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## **British Columbia's Commercial Salmon Industry**

by

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## **Abstract**

The salmon industry in British Columbia includes the commercial and recreational sectors as well as the salmon farming industry. Catches in the commercial fishery have decline from historic high levels of 107,500 t in 1985 to historic low levels of 17,000 t in 1999. This decline has resulted in the commercial fishing fleet being reduced by 50% over the past five years. The recreational fishery (freshwater and saltwater) has remained fairly stable since the mid-1980s with a slight (~10-15%) decline (primarily in the saltwater sector) in economic performance since 1993. The salmon farming industry has undergone explosive growth over than past 15 years and current production is now 62,000 t or roughly three times the harvest in the commercial sector. The salmon farming industry has been constrained for the last seven years by a moratorium on new sites but is expected to grow considerably in the near future. The performance of the processing sector has for the most part mirrored the commercial fishing industry. Substantial reductions in employment and a restructuring of the processing sector have occurred in recent years. New policy initiatives by the Federal government have resulted in an increased emphasis on conservation and will ensure that commercial fisheries are more selective in their harvest. Canada's Ocean Act and Species at Risk Act are intended to ensure resource management decisions reflect ecosystem health rather than single species management approaches and to provide protection for all species at risk not simply those that are of commercial value.

## **Introduction**

The cultural, social, and economic importance of Pacific salmon have figured prominently in the development of the seafood industry in British Columbia. For decades, the commercial salmon industry played a dominant role in the management of our freshwater and marine resources as well as the overall economic and social health of coastal communities. By the mid-1990s, the worldwide growth of salmon aquaculture had increased supply to the point where the economic viability of the commercial salmon fishery was being seriously questioned (Beamish and Hunter 1994). Concurrently, climatic changes resulted in significant decreases in marine survival for all species of Pacific salmon resulting in sharp declines in the abundance of Canadian salmon stocks as well as some salmon stocks in the United States (Beamish et al. 1999, 2000).

In response to these various factors, the Canadian Department of Fisheries and Oceans restructured the industry to reduce fishing capacity and produced a series of policy papers outlining new directions for the management of salmon resources in British Columbia (DFO 1998a, 1998b, 1999, 2000). These policies outlined specific principles that would be used to promote conservation and sustainable use as well as to develop an improved more inclusive and transparent decision-making process (DFO 1998a). The policies also defined an allocation framework to partition catch among the various user groups (commercial, sport, and aboriginal) and gear types (DFO 1998b) as well as to develop harvesting strategies that would be more selective (DFO 1999). The Department also produced a Wild Salmon Policy Discussion Paper that outlines the principles to be used in resource management decisions (DFO 2000). These new policies have resulted in significant changes and it is fair to say that further adjustments are expected and necessary before the efficacy of these initiatives can be fairly judged.

In addition to these policy initiative, Canada's Oceans Act (Government of Canada 1996) and the Species at Risk Act (SARA) (Government of Canada 2002) are new initiatives that highlight the

requirement to consider ecosystem-based management approaches and provide protection for any species that is at critically low abundance. It is true that developing an ecosystem-based management approach is difficult because fisheries are often regulated at the single-species level. It is also true that it is difficult for science to determine fishing quotas using multi-species assessments because the required models are poorly developed. Perhaps our own organizations perpetuate a single-species orientation by assigning the management and research of single species to individual investigators rather than creating multi-species task teams. SARA treats all species equally and through legislation requires the protection and recovery for any species that is determined to be in need of protection. In fisheries management, there has been a preference for some species because of their taste or charisma and an indifference or even aversion and fear for others. A legislative requirement to protect species and stocks at risk will eventually require that there is an assessment of the affects of fishing on associated species. It will be in the best interest of the fishing industry to ensure that bycatch as well as targeted catch are not overfished. Eradication fisheries, such as existed for spiny dogfish (*Squalis acanthias*) in British Columbia in the 1950s and early 1960s (Ketchen 1986), will no longer be tolerated.

