THE PROFITS OF JUSTICE:

RESTORING ABORIGINAL RIVER FISHERIES IN BRITISH COLUMBIA[1]

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Introduction

For thousands of years prior to the arrival of Europeans, the abundant salmon resources of what is now the Province of British Columbia provided a major source of food for many of the Aboriginal peoples of the region (see, e.g., Carlson 1994, Mitchell 1925, and Ware 1983) . Surpluses from the catch served as an important trading good.

Pacific salmon, at the end of their life cycle, return from their ocean feeding grounds to run up the rivers and spawn in the very tributaries from which they originated. Thus salmon have been available not only to the coastal peoples of the region, but also to the tribes inhabiting the inland watersheds of the rivers they ascend. Indeed, as the coastal people had access to many alternative marine resources, it was often among inland river tribes that the greatest dependence on salmon was established. Coincidentally, the

productivity of salmon harvesting was exceptionally high in the "gauntlet" fishery of the rivers, where the fish were concentrated in dense spawning runs.

In the 1870s Europeans established a salmon canning industry in British Columbia (B.C.), with the raw material being supplied by a newly developed commercial salt-water fishery. While the canning industry and associated harvesting operations provided employment for many Aboriginal people, primarily from coastal settlements, their operations impacted adversely on the established salmon harvest of inland river tribes (see, e.g., Copes and Reid 1994). Added to the existing level of the Aboriginal catch, the increasing demand for fish from the canneries was pushing up the harvest to levels that were unsustainable. Faced with the need to conserve salmon stocks, the federal government, in support of the canneries, introduced regulations in 1988 under the Fisheries Act, which severely curtailed the Aboriginal river catch.

The 1988 regulations confined Indians on the rivers to a "food fishery" for their domestic use and prohibited them from catching any salmon for sale, thus destroying what for many was their primary source of cash income. They were also prohibited from using their efficient weirs and traps, being confined to fishing devices that diminished their harvesting ability. The impact of the regulations affected mostly the tribes inhabiting the watersheds of the two great river systems of the Fraser and the Skeena, with which this paper will, be primarily concerned. The lands of these tribes for the most part were too far from the sea for them to take part effectively in the commercial fishery in which many

of the native people on the coast participated.

In recent decades the Aboriginal peoples of B.C., now identifying themselves as "First Nations", have become far more assertive of their rights, for which they have received increasing recognition through appeals to the courts (Binnie 1990, Helin 1994). Demands by the river tribes for restoration of greater access to salmon catches have been coupled with land claims, which are currently under negotiation in a process that will take years to complete. The most elaborate case heard by the courts so far has been that of the Gitksan-Wet'suwet'en inhabiting the upper Skeena region (Copes and Reid 1994). In the meantime, under pressure from the courts, the federal government has implemented an *Aboriginal Fisheries Strategy* (AFS), that started in 1992 on a modest scale to allocate more fish to river tribes, including some catches that have been allowed to be sold through commercial channels. In an effort to explore further opportunities for river tribes to secure greater benefits from salmon fisheries, a study of this matter was commissioned by the federal Royal Commission on Aboriginal Peoples (Copes et al., 1995).

The Aboriginal Fisheries Strategy has been fiercely opposed by most groups representing the commercial salmon fishery. The expanded Aboriginal fishery permitted under the AFS has been plagued by problems of hasty implementation, including inadequate controls on the catch. This has added to other recent management problems in the salmon fishery, provoking a major government-ordered enquiry in 1995 (Fraser 1995), that has resulted in the announcement of tough new management measures, of

which the prospective impact on the AFS remains uncertain.

Opposition by other stakeholders to the allocation of more salmon to the river tribes is predicated largely on the belief that reapportionment of the salmon catch is a "zero-sum game", where the gains by First Nations on the rivers will be matched by losses imposed on the commercial sector. A major purpose of this paper is to explain why this need not be the case. The reason for this is that river fisheries offer the possibility of greatly improved stock management through selective harvesting, so that with an initial increase in the amount of salmon allowed to reach the rivers, stocks may be increased substantially, allowing eventually larger catches in all harvesting sectors. The other equally important point of this paper is to present argument that allocation of additional catches to river tribes--as required, at least in part, by the decisions of the courts--is warranted as a measure of historical justice.

The Salmon Resource and its Management

To demonstrate the possibilities for a major improvement in productivity of B.C. salmon stocks, it is necessary to refer to the basic features of the salmon life cycle and the principles by which the stocks may be effectively managed. Pacific salmon comprise the genus *Oncorhynchus*, of which six species are represented in the B.C. catch. In approximate order of their overall economic importance they are: sockeye (*Oncorhynchus nerka*), pink (*O. gorbuscha*), coho (*O. kisutch*), chinook (*O. tshawytscha*), chum (*O. keta*),

and steelhead (*O. mykiss*).[2]

Salmon, with some exceptions, are anadromous fish, i.e., they spawn in freshwater but migrate to sea where they spend most of their life. Aided by a well-developed homing capacity, the mature fish return to spawn in their native streams. Pacific salmon die shortly after spawning, except for steelhead which may live to spawn more than once. Fish from each of the species may be divided into races, constituting distinct breeding populations. Each race utilizes spawning beds in a particular river system, with some cross-breeding among races of the same species resulting from strays. Because salmon have a multi-year life cycle, spawning beds will be used by different races in successive years. Typical life-cycle lengths vary among species and races, ranging from two years for pinks to up to as much as nine years (occasionally) for chinook. Variation of life-cycle length within each species leads to some cross-breeding among fish of the same species, but of unequal cycle-length, which are using the same spawning grounds.

An important factor affecting the total size of the resource is the extent to which available beds are used to full capacity for purposes of spawning. To obtain the best rate of reproduction, i.e., resulting in the largest number of surviving offspring, the number of spawners should be sufficient to utilize the available spawning beds fully. But the number of spawners should not be much larger than that, or else their spawning activity will so disturb the deposited spawn as to cause unduly high mortality of eggs and larvae, thus resulting in a smaller number of surviving offspring. Optimal management of salmon

stocks means getting neither too few, nor too many returning fish onto the spawning grounds.

