

Economic Impact of the

Valdez Fisheries Development Association



VFDA



Prepared for
*Valdez Fisheries
Development
Association*

Prepared by



December 2013

Economic Impact of the Valdez Fisheries Development Association

Prepared for:
**Valdez Fisheries
Development Association**

Prepared by:



Juneau • Anchorage

December 2013

Table of Contents

- Executive Summary 1**
 - Commercial Harvest 1
 - Seafood Processing 2
 - Sport Fishery 3
 - Total Economic Impact of VFDA..... 3
 - Potential Impact of Increasing VFDA Pink Salmon Production 4
- Purpose and Methodology..... 5**
- Overview of VFDA Organization and Facilities..... 7**
 - Valdez Fisheries Development Association Organization 7
 - VFDA Facilities..... 7
- VFDA Salmon in Commercial Fisheries 9**
 - Overview of PWS Seine Fleet..... 9
 - Commercial Harvest of VFDA Salmon..... 10
 - Geographic Distribution of Commercial Harvest 13
- VFDA Salmon and the Seafood Processing Sector..... 14**
- VFDA Salmon in Sport Fisheries..... 16**
 - Harvest of VFDA Salmon in Sport Fisheries 17
 - Charter Fleet Harvest of VFDA Salmon 19
 - Valdez Salmon Derbies..... 20
- State and Local Tax Revenues Generated by VFDA 21**
- Employment and Spending by VFDA 22**
- Economic Impact of VFDA..... 23**
 - Economic Impact of Harvesting VFDA Salmon in Commercial Fisheries 23
 - Economic Impact from Processing VFDA Salmon 24
 - Economic Impact of VFDA Salmon Caught in Sport Fisheries 25
 - Economic Impact of VFDA Business Operations..... 26
 - Summary of VFDA Economic Impacts..... 26
- Projected Impact of Increasing VFDA Pink Salmon Production 28**
 - Key Assumptions about Increasing VFDA Pink Salmon Production..... 28
 - Estimating the Increase in Returning Adult Pink Salmon..... 29
 - Value of Additional VFDA Pink Salmon Production 30
 - Potential Economic Impact of Additional Pink Salmon Production..... 31
- VFDA Hatchery Salmon and Wild Stock Returns..... 32**
- Salmon Market Summary..... 34**
 - General Trends in Salmon Market Impacting Pink Salmon 34
 - Production and Price Trends for Pink Salmon..... 35
 - Salmon Roe Market Summary 36
 - Smoked Salmon Market Summary 37
- Appendices..... 38**
 - Historical VFDA Pink Salmon Production 38
 - Historical VFDA Coho Salmon Production 39

Executive Summary

This study analyzes the impact of the Valdez Fisheries Development Association (VFDA) on Alaska's economy, its commercial seafood industry, and the regional sport fishing industry. It also examines the potential economic impact of additional VFDA pink salmon production and summarizes market trends for pink salmon as well as smoked salmon products. The analysis generally focuses on the recent five-year study period from 2008 to 2012, as data for 2013 is not yet available.

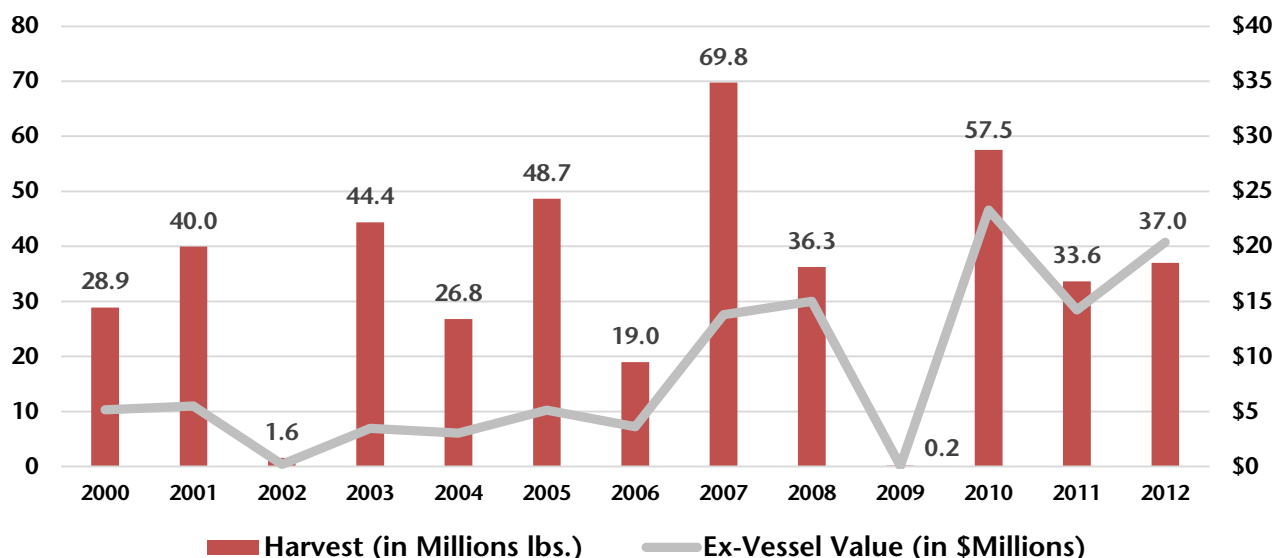
VFDA is a private, nonprofit salmon hatchery operation based in Valdez whose mission is 'raising, propagating, and marketing fish and fish products, and developing renewable fisheries for the benefit of sports fishermen, commercial fishermen, fish processors, tourists, and all businesses dependent upon the fishing industry in Alaska.' Key findings from the analysis of VFDA's economic impacts are presented in this section.

Commercial Harvest

VFDA salmon are caught by commercial fishermen in the Prince William Sound (PWS) seine fishery. Pink salmon account for 97 percent of VFDA's contribution to commercial fisheries, although in most years seiners also harvest coho late in the season after the sport fishing season has run its course (provided broodstock needs have been met and there are enough fish for a commercial opening).

- VFDA has contributed an estimated 444 million pounds of salmon to the PWS seine fishery worth a total of \$113 million in ex-vessel value since 2000.
- Since 2000, the most valuable contributions VFDA made to the commercial fishing sector came in the three most recent seasons for which data was available (2010-2012).

**VFDA Contribution to Common Property Fisheries,
Harvest Volume and Ex-Vessel Value, 2000-2012**



Source: McDowell Group estimates based on ADFG and VFDA data.

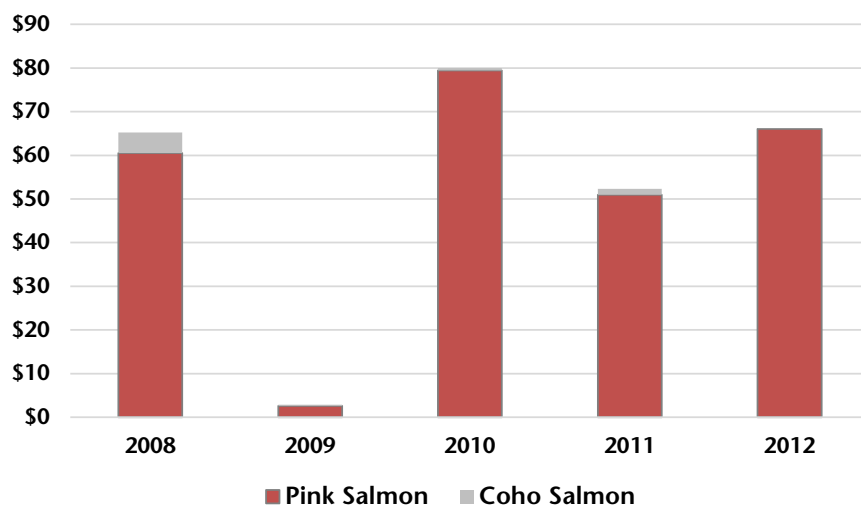
- PWS seiners grossed an annual average of \$100,800 per permit catching VFDA salmon during the 2010-2012 seasons.
- Between 2000 and 2012, VFDA salmon accounted for 30 percent of PWS seiners' gross earnings.
- VFDA salmon benefit almost all of the PWS seine fleet to some degree each year. Between 2008 and 2012, the PWS seine fleet averaged about 840 workers per year. Based on the value of VFDA salmon caught versus total gross earnings, it is estimated that VFDA salmon created the basis for 241 commercial fishing jobs per year between 2008 and 2012 (on average).
- VFDA salmon was particularly important to fleet in 2012. The PWS seine fleet expanded by 22 percent to 225 boats in 2012 and VFDA salmon accounted for 43 percent of their total gross earnings – providing the basis for 454 commercial fishing jobs in 2012.
- Pink salmon runs failed to materialize in 2002 and 2009, despite a steady release of juvenile pink salmon the prior year. VFDA managers believe these poor runs were related to ocean conditions.

Seafood Processing

VFDA salmon caught in the common property seine fishery and those caught in cost recovery efforts benefit PWS processors.

- Since 2000, PWS processors have grossed an estimated \$524 million by processing VFDA salmon, including \$378 million after the cost of buying fish. The 2010 season was particularly valuable when the first wholesale value¹ of VFDA salmon was worth \$80 million.
- Processing VFDA salmon created jobs for 270 workers per year during the five-year study period.

**First Wholesale Value of VFDA Salmon,
Pink and Coho Salmon, in \$Millions, 2008–2012**



Note: Includes common property and cost recovery harvests.
Source: McDowell Group estimates based on VFDA and ADFG data.

¹ First wholesale value represents the value of the product when it is first sold outside of a processor's network; it includes the ex-vessel value paid to fishermen.

- During the recent five-year study period, it is estimated that VFDA salmon accounted for 19 percent of all seafood processed in Prince William Sound (in terms of wholesale value).

Sport Fishery

VFDA produces coho for sport fishers in the Valdez area. Pink salmon, produced primarily for commercial use are also enjoyed by sport fishers. Angler spending on charters, supplies, lodging, and other expenses creates significant local economic benefits.

- VFDA salmon caught in sport fisheries resulted in \$6.6 million in annual economic output during the study period, and was the basis for 85 jobs and \$2.6 million in labor income each year between 2008 and 2012.
- VFDA accounts for an estimated 75 percent of all coho and over 90 percent of all pink salmon caught in Valdez Arm. The hatchery contributed an average of 56,900 coho and 13,400 pink salmon per year to Valdez-area sport fisheries between 2008 and 2012.
- An estimated average of 17,500 anglers targeted salmon in Valdez sport fisheries each year between 2008 and 2012. Based on license sales and data from the Alaska Visitors Statistics Program (AVSP), it is estimated that 15,500 of these anglers were not local residents, and over half (9,700) were non-resident visitors from out-of-state. Vacationing non-resident visitors are especially important because they bring new money from outside the Alaska economy into Alaskan communities.
- VFDA contributed an estimated 6,900 coho to the charter fleet in 2011. A total of 38 charter boats served 5,617 clients out of Valdez that year. It is estimated that VFDA salmon accounted for an average of \$1.7 million in revenue to charter operators per year during the study period.
- Valdez hosts several salmon derbies. VFDA salmon are crucial to providing enough fish to make these derbies viable and popular. The Valdez Silver Salmon Derby sold 4,966 tickets in 2011, while the one-day events such as the Women's Silver Salmon Derby and the Kids' Pink Salmon Derby attracted 700 and 300 participants, respectively, in 2013.
- Hatchery-bred salmon also benefit local anglers and has made sport fishing a popular pastime during Valdez's summer months (with the added benefit of filling local freezers with salmon fillets). An estimated 61 percent of all adult Valdez residents purchased sport fishing licenses in 2011.

Total Economic Impact of VFDA

The impact of VFDA varies from year to year, depending on how many salmon return, as well as other factors. Nevertheless, the overall economic impact of commercial harvest and processing of VFDA salmon, sport harvest of VFDA salmon, and of VFDA business operations is substantial.

- VFDA operations and the salmon it produces directly created jobs for 623 workers who earned an estimated \$14.7 million per year during the 2008 to 2012 study period. The multiplier effects of these jobs and income included an additional 201 workers and \$6.8 million in labor income.

- In total, VFDA operations and VFDA salmon created jobs for 824 workers who earned an annual average of \$21.5 million in labor income, including direct, indirect, and induced effects.
- Converting the number of workers into an average monthly figure translates to the equivalent of 368 year-round jobs created by VFDA.
- VFDA generated an average of \$80.1 million in economic output per year within Alaska’s economy during the five-year study period.
- For each hatchery employee, it is estimated that VFDA created jobs for another 16 Alaska workers each year.

