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

SUBMITTED
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Date: January 19 and 20, 1960

Place: State Office Building, 1400 S. W. 5th Avenue, Portland, Oregon

Participants:

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	M. C. James (observer)

The first meeting of the Technical Sub-Committee was held in accordance with instructions contained in the minutes of the Trawl Fishery Committee's meeting held on November 4, 1959 in Seattle, Washington. Business of the meeting was guided by a prepared agenda, copy of which is attached as Appendix A.

The current terms of reference of the Sub-Committee are, perforce, very general. As such, they encompass a wide variety, if not all of the important problems pertaining to the Canadian and United States trawl fisheries along the Pacific coast of North America. It seemed appropriate, therefore,

that in its first meeting the Sub-Committee should undertake a rather broad survey of its various responsibilities and discover as far as possible what information is available (or not available) to provide the parent committee with sound and effective guidance.

For the purpose of reporting, Agenda Items IV to XIII will be covered in the order given but with revised numbering (I to X). It is not expected that members of the Trawl Committee will wish to read all of the report, for there are certain sections (eg., Items V and VI) which were included primarily for the benefit of research staffs. Nevertheless, from such items and others there have arisen a number of recommendations (Item X). These require the Committee's particular attention.

I. REVIEW OF FUNCTIONS OF THE TECHNICAL SUB-COMMITTEE

The functions of the Technical Sub-Committee had to be considered in the light of those of the parent committee, which are as follows:

1. To review proposed changes in trawl regulations affecting fisheries of mutual interest before they are implemented.
2. To review the effectiveness of existing regulations.
3. To exchange information on the status of bottom fish stocks of mutual concern and to coordinate wherever possible programs of research.
4. To recommend the continuance and further development of research programs in order to provide a basis for future management of the trawl fishery.

The parent committee regarded Items number 3 and 4 as the primary terms of reference of the Technical Sub-Committee. Item number 2 was to be treated on an ad hoc basis. The Sub-Committee was charged with the responsibility of preparing for the full committee a report on Items number 2, 3, and 4.

While the general purport of these three items was given particular attention by the Sub-Committee, all four terms of reference of the parent committee were discussed. Only Item number 4 offered any difficulty of interpretation. The Chairman suggested that the intent of this item was to determine, in the light of existing scientific evidence, whether or not research programs should be continued, and if so, whether they should be developed further. Other members of the Sub-Committee agreed that this interpretation provided more flexibility and meaning to the work of the Sub-Committee.

II. REVIEW OF EXISTING TRAWL FISHERY REGULATIONS

The Sub-Committee is indebted to Mr. M. C. James, Executive Director of P. M. F. C., for the work which he has done in summarizing existing trawl fishery regulations for the United States and Canada. In the course of discussion of these regulations a few minor omissions were noted. An amended copy of Mr. James' compilation is attached to this report as Appendices B (1) and B (2).

Although many of the regulations are of only local concern there are some which have international implications and these were the subject of considerable discussion - particularly from the standpoint of consistency from area to area. The following is a summary of points raised:

1. Closure of fishing by season

Of international interest is the current status of regulations pertaining to the closed season on the fishery for petrale sole. It was noted that in Oregon, Washington, and Canada a closed season exists from December 20 to April 15. In Oregon an incidental catch of 3,000 pounds per trip is allowed, with no limit on the number of trips during the closed season. In both Canada and Washington a maximum of two incidental landings of petrale

sole is allowed per boat per month. However, in Canada the catch limit per boat trip is 3,000 pounds, while in Washington it is 3,000 pounds or 8% of the total food fish landed per boat trip.

These differences have already been noted on page 18 of the summary of proceedings of the Second Conference on Coordination of Fisheries Regulations (April 21-24, 1959). The proceedings note also that California is to take such action as necessary to prevent the use of its ports for the purpose of evading regulations in northern areas. California has no seasonal closure on fishing for petrale sole.

2. Closure of fishing by area

The Sub-Committee noted that in Canada and Washington, with the exception of certain inshore bays, channels, inlets, etc., there are no areas closed to trawling off the exposed coast. Similarly there are no closed areas along the Oregon coast. Off California, however, possession of a trawl net in territorial waters south of the Santa Barbara-Ventura county line is prohibited, and along the remainder of the coast to the north, trawling is prohibited in waters less than three nautical miles from the mainland shore.

3. Definition of legal gear

In view of the long-term prospect that there may be need for international decision on the regulation of mesh size in trawl nets, the Sub-Committee spent considerable time in discussing the wording of current regulations. It was soon apparent that the regulations are inconsistent not only between Canada and the United States but within the United States itself. No better summary of these inconsistencies can be provided than that given in Appendix B (2). Further comment on these regulations will appear under Item III following.

4. Minimum size limits

There is uniformity in the minimum size limit on blackcod in Oregon, Washington, and Canada, but no legal size limit on this species exists in California or Alaska.

Legal size limits on flatfish other than flounder vary from 11 inches in Oregon, to 11 1/2 inches in Washington, to 12 inches in Canada. California imposes a minimum size on California halibut (Paralichthys) of 4 pounds round, 3 1/2 pounds dressed head-on or 3 pounds dressed head off.

5. Regulations of utilization (food and non-food use)

In neither California nor Canada is there any limitation on the species of fish which can or cannot be used for animal food, except where there are size limit regulations pertaining to food fish. In Oregon, use of Dover sole, English sole and petrale sole (in excess of an aggregate 2,000 pound incidental catch limit per landing or 20% of the landing, whichever is greater) is prohibited. In contrast, the regulations for Washington specify species or groups of species which may be used for animal food (see Appendix B (1), Item 5).

6. Shrimp fishery regulations bearing on groundfish

Regulations pertaining to incidental landings of groundfish in the course of shrimp fishing operations vary from area to area. In California, no incidental catches are allowed in shrimp landings, while in both Oregon and Washington an incidental catch limit of 3,000 pounds of groundfish per trip is permitted. In Canada, the regulations state that no groundfish may be landed by vessels using less than 4-inch mesh, implying that such landings by shrimp trawlers, no matter what the amount, are unlawful.

III. EFFECTIVENESS OF EXISTING REGULATIONS

Here again, the Sub-Committee concerned itself primarily with those regulations which bear on the international fishery or which may be of international concern in the near future.

