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THE FRASER RIVER SALMON REBUILDING PROGRAM

Department of Fisheries and Oceans
Pacific Region
March 1991

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Fraser River salmon management is complex because of its "mixed-stock" nature: there are many races or groups within each species. Stressing sustainable balance, managers are adamant that abundant species like sockeye and pink will not be increased at the expense of less abundant species such as chinook, coho or steelhead. And, since a primary means of increasing production is to fish more conservatively to allow more fish to reach their spawning grounds, all species will benefit. This has already been the case. Despite recent high returns of sockeye, the harvest rate of the other salmon species has not increased.

Development of this multi-species management and enhancement plan for all Fraser River salmon is well underway. While most effort to date has focused on sockeye, an integrated plan for all Fraser salmon and steelhead lies ahead.

La gestion du saumon du Fraser est complexe en raison de sa diversité : il y a de nombreuses races ou de nombreux groupes dans chaque espèce. Dans le but de conserver un équilibre durable, les gestionnaires sont déterminés à ne pas laisser augmenter la population des espèces abondantes telles que le saumon rouge et le saumon rose, au détriment de celles qui le sont moins, comme le coho ou la truite arc-en-ciel anadrome. De plus, étant donné que la première solution à adopter pour accroître la production est de pêcher de façon plus modérée pour que plus de poissons atteignent leur aire de frai, toutes les espèces en bénéficieront. Cette façon de procéder a déjà fait ses preuves. Ainsi, malgré la pêche abondante du saumon rouge, les taux de pêche des autres espèces de saumon n'ont pas augmenté.

La mise au point de ce plan de gestion et de mise en valeur de toutes les espèces du Fraser est déjà bien avancé. Bien que jusqu'à maintenant l'attention ait été axée sur le saumon rouge, un plan commun pour toutes les espèces de saumon et pour la truite arc-en-ciel anadrome du Fraser sera établi.

Results to date show clearly that the Fraser River is capable of producing substantially more salmon. Striking examples are the record-setting Horsefly and Adams sockeye runs of the past two years. But because optimum spawning levels are still unknown, DFO plans to gradually increase spawning escapement to test production at higher levels.

Meanwhile, in some parts of the river, habitat is slowly being degraded as a result of human activities. As spelled out in the Green Plan, DFO has tailored a new habitat management plan specifically for the Fraser River. Without it, the river's true production potential may never be realized.

To restore all Fraser River salmon stocks (a stock is a group of one species returning to a particular stream to spawn) to full potential, DFO proposes the following management strategies:

Jusqu'à maintenant, les résultats montrent clairement que le Fraser peut produire beaucoup plus de saumons. Les remontées record des rivières Horsefly et Adams au cours des deux dernières années se révèlent des exemples frappants à cet égard. Cependant, étant donné qu'on ne connaît pas encore les taux optima de frai, P et O prévoit augmenter graduellement les échappées vers les frayères pour faire l'essai de taux plus élevés de production.

D'autre part, à cause des activités humaines, l'habitat se détériore lentement dans certaines parties du fleuve. Comme l'indique le Plan vert, P et O a dressé, spécifiquement pour le Fraser, un nouveau plan de gestion de l'habitat. Sans ce plan, le fleuve pourrait ne jamais atteindre sa pleine capacité de production.

Pour restaurer tous les stocks de saumon du Fraser à leur plein potentiel (un stock est un groupe d'une espèce qui remonte à une rivière précise pour frayer), P et O propose les stratégies de gestion suivantes :

- * Increased escapement to spawning grounds through an intricate formula of fishing times and opportunities will be a primary tool.
 - * Resource enhancement techniques such as artificial spawning channels and small hatcheries will augment wild stock rebuilding. In some cases, enhancement will "kick-start" small fish populations to levels where they can be further increased through more conservative fishing management, eventually becoming self-sustaining.
 - * Vigorous protection of habitat and, wherever possible, rehabilitation of degraded habitat.
- * Tout d'abord, augmenter les échappées vers les frayères au moyen d'un agencement complexe de périodes de pêche et de répartition des types de secteurs de pêche.
 - * Utiliser des moyens de mise en valeur des ressources, tels que l'établissement de canaux de frai artificiels et de petites écloseries, pour augmenter la reconstruction des stocks sauvages. Dans certains cas, les travaux de mise en valeur comprendront l'établissement de petites populations de poissons, assez nombreuses pour qu'elles s'accroissent et éventuellement se maintiennent grâce à une gestion plus prudente.
 - * Protéger énergiquement l'habitat et, si possible, reconstruire l'habitat endommagé.

This discussion paper then, will examine stock status, fisheries and rebuilding potential of all Fraser River sockeye, pink, chum, coho, and chinook salmon.

