2017 Sockeye Market Analysis

PREPARED FOR

BRISTOL BAY
Regional Seafood
Development Association

PREPARED BY

McDowell GROUP

November 2017

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Acknowledgements

The study team would like to express its appreciation to members of the industry and government agencies that provided valuable information and insight for this project, especially Elizabeth Nudelman (Alaska Department of Revenue) and Jennifer Shriver (Alaska Department of Fish and Game).

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Executive Summary

Bristol Bay Regional Seafood Development Association (BBRSDA) is tasked with increasing the value of Bristol Bay sockeye and has contracted with McDowell Group to produce bi-annual sockeye market reports. These reports analyze market conditions for sockeye products, investigate market issues, examine historical trends, and discuss impacts on Bristol Bay fishermen. Key findings are listed below:

- The preliminary ex-vessel value of Bristol Bay sockeye increased 37 percent in 2017 to $210 million. Ex-vessel prices increased 34 percent over the prior year, based on preliminary data, while Bristol Bay sockeye harvests increased 2 percent.
- Assuming static prices, the value of foregone sockeye harvests in Bristol Bay is estimated at $29 million in 2017. This equates to approximately $12,120 of foregone harvest value per active permit (drift and setnet combined). Several river systems exceeded their escapement goals for a variety of reasons.
- Global sockeye harvests declined 5 percent in 2017 (approximately 20 million pounds), based on preliminary data. Harvests were expected to decline 18 percent in Alaska and Russia, collectively, heading into the season. After a couple years of below average production growth, farmed salmon production forecasts are generally being increased.
- First wholesale prices of all major sockeye product forms increased in 2017, indicating strong demand. However, early sales volumes of frozen H&G sockeye produced during the 2017 season trailed 2016 sales by 31 percent. Selling out frozen inventory ahead of the 2018 season will be critical for pricing prospects next spring.
- Prices of H&G and fillet products have increased faster than canned forms in recent years, prompting processors to can less sockeye despite larger harvests. Lower production volume is pushing canned prices upward; however, this could result in less demand for canned product going forward.
- Frozen fillets and fresh sales have seen growth in recent years. Statewide sockeye fillet production increased 63 percent between 2013 and 2016, and may have increased even further in 2017. Sales of fresh H&G sockeye from Bristol Bay jumped 39 percent in 2017 to 3.1 million pounds.
- Alaska sockeye markets have undergone a fascinating transformation over the past 15 years. See "The Story of Sockeye Market Diversification" chapter on page 26 to learn more.

Outlook for Bristol Bay Sockeye Fishermen

Operating revenue increased substantially for Bristol Bay fishermen in 2017. While future market developments can never be predicted with total certainty and several factors could negatively affect sockeye value over the next 18 months, the value outlook is relatively stable. The recent spike in harvest value is not expected to be followed by a sharp decline, as happened in 2014-2015 (barring a significant reduction in future harvest volume). Wholesale sockeye prices are much higher than recent years and demand remains relatively strong, and although competing farmed prices have declined this year most farmed salmon analysts predict prices will remain relatively steady for at least the next year. Further, net processing revenue has trended up in recent years and is not expected to face a precipitous decline this year, as was witnessed following the 2014 season.

Glossary of Terms and Abbreviations

Abbreviations and Acronyms

ADOR	Alaska Department of Revenue
ADF&G	Alaska Department of Fish and Game
ASMI	Alaska Seafood Marketing Institute
ASPR	Alaska Salmon Price and Production Reports (published by ADOR)
BBRSDA	Bristol Bay Regional Seafood Development Association
EV	Ex-Vessel terms
COAR	Commercial Operators Annual Report (published by Alaska Dept. of Fish and Game)
CPI	Consumer Price Index
DFO	Canadian Department of Fisheries and Oceans
FAO	United Nations Fisheries and Aquaculture Organization
FW	First wholesale terms
H&G	Headed and gutted
HY	Harvest year cycle
NMFS	National Marine Fisheries Service
PACFIN	Pacific Fisheries Information Network
RSDA	Regional Seafood Development Association

Glossary of Terms

Ex-Vessel Value/Price	The value or price paid to fishermen by a processor for whole fish.
First Wholesale Value	The value (or average price) of processed product sold by processors to entities outside of their affiliate network. Typically refers to the value of product as it leaves Alaska.
First Wholesale Volume	The weight of processed product sold by processors to entities outside of their affiliate network. Also referred to as production volume.
Harvest Year Cycle	Refers to the 12-month period when most sockeye are caught and sold into the wholesale market. The harvest year cycle runs from May of the harvest year through April of the following year. Aligning the data by sales season, as opposed to calendar year provides a better basis for comparing first wholesale data to ex-vessel data. This period is also referred to as the annual sales cycle.
Net Processing Revenue	First wholesale value earned by processors less ex-vessel payments to fishermen.
Refreshed Sockeye	Refers to frozen H&G product which has been thawed out and filleted. This is usually done at secondary processing plants near final consumer markets by local seafood distribution companies. Processed, chilled sides/portions are then delivered to retailers and restaurants.
Round Weight	The weight of a whole fish as it is delivered to the processor in an uncut and unprocessed state.

Introduction and Data Sources

The Bristol Bay Regional Seafood Development Association (BBRSDA) has commissioned McDowell Group, Inc. to analyze sockeye markets and report findings bi-annually since 2013.

In business since 1972, McDowell Group is Alaska's most experienced research and consulting firm. McDowell Group has served as a market-research contractor for the Alaska Seafood Marketing Institute for the past 19 years and has conducted market research, feasibility studies, and other seafood industry-related projects for public and private sector clients throughout Alaska and elsewhere in North America.

Study Purpose and Scope of Work

BBRSDA represents the world's largest group of sockeye fishermen and is tasked with increasing the value of Bristol Bay salmon (principally sockeye). In addition to bi-annual reports, the *Sockeye Market Analysis* project includes summary presentations at the direction of BBRSDA Board and staff. The project tracks market trends affecting sockeye salmon to help BBRSDA direct promotional efforts, inform its members, and react effectively to emerging issues and trends.

Past analyses can be viewed or downloaded from BBRSDA's website (www.bbrsda.com) or requested by contacting McDowell Group staff at seafood@mcdowellgroup.net.

Methodology and Data Sources

McDowell Group compiled data from government agencies, including the Alaska Department of Fish and Game (ADF&G), the Alaska Department of Revenue (ADOR), and export data from the National Marine Fisheries Service (NMFS).

Specific data sources used in this report are summarized below:

ADF&G Fish Ticket Data

Bristol Bay fish tickets often contain no documentation of ex-vessel price or value for salmon. However, in cases where ex-vessel price has been omitted from fish tickets an average price is applied to the harvest volume based on information collected by fishery biologists in each region. More information about ADF&G fish tickets can be found at: http://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.fishtickets.

ADF&G Commercial Operators Annual Report (COAR)

The first buyer of raw fish, persons who catch and process fish, and persons who catch and have fish processed by another business are required to file an annual report of their purchasing and processing activities. This report is called the Commercial Operator's Annual Report (COAR) and is due by April 1 of the following year. Historical COAR data extending through 2015 is used as a supplementary information source in this sockeye market analysis.

COAR contain data on seafood purchasing, processed production volume, and both ex-vessel and wholesale values of seafood products. The buying information from COAR is reported by species, area of purchase, condition of fisheries resources at the time of purchase, type of gear used in the harvest, pounds purchased, and ex-vessel value. The ex-vessel value in COAR includes any post-season adjustments or bonuses paid after the fish was purchased. Production information from COAR is reported by species, area of processing, process type (frozen, canned, smoked, etc.), product type (fillets, surimi, sections, etc.), net weight of the processed product, and the first wholesale value. More information about COAR data can be found at: http://www.adfg.alaska.gov/index.cfm?adfg=fishlicense.coar.

ADOR Alaska Salmon Price and Production Reports (ASPR)

The Alaska Salmon Price Report (ASPR) covers first wholesale volume and value - by species and area - for six key Alaska salmon products. First wholesale is defined as the value and volume at the point when product is sold to an entity outside of the processor's affiliate network. The data set includes all processors that sold more than one million pounds of processed salmon products in the previous calendar year, which includes the majority of Alaska's wholesale production of salmon products. The ASPR is a major data source for salmon market analysis. ASPR reports are available on the ADOR website at:

http://www.tax.alaska.gov/programs/programs/reports/index.aspx?60624

Data from these sources have been structured to provide information applicable to Bristol Bay sockeye to the fullest extent possible. Where the timing of data releases by the agencies causes gaps, McDowell Group has developed estimates based on historical ratios and other relationships.

Limitations of Data and Analysis

Commercial fishing is a heavily regulated business and government agencies collect data on a wide range of variables, from harvest to price to participation. As wild fish move closer to the consumer, publicly available data diminishes. For instance, there is no readily accessible public data on the average retail price of canned salmon or the amount of sockeye fillets sold by individual retailers. This data gap has been addressed, to the extent practical, by purchasing point-of-sale information and interviewing sockeye buyers. McDowell Group also maintains subscriptions to most major trade press outlets and uses trade-press data to supplement the public information and provide additional context.

Legal Disclaimer

The views expressed herein do not necessarily represent those of the Bristol Bay Regional Seafood Development Association.

2017 Bristol Bay Season Summary

This section relies on preliminary data to summarize the 2017 Bristol Bay salmon season.

KEY FINDINGS:

- The 2017 Bristol Bay sockeye harvest was the second-largest of the past 20 years and produced the largest total ex-vessel value since the mid-1990s after adjusting for inflation.
- As good as the 2017 season was, it could have been even better. Harvest limits resulted in over-escapement for several river systems and an opportunity cost to Bristol Bay salmon fishermen of an estimated $29.2 million.

The tables below summarize Bristol Bay salmon harvests over the past two seasons. While the total harvest volumes are similar, ex-vessel value increased 37 percent in 2017, based on preliminary data, due to higher sockeye prices. The total inshore sockeye run of 56.5 million fish was the second-largest of the past 20 years (1997-2016) and 62 percent above the average run for the same period. The ex-vessel value was nearly twice the (nominal) average season over the past twenty years, and returned the highest preliminary ex-vessel value since 1996 (adjusted for inflation).

Table 1. Bristol Bay Salmon Harvest Summary, by Species, 2017

Species	Preliminary Price/lb.	Preliminary Value	Avg. Fish Weight (lbs.)	Number of Fish Harvested	Harvest Weight (lbs.)
Sockeye	$1.02	$209,898,218	5.5	37,682,774	205,782,567
Chum	$0.30	$3,417,535	6.4	1,779,888	11,391,783
Coho	$0.65	$988,376	6.3	239,980	1,520,578
Chinook	$0.72	$312,499	11.2	38,835	434,027
Pinks	$0.16	$22,176	3.9	35,352	138,602
Total	**-**	**$214,638,805**	**-**	**39,776,829**	**219,267,557**

Notes: Preliminary prices represent base ex-vessel prices, not including supplemental payments (e.g. quality bonuses, etc.).
Source: ADF&G.

Table 2. Bristol Bay Salmon Harvest Summary, by Species, 2016

Species	Preliminary Price/lb.	Preliminary Value	Avg. Fish Weight (lbs.)	Number of Fish Harvested	Harvest Weight (lbs.)
Sockeye	$0.76	$153,204,040	5.4	37,330,419	201,584,263
Chum	$0.32	$2,001,302	6.0	1,042,345	6,254,070
Coho	$0.49	$259,722	5.8	91,387	530,045
Chinook	$0.67	$249,419	12.6	29,545	372,267
Pinks	$0.15	$451,054	4.0	751,756	3,007,024
Total	**-**	**$156,165,537**	**-**	**39,245,452**	**211,747,669**

Notes: Preliminary prices represent base ex-vessel prices, not including supplemental payments (e.g. quality bonuses, etc.).
Source: ADF&G.

Table 3 presents 2017 harvest and escapement data by district. The 2017 Bristol Bay inshore sockeye run was 43 percent above the preseason forecast. The 2017 harvest for all river systems met or exceeded their

escapement goals. The Egegik, Nushagak, Wood, and Igushik rivers exceeded the upper end of their escapement goals in 2017.

Table 3. Bristol Bay Sockeye Harvest Summary, Numbers of Fish, by Fishery District

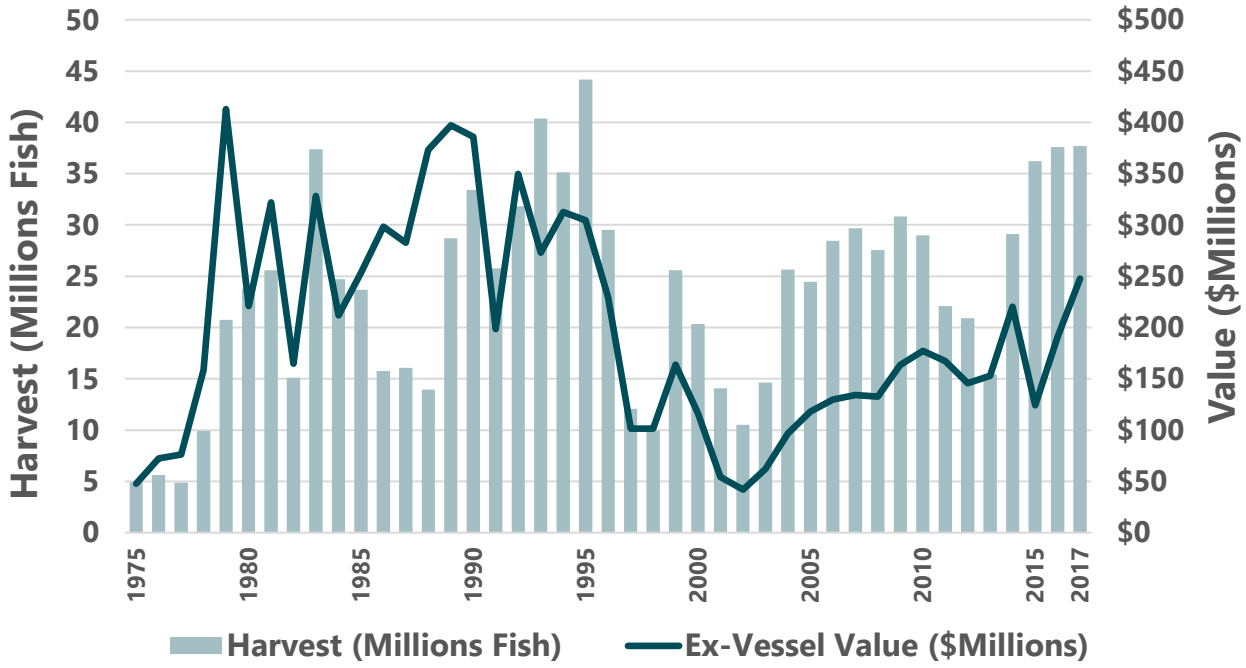
District	Run Forecast	Actual Run	2017 Harvest	1997-2016 Avg. Harvest	Escapement Goals	2017 Escapement
Naknek-Kvichak	15,480,000	15,217,467	8,112,267	7,631,212	3.1-12.3M	7,105,200
Egegik	10,260,000	14,466,239	11,865,257	6,466,235	800K - 2.0M	2,600,982
Ugashik	5,260,000	6,663,484	5,447,038	2,606,071	500K -1.4M	1,186,446
Nushagak	8,300,000	19,457,962	11,752,310	5,934,608	1.2 – 3.1M	7,705,652
Togiak	630,000	696,000	505,902	539,111	120 - 270K	190,098
Total	**39,390,000**	**56,471,152**	**37,682,774**	**23,177,237**	**5.8 – 19.1 M**	**18,788,378**

Source: ADF&G.