1. Seasonal closure on petrale sole

The original intent of the winter closure on petrale sole was to discourage fishing on the densely concentrated schools of spawning fish (in deep water) which comprise the depressed stocks inhabiting waters off the Canadian and Washington coasts. The restriction was aimed primarily at the fishery by Washington vessels in the Esteban Deep, but also at fisheries in deep water off the Washington coast. Canadian fishermen had never been involved in the deep water fishery but regulation was instituted as a preventive measure. Oregon fishermen had engaged in limited fishing in the Esteban and other deeps and a winter closure was imposed (1) to discourage development of deep water fishing on the northern grounds and (2) to prevent Washington vessels from using Oregon ports for evasion of regulations in the State of Washington.

(a) Canadian fishery

Since the inception of the winter closure the Canadian fishing operations have remained unchanged. Negligible quantities of petrale sole are landed during the winter months. The closure has been effective in preventing the development of a fishery on spawning fish in deep water.

(b) Washington fishery

In Washington the December 20 to April 15 closure came into effect in the winter of 1957-58 (complete closure until February 14; 3,000 pounds - two trip tolerance from February 15 to April 15). In the months of January through April, 1958, the total catch of petrale sole (from all areas) was

247,519 pounds. For the comparable period in 1957 the catch was 2,993,049 pounds (from all areas). While an industry strike during January and part of February, 1958 had a pronounced effect on the operation of the Washington fleet, it appears that the closure was an effective deterent to winter fishing, particularly on the Esteban grounds. In March of 1958 there were no individual landings in which the petrale sole catch exceeded 3,000 pounds. In April, when over 70% of the winter catch was made (i.e., 112,723 pounds) only one landing exceeded 3,000 pounds and this was made after April 15. Apparently the bulk of the April catch was made after the middle of the month.

In the winter of 1958-59 (December through April), 171,034 pounds of petrale sole were landed from the Esteban grounds. In December, January, and March there were no vessel landings containing more than 3,000 pounds of petrale sole. In February there were four such landings, but all were within the alternative 8% limit. In the first 15 days of April there were two landings greater than 3,000 pounds and one was over 8%, in violation of the regulation.

At the time of reporting, no information was available on the winter fishery of 1959-60.

The petrale sole regulation appears to have been effective in discouraging fishing on spawning concentrations of petrale sole.

(c) Oregon fishery

In Oregon, the winter closure has been effective in discouraging expansion of the winter fishery for petrale sole. Winter catches are generally well below the 3,000 pound tolerance limit. There is, however, some tendency to violate this regulation when incidental catches are close to the limit, for some petrale sole are intentionally mixed with other species.

In southern Oregon (Coos Bay-Newport Area) there is a potential deep water fishery for Dover sole, which although restricted a great deal by weather,

is also restricted by the presence of petrale sole. These deep water grounds have been prospected by Oregon fishermen but as yet have not been subjected to a winter fishery. As they are within the potential operating range of the northern California fleet (which has no petrale sole restriction) there is fear that the California fleet will have unfair advantage over Oregon vessels. While California vessels apparently have yet to exploit appreciably these southern grounds during the closed season, there is a potential danger of discrimination against Oregon fishermen.

At the time of reporting no information was available on the 1959-60 winter fishery for petrale sole.

(d) California fishery

Although California is not involved in the winter closure on petrale sole, it is worthwhile to comment briefly on events in that area. The first deep water fishing in California (Eureka-Crescent City area) occurred in 1948 with a resulting catch of 2,000,000 pounds of petrale sole. Thereafter the winter catch declined somewhat. A second deep water fishing ground was discovered in the winter of 1953-54 adjacent to San Francisco. This produced heavily in the initial stages and then declined to a somewhat lower but stable level.

About one-quarter of the annual landings of petrale sole in California are now made in the January to March period. However, attractiveness of the fishery for shallow water species (principally English sole) in recent years has tended to draw fishing pressure away from deep water.

2. Mesh regulations

As mentioned in Section II, there is considerable inconsistency from area to area in the legal definition of mesh size. Notwithstanding these differences there is some basis for believing that the effects of the various

regulations in respect to escapement of undersized fish are not as different as the legal definitions imply.

In California and Oregon, a 4 1/2 inch mesh size (inside measurement) is specified, while in Washington the specification is 3 1/2 inches (legally defined as an inside measurement, but apparently interpreted by fishermen as a measurement including one knot or measuring from center of knot to center of knot). In Canada the mesh size is specified as 4 inches but the method of measurement is not defined.

A problem which clouds interpretation of mesh regulations is that in all regions it is permissible to use double codends (a double layer of netting). In actual practice it appears to be fairly general that the mesh size in the doubled netting is the same as that used in nets employing a single layer of netting - despite the fact that regulations in some areas (Oregon and Washington) specify larger mesh size (5 inches) in double codends. In theory at least, a double codend is unlikely to release as many small fish as a single codend, simply because the meshes of the two layers tend to overlap and thus reduce the escapement opening. It appears that there is insufficient experimental evidence to demonstrate the relative escapement qualities of double and single codends, and until this is done there seems to be little prospect of determining whether or not regulations are consistent even within the bounds of one political area.

The Sub-Committee recognizes that the biological basis for mesh regulations has not been clearly established. Until such time when this can be done, it endorses the view that a 4 1/2 inch minimum mesh size (in single codends, or whatever mesh size provides equivalent escapement qualities in double codends) is an effective means of minimizing the capture of undersized fish of those species used primarily for food fish purposes. The Sub-Committee

recognizes, however, that there are practical problems in certain areas which prevent international action on mesh regulations at the present time. Use of large mesh results in excessive gilling of dogfish and ocean perch.

3. Minimum size regulations

It was the view of Oregon representatives that the minimum size limit imposed on petrale sole, Dover sole and English sole had reduced the percentage of these species in the landings of mink food.

In Canada the minimum size limit, particularly on English sole and rock sole, has been effective in reducing the amount of juveniles used in mink food, at least in international waters. In certain territorial waters (part of the Strait of Georgia) however, the ruling is difficult to enforce and other means (eg., mesh size regulation) may be the only solution.

Reduction in the Canadian minimum size of blackcod in 1957 from 4 1/2 pounds to 3 pounds dressed head-off, seems to have been responsible for a marked increase in the trawler landings of that species. While this has provided the Canadian fleet with the opportunity to compete with the U. S. fleet on an equal footing, market problems will probably limit the further development of this fishery.

4. Regulation of utilization

Representatives of Oregon reported that the 20% tolerance of petrale sole, Dover sole, and English sole in mink food has proved difficult to enforce. While this regulation is still "on the books", it is hoped that the newly instituted minimum size regulation, coupled with adequate enforcement of mesh size regulations will provide more effective control.

