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REPORT OF THE TECHNICAL SUB-COMMITTEE OF THE TRAWL FISHERY COMMITTEE APPOINTED BY THE SECOND CONFERENCE ON COORDINATION OF FISHERIES REGULATIONS BETWEEN CANADA AND THE UNITED STATES

SUBMITTED
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Report of the Technical Sub-Committee of the Trawl Fishery Committee Appointed by the Second Conference on Coordination of Fisheries Regulations Between Canada and the United States

Date: August 29 and 30, 1961

Place: Department of Fisheries, 1110 W. Georgia St., Vancouver, B.C.

Participants:

Canada

K. S. Ketchen (Chairman)
J. A. Thomson
J. C. Stevenson (Observer)

California

E. A. Best

Oregon

S. J. Westrheim
A. R. Morgan

Washington

D. E. Kauffman
E. K. Holmberg

P. M. F. C.

A. Kemmerich (Observer)

The second meeting of the Technical Sub-committee was held to continue the functions of the subcommittee as outlined by the parent committee. The functions are recorded in the minutes of the first meeting. The business of the meeting was guided by a prepared agenda which is included as Appendix A.

The agenda items were discussed, and there were no changes or additions. Following the pattern established by the report of the first meeting, the agenda items are reported in the order given.

1. Holmberg of Washington was appointed to act as secretary.
2. Review of the 1960 - 1961 winter fishery for petrale sole, and a comparison with the 1959 - 1960 fishery

Table 1 was prepared to present these findings in summary form.

California has no winter regulation of the petrale sole fishery. A comparative synopsis of the regulations of the various agencies was appended to the minutes of the first meeting.

Table 1

Landings of petrale sole for all agencies by P.M.F.C. area during the winter season, December to April

Region	PMFC Area No.	Reporting Agency	Landings Dec. 1959 to April, 1960	Landings Dec. 1960 to April, 1961	10-year Ave. Dec-Apr	Depth in fathoms
Morro Bay Santa Barbara	1A	California	326,000	439,000	203,000	145-150
San Francisco Monterey Bay	1B	California	411,000	426,000	525,000	190-210
Eureka to Cape Blanco	1C&2A	California	253,000	490,000	494,000	180-200
C. Oregon	2B	Oregon	26,000	36,000	?	100-
S. Oregon	2B	Oregon	17,000	8,000	?	100+
Cent. Oregon	2C	Oregon	22,000	25,000	?	100-
Cent. Oregon	2C	Oregon	9,000	none	?	100+
Columbia River	2D	Oregon	106,000	128,000	?	100-
Columbia River	2D	Oregon	21,000	9,800	?	100+
Cent. Wash.	3A	Oregon	6,000	1,500	?	100-
Cent. Wash.	3A	Oregon	none	none	?	100+
N. Washington	3B	Oregon	6,500	none	?	100-
N. Washington	3B	Oregon	2,500	none	?	100+
Esteban Deep	3D	Washington	46,000	200,000	?	100+
Other areas	3B-5D	Washington	360,000	600,000	?	all depths
Gulf of Georgia	4B	Canada	1,700	1,000	600	65-
S.W. coast Van. I.	3C	Canada	2,000	9,000	7,300	65-
N.W. coast Van. I.	3D	Canada	2,700	none	5,500	65-
Cape Scott	5A	Canada	100	2,200	4,000	65-
Goose Island	5B	Canada	3,000	3,000	500	65-
N. Hecate Strait	5D	Canada	22,500	24,000	18,100	65-

California

Santa Barbara - Morro Bay area, P.M.F.C. Area 1A: The catch of petrale and the number of boats fishing increased in this area. Landings were 326,000 pounds from December through April of 1959 - 1960. For the same period in 1960 - 1961, 439,000 pounds were landed, which was the best catch on record. The 10-year average is 203,000 pounds. A new fishery on petrale was developed in the summer of 1961, south of Pt. Conception in 100 to 110 fathoms. The winter fishery north of Pt. Conception takes place in 145 to 150 fathoms.

San Francisco - Monterey Bay area, P.M.F.C. Area 1B: Approximately 400,000 pounds of petrale were landed from this area in both winters. The 10-year average here is 525,000 pounds. There is a deep-water fishery (210 fathoms) from November through February in this area.

Eureka area, P.M.F.C. Areas 1C and 2A: Landings of petrale sole increased from 253,000 pounds in the winter of 1959 - 1960, to 490,000 pounds in the same period of 1960 - 1961. The 10-year average is about 494,000 pounds, and the fishery takes place from 180 to 200 fathoms.

Oregon

Southern Oregon area, P.M.F.C. Area 2B: Winter catches of petral sole taken at depths less than 100 fathoms in the south-central Orego area were 26,000 pounds during the 1959 - 1960 season and increased to 36,000 pounds during the 1960 - 1961 season. The catches at depths greater than 100 fathoms decreased from 17,000 pounds during the 1959 - 1960 period to 8,000 pounds during the 1960 - 1961 period. The regulation of the winter fishery was given as the reason for the declining catches from deep water. Total landings for the calendar year 1960 were reported to have increased 600,000 pounds with peak landings occurring in the summer season.

Central Oregon area, P.M.F.C. Area 2C: This is the area extending from Cape Perpetua to Cape Falcon. Shallow water landings (less than 100 fathoms) increased from 22,000 pounds during 1959 - 1960 to 25,000 pounds during 1960 - 1961. Landings of 9,000 pounds were taken from depths greater than 100 fathoms during the winter season of 1959 - 1960, but no landings were made from deep water during the 1960 - 1961 winter period. Petrale landings from greater than 100 fathoms are usually incidental to catches of rockfish or Pacific Ocean perch.

Columbia River area, P.M.F.C. Area 2D: The Oregon fleet is most active within this area, which extends from Cape Falcon to Willapa Bay. Shallow-water landings of petrale sole from this area were 106,000 pounds during the 1959 - 1960 winter period, and were increased to 128,000 pounds during 1960 - 1961. Deep-water landings decreased from 21,000 pounds in 1959 - 1960 to 9,800 pounds in 1960 - 1961.

