Information for Crab Hearing on November 24

The purpose of this report is to discuss the general status of the Dungeness crab fishery in Oregon, to present the information available concerning the opening date of the 1964 season, and to inform the commission as to the merits of some regulation changes being considered by the staff.

Life History

Mating of the Dungeness crab occurs in April through July between a hard-shell male and a soft-shell female. The sperm are carried in the oviduct until the eggs are deposited under the abdominal flap in October through December. Fertilization of the egg takes place just prior to extrusion of the eggs onto the abdomen. The egg mass when first extruded is a bright orange becoming darker as development of the embryo within the egg progresses. Hatching occurs in January through May. The larvae are free swimming for about 3-4 months before assuming the appearance of the adult crab and settling to the bottom. Growth is accomplished by a succession of moltings which normally occur in August and September after the first year of life and attain the legal minimum size of 6-1/4 inches in 3-4 years.

Status of the Crab Fishery

The Oregon crab fishery is being exploited at the maximum allowable rate. Crab fishermen remove more than 90% of the legal-sized male crabs each season. When a fishery operates largely on a single year class of animals, such as crabs, yearly landings fluctuate widely. Oregon annual landings range from 3.5 to 12 million pounds with the success of each season appearing to be dependent upon environmental conditions which prevailed and affected crabs as juveniles. However, when viewed over a long-term period, the production trend is relatively stable between 7-8 million pounds annually (Figure 1).

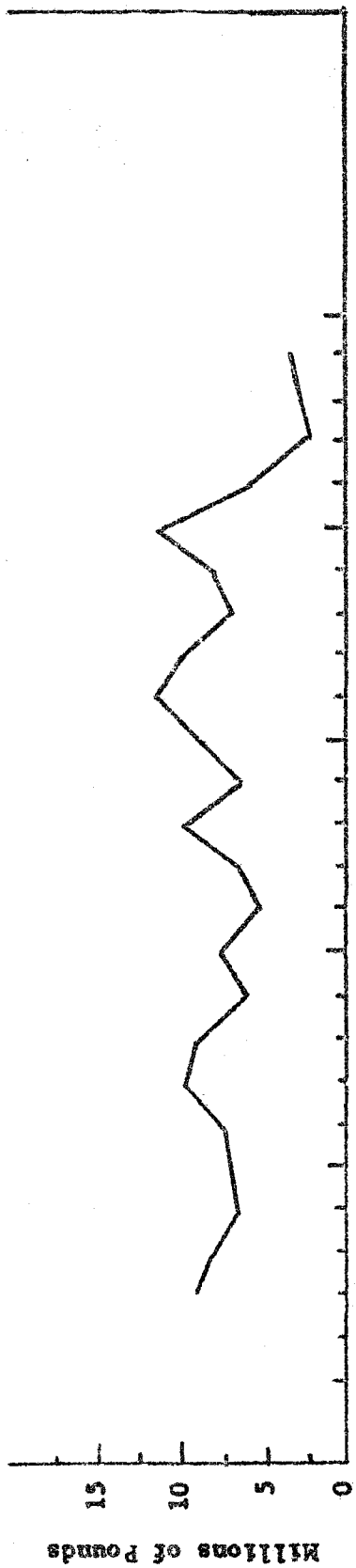

Figure 1. Oregon Dungeness Crab Landings.

The reason for the high rate of removal of legal crabs each year is the fishing intensity which has increased from 64 crab fishermen using 8,000 pots in 1947-48 to a high of 134 fishermen using 28,000 pots in 1961-62. The intensity has declined slightly in the past two seasons with 118 and 95 boats fishing 25 and 23,000 pots respectively (Table 1). The decline in intensity is probably related to the decline in abundance of crabs. of economic reasons) The effect of the increased intensity over the past few years has been to move the peak period of landings closer to the opening date of the season. In 1947-48, the months of major harvest occurred in April and May. In the past 5 seasons the major landings occurred in the first 2 months of the season (December-January) with a steady decline thereafter.

Table 1. Number of Boats and Estimated Number of Crab Pots Fished by Year, 1947-64.

Year	Numbers of Boats Fishing	Maximum No. of Pots Fished 1/
1947-48	67	8,015
1948-49	35	3,935
1949-50	29	3,795
1950-51	63	13,626
1951-52	83	15,709
1952-53	71	13,507
1953-54	83	16,177
1954-55	91	19,634
1955-56	92	18,923
1956-57	94	19,206
1957-58	73	21,307
1958-59	81	21,824
1959-60	97	20,623
1960-61	118	24,443
1961-62	134	28,399
1962-63	118	24,618
1963-64	95	23,000

1/ All estimates are probably minimal and those for 1948-49 and 1949-50 are undoubtedly low.