For management purposes fish populations are divided into stocks. Generally, fisheries managers attempt to define and identify stocks to coincide with distinguishable breeding populations. In the case of Pacific salmon, this means that, where possible, stocks are defined to correspond with identifiable races of particular species, so that managers may focus on the achievement of optimal spawning. They may attempt to secure this by opening and closing the fishery in particular locations to allow for safe passage of the right "escapement" for each stock, while ensuring that the harvestable surplus is taken in the fishery.

Fish from different species of salmon may be recognized from outward appearance. While fish from different races of the same species cannot be distinguished by sight, there are electrophoretic laboratory techniques by which the various races may be identified by their scales. Spawning fish in each distinct breeding stock of a large river system tend to return together and to run up river at about the same time, so that the bulk of each stock passes through a stretch of river over a period of a few weeks or less. As each stock migrates at a particular time in the season, fishery managers are able, to some extent, to distinguish among different stocks of the same species by the timing of their migration runs and schedule appropriate closures accordingly.

There are many hundreds of distinct breeding stocks in the Fraser and Skeena systems. Thus there often are several migrating stocks mixed in the river at the same time. Some of these may be very strong and require only a short period of closure to secure sufficient escapement, while others are likely to be weak and require a longer period of closure--or even a complete closure--to guarantee adequate escapement. Managers are usually able to identify the runs of larger stocks easily and to secure escapement targets for these runs by manipulating fishery closures. But with closures keyed to the escapement targets for the larger stocks, it becomes difficult, if not impossible, to do anything to secure the right escapement for the smaller stocks that are mixed in with the larger ones.

The mixed-stock problem has been exacerbated in recent years by the successes of the *Salmonid Enhancement Program*, carried out by the federal Department of Fisheries and Oceans in cooperation with provincial authorities and various local interests. The objective of this program has been to increase British Columbia's salmon and steelhead resources by various artificial means. For example, in the Skeena River system, an enhancement project on Babine Lake (figure 1) expanded the spawning capacity for sockeye salmon enormously through the construction of a large number of artificial spawning channels, to supplement those naturally available. This has resulted in runs of Babine sockeye that dwarf the runs of other Skeena salmon stocks. On the Fraser River, also, enhancement projects have produced a number of very large sockeye stocks.

The enhanced sockeye stocks can stand a high rate of exploitation and still produce adequate escapement. Accordingly, fisheries managers have allowed heavy fishing on many sockeye runs. This has resulted in serious depletion of smaller wild stocks that are mixed in with the enhanced sockeye and that cannot stand the same level of fishing pressure. Reduction or destruction of the smaller wild stocks is a serious matter. This is so not only because these stocks will no longer contribute to the total salmon catch. A more important consideration, probably, is the reduction in the available gene pool. The large stocks of enhanced salmon are drawn from a gene pool of restricted size and may prove vulnerable to disease. For example, approximately 60 percent of all Skeena sockeye are derived from the enhanced Babine Lake stocks, suggesting limited genetic diversity for the Skeena system sockeye (Sprout and Kadowaki 1987; Jakubowski 1990). Successful rebuilding of stocks depleted by disease may depend crucially on being able to draw sufficient numbers of spawners with disease-resistance characteristics from the few remaining wild stocks. Similar considerations apply to the large enhanced stocks of sockeye in the Fraser River system.

Because many of the smaller stocks of the Fraser and Skeena systems are threatened with extinction, fisheries managers have imposed some fisheries closures to reduce the threat. In turn, this has resulted in large numbers of surplus sockeye being wasted in some years (e.g., on the Babine), because they could not be fished during the closures. An important management problem now is to find ways of providing a greater harvest of fish from existing strong stocks and those capable of significant enhancement,

without destroying or seriously weakening the smaller wild stocks.

To solve the mixed-stock problem, an obvious strategy would be to disjoin the fishing effort on different stocks as much as possible, targeting each stock separately at a point where there was no mixing or little mixing with other stocks. Often this would mean fishing a stock as it entered a tributary specific to its spawning grounds. In this fashion the fishery on each stock could be regulated separately to allow for an optimum spawning escapement. Such stock-by-stock management, allowing for a "terminal fishery" on each separate stock, would offer considerable benefits in terms of increasing production from the salmon resource towards its maximum potential.

It should be noted that expert opinion has long held that the potential for increase in B.C. salmon stocks is quite substantial, in part based on conclusions regarding ecological capacity and the larger size of these stocks in former times. At least a doubling of the aggregate stock size appears feasible. For sockeye, which constitute the largest component of the fishery, it has been estimated that stocks could be increased to allow for a tripling of harvests to an average of about 30 million fish per year (Henderson 1991). The launching of the Salmonid Enhancement Program is evidence of the opinion that the stocks could be brought back to larger size and the successes of the SEP so far are evidence of the practical feasibility of the techniques that have been developed. These SEP techniques, by and large, have concentrated on physical manipulation of the stocks and their environment in a management setting that has remained constrained and little

changed by institutional conditions. What this paper suggests is that progress in the pursuit of larger salmon stocks and larger harvestable surpluses may be greatly advanced by strategic changes in institutional circumstances. This would be based on an increased role for Aboriginal river fisheries, with the proviso that these fisheries would be conducted in a highly selective manner to optimize stock-specific spawning escapements and minimize non-harvest mortality. We will return to the subject of this stock-specific management after discussing past and present patterns of salmon fishing.

The Traditional Indian Fishery

There is clear prehistorical evidence of the utilization of fish resources by the people inhabiting the Fraser and Skeena watersheds (Carlson 1994). On the Skeena, for instance, numerous settlements were established in prime fishing areas (MacDonald et al. 1987). While relevant archaeological exploration has not been extensive, excavations have turned up bone fragments of salmon and other fish at four Skeena sites, namely at Hagwilget (Ames 1979), at Kitwanga (MacDonald 1989), and at two Kitselas Canyon sites (Allaire 1978, Coupland 1985). Some of the fragments may date back to as far as 2000 B.C.