Fishery managers try to coordinate openings to keep escapement within a defined range or minimum threshold for each river system in the region, but overescapement can occur for numerous reasons. During periods of heavy fishing, processing capacity can struggle to keep up with harvest volume forcing processors put fishermen on limits. Overescapement and harvest limits represent an opportunity cost/loss to commercial fishermen.

The 2017 Bristol Bay salmon season was an excellent year for fishermen, but it could have been even better. The combined overescapement of the Egegik, Nushagak, Wood, and Igushik rivers was 5.2 million sockeye in 2017. At 5.5 pounds per fish and a preliminary ex-vessel price of $1.02 per pound, this overescapment represents $29.2 million of foregone harvest value this past season. Assuming a similar number of permits participated in the fishery in 2017 compared to the prior year, that is the equivalent of $12,120 of foregone harvest value per active permit (drift and setnet combined).

Figure 1. Harvest and Ex-Vessel Value of Bristol Bay Sockeye, 1975-2017



Note: Ex-vessel value adjusted for inflation, final value for 2017 is estimated and subject to change as data becomes available.
Source: ADF&G, compiled by McDowell Group.

Global Supply Analysis

Global harvests of sockeye and other competing salmon species have a significant impact on first wholesale prices and future ex-vessel prices for Bristol Bay sockeye. This chapter examines recent supply trends.

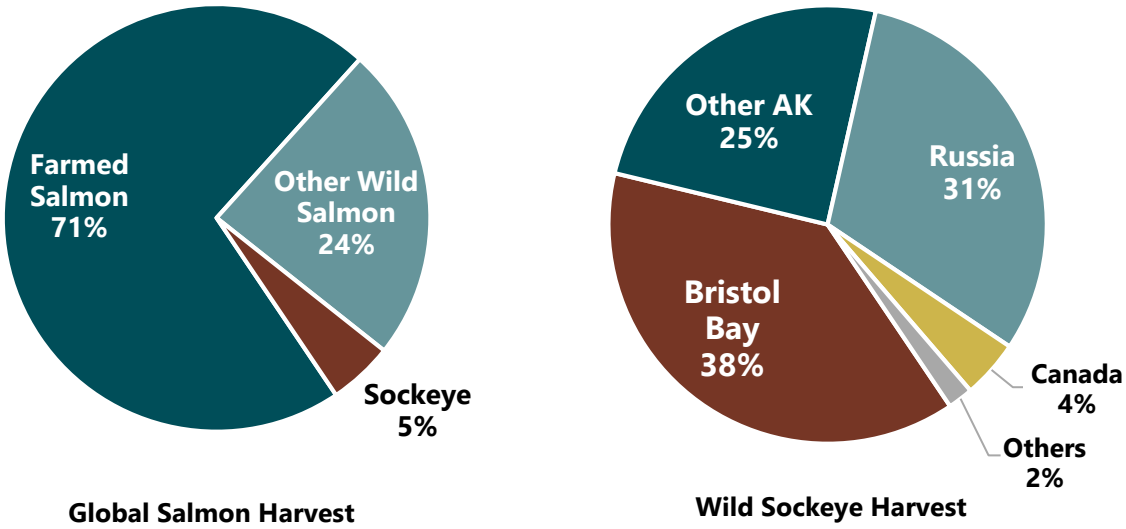
KEY FINDINGS

- Sockeye harvests declined by 5 percent in 2017, or approximately 20 million pounds, based on preliminary harvest estimates. Sockeye harvests in Alaska and Russia were projected to decline a combined 18 percent (71 million pounds) in 2017, compared to 2016.
- Sockeye harvests pale in comparison to farmed salmon production. After years of production growth, farmed salmon supply declined 10 percent in 2016 and is expected to remain below 2015 levels for several years. However, several farmed salmon analysts have increased production forecasts.

Sockeye Supply

Compared to global salmon production, sockeye are relatively rare creatures. Like other wild salmon species, sockeye harvests fluctuate but generally comprise 4 to 7 percent of global salmon production and 10 to 30 percent of wild salmon harvests. Between 2012 and 2015, sockeye accounted for 5 percent of the world's salmon harvest by volume, 17 percent of the world's wild salmon harvest, and 38 percent of the world's wild sockeye harvest.

Figure 2. Global Salmon Harvest and Sockeye Harvest by Region, 2012-2015 Average



Source: ADF&G, FAO, and PACFIN.

Bristol Bay accounted for over half (54 percent) of the world's commercial sockeye harvest in 2017, based on preliminary harvest estimates. Over the past 25 years, the Bay produced 44 percent of the world's sockeye harvest. Russia is the next largest sockeye producer. All other regions in Alaska combined generally produce

less sockeye than Bristol Bay, but still account for more than a quarter of global production. Canada and Japan are the only other notable sockeye producers. Canada's harvests tend to jump to the 20 to 50 million pound range once every five years, with the last large harvest occurring in 2014. The next large Canadian sockeye harvest is expected to take place in 2018.

Global sockeye harvests fell to 305 million pounds in 2013, the lowest figure since 2003. Harvests increased 78 million pounds in the following year posting the largest production figure since the mid-1990s. The sudden shift in supply during 2014, in addition to a strengthening dollar and other factors, led to much lower sockeye prices in 2015.

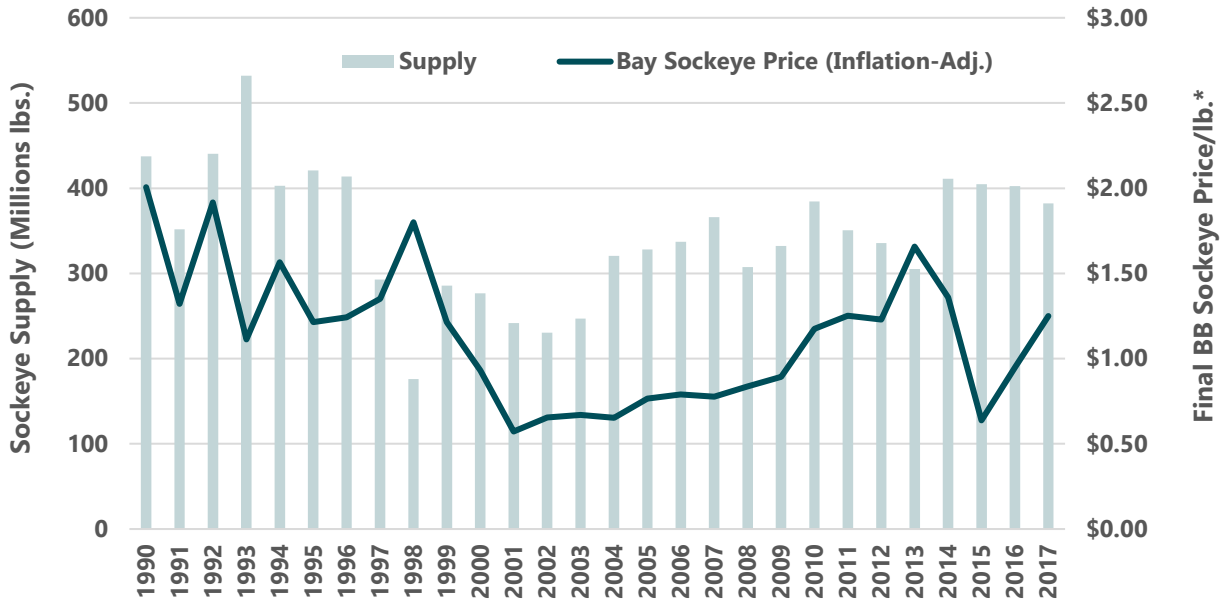
Global sockeye supply declined 5 percent in 2017, based on preliminary harvest estimates. The Bristol Bay harvest increased (in terms of pounds caught), but other areas had smaller harvests. This is a positive development for Bristol Bay sockeye producers.

Table 4. Global Sockeye Harvest by Region, Millions of Pounds, 2010-2017

Country/Area	2010	2011	2012	2013	2014	2015	2016	2017P
Alaska Total	243	249	214	178	245	280	286	289
Bristol Bay	**170**	**135**	**119**	**92**	**161**	**185**	**202**	**206**
Other AK Areas	73	114	95	86	85	96	85	83
Other U.S. Areas	11.6	1.8	0.9	0.2	4.3	0.5	0.1	0.1
Russia	80	90	112	122	104	113	110	93
Canada	44	7	5	1	52	6	4	0.4
Japan	6	4	5	5	6	6	2	N/A
Total	**384**	**351**	**335**	**305**	**411**	**405**	**403**	**382**
Bristol Bay Pct.	**44%**	**38%**	**36%**	**30%**	**39%**	**46%**	**50%**	**54%**
BBay Sockeye Base Price/lb.	**$0.95**	**$1.00**	**$1.00**	**$1.50**	**$1.20**	**$0.50**	**$0.76**	**$1.02**

Notes: 2017 figures are preliminary. Base prices do not include supplemental payments (e.g. bonuses, etc.).
Source: ADF&G, PACFIN, FAO, DFO, Russia FFA, and McDowell Group estimates.

Figure 3. Global Sockeye Supply versus Bristol Bay Sockeye Price, 1990-2017



*Historical prices are adjusted for inflation and are shown in 2016 dollars. Final 2017 price is estimated.
Note: 2017 supply figures are preliminary estimates.
Source: ADF&G (COAR) and McDowell Group estimates.

Farmed Salmon Supply

Although a growing number of consumers differentiate between farmed and wild salmon, the price and availability of farmed Atlantic and coho salmon still have a meaningful impact on values for sockeye and other wild salmon species in North American and European markets.

Farmed salmon industry analysts began predicting slower supply growth rates last year but those supply forecasts have been increased in recent months. Atlantic salmon production tends to grow around 5 percent per year (2005-2016), but the last few years have been tumultuous for farmed salmon producers. Sea lice and an algal bloom have negatively impacted production. Though forecasters predict growth will return to the 5 to 8 percent range in coming years, this production growth is not assured. According to Marine Harvest, the world's largest salmon farming company, the farmed salmon industry has reached a production level where biological boundaries are being pushed.

Farmed coho production also declined sharply from 2014 through 2016. Chile produces the vast majority of farmed coho salmon. Most of it is sold to Japan, where it directly competes with Alaska sockeye.

Table 5. Farmed Salmon Production & Wholesale Price, in Thousands of Metric Tons, 2010-2020F

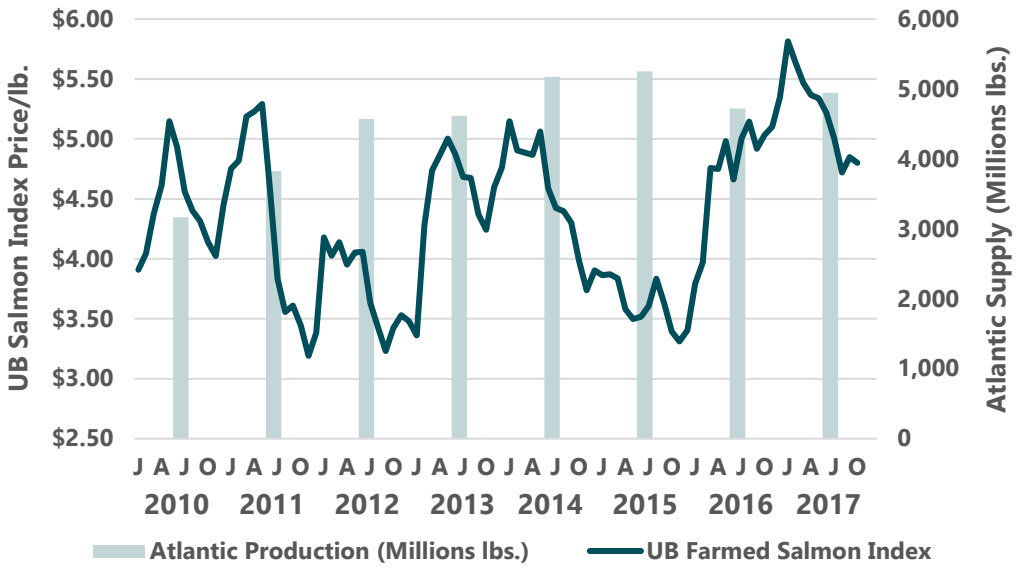
Year	Atlantic Salmon	Farmed Coho	UB Atlantic Salmon Index Price/lb.
2010	1,437	138	$4.26
2011	1,735	160	$5.01
2012	2,074	172	$4.08
2013	2,094	157	$4.28
2014	2,348	172	$4.95
2015	2,382	141	$3.78
2016P	2,141	125	$4.34
2017F	2,258	130	$5.25*
2018F	2,438	N/A	-
2019F	2,579	N/A	-
2020F	2,704	N/A	-

*Average index price through 10/9/17.
Note: The UB Atlantic Salmon Index represents a weighted-average proxy of wholesale prices on fresh farmed salmon fillets sold in the U.S.
Source: FAO, Groundfish Forum (Atlantic/Coho production in 2016-2017), Bank Nordea (Atlantic production 2018F-2020F), and Urner Barry (Salmon index).

Atlantic salmon production declined 10 percent in 2016 due to an algal bloom that killed more than 100,000 metric tons of salmon in Chile, and sea lice issues in Norway. As a result, the average wholesale price of fresh farmed salmon in the U.S. is up 39 percent since 2015. These shifts in price clearly show that demand has outgrown supply in recent years.

However, farmed salmon prices have retreated in recent months – down 17 percent, or roughly $1.00/lb., since peaking in January 2017. As with any commodity, higher prices diminish demand. It is likely that farmed prices could continue to be volatile in coming years as the supply chain responds to lower supply growth and buyers attempt to contain costs. Currency fluctuations or additional supply shocks could also have a significant impact on farmed salmon prices, as has been the case since 2015.

Figure 4. Farmed Salmon Pricing and Supply, 2010-2017



Note: 2016 and 2017 production figures are preliminary estimates.
Source: Urner Barry Salmon Index, FAO (2010-2015 supply), and Groundfish Forum (2016-2017).

Wholesale prices have a direct impact on future ex-vessel prices. This section examines trends in the wholesale market for major sockeye products as well as competing salmon products.

