Report on the

Central Coast Salmon Stock Management Plan (SSMP) Process

Program Planning and Economics Branch
Fisheries and Oceans - Pacific Region

August 1991

TABLE OF CONTENTS

EXECUTIVE SUMMARY

- In the summer of 1988, the Department of Fisheries and Oceans (DFO) and the B.C. Ministry of Environment's Fish and Wildlife Branch (F&W) established a joint Working Group to develop a pilot Salmon Stock Management Plan (SSMP) for Central Coast Statistical Areas 7 & 8.

- This document marks the end of the pilot project, though only a partial completion of the original goals of the Working Group.

- The purpose of the SSMP process is to develop a long term plan that integrates harvest and production (habitat and enhancement) management and that meets the fundamental objectives of the Department: *stewardship*, *service to the public* and *best use*.

- Two basic processes are at issue here: the existing fisheries management process (which follows an annual cycle), and the long term, strategic planning process - both of which must be integrated. The task of bringing these two together - doing long term planning while meeting short term management responsibilities - is difficult but crucial if the Department is to meet its fundamental objectives in managing the salmon resource.

- The *development* of the SSMP follows these basic steps: resource status, public consultation, option analysis and strategy selection.

- Central Coast Areas 7 & 8 are located midway up the B.C. coast in a remote and rugged section of coastline marked by long, winding channels and inlets.

- The fisheries in Areas 7 & 8 are primarily commercial net fisheries, which often attract large gillnet and seine fleets. The troll fishery mainly occurs outside of the mainland inlet areas and targets on passing (mostly Fraser River) and some local stocks. The sport fishery in the areas is primarily freshwater with a marine component based primarily in Hakai Pass. Native food fishing occurs throughout the area by the various bands.

- Area 7 and 8 pink and chum stocks are the mainstay of the local commercial fishery. Sockeye and chinook provide additional, limited commercial opportunities in Area 8.

- Pre-season forecasts have proven to be quite inaccurate, both because there is a lack of good information and because environmental and physical variables affecting overall survival rates cannot be measured. Currently, there is no adequate method of measuring actual in-season abundance or of specifically identifying the stocks

contributing to the fishery. Thus, the uncertainty that plagues forecasting also undermines in-season assessment.

- The average landed value of the Area 7 chum catch for 1986-89, was about $2 million, for pink about $.5 million and for all salmon about $3.5 million (about 1% of total coastal landed value). The average value of Area 8 chum was $7.1 million, for pink about $4.9 million, and for all salmon about $14.8 million (about 5% of total coastal landed value).

- The status of stocks in Areas 7 and 8 is alarming and cause for serious concern. In general, the aggregate stocks of all species are depressed or show signs of decline.

- Only the Area 8 even-year pink stocks appear to be at target levels, however, the Atnarko River stock often exceeds its escapement target so aggregate pink data tends to mask the depressed status of the other even-year pink stocks in Area 8. Sockeye and chinook stocks are very weak. The Atnarko River chinook stock appears to be rebuilding. The Dean River steelhead stock appears to have stabilized in recent years. No information exists to carry out an analysis of the coho stocks in either Area 7 or 8.

- The high level of chum production from Snootli Creek Hatchery poses a mixed stock fishery problem for fisheries managers. Total Area 8 chum catch is composed of 40 to 50% enhanced chum, harvested at a rate of 70 to 85%. This is a very high harvest rate for wild chum stocks relative to other harvest rates for chum on the coast.

- A key goal of the Central Coast pilot was to explore more effective ways to consult with the users and the public, testing innovative forums for consultation - Open Houses and Workshops. Open Houses were held in Williams Lake, Bella Coola, Bella Bella, and Vancouver in May-June, 1989. The purpose of the Open Houses was to introduce the SSMP process to the public and to give them an opportunity to express their opinions about salmon management. Workshops were held in Williams Lake, Vancouver, Steveston, Bella Bella and Bella Coola in January-February, 1990. The Workshops were intended to foster more detailed discussions of specific stock issues and develop preliminary options.

- The Open House series provided input to the Working Group on public opinion on fisheries issues, gave the Working Group the chance to inform the public of the SSMP process and the state of Central Coast fisheries, and allowed the public the opportunity to participate in a constructive, non-confrontational forum.

- The Central Coast Workshops can be seen as both success and failure. They were a success in that they were a continuation of the Open House philosophy of allowing wider involvement in consultation. At this point, however, key field staff were unable to continue work and the Central Coast SSMP process stalled. A further round of workshops to discuss specific options is necessary to complete the process.

- The information gathered from the surveys, Open Houses and Workshops provides a valuable body of information for the Central Coast Working Group. There are a number of key points worth noting:

  • people have many concerns and see many issues as being critical, few were content with the status quo,
  • members of particular fishery user groups tend to blame other groups for over-harvesting and the resulting problems with low stocks,
  • people have a wide range of opinions on fishery issues, though their information is not always factual or complete,
  • people believe DFO can do something about the many problems facing the fishery whether through more enforcement, more enhancement, or reallocation of harvest or research efforts.

- The "Issues and Options" chapter was originally envisioned as the heart of the Central Coast planning document. It was to include a comprehensive list of general and stock-specific issues, a number of options for addressing each, and the recommended option for each issue. Because the SSMP process was halted, no further work could be done on option development, biological and economic modelling, or option analysis. The authors of this report have sought to consolidate the work of the Central Coast Working Group but can proceed no further in discussing Central Coast management options. Nonetheless, it is fruitful to list a number of important issues facing Central Coast salmon management, in this chapter renamed as "Issues". These general issues include uncontrolled harvest rates, depressed salmon stocks, increasing Native food fish needs, public consultation, commercial fleet control, and steelhead interception conflicts.

- Until the effort to develop a long term salmon management plan in the Central Coast is sustained through to completion, the true potential of the salmon resource in the area will not be realized. The Central Coast SSMP consultation process has raised the expectations of public stakeholders as to the Department's intention to undertake open, long term planning. The failure to complete the process does little for the Department's reputation.

- There is a pressing need for the Department to review its resource planning function and the roles and authorities of different Branches in carrying it out. The short-sighted, reactive management that prompted the call for long term planning is also its greatest obstacle. There may be a need for a significant change in the roles of the Department and resource stakeholders before an SSMP can be completed. A move towards local management and empowerment can be expected to encourage the sound management and open decision-making that all players seek, by making fisheries managers more accountable for the resource they manage.

Chapter I:
INTRODUCTION

In the summer of 1988, the Department of Fisheries and Oceans (DFO) and the B.C. Ministry of Environment's Fish and Wildlife Branch (F&W) established a joint Working Group to develop a pilot Salmon Stock Management Plan (SSMP) for Central Coast Statistical Areas 7 & 8. Over the following two years, the Working Group designed and implemented a process aimed at completing a documented management plan. This paper is not that document. Rather, it is a report written by the Program Planning and Economics Branch (PPEB) members of the Working Group[1] that is intended to serve two purposes. First, it scopes out the elements of a management plan for Areas 7 & 8 and thus serves as a basis for a complete working plan. Second, both the document and the process serve as models for future efforts at long term fisheries planning.

THE SALMON STOCK MANAGEMENT PLAN

The goal of the SSMP process is the development of long term salmon management plans for specific areas of the Pacific coast. Each plan is to be developed in a coordinated effort between relevant government agencies and different branches within DFO. The scope of the plan is to be comprehensive, focusing on all salmon species, considering all related resource activities and examining all proposed options within the framework of national, regional and provincial resource related policies. Finally, the management plan is to be developed using open and constructive consultation with the public and all stakeholders in the salmon resource.

WHY THE SSMP?

The SSMP concept was developed in response to a number of critical reviews of DFO management. In particular, the Report of the Commission on Pacific Fisheries Policy (the Pearse Report) cited "the lack of cohesive, consistent and forward-looking policies and programs with respect to fisheries management, enhancement and environmental protection." It further identified the need for significant reforms: "[t]he Department should formulate and publish long-term plans and objectives for managing each of the major species and for ensuring the most beneficial utilization of the resources."[2]

There are a number of important benefits, both immediate and long term, that the SSMP process promises. It will:

---

[1] This document was not intended to, nor does it necessarily, reflect the opinions of all Working Group members.

[2] Pearse, P. Report of the Commission On Pacific Fisheries Policy, 1982. p.3 & p.39.

- establish domestic harvest and production plans required by the Canada-U.S. Pacific Salmon Treaty negotiations;
- reduce user conflicts by identifying the cause of these conflicts and finding cooperative strategies to correct them;
- improve management of mixed stock fisheries to reduce wasted surpluses and rebuild threatened stocks;
- address Native issues in a forum that will lead to cooperative management; and
- promote new and innovative ways to manage fisheries under the combination of fiscal restraint and increased responsibilities for DFO now and in the future.

Recently, there has been a growing demand by the Canadian public for better stewardship of natural resources and the environment. Also, the public clearly want more opportunity to participate in resource management decisions. The SSMP does both.

THE CENTRAL COAST PILOT

In 1986 (and following), a series of discussion documents (the Blue Books) were prepared. Each volume covered a different area of the coast and contained a preliminary biological status of local salmon stocks, descriptions of fisheries and general options for change. None constitutes a plan, but each provides the groundwork for the development of a true long term salmon management plan.

As the next stage, a pilot project aimed at developing that first plan, was initiated in Central Coast Areas 7 & 8. DFO's PPEB proposed that a pilot be undertaken in this relatively small and more remote area. Fisheries Branch (FB) North Coast staff supported the project and a Working Group involving both Branches and staff from the Salmonid Enhancement Program (SEP) and the Provincial Fish and Wildlife Branch (F&W) was formed. This document marks the end of the pilot project, though only a partial completion of the original goals of the Working Group.

REPORT ORGANIZATION

This report is divided into six chapters: Chapter II: PROCESS begins at the highest level, outlining the fundamental objectives which should motivate fisheries management and sketching a model of the planning and management processes. Chapter III: STATUS contains a summary assessment of the status of salmon stocks and management practices in Area 7 & 8. Chapter IV: CONSULTATION describes the local communities and reports the results of public consultation efforts to date. Chapter V: ISSUES describes a number of general fisheries management issues in the Central Coast. Finally, Chapter VI: CONCLUSIONS summarizes the key recommendations of the report and outlines where further work is needed to complete this important process.

Chapter II:
PROCESS

This chapter describes a comprehensive process for managing and planning salmon fisheries. It begins with a discussion of the fundamental objectives of fisheries managers - objectives which give purpose to the process. Actually, two basic processes are at issue here: the existing fisheries management process (which follows an annual cycle), and the long term, strategic planning process both of which must be integrated. The task of bringing these two together - doing long term planning while meeting short term management responsibilities - is difficult but crucial if the Department is to meet its fundamental objectives in managing the salmon resource.

FUNDAMENTAL OBJECTIVES

The purpose of the SSMP process is to develop a long term plan that integrates harvest and production (habitat and enhancement) management and that meets the fundamental objectives of the Department. The fundamental objectives[2] of the Department of Fisheries and Oceans are:

- *STEWARDSHIP: to conserve and protect the fisheries resource and its habitat in trust for future generations, seeking to restore optimum abundance and diversity of this valuable, natural endowment.*

---

[2] The word "objectives" means different things to different people. To clarify what we mean here, the term "fundamental objectives" is used to define the basic purpose of an organization and what its managers should be trying to do at a very general level. (Thus, the fundamental objective of a manager of a small company is likely to be "to maximize profits". The manager may set goals or targets such as increasing sales by 50%, or cutting costs by 10%, but ultimately her objective is to maximize profits.)

Problems arise when individuals mistake specific targets as their fundamental objectives. Some claim that DFO's job is to maximize catch or stock levels, but neither is truly a fundamental objective. The test is to ask why. Possible answers, in this case, are "more catch means people gain more of the benefits of fishing," or "more fish means stocks will not be threatened with extinction." Both answers imply a more fundamental objective exists. In fact they imply two fundamental objectives, *best use* and *conservation*. Miscast or misunderstood objectives are especially a problem in large organizations where good communication and consensus are difficult to come by.

A further problem arises from the fact that even at a fundamental level, there may be more than one objective (in DFO's case there are three). Multiple objectives are inevitable in the management of a complex resource. Thus, decision making is often a matter of evaluating the tradeoffs between different objectives.

For more on departmental objectives see Exploring the Role of Decision Support Technologies for In-Season Management, by Timothy McDaniels & Carl Walters, Draft Report for DFO, January, 1991; and Directions for Managing Canada's Pacific Fisheries Resource, DFO Pacific Region, Draft April, 1991.

- *SERVICE TO THE PUBLIC: to serve the people of Canada, who own the resource, by supporting public involvement in management.*

- *BEST USE: to ensure the best use of the resource, maximizing the financial, cultural and aesthetic benefits to the people of Canada through wise management of all resources, allocating access to the resource fairly and securing returns for the public.*

In all aspects of management and planning, DFO personnel can be said to be seeking to fulfil these fundamental objectives. These objectives, however fundamental, are not specific enough to guide day-to-day management. A transition must be made from such lofty aims to direct, specific and immediate actions. The SSMP gives DFO an opportunity to reconsider whether present management meets these objectives and to determine what actions can be taken to ensure that future management does.

ANNUAL FISHERIES MANAGEMENT PROCESS

The distinction between the annual fishery management process and the long term planning process is based on different time scales for decision making. The long term planning process can be said to involve *strategic* decisions while the short term fisheries management process involves *tactical* decisions. Strategic decisions, such as rebuilding strategies, serve to direct the tactical in-season decisions, such as the length of openings. Without the strategic perspective, tactical decisions will be based only on short term pressures ("more fish now"). Without a strategy, significant change from traditional patterns is unlikely, even when it is necessary or desirable.

The present fisheries management process operates through an annual cycle involving three basic elements for managers - collecting information, making decisions based on that information and implementing those decisions. A simple outline of the fisheries management process is outlined here (Fig. II-1). Prior to each fishing season, predictions are made about the numbers of salmon that will return to each area. These "pre-season expectations" are based on estimates of spawners in the relevant brood years, assumptions about how productive each stock is and any other factors which could affect stock levels. Expectations are prepared for major

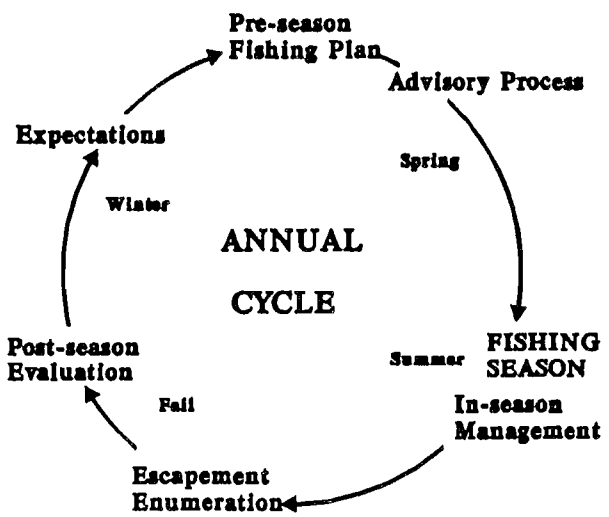


Figure II-1

stocks in each area and provide the basis for the fishing plan. The fishing plan is developed, usually in consultation with commercial fishermen, during the winter and outlines fishery openings by sub-area and gear.

At the onset of the fishing season, as the first runs of salmon return, the fishing plan is put into action. Commercial fishing vessels motor up the coast in anticipation of the first openings (usually in the North Coast). Once the fishery is open, salmon harvesting and in-season monitoring begin (pre-season index fisheries having been used to reassess original expectations). Through various means, fisheries managers gather information on the numbers of fish being caught and then use that information to re-estimate the salmon abundance and change fishing plans accordingly. Interpreting this information is problematic due to both extreme variability in nature and the limits of science. Uncertainty is a central and inescapable feature of fisheries management.

How in-season information is used depends on a number of factors. The manager has an escapement target to meet for each stock and has planned fisheries to harvest only what is expected to return in surplus to that target[3]. If indicators show that the returns are substantially different than expected, a change to the fishing plan may be required - either closing to protect a smaller run or opening more to harvest a larger than expected surplus.

Such decisions are complicated by a number of factors. Most salmon fisheries are mixed stock fisheries where different stocks swimming together are harvested together (often at the same rate). In a mixed stock fishery, if one stock has a large surplus (permitting a high harvest rate) while another has little or no surplus (requiring closure or a low harvest rate), any decision will require a tradeoff between either underharvesting one stock or overharvesting the other. Decisions must also be made taking into account the response of the fleet. If much of the coast is closed, a large fleet may descend on the one fishery that is open, making control of harvest rate more difficult. Also, fisheries managers are required to provide opportunities for all gear types to catch their pre-arranged allocation of fish. The complications facing fisheries management and the requirement to make important in-season decisions quickly makes the need for a long term strategy particularly pressing.

LONG TERM PLANNING PROCESS

A comprehensive long term planning process for salmon management (an SSMP) has never been completed, thus discussion of what this process entails is largely hypothetical. (Indeed, testing whether long term planning can work with and improve annual fisheries management is the purpose of this pilot project.) The following outlines a long term planning process for salmon management.

