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PACIFIC SALMON COMMISSION
JOINT CHUM TECHNICAL COMMITTEE REPORT

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SUMMARY REPORT ON THE CURRENT AND FUTURE
MANAGEMENT AND ENHANCEMENT INTENTIONS OF THE
UNITED STATES AND CANADA
FOR SOUTHERN CHUM SALMON

February 1988

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PREFACE

This report was prepared in response to a request made by the Pacific Salmon Commission in October, 1987, for a description of the current and future southern chum management strategies of Canada and the United States (U.S.), chum enhancement activities and plans in the two countries, and for a outline of anticipated changes in management and enhancement activities and an evaluation of resultant effects on future interceptions.

JOINT SUMMARY AND CONCLUSIONS

The October, 1987, assignment to the Chum Technical Committee from the Pacific Salmon Commission was: To prepare a summary report on the long-range chum salmon management and enhancement intentions of each country. The report should contain any fundamental differences in management or management approaches and an evaluation of their potential effects on future interceptions.

It is a difficult task to predict, with any certainty, future management and enhancement activities, especially while implementation of the Pacific Salmon Treaty (PST) is still in its early stages. Therefore, the Committee felt that the only meaningful forecasts possible would be for the next one or two chum cycles (4-8 years). This was based on the assumption that any major enhancement activities that are not already proposed and placed into the funding processes of each country are not likely to be constructed and producing harvestable fish for one to two cycles. Management strategies for chum have been relatively stable in recent years and there are no indications of major changes on either side.

The following sections provide an overview of southern chum management by the U.S. and Canada and illustrate a basic difference in approach. A better understanding of this difference should be helpful in preventing misunderstandings about each others fisheries and reduce conflict. While there are exceptions and some variation caused largely by domestic allocation and other localized needs, the two countries utilize the following general management philosophies.

Canada is currently managing to provide wild stock rebuilding by reducing harvest rates in the mixed stock fishery in Johnstone Strait. Terminal area fisheries are used to harvest those fish that could not be harvested in the mixed stock fishery due to natural stock limitations. Additionally, Canada employs enhancement as a means to augment harvests, as well as wild escapement of certain stocks.

Inside Stocks are harvested in two types of fisheries, a mixed stock fishery in Johnstone Strait and terminal fisheries in the Strait of Georgia and the Fraser River. This approach provides for a continuation of traditional fishing patterns and harvest opportunity in areas of higher product quality.

Harvest rates are established annually for Johnstone Strait fisheries at levels necessary to facilitate wild stock rebuilding. For stocks that have a surplus beyond escapement, after the harvest in Johnstone Strait, additional harvest may be taken in terminal areas. This combined approach, mixed and terminal, has recently resulted in a catch distribution of 54% in Johnstone Strait and 46% in the terminal areas.

The Nitinat stock (wild and enhanced) is managed for a fixed escapement. Enhancement is used to augment wild escapement and to stabilize annual harvests. The fishery targeting on Nitinat stock occurs in the marine area adjacent to Nitinat Lake. Some interception of passing stocks occurs. No targeted fisheries are conducted on the Juan de Fuca Strait stock due to small harvestable surplus.

In Washington, chum management emphasizes regional natural stock management. Only one of six Puget Sound regions (Hood Canal) has major chum enhancement and management focused on the hatchery stocks. Washington fisheries are managed to achieve fixed escapement goals each year. Management emphasizes terminal area fisheries within each region, where harvest can be directed at discrete stocks or stock groupings. The mixed stock fisheries in the western Strait of Juan de Fuca and San Juan Islands are traditional fisheries. They are also required under domestic treaty obligations to provide fishing opportunity for Indian tribes in usual and accustomed fishing locations, as well as to balance domestic allocations. These fisheries are small in comparison to the terminal fisheries (<20% of the total harvest). Domestic conservation and allocation constraints, as well as PSC mandated ceilings, can also limit the Puget Sound mixed stock fisheries.

The two countries' management strategies for chum fisheries can be categorized as follows:

<u>Fishery</u>	<u>Strategy</u>
Johnstone Strait	Variable harvest rate
U.S. Strait of Juan de Fuca	Fixed effort
Qualicum, Nitinat	Fixed escapement
U.S. San Juans/ Pt. Roberts	Variable ceilings

Both countries intercept chum destined for the other country's rivers, but the manner in which these interceptions have occurred is quite different due to the differences in management strategy. These differences in strategy will also have an impact on the future trend of interceptions. Interceptions of Washington origin chum occur in the mixed stock fisheries in Johnstone Strait and in terminal area fisheries at Qualicum and Nitinat directed at

Canadian origin fish, with U.S. fish making up a small proportion of the catch. When these fisheries catch large numbers of fish, the interceptions of U.S. origin chum may be significant. Of the two Washington fisheries that intercept Canadian chum, the most significant interceptions occur in the San Juan Island - Point Roberts fishery which harvests primarily Canadian origin fish. The total catch in this fishery is not large but the high proportion of Canadian origin fish may result in significant interceptions. The other fishery that intercepts chum of Canadian origin is the treaty Indian fishery in the Strait of Juan de Fuca. This fishery is not large and is composed primarily of U.S. origin fish.

In summary, chum interceptions in the two countries' fisheries can be categorized as follows:

<u>Fishery</u>	<u>Interceptions</u>
Johnstone Strait and U.S. Strait of Juan de Fuca	Directed at domestic mixed stock w/incidental interceptions.
Qualicum, Nitinat	Terminal area fishery with incidental interceptions.
U.S. San Juans/Pt. Roberts	Directed at U.S. and Canadian mixed stocks.

The Committee is unable to quantify future interception levels and trends. However, we have made the following general observations based on our understandings of current management strategies. Both of the Washington chum fisheries that catch Canadian chum have been restricted by the chum annex of the PST, and are expected to continue to be restricted. Areas 7/7A are expressly limited to harvest ceilings, while the Strait of Juan de Fuca fishery is limited by gear and participation. The Strait of Juan de Fuca fishery has experienced a growth in catch in the last three years due to favorable fishing conditions and good chum abundance, but further significant growth is not expected under current limitations. Both of these fisheries may be further constrained, in any given year, by domestic allocation and conservation needs that have not as yet been defined. Future stock compositions in areas 7/7A could change given Canadian natural stock rebuilding.