Economic Impact of VFDA on Alaska’s Economy, Annual Averages, 2008–2012

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
Impact of VFDA Business Operations			
Number of Workers	47	20	67
Labor Income (in \$Millions)	\$1.6	\$0.8	\$2.4
Output (in \$Millions)	\$3.8	\$2.0	\$5.8
Impact of VFDA Salmon on Commercial Fishing and Seafood Processing Sectors			
Number of Workers	511	161	672
Labor Income (in \$Millions)	\$11.1	\$5.4	\$16.5
Output (in \$Millions)	\$50.2	\$17.5	\$67.7
Impact of VFDA Salmon Caught in Sport Fisheries			
Number of Workers	65	20	85
Labor Income (in \$Millions)	\$2.0	\$0.6	\$2.6
Output (in \$Millions)	\$4.6	\$2.0	\$6.6
Total Economic Impact of VFDA			
Average Monthly Employment	224	144	368
Number of Workers	623	201	824
Labor Income (in \$Millions)	\$14.7	\$6.8	\$21.5
Output (in \$Millions)	\$58.6	\$21.5	\$80.1

Source: McDowell Group estimates using IMPLAN, ADFG, DOLWD, VFDA data, and authors’ calculations regarding VFDA impacts on sport fishing.

Potential Impact of Increasing VFDA Pink Salmon Production

VFDA’s Board of Directors is considering increasing pink salmon production by 70 million eggs, from its current capacity of 230 million eggs. By way of comparison and assuming similar survival rates and prices, this additional production could have increased the ex-vessel value of VFDA salmon caught in commercial fisheries by \$5.2 million per year from 2008 to 2012. That represents an additional \$29,600 per seine permit fished per year. Such an increase could have created an additional 200 jobs.

Purpose and Methodology

Purpose and Scope

Valdez Fisheries Development Association (VFDA) contracted with McDowell Group, an Alaska research and consulting firm, to analyze the economic impacts of its salmon enhancement program. This report presents volume and value data associated with VFDA-produced salmon harvested between 2000 and 2012, as well as economic impacts associated with VFDA production and operations during the 2008 to 2012 time period (sometimes referred to as the study period in this document). The analysis is presented in the following five sections:

1. **Commercial Harvest** - The economic value of commercially caught VFDA salmon is measured using the ex-vessel income earned by Prince William Sound fishermen (primarily purse seiners). Ex-vessel income represents the gross value paid to fishermen for their catch.
2. **Salmon Processing** - The economic benefits from processing VFDA salmon are presented in terms of first wholesale value. First wholesale value represents the value paid to the primary processor by the initial buyer outside their affiliate network.
3. **Sport and Recreational Harvest** - Estimates of the economic contributions of VFDA salmon to the Valdez area sport fishery are discussed, including economic activity resulting from harvests facilitated by the charter industry and those resulting from local and visiting recreational anglers.
4. **VFDA Operations** - Economic and employment information related to VFDA operations and administration are presented.
5. **Economic Impacts** - The overall economic benefits to Alaska resulting from the commercial harvest, processing and sport harvest of VFDA salmon, and VFDA operations, are estimated in this section. Additional sections profiling local and regional tax benefits generated via the Salmon Enhancement Tax and the Fisheries Business Tax are also included.

For purposes of this report, Prince William Sound is defined as Area E when referencing commercial fisheries. The five-year study period covers years 2008 to 2012.

This report analyzes VFDA's impact on the commercial fishing, salmon processing, and sport fishing sectors, as well as the regional economy overall. This report also investigates projected impact of increasing VFDA production. Finally, this document contains a discussion of current market conditions for pink salmon.

Methodology

Data presented in this report comes from a variety of sources, including VFDA, the Alaska Department of Fish and Game (ADFG), Alaska Commercial Fisheries Entry Commission (CFEC), Alaska Department of Labor and Workforce Development (ADOLWD) and the Alaska Department of Revenue (ADOR). Additionally, McDowell Group conducted interviews with Valdez-area charter operators and other businesses that provide goods and services to recreational anglers.

Data on the number of VFDA salmon harvested in commercial fisheries comes from annual statewide salmon enhancement reports published by ADFG. The number of VFDA salmon harvested is used as a basis for harvest volume estimates. Annual average per-fish weights by species for Prince William Sound are combined with the harvest counts to estimate the total harvest volume of VFDA salmon. Average per-fish weights are based on numbers published in the ADFG Annual Management Report for the salmon fisheries in Prince William Sound. Average prices were then applied to the estimated harvest volume of VFDA salmon caught in Southcentral purse seine and cost recovery fisheries.

The Commercial Fisheries Entry Commission (CFEC) provides information on the city of residence and earnings of permit holders in Prince William Sound's (Area E) salmon fisheries. VFDA production is compared to data for the total Area E harvest. Estimates are made as to the percentage of the total value of Area E salmon that are attributable to VFDA production. Because VFDA fish are primarily harvested by the seine fleet, only seine (permit S01E) data are considered.

VFDA impacts on the processing sector are calculated based on the total first wholesale value of VFDA salmon versus the first wholesale value of all species processed in the Cordova-Valdez Census Area. Impacts of VFDA salmon on the processing sector includes fish caught in common property fisheries and those harvested in cost recovery fisheries. First wholesale values are calculated using annual average prices and average recovery rates per product based on statewide ADFG data from the (Commercial Operators Annual Report) and ADOR data. Processing employment data comes from DOLWD.

Estimates of VFDA salmon taken in sport fisheries are drawn from annual statewide enhancement reports published by ADFG. Economic impacts related to charter fishing are based on a survey of charter operators and logbook data collected by ADFG. Impacts associated with recreational fishing are based on data from the Alaska Visitor Statistics Program (AVSP), surveys of local businesses, and authors' estimates. The amount of value and impacts attributed to VFDA is based on the percentage of VFDA salmon caught in sport fisheries and estimated impacts associated with all sport fishing for salmon.

McDowell Group used primary data from public sources and the Alaska IMPLAN model to estimate secondary economic impacts related to VFDA production and operations. Inputs to this model were drawn from the sources described above. Though IMPLAN is generally a robust economic modeling tool, it does require modification for analyses of some Alaska industries, including commercial fishing and seafood processing. As such, the model was modified to provide a more accurate estimate of actual indirect and induced effects.

Overview of VFDA Organization and Facilities

Valdez Fisheries Development Association Organization

The Valdez Fisheries Development Association is a non-profit organization in Valdez focused on fisheries and fisheries-related development opportunities in the Eastern District of Prince William Sound. Its mission is “raising, propagating, and marketing fish and fish products, and developing renewable fisheries for the benefit of sports fishermen, commercial fishermen, fish processors, tourists, and all businesses dependent upon the fishing industry in Alaska.” The organization was formed by a group of commercial fishermen in 1978 and the first salmon fry were released in 1982 from the Solomon Gulch Hatchery. Today VFDA has an eight-member board of directors, consisting of four active seiners, two retired commercial fishermen, one sport harvester, and one tourism business owner.

VFDA is an independent hatchery, meaning it does not receive revenue from the salmon enhancement tax levied by the State of Alaska. VFDA’s funding comes primarily from cost-recovery harvests from its pink and coho salmon hatchery production. The organization also receives funding from contract sources, and program revenues from the City of Valdez, which are used to offset expenses in the coho program. In 2000, VFDA began performing value-added processing on a portion of its cost-recovery harvest, thereby increasing the value of the fish to the organization. That increase in value has allowed VFDA to decrease the number of fish harvested in its cost recovery fishery, leaving more fish for common property users.

ADFG has permitted VFDA to collect and incubate 230 million pink salmon eggs and 2 million coho salmon eggs. At one point the facility was also permitted to incubate 18 million chum salmon eggs but VFDA discontinued its chum salmon program in 1994. The organization continues to produce pink and coho salmon. VFDA salmon are harvested in commercial and sport fisheries, with the majority of the harvest of occurring in the vicinity of Valdez Arm.

In 2012, VFDA provided a peak of 41 jobs in August, and an average of 36 workers during the third-quarter, which includes the height of the salmon season. These employees included processing workers at the value-adding facility (see below), as well as hatchery technical and biological employees, and administrative staff. VFDA typically employs 30 to 55 seasonal workers and 12 to 16 full-time employees.

The total VFDA budget for fiscal year 2012, which ended May 31, 2012, was \$3.6 million. Much of the organizational budget was spent within Alaska, particularly on businesses located in Valdez and Anchorage.

VFDA Facilities

VFDA facilities consist of the Solomon Gulch Hatchery and the VFDA community processing plant. The plant location also includes a modular cold storage facility and VFDA’s administrative offices.

Solomon Gulch Hatchery

The Solomon Gulch Hatchery was completed in 1982 and is located on Dayville Road south of Valdez, Alaska. Pink salmon and coho salmon are bred and reared at the facility. Over the past 10 years, VFDA has released an average of 217 million pink fry and 1.7 million coho smolt per year. Returns of pink and coho salmon during that time averaged 13 million and 160,000 fish per year, respectively. In 2013, releases of pink salmon fry from VFDA's Solomon Gulch Hatchery topped 5 billion fry (cumulative, since 1988). VFDA has also released a total of 38.5 million coho smolt for the region's sport fishery.

Salmon hatcheries require tremendous amounts of clean freshwater. VFDA receives discharge water from the nearby Solomon Gulch hydroelectric plant owned by the Copper Valley Electric Association (CVEA). VFDA and CVEA have had a long and cooperative relationship dating back to the hatcheries inception. Due to the steep terrain, salmon could not access the upper reaches of Solomon Creek and so the dam did not displace any wild salmon stocks. Ironically, the Solomon Gulch hydroelectric dam actually helps the hatchery create wild salmon.

VFDA Fisheries Business Incubator

VFDA manages a modern, HAACP approved processing plant capable of producing, fresh, frozen, smoked, and cured salmon products. The facility was built in 2003 with funding from VFDA and an Economic Development Administration grant as part of VFDA's Fisheries Business Incubator Investment Program. The business incubator concept provides opportunity for direct marketers to begin operations without bearing the entire burden of overhead and capital costs. The plant's processing equipment includes heading and gutting (H&G) equipment, fillet machines, a smoker, blast freezer tunnels, packaging equipment, and other items.

VFDA is the primary user of the facility, processing cost recovery resources for its Solomon Falls line of salmon products. VFDA has developed processing techniques and markets for numerous value-added salmon products, including flavored smoked coho fillets, *ikura*-style salmon caviar from both pink and coho roe, and smoked pink salmon sides which won the 2009 Symphony of Seafood award for best smoked product. Two direct marketers also use the facility to glaze and freeze spot prawns.

VFDA Cold Storage Facility

In 2012, VFDA opened a new modular cold storage facility that will eventually be capable of storing 300,000 pounds of product at temperatures down to 10 degrees below zero. Space in the cold storage facility is leased by local businesses. It is expected to increase opportunities for local fishermen to do direct marketing and allow local businesses to achieve greater economies of scale when purchasing perishable products. The facility is used by local seafood processors to store frozen product, local sport fish custom processors, a marine hardware store to hold frozen bait, and for Fedex overflow of perishable packages.

VFDA Administrative Offices

VFDA's administrative offices are located at 1815 Mineral Creek Loop Road in Valdez, Alaska, in the same facility as the processing plant. The offices house full-time VFDA employees.

VFDA Salmon in Commercial Fisheries

VFDA contributes a significant number of pink and coho salmon to common property fisheries in the Prince William Sound area. Pink salmon taken by PWS seiners account for the majority of VFDA salmon harvested in commercial fisheries. Almost all pink salmon caught in Prince William Sound are hatchery-bred fish. Both VFDA and Prince William Sound Aquaculture Corporation (PWSAC) produce pink salmon smolt to support regional fisheries.

Overview of PWS Seine Fleet

The PWS seine fleet primarily targets hatchery-bred pink and chum salmon. The regions two hatchery operators (VFDA and PWSAC) provide a foundation for the fishery and all the jobs associated with it. Each seiner typically employs a skipper and three to four crew members. PWS seine boats, like all seine boats in Alaska, are limited to 58 feet.

Aside from sport anglers, VFDA salmon primarily benefit the PWS seine fleet. The size of the fleet has grown substantially in recent years as more permits are being fished. In 2008, just 141 PWS seiners participated in the fishery out of 267 total permits held. By 2012, the number of permits fished had increased 59 percent to 224 permits fished.



*Crewmen stacking a seine net near Valdez
(Photo Credit: Garrett Evridge)*

PWS Seine Fleet, Common Property Fishery, 2008–2012

	2008	2009	2010	2011	2012*
Permits Fished	141	154	174	183	224
Harvest (Millions of lbs.)	131.3	35.5	224.8	171.1	95.5
Ex-Vessel Value (in \$Millions)	\$52.0	\$10.5	\$82.2	\$37.7	\$47.9
Ex-Vessel Value/permit	\$369,135	\$67,825	\$472,488	\$206,031	\$213,931
Average Permit Price	\$70,200	\$75,300	\$100,500	\$140,000	\$168,700
Pct. Ex-Vessel Value from VFDA	26%	<1%	25%	41%	38%
Average VFDA Contribution per PWS Seine Permit Fished	\$106,400	\$350	\$133,800	\$77,700	\$90,900

Notes: 2012 figures are preliminary.

Source: ADFG and VFDA, 2013.

The PWS seine fleet caught 568 million pounds of salmon in common property fisheries worth \$230 million from 2008 to 2012. During this five-year period, the average PWS seine boat grossed \$265,882 per year. Harvest volume and total ex-vessel value in the PWS seine fishery fluctuates significantly from year to year. Due to rising prices for pink and chum salmon, total earnings have increased significantly since 2005.