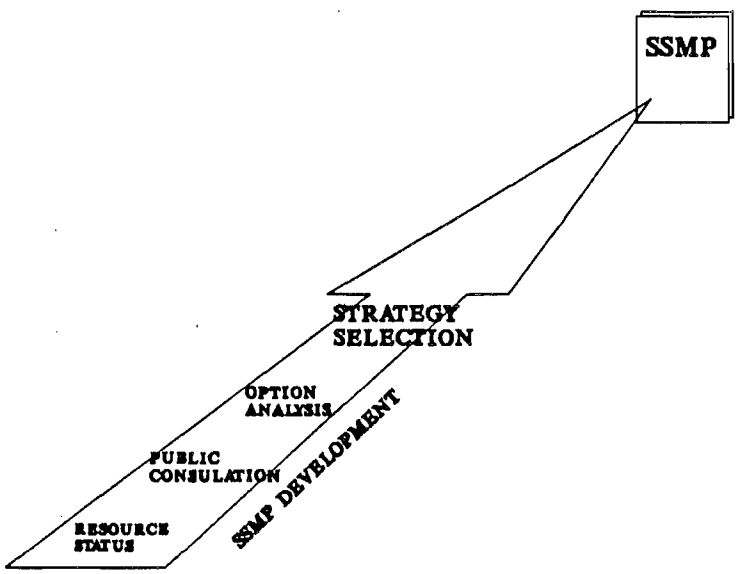
---

[3] Some fisheries are managed to a fixed harvest rate, however, a target escapement level may be implied.

The planning process for a specific area must be undertaken by a team of DFO (and F&W) staff. This planning group would be responsible for developing and completing the major tasks - compiling a resource status document, conducting public consultation, developing and analyzing options and, finally, selecting a package of recommended stock-specific and general options which together would form the long term plan for the area. The planning group would need to incorporate a broad range of expertise; staff would include local fisheries officers, habitat and stock assessment biologists, SEP personnel and economists.

Co-ordinating the efforts of this multi-disciplinary group is an important, and difficult task. A suitable chairperson should be responsible for completion of the plan, reporting to senior management (perhaps a regional steering committee on planning). All members will have other responsibilities to fulfil while working on the SSMP, and, of course, will be accountable to different managers in different Branches of the Department. To ensure that the necessary work is done, therefore, staffing commitments must be clarified at the outset, agreed to by all managers and specified on each individual's workplan. The use of project management methods (i.e. identifying tasks, scheduling order of work, reporting on progress) would be extremely useful in co-ordinating the group's effort and ensuring the project is completed on time.

Figure II-2



An SSMP would be integrated into the present annual fisheries management cycle described above. But, the first and most important stage is the *development* of the plan (see Fig. II-2). A relatively large investment of human resources is needed to develop this plan. Development may take place over a long period (almost certainly more than a year). Once developed, the next stage of *operation* of the plan can begin. Operation involves both implementation of the plan during the fishing season and the necessary revision of the plan after each season.

The development of the SSMP follows these basic steps:

- RESOURCE STATUS: A baseline assessment of fish stocks and habitat, as well as existing management practices, should be prepared at the outset. This work will provide the basis for early consultation and option development. It will also identify key issues and reveal the gaps in the existing information.

- PUBLIC CONSULTATION: Consultation with public stakeholders should be undertaken at a number of steps throughout the planning process. Consultation helps to identify concerns and needs specific to the area, to inform the public of the issues and process and to allow everyone the opportunity to be involved in the process.

- OPTION ANALYSIS: A wide range of general and stock-specific management options should be developed both in-house and through the consultation process. Options should be evaluated based on expert analysis, long term models using available data, and a set of criteria which reflects DFO's fundamental objectives (option analysis outlined in more detail below).

- STRATEGY SELECTION: Based on the option analysis a package of general and stock specific options should be selected. These most desirable options will be compiled into a strategic plan which is then implemented by fisheries managers.

Under each basic step there are a number of separate but dependent tasks. The planning process is, in effect, a project aimed at producing one end product - a plan. The plan is a document that clearly outlines specific management tactics (harvest rates, days, fishing) and long-term strategies (rebuilding goals) for salmon management in the area.

OPTION ANALYSIS PROCESS

Option analysis is the crux of the SSMP process and yet it is perhaps the least understood element. Therefore, it is discussed in further detail here.

The development of the SSMP (outlined above) follows a sequence of tasks culminating in the crucial stage of strategy selection and decision-making. This stage involves the analysis of options and the selection of one recommended option for a range of policy and operational issues. The option analysis process (displayed in Fig. II-3), provides a logical framework for making the many decisions that together will constitute the final plan.

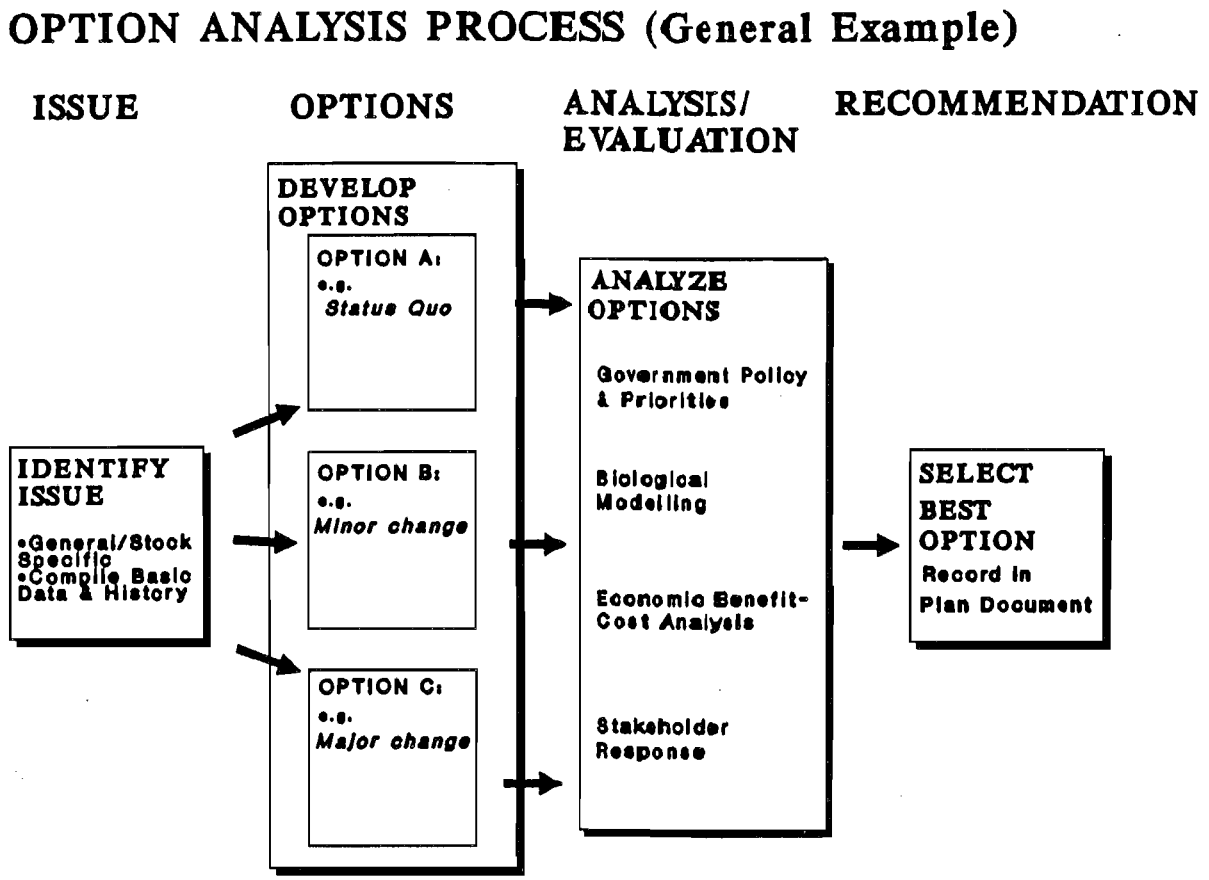


Figure II-3

As mentioned the process begins with the identification of all issues. Next, a number of options which address these issues are developed. The number of different options considered for each issue is constrained only by reasonable limits on the time and effort required to analyze each. Once a list of options is available, each can be analyzed and evaluated.

Analysis is based on a number of steps. Options must fit within government policy and priorities; options that do not can simply be eliminated (for instance, options which violate the Pacific Salmon Treaty). Stock-specific options can be analyzed using a computer simulation model. Such models combine assumptions about biology and economics to make predictions about the long term results of various strategies. This would allow the analyst to compare various marginal changes in harvest rates, for example, and show the expected effects on future harvests and derived benefits. Another key element of the option analysis involves considering what the response of the various stakeholders is or would be.

Information on what that response is can come from previous consultation. A further workshop may be required, however, to discuss the options further. Once all options have been analyzed and evaluated, one is selected as the recommended option. The aggregation of all the recommended options (one for each issue) constitutes the plan.

The option analysis process outlined here is a general framework for decision making. With experience over time, planners would be better able to refine the process and reduce inconsistency and complexity. Even using the rough steps outlined above, however, resource planning decision making would be vastly improved over present practice.

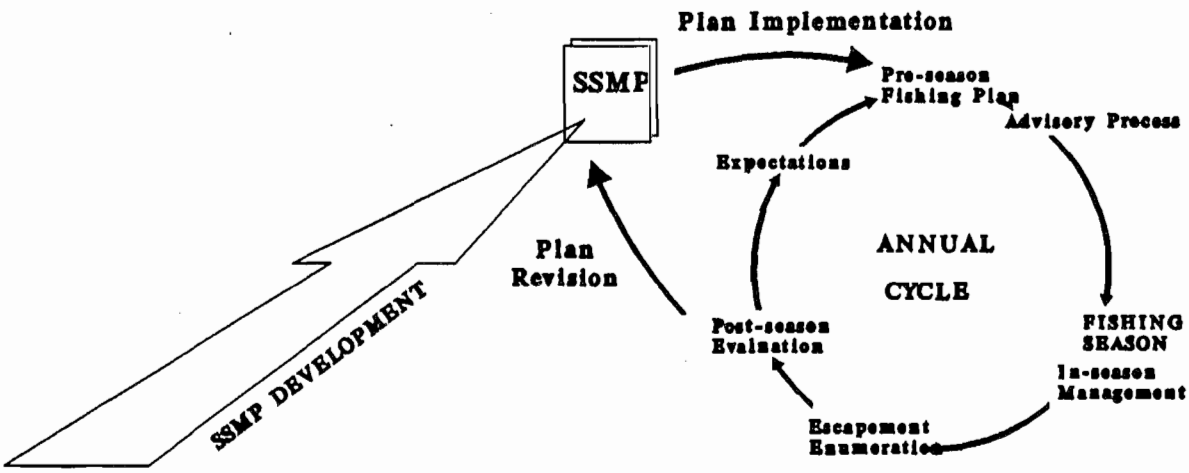


Figure II-4

INTEGRATING PLANNING AND MANAGEMENT

The integration of the SSMP into the annual salmon management cycle will serve to lift present management out of a reactive, unplanned cycle (see Fig. II-4). The strategy defined in the SSMP document would drive the development of the pre-season fishing plan. Actions which contradicted the long term plan could only be done with senior manager's approval. Changes to the long term plan would only come through a post-season review. Thus, ongoing re-evaluation and revision of the plan would be integrated into the annual cycle of fisheries management.

Chapter III:
STATUS

The preceding chapters have introduced the Central Coast SSMP project and outlined the nature of the planning process and how it integrates into ongoing fisheries management. This chapter turns to Central Coast Areas 7 & 8 describing fisheries management in the area and the status of local salmon stocks. As such, it provides a baseline of information which is essential to begin the planning process.

Central Coast Areas 7 & 8 are located midway up the B.C. coast in a remote and rugged section of coastline marked by long, winding channels and inlets (see Fig. III-1, III-2). Criss-crossing waterways create an archipelago of islands in the outer, west reaches (Area 7); while to the east, long fiords carve deep troughs in the rising landscape up to the mountainous mainland (Area 8). The shattered geography of the area presents a complex of interlocking waterways and thus alternate routes for returning salmon. This complexity makes management of the Central Coast fisheries a true challenge.

THE FISHERIES

The fisheries in Areas 7 & 8 are primarily commercial net fisheries, which often attract large gillnet and seine fleets. The troll fishery mainly occurs outside of the mainland inlet areas and targets on passing (mostly Fraser River) and some local stocks. The sport fishery in the areas is primarily freshwater with a marine component based primarily in Hakai Pass. Native food fishing occurs throughout the area by the various bands.

COMMERCIAL

Area 7 and 8 pink and chum stocks are the mainstay of the local commercial fishery. Sockeye and chinook provide additional, limited commercial opportunities in Area 8. The explicit strategy is to manage the salmon resource on an "active/passive" basis. The terms "active" and "passive" management have often been used to differentiate between stocks for which management actions are taken (actively managed stocks) and stocks (usually less abundant) for which no management actions are taken (passively managed stocks). In mixed stock fisheries, many different stocks are harvested together, thus harvest rates set for "actively" managed stocks will be the same for "passively" managed stocks passing through that fishery at the same time. In truth, "actively" managed stocks are managed stocks and "passively" managed stocks are unmanaged stocks. In this paper, we have used the latter terms.

The stocks selected for management are generally the most abundant and economically valuable stocks in the mixed stock fishery. Management decisions governing the fishery are made with regard to these selected stocks, with the harvest rate set at a level

