

History and Status of the Oregon Dungeness Crab Fishery

by

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# The Oregon Dungeness Crab Fishery

## Introduction

The Oregon fishery for Dungeness crab has a long history. Catch records have been kept for this fishery since 1889. The management strategy for Dungeness crab is derived from these records and from our knowledge of crab biology. Management of a single species fishery such as this should be a simple matter compared to a multispecies fishery, especially with the biologically conservative regulations that currently exist. Nevertheless, the Dungeness crab fishery has changed from a simple fishery to one with complex issues. Over the past 30 years the fishery has been in transition. In recent years fishery issues have gone beyond biology and state boundaries, and are primarily social and economic in nature. This report summarizes the history and the changes that have occurred in the Dungeness crab fishery in Oregon.

## Dungeness Crab Biology

The basic biology of Dungeness crab is well known. A few specific studies, many years of observations at the dock and at sea, and the many insights of fishermen have added to our understanding of the crab resource.

Crabs grow by shedding their old shell, a process called molting. During their first two years crabs molt several times each year. At a size of about 4 inches, or by the third year of life, molting becomes less frequent, occurring only once each year. During an annual molt a crab will grow about one inch. Just after molting, crabs are very watery and soft and their shell is easily punctured. They dig into the sand and stay there for several days while their shell starts to harden. About 2 to 3 months are required for an adult crab to completely harden and fill with meat. Most males molt during the summer and fall months, but the time can vary greatly by year and area. In general molting is later north of Cascade Head.

Male crabs are active breeders at an age of 3-4 years and at a size of about 5 1/2 inches. They will mate with several females. Mating takes place between a hard male and a soft, smaller female immediately after the female molts. A female produces up to 2.5 million eggs. Most crabs caught in the fishery are age 4 and have been sexually mature for 1-2 years. The 6 1/4 inch size limit and protection of females insures that the reproductive capacity of the population is protected. Escape ports in the pots help to further reduce handling loss of sublegal crab.

## The Fishery

### Season

Prior to 1948 the season was open all year and included female crabs. Summer and fall closures were initiated in 1948-49 when the legislature created a state agency to manage commercial fisheries. From 1950 through 1963 the open season south of Cascade Head was from November 15 to August 15, while north of Cascade Head the open season was December 15 to September 15. From 1964 to the present the season has been December 1 to August 15 with some extensions.

### Catch

Catch records date from 1889, but there is no way to verify their accuracy up to about 1946 (Table 1, Fig. 1). For many years crabs were landed by the dozen and then converted to pounds using 25 pounds to the dozen. The actual weight in pounds was recorded in about 1963 and along with more improvements in 1977, provided more accurate landing statistics.

The catch exceeded one million pounds for the first time in 1933 and showed a steady increase up to 1948 when 10 million pounds were landed. Thereafter the catch began to fluctuate from about five million to 11 million pounds. In 1963 the bottom fell out and only 3.6 million pounds were landed, but after two poor seasons the catch increased steadily and hit 15 million pounds in 1971. In 1973 the bottom again let go and landings fell sharply to 3.1 million pounds. From 1977 to 1980 three record high years occurred. In 1983 landings plummeted again but have since shown an upward trend, reaching 11.2 million pounds in 1989. A slight drop is expected in 1990.

For many years the peak of the landings for each season occurred from March to May. By 1960 the peak months were December and January. For seven of the nine years from 1981 to 1989, over 60% of the total catch was landed by the end of January (Fig. 2). In 1986, almost 90% of the catch was landed by the end of January.

### Effort

Effort can be measured by the number of boats, pots, or trips. The number of boats and pots shows a dramatic change through time (Fig. 3). Through 1968, fewer than 100 boats were in the crab fleet (except for 6 years: 1959-63, 1965). Since 1969 there has been a steady increase in the number of boats to a peak of over 500 in 1980. Over 300 have fished each year since 1973. The number of boats does not correlate well with catch, although for the record years of 1977-80 the number of boats increased substantially. As catch has decreased since the early 1980's, the number of boats has stayed high. Clearly, the result of a larger number of boats is increased competition and generally a lower average catch per boat.

The number of pots fished has also shown a marked increase from 20,000 in 1960 to 126,000 in 1980 (Fig. 3). In recent years 70 to 105 thousand pots were fished annually (an average of about 250-300 pots per boat).