Central Washington area, P.M.F.C. Area 3A: Petrale sole landings by the Oregon fleet from shallow depths from this area were 6,000 pounds during 1959 - 1960 and 1,500 pounds during 1960 - 1961. No landings were recorded from the Willapa deep area by the Oregon fleet during either season.

Northern Washington area, P.M.F.C. Area 3B: The Oregon fishermen venturing north to the Destruction Island area caught 6,000 pounds of petrale in less than 100 fathoms of water during the 1959 - 1960 winter season. They accounted for 2,500 pounds during March and April of 1960 from depths greater than 100 fathoms. During the 1960 - 1961 period no landings were recorded. Weather and the regulations kept landings down during the 1960 - 1961 winter season.

<u>Washington</u>

The petrale sole landings by the Washington fishermen were presented in slightly different manner from an original agenda which did not specify by P.M.F.C. area and 100 fathom interval. As has been done in the past, the original problem area of Esteban Deep was

separated and compared to landings from all other areas and depths for the December to April period 1959 to 1961. During the winter period of 1959 - 1960 there were 46,000 pounds of petrale landed from Esteban Deep, and 360,000 pounds were landed from all other areas. During the comparable period of 1960 - 1961 about 200,000 pounds were taken off Esteban Deep and 600,000 pounds from other areas. The Washington fleet was tied up for about three months in early 1960 by a price dispute. Although there was a similar dispute in 1961, it was of shorter duration (lasting about a month), and it did not include the entire fleet.

Canada

Gulf of Georgia area, P.M.F.C. Area 4B: During the period December 1959 through April 1960, 1,700 pounds of petrale were landed from the Gulf of Georgia area. Only 1,000 pounds were landed during the comparable period of 1960 - 1961.

Lower West Coast Vancouver Island, P.M.F.C. Area 3C: Landings of petrale sole from this area were 2,000 pounds in winter 1959 - 1960 and 9,000 pounds in 1960 - 1961.

Upper West Coast Vancouver Island, P.M.F.C. Area 3D: Landings of petrale sole from this area were 2,700 pounds in 1959 - 1960 and none in 1960 - 1961.

Cape Scott area, P.M.F.C. Area 5A: Only 100 pounds were taken here in the winter of 1959 - 1960. However, during the 1960 - 1961 period 2,200 pounds of petrale sole were landed.

Goose Island area, P.M.F.C. Area 5B: During the winter of 1959 - 1960, 3,000 pounds of petrale were taken, and a similar poundage was caught by the Canadian fleet in 1960 - 1961.

Upper Hecate Strait area, P.M.F.C. Area 5D: This area produces th most petrale sole landings in the winter period. During 1959 - 1960 22,500 pounds were taken, and during the 1960 - 1961 period the catch increased to 34,000 pounds.

All Canadian catches were made at depths of less than 65 fathoms. Only one fisherman attempted deep-water trawling sometime in 1955 or 1956. The Canadian fishermen presently take no interest in exploiting the deeper waters. Total 1960 landings of petrale sole amount to 980,000 pounds. Of this total 438,000 pounds are landed from the lowe west coast of Vancouver Island.

3. Effectiveness of the Petrale Sole Regulation

California fishery

As pointed out previously in this report, California does not regulate the winter petrale sole fishery. Because of this, there was concern that the California fishermen would exploit the deep-water spawning grounds off south-central Oregon, but these fishermen confine their activities to areas south of Oregon during the winter season.

Oregon fishery

No violations of any great magnitude over the 3,000 pound limit were experienced. There was one landing of 3,200 pounds from deeper than 100 fathoms. Several landings of 2,800 pounds were made. These catches were thought to result from fishermen making single tows on known concentrations of petrale sole prior to returning to port, or in trying to catch exactly 3,000 pounds and exceeding that weight slightly.

Washington fishery

In considering the effectiveness of a regulation, the three aspects of adequacy, necessity, and enforceability should be discusse

The regulation has proven adequate in preventing increased exploitation. But, is this efficiency-limiting type of regulation necessary? A quota regulation would be less objectionable. If the

secondary purpose of the regulation is to divide the catch between Canadian and American fishermen, then let the Canadian's take their quota in summer at shallow depths as is their habit, and let the Americans take their quota in winter in an efficient manner when market demand is best. The present regulation is almost impossible to enforce adequately. Instead of relying upon informers, a patrol boat capable of withstanding winter storms should be maintained on the fishing grounds. The vessels of suspected violators should be boarded and searched. Extra personnel are now used to maintain a 24-hour watch over one landing point. Watching every hoist in the Puget Sound area is impossible.

The eight per cent tolerance limit has encouraged over-limit catches and should be replaced by the 3,000 pound limit.

The percentage tolerance requires a patrol officer to obtain the weight of the entire boat load of fish and not simply the weight of the petrale sole. The intent of the tolerance was to allow fishermen to keep the incidentally caught petrale in areas other than the spawning grounds, thus preventing wastage. In practice, fishermen proceed to the spawning grounds, catch what they estimate is eight per cent of their potential boat capacity, and then fish for other food species to fill the other 92 per cent of their hold's space. As stated, the 3,000 pound limit would be retained as would the two trip per month limit.

We would also propose shortening of the closed period by one month at the end of the period. The closed period would extend from December 20 to March 15 of the next year, rather than April 15, as it is now. This would allow fishing for petrale sole during a part of the lenten period when demand for fresh fish is greatest. During March, 1957, about 200,000 pounds of petrale sole were landed, but conceivably 500,000 pounds could be taken with favorable weather. Allowing petrale sole fishing at this time would lessen the rationalization for circumventing the regulation.

Canada fishery

Violations of the regulation by Canadian fishermen is practically nil. The fishery during the closed period takes place at depths less than 65 fathoms where the catch of petrale sole is incidental to other species. Essentially, the Hecate Strait petrale fishery takes place during December. Any violations, if they exist, are minor

In summary, the chairman pointed out that petrale sole stocks were in decline prior to the heavy exploitation in the deep fishery. The regulation was designed to prevent further decline of the inshore fishery which has leveled out since enactment of the regulation. The regulation, now apparently effective in preventing over-exploitation, could lose effectiveness by inadequate enforcement and inadequate biological knowledge.