Although just over two decades old, the salmon farming industry in British Columbia has grown substantially to the point where the 2001 production of farm salmon (62,000 t) was almost three times the harvest in the commercial salmon fishery (23,000 t). The salmon farming industry is regulated by the British Columbia Provincial Government and is poised to undergo significant growth in the next few years after being restrained for the last seven years by a moratorium on new farm sites imposed by the Provincial Government. The Provincial Government has developed a regulatory framework to guide industry development and Fisheries and Oceans Canada has developed a policy framework to address issues related to aquaculture (DFO 2002).

The British Columbia commercial salmon industry has gone through dramatic changes in the last decade. The commercial fishery has changed forever, the salmon farming industry has assumed a dominant role, and the processing sector has gone through significant downsizing and restructuring. New policy initiatives by both the federal and provincial governments will continue to guide the development of this sector and further adjustments will be necessary as these various initiative mature. The following is a brief account of the status of each sector.

### **The Commercial and Recreational Fisheries**

Commercial Pacific salmon fisheries began in British Columbia in 1829. Six species of Pacific salmon are harvested in British Columbia coastal waters. Sockeye (*Oncorhynchus nerka*), pink (*O. gorbuscha*), and chum (*O. keta*) salmon are mainly harvested in commercial net fisheries while chinook (*O. tshawytscha*) and coho (*O. kisutch*) salmon are targeted by commercial troll and by the sport fisheries. Steelhead (*O. mykiss*) trout are harvested primarily by the recreational sector and the annual catch of this species is quite small. During the early 1900s, salmon catches increased until they reached a maximum of 93,210 t in 1936 and then declined. Catches increased again in the late 1970s through to the late 1980s, reaching historic high levels of 107,500 t in 1985 (Figure 1). In the 1990s, catches declined rapidly to approximately 17,000 t in 1999 - the lowest level in the history of the fishery (Bijsterveld and Nagy 2001). Catches in 2000 and 2001 increased slightly to approximately 19,000 t and 23,000 t, respectively, with some evidence of increased marine survival. Since 1952 when more accurate records were kept, the average Pacific salmon catch in British Columbia has been approximately 65,000 t with sockeye, pink and chum catches on average accounting for three quarters

of this total (Bijsterveld and Nagy 2001). Since the late-1990s, severe fishing restrictions have virtually eliminated all fisheries targeting coho salmon and have significantly restricted the harvest of chinook salmon to the point where catches for these two species accounts for less than five percent of the total. The changes in catch generally reflect changes in abundance, which is now known to respond to trends in climate as well as to the affects of fishing (Beamish et al. 1999, 2000).

The history of the fishery is closely associated with the history of fisheries science on Canada's Pacific coast. Dr. Bill Ricker published his theory of stock and recruitment in 1954 that suggested a maximum productivity was associated with an optimal number of spawning adults. However, despite attempts in the 1950s and 1960s to achieve this optimal escapement, catches could not be built up to levels thought to exist in the late 1800s. This inability to increase catches led to the establishment of an enhancement program, officially funded in 1977 (Fisheries and Environment Canada 1978). The original goal of the Salmon Enhancement Program was to more than double salmon production to approximately 150,000 t annually based in part on rebuilding targets proposed by Ricker (1962). Salmon catches did increase and reached the highest levels of the fishery in 1985 and 1986 with catches of 107,500 t and 104,000 t, respectively. Despite the apparent rebuilding and the new enhancement program, catches declined steadily until 13 years later they were the lowest in the history of the fishery in 1999. The historic low catches have persisted although there is strong evidence that juvenile salmon that went to sea in 2000 experienced improved marine survival resulting in exceptional returns of pink salmon to the Fraser River in 2001 and sockeye salmon in 2002.

In general, escapement goals are established in Canada for major sockeye, pink, and chum stocks, and fisheries are managed to meet these escapement objectives. Chinook and coho fisheries are managed to achieve specified harvest rates although escapement goals have also been established for a few key stocks. As part of an overall management strategy, Canada has maintained an extensive salmon enhancement program since the late 1970s producing on average 485 million salmon in various enhancement projects (Noakes et al. 2000). The vast majority (425 million) of these enhanced salmon are produced to support commercial sockeye, chum and pink salmon fisheries. Approximately 60 million chinook (42.5 million) and coho (17.5 million) fry and smolts are produced to support recreational fisheries and to rebuild depressed stocks.

