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**REPORT TCCHINOOK (91)-2**

**REVIEW OF CANADIAN PROPOSAL FOR  
TERMINAL AREA EXCLUSION OF CHINOOK CATCHES  
FROM THE ALL-GEAR  
NORTH AND CENTRAL B.C. CATCH CEILING**

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# CHINOOK TECHNICAL COMMITTEE REVIEW OF CANADIAN PROPOSAL FOR TERMINAL AREA EXCLUSION OF CHINOOK CATCHES FROM THE ALL-GEAR NORTH AND CENTRAL B.C. CATCH CEILING

This report on the Canadian paper on terminal exclusions<sup>1</sup> has been prepared by the bilateral Chinook Technical Committee (CTC) in compliance with the 1990 Letter of Transmittal. In this report, we review the purpose and objectives of the terminal exclusion approach, summarize data needs for implementing the concept, and review the three terminal exclusions identified by the 1990 Letter of Transmittal. A full technical review is not possible at this time, given the short time permitted for review and the limits of available information. However, we conducted a preliminary constructive review of the data and analyses presented, and provide recommendations for further data or monitoring needs. During technical review of the Canadian terminal exclusion report, it became apparent that a difference exists between the U.S. and Canadian understandings of how base catch levels in terminal exclusion areas were to be handled in the all-gear north and central British Columbia (NBC) catch ceiling (see discussion in Appendix).

## CONCLUSIONS AND RECOMMENDATIONS

The general concept of terminal exclusions for harvest of localized natural or hatchery stocks returning in surplus of spawning escapement goals is a sound management approach. However, available data indicate that the three exclusion areas defined in the Canadian paper do not completely satisfy conditions for an ideal terminal exclusion. Because the Canadian terminal exclusion report lacks complete data analysis and because insufficient time was available for a complete review, the CTC is unable, at this time, to recommend unconditional technical acceptance of any of the terminal exclusion areas in the Canadian paper.

### General Recommendations

1. Some procedures used to monitor fisheries and to estimate catches and stock composition need further refining. The sampling rates for coded-wire-tags (CWT) should be increased wherever practical and the accuracy of haul catch by subarea evaluated.
2. If the terminal exclusion program is continued, annual reports should be provided until such time as the CTC determines that they are no longer necessary to address technical concerns.
3. U.S. members of the CTC recommend that Canada provide a time schedule for providing data necessary to evaluate terminal exclusions.

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<sup>1</sup> Review of 1989 and 1990 Terminal Area Exclusion of Chinook Catches from the Northern B.C. Catch Ceiling. prepared by Canadian members of the Chinook Technical Committee, Feb. 04, 1991.

## Recommendations Specific to Exclusion Areas

### Skeena

Presuming continued sampling and that completion of analysis of biological sampling data affirms assumptions regarding stock composition and maturity, this revised exclusion area is consistent with conditions for terminal exclusion.

### Bella Coola

1. The CTC notes concern for local natural stocks classified as Probably Not Rebuilding. Consequently, terminal exclusion should be carefully evaluated and monitored for impacts on this depressed stock complex.
2. Exclusion area impacts on depressed natural stocks could be reduced by restricting the exclusion fishery to the early season, large mesh, gillnet fishery.

### Kitimat

1. On the basis of information contained in the Canadian report, the case for the Kitimat exclusion area is the weakest of the three exclusion proposals. Confidence in this proposal is reduced by: the relatively high incidence of non-local and immature fish, the large fishing area involved, the presence of local natural stocks classified as Probably Not Rebuilding, and lower quality of data.
2. The CTC cannot recommend support for the 1989 and 1990 terminal exclusion as presented in the Canadian report due to the concerns identified.
3. The exclusion area would be consistent with conditions for terminal exclusion if exclusions could be limited to mature chinook returning to enhanced stocks in Subarea 6-1 during June and July only. Further time/area restrictions may be of value in achieving this objective.
4. Time and area resolution of catch and biological sampling data from sport census programs in the Kitimat exclusion area should be improved and more thoroughly documented.
5. A base catch level for a redefined exclusion area could not be directly estimated. The CTC recommends that the most technically defensible approach for calculation of a base level would be to use data collected for the 1989 and 1990 seasons; such a procedure would be conservative in that it would likely over-estimate the true catch within this area during the 1979-1982 base period used for other exclusion areas. While this approach would be of limited value when determining exclusions for the 1989 and 1990 seasons, it would establish a base level for consideration of future exclusions for the Kitimat area. A more conservative base level catch implies a larger base catch before any exclusion catch is allowed.

