

SHELLFISH INVESTIGATION

PROGRESS REPORT NO. 17

1948

SOFT-SHELL CRAB SEASON AND REGULATION REVIEW

Closure of Season--Summary:

In accordance with the regulations drawn up following a public hearing July 22, 1948 the closed season for offshore crab fishing for 1948 was set by means of experimental fishing by the Commission. The procedure used, and data collected for closing the season was reported at the time and summarized with recommendations in Progress Report No. 15, December 9, 1948.

The main points in this summary were as follows: Sampling commercial pots during the week of July 31 through August 5 in Area II (South of Cascade Head) showed the area immediately around the mouth of Coos Bay to be running 53.7 percent soft shell with the Umpqua to Alsea areas running from 10.3 percent to 14.1 percent soft shell. The overall condition was 23.1 percent soft. A closed season was invoked for Area II, effective August 26. Subsequent checking showed that the numbers of soft shells remained around 10 percent through August but that the peak of soft crabs suddenly occurred "or moved in" during the first week of September. What data was obtained in 1947 showed that the peak appeared slightly earlier that year, apparently by about the middle of August. The possible need of another area in the present Area II was discussed and the need for more data from Cape Arago south was shown.

In Area I (North of Cascade Head) sampling during the week of August 13-20 showed the crabs to be running 10.3 percent soft at Cascade Head; from 15.6 percent to 39.3 percent soft in the area from Cape Lookout to Tillamook Head;

and 0.5 percent at the Columbia River; or an overall condition of 16.4 percent. The extreme difference between the crabs in the Tillamook area as against the Astoria area was pointed out as demonstrating the need for splitting the present Area I into two separate areas, one for Astoria and one around Tillamook. Continued sampling out of Astoria showed the crabs here remained at but a few percent soft until about September 20 when a heavy "wave" of soft shells moved in. Closed season was declared effective October 10.

Opening of Season--Method:

Since there was of course no commercial gear out, it was necessary for the Commission itself to run experimental gear to determine the proper time to open the season in the early winter. This was accomplished by chartering boats and gear to be run under Commission supervision. The "Pacific Belle" with Mr. Harold Powell as skipper was chartered at Coos Bay; the "Ethel-G" with Mr. Bert Erickson skipper out of Newport; and the "Gladys" with Mr. Cecil Hall skipper out of the Columbia River. In each case the boat was paid \$50.00 for each trip completed, no charge being listed if the boat was unable to get out of port across the bar, but with the trip being listed any time the boat reached the grounds even though the gear may not have been showing. From this sum the boat paid all operating expenses and furnished the gear with the provision that the Commission was to pay up to \$20.00 for each pot, line and buoy lost in course of the fishing or up to \$15.00 for pots alone.

Eight trips were attempted out of Coos Bay, six being paid for as completed trips with eight pots, lines, and buoys being lost. Two trips were attempted out of Newport, both completed and paid for, with four pots, lines, and buoys lost. Twelve trips were attempted out of Warrenton, five being completed and paid for with five pots, lines and buoys lost. A total of 44 pots were fished out of Coos Bay, 48 out of Newport, and 63 out of the Columbia.

The total charter cost for all three ports was \$990.00.

With the funds available it was possible to run but one string of gear from each port, timed so as to require a minimum number of trips before season opening. As a result, as will be seen, the data gathered was lacking in many respects. Although covering an adequate time period to actually open the season it did not permit collection of data showing the progressive building up in condition of crabs <sup>from a</sup> biological standpoint. Further, the number of areas covered and amount of gear from each port were insufficient for showing anything but general conditions.

The Coos Bay gear was fished in twenty fathoms off the "knoll", several miles north of the entrance to the bay and later shifted north to off the "New Wreck" (The "Alvarado"), halfway to the Umpqua. The Newport gear was run off the Alsea, from the deadline at the mouth of the river south along Big Stump Beach in twenty fathoms. The Astoria gear was run just S.E. of Buoy No. 2 at the mouth of the river.