Recently, the most dramatic changes in British Columbia fisheries have been for coho and sockeye salmon. Until the late-1990s, coho stocks were, in general, not actively managed in-season. Adjustments were made post-season once harvest rates could be estimated and this information was used to plan for the following season. Virtually all of this information was generated from hatchery stocks since few reliable data were available for wild coho stocks. In the late 1990s, several coho stocks were severely depressed including stocks from the Skeena and Thompson watersheds (Beamish et al. 2000). These low levels of coho salmon abundance resulted the virtual elimination of all directed fisheries for coho salmon and severe restrictions on fisheries that caught coho incidentally and provided the impetus for the new policy initiatives aimed at assuring conservation would be given priority (DFO 1998a, 1999, 2000). Some coho stocks now appear to be at higher abundance perhaps due to the 1998 regime shift.

Two significant issues have affected sockeye salmon fisheries in British Columbia. The first issue was the collapse of sockeye salmon stocks in the Central Coast region of British Columbia specifically the Smith and Rivers inlet sockeye salmon populations. At one time, stocks from these watersheds

supported the third largest sockeye salmon fishery in British Columbia behind the Fraser and Skeena-Nass fisheries. The reasons for the decline are not clear but the evidence suggests it may be related to changes in marine survival and not related to changes in the watershed such as commercial logging (McKinnell et al. 2001).

Fisheries on Fraser River sockeye stocks have also been curtailed for the past 3 or 4 years because of suspected high pre-spawning mortality of stocks entering the river later in the run. There is some evidence to suggest that certain late-run stocks have entered the Fraser River up to 6 weeks earlier than normally in recent years. This early migration has apparently resulted in significant pre-spawning mortality. In 2002, managers guessed that the in-river mortality may reach 90% and thus plans (based on pre-season estimates of returns) were put in place to maintain a harvest rate of no more than 15%. Although considerably more fish than anticipated returned, few additional fishing opportunities were provided to ensure the harvest rate remained in the range of 15%. A number of studies have been initiated in hopes of determining why the sockeye salmon are entering the river early, specifically what stocks are affected, where the pre-spawning mortality is occurring, and whether other species of salmon may be affected.

### **Salmon Aquaculture**

Salmon aquaculture began in British Columbia in the late 1970s and after modest growth the industry went through a major rationalization exercise in the late 1980s that reduced both the number of active farm sites and the number of companies involved in the industry. Although the Provincial Government regulates this industry, a number of federal government departments including Fisheries and Oceans Canada are also involved in the management of this industry. Growth in the industry has been limited in the 1990s due to a moratorium on new farm sites imposed by the Provincial Government and there has been a gradual move away from Pacific salmon to the more domesticated Atlantic salmon (*Salmo salar*) during the 1990s. The farming of Atlantic salmon had been allowed in Washington State for a number of years before Atlantics were raised in British Columbia and this, in part, contributed to the decision by the Canadian government to allow Atlantic salmon to be farmed in British Columbia. Current farmed salmon production in British Columbia is approximately 62,000 t (Table 1). To put this level of production in perspective, the world production of farmed salmon is roughly 1,300,000 t (International Salmon Farmers Association) and the fishery for Pacific salmon is about 800,000 t (Beamish et al. 1999). The production of farmed salmon in British Columbia is now roughly three times the commercial harvest of Pacific salmon and is expected to grow in the future.

The economic and social consequences of the growth in salmon aquaculture have been dramatic. The world production of salmon (both farmed and from capture fisheries) has increased from about 500,000 tonnes in 1985 to approximately 2 million tonnes in 2001. The production of farmed salmon was relatively small in 1985 whereas in 2001 farmed salmon production is almost double the harvest from the commercial fisheries (Figure 2). The increased abundance of salmon (both cultured and wild) on the world market has resulted in a reduction in price for all salmon. Also, the ability to supply high quality fresh farmed salmon year round has resulted in farmed salmon replacing wild salmon in many traditional markets globally (see for example Clayton & Gordon 1999 on substitute relationships for farmed and wild salmon).

