First Nation Ingenuity – A Promising Approach to The Skeena Salmon Crisis

Greg Knox
MA Candidate, Royal Roads University
November 16, 2008

Table of Contents

List of Figures

First Nation Ingenuity – A Promising Approach To The Skeena Salmon Crisis

The Skeena has been faced with conflict and crisis over salmon since traditional live capture harvesting methods were outlawed in the early part of the twentieth century. Prior to that Skeena First Nations used selective fishing techniques that were highly effective in both harvesting large numbers of salmon and ensuring enough fish made it to their spawning areas. This is evident in the fact that at the time of European contact, vibrant runs of salmon were commonplace, supporting rich cultures and economic structures. Since that time, traditional harvesting methods in the marine and river system have been largely replaced by mixed stock commercial net fisheries. These modern day net fisheries have faced increasing criticism around selectivity, unable to select out strong populations from weak ones, and often inflicting high mortalities on non-target species. Growing uncertainty from climate change and increases in ocean ranching production are impacting the survival rates of Skeena salmon on a level never before seen. These issues and the desire by Canadian and First Nations people require that we take a new approach to salmon harvesting in the Skeena watershed and nearby coastal areas. A return to the techniques successfully used by First Nations people for thousands of years holds much promise in ensuring conservation, social and economic goals are achieved. Over the past few decades several First Nations have shown how effective they can be at harvesting Skeena salmon in an ecologically and economically sustainable manner using their traditional fishing sites and methods. Time is past due to embrace this ingenuity and expand these traditional technologies in both the Skeena River and nearby coastal environs.

Figure 1. Skeena watershed, showing the location of major tributaries and communities (Walters et al, 2008).

The Fishery Since Contact

For much of the past 130 years the commercial fishery flourished, bringing benefits to the coastal communities near the Skeena, drawing on skilled knowledge and labor of First Nations people throughout the watershed. This fishery provided benefits many of those who were displaced from their traditional way of life. The canneries employed large numbers of First Nations women (Figure 2) while the men participated in the harvesting (Menzies and Butler, 2007). The canneries and the majority of harvesting were and still are located at the mouth of the Skeena where all populations of Skeena salmon co-mingle as they return to the river. The technology used in this fishery was dominated by gill nets and small vessels until the 1950's. At that time, large seine boats were introduced to increase harvesting capacity (Wood, 2001). Gill nets typically set in a straight line, drifting with the tide (Figure 3). These nets are designed to capture salmon around the gills and as a result many of the fish are dead by the time they are retrieved, inflicting mortality rates of 30 – 80 % on by-catch (Buchanan et al, 2002). In comparison Seine boats use a large net v

Figure 2. North Pacific Cannery – Skeena River (Stewart, 1977)

Figure 3. Gill Net boat at Skeena River mouth (Keith Douglas, 2008)

closing the bottom and drawing the fish into a tight bag alongside the boat (Figure 4), where non-target species are released with large dip nets (Kelly and Hop, 1997). While seine boats can be highly species selective, they harvest salmon before they enter the river, where both strong and weak populations of target sockeye salmon are mixed together. Both Gill nets and seines continue to dominate the fishery today.

Figure 4. Seine Boat near Skeena River (Keith Douglas, 2008)

The Skeena contains well over a hundred genetically unique populations composed of all of the five species of pacific salmon which include sockeye, chinook, pink, coho, and chum (Gottesfeld and Rabnett, 2008). Of these, sockeye have been the most commercially valuable, but all species were harvested intensely. Most of these species began to decline steadily until the 1960's (Menzies and Butler, 2007). At that time, artificial spawning channels were built in the Babine tributary to boost production of sockeye. Overall numbers of sockeye rebuilt as the enhanced stocks replaced the depleted wild populations (Wood, 2001). The commercial fishery again rebounded with this increase in production until the 1990's when a coast wide coho salmon collapse resulted in significant restrictions on the commercial fleet and a drastic decline in employment in the industry (Menzies, 2006). These restrictions were largely a result of the fleet's inability to select out stronger populations and species while minimizing its impacts on weak runs of salmon (Menzies, 2006).