IV. DISCUSSION OF PROPOSED CHANGES IN REGULATIONS

1. Petrale sole

The Sub-Committee gave consideration to a proposal that the southern part of Oregon be excluded from the current seasonal closure on petrale sole fishing. The Sub-Committee had received no formal instruction to do so, but it understood that the proposal arose as a resolution of the Industry Advisory Group at the 1959 annual meeting of P. M. F. C. and that it had been referred to the Trawl Fishery Committee for consideration. Mention has already been made in Section III (1) that there is impending danger of conflict or discrimination respecting the possible development of a winter fishery for petrale sole off the southern part of Oregon (Coos Bay-Newport area).

Proper evaluation of this proposal requires answers to two rather important questions: 1. If the winter fishery in southern Oregon were allowed to develop free of seasonal restriction, would it involve the stock or stocks of petrale sole which inhabit the Washington and Canadian coasts during the summer months, i.e., those stocks which have been shown to be in a depressed state of abundance? 2. Is the current practice of restricting winter fishing a valid means of protecting the petrale sole from still further declines in abundance?

It was the view of the Sub-Committee that further consideration of these points could best be handled after dealing with Item VI (Status of knowledge of major species).

2. Mesh size

Mention was made of a Canadian proposal to institute a 4 1/2 inch minimum mesh size in the territorial waters of the Strait of Georgia. The English sole fishery, in areas which have been the site of mink food operations,

has declined and it is suspected that substantial quantities of juvenile English sole have gone to mink food. A larger mesh size would aid in allowing escapement of these young fish.

V. REVIEW OF RESEARCH PROGRAMS

The following is a summary of the current level of research effort in the various areas along the Pacific coast:

1. California

(a) Personnel

The staff consists of two biologists at Stanford; one biologist and assistant at Eureka. Additional support is obtained from six-man-months of seasonal personnel. Another biologist is working full-time on rockfish, more or less independently of the Stanford-Eureka group.

(b) Collection of statistics and market samples

Statistics of catch are obtained from log-book records and these are compared with sales slip receipts. Effort statistics are now recorded in terms of drags and days only, but formerly they contained information on hours of fishing as well.

Routine market sampling for length and sex of Dover sole, English sole and petrale sole is now being conducted at Eureka, San Francisco, and Fort Bragg. Earlier sampling of petrale sole for length and sex covered the period 1950-54 at Eureka only. Length and sex sampling of Dover sole at Eureka has been in progress since 1950. Also on the sampling schedule are mink food landings (sampled for species and size) as well as a comparative study of the trawl and party-boat fisheries. The work on rockfish is of general nature (taxonomy and life-history) and involves the three most important species

(c) Field studies

Recent field work (December, 1958) involved the tagging of 3,900 English sole and 876 petrale sole.

2. Oregon

(a) Personnel

Two biologists are stationed at Astoria, the main port of landing of bottom fish in Oregon. One seasonal assistant is employed during the summer months.

(b) Collection of statistics and market samples

Production records for the State as a whole have been maintained since 1941; for three major areas since 1951 and for the smaller P. M. F. C. areas since 1956. The statistical system is tied to the system of recording sales records and hence the only measure of fishing effort available is the number of landings.

Market sampling is restricted to the collection of data on length, sex and age of Dover sole, and to studies of species composition of mink food. Sampling of petrale sole, English sole, and Dover sole and turbot for age and length was conducted during the period 1948-50.

(c) Field studies

Tagging in the Willapa Deep in 1955 involved 2,400 Dover sole. In 1959 at Cape Lookout, 550 petrale sole and 4,599 English sole were tagged. Further tagging of petrale sole is planned for the Coos Bay area in March of 1960. Other field studies involve the determination of fair tolerance of Dover, English, and petrale sole in landings of mink food.

3. Washington

(a) Personnel

Present staff consists of one biologist full-time and one half-time at Seattle, and one part-time port observer at Bellingham. At present there is an acute man-power shortage which will be alleviated to some extent if seasonal assistance is secured.

(b) Collection of statistics and market samples

Trawl catch statistics are tabulated with the aid of IBM from fish tickets and are available on a current basis. Since the inception of the trawl interview system in 1953, the statistics have been supplemented with more detailed information according to areas of catch and effort. The latter is based on hours of fishing by area. At the present level of staff it is not possible to accomplish much more than keep up-to-date with total catch statistics by month and area and to summarize the remaining data.

Market sampling will be done as opportunity permits, however, it will not be as extensive as in former years.

(c) Field studies

For several years tagging of blackcod has been conducted at Holmes Harbour and this is to be continued. Four hundred blackcod were tagged in 1958 and 1,000 in 1959. In February of 1958, about 1,000 true cod were tagged in the Port Angeles area to determine whether these fish migrate to the open coast and enter the summer fishery. There is a possibility of tagging petrale and English sole early in 1960, and lingcod later in the year on 40-Mile Bank.

4. Canada

(a) Personnel

Present staff consists of two biologists; two laboratory technicians who spend part time on field operations; and two port observer-samplers, one at Vancouver and other other at Prince Rupert. In the past, two seasonal

workers have been employed, one for sampling at Vancouver and the other for laboratory work. One additional laboratory assistant may be obtained for the summer of 1960.

(b) Collection of statistics and market samples

Interview records providing well over 80% coverage of food fish landings and a lesser percentage of mink food landings has been maintained since 1947. Effort statistics are recorded in hours, drags and days. Sampling for age, sex and length involves all flatfishes of importance to the Canadian fishery. Sampling for length only is conducted on true cod, lingcod, and sablefish. For certain species, areas and seasons the coverage is considered to be inadequate, because of the selective nature of the Canadian fishery.

(c) Field studies

The main effort in tagging is now being directed to true cod. In the past three years (1957-59), 3,912 of these fish have been tagged mainly in inshore waters. Currently, efforts have been directed more to offshore waters and will be continued until satisfactory results are obtained. In this same three-year period, 3,387 rock sole were tagged on Hecate Strait grounds. The policy of the investigation is to tag petrale sole whenever encountered in numbers. No specific program for the tagging of this species is now possible because of their reduced abundance and hence uncertainty of capture.

During 1958 and 1959 a limited amount of work was done on the mesh selection problem.

VI. STATUS OF KNOWLEDGE OF MAJOR SPECIES

The purpose of this topic was to explore in a general way the extent of existing knowledge of the more important species, in the hope that this would bring to light some information on the current status of stocks or at least show where gaps still exist.

1. Dover sole

(a) Production

California and Oregon appear to be the most important areas for the production of Dover sole. Generally speaking, catch has been somewhat lower during recent years (1956-58) than in an earlier period (1950-52), because of reduced demand after the end of the Korean war. Production off Washington and British Columbia has risen in the latter period, but only in the case of the Washington fleet. The Canadian catch, which never has been of great importance, has declined in more recent years.