## SUMMARY

In order for terminal exclusion to work for a particular area, the area must have a largely pure catch of the target stock with little incidental harvest of non-local or immature stocks. Reporting of the catch must be "clean", such that fish caught in other areas are not landed in and reported from the terminal area. There must be some means of determining the stock composition of the catches from the exclusion area. And it must be possible to define a base period catch level for the area such that only catches exceeding this level are allowed for exclusion. All these requirements are technically feasible, but need to be demonstrated for any potential terminal exclusion area.

Given limits of practicality for fisheries regulation and catch/sampling programs, some "contamination" (i.e. harvest impact on nonmature or non-local stocks) is unavoidable. The impact of the catch of non-local or immature fish in the exclusion areas on the rebuilding of individual natural stocks can likely not be assessed, but are likely less than impacts imposed by other changes to the rebuilding program (i.e. ceiling changes, increased incidental mortalities, etc.). Changes in large mixed-stock fisheries are likely to have greater impacts on rebuilding than changes in harvest rates by terminal fisheries which target local, mature stocks exceeding their escapement goals. Evaluations of future terminal exclusions should focus on whether the objectives and conditions of the terminal exclusions are achieved.

In conducting the studies associated with the three terminal exclusion areas in NBC, the Canadian Department of Fisheries and Oceans (DFO) found that it was necessary to redefine slightly each of the three areas. For the Skeena River, the terminal exclusion area was reduced to define an area more easily monitored for catches uncontaminated with catches from nearby areas. In the Bella Coola terminal area, it was decided to close Subarea 8-13 since catch in that area was too small to adequately sample. The catch from the Kitimat area was shown to have a higher contribution from non-local and immature fish than the Skeena or Bella Coola area. To focus the harvest on mature chinook (> 5 lbs.) returning to the enhanced Kitimat stocks, Canada proposed to limit the exclusion area/period to Subarea 6-1 during June and July. This experience demonstrates the necessity for flexibility and refinement in defining terminal exclusion areas.

Under circumstances where increased terminal catches result from new enhancement activities, a hatchery add-on concept could alternatively allow harvest of new enhanced production. However, the hatchery add-on concept determines the catch from new enhancement production (minus a risk adjustment) taken in addition to the allowable catch ceiling. The add-on approach would increase demands upon tagging and sampling programs throughout B.C. areas where enhanced fish are harvested. Under the terminal exclusion concept, enhanced stocks contribute to non-terminal fisheries and thus contribute to the rebuilding program by buffering (i.e. increased contributions of hatchery fish would reduce impacts on other stocks in mixed-stock fisheries operating under catch ceilings).

The catch excluded from each area depends upon the base catch level established. The base catch is the portion of the base period catches taken in the exclusion area adjusted for implementation of the NBC catch ceiling. Different base catch levels result from the use of different assumptions. A decision on an appropriate base catch for each exclusion area is not purely a technical matter. Alternative procedures are outlined in this review.

## CTC REVIEW OF CANADIAN TERMINAL EXCLUSION PAPER

### Rationale

An all-gear catch ceiling for troll, net, and recreational fisheries in NBC was established by the Pacific Salmon Treaty. Canada has identified two problems with including all gears and all areas in the catch ceiling for this area:

- (1) Incidental chinook catches in net fisheries harvesting Canadian sockeye, pink, and chum salmon increase as chinook abundance increases.
- (2) Production from new enhancement of chinook cannot be fully accessed without significantly disrupting some existing fisheries.

These problems could lead to three undesirable results : (a) reduced abilities to harvest returns of other species in order to reduce the harvest rate on chinook salmon; (b) disruption of other fisheries as the result of increased catches of mature chinook taken from stocks exceeding escapement needs; or (c) implementation of new non-retention regulations to control the reported catch of chinook.

### Objective of the Terminal Exclusion Proposal

The objective of the terminal exclusion proposal is to allow harvest of mature chinook in specified terminal areas without undue disruption to other NBC salmon fisheries and without impacting the rebuilding of depressed chinook stocks.

If implemented in accordance with the conditions identified in the following section, terminal exclusions should not be detrimental to the chinook rebuilding program. It remains the Canadian intention:

- o to meet escapement goals for natural and enhanced stocks returning to or passing through terminal exclusion areas;
- o to rebuild the natural chinook populations in Areas 6 and 8; and
- o to avoid adversely affecting rebuilding of other depressed stocks by refining exclusion area/time/gear definitions to minimize the incidental catch of non-local chinook harvested in the exclusion area.

### Operation of Terminal Exclusions

In selected areas, the catch of large (> 5 lbs.) chinook in excess of a base catch level would not count against the all-gear catch ceiling if the following conditions are satisfied:

1. Spawning escapements of stocks targeted in the exclusion area are meeting or exceeding the interim escapement goal (larger domestic management goals may be

used to limit the fishery when an exclusion is implemented);

2. The harvest is comprised of mature chinook returning to local stocks while minimizing the harvest of immature and non-local fish.
3. Management capabilities must exist to accurately account for and sample current and future harvest occurring exclusively in the exclusion area. In addition, capabilities to account for historical harvest are needed.