Another measure of fishing effort is the size and mobility of the vessels. Thirty years ago most of the crab boats were fairly small, but over the years that has changed. Most boats in recent years range from 35 to 50 feet in length. About 20% range from 65 to 160 feet and have the capacity to haul hundreds of pots at one time, can fish in marginal weather and sea conditions, and can fish a much larger piece of ocean. With the influx of larger vessels, efficiency increased. The larger vessels make multi-day trips. With the advent of deck lights, crabbing for many vessels became a 24 hour a day operation. Some boats are now landing more crab in one trip than some boats used to land in an entire season.

Although some boats are landing large quantities of crabs, the average annual pounds landed per boat has dramatically decreased since 1970 (Fig. 4). Another measure of the extreme competitiveness of the fishery is the decrease in pounds of crabs caught per pot since 1970 (Fig. 5). These figures clearly

Table 1. Annual Dungeness crab catch and effort, 1889-1989.

Year	Pounds (a)	Boats	Trips	Pots (b)	Year	Pounds (a)	Boats	Trips	Pots (b)
1889	6,628	--	--	--					
1890	4,200	--	--	--	1920	--	--	--	--
1891	3,521	--	--	--	1921	--	--	--	--
1892	4,125	--	--	--	1922	737,802	--	--	--
1893	--	--	--	--	1923	359,283	--	--	--
1894	--	--	--	--	1924	--	--	--	--
1895	23,520	--	--	--	1925	522,201	--	--	--
1896	--	--	--	--	1926	532,884	--	--	--
1897	--	--	--	--	1927	599,852	--	--	--
1898	--	--	--	--	1928	492,811	--	--	--
1899	--	--	--	--	1929	705,364	--	--	--
1900	--	--	--	--	1930	547,125	--	--	--
1901	--	--	--	--	1931	512,975	--	--	--
1902	--	--	--	--	1932	863,425	--	--	--
1903	211,600	--	--	--	1933	1,529,000	--	--	--
1904	246,266	--	--	--	1934	1,813,000	--	--	--
1905	318,300	--	--	--	1935	2,134,000	--	--	--
1906	405,000	--	--	--	1936	3,177,000	--	--	--
1907	--	--	--	--	1937	4,912,000	--	--	--
1908	216,011	--	--	--	1938	5,988,000	--	--	--
1909	179,893	--	--	--	1939	5,749,000	--	--	--
1910	227,660	--	--	--	1940	6,716,000	--	--	--
1911	328,633	--	--	--	1941	6,918,000	--	--	--
1912	294,532	--	--	--	1942	7,787,000	--	--	--
1913	--	--	--	--	1943	8,838,000	--	--	--
1914	--	--	--	--	1944	8,068,000	--	--	--
1915	415,272	--	--	--	1945	6,469,000	--	--	--
1916	--	--	--	--	1946	6,941,000	--	--	--
1917	--	--	--	--	1947	8,117,000	--	--	--
1918	--	--	--	--	1948	10,044,000	67	--	--
1919	--	--	--	--	1949	9,354,000	35	--	--

Notes - (a) - Includes December of previous year after 1950; (b) - Accuracy of counts unknown; (c) - Estimates

Table 1. (continued)

Year	Pounds (a)	Boats	Trips	Pots (b)	Year	Pounds (a)	Boats	Trips	Pots (b)
1950	6,252,000	29			1980	18,277,000	519	13,105	98,600
1951	7,478,400	63	(c)5040	13600	1981	9,529,000	450	11,046	112,500
1952	5,407,675	83	(c)5810	15700	1982	8,716,000	426	10,400	127,600
1953	6,413,275	71	5681	13500	1983	4,327,000	391	8,662	104,000
1954	10,131,125	83	6282	16200	1984	4,776,000	325	8,800	84,000
1955	6,413,100	89	5932	19600	1985	4,901,000	315	8,153	90,300
1956	8,910,600	92	7355	18900	1986	7,120,000	314	7,175	91,600
1957	11,737,800	68	5269	19200	1987	4,182,792	324	6,796	88,700
1958	10,103,000	75	6185	21300	1988	8,600,000	327	7,669	85,200
1959	7,125,525	105	7181	21800	1989	11,077,000	342	7,525	91,900
1960	8,296,125	103	(c)7500	20600					
1961	11,359,000	110	7987	24400					
1962	5,813,000	103	9171	28400					
1963	3,620,975	121	6496	24600					
1964	3,586,335	95	7384	23000					
1965	6,418,411	100	7362	22100					
1966	10,476,476	81	6287	25000					
1967	9,580,968	87	8220	27100					
1968	10,214,695	90	7680	28600					
1969	11,965,246	105	9558	29200					
1970	14,062,793	143	10427	33500					
1971	15,000,000	193	10725	49600					
1972	6,800,000	205	8767	54900					
1973	3,124,320	310	6221	(c)52000					
1974	3,417,346	(c)300	5293	(c)50000					
1975	3,352,909	(c)300	(c)5000	(c)50000					
1976	9,081,469	220	(c)6500	(c)55000					
1977	16,143,000	346	9763	68500					
1978	10,397,000	452	9909	91400					
1979	16,400,000	444	12116	102700					