KEY FINDINGS:

- Demand for Alaska sockeye products is strong, reflected by higher prices for all major product forms
- Wholesale sales volumes of H&G sockeye in July and August 2017 were well below the prior year
- Wholesale prices of frozen H&G sockeye during the second trimester of 2017 were up 23 percent, compared to the previous year
- Prices of H&G and fillet products have increased faster than canned product, leading processors to prioritize H&G and fillet production
- Farmed salmon prices are down 17 percent since beginning of year and down 5 percent since this time last year

Key Product Forms and Markets for Bristol Bay Sockeye

Frozen H&G accounted for 58 percent of production volume and 49 percent of first wholesale value in 2016. Fillets had the next highest total value, comprising 24 percent of the value and 15 percent of production volume. Canned product accounted for 16 percent of volume and value. By comparison, cans accounted for 43 percent of first wholesale value and fillet production was virtually non-existent in 2000.

Fresh H&G accounted for 4 percent of value in 2016. Fresh production in Bristol Bay is up nearly 400 percent since 2014 (through 2016). Larger harvests have resulted in more product available for fresh markets, but most of the growth has been due to processors prioritizing fresh shipments to meet demand from customers. Fresh sockeye production in Bristol Bay has varied since the early 2000s, trending up and down at times. Only time will tell if the recent uptick can be sustained.

Table 6. Bristol Bay Sockeye Product Form Composition, 2016

Product Form	Pct. Volume	Pct. Value	Major Markets
Frozen H&G	58%	49%	U.S., Japan, Europe, Canada
Fillets*	15%	24%	U.S., Canada
Canned	16%	16%	U.K., Canada, U.S., Australia
Roe	4%	6%	Japan
Fresh H&G	4%	4%	U.S.
Other & Ancillary Products	4%	1%	U.S.

*Virtually all fillets are frozen.
Note: Percentages may differ slightly from other figures quoted in this report due to different underlying data sources.
Source: ADF&G (COAR).

Roe and other products accounted for 7 percent of Bristol Bay sockeye's first wholesale value in 2016. Most of that is comprised of frozen and sujiko-style roe products. Other salmon species accounted for 3 percent of the salmon fishery's overall first wholesale value in 2016.

For a more detailed analysis of product/market composition and the entire Bristol Bay sockeye supply chain, please see the *Spring 2015 Sockeye Market Report*.

Sockeye Market Outlook

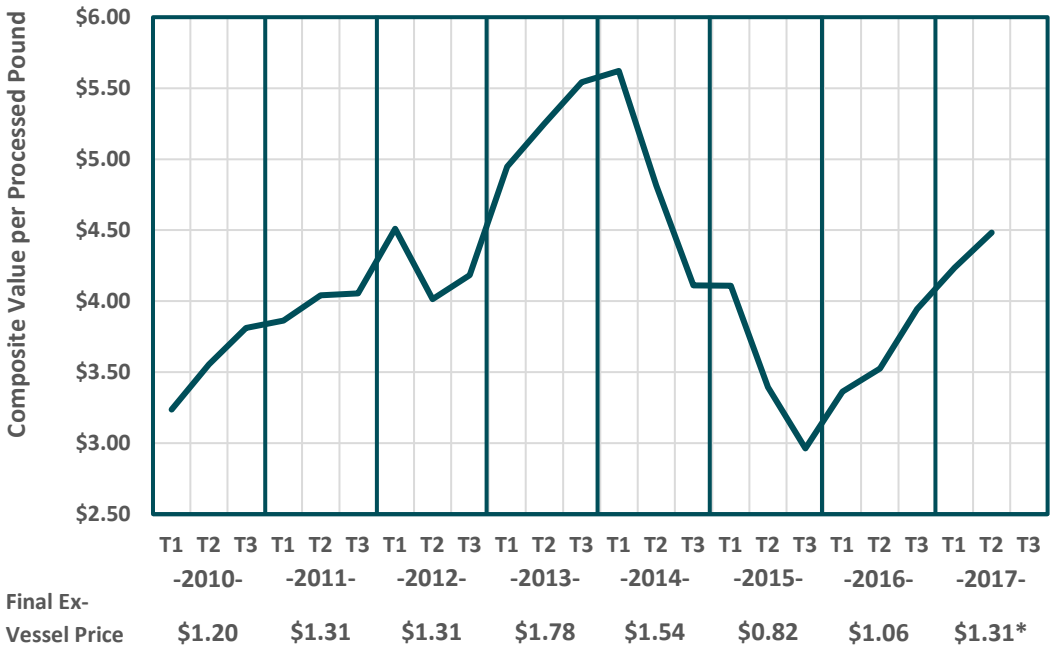
Ex-vessel and first wholesale prices for all major sockeye products have increased in 2017. Demand is high after several years of lower sockeye prices and an increase in marketing efforts. Retail prices of sockeye products will likely climb in 2017 and early 2018. Price expectations for 2018 are uncertain at this point. Sales volumes in coming months and future supply expectations will be key variables in shaping sockeye prices next year.

Wholesale Market Analysis for Key Sockeye Products

Collectively, first wholesale sockeye prices are up since late 2015, and average prices for sockeye products sold during the final trimester of 2016 are up 33 percent from the same period in the prior year (see Figure 5). Prices for every major sockeye product form have increased during the most recent trimester, based on available data (September-December 2016).

Ex-vessel prices tend to track movements of average first wholesale prices. Ex-vessel and first wholesale prices fell substantially from 2014 through 2015. Both prices rebounded in 2016.

Figure 5. Average First Wholesale Value per Pound, All Major Alaska Sockeye Products, by Trimester and Average Final Ex-Vessel Price for Alaska Sockeye, 2010-2017



*2017 final price is estimated based on preliminary/final relationships in previous years.
Source: ADOR (ASPR), ADF&G (COAR), and McDowell Group estimates.

Market conditions for major product forms are summarized in following sections.

Note: Charts in the following section represent unit values per processed pound. Unit values are equal to the first wholesale revenue divided by the number of pounds sold for each product form. This average price (i.e. unit value) is not a perfect proxy for product form prices because sizing and other specifications can change from year to year. For example, smaller frozen sockeye sell for a discount to medium and larger sized product. Therefore, an increase in the number of small sockeye (as there was during 2014, 2015, and 2016) can drag down average price for frozen H&G sockeye – even if prices for each size did not change. Regardless of this technicality, unit values are an important measure of value over time because they track how much revenue is being generated from each pound of sockeye production. As such, they are a better indicator for value trends than prices for individual sizes.

Frozen H&G Sockeye

KEY MARKETS: U.S., JAPAN, AND EUROPE
ESTIMATED PCT. OF BRISTOL BAY SOCKEYE FIRST WHOLESALE VALUE (2016): 49 PERCENT

Key market developments for frozen sockeye are as follows:

- Frozen H&G sockeye prices eclipsed $3.50/lb. in August 2017, their highest point since early 2014.
- Sales of frozen H&G sockeye have turned over slower during the first few months of the sales season compared to prior years
- Sales of fresh H&G sockeye from Bristol Bay increased 39 percent in 2017 to 3.1 million pounds

Frozen sockeye prices increased sharply from early 2013 through early 2014, due to smaller harvests and a weak U.S. dollar. Harvest volumes increased significantly in 2014 and 2015 and the percentage of smaller sockeye increased as well. This coincided with an extraordinary shift in exchange rates that led to a stronger U.S. dollar. These events resulted in a 49 percent decline for frozen H&G sockeye prices from early 2014 through 2015.

Prices of frozen H&G sockeye from Bristol Bay have rebounded significantly since 2015. Prices slightly exceeded $3.50/lb. in August 2017, the most recent month with available price data. Prices in the second 2017 trimester (May-August) averaged $3.46/lb., a 23 percent increase over the prior year. However, this year exports of frozen H&G sockeye to Japan are running 26 percent behind 2016. These exports tend to be smaller fish, sold at lower prices. Therefore, it would not be surprising to see average prices possibly decline in the final 2017 trimester.

For all the volatility of the past four years, the average price of Bristol Bay frozen H&G sockeye from 2009 through August 2017 was nearly identical to the average price from 2009 through 2012, approximately $3.05/lb. after adjusting for inflation. During the 2009-2012 four-year period, prices fell outside the $2.70-$3.25/lb. range

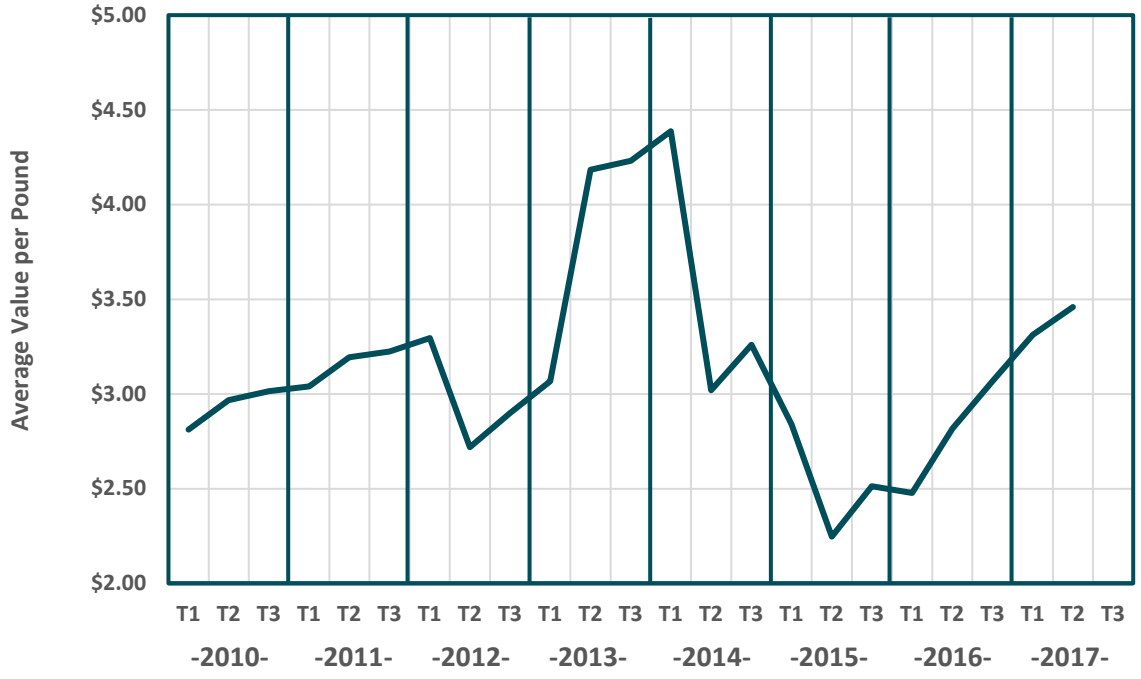
Want to find some great sockeye recipes?

BBRSDA has you covered:
https://bristolbaysockeye.org/recipe-pages

Pictured: Mustard Maple Sockeye with Roasted Vegetables
Link: https://bristolbaysockeye.org/mustard-maple-sockeye-salmon-and-veggies

in just one trimester. Prices fell outside that range eight times from 2013 through mid-2017. Whether this means the fishery is headed for lower prices at some point in the future remains to be seen, as many variables affect pricing from year to year.

Figure 6. Average First Wholesale Value per Pound, Frozen H&G Bristol Bay Sockeye, by Trimester, 2010-2017



Final Ex-Vessel Price for Bristol Bay Sockeye (Average)

2010	2011	2012	2013	2014	2015	2016	2017
$1.07	$1.17	$1.18	$1.61	$1.34	$0.63	$0.95	$1.21*

*Final price for 2017 is estimated.
Note: 2016 final price is preliminary.
Source: ADOR (ASPR), ADF&G (COAR), and McDowell Group estimates.

In the Spring 2017 Sockeye Market report, we projected prices on frozen H&G Bristol Bay sockeye would be in the $3.30-$3.75/lb. range during the 2017 sales season (roughly May 2017 through April 2018). Through the first few months of the 2017 sales season, this prediction looks pretty good despite a larger-than-expected harvest (which generally results in lower prices).

Frozen H&G sockeye pricing is highly dependent on fish size. Frozen H&G sockeye are generally categorized into three sizes: 2-4 lbs., 4-6 lbs., 6-9 lbs. (based on the processed H&G weight). The 4-6 lb. medium size is historically the most common size category; however, as sockeye size has declined in recent years the percentage of 2-4 lb. product has increased. Wholesale prices for 2-4 lb. fish are generally about 20 percent less than the 4-6 lb. size. Prices on 6-9 lb. fish are generally about 20 percent above the 4-6 lb. size.

Different size categories also have different markets. Smaller frozen sockeye primarily goes to Japan, where consumers are more price sensitive and Japanese dishes lend themselves better to smaller, thinner fillets. Larger fish (6-9 lbs.) tend to be sold to European markets, where many of the fish are smoked. Although Japan and Europe also buy some 4-6 lb. fish, the U.S. is the key market for medium-sized fish. Frozen sockeye are generally

sold to retailers and wholesale distributors who thaw out the product and sell fillets to consumers, grocery stores, and restaurants.

While increasing prices suggest strong demand, there is some reason to temper optimism. The volume of frozen H&G Alaska sockeye sold during the second 2017 trimester was 31 percent below the prior year. Given that harvest volume was similar during the past two seasons, and in fact slightly larger in 2017, this development suggests buyers are being more cautious in 2017. It will be important to monitor sales volume throughout the 2017 sales season. Heading into a season with inventories of frozen product is almost always a drag on pricing. The Spring 2018 report will provide an update on inventory conditions.

Table 7. First Wholesale Sales Volume of Frozen H&G Alaska Sockeye, by Trimester, Millions of Pounds, 2011-2017

	2011	2012	2013	2014	2015	2016	2017	Pct. Change YoY
Trimester 1 (Jan.-Apr.)	7.8	6.6	3.0	3.4	10.5	10.8	7.2	-33%
Trimester 2 (May-Aug.)	36.5	26.1	18.3	13.8	38.9	53.6	36.9	-31%
Trimester 3 (Sep.-Dec.)	33.2	29.3	17.5	29.6	54.6	38.2	-	-
Annual Production	86.8	61.4	56.0	77.6	111.9	111.9	-	-
Bristol Bay Harvest Volume	134.7	119.2	92.0	160.6	184.8	201.6	205.8	+2%

Source: ADOR (ASPR).