At the time of European contact in the late eighteenth century it was evident that the Northwest Coast Indian tribes had developed societies which had--in relation to time and place--a notable level of material sufficiency, cultural expressiveness and artistic

refinement. Fish resources played an especially important role in providing them with a plentiful supply of food, in response to which they developed a variety of ingenious and very efficacious fishing techniques. These have been described effectively, attractively and artistically by Hilary Stewart (1977) in her book on *Indian Fishing*. Among the fish resources salmon were evidently the most important. Garfield (1951:13) writes: "Salmon was the decisive food resource of the Tsimshian, as it was of most other Northwest Coast tribes. Cohoes or spring salmon and sockeye salmon furnished the bulk of the fish dried for winter use ...."

When, in the early 19th century, the North West (NWC) and Hudson's Bay Companies (HBC) brought the fur trade to the region, several tribes gained an opportunity for a significant extension of their salmon trade. Indian-caught salmon--both fresh and smoke-dried--became an important staple for the provisioning of the HBC, and later also for other frontier groups, such as miners and construction workers (McDonald 1985:164, Morrell 1985:23-24, Ray 1984, Shepard and Argue 1989). Salmon was so important a commodity that it was accepted as a form of currency, with a well-known exchange rate (Ray 1984:25 and 63-64).

In their traditional fishery, the Indians of the upper Fraser and Skeena river systems made great use of a variety of highly effective weir and trap systems (Stewart 1977, Morrell 1985:24-33), which intercepted salmon on their migration paths. These systems, operating under the authority of local chiefs, were eminently compatible with

effective conservation. Fish were easily taken from the traps or along the weirs with dipnets, gaffs and baskets. When enough fish was taken to occupy fully those engaged in processing the fish, the weirs and traps would be opened to let migrating fish pass through. Intermittently, the weirs and traps would be put into operation again to provide further raw material for processing, which mostly involved smoking. This fishing system assured bountiful harvests with escapement that was quite adequate to maintain the stocks in a healthy state, as is evidenced by the prosperous condition of the tribes at the time of European contact and the healthy state of the salmon stocks then observed (Morrell 1989, 1985).

The establishment of salmon canneries in the 1870s marked the beginning of a Euro-Canadian commercial salmon fishery. Initially it relied to a great extent on local Indian labour, with the men employed in fishing and the women in processing. Over the ensuing decades, the commercial fishery expanded by attracting non-Indians, often from outside the region. Competition for raw material with local tribal fisheries became more acute. Government fishery managers, evidently preoccupied with the interests of the Euro-Canadian dominated commercial fishery, were concerned that the effective weir and trap fisheries of the up-river Indians would take "too much" fish and endanger the stocks. In reality, of course, it was the additional pressure of an expanding commercial fishery that upset the pre-existing balance of catches and escapement, leading initially to large increases in harvests, but thereby depressing stock strength and threatening sustainability of catch levels.

As the commercial fishery expanded, progressively tighter restrictions were placed on upriver Indian fishing (Lane and Lane 1978, Morrell 1985). There were two principal forms of restriction. One was to gradually suppress the effective Indian weir and trap fishery, eventually leading to outright prohibition of these devices--referred to as "barricades" by fisheries officials. The other was to reduce the authorized catch of Indians by limiting it to the satisfaction of domestic needs, the so called "food fishery", while prohibiting the Indian salmon trade (Ray: 1984:66).

In 1877 salmon fishing regulations were introduced to British Columbia which included a prohibition on non-tidal net fishing. There was provision to exempt Indians but it was never exercised by the government. In 1888, the regulations were modified to allow Indians to fish, at their liberty, by any means others than with drift nets or spearing, provided the fish were not offered for sale, barter, or traffic. An Order-in-Council in 1894 banned spears, traps, and pens. It also required Indians to apply for permission to fish for food purposes (Giraud 1975: 5,6). Fishery officials, on the whole, appeared ignorant of the sound principles of resource conservation underlying the Indian barricade fishery and oblivious to the rights and needs of the Indian community in its dependence on the fishery resource.

John T. Williams, Inspector of Fisheries, in 1905 reported to the Dominion Commissioner of Fisheries as follows (Williams 1906):

> With regard to the Skeena River I may say that the conditions existing at the head waters are dangerous in the extreme (a detached report of which I herewith enclose), more especially on the Babine lake, and unless drastic measures are adopted by the department at once to check the illegal fishing by the Indians, now in operation and to ensure the protection of the salmon, we may speedily look for the complete annihilation of this valuable fish and entire depletion of the river, and shall have another example of ruination of an extensive industry exactly coexistent with the conditions prevailing on the Fraser river at the present time.

Inspector Williams added an extensive report by Fishery Officer Hans Helgeson (1906), regarding two Indian barricade operations on the Babine River. The latter appeared greatly impressed with the most "formidable and imposing appearance" of the barricades, "constructed of an immense quantity of materials, and on scientific principles." He remarked on some of the "beautifully made" detail of the "magnificent fence which not a single fish could get through." Helgeson described the barricade site as a hive of activity and went on to remark:

> The banks of the Babine river have a lovely appearance at this place and a most wonderful sight met our eyes when we behold the immense array of dried salmon. On either side, there were no less than 16 houses 30 x 27 x 8 feet filled with salmon from the top down so low that one had to stoop

> to get into them and also an immense quantity of racks, filled up outside. If the latter had stood close together they would have covered acres and acres of ground, and though it was impossible to form an estimate, we judged it to be nearly three quarters of a million fish at those two barricades, all killed before they had spawned, and though the whole tribe had been working for six weeks and a half it was a wonder that so much salmon could be massed together in that time.

Despite his evident admiration for the industriousness of the Babine Indians, Fishery Officer Helgeson showed no hesitation in his determination to enforce government orders against the Indians and to uphold the official view, regardless of the consequences for the Indians. In reporting on his meeting with the Chief at the site of one of the barricades he wrote:

> I informed him that I was sent by the government to destroy and remove all barricades and any other obstructions that prevent the salmon from getting up to their natural spawning grounds. That the government had wisely adopted this policy on account of salmon having sadly diminished in all the rivers along the coast just on account of barricades in nearly every stream throughout the whole country. That the fish which providence intended to go into lakes and streams for the purpose of propagation were slaughtered at the barricades before they had spawned, and I gave him to understand that the barricades must be removed immediately.