(b) Definition of stocks

There is an evident lack of information on number of stocks which contribute to the fishery. However, tagging off Oregon suggests some separatene of fish north of the Astoria Canyon to Cape Flattery from those to the south of the Canyon. Tagging conducted off Eureka in 1949 and 1950 showed little movement from the tagging area.

(c) Trends in abundance

Again, little is known. Catch has declined in some areas but this is probably attributable to weaker market conditions in recent years. Studies in Oregon waters show no sustained trend in catch per effort or in average length. Catch per hour by Washington trawlers in 1959 was greater than in the period 1954-56.

(d) Conclusions

At the moment, there is insufficient information to draw any definite conclusions. Market conditions may be the dominant factor in catch fluctuations.

2. English sole

(a) Production

English sole in California waters have been the object of exploitation

for about eighty years. In both California and Oregon, production was somewhat less in the 1956-58 period than in 1950-52, but it is evident that there are fairly long-term fluctuations in production. In Oregon at least, this may be related to market conditions. Washington production was about the same in the two periods compared, while recent Canadian production was about half of that in the earlier period and this drop appears to be the consequence of declining market demand.

(b) Definition of stocks

More tagging has been conducted on this species than on any other, but even so there is still uncertainty as to the amount of overlapping of stocks along the coast. Tagging in California waters has suggested some intermingling of stocks adjacent to Eureka and San Francisco and movement northward to southern Oregon. In Oregon and Washington waters there are three major fishing areas which may be indicative of three more or less separate stocks (Cape Lookout area, Columbia River to Grays Harbour and Destruction Island). However, results of tagging off Cape Lookout demonstrate some degree of interdependence. Tagging results off the Washington coast support the view that a more or less distinct stock inhabits waters between Cape Flattery and Destruction Island and that another more or less distinct stock inhabits Puget Sound.

Tagging in Canadian waters shows that English sole in the Strait of Georgia are separate from those in Puget Sound and largely separate from other populations offshore. The major fishery occurs on a stock which inhabits northern Hecate Strait. Tagging shows only minor movement from this area to Queen Charlotte Sound and the Washington coast. Tagging on the Goose Island Banks shows a small extent of movement northward into Hecate Strait and southward as far as California.

(c) Trends in abundance

At the time of reporting no information was available on California stocks of English sole, but, as catch has been maintained over a long period of years, it seems unlikely that there has been any sustained downward trend in abundance. There appear, however, to be short-term variations. Similarly in Oregon and Washington there have been short-term trends (currently upward) with no sign of any sustained trend. In northern Hecate Strait (the principal fishing area in Canadian waters) no trend has developed following the initial expansion of the fishery. In territorial waters, abundance has declined on grounds which are not subject to seasonal closure.

(d) Conclusion

The English sole appears to be subject to trends in abundance extending over several years, but the long-term picture does not suggest any serious decline in abundance.

3. Petrale sole

(a) Production

For the periods compared (i.e., 1950-52 and 1956-58) California production has shown little change; Oregon catch has shown a modest drop; Washington catch is about the same and Canadian catches averaged only one-half that in the earlier period. Accurate comparisons are difficult to make, however, in view of the changing character of the fishery. In recent years there has been a tendency in all areas of the coast to exploit petrale sole more intensively during the winter months than formerly.

(b) Definition of stocks

Information on the distribution of catch and the results of tagging suggest the possible existence of three stock units in California waters (Point Conception area, San Francisco-Fort Bragg, Eureka - Southern Oregon) with some

intermingling as far north as the Vancouver Island coast. Tagging off Oregon has shown no definite pattern, as movements have been recorded both to the north and south. Off the Washington and British Columbia coasts the picture is clearer, but still rather incomplete. Petrale sole taken to the north of, and including, the Esteban Deep appear to be more or less separate from those encountered in the summer months off the southern Vancouver Island and Washington coast. Tagging of the latter group suggest some movement southward in winter, but few recoveries are made south of Destruction Island.

(c) Known or suspected spawning areas

In California waters:

1. Vicinity of Point Conception
2. Between Monterey Bay and San Francisco
3. Between Crescent City and Eureka

In Oregon - Washington waters:

1. Between Coos Bay and the Umpqua River
2. Willapa Deep
3. Adjacent to Grays Harbour
4. Adjacent to Destruction Island
5. Adjacent to Umatilla Reef
6. Adjacent to Cape Flattery

In Canadian waters:

1. Esteban Deep

(d) Trends in abundance

In California waters there appears to have been an initial drop in abundance when the petrale sole was first subjected to serious exploitation in 1948. Subsequently there was some tendency to stabilize at a lower level, although catch per effort estimates are difficult to make. In Oregon waters

there has been no particular trend in catch per effort since 1948 but the masking effect of other fisheries makes precise determination difficult.

Canadian catch per effort data which apparently apply to both the Canadian and Washington fishery off the Canadian coast show a sustained downward trend between 1948 and 1956. A recovery is now in progress in the area south of Esteban Point, but on northern grounds catch per effort has increased only slightly between 1956 and 1959.

(e) Conclusion

There can be no doubt that the abundance of petrale sole in Canadian waters has undergone marked changes in the past decade. Proceeding southward the situation becomes less clear. Apparent abundance of petrale sole in Oregon waters paralleled closely that off the Canadian coast until 1954, but after that time showed no tendency to decline further. There is some question as to whether current catch per unit of effort is an accurate measure of abundance (at least in the northern part of Oregon). After an initial decline, abundance appears to have stabilized at a lower level in California waters.

4. Rock sole

(a) Production

The rock sole is exploited by Canadian fishermen in Hecate Strait and Queen Charlotte Sound. Landings in the 1950-52 period averaged 3.7 million pounds as compared with 4.4 million pounds in the 1956-58 period. Production has been following a gradual upward trend over the past decade, largely through further development of the fishery in southern Hecate Strait and Queen Charlotte Sound.

(b) Definition of stocks

Tagging reveals very little mingling from bank to bank. No recaptures have been made in southern Hecate Strait from tagging conducted in the northern

part, and there is negligible mixing between the Cape Scott and Goose Island Banks. Thus, to the north of Vancouver Island there appear to be at least four stock units.

(c) Trends in abundance

In northern Hecate Strait, the seasonal average catch per effort varies markedly from year to year. No long-term trends are evident. Market sampling and field observations suggest that there are substantial variations in recruitment, perhaps more than in any other species of flatfish.

(d) Conclusion

There is as yet no evidence that annual removals are consistently exceeding annual replacements. Production appears to be governed largely by market demand and by year to year variations in recruitment.