Interceptions of U.S. origin chum in Canadian WCVI troll and net fisheries are not expected to increase significantly over current levels. The troll chum harvest, which increased considerably in 1985 and 1986, is expected to be variable due to fluctuations in chum availability and fishing opportunity, but

should remain below the levels of 1985 and 1986 due to domestic allocation constraints. The chum fishery at Nitinat has grown in recent years due to increased enhancement. In 1984 the fishery was moved outside the lake, with associated increased interceptions of non-Nitinat origin fish. The hatchery in this area is now at full production and full impact on harvest levels should be realized in the next couple of years. Interception levels should not change significantly after full hatchery production is realized. However, it should be noted that the natural stock demonstrates large variations in survival with occasional boom years, such as 1985, which can result in very large harvests and interceptions.

Interception levels in most inside B.C. fisheries are not expected to change significantly. The only area that might be expected to experience a change in interceptions is Johnstone Strait. In this area the "Clockwork" management strategy has been established with the intent to accomplish the rebuilding of depressed natural chum stocks, and has resulted in harvest rates of 10 to 20 percent in recent years. As the "Clockwork" strategy succeeds in rebuilding the stocks it is expected the allowable harvest rates in Johnstone Strait, and the associated interceptions, will increase to a level comparable to those observed in 1982 and 1986 (30 - 40%). Of course, actual future interceptions can be dependent upon a variety of factors such as the size of U.S. runs, migration routes and timing of fisheries. Hatchery production in both the Qualicum area and the Fraser River has reached the capacity of the facilities, and no new major projects are expected to come on-line soon.

Finally, in looking to the future, the Committee was asked to identify needed future work efforts. In our evaluation of differences in management and expectations for future interception levels, it has become apparent that we are unable to predict, on an annual basis, the proportion of U.S. or Canadian stocks that migrate around either side of Vancouver Island (rate of diversion). A better understanding of migration routes and their annual variability is vital to our ability to project and evaluate the effect of future changes in management or enhancement strategies. This understanding will likely be derived from fishery stock identification information such as GSI, and jointly developed run reconstruction models. Efforts such as these will also allow the Committee to examine timing and location of stock passage and identify and recommend alternative means for limiting interceptions. Therefore, the Committee recommends that its future work efforts be directed to continued improvements in the techniques and fishery coverage of stock identification work, and that work begin on chum run reconstructions that account for changes in migration routes and timing.

WASHINGTON CURRENT AND FUTURE CHUM MANAGEMENT AND ENHANCEMENT

INTRODUCTION

This report provides a summary of the current and future chum salmon management and enhancement intentions of the tribal and state fisheries managers of Washington for those stocks and fisheries of interest in Annex 4, Chapter 6.

CURRENT MANAGEMENT AND ENHANCEMENT STRATEGY

Puget Sound Background

Salmon management in Puget Sound is conducted under the framework of the Puget Sound Salmon Management Plan (PSSMP), an agreement between the Puget Sound Treaty Tribes and the State of Washington. The PSSMP establishes domestic allocations for chum salmon destined for each of seven regions of origin: Strait of Juan de Fuca tributaries, Nooksack/Samish, Skagit, Stillaguamish/Snohomish, South Puget Sound, Hood Canal, and Canada. Chum salmon runs in Puget Sound return in three distinct timing segments: early, normal and late, one or more of which may occur in any given region. Generally, early runs overlap with coho or fall chinook, and late runs with steelhead. The PSSMP requires the State and the Tribes to develop annual preseason agreements on management and harvest planning for all Puget Sound salmon stocks. These agreements include the escapement objectives, harvest rates, domestic allocations, management periods (the time period when a catch area will be managed for a species or stock), methods used to estimate run size inseason, and scheduling of test fisheries. The PSSMP also requires agreement between the managers on enhancement planning, both annually and long-term.

For the past decade, the basic management strategy for chum salmon in five of the six Puget Sound regions of origin (Nooksack/Samish, Skagit, Stillaguamish/Snohomish, normal and late-timed stocks from South Puget Sound, and Strait of Juan de Fuca tributaries) relied primarily on natural stock production. The intent for most naturally produced Puget Sound chum stocks is to provide escapement levels expected to provide for maximum sustainable harvest (MSH) to Washington fisheries. As many natural chum stock productivities differ between even and odd years, the escapement goals vary correspondingly between years. The bulk of the harvest is taken in terminal area fisheries on discrete stocks or groups of stocks (management units). Harvest

levels in these regions are set to meet the natural escapement goals.

The only region where stocks are managed to achieve full harvest of enhanced normal-timed chum is the Hood Canal region. Early-timed chum returning to South Puget Sound and Hood Canal commingled with hatchery returns of coho or chinook are harvested at rates appropriate for these other species; and the chum natural escapement objectives are considered secondary. Although some hatchery production occurs in the five natural production regions, it is limited to areas where the hatchery surplus can be discretely harvested after separation from natural runs, or where it supplements natural stock production.

Washington Coast Background

Treaty Indian and/or non-Indian fisheries harvest chum in three terminal areas: the Quinault River, Grays Harbor and Willapa Bay. The Quinault River fishery is managed to meet the hatchery escapement goal, while the Grays Harbor and Willapa Bay fisheries are managed to meet fixed natural escapement goals. The Grays Harbor fishery is managed to meet domestic treaty/non-treaty allocation requirements.

Stock Sizes and Production Levels

The average (1976-1986) return of chum to Puget Sound is over 1.1 million, of which 90% are normal-timed. The average run sizes, harvests and escapements by region are shown in Table 1. The average total harvest rate on naturally produced stocks is 55%. Enhanced stocks contribute an average of 30% of the total Puget Sound run.

Table 1. Average (1976-1986) Annual Puget Sound Chum Stock Status

Region of Origin	Run Size	Harvest	Escapement
StJdeFuca	7,483	972	6,511
Nook/Sam	93,466	53,770	39,696
Skagit	140,277	89,070	51,207
Still/Sno	155,775	75,059	80,716
South Snd	369,309	247,585	121,724
Hood Canal	350,381	282,611	67,770
=====	=====	=====	=====
	1,116,691	749,066	367,625

The magnitude of chum salmon enhancement in Puget Sound is limited in most regions in order to maintain natural stock management and to avoid hatchery/wild stock harvest conflicts. As previously indicated, the only major enhancement of normal-timed chum is in the Hood Canal region. Figure 1 provides a historical perspective of Hood Canal chum enhancement relative to the total levels of chum enhancement in all Puget Sound. Figure 2 illustrates current proportions of chum enhancement by region for Puget Sound, based on the 1985 brood which is representative of current patterns. The trends of hatchery and natural returns to Puget Sound over the past 11 years are shown in Figure 3. The average (1976-86) total hatchery origin return to most regions of Puget Sound, other than Hood Canal, is small, 13%.