And at intervals during the conversation I explained the fishery laws and regulations, that they must not use barricades and only fish one third the channel with their nets or any other contrivance, that they must observe the close season, they must not sell fish as they had done in the past, but only take enough for themselves and their families, and must not kill more fish than they use and not waste any.

The chief advanced many points and some of them were well taken, he said they have had an indisputable right for all time in the past, that if it was taken away the old people would starve, that by selling salmon they could always get *iktahs* [i.e., "goods"], and he wanted to know to what extent the government would support them, he thought it unfair to forbid them selling fish when the cannerymen sold all theirs, and I had to promise him to tell the government to compel the canners to let more fish to come up the rivers, as some years they did not get enough, that the canners destroyed more spawn than they, that formerly he could not see the water below his barricade for fish, that they were so plentiful that some of them were force out on the beach, but latterly they had diminished, little by little every year.

But Helgeson was not to be moved. He continued:

I met all his arguments in a prompt manner, and sent back those who

> showed a spirit of resistance, by telling them that they had committed a gross breach of the law, that they had put in their barricades this year notwithstanding the inspector had by letter forbid them to do so, and that if they resist and do not destroy the barricades nothing will save them from punishment or imprisonment.

Helgeson's authority appeared to be compelling. He recorded how the Indians carried out his orders immediately to utterly destroy the barricade. Continuing his long report, he recorded how he visited numerous other river sites throughout the area, seeing to it that all barricades at these sites were destroyed. Interestingly, he continued to express admiration for the variety of ingenious trapping devices built by the Indians in conjunction with their barricades. Nevertheless, he showed no twinges of conscience in causing their destruction, apparently holding fast to the belief that they could not be justified in fishery conservation terms. Summing up his observations in one large district he remarked that "... when we take into consideration that nearly every salmon stream in the country is barricaded and that this has gone on for years and years, is it not then a great wonder that there are any fish at all left?" Perhaps, what is the greater wonder is that Helgeson would not show any hint of acknowledgment that the survival of healthy salmon stocks over the thousands of years of Indian fishing with their accustomed devices was obvious proof that the barricades, as operated by the Indians with alternating openings and closures at their accustomed rates of exploitation, were entirely compatible with stock conservation.

Though the authorities may have evinced ignorance in branding Indian fishing practices as innately incompatible with conservation, there is good reason to believe that the British Columbia salmon stocks were seriously threatened. The Indian fishery, by itself, had proven to be sustainable on the evidence of a long past. But the combination of a strongly developed salt-water fishery and continuation of the traditional Indian fishery for domestic consumption and trade goods might well spell overfishing. While the Indians on the upper Skeena were not the originators of the new pressures on the fish stocks, they were easy targets to blame for the results. Apart from having little influence with the government, the media or the general public, they were also in the unfortunate position of being the last user group in line along the migration path of salmon to their spawning grounds. The ultimate onus of letting enough fish through to make up an adequate escapement, by force of circumstance was then placed on them. Any attempt by them to maintain their historical harvest levels, in the face of much greater catches downstream, except in very good years might then have the "depensatory" effect of not leaving enough spawning escapement (Peterman 1980).

The foregoing account indicates that a large part of the salmon resources held and utilized by Indians in the Upper Skeena region an hundred-or-so years ago, was forcibly taken from them, without any significant compensation. It was handed over, essentially free of charge, to a new user group favoured by the government and protected by the force of law. The Indians were compelled to use often inefficient and wasteful fishing

practices with nets and gaffs, instead of weirs and traps. The supply of food fish left to them was at times inadequate, occasionally leading to actual starvation; e.g., in 1916 (Sprout and Kadowaki: 387). Their salmon trade, which supplied them with many needed goods, was prohibited in law and greatly inhibited in practice. The descent of the Indian tribes concerned from economically and culturally vibrant societies, by their standards of place and time in the mid-nineteenth century, to socially and materially depressed communities an hundred years later, without any reasonable doubt is due in part to the severe reduction in access to the salmon resource that they suffered. The equity implications of the foregoing require no elucidation. It is well nigh impossible to believe that a similar discriminatory act of confiscation would be undertaken, or even contemplated, by any Canadian government in the present day and age. And surely, any attempt in that direction would be quickly negated by the courts. Indeed, the courts are now busily engaged in reversing, to some degree, the effects of the injustices exemplified in the above account.

There is a concept in law, known as the "abstention principal", which is used both intra- and internationally. It holds that when a (fishery) resource is fully exploited by a user group, no new group is entitled to join in the exploitation of that resource. Canada and the United States have called on this principle in persuading Japan and other countries to refrain from fishing for salmon of Canadian or American origin in the North Pacific. The principle, in fact, is enshrined in Article 66 of the United Nations Convention on the Law of the Sea. Past actions of the Canadian government in suppressing Indian fishing

rights would appear to constitute a flagrant violation of the abstention principle.

After the removal of barricades, Indian fishers on the upper Skeena were restricted, largely, to using nets and gaffs, which were relatively inefficient and damaging to the stocks. When gaffs are not used in conjunction with traps or weirs that inhibit the escape of fish, they become a wasteful technique. Many fish drop off gaffs gravely wounded and die. In an open-river fishery they cannot be retrieved and are therefore lost both for purposes of consumption and spawning. Similar stock damage results when nets are lost in swift-flowing river waters and continue to entangle and kill fish ("ghost-fish"), unseen and unattended on the river bottom.

Current User Groups and Product Patterns

The salmon fishery has been referred to as a gauntlet fishery. After spending much of their life on ocean feeding grounds, salmon return to the coast to assemble in concentrations which migrate upstream to spawn. In doing so they must "run the gauntlet" of various fishing groups intercepting them along the way. The order of interception has significant implications. Fishing fleets that are furthest out to sea have the first opportunity to capture returning fish and thus have the largest amounts of fish available for exploitation. Fishing groups on the river can exploit only what is left of the stocks after other groups have taken their catch, but they do have the advantage of fishing in confined waters where fish are concentrated in a narrow passage so that they are easy to

capture.