When running the gear all the crabs caught were recorded as to size, shell condition, sex, etc. A random sample from several pots (entire catch of the pots) was brought back to the laboratory each time for further work. All surplus crabs were then tagged and released. Data was kept on length of time of fishing of the gear, type of pots, bait used, etc., but it was felt to be neither possible nor necessary to correct for such factors in light of overall accuracy and extent of the figures.

#### Determination of Soft-Shells--Grading:

A series of grades of crabs was used as previously set up to express the shell condition of the crabs caught. These were as follows:

- No. 3      just shed--entire crab soft and pliable.
- No. 2      fairly recent shed--carapace very springy, easily broken when testing by squeezing at a point directly in from lateral points.

- No. 2B hardening up--carapace still some spring when squeezed in from point.
- No. 1W new hard shell--carapace hard--no spring except on small crabs--new shiney appearance.
- No. 1 hard shell--carapace hard--dull appearance.
- No. 10 old hard shell--carapace hard, older appearance--barnacles, etc.
- No. 1-OB old hard shell--covered with large massive barnacles.
- No. BB black backs--old hard shells, back eroded with large black spots.

For immediate determination of the correct opening date the figures obtained by grading on the boats in the above classes were used. Number 2 grade crabs only (no No. 3's were taken) were considered soft shell, all other grades being considered hard, being broken down only for biological and other related data. There was a question at the time as to whether or not the No. 2B grade should be called soft shells but for at least 1948 this was decided against. The following table shows the times of fishing the experimental gear and the percentages of soft shells obtained:

AREA	DATE 1948		Percent No. 2's
Coos Bay	Oct. 18	Gear put out.	
	Oct. 23	20 pots pulled, 32 legal males checked.	28.6
	Nov. 5	Turned back at bar.	
	Nov. 8	No gear found.	
	Nov. 9	9 sanded pots found--data not considered true.	
	Nov. 12	No gear found.	
	Nov. 13	37 pots pulled, 328 legal males checked.	3.7
	Nov. 27	Turned back at bar.	
Newport	Nov. 10	Gear put out.	
	Nov. 21	20 pots pulled, 387 legal males checked.	0.0
Astoria	Nov. 24 thru Nov. 28	Attempted to put gear out each day. Turned back at bar.	
	Dec. 3	Gear put out.	
	Dec. 7	Turned back at bar.	
	Dec. 8	18 pots pulled, 301 legal males checked.	27.8
	Dec. 12	Turned back at bar.	
	Dec. 13	Data confirmed but since lost.	12.1
	Dec. 14	11 pots pulled, 72 legal males checked.	9.7
	Dec. 22	10 pots pulled, 97 legal males checked.	9.4
	Jan. 4	23 pots pulled, 102 legal males checked.	6.8

In addition to the foregoing at least the same number of additional trips were made to the respective ports and preparations made for going out without ever leaving the dock. In short, although such sampling can be done in the winter, it involves a tremendous expenditure of time and money even for the minimum amount here listed.

Condition of Crabs--Meat Yield:

All the foregoing grading of crabs was necessarily subjective in nature so it was desired to supplement this with some exact type figures that would guarantee uniform results. Since there is an unquestionable decrease in yield of meat from extremely soft crabs, an attempt was made to investigate the yield for each grade of crab, and for each trip. Accordingly a sample of crabs was brought back to the laboratory, graded, weighed, and cooked (entire sample cooked together).

The first sample from Coos Bay (October 23) was picked for actual meat yield, each crab picked and recorded individually. However, when done on the exact experimental basis required, this method was found to be too time consuming for regular use. As a result the weights of the cooked, backed (cleaned), and drained crabs were adopted instead as a criteria of the amount of meat contained. At this stage there is a minimum of excess water contained which might vary depending upon time, handling, etc., and thus affect the results. With this same idea in mind the width of the crab was accepted as the starting point, or base for comparison, rather than the live weight of the crab. This gives merely a ratio, rather than any sort of percentage but both will show the same trends and comparative figures. (It was shown in Report No. 9, December 1947, that for practical purposes there is a straight-line relationship between width and weight within the average size ranges landed.)