Less than 10% of the chum produced in Willapa Bay or Grays Harbor on the Washington coast are from hatcheries. The Quinault River production is largely hatchery origin, with annual releases of two to three million.

Current Management Approach

The majority of the United States (U.S.) harvest of Puget Sound chum, over 80% in recent years, is taken in terminal area fisheries where the catch is comprised of individual stocks or groups of stocks destined for a single region. Terminal area fisheries are utilized to meet the fixed escapement objectives, to fulfill the requirements of domestic treaty allocations and to minimize management constraints imposed by interactions with other species or stocks. Harvestable numbers for these terminal fisheries generally are determined using inseason estimates of the run size entering each terminal area; and, since escapement requirements are fixed, harvestable numbers change as run size estimates fluctuate through the season. Fishing schedules in each terminal area are set to harvest the allowable surplus, and achieve domestic allocations and escapement from all segments of the run.

Large scale mixed stock chum fisheries have been deemphasized in Puget Sound harvest management. Limited mixed stock fisheries occur in three areas: the western Strait of Juan de Fuca, the San Juans and Point Roberts, and Admiralty Inlet. The fishery in the western Strait of Juan de Fuca (areas 4B,5,6C) is limited to the four Treaty Indian tribes who have fishing rights in the area. They fish on a fixed schedule and specifically exclude purse seines. Catches in this area are primarily of Puget Sound origin and represent an exploitation rate on Puget Sound stocks of only about 5%. Fisheries in the San Juans and Point Roberts areas (7/7A) are conducted as necessary to meet international (Pacific Salmon Treaty) and domestic allocations by both Treaty Indian and Non-Indian fleets. The beginning of the chum run through areas

7/7A overlaps with coho, and in some years, with late pink and sockeye milling in northern 7A. Test fisheries and management periods are the management tools used to address these timing overlaps. Altogether, the catch of Puget Sound origin chum in areas 4B,5,6C,7 and 7A, in directed fisheries as well as incidentally during other fisheries, is less than 20% of the total U.S. catch of Puget Sound chum. The Admiralty Inlet (Area 9) fishery is conducted occasionally by Treaty Indian and Non-Indian fleets under domestic allocation constraints after in-season information confirms the abundance and remaining harvestable

surpluses from the Hood Canal, South Puget Sound and Stillaguamish/Snohomish regions.

FUTURE OUTLOOK FOR MANAGEMENT AND ENHANCEMENT

No major changes are expected in either management approach or production for chum in any of the Puget Sound regions. The fisheries managers are developing long range management plans for all regions, which include a framework for anticipating future enhancement needs. Most regional plans are expected to continue the current reliance on natural production and resulting harvest strategies. Most of the Puget Sound naturally produced chum salmon populations are currently meeting escapement goals and are at full production; thus, expectations for the next two cycles are for only modest increases in natural chum production. No new major hatchery production of chum is currently planned in any of the Puget Sound areas. Some natural stocks will be rebuilt using a combination of tools, including protection through the fisheries and enhancement measures to improve survival and productivity of the natural stocks (ie., spawning channels, egg boxes, eyed egg outplants).

The natural chum stocks on the Washington coast show wide variability in production. Other than some supplementation to increase stock stability, there are no anticipated changes in enhancement levels. There are no plans to move any of the coastal chum fisheries outside of the terminal areas.

There should be no major shifts in fishing patterns either inside Puget Sound or along the Washington coast. Alterations of current enhancement programs for specific stocks to help resolve specific fisheries problems will also continue. There are currently no plans for U.S. enhancement on a level that would alter the current stock composition in areas 7/7A. Canadian natural stock rebuilding could affect stock compositions in areas 7/7A. Current patterns of interception of Canadian chum in Washington fisheries are not expected to be altered significantly, except as provided for by the Pacific Salmon Commission.