Oregon crab landings in 1963-64 totaled 3.1 million pounds through June as compared to 3.0 million pounds during the same period of the 1962-63 season. Total landings for the season are expected to be a little over 3.5 million pounds, 50 per cent below the long term mean of 7-8 million pounds, although slightly better than the 1962-63 season.

Factors Possibly Affecting Crab Production

The following factors affecting the abundance of crabs cannot be substantiated by convincing biological evidence. However, there is general agreement among shellfish biologists along the coast that these factors are operating.

Oceanic Currents. I believe that potentially the major factor limiting production is oceanic currents prevailing during the free-swimming period of larval crabs. If the southern currents move in along the Oregon coast in the spring and early summer through July which is during the free-swimming period and the larvae are displaced seaward and reach settling size in the deeps, I am convinced they will be lost to the fishery.

Predation. Within the last few years a great abundance of coho salmon have been present in the ocean. These fish feed on crab larvae and as many as 1,500 megalops-stage crab larvae have been found in a single salmon stomach. Other predators are rockfish, lingcod, wolf-eel, halibut, and any other fish.

Trawl Fishing. Another factor that undoubtedly has some effect upon the resource is the trawl fishery. In recent summers the trawl fleet has moved into the shallow shelf areas (15-25 fathoms). One load of mink food this summer was observed to have many Dungeness crab legs mixed in with the fish and trollers who are also crabbers reported hearing trawl fishermen complaining over the radio of plugging their

nets with crabs. In one instance a dragger reported capturing 3 of our tagged crabs in his net.

Population of Breeding Males. A final factor, although not fully understood but certainly potential is our minimum size regulation. We have established a minimum size of 6-1/4 inches to allow the males to mate once or twice prior to reaching legal size. This was to provide breeding population of males that was unaffected by the fishery. However, growth work in California and Oregon indicate that a segment of our crab population grows fast enough to enter the fishery before mating and we may not have enough breeding males to service available females. This evidence is preliminary and we need further study before we can make sound recommendations.

Seasons

There are as many opinions on when the crab season should open and close as there are fishermen and plant operators. This is caused mainly by location of a fishing area in relation to markets and the direct effect upon the individuals by prevailing economic conditions. Some individuals suggest a uniform coastwide opening date. This certainly has merit; however, the problem is how to arrive at an opening date that will please a major portion of biologists, fishermen, and processors. A date that would satisfy Washington (January 1) would probably be opposed by California biologists for the area south of Point Arena. Most Oregon fishermen and some plants would oppose it. Yet Washington, justifiably, feels this is the earliest the season should open--except their Puget Sound fishery. California would probably agree to this date for the area north of Point Arena. A uniform season opening would probably reduce border conflicts and reduce the number of boats that run from area opening to area opening and fishing on the "cream of the crop". The justification for

different opening dates lies in the realm of crabs reaching prime condition in some areas prior to or later than in other areas.

Some fishermen have suggested that the seasons be set by condition sampling by the Fish Commission. They would even like this broken down to areas. The argument for this is that the crabs would be harvested when they are in prime condition and the greatest meat yield can be realized. The arguments against this are: (1) industry complained that they did not know when to prepare to fish or operate and (2) the lack of money, time, and manpower that would be required by the Oregon Fish Commission to implement this sampling.

The 1963-64 crab season opened uniformly along the Oregon coast on December 1, 1963, for the first time in many years. The condition of crabs, as measured by the percentage of soft shells in the catch, was good. The former Area I (north of Cascade Head) and Area II (south of Cascade Head) both had less than 10 per cent soft shells in the catch at the opening (Table 2). Sampling at Astoria on December 8, 1963, revealed a soft-shell percentage of 5.4 per cent north of the river and 8.3 per cent south of the river. Later sampling in December revealed an increase in the percentage of soft shells north of the river to a maximum of 14 per cent and a steady decline in the percentage of soft shells south of the river with one exception. This latter sample was biased by the fact that the shell crab had been removed prior to sampling. Area II crabs were the best at the opening that they have been for many years and on only two occasions during the sampling period exceeded the 10 per cent soft-shell level.