4. Up-to-date reports on results of petrale sole taggings.
These data are summarized in Appendix B, Table 1

California

1960 - winter tagging off San Francisco in 165-210 fathoms. A total of 2,300 petrale was tagged. To date, there have been 24 recoveries for approximately one per cent. The tagging actually took place during November and December off Halfmoon Bay, which is about 20 miles south of San Francisco. Two groups of petrale were discovere one group was composed of about 90 per cent small males, and the secon group was more mixed in composition with only 40 per cent small males. Four returns were made in December from the area of tagging. The one return during January also was taken in the same area. During March, one recovery was made from the tagging area and four were taken inshor off Pt. Montara in 70-90 fathoms. Another was taken here in April. Two recoveries were made during June near S. F. lightship. One tagged fish was caught in July off Pt. Reyes in 40 fathoms. Migrations of 1-2 miles per day into shallow water were indicated. Other tag

recoveries were made from the San Francisco area. Although one tagged fish was taken in May off Santa Cruz in 45 fathoms, about 30 miles to the south, the main pattern of migration was northward and inshore during the summer. Tag recoveries tend to follow the seasonal fishing pattern. Fishing is conducted north and south of the tagging area.

1958 - Eureka tagging. This experiment was conducted in shallow water (30-40 fathoms) during November and December along with English sole. There were 876 petrale sole tagged and 135 tags have been returned. Twenty tags have been returned since the meeting in September 1960. In January, 1961, four tags were recovered after the fish had been at liberty three years. These were returned from the spawning grounds south of Eureka in 150 to 180 fathoms. During March, one tag was returned from the Eureka area, one was returned from the Coos Bay area, and one was returned from off the Washington coast. No returns have come from the areas south of Cape Mendocino. The rate of migration from the tagging area to the deep water area has been as much as four miles per day. Total out-of-state returns include eight taken off Oregon, two off Washington, and one off British Columbia.

Oregon

1959 - Cape Lookout tagging. Tagging was conducted from the United States Fish and Wildlife Service vessel "John N. Cobb" during April in less than 70 fathoms in this north central Oregon area. There were 550 petrale sole tagged, and of these, 92 tags have been recovered. During 1959 the following tags were returned: 2 from south-central Oregon, 8 from north-central Oregon, 4 from the Columbia River area, 1 from central Washington, and 3 from northern Washington. During 1960 the following tags were returned: 4 from south-central Oregon, 18 from the tagging area (north-central Oregon), 15 from off the Columbia River, 2 from off central Washington, and 4 from off northern Washington. During 1961, the following tags were returned:

3 from 180-220 fathoms off the Eureka area, 4 from south-central Oregon, 13 from north-central Oregon, 10 from off the Columbia River, 2 from central Washington, and 2 from off the northern coast of Washington.

1960 - Heceta Bank tagging. The trawler "Betty" was chartered by Oregon for this experiment. The tagging was conducted in two phases: the deep-water phase was conducted during February, from 170 to 200 fathoms; the shallow-water phase was pursued during March from 80 to 100 fathoms. For clarity, these will be given separately.

Greater than 170 fathoms. In this phase of the experiment 3,118 petrale sole were tagged. One tag was returned from the Eureka area, one was returned from the southern Oregon area, four came from the north-central Oregon area, four came from the area off the Columbia River, three were recaptured off northern Washington, three came from the area off the lower west coast of Vancouver Island, and two were returned from the upper west coast of Vancouver Island. During 1961 the following tags were returned from the deep-water experiment: three from south-central Oregon, one from north-central Oregon, three from off the Columbia River, eight from off northern Washington, and only one from lower Vancouver Island. The trend of returns from the deep-water phase has been generally northward and to inshore waters.

Less than 100 fathoms. Of the 1,908 petrale sole tagged in the relatively shallow water phase, 143 tags have been returned. During 1960 the following tags were returned: one recovery was made to the south in the Eureka area, 95 were returned from south-central Oregon (the tagging area), 22 came from north central Oregon, 4 from the Columbia River area, and 2 from northern Washington. During 1961, 14 tags were returned from north central Oregon and five from off the Columbia River. None were returned from south of central Oregon or north of the Columbia River. The trend of recoveries from the shallow water tagging experiment has been to the northward and to inshore grounds.

Washington

1960 - Cape Flattery Spit. While aboard the United States Fish and Wildlife Service "John N. Cobb" 174 petrale sole were tagged in a new fishing area (67-75 fathoms) discovered by the crew of the "John N Cobb". Forty-five of these tags have been returned. During 1960, thirteen tagged fish were recaptured on the tagging area, one was taken on 40-mile bank (lower west coast Vancouver Island), and three were taken inshore off the northern Washington coast. During 1961, eleven tags were returned from the tagging area, seven were returned from 40-mile bank, two fish migrated inshore, and one tag was returned from off the Umpqua River (south central Oregon). The area of recovery was undetermined for seven of the returned tags. While most of the tags were recovered at the area of tagging, there was a tendency of some fish to migrate northward and inshore.

1961 - Swiftsure. As a guest aboard the Canadian research vessel "A. P. Knight," 33 petrale sole were tagged at the Swiftsure area, which is included in the rather broad P.M.F.C. area and is called the lower west coast of Vancouver Island. Four tags have subsequently been returned. Two were returned from the Swiftsure area, one fish migrated offshore to the Cape Flattery Spit (the Cobb spot), and the recovery information was lacking for one tag.

Canada

1960 - Cape Scott. A Canadian research vessel was employed to tag 731 petrale sole in this area during June and July of 1960. To date, 76 tags have been recovered. Thirty-seven of these recoveries were made by Canadian fishermen. The remainder were returned by American fishermen. One tagged fish was recaptured by an Oregon fisherman. Two tags were returned from off the Washington coast. Four tags came from the upper west coast of Vancouver Island; three of these were taken from the Esteban deep area. Most (57) tags were returned from the area of tagging (Cape Scott). Four recoveries were made at the nearby Goose Island area. Two tags were returned from lower Hecate Strait, and but one tag was returned from Upper Hecate Strait.