As participation rises, so too does the value of PWS seine permits. Entry to the fishery cost \$70,200 in 2008, but the going prices for permits reached \$168,700 in 2012 as a result of increasing demand from fishermen wanting to participate in the PWS seine fishery. A proverbial double-edged sword, rising permit values increase the cost to enter the fishery but add value to the balance sheets of existing permit holders.

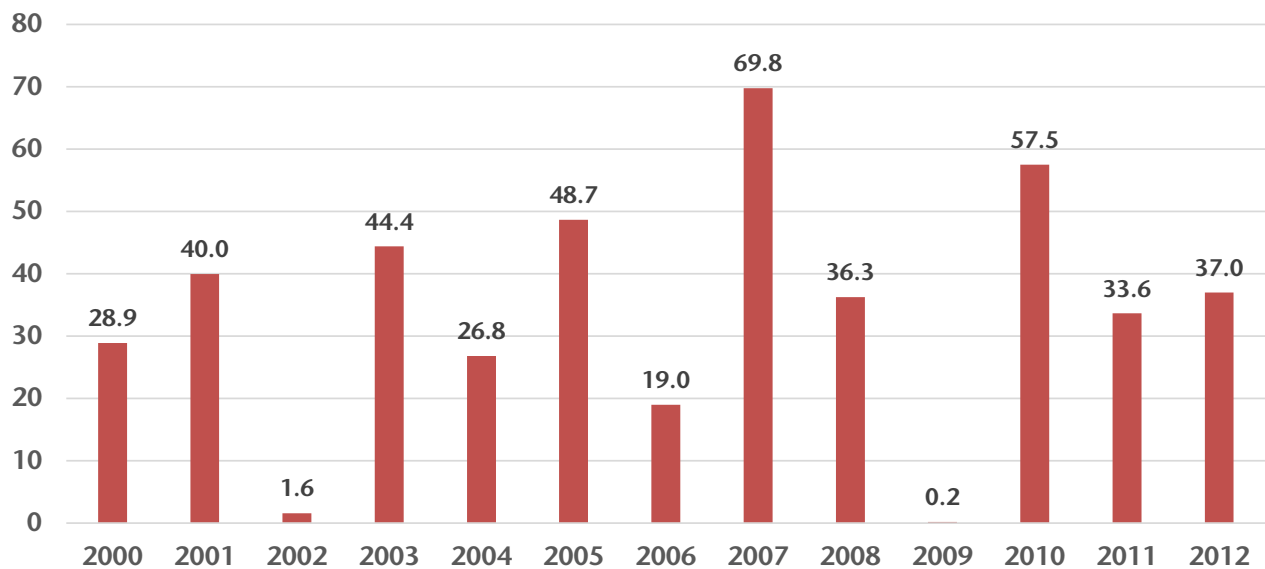
Commercial Harvest of VFDA Salmon

Between 2000 and 2012, VFDA contributed to common property fisheries almost 125 million salmon worth an ex-vessel value of more than \$112 million. Most of the value contributed to commercial fisheries comes from pink salmon. VFDA salmon smolt production has been stable for many years, but due to increasing prices for pink salmon, VFDA contributions to the PWS seine fishery have increased in recent years.

Harvest Volume of VFDA Salmon

VFDA contributed an annual average of 32.9 million pounds and a total of 164.6 million pounds of salmon to common property fisheries during the five-year study period. Since 2000, VFDA contributed a total of 443.6 million pounds of salmon to the PWS seine fishery. Based on preliminary data, the 2012 season ranks as the sixth-largest contribution made by VFDA to common property salmon fisheries since 2000, in terms of harvest volume.

**Total Pounds of VFDA Salmon Harvested
in Common Property PWS Seine Fishery, in Millions Lbs., 2000-2012**

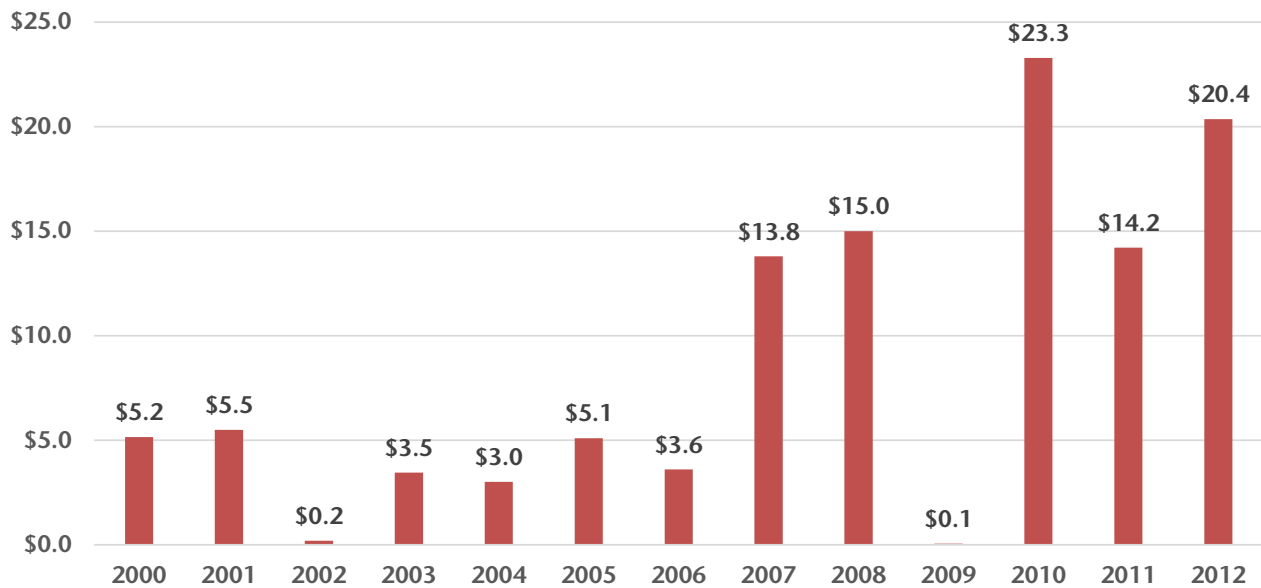


Note: 2012 data is preliminary.
Source: VFDA, 2013.

Ex-Vessel Value of VFDA Salmon

With increasing prices for pink salmon, the value of VFDA salmon caught in commercial fisheries has increased in recent years despite 2011 and 2012 being relatively average years in terms of volume. From 2008 to 2012, VFDA salmon caught in common property fisheries were valued at an estimated \$72.9 million, averaging \$14.6 million per year.

**Ex-Vessel Value of VFDA Salmon Harvested
in Common Property PWS Seine Fishery, in \$Millions, 2000-2012**



Note: 2012 data is preliminary.

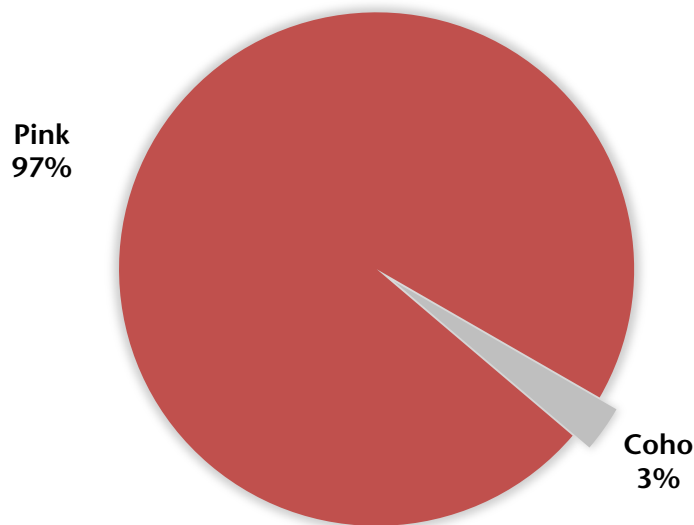
Source: McDowell Group estimates based on ADFG and VFDA data.

PWS seiners earned an average of \$81,900 per year (per permit) catching VFDA salmon in common property fisheries between 2008 and 2012. The average benefit per PWS seine permit fished is especially significant, given the annual amount of salmon enhancement tax collected on VFDA salmon was less than \$1,650 per permit fished during that period. As a private, non-profit hatchery that is not designated as a regional aquaculture association, enhancement taxes on VFDA salmon (and other PWS salmon) actually go to the Prince William Sound Aquaculture Corporation.

Pink salmon account for 97 percent of the total ex-vessel value of VFDA salmon. PWS seiners caught \$71.1 million worth of VFDA pink salmon and \$1.9 million worth of VFDA coho salmon during the five-year study period.

See chart on next page.

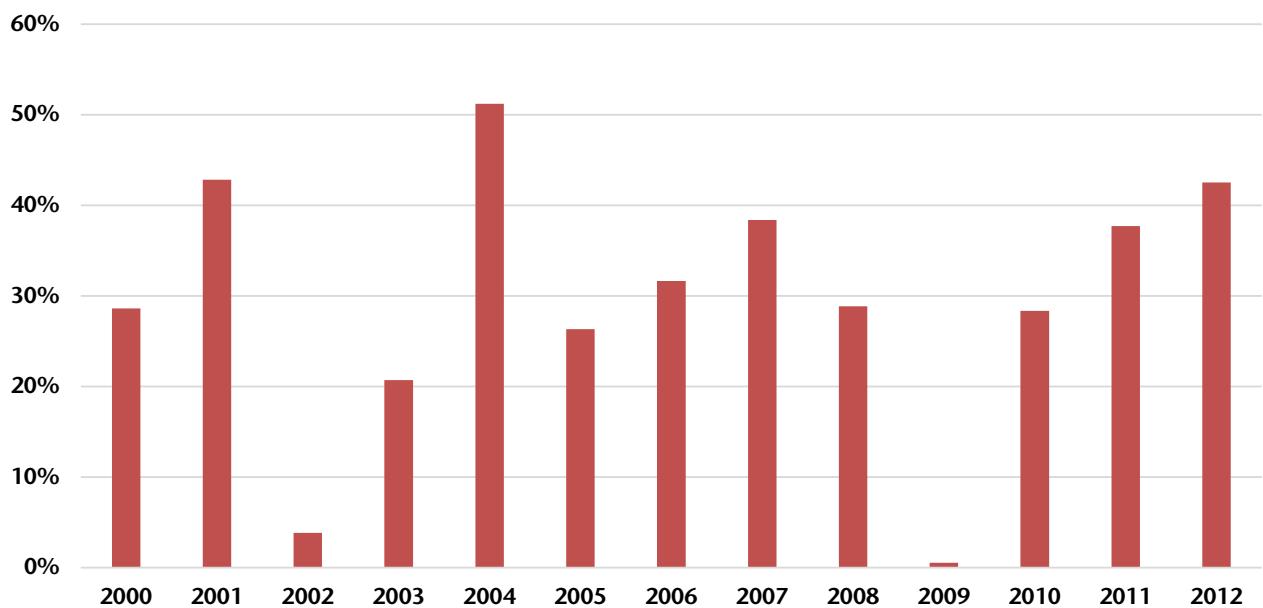
Ex-Vessel Value of VFDA Salmon Harvested in Common Property Fisheries, by Species, 2008-2012



Source: VFDA, 2013.

Generally speaking, PWS seine fishermen receive 20 to 40 percent of their seining income from catching VFDA salmon. Between 2000 and 2012, VFDA accounted for 30 percent of total gross earnings in the PWS seine fishery. In 2011, VFDA salmon accounted for 38 percent of total gross earnings in the PWS seine fishery as the survival rate for PWSAC pink salmon declined. Conversely, PWSAC salmon provided nearly all of the common property resource (of pink salmon) in 2009 when survival rates for VFDA salmon declined.

Ex-Vessel Value of VFDA Salmon as a Percentage of the Common Property PWS Seine Fishery Salmon Harvest, 2000-2012



Note: 2012 data is preliminary.

Source: McDowell Group estimates based on ADFG and VFDA data.