During the 1970's and 80's Alaskan catch of Skeena salmon increased dramatically taking an average of 12 – 54 % annually, depending on species (Walters et al, 2008). The increased catch pressured both strong and weak populations which were already heavily harvested domestically. Interception in Southeast Alaskan commercial net fisheries continues to be an issue, especially for the ailing domestic commercial fishery and the weak runs First Nations, governments and interest groups are trying to protect.

Today, the commercial fishery is faced with an uncertain future, incomes have dropped substantially in recent years due to decreasing harvests, increasing fuel prices, and poor prices resulting from massive expansions in aquaculture and ocean ranching production (Blewet and Nelson, 2008). The implementation of Canada's new Wild salmon policy, market pressures, and First Nations legal assertions over food fishing rights will likely mean further reductions in harvest rates for these mixed stock commercial fisheries, unless they can adapt and become more selective (Blewet and Nelson, 2008).

A New Age Of Uncertainty

Unfortunately the difficulties facing the Skeena commercial salmon fishery are likely to become exacerbated by even greater uncertainties at a global level in the form of climate change and increasing competition from ocean ranching production.

Climate change is now accepted as one of the greatest challenges to ever face humankind. Unfortunately salmon are likely to be a species at increased risk due to their reliance on cool ocean temperatures for food supply, and regular fresh water flow

regimes and temperatures (Mote et al, 2003). It is expected that in particular southern populations (British Columbia to California) will experience the biggest challenges from increasing ocean temperatures, and many of these populations already appear to be suffering (Beamish, 1995). It is believed this decline is due largely to increased sea surface temperatures resulting in lower survival rates for juvenile salmon (Mueter et al, 2002). Previously the Skeena was thought to be immune to the decreases in salmon abundance that has been experienced in Southern BC, Washington and Oregon, but new evidence suggests otherwise. Recent years have seen poor survival rates for juveniles that returned to the ocean in 2003 and 2005, as well as significant shifts in the migration patterns of returning sockeye salmon (DFO, 2008). In addition, an independent science review panel recently warned that a similar population crash to that experienced in nearby Rivers and Smiths Inlet sockeye populations would not be surprising for the Skeena (Walters et al, 2008).

Wild Skeena salmon are also being threatened by increasing production from ocean ranching and other artificial enhancement production. Since 1991 the United States, Canada, Japan and Russia have released an average of 5 to 6 billion hatchery reared salmon into the Pacific Ocean annually (University of Alaska, 2001). These releases account for over 40% of the total harvest (wild and enhancement) in the Pacific Rim (Knapp, 2001). Further planned increases in production are expected in the coming years, which will place even greater pressure on the wild salmon competing for food in the common pool resource of the North Pacific (Holt et al, 2007). There is a growing body of scientific evidence suggesting the North Pacific is currently at carrying capacity (Holt et al, 2007; Knapp, 2001) and that wild and enhanced fish are competing for food

in the North Pacific. As a result, increasing competition from hatchery production will likely have an adverse effect on the survivability and fitness of wild populations like the Skeena (Beamish et al, 1997). Southern populations may be at an increased disadvantage due to their migration delay in arriving to the ocean pastures of the North Pacific compared to the wild and enhanced Northern populations which are closer and much more prolific (Holt et al, 2007). This evidence and warnings by DFO stock assessment biologists demonstrate an even greater need for a selective and precautionary approach to our fisheries to protect against growing uncertainties from climate change and increasing ocean ranching production.

Technologies With The Test Of Time

A sensible approach to these issues is to return a significant portion of the fishery to a system of harvesting that worked successfully for millennia. At the time of contact, traditional harvesting practices were in place everywhere from the outer islands bordering Hecate straight to the Headwaters of the Skeena (Menzies and Butler, 2007; Morrell, 1985). Nearly every coastal stream, bay, and tributary of the Skeena River had some form of harvesting capacity. These technologies were skillfully developed over thousands