The data for the October 23 Coos Bay sample is presented below to support the method of using cooked-backed weights rather than final picked meat. Weights are in grams, widths in millimeters:

Grade Crabs	<u>Cooked-backed wt.</u> width	<u>Picked meat wt.</u> width	<u>Picked meat wt.</u> <u>Cooked-backed wt.</u>
1-O	2.26	1.13	49.9%
1-N	2.42	1.20	49.4%
2-B	2.55	1.22	48.0%
2	1.96	0.86	43.9%

It will be seen that the first two columns are identical in trend and magnitude. The last column shows they are not exactly equivalent, the picked meat weights decreasing at a faster rate than the cooked-backed weights as the shell condition becomes softer. In short, cooked-backed weights minimize the yield differences slightly but bearing this in mind the procedure is justified.

Since to avoid criticism, etc., it was felt undesirable to take large samples of crabs for cooking and testing, the samples were limited to from two to three dozen crabs each. In samples of this size the results of such weight-width ratios may at times vary considerably due to condition of the crabs with respect to number of appendages missing. A sample of all perfect crabs would of course give a much higher yield figure than the same sample if half the legs were gone. Accordingly it was necessary to derive a correction factor for missing appendages.

Two of the crabs in the first sample (condition 2B and 1N, widths 178 and 158) were weighed and picked by portions, i.e., each portion of each appendage and body was weighed, picked, and recorded individually. The combined results are summarized as follows:

Proportions of Body Portions to Total  
Percent of Total in Yield of Picked Meat

Coos Bay, October 23, 1948

Appendage No. * (Both appendages)	Basal Segment **	Two Remaining ** Distal Segments	Entire Appendages ** (Both)
1	6.7%	11.0%	17.8%
2	9.2%	4.4%	13.6%
3	7.7%	3.2%	10.9%
4	5.6%	1.9%	7.6%
5	3.1%	1.2%	4.3%
Total appendages	32.4%	21.8%	54.2%
Body			<u>45.8%</u>
			100.0%

\*Appendages are numbered from anterior to posterior.

\*\*For a single appendage divide the percentage shown by two (2).

From the above it was then possible to arrive at the following correction factors:

Appendage No.	Correction Factor
* No. 1 small (regenerated)	0.06 (arbitrarily chosen)
1	0.13
2	0.07
3	0.06
4	0.04
5	0.03

\*Correction factor arrived at from results of a single normal crab, since the other as listed in combined table had small, regenerated claws.

Although the foregoing figures are certainly inadequate in numbers and should be rechecked on more specimens, they do permit temporary correction of cooked-backed weights on the basis of missing appendages by use of the formula:

$$\frac{\text{Original Cooked-Backed Wt.}}{1.00 - \text{Sum of correction factors of missing appendages}} = \text{Corrected Cooked-Backed Weight}$$

Each sample of crabs brought back to the lab was therefore handled as follows: They were placed in running sea water for overnight or slightly longer to come back to fresh, normal condition. When taken out they were graded according to shell condition and weighed and measured individually,

each being given a specimen number which was written on the back with pencil to permit identification later. The entire sample was then cooked at once in the same cooking pot. After cooking they were backed and cleaned and allowed to drain on their back for 15 to 20 minutes, after which they were reweighed. The missing appendages, if any, were also recorded for each. These weights were then corrected for missing appendages and the weight-width ratio calculated individually and for each grade.

When the figures were plotted by individual crabs it was found there was considerable variation and overlapping between the various No. 1 condition subgrades. When the group averages were calculated it did appear that there was still a progressive trend towards improved condition as the shell condition became older but in light of the numbers involved and the methods used the trend was not obviously significant and certainly of no practical importance here. Hence, all the No. 1 subgrades (as No. 1-N, No. 1, No. 1-O, etc.) were grouped together, thus leaving three grades of shell condition of importance from the soft-shell meat yield standpoint; No. 2, No. 2-B, and No. 1.