Ce document de travail examinera ensuite l'état des stocks et des pêches, ainsi que les possibilités de reconstruction des stocks de saumon rouge, rose, kéta, coho et quinnat du Fraser.

SOCKEYE

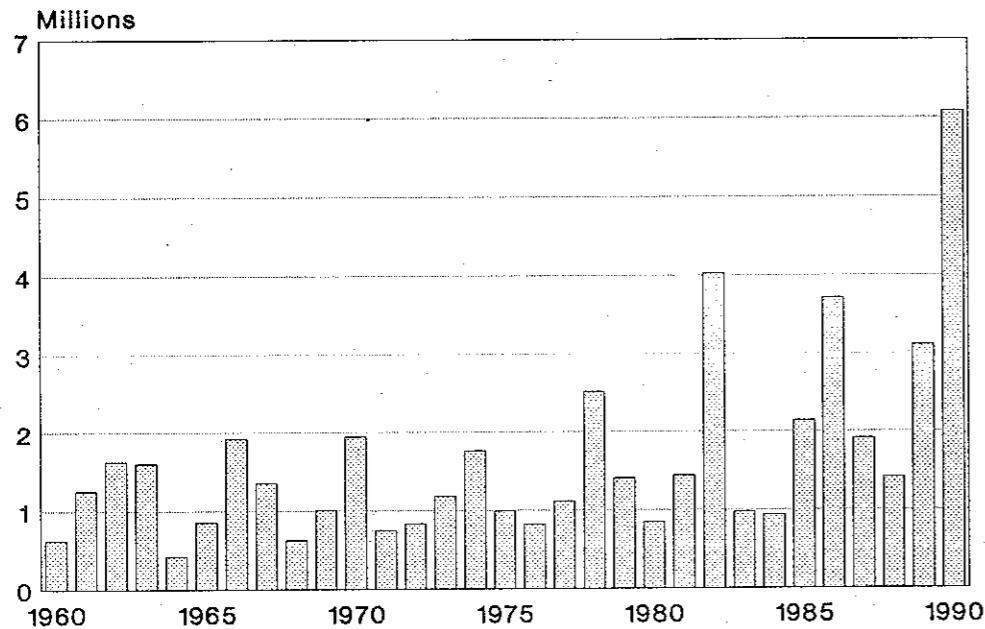
The 1985 Canada-U.S. Pacific Salmon Treaty provided Canada with the impetus to launch an aggressive sockeye rebuilding program. As spelled out in the treaty, Canadians will reap all the benefits of sockeye rebuilding because the U.S. has a set catch ceiling.

STOCK STATUS

Sockeye spawn throughout the Fraser River system, with most production concentrated in nine stocks. Most Fraser sockeye live four years and have a pattern of adult returns characterized by one strong year (the dominant cycle year) followed by a moderately abundant year (subdominant) then two relatively weak years. Highly-publicized and record-setting sockeye returns in 1989 (Horsefly) and 1990 (Adams River) are excellent examples of dominant year returns.

The abundance of Fraser sockeye has been increasing steadily in recent years. These increases resulted from the combined effects of large spawning escapement and above-average rearing conditions in the ocean. The total run (catch plus spawning escapement) averaged about 12.8 million from 1987-1990, 25 per cent higher than the 1983-1986 average. During this period spawning escapement increased by 58 per cent and catch by 18 per cent. Two stocks -- Horsefly and lower Shuswap -- experienced rapid growth on the dominant cycles. Escapement of Horsefly sockeye increased to 1.6 million in 1989 from 253,000 in 1973 and lower Shuswap increased to one million in 1990 from 29,000 in 1970.