Canned Sockeye

KEY MARKETS: UNITED KINGDOM, CANADA, U.S., AND AUSTRALIA
ESTIMATED PCT. OF BRISTOL BAY SOCKEYE FIRST WHOLESALE VALUE (2016): 16 PERCENT

Key market developments for canned sockeye are as follows:

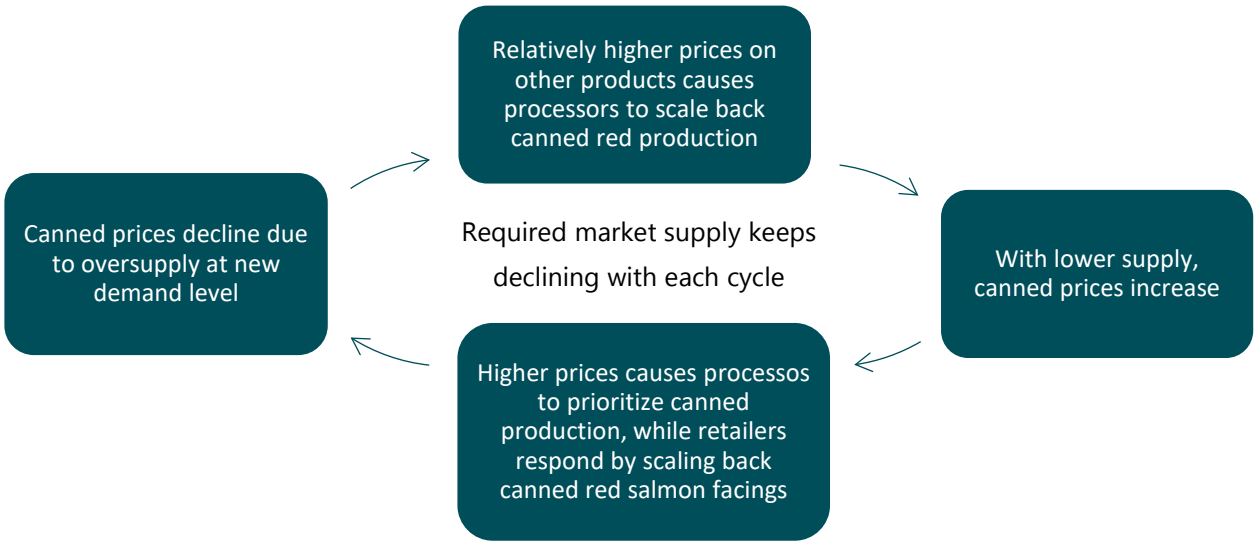
- Canned prices have increased, but not as much as other forms. The first wholesale price spread between frozen H&G and canned sockeye (half-cans) fell to $0.11 per pound – the narrowest gap on record.
- Canned production data for 2017 is not yet available, but is expected to decline despite another large sockeye harvest.
- In the short term, a small canned pack will likely exert upward pressure on canned prices. However, if canned prices get too high or supply is inadequate (at acceptable prices for buyers), red cans could lose more shelf space at retail setting up less demand for future years. Cans have already been through this cycle once in recent years, and may be heading for another round.

Bristol Bay typically produces at least two-thirds of the state's total canned red salmon pack, and often accounts for more than three quarters of statewide production. As a result, the region has more exposure to the canned salmon market than other sockeye fisheries.

The canned red market is like an older brother at the county fair, stuck on a roller coaster against his will with his more excitable little brother. He's going for a ride, again, and there's nothing he can do about it. Movements in the canned market during recent years have primarily been a side effect of demand for H&G and fillet products. A tighter spread between H&G and canned prices has incentivized processors to produce H&G products, instead of canned sockeye. This puts in motion a predictable pattern diagramed on the following

page. Unless demand increases for canned red salmon, the result is less and less canned red salmon production is needed.

The emerging cycle goes something like this:



Many retailers reduced the amount of shelf space allocated to canned sockeye from 2012 to 2014, as retail prices for talls often exceeded $9.00 per can. Once shelf space and product facings are reduced, it is very difficult to regain the lost retail space. In addition, canned salmon consumers tend to be older, and as a result the product category is not seen as a growth-oriented product – making the prospect for regaining shelf space even more difficult.

Despite these recent trends, canned remains an important product form. First, canning sockeye allows processors to greatly extend the shelf life of the resource well beyond a single year. This allows packers to even out production despite variations in harvest volume, and spread out sales during large or lean years. Secondly, processing plants have historically used canning lines as a means of increasing plant throughput. Canning lines provide a "release valve" to deal with high volume days that exceed the plant's freezing capacity. This is becoming less of a factor in processors' product form decision making process, as processors have expanded freezing capacity and efficiency. However, there are exceptions to this, both in terms of specific plants and in terms of circumstance. Finally, the canned market is still very appealing for processors. Most plants have adequate canning equipment, whose capital costs were paid off long ago. Also, there is not the same need to use chilled fish in canned product forms, as the wholesale premium for doing so is negligible. Therefore, processors can purchase raw material for lower prices.

Want to try a different take on canned sockeye?

Try making Salmon Kedgeree (Indian curried rice with salmon)

Recipe from Food52
or just google: Salmon Kedgeree

Canned prices trended up in 2016 after two years of lower canned production volumes (despite larger harvests). Canned prices have slowly increased in 2017 and are near early-2011 levels. Production data for the 2017 season will not be available for several months; however, based on anecdotal reports production is expected to be relatively low. This could result in a tighter canned salmon market this year and add to the amount of H&G and fillet product which must be sold ahead of next season.

Figure 7. Average First Wholesale Value per Pound, Canned Alaska Sockeye – Half Cans, by Trimester, 2010-2017

Source: ADOR (ASPR).

Table 8. Canned Sockeye Price vs. Frozen H&G Price and Production Trends, 2010-2017

Year	2nd Trimester Frozen H&G Sockeye Price/lb.	2nd Trimester Canned Half Sockeye Price/lb.	Price Spread	AK Canned Production (Millions lbs.)	AK Sockeye Harvest (Millions lbs.)	Canned to Harvest Volume Pct.*
2010	$2.99	$3.10	$0.12	31.7	242.6	13%
2011	$3.17	$3.83	$0.66	31.4	248.7	13%
2012	$2.81	$4.73	$1.93	41.2	213.8	19%
2013	$4.12	$4.89	$0.77	29.2	177.7	16%
2014	$3.14	$5.14	$2.00	44.5	245.4	18%
2015	$2.23	$3.63	$1.40	33.2	280.4	12%
2016	$2.82	$3.11	$0.28	29.1	286.2	10%
2017	$3.46	$3.57	$0.11	*N/A*	288.8	*N/A*

*Canned production volume divided by Alaska sockeye harvest volume. Note: 2017 harvest data is preliminary.
Source: ADOR (ASPR) & ADF&G.

Changes in the canned market have implications for Bristol Bay fishermen. Declining production and emphasis on canning lowers demand for unchilled fish. This transformation is well underway, as several processors no longer buy unchilled fish in the Bay or have announced plans to require chilling in future years.

Sockeye Fillets

KEY MARKETS: U.S. AND CANADA
ESTIMATED PCT. OF BRISTOL BAY SOCKEYE FIRST WHOLESALE VALUE (2016): 24 PERCENT (FRESH & FROZEN)

Factors influencing sales volume and pricing for frozen Alaska sockeye fillets:

- Fillet market follows trends in the frozen H&G market, which are often used to produce refreshed fillets
- Frozen fillet prices during the second trimester of 2017 are up 8 percent compared to the same period in the prior year
- Alaska processors packed more frozen sockeye fillets in 2016 than ever before and may have produced even more in 2017

Bristol Bay processors cut and froze 20.5 million pounds of sockeye fillets in 2016 – a record volume. Fillet production from the 2017 season will not be known until next spring, but early sales suggest fillet production may have even increased further in 2017.

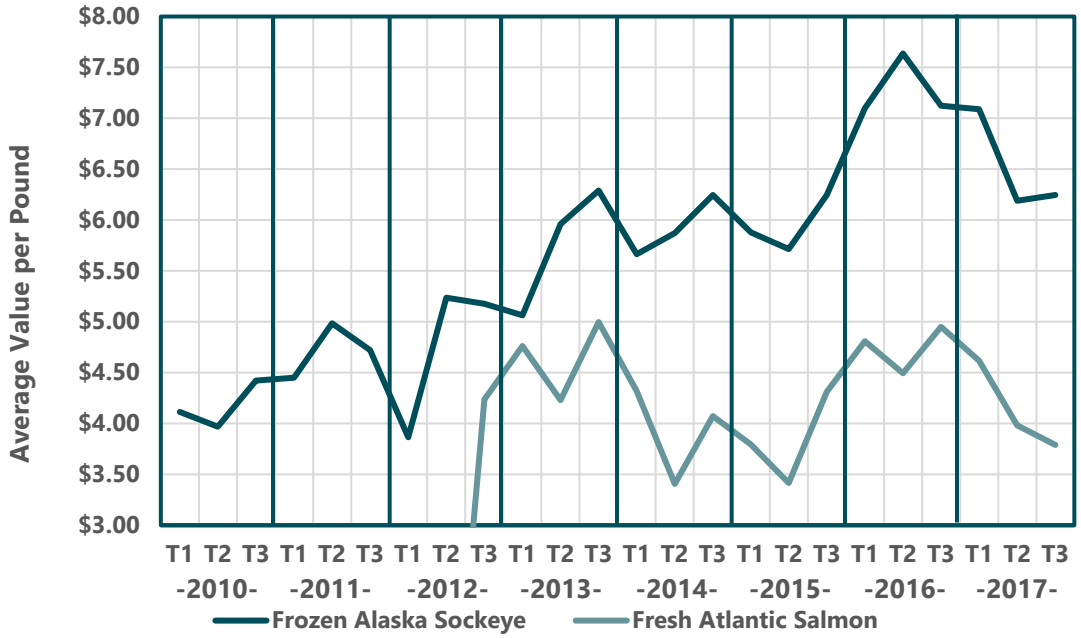
Image credit: Leader Creek Fisheries.

Like frozen H&G sockeye, prices on frozen sockeye fillets have generally trended up since last season. The spread between sockeye fillets and Atlantic salmon fillets has tightened since 2015; however, prices of both products are up. The price of Alaska sockeye fillets is currently 50 cents/lb. more expensive than last year (or more in some cases).

Unlike frozen H&G product, sales volumes of frozen sockeye fillets increased 7 percent in the second trimester of 2017, compared to the same period in the previous year. This suggests that processors had a growing book of preseason fillet orders and fillet inventories were likely very thin headed into the 2017 fishing season.

See chart on following page.

Figure 8. Average First Wholesale Value per Pound, Frozen Alaska Sockeye Fillets vs. Fresh Farmed Salmon, by Trimester, 2010-2017



Note: Fresh Atlantic salmon prices utilize the Urner Barry Fresh Salmon Index, which reflects the estimated average wholesale price of fresh Atlantic salmon fillets sold in the U.S. market.
Source: ADOR (ASPR) and Urner Barry.

Frozen sockeye fillets are convenient, and a tight vacuum-packed sleeve protects fish quality for many months. They cut down on the need for skilled fillet staff on the part of buyers, whether that is a retailer, distributor, or consumer. They also provide a more manageable portion size for consumers than H&G fish, as one frozen side can generally feed four to six people. The attributes of this product form make it a good fit for a large market segment, which explains why fillet production in Bristol Bay has risen substantially over the past 15 years.

However, large distributors who supply fish for grocery store seafood cases may prefer frozen H&G product. These large distributors have the scale and staff to profit from slacking out frozen H&G sockeye, cutting it to a specification (typically a skin-on fillet portion of 5 to 10 ounces), and shipping it to local customers. Distributors we spoke with reported good results with the process. Further, H&G buyers located near population centers may be in a better position to utilize waste streams, such as frames or scrape meat, compared to a plant in Alaska.

Want to eat a popular Japanese dish using salted sockeye?

Try making Shiozake with rice or go all out and make a traditional Japanese breakfast

Shiozake Recipe with Sake Japanese Breakfast Video

or just google: Shiozake or Japanese Breakfast with salmon to find more

Sockeye Roe

KEY MARKET: JAPAN
ESTIMATED PCT. OF BRISTOL BAY SOCKEYE FIRST WHOLESALE VALUE (2016): 6 PERCENT

Factors influencing sales volume and pricing for frozen Alaska sockeye roe:

- Salmon roe prices have increased in 2017 due to smaller global harvests of pink and chum in recent years
- The value of Bristol Bay sockeye roe has increased since 2015, due to higher prices and larger harvests

Roe typically accounts for 5 to 6 percent of sockeye's total first wholesale revenue. Although roe is a small part of the sockeye's total first wholesale value, roe prices can have a significant impact on processors' profitability and the willingness to pay higher ex-vessel prices. For example, one round pound of Alaska sockeye produced about 20 cents of roe value in 2013 when prices were near peak levels. Roe generated only about 9 cents per round sockeye pound in 2015, as roe prices were 49 percent lower than 2013. Roe prices have a greater impact on pink and chum salmon, where the value of roe comprises a higher percentage of total wholesale value. Lower roe prices were the primary reason Alaska pink salmon prices declined sharply between 2013 and 2015.

Table 9 on the following page provides first wholesale information about Alaska sockeye roe sales corresponding with harvest years (not necessarily calendar year sales). However, most of Alaska's sockeye roe is exported to Japan soon after the harvest season.

Alaska sockeye roe prices are affected by many factors, but the yen/USD exchange rate and production volume usually have the largest impact on first wholesale prices. Roe prices tend to be higher when the Japanese yen is strong and lower if the yen is weak, as the product is more expensive from the buyer's perspective in the latter situation. Despite the impact of exchange rates, harvest volume is often the biggest driver for roe pricing. Alaska sockeye roe sales tend to produce consistent sales revenue each year, often between $30 and $35 million.

Sockeye roe revenue increased 50 percent in 2016, compared to the prior year, and the average price was up 33 percent. However, 2015 was a poor year for sockeye roe, both in terms of total value and average prices (see Table 9).

Figures pertaining to sockeye roe produced and sold from the 2017 season will not be known until next spring; however, the statewide harvest was similar and early prices were on the order of $6.00/lb. Seven million pounds of sockeye roe production at $6.00/lb. could create an additional $5 million in revenue for Alaska sockeye processors, or about 1.7 cents per round pound of sockeye caught in 2017.

Want to eat an authentic Japanese dish using salmon roe?

Try making Ikura Don
(Rice Bowl with Salmon Roe)

Recipe #1 Recipe #2
*or just google: Ikura Don recipe**

**If you use wild salmon to make sashimi at home, make sure it has been frozen according to FDA guidelines (below -4°F for at least 7 days to kill any potential parasites). Never consume fresh fish raw.*

Table 9. Alaska Sockeye Roe Sales Value and Unit Value, 2008-2016

Harvest Year	Sales Volume (Millions lbs.)	Sales Value ($Millions)	Pct. of Total Sales Value	Average First Wholesale Value/lb.	August Yen/USD Exchange Rate
2008	4.4	$29.8	6.5%	$6.72	109.4
2009	5.9	29.9	5.5%	5.06	95.0
2010	5.8	29.7	5.0%	5.11	85.6
2011	5.8	34.4	5.1%	5.89	77.1 (strong yen)
2012*	4.8	34.7	5.6%	7.19	78.7
2013	4.6	35.0	6.1%	7.53	97.9
2014	5.4	33.0	5.8%	6.07	102.9
2015*	6.4	24.6	3.8%	3.81	123.3 (weak yen)
2016*	7.3	37.1	5.3%	5.08	101.3

*Sales data only includes product sold between May and December, sales made between January and April of the sales cycle were withheld for confidentiality reasons but were likely relatively minor compared to first two trimesters in the sales cycle.
Source: ADOR (ASPR) and OANDA.com, compiled by McDowell Group.

Roe data shown in the table above includes all roe product types, consisting primarily of sujiko (frozen, salted salmon roe skeins) and green roe (frozen, unsalted salmon roe skeins). Sujiko takes longer for processors to produce, since it must be salted according to exact specifications. As a result of the additional processing, sujiko is more valuable than green roe, selling for a premium of 50 to 60 percent per pound in most years.