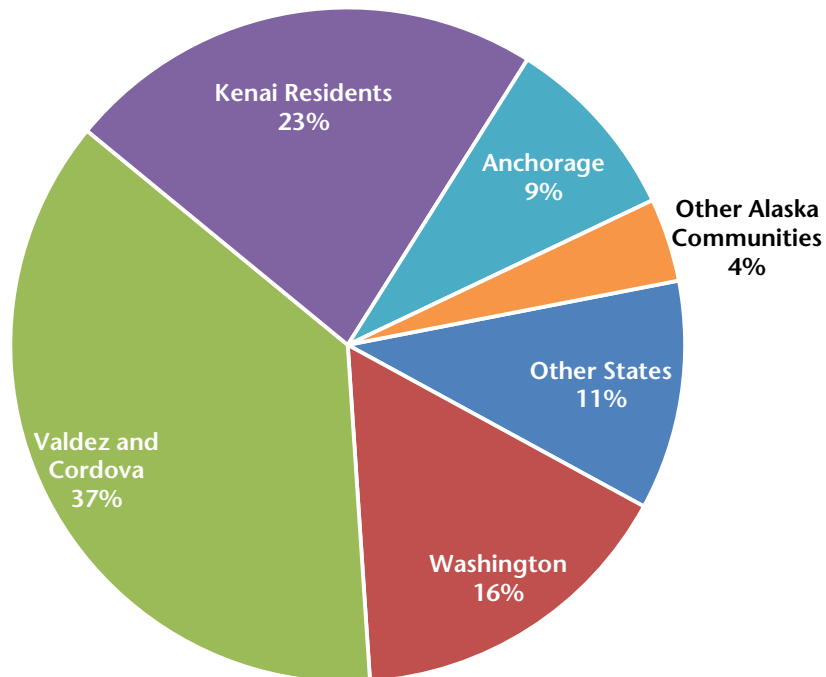
Geographic Distribution of Commercial Harvest

As noted above, between 2008 and 2012, the VFDA salmon harvest was worth \$72.9 million; an average of \$14.6 million per year. Alaska residents accounted for seventy four percent (\$54.0 million) of the earnings with the remaining 26 percent (\$9.0 million) going to residents of other states. Washington residents earned the most (\$11.7 million or 16 percent) of any other Lower 48 state. Within Alaska, sixty percent of the harvest value went to residents of Valdez and Cordova (\$27.0 million or 37 percent) and the Kenai Peninsula (\$16.8 million or 23 percent). Residents of Anchorage earned 9 percent (\$6.6 million) of the total. Finally, residents of Kodiak, Mat-Su, Sitka, and the combined Wrangell-Petersburg area earned \$2.9 million (4 percent).



*Seine Boats Hot-Berthing in Valdez Harbor
(Photo credit: Garrett Evridge)*

Average Ex-Vessel Value of VFDA Salmon Harvested in Common Property Fisheries in PWS, by Residency of Permit Holder, 2008-2012



Source: McDowell Group estimates, based on CFEC, ADFG, and VFDA Data.

VFDA Salmon and the Seafood Processing Sector

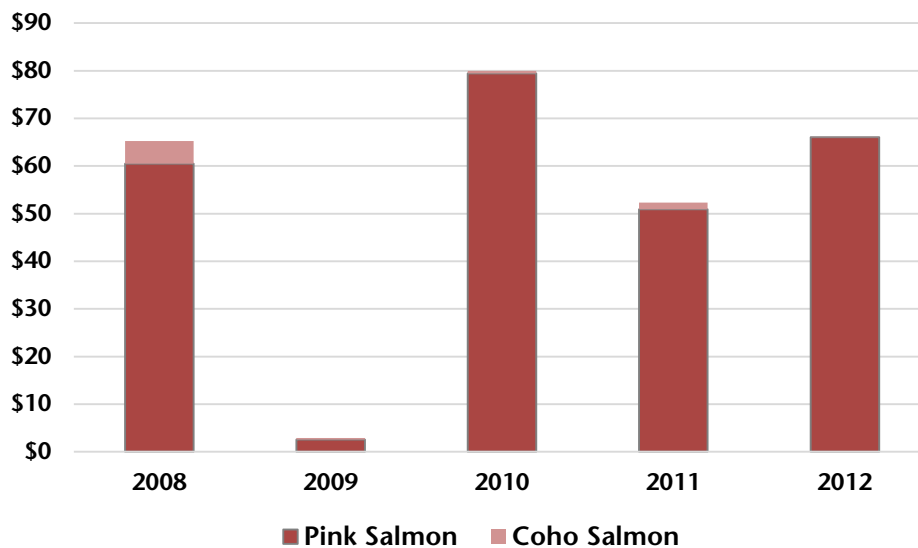
VFDA benefits regional processors by providing a relatively stable supply of pink salmon. The vast majority of pink and chum salmon caught in PWS begin their life in a hatchery. Hatchery-raised pink and chum salmon are crucial for PWS processors because they represent significant additional supply to run through plants, in addition to wild stock salmon and other species such as halibut, black cod, and pacific cod.

PWS pink salmon accounted for 40 percent of all pink salmon caught in Alaska during the five year study period (2008-2012). These fish are crucial to Alaska processors' canning, frozen, and roe production operations.

Between 2008 and 2012, the cumulative first wholesale value of VFDA salmon is estimated to be \$266 million (an average of over \$53 million per year). The 2010 season was particularly valuable, when the first wholesale value of VFDA salmon reached \$80 million.

Less the cost of fish, processors earned a total gross margin of \$178 million on VFDA fish during the five-year study period (an annual average of \$35.6 million). Gross margin, in this report, refers to wholesale revenue less payments (to fishermen and hatcheries) for fish. This metric should not be confused with net profit, because processors incur many other costs in addition to the ex-vessel cost of fish.

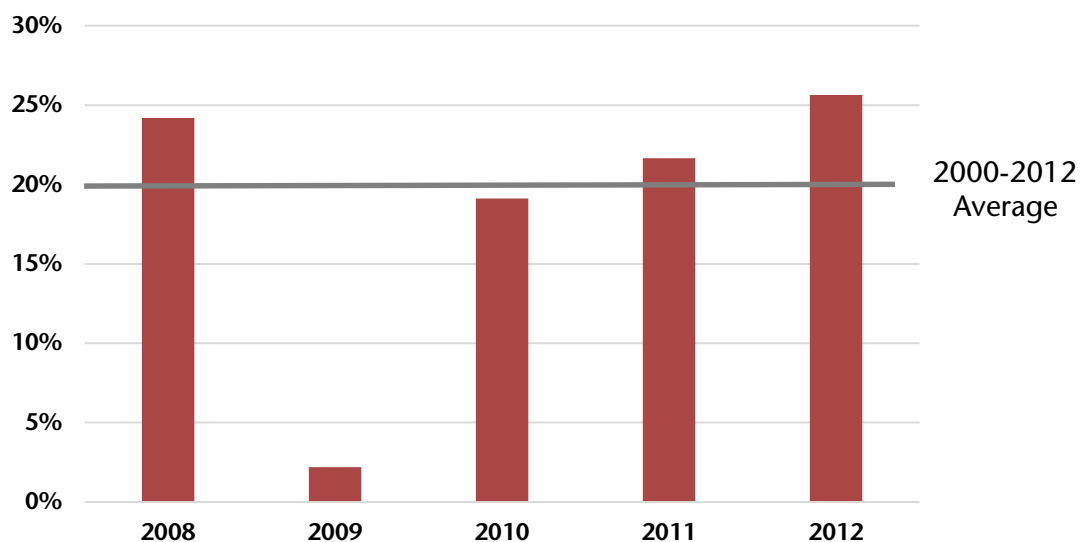
**First Wholesale Value of VFDA Salmon,
Pink and Coho Salmon, in \$Millions, 2008–2012**



Note: Includes common property and cost recovery harvests.
Source: McDowell Group estimates based on VFDA and ADFG data.

Salmon is by far the biggest revenue generator for PWS processors and VFDA is a key source of PWS salmon. Between 2008 and 2012, it is estimated that VFDA salmon accounted for 19 percent of total first wholesale revenue of all seafood processed in Prince William Sound.

VFDA Salmon as Percentage of Total PWS First Wholesale Value, 2008–2012



Note: Includes common property and cost recovery harvests.
Source: McDowell Group estimates based on VFDA and ADFG data.

Seafood Processing in Prince William Sound

Seward, Valdez, and Cordova have 10 private seafood processing facilities run by the following companies: Copper River Seafoods, Great Pacific Seafoods, Ocean Beauty Seafoods, Peter Pan Seafoods, Prime Select Seafoods, Silver Bay Seafoods, Trident Seafoods, and Wild by Nature LLC. Additionally, VFDA processes cost recovery salmon producing frozen salmon portions and the Solomon Falls brand of smoked salmon.

Shoreside processing plants in the Prince William Sound region (from Whittier to Cordova) employ roughly 1,600 workers and generate \$19 million in labor income. Most processing jobs are seasonal, coinciding with the summer salmon season. Because of the large number of seasonal workers needed, most processing jobs are filled by nonresident workers. However, local residents that do work at PWS shoreside plants tend to occupy higher-paying jobs and work in year-round positions.



Peter Pan Seafood Plant in Valdez, AK

Seafood processing plants also contribute to the property tax base in Prince William Sound communities. Seafood processing companies own \$3.8 million worth of property in Valdez alone (that is subject to property tax).

VFDA Salmon in Sport Fisheries

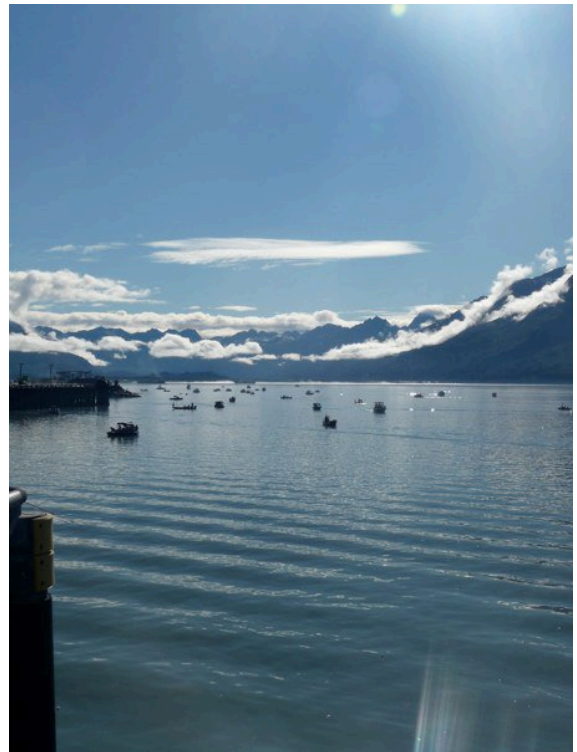
VFDA salmon are economically important to the Valdez area for reasons other than commercial harvest and processing. The annual return of salmon is accompanied by thousands of visiting sport anglers who spend time and money in the community. Non-resident anglers often purchase overnight accommodations in the community. These non-resident visitors may rent a boat or hire a local charter fishing company. The charter companies source many supplies locally, and charter owners and workers contribute to the Valdez economy by spending a portion of their earnings in the community. In addition, resident anglers spend money on fishing gear, fuel, supplies, and fishing related services such as boat maintenance and repair.

Sport fishing activity in Valdez supports many seasonal and year-round businesses. These businesses include outfitters, charter companies, fishing gear retailers, and boat rental companies. They also include businesses that process, pack, and ship sport-caught fish. In addition to businesses that directly cater to sport fishing interests, non-resident anglers frequent local restaurants, gift shops, coffee shops, grocery stores, and gas stations.

During the summer of 2011, 57,000 non-Alaska resident visitors traveled to Valdez, according to the Alaska Visitors Statistics Program (AVSP).² AVSP indicates that 17 percent of Valdez's 57,000 nonresident summer visitors sport fished while visiting Valdez. Most (about three-quarters) of the 9,700 nonresident sport fishermen were unguided. About one-third purchased a guided fishing trip (this includes some fishermen who fished unguided and guided)

Including residents, other Alaska residents, and non-resident visitors, more than 17,000 sport anglers fished in the Valdez area during 2011, based on AVSP data and assumptions regarding sport fishing license sales. The vast majority of these anglers are not residents of Valdez.

Coho and pink salmon are primary targets for Valdez sport anglers. VFDA accounts for an estimated 75 percent of coho salmon and an even larger portion of pink salmon caught in Valdez waters.



² Alaska Visitor Statistics Program VI, Summer 2011, McDowell Group, Inc.. Data pertains only to visitors who do not reside in Alaska.

Harvest of VFDA Salmon in Sport Fisheries

Coho is the biggest draw for Valdez salmon sport anglers but the increasing volume of VFDA pink salmon has resulted in a popular shoreside fishery. In fact, Valdez is one of the only places in Alaska where residents and visitors alike target and retain pink salmon.

Harvest of VFDA Pink Salmon

VFDA pink salmon are a central component of the Southcentral pink harvest.³ On average over the past decade, the pink salmon fishery in the North Gulf Coast/Prince William Sound (NGC/PWS) region has accounted for approximately one-third of the total statewide annual pink salmon sport harvest. Within Southcentral Alaska, the NGC/PWS pink salmon sport harvest has averaged over three-quarters (78 percent) of the total Southcentral harvest over the last 10 years. In 2012, the NGC/PWS sport pink salmon harvest totaled 21,061 fish.⁴

Over the past ten years, two-thirds of the pinks harvested in NGC/PWS were harvested in Valdez Arm, mostly from the shoreline. An estimated 80 percent of pinks harvested in commercial fisheries in the Eastern District of Prince William Sound are VFDA pink salmon. Thus, it is assumed VFDA pinks comprise a similar percentage of the sport harvest in the district and that the percentage is likely higher than in Valdez Arm, totaling at least 90 percent.⁵ The 2012 saltwater sport pink salmon harvest in Valdez Arm totaled 12,044 fish, of which approximately 10,800 were estimated to be VFDA fish. Between 2008 and 2012, the Valdez Arm pink salmon sport harvest averaged 14,877 fish. Thus, the VFDA contribution to this harvest averaged approximately 13,400 pink salmon annually.