The development of the salmon farming industry in has been controversial in British Columbia. In addition to various social and economic factors, questions concerning environmental sustainability have also been

raised. To address these concerns the Provincial Government in 1995 asked the British Columbia Environmental Assessment Office to conduct a review of the salmon farming industry and make recommendations on how best to improve the environmental performance of this sector. Their report was completed in 1997 and included 49 recommendations. The conclusion of this 18-month public review was that salmon farming as currently practiced in British Columbia posed a low overall risk to the environment (BCEAO 1997). These general findings were echoed in two recent reports from the National Marine Fisheries Service (Nash 2001; Waknitz et al. 2002).

Both the Federal and Provincial governments to address the issues raised during the review conducted by the Environmental Assessment Office have undertaken several initiatives. In August 2000, the Department of Fisheries and Oceans announced a Program for Sustainable Aquaculture including a national investment of \$75 million (Canadian) over five years. The majorities of these new resources have been invested in biological and environmental research, hiring new staff to specifically monitor and enforce regulations under the Fisheries Act and Navigable Waters Protection Act at aquaculture sites, develop policies to guide aquaculture development in Canada, and to address issues of food safety. All new farms and significant changes to current aquaculture sites are now subject to review under the Canadian Environmental Assessment Act. Fisheries and Oceans has also adopted a new National Code on Introductions and Transfers including a comprehensive risk assessment framework to ensure that Canadian regulations are current and reflect existing international standards. The Council of Canadian Fisheries and Aquaculture Ministers has endorsed the development of a National Aquatic Animal Health Program to ensure both the protection of wild stocks and the responsible development of the aquaculture industry. The recently developed Aquaculture Policy Framework will also help guide industry development (DFO 2002). The Province has also developed a salmon aquaculture framework and announced new waste management regulations and funding for environmental research and when the moratorium was officially lifted on September 12, 2002. While these steps represent progress, continued controversy is expected given the highly polarized nature of this issue.

## **The Industry**

The abundance and resulting catch of British Columbia salmon stocks started to decline in the early 1990s (Beamish et al. 1999, 2000). By the late 1990s, salmon abundance had declined to the point where the Fraser River sockeye salmon fishery, once one of the most important salmon fisheries in the world, was closed for the first time in a century and many other British Columbia salmon fisheries were substantially curtailed. During this period, the industry did not post a profit for seven out of nine years due to both low catches and low prices. The total landed value of the commercial salmon fishery decreased from a high of approximately \$410 million (Canadian) in 1988 to \$55 million (Canadian) in 1998 (Table 2). In 2000, the landed value of the salmon catch was only \$25 million (Canadian) rebounded to \$50 million (Canadian) in 2001 (source DFO). In part, this was due to roughly a 30% decrease in the average price of the catch between 1985 and 2000. However, the reduction was substantially a result of the decreasing abundance of wild salmon in British Columbia. The composition of the catch in the late 1990s also changed slightly to a higher proportion of lower valued pink and chum salmon and fewer chinook, coho, and sockeye salmon.

To improve the economic outlook, the commercial salmon fleet was substantially reduced leading to drastic increases in unemployment in coastal communities. Between 1995 and 2000, the fleet size was reduced by approximately 50% from 4,396 to 2,228 vessels (Table 3). Despite the substantial reduction in the number of fishing vessels, the average income per licence decreased more than 35% during the same

period (Table 3). In some cases, this decrease has resulted in a substantial negative change in the standard of living for the affected fishermen. There has also been a shift in effort to fisheries for non-salmon species in an effort to supplement incomes. The net result has been a substantial reduction in the landed value of commercial fisheries from approximately \$770 million (Canadian) in 1988 to less than \$300 million (Canadian) by 2000 (Table 3).

The fleet restructuring and declines in catch also resulted in significant structural changes in the British Columbia fishing and processing industries. In the mid-1980s, British Columbia Packers (BC Packers) was the largest fish processing company in British Columbia. BC Packer controlled roughly 50% of the salmon fishery that at the time represented approximately 70% of the total commercial fishing industry in British Columbia. Faced with a downward trend in return on investment and continued loss of market share in both the canned and frozen salmon markets, BC Packers' parent company Weston decided to divest its interests in the industry. The divestiture started in 1998 with the sale of market-related assets (such as the CloverLeaf label) and the disposal of many of its remaining assets including its fleet of fishing vessels began in 1999. Other companies also restructured their operations in order to remain economically viable.