FIGURE 1. PUGET SOUND CHUM PRODUCTION

HATCHERY RELEASES

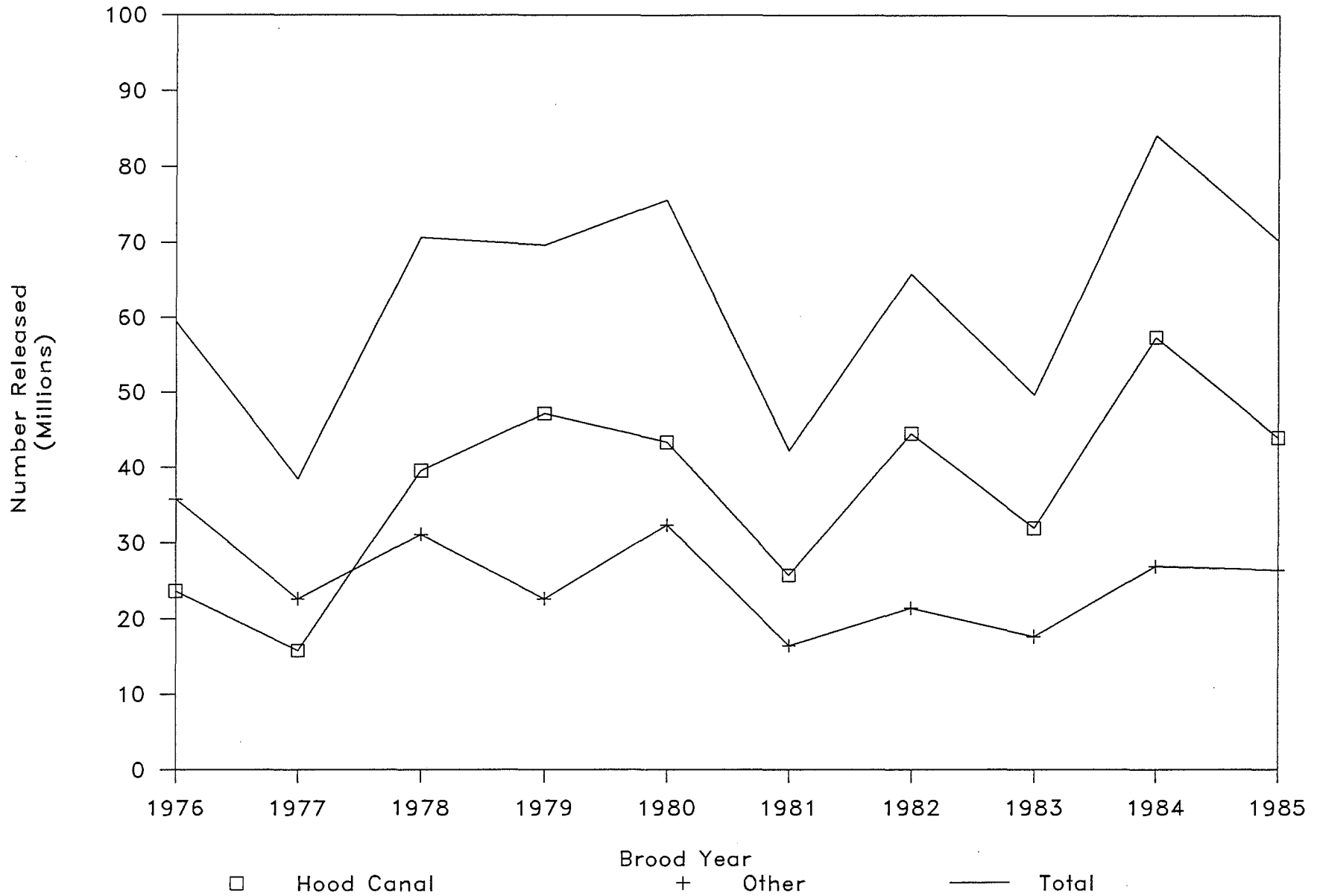


FIGURE 2. PUGET SOUND CHUM

REGIONAL HATCHERY RELEASES, 1985 BROOD

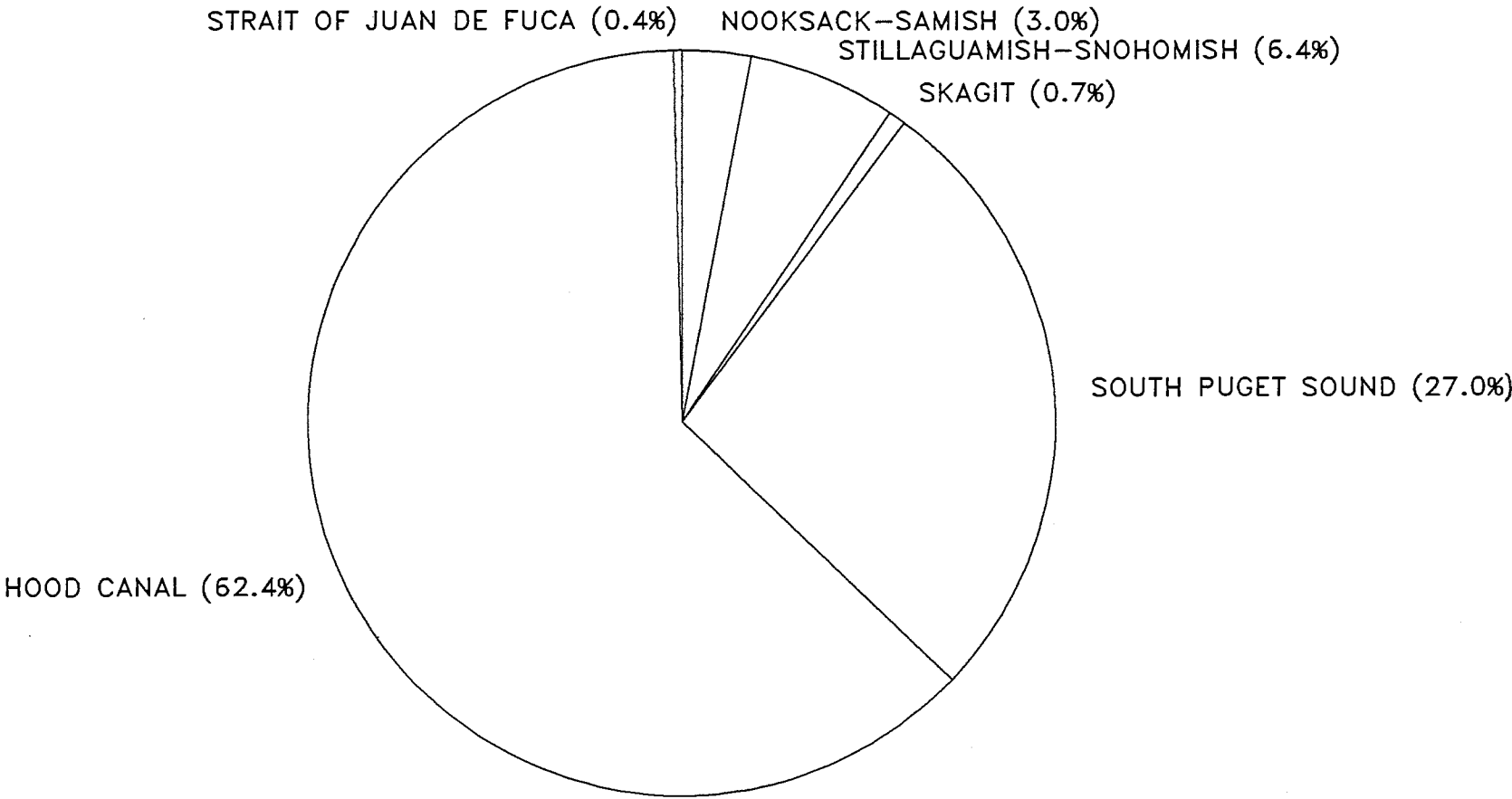
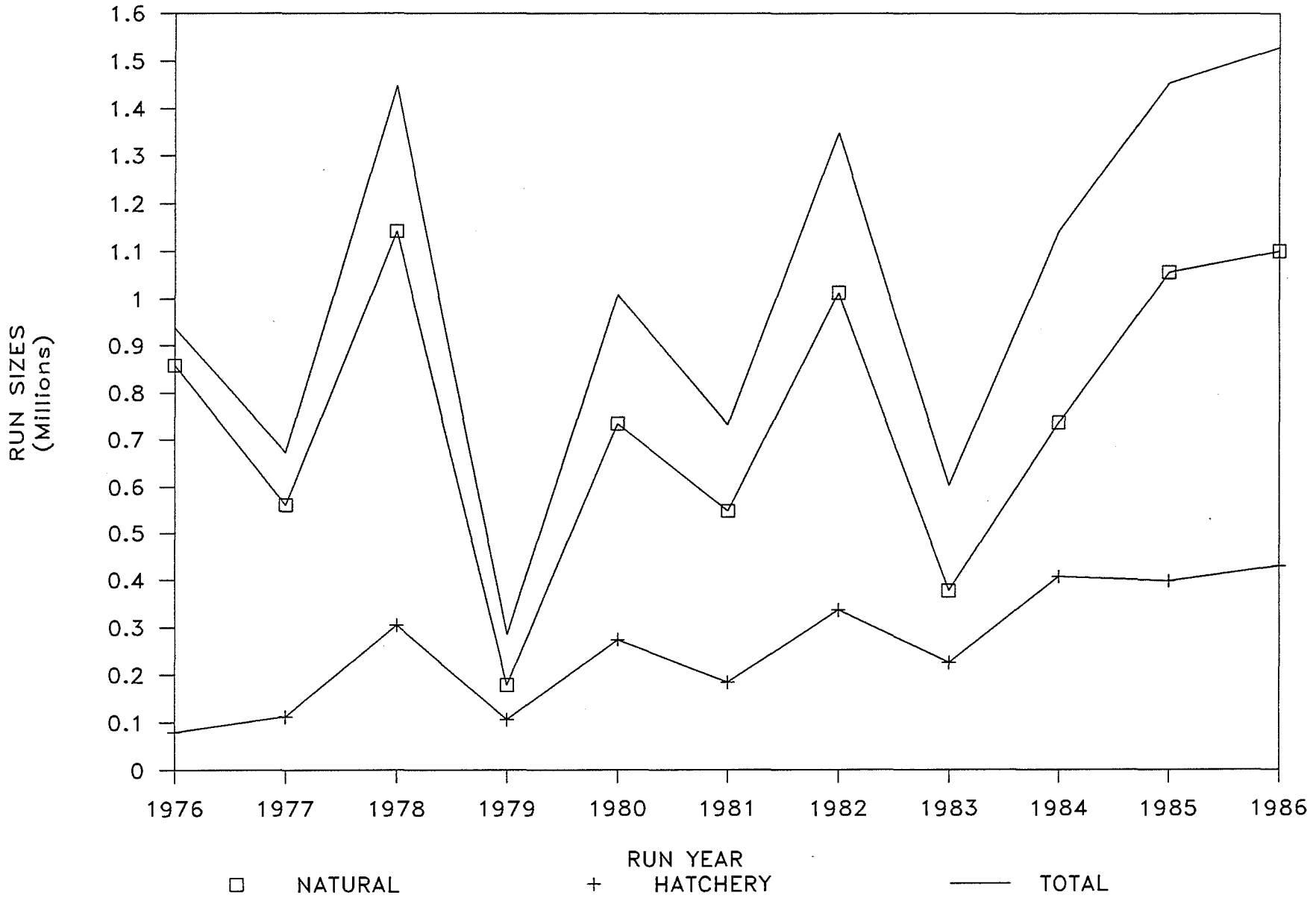