Notes - (a) - Includes December of previous year after 1950; (b) - Accuracy of counts unknown; (c) - Estimates

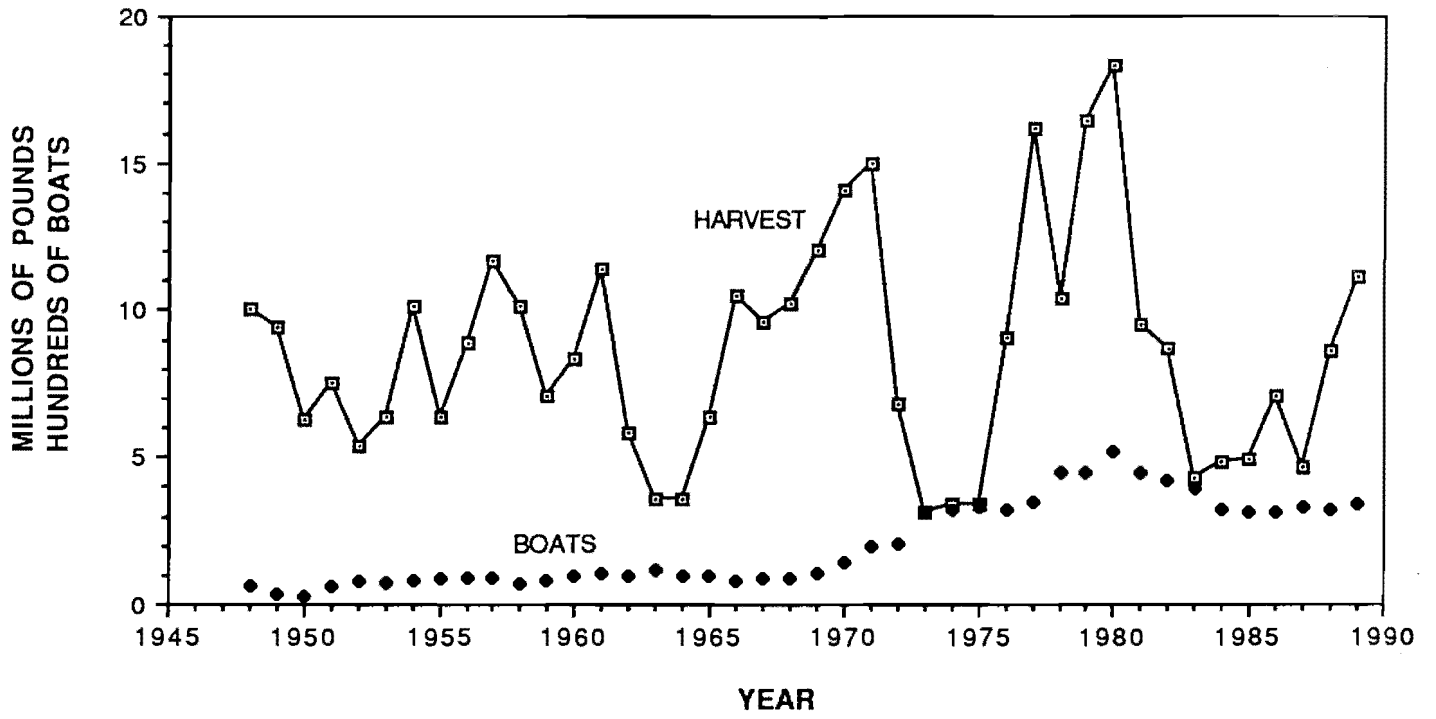


Figure 1. Oregon Dungeness crab harvest and number of boats, 1948-89.