The exit of BC Packers from the commercial salmon fishing and processing sectors had significant consequences for the entire industry. The Fisheries Council of British Columbia was the organization that acted as an advocate for the interests of all the major fish processors in British Columbia. In the mid-1980s, members of the Fisheries Council accounted for 70% of the salmon production coast-wide. The Fisheries Council was funded by industry with companies contributing annual fees roughly equivalent to their share of production. As the largest producer, BC Packers was the key supporter of the Fisheries Council. Faced with the loss of BC Packers' support, the decision to dissolve the Fisheries Council was made in early 1999. Over the next year or so, attempts to establish a more broadly based seafood processors association that would represent the interests of most finfish and shellfish producers met with limited success in large part due to a lack of funding. The net result was a shift in influence away from the commercial fishing sector. It is difficult to predict what this means for the future of the commercial fishing sector.

The economic health of the fish processing sector has been closely associated with trends in the commercial fishery. The GDP from the fish-processing sector has dropped by roughly 40% since 1984 with the most dramatic decline since 1994 primarily related to the salmon fishery. Employment in this sector decreased from approximately 4,000 in 1984 to about 2,000 workers in 1999. The decline has been buffered somewhat from increased processing of non-Canadian origin fish. Also, the decline in this sector would have been substantially higher if not for increased production from the aquaculture industry. Fresh and chilled product is now the most important component of the export market contributing more than \$400 million in revenue while canned or smoked product contributed \$69 million (Canadian) in 2000. The United States (58%) and Japan (26%) were the major export markets for these products (BCMFCR 2001).

The 1990s also saw greater emphasis placed on fisheries for First Nations. In 1990, the Supreme Court of Canada issued a landmark ruling in the "Sparrow" decision (named after the defendant). The decision defined Aboriginal peoples' right to fish for food, social, and ceremonial purposes and ruled that this right takes priority over all other users of the fishery subject to certain overriding considerations such as conservation of the resource. These rights have been confirmed and refined by subsequent

decisions of the court. In response, Fisheries and Oceans launched the Aboriginal Fisheries Strategy (AFS) in 1992 to ensure stability in fisheries management. The AFS applies where Fisheries and Oceans manages fisheries and where land claims have not put a fisheries management regime in place. Under AFS, the Department enters into agreements with First Nations to establish a regulatory framework for the management of their fishery. The AFS continues to evolve over time to address changing circumstances.

Catches in the recreational fishery are quite modest when compared to the commercial sector. One of the key objectives of this sector is to provide fishing opportunities for clients and thus its success and performance are perhaps best measured by its contribution to the provincial GDP. This contribution for both freshwater and saltwater fisheries has been fairly constant in the range of \$200 million (Canadian) not including non-angling activities since the mid-1980s declining by 10 to 15% since 1993. The decline is primarily attributed to reductions in saltwater fisheries (BCMFCR 2001). In recent years, there has also been a shift away from sports fishing for salmon as stocks declined to sports fishing directed at other marine species such as halibut.

At the same time, the salmon farming industry in British Columbia was expanding at the rate of approximately 20% per year. In 1988, the British Columbia salmon farming industry was worth \$52.1 million (Canadian). By 1998, the value of the salmon farming industry had grown six fold to \$298 million (Canadian) surpassing the landed value of all British Columbia commercial fisheries combined (Table 2). This growth occurred despite a moratorium on new farm sites. With the lifting of the moratorium in September 2002, the industry is expected to grow to \$1 billion (Canadian) as the industry expands. This extreme economic dichotomy undoubtedly influenced the attitude of many in the salmon fishing industry and contributed, in part, to the strong negative views expressed towards the salmon farming industry by the fishing sector and others. The reality is that these changes in both abundance and price would have occurred regardless of the development of aquaculture in British Columbia given the global nature of the seafood industry and the natural forces governing the production of wild salmon (Noakes et al. 2000).

Salmon farming has outperformed virtually every other industry in the British Columbia economy since 1985 and farm salmon is currently the province's largest agricultural export. Aquaculture's contribution to British Columbia's GDP has doubled between 1995 and 1999 and grew by a factor of 60 between 1984 and 1999. The industry employs approximately 1,800 people and further expansion of the industry is expected to create much need new employment opportunities in coastal communities as well as in the processing industry (BCMFCR 2001).