FIGURE 3. PUGET SOUND CHUM RUN SIZES

NATURAL VS. HATCHERIES

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CANADIAN CURRENT AND FUTURE CHUM MANAGEMENT AND ENHANCEMENT

INTRODUCTION

This report provides a summary of the current and future chum salmon management and enhancement intentions of Canada for those stocks and fisheries of interest in Annex 4, Chapter 6. The stocks and fisheries of interest are those of the Johnstone Strait - Strait of Georgia - Fraser River (Inside Stocks), Nitinat and Juan de Fuca Strait (Outside Stocks) and the west coast of Vancouver Island troll fishery.

CURRENT MANAGEMENT AND ENHANCEMENT STRATEGY

Inside Stocks and Production Levels

The Inside Stocks are produced from 150 streams. The main production areas (60%) are the Fraser River (both wild and enhanced fish), Howe Sound (wild), mid-Vancouver Island (enhanced), and southern Vancouver Island (wild).

Annual returns (wild plus enhanced) have averaged 1,253,000 fish for the 1960's, 2,233,000 fish for the 1970's and 2,516,000 fish for 1980-86. Escapements have averaged 882,000 fish for the 1960's, 1,173,000 fish for the 1970's and 1,614,000 fish for 1980-86 (Fig. 1).

The current escapement target for wild stocks is 2.5 million fish, including 700,000 to the Fraser River. Future adjustment to this target is likely as stock recruitment analyses suggest an optimum escapement of 2.9 million fish with 1.0 million to the Fraser River. Optimum escapements maybe lower in odd-numbered years than in even numbered years, presumably as a result of competitive interactions with pink salmon.

Enhancement began in 1967 with a spawning channel on the Big Qualicum River (midi-Vancouver Island). Further enhancement, starting in 1977, added facilities in Johnstone Strait, Strait of Georgia, and Fraser River areas. Facilities have a designed capacity to produce 1,415,000 returning fish. This total includes 501,000 for the Fraser River and 737,000 for the mid-Vancouver Island.

Annual enhanced returns have been increasing as the facilities achieve designed capacities. Enhanced returns averaged 287,000 fish for the 1980-84 period and 1,288,000 fish for the 1985-86 period. For these time periods, the enhanced component of the total return averaged 14 percent and 34 percent, respectively.

The enhanced returns in 1985 and 1986 were near designed capacities (Fig. 2).

Current Management

The majority of Inside Stocks migrate from the north through Johnstone Strait. There are three principal fishing areas (Johnstone Strait, mid-Vancouver Island and the Fraser River). Fish quality and value are highest in Johnstone Strait and decline as the fish migrate to their spawning areas.

Numerous stocks coincide in their migrational timing in Johnstone Strait. As such, single stock management is not totally effective. However, the mixture of stocks varies in time. This variation allows some single stock management. As stocks migrate from Johnstone Strait single stock management becomes more effective.

The management of the Inside Stocks (since 1983) has been conducted under the "ClockWork Plan". This Plan is a system whereby specific harvest rates, stepped to run sizes, and criteria on which management decisions are based, have been established and agreed to by both the Department and Industry. The long term objective, through reduced harvest rates, is to achieve increased wild spawning escapement to 2.5 million in all areas combined, including 700,000 to the Fraser River by 1995. A further objective is to determine, over the long term, the biological optimum escapement by allowing escapements in excess of the interim targets in some years and evaluating the subsequent returns.