Figure III-1 Area 7: Bella Bella

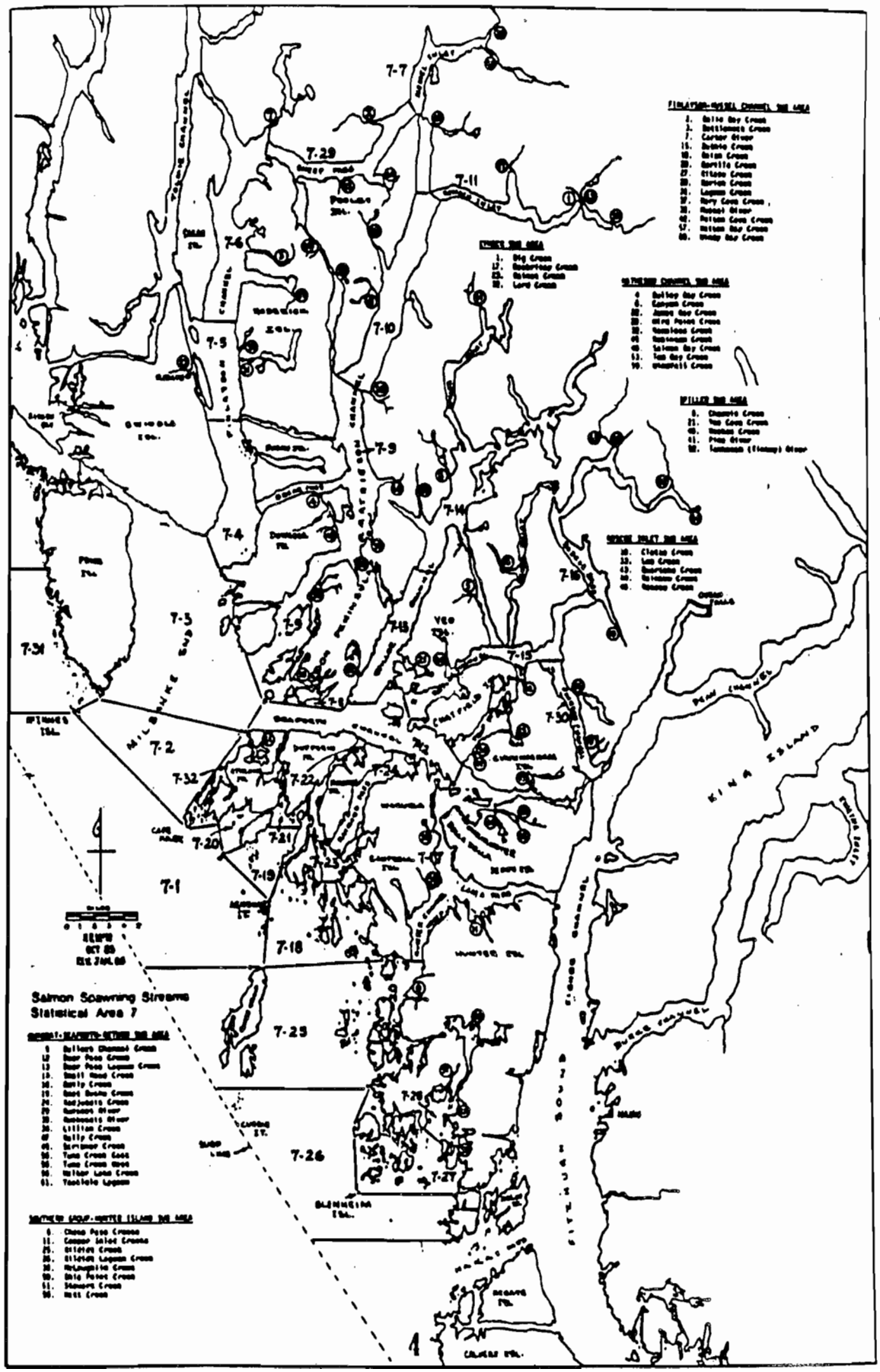
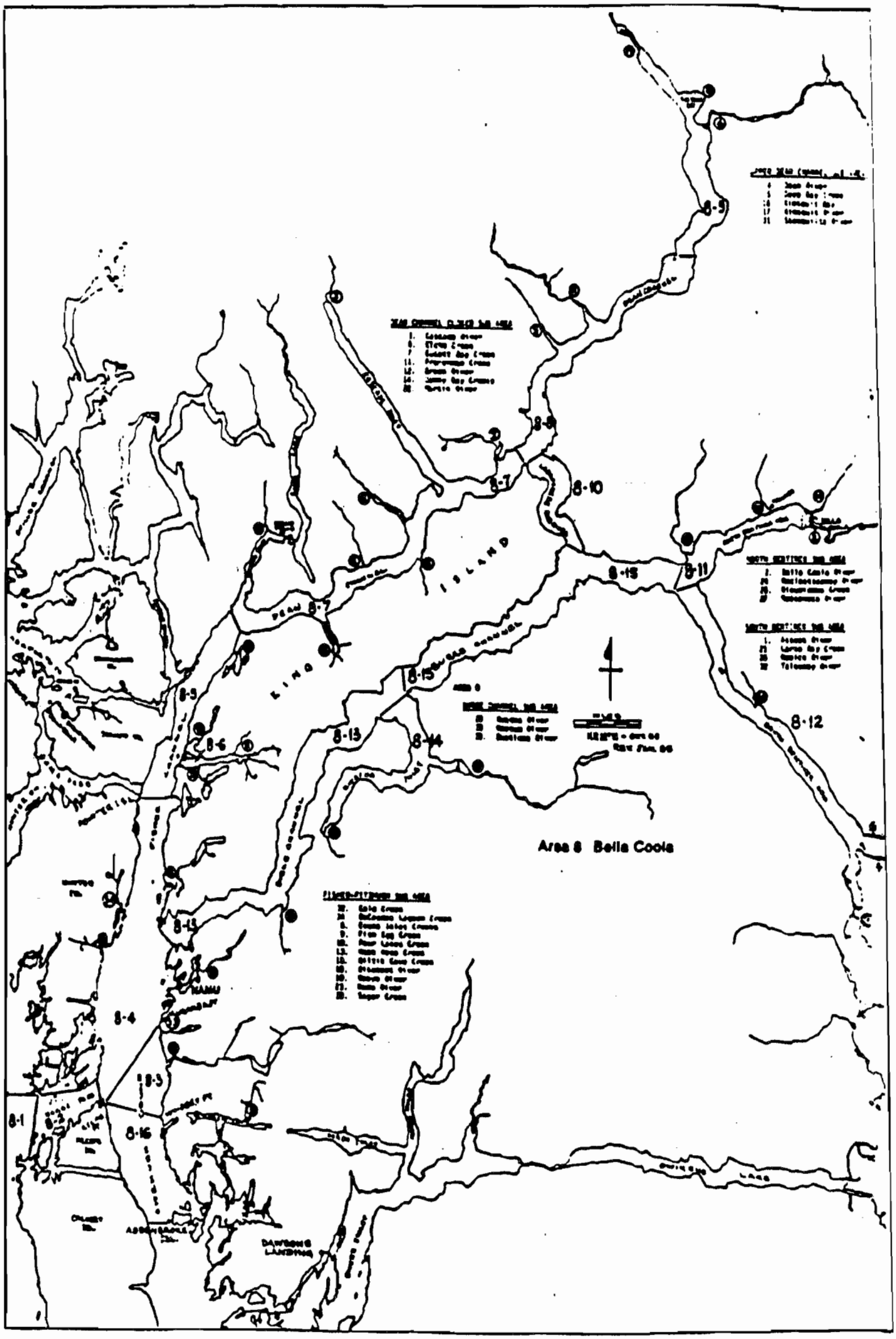


Figure III-2 Area 8: Bella Coola



that allows enough spawners onto the grounds to meet the escapement target. This strategy presupposes that the managed stocks can be identified and their abundance estimated during the fishery, so that management actions can respond to actual abundance. Thus, the in-season strength of the managed stocks, governs in-season management actions in the commercial fisheries. If conservation measures are required to meet escapement targets, the fishery is reduced.

Gillnet and Seine

From the mid 1960s to 1983, the major fisheries in Area 7 occurred in Milbanke Sound and intercepted passing stocks, particularly of Fraser River origin, as well as Area 7 and 8 stocks. Since 1983, the Milbanke Sound fishery was closed and the fishery was moved into the inlets to reduce the interception of passing stocks. This change also reduced the complexity of the stock aggregations in the mixed stock fisheries in Area 7 and allowed fisheries management to concentrate on Area 7 and 8 stocks. For most stocks of chinook, coho, steelhead, sockeye and some of the weaker stocks of chum and pink, however, the problems of the mixed stock fisheries still remain critical.

The current management strategy is to harvest surpluses to the escapement needs of the managed stocks. These surpluses are forecast on a stock-by-stock basis during the pre-season. Stock expectations for the coming season are based on the annual escapement estimate (for the relevant brood year) and the average return per spawner rate for the overall stocks in the area. These estimates are adjusted based on other information such as incubation and juvenile sampling data (although such data is rarely collected). Adjustments to pre-season expectations are usually based on poorly substantiated personal judgements (e.g. unmeasured effects of flooding). These pre-season expectations are not verified or updated by in-season monitoring (index fishery).

Based on these forecasts, a pre-season fishing plan is developed through consultation with the Central Coast Advisory Board. The plan details expected catch and days of fishing for the upcoming season. In-season, indicators of actual stock abundance are collected, such as catch per unit effort (CPUE) of the Indian food fishery and early commercial openings. Later in the season, escapement estimates and CPUE of the commercial fleet are the key indicators for harvest management.

Pre-season forecasts have proven to be quite inaccurate, both because there is a lack of good information and because environmental and physical variables affecting overall survival rates cannot be measured. When in-season indicators show a large discrepancy between estimated and actual abundance, it is necessary to change the fishing plan. Currently, there is no adequate method of measuring actual in-season abundance or of specifically identifying the stocks contributing to the fishery. Thus, the uncertainty that plagues forecasting also undermines in-season assessment.

This lack of scientifically defensible in-season abundance estimates, undermines DFO managers' ability to impose any changes to the pre-season plan that they deem necessary. If the harvest manager insists that the forecasts were too high, fishermen demand to stay with the pre-season plan. If fishermen feel their catches and personal observations indicate a greater abundance than predicted, they demand an increase in the catch. Lacking accurate data to defend changes to the pre-season fishing plan, it is difficult for the harvest manager to act conservatively. As well, if abundance is much different than anticipated, it is difficult in the heat of the moment, to allocate agreed-upon shares of the catch between the users. As a result serious conflicts often arise.

After each fishing season, a workshop is held with the Central Coast Advisory Board to review the fishery and to recommend changes for next season. The entire process is recorded in the Record of Management Strategy (RMS) documents. The process continues with the next year's pre-season forecasts and development of the fishing plans.

Troll

The troll fishery has virtually disappeared from Areas 7 and 8 in recent years, and moved to the outside troll areas off the Central and North coasts. This fishery intercepts coho and chinook stocks bound for local areas, but primarily harvests stocks returning to more southerly areas. A quota on chinook is in place as a result of the Pacific Salmon Treaty negotiations. Rebuilding of chinook stocks in the Central Coast is expected to occur as a result since there is an obligation not to institute new fisheries on these stocks until they have rebuilt. The coho troll fishery is only limited by season length as there are no similar coastal restrictions for northern coho troll fisheries.

SPORT

The freshwater steelhead sport fishery is managed by the provincial Fish and Wildlife Branch (F&W), and the freshwater chinook and coho sport fisheries, by DFO. All saltwater fishing is managed by DFO. The majority of the freshwater sport fishing in Area 7 and 8 takes place on the Atnarko (Bella Coola), Dean and Kwatna Rivers, with a small effort targeted on the Kimsquit River stocks. The saltwater sport fisheries are concentrated in Hakai Pass, Seaforth Channel (Area 7) and North Bentinck Arm (Area 8).

To date, marine sport fishing activity is limited, having not grown as dramatically as elsewhere. These sport fisheries are managed under generic coastwide regulations; there is no specific local sport fishing plan. There is concern, however, that the sport component may grow significantly, causing problems similar to those in areas such as Langara Island and Georgia Strait.

DFO manages its freshwater responsibilities using a number of methods: daily possession limits, seasonal closures, bait bans and restricted boat use on the Atnarko River. F&W staff have developed specific plans for the major steelhead rivers in the areas. These plans have been developed with the goals of providing as great a diversity of angling opportunities as possible, maintaining the quality of fishing, and ensuring that no enhancement of stocks occurs. They impose similar restrictions as those for the chinook and coho fisheries.

Management efforts by DFO, appear to have significantly reduced the commercial interception of steelhead stocks in Area 8. DFO, largely at the urging of F&W, has instituted an experimental "weed line" restriction in Dean Channel, to evaluate the potential of gear modifications, as a further conservation measure.

NATIVE FOOD FISHERIES

The Native food fishery is managed by DFO, which issues food fish permits to band members or the band itself. The preferred target species for food fish is sockeye, but if there is a low abundance of sockeye, as has been the case recently, other species are targeted. Licences are issued to band members at Kitasoo, Bella Bella, Bella Coola and Anaheim Lake (the Ulgatcho Band on the upper Atnarko River).

In Area 7, the Kitasoo and Bella Bella residents receive permits to take chinook, with sport gear. They also receive permits to take sockeye with commercial seine gear in the Milbanke Sound area, but are required to release incidentally caught chinook.

In Area 8, the Bella Coola band members target on early run steelhead, sockeye and chinook in the Bella Coola River. If the runs are poor, they are restricted to fewer fishing days. Food fishing on the Koeye River is restricted to fishing outside of the river mouth boundary. A similar restriction is placed on the Namu River food fishery.

All of these fisheries are monitored by guardians and catch statistics are collected, to estimate the strength of returning commercially fished stocks. Catch statistics are compiled by observing fishing operations for catch/unit effort, by interviewing fisherman and from numbers supplied by bands. Scale samples and coded wire tag data are also collected. Illegal food fishing activities seem to be minimal in the Central Coast area and relations between DFO and the Native bands, have largely been positive and constructive.

In light of the recent Sparrow decision[4] and the probability of additional court decisions forthcoming, management could change significantly in the near future. Social conditions are changing as well. There are now many young band members who wish to remain in their communities, rather than moving to urban centres. They, of course, would expect to fish if they remain.

Band populations have been predicted to double in the next 20 years[5], resulting in a significant increase in food fish requirements. In view of the current, severely depressed sockeye levels in the Central Coast, the Native people are beginning to question DFO's ability to manage the fisheries properly. They are concerned that the Department will be unable to meet present and future food fish requirements.

STOCK STATUS

The following stock status is based on catch and escapement data from the Salmon Escapement and Timing Data documentation, the Salmon Stock Assessment databases and the Record of Management Strategies for the years 1951 to 1989. This summary reflects historical trends of the many runs that compose the area's resource base. This summary provides a baseline for assessment of the problems and opportunities for management of the salmon fishery in these areas.

The analysis focuses on the total catch and escapement data for each species in the respective areas for the years 1951 to 1989. Treating all stocks of one species for an area as a single stock, tends to average out the variability of the data but does, at least, give an overall view of historical trends. The harvest rate is presented as the percentage of total catch in Areas 7 & 8 to total size of runs returning to the area for each species[6].

AREA 7

The pink and chum stocks are the mainstay of the commercial fisheries in Area 7 (Fig III-3). The average value of the chum catch, for 1986-1989, was about $2 million, the average value of the pink catch was about $ .5 million, and for all salmon about $3.5 million (about 1% of total coastal landed value).

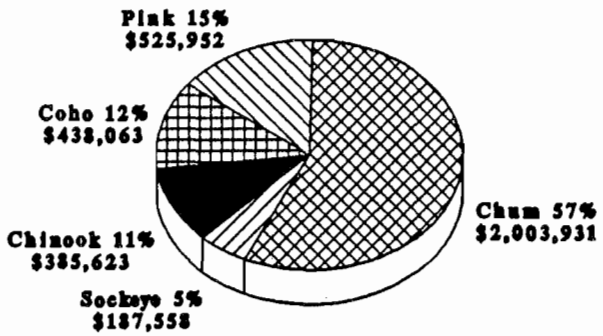
---

[4] The Supreme Court of Canada decided that there is an aboriginal right to fish for "food, social and ceremonial purposes," and that this right to fish must be accorded first priority after conservation needs are met.

[5] Cecil Reid, Bella Bella Band

[6] *Harvest* rate refers to the proportion of fish harvested in a specific area over a specific time. *Exploitation* rate refers to the proportion of the total stock harvested during a specific period (i.e., including all foreign interceptions, approach and terminal fisheries).

Landed Value of Salmon Catch
1986-89 average in 1989 Dollars



AREA 7
Total $3,541,128

Figure III-3

Twenty-three key pink and chum stocks are managed in Area 7. The majority of these stocks appear to be very depressed or declining. The exceptions are Carter Creek pink stock and the Neekas River chum stock which are at the target escapement. Quartcha, Clatse and Kwakusdis River pink stocks appear to be rebuilding, as are the Mussel River pink and chum stocks.

Twenty-three streams produce sockeye that are unmanaged, however none are major producers. Total sockeye escapement for Area 7 has declined from an average of 12,000 in the early 1970s to approximately 3,000 in more recent years. Sockeye are not a primary target of any commercial fisheries but are harvested in the native food fishery and incidentally in the commercial chum and pink fisheries.

Coho are also unmanaged and, while the target escapement for the area is 32,000, escapements from all streams are currently below 5,000. Aside from a small troll fishery there are no commercial fisheries directed at coho in the area.

FIGURE III-4 GRAPH OF DAYS FISHED AND NUMBER OF BOATS IN AREA 7, 1970-1990. (THOUSANDS)

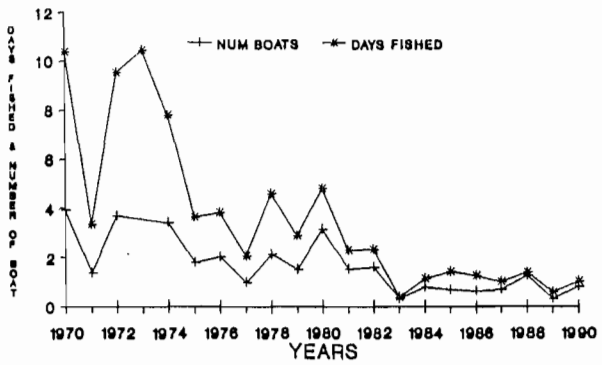


FIGURE III-5 GRAPH OF CATCH FOR AREA 1970 TO 1990.

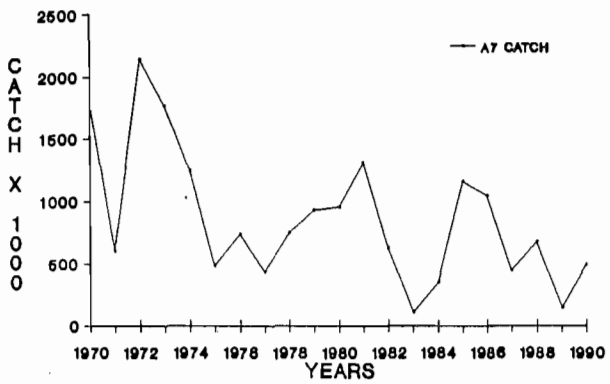
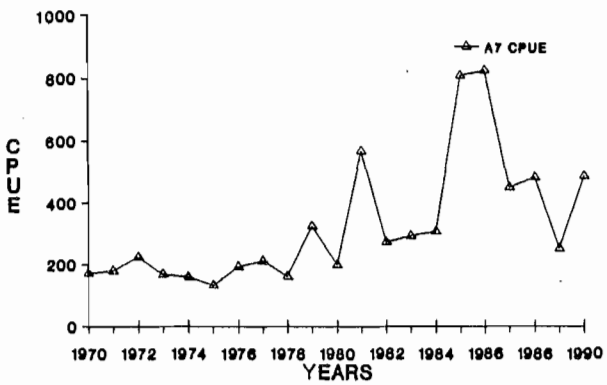


FIGURE III-6 GRAPH OF CATCH PER UNIT EFFORT FROM 1970-1990.



Similarily, only the occasional chinook escapement was reported in Area 7 up to the late 1960s. The small incidental catch of chinook in the commercial and Native food fisheries is believed to be interceptions of passing chinook stocks.

There are no managed steelhead stocks in Area 7. Steelhead have been observed in some streams in this area, but there is no documentation of spawning streams or escapement. Sport fishing pressure is minimal. Commercial interceptions, primarily on passing Area 8 stocks, have averaged between 300-1,000 fish (although there is some dispute regarding this number between F&W and DFO biologists).