During their return migration from the high seas some of the salmon originating in British Columbia rivers first pass through Alaskan waters, where the Alaskan fleet has the earliest opportunity to fish them. When they reach Canadian coastal waters returning salmon are subject to a commercial fishery conducted by trollers using hook-and-line gear and seiners using purse seine nets. Next in line is the commercial gillnet fleet, operating mostly in or near the estuarial waters of B.C. rivers. It is only after all commercial fleets have taken their catches in tidewater that the various Indian bands on the rivers have an opportunity to exploit the remainder of the stocks for their food fishery. One further user group should be noted: sport fishermen angle for salmon, including steelhead, both in coastal waters and on some of the rivers.

It is important to note that with the techniques and equipment they possess, the various groups exploiting B.C. salmon stocks have an aggregate fishing capacity that is several times as large as what is needed to take the entire harvestable surplus. If no constraints were placed on their fishing effort they could fish the salmon stocks to extinction in a few years' time, with each group blaming the others for the result. Only the restraint of government regulation and management has prevented this from happening.

Canada and the United States have negotiated, with repeated difficulties, a series of

short-term agreements to regulate and restrain mutual interception of salmon returning to the waters of the two countries. Within Canadian waters fisheries regulations imposed by the federal government, including in particular time and area restrictions that impact diversely on the different components of the harvesting sector, are the prime determinant of how much fish each group is able to take. Thus the government in effect has to carry responsibility for deciding what will be the allocation of benefits from the fishery among the various user groups.

Economic Efficiency

Fisheries regulation and catch allocation have bearing both on efficiency in resource use and on equity in the distribution of benefits among user groups. Efficiency may be measured in terms of the total value of net benefits, i.e., the total value produced minus the costs of production. Efficiency calculations are not free of conceptual controversy and practical ambiguity, with which this paper will not attempt to deal. In fact, no attempt will be made to estimate in any way the monetary values of costs and benefits generated under various scenarios referred to in this paper. This would require access to and assembly of masses of detailed data, along with major investments in time, effort and material resources not available to the author. Instead, speculative conclusions regarding major improvements in efficiency will be drawn from *a priori* arguments regarding the effect of strategic management changes. These changes will be linked to the allocation of more fish to river tribes, and will refer to both the quantity and the quality of salmon harvested

by different stakeholder groups in different locations.

To understand how maximum sustainable catches may be obtained, one needs to consider first the components of returning salmon stocks according to their final disposal. The fish from each distinct breeding stock, assembling in coastal waters to commence their final spawning run up-river are referred to as the "recruitment" to the fishery for that stock in the year concerned. This recruitment (R) may be divided into the harvest taken (H), the non-catch mortality of fish en route to the spawning grounds from natural causes (N) and from harvesting-induced stress (S); and the final escapement of fish onto the spawning grounds (E). Therefore, the harvest

$$H = R - N - S - E$$

To achieve a sustainable maximum harvest (H_{max}) it is necessary to secure the largest possible recruitment on a sustainable basis (R_{max}), which in turn requires escapement to be optimized (E_{opt}), while losses through harvesting-induced stress should be eliminated. Thus

$$H_{max} = R_{max} - N - E_{opt}$$

In this paper we are abstracting from questions regarding environmental conditions, important as they may be in a more general context. We are therefore treating N as a given. As a major efficiency objective we are seeking through management measures in the Fraser and Skeena systems to obtain maximum sustainable harvests (H_{max}), stock by stock, by recruiting returning stocks of maximum size (R_{max}) through preceding optimal

spawning escapement (E_{opt}), while eliminating, or at least reducing, mortality from harvesting-induced stress (S).

As indicated above, stock-by-stock management is a requirement to achieve optimal stock-specific spawning escapements, which will make the fullest use of available spawning beds and thereby increase stocks to the largest size possible. There is considerable mixing of stocks in coastal waters where they are targeted by the largely indiscriminate fishing of commercial fleets, resulting in overfishing of weak stocks and underfishing of strong stocks. But in the river, stocks are separated in part by the timing of their runs. As they move up river the stocks separate further by turning into the different tributaries on the way to their respective spawning areas. The higher up-river one goes, the more stock separation takes place, allowing for better stock-specific management and achievement of precise escapement targets. As long as sufficient numbers of fish of each stock are allowed to reach the river and are fished only selectively en route to the spawning grounds, sufficient escapement for each spawning stock may be ensured. Any fish surplus to escapement targets that are approaching the end of their run may be removed in a "terminal" fishery near the spawning grounds.

River tribes are demanding a greater allocation of salmon to allow them to conduct a substantial commercial fishery in addition to their food fishery for domestic needs. Strategically located large traps would be a very appropriate gear for an in-river commercial fishery. These have been used historically by river tribes, but have long been

banned by government authority. However, as part of the AFS a few traps have been reintroduced on an experimental basis. Traps are an economical device for the harvesting of fish and have great utility in escapement management and in catch handling. Traps may be constructed to allow fish to be readily live-sorted by species. Fish from weak stocks may be released unharmed and fish that are retained may be butchered in their freshest condition. This contrasts with commercial net fisheries in which most fish are killed outright or are so stressed that they die after release in any case.

The gillnet fisheries of the commercial fleet present an additional deleterious effect in that many fish are killed by entanglement, but are not part of the catch because they drop out of the net dead or struggle free to die later from the stress endured. A report by Peter Pearse (1992:28) to the Minister of Fisheries and Oceans regarding salmon management problems on the Fraser appearing with the introduction of the AFS in 1992, estimated that in a phase of the fishery that produced a catch of 583,000 fish, another 248,000 were lost to mortality, half of which was from natural causes while the other half was fishing induced. In a properly conducted trap fishery fishing induced non-catch mortality should be virtually eliminated.

In the case of the Fraser and Skeena river fisheries, traps would allow ideally selective harvesting. Fish from the valuable but weak stocks of steelhead, chinook and coho could be released entirely, which would help to rebuild those stocks. As well, pink salmon that are often discarded (dead) in the river fishery by Aboriginal fishers, because of their poor

quality when caught in freshwater, could be live-released when taken in traps instead of gillnets. The pinks thus released would add to spawning escapement and allow for a larger commercial pink catch in salt water. With the recovery of weak stocks allowed by the trap fishery, the large surpluses available from enhanced sockeye stocks could be fully harvested, overcoming the waste that now occurs when the fishery on the surplus sockeye is closed to prevent more serious depletion of smaller wild stocks.