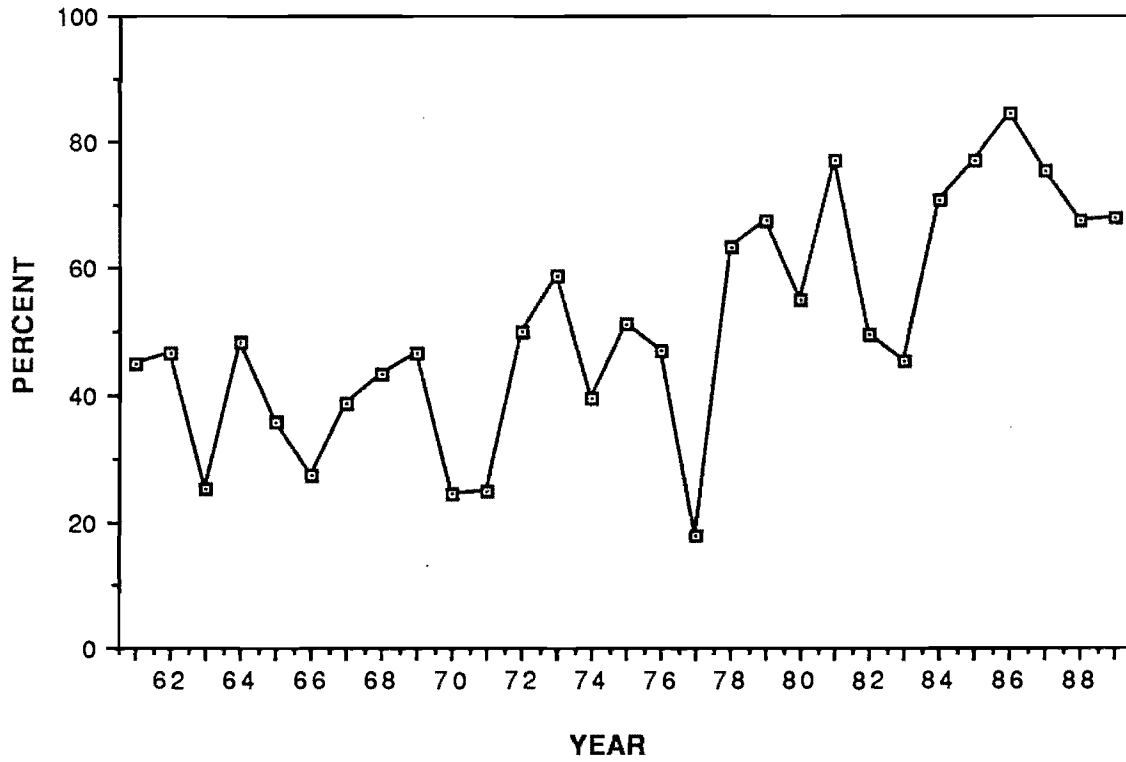


Figure 2. Percent of annual landings of Dungeness crab harvested in December and January, 1960-89.