Practically, these limitations will likely involve some compromise between minimizing the incidence of non-local stocks and defining a fishing area in which catch and sampling data can be collected discretely from adjacent, non-terminal fishing areas. Since proposed exclusion areas are coastal marine waters, it is highly likely that small numbers of non-local or non-mature stocks will be taken.

Hatchery add-on was not proposed for enhancement production from Areas 6 (Kitimat) and 8 (Bella Coola) because these enhanced stocks are mixed with natural production to supplement total system production (catch and escapement). Therefore, the benefits from new enhanced production would be more difficult to determine than simply expanding by the mark rates of hatchery released stocks.

#### Basic Data Needs

Assessment of a terminal exclusion requires reliable estimates for three basic data items: (1) catch during the base period; (2) stock composition in the terminal exclusion area; and (3) current catch.

The base catch level is included in the NBC ceiling. The terminal exclusion would be the annual catch greater than the base catch level. The catch in the terminal exclusion area in excess of the base catch level would not be counted as part of the NBC catch ceiling. A problem which has arisen is the lack of catch data of sufficient resolution during the base period.

Estimates of stock composition are used to determine the harvest of non-local stocks in exclusion areas. Ideally, the stock composition data would provide estimates of the catch of each natural and hatchery stock. Existing available techniques for stock identification do not provide sufficient resolution and reliability for estimating contributions of stocks that comprise a small proportion of the catch. Alternative estimation techniques include CWT recoveries, maturation data, and mass marking.

The final data element required is current catch in the terminal exclusion area. In some fisheries, this may be difficult to determine since: (1) fishermen may fish in several areas before landing the catch; (2) the catch reporting system may not record the area of catch in sufficient resolution; and/or (3) there could be some incentive to report catches as coming from exclusion areas since these harvests would not count against the NBC catch ceiling. This suggests that monitoring requirements and/or landing restrictions may be necessary to assure accountability. Incorrect reporting of catch may also lead to misreporting of stock

identification information and subsequently compromise one of the conditions identified for designation of a terminal exclusion area. If CWT analysis is to be the primary method for stock identification, an incentive to misreport catch or not to land adipose-clipped fish would be created; this suggests that some other means of stock identification may be necessary to supplement CWT analysis.

### Proposed Terminal Exclusion Areas

Three terminal exclusion areas were implemented on a trial basis for 1989 and 1990: Skeena, Kitimat, and Bella Coola. Descriptions of these exclusion areas and comments on the information available for evaluation are presented below.

The terminal exclusion would be the annual catch in the terminal exclusion area which exceeds the base catch level established for that terminal exclusion area. A base catch level for each exclusion area is calculated as the portion of the total NBC catch ceiling which is attributable to the exclusion area.

#### Area 4 Skeena River Terminal Exclusion Area

The objective of the Skeena River terminal exclusion area is to minimize the disruption of other NBC fisheries while allowing for the harvest of Skeena sockeye and pink returns and to allow for the prospect of a chinook-directed terminal area harvest of mature Skeena chinook in excess of the number required to meet the Skeena River escapement goal. The Skeena River terminal exclusion area, referred to as the River/Gap/Slough (RGS), consists primarily of the waters which are landward of Smith and Kennedy Islands (see Figure 1 in the Canadian Terminal exclusion paper). This area definition is reduced in size from that specified in the letter of transmittal. The exclusion area is bounded on the north by Inverness Passage (the "Slough") and on the south by a line drawn from the southern end of Kennedy Island to the mainland. The exclusion area in Marcus Passage between Smith and Kennedy Islands ("known as the "Gap") is defined as the waters landward of a line from Gregory Point on Kennedy Island to Gamble Point on Croasdaile Island. It was proposed that the annual chinook gillnet catch (chinook > 5 lb.) taken incidentally in these waters during the execution of targeted sockeye and pink fisheries be included in the calculation of the terminal exclusion. Tidal sport catches in this area operate throughout the coastal waters around Prince Rupert and would not be subject to terminal exclusion.

#### Catch Estimation Procedure

Catch by vessel in the exclusion area is sampled for a portion of the fishing fleet, usually twice daily, by Departmental staff hailing fishing vessels. Counts of fishing vessels operating in the area are provided by patrol vessels and from aerial counts. The daily catch is then estimated by multiplying the catch per vessel by the number of vessels. These "hail" catch estimates are accumulated over the entire season for the terminal exclusion area and for all of DFO Statistical Area 4. The catch in the exclusion area in terms of reported sales slip catch can then be estimated by multiplying the sales slip catch estimate for Area 4 by the ratio of the hailed catch in the exclusion area relative to the hailed catch in all of Area 4.