Farmed Salmon Market Conditions

Factors influencing pricing for farmed salmon products:

- Less farmed salmon production due to Chilean algal bloom in early 2016 and sea lice problems have led to higher price environment in past two years
- Farmed production expected to grow slowly for several years, but higher prices could lead to larger-than-expected production growth (as has happened in the past)
- Lice, disease, antibiotics/pesticide limiting factors for production growth and are increasing production costs
- Consumer demand has likely eroded somewhat due to high salmon prices, farmed salmon prices are down 17 percent since beginning of year and down 5 percent since this time last year

Although many consumers differentiate between wild and farmed salmon, many major buyers still react to pricing differences. As farmed salmon production dwarfs the supply of wild salmon, farmed product creates a natural baseline for wild salmon prices. In the U.S. and Japan, sockeye prices generally slot in above farmed salmon prices. This generally leads to greater interest in sockeye when farmed salmon prices increase.

Farmed salmon prices have risen dramatically over the past two years, according to the Urner Barry Fresh Farmed Salmon Index (see Figure 9). However, prices are down substantially since early 2017. The index represents a trade-weighted proxy for the wholesale price of fresh farmed salmon fillets sold in the U.S. market.

While farmed salmon prices have declined in 2017, they are still well above 2014-2015 averages. This remains good news for Alaska's salmon industry, but as always Alaska fishermen and processors who are interested in looking ahead to the value of future harvests must keep a close eye on prices of competing farmed product.

Figure 9. Urner Barry Fresh Farmed Salmon Index, by Month, January 2013 – October 2017

Source: Urner Barry.

Demand for farmed salmon has outstripped supply growth in recent years, but that trend may have run its course. A recent Undercurrent News article noted this assessment from one salmon industry analyst, "Salmon supply is growing faster than demand growth globally, and key European markets like France, Denmark, Poland, and the UK are getting softer at these prices." The trade press outlet went on to say that, "The new price equilibrium has resulted in a substantial decline in price-sensitive markets and segments, mainly in the EU and Russia."

Several investment banks have recommended selling shares of most salmon farming companies. Analyst forecasts and forward prices on Atlantic salmon for 2018 are steady. However, a few believe there could be more downside pricing risk in the near term. Despite this pessimism, most analysts predict a brighter future in the long term.

Recent forecasts about farmed salmon production and pricing suggest it may be more difficult to add value to the Bristol Bay sockeye harvest in 2018 and 2019. However, the 2017 season was an excellent year for Bristol Bay salmon fishermen and many would gladly lock in that revenue if given the chance. And, as always, sockeye harvests from competing fisheries will have a significant impact on the relative value of Bristol Bay fish. Current prices of fresh and frozen sockeye are generally workable (in relation to farmed salmon prices), but higher price spreads will require a continued effort to produce high quality product, as well as marketing programs that increase the value proposition for consumers. Despite the volatility of recent years, the goals surrounding raising the value of Alaska sockeye remain consistent: continue raising the bar on quality and cultivating a deeper connection with the consumer.

Russian Sockeye

U.S. imports of Russian sockeye tend to spike when Alaska sockeye prices rise and 2017 is revisiting that pattern. Historically, the volume of Russian sockeye imported into the U.S. is relatively small. However, when Alaska sockeye harvests were poor in 2013, the U.S. imported 8.0 million pounds of Russian sockeye. That volume declined in 2014 and 2015 as Alaska sockeye harvests increased and prices declined.

Last year, imports of Russian sockeye spiked to 3.6 million pounds despite a large harvest in Alaska, suggesting that some buyers are at least experimenting with selling Russian sockeye in the U.S. Imports of Russian sockeye are up 213 percent in 2017 through August, year-on-year. Not surprisingly, the average import price of Russian sockeye has also increased (see Table 10).

Table 10. U.S. Imports of Russian Sockeye, 2010-2017

Year	Volume (000s lbs.)	Value ($000s)	Alaska Sockeye Harvest (Millions lbs.)	Avg. Alaska Sockeye Frozen H&G Price/lb.
2010	130	$466	243	$2.98
2011	23	$77	249	$3.19
2012	294	$1,053	214	$2.93
2013	7,954	$29,589	178	$4.03
2014	1,906	$7,001	245	$3.19
2015	1,018	$3,147	280	$2.38
2016	3,646	$11,710	286	$2.87
JAN-AUG 2016	705	$2,185	286	$2.75
JAN-AUG 2017	2,207	$7,392	289	$3.44

Errata Note: Data in this section published in previous reports mistakenly quoted import volume in kilos, as opposed to pounds.
Source: NMFS Trade Data.

Although Russian waters produce the same salmon species as those caught in Alaska, the primary harvest method is very different. Russian salmon producers typically use fish traps located near the mouths of rivers. Trap sites are leased by salmon processors, who employ laborers to harvest, transport, and process salmon. Due to the differences in harvest gear, Russian salmon companies are capable of producing high quality sockeye. However, interviews with buyers report that historically Russian sockeye quality varies widely from company to company.

Developing a broader U.S. market for Alaska sockeye is an important goal for the Alaska seafood industry; however, it could also provide an opportunity for buyers to substitute Alaska product with Russian salmon. Branding and marketing efforts undertaken by BBRSDA, ASMI, and the Copper River/Prince William Sound RSDA are critical to creating consumer loyalty for Alaska salmon products. Since affluent consumers primarily base their seafood purchases on quality and taste, it is also important that Bristol Bay sockeye products offer comparable or superior quality.

Large Scale Mining in Bristol Bay

In May 2017, the Environmental Protection Agency (EPA) settled a lawsuit with the Pebble Limited Partnership, allowing the permitting process for the proposed Pebble Mine to continue. More recently, details have emerged about a May meeting between EPA administrator Scott Pruitt and Pebble Limited Partnership executives. Shortly after the meeting, EPA leadership directed staff to withdraw protections for the area from certain mining activities. If finalized, the agency's reversal of actions taken by the previous administration would allow Pebble to apply for a mining permit, but does not guarantee that those plans would be approved.

A 90-day public comment period closed on October 17, 2017. Pebble leadership has expressed plans to file mining permit applications for a scaled-down operation in December 2017. Link.

The Pebble Mine is an extremely contentious issue. Fishermen are worried that such a mine could jeopardize the natural productivity and purity of the Bristol Bay watershed. Large buyers have expressed concern that a mine could tarnish the fishery's reputation and affect consumer demand for Bristol Bay salmon.

Amazon's Whole Foods Purchase a Sign of Grocery Store Evolution

Amazon bought Whole Foods, a high-end grocery chain with 430 stores, for $13.3 billion in June. Interestingly, the increase in Amazon's stock market valuation after the announcement paid for the purchase in a single day. Amazon's digital reach is impressive, as an estimated two-thirds of U.S. households subscribe to its Prime membership program. The move is consistent with an emerging theme in retail where retail websites are merging with the services of brick-and-mortar stores in an effort to gain, or retain, market share. Tracking customer orders and habits via website purchases provides far greater accuracy for retailers in answering the all-important question of what do people want to buy? Link.

This transformation is well under way in China. ASMI has had good success with e-commerce promotions in China, selling over $1 million worth of product for a "Single's Day" promotion. Executive Director Alexa Tonkovich recently told Intrafish, "Traditional channels are blurring. It's the people at the intersection of physical and virtual worlds who will thrive. If not, you will become obsolete."

In an effort to stay ahead of competition, existing grocery stores are increasingly offering delivery services and digital ordering platforms to customers. Consumers are gaining power to shape the food supply chain from "you'll eat what is provided" to "order anything you like." Changing the point of purchase from store to the home brings about opportunity and challenges. The impacts may take longer for perishable products like seafood, but the paradigm shift undertaken by Amazon and others could revolutionize the business of retail seafood. Successful marketing efforts will need to thrive within this evolving food delivery system.

Farmed Salmon Escape

In August, a net pen containing 305,000 Atlantic salmon broke apart in Washington state. Salmon farming company Cooke Aquaculture says it is unsure exactly how many salmon escaped. Local tribal organizations,

fishermen, and environmental groups worry the escaped fish could spread disease and parasites. In response, Washington governor Jay Inslee has instituted a moratorium on permits for salmon net pens. Link.

GMO Food Research Advances, Producers Contemplate Messaging

Chinese scientists have achieved a breakthrough with a genetic modification to pork resulting in low-fat pigs. The experiment marks a significant advance in genetic modification, successfully applying a new gene-editing tool known as CRISPR that makes changing DNA code easier and more precise. While this recent advance was achieved differently than techniques used by AquaBounty to create a genetically modified salmon, the benefits for producers in each case are substantial. GMO salmon are generally faster growing and likely consume less feed, major cost issues for farmed salmon producers. Link.

Consumer perception of genetically modified (GMO) foods remains mostly negative in the U.S. and Europe. Some experts doubt GMO pig products would ever be approved in the U.S., but that notion might not be too farfetched. FDA regulators approved GMO salmon in 2015. Thus far, consumers have not widely accepted GMO food products, at least knowingly. GMO grains are commonplace, often used in animal feeds and as ingredients in human foods. The implications for Alaska seafood producers are unclear, but it is possible that GMO foods may eventually gain wider acceptance as the benefits of such modifications become greater.

Alaska Ballot Measure Regarding Fish Habitat Restored

Anchorage Superior Court Judge Mark Rindner overruled Lt. Governor Byron Mallott, finding that the Stand for Salmon group could move ahead on a ballot initiative aimed at creating a new multi-tiered system of permits for development projects affecting fish habitat. The matter ended up in court after Lt. Governor Mallott rejected the proposed ballot initiative. If the court's decision stands, initiative backers will need to get 32,000 signatures before the new law can go before voters in 2018. *(Seafood News, subscription required)*.

Upstart Bay Processing Operation Becomes a Cautionary Tale

The 180' F/V Akutan went to Bristol Bay this summer to process sockeye for a group of roughly 15 drift boat fishermen, primarily members of an Old Believer community in Homer. The story of the vessel, its crew, and those involved was well documented in an August article written by KDLG's Dave Bendinger. While the story is too long to fully recount here, the results underscore the risk associated with processing in the fishery. Poor planning and a series of unfortunate events led to production of just 160,000 lbs., an unpaid crew, bankruptcy for the processing company, and repossession of the vessel. The Homer fishermen who hired the processing company, essentially lost an entire season. More recently, news outlets have reported that all the vessel's 2017 product had to be disposed of due to product being saturated with diesel fuel, making it unfit for human or animal consumption. Link.

The idea of bypassing Alaska processors and selling products directly to other markets is an alluring idea for many fishermen. However, with greater potential revenue comes greater risk. Silver Bay fishermen have successfully established a new vertically-integrated, fisherman-owned company, but for each success there are many ventures that either fail outright or return too little in exchange for the investment of time and money.

The Story of Sockeye Market Diversification

The diversification of sockeye markets is a fascinating story. Most changes of any sort are reactionary in nature. The sockeye industry is no different. With increasing competition from less expensive farmed coho salmon in Japan and the canned product losing demand due to changing tastes, a reaction would be necessary if the industry was ever going to flourish again. However, change does not come with a guarantee. Through a lot of careful planning, hard work, and large investments, the effort has been successful.

This section summarizes changes to Alaska sockeye markets over the past 15 years. A much longer version could be written about the important contributions of the people and companies who have revolutionized the Alaska sockeye industry.

Once Upon a Time: Frozen to Japan or Packed in a Can

For more than 100 years, virtually all Bristol Bay sockeye was either canned or frozen and exported to Japan. Table 11 provides market share estimates extending back to 2001, when an estimated 86 percent of Alaska's sockeye production followed these two primary sales channels. The percentage for Bristol Bay sockeye would have been even higher as salmon caught in the Bay are more likely to be canned and were less likely to be sold as fresh product to domestic markets.

Table 11. Estimated Market Share of Production Volume of Alaska Sockeye, 2001-2016

Calendar Year	Japan (Frozen/Roe)	Canned	U.S. Market (Fresh/Frozen)	Other Countries (Mostly Frozen)	FW Sockeye Value ($Millions)
2001	53%	34%	7%	7%	$227
2002	45	37	15	3	245
2003	38	38	19	4	238
2004	38	36	18	8	334
2005	46	30	13	11	369
2006	19	31	32	17	386
2007	17	30	30	23	446
2008	26	27	20	28	493
2009	26	25	27	22	520
2010	26	17	35	22	601
2011	25	17	33	26	670
2012	14	26	34	26	628
2013	11	21	50	17	591
2014	13	25	53	9	526
2015	26	16	37	21	632
2016	20	14	41	25	725
2016 vs. 2001	**-33%**	**-20%**	**+34%**	**+18%**	**+$498**

Notes: Japan figures include frozen sockeye exports to South Korea, as these shipments are often re-exported and consumed in Japan. Most canned production is exported. Figures may not sum due to rounding. Fillets converted to H&G weight basis.
Source: NMFS Trade Data, ADOR (ASPR), and McDowell Group estimates.

A tremendous shift has occurred over the past two decades, as cans and Japan have lost their place as the only major sockeye sales channels. In 2016, it is estimated that only 34 percent of Alaska sockeye production went to Japanese or canned markets. The U.S. is now the largest market for Alaska sockeye by a wide margin.

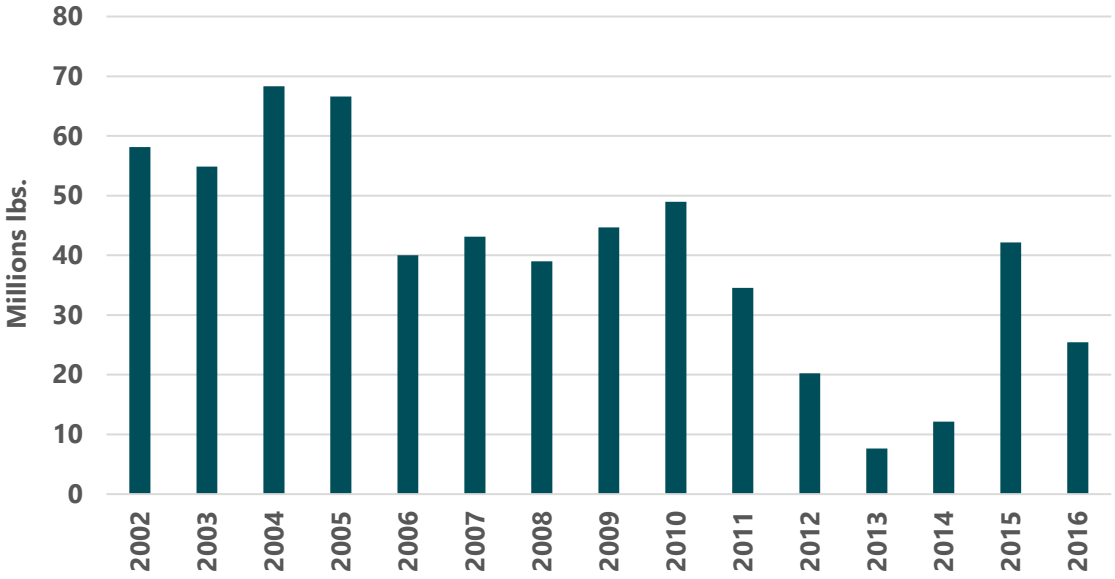
Prior to the mid-2000s, sockeye products were relatively limited too. Canned sockeye had bones and skin. There was very little filleted product. Heads and guts were discharged as ground waste. Processors are now experimenting with more canned specifications, fillet production has increased dramatically, and waste streams are slowly being utilized in ancillary products (such as salmon oil or pet food ingredients).