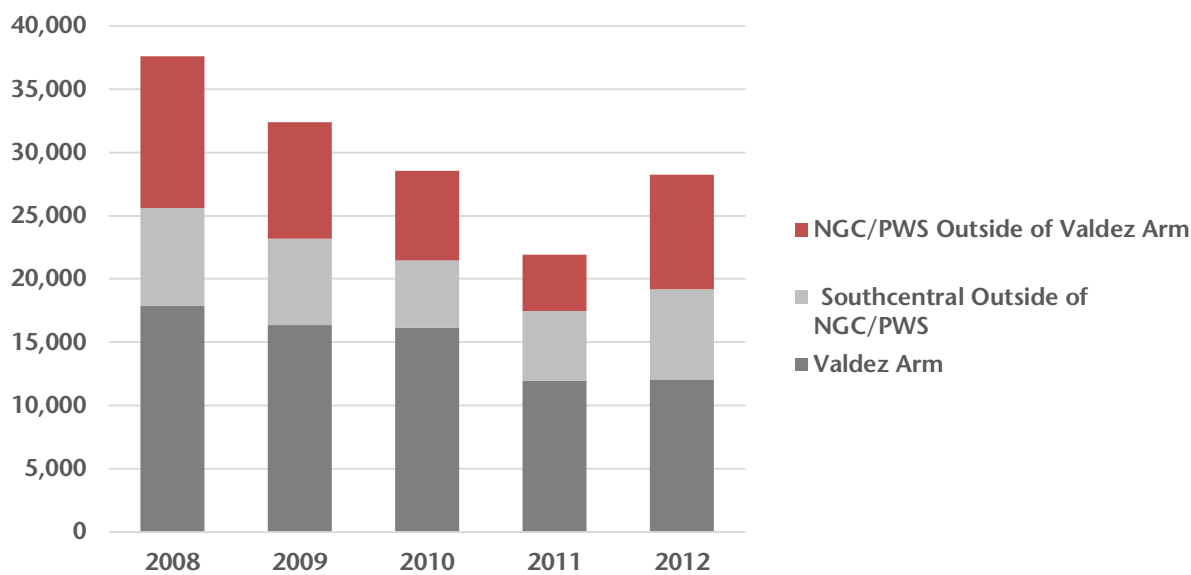
See chart of VFDA pink salmon caught in sport fisheries on following page.

³ Stopha, Mark, 2013. *An Evaluation of the Solomon Gulch Hatchery for Consistency with Statewide Policies and Prescribed Management Practices*. Regional Information Report No. 5J13-04. Alaska Department of Fish and Game, Division of Commercial Fisheries.

⁴ Saltwater only.

⁵ ADFG. Valdez Fisheries Development Association (VFDA) pink salmon contributions (number of fish) to commercial common property fisheries in the Eastern District of Prince William Sound. Contribution estimates estimated from recoveries of thermally marked otoliths.

Saltwater Sport Harvest of Pink Salmon in Southcentral Alaska, Numbers of Fish, 2008 - 2012



Source: ADFG.

Harvest of VFDA Coho Salmon

On average, the NGC/PWS area supports the largest coho sport harvest in Alaska. Over the ten-year period from 2003 through 2012, the NGC/PWS harvest averaged 38 percent of the entire statewide coho sport harvest.⁶ Within the NGC/PWS area, just over a quarter (28 percent) of sport-caught coho are harvested in Valdez Arm.

The 2012 sport harvest of 10,254 coho in Valdez Arm was well below the five-year average harvest of 40,614 fish.

Overall, an estimated average of 56,906 VFDA coho were harvested annually in the sport fishery⁷. VFDA coho are primarily caught in Valdez Arm, but are also harvested by saltwater anglers in other areas outside of the Valdez Arm.

An estimated 75 percent of coho salmon harvested for sport in Valdez Arm are hatchery fish.⁸

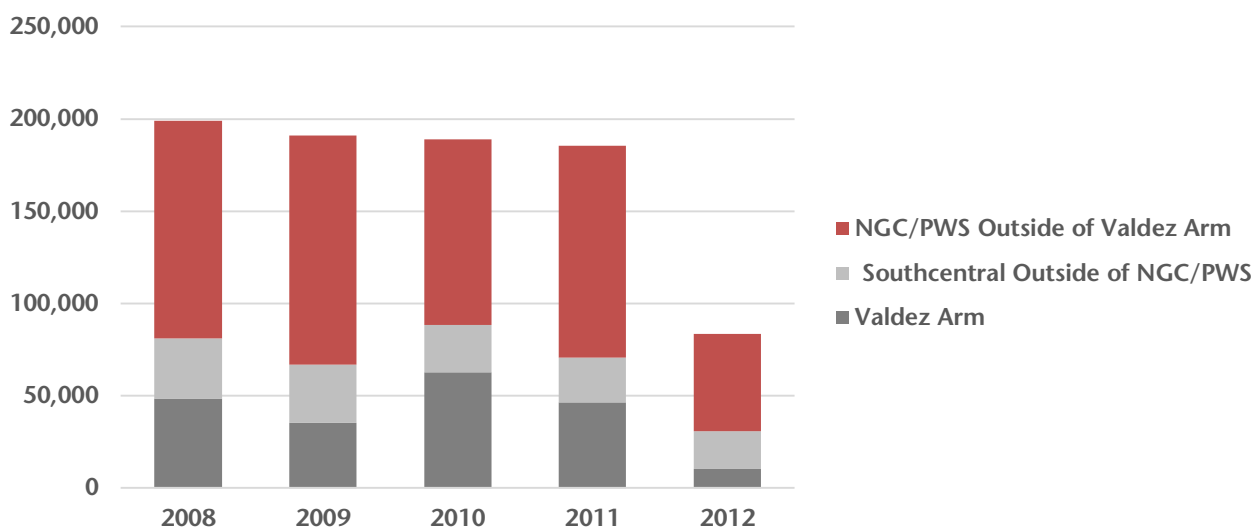
See chart of VFDA coho salmon caught in sport fisheries on following page.

⁶ Saltwater, sea run coho.

⁷ Five-year average, 2008-2012.

⁸ McDowell Group estimate based on ADF&G estimates of Solomon Gulch Hatchery contributions to the sport harvest and on results from the ADFG Alaska Sport Fishing Survey.

Saltwater Sport Harvest of Coho Salmon in Southcentral Alaska, Numbers of Fish, 2008-2012



Source: ADFG.

Charter Fleet Harvest of VFDA Salmon

Charter fishing is an important part of the Valdez visitor industry and VFDA is a key source of fish harvested by charter fishermen. An estimated 38 sport fishing charter vessels offloaded in Valdez in 2011.⁹ The charter businesses that operated these vessels accommodated 5,617 anglers on 1,092 trips.

In 2011, 9,249 coho were offloaded in Valdez by charter fishery participants, 97 percent of the total salmon charter harvest offloaded in Valdez that year. An estimated 6,900 of these fish (75 percent) were VFDA coho. Pink salmon are not a target species for the charter fleet. While the charter fleet certainly catches pink salmon, that harvest is generally not recorded in ADFG logbook data.

In 2011, non-residents accounted for 72 percent of the charter fishing angler days targeting coho salmon in Southcentral, while Alaska residents accounted for 23 percent¹⁰. The remaining angler days were crew or complementary trips, or associated with unknown residency. Valdez charter fishing operators generally charge approximately \$225 per client for a half-day (4 hour) trip, and \$250 for a full-day trip. Pricing does not include purchase of a fishing license (\$20 for a one-day non-resident license or \$35 for a three-day license), tips, or other on-board charges.

Based on ADFG logbook data and interviews with VFDA charter operators, it is estimated that clients spent \$2.2 million on charter fishing opportunities in Valdez for trips targeting salmon (primarily coho) in during the study period. Three quarters of this spending, an estimated \$1.7 million, can be attributed to the harvest of VFDA salmon.

⁹ ADFG logbook data and personal communication.

¹⁰ ADF&G logbook data.

Valdez Salmon Derbies

After the VFDA hatchery was opened in 1982 and large numbers of salmon started returning to the waters around Valdez, the existing salmon derby grew dramatically. City leaders viewed the increase in salmon as a way to market Valdez as a destination for world-class fishing and used the derby to communicate that message.

Two main salmon derbies are held annually in Valdez; the Silver Salmon Derby and the Pink Salmon Derby. Anglers compete to catch the largest fish and prizes are awarded for catching the heaviest silver (coho) or pink salmon.

The Valdez Silver Salmon Derby has occurred annually since 1952 and typically runs from late July to early September. First prize in the derby in 2013 was \$15,000, with thousands of dollars in additional prizes awarded during the tournament. Derby tickets are sold for \$10 per day or \$50 for the season per species. In 2011 the derby sold 4,410 daily tickets and 556 season tickets.



Photo Credit: Garrett Evridge

The Women's Silver Salmon Derby was added to the Silver Salmon Derby in 2005. This all-women, one-day event is held in August and has grown from 372 participants to over 700 participants in 2013.

A Kids' Pink Salmon Derby was launched in 2008. It's a free one-day tournament for children ages 5 through 16. The July event attracted almost 300 participants in 2013.

The VFDA hatchery provides most of the salmon caught in these derbies and therefore accounts for much of the economic activity generated by the derbies.

State and Local Tax Revenues Generated by VFDA

As with all salmon commercially harvested and processed in Alaska, VFDA salmon are subject to a 3 percent State of Alaska Fisheries Business Tax. The tax is based on the ex-vessel value of the fish. Half of the tax revenue is deposited into the State’s General Fund while the other half goes to the borough or incorporated city government where the fish was processed. Cordova, Valdez and Whittier are the communities within PWS that receive money from this tax.

From 2008 to 2012, PWS commercial fishermen and processors paid an estimated \$15.7 million in total fisheries business tax.¹¹ Of that amount, Cordova received a total of \$5.4 million while Valdez and Whittier received \$1.6 million and \$485,000, respectively.

The tax collected on VFDA salmon accounted for approximately 14 percent of the \$15.7 million total, or \$2.2 million, including fisheries business taxes paid on common property harvests and VFDA cost recovery fish.

Fisheries business tax receipts from VFDA salmon trend up or down with the value of the harvest. A run failure in 2009 reduced tax revenue almost to zero while 2010 was a record year.

**Estimated Fisheries Business Tax Receipts Resulting from
VFDA Salmon, 2008-2012**

	2008	2009	2010	2011	2012	Total
Fisheries Business Tax (FBT)						
FBT to State of Alaska General Fund	\$225,000	\$800	\$349,000	\$213,000	\$306,500	\$1,095,000
FBT to Local Gov. in Southcentral Alaska	225,000	800	349,500	213,000	306,500	1,095,000
Total FBT	\$450,000	\$1,600	\$699,000	\$426,000	\$611,000	\$2,188,000

Note: Totals may not sum due to rounding.

Source: McDowell Group estimates, based on ADFG, ADOR and VFDA data.

¹¹ <http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?841r>

Employment and Spending by VFDA

During the four-year period of 2009 through 2012, VFDA employed an average of 27 workers each year. Because of the seasonal nature of hatchery and processing operations, monthly employment drops to an average of 18 from November through January and peaks in May and June with an average of 42 employees. Year-round staff positions average 15 including staff engaged in operations, management, and administration. Entry-level positions filled by seasonal workers offer the development of skills needed to work in the processing, customer service, marine biology, aquaculture, and operations professions.

From 2009 to 2012 VFDA spending totaled \$13.8 million, an average of \$3.4 million per year. Over this time period, VFDA employees were paid \$6.2 million or 45 percent of total spending.

The majority of VFDA's spending occurs in Alaska in the form of payroll and operating expenses. In an average year, fish food (\$250,000), electricity (\$220,000) and medical insurance (165,000) are the top three operating expenses for VFDA. Other important operating expenses include, fuel, shipping, maintenance, and materials necessary for fish processing.

VFDA Monthly Employment, 2009-2012

	2009	2010	2011	2012	2009-2012 Average
January	19	20	19	19	19
February	21	28	24	19	23
March	26	17	35	22	25
April	39	38	42	36	39
May	39	44	41	41	41
June	45	44	47	32	42
July	29	26	36	29	30
August	26	21	22	22	23
September	22	24	23	21	23
October	19	18	18	19	19
November	17	17	17	19	18
December	19	17	17	17	18
Monthly Avg.	27	26	28	25	27

Source: VFDA, 2013.

Economic Impact of VFDA

VFDA creates jobs for hatchery workers, commercial fishermen, seafood processors, charter fishing guides, and businesses that provide goods and services to the sport fishing sector. These sectors, along with VFDA itself, generate secondary economic (multiplier) impacts within the regional economy and elsewhere in Alaska.

As money related to VFDA salmon flows through the economy, income is created for workers in a wide variety of businesses. In some cases that income is a substantial portion of a worker's income and in other cases it may be a small portion. For example, a commercial fisherman (who may be very dependent on VFDA salmon for his livelihood) might hire a local diesel mechanic for engine repairs, purchase fuel from a local supplier, and buy groceries from the local market. The fisherman and the mechanic owe a higher portion of their job to VFDA salmon, but the grocer and the fuel vendor also benefit, though to a smaller degree. In this way money originally generated by VFDA flows through the economy, touching workers in nearly every sector. The figures in this section reflect the total amount of employment and labor income related to VFDA if all those fractional jobs were added up to a whole number. It is important to note that the total number of workers earning some part of their income from VFDA salmon is far larger than the employment figures shown in this section.