Separate hail estimates for the RGS area were not maintained by DFO district staff prior to 1984. It was not possible to directly estimate the base period catch in the Skeena terminal exclusion area. Instead, the base catch level was indirectly estimated by using the average proportion from 1984 to 1987 of the RGS relative to the total Area 4 gillnet catch. In the Canadian report, the NBC catch ceiling established domestically for net gear (40,000) was used.

#### Stock Composition Estimates

Quantitative stock composition estimates were not available for this exclusion area. A detailed sampling program was instituted for both 1989 and 1990 with the objective of examining the catch of vessels which have entirely fished in the exclusion area. This catch is sampled for CWT and for biological information. The biological sampling data have not yet been provided, but the CWT sampling and recovery data were presented in Table 10 (pg.15, Canadian report). A total of 38 tags were recovered (1989 and 1990) in RGS from a sample of 3,176 chinook. In 1990, three tags (from Robertson Creek, Quinsam River, and Kitimat River) of 23 CWTs recovered from the RGS were from non-local stocks.

#### Potential Impacts on Depressed Chinook Stocks

The Skeena River chinook stock is currently evaluated as Rebuilding in the CTC rebuilding assessment (TCCHINOOK 90-2). Canadian assessment including data through 1990 data does not indicate a change in status for this stock. The recovery of non-local tags in RGS does demonstrate the potential for impacts on other stocks, if these recoveries were correctly reported. The impact on any single stock should, however, be small. To ensure that these impacts are minimized, future sampling programs should be designed to test if non-local tags are recovered in RGS and/or portions of RGS are subject to contamination by chinook caught in adjoining waters.

#### Additional Information Needs

- (1) Investigation of the accuracy of hailed catch data and the use of saleslips to prorate the RGS catch.
- (2) Continued sampling for CWT in RGS, including procedures to avoid sampling catches possibly taken in waters adjacent to the RGS.
- (3) Provision of biological sampling data on age, size, and maturity of the terminal catch and Skeena chinook escapement.

#### Bella Coola Gillnet Area (BCGNA) Terminal Exclusion Area

The objective of the BCGNA terminal exclusion is to allow a terminal area harvest of mature local chinook stocks surplus to the spawning requirements (River escapement goal plus hatchery egg-take) for the Bella Coola Hatchery production area, without disrupting other Canadian fisheries. The BCGNA is a terminal gillnet fishery defined by the Subareas 8-10, 8-

11, 8-12, 8-15. The fishery is divided into two distinct periods: an early large mesh (8" gillnet) fishery targeting mature enhanced chinook returning to the Bella Coola Hatchery and river and a smaller mesh fishery targeting on sockeye, pink, and chum salmon.

As currently proposed, the catch for exclusion in this area would include all gillnet catch of large chinook, any mesh size, in all BCGNA subareas. In the BCGNA previous to 1990, Subarea 8-13 (south Burke Channel) was included in the gillnet area open during the early summer large-mesh gillnet fishery. From 1991 onward, the management intent is to close this subarea. The effort in Subarea 8-13 in the last few years has been limited to 1 or 2 boats, and has not been kept separately from the rest of BCGNA. Consequently, the exclusion base catch level included early-season gillnet catches from all of Area 8.

The early fishery in the BCGNA was closed in 1984, 1985, and 1986 to conserve local chinook. Prior to 1984, hail catches reported from the BCGNA during the early, large-mesh fishery also included catches from the outer portions of DFO statistical Area 8. Regional managers report that the size of this outer-area catch was small relative to the true BCGNA catch.

#### Catch Estimation Procedure

The BCGNA represents a set of distinct management subareas for which in-season hail data have been collected since 1975, and which will continue to be monitored. Hail data and final saleslip records compare very closely, due to the high vessel sampling rate in this area. The average unweighted daily sample rate for 1989 and 1990 was 91%. The overall ratio of 1989-1990 chinook saleslip to hail catch was 1.03. Annual hailed catch and final saleslip records of total Area 8 chinook catch were used to prorate the hailed BCGNA catch. The prorated gillnet catch during 1979-1982 was averaged to provide the base level catch in the same manner as for the Skeena exclusion area.

It is not possible to estimate exclusion area catches separately from those taken in all of Area 8 prior to 1983. In the original Canadian proposal, the base catch for this exclusion area, this base period average catch was multiplied by the Area 8 proportion of the NBC net ceiling. The average prorated catch for BCGNA for 1979-1982 was 5,000, including both the large and small mesh fisheries. The NBC net allocation divided by the total NBC net catch for this base period is 40,000/71,000. Applying this ratio to the base period catch of 5,000 results in a base catch level of 2,800. Catches in excess of 2,800 would be excluded.

