

10. PURPLE SEA URCHIN

Overview of the Fishery

Although the purple sea urchin, *Strongylocentrotus purpuratus*, has been harvested for thousands of years, comparatively few are harvested nowadays. Along with the closely-related red sea urchin, *S. franciscanus*, purple sea urchins were considered pests prior to 1970 because they voraciously consumed kelp.

Purple sea urchin populations today could support a more substantial fishery than currently exists; however, they have only been harvested on a limited and experimental basis in California in association with the much larger and more lucrative red sea urchin fishery. Purple sea urchin roe is reportedly very similar in quality to some of the highly-desirable, domestic Japanese species, and is sought in Mediterranean countries.

Since 1990, annual purple sea urchin landings have ranged from 5,900 lb to 390,000 lb, with an average of about 119,000 lb (Figure 10.1 and Table 10.1). The largest landings (390,000 lb in 1991 and 316,000 lb in 1992) occurred when several attempts were made to establish buyers in the Japanese market. In recent years, purple sea urchin roe has also been exported to markets in the Mediterranean region.

Approximately 60% of purple sea urchin landings originate in northern California, although this species is harvested in southern California as well. A robust fishery for purple sea urchins has not yet developed because this species is smaller, yields less roe, and requires more effort to harvest and process than red sea urchins. The purple sea urchin's marketability in Japan has been limited by these factors and associated costs.

Sea urchin fishery regulations, as described in the report on red sea urchins in this volume, apply to the harvest of purple sea urchins as well, except that there are no minimum size limits or closed periods for purple sea urchins. (For a detailed review

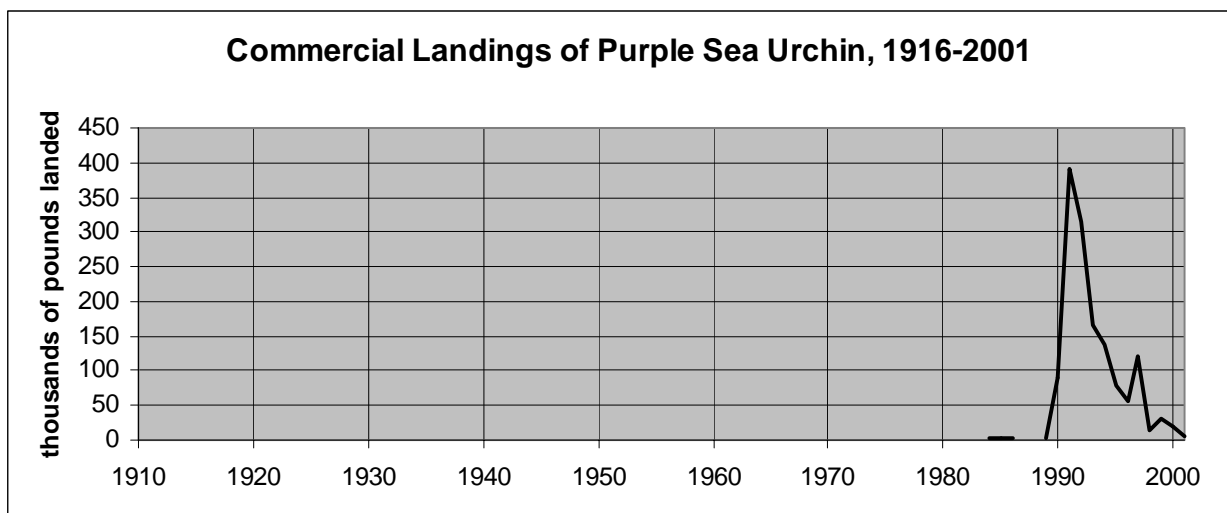


Figure 10.1. Annual commercial landings (pounds) of purple sea urchin from 1916 to 2001. Data sources are the California Department of Fish and Game (DFG) Catch Bulletins (1916-1983) and the DFG commercial landing receipt database (1984-2001).

of the sea urchin restricted access program, see the red sea urchin report.) A minor recreational fishery for purple urchins also takes place in southern California with a daily bag and possession limit of 35 urchins.

Status of Biological Knowledge

Purple sea urchins inhabit waters from Alaska to Cedros Island, Baja California, Mexico, at depths of up to 500 ft; however, they live primarily in shallow water and are the only abundant sea urchin in intertidal areas along the California coast.

General biology of the purple sea urchin is very similar to that of the closely-related red sea urchin (see the report on red sea urchins for a more detailed review of urchin biology). In addition to external color differences, purple sea urchins are much smaller than red sea urchins, rarely attaining a body (or “test”) diameter of over 4 in.