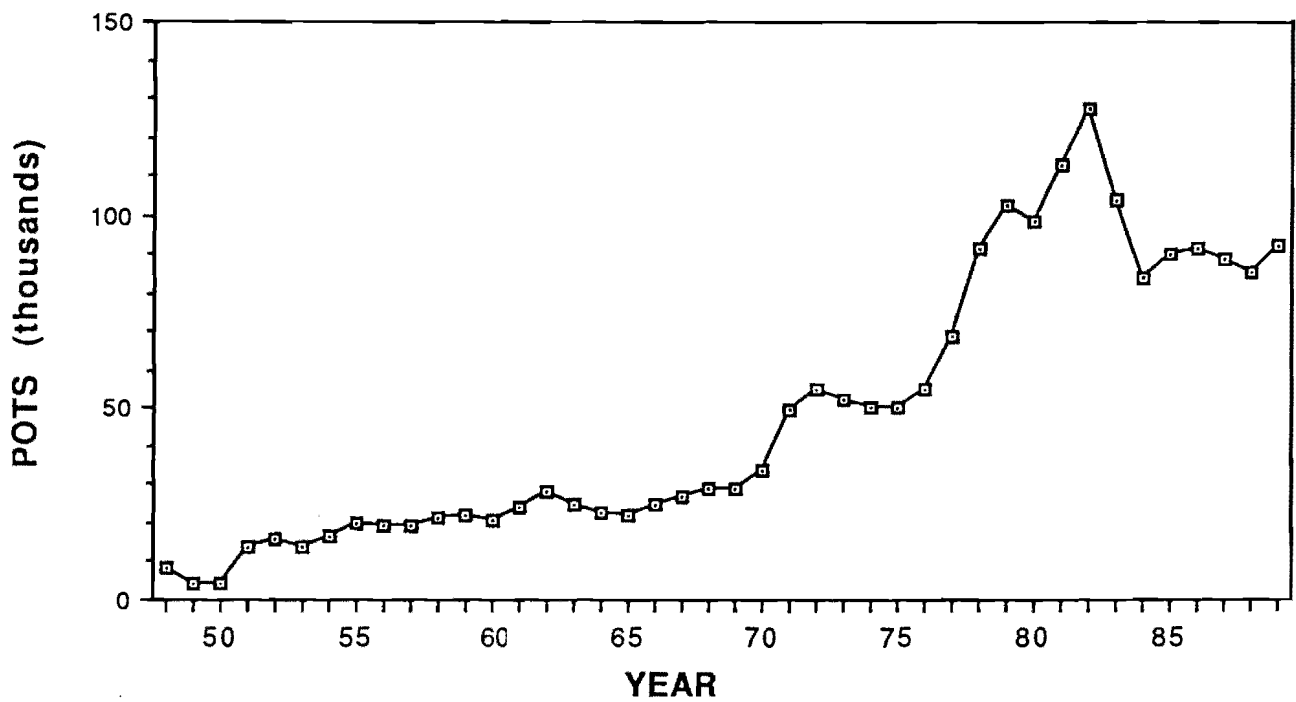
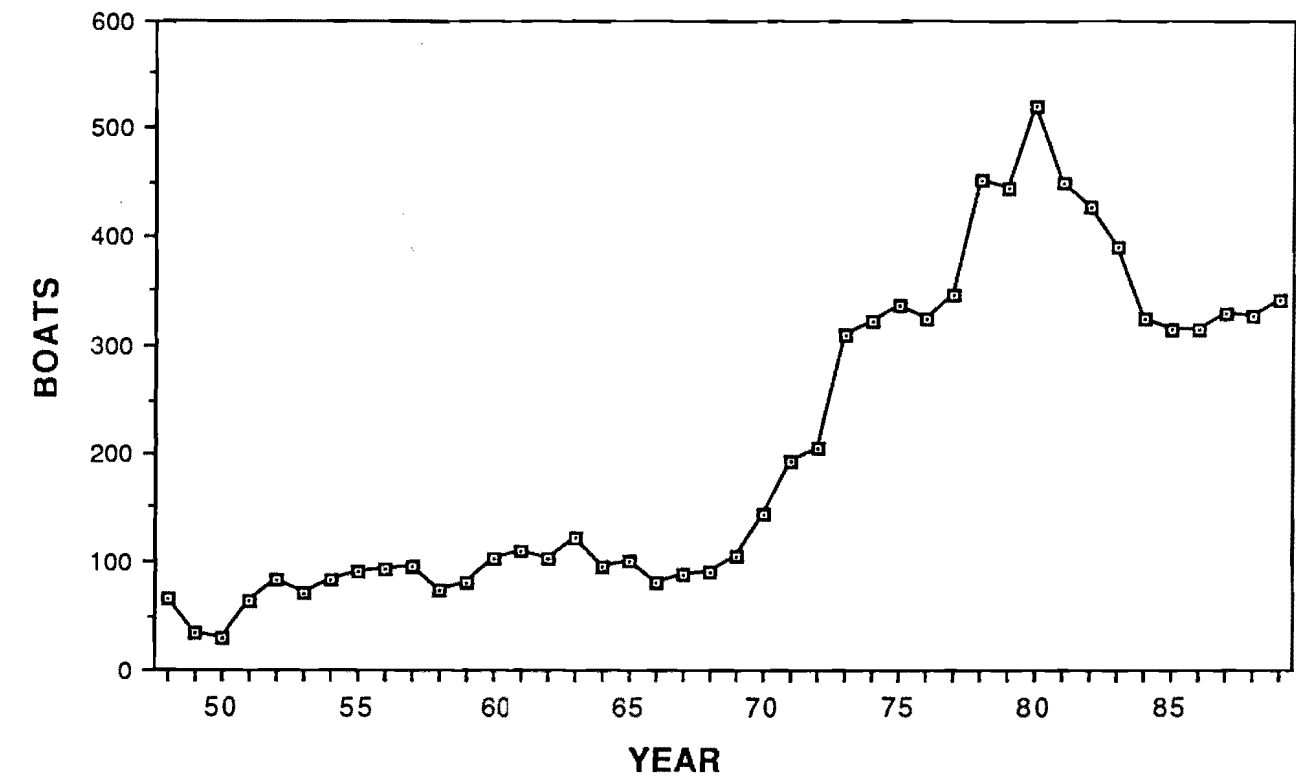


Figure 3. Annual number of boats and pots in the ocean crab fishery, 1948-89.