It is not possible to identify all the jobs in the dozens of businesses that provide equipment, materials, supplies, and services to VFDA, the commercial fishermen that harvest VFDA salmon, and the processors of VFDA fish. However, it is possible to use economic models to estimate the total employment and payroll effects of VFDA salmon, including all multiplier effects. VFDA's multiplier effects include jobs and income generated as a result of business spending on goods and services, termed "indirect" effects. Jobs and income created when workers spend their earnings in the local economy are termed "induced" effects. This includes jobs and income occurs throughout the economy wherever residents spend their income on household necessities, transportation, recreation, health care, other personal services, etc. Together indirect and induced impacts are termed "multiplier effects."

This section details the full impact VFDA has on Alaska's economy and addresses three basic questions:

1. How many jobs are created or affected by VFDA salmon and business operations?
2. How much do workers employed in those jobs earn?
3. How much total economic activity is generated through direct and secondary effects?

The total employment and income effects of VFDA salmon are described below, including commercial harvest and processing of VFDA salmon, VFDA operations, and sport fish harvest of VFDA salmon.

Economic Impact of Harvesting VFDA Salmon in Commercial Fisheries

During the past five seasons, from 2008 through 2012, commercial fishermen averaged gross revenues (ex-vessel income) of \$14.6 million per year harvesting VFDA salmon in common property fisheries. Labor income (gross revenues less expenses) for permit holders and crew derived from harvesting VFDA salmon is estimated to be \$7.8 million per year. VFDA salmon directly generated the equivalent of 241 commercial fishing jobs for permit holders and crew, on average, per year during the five-year study period.

The majority of this income was earned by Alaska residents living in Prince William Sound, the Kenai Peninsula, or the Anchorage/Mat-Su area. VFDA salmon also created income for an estimated 118 additional workers in the support sector through commercial fishermen spending activity. In total, it is estimated that VFDA salmon caught in common property fisheries generated an average of \$11.8 million per year in income for 359 individuals in Alaska during the 2008 to 2012 time period.

Economic Impact on Alaska’s Economy from Harvesting VFDA Salmon in Commercial Fisheries, Annual Averages, 2008–2012

	Direct	Indirect & Induced	Total
Number of Workers	241	118	359
Labor Income (in \$Millions)	\$7.8	\$4.0	\$11.8
Output (in \$Millions)	\$14.6	\$11.6	\$26.2

Note: Direct output is equal to ex-vessel value.
Source: McDowell Group estimates.

Economic Impact from Processing VFDA Salmon

For the period from 2008 through 2012, processors in Prince William Sound earned estimated average gross margins of \$35.6 million per year processing VFDA salmon. For the purposes of this study, gross margin is equal to sales revenue (payments received for selling processed fish) less the cost of that fish (payments to fishermen or hatcheries for cost recovery fish). Processors have many more expenses than just the cost of fish, so gross margin should not be confused with net profit.

VFDA salmon caught in common property fisheries and those sold to processors from cost recovery operations accounted for an estimated 19 percent of PWS’s total first wholesale value of all species, from 2008 to 2012. Based on that estimate, VFDA salmon generated income for approximately 270 processing workers. Further, the salmon processing sector generated indirect and induced income of \$1.4 million per year for an estimated 43 support sector workers.

In total, VFDA salmon running through seafood processing lines in Prince William Sound directly and indirectly created income for 313 workers who earned a total of \$4.6 million in labor income. These figures do not include commercial fishing employment utilizing VFDA salmon or the activities of VFDA itself (which are described below).

Economic Impact of VFDA Salmon Utilized by Seafood Processors on Alaska’s Economy, Annual Averages, 2008–2012

	Direct	Indirect & Induced	Total
Number of Workers	270	43	313
Labor Income (in \$Millions)	\$3.3	\$1.4	\$4.7
Output and Value Added (in \$Millions)	\$35.6	\$5.9	\$41.5

Note: Direct processing output is equal to gross margin.
Source: McDowell Group estimates.

Direct employment and wages refers to workers employed by seafood processors, who are directly utilizing VFDA salmon. Indirect employment is created when processors spend money on inputs in Alaska such as shipping, maintenance work, supplies, utilities, tender boats, or equipment. Additional employment is created when workers spend their earnings in Alaska’s economy (induced effects).

Economic Impact of VFDA Salmon Caught in Sport Fisheries

It is well beyond the scope of this study to comprehensively measure the economic impact of sport fishing in Valdez. However, it is possible to make broad estimates of the scale of the industry and, further, consider VFDA’s role in the industry.

It is clear that VFDA plays an important role. It is estimated that VFDA salmon accounted for 75 percent of all coho salmon and over 85 percent of all pink salmon caught in sport fisheries in the Valdez area during the study period. As described previously, Valdez is a very popular salmon fishing destination, thanks in large part to VFDA.

Spending by anglers creates jobs and income in Valdez. Estimating the employment and income impacts of VFDA-related sport fishing requires assumptions about the number of non-resident anglers targeting VFDA salmon and how much they spend on average in Valdez. The number of non-resident anglers fishing in Valdez in 2011 is estimated at approximately 15,500, including 9,700 non-Alaskans, with the balance comprised of other Alaska residents. The total amount of sport fishing-related spending in Valdez is unknown; however, a reasonable estimate would place total spending by visiting sport anglers at about \$7 million. This includes spending on charters, lodging, fishing gear, food, fuel and other miscellaneous expenditures.

Based on McDowell Group modeling, this spending generates approximately 100 seasonal jobs in Valdez and \$3 million in labor income. Including the indirect and induced effects, the impact is 130 jobs and \$4 million in labor income. Total economic activity related to sport fishing is estimated at \$10 million annually. Recognizing that there is no definitive way to measure the hatchery’s role in this economic activity, it is reasonable to attribute two-thirds to VFDA, given its essential role in providing coho and pink salmon for the sport fishery.

Economic Impact of Sport Fishing for VFDA Salmon, Annual Averages, 2008–2012

	Direct	Indirect & Induced	Total
Total Non-Resident Sport Fishing			
Number of Workers	100	30	130
Labor Income (in \$Millions)	\$3.0	\$1.0	\$4.0
Output (in \$Millions)	\$7.0	\$3.0	\$10.0
Total VFDA-Related Sport Fishing			
Number of Workers	65	20	85
Labor Income (in \$Millions)	\$2.0	\$0.6	\$2.6
Output (in \$Millions)	\$4.6	\$2.0	\$6.6

Note: Totals may not sum due to rounding.
Source: McDowell Group estimates.

Economic Impact of VFDA Business Operations

As the operator of a major salmon hatchery, VFDA itself has a significant direct impact on the regional economy. VFDA employs a peak of 45 to 50 workers each year and spends \$3.0 to \$3.5 million per year on operational costs. In addition, VFDA has spent \$2.0 million during the past five years on capital improvement projects, further increasing its total economic output. That spending, and the spending of its workforce, creates secondary employment and income in Alaska's economy. Over three-quarters of VFDA's budget is spent within the state of Alaska and the majority of that spending occurs within Valdez and Anchorage.

Including multiplier effects, VFDA business operations directly or indirectly generated an estimated \$2.4 million in annual income for 67 workers during the 2008 to 2012 period.

Economic Impact of VFDA Business Operations on Alaska Economy, Annual Averages, 2008–2012

	Direct	Indirect & Induced	Total
Number of Workers	47	20	67
Labor Income (in \$Millions)	\$1.6	\$0.8	\$2.4
Economic Output (in \$Millions)	\$3.8	\$2.0	\$5.8

Source: McDowell Group estimates.

Summary of VFDA Economic Impacts

In summary, for the period 2008 through 2012, VFDA salmon and hatchery operations generated income for an estimated average of 824 workers who earned a total of \$21.5 million per year (see Table 8.1). For every VFDA employee, there were 16 more Alaska workers employed as a result of VFDA salmon and business operations.

Most VFDA-related jobs are in commercial fisheries, seafood processing, or charter fishing. Employment was created for an additional 201 workers through indirect and induced impacts.¹² It is estimated that VFDA salmon generated direct, indirect, and induced economic output of \$80.1 million per year between 2008 and 2012.

See table of total economic impacts associated with VFDA on following page.

¹² Indirect impacts occur as a result of business spending related to VFDA salmon or VFDA operations. For example, indirect employment is created when VFDA hires a local contractor or when a commercial fisherman pays a mechanic to overhaul their boat. Induced impacts occur as a result of direct and indirect workers spending their earnings (as consumers) within the study area's economy.

Economic Impact of VFDA on Alaska's Economy, Annual Averages, 2008–2012

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
Impact of VFDA Business Operations			
Number of Workers	47	20	67
Labor Income (in \$Millions)	\$1.6	\$0.8	\$2.4
Output (in \$Millions)	\$3.8	\$2.0	\$5.8
Impact of VFDA Salmon on Commercial Fishing and Seafood Processing Sectors			
Number of Workers	511	161	672
Labor Income (in \$Millions)	\$11.1	\$5.4	\$16.5
Output (in \$Millions)	\$50.2	\$17.5	\$67.7
Impact of VFDA Salmon Caught in Sport Fisheries			
Number of Workers	65	20	85
Labor Income (in \$Millions)	\$2.0	\$0.6	\$2.6
Output (in \$Millions)	\$4.6	\$2.0	\$6.6
Total Economic Impact of VFDA			
Number of Workers	623	201	824
Labor Income (in \$Millions)	\$14.7	\$6.8	\$21.5
Output (in \$Millions)	\$58.6	\$21.5	\$80.1

Note: Totals may not sum due to rounding.

Source: McDowell Group estimates using IMPLAN, ADFG, DOLWD, VFDA data, and authors' calculations regarding VFDA impacts on sport fishing.

It should be noted that these economic impact figures refer to the number of jobs and economic activity created by VFDA on a statewide level. The majority of these jobs are located in the Valdez area. However, the commercial fishing and seafood processing sectors employ many workers who reside elsewhere in Alaska or out-of-state. Additionally, a portion of indirect/induced jobs will occur outside the Valdez region as other businesses in Alaska benefit from the economic activity associated with the resource.

Projected Impact of Increasing VFDA Pink Salmon Production

Hatchery permits issued by the Alaska Department of Fish and Game are required to construct and/or operate a private, non-profit hatchery in Alaska. Currently, VFDA is permitted to collect 230 million pink salmon eggs and 2 million coho salmon eggs. VFDA's Board of Directors is considering increasing pink salmon production by 70 million eggs. Such an increase would require approval by ADFG through a Permit Alteration Request (PAR). PAR applications are reviewed by regional planning teams with final approval from the ADFG Commissioner.

From 1995 to 2011, VFDA released an average of 210 million pink salmon juveniles per year. The average number of pink salmon eggs collected during this period was 220 million yielding an average survival rate of 96 percent from the egg-to-juvenile stage.

Pink salmon have a rigid two-year lifecycle. This means that a fish returning in 2013 was spawned in 2011. The average marine survival rate of juvenile pink salmon released by VFDA during this 15-year time period was 5.9 percent, with a low (survival rate) of 0.6 percent in 2007 and a high of 10.8 percent in 2005.



For more information, see the Appendix for a table detailing historical VFDA pink salmon egg collections, juvenile releases, adult returns, and survival rates.

Key Assumptions about Increasing VFDA Pink Salmon Production

Explaining the rationale for and against increasing permitting capacity is beyond the scope of this economic study. Rather, this report examines the potential economic value of these additional salmon eggs on the seafood industry and Alaska's economy.

In this section the hypothetical impact of an increase in production is assessed, assuming that increase had been in place during the 2008 to 2012 study period. To perform such an analysis, a set of assumptions were established, including:

- VFDA egg collections increase by 70 million pink salmon eggs,
- an egg-to-juvenile survival rate of 96 percent (based on historical VFDA rates),
- a marine survival rate of 5.9 percent (based on historical VFDA rates),

- fishermen and processors have the capacity to catch and process additional pink salmon,
- and the additional fish have no impact on ex-vessel or wholesale prices for PWS pink salmon (additional production of 70 million pink salmon eggs would represent a minor increase in total pink salmon supply, and therefore not be expected to affect prices).

The last assumption could be seen as debatable, since the law of supply and demand dictates an increase in supply will result in a decrease in prices (holding all other factors constant). However, the estimated increase resulting from 70 million pink salmon eggs would represent a minor increase in total pink salmon supply. The pink salmon market has proven it is able to absorb large amounts of supply in recent years, with little impact on price. Therefore, we will assume no change in average prices during the 2008 to 2012 study period.

Estimating the Increase in Returning Adult Pink Salmon

The first step in estimating the potential economic value of collecting more pink salmon eggs is to estimate how many additional adult salmon could have been expected to return to PWS fisheries as a result. Pink salmon returning during the 2008 to 2012 time period would have come from the 2006 to 2010 brood classes.

To estimate the volume of pink salmon added to the fishery during the 2008 to 2012 study period, as a result of a 70 million egg take, the average egg-to-juvenile survival rate and average marine survival rates for each brood year between 2006 and 2010 was applied to an annual figure of 70 million eggs.