The following table summarizes the results obtained for each grade for each sample taken:

Soft-Shell Grading Ratios--1948  
Cooked-backed vs. width ratios

Area	Date	No. 2	No. 2-B	No. 1	Calculated Load	Total Soft-Shells Percent *
Coos Bay	Oct. 23	2.21	2.62	2.68	2.54	28.6%
	Nov. 13	2.35	2.50	2.67	2.65	3.7%
	Total--Average	2.27	2.57	2.68	----	----
Newport	Nov. 21	----	----	3.20	3.20	0.0%
Astoria	Dec. 8	2.66	2.97	3.12	2.98	27.8%
	Dec. 13	2.87	2.97	3.10	3.06	12.1%
	Dec. 14	2.56	2.94	3.31	3.18	9.7%
	Dec. 22	2.62	2.95	3.18	3.09	9.4%
	Jan. 4	?	?	?	3.08**	6.8%
Total--Average		2.66	2.96	3.18	----	----

\*From immediate field determinations of No. 2 grade.

\*\*Used average Astoria weight ratios.

It will be seen that within each area the ratios obtained for each grade of crab agreed quite closely, thus showing that the subjective grading on the boats was consistent. The figures also show the relative value of the three grades for meat showing the no. 2 grade crabs as graded to be truly poorer crabs that should not be taken. A point worth noting here is that on every trip random samples of crabs were brought to the dock for the various fishermen themselves to examine, demonstrating the grades and method of grading to them. At no time did any fisherman ever complain as to the method or grades, or object to the final figure arrived at.

It will also be seen that the Coos Bay crabs have a lower ratio, grade for grade, than do the northern ones. This of course is not an unusual phenomenon in fish but is one that must be remembered in work of this type. That is, the yield ratios must be referred to their own respective areas and that where a figure of about 3.1 or 3.2 is desired for Astoria or Newport, a figure of about 2.7 is equally good for Coos Bay.

We then have further data to substantiate subjective field grading of the crabs, showing that the crabs were in near optimum condition off Coos Bay and Newport by the middle of November, and by the middle of December had leveled off near the same point at Astoria.

1949 Season to Date:

Although this year's season is just approaching now, a great many fishermen have been contacted as to the presence or absence of soft shells to date, and several inspection trips have been made out of Newport plus one out of Tillamook. Apparently a run of "rubber-legs", or "paper-shells" (crabs getting ready to shed, where the shell has become limber giving much the same feel as a soft-shell) occurred off Coos Bay about in April and May, with a good number also having been found off nearly all other areas since

about the end of May. However only stray soft-shells have been found, less than one or two percent. These inspection trips are continuing on an expanding basis and will permit detection of the soft shells when they occur.

Periodic inspections of the beaches in various spots have also been made to find shed backs which was up following shedding. To date great numbers of female backs have been found but only a very occasional legal male.

Examination of the females found in the crab pots have shown that less than half of these are soft, the other half still having to shed. This is of importance since it was found in British Columbia that the hard shell males fertilize new shell females, thus inferring that the females shed earlier. Our own figures for 1948 definitely bear out this general time differential between the sexes.

Nearly all of the males now have their new shell formed or forming underneath, again showing that the shedding is yet to occur.

#### Summary of Soft-shell Season:

As has been reported earlier what little data was gathered in 1947 indicated the soft-shell season built up to a peak about the middle of August off Newport. No valid data was obtained on hardening up time.

In 1948 the crabs reached a soft-shell peak the first of September off Cascade Head, Newport, and the Umpqua. However by the middle of August one-third were already soft off Tillamook and in a small sport directly around the mouth of Coos Bay. It was the end of September before soft shells were encountered off Astoria. The crabs were hard and in good condition by the middle of November off Coos Bay and Newport. They had leveled off at a nearly hard stage by the middle of December off Astoria.

