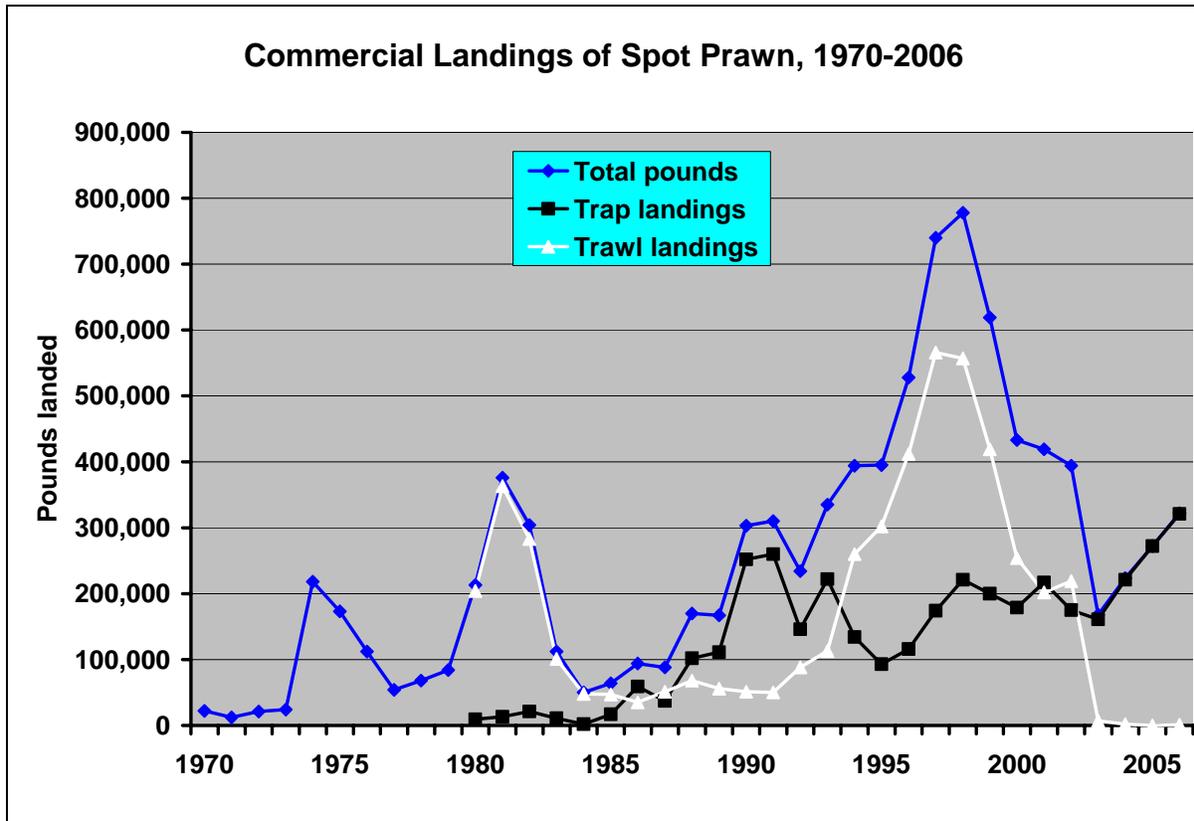


Figure 2.1. California spot prawn landings from 1970 through 2006 in pounds. Data source: CDFG commercial landing receipts.

attached to a common groundline with anchors and a buoy at one end or both ends. Traps are set at depths of 400 to 1,000 feet (122 to 305 meters) along submarine canyons or along shelf breaks. By law, all bycatch is returned to the water immediately.

Trap logbooks are required to be completed by all spot prawn fishermen after every day of trapping. These provide an informative historical data base of catch and effort by the Department fishing block which are areas of approximately 100 square miles (259 square kilometers); however, the spatial resolution is very broad.

It is legal to harvest spot prawns with a recreational fishing license, but practically speaking, it is difficult at best due to the depth range of the spot prawns. Although there is no season or limit on the number of traps that may be used, the recreational bag limit is 35 spot prawn per day. Given the depth at which the traps must be fished, and the bag limit of 35 prawn, there is little recreational fishing for this species.

## **Status of Biological Knowledge**

Spot prawns range from Alaska to San Diego, California, in depths from 150 to 1,600 feet (46 to 488 meters). Areas of higher abundance in California waters occur off of the Farallon Islands, Monterey, the Channel Islands and most offshore banks. This species is a protandric hermaphrodite, beginning life as a male and changing into a female. Sexual maturity as a male is reached during the third year, with the carapace length (CL) averaging 1.5-inches (33-millimeters). By the fourth year, many males begin to change sex to the transitional stage. By the end of the fourth year, the transitionals become females averaging 1.75-inches (44-millimeters) CL. Maximum observed age is estimated at over 6 years, but there are considerable differences in age and growth of spot prawns between areas. Animals from Canada live no longer than 4 years, whereas, prawns from southern California can reach 6 years. Studies indicate that prawns grow faster in a temperate environment than in a cold environment.

Spawning occurs once a year, and each individual mates once as a male and once or twice as a female. Females spawn at a carapace length of 1.75-inches (44-millimeters). Spawning takes place at depths of 500 to 700 feet (152 to 213 meters). September appears to be the start of the spawning season, when the eggs are extruded onto the females' swimmerets. Female spot prawn carry eggs for a period of 4 to 5 months before they hatch. By April, only 15 percent of females still carry eggs.

Fecundity varies with size and age, ranging from approximately 1,400 to 5,000 eggs for the first spawning down to 1,000 eggs for the second spawning. Eggs hatch over a ten-day period and the first three or four larval stages are planktonic. During the third or fourth stage, spot prawn larvae begin to settle out at depths as shallow as 175 feet (53 meters). After completing larval stage six at a carapace length of approximately 0.3-inches (8-millimeters), spot prawns are considered to be juveniles and progressively move deeper as they reach adulthood.

Spot prawns feed on other shrimp, plankton, small mollusks, worms, sponges, and fish carcasses. They usually forage on the bottom throughout the day and night.

## **Status of the Population**

Exploratory surveys conducted by the Department during the 1960s revealed the presence of prawns along the coast, but no estimates of population size have ever been made. During the 1980s, additional surveys were conducted in southern California to further define distribution and range. The development of the southern California trap fishery in the mid-1980s detected sizable aggregations of this species, which were previously unknown. The introduction of roller gear on trawl nets in the 1990s led to the exploration of even more areas and the location of additional habitat suitable for spot prawns. Anecdotal information on relative density

and habitat associations of spot prawns has become available through the use of manned submersible observations conducted by National Marine Fishery Service (Santa Cruz, California facility) biologists in central and southern California from the early 1990s to the present.

### **Management Considerations**

The small, restricted access trap fishery for spot prawn that currently exists in California is considered sustainable and environmentally friendly. Although traps can catch species of concern and disturb the bottom, bycatch is usually released alive with little harm, and lasting bottom impacts for traps are unknown. Population estimates would require trawl surveys to efficiently cover large areas of California's nearshore habitat, and are not economically feasible for the Department to undertake. Genetic work to determine whether there is one large population of spot prawn or a series of subpopulations along California's coast would also be helpful.

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### **Further Reading**

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