There has long been a major argument against in-river fishing, namely, that Pacific salmon deteriorate greatly in quality when they enter freshwater. This contention underlies a widely accepted conventional wisdom that there cannot or should not be any commercial in-river fishery. Recently this contention has come under closer scrutiny. It is no doubt true that the physical condition of Pacific salmon changes while the fish move upstream on their spawning migration, as they use up body reserves along the way. It is also true that deterioration of the flesh of migrating salmon may become so severe as to render the fish unsuitable for human consumption. But the extent to which change or deterioration takes place varies greatly by species, race and river system. Generally speaking, chum and pink salmon show a distinct deterioration in quality as the fish move up river, while sockeye, chinook and coho are much less affected. Steelhead, which continue to feed on their spawning run and which tend to survive to spawn more frequently, are essentially unaffected.

Extensive quality testing of sockeye caught in-river on the Skeena was undertaken for

DFO in 1982 (Slaney and Birch 1983). The results generally showed that sockeye caught in the lower river were of "number one" quality and those caught further upstream were of "number two" quality, which is entirely acceptable for human consumption. Fish taken near Hazelton, in the Upper Skeena, were found suitable for export grade canned products and yielded smoked products of "acceptable quality".

The "number two" grading of up-river fish apparently was based largely on water- and netmarking of fish, which were taken by gillnets in which fish habitually are drowned. Live-catching in traps would produce a substantially superior quality of fish. The potential damage caused by gillnets should not be underestimated. This problem will be much alleviated by changing from river net fisheries to the trap fishery proposed by the Gitksan-Wet'suwet'en for their expanded commercial fishery (Morrell 1985); which is already being applied in their experimental fishery opened in 1992 under the provisions of the AFS. Therefore, the move from net fishing to trap fishing in the river offers promise both for an improvement in quality by the reduction in netmarking, and an increase in the harvest by reduction of the considerable incidental mortality occurring in net fishing.

Ocean-caught salmon has qualities that cannot be matched--at least not in every respect--by salmon harvested upriver. Ocean fish may be superior particularly in producing commodities in the fresh and frozen product sector. There are some counter-considerations. As mentioned above, if river fisheries use traps, fish can be taken live from the traps and butchered in the freshest possible condition. It appears also that both

the quality and quantity of salmon roe (a valuable by-product) increase as the fish migrate up river. Upriver fish is also more suitable for some smoked products. It bears noting that upriver Indian groups in British Columbia have used local salmon for ages as a highly appreciated staple food and as a valuable trading commodity. Their continuing illegal trade demonstrates that the general population also finds their smoked salmon an attractive product. It is evident that an upriver Indian commercial fishery should have little trouble in producing readily marketable commodities.

Given the dominant demand patterns for products from the commercial ocean fisheries, it remains reasonable to conclude that, for most end-uses there is a reduction in the product quality of salmon as they move upstream. This must be set against the considerable potential for greater harvests resulting from the superior management possible in river fisheries. Evidently there is a trade-off, then, between quality and quantity of fish when harvesting is moved into and up the rivers. The calculation of the trade-off--or, rather, set of trade-offs--is greatly complicated by the varied quality considerations pertaining to different product sectors and by speculation with regard to potential improvements in the catch composition by rebuilding the weak stocks of valuable species. Much more research and practical experience is needed to produce a refined calculation of the relevant trade-offs. One may speculate that optimum economic results will be achieved in an intermediate position that balances quality and quantity considerations. Presumably this would require an in-river fishery substantial enough to make a significantly larger escapement of fish from weak stocks possible. This would be

consistent with the establishment of a commercial fishery by river tribes that would be managed to achieve optimally selective escapement. The value of the river catch may be enhanced by directing it towards the best uses of river fish, including typical Indian smoked fish products.

The Fraser and Skeena Rivers support very large salmon fisheries. The shift of a moderate share of fishing effort to upriver locations may suffice to yield significant benefits by reducing pressure on critically weakened wild stocks. This would be so, particularly, if fishery closures in tidal waters were made to coincide as much as possible with the passage of migrating fish from the weaker wild stocks. In conjunction with fuller utilization of surplus enhanced fish, one may anticipate that the total harvest from the two river systems would be increased significantly, so that catch gains in the river would be much larger than catch losses in the commercial tidewater fisheries. If the river fishery is managed to yield various products of moderate to good quality--of which they seem capable--it is reasonable to expect that the potentially much larger salmon harvest would result also in a significantly larger total value of output. The initial shift of additional catching effort to Aboriginal river fisheries implies a corresponding reduction in effort for the commercial fishery. However, if a much larger harvest indeed is achieved, it should be possible to restore harvests in the tidewater commercial fishery to their original levels and even to increase them beyond that level.

Of course, one needs to guard against an excessive shift in effort from the tidewater

fishery to upstream locations. For this might result in the loss of too large a share of fresh, frozen and other high quality output on which the market depends. It might also strain the capacity of the market to absorb a larger volume of those products that are obtainable form lower quality fish. One must further recognize that any notable shift in effort will take time to implement, while facilities and skills are developed in the river fisheries.

There is another efficiency consideration that should not be overlooked. It is noteworthy that employment prospects in Indian communities are particularly low. For instance, using 1986 census data, the native unemployment rates in the Smithers area (including Gitksan-Wet'suwet'en territory) were found to be three times as high as the comparable non-native unemployment rates (Smelser 1992, 1991). Neil Sterritt, the then-president of the Gitksan-Wet'suwet'en Tribal Council, in 1985 estimated unemployment among his people to be in the range of 65-95 percent, resulting in obviously serious social problems (Sterritt 1985:14). The provision of a worthwhile amount of employment that would result from the establishment of commercial in-river fisheries for inland tribes is likely to have a positive impact on the economy as a whole by reducing structural unemployment. It is true that some employment downstream would likely be displaced initially, but this might be absorbed by normal turnover of labour in the coastal commercial fishery. In any case, the coastal fishing labour force is drawn from a population that generally has much better prospects for alternative employment than are available to inland Aboriginal communities. It is, of course, also important that increased

employment in an industry that is highly compatible with traditional activities of Indian communities may help notably to reduce the severe social problems from which they have suffered.