5. True cod

(a) Production

True cod is currently the mainstay of the Washington and Canadian fisheries. Landings in the period 1956-58 were 35% to 40% higher than in the period 1950-52. Even in Oregon where the fishery is of minor importance production has increased during the period under consideration. Generally, production has increased tenfold in the post-war years.

(b) Definition of stocks

There has been insufficient tagging in offshore waters to determine directly the number of stocks contributing to the various fisheries along the coast. The pattern of fishing, however, suggests that there are three or four units to the north of Vancouver Island and possibly three off the Washington and Vancouver Island coasts. Tagging in the Canadian part of the Strait of Georgia so far has failed to reveal extensive mixing with stocks offshore, but there is substantial movement into U. S. territorial waters

(c) Trends in abundance

Substantial year to year fluctuations are noted in the Canadian offshore waters, but as yet there are no indications of a long-term downward trend.

(d) Conclusion

To the time of reporting there is no evidence that annual removals by the fishery are in excess of annual replacements. Production does, however, seem to be stabilizing in the neighbourhood of 20 million pounds annually.

6. Sablefish

(a) Production

Average production by California trawlers in the 1956-58 period was about three times that in 1950-52, but production by all gear increased by only 20%. Oregon's production was about double while Washington's was up about 20%. In contrast, Canadian production was less than half of that in the earlier period, primarily for economic reasons.

(b) Definition of stocks

No information is available beyond that which is contained in P. M. F. Bulletin No. 3.

(c) Trends in abundance

There is no information other than that contained in the P. M. F. C. Bulletin. Generally it appears that landings are governed to a large extent by market conditions. An exception to this is the stock which is subject to a line fishery off Cape Flattery. While this stock is presumably still at a low level of abundance, total production is being maintained or even increased by utilization of small (trawl-caught) fish.

(d) Conclusion

Aside from a specific instance noted above, there does not appear to be a fishery problem requiring immediate attention.

7. Pacific ocean perch

(a) Production

Landings are confined mainly to Oregon and Washington and since 1953 production has varied between 5 and 10 million pounds with no evidence of trend. 2500 - 5,000 mt

(b) Definition of stocks

No direct information is available from tagging, but the patterns of fishing suggest the existence of at least three or four stocks between Oregon and northern British Columbia.

(c) Trends in abundance

In Oregon waters there has been a decline in the catch per trip. In Canadian and Washington waters the catch per effort has been highly variable during the few years the species has been under study.

(d) Conclusion

It is possible that removals may now be exceeding annual replacements in Oregon waters, but the situation farther to the north particularly off British Columbia is uncertain. As far as the Washington and Canadian fisheries are concerned, there is a severe market limitation which currently prevents further expansion of the fishery.

8. Other rockfish

Although rockfish other than ocean perch are of considerable importance in all areas there is very little information available on the fisheries for these species. Markets seem to be the governing factor, and the available statistics are totally inadequate for appraisal.

9. Lingcod

(a) Production

There have been but minor changes in the average production for the

periods 1950-52 and 1956-58. Washington and Canadian landings (which account for the bulk of the catch) have increased only about 10%.

(b) Definition of stocks

No information from offshore waters is available but Canadian tagging in territorial waters suggests a relatively sedentary behaviour and possibly the existence of numerous small stocks along the whole coast.

(c) Trends in abundance

To time of reporting no analysis of trends in catch per effort have been conducted on data for international waters.

(d) Conclusion

The situation is uncertain in international waters, but as trawler landings from the Vancouver Island coast are on the increase, there is probably no immediate cause for concern.

10. Dogfish

(a) Production

Removals of dogfish by Washington fishermen amounted to about 1.5 million pounds in 1958. Canadian catch in that year was 1.1 million pounds. Between January and March, 1959, a subsidy was in effect in Canada which resulted in a removal of 2.3 million pounds plus 1.4 million pounds taken by chartered killer boats. From late in July to the end of 1959 when the subsidy was again in effect, the removals amounted to 6.3 million pounds, which brought the total for the year to approximately 10 million pounds.

(b) Definition of stocks

Tagging has suggested separateness of the dogfish inhabiting the Strait of Georgia and Puget Sound. Neither of these two groups show much tendency to move into the offshore waters. Although coastwide migrations of individual fish have been recorded in offshore waters, the actual numbers of

(c) Trends in abundance

In the years following collapse of the liver market (about 1950), dogfish have increased in abundance, particularly along the lower west coast of Vancouver Island. The present Canadian subsidy program probably has had no effect in stemming the increase in numbers of dogfish offshore, as most of the fishing has been concentrated in the Strait of Georgia. As yet it is difficult to say to what extent this localized fishery has reduced the stock inhabiting inshore waters.

(d) Conclusion

Estimates made elsewhere suggest that an annual removal of about 30 million pounds would be necessary to have any lasting effect in reducing the abundance of dogfish along the Pacific coast of North America. Current level of exploitation (largely under subsidy) is about 10 million pounds, and may be of only local effectiveness.

VII. SUBJECTS OF CONCERN

1. Petrale sole

The Sub-Committee agreed that of all the species reviewed under Item VI, petrale sole was the only case in which there has been a pronounced reduction in catch in the past decade for reasons other than market. Even so this apparently applies more to the northern part of the coast than to the south, and the decline may not be entirely or even partly the result of fishing.

There are two matters concerning petrale sole which, for lack of adequate data or incomplete analysis of existing data, make difficult an appraisal of current management practice:

(a) Definition of stock relationship

Currently, there is concern amongst certain sections of the Oregon

fleet, which fish in the Coose Bay-Newport area, that they are likely to suffer an injustice by having to abide by the winter closure on petrale sole. It may well be that spawning grounds south of the Astoria Canyon are not frequented by fish from the depressed areas to the north and that these regions south of the Canyon should not be subjected to winter closure at the present time. Unfortunately, the Sub-Committee lacks information which is necessary to determine whether or not control of the fishery in Oregon water is vital for the protection of the stocks inhabiting waters farther to the north. The winter spawning grounds of petrale sole which inhabit the Washington and southern Canadian coasts in summer months are not properly defined. Also there is a deficiency of information on the relation between spawning grounds and summer grounds of petrale sole in the area between Cape Flattery and the California border. In order to determine the validity of current complaints, more extensive tagging appears to be necessary along the Oregon and Washington coasts, particularly during the winter months.