In the BCGNA, an alternative base catch could be calculated for the early season, large meshed (8") gillnet fishery only (the fishery is complete by the last week in June or the first week in July). A base catch would be calculated as the average annual catch of mature chinook during the large mesh fishery in the time period 1979-1982 (3,800). Applying the 40,000/71,000 ratio of net allocation to total net catch results in a base catch level of 2,100, some 700 less than base catch estimated for the combined large and small meshed gillnet fisheries.

#### Stock Composition Estimates

Direct estimates of stock composition are not available for this fishery. The BCGNA is sampled annually as part of an extensive coastwide CWT recovery program. Scales, lengths, and weights of these tagged fish are recorded. When the BCGNA is identified by detailed location information and time of catch (restricted prior to July 1), the CWT information from 1987 through 1990 shows only recoveries from the Snootli hatchery or the Atnarko River (88 recoveries), except for one age 4 tag from Tenderfoot Hatchery (Squamish River, Lower Georgia Strait). Data prior to 1987 show more interceptions from non-local stocks, but prior to 1983, catches in Area 8 were partially taken in areas outside the proposed BCGNA.

#### Potential Impacts on Depressed Chinook Stocks

Chinook escapements to Area 8 are dominated by enhanced returns to the Bella Coola River. Terminal runs and spawning escapements to this river have been very good. The Area 8 escapement index presented in TCCHINOOK (90)-2 consists of 7 natural chinook populations dominated by the Dean River. Through 1989, the Area 8 escapement index was assessed as Probably Not Rebuilding. To conserve chinook returns to the Dean River, approaches to the river (Fisher and Dean Channels) have been closed to fishing.

The incidence of a non-local tag does indicate the potential for impacts on other stocks. However, as noted in the "Operation of Terminal Exclusions" section of this report, the terminal exclusion procedure does provide buffering from new enhanced production in non-terminal areas. This should ameliorate the effect of catches in terminal areas. BCGNA harvest rate indices since 1987 were lower than those observed prior to 1984.

#### Additional Information Needs

- (1) Biological samples should be collected to determine age, size, and maturity of fish harvested by time and area in the BCGNA.
- (2) The interception of fish from depressed natural chinook populations in the exclusion area should be assessed.

#### Kitimat Terminal Exclusion Area

The objective of the exclusion is to allow harvest of the mature chinook returning to the enhanced stocks in the Kitimat, Dala, and Kildala rivers, without unduly restricting other fisheries in the NBC catch ceiling. To meet this objective, the proposed exclusion is for catch of large chinook (> 5 lbs) harvested in Subarea 6-1 during June and July. The Kitimat terminal exclusion area is defined as Management Subarea 6-1 (see Figure 3, Canadian terminal exclusion report). The excluded catch would be calculated as the total catch in this time and area minus the base period catch in this time and area. Although currently there is only a sport fishery in this area, there is potential for a large-mesh gillnet fishery in the future. This definition is different than that presented in the original 1990 proposal; in 1990, catch in this subarea throughout the year was proposed for exclusion.

### Catch Estimation Procedure

Recreational catch was estimated by creel censuses with sufficient detail to separate the catch in the designated exclusion area for 1980, 1987, 1988, 1989, and 1990. Methods for estimating daily catch varied among years. Surveys in recent years were only conducted in June and July since chinook are available in the terminal area in these months.

There is some concern over the variability in methods used to estimate daily catch, lack of statistical design to the catch estimation procedures, and (in most cases) lack of documentation in the procedures that were used. The accuracy of the catch estimates are unknown. In 1990, changes were made to the creel survey design in order to develop more accurate estimates of subarea catch. One problem with the available catch information is the lack of base period catch estimates. For the Kitimat exclusion area, catch of chinook greater than 5 pounds during the 1979-1982 base period can not be directly estimated. Instead, the Canadian report calculates an alternative "base" as an average of all available years prior to 1989. The only available years are 1980, 1987, and 1988.

### Stock Composition Estimates

The CWT recovery information indicates that this Subarea 5-1 probably has a greater mixture of stocks and maturities than the other areas being considered for terminal exclusion. During the years 1984-1990, 16 of 112 (14%) of the tagged chinook recovered in this fishery were of non-Kitimat hatchery origin (although this percentage has been low in recent years). These non-Kitimat recoveries have been from both Canadian inside and Southern U.S. stocks.

### Potential Impacts on Depressed Chinook Stocks

There are two general areas of concern regarding potential impacts of this fishery on depressed stocks: (1) impacts on natural stocks included in the Area 6 escapement index; and (2) impacts on non-local or immature stocks.