Prior to 1984, the commercial fleet fished in Milbanke Sound almost exclusively. To reduce interception of passing stocks, the Milbanke Sound area was closed in 1983. The fleet was moved into the inlets in an effort to harvest only local Area 7 and some passing Area 8 stocks. This action also resulted in a significant reduction in the number of boats fishing in Area 7 and the number of days of fishing (based on landing counts). Since 1983, however, the CPUE has increased sharply. From 1970 to 1982 the average CPUE was 229 and increased to an average of 488 for 1983 to 1990. This CPUE increase must be due to other factors such as the reduced number of boats and the increased efficiency of their catching power. (Fig. III-4, III-5, III-6).

Area 7 Even-year Pink Stocks

Only twice since 1952 (in 1966 and 1968) have the even-year pink salmon stocks met or exceeded the target escapement of 440,820 (Fig. III-7). The harvest rate on these stocks has been variable over this period, but has averaged 64 percent. Although harvest rates were decreased from 1972 to 1984 (Fig. III-8), the reductions were insufficient to rebuild stocks, as escapement and even total return levels are well below the target escapement. From 1972 to 1988, total escapement has averaged 50% of the target escapement.

A lower harvest rate on the even-year pink stocks is necessary to achieve the target escapement. These stocks demonstrate an average adult return/spawner rate of 3.7, thus rebuilding could be achieved quickly. Once the target escapement is reached and maintained, the catch would be significantly increased. At a 55% harvest rate, about 10% below the present average, the catch could be expected to increase about 300,000 pieces per year.

Area 7 Odd-year Pink Stocks

Area 7 odd-year pinks have generally been below the escapement target of 440,820 adult spawners (Fig. III-9). These stocks have been harvested at an average rate of 49% (Fig. III-10), much less than the 64% average for even-year pink stocks. The harvest rate

FIGURE III-7 AREA 7 EVEN-YEAR PINK STOCK CATCH AND ESCAPEMENT DATA, 1952-1988.

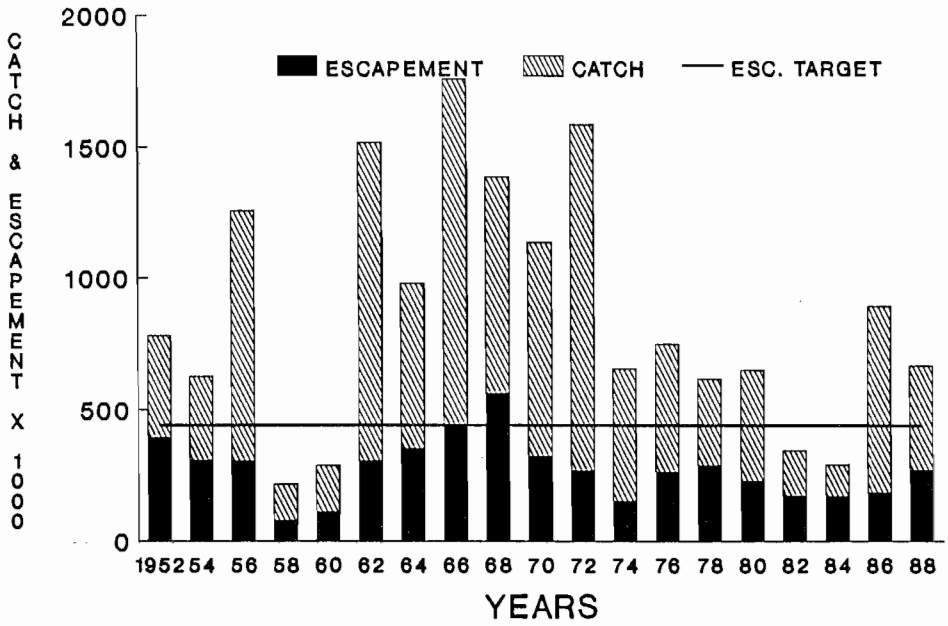


FIGURE III-8 AREA 7 EVEN-YEAR PINK STOCK HARVEST RATE DATA 1952-1988.

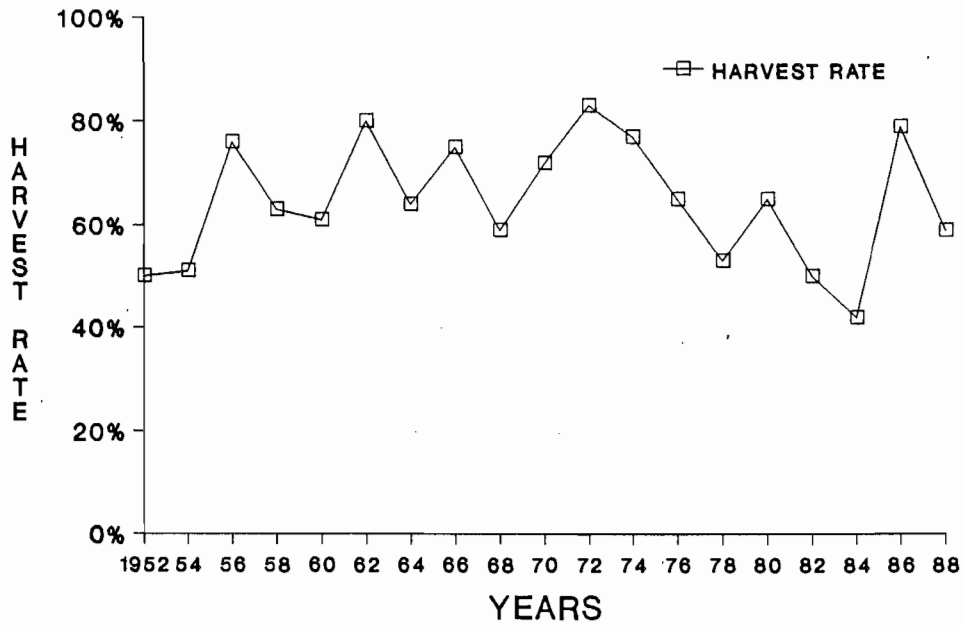


FIGURE III-9 AREA 7 ODD-YEAR PINK STOCK CATCH AND ESCAPEMENT DATA, 1951-1989.

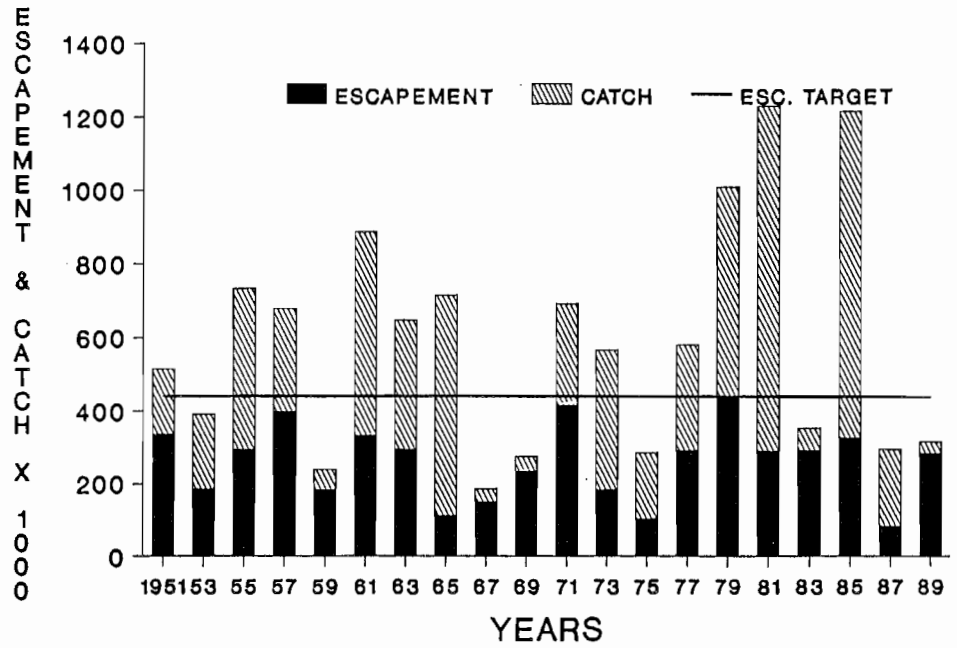


FIGURE III-10 AREA 7 ODD-YEAR PINK STOCK HARVEST RATE DATA, 1951-1987.

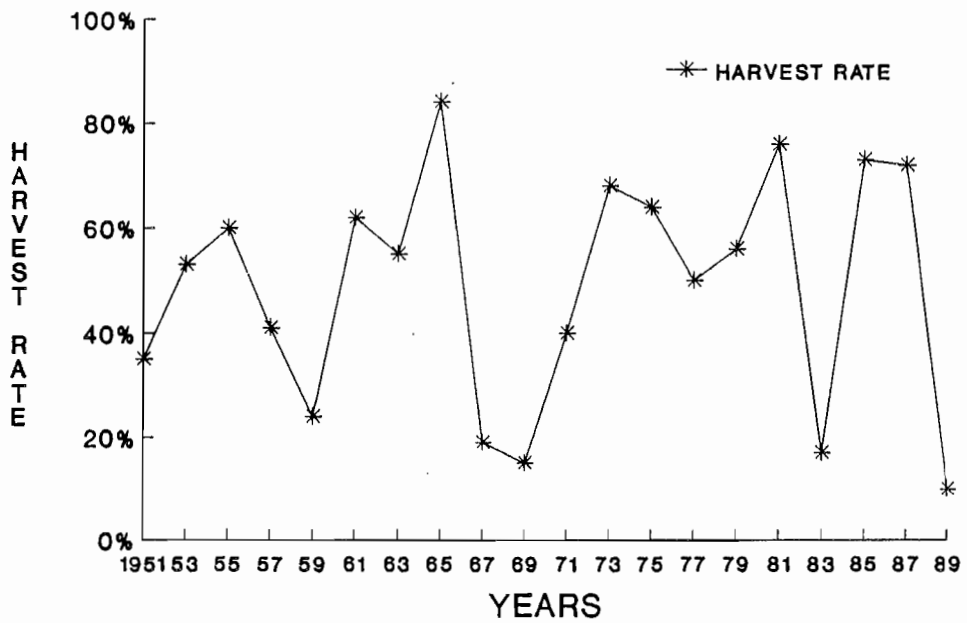


FIGURE III-11 AREA 7 CHUM STOCK CATCH & ESCAPEMENT DATA 1951-1989.

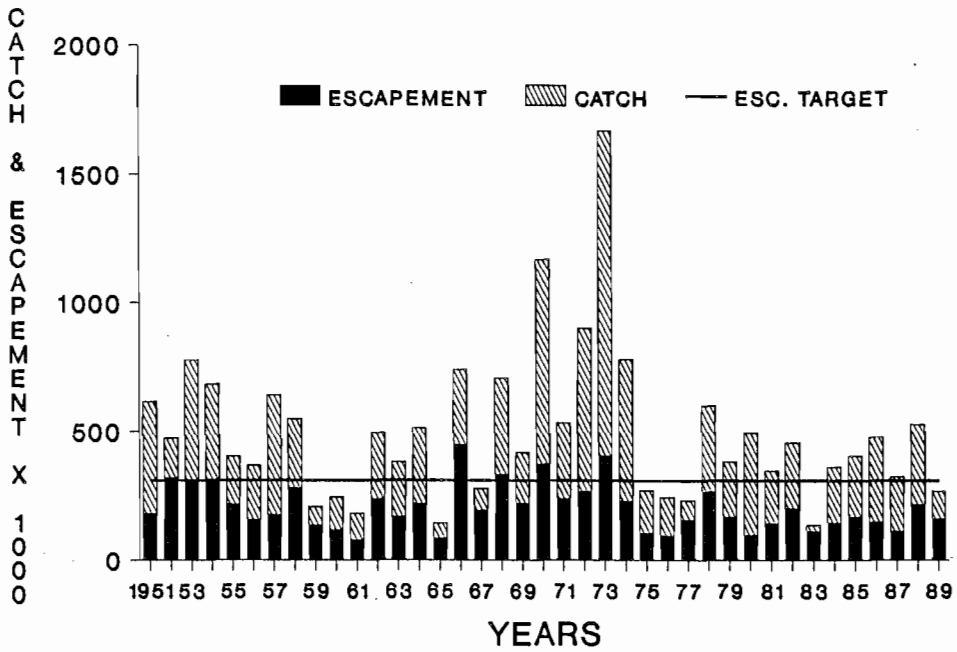
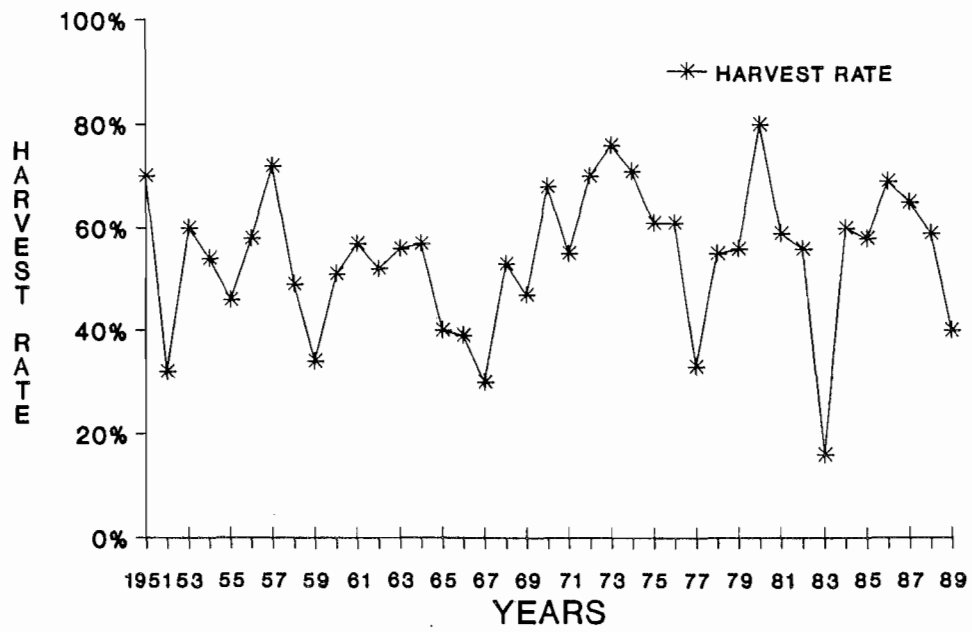


FIGURE III-12 AREA 7 CHUM STOCK HARVEST RATE DATA, 1951-1989.



on these stocks, however, changes by 60% from cycle to cycle. The harvest rate tracks the relative in-season abundance of the stock.

It is high when abundance appears to be large and low when few fish are returning (Fig. III-10). The productivity of these stocks fluctuates substantially from cycle to cycle which is partially the cause of the wide variation of the harvest rate. Without precise in-season measurement of the stock abundance, it is very difficult to put an adequate number of spawners on the grounds.

Area 7 Chum Stocks

Over 50 streams in Area 7 support chum spawning populations, thus management of these small, separate spawning populations is difficult. From 1951 to 1974, escapement levels for Area 7 chum stocks have averaged 76% of the escapement target of 310,760 spawners. Since 1975, stocks have averaged only 49% of the target escapement. The low average harvest rate of 47% from 1966 to 1970 resulted in relatively large returns in the 1970s. The harvest rate average increased to 66% between 1971 and 1975, and with very low return/spawner rates for the 1972 and 1973 broods (.9 and .7, respectively), total stock abundance dropped drastically (Fig. III-11 & III-12).

Harvest rates from 1976 to 1989 have varied somewhat, but averaged 55%. The return/spawner rates for this period have averaged 2.8, slightly greater than the overall average of 2.5. The stocks have not rebuilt at this harvest rate. The harvest rate will need to be lowered significantly, if the target escapement is to be met.

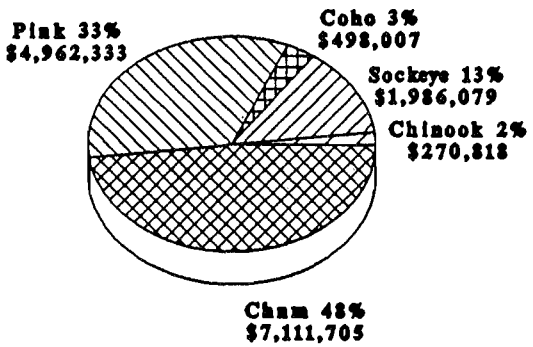
Meeting the target escapement could substantially increase future catches (Fig. III-11 & III-12). Catch averaged about 498,000 pieces from 1966 to 1974 when the escapement target was generally attained. Catch has averaged only 215,000 pieces from 1975 to 1989.

AREA 8

Pink and chum stocks make up the major proportion of the catch in Area 8. The average value of pink and chum catch from 1986-1989 was about $4.9 and $7.1 million, respectively (Fig. III-13), and for all salmon about $14.8 million (about 5% of total coastal landed value). Some sockeye and recently, chinook stocks are also targeted in the commercial fisheries. Sockeye catch has averaged about $2 million in this period. The early sockeye and chinook fisheries are used as indicators of early chum and pink stock abundance.

Rebuilding of the Atnarko River chinook stock has resulted in a small chinook fishery which can begin as early as mid-May. Harvest of sockeye, pink and summer run

Landed Value of Salmon Catch
1986-89 average in 1989 Dollars



AREA 8
Total $14,828,943

Figure III-13

chum stocks extends the fishing season to at least mid-August. If strong returns of fall run chum are experienced, the fishery may extend into September.