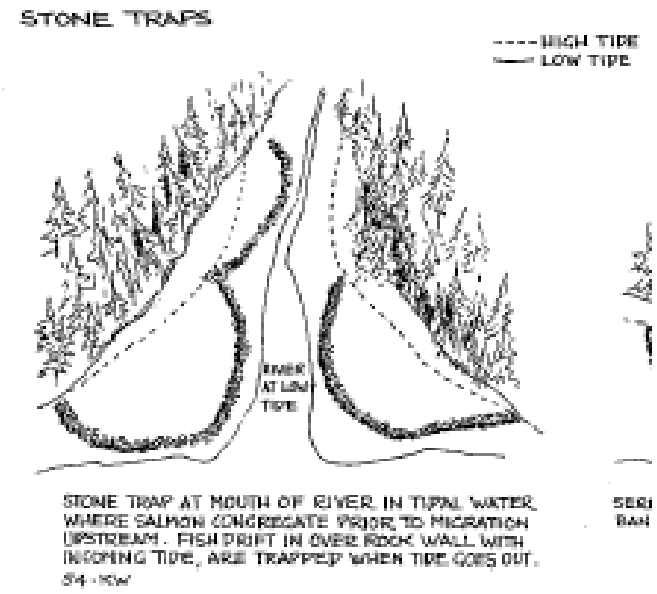

Figure 5. Stone Traps at small river mouth (Stewart, 1977)

of years, bearing the ingenuity of necessity.

On the coast near the mouth of the Skeena, Tsimshian First Nation people developed efficient and sustainable methods of harvesting salmon as they returned to the creek mouths each season. Here they used tidal traps which corralled and trapped fish as the tides dropped (Figure 5). The tidal traps allowed sufficient escapement of fish into the river on each high tide, only catching a portion of the run on any given tide cycle (Stewart, 1977). The Tsimshian also used drag seine nets to coral fish into the beach with the use of a boat. Here the desired species were selected out while other species were released to swim upriver. These drag seine camps were highly effective and operated until 1964 when they were outlawed by the Department of Fisheries & Oceans for "conservation" reasons at the request of the canneries (Menzies and Butler, 2007). Other types of traditional harvesting technologies used on the coast included a wide variety of weirs (Figure 6), reef traps, dip nets and trolling gear (Stewart 1977).

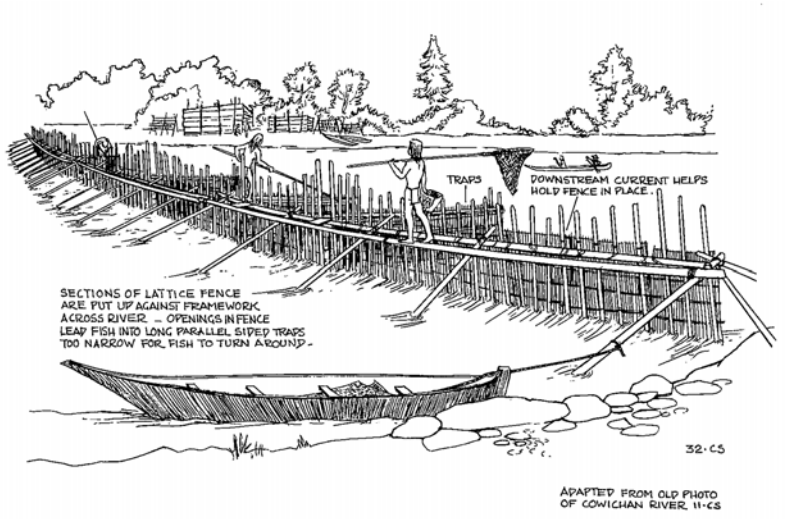

Figure 6. Traditional Salmon Weir (Stewart, 1977)