In the ensuing discussion the original Esteban tagging of 1954 - 1955 was partially reviewed. This was a cooperative experiment with Canadian and Washington scientists taking part. A total of 3,802 was tagged, and 223 were recovered. Tagging was done during March and April at depths of over 100 fathoms. Returns from the tagging area totaled 112. Nine tagged fish were recaptured inshore on the Sydney Inlet grounds. Another 47 were taken inshore near Esteban at less tha 100 fathoms. Nine tags were returned from off the lower west coast of Vancouver Island. Northward migrations were indicated by recoveries from Cape Scott (34 tags), eight from Goose Island grounds, three from lower Hecate Strait, and one from Upper Hecate Strait.

Summary

Until the recent results from the Oregon experiments, Ketchen in his forthcoming paper on petrale sole was prepared to conclude that the United States experiments indicated no contribution of fish to the petrale stocks off the coast of Canada. The shallow water (less than 100 fathoms) studies bear out this conclusion. Oregon's deep water tagging indicated negligible influx of fish to the inshore Canadian grounds. A division in the petrale sole stocks is indicated along a line drawn southwest from the Strait of Juan de Fuca, but experimentation off the Washington coast has been inadequate. It is debatab whether results would be adequate with the restricted winter fishery. The experiments are dependent upon fishing activities to recover tagge fish. No sampling is obtained in areas where the fishery does not operate. The fact that returns from the areas of tagging account for almost as many recoveries as found elsewhere indicated the existence of individual populations of petrale with occasional migrants.

The disadvantages of the winter regulation were enumerated. One, the low numbers of total tag returns indicates a low rate of fishing mortality. Two, regulation of petrale sole possibly interfere with effective production of Dover sole and other species. Three, there is little to indicate that large removals of stocks from the

spawning grounds immediately affects stocks on inshore grounds. Four, there are other limiting factors; such as: present regulation could cause discard and, therefore, wastage of fish; inaccurate statistics caused by unreported landings of fish. Five, without a fishery, the discovery of new deep water spawning populations is impossible.

The possibility of tagging fish on the A.E.C. trips was discussed. Oregon plans to proceed with trips and a contract has been proposed. Washington has not planned to make the trips.

The relative value of petrale sole landings when compared to the value of all other bottom fish was discussed, and it was found to be about 10 per cent in value to the fishermen practically coastwide.

5. Review of Petrale Sole Catch and Catch per Unit of Effort Trends

California

Santa Barbara-Morro Bay area. A fishery is now developing in this area. Fishing effort is increasing and catch per unit of effort is increasing.

San Francisco-Monterey area. Prior to 1945 catches were relative constant. There was a decline in 1946, but in 1948 the catch effort increased. It will be noted that 1948 was a good year for petrale sole fishing almost coastwide. Central California catch then declined until a low of 34 pounds per hour was reached in 1952. Then catch/effort improved until it reached 128 pounds per hour in 1957. The catch per hour has ranged around 100-115 pounds through 1960.

Northern California area. Records start with 1946 with catch/effort at 76 pounds per hour. Catches and catch/effort increased through 1948 when catch/effort was 130 pounds per hour. A decline occurred until 1951 when only 50 pounds per hour were caught. Catches increased gradually through 1958 with catch/effort reaching 271 pounds per hour. Catches were down again through 1960 when catch

per effort was 119 lbs./hour. Age determination studies undertaken during 1960 showed large contributions to the catch from the 1949 and 1950 year classes. These may account for the above-average catch rates during 1958.

Oregon

Central Oregon area. Catch per effort studies are not complete for this area because data have been obtained only from Astoria trawlers which travel to the grounds south of Astoria. In recent years, only a few landings have been made. Catch trends from 1957 to 1960 were downward. During 1957, significant catches (those of greater than 29 per cent petrale sole) were 13,000 pounds per landing while during 1960 these had declined to 6,000 pounds per landing.

Columbia River area. Significant catches averaged 7,000 pounds per landing during 1960, which is the best on record. The catch per significant landing during 1954 was 6,200 pounds per hour. There was a decline to 1,900 pounds per landing in 1958, and an increase to 2,700 pounds per landing during 1959. The increase in later years possibly stems from the fishermen not being limited in the number of landings of petrale they can make per month.

Willapa area. Weather limits the fleets' activities to the northward, but in general, as good or better landings have been made from the Willapa area as from the Columbia River area.

The total petrale sole landings for the 1960 calendar year were given as follows:

N. Central Oregon (P.M.F.C. Area 2C)	494,000 pounds
Columbia River area (P.M.F.C. Area 2D)	766,000 pounds
Central Washington (P.M.F.C. Area 3A)	170,000 pounds
N. Washington (P.M.F.C. Area 3B)	50,500 pounds
L.W. coast Van. Isl. (P.M.F.C. Area 3C)	4,500 pounds
U.W. coast Van. Isl. (P.M.F.C. Area 3D)	6,000 pounds

Washington

Washington trawlers landed nearly 2.5 million pounds of petrale sole during 1960. About 3 million pounds were landed during 1959. This is almost equal to the 6-year average annual landings for this species. Fishing effort was about equal in both years, 16,300 hours, which is about 800 hours below the 6-year average. The catch per hour of fishing was down to 151 from 187 pounds per hour in 1959. The 6-year average is 177 pounds per hour from all areas. Washington data are divided north and south of Esteban at the 100 fathom line.