It is the contention of many of the fishermen that the season last year was later than usual. A possibility of this being correct is shown in the one case where data is available.

Recommendations for Seasons:

As was expected even before its inauguration the present method of setting crab seasons by means of sampling has several disadvantages. The first is cost. As has been seen it cost the Commission \$1,000.00 in direct boat and gear expense plus an estimated five-man months of time valued at at least \$1,000.00 more plus several hundred dollars additional miscellaneous expense (travel-meals, etc.) to set the season in 1948. That of course was set on an absolute minimum amount of data, only four areas having been sampled for closure and only three for opening and in each case it would have been highly preferable to have had more information even within these areas. The program as called for this year if this method is followed will involve from two to three times last year's expenditure. It is true, that considerable other valuable data is obtained in conjunction with the work but this could be obtained much cheaper by other means. In short it is very conservative to say that properly done, it will cost the Commission an absolute minimum of \$5,000.00 a year to set seasons by this method.

A second disadvantage became readily apparent last year when it was found November 13 that the crabs at Coos Bay were ready to be taken but weather conditions prevented any determination of condition at Newport from November 5 until November 21, at which time it was found the crabs were in excellent shape. In short, a two or three week storm coming at an inopportune time could delay declaration of opening by that same amount of time solely because it would be impossible to sample. Since an additional two-week waiting period is called for before fishing may begin it would be conceivably possible that another storm coming at that moment would prevent fishing for a still longer time. Thus to cite an extreme situation there might be a year when fishing was needlessly delayed for as much as a month or month and one-half under this system while under a fixed system of dates the fishermen could have their gear fishing for at least half of that time and could have made two or

three landings in the same time period. Granted that the foregoing is unlikely the fact does remain that some slight hardship probably would occasionally be worked on the fishermen at a time of the year when the income, even though small, means a considerable amount to most.

A final disadvantage is that under the system of sampling, the industry is uncertain as to how to make their plans. The fishermen cannot plan the maximum utilization of their effort due to the question as to exactly when they should have their boats and gear ready to start or as to when they must plan on bringing in their gear with respect to other types of fishing (especially tuna) which they may be carrying out. Plants and dealers do not know exactly how to plan their activities nor when they can expect their supply to start or be cut off. This is really a ~~minor~~ disadvantage since they can estimate fairly close but <sup>it</sup> is a "nuisance" factor.

The major original reason for the system of course was that at time of inception the Commission had no accurate data as to what time a fixed season should have been. It was a method of allowing seasons <sup>even</sup> while this data was being gathered.

The main normal advantage is that the method is flexible and permits setting correct dates every year even if considerable fluctuation should occur in time of crabs shedding.

In relation to the total value of the industry, the expenditures to set seasons by sampling are certainly justified. However, regardless of how valid these expenditures are, when they constitute up to 30 percent of the entire shellfish budget they in turn necessitate cutting out or reducing the work on other important problems, the deletion of which is certainly as undesirable as the continuation of the other is desirable.

It is also highly desirable to continue the sampling procedure to increase our data which is very weak. However, the sampling will continue regardless, i.e., even if fixed seasons are set, they would be checked at regular intervals. If then it was found that they were grossly in error,

corrections could be made. It would be several times easier and cheaper to obtain such information by a substantiating type of checking rather than by sampling for setting seasons where an extreme form of pressure from the industry is one which necessitates continual standing by and attempting to obtain data, regardless of cost or time; on occasion even when there is not one chance in ten or more of obtaining such. At that time of the year the industry will not, and should not, tolerate anything short of an absolute all-out effort when they have well over a million dollars worth of equipment standing by.

The Commission now has some data and is in the process of obtaining more. Further, it is now doubted by the writers (opinion only - based on reports and contacting the fishermen) that any excessive variation occurs in the general time of shedding from year to year. Without question it varies several weeks but it is believed that an average date might be approximated which would at least consistently cover the largest and more important portion of the proper season.