Declining Exports to Japan

Japan routinely imported 50 to 70 million pounds of frozen H&G sockeye from the U.S. until 2006. However, the volume has diminished substantially since then. Japanese imports fell all the way to 8 million pounds in 2014, but rebounded in 2015 and 2016 largely due to sales of smaller fish to Japan (see Figure 10). Japanese imports of frozen U.S. sockeye are down 36 percent in 2017 through August compared to same period in previous year.

Kirimi-style cuts (pictured) of lightly salted salmon are a staple in Japanese cuisine. Sockeye has been somewhat supplanted by farmed Chilean coho in Japan; however, overall seafood consumption has also been contracting for more than a decade compounding the declining sockeye trade.

Figure 10. Japan Imports of U.S. Frozen Sockeye, in Million lbs., 2002-2016

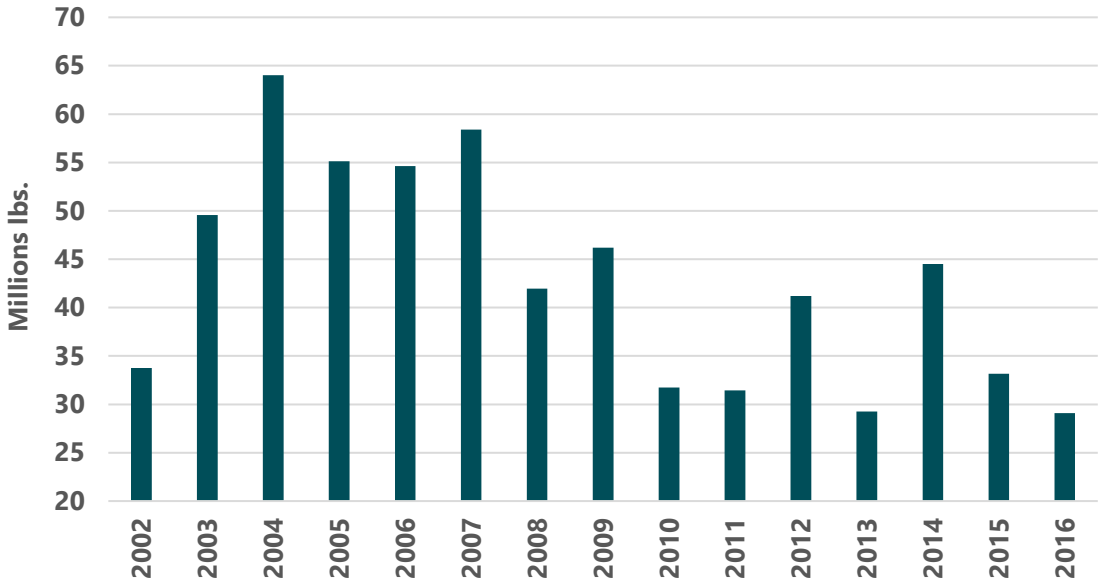


Note: Includes direct U.S. exports and those sold to Japanese buyers after being stored in other countries.
Source: Global Trade Atlas.

Pulling Sockeye out of the Can

As other markets and product forms became more popular, raw material had to come from somewhere. What wasn't taken out of the Japan trade, was generally pulled from the canned format.

Figure 11. Canned Sockeye Production, in Million lbs., 2002-2016



Source: ADOR (ASPR).

Canned production generally accounted for a third or more of the total sockeye production volume prior to 2008. Since 2010, the canned product form has averaged just 20 percent of total sockeye production volume. This has resulted in a downward cycle where less supply results in higher canned prices, leading to less shelf space at retail; which reduces demand and supply even further. The progression and implications of this cycle are explained in greater detail in the Sockeye Market Analysis section.

Revitalizing Alaska Seafood

Diversifying sockeye markets and products was borne out of a much larger effort to revitalize a struggling seafood industry. Alaska's salmon industry experienced a value crisis in 2002. Prices had been in decline for years, as canned inventories mounted and competition from farmed salmon limited prices for frozen product. Harvests generally declined from 2000 through 2003 and the average statewide sockeye price fell by more than a third – resulting in an extended double whammy that drained earnings from fishermen and processing companies alike. Many fishermen and several large processors went out of business or were bought out by other operators. Between 1999 and 2003 the number of Bristol Bay driftnet permits fished declined 24 percent and ex-vessel value fell 59 percent. The first wholesale value of Alaska salmon fell by nearly $300 million. It was clear that the industry would need to change dramatically if it was to survive. Tens of thousands of jobs and an iconic, multi-billion dollar industry depended on a successful overhaul.

Shortly after taking office in late 2002 Governor Frank Murkowski launched the Fisheries Revitalization Strategy with the goal of boosting investment and innovation in Alaska's seafood industry. The multi-year plan created a fish cabinet and an Alaska Fisheries Marketing Board that quickly brought together industry, government leaders, and agencies to address the numerous challenges. However, fixing the industry's problems would require more than planning - it would require a lot of money.

The late Senator Ted Stevens secured $40 million in federal funding for seafood marketing and development grants and the State of Alaska contributed $10 million to be used for salmon specifically. The $50 million funding

package was administered through a competitive grant program that supported marketing and development projects for several years. Government officials wanted to ensure the funds would be used to maximum effect. So, grants to private companies and fishermen required matching funds, greatly leveraging the original $50 million and requiring recipients to have "skin in the game." The amount of public and private investment in program projects totaled $116 million.

An influx of grant funding allowed fishermen to perform quality upgrades on vessels. Communities made infrastructure improvements. Processors invested in equipment to produce new product forms, such as vacuum-packed sockeye fillets. Direct marketers, processors, and the Alaska Seafood Marketing Institute received funds to market seafood products to new customers, all in an effort to raise the value and public profile of Alaska's seafood resource.

Overall, the effort was very successful. Between 2003 and 2016, the first wholesale value of Alaska salmon has increased by an average of $39 million per year (above 2003 levels, adjusted for inflation). The growth in value of all Alaska seafood products has averaged $67 million per year. Bristol Bay salmon fishermen have benefitted tremendously from the projects completed as part of the program, averaging $10 million in growth above 2003 levels (adjusted for inflation).

Of course, not all the additional value can be attributed to the revitalization grant program. Resource value benefitted from several trends since 2003:

- A significantly weaker U.S. dollar (2003-2011), providing more favorable market conditions for Alaska seafood
- Larger harvests of sockeye, cod, crab, and sole, although halibut harvests declined significantly since 2013
- Shift in consumer preference towards attributes associated with Alaska seafood
- Ongoing marketing activities of ASMI and RSDAs.

In addition, the industry has continued to invest significantly since the program ended in 2007. Acknowledging the contributions of the Strategy in no way detracts from the valuable marketing/development work done prior to 2003, during the grant period, or after. All of these efforts have collectively had a hand in raising the value of Alaska seafood.

However, public and private sector leaders involved in the Fisheries Revitalization Strategy deserve much credit for providing an influx of funding, creating an effective framework to deploy investment, and executing a vision at a critical point in time.

Growing a U.S. Market for Alaska Sockeye

The share of Alaska sockeye products sold into the U.S. has nearly tripled since 2002. In value terms, the growth has likely been even greater. Several trends converged to make this the success story it is today. First, Alaska sockeye fishermen greatly improved fish quality by chilling their harvest. Secondly, salmon consumption was on the rise in the U.S., largely due to increasing volumes of imported farmed salmon, but eventually many consumers began looking for a premium, wild product from sustainable fisheries. Some were turned off by antibiotic use in salmon farms, some objected to the use of dyes to add color to flesh, and many simply found

they preferred the taste of wild fish. Ironically, the thing that nearly ended the Alaska salmon industry has created a much larger niche for premium salmon products and helped pave the way for its revival.

During the mid-2000s, some Alaska sockeye processors found they could achieve higher returns by selling frozen fillets (often vacuum-packed) to U.S. grocers or distributors. Production of Alaska sockeye fillets quadrupled between 2005 and 2010 and the U.S. market share of sockeye products nearly doubled. Frozen (filleted) sides have proven to be a good product for retailers and restaurants alike. They are easy to portion and do not require retail/restaurant staff to hand fillet expensive fish where mistakes or lost yield can quickly eat into margins. Frozen sides and portions are also convenient for consumers. Prior to 2002, Alaska processors packed less than 2 million pounds of sockeye fillets, but now processors put up 20 to 30 million pounds per year. Approximately a quarter of these fillets are exported, but the vast majority are sold to U.S. customers.

In more recent years, there has been a growing trend towards refreshing frozen H&G sockeye. This has increased the available supply of sockeye products to U.S. buyers. Refresh programs, as they are called, generally work like this:

- Local seafood distributors buy frozen H&G sockeye from Alaska processors
- Distributors thaw out frozen H&G salmon and then hand fillet them in small batches depending upon how much their customers order
- Chilled fillets are sent as sides or portions to local restaurants and grocery stores where they are sold from seafood cases or refrigerated bunkers

Many distributors and retailers report good success using refreshed sockeye. Quality is generally very good, assuming the fish were chilled after harvest and graded properly. The cost of filleting slacked out H&G fish in the lower 48 can be less expensive than purchasing fillet products, and most distributors have processing staff who are skilled filleters. Plus, distributors can sell belly trimmings and frames, or further process them into additional products, such as scape meat.

Going forward, U.S. buyers will have the added benefit of marketing a branded Bristol Bay sockeye product. BBRSDA has created a compelling brand image and sales assets designed to build value in the minds of consumers.

The popularity of Alaska sockeye among U.S. buyers has grown substantially over the past decade. U.S. consumers can now buy high-quality sockeye virtually year-round in most major grocery stores, from the "fresh" case or the freezer aisle. This transformation was the result of vision, execution, and investment on the part of fishermen, processors, and government. The past, current, and future returns of these efforts is significant.

Growing Other Alaska Sockeye Markets

Alaska sockeye producers have found new markets for frozen products outside of the U.S. as well. Exports of frozen sockeye to countries other than Japan or South Korea increased from $9 million in 2003 to $125 million

in 2016.[1] Twenty years ago, if sockeye wasn't canned the vast majority was exported directly to Japan. Now, the situation is much different, and the resource value is more resilient as a result.

Japan is still the largest export market for frozen sockeye by a wide margin; however, the route some of that product takes has changed. Over 40 percent of Japan's purchases of frozen sockeye now come from South Korean cold storage facilities, which reportedly have lower storage costs than North American or Japanese facilities. Product stored in ports like Busan, South Korea, create additional access to global markets. Buyers from all over, including Japan, can bid for product stored in North America or Asia, depending on which trade route works best for them.

Sockeye producers also have a much larger roster of buyers to do business with around the globe. As with any commodity, generally the more buyers the better. Instead of being locked in to the Japanese market, sockeye processors have access to buyers in Canada, Europe, and high-end niche markets elsewhere. These other markets went from buying 9 percent of the U.S. frozen sockeye pack in 2003, to purchasing 58 percent of it in 2016 (see Table 12).

Today, Germany, China, France, the Netherlands, and Poland all import substantial volumes of Alaska sockeye. European buyers bought $54 million of frozen sockeye in 2016, while Chinese buyers directly imported $22 million of frozen sockeye. Many European sales are made to smoked fish processors; whereas Chinese buyers typically fillet sockeye for U.S. and European customers. As a result of this diversification, made possible through an increase in fish quality, Alaska sockeye has a growing footprint in Europe. This is an exciting development. Similar to the situation in the U.S. market where sockeye found appeal with farmed salmon consumers, Europe is easily the largest salmon consuming region in the world. Growing the niche for smoked and refreshed sockeye products in Europe is an important part of growing the resource value.

Table 12. U.S. Exports of Frozen Sockeye, by Pct. of Value, 2003 vs. 2016

Export Destination	2003	2016
Japan & South Korea	90%	43%
Canada	5%	17%
Other Countries	4%	41%
Total Export Value ($Millions)	**$95**	**$220**

Note: The majority of sockeye exported to South Korea is likely re-exported to Japan. Figures may not sum.
Source: NMFS Trade Data, compiled by McDowell Group.

Smaller niches in vacation destinations and high-income markets are also developing. In 2016, exporters sold over $3 million of frozen sockeye to buyers in a dozen "high-end" niche countries.[2] None of these countries directly imported any sockeye from the U.S. in 2003. Though a small part of overall sales, these niche markets are appealing because buyers' have the ability to pay premium prices for high quality products. Growing supply to these countries is less likely to require lower prices.

[1] It is believed that almost all sockeye exported to South Korea is re-exported to other countries, primarily Japan.
[2] The dozen countries are: Hong Kong, Singapore, Dominican Republic, Aruba, Australia, Kuwait, Cayman Islands, Costa Rica, United Arab Emirates, Saint Kitts-Nevis, and Brazil.

Impact of U.S. Dollar on Bristol Bay Sockeye

Key Finding: The U.S. dollar has weakened by 7 percent since the beginning of the year, a positive trend for Alaska salmon producers. However, the dollar remains much stronger than it was from 2005 to 2015.

Why Exchange Rates Matter

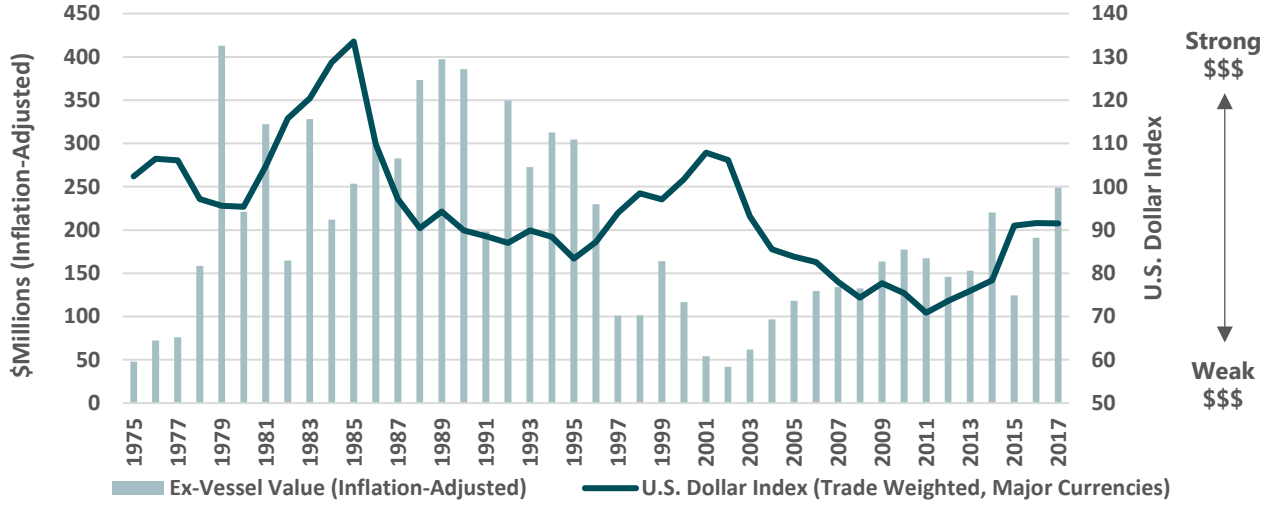
Changes in the value of one currency versus another impact the value of goods traded between those countries. A large percentage of Alaska salmon is exported abroad, where buyers must convert their own currencies to buy salmon in U.S. dollar terms. Additionally, Alaska salmon compete against imported salmon in the U.S. market. The exchange rate of U.S. dollars affects the price of Alaska sockeye for foreign buyers, and impacts prices for competing salmon products in the U.S. market.