The northern area from Esteban greater than 100 fathoms northward through Hecate Strait accounted for the decreased poundage in 1960. Effort in this area declined 1,700 hours, but catch per effort had also declined during 1960. Landings from the northern Canada area were 940,000 pounds during 1959 and 430,000 pounds during 1960, with the 6-year average of 1,580,000 pounds. Effort was 5,400 hours of fishing in 1959, 3,700 hours during 1960, and averaged 7,100 hours per year for six years. Catch per hour was 173 pounds per hour in 1959, 116 pounds/hour in 1960, with 220 pounds/hour as the 6-year average. Fishermen are showing decreased interest in petrale sole fishing in the Hecate Strait area where all three measures have declined. Only the Goose Island grounds show promise. The 35,000 pounds taken here in 1959 was increased to 62,000 pounds during 1960. This is still below the 88,000 pound average. Effort at Goose Island decreased slightly from 460 to 450 hours from 1959 to 1960, but catch/effort almost doubled: 76 to 138 pounds/hour. The average is 120 pounds/hour. Fishermen also reported that there were many small petrale in the Goose Island area. Catch/effort increased slightly in the Cape Scott area from 112 to 121 pounds/hour. The average catch/effort here is 162 pounds/hour. All other northern areas were below average.

The southern area from Esteban less than 100 fathoms southward produced about equal catches in the last two years with a slight

increase in effort and with a slight decline in catch per hour of fishing. However, fishing off the southwest of Vancouver Island was poorer, and the fishing off Washington improved.

For the area from Esteban-shallow to Swiftsure, catches declined about 500,000 pounds from 1.7 to 1.2 million pounds in the two years, 1959 and 1960. Effort decreased from 4,700 hours of fishing during 1959 to 4,600 hours in 1960. Catch per hour declined from 370 pounds/hour in 1959 to 260 pounds/hour in 1960. Except for the latter figure these measures are all above the 6-year average of about a one million pound average catch, 3,100 hours of fishing, and a fishing success rat of 310 pounds per hour. American fishermen have experienced a 30 per cent decline in fishing success in this area from 1959 to 1960.

The Washington coast petrale sole fishing was improved partially as a result of an apparently new stock discovered by the Fish and Wild life Service. Catch data on the new area were included in the Washing coastal data. Catches increased from 320,000 pounds in 1959 to 840,00 pounds in 1960. The 6-year average is 450,000 pounds. Effort increased from 6,000 fishing hours in 1959 to 8,000 hours during 1960 with the average for six years at 6,800 hours. Catch per hour normally about 66 pounds per hour, increased from 54 to 105 pounds per hour.

Canada

Canadian catch statistics are based upon all petrale sole landings by a standard tonnage class fishing vessel, 10-49 ton single gear vessels. Total fishing hours are used for each trip.

The lower west coast of Vancouver Island has experienced a decline in the catch per effort for petrale sole. During 1959, the fishing rate was 121 pounds per hour. This declined to 98 pounds per hour during 1960. Historically, the rate of fishing declined 45 pounds/hour in 1945, increased to 250 pounds/hour in 1948, declined again to 30 pounds/hour in 1956, increased to 140 pounds/hour in 1959, and, as above, declined to 98 pounds/hour in 1960. The 1959 to 1960 decline

amounts to approximately 18 per cent which is much less severe than the 30 per cent decline felt by American fishermen here. Canadian landings for some of the years quoted above were: 77,000 pounds for 1956, 105,000 pounds for 1959, 79,000 pounds in 1960, and 197,000 pounds from January to July of 1961.

For the area north of Esteban, there was a small catch in 1943. The fishery quickly gained momentum, and in 1948 there were 10 million pounds landed at 900 pounds/hour. Catch per unit gradually declined to a low of 50 pounds/hour during 1956. There was a quick revival to 160 pounds/hour in 1957 and then a decline to 115 pounds/hour in 1960. Smaller areas within the larger group show a similar pattern, which is typically an early increase in catch per effort with a subsequent decline.

The age and analyses on petrale sole, as these pertain to the catch per effort data, were reviewed. Catch per unit of effort declined and then increased as 3 or 4 numerically strong year-classes entered the fishery. The 1940 to 1943 year-classes were comparatively large in number. Catch per unit of effort has declined as the following year-classes contained less individuals. The 1957 year-class of petrale produced by the survival of the 3.5 million pound catch removed from Esteban Deep should appear in the 1961 catch as three-year-olds. According to Ketchens' analysis the recruitment was increasing from broods prior to the Esteban Deep fishery. Environmental effects show a high correlation with subsequent year-class strength. During 1958 environmental conditions were favorable for strong year-class production, and an abundant survival from this year-class is anticipated.

6. Unresolved Problems in Coordination of Catch Statistics

California had shifted the southern boundary of the Eureka area from Point Arena to Cape Mendocino.

Washington had revised the sub-areas to such an extent that the boundaries no longer agreed with P.M.F.C. area boundaries. These were discussed and compromised where necessary.

7. Coordination of Effort Statistics

The problem of coordination of effort data is that some agencies are unable to record hours of fishing by area by species. Gear efficiency or fishermen efficiency among fleets must be studied. The minimum of data that could be exchanged would be the total fishing hours per area on an annual basis.

California has the 1960 data in total hours by area by depth but not by species. Oregon has total hours per month by area since 1958. The data are broken at 90 fathoms. Washington has total hours by month by area by species since 1955. Canada has total hours by gear class by month by P.M.F.C. area since 1954. It was concluded that we must proceed to achieve uniformity as best we can.

8. Publication of P.M.F.C. Statistics

Most agencies have or can obtain trawl catches in pounds by area by species by month. It would be an advantage to have these data published under one cover for reference by any and all agencies. Although monies are scarce for publication at this time, it was thought advisable to assemble this material for ready publication when monies are available.

After lengthy discussion it was agreed that the Fisheries Research Board of Canada would supply each agency with printed statistical forms which are to be filled out by the individual agency. The exchange will start with 1960 data. The completed forms will be sent to Fisheries Research Board for compilation which will be sent to P.M.F.C. for filing to be available for reference. Animal food will be given by percentage of a listed species. Poundage will be rounded to nearest 500 pound interval. Data will be on a monthly basis.

9. Current Views Regarding Mesh Regulation and Minimum Size Limits

Mesh Regulations

Canada has instigated a 4½ inch minimum mesh size limit within the Gulf of Georgia. The regulation is to be effective September 1, 1962 There is evidence that greater yield will be gained by use of larger mesh. The dogfish shark are localized in inside waters, and therefor fishermen can avoid them. Ocean waters have not been considered because of dogfish problem that exists there. Biological basis as affecting yield has not been studied for the outside waters where a 4-inch regulation is in effect.