Estimated Increase in VFDA Salmon Production from Additional Broodstock

Brood Year	2006	2007	2008	2009	2010
Additional Pink Salmon Egg Take	70 million	70 million	70 million	70 million	70 million
Egg-to-Juvenile Survival Rates (2006-2010 Brood Years)	92.3%	94.6%	86.7%	95.7%	94.5%
Average Juvenile-to-Adult Survival (Return) Rate	6.8%	0.6%	9.2%	5.9%	4.8%
Return Year	2008	2009	2010	2011	2012
Expected Number of Additional Returning Pink Salmon	4,423,000	388,000	5,588,000	3,957,000	3,150,000
Average Weight of Pink Salmon Caught in Seine Fishery	3.40	3.05	3.58	3.04	3.98
Expected Volume of Additional Returning Pink Salmon (lbs.)	15,038,000	1,183,000	20,005,000	12,029,000	12,537,000

Note: The expected number of returning pink salmon and the expected volume of returning pink salmon has been rounded to the nearest 1,000 fish/pounds.

Source: McDowell Group estimates.

Based on historical return and survival rates, it is estimated that collecting an additional 70 million eggs per year between 2006 and 2010 would have resulted in an additional 3.5 million salmon returning to PWS each year, on average, between 2008 and 2012. Based on the weight of pink salmon harvested in the common property seine fishery, it is estimated these additional 3.5 million pink salmon would have weighed 12.2 million pounds.

Value of Additional VFDA Pink Salmon Production

Assuming PWS commercial fishermen would have harvested these 3.5 million additional pink salmon in common property fisheries, fishermen would have earned an additional \$5.2 million per year during the five-year study period. That is equal to \$147,900 per active seine permit holder during that time, or \$29,600 per permit holder per year.

Value of Additional Pink Salmon for Commercial Fishing Sector

Fishing Season	2008	2009	2010	2011	2012	Avg.
Expected Volume of Additional Returning Pink Salmon (Millions lbs.)	15.04	1.18	20.01	12.03	12.54	12.16
Average Ex-Vessel Price of Pink Salmon Caught in Seine Fishery	\$0.38	\$0.28	\$0.40	\$0.42	\$0.55	-
Expected Ex-Vessel Value of Additional Pink Salmon (\$Millions)	\$5.79	\$0.33	\$8.10	\$5.04	\$6.91	\$5.23
Number of PWS Seine Permits Fished	141	154	174	183	224	-
Average Increased Ex-Vessel Value per PWS Seine Permit Fished	\$41,000	\$2,100	\$46,500	\$27,500	\$30,800	\$29,600

Source: McDowell Group estimates, based on ADFG and VFDA data.

Gaining access to an additional 12.2 million pounds of pink salmon per year could have provided PWS processors with additional first wholesale revenues of \$15.0 million per year during the study period. Less the cost of fish, processors could have gained \$9.7 million in gross margin per year.

Value of Additional Pink Salmon for Seafood Processing Sector

Fishing Season	2008	2009	2010	2011	2012	Avg.
Expected Volume of Additional Returning Pink Salmon (Millions lbs.)	15.04	1.18	20.01	12.03	12.54	12.16
Average First Wholesale Price of Pink Salmon (Adjusted for Round Weight)	\$1.11	\$0.91	\$1.16	\$1.23	\$1.52	-
Expected First Wholesale Value of Additional Pink Salmon (\$Millions)	\$16.64	\$1.07	\$23.27	\$14.74	\$19.06	\$14.96
Expected Gross Margin on Additional Pink Salmon (\$Millions)	\$10.85	\$0.74	\$15.17	\$9.70	\$12.15	\$9.72

Source: McDowell Group estimates, based on ADFG and VFDA data.

This analysis may underestimate ex-vessel value and overestimate processors' gross margin. In general, as total first wholesale value rises fishermen tend to receive a higher proportion of the first wholesale value. Like fishermen, processors also have to cover a set of fixed costs and it costs much less to run the last 100 tons of salmon through a plant than the first 100 tons. Lower marginal production costs and steady wholesale prices could result in rising prices for raw product, in this case PWS pink salmon. This trend has occurred on a statewide level; the percentage of first wholesale value paid to fishermen has increased in recent years as the first wholesale value of pink salmon has increased. Therefore, the ex-vessel price paid to fishermen may actually go up as increasing wholesale revenue allows processors to bid up the ex-vessel price of raw product, assuming enough capacity exists to process the additional pink salmon harvest.

Potential Economic Impact of Additional Pink Salmon Production

Assuming similar existing relationships between revenue and employment in the fishing and processing sectors, additional pink salmon production on the order of 70 million eggs would have had the potential to add \$7.6 million in labor income to the Alaska economy. Most of this income would be either for fishing or processing workers located in Prince William Sound. However, the economic benefit would extend well beyond PWS as many Alaska residents from the Kenai Peninsula Borough, Anchorage, and Matanuska-Susitna Borough participate in the PWS seine fishery (as permit holders or crew members). These areas also contain numerous support sector businesses that service the commercial fleet and the processing sector.

Estimated Economic Impact of Additional VFDA Pink Salmon on Alaska Economy, Annual Averages, 2008-2012

	Direct	Indirect & Induced	Total
Number of Workers	162	54	216
Labor Income (in \$Millions)	\$5.8	\$1.8	\$7.6
Output (in \$Millions)	\$15.0	\$5.8	\$20.7

Note: Totals may not sum due to rounding.

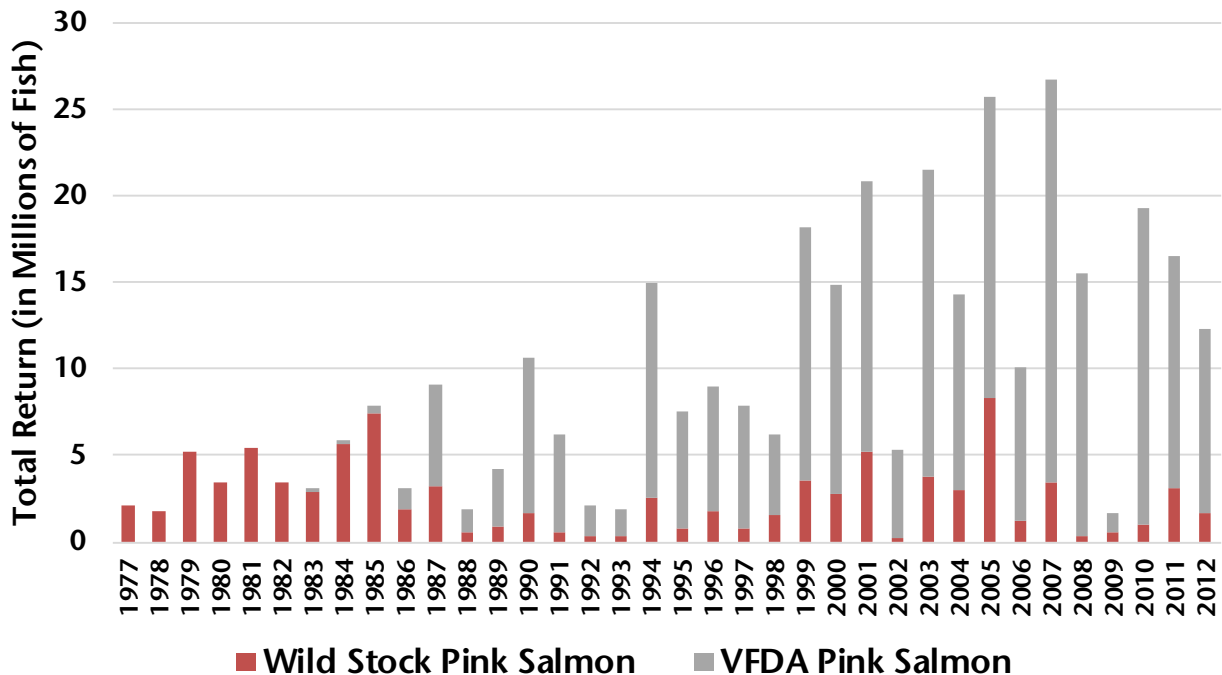
Source: McDowell Group estimates using IMPLAN, ADFG, and VFDA data.

Commercial seine fishermen and salmon processors would clearly benefit from additional pink salmon supply. As the fishing and processing sectors adjust to utilize the new production, additional fishing and processing jobs would be created. Higher total production values and earnings would likely increase the number of indirect and induced jobs created by VFDA salmon in Alaska.

VFDA Hatchery Salmon and Wild Stock Returns

VFDA has significantly increased the total size of pink salmon returns in the Eastern Prince William Sound (PWS) district. Since VFDA's pink salmon operations ramped up in 1984, total pink salmon returns to the Eastern PWS district have averaged 11.4 million pink salmon per year; while in the nine prior seasons returns averaged 4.2 million. Larger pink salmon returns have expanded economic opportunities for fishermen, processors and other Valdez businesses.

Total Returns of VFDA and Wild-Stock Pink Salmon to the Eastern PWS District, in Millions of Fish, 1977–2012

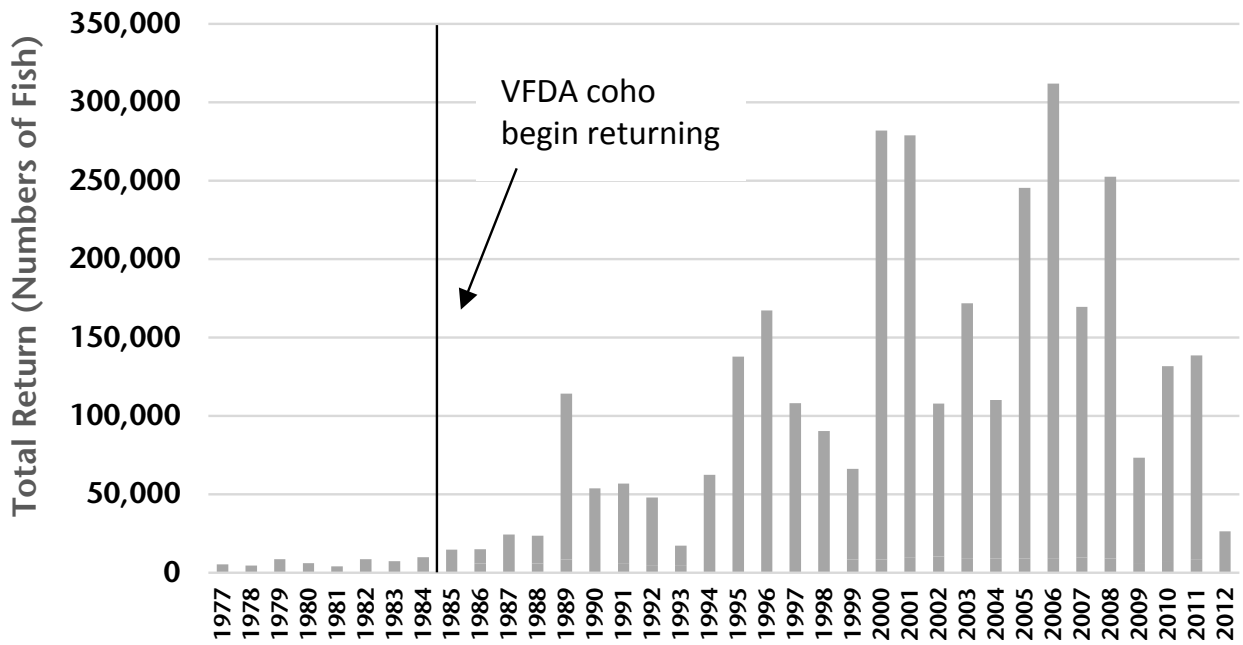


Source: ADFG.

VFDA has increased the number of coho salmon in the region as well. Estimated annual coho harvests often exceeded 50,000 over the past two decades, whereas the estimated harvest prior to VFDA rarely eclipsed 10,000 fish. Larger coho salmon returns provide a significant economic benefit to Valdez businesses that support the sport fishery, and add to the quality of life in the region by providing more salmon for local anglers.

See graph on next page.

Total (Combined) Returns of VFDA and Wild-Stock Coho Salmon to the Eastern PWS District, in Numbers of Fish, 1977–2012



Note: Data collection methods differ for coho salmon returns, as opposed to pink salmon. As a result of data collection methodologies, the mix of wild stock and hatchery stock and the total estimated return may not be as accurate for coho salmon as similar data shown for pink salmon. Therefore, the combined returns are being shown.
 Source: ADFG.

Salmon Market Summary

Pink salmon account for over 95 percent of the value associated with VFDA salmon caught in commercial fisheries. However, VFDA also generates revenues from smoked coho salmon products. Therefore, this market summary focuses on pink salmon and the market for smoked salmon products.