Distributional Effects

Predictably, there has been a strongly negative response to the AFS and to claims for a greater share of salmon catches by the river tribes, coming from other stakeholder groups, including some Aboriginal fishers working in the commercial sector. These other stakeholders naturally fear that more fish for the river tribes will mean less fish for them. Understandably, they are inclined to look at the equity issue in terms of maintaining their current share of the catch, with most of their members probably being not well informed in respect of the historical injustices suffered by the Indian tribes.

What needs to be considered is that allocating a greater share of the catch to Aboriginal fishers on the river is not just a matter of redistributing the harvest among stakeholders. It is extremely important for improved management leading to potentially much larger aggregate catches. Naturally, any initial reallocation of the catch to move more of the harvesting effort up river, would mean a reduction of catches available to the commercial fishery at that point in time. However, the stock-specific management that would be possible with the shift of a greater share of the effort upstream, should result in significantly larger total harvests, which would allow more fish to river tribes and no

less fish to other stakeholders in the long run. The prospects for this outcome will be further enhanced if current plans to direct salmonid enhancement effort more towards assisting weaker stocks are successful. Indeed, in the long run this could well result in much larger catches for all harvesting sectors, including the coastal fleet.

To make the establishment of in-river commercial fisheries for inland tribes at all palatable to commercial fishermen, it is undoubtedly necessary to provide them with compensation for any reduction in the tidewater harvest, temporary or otherwise. This indeed appears to be recognized by the federal government, which has justified the AFS allocations made to Aboriginal river fisheries by actions of two kinds. The government has bought out licensed vessels from some operators retiring from the commercial fishery, withdrawing those vessels from the fishery and transferring their estimated catch allocations to the river fisheries. Secondly, they have made allocations to the river fisheries from some of the salmon stock additions attributable to government-financed enhancement projects. A continuation of such compensation measures in respect of further salmon allocations to river fisheries appears in order. However, this might not satisfy the processing companies who would fear reduced throughput for their plants. However, the larger total harvests in prospect, plus the likelihood that much of the river catch might flow through their establishments, could result in an outcome that they would find amenable eventually, if not immediately.

A reduction in the size of the present commercial fleet has advantages, regardless of

any catch diversion to an upriver fishery. For the catching capacity of the current fleet is vastly in excess of any current or prospective future needs, resulting in greatly excessive harvesting costs in relation to the value of the catch (Pearse 1982). A rationalization of the fleet through a reduction in the number of vessels is capable of generating much greater net benefits for the harvesting sector. Unfortunately, attempts at rationalization so far have not been very successful (Pearse and Wilen 1979; Copes 1990). The federal government, however, appears to have a continuing commitment to further efforts at rationalization. A reduction of the coastal salmon fleet to accommodate more up-river fishing could be made part of any larger program of effort rationalization.

It is interesting to note the reaction of sport fishermen to claims put forward by river tribes. Sport fishermen are likely to benefit significantly from stock-specific management. Their target species consist largely of steelhead, chinook and coho, all of which are represented by stocks that have been quite vulnerable to depletion in mixed-stock fisheries. Many sport fishermen initially were as opposed to the allocation of more fish to river tribes, as were the commercial fishers, fearing that it would leave less fish available to them. Many have now discovered that a shift of commercial fishing effort from the mixed-stock tidewater fisheries to an in-river Aboriginal fishery could result in much better conservation of the stocks with which they are primarily concerned. Many recreational fishers, and their organizations, have in fact become allies of the river tribes on the understanding that the river fisheries will be conducted in an appropriately selective manner.

Management Authority

As part of their lands claim policy, the Gitksan-Wet'suwet'en Tribal Council stock-specific management strategy recommended "that Tribal Council take the necessary legal and political steps to establish a Gitksan and Wet'suwet'en fishery agency with full authority over fishery management within the territory and with a mandate to negotiate with agencies from other jurisdictions regarding management of Skeena stocks while they are outside of Gitksan and Wet'suwet'en territory" (Morrell 1985). This approach reflects the circumstance that Indian tribal groups with a serious interest in fisheries find it unacceptable to be considered just another supplicant "user group" pleading for a favoured share of the fishery resource from an omnipotent federal government.

In their current mood of self-assertion, First Nation peoples are demanding recognition of what they consider to be unextinguished and unextinguishable rights to fishery resources, including many that have been lost to them through attachment of these resources by other user groups. The establishment and legal recognition of a fishery agency such as proposed undoubtedly would be of great political advantage to the Gitksan-Wet'suwet'en Tribal Council in defending their fishing claims. But it would be clearly contrary to the interests of other stakeholder groups and, most importantly, it would be inconsistent with the true manangement needs for the salmon stocks of the Skeena River system.

Effective management requires that the fishery for each river system complex be regulated and coordinated through a single authority which is able to follow a consistent overall plan and to discipline all participants so that they will not exceed their catch allocations or otherwise subvert the plan. This single authority also needs to retain the power to engage in "on-line" management, i.e., to impose fishery closures and other strictures at short notice in any part of the system, in order to react to stock conditions ascertained by constant monitoring. The need to bargain continuously with Americans over interception of B.C.-origin fish in Alaskan waters is already enough of a debilitating circumstance. To concede similar ongoing bargaining powers to individual Canadian stakeholder groups could well lead to serious unresolved (perhaps, unresolvable) conflicts among user groups and a consequent erosion of effective management.

As further considerations it may be noted that an effective management agency should be possessed of a competent administrative facility, a well-developed scientific capability, a powerful regulatory capacity, and a correspondingly adequate budget. Most essentially, the management agency needs to have the legal power to structure, administer and enforce the system-wide management plan. No tribal authority, nor any other stakeholder group involved with the Fraser and Skeena fisheries is capable of supporting such a management agency, nor should any individual interest group be entrusted with the powers of such an agency.