The new regulation is unique in that it specifies measurement to be made wet and in use, and also in that different mesh sizes are specified for the different materials used in trawl nets. (See Appendix C)

The new regulation should decrease the amounts of small fish that currently go into the mink food landings.

Washington has a 3½ inch minimum size mesh regulation, but must investigate all ramifications of the problems involved if the minimum mesh size is to be increased. Many small fish are being destroyed with present practices, and it remains to be seen how stocks are affected.

Oregon The 4½ inches single and 5 inches double mesh regulation is in effect. About a third of the fleet is fishing for mink food, and a high percentage of small fish are being landed. Oregon may be asked by fishermen to reduce mesh size in main net but keep cod-end 4½ inches.

California The current 4½ inch single or double mesh regulation is satisfactory.

Minimum length regulations

Washington has observed many less than three pound lingcod in the landings. It is felt that an increased yield would be gained by the protection of small fish as was shown in the Canadian experiments.

Oregon adopted minimum length regulations during 1959 to augment the mesh regulations in the protection of small sole. Much sampling has been done at sea to set tolerances on the minimum size restriction. Many English sole are taken in mink-food fishing, and there appears to be an average of more than 100 fish per load which measure less than the 11-inch minimum allowable size. This figure could be adopted as a tolerance limit for Dover sole, but appears to be too low for Englis and petrale sole.

10. Discussion of the Russo-Japanese Fishery in the Eastern Bering Sea and the Current (I.P.H.C.) program of Exploration in the Gulf of Alaska

The Russo-Japanese activities were reviewed.

The Japanese agreed to stay north of the Aleutian Islands this year. Japanese catches in the eastern Bering Sea have been:

1954 - 27 million pounds

1955 - 22 million pounds

1956 - 53 million pounds

1957 - 53 million pounds

1958 -103 million pounds

1959 -356 million pounds

1960 -977 million pounds

In 1960 the combined Russian-Japanese catches in the Eastern Bering Sea totaled over a billion pounds of bottomfish. The Russian commercial fishing fleets have not gone south of the islands, but they have expressed a desire to do so. Russian experimental fishing was conducted on rockfish stocks south of Kodiak Island in 1960.

The Halibut commission is carrying on exploratory trawling in the Gulf of Alaska and with reportedly good success. Three trawlers were chartered for a year, and much biological information is being collec for future reference along with the fishing results.

Canadians estimate that on the basis of relative area the Gulf of Alaska should produce from 350 to 400 million pounds of bottomfish annually.

11. General Review of Current Research by Each Agency

California

1. Market samples are being collected at San Francisco and Eureka. Material is being collected for age analysis of Dover, English, and Petrale soles.

2. The logbook system of collecting catch and effort data is being continued.

3. The mink-food landings are being sampled for species composition. Spot checks on mink food landings are made to the south (Monterey to Santa Barbara).

4. Petrale sole were tagged off San Francisco.

5. Phillips is studying rockfish biology, age, and fecundity.

The California staff includes 5 people: a biologist and an assistant at Eureka, two biologists at Stanford, and one at Monterey.

Oregon

1. The logbook and interview system continues.

2. Market sampling for Dover and petrale is being conducted for size, age, and sex composition. The transition is being made from otoliths to scales for Dover age determinations.

3. Sampling is being carried on at sea to determine catch composition and the discard of small fish.

4. Tag recovery information is being kept current. Some Dover sole are still being returned from the Willapa tagging done in 1955. Tags are also being returned from the 1959 English and petrale tagging off Cape Lookout, the 1960 petrale tagging, and the 1961 Dover tagging off Stonewall Bank and the Columbia River. Additional Dover tagging may be done off the Columbia River in cooperation with the U. S. Fish and Wildlife Service.

5. Sampling of mink food species composition has been discontinued but estimates of the species composition are being made.

The staff consists of 2½ full time biologists and 2 summer helpers.

Washington

1. The interview program is being continued.

2. Market sampling for species composition of rockfish and ocean perch landings.

3. Some samples being collected for size, age, and sex of petrale, English, lingcod and Pacific cod.

4. Tag recovery records kept of lingcod and petrale experiments.

Staff consists of 2 biologists and 2 part time biologists that act as port observers at Bellingham and Westport.

Canada

1. The interviewing and sampling programs are being maintained on petrale, English, rock sole, Pacific cod, and lingcod. A new sampling program has been started on ocean perch.

2. Age studies continuing on English, petrale and rock soles. Studies on Pacific cod consist of length composition, size at maturity, and fecundity.

3. Field operations consisted of the following tagging trips.

1960 Pacific cod in Hecate Strait (1,200) fish tagged with darts and spaghetti. Migration was mostly northward.

1961 Pacific cod in Hecate Strait (1,000) fish. Results similar to above.

1961 Pacific cod at Firing Range 2 trips 1,000 fish. Recoveries differed oddly between experiments. Most returns from tagging area.

1958-1959 Rocksole Hecate Strait two per cent returns from each year.

1960 Rocksole Cape Scott 1,800 tagged 7.5 per cent returned thus far. No migration is indicated.

4. Canada has a paper on Pacific cod to be published this winter. In the population dynamics study an instantaneous natural mortality rate of 1.0 was found indicating a 50 per cent mortality rate per annum which is surprisingly high, may actually prove to be an underestimation. Fecundity was found to be 5 to 9 million eggs per female with fish measuring 49 to 80 centimeters in length included in the study. Fifty per cent of the cod were found to be mature at 55 centimeters in length.

The trawl staff consists of five persons and two seasonal helpers. One permanent port observer is stationed at Vancouver, and one part time observer works at Prince Rupert when landings are expected there.