**FRASER RIVER SOCKEYE SPAWNING ESCAPEMENT
1960 - 1990**



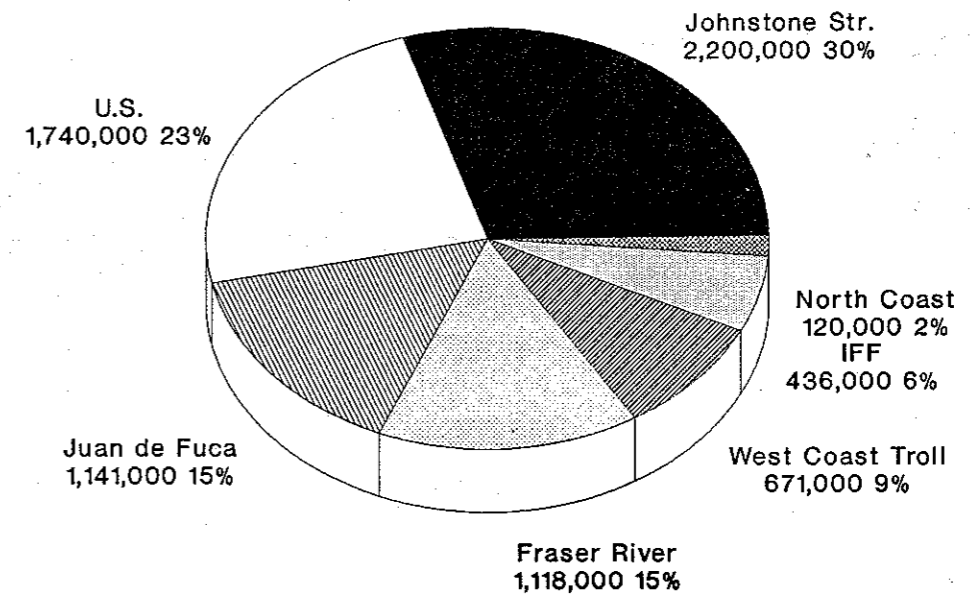
Sockeye are also produced in five spawning channels, one incubation channel and one small hatchery. Total production capacity at these facilities is estimated to be about 1.3 million adults. In addition, nutrient enrichment has been piloted on an experimental basis at Chilko Lake. Fishways at Hell's Gate and other difficult passageways have led to greater production by providing adult sockeye (and other species) easier access to the upper river.

FISHERIES

The major Canadian commercial fisheries for Fraser sockeye are the troll fishery off the west coast of Vancouver Island, purse seine and gillnet fisheries in the Strait of Georgia and Johnstone Strait and a gillnet fishery in the lower Fraser River. Net fisheries in Juan de Fuca Strait, the San Juan Islands and off Point Roberts are the principal U.S. fisheries intercepting Fraser sockeye.

Sockeye are harvested by Indian food fisheries (IFF) throughout the Fraser. Limited food fish catch of Fraser sockeye also occurs outside the Fraser, primarily in Johnstone Strait.

**FRASER RIVER SOCKEYE CATCH DISTRIBUTION,
1980 - 1989 Average**



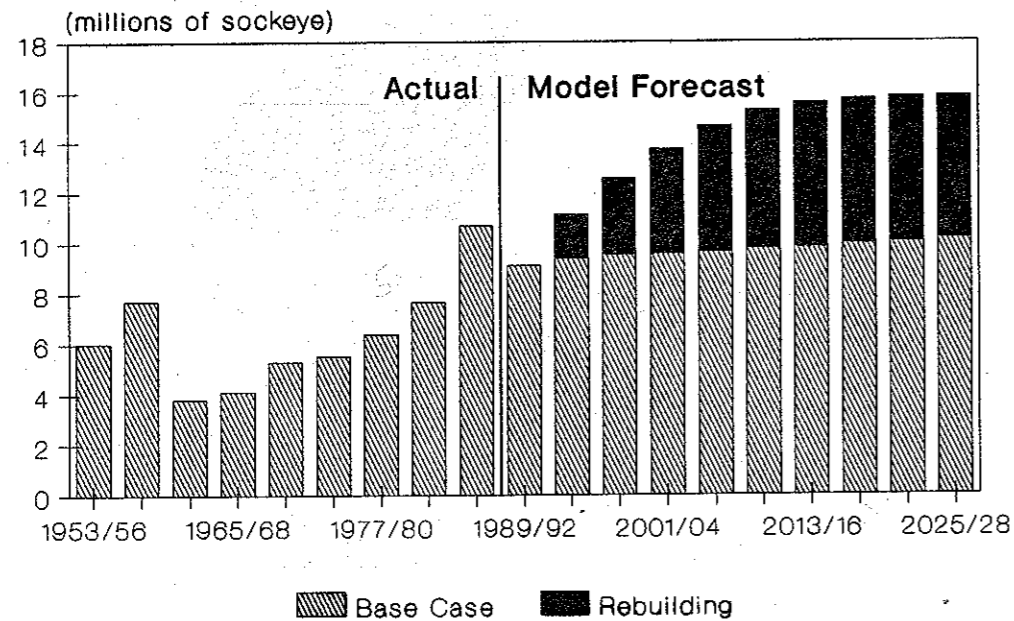
Although the Canadian sport catch of these fish is relatively small at present, there is growing interest among anglers.