The "ClockWork Plan" has shifted the distribution of catch from the Johnstone Strait mixed stock fishery to the single stock terminal fisheries as follows:

DISTRIBUTION OF CATCH

PERIOD	MIXED STOCK FISHERY	TERMINAL FISHERIES	
	JOHNSTONE STRAIT	STRAIT OF GEORGIA	FRASER
Pre-ClockWork 1970 - 1982	76%	12%	12%
ClockWork 1983 - 1986	54%	40%	6%

The ClockWork Plan

The management strategy involves a stepped increase in harvest rates to a maximum of 40 percent as the run size, estimated to be passing through Johnstone Strait, increases. Phase 1 (1984 - 1986), was based on a total wild stock escapement of 1.8 million, including 500,000 for the Fraser River. Phase 2 (1987 - 1990), the escapement goal was increased to 2.0 million, including 700,000 for the Fraser River. Incremental increases are planned to 2.5 million goal by 1995.

Run sizes and harvest rates for Phase 1 and Phase 2 are as follows:

HARVEST RATES	RUN SIZE (MILLIONS)	
	Phase 1 1984 - 1986	Phase 2 1987 - 1990
up to 10%	0 to 2.6	0 to 3.0
20%	2.6 to 3.3	3.0 to 3.7
30%	3.3 to 4.8	3.7 to 5.2
40%	Over 4.8	Over 5.2

The incremented wild escapement goals and other run components for Phase 1 and Phase 2 are as follows:

COMPONENTS	Phase 1 1984 - 1986	Phase 2 1987 - 1990
Wild escapement goal	1,800,000	2,000,000
Enhanced production	700,000	900,000
U.S.A. portion in Johnstone Strait	<u>100,000</u>	<u>100,000</u>
	2,600,000	3,000,000

Phase 3 is to be implemented in 1991. Details of Phase 3 will be developed from the review and analysis of performance to 1990. Such details would be available late 1990 - early 1991.

Once the run has migrated through Johnstone Strait, (and the stepped harvest rate strategy) the stocks in the terminal areas are managed to fixed escapement goals. When surpluses are identified, fisheries are conducted. The main terminal fisheries are those of the mid-Vancouver Island area and the Fraser River. Occasionally, fisheries are held to harvest identified surpluses off other rivers such as Nanaimo and Cowichan. These are much smaller fisheries.

A schematic of the management strategy for the mixed stock fishery in Johnstone Strait and the single stock areas is presented in Figure 3.

The specific strategies for these terminal fisheries areas are as follows:

Mid-Vancouver Island

Chum returning to the Qualicum area (mainly enhanced fish) are managed on the basis of local abundance. When additional surpluses are identified, fisheries are conducted. To take advantage of relatively high quality fish, a portion of the surplus is taken early in the season. The remaining portion of the surplus is harvested later in the season, once escapement goals are assured.

Fraser River

The review of Phase 2 indicated that management in the Fraser River was not flexible enough to allow the Fraser to be managed on the basis of local abundance. In Phase 2, the Fraser River is managed on the basis of chum actually entering the river, as determined from test fishing. Management is now based on two timing components with minimum run sizes established for each component before directed commercial fishing is permitted. As run size increases, catch increases in a stepped manner to a maximum of about 250,000 fish. In this way, the Fraser River escapement of 700,000 will increase in years of large returns, eventually providing information on biological optimums while at the same time allowing a portion of the surpluses to be harvested.

The enhancement program for Fraser was designed to enhance all the major stocks and many of the smaller ones. Returning enhanced fish would be permitted to augment wild spawning levels as well as providing additional fishing opportunities within the river.

Other Species Interaction

Incidental catches of other species occurs during targetted chum fisheries. Also, chum may be caught incidentally during late season targetted sockeye and pink fisheries on the Fraser River. To minimize these incidental catches, directed chum fisheries are generally not conducted within the Fraser River prior to October 15. In the Qualicum area, the targetted chum fisheries are conducted after early October and fishing boundary lines are arranged to minimize the incidental catch of passing Fraser River chum and local chinook and coho stocks.

Outside Stocks and Production Levels

Nitinat

Production originates mainly from Nitinat River with small contributions from four other streams. To augment wild production and to provide stable catches, a chum production facility was built on the Nitinat River. The first harvestable returns of enhanced fish occurred in 1984. The designed capacity of this hatchery is to produce 340,000 returning fish.

Returns to the Nitinat area prior to enhancement have been variable. During the 1960's, annual returns averaged 46,000. Only one fishery occurred during this decade. During the 1970's, annual returns averaged 215,000, with only two fisheries occurring during this decade. During the period 1980-83, returns averaged 118,000 with one fishery occurring. For years of enhanced returns, 1984-86, fisheries have occurred each year and returns have averaged 882,000 with catches of 728,000 and escapements of 154,000.

The escapement goal for the Nitinat area for the start of the 1980's was 150,000. This goal was changed in 1987 to 200,000, of which 175,000 is for the Nitinat River (enhanced plus wild).

Other Species Interaction

Catches of other species during the targetted chum fisheries at Nitinat have been minimal. Catches since 1984 of other species (primarily of coho) have been less than 3.3 percent of the catch of all species.

Juan de Fuca

Chum salmon production originates from eight streams with the Sooke River being the most important. During the 1960's, escapements averaged 30,000 and during the 1970's, 35,000. The 1980-84 average was 20,700 indicating a downward trend from

earlier years. There is no available information on total run sizes or productivity.

The catch in Area 20, of all origin chum stocks, has been relatively small compared to most other areas although there were occasional years when substantial numbers were taken. The average total catches were 22,000 for the 1960's, 74,000 for the 1970's, and 17,000 for 1980-84.

Current Management

Nitinat

The enhanced and wild Nitinat stocks are managed as a single stock. Fisheries are designed to provide for total fixed escapement. The strategy is to harvest some chum early (quality and price considerations) and to provide early season stock assessments. Continuing assessments (particularly monitoring escapements into the lake) determine whether additional stock is available for harvest. If so, additional fisheries are conducted late in the season.

Juan de Fuca

The major fisheries in this area are directed by the Fraser Panel towards sockeye and pink salmon. This area has not opened for targeted chum salmon fisheries in recent years.