12. Research Plans for 1962

California

1. Continue routine sampling and statistics.
2. A tagging cruise is planned to tag Dover and petrale soles near the Oregon-California border both deep and shallow relatively. They will get as far north as Mack Arch rocks vicinity. They will tag with knotted spaghetti.
3. Some work may be required on California halibut such as catch record data.
4. Species composition of rockfish landings are to be determined

Oregon

1. Routine sampling and statistics will be continued.
2. A tagging trip is planned to deep water off the Columbia River in conjunction with United States Fish and Wildlife Service "Commando" trip.
3. Work begun on species composition of rockfish catch, i.e. ratio and identity of red and black rockfish.
4. Length-weight and age studies begun on rex sole and will continue.

Washington

1. Continue routine interview and sampling programs. Hope to start age analysis of ocean perch catches if species complex can be settled.

Canada

1. Major effort will be concentrated on analysis of material already collected.
2. Field work will be designed to complete missing data needed to analyze past studies.

3. Pursuant to item 2 above, two cruises are planned to international waters off the west coast of Vancouver Island. One is planned during the summer of 1962 to systematically survey for larval petrale sole with small-mesh trawls. Another cruise is planned during September and October of 1962 to tag petrale sole. The purpose is to discover the identity of the southern petrale stocks.

4. A winter trip is planned to discover the spawning grounds of the rock sole. Rock sole eggs are thought to be adhesive and demersal

5. The fecundity of Pacific cod will be studied further to discover any difference in the southern stocks found in inside and outside waters.

6. The analysis of gear-class efficiency will be completed.

7. The new 177 foot vessel will be completed in the winter of 1962-1963 and will be taken on a shake-down cruise. The vessel will be used to explore fishing areas and species not before studied. Two additional biologists and 4 or 5 technicians will be required to accomplish the added work to be done by the vessel.

13. Recommendations

The sub-committee has a number of recommendations to make to the parent committee:

(1) It is recommended that the winter closed period on petrale sole fishing, which heretofore has extended from December 20 to April 15 of the secceeding calendar year, be changed to January 1 to March 31, inclusive.

This proposal does not alter appreciably the intent of the original regulation. Negligible fishing occurs between December 20 and 31, and continued closure beyond March 31 serves little purpose since by that time of year the majority of fish have completed spawning.

Studies are underway to determine the effect of this regulation. Evaluation is likely to require several more years.

(2) Regarding tolerance limits on petrale sole landings during the closed season, the sub-committee recommends that regulations involving Washington vessels be modified to exclude the percentage (8%) tolerance.

This proposal is made in the interest of improving the effectiveness of enforcement and restoring some uniformity to the regulations along the coast. It means that in all areas involved (Oregon, Washington and British Columbia) a uniform tolerance of 3,000 pounds of petrale sole per trip will prevail. The two-trip limit per boat per month should remain in force in Washington and British Columbia. This requirement (by previous consent of the committee) no longer applies in Oregon.

(3) While the sub-committee commends the current research programs of the various agencies involved, it recognizes that certain avenues of investigation require expansion if a sound basis for management of the trawl fisheries is to be achieved. It is vital that more information be obtained on the geographical limits of stocks and on the rates of growth and mortality of the major species involved.

Of particular concern is the definition of petrale sole stocks off the Washington and southern British Columbia coasts; the extent of intermingling of English sole and true cod between Washington and British Columbia territorial waters; the accurate identification of Sebastodes species now collectively referred to as "ocean perch."

(4) The sub-committee notes with satisfaction recent progress in the coordination and compilation of catch statistics for the North American trawl fishery. It recommends that this work be continued and expanded to include statistics of fishing effort. This basic information would be of considerable value in interpreting the results of recent taggings. Early publication of catch statistics is recommended.

(5) The sub-committee views with concern the impending developme of foreign (Soviet and Japanese) trawl fisheries in the nort eastern Pacific Ocean and therefore recommends that Canada a the United States take early action (a) to conduct a thorough assessment of the demersal fish resources in areas not now fished by North American nationals and (b) to fill important gaps in knowledge of species which are now fished and which may soon become exposed to the added pressure of foreign fishing.

Demersal fish stocks are of such complexity that they do not submit, in more than a superficial way, to so-called crash programs of investigation. To cope effectively with the dynamic features of these stocks, the sub-committee stresses the importance of long-term, continuing research, as the only way of providing a sound basis for management and/or negotiation at the internation(trans-Pacific) level.

14. Appendices

Appendix A

Agenda

Second Meeting of the Scientific Sub-Committee of the International Trawl Fishery Committee

Date: August 29-30, 1961
Place: Vancouver, B.C.

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1. Appointment of secretary
2. Review of the 1960-1961 winter fishery for petrale sole
3. Effectiveness of the petrale sole regulation
4. Up-to-date reports on results of petrale sole taggings
5. Review of petrale sole catch and catch/effort trends
6. Unresolved problems in coordination of catch statistics
7. Coordination of effort statistics
8. Publication of P.M.F.C. statistics
9. Current views regarding mesh regulations and minimum size limits
10. Discussion of the Russo-Japanese trawl fishery in the easte Bering Sea and the current (I.P.H.C.) program of exploratio in the Gulf of Alaska
11. General review of current research by each agency
12. Research plans for 1962
13. Recommendations to the parent Committee
14. Other business

Summary of the Petrale Sole Tagging Experimental Results by All Agencies in Recent Years