In addition to these technologies, it is likely that tidal pulse fishing was also used at the mouth of the Skeena, similar to techniques used by the Tlingit First Nation (Southeast Alaska). The Tlingit used wooden steak weirs with basket traps which trapped salmon on the first part of the incoming tide. Once high tide was reached salmon would simply

swim over the weir ensuring regular escapements upriver (Menzies, 2006).In the Skeena river and tributaries Tsimshian, Gitxsan, Wet'suwet'en and Ned' u' ten First Nations utilized a complex array of harvesting technologies to capture salmon in huge numbers. There were several different technologies used in river which included a variety of traps, weirs baskets and dip nets (Morrell, 1985). Of these technologies weirs were by far the most effective and were prevalent on many of the smaller Skeena tributaries and some of the larger ones where water conditions and bottom structure allowed (Morrell, 1985; Menzies, 2006). The most impressive of these sites existed at the outlet of Babine Lake (tributary of Skeena) where a fence was constructed spanning several hundred feet right across the river. Along this fence were several traps where salmon were allowed to swim into from downstream. Here the Ned' u' ten First Nation people used dip nets and gaffs to remove the desired fish from the traps for processing nearby. At regular intervals the traps were opened to allow salmon to swim upstream to their spawning sites, ensuring healthy future returns (Morrell, 1985; Copes, 1992). These weir and trap systems were so efficient that the Euro-Canadian commercial fishery at the mouth of the Skeena River referred to them as "barricades" and had them outlawed by the provincial government in 1906, stating they were a conservation concern (Copes, 1992). In reality, it was the increased pressure from the rapidly expanding commercial fishery that was causing conservation issues. Traps were also widely used in places such as Moricetown canyon, these

were also highly efficient (Figure 7). Complex basket and lash wooden slit traps were often combined with chutes to deliver the fish to harvesters waiting on shore (Gottesfeld and Rabnett, 2008). Another method used weirs placed at an angle downstream which guided migrating fish into traps along the shore

Figure 7. Tsimshian basket trap on Skeena (Stewart, 1977)

In canyon areas such as Gitsegas and Moricetown strong currents forced fish to migrate along steep canyon walls, here dip nets were used by individuals as a capture method (Morrell, 1985).

An additional technology, which was not used historically by Skeena First Nations, is fish wheels (Figure 8). Fish wheels were originally developed and used by Columbia River First Nations to harvest salmon. This technology was composed of a floating platform with rotating baskets powered by the rivers current. As the baskets turned around, they scooped up salmon swimming upstream.

Figure 8. Tsimshian Fish Wheel near Kitselas (Keith Douglas, 2008)

The salmon then slid out of the basket into a live holding tank for harvest or release (Menzies, 2006). Fish wheels are currently effectively used by several Skeena First Nations to live harvest salmon (Skeena Fisheries Commission, pers comm).

Unlike the modern day commercial fishery, the majority of the traditional harvest took place in areas close to where individual populations spawned, such as creek mouths and tributary rivers of the Skeena. This allowed for an amazing ability to control the harvest of individual runs, ensuring enough fish of any single population made it back to their natal areas to reproduce. Traditional technologies were also used by Skeena First Nations in areas of mixed stock fisheries such as those in the marine environment, mouth and main stem of the Skeena River. The difference was that the fishing pressure was spread over a much larger area, with much of it occurring in terminal areas of the watershed were specific populations were harvested in accordance with their annual returning numbers. In addition, these traditional live capture harvest methods allowed for the release of non-target species with minimal harm (Copes, 1992).

The complex social structures used to manage these fisheries are also a critically important reason for their success (Menzies and Butler, 2007). The importance of this is fully recognized but is outside of the scope of this paper. The current fisheries system allocates harvest at a broad scale based on modern science as opposed to traditional management systems. Traditional systems are however still used within individual First Nations fisheries in controlling and distributing harvesting locations and other aspects of their fisheries. Use and potential application of traditional management systems in the Skeena fishery deserves further exploration.