## **Summary**

The British Columbia salmon industry has changed dramatically over the past decade and will continue to evolve. While the salmon aquaculture industry now holds a dominant position, there is still considerable value in the other sectors of the industry. New approaches to harvest and market salmon, either in the commercial or recreational sector, will be required for the industry to remain competitive and sustainable. Commercially, it will be important for the different groups to recognise that they are all part of a global seafood economy and that their individual survival may depend on their ability to act collectively. All sectors need to recognise the importance of establishing fair and equitable access to the resource including a process to address inequities when the need arises. This will be particularly important as we begin to better understand and predict natural fluctuations in wild salmon abundance.



Finally, the resolution of outstanding land claims will be essential to bring a level of stability to the system.

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Table 1: British Columbia farmed salmon production (tonnes), 1981-2001.

Year	Atlantic	Chinook	Coho	Total
1981	NA	NA	149	149
1982	NA	36	195	231
1983	NA	47	62	108
1984	NA	36	543	580
1985	NA	46	577	623
1986	NA	74	258	331
1987	NA	804	669	1,474
1988	68	3,017	2,352	5,436
1989	1,085	7,215	1,538	9,838
1990	1,517	10,150	1,279	12,946
1991	3,344	17,488	486	21,318
1992	6,215	10,636	655	17,506
1993	11,308	9,010	2,417	22,735
1994	12,824	6,706	859	20,389
1995	16,011	7,131	680	23,822
1996	16,900	7,530	720	25,150
1997	26,336	5,203	975	32,514
1998	30,165	7,114	1,976	39,255
1999	37,673	7,510	1,555	46,738
2000	35,680	6,370	1,390	43,440
2001 <sup>1</sup>	53,490	6,330	2,180	62,000

NA – Not Applicable

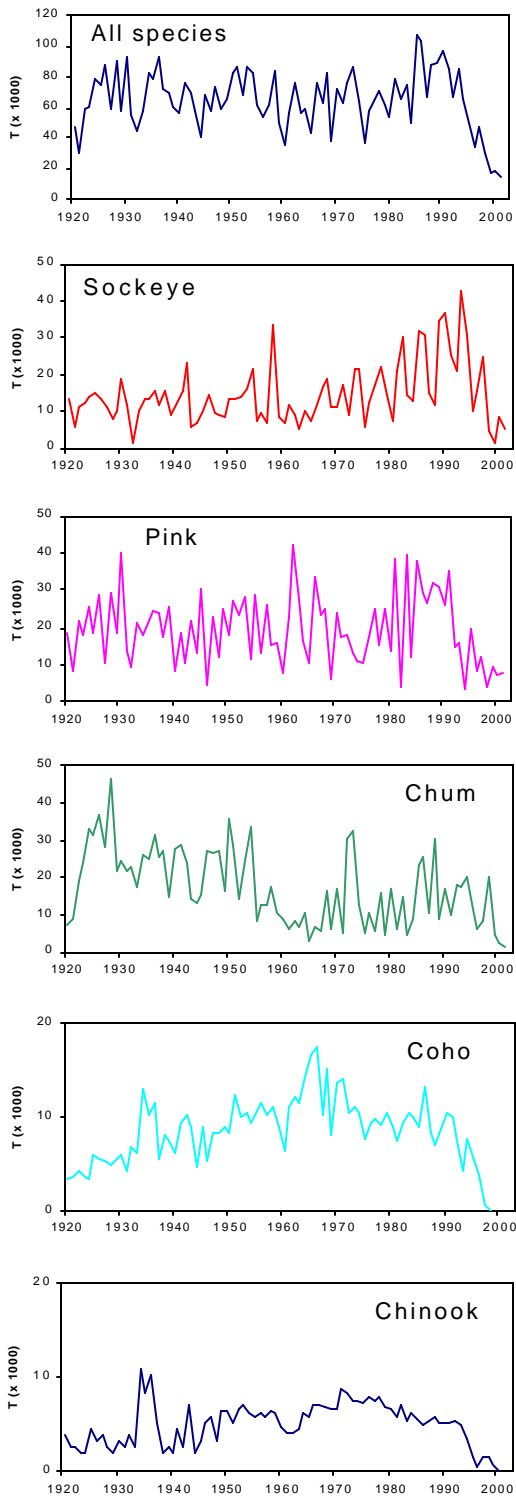
<sup>1</sup>Preliminary**Table 2:** Comparison of landed value by species group for the British Columbia Commercial Fishery and the British Columbia Aquaculture Industry in 1988 and 1998.