REBUILDING

Many Fraser River sockeye spawning grounds and rearing lakes are currently underutilized. To take advantage of potential production capacity an aggressive program to increase abundance and catch has been initiated. Because the ultimate capacity of the habitat is uncertain, interim spawning escapement goals, specific for each cycle, have been designed by DFO for major stocks of sockeye. Only modest increases in escapement are proposed for the dominant cycle of most stocks, the subdominant cycle goals are the same as on the dominant years while goals on the other two cycles are lower. If harvest rates are reduced

to an average of about 70 per cent, most interim escapement goals should be achieved by the years 2004-2007. As rebuilding proceeds, production from higher escapement levels will be evaluated and goals modified as necessary.

FRASER SOCKEYE REBUILDING PLAN
Average Cycle Year Run



Rebuilding will be achieved primarily by reducing fisheries to increase escapement. Enhancement will also contribute. Spawning channels and hatcheries can increase productivity and speed up the rebuilding process. Projects such as these also serve to compensate for severe natural conditions such as recent winter floods which dramatically damage natural spawn. Lake enrichment, a technique used to improve sockeye production in coastal lakes is also a potentially important tool for Fraser sockeye enhancement.

The sockeye rebuilding program is expected to increase production and catch by many millions of fish.

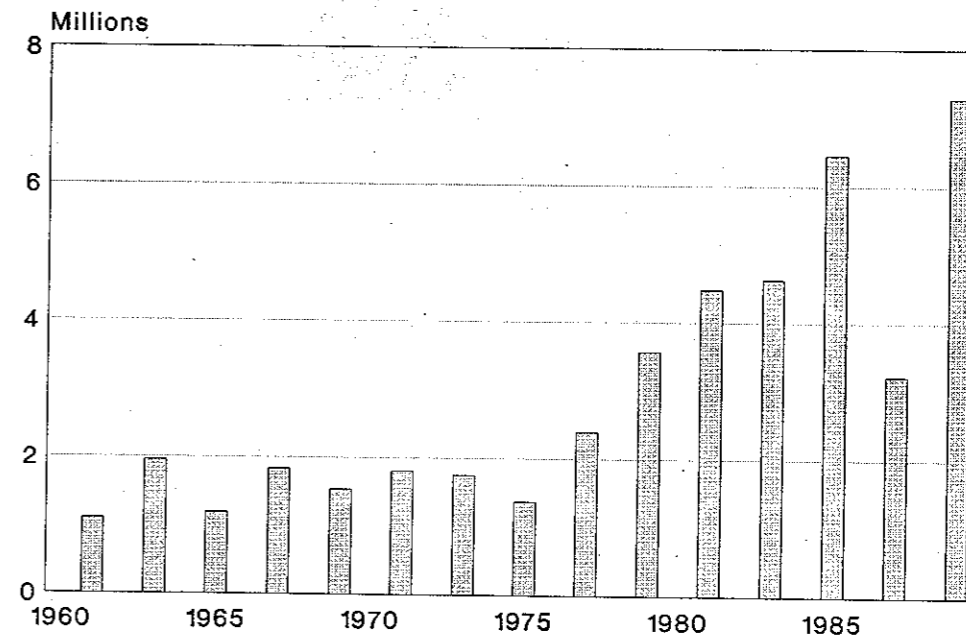
PINK

STOCK STATUS

Pink salmon spawn in the Fraser River in odd years (e.g. 1987, 89, 91,) only. Spawning occurs as far upstream as the Quesnel River with major populations in the lower Fraser, Harrison, Chilliwack, Thompson rivers, and Seton Creek. There are two migration groups whose timing is separated by about seven to ten days. The earlier run is the larger.

Fraser River pink salmon have responded well to increased spawning escapement, though not all stocks at the same rate. Over the past five cycles (10 years) escapement has averaged 5.2 million, ranging from 3.2 million in 1987 to 7.2 million in 1989. The 1979-1989 average total run (catch plus spawning escapement) of 15 million pinks was double the 1959-1977 average.