Area 6 contains 4 enhanced rivers in upper Kitimat Arm and 13 natural populations in the lower portions of Area 6. Although confidence in the evaluation of the natural population escapements is weak, these populations have been classified as Probably Not Rebuilding (Area 6 Index, TCCHINOOK 90-2). While all of the natural spawning areas are south of the exclusion area, there is some concern that these natural stocks may be harvested in the exclusion area.

The size limit in the Kitimat sport fishery is 48 cm (18 inches). Although recently, the average weight of the fish caught in the fishery is large (33.7 lb. in 1989), between 5% and 19% of the landed catch was comprised of fish smaller than 5 pounds in 1989 and 1990. Of those under 5 pounds in 1990 (comparable biological sampling data were not collected in 1989), 86% were classified as either "feeders" or "unknown" maturity. This fairly high catch of immature fish may not be consistent with the stated intent of the fishery to harvest "mature chinook returning to the

enhanced stock."

The Canadian terminal exclusion report points out that "more area and/or time restrictions may be needed to define an Area 6 exclusion area."

### Committee Concerns

The CTC is concerned that the catch in Kitimat Subarea 6-1 includes a significant portion of immature and non-local chinook. The large fishing area involved, the presence of local natural stocks classified as Probably Not Rebuilding by the CTC, and lower quality of data reduce the CTC's confidence that this proposed exclusion satisfies the stated conditions. The CTC cannot recommend the acceptance of the proposed Kitimat exclusions for 1989 and 1990.

The CTC recommends that if the Kitimat is accepted as an exclusion area, then excluded catch should only include mature chinook returns to the enhanced stocks in Kitimat sub-area 6-1. To accomplish this, it would be necessary to use maturity data to calculate the exclusion, and it might be necessary to further refine the time and area definitions of the exclusion area.

A difficulty with this approach is that it is not possible to calculate a base period catch level of mature chinook because maturity data are not available. The most technically defensible approach would be to use average maturity estimates from the available years, 1989 and 1990, in lieu of base period data. This likely overestimates the base period catch of mature, Kitimat area chinook and, as such, would be a conservative approach.

### Additional Information Needs

- (1) Information about the stock composition of the catch in the proposed exclusion area.
- (2) Biosample information.
- (3) Consistent, well-designed catch estimation procedures.
- (4) Information about potential area and/or time restrictions to reduce non-Kitimat catch.

## ALTERNATIVE APPROACHES TO COMPUTE BASE LEVEL CATCHES

Some alternative approaches for computation of base levels for each of the proposed terminal exclusion areas are presented in the following tables. In the tables pertaining to the Skeena and BCGNA exclusion areas, two alternative adjustment ratios are presented which could be applied to the calculated base period catches in each area. The first, used in the Canadian report, is calculated by dividing the Canadian domestic allocation to nets by the base period (1979-1982) net catch in DFO statistical Areas 1 to 10 (40,000/71,000). A second proposed

ratio could be calculated by dividing the entire NBC catch ceiling by the total average NBC catch during the base period (263,000/325,000). Base catches calculated using the procedure suggested by the Canadian proposal are lower than those calculated using the overall reduction due to the NBC catch ceiling. This is because Canadian domestic allocation to the NBC net ceiling resulted in greater reductions in net than in troll or sport fisheries.

Table 1. Alternate suggestions for calculating base levels and resulting exclusions for the Skeena River/Gap/Slough exclusion area.

Base Period Calculation	Alternative	Adjustment Ratio (Thousand fish)	Base Period Catch	Base Catch before Exclusion applies	Excluded Catch for each Alternative	
					1989	1990
Total annual sales slip adjusted by hail proportions	Canadian proposal using net ceiling only	$\frac{40}{71}$	4200	2400	6900 - 2400 4500	6800 - 2400 4400
	Alternate proposal using full NBC ceiling	$\frac{263}{325}$		3400	6900 - 3400 3500	6800 - 3400 3400

Table 2. Alternate suggestions for calculating base levels and resulting exclusions for the Bella Coola Gillnet Area.

Base Period Calculation	Alternative	Adjustment Ratio (Thousand Fish)	Base Period Catch	Base Catch before Exclusion applies	Excluded Catch for each Alternative	
					1989	1990
Total annual sales slip adjusted by hail proportions	Canadian proposal using net ceiling only	$\frac{40}{71}$	5000	2800	3100 - 2800 300	3900 - 2800 1100
	Alternate proposal using full NBC ceiling	$\frac{263}{325}$		4000	3100 - 4000 None	3900 - 4000 None
Early season large mesh gillnet catch	Canadian proposal using net ceiling only	$\frac{40}{71}$	3800 <sup>1</sup>	2100	2100 <sup>2</sup> - 2100 None	2400 <sup>2,3</sup> - 2100 300
	Alternate proposal using full NBC ceiling	$\frac{263}{325}$		3100	2100 - 3100 None	2400 - 3100 None

<sup>1</sup> Hail catch estimates for BCGNA are not available for the base period (1979-82). Early season large mesh gillnet catches are inferred from the total Area 8 sales slip data based on the absence of "jacks" (chinook < 5 lb). This method will overestimate the size of the base period catch since portions of Area 8 outside of the BCGNA were open at the same time.