In short, while from a strictly biological standpoint the method of annual determination of soft-shell season by means of sampling should be continued for several more years, when looked at from an overall standpoint of practicability it is felt that fixed seasons not only now could be, but should be, invoked.

#### Recommended Areas and Times of Seasons:

Since, as has been shown earlier, the time of shedding at Tillamook is entirely incompatible with that of Astoria with which it is now grouped, some correction must be made here. It was originally proposed that this be subdivided into a third area. However, due to unusual fishing conditions, this year has seen a large amount of gear (1,500 pots) fished in the Cascade Head-Cape Lookout area by Newport boats from Area II. Such a situation

complicates even the present area regulations. This is especially true when it is remembered that in 1948 the Cascade area was virtually identical with Newport and the Umpqua in time of crab shedding. Last year there was little gear fished there (all out of Tillamook) so it was far outweighed by the amount of gear fishing the softer crabs off Tillamook but such will not be the case this year. A further aspect of a different nature to be remembered is the situation that arose in California this winter when the earlier opening San Francisco area made huge early landings which upset the market by the time the Eureka fishery opened, both areas selling primarily through the same type outlets to the same markets. As a result there has been considerable agitation there toward having the entire state included in only one area, which apparently may be done using the present Eureka area regulations throughout. In any event the developments give support to the contention of some that one should have as few areas as possible. Even now in Oregon there has been some concern expressed by the Newport fleet regarding the effects of time differential between Newport and Tillamook both of which compete with their summer crabs for the same local markets. Their fear is that if either area (referring of course to Tillamook in their case) has a longer summer season than that area would capture more of the better markets due to ability to supply longer.

Going for a moment to the 1948 closing data we see that of all the territory for which data is available south of Tillamook Head was the same in magnitude of time of shedding except the small spot at the mouth of Coos Bay and the larger area off Tillamook from about Cape Mears to Neahkanie. Both of these were earlier in time which fact combined with the distribution of pots off Tillamook being such as to then warrant a third area there. As has been mentioned it is expected that the distribution of pots off Tillamook this year will not warrant as early a closure as should have taken place last year. Hence, the justification for a third area will be reduced correspondingly unless

a small area were set from Cape Mears to Tillamook Head which would be almost unworkable.

However there can be no question whatsoever as to which end of the state the Tillamook area approaches most closely. If anything it should close before the present Area II south of Cascade Head; at the very latest they should close at the same time.

Therefore, reconsidering all facts in the light of present data, again from the standpoint of practicability it is recommended that two areas (I and II) be retained for the State but that the dividing line be shifted from Cascade Head to Tillamook Head.

Such a division admittedly looks peculiar at first glance, having one area at the extreme north about 30 miles in length with one other extending 12 times that distance to the California line. However, the soft-shell data is certainly clear enough to justify such a sharp break in that area. Results of tagging of crabs also supports such a contention. Of all tags recovered from releases north of Tillamook Head in 1947 and 1948 only two percent were recovered south of that 30-mile strip. From about 500 crabs tagged below Tillamook Head there was only one case definitely established where a crab moved across the Head in the other direction. Tagging within the Tillamook area in question showed the possibility that there might be still another population division on the south end of that area. In contrast 1948-1949 tagging off Newport and Coos Bay show the presence of a single stock from the Lincoln Beaches (South of Cascade Head) at least to Cape Blanco. It appears to be merely a case where an interstate political boundary happens to coincide closely but not exactly with the division between two fishery populations, the crabs off Astoria and Seaside being biologically speaking, Washington crabs.

Such a division might bring up some enforcement problems due to the close proximity of two major ports in two different areas but such is felt unavoidable. It is impossible to "compromise" the biological facts any further; any problems that might arise would have to be accepted by the enforcement officers as a serious problem that would have to be solved by them.