Therefore, the value of the U.S. dollar, relative to other currencies, fundamentally affects salmon prices. When the value of the U.S. dollar is low, or weak, Americans must pay more for imported goods to achieve the same price denominated in foreign currency. In a weak dollar environment, the price of salmon quoted in U.S. dollars will generally be higher. Conversely, if the value of the U.S. dollar is high, or strong, Americans generally pay less for imported goods to achieve the same price denominated in foreign currency. In a strong dollar environment, the price of salmon quoted in U.S. dollars will generally be lower. All things being equal, a weaker U.S. dollar is generally good for Alaska salmon producers and a stronger U.S. dollar is generally bad. However, there are additional factors which impact price in different ways from year to year.

Exchange Rate Movements and Bristol Bay Sockeye Value

Indeed, graphing historical data for the U.S. dollar index versus the ex-vessel value of Bristol Bay sockeye shows that sockeye value tends to be lower when the U.S. dollar is stronger (see Figure 12). This was certainly the case from 1997 to 2004. However, dollar strength/weakness does not always predict resource value.

Figure 12. Ex-Vessel Value of Bristol Bay Sockeye vs. U.S. Dollar Index, 1975-2017

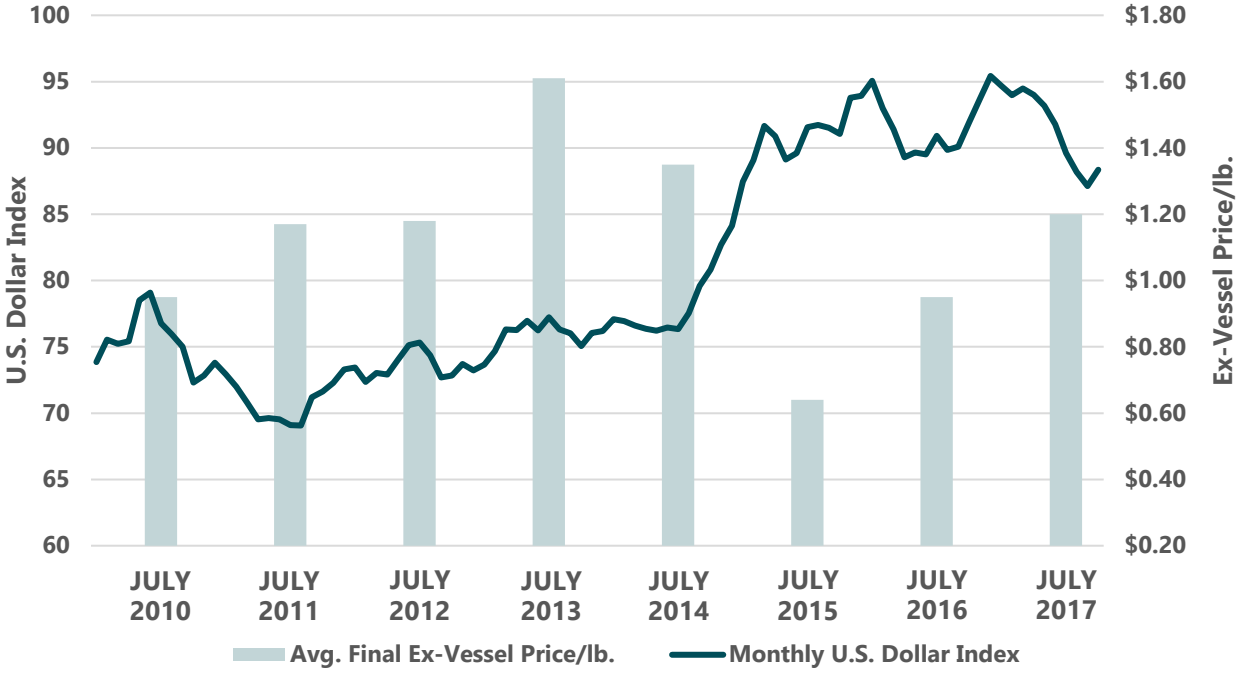


Note: 2017 valuation is an estimate of final ex-vessel value. U.S. Dollar Index figures are annual averages.
Source: ADF&G, McDowell Group estimates, and Board of Governors of the Federal Reserve System.

The U.S. dollar strengthened considerably almost as soon as the fishery began wrapping up in 2014. The dollar's value declined 15 percent between August 2014 and July 2015, and ex-vessel prices of Bristol Bay sockeye fell 53 percent. However, the U.S. dollar has weakened over the past twelve months, with the index at its lowest point since late 2014. This provided some support for Alaska salmon prices in 2017, in addition to other factors.

Drastically lower prices in 2014 rejuvenated demand for sockeye products. Sockeye prices have nearly climbed back to pre-2014 levels, despite a persistently strong dollar. Although the 2017 price was below that of 2011, 2012, and 2014 after adjusting for inflation, the 2017 price would be higher if adjusted for the value of the U.S. dollar. Given the large harvests in 2016 and 2017, these trends suggest that demand for Bristol Bay sockeye has grown significantly in recent years.

Figure 13. Final Average Ex-Vessel Price of Bristol Bay Sockeye vs. U.S. Dollar Index, 2010-2017



Note: Final 2017 price is estimated.
Source: ADF&G, McDowell Group estimates, and Board of Governors of the Federal Reserve System.

The amount of first wholesale revenue paid to fishermen through ex-vessel prices, as well as the gross marginal amount retained by processors provide strong clues as to the future direction of ex-vessel prices and/or value.

KEY FINDINGS:

- Net processing revenue (see definition below) was the lowest on record during the 2014 harvest year, but was the highest on record (since 2001) during the following harvest year. Net processing revenue declined slightly in 2016, but was still the second-highest figure on record (since 2001). Figures for 2017 will not be available until next June.
- Increases in net processing revenue tends to result in higher future ex-vessel values.

Ex-Vessel and First Wholesale Accounting

Trends in processors' cash flow have a direct bearing on ex-vessel prices. Cash flows can be tracked by comparing first wholesale value to the ex-vessel value paid for the fish, in this case Bristol Bay sockeye. Analyzing processing sector cash flows using ex-vessel and first wholesale data requires a few adjustments and conventions:

1. In this chapter we focus on a calculated statistic called **Net Processing Revenue**, which is an estimate of revenue earned by Bristol Bay processors for selling key sockeye products (H&G, fillets, canned, and roe) made in the region, less the ex-vessel cost of sockeye (i.e. payments to fishermen).

2. First wholesale sales are compiled according to a customized "sales cycle" intended to better imitate the actual wild salmon sales season. Because first wholesale data is generally broken into trimesters and most commercial salmon fisheries start up in May/June, we treat the period of May through the following April as one 12-month "sales cycle." For example, salmon caught in July 2014 and sold by Alaska processors in February 2015 would be part of the 2014 harvest year (also referred to as the 2014 sales cycle). Compiling the sales data in this manner, as opposed to a calendar year basis, allows for a better comparison to ex-vessel figures.

Historical Resource Value: Ex-Vessel vs. First Wholesale

Table 14 (shown on the following page) summarizes historical first wholesale value and ex-vessel value, as well as net processing revenue over time. Net processing value increased significantly from 2003 through 2011, but contracted substantially between 2011 and 2014. With low ex-vessel prices paid out in 2015 and a large harvest, net processing revenue increased sharply during the 2015 sales cycle despite lower wholesale prices. Final figures used to calculate the 2016 season were not available at the time of publication, but available data suggests net processing revenue increased slightly during the 2016 sales cycle despite higher ex-vessel prices.

Higher net processing revenues in recent years have translated to an increase in sockeye prices for Bristol Bay fishermen. Net processing revenue is an important metric for Bristol Bay fishermen. Last year's processing margins form the basis for next season's working capital. Less capital means less ability to bid up the price of fish. Further, declining net processing revenue indicates a less attractive business line, which typically results in a lower value being placed on raw materials.

Table 13. Net Processing Revenue Derived from Bristol Bay Sockeye, in $Millions, 2001-2016

Harvest Year/Cycle	First Wholesale Value	Final Ex-Vessel Value	Net Processing Revenue (NPR)	NPR Four Year Avg.	Next Year's Ex-Vessel Value
2001	$103	$38	$65	-	$32
2002	138	32	106	-	47
2003	122	47	75	-	76
2004	178	76	102	87	96
2005	180	96	84	92	110
2006	241	110	131	98	119
2007	268	119	149	116	118
2008	280	118	162	131	142
2009	340	142	198	160	177
2010	383	177	206	179	155
2011	360	155	206	193	140
2012	310	140	171	195	149
2013	291	149	142	181	217
2014	293	217	76	149	121
2015	355	121	233	156	191
2016*	430	191	239	173	248

*2016 and 2017 figures are estimated. Final data was not yet available at time of publication.
Note: NPR = Net Processing Revenue (see definition on page 34).
Source: ADF&G, ADOR, and McDowell Group estimates.

Processors, like fishermen, understand the inherent variability of a business dependent on wild salmon runs. Some years can bring windfall profits while others may produce poor returns or even result in operating losses. The important thing for both sectors is that over time, revenues exceed costs by a higher enough margin to keep the fishery healthy from a financial perspective. The four-year average net processing revenue on Bristol Bay sockeye has rebounded strongly since 2014. In fact, recent data suggests the value of the fishery for fishermen and processors is at its highest point in many years. The efforts of fishermen to improve quality while maintaining harvest capacity, processors' investment in market/product development, as well as the work of marketing organizations like BBRSDA and ASMI have been major factors in the fishery's resurgence, in addition to some better fortune with regard to market forces.

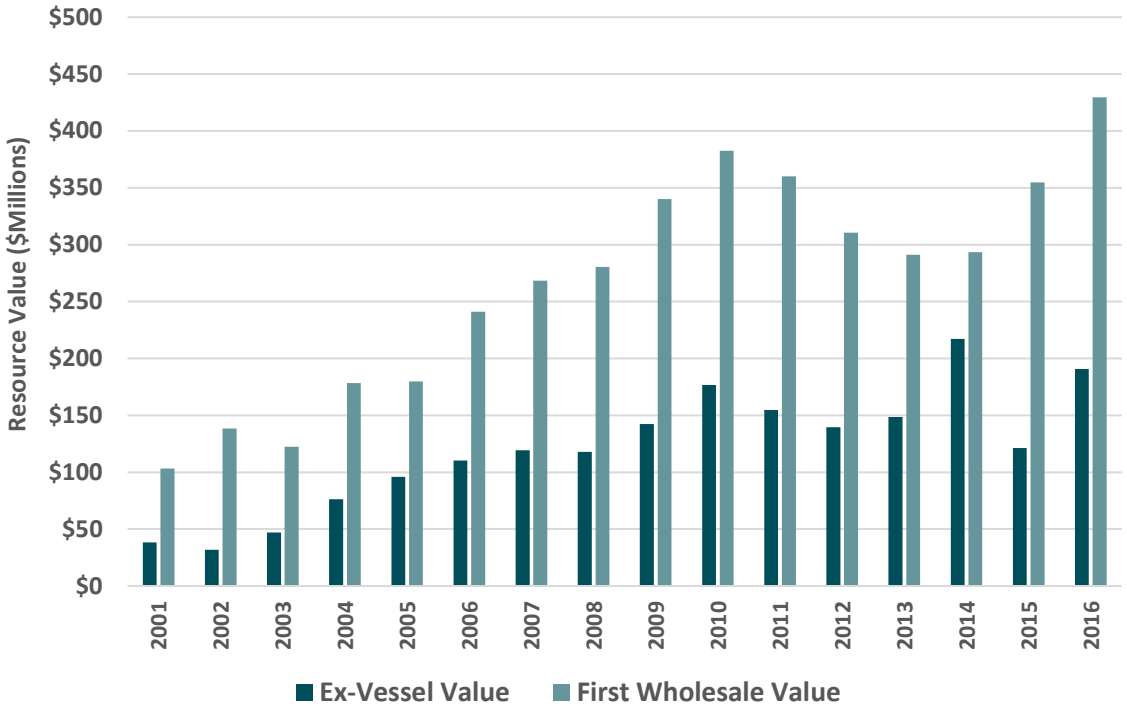
Net processing revenue for the 2017 season will not be known until that product has been sold. Typically, that data becomes available next June. First wholesale prices are up significantly during these early stages of the (wholesale) sales season, but will have to maintain those levels in order to pay for the increase in ex-vessel payments to fishermen.

As with all historical analyses, comparing net processing revenues over time does not adjust for the changes in other operating costs. Investment in new processing plants or product lines are costs that must be paid for through higher fish values. Likewise, the cost of processing labor is not static. An analysis of labor statistics

suggests the average wages per peak processing worker in the Bristol Bay region increased 17 percent from 2010/2011 to 2015/2016. Part of that increase is due to larger harvests, but changes to labor laws such as the J-1 Visa program have also led many processors to increase wages to attract workers. Processing costs are affected by inflation, but may deviate more than a standard CPI adjustment would suggest. Therefore, it is not possible to adjust net processing revenue for changes in other operating costs.

Regardless, the most important factors are the absolute value of the resource, and how that value is allocated between fishermen and processors. Figure 14 details the progression of resource value since 2001. The data show that as first wholesale value increases, ex-vessel value also increases by at least a similar percentage if not more.

Figure 14. Bristol Bay Sockeye Resource Value, in $Millions, 2001-2016



Note: First wholesale data is based on harvest year cycle, see glossary (page 2) for definition.
Source: ADOR, ADF&G, and McDowell Group estimates.

Difference in Ex-Vessel Value and Price by Region

Key Finding: Sockeye prices have increased substantially since 2014 in all major producing regions. However, the total ex-vessel value of sockeye caught in Bristol Bay has increased far more during that time than most other regions (with the lone exception of the Alaska Peninsula region).

Ex-Vessel Price in Other Alaska Sockeye Fisheries

Bristol Bay sockeye fishermen typically receive the lowest price of any region. Prince William Sound (PWS) and Cook Inlet fishermen are paid the highest sockeye prices in Alaska. Kodiak sockeye prices are generally $0.20 to $0.50 per pound above Bristol Bay, while Alaska Peninsula prices tend to be within a dime of Bristol Bay prices.