FRASER RIVER PINK SPAWNING ESCAPEMENT
1961 - 1989

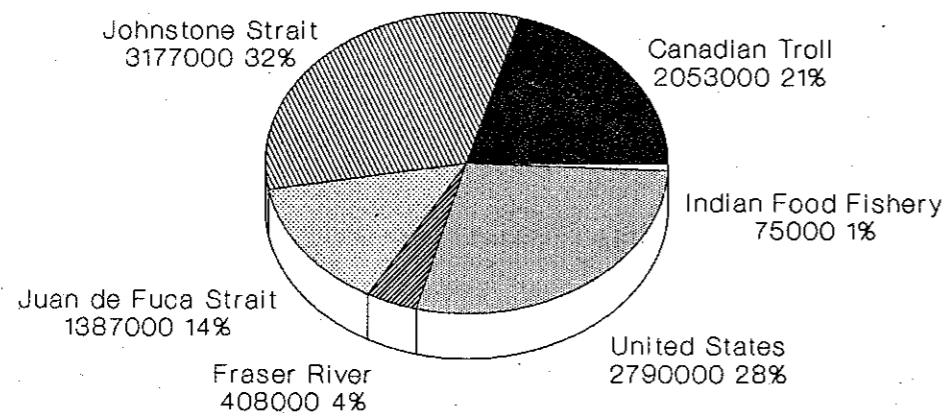


Three spawning channels and a small hatchery near Haney augment pink production in the Fraser River. The majority of enhanced production is from two channels adjacent to Seton Creek built to compensate for loss of spawning grounds due to a hydroelectric dam near Lillooet. A small channel at James Creek near Hope also produces pink salmon. Total enhanced pink production is estimated at 400,000 adults.

FISHERIES -- Pink salmon are caught in basically the same fisheries as Fraser sockeye, although there is a difference in catch distribution. A greater proportion of pinks is caught by fisheries outside the Fraser River area. Troll allocation of pinks is greater than that of sockeye, while the gillnet share is smaller. Indian food fish catch is much lower than that of sockeye and sport catch is also relatively low.

FRASER RIVER PINK CATCH DISTRIBUTION

1979 - 1989 Average



REBUILDING -- Although the optimum spawning escapement to produce the largest average catch is uncertain, it is believed to be between six and seven million pink. As with sockeye, management will evaluate production at higher escapement levels.

Construction of a spawning channel or hatchery adjacent to the Chilliwack River is being considered. It will have the capacity to produce enough fry to grow into 500,000 adult pink. The project would stabilize production in the river, which is subject to severe flooding. New spawning channels now being considered for the Thompson River would also help to rebuild pink stocks and would benefit chinook, coho and steelhead by providing refuge and rearing areas.

CHUM

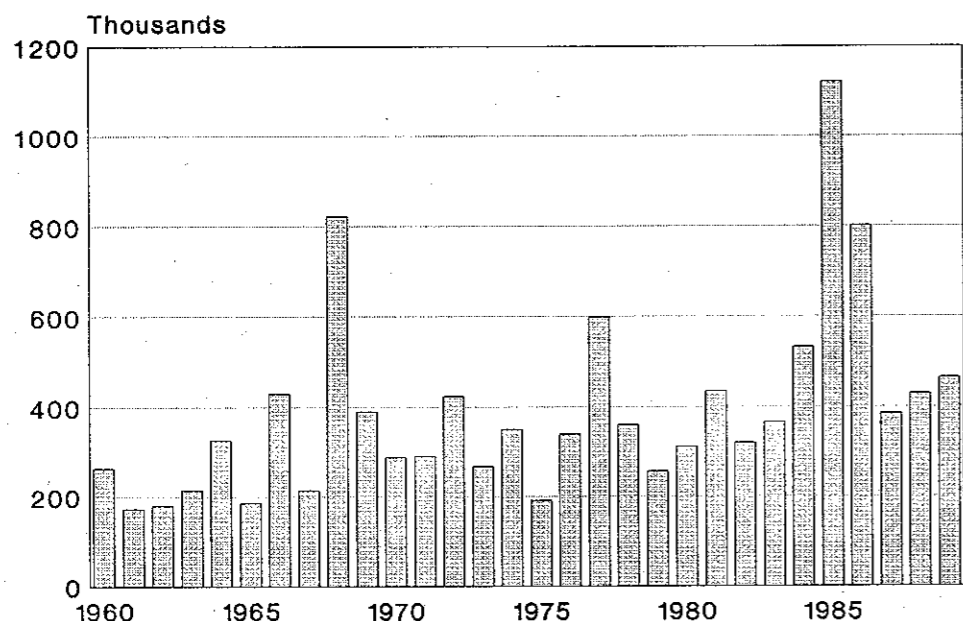
STOCK STATUS

Chum spawn mainly in the lower 160 kilometres of the Fraser River up to Hope, with most wild production in three rivers: Harrison, Chilliwack and Stave. Fraser chum return to the Fraser River over an extended period of time, entering the river in great numbers from early October to mid-December.

There is a general trend towards increasing chum abundance with escapement and run sizes well above those of the 1960s. Average run size from 1980-89 was 905,000; from 1960-69 it was 512,000. From 1986-1989, total run, catch and spawning escapement averaged 1 million, 456,000 and 531,000 respectively.

FRASER RIVER CHUM SPAWNING ESCAPEMENT

1960 - 1989



Enhanced production of Fraser chum comes from three major hatcheries -- Chehalis, Inch and Chilliwack -- as well as several small hatcheries, incubation boxes and a number of groundwater channels. Total enhanced production is estimated at 540,000 chum adults.