YEAR	AGENCY AND TAGGING DATA	NUMBER RETURNED	MONTH/ YEAR RETURNED	AREA RETURNED	PMFC AREA	DEPTH RETURNED
1960	California	4	12/60	Off Halfmoon	1B	165-210
	2300	1	1/61	Off Halfmoon	1B	165-210
	tagged	1	3/61	Off Halfmoon	1B	165-210
	Nov.-Dec.,	4	3/61	Off Halfmoon	1B	70- 90
	1960	1	4/61	Pt. Montara	1B	70-90
	off	2	6/61	S.F.Lightship	1B	30
	Halfmoon	1	7/61	Pt. Reyes	1B	40
	Bay 1B	1	5/61	Santa Cruz	1B	45
	165-210	9	various	S.F.Market rcvrys.		--
	fathoms.	24 Tags Returned				
1958	California	80	1959	N. Calif.	1C	40-180
	876	3	1959	S. Oregon	2A	40-50
	tagged	3	1959	S.C. Oregon	2B	50-70
	Nov.-Dec.,	1	1959	N.C. Oregon	2C	40
	1958	1	1959	L.W.Cst. Van.I.	3C	?
	off	13	1959	Market revrys.		--
	Eureka 1C	10	1960	N. Calif.	1C	40-180
	30-40	1	1960	Columbia R.	2D	18
	fathoms.	7	1960	Market rcvrys.		--
		10	1961	N. Calif.	1C	30-180
		1	1961	S.C. Oregon	2B	?
		1	1961	Washington	3A-3B	?
		4	1961	Market rcvrys.		--
		135 Tags Returned				
1959	Oregon	2	1959	S. C. Oregon	2B	?
	550	8	1959	N. C. Oregon	2C	?
	tagged	4	1959	Columbia R.	2D	?
	April,	1	1959	C. Washington	3A	?
	1959	3	1959	N. Washington	3B	?
	North	4	1960	S. C. Oregon	2B	?
	Central	18	1960	N.C. Oregon	2C	?
	Oregon	15	1960	Columbia R.	2D	?
	(Cape	2	1960	C. Washington	3A	?
	Lookout)	4	1960	N. Washington	3B	?
	less than	3	Jan.,1961	Eureka	1C	180-220
	70fms.	4	1961	S. C. Oregon	2B	?
		13	1961	N. C. Oregon	2C	?

(Continued)

YEAR	AGENCY AND TAGGING DATA	NUMBER RETURNED	MONTH/ YEAR RETURNED	AREA RETURNED	PMFC AREA	DEPTH RETURNED
1959	Oregon (cont.)	10	1961	Columbia R.	2D	?
		2	1961	C. Washington	3A	?
		2	1961	N. Washington	3B	?
		95 Tags Returned				
1960	Oregon 3118 tagged February, 1960 S. C. Oregon 2B (Heceta Bank) Less Than 170fms.	1	1960	Eureka	1C	?
		1	1960	S. Oregon	2A	?
		4	1960	S.C. Oregon	2B	?
		4	1960	N.C. Oregon	2C	?
		4	1960	Columbia R.	2D	?
		3	1960	N. Washington	3B	?
		3	1960	L.W.Cst. Van.I.	3C	?
		2	1960	U.W. Cst.Van.I.	3D	?
		3	1961	S. C. Oregon	2B	?
		1	1961	N. C. Oregon	2C	?
		3	1961	Columbia R.	2D	?
		8	1961	N. Washington	3B	?
		1	1961	L.W.Cst. Van.I.	3C	?
		38 Tags Returned				
1960	Oregon 1908 tagged March, 1960 S.C. Oregon 2B less than 100fms.	1	1960	Eureka	1C	?
		95	1960	S. C. Oregon	2B	?
		22	1960	N. C. Oregon	2C	?
		4	1960	Columbia R.	2D	?
		2	1960	N. Washington	3B	?
		19	1961	S. C. Oregon	2B	?
		14	1961	N. C. Oregon	2C	?
		5	1961	Columbia R.	2D	?
		162 Tags Returned				
1960	Washington 174 tagged May,1960 N. Wash. 3B Cape Flattery Spit 70fms.	16	1960	N. Washington	3B	60-70
		1	1960	L.W.Cst. Van.I.	3C	40
		13	1961	N. Washington	3B	60-70
		7	1961	L.W.Cst. Van.I.	3C	40
		1	1961	S. C. Oregon	2B	?
		7	60&61	Market rcvrys.	--	---
		45 Tags Returned				

(Continued)

YEAR	AGENCY AND TAGGING DATA	NUMBER RETURNED	MONTH/ YEAR RETURNED	AREA RETURNED	PMFC AREA	DEPTH RETURNED
				(Swiftsure)		
1961	Washington	2	1961	L.W.Cst.Van.I.	3C	55
	33 tagged	1	1961	N. Washington	3B	70
	May,1961	3 Tags Returned		(CapeFlatterySpit)		
	Swiftsure					
	3C					
	55fms.					
1960	Canada	1	May	Oregon	2?	?
	731 Tagged	2	Jan-May	N. Washington	3B	?
	June-July,	4(3)	Feb	U.W.Cst.Van.I.	3D(Esteban)	100+fms.
	1960	57	Apr-Nov	Cape Scott	5A	?
	Cape Scott	4	Apr-Aug	Goose Island	5B	?
	5A	2	Nov	L.Hecate Strt.	5C	?
	50fms.	1	Apr	U.Hecate Strt.	5D	?
		3	-	Market rcvrys.	--	-
		74 Tags Returned				
1954-55	Canada&Wash.	9	----	Sydney Inlet	3C	100-
	3802	9	----	L.W.Cst.Van.I.	3C	100-
	tagged	112	----	Esteban Deep	3D	100+
	March-April	47	----	Esteban	3D	100-
	Esteban Deep	34	----	Cape Scott	5A	?
	3D	8	----	Goose Island	5B	?
	greater than	3	----	L.Hecate Strt.	5C	?
	100fms.	1	----	U.Hecate Strt.	5D	?
		223 Tags Returned				

Appendix C

New Canadian Regulations Affecting Otter Trawl

Effective August 24, 1960

subsection (1) of section 71

"(1) The mesh of the net in any otter trawl or beam trawl used for catching fish other than shrimps, shall be not less than four inches extension measure when in use.

"(1A) Commencing January 1, 1962, the mesh in the final seventy-five meshes, including the cod-end, of the net in any otter or beam trawl used for catching fish other than shrimps in the waters between Vancouver Island and the mainland including the Straits of Georgia and Areas 18 and 19 lying south of a straight line drawn across Johnstone Strait from Tuna Point at the easterly entrance to Blinkinsop Bay due south magnetic to a point on Vancouver Island shall be not less than four and one-half inches extension measure when in use; and the mesh in the remainder of the net shall be not less than four and one-quarter inches extension measure when in use."