<sup>2</sup> Weekly hail catch data were used to estimate the distribution of the total annual BCGNA sales slip catch (Table 2, Canadian report).

<sup>3</sup> Local Area 8 records indicate that 50% of the 1990 catch in the first statistical week in July was taken by large mesh gillnet (based on sampling during hails).

Table 3. Alternate suggestions for calculating base levels and resulting terminal exclusions for the Kitimat (Area 6-1) exclusion area.

Base Period Calculation Method	Alternative	Calculation Method	Base Catch before Exclusion Applies	Excluded Catch for each Alternative	
				1989	1990
Large (> 5 lbs) catch in Area 6-1 during June & July only  Catch estimation procedure depends on year.	Current Canadian Proposal	Average of three years with usable catch estimate (1980, 1987, 1988)	1600	2200 - 1600 600	3000 - 1600 1400
	Alternate Canadian Proposal	Use the only catch estimate collected during base period (1980)	900	2200 - 900 1300	3000 - 900 2100
Estimated proportion of total NBC sport catch ceiling taken in Area 6-1	Original Canadian Proposal	$20,000 * 0.25 * 0.67^1$	3400	<sup>2</sup>	<sup>3</sup>
Estimated proportion of <u>mature</u> fish in the catch of large (> 5 lb) chinook during June and July only	CTC Proposal using Canadian NBC sport allocation	'89: $0.95 * 2200^4$ '90: $0.89 * 3000^5$  (Average of 2 years = 2400)	2400 <sup>6</sup>	2100 - 2400 None	2700 - 2400 300
	CTC Proposal using total NBC Ceiling Reduction	As above: 2400 *  <u>263,000</u> 325,000	1900	2100 - 1900 200	2700 - 1900 800

<sup>1</sup> Base period catch estimated by multiplying the NBC sport ceiling (20,000) by the estimated proportion of the total NBC sport catch which was taken in Area 6 during the base period (25%, after adjustment for size limit change) and by the estimated proportion the Area 6-1 catch is of the total Area 6 sport catch (67%).

<sup>2</sup> Catch estimate for June & July 1989 for all chinook in Area 6-1 is 2325. Total catch for the entire year would have to be estimated and is likely to exceed the base catch.

<sup>3</sup> Catch estimate for June & July 1990 for all chinook in Area 6-1 is 3739, which exceeds the base catch. Total catch for the entire year would have to be estimated.

<sup>4</sup> Proportion mature estimated by calculating the percentage of fish > 5 lb which are larger than 12.5 lb.

<sup>5</sup> Proportion mature estimated from the examination of biological samples for maturity characteristics. Maturity estimated separately for both size categories (greater and less than 5 lb).

<sup>6</sup> Canadian domestic allocation to the NBC sport ceiling did not involve any reduction to the base period catch levels.