Only Area 8 even-year pink escapements have been maintained around the target level. Odd-year pink stocks met or exceeded the target escapement in 1983 and 1985, but are presently well below the escapement goal. Sockeye escapement to Area 8 is far below the escapement goal and appears to be declining.

Abundance of Area 8 chum stocks appears to be increasing significantly. A large portion of this increase, however, is due to Snootli Creek Hatchery chum production. This enhanced production masks the status of naturally produced stocks. Snootli Creek Hatchery has produced significant numbers of summer run chum to the Area 8 pink and chum fisheries since 1986.

The original purpose of the Snootli Creek hatchery was to strengthen Bella Coola River summer chum runs to allow an efficient level of harvest on large concurrent pink runs. Early indications are that high returns of enhanced chum stocks are now driving the Area

FIGURE III-14 GRAPH OF NUMBER OF BOATS AND DAYS FISHED IN AREA 8 1970-1990. (THOUSANDS)

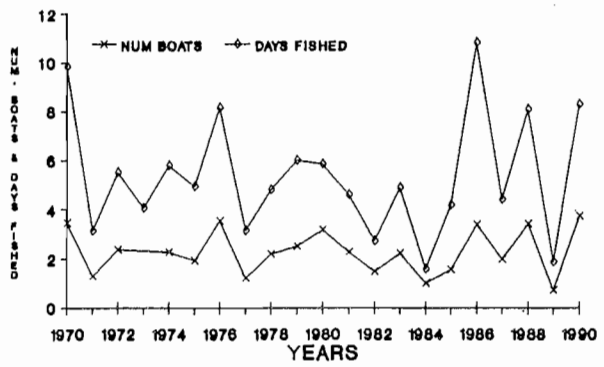


FIGURE III-15 GRAPH OF CATCH IN AREA 8 FOR 1970-1990.

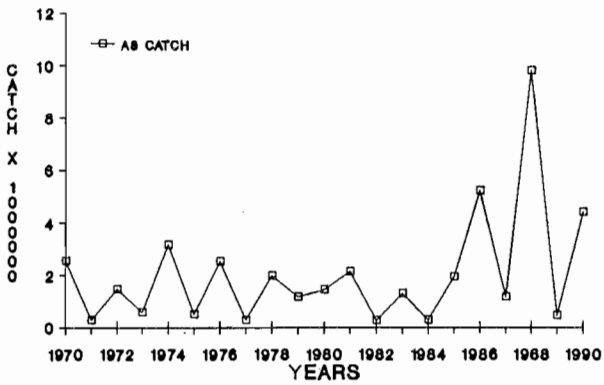
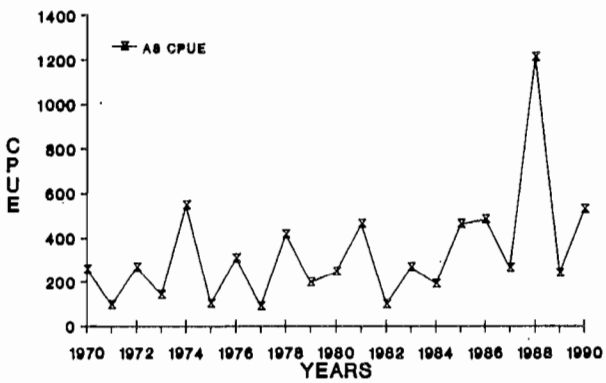


FIGURE III-16 GRAPH OF CATCH PER UNIT EFFORT FOR AREA 8, 1970-1990.



8 fisheries. There is a trend of increasing days fished, catch and CPUE (Fig. III-14, III-15, & III-16). SEP was requested to enhance other stocks (chinook), and thus only a few of the targeted chum stocks are enhanced. Consequently, harvest pressures on unenhanced chum stocks have increased.

Area 8 Even-year Pink Stocks

Even-year pink stocks have generally been at or above the target escapement level of 1,475,000 and have been steadily maintained around this goal since the early 1970s (Fig. III-17). Summing all stocks is misleading, however, since the Atnarko River escapement target accounts for 68% of the total target escapement for Area 8 pink stocks. Any fluctuations in the level of Atnarko pink production tends to mask the status of other Area 8 pink stocks.

Low returns in 1982 and 1984 (Fig. III-16) are due to relatively low returns to the Atnarko River (Table 1). The high return of Area 8 even-year pink for 1986 is due to extremely high escapement to the Atnarko River (Fig. III-16; Table 1). In 1988, non-Atnarko even-year pink stocks greatly overwhelmed even the high return of Atnarko pinks.

Table 1. Comparison of the Atnarko River pink production to the total escapement of Area 8 pink stocks, 1980-1988

YEAR	ATNARKO ESCAPEMENT	TOTAL ESCAPEMENT	% ATNARKO OF TOTAL ESC.	% ATNARKO OF TARGET ESC.
1980	1000000	1127725	89%	68%
1981	375000	737360	51%	25%
1982	150000	195600	77%	10%
1983	1100000	1420270	77%	75%
1984	650000	967210	67%	44%
1985	2300000	2795404	82%	156%
1986	2886000	3285535	88%	196%
1987	343000	383056	90%	23%
1988	1700000	5204570	33%	115%

FIGURE III-17 AREA 8 EVEN-YEAR PINK STOCK CATCH AND ESCAPEMENT DATA (MILLIONS), 1952-1988.

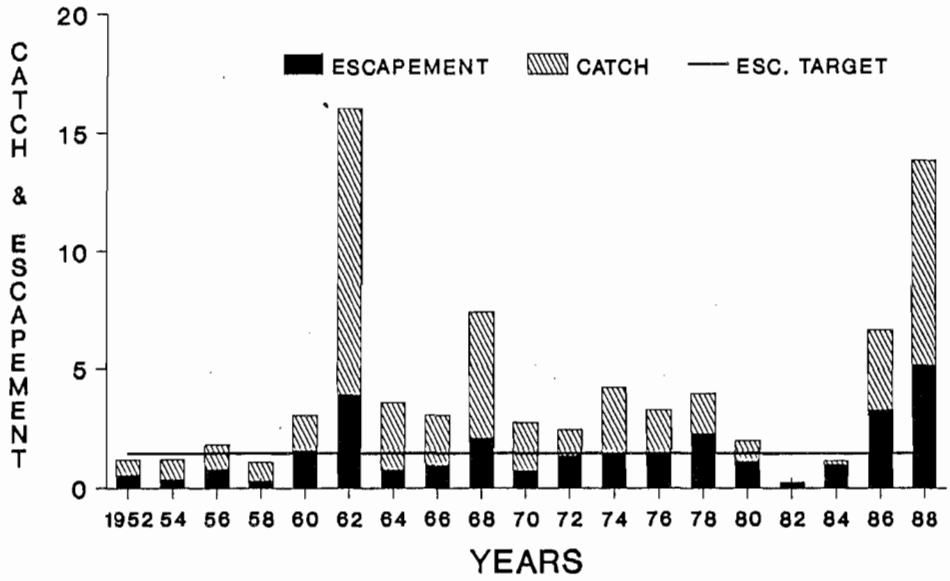
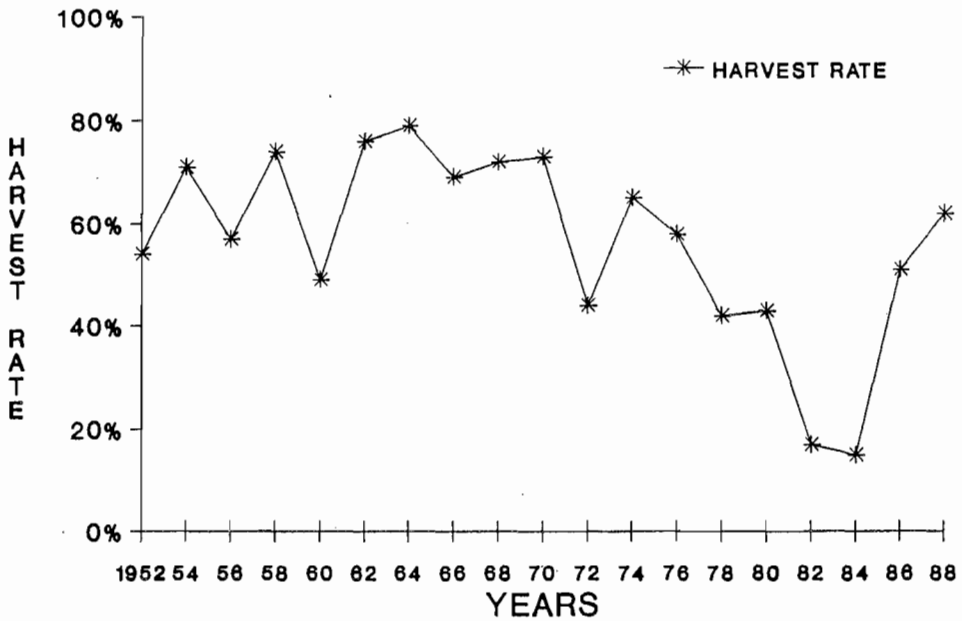


FIGURE III-18 AREA 8 EVEN-YEAR PINK STOCK HARVEST RATE DATA, 1952-1988.



The harvest rate on even-year pink stocks is well coordinated with stock abundance and productivity. From 1952 to 1968, the average harvest rate was 67% and the returns/spawner rate averaged 4.9. From 1970 to 1984 the harvest rate averaged only 45%, with a return/spawner rate of 2.6. The harvest rate has been increased to around 60% recently, in response to a much higher productivity (>5) and corresponding abundance (Fig. III-18).

The fluctuating productivity of these pink stocks requires close monitoring to optimize the harvest. More importantly, estimates of productivity must be accurate to detect sharp declines in productivity, so harvest rates can be adequately reduced to meet the escapement goal.

Area 8 Odd-year Pink Stocks

The escapement target of 1.475 million odd year pink salmon has only been achieved twice since 1951 (Fig. III-19). The average escapement level from 1951 to 1977 was 34% of the target escapement, and only 13% of this goal between 1965 and 1977 (Fig. III-19). The escapement target was met and exceeded in 1983 and 1985 respectively, due to the relatively high returns of pink salmon to the Atnarko River (Table 1), but has dropped to low levels once again in 1987 and 1989 (Fig. III-19).

Return/spawner rate for Area 8 odd-year pinks have averaged 2.2. When escapement levels are as low as they were in the late 1960s, recovery is very slow (Fig. III-19). This stock demonstrates variable return/spawner rates that can be greater than 5 and less than 0.5, making abundance predictions difficult.

In-season monitoring of the stock abundance is occasionally inadequate for adjusting harvest rates in response to dramatic changes in adult abundance. For example, the harvest rate was 72% in 1965 when total abundance was just over 50% of the target escapement. Conversely, the harvest rate was 30% on the year of the largest return (1985) (Fig. III-19 & III-20). Escapement was double the target which could be cause for the subsequent very poor return/spawner rate of 0.3.

Area 8 odd-year pink stocks require very precise harvest management to achieve and maintain escapement targets. Much lower average return/spawner rate for odd-year pinks (2.2), relative to the even-year pinks (5) indicates quite different biological productivity between these stocks (although this requires research to confirm and explain a difference). There is no indication that either cycle affects the other (Fig. III-21).

Odd and even year pinks have different productivities and thus should have different harvest rates and, most likely, different target escapements. In general, return/spawner

FIGURE III-19 AREA 8 ODD-YEAR PINK STOCK CATCH AND ESCAPEMENT DATA (MILLIONS), 1951-1989.

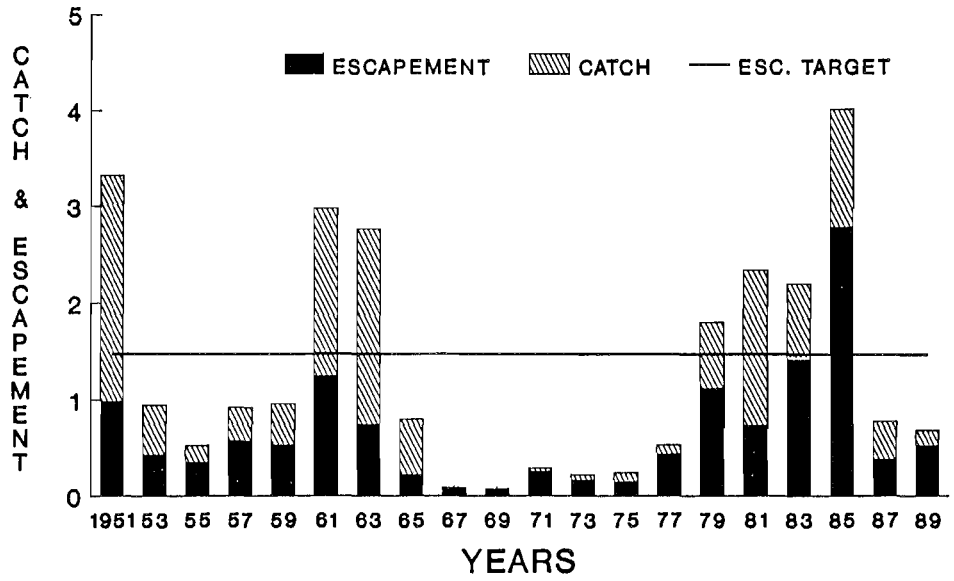


FIGURE III-20 AREA 8 ODD-YEAR PINK STOCK HARVEST RATE DATA, 1951-1989.

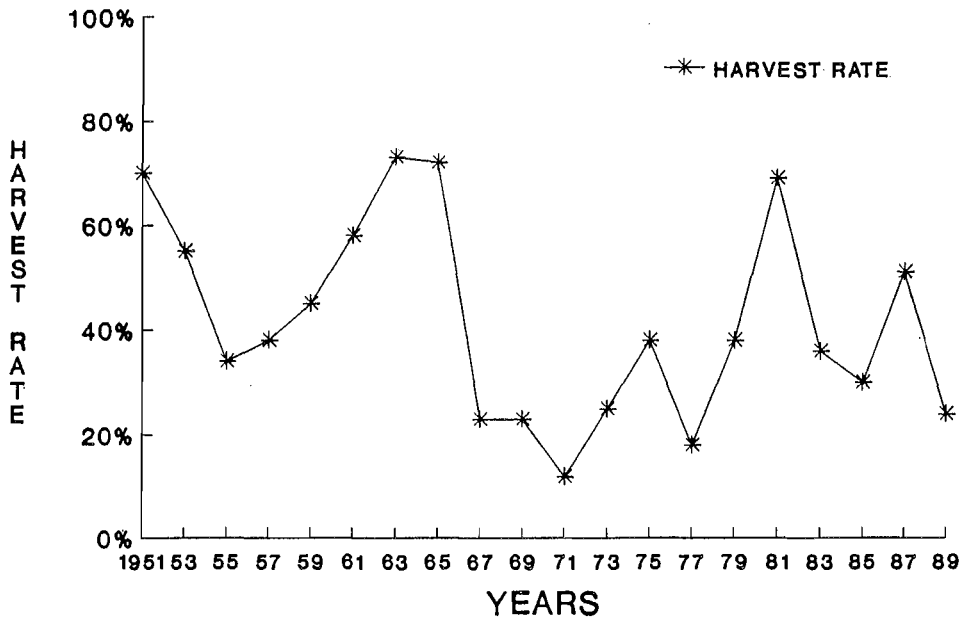


FIGURE III-21 GRAPH OF RECRUIT/SPAWNER RATES OF AREA 8 EVEN AND ODD-YEAR PINKS.