General Trends in Salmon Market Impacting Pink Salmon

Major trends that are expected to continue impacting Alaska pink salmon markets are:

- Increasing supply of farmed salmon (and likely increasing prices due to rising production costs)
- Pressure to increase hatchery production of pink and chum salmon in Russia and Alaska
- Rising production costs in China eventually shifting secondary processing elsewhere (potentially)
- Gentrification of the canned salmon consumer
- Alaska becomes a more unique niche as aquaculture production increases and wild-capture fisheries from pristine marine environments becomes less common
- Increasing global population and rising standard of living in developing countries

It is highly likely the last two trends will continue in the long run. From a demand perspective, that situation bodes well for Alaska pink salmon. In addition to these trends, there are other unforeseeable macroeconomic events (such as the 2008-2009 global recession) or issues that could have an impact on the industry.

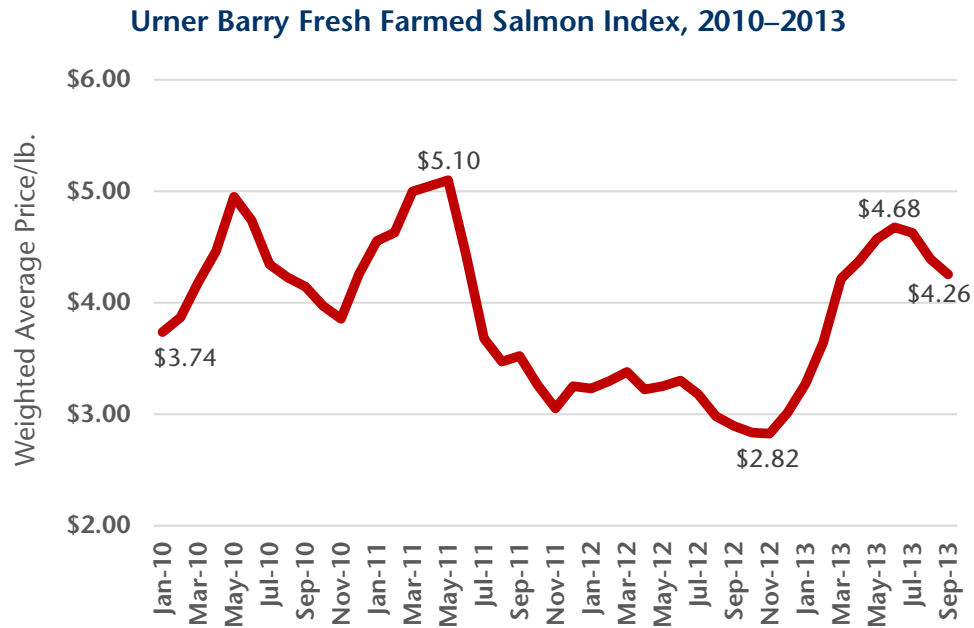
In the salmon hierarchy, pink and chum salmon typically slot in near the bottom. Next is farmed salmon, then coho, sockeye, and Chinook. This means that farmed salmon prices act as somewhat of a price ceiling for frozen pink and chum salmon. However, being the most affordable salmon option in a world desperate to cut costs is not a bad place to be. Secondary processors and budget conscious buyers will likely keep prices for frozen pink and chum salmon just underneath farmed salmon.

Salmon Hierarchy, Current Wholesale Prices of Dressed Salmon

Fresh Chinook Salmon (Troll Caught, 11-18 lbs)	\$7.38
Fresh Sockeye (Gillnet, 4-6 lbs)	6.28
Fresh Coho (Troll Caught, 6-9 lbs)	4.30
Farmed Atlantic (Norwegian, 12-14 lbs)	4.03
Farmed Atlantic (Chilean, 12-14 lbs)	3.93
Fresh Chum (Seine/Gillnet)	1.40
Fresh/Frozen Pink (Seine/Gillnet)	1.30

Source: Urner Barry Comtell and ADOR (Alaska Salmon Price Report)

In 2012, prices for frozen H/G pink and chum salmon fell as inventories built up due to record low prices for farmed salmon in late 2011 and early 2012. Demand for frozen pink and chum salmon is reportedly picking up now that farmed salmon prices are back up.



Source: Urner Barry Comtell.

What happens if farmed salmon prices fall sharply again? Such a situation could happen again; however, the prices seen during late 2011 and early 2012 were not sustainable. Put simply, those prices were below the breakeven point for most salmon farms. Many smaller Chilean farms went out of business or were bought out by competitors. Even large salmon farmers posted negative earnings during this period. More consolidation means producers should be able to do a better job of balancing supply to meet demand.

Prices for farmed salmon are expected to increase in the long run, due to projected increases in demand and production costs for salmon farmers. As salmon farmers increase production, it will place a greater strain on the feed supply. Fish feed contains a crucial percentage of wild-caught fish species, and these stocks are barely keeping up with current demand. Feed costs make up 40 to 50 percent of salmon farmers' operating expense, thus they have an enormous impact on production costs.

Production and Price Trends for Pink Salmon

Canned pink salmon production has declined since 2002 with more fish being diverted to a frozen H/G product in order to satisfy demand from secondary processors (primarily in China). This product form shift away from canned salmon resulted in more products (made from frozen pink salmon) and allowed the canned market to work through its longstanding surplus inventory. As the chart below illustrates, diversifying the product base by shifting some production away from the canned market has led to an increase in pink salmon prices.

First Wholesale Value per Pound and Product Form Shift, Alaska Pink Salmon, 2002–2012



Source: McDowell Group estimates based on ADFG (COAR) and Alaska Salmon Price Report.

Prices for Alaska pink salmon products, as a group, are higher than they've ever been (in nominal terms). Canned salmon prices are up 143 percent since 2005 and the average price during the first trimester in 2013 broke the \$100/case mark (for canned talls). Prices for frozen product is down significantly from 2011 levels – especially considering 2012 was a down year – but prices are still greater than those seen prior to 2010.

First Wholesale Price of Selected Pink Salmon Products, 2005-2012

	2005	2006	2007	2008	2009	2010	2011	2012
Canned Salmon Case (Tall, 48-ct)	\$41.00	\$46.12	\$56.48	\$59.77	\$75.93	\$79.18	\$81.57	\$99.73
Frozen H/G Pink Salmon (\$/lb)	0.62	0.82	0.77	0.93	0.93	1.29	1.45	1.28
Pink Salmon Roe (\$/lb)	3.36	4.09	4.96	10.30	5.23	5.84	7.66	10.29

Note: Canned salmon price represents the price per case.
Source: ADOR (Alaska Salmon Price Report).

Salmon Roe Market Summary

Prices for Alaska salmon roe during the 2013 season have been comparable to 2012 levels due to a lower than expected harvest in Russia this year. Prices for Alaska salmon roe were at or above record levels in 2012 due to the following factors: lower roe production in Japan, a strong yen, and continued demand from markets in Eastern Europe and Russia.



Sujiko sold in seafood market in Kyoto, Japan
Photo Credit: Kyoto Foodie

The yen has weakened by more than 20 percent since last year, so the ability of Japanese buyers to

pay similar prices this year will be tested. However, a smaller than expected Russian pink salmon harvest is making Russian buyers more aggressive. Like Alaska, odd years typically produce large pink salmon harvests in Russia. Obtaining accurate in-season production data from Russia is difficult, but the general consensus is that the Russian pink harvest was down considerably in 2013. The last reliable report showed a 40 percent decline versus 2011 through the first week in August.

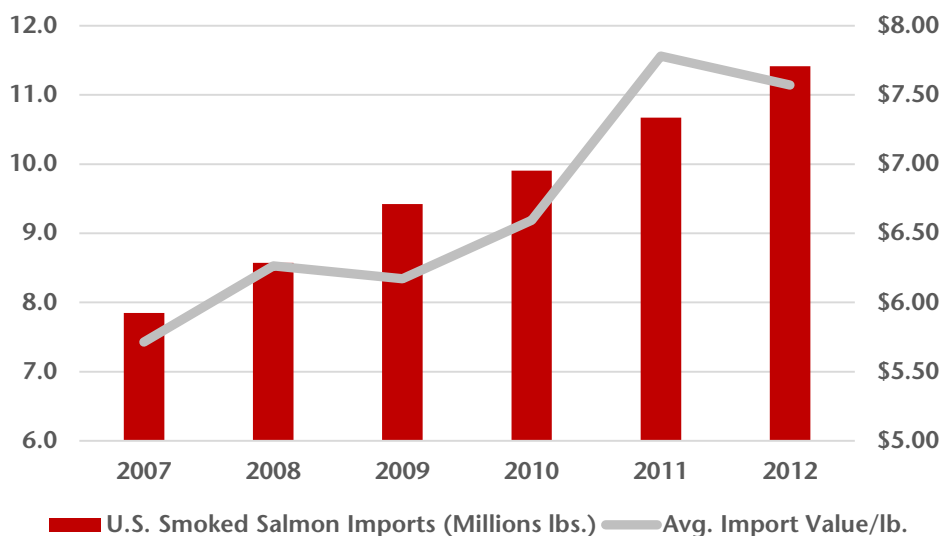
Smoked Salmon Market Summary

The Bristol Bay sockeye harvest declined for the fourth year in a row in 2013. The 2013 Bristol Bay sockeye harvest is the smallest since 2003. Conversely, harvests of Alaska coho are up significantly in 2013. While trollers in Southeast Alaska are having one of their best years ever, gillnetters and seiners are also catching more coho. A shortage of sockeye in 2013 could force smokers to rely more heavily on coho to meet demand for wild smoked salmon.

Troll-caught coho is primarily sold into fresh or frozen markets; however, more mature fish caught by gillnetters and seiners are perfect for smoking operations. Relatively little product is smoked in Alaska, but a portion of the state’s frozen H/G pack is smoked by facilities located outside of Alaska. Ocean Beauty Seafoods, Vita Foods, and Acme Smoked Fish are just a few of the domestic companies that smoke Alaska salmon outside of Alaska.

There is no public data set related to production or price trends for smoked salmon in the U.S., but an investigation of import statistics does reveal a trend for imported product. Since 2007, the amount of smoked salmon imported into the U.S. has increased 33 percent and the average wholesale value per pound of that product has increased 21 percent. These statistics suggest U.S. demand for smoked salmon products has increased - at a remarkably steady pace - in recent years.¹³

Smoked Salmon Imports into U.S., 2007–2012



Source: NMFS Trade Data.

¹³ Anecdotal evidence also suggests increasing interest in smoked salmon, Dan Kim general manager of Alaskan Feast at the Fulton Fish Market in New York notes, “Smoked salmon is (also) getting more traction... Customers are looking for different uses for wild product and we’ve seen increased demand for, whether hot or cold smoked.”

VFDA Pink Salmon Production, in Thousands, 1982–2012

Brood Year	Eggs Collected	Juveniles Released	Return Year	Return of Adult Pink Salmon
1982	8,400	7,900	1984	222
1983	12,900	5,600	1985	566
1984	72,700	8,400	1986	1,240
1985	84,800	51,300	1987	5,745
1986	64,100	54,600	1988	1,127
1987	158,900	59,700	1989	3,439
1988	154,600	130,800	1990	11,019
1989	142,500	128,400	1991	6,121
1990	156,500	122,200	1992	2,100
1991	199,000	131,300	1993	1,732
1992	208,800	86,900	1994	13,354
1993	231,700	141,900	1995	6,827
1994	219,200	149,400	1996	7,476
1995	239,900	205,400	1997	7,256
1996	208,500	223,100	1998	4,760
1997	237,900	188,900	1999	14,924
1998	231,900	195,200	2000	12,351
1999	238,700	213,900	2001	16,127
2000	235,300	195,800	2002	5,265
2001	230,000	203,900	2003	17,375
2002	236,400	202,600	2004	11,100
2003	237,000	206,400	2005	18,100
2004	233,800	222,500	2006	9,100
2005	239,000	222,200	2007	23,908
2006	235,100	216,900	2008	14,854
2007	233,000	220,400	2009	1,292
2008	230,200	199,600	2010	18,377
2009	236,300	226,200	2011	13,357
2010	236,200	223,100	2012	10,629
2011	236,100	223,600	2013	N/A

Source: Stopha, M. 2013. An evaluation of the Solomon Gulch salmon hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 5J13-04, Anchorage.

VFDA Coho Salmon Production, in Thousands, 1982–2011

Year	Eggs Collected	Frye Released	Calendar Year Return of Adult Coho Salmon
1982	115	-	-
1983	143	-	-
1984	370	-	-
1985	112	95	-
1986	2,700	232	4
1987	1,600	304	14
1988	1,600	822	16
1989	1,500	987	108
1990	1,800	797	85
1991	2,000	944	55
1992	2,200	1,226	45
1993	2,200	462	4
1994	2,400	915	44
1995	2,800	1,325	142
1996	2,200	1,876	148
1997	2,300	1,315	96
1998	2,200	1,748	98
1999	2,200	1,864	132
2000	2,400	1,626	473
2001	2,400	1,519	313
2002	2,300	1,842	99
2003	2,200	1,295	203
2004	2,100	1,442	144
2005	2,200	1,968	242
2006	2,500	1,512	295
2007	2,300	1,974	143
2008	2,300	1,828	268
2009	2,300	1,526	83
2010	2,000	1,915	92
2011	2,000	2,111	140

Source: Stopha, M. 2013. An evaluation of the Solomon Gulch salmon hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 5J13-04, Anchorage.