In view of the foregoing it is the staff's recommendation that the season open on December 1, 1964 and close no later than August 15, 1965. The season as now provided for in General Order 13 will automatically open on these dates.

Use of Crab Pots with Uniform Escape Rings

The commercial crab harvest is made primarily by fishermen using crab pots.

Table 2. Numbers of Crabs Sampled and Per Cent Soft Shelled, by Area Caught and Date Sampled, for the 1963-64 Season.

Week Ending	Area I						Area II							
	Longbeach, Wn. to Columbia R.		Columbia R. to 1/ Cape Falcon		Cape Falcon to Cape Lookout		Cape Lookout to Umpqua R.		Umpqua R. to Cape Blanco		Cape Blanco to Rogue R. Reef		Rogue R. Reef to Calif Border	
	No. Sampled	% Soft	No. Sampled	% Soft	No. Sampled	% Soft	No. Sampled	% Soft	No. Sampled	% Soft	No. Sampled	% Soft	No. Sampled	% Soft
Dec. 8	314	5.4	278	8.3		---	367	8.2	238	2.9	889	1.9	0	---
Dec. 15	274	10.9	218	7.8 2/		---	1,562	7.6	---	---	427	3.5	0	---
Dec. 22	221	14.0	244	4.9		---	426	10.6	310	2.6	703	3.3	0	---
Dec. 29	0	---	0	---		---	0	---	0	---	0	---	0	---
Jan. 5	0	---	346	56.6 3/		---	0	---	0	---	0	---	572	5.1
Jan. 12	0	---	0	---	No Sample	---	0	---	0	---	0	---	0	---
Jan. 19	0	---	0	---		---	0	---	0	---	0	---	0	---
Jan. 26	0	---	0	---		---	0	---	0	---	0	---	0	---
Feb. 2	0	---	0	---		---	442	2.5	0	---	0	---	0	---
Feb. 9	204	1.5	0	---		---	439	15.0	580	1.4	74	0.0	0	--
Totals	1,013		1,086				3,236		1,128		2,093		572	

1/ Cape Falcon is 43 miles north of Cascade Head, the northern boundary of Area II.
2/ Composite sample containing crabs from the North and South sides of the Columbia River.
3/ The shell crab had been sorted out prior to sampling.

The present regulations of Oregon do not require escape ports in crab pots for the purpose of allowing escapement of small crabs. Some people have suggested that escape ports in pots be required. This suggestion has merit and the principle of escape ports is endorsed by the staff. At the present time virtually all of the gear has escape ports of varying sizes as the fishermen long ago realized the value of this gear. The major problem is the variation in size of these ports. To remove and replace them now would be a major expense to the fishermen who did not have rings of the proper size.

There are several important reasons for having escape ports in pots. Some of these are: (1) reduction of handling mortality to sub-legal male and female crabs; (2) reduced fighting and injury to smaller crabs confined in the pots; and (3) selective fishing if a buoy breaks off of a pot and the pot continues to fish. If the pot has escape ports, then only the legal-sized crabs are killed and the sublegals escape to breed and possibly enter the fishery. The crabs that die from entrapment though lost to the fishermen represent nothing more than a fishing mortality to the population.

There are nearly as many versions of how big escape ports should be as there are fishermen. Some individuals feel that they should be at least 4-1/2 inches in diameter so that the smallest legal crabs could escape for mating; other fishermen feel that they should be of a size to retain all legal crabs.

The shellfish investigation has conducted two escape port studies. The first study showed that to really be effective (as measured by the average size of crabs retained) the pots had to fish for at least 48 hours. After this time period the average size increased very gradually through 120 hours. The second study was designed to determine the width-length relationship of the crab carapace (a crab goes out the ports sideways), and to determine the most effective size of escape ring. In all, 1,000 crabs were measured for length and width and a regression line calculated. It was determined from

these data that there is a straight-line relationship (slope 0.9999) between width and length. From this it was also determined that a crab of legal size of 6-1/4 inches in width has a length of 4-3/8 inches. The proper sized escape port should therefore be 4-3/8 inches in diameter. Of course this sized ring will allow some legal-size crabs to escape and also retain some that are sublegal.

Because of the necessity of affording protection to sub-legal male crabs and reducing fishing mortality from lost pots the staff would like to inform the Commission that the staff is considering a recommendation on this matter to be presented at a later date.

C. Dale Snow
November 18, 1964

cc: Commissioner Meierjurgen
" Huffschmidt
" Hall
Bob Schoning
Dale Snow
Research