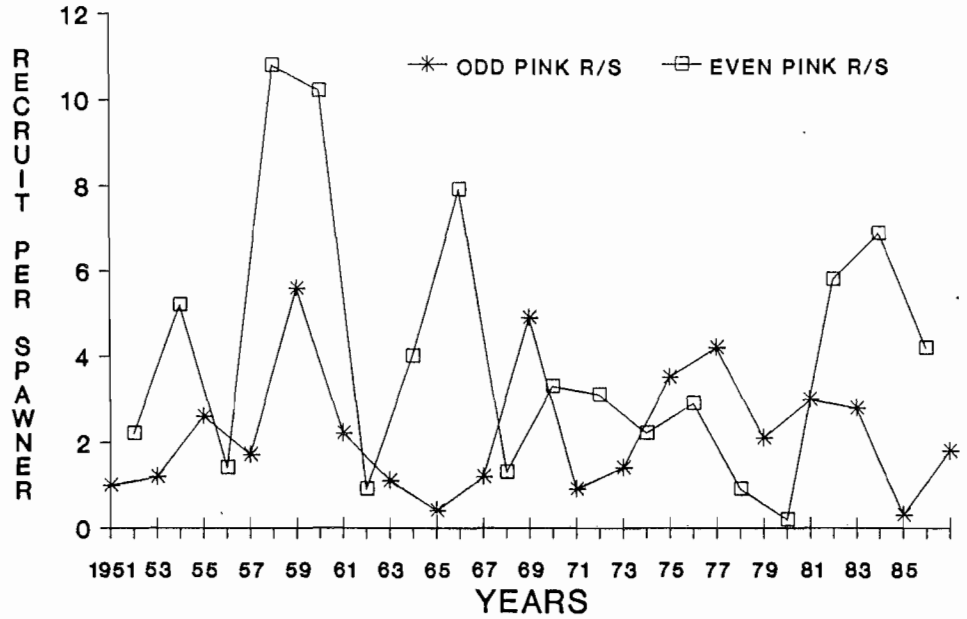
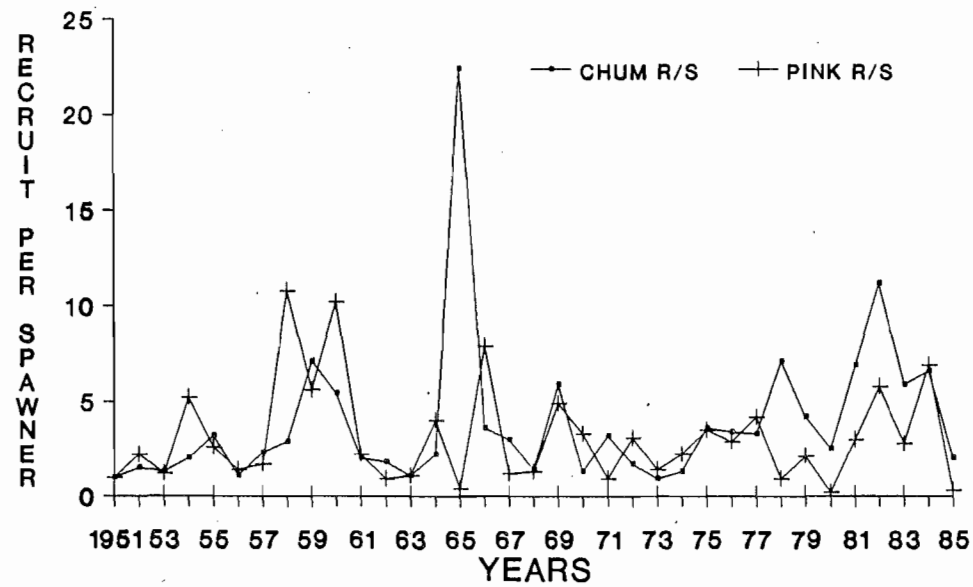


FIGURE III-22 COMPARISON OF RECRUIT/ SPAWNER RATES OF AREA 8 PINK AND CHUM STOCKS.



rates for even and odd-year pinks is closely correlated with that of Area 8 chums (Fig. III-22), indicating equal responses to prevailing environmental conditions.

Area 8 Chum Stocks

Area 8 chum stocks have never exceeded the escapement target of 332,100 adults (Fig. III-23). The total run size from 1985 to 1988 has been quite high, relative to the previous 30 years, however, harvest rates may be too high. These high levels are due to significant returns from chum enhancement at the Snootli Creek Hatchery (Table 2). Analysis of the hatchery contribution indicates that a minimum of 70 to 80% of the catch is taken in Area 8 chum fisheries, but is probably as high as 90% (Don Bailey, pers comm).

Harvest rates on hatchery chums from 1985 to 1988 average 88%. At this rate of harvest, escapements are quite low. Contribution of hatchery produced chum to escapement averaged 16,000 spawners from 1985 to 1988 (Table 2; Fig. III-25). On average this contribution is only 8% of the total Area 8 chum spawners, thus hatchery production does not result in any significant increase in the spawning population, while it does greatly increase total catch (Fig. III-26).

Table 2. Comparison of the contribution of the Snootli Creek Hatchery chum production to the Area 8 chum fishery and the overall natural chum production.

YEARS	HATCHERY ESCAPEMENT	HATCHERY CATCH	WILD ESCAPE-MENT	WILD CATCH	PERCENT. HATCHERY OF TOTAL CATCH
1985	13204	34754	207661	491020	1%
1986	15423	153947	250799	1351460	10%
1987	14765	223533	123405	296614	43%
1988	20797	426587	160690	413050	51%

An average return/spawner rate for the 1981 to 1983 brood years was about 50 (at Snootli Hatchery), while natural spawners averaged 3.9. Harvesting this very productive enhanced stock in the mixed stock, traditional fishing areas at a high harvest rate suitable for the enhanced stocks results in an excessive harvest rate on the much less productive natural stocks.

FIGURE III-23 AREA 8 CHUM STOCK CATCH ESCAPEMENT DATA, 1951-1989.

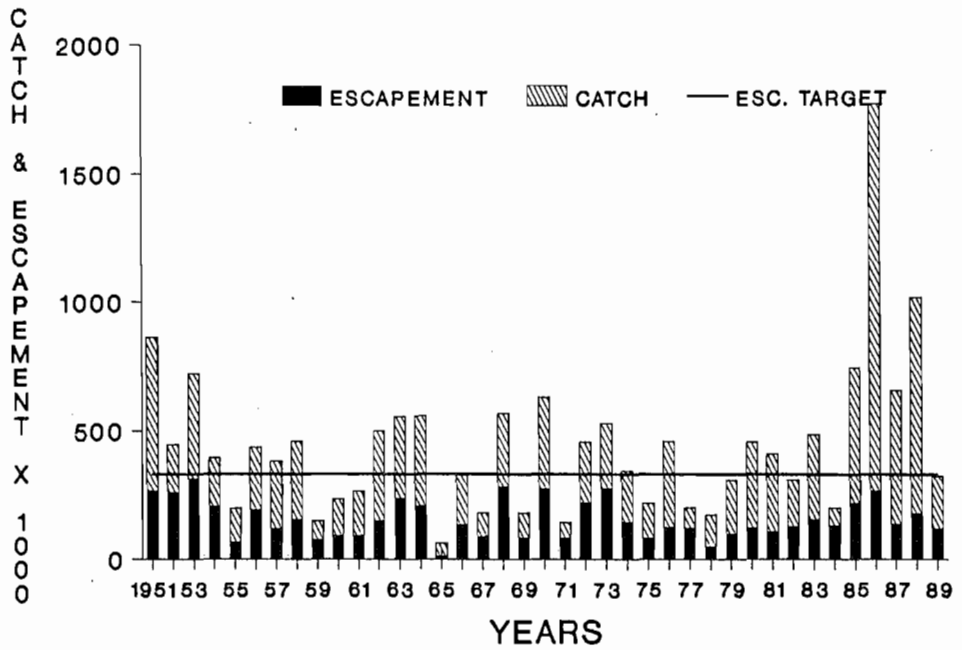


FIGURE III-24 AREA 8 CHUM STOCK HARVEST RATE DATA, 1951-1989.

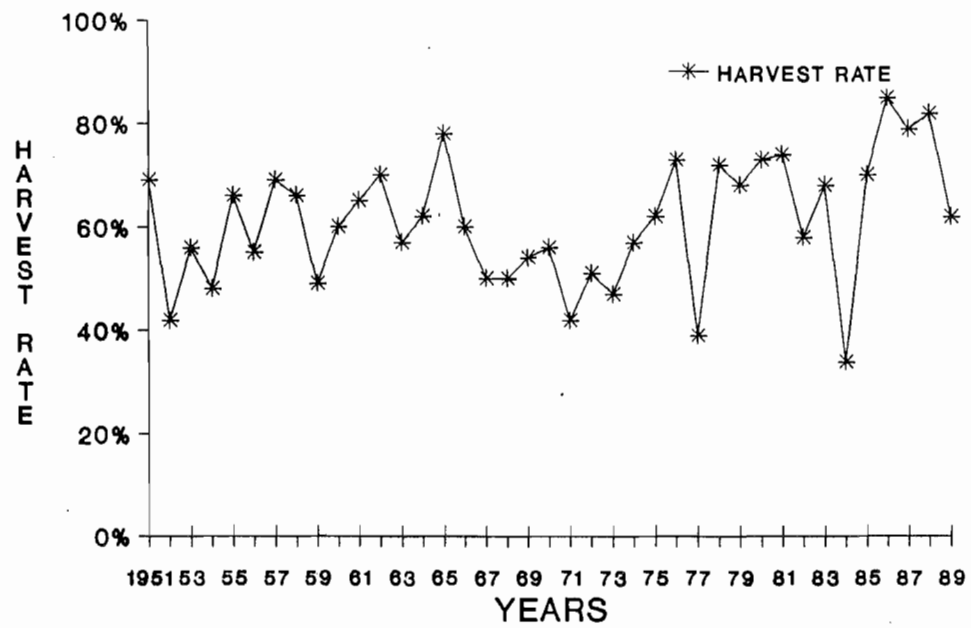


FIGURE III-25 AREA 8 WILD CHUM
vs HATCHERY CHUM ESCAPEMENT 1981-1988.

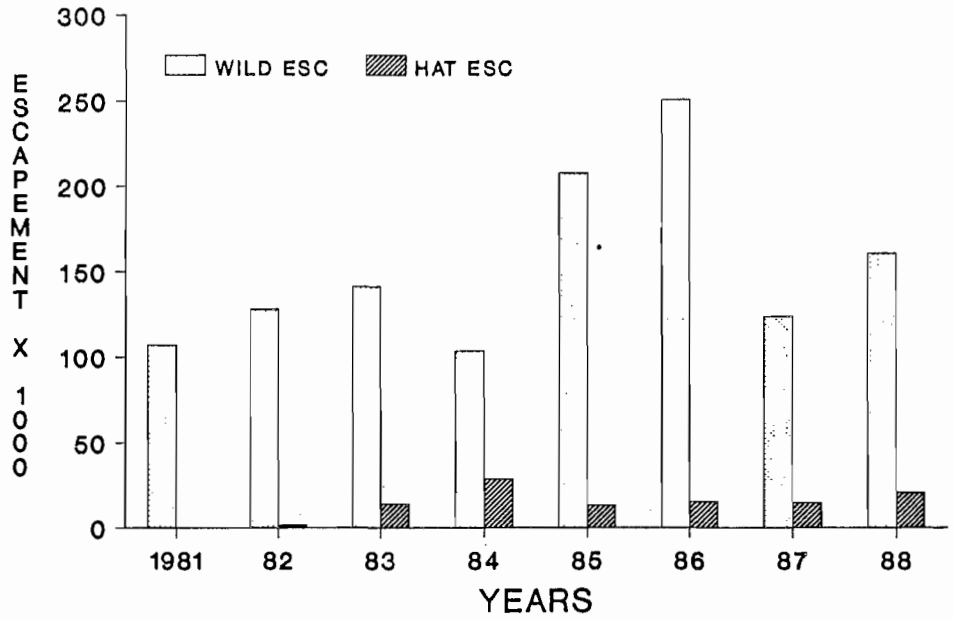
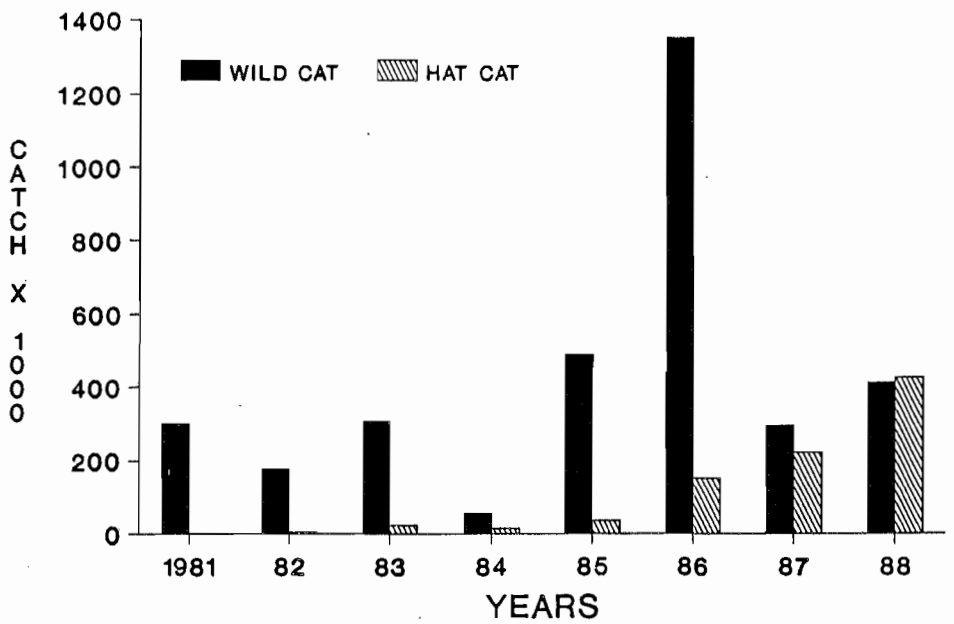


FIGURE III-26 AREA 8 WILD CHUM CATCH vs
HATCHERY CHUM CATCH, 1981-1988.



The Atnarko, Cascade, Kimsquit, Martin Rivers and Elcho Creek are managed in Area 8. Only the Atnarko River (Bella Coola River) chum stocks show a steady rebuilding trend (Table 3). The Cascade and Martin River chum stocks are decreasing and the status of Elcho Creek and Kimsquit River chum stocks is indeterminate.

Prior to enhancement, an average harvest rate of 59%, kept total escapement well below the target escapement (Fig. III-23 & III-24). From 1951 to 1984, total escapement averaged only 46 % of the target escapement. After enhancement, from 1985 to 1989, the average harvest rate was 76%. It appears that the hatchery chum production is driving the fishery, since the average harvest rate on pink stocks has not increased.

A lower average harvest rate is required to rebuild the escapement levels to the target and thus preserve natural stocks. The significant benefits of enhancement can be realized without serious loss of wild stocks only if the excess production is assessed through scientific index fisheries and harvested terminally to protect natural chum stocks.[7]

Table 3. Spawning Escapements for the Managed Chum Stocks in Area 8.

YEAR	ATNARKO	CASCADE	ELCHO	KIMSQUIT	MARTIN
1980	25000	10000	20000	30000	3200
1981	20000	7000	10000	10000	20000
1982	30000	5000	11000	40000	16000
1983	55000	8000	12000	55000	2300
1984	48000	3500	10000	37000	10000
1985	65000 *	11000	13000	80000	1200
1986	77000	7500	7300	-	2300
1987	52000	8480	500	38000	350
1988	81000	6000	20000	46000	1000
TARGETS	**80000**	**12000**	**20000**	**60000**	**15000**

* NATURAL ESCAPEMENT (ie HATCHERY CONTRIBUTION IS NOT INCLUDED, (1985 to 1988)

[7] See Pacific Region Salmon Stock Management Plan Discussion Document Vol. F

Area 8 Sockeye Stocks

The sockeye stocks of Area 8 are in a depressed state (Fig. III-27). They have only been above the target escapement of 138,750 twice, and have been declining since the 1950s. Average escapement from 1980 to 1989 is only 34% of the target escapement, while it was 65% in the 1950s.

There is usually a commercial fishery targeting on sockeye stocks in July. These fisheries attract a large number of boats as it is an early fishery, and the harvest rate is quite high (Fig. III-28) (avg. 69%, 1980-89). It is obvious that these stocks cannot support this fishing effort if they are to rebuild. The directed fisheries take up to 50% of the catch and the rest is caught incidentally, later in the season. Removal of this fishery would reduce the harvest rate substantially and should rebuild the stocks.

Area 8 Chinook Stocks

The target escapement for Area 8 chinook stocks is 42,600 spawners. Atnarko and Dean River chinook stocks account for 87% of the target (25,000 and 12,000, respectively). At present, the total escapement levels are well below target (Fig. III-29).

The Atnarko River stock has been rebuilding and is close to target. The Dean River stock is, however, only around 2,000 adults. The rebuilding trend apparent in Figure III-29, is due to high return/spawner rates (3.1-5.1, 1980-1983) for the Atnarko River and other stocks, and lower harvest rates from 1984-1989 (avg 29%) (Fig. III-30). Also, the Pacific Salmon Treaty has reduced foreign and Canadian interception of these stocks.

Harvest rates on Area 8 chinook stocks averaged 58% between 1970 and 1983 with an average return/spawner rate of 2.6. It appears that the harvest rate must be held below this level to maintain the rebuilding trend for the Atnarko River stock. This harvest pattern has not resulted in a similar trend for Dean River chinook stocks.

A preliminary analysis of the Snootli Creek Hatchery Atnarko River chinook enhancement data indicates a 10 to 20% contribution to the Atnarko River chinook rebuilding. It would appear that Dean River chinook are subject to other detrimental factors since the hatchery contribution to rebuilding is relatively low. This must be studied to identify why rebuilding is not occurring.

Area 8 Steelhead - Dean River

The status of the Dean River steelhead stock is based on data provided by F&W. There is no defensible escapement data and it is suspected that commercial steelhead interceptions are under reported, thus the actual status of the stock is unknown. Because

FIGURE III-27 AREA 8 SOCKEYE STOCK CATCH AND ESCAPEMENT DATA, 1951-1989.