(b) Validity of the winter closure

In the initial phase of the petrale sole fishery in southern Canadian waters a sharp decline in catch per effort occurred in company with a decline in average size. This was to be expected, for it was the inevitable consequence of exploiting a virgin stock. By 1948, however, the fishery instead of stabilizing continued to decline, and the average size of fish began to increase. This situation continued through 1956. What had happened was that recruitment to the stock had declined very noticeably. It is fairly certain that this was not merely the indirect effect of fishing (i.e., progressive reduction in the spawning stock and hence progressive reduction in the numbers of young), for the same phenomenom was detected in the northern British Columbia stock which did not come under heavy exploitation until 1948. Apparently, some factor in

the natural environment, other than the numbers of spawning fish, had been responsible for the decline in recruitment both in the southern and the northern British Columbia stock.

Thus, the environment may have been responsible at least in part for the decline in production from 1948 to 1956. We say "in part" because even if recruitment had been constant it is possible that fishing may have been too heavy for maximum sustained yield.

The winter closure to protect spawning fish was imposed as a common sense measure. Even though natural factors apparently were responsible for the declining recruitment, it was theoretically possible that unrestricted fishing could reduce the spawning stock to the point where the number of eggs produced would be so few that recruitment would remain poor even if environmental conditions changed for the better.

Recent evidence suggests that the decline in recruitment has been arrested and that an upward trend is in progress. This increase in recruitment arose from the spawnings of 1950 to 1953 - several years before the spawning grounds came under active exploitation and at least seven years before winter fishing was effectively curbed.

If recruitment continues to improve over the next five years we shall know that the protection of spawning fish by winter closure was an unnecessary measure. But it may still have been a valid means of reducing the rate of exploitation so that a better yield could be obtained from the available stock. On the other hand, if recruitment goes into another decline (that is, the spawnings of 1954 and more recent years produce fewer recruits than the spawnings of 1950 to 1952), then we shall be unable to say whether a turn for the worse in the environment of the eggs or the fishing on spawning fish was responsible.

The fishery on spawning fish which began in 1953 and the subsequent abolition of such fishing after 1957 will no doubt create serious problems of interpretation three or four years from now. In the meantime a careful watch should be maintained. If we fail to obtain conclusive evidence that the winter closure is a valid measure for the protection of petrale sole, it may have to be abandoned, particularly if it appears to be impeding effective exploitation of other deep water species.

2. Mesh regulations

There has been much talk about the value of increasing the mesh size in trawl nets to permit the escapement of sub-commercial sizes of bottom fish. Granted that a larger mesh size means cleaner and larger hauls of commercial-sized fish and hence greater fishing efficiency, it remains to be demonstrated that this increase in efficiency (i.e., dollar return to the fisherman per unit of effort) is greater than the value of the catch of undersized fish which might be obtained with smaller mesh and used as mink food or in some form other than as food fish. Whether or not the latter would be greater or less depends heavily on the natural mortality and growth rates of the species involved.

The scientific basis for regulation of mesh size in trawl nets requires knowledge of (1) whether a greater monetary yield can be derived from a stock by catching the fish when they are young or by delaying capture until they are of an older age and larger size, and (2) whether or not it is possible from a practical standpoint to fish a stock down to such a level that the amount of spawn produced is of critical importance to the amount or size of the resulting recruitment. These are important questions which deserve the attention of all biologists associated with Pacific coast trawl fisheries.

VIII. FURTHER NEEDS FOR RESEARCH AND REGULATION

1. Petrale sole

(a) Concern over the lack of full understanding of the current status of the petrale sole fishery and the efficacy of existing regulations has been covered in Item VII of this report. The need for more information on seasonal movements and the inter-relationships of petrale sole along the coast, particularly between Cape Flattery and northern California is indicated. Greater sampling coverage (if only by length and sex) is needed for certain seasons and areas not covered by the current Canadian sampling program: Central Hecate Strait and Queen Charlotte Sound - all seasons; Washington and Oregon coast - all seasons.

(b) Completion of the analysis of existing data on the Canadian fishery warrants high priority.

2. Research relevant to the mesh problem

Information on mortality and growth rates of the important species and on the relation between spawning stock size and recruitment is required in order to establish the biological basis for mesh regulations.

3. Catch statistics

(a) Monthly records of catch

Effective study of fisheries of international interest (specifically, those of Washington and Canada) requires compilation of catch records by month as well as by year for the various statistical areas. The accuracy and hence usefulness of such records depends on an effective (representative) coverage of the fishing fleets.

(b) Statistics of fishing effort

In the long run, accurate statistics of fishing effort by month and

area and preferably based on some standard unit will be of value in study of the Pacific coast trawl fishery. Washington and Canada are equipped for compilation of such statistics, because both agencies collect information on hours of fishing. However, existing limitations on man-power and some basic questions regarding the efficacy of standardizing effort statistics are an obstacle to development and coordination of such a program. Statistics of effort for Oregon and California fleets are expressed in drags and days or trips, and hence could not be included as they stand, in a coastwide program of coordination.

Nevertheless, the subject of coordinating on statistics of fishing effort remains one of continuing interest to members of the Sub-Committee.

4. Oceanographic research

The Sub-Committee recognizes the importance of oceanography as a tool for the study and explanation of phenomena which appear to be unrelated to the effects of fishing, and accordingly, would be interested in the development of oceanographic programs for the monitoring of environmental changes on the continental shelf and slope in the northeastern Pacific Ocean.

IX. PLANS FOR FUTURE MEETINGS OF THE SUB-COMMITTEE

The Sub-Committee was of the opinion that planning for future meetings should be deferred until it has received further instructions from the parent committee.

X. RECOMMENDATIONS OF THE SUB-COMMITTEE

1. The Sub-Committee acknowledges that there is potential danger of unfair discrimination against Oregon fishermen, respecting the winter closure of petrale sole fishing in waters off southern Oregon (Coos Bay-Newport area). These newly

discovered grounds apparently are within the working range of California fishermen who are not required to abide by the winter closure.

Since (1) the winter closure regulation is designed primarily for the protection of northern stocks (Washington and Canadian water), (2) the southern limits of migration of northern stocks are ill-defined and (3) the efficacy of the winter closure has not yet been clearly established, the Sub-Committee recommends: that at least for the winter of 1960-61 (i.e., December 20, 1960 to April 15, 1961) the winter closure be waived in southern Oregon waters. It is suggested that this can be accomplished without detriment to the enforcement of regulations in waters farther to the north by requiring that vessels fishing in southern Oregon waters obtain clearance in and out of adjacent ports (Coos Bay or Newport) within specified time limits to prevent fishing on grounds in other areas affected by the regulation.

The Sub-Committee makes this recommendation on the understanding that the Oregon Fish Commission will undertake to tag petrale sole on the southern Oregon grounds some time within the period February 15 to April 30, 1960.