W.C.V.I. Troll Fishery

Until the 1960's, troll catches of chum off the West Coast of British Columbia were minor with an annual average of 1,000 or less. Higher catches have occurred with the average increasing to 9,000 in the 1970's and to 85,000 for 1980-86. The largest annual catches occurred in 1986, when 265,000 were taken. The majority of the catch is taken in the northwestern Vancouver Island area and occurs during the latter half of July. Preliminary G.S.I. results indicate a mixture of stocks, with the main components being from the central and northern areas of British Columbia.

FUTURE OUTLOOK FOR MANAGEMENT AND ENHANCEMENT

Inside Stocks

The outlook for management of Inside Stocks for the next couple of cycles is similar to what has taken place starting in 1983. In general, spawning escapements have increased. As a result of larger escapements and greater numbers of enhanced chum, average run sizes should be larger in the future.

At present, there are no specific plans for further major increases of enhanced Inside Chum production. Returns are still building from existing facilities but are expected to plateau within the next few years.

In the immediate future, production would result from current brood year escapements (1983-86) for wild and enhanced fish. In the longer term, production would result from the attainment of the 2.5 million escapement for wild stocks plus the designed enhanced level of production. In the immediate future (1987 - 1990), returns averaging 4.9 million are expected. In the longer term (1991 - 1994), returns averaging 5.0 million wild fish plus 1.4 million enhanced fish are expected.

Returns in the immediate future are expected to average 4.9 million. The harvest rate in Johnstone Strait for returns of this size would be 30 percent. Recent year fisheries with similar harvest rates were as follows:

(1) YEAR	(3) HARVEST RATE	JOHNSTONE STRAIT	
		CATCH	NUMBER OF FISHERIES
(2) 1982	39%	1,109,000	5
1985	21%	513,000	2
1986	31%	1,047,000	4

- (1) Assessment fisheries only (less 10% harvest) occurred in 1983 and 1984.
- (2) 1982 is pre-ClockWork.
- (3) Harvest rates are those calculated by the ClockWork formula.

Thus, fisheries in the immediate future would be similar to those of the immediate past. Given this, interception rates of the U.S. bound chums should remain similar.

Outside Stocks

Nitinat

The outlook for management and returning stock sizes for Nitinat is similar to what has taken place since 1984. Thus, the rate of interception of U.S. bound chum would remain similar.

Juan de Fuca

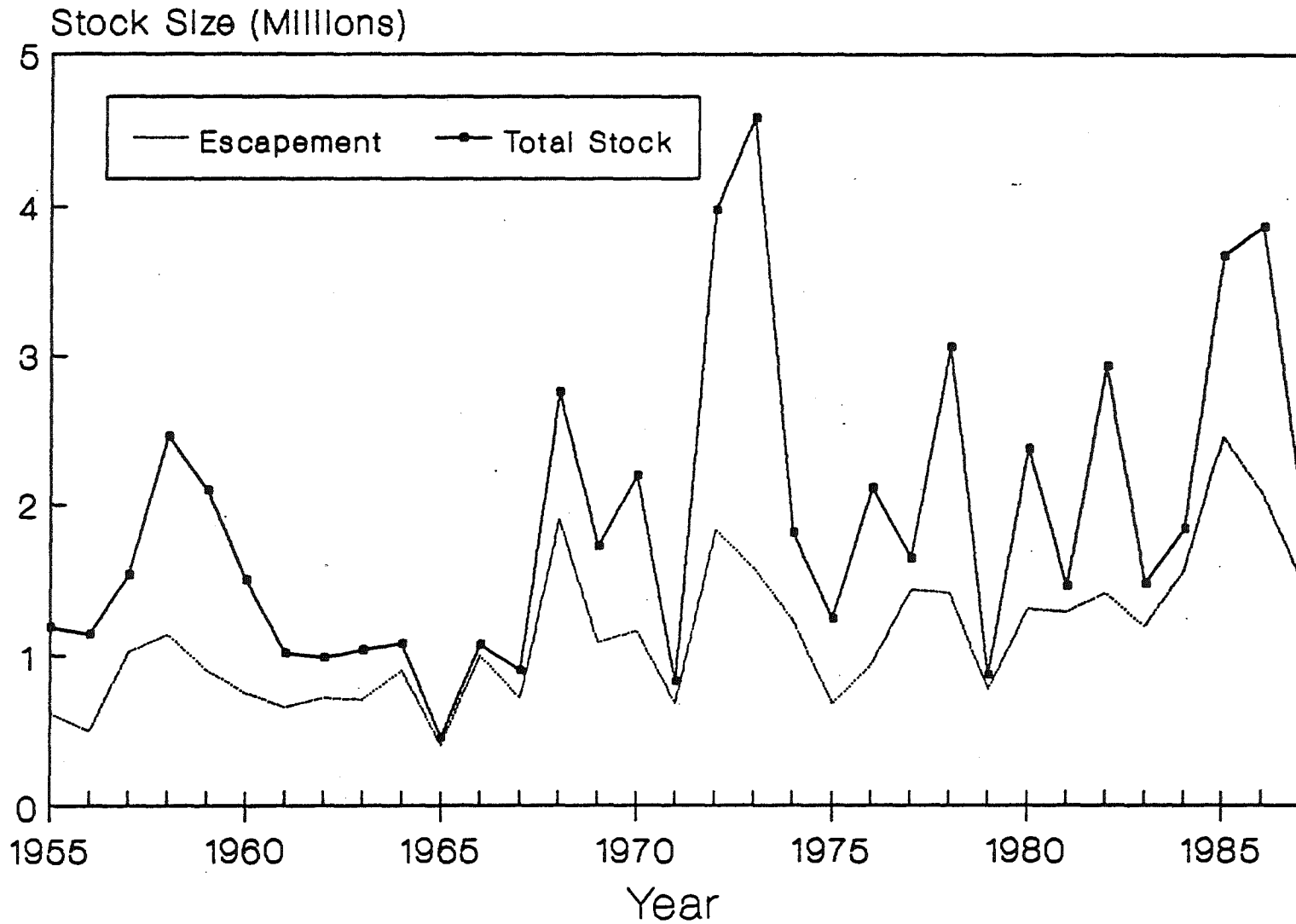
This area and its stocks have not been actively managed for chum salmon and, since 1982, this area has not been fished for chum salmon. Currently, Canada has no enhancement plans for this area. As such, no changes in interceptions would occur.