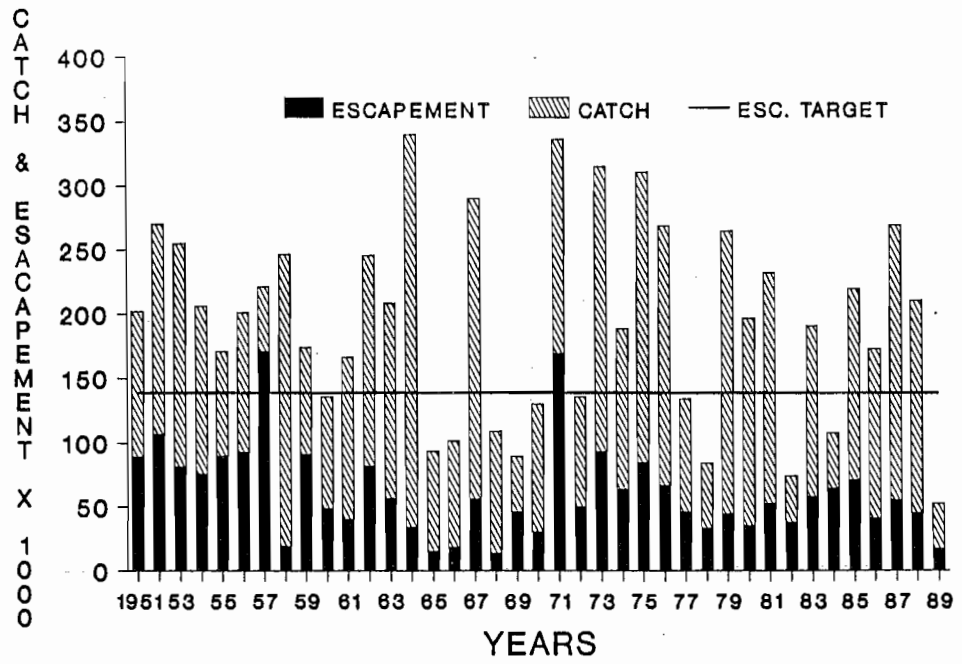


FIGURE III-28 AREA 8 SOCKEYE STOCK HARVEST RATE DATA, 1951-1989.

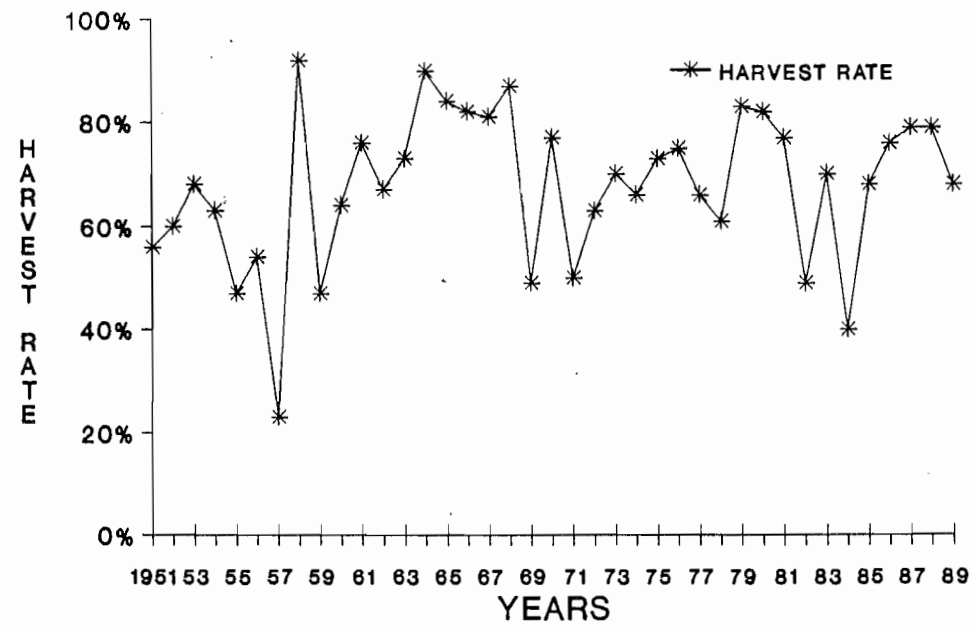


FIGURE III-29 AREA 8 CHINOOK STOCK
CATCH AND ESCAPEMENT DATA, 1951-1989.

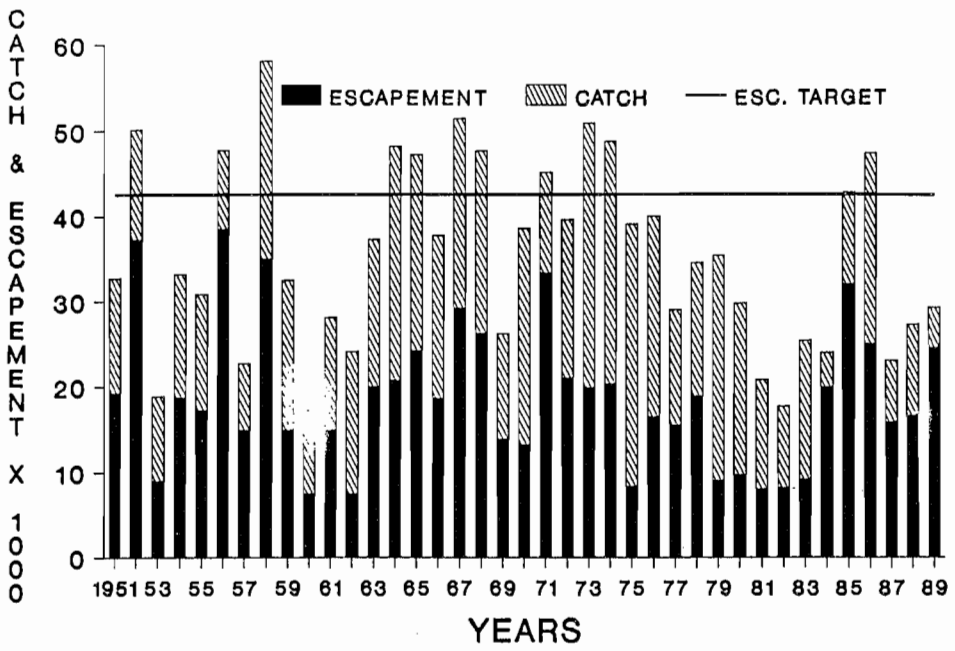
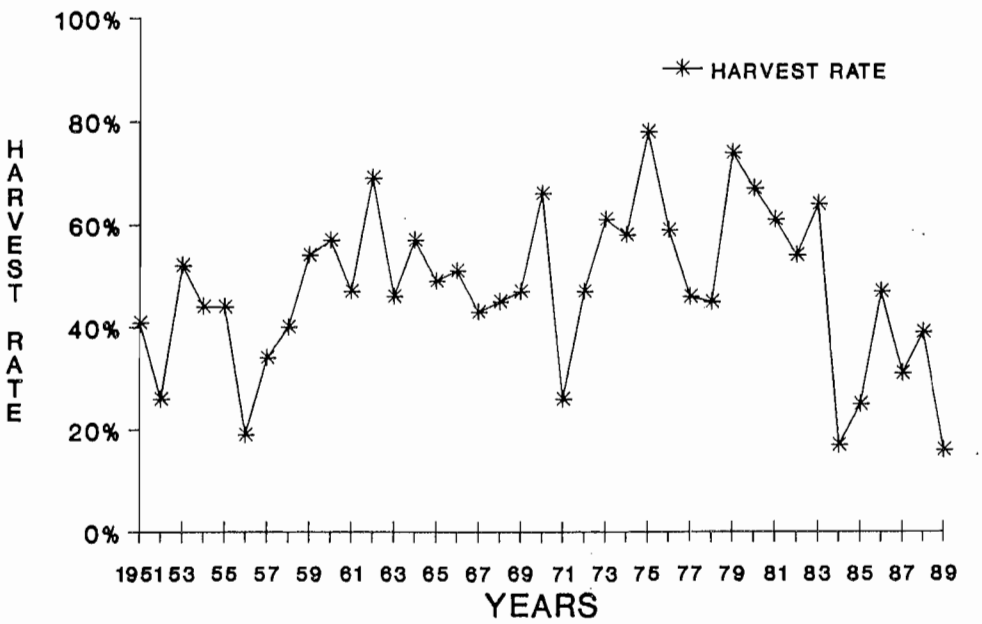


FIGURE III-30 AREA 8 CHINOOK STOCK
HARVEST RATE DATA, 1951-1989.



of these data inadequacies, it is not yet clear whether the harvest rate on Dean River steelhead has been reduced since the mid 1970s (Fig. III-31 & III-32).

In 1985 and 1986 the harvest rate appears to have increased dramatically, but the escapement levels decreased only slightly. F&W biologists believe that ocean survival rates two to three times that of normal years, may account for this anomaly. It would appear that the escapement levels of this stock has been maintained at its highest level since 1974.

F&W biologists believe that the chum exploitation rate experienced in Dean Channel is the same for Dean River steelhead stock. At this time there is no exploitation rate data available for this fishing area, thus it cannot be assessed. A joint effort between DFO and F&W, to investigate the effect of using weed-lines in the gillnet fleet to reduce steelhead interception is underway in Dean Channel. It is too early to determine if the experiment is successful or not.

SUMMARY

The status of stocks in Areas 7 and 8 is alarming and cause for serious concern. The above summary analysis indicates that in general, the aggregate stocks of all species are depressed or show signs of decline (rarely meeting target escapements).

Only the Area 8 even-year pink stocks appear to be at target (escapement) levels, however, the Atnarko River stock often exceeds its escapement target so aggregate pink data tends to mask the depressed status of the other even-year pink stocks in Area 8. Sockeye and chinook stocks are very weak stocks. The Atnarko River chinook stock appears to be rebuilding. The Dean River steelhead stock appears to have stabilized in recent years. No information exists to carry out an analysis of the coho stocks in either Area 7 or 8.

The high level of chum production from Snootli Creek Hatchery poses a mixed stock fishery problem for fisheries managers. Total Area 8 chum catch is composed of 40 to 50% enhanced chum, harvested at a rate of 70 to 85%. This is a very high harvest rate for wild chum stocks relative to other harvest rates for chum on the coast.

All harvest management is based on pre-season forecasts. Harvestable surpluses to escapement are predicted using brood year escapement estimates alone and are thus very unreliable. There are no in-season abundance estimations made for specific stocks.

The lack of any index fishery information, overall or stock specific, severly hampers the harvest managers ability to alter the fishing plan in-season. There is considerable pressure from the fishermen to hold to the plan if abundances appear low or to increase fishing if abundance appears high.

FIGURE III-31 AREA 8 STEELHEAD STOCK CATCH AND ESCAPEMENT DATA, 1974-1989, FOR THE DEAN RIVER.

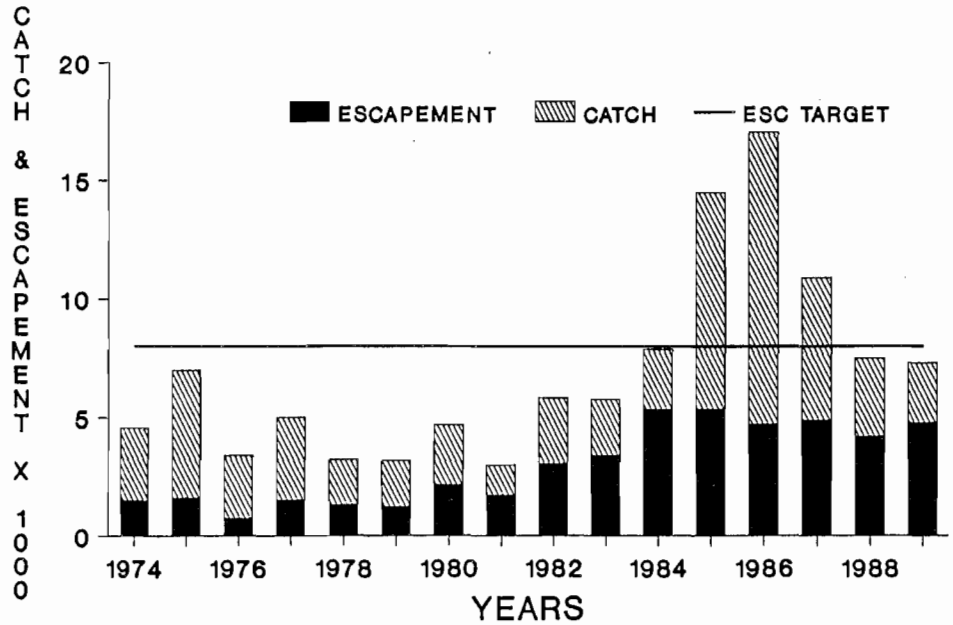
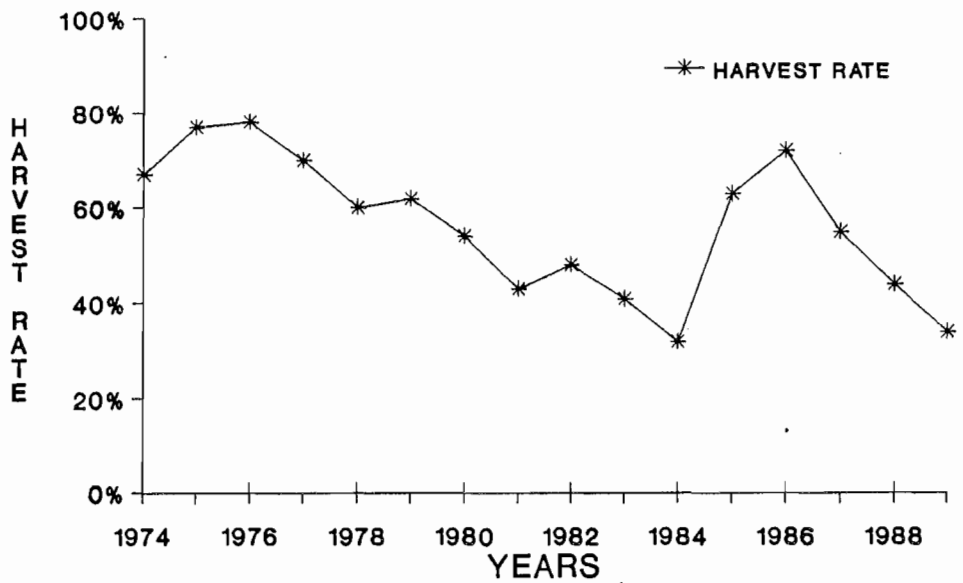


FIGURE III-32 AREA 8 STEELHEAD STOCK HARVEST RATE DATA, 1974-1989, FOR THE DEAN RIVER.



The lack of good in-season abundance data has resulted in depressed stock levels, difficulties in meeting pre-arranged allocation plans and considerable confrontation between the users and DFO. Harvest rates cannot be controlled adequately without definsible in-season abundance data.

Chapter IV:
CONSULTATION

A key goal of the Central Coast pilot was to explore more effective ways to consult with the users and the public, testing innovative forums for consultation - Open Houses and Workshops. The purpose of consultation is for DFO staff to learn what the public knows of and expects from the resource; for the public to learn about the fisheries resource and the SSMP process; and for both to develop a co-operative relationship working for better management of the salmon resource. The Central Coast SSMP consultation process was different from more traditional forms of consultation in that it involved a wider base of the public. This chapter describes the Central Coast experience with consultation.

Too often in the past, consultation on fisheries management issues has been a closed affair between DFO and select advisors from organizations representing specific interests. A large share of the fishing public, however, do not belong to any organization and so have had no voice in management. As stewards of the resource, DFO staff should be aware of the greater interest and remember in all public consultation there will be those whose interests cannot be voiced, especially future generations. It is the responsibility of DFO to represent the overall, long term interest.

PROFILE OF THE CENTRAL COAST

The first step in the consultation process involved compilation of a social profile for the area, which describes the local communities and people interested in Central Coast fisheries.[8] The Central Coast area is sparsely populated and relatively isolated. Settlement in Areas 7 & 8 is centred around two main towns. In Area 7, the main town is Bella Bella and in Area 8, Bella Coola at the head of Bentick Arm on the mainland.

The area is home to peoples of four Native nations: the Kitasoo Band is of the Tsimshian Nation, the Bella Bella (or Heiltsuk) Band is Kwakiutl, the Bella Coola or Nuxalk are of Coast Salish descent, and the Ulgatcho Band are Athapaskan. Immigrants from Norway were some of the first European settlers in the Bella Coola Valley.

The remoteness of the area, due to a lack of transportation in the form of marine and railroad freight services, has limited opportunities for economic growth and development. Employment in the area is provided mainly by the primary industries of forestry and fishing. The local unemployment rate is especially high (see Table IV-1). With the advent of modern refrigeration technologies and due to the economies of scale from fewer large plants, the salmon processing industry has moved from many small coastal canneries to Vancouver and Prince Rupert mainly. The closing of the Ocean Falls pulp in

[8] A Social Profile of the Central Coast. 1990. MacKinnon, C., R. Hilland and G. Berezay. DFO.

1980 also contributed to significantly reducing employment opportunities in the Central Coast. The effect of these changes has been particularly serious for Native communities.

Table IV-1

Unemployment	
Bella Bella	47%
Bella Coola	54%
Central Coast	26%
B.C.	13%
Canada	10%

Source: 1986 Census, Statistics Canada

In this century the commercial fishery has been the dominant user of the fishery resources in the Central Coast area, but since the early 1950s the sport fishing and Native food fishing have grown in importance. The relationship between local DFO staff and Native bands has at times been marked my misunderstanding and mistrust. In matters of conservation, however, the Natives have co-operated with DFO requests. Recently, the local bands have become more critical of fisheries management practices.