2. The Sub-Committee further recommends that deep water tagging of petrale sole on grounds off the Washington coast (Willapa Bay, Grays Harbour, Umatilla Reef, etc.) be undertaken at the earliest opportunity to determine whether or not these fish belong to the depressed stocks inhabiting waters farther to the north. This information is required in order to establish more clearly the southern limit of the area to which the current winter closure should apply.

3. The Sub-Committee recommends that, where possible, programs of petrale sole sampling be instituted to complement those already in effect in Canada.

4. The Sub-Committee recognizes that the biological basis for mesh regulations is not clearly established and therefore recommends that studies of

growth rates and natural mortality rates of important species be initiated at the earliest opportunity. The Sub-Committee also wishes to point out that even within small or local political divisions of the coast there are apparent inconsistencies in the enforcement and definition of mesh regulations.

5. In recognition of the need for long-term studies of the groundfish fisheries of the Pacific coast, the Sub-Committee recommends that the exchange of detailed statistics of catch by area, month and year be continued, particularly for the area of international interest (Columbia River to northern Hecate Strait) and that efforts be made to improve upon the accuracy of such statistics.

6. The need for a better understanding of environmental changes on the continental shelf and in adjacent waters is apparent. Accordingly, the Sub-Committee would view with interest any proposal to develop or intensify coastal oceanographic programs.

7. The Sub-Committee makes no specific recommendations for another meeting but wishes to draw to the attention of the parent committee the fact that it will not be possible to assess the effectiveness of the winter closure on petrale sole (December 20, 1959 to April 15, 1960) until some time in the late spring or early summer. Such an occasion would also be opportune for a critical review of all the results of past taggings on petrale sole.

8. With regard to the terms of reference both of the Sub-Committee and the parent committee, attention is drawn to the difficulty of interpreting Item number 4. The Sub-Committee seeks approval of its interpretation of this term of reference (see Section I, page 3 of this report).

XI. APPENDICES

Appendix A

AGENDA

First meeting 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: January 19-20, 1960
Place: Portland, Oregon

I. Call to order

II. Approval of the agenda

III. Appointment of recording secretary

IV. General review of the functions of the Technical Sub-Committee

V. Review of existing trawl fishery regulations

VI. Review of effectiveness of existing regulations

VII. Discussion of proposed changes in regulations, if any

VIII. Review of current research programs

IX. Status of knowledge of the major species

X. Subjects of concern

XI. Further needs for research and regulation

XII. Plans for future meetings of the Sub-Committee

XIII. Recommendations of the Sub-Committee

XIV. Drafting of a report to the Committee

XV. Other business

XVI. Adjournment

Appendix ~~B (1)~~ D(1)

TRAWL FISHERY TECHNICAL SUB-COMMITTEE

SYNOPSIS OF OTTER TRAWL REGULATIONS IN EFFECT ~~ON JANUARY 1~~, 1968, IN THE SEVERAL JURISDICTIONS OF THE PACIFIC COAST

Prepared by

M. C. James,
Executive Director,
P.M.F.C.

Note: The following summary covers the fishery for fin-fish and cites only those regulations which are considered as having a direct bearing on the management and conservation of bottom fish stocks. Legal provisions having primary fiscal or administrative purposes, such as poundage taxes, keeping of records, submission of reports; or having general application, such as licenses, boat registration, etc. are omitted. For purposes of this report, no effort is made to distinguish between territorial and non-territorial waters. The shrimp fishery may be considered as a trawl fishery but presents distinct individual problems of management and regulation which have not yet become a matter of international concern. It is accordingly treated separately in a supplementary concluding analysis.

Type of Regulation

1. CLOSURE OF FISHING BY SEASON

California

No seasonal closure for fin-fish.

Oregon

During period ~~December 20~~ to April 15 ~~of year following~~, incidental catches of petrale sole limited to not more than ~~3~~6,000 lbs. per boat trip. Not more than 100 such fish may be less than 11 in. No other seasonal closures for fin-fish.

Washington

During period December 20 to April 15 of year following, incidental catches of petrale sole limited to not more than 3,000 lbs. or 8 percent of total food fish landed per boat trip not exceeding two trips per month per boat.

Five varying closure periods are applied to six local areas in the inside waters of Puget Sound.

Canada

During period December 20 to April 15 inclusive no brill (petrale sole) may be taken except for incidental catch not exceeding 3,000 lbs. per boat trip for a maximum of two boat trips per month.

During period December 1 to the last day of February no lingcod may be taken in the waters of the Strait of Georgia.

Alaska

Sablefish may be taken from May 1 to November 30 by long line only in southeastern Alaska. Otherwise, no restrictions on bottom fish.

2. CLOSURE OF FISHING BY AREA

California

Use of trawl nets prohibited in waters less than 3 nautical miles from nearest point of land on mainland shore, including certain named bays.

Possession of trawl net prohibited in waters south of Santa Barbara to Mexican border.

Oregon

Otter trawl fishing limited to waters of the Pacific Ocean.

Washington

Otter trawl fishing prohibited in 15 named areas in inside waters of Puget Sound.

Grays Harbor, Willapa Harbor and Columbia River excluded from "coastal waters" open to otter trawl fishing.

Canada

Chief Supervisor may prohibit all trawl fishing in any area at any time when deemed necessary to prevent adverse effects on population.

Numerous named areas in inside waters are closed entirely to trawl fishing or for specified periods.

Alaska

See Sect. 1 above.

3. DEFINITION OF LEGAL GEAR

California

See Appendix B (2).

Oregon

See Appendix B (2).

*Washington

See Appendix B (2).

Canada

See Appendix B (2)

Alaska

Trawls legal for bottom fish, with exception noted above.

*Nets having minimum mesh of 3 in. throughout may be operated in ocean perch fishery under permit.

4. MINIMUM SIZE LIMITS

California

Only minimum size for bottom fish is 3 1/2 lbs. dressed dead on, or 3 lbs. dressed head off, for California halibut (Paralichthys californicus). Tolerance for incidental catch of sub-legal fish 30 lbs. during one day.

Oregon

Minimum size of 11 in. over-all for dover, English or petrale sole, with tolerance of sub-legal fish of not to exceed 100 in the aggregate per boat trip.

Minimum size of 17 in. measured from origin of first dorsal to end of tail or 3 lbs. dressed weight for sablefish (black cod).

Washington

Minimum size of 11 1/2 in. for any species of flounder and sole, except minimum of 14 1/2 in. for starry flounder.

Minimum size of 17 in. from origin of first dorsal fin to end of tail for sablefish (black cod).

Canada

Minimum size of 12 in. tip of snout to tip of tail for lemon sole, rock sole, brill (petrale sole) or starry founder.