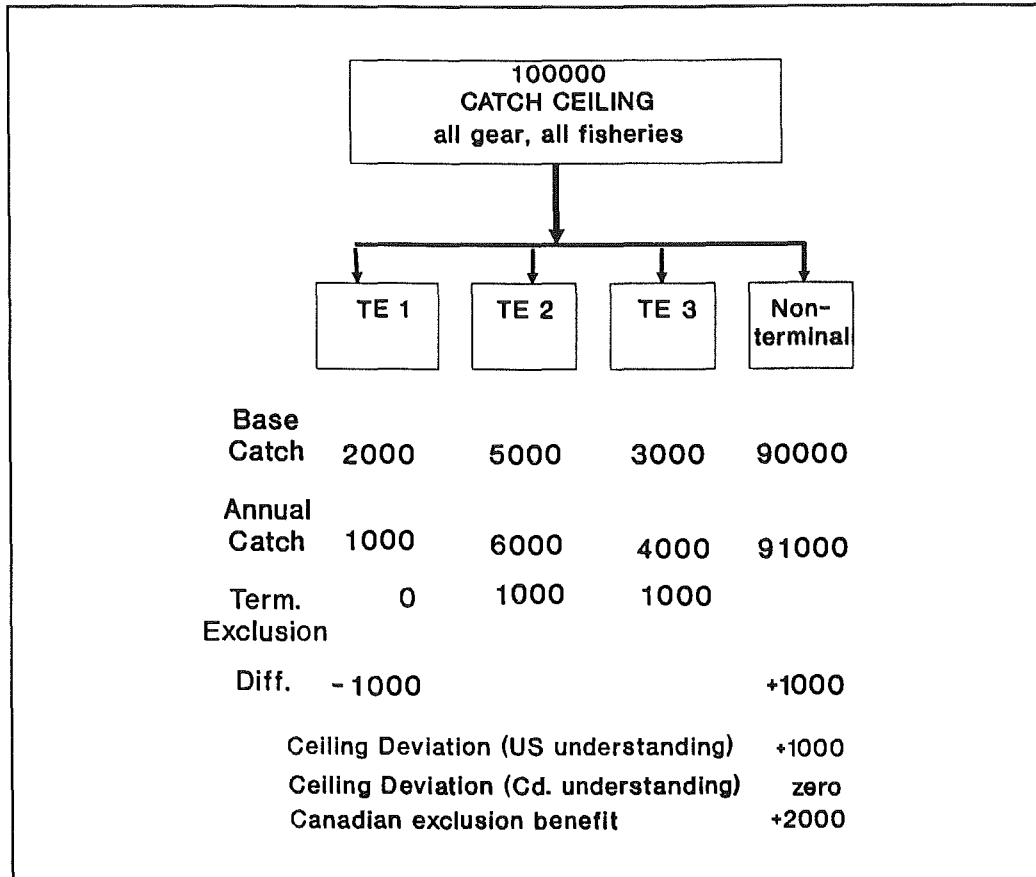
APPENDIX- Differences In Understanding Of  
How Base Catch Levels in Terminal Exclusion Areas  
Relate to the All-Gear NBC Catch Ceiling

The 1991 Canadian terminal exclusion report does not address how the terminal exclusion relates to the all-gear NBC catch ceiling. During technical review of the exclusion report, it became apparent that a difference exists between U.S. and Canadian understandings of how base catch levels for terminal exclusion areas are to be accounted for within the all-gear NBC catch ceiling (see example).

The effect of the two understandings is identical if terminal area catches exceed the base level catches. But, under the U.S. understanding, underages from base levels established for exclusion areas could not be applied to overages in non-exclusion areas. The total all-gear catch could thus be less than 263,000, if the catch in exclusion areas is less than the combined base catch levels for established exclusion areas. The likelihood of this event occurring is low, particularly when the benefits from terminal exclusion are considered over the three areas proposed. If the likelihood is not considered low, then the terminal exclusion proposal may not be worthwhile. However, it should be appreciated that the risk of a potential all-gear NBC chinook catch below 263,000 is related to the base catch levels established for the exclusion areas. The larger the base catch levels, the greater the risk that this possibility will occur.

The U.S. understanding was based on discussions with Canadian technical staff and materials submitted in conjunction with Canadian terminal exclusion proposals made during 1989 and 1990. An important consideration in the approval of the 1989 and 1990 exclusions on an interim basis was the understanding that the all-gear catch ceiling would be separated into components. Each exclusion area would be allocated a portion of the NBC ceiling which is equal to the base catch level for that exclusion area. The all-gear catch ceiling for remaining fisheries would be the balance of the NBC ceiling after deduction of the base catch levels for terminal exclusion areas. Catches in each exclusion area in excess of the base level would not be counted against the NBC ceiling. If the catch in each exclusion area did not exceed the base level, the NBC catch ceiling for other fisheries would not be increased to compensate. Consequently, terminal exclusion would not increase the portion of the catch ceilings taken in non-terminal fisheries above that anticipated when the exclusion areas were established.

It has never been Canada's intention in the terminal exclusion proposals to re-direct catch to non-terminal areas, but Canada's intended accounting for terminal exclusions would not separate the base catch level from the all-gear catch ceiling. The NBC ceiling would remain 263,000. Catches in exclusion areas which exceed the base level for each exclusion area would not be counted against the total NBC ceiling.



Example illustrating the differences between the Canadian and U.S. understanding.

In this example an all-gear, all-fishery catch ceiling of 100,000 chinook has been established. Three terminal exclusion areas were identified (TE 1-3) with base catches of 2,000, 5,000, and 3,000 respectively. These base catches result in an effective ceiling in the non-terminal fisheries of 90,000. Actual catches resulted in a 1,000 underage in TE 1, and exclusions of 1,000 in TE 2 and TE 3. The total catch in non-terminal fisheries had a 1,000 overage.

Under the U.S. understanding, the cumulative deviation from the catch ceiling would be +1,000. The Canadian understanding would allow for offsetting of overages in non-terminal fisheries if underages occurred in terminal fisheries; therefore, the cumulative deviation would be zero. The terminal exclusion strategy would also have benefitted the Canadian by +2,000 chinook. Without terminal exclusion, this example would have resulted in a cumulative deviation of +2,000 chinook.