W.C.V.I. Troll Fishery

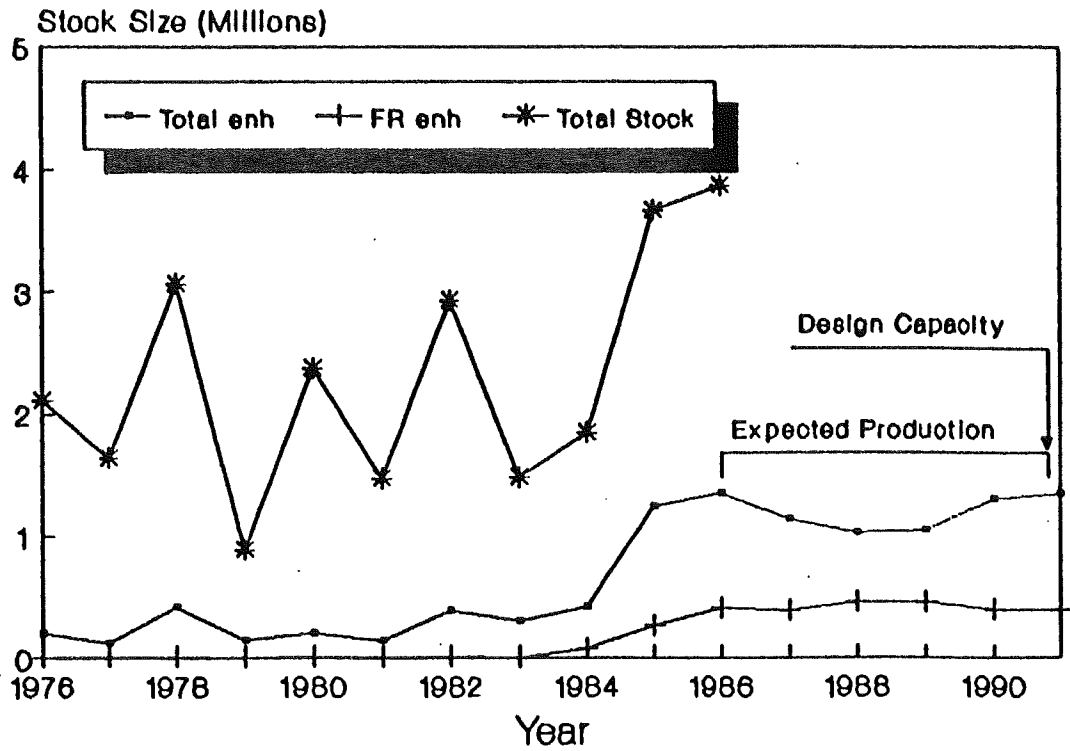
Catches in the West Coast Troll Fishery (Statistical Area 121-127) have occurred as incidental to the other troll caught species. Catches of chum are of mixed stock origin, primarily of northern Canadian stocks.

In recent years, catch levels in this fishery have been controlled by domestic allocation. As such, it is unlikely this fishery will significantly affect future interceptions.

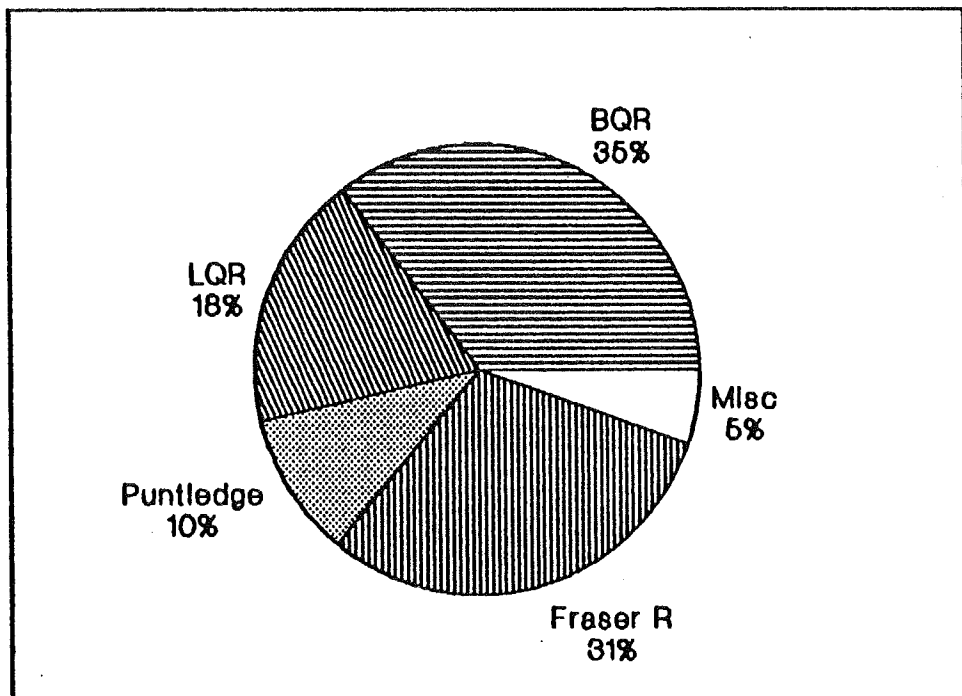
Annual Escapement and Total Stock



Inside Chum Production



Composition of the Enhanced Chum Return 1986



SCHEMATIC OF INSIDE CHUM MANAGEMENT STRATEGY

MIGRATION

JOHNSTONE STRAIT MIXED STOCK AREA

- mixed stocks (14 sub-areas, 150 streams)
- enhanced and wild stocks
- managed to optimize production of wild stocks at 2.5 million escapement
- stepped harvest rates to stock size ranging from 10% at 3.0 million or less to 40% at 5.2 million or greater.

MID VANCOUVER ISLAND SINGLE STOCK TERMINAL AREA

- single stock (1 sub-area, 16 streams)
- mainly enhanced stocks (3 streams accounting for 90% of escapement)
- fixed escapement at 299,000
- managed to enhanced stocks and to maximize quality of catch

OTHER STRAIT OF GEORGIA SINGLE STOCK

- single stock
- mainly wild
- fixed escapements
- managed to wild stocks and to provide increased escapement on larger returns

FRASER RIVER TERMINAL AREA

- single stock (1 sub-area, 40 streams)
- wild and enhanced stocks
- managed to achieve wild escapements
- staged escapements from increasing run sizes ranging from 700,000 from an 800,000 run size, on through nine intermediate levels, completing at an escapement of 1,260,000 from a 1,550,000 run size.