In light of the figures already presented and discussed on the occurrences of soft shells the following fixed seasons are recommended:

For Area I, north of Tillamook Head; close September 15,  
open December 15.

For Area II, south of Tillamook Head; close August 15,  
open November 15.

The data on which these are based, especially in Area I, are not complete enough but what the dates might be altered a few days.

In any event checking and sampling is continuing which will increase our available data considerably in even the next few weeks and if necessary will permit closing the areas if the foregoing recommendations are not adopted. However, especially from the standpoint of equalizing the areas, immediate action is again urged.

#### Review of Other Crab Regulations:

The only important ones in question concern the bays, both size limits and seasons. Although work has continued on this the data does not yet justify action. At times the bay situations appear to become more complex by the day but in general it might be said that what information has been gathered, primarily from tagging, indicates the probability that at least large portions of the bay stocks are of the same populations as those offshore. If correct this would show a desirability of identical regulations both in the bays and offshore if looked at from a strictly biological standpoint and disregarding economic and sociological effects. However, this is merely considered a fair indication as yet. A point worth remembering here is that in a previous report (Progress report No. 16, April, 1949) it was calculated

that <sup>the</sup> bay crab fishery constitutes but five percent of the State's total landings. In other words it is really a lesser or minor problem from a biological standpoint although worthy of serious economic consideration.

A specific point likely to be in question however involves the size limit in the Columbia River which last year was raised to the same as that offshore ( $6\frac{1}{2}$  inches across the back) while the rest of the bays were left under the old smaller size limit of six inches across the points. Further investigation while showing more justification for such a regulation here than in the regular bays still reveals a surprisingly large hardship being worked on the river crabbers by means of considerable reduction in catch. This as a result has led to numerous charges of discrimination against the Columbia River fishery. Such arguments it must be admitted have a point. The most important justification for a  $6\frac{1}{4}$ -inch back measurement here is to avoid conflict not only with our own offshore fishery but also with the river fishery of Washington, that state of course having concurrent jurisdiction. It is a matter of delicate interstate relationship which must be considered carefully. However, with the idea of writing from a biological rather than administrative standpoint the following is hesitantly and regretfully recommended: That since further investigation has shown little biological difference between the Columbia River and the other inland bays of the State, insufficient to definitely justify the differential between the fishermen in the areas; the present minimum  $6\frac{1}{4}$ -inch back measurement in the Columbia should be reduced to the same as that applying in the other bays. It is reminded again that what data is available actually indicates that rather than this step it is likely that it will be found that the size limits in the other bays should instead be raised to that of the Columbia, from a solely biological standpoint. However, unless and until such may be done, in an effort to make the regulations fairer to all concerned, the former alternative is recommended.

It was the intent at the meeting last year to make the same type of measurements legal both in the bays and offshore. For unintentional reasons this was not accomplished. Therefore to avoid the considerable confusion existing this opportunity is taken to again recommend the same thing, namely, all measurements to be across the back directly in front of the lateral spines, or points. Many more ratios have been worked out, in magnitude substantiating that presented at the last hearing. Therefore it is recommended the present six-inch across the point measurement wherever effective be changed to read 5 3/4 inches across the back.

Summary:

All information to date relating to soft-shell season and determination of such is summarized and discussed.

The following proposed regulations are recommended on the basis of the above:

1. Fixed seasons are recommended rather than the present method of setting the seasons as they occur by means of sampling.
2. The division line between the present areas I and II should be changed from Cascade Head to Tillamook Head.
3. Area I from Tillamook Head north should close to commercial fishing September 15 and reopen December 15.
4. Area II from Tillamook Head south should close August 15 and reopen November 15.

The following points are also discussed and recommended:

5. The present minimum size limit within the Columbia River which now conforms to that offshore be changed to conform to that in the other bays.

6. The method of measuring minimum size for bay crabs and sports use be changed to conform to that used offshore, measuring across the back in front of the lateral spines, minimum size then being  $5 \frac{3}{4}$  inches.

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