Back To The Future

During the 1990's there was a resurgence of traditional selective fishing in the Skeena system. This was brought on by a desire by many Skeena First Nations to once again use these technologies to harvest fish for food, social, ceremonial and commercial purposed (Skeena Fisheries Commission, pers comm). In 1998, the coho salmon crisis instigated further development of these technologies driven by the need to move to more selective harvesting technologies to ensure this species was not at risk of extinction (Menzies, 2006). The Skeena Fisheries Commission, Gitxsan, Wet'suwet'en, Ned' u' ten and Tsimshian First Nations lead this movement, testing out a variety of methods in locations throughout the Skeena. Several of these tests were successful and are currently in use today for both food fishing and commercial harvesting, and include the use of beach seining, fish wheels, dip netting and a weir. Fish wheels currently operate at Kitselas Canyon in the lower Skeena, and Gitsegas canyon in the Babine tributary. These fish wheels have been highly effective, but are dependent on water conditions and therefore cannot always be operated for the entire fishing season (Skeena Fisheries Commission, pers comm). Beach seining has been developed on the middle Skeena and has proven to be very efficient

Figure 9. Beach Seining on the Middle Skeena (Greg Knox, 2008)

at harvesting sockeye and pink salmon with by-catch mortality rates averaging 3.4% (Bravi, 2000). Beach seining currently harvests approximately 25% of the in-river commercial catch and employ over 90 people in small First Nation communities suffering from high unemployment (Skeena Fisheries Commission, pers comm). Dip netting has been taking place for millennia at Moricetown Canyon and Gitsegas Canyon. These fisheries are now involved in commercial harvesting at these sites providing fish for the fresh and canning markets (Skeena Fisheries Commission, pers comm). A modern weir has replaced the original weir which operated for thousands of years at the outlet of Babine Lake. The modern weir was constructed by the Department of Fisheries and Oceans as a key counting facility and bears remarkable resemblance to the weir that stood there at the time of European contact. The weir is once again being used to harvest the wild and enhanced Babine runs commercially, and has the benefit of being highly efficient and population selective due to its terminal location (Skeena Fisheries Commission, pers comm).

Figure 10. Modern Babine River Weir (Greg Knox, 2008)

In addition to these successes, there were several other tests using traditional selective technologies which failed for a variety of reasons. One of the key problems facing First Nations people in their attempts to reconstruct the past is the loss of knowledge in constructing and placing these devices. Thousands of years of trial, error

and wisdom, understanding the flow of tides, currents, and behavior of the fish was critical to their effectiveness (Stewart, 1977). Despite this, there still exists a vast amount of traditional expertise that can be applied to expanding the current traditional selective harvesting capabilities in the Skeena. There are several sites that are not being utilized for beach seining in the middle Skeena and fish wheel sites that are not in use or underutilized in the lower Skeena. The lower Skeena also contains over 100 kilometers of river that have the potential for beach seining, traps and weirs which are for the most part unexplored.

Despite this underutilization and potential for expansion, current selective harvesting capabilities are substantial with the ability to increase harvests at existing sites (Menzies, 2006). Skeena First Nations have harvested up to 700,000 salmon annually from these sites in recent years, resulting in better selectivity, a revival of traditional ties to the land, and economic benefits to communities with few other economic opportunities (Skeena Fisheries Commission, pers comm).

Since 2002 commercial harvests of salmon from in-river selective fisheries have average approximately 144,000 fish annually (Blewet and Nelson, 2008). This compares to an average of a 967,000 annual harvest by the modern marine commercial fishery over the same time period. Expanding the harvest in selective locations beyond 13% of the domestic catch is essential if we are going to protect weak populations of salmon in the Skeena.

Conclusion

As stated by a senior Department of Fisheries and Oceans scientists “The most important lesson from the last 30 years is that non-selective mixed-stock fishing in tidal waters must be reduced to conserve salmon diversity in the Skeena and elsewhere.” (Wood, 2001:13). Growing uncertainty from climate change and increased ocean ranching production will continue to add further pressure to the issues that have been plaguing the commercial fleet for decades. There appears to be little alternative but to increase the selectivity in the commercial harvesting of Skeena salmon if access to harvesting is to be maintained. Using traditional harvesting technologies and locations holds much promise, providing the ability to harvest out strong runs of Skeena salmon while allowing weak populations to migrate home.

References

Beamish, R., (1995). *Climate Change and Northern Fish Populations.* Department of Fisheries and Oceans. Pacific Biological Station. Nanaimo. British Columbia.

Beamish, R., Mahnken, C., Neville, C., (1997). *Hatchery and wild production of Pacific salmon in relation to large-scale, natural shifts in the productivity of the marine environment*. ICES Journal of Marine Science, Volume 54.