Much of the spirit of the Gitksan-Wet'suwet'en proposal to involve them meaningfully

in the management of fishery resources in their claimed territory undoubtedly can be accommodated in an effective management regime. Given, particularly, the strong propensity for controversy and confrontation in the fishing industry, there is merit in the establishment of a "co-management" process between a senior (government) authority and user groups in an effort to foster cooperation, understanding, and mutual advice (Pinkerton 1985). Some elements of this process are already present in Canadian fisheries through various advisory councils. However, this falls short of co-management, which implies that some ongoing decision making powers are exercised by user groups directly, or jointly, under agreement with the constitutionally empowered authority.

Considering the disparate and often opposing interests of different user groups in respect of B.C. salmon stocks, it would seem useful, if not essential, for a senior authority to retain whatever decision-making powers are necessary to resolve conflict or to take quick and decisive action on urgent day-to-day management questions. But there is room, no doubt, for some delegation of management responsibilities to user groups, provided these responsibilities are not subject to serious conflicts of interest, are carried out competently, and are adequately monitored.

DFO for some years now has shown an interest in the possibilities of co-management structures involving Indian community-based fisheries (Cassidy and Dale 1988:194). In conjunction with the ongoing shift in fishery resource access in favour of river tribes there is undoubtedly room for their increased participation in the management process at the

local level. Among others this should include collaboration in establishing optimally located terminal fisheries, the operation and control of such fisheries, the design of enhancement works, and the carrying out of enhancement activities. The complex of such activities could provide considerable economic benefits for some of the tribes. There would be larger fish catches, much of which would be available for commercial sale, possibly with value-added benefits from processing. In addition, work carried out on enhancement of benefit to salmon fisheries overall presumably would be paid for from federal funds and provide much needed employment income. The AFS strategy indeed calls for developments along these lines and a start has been made on implementing them.

The courts, for one reason or another, have shown themselves quite sympathetic to the Aboriginal case for greater salmon resource entitlement. Most politicians--and many concerned members of the general public--have been prepared to acknowledge past injustices inflicted upon Native people and to offer a measure of redress. There is an apparent readiness to concede a measure of self-government, which would have as a logical corollary the competence to participate in resource management decision-making in an appropriate context. At the very least there should be room to undertake productive local management tasks, including enhancement operations, that could be performed under the aegis of tribal fishery agencies. However, it may be noted that recent crises in salmon stock management, in part attributable to hasty and inadequate implementation of newly established AFS fisheries, has eroded some of the public goodwill towards Indian fishing rights, in conjunction with a general push to reestablish tighter fishery manangement

controls through DFO (Fraser 1995).

Conclusion

There is firm historical evidence that a century ago Indian tribes inhabiting the Fraser and Skeena watershed territories had independent native economies, many of which drew heavily on the salmon resources of these rivers. It provided them with an important staple food for domestic use, as well as a surplus from the catch to serve as a significant trading commodity. For some tribes, such as the Gitksan-Wet'suwet'en, salmon was the mainstay of their economy. It afforded them a measure of material well-being and cultural expression that was high by the standards of time and circumstance. The salmon economy of the river tribes was wrecked by the encroachment of the commercial fishery developed by Euro-Canadian interests. On the latter's behalf the government in effect confiscated a large part of the salmon resource used by river tribes and destroyed the weirs and traps that constituted their most effective fishing equipment. A reallocation now of part of the Fraser and Skeena salmon harvest to allow reestablishment of a significant commercial fishery for Indian river communities would provide at least partial redress for the effect of past injuries inflicted upon them. The form of redress is important. Providing a significant amount of much needed employment in the fishery, which is an area that is highly compatible with the traditional activities of the community, may help significantly to overcome the chronic conditions of economic depression, demoralization, and dissolution from which the Aboriginal communities now suffer.

The present day commercial fishing industry cannot be held responsible for injuries to native groups caused by previous fisheries developments. If there is to be a reallocation of fish to Native fishing interests, there would be a case on equity grounds to provide fair compensation to operators in the fishing industry that were adversely affected. Fortunately, the reallocation may help to create superior conditions for salmon fisheries management, which could be translated into improved economic returns in the industry and provide the government, directly or indirectly, with the means for compensation.

Non-Native stakeholder groups in the salmon fishery for the most part have been critical of the AFS allocations of salmon to river tribes. They have obviously thought of the reallocation of salmon catches as a zero-sum game, with gains to Native tribes meaning losses to other stakeholders. An important purpose of this paper has been to explain that this need not be the case, because an expanded river fishery may be used to produce greatly enhanced salmon stocks through much improved management of spawning escapement. The resulting build-up of stocks would allow eventually greater harvest allocations to be made to all stakeholder groups. Unfortunately, not much progress has yet been made in this direction. The greatest share of additional fish to river tribes has gone to tribes on the lower Fraser River, which have harvested the fish non-selectively in a gillnet fishery that was so hastily implemented as to produce significant management and control problems. As a result, the lower Fraser River AFS fishery so far has only added to the management problem instead of being part of the solution to it.

However, many Aboriginal leaders are quite conscious of the need for a selective Aboriginal fishery on the rivers and are keen on seeing it implemented. They recognize that such a fishery will serve as justification for a harvest reallocation in their favour and should help to allay the resistance from other stakeholder groups to further allocations in favour of the river tribes. It is to be hoped that further negotiations between DFO and the river tribes will result in the implementation of highly selective river fisheries that will facilitate optimal stock management.

The current claims by river tribes for reestablishment of a greater entitilement to a share of the salmon resource may be settled by the courts, or by a political process, or by a bit of both. But by whatever process, it is to be hoped that the solution arrived at will be made compatible with sound use of the resource, with a high level of benefits to society, and with equitable results for Aboriginal peoples and for other user groups.

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Notes

1. Much of this paper overlaps Copes and Reid (1994) and Copes et al. (1995). For an early treatment of the topic see Copes (1988).

2. Steelhead are a sea-run form of rainbow trout. The rainbow/steelhead species originally (as *Salmo gairdneri*) was considered to belong to the *Salmo* genus, which includes many trouts as well as Atlantic salmon. Some years ago it was reclassified to the genus *Oncorhynchus*, as *O. mykiss*.

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