Minimum size of 3 lbs. dressed head off, for both lingcod and sablefish (black cod).

Alaska

No restrictions.

5. REGULATION OF UTILIZATION (FOOD AND NON-FOOD USE)

California

Trawl-caught fish used for other than human consumption taxed 5¢ per 100 lbs. Whole fish ground for mink food must be held under refrigeration.

Oregon

Catching or disposal of dover sole, English sole or petrale sole for animal food or reduction purposes prohibited. However, incidental catch tolerance for reduction or animal food purposes

of above species allowed in the aggregate in the amount of 2,000 lbs. or 20% by weight, whichever is greater, of any single landing.

Washington

Taking or disposal of food fish except for human consumption or bait prohibited, with exception of following species:

Dogfish and other species of shark
Arrowtooth halibut
Hake
Pollock or whiting
Bellingham sole
*Priest fish (Sebastodes mystinus)
*Sand dabs
*Slender sole
**Herring

*When taken in waters of Pacific Ocean.
**In Strait of Georgia Areas 2 and 2A.

Canada

No limitation on utilization of legally-caught bottom fish.

Alaska

No restrictions.

6. MISCELLANEOUS REGULATIONS

California

Otter or beam trawl operators must keep a daily log book and render the information to the Department. The required recording includes:

(a) Time and place of each haul, each trip.

(b) Duration of haul and approximate composition of catch for each haul.

(c) Time of the trip.

(d) Total landed weight by species.

~~Taking of soupfin shark by trawl gear prohibited.~~

The Shrimp Fishery

Since the ocean shrimp fishery is apparently not within the present terms of reference of the Joint Trawl Committee no exhaustive digest of the regulations is herein presented. It may be noted that California permits only the beam trawl for shrimp fishing; sets over-all quotas on an area basis; has a winter closed season. Oregon has no restrictions on season or quantity of shrimp to be taken and permits use of "shrimp trawls" as well as beam trawls. Washington has

seasonal closures in certain inside waters of Puget Sound, but permits year-round fishing with any suitable gear in coastal waters and waters of the Pacific Ocean. Washington regulations stipulate a maximum distance between otter-doors and wings of shrimp trawl nets and require that undersized shrimp (described as unmarketable) must be returned to the water with a 10% tolerance. Canada apparently imposes no restrictions on an ocean shrimp fishery. However, the regulations governing the retention of a fin-fish caught incidental to a lawful shrimp fishery may be relevant to any study of the status of bottom fish stocks. The existing provisions are cited below:

California

It is unlawful to possess any fish other than shrimp or prawns on a boat engaged in the shrimp fishery.

Oregon

An incidental catch of not to exceed 3,000 lbs. of ocean or bottom fish per boat trip is permitted. Not more than 100 of such fish in the aggregate may be English, petrale or dover sole of not less than 11 in. in length.

Washington

It is lawful to retain, for human consumption, bottom fish of legal size, other than halibut, not exceeding 3,000 lbs. per boat per trip when taken incidental to lawful shrimp fishing in the ocean.

Canada

No provisions covering incidental catches of fin-fish, although regulations imply that no fin-fish may be taken with less than 4 in. mesh.

Alaska

No restrictions.

TRAWL FISHERY TECHNICAL SUB-COMMITTEE

Summary of laws and regulations relating to definition and measurement of net mesh sizes on the Pacific Coast

	California	Oregon	Washington	Canada	Alaska
Legal definition of minimum mesh size	No ~~cotton mesh~~ less than 4½ in. may be possessed on boat. Hog-ring bags or cod-ends shall have minimum mesh measurement not less than 6 in. when wet. Double bags or cod-ends shall have individual meshes, coinciding knot for knot in each layer, not less than 4½ in. in length. Chafing gear permissible.	Meshes measuring more than 3 in. but less than 4⅞ in. prohibited. Chafing gear permissible subject to restrictions as to mesh size (~~12~~ in.) or protective coverage. Hog-ring cod-ends shall have minimum mesh measurement not less than 6 in. Double bags or cod-ends shall have individual meshes, coinciding knot for knot in each layer, measuring 3 in. or less, or 5 in. or greater.	Minimum mesh size of 3½ in. permissible in last 75 meshes of cod-end and intermediate; all meshes forward of last 75 may be of any size greater than 3 in. Hog-ring meshes shall measure not less than 6 in. when wet. Double bags or cod-ends shall contain meshes measuring not less than 5 in. tied so that meshes and knots coincide. Chafing gear permissible subject to restrictions as to net area protected.	Mesh of ~~otter trawl~~ or beam trawl net (other than shrimp net) shall be not less than 4 in. extension measure when in use. Operating vessel shall have a scupper opening not less than 36 in. wide or multiple openings not less than 12 in. each.	Nil
Legal definition of methods of measurement	"by taking at least four meshes and measuring them inside the knots while they are simultaneously drawn closely together" <u>Hog rings</u> "by taking at least four meshes and measuring them inside the wire, hog-rings while they are simultaneously drawn closely together", <u>and</u> "measured when wet between proximal wires, rings, etc."	Definitions are variable. By statute: "by measuring the mesh diagonally from opposite corner to opposite corner between the center of the knots, the mesh to be stretched taut so as to bring together the other 2 corners" By Fish Comm. Orders and in local statutes: "taut measure" "stretch measure between knots" or "opposing knots" or "hog-rings" or "by stretching mesh taut and measuring distance between knots of a single mesh"	"is defined as the distance between knots when the mesh is stretched diagonally while wet"	All regulations for B.C. specify "extension measure". This is not further defined.	

TRAWL FISHERY TECHNICAL SUB-COMMITTEE

Summary of laws and regulations relating to definition and measurement of net mesh sizes on the Pacific

	California	Oregon	Washington	Canada	Alaska
Methods of measurement used by enforcement officers	As described above	Generally by stretching web and measuring single meshes with ruler or flexible tape.	Usually web is stretched by hand and distance between knots is measured with a ruler or tape.	Officers measure when the net is wet by grasping diagonally opposite knots and applying tension so as to close the mesh. Measurement is made from the inside of one knot to the outside of the knot diagonally opposite. ~~Elsewhere in Canada measurement is made between the knots diagonally opposite.~~	
Devices used or capable of use for measurement.	No special devices.	No ~~special devices.~~ CONSTANT PRESSURE MESH MEASURING GAUGE [illegible] [illegible] AVAILABLE AT RESEARCH LAB.	None currently used. A constant tension device has been designed experimentally.	No special device. ~~A constant tension device has been designed experimentally.~~ an official I.C.E.S. gauge is available - not used for enforcement.	