Feeding habits and reproduction are quite similar to those found in red sea urchins. Purple sea urchins reach reproductive maturity at around one or two years of age. Larvae drift with the prevailing water currents for an uncertain amount of time, probably about six to eight weeks. As the larvae mature, they settle to the bottom and change into the juvenile form. Peak settlement periods tend to be in spring and early summer, with substantial year-to-year variation in both timing and intensity. Settlement tends to be less variable south of Point Conception (Santa Barbara County) and is depressed during El Niño events. El Niño events appear to favor settlement in northern California, however. Energetic movement of water offshore in northern California has been associated with reduced recruitment.

Growth is highly variable and strongly linked with food availability. At one year, the size of purple sea urchins can range from about 0.4 in. to 1.2 in. After five years, size can range from 1.25 in. to 2.0 in. Growth rates of very small individuals under one year old are not well known.

Predators of purple sea urchins include those for red sea urchins (sea otter, spiny lobster, sea stars, and fishes), however because purple sea urchins are common in the intertidal zone, predators also include sea gulls, oystercatchers, and raccoons. Sea otters, currently found off the coast of central California, are able to reduce sea urchin populations to levels unsuitable for commercial or recreational fishing, but apparently do not threaten the species’ continued existence.

When water temperatures exceed 73° F, purple sea urchins exhibit increased mortality, which appears to be partly caused by physiological stress. Elevated temperatures also promote development of one or more urchin pathogens that can cause mass mortalities. These die-offs have been observed more frequently in southern than in northern California, especially in association with elevated water temperatures during El Niño events.

Status of the Population

Larval settlement rates monitored at a number of locations in southern and northern California over the past 10 years do not indicate a change in larval production and settlement patterns, which indicates that the status of this species appears to be stable.

Management Considerations

There are several gaps in basic knowledge concerning purple sea urchins. Although there are scattered studies of growth and survival in the literature, data have not been synthesized in a manner that would assist in setting informed harvest size limits. Studies of early growth and survival up to an age of one year are few. These studies are needed to link settlement information with recruitment to the reproductive population. Studies are also needed to link sources of larvae with sites of settlement – information crucial to developing management plans that involve marine reserves. Both fishery-dependent and -independent monitoring should continue in order to assess changes in stock condition. Fishery-dependent monitoring of commercial landing levels and patterns should detect any trend toward large-scale harvests that might require more specific management measures. At present, the most comprehensive fishery-independent data consists of the long-term monitoring of settlement patterns in northern and southern California. Continuing this monitoring should provide a measure of settlement supply, and an early warning of possible adverse effects of harvesting on recruitment.

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Further Reading

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Table 10.1. Commercial landings (pounds) of purple sea urchin, 1916-2001

Year	Pounds	Year	Pounds	Year	Pounds	Year	Pounds	Year	Pounds
1916	-----	1933	-----	1950	-----	1967	-----	1984	2,755
1917	-----	1934	-----	1951	-----	1968	-----	1985	2,260
1918	-----	1935	-----	1952	-----	1969	-----	1986	1,424
1919	-----	1936	-----	1953	-----	1970	-----	1987	-----
1920	-----	1937	-----	1954	-----	1971	-----	1988	-----
1921	-----	1938	-----	1955	-----	1972	-----	1989	2,781
1922	-----	1939	-----	1956	-----	1973	-----	1990	89,633
1923	-----	1940	-----	1957	-----	1974	-----	1991	390,186
1924	-----	1941	-----	1958	-----	1975	-----	1992	316,134
1925	-----	1942	-----	1959	-----	1976	-----	1993	165,032
1926	-----	1943	-----	1960	-----	1977	-----	1994	137,613
1927	-----	1944	-----	1961	-----	1978	-----	1995	79,802
1928	-----	1945	-----	1962	-----	1979	-----	1996	55,701
1929	-----	1946	-----	1963	-----	1980	-----	1997	122,004
1930	-----	1947	-----	1964	-----	1981	-----	1998	14,068
1931	-----	1948	-----	1965	-----	1982	-----	1999	29,797
1932	-----	1949	-----	1966	-----	1983	-----	2000	19,095
								2001	5,953

----- No landings data from 1916 to 1983 and from 1987 to 1988. No directed fishery until 1984.
 Data sources: DFG Catch Bulletins (1916-1983) and DFG commercial landing receipt database (1984-2001).