Blewet, E., Nelson, S., (2008). Economic Dimensions of Skeena Watershed Salmonid Fisheries. Counterpoint Consulting. Vancouver.

Bravi, R., (2000). *By-catch Mortality Study on the 2000 ESSR Beach Seine Fishery in the Middle Skeena River.* Gitxsan Watershed Authority. Hazelton.

Buchanan, S., Farrell, A., Fraser, J., Gallaugher, P., Joy, R., Routledge, R.,(2002). *Reducing Gill-Net Mortality of Incidentally Caught Coho Salmon.* North American Journal of Fisheries Management Volume 22, pp. 1270 – 1275.

Copes, P., (1992). *Reallocating A Regional Fishery Resource: Restoring Aboriginal Fisheries on the Upper Skeena, British Columbia.* Simon Fraser University. Burnaby British Columbia.

DFO, (2008). *Skeena River Management of Salmon and Steelhead Stocks.* Retrieved from www.dfo-mpo.gc.ca/media/back-fiche/2008/pr08-eng.htm November 10, 2008.

Gottesfeld, A., Rabnett, K., (2008). *Skeena River Fish and their Habitat.* Skeena Fisheries Commission. Ecotrust. Portland. Oregon.

Holt C., Rutherford, M., Peterman, R., (2007). *International Cooperation Among Nation States of the North Pacific Ocean on the Problem of Competition Among Salmon for a Common Pool of Prey Resources.* School of Resource and Environmental Management. Simon Fraser University. Burnaby British Columbia.

Kelly, J., Hop, W., (1997). *Incidental salmon catch monitoring in Juan de Fuca Strait and Johnstone Strait net fisheries, 1997.* Canadian Journal of Fisheries and Aquatic Science. Vol 2460.

Knapp, G., (2001). *The Wild Salmon Industry: Five Predictions for the Future.* Institute of Social and Economic Research. University of Alaska. Anchorage.

Menzies, C., (2006).*Traditional Ecological Knowledge and Natural Resource Management.* University of Nebraska Press.

Menzies C., Butler, C., (2007). *Returning to Selective Fishing Through Indigenous Fisheries Knowledge.* American Indian Quarterly. Volume 31. No. 3.

Morrell, M., (1985). *The Gitxsan and Wet' suwet' en Fishery in the Skeena River System.* Gtxsan-Wet' suwet' en Tribal Council. Hazelton, B.C.

Mote, P., Parson, E., Hamlet, A., Keeton, W., Lettenmaier, D., Mantua, N., Miles, E., Peterson, D., Slaughter, R., Snover, A., (2003). *Preparing for climatic change: the water, salmon, and forests of the Pacific Northwest.* University of Washington. Seattle.

Mueter, F., Peterman, R., Pyper, B., (2002). *Opposite Effects of Ocean Temperature on Survival Rates of 120 Stocks of Pacific Rim Salmon (Oncorhynchus spp.) in Northern and Southern Areas.* Canadian Journal of Fisheries and Aquatic Sciences Vol 59. Pp 456 – 463.

Skeena Fisheries Commission, Personal communications with Mark Duiven, Deputy Commissioner, November 14, 2008.

Stewart, H., (1977). *Indian Fishing, Early Methods on the Northwest Coast*. University of Washington Press. Seattle.

University of Alaska, (2001). *Evaluating Alaska's Ocean-Ranching Salmon Hatcheries: Biologic and Management Issues.* Environment and Natural Resource Institute, University of Alaska, Anchorage.

Walters, C., Lichotowich, J., Peterman, R., Reynolds, J., (2008). *Report on the Skeena Independent Science Review Panel.* A Report to the Canadian Department of Fisheries and Oceans and the British Columbia Ministry of Environment.

Wood, C., (2001). *Managing Biodiversity in Pacific Salmon: The Evolution of the Skeena River Sockeye Salmon Fishery in British Columbia.* Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, B.C. Canada. Retrieved September 20, 2008 from: http://www.unep.org/bpsp/Fisheries/Fisheries%20Case%20Studies/WOOD.pdf