Because of the importance of the salmon fishery, DFO is one of the most important government agencies in the area, however, there is little public knowledge of DFO and its mandate. Even so, there may be greater contact between DFO staff and the user groups in the Central Coast than in other areas of the coast. This may be due to a number of factors including the small community size and the high profile of SEP. This relationship provides an opportunity for exploring open dialogue with little confrontation.

THE CONSULTATION PROCESS

The Open Houses were held in May-June, 1989 and the Workshops were conducted in January-February, 1990. The purpose of the Open Houses was to introduce the SSMP process to the public and to give them a first opportunity to express their opinions about salmon management. The Workshops were intended to foster more detailed discussions of specific stock issues and develop preliminary options.

A brief summary of the Open Houses is presented here. Open Houses were held in four communities: Williams Lake, Bella Coola, Bella Bella and Vancouver.[9] As a preliminary step, a pamphlet was prepared and distributed in two regional papers. The pamphlet introduced the SSMP, invited people to the Open Houses and included a mail-back survey to elicit the views of the public. A similar survey was available at each Open

[9] The experience of Open Houses is recorded in: Open House Review: Lessons from the Central Coast by S. Wright & A. Greer, October, 1989; Open House Manual by J. Thompson & A. Greer, October, 1989 and the Open House, a video produced by G. Inglis.

House.[10] These survey questionnaires provide much of the important feedback sought in this process.

A total of 222 survey responses were received, 158 of which were mailed and 64 filled out at the Open Houses. Responding to the question of what management options were preferable, over half selected "harvest less/rebuild stocks". Other suggestions were many and varied, suggesting the public is aware of a wide range of issues affecting the fisheries. The two most common suggestions were to restrict Indian food fishing or to reduce high-sea interceptions (driftnets). Understandably there was a tendency for participants in one sector to call for restrictions on another sector's catch. People also expressed concern for fish habitat threatened by pollution or logging practices.

OPEN HOUSES

The dominant issues at the Williams Lake Open House were sports fishing ones as most visitors were sports fishermen. Discussion ranged from local topics such as the roe ban on the Atnarko River to international concerns such as offshore oil spills and high seas driftnetting. Staff were surprised to learn that many had no objection to using enhancement to supply sports fish, as sports representatives have often expressed clear opposition to enhancement.

The Bella Coola Open House had the largest turnout, and thus, the most discussion. Topics ranged over a wide spectrum. Staff heard complaints about sports regulation, "wasteful" Indian food fisheries, and habitat problems caused by agricultural diking, logging and the activities of beavers. There were also calls for a seal cull to protect salmon, a halt to steelhead fishing to rebuild runs, more enhancement at the hatchery and the establishment of enhanced stockeye runs in a number of coastal lakes, and more involvement of Native bands in fisheries management. Again concerns about offshore oil transport and highseas driftnets were voiced.

The Bella Bella Open House provided a forum for inhabitants of the remote western islands to voice their concerns. Similar issues were raised as those at the other Open Houses, but some additional points were also raised. Criticisms were levelled at the Northern troll fisheries near Dundas Island for their effect on local stocks. The benefits of terminal fisheries were questioned because of the poor quality of the fish. A strict area licensing system was proposed.

---

[10] This survey was not carried out using rigorous statistical procedures, which would have required considerably more effort. Thus, the results should be interpreted as a general representation of public opinion, not an accurate or precise one.

The final Open House in Vancouver was attended mainly by commercial and sport fishermen who fish the Central Coast. Much was made of the issue of steelhead interception. Discussion revolved around ways of controlling the fleet. While some suggested shorter, snap openings, other believed area licensing would be required.

Following the Open Houses, surveys and recorded comments were compiled and included in the Open House Review. A one page newsletter was prepared and mailed to survey respondents.

The Open House series served a number of functions, beyond a test of an innovative public forum. First, the Open Houses spurred the Central Coast Working Group into action, focusing attention on the task at hand. Second, the Open Houses provided input to the Working Group on public opinion on fisheries issues. Third, Open Houses gave the Working Group the chance to inform the public of the SSMP process and the state of Central Coast fisheries. Finally, Open Houses fulfilled a requirement to allow the public the opportunity to participate in a constructive, non-confrontational forum.

WORKSHOPS

The second stage of the SSMP consultation process involved a series of Workshops with invited representatives from the Native, sport and commercial sectors. Workshops were held in Williams Lake, Vancouver, Steveston, Bella Bella and Bella Coola.[11] The Workshop series was originally designed to start with local sessions involving all sectors in each key community and then a final plenary Workshop involving a select representation from each community and sector. The purpose of this structure is to bring all users together face-to-face so that the different interests could be heard by all. Some Working Group members, however, urged that the design follow more traditional formats, so the Workshops tended to involve people from one sector, depending on the community involved. The Williams Lake and Vancouver Workshop were made up completely of sports fishermen, the Steveston Workshop of commercial fishermen and the Bella Bella session of Native food and commercial fishermen. Only the Bella Coola Workshop involved a complete cross-section of users.

The first Workshop was held on the evening of January 16, 1990 in Williams Lake and involved mainly sportsfishermen from the interior who frequently travel to the Central Coast to fish. Discussions ranged over a number of topics including the need for measures to protect certain stocks through closures and access restrictions.

On January 23, the second Workshop was held in Steveston. A number of local commercial fishermen attended. Topics of discussion included the problems with poor information, the possibilities for enhancement in Area 7, and the need to consider new

[11] Minutes of each workshop have been compiled in a comprehensive document.

options brought forward at the Workshops. A number of specific stock issues were also discussed.

The following night, January 24, an evening Workshop was held in downtown Vancouver with sportsfishermen living in the Lower Mainland. The group discussed the status of a number of prized sport fishing stocks including the Bella Coola steelhead, Atnarko chinook and the Dean River steelhead. The key issue was the commercial interception of these stocks, especially the Dean steelhead.

A two day Workshop was held in Bella Bella on January 30-31. Most participants were commercial fishermen and members of the Bella Bella band. This group discussed the history of fisheries management changes over the last few decades especially closures of outer fisheries such as Milbanke Sound. Most of the discussion centred on pink and chum fisheries.

The final Workshop was held over three days in Bella Coola on February 12-14. This was the largest Workshop and the one with the widest range of interests participating together. A wide range of topics were raised.

The Central Coast Workshops can be seen as both success and failure. They were a success in that they were a continuation of the Open House philosophy of allowing wider involvement in consultation. At this point, however, key field staff were unable to continue work and the Central Coast SSMP process stalled. A further round of workshops to discuss specific options is necessary to complete the process.

SUMMARY

The information gathered from the surveys, Open Houses and Workshops provides a valuable body of information for the Central Coast Working Group. There are a number of key points worth noting:

- people have many concerns and see many issues as being critical, few were content with the status quo,
- members of particular fishery user groups tend to blame other groups for over-harvesting and the resulting problems with low stocks,
- people have a wide range of opinions on fishery issues, though their information is not always factual or complete,
- people believe DFO can do something about the many problems facing the fishery whether through more enforcement, more enhancement, or reallocation of harvest or research efforts.

Chapter V:
ISSUES

The "Issues and Options" chapter was originally envisioned as the heart of the Central Coast planning document. It was to include a comprehensive list of general and stock-specific issues, a number of options for addressing each, and the recommended option for each issue. Because the SSMP process was halted, no further work could be done on option development, biological and economic modelling, or option analysis. The authors of this report have sought to consolidate the work of the Central Coast Working Group but can proceed no further in discussing Central Coast management options. Nonetheless, it is fruitful to list a number of important issues facing Central Coast salmon management, in this chapter renamed as "Issues". These general issues include uncontrolled harvest rates, depressed salmon stocks, increasing Native food fish needs, public consultation, commercial fleet control, and steelhead interception conflicts.

HARVEST RATE CONTROL

The stock status summary presented in Chapter III indicates that many stocks are depressed or declining relative to present escapement targets. Current fisheries management practices, in particular the inability to keep harvest rates at desired levels in mixed stock fisheries, is the primary cause of this over-harvest. There are a number of factors which underlie the problem with harvest rate control.

Basic Information

There is very little basic biological information collected for some stocks. For example, although there is a general belief that coho stocks are severely depressed and declining, there is no data to confirm this. The late timing, relative to the commercial net fisheries, indicates that the stocks are being harvested in the outer troll fishing areas and the Alaskan fisheries. To rectify this problem it would be necessary to initiate a program to collect better escapement data, habitat information, and harvest data from all fisheries intercepting the coho from Central Coast streams. The coded-wire tag data available from coho enhancement efforts should be evaluated as a basis for this stock assessment work and some plans developed to deal with the issue.

There is also a lack of basic information about fisheries habitat, either on the carrying capacity of spawning streams or the plans for development or industrial activity. Although the Central Coast is relatively undeveloped, as elsewhere in B.C. there is a great deal of logging activity. The lack of even baseline habitat information leaves managers with little understanding of the potential of local salmon-producing streams, consequently escapement targets are little more than educated guesses.

Pre-season Forecasting

Current pre-season forecasts are very unreliable because few of the controlling variables that affect stock productivity are measured. Forecasts could be improved by undertaking extensive spawning success sampling, downstream enumeration of the juvenile salmon production, and assessment of variables in the marine environment which influence survival rates - although these would be expensive.

In-season Abundance Estimation

The current lack of good in-season abundance estimation may be the most serious flaw in present management practice in the Central Coast. Without such information, the necessary fisheries management decisions cannot be made to respond to varying stock levels and run-timing. The result is ongoing over- or under-harvesting. Tragically, the evidence presented in the Status section suggests that over-harvesting has been the most common result of this management deficiency.

The most readily available and reliable method of abundance estimation is the index fishery. Index fisheries provide estimates of in-season abundance and run timing of the stocks through the fishing areas, as they migrate back to their respective natal streams. This information allows the harvest manager to control the harvest rate to meet escapement targets. Abundance estimates for each specific stock in the fishing area would theoretically allow precise harvest rate control and selective harvesting of each stock. In practice, such control is severely compromised in the mixed stock fisheries because of the great number of stocks and the difficulty of stock identification. Moreover, commercial fishing vessels have a limited ability to selectively harvest different stocks at different rates.

REBUILDING DEPRESSED STOCKS

Once better management tools are used for measuring and ultimately controlling harvest rates, a number of different alternatives are available for rebuilding depressed stocks including some combination of terminal harvesting, stock rebuilding, and enhancement.

Terminal Harvesting

Terminal harvesting involves fishing closer to natal streams, either at the head of inlets or in- river. This allows fisheries to target on specific stocks without over-harvests of passing stocks which are unavoidable in outside areas where more mix together. Salmon flesh quality degrades, however, as the fish approach freshwater and especially once they are in the river due to the physical transformation required for sexual reproduction. Thus, terminal fisheries may entail some loss in fish value reflected in lower prices to fishermen.

As well, fishermen may fear giving up traditional fishing areas as they may lose them forever. In-river fisheries could also be conducted from fences, traps, or weirs, thus constituting a profound change in fishing practice and the resulting transfer of fishing opportunity away from the commercial fleet. Nonetheless, terminal harvests may be the most effective method of harvesting salmon selectively and eliminating mixed stock fishing.

Stock Rebuilding

Often the best way to get more fish in the long run is to cutback on present harvests and allow more fish to spawn. Stocks may thus be rebuilt to the highest level possible given the productivity of the stock and the carrying capacity of habitat. Stock rebuilding requires some long term planning which, of course, requires some reasonable understanding of the present state of stocks and the potential for more production (all made explicit in simulation models). It also requires the commitment of managers to implement harvest rate reductions, often in opposition to short term pressures. A number of different harvest strategies such as fixed harvest rates or a step-wise contingency (clockwork) plan can be utilized in the effort to rebuild stocks.

Enhancement

Salmon enhancement technology can be an effective tool for increasing production and thus catch. The harvest of enhanced stocks can be more easily controlled because stocks can be tagged, their productivity may be predicted with greater certainty, and the high productivity and low spawner levels provide some buffering for harvest mistakes. The major problem is that, because enhanced stocks can sustain much higher harvest rates, unless they are harvested discretely, they will either be under-harvested to protect the less productive, natural stocks, or worse, wild stocks will be over-harvested. Moreover, the costs of enhancement may be substantial and the government has a limited ability to fund new projects, especially large scale ones.

NATIVE FOOD FISH NEEDS

The severely depressed status of all sockeye stocks in the area exacerbates the problem of meeting Native food fish requirements. (Native people generally prefer sockeye for food fish). The population of the Bella Bella band has increased rapidly and is expected to double in the next decade. Both improved harvest management, through harvest rate control, and possibly enhancement efforts may offer some solutions to the issue. As discussed above, precise harvest rate control in the mixed stock fisheries would be necessary to deliver the fish to the Indian food fisheries.

Several enhancement opportunities have been identified to seed inaccessible lake systems with sockeye. These operations would be aimed at providing food fishing projects and would mitigate sockeye interceptions in the commercial fisheries. These opportunities will be costly and require transplanting seed stock from other river systems. This practice has a highly variable success rate, to date. The local sockeye stocks are depressed and since there is no guarantee that the transplanted brood stocks will have any chance of success, it may be a very costly experiment.

PUBLIC CONSULTATION

The Central Coast Advisory Board has been a fairly effective body in developing pre-season commercial fishing plans. While commercial representation may approach 40 members, however, there has been one lone sports representative and no Native band representatives. Moreover, changes to the plan in-season have resulted in protests (DFO office occupations), because of perceptions that DFO had broken promises. Effective management that involves the public may require more comprehensive consultation.

COMMERCIAL FLEET CONTROL

The continued increase in fishing power coastwide (from ongoing reinvestment) has resulted in a faster and thus more mobile fleet. The Central Coast has seen increased fleet sizes at fishery openings and local fishermen are forced to motor farther afield to maintain their share. The large fleet makes for shorter, crowded openings and precludes smaller pocket fisheries where surpluses exist but are too small to permit a large number of vessels. Present licensing rules do not allow restrictions on the number of vessels fishing in an area.

STEELHEAD INTERCEPTION CONFLICTS

Conflict between sport and commercial fishermen has surrounded the by-catch of Dean River steelhead - a prized sport fish - in commercial fisheries targeting on other stocks, in particular Kimsquit chum. While the summary stock analysis does not show any threat of over-harvesting of Dean steelhead, there is still a valid concern about the proper allocation of the catch. Though low in numbers, Dean steelhead are the mainstay of a highly-valued sport fishery. Each fish has far greater value to the sport than the commercial fishery. In fact, commercial fishermen would likely have few qualms about giving all steelhead to the sports fishery. They are more concerned with the chum they would have to forego to deliver those steelhead. Experiments with weedlines on gillnets (allowing more steelhead past nets targeting on chum) have been somewhat effective but the possibility for conflict remains.

Chapter VI:
CONCLUSIONS

The main goal of developing a long term management plan for Central Coast Areas 7 & 8 has not been realized. The SSMP process has proceeded only to the second stage of consultation (workshops) and the early stage of option analysis. More work is required to complete a plan. Nevertheless, the work done to date forms a foundation for future efforts. The other goal of this SSMP project was to pilot a process that could become a template for SSMPs regionwide. The pilot successfully tested new and better means of consultation (Open Houses and Workshops) and explored planning process improvements.

The information presented in this report supports a number of conclusions regarding Central Coast salmon management and Pacific Region planning, in general:

- The poor status of salmon stocks in the Central Coast is alarming and cause for concern. The summary biological analysis revealed that almost all salmon stocks harvested in Areas 7 & 8 are below existing escapement goals.

- Central Coast stocks have been managed without adequate stock assessment or in-season abundance information. To manage the salmon resource effectively, DFO will need to undertake a detailed stock and habitat assessment of all stocks in the area. Only sound stock assessment can provide the fundamental information that is needed to set appropriate escapement targets.

- Nonetheless, under present harvest management, even existing target escapements are rarely met. This is largely due to the lack of timely in-season abundance information (run size, timing, and stock identification), without which managers cannot adjust harvest rates accordingly. Because of the weakness of in-season estimates, pressure from the commercial sector forces the manager to harvest at the upper limits of the pre-season forecast or to the in-season abundance estimates (whichever is greatest). To achieve and sustain target escapement goals, DFO must develop accurate in-season abundance capabilities in order to control the harvest rates. The present single pre-season fishing strategy is ineffective, as it lacks contingency plans for when pre-season forecasts are inaccurate. Without adequate in-season abundance estimation, however, it is virtually impossible to deliver any innovative fisheries management strategies.

- Until the effort to develop a long term salmon management plan in the Central Coast is sustained through to completion, the true potential of the salmon resource in the area will not be realized. The Central Coast SSMP consultation process has raised the expectations of public stakeholders as to the Department's intention to

undertake open, long term planning. The failure to complete the process does little for the Department's reputation.

- There is a pressing need for the Department to review its resource planning function and the roles and authorities of different Branches in carrying it out. The short-sighted, reactive management that prompted the call for long term planning is also its greatest obstacle. There may be a need for a significant change in the roles of the Department and resource stakeholders before an SSMP can be completed. A move towards local management and empowerment can be expected to encourage the sound management and open decision-making that all players seek, by making fisheries managers more accountable for the resource they manage.