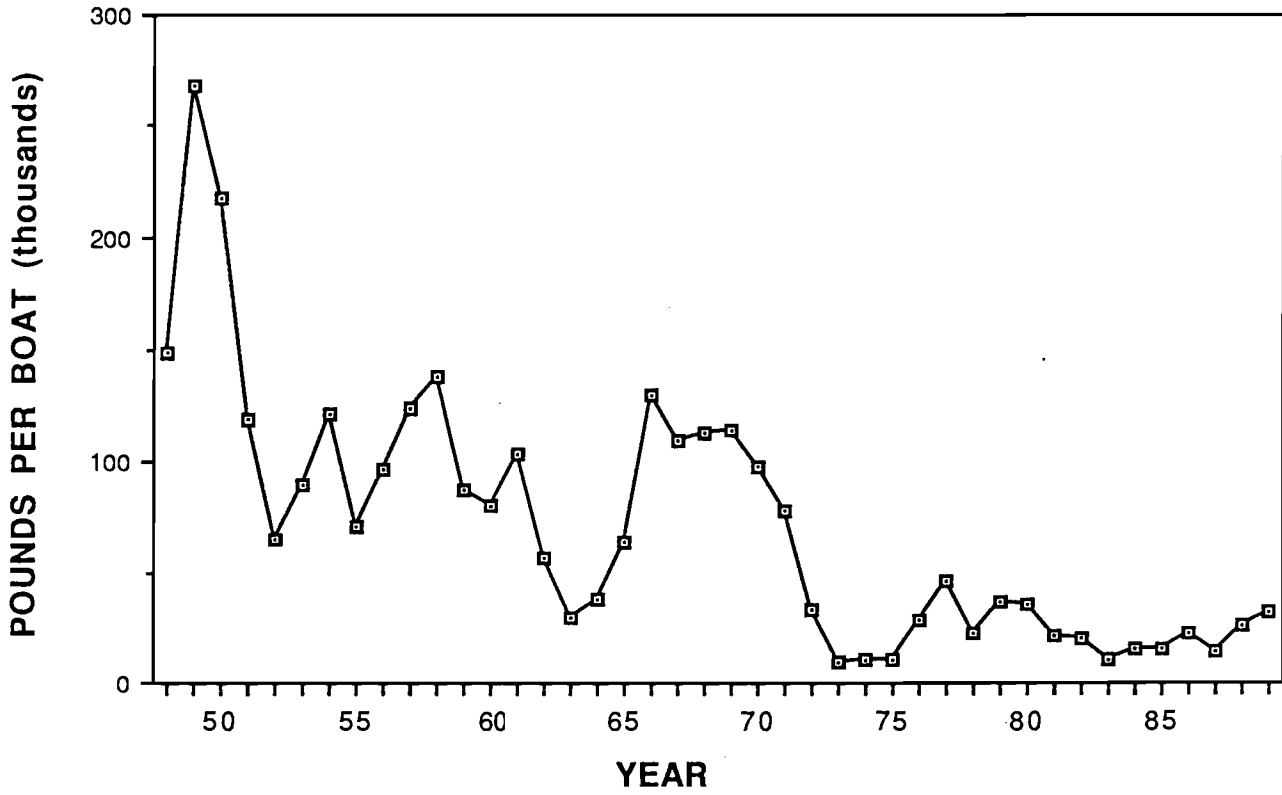


Figure 4. Annual average pounds of crab per boat, 1948-89.