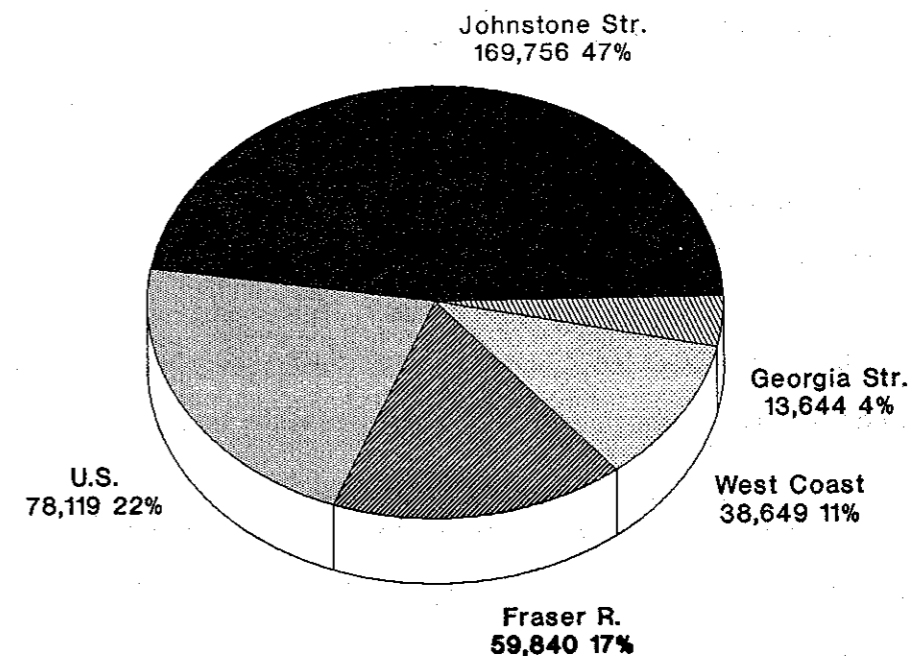
FISHERIES

Fraser chum are harvested in three major commercial fisheries: Johnstone Strait, Fraser River and U.S. fisheries off Point Roberts and the San Juan Islands. In Johnstone Strait, Fraser River chum are caught along with other chum stocks headed primarily for Vancouver Island and mainland inlets and, as a consequence, the harvest rate depends on rates applied to the total chum run in this area. The catch in Johnstone Strait is governed by a

management scheme which involves stepwise increases in harvest rate as run size increases. As a result, both escapement and catch increase.

FRASER RIVER CHUM CATCH DISTRIBUTION

1980 - 1989 Average



In the Fraser River, chum commercial fishing is dependent on run strength. Indian food fishermen catch a small number of chum.

REBUILDING

At present, there are no major plans to expand chum enhancement in the Fraser River. Although the interim escapement goal is 700,000 fish, optimum escapement is now being evaluated. Current management strategy is designed to provide higher escapement at larger run sizes in order to evaluate production potential of larger than normal spawning populations.

COHO

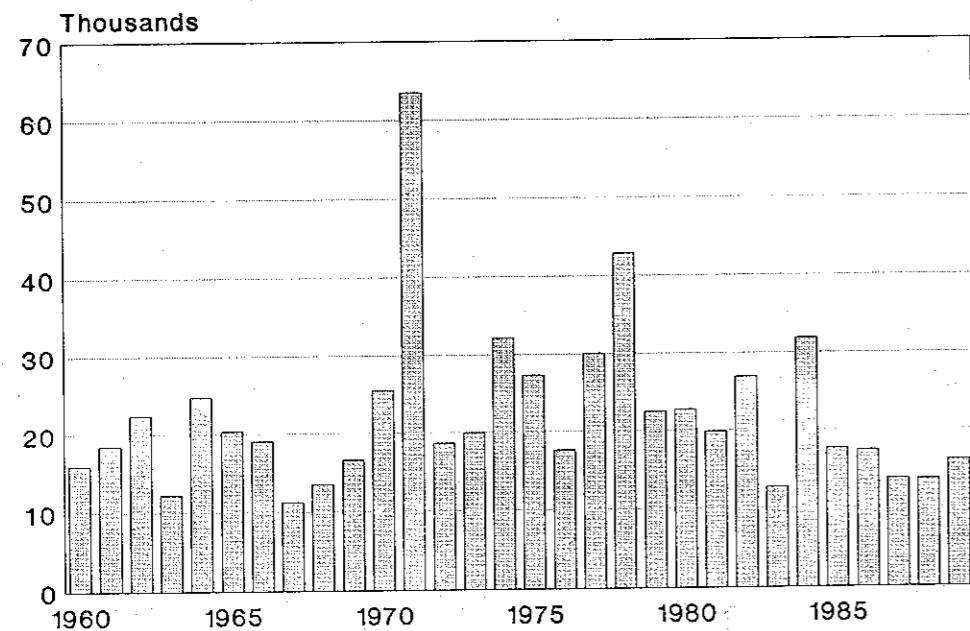
STOCK STATUS

Coho spawn throughout the lower Fraser and Thompson River systems with only scattered spawning in Fraser tributaries north of Lytton, where the Thompson and Fraser rivers join. Lower Fraser coho make up two-thirds of all spawners.