		1988		1998	
		Value	%	Value	%
British Columbia	Salmon	\$410.4	54	\$ 55.0	19
Commercial Fisheries	Herring	\$126.9	16	\$ 35.0	12
	Groundfish	\$164.1	21	\$115.0	38
	Shellfish	\$ 68.5	9	\$ 90.0	31
	Total	\$769.8	100	\$295.0	100
British Columbia	Salmon	\$52.1	93	\$298.0	96

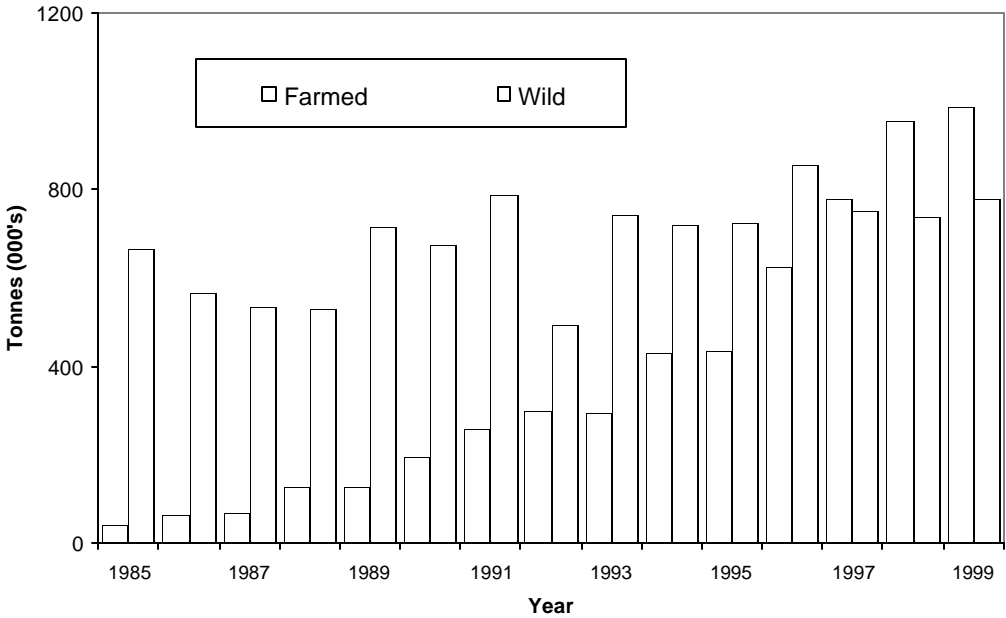
Aquaculture	Shellfish	\$ 3.7	7		\$ 8.6	4
	Total	\$55.8	100		\$306.6	100

**Table 3:** Changes in the number of licenses and the average landed value (\$ Canadian) per license for seine, gillnet, and troll vessels participating in the British Columbia commercial salmon fishery in 1995 and 2000 (Source: Fisheries and Oceans Canada).

Year	Number of Licenses			Average Landed Value per License		
	Seine	Gillnet + Troll	Total	Seine	Gillnet + Troll	All gear types
1995	536	3,860	4,396	\$124,709	\$30,298	\$41,809
2000	276	1,952	2,228	\$87,219	\$18,320	\$26,855
% change	-49 %	-49 %	-49 %	-30 %	-40 %	-36 %



**Figure 1:** Canadian salmon catch from 1920 through 2001. The top panel represent the total catch in thousands of tonnes. Catch for individual species is shown in the lower five panels.



Note: includes farmed sea trout production  
Sources: International Salmon Farmers Association, the University of Alaska, Bill Atkinson's News Report, and *Pacific Fishing*

**Figure 2:** All nation commercial Pacific salmon catch and world farm salmon production 1985-99.