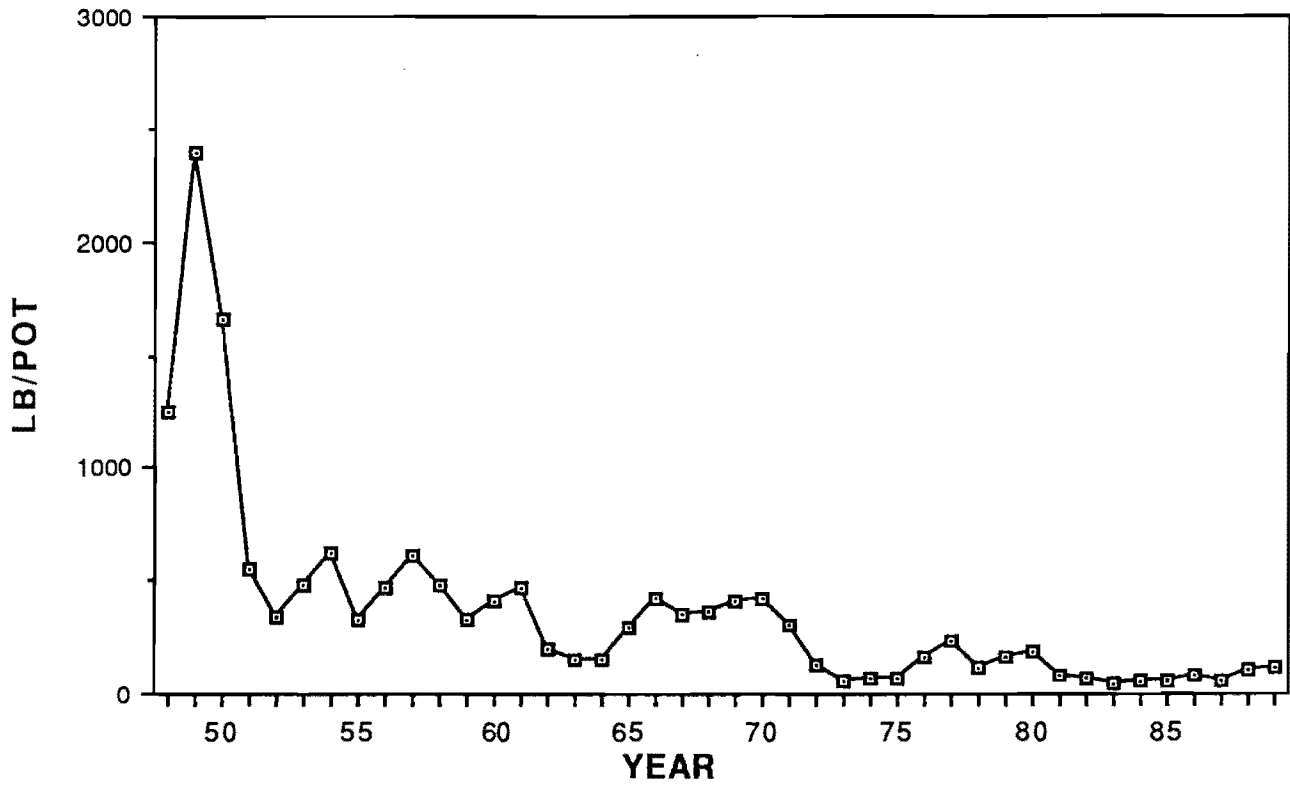


Figure 5. Annual average pounds of crab per pot, 1948-89.

show that the limited crab resource is being distributed among more and more units of gear.

The dramatic increase in effort has also created a marked increase in fishery interactions. During the years prior to about 1964 most boats fished within a certain radius of their home ports and few boats crossed into another port's radius. But as effort increased and competition for space to fish became more intense, many fishermen began to venture into other areas, across state boundaries and into deeper waters. As more and younger fishermen began crabbing many of the traditional agreements of space and timing among various fisheries began to disappear and unrest among fishermen increased.

The intense competition at the beginning of the season created conflicts between big and small boats. The skippers of smaller boats sensed a disparity between themselves and the larger boats. Skippers of small boats stated that they needed a preseason pot setting time to avoid being forced to take more chances in order to compete for space to fish. This conflict resulted in a regulation to allow gear to be set before the season opened. The reasoning was that the extra time would give the smaller vessels parity with the big boats at the start of the season. Since the big boats also set gear early, however, they still have an advantage in selecting fishing grounds. Even with the preseason setting time chances are still being taken. Since 1978, 43 crab boats have been lost off Oregon, 10 of them during the winter months. Twenty three of the boats lost were from 24-42 feet in length.

The increase in effort and shift to fishing early in the season created intense competition, but it also has a biological risk. Samples taken at sea show that from January into March up to 60% of the crabs in the pots are females, most with large egg masses. Egg masses are regularly lost as the crabs are removed from the pots. The number of pots, the frequency of pulling, and the number of eggs lost per each crab produces a huge figure, but the significance of that figure is unknown. Less effort during December and January would greatly reduce crab egg loss as well as loss of boats.

Another matter related to resource risk, increased effort, and intense competition, is the handling and landing of large numbers of soft crab. Late in the season from 1982-84 a major fishing effort resulted when the seasons were extended. Up to 20 legal size, soft crab were being sorted out at sea for every crab kept. Upon landing, processors sorted out up to an additional 70% because the crabs were not full enough. Crab that soft are easily injured and a high percentage most likely will not survive the handling. A portion of those crab would have mated again. The economic loss can be estimated, but the significance of the biological risk is unknown.