Lower Fraser coho return to the river mainly as three-year-olds from late August to December, peaking from late September to mid-October. Thompson coho tend to return early in the same time period.

Since 1970 coho escapement has declined in the Fraser and Thompson rivers, and total returns (catch plus escapement) of wild coho has also declined.

FRASER RIVER COHO SPAWNING ESCAPEMENT
1960 - 1989



Lower Fraser coho are enhanced at Inch, Chehalis and Chilliwack hatcheries and at a number of smaller sites. Estimated production capacity is 305,000 adults.

Upper Fraser coho are enhanced at Eagle River and Spius Creek hatcheries. Estimated production capacity is 40,000 adults. In addition, coho are enhanced at a large number of small community projects.

FISHERIES

Fraser coho are caught primarily by sport and troll fishermen in the Strait of Georgia and in the southwest Vancouver Island troll fishery. Relatively small numbers of Fraser coho are taken incidentally in various southern B.C. net fisheries. U.S. fishermen also intercept a significant number of Fraser-bound coho.

In addition, Indian food fishermen are catching an increasing number of Fraser coho, especially in even-numbered years. There is an extremely active in-river coho sport fishery in the lower Fraser and its tributaries, especially the Vedder-Chilliwack system.

REBUILDING

In consultation with fishermen, interest groups and the public, DFO is now developing a rebuilding program for Strait of Georgia and Fraser River wild coho. The program hinges on improved habitat management, harvest rate reduction and increased enhancement.

Because of increased production and reduced harvest rate, there are likely to be substantial increases in the numbers of coho entering the Fraser River.

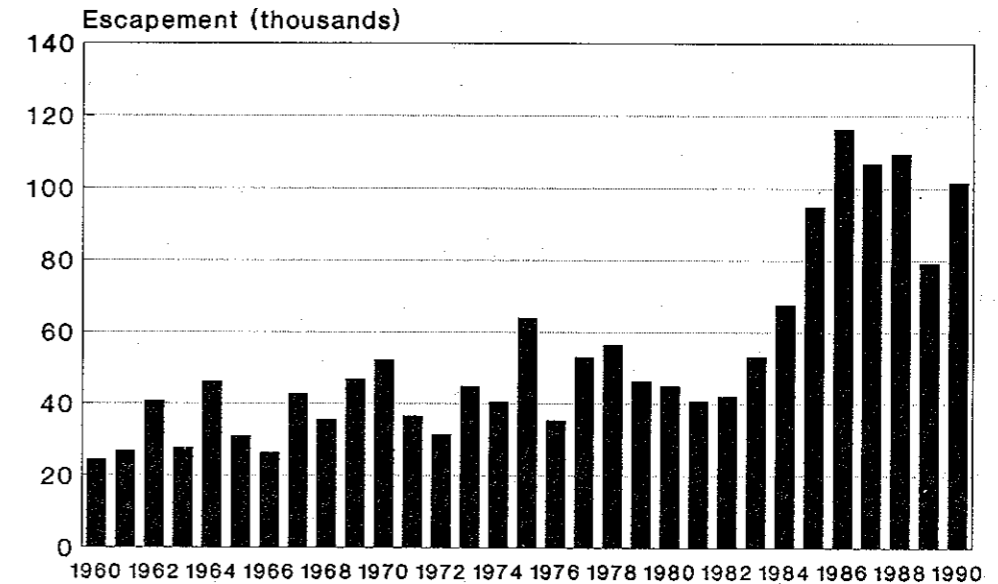
CHINOOK**STOCK STATUS**

Chinook spawn in major tributaries throughout the Fraser River. The migratory period for chinook entering the river extends from February to October. Managers divide runs into spring (before July 15), summer (to end of August) and fall components. Spring and summer fish are those that spawn in the upper and middle Fraser and Thompson rivers, while the fall run spawns mainly in the Harrison River.

Responding to management initiatives associated with a rebuilding program, escapement of most upper Fraser chinook has increased in recent years. The spawning population of Harrison chinook was well below desired levels from 1987-89 although the 1990 return was fairly strong.

In the lower Fraser Harrison chinook are enhanced in the Chehalis and Chilliwack hatcheries. A number of smaller stocks are enhanced at these and several smaller hatcheries. Upper Fraser and Thompson chinook are produced at Quesnel, Clearwater, Eagle, Shuswap and Spius hatcheries and a number of smaller community projects. The production capacity is estimated at approximately 100,000.

FRASER RIVER CHINOOK ESCAPEMENT
(excluding Lower Fraser River)

**FISHERIES**

Fraser River chinook are caught in fisheries all the way to Alaska. Ocean distribution of most upper Fraser chinook ranges from mid to far north and, as a consequence, many are caught in troll fisheries in northern B.C. and southeast Alaska. Some may be caught incidentally in commercial net fisheries in Johnstone Strait, the Strait of Juan de Fuca and U.S. waters, although in recent years, these fisheries have started after peak migration. Thompson River stocks, which are later timed, contribute more to these net fisheries than do middle or upper Fraser stocks. In general, upper Fraser stocks are not caught in large numbers in Strait of Georgia fisheries.

Harrison chinook, which have a more southerly distribution, are caught in Strait of Georgia sport and troll fisheries and in southwest Vancouver Island fisheries. Harrison River chinook are also caught by U.S. fishermen.

Fraser chinook are caught in commercial, sport and Indian food fisheries in the river itself. Most upper Fraser stocks migrate into the river prior to the start of commercial fishing in July, although later-timed Thompson stocks are regularly subject to incidental harvest. Commercial catch in the 1980s declined sharply from the previous decade because of the elimination of directed gillnet fisheries for chinook in the Fraser River, implemented as a conservation measure. Sport catch of chinook in the river is relatively small, but growing. Catch of chinook in Indian food fisheries has remained stable since the 1970s.

REBUILDING

Current chinook escapement goals were set in 1984 to double returns by 1998.

At present, there are no plans to further increase enhancement of Fraser chinook. Rearing and release methods are now being evaluated at several hatcheries to determine effective ways to increase productivity.

STEELHEAD

Important populations of steelhead trout occur in the Fraser River and must be taken into account in the management and enhancement plans for salmon. There are basically three runs of Fraser steelhead. A small summer run migrates through the lower Fraser from May to late June or early July, a fall run is present in this area in September and October and a winter run migrates from mid-November to April.

Summer-run steelhead spawn in several tributaries of the lower Fraser River including the Coquihalla and Silverhope rivers. The fall run includes populations that spawn in the Thompson and Chilcotin rivers while winter steelhead spawn in tributaries of the lower

Fraser, with the Chilliwack population being the most famous. Some steelhead populations are augmented by enhancement techniques.

Prized by sport fishermen, steelhead are managed by the provincial government to maximize sport fishing opportunities. To this end, sport fishermen are presently required to release wild steelhead in most areas of the Fraser system to increase spawning escapements. Fraser steelhead are caught incidentally by commercial and Indian food fishermen. If steelhead are to prosper, the catch in all fisheries must be taken into account. Therefore, an important objective of the Fraser salmon management plan is to develop fishing regimes for salmon that minimize the incidental catch of steelhead.

CONCLUSION

Experience for some stocks on the Fraser has shown that abundance can be increased as a result of putting more fish on the spawning grounds. Excellent examples are the growth of the Horsefly and Lower Shuswap sockeye stocks. A similar approach is proposed for all salmon stocks.

Fraser River Salmon Production Schedule

<u>Species</u>	<u>Goal</u>	<u>Time Period</u>
Sockeye	at least double 1975-86 average production to 16 million	2004-2007
Pink	achieve minimum escapement goals of 6-7 million; goals are under review	by 1993
Chinook	double 1979-82 average spawning escapements	by 1998
Chum	achieve minimum spawning escapement of 700,000; goal is under review	by 1991
Coho	increase catch of wild Strait of Georgia and Fraser coho by 300,000-800,000	by 1998-2004

There is much more to learn.

To investigate further, DFO will use funds from the Green Plan to monitor and evaluate rebuilding and better understand the carrying capacity of the habitat. For DFO managers there are three inviolate rules: harvesting rates must never exceed the capacity of a particular stock to maintain itself, increased production of one species must never be at the expense of another, and the habitat must be maintained to ensure that all stocks remain productive now and in the future.

The program was designed with the built-in flexibility to allow managers to meet the conservation needs of all Fraser salmon and steelhead.

Scientists are confident this program will play a pivotal role in helping DFO better manage Fraser River salmon, and accelerate progress to sustain our environment and our economy.

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