## Economic Factors

### Price

The price of crab to the fisherman has dramatically increased in the past 20 years. During the 1950's the going price for most crab was 8 to 10 cents per pound; as recently as 1977, the price started out at 25 cents and gradually increased to 50 cents. Monthly maximum, minimum and average price for crab has been compiled since 1978 (Fig. 6). Several trends are evident. In general there has been a clear increase, although price was low when

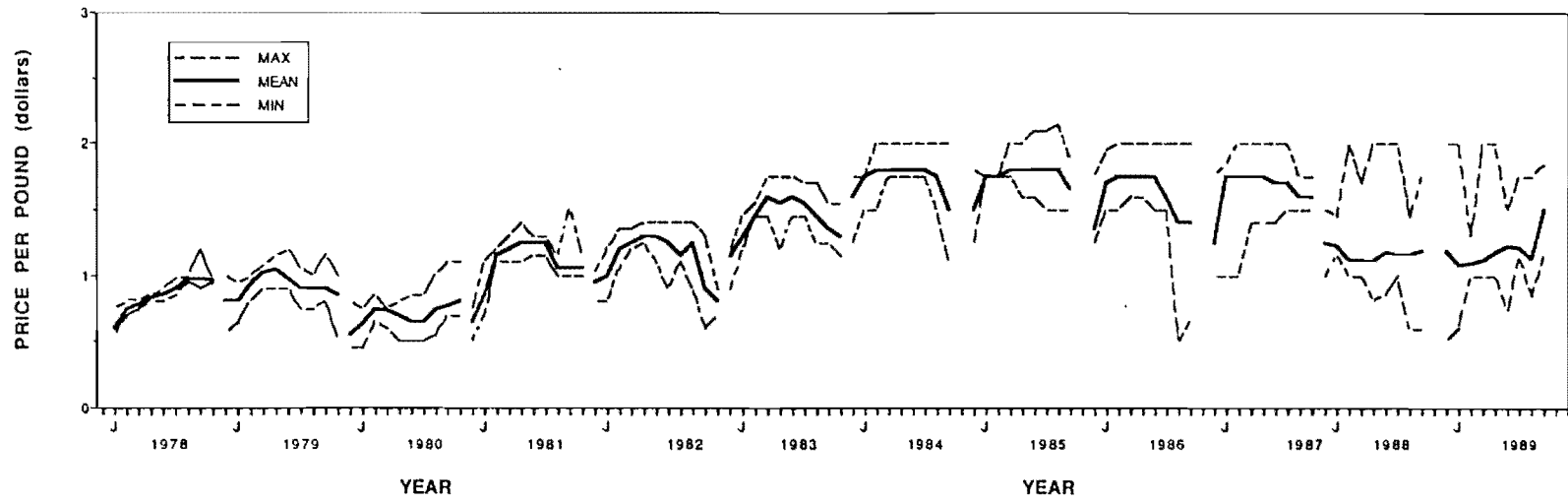


Figure 6. Maximum, minimum, and average price for crab by month, 1978-1989.

production was high. There is also a general trend showing a low price early in the season with an increase as the season progresses and crab volume decreases. The high prices at the end of the season reflect small specialty markets that individual crabbers have developed. Low prices late in the season usually reflect a high volume of poor quality crab as was the case in 1982-84.

The price of crab to fishermen depends upon several factors. Since about 70% of Oregon crab is marketed in California, the California pricing mechanism controls the Oregon and Washington price as well. The previous year's fishery also affects the price. High volume one year and perhaps a soft market because of the volume available, will prompt a low price for the opening of the following season. Poor crab condition will also depress the price.

In the past few years, ex-vessel price has been lower than expected, primarily due to a large harvest of soft crabs. One irony in the crab fishery is that a fisherman who takes extra care to bring in good crab frequently does not receive an extra benefit for his efforts, while the fisherman who brings in everything that is legal (including soft crab) often receives the same price. At most plants the sorting to make such a distinction is being done, but the next step to record the sorting and pay accordingly is not being done. The current system encourages the landing of all crabs regardless of condition, resulting in a reduced overall market price for crab.

#### Summary

The Dungeness crab population has shown cycles in abundance. Current fishery management practices are sufficient to protect the reproductive capability of the stock. The issues facing the Dungeness crab fishery are more economic and social than biological. The dramatic increase in effort in the fishery has fostered keen competition for space and crabs, and considerable unrest among fishermen and processors. The ex-vessel price of crab increased dramatically in the late 1970's. A few times in the 1980's, competition and early season fishing adversely affected price and markets by glutting the market, sometimes with soft crabs. In some years the industry has shown an inability to control the soft crab problem; management agencies have been reluctant to change regulations to help resolve the problem without an industry consensus.