The spread between Bristol Bay sockeye prices and all other Alaska sockeye narrowed in 2016, versus the previous year. That spread was roughly flat in 2017, based on preliminary prices. Tighter pricing spreads between the Bay and the rest of Alaska sockeye has been driven by larger harvests in the Alaska Peninsula region, as opposed to Bay pricing drawing closer to other regions. Therefore, it is generally more instructive to examine pricing on a region vs. region basis. However, it is important to realize that regional harvest volumes have an impact on regional pricing. Sometimes wider or tighter pricing is the result of changes in harvest volume. Smaller harvests usually mean a relatively higher price, and vice versa. As a result, it is important to consider both price and volume. Table 15 provides historical sockeye harvest volume by region.

Table 14. Ex-Vessel Price of Bristol Bay Sockeye versus Other Regions, 2011-2017

Region	2011	2012	2013	2014	2015	2016	2017P
Average Ex-Vessel Price/lb.							
Bristol Bay	**$1.17**	**$1.18**	**$1.61**	**$1.35**	**$0.64**	**$0.95**	**$1.02**
Prince William Sound	$1.86	$1.82	$2.45	$2.42	$1.98	$2.33	$2.56
Cook Inlet	1.42	1.46	2.18	2.11	1.54	1.51	1.94
Kodiak	1.53	1.47	1.82	1.83	0.93	1.28	1.38
Alaska Peninsula	1.24	1.26	1.66	1.41	0.75	1.02	1.00
Other Alaska Sockeye Avg.	**$1.47**	**$1.49**	**$1.96**	**$1.91**	**$1.17**	**$1.34**	**$1.40**
Difference with Bristol Bay							
Prince William Sound	$0.69	$0.64	$0.84	$1.08	$1.34	$1.38	$1.54
Cook Inlet	0.25	0.28	0.57	0.77	0.90	0.56	0.92
Kodiak	0.36	0.29	0.21	0.49	0.29	0.33	0.36
Alaska Peninsula	0.07	0.08	0.05	0.07	0.11	0.07	-0.02
Other Alaska Sockeye Avg.	**$0.30**	**$0.31**	**$0.35**	**$0.57**	**$0.53**	**$0.39**	**$0.38**
Other Alaska Sockeye as Pct. of Alaska Harvest	**46%**	**44%**	**48%**	**35%**	**33%**	**30%**	**29%**

Note: Final prices, including bonuses and other supplemental payments.
Source: ADF&G.

The gap between Bristol Bay sockeye prices and those in PWS and Cook Inlet widened in 2017, based on preliminary data. However, sockeye harvests in PWS and Cook Inlet were relatively poor and well below the previous year. In contrast, Bristol Bay produced one of the larger harvests on record. Final price adjustments

tend to be relatively larger in Bristol Bay than other areas (save for Alaska Peninsula), so it is likely that 2017 price spreads will be lower once final pricing data is available.

Sockeye price spreads between Bristol Bay and other areas have responded more to changing harvest volumes than any general trend towards a tighter or wider spread over the past seven years. The price spread between PWS and Cook Inlet sockeye has widened substantially, but the harvest volume of those fisheries has also declined dramatically (see Table 16). Based on preliminary data, the Kodiak price spread was the same in 2017 as 2011.

Table 15. Harvest Volume of Bristol Bay Sockeye versus Other Regions, in Millions of Pounds, 2011-2017

Region	2011	2012	2013	2014	2015	2016	2017P
Bristol Bay	**134.7**	**119.1**	**92.3**	**161.7**	**192.6**	**200.9**	**205.8**
Prince William Sound	21.6	24.8	14.2	19.5	17.3	10.4	8.0
Cook Inlet	36.2	22.2	17.7	15.8	15.0	15.0	11.9
Kodiak	13.4	12.4	14.8	17.0	15.0	10.6	12.9
Alaska Peninsula	16.8	16.4	17.3	19.1	33.3	33.8	40.8
Other Alaska Sockeye Total	**114.0**	**94.6**	**85.7**	**84.8**	**95.6**	**86.6**	**83.0**

Note: 2017 is preliminary.
Source: ADF&G.

Ex-Vessel Value of Other Alaska Sockeye Fisheries

Table 17 summarizes the total ex-vessel value of Alaska sockeye from key producing areas. Even though Bristol Bay sockeye prices remained well below most other regions, the difference in (total and average) ex-vessel value is the most important consideration. The total ex-vessel value of Bristol Bay sockeye fell sharply in 2015, but has rebounded to post relatively valuable harvests the past two years. In contrast, the combined ex-vessel value of other Alaska sockeye fisheries has not increased much since 2015.

Table 16. Ex-Vessel Value of Bristol Bay Sockeye versus Sockeye from Other Alaska Regions, in $Millions, 2011-2017

Region	2011	2012	2013	2014	2015	2016	2017P
Prince William Sound	$39.4	$45.4	$34.0	$47.5	$35.5	$24.2	$20.6
Cook Inlet	50.1	32.2	37.4	32.8	22.9	22.6	23.1
Kodiak	20.5	18.3	26.9	31.1	13.9	13.8	17.7
Alaska Peninsula	20.9	20.5	28.4	26.8	23.5	33.5	40.8
Other AK Sockeye	**$157.7**	**$134.4**	**$163.8**	**$159.8**	**$112.4**	**$115.0**	**$116.2**
Bristol Bay	**$154.7**	**$139.7**	**$148.7**	**$209.6**	**$121.2**	**$186.9**	**$209.9**

Notes: 2011-2016 represents final ex-vessel values, including bonuses and other supplemental payments. Data for 2016 is estimated. Data for 2017 is preliminary, not including bonuses and other supplemental payments.
Source: ADF&G and McDowell Group estimates.

Over the past five years with available data (2011-2016), Bristol Bay's driftnet fishermen had average earnings below those of the Prince William Sound and Alaska Peninsula driftnet fishermen, but well above Cook Inlet driftnet fishermen and Kodiak setnetters. Earnings for PWS driftnet fishermen and Kodiak setnetters declined in 2017, while sockeye fishermen in Bristol Bay, Alaska Peninsula, and Cook Inlet increased (see Table 18). Data for the 2017 season is not yet available through CFEC; however, once final pricing data is applied (next fall) it is very likely that 2017 will represent the highest average driftnet earnings on record (in nominal terms).

Table 17. Ex-Vessel Value of Bristol Bay Driftnet Fishery versus Other Alaska Sockeye Fisheries, Average Gross Earnings per Active Permit, 2011-2016

Region	2011	2012	2013	2014	2015	2016E	2011-2016 Avg.
Pr. William Sound (S03E)	$97,774	$115,502	$99,087	$104,137	$72,747	$66,539	$92,631
Cook Inlet (S03H)	65,753	61,586	50,868	44,148	20,158	26,239	44,792
Kodiak (S04K)	32,200	55,591	62,797	61,369	30,862	23,145	44,327
Alaska Peninsula (S03M)	79,766	85,071	109,085	124,388	83,262	108,297	98,312
Bristol Bay Drift (S03T)	**$86,325**	**$77,954**	**$85,687**	**$118,241**	**$67,885**	**$104,000**	**$86,213**
Bristol Bay Setnet (S04T)	**$31,173**	**$28,008**	**$28,210**	**$44,912**	**$22,852**	**$45,200**	**$31,833**

Notes: 2016 figures for non-Bristol Bay fisheries are preliminary (non-Bay figures) and may not include all bonuses. Final 2016 figures for Bristol Bay have been estimated.
Source: CFEC and McDowell Group estimates.

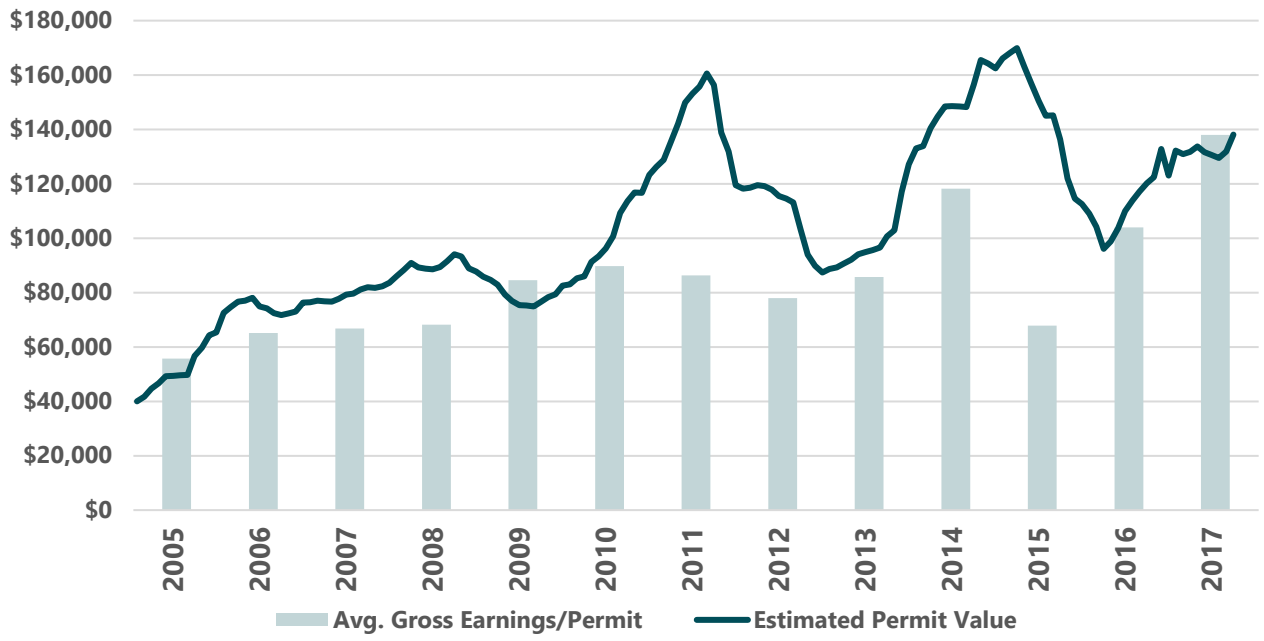
See Table 19 in the Appendix (page 41) for an expanded account of historical performance in the Bristol Bay driftnet fishery, including average gross earnings, active permits, and harvests.

Bristol Bay Salmon Driftnet Permit Market Value

Bristol Bay driftnet permit prices have increased slightly since this past spring, buoyed by higher sockeye prices and a larger harvest. Bristol Bay gross earnings data for 2016 and 2017 are at various stages of finalization; however, using historical relationships between preliminary and final valuation, it is possible to make a reasonable estimate of average gross earnings. Obviously, average gross earnings have a significant bearing on the underlying value of driftnet permits.

Figure 15 graphs average permit value, published by CFEC, against final and estimated average gross earnings in the Bristol Bay driftnet fishery. Relative to gross earnings, permit prices are currently relatively lower than previous years. However, there are factors that could put downward pressure on permit prices. The announcement that two major processors will stop buying fish from dry boats in 2018 could push fishermen who are unable to chill fish to put their permit up for sale. More permits for sale could drive prices down. In addition, fishery earnings across Alaska have generally declined since 2013, and were especially bad in 2016 outside the Bay. This may limit the amount of capital collectively available from potential buyers, compared to past years.

Figure 15. Estimated Bristol Bay Salmon Driftnet Permit Value and Average Gross Earnings, 2005-2017



Note: 2016 and 2017 are estimates of final ex-vessel value per permit fished.
Source: CFEC and McDowell Group estimates, compiled by McDowell Group.

The cost of boats also affects the value of permits, as both are needed to independently participate in Bristol Bay salmon fisheries. With the growing requirement of RSW-equipped vessels, and competition from newer vessels, the cost of buying an "average" Bristol Bay driftnetter has increased substantially over the past decade. This increases the true cost of entering the fishery, making the permit somewhat less valuable (if buyers cannot afford a profitable boat as well). Unfortunately, it is not possible to also track boat value in the same uniform manner as permits.

Table 18. Performance in Bristol Bay Salmon Driftnet Fishery, 2000-2017

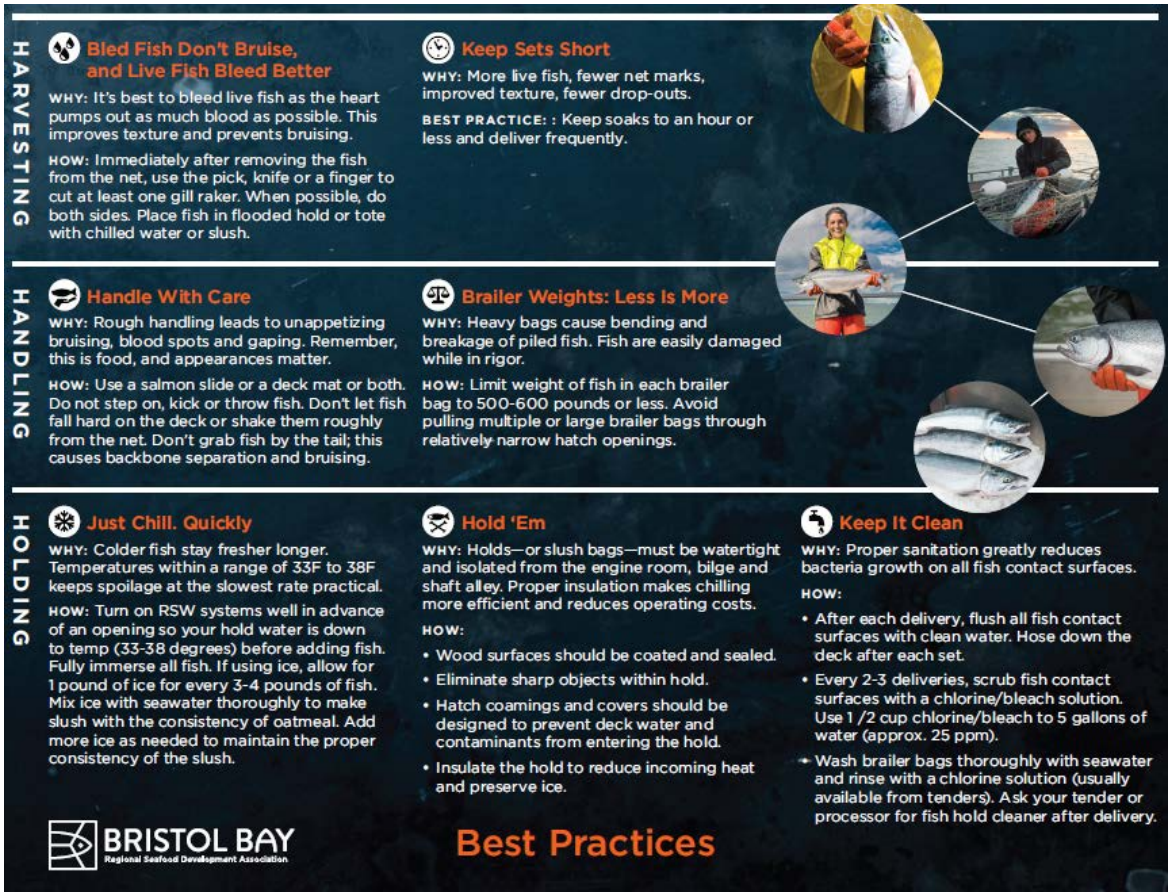
Year	Harvest Volume (Millions lbs.)	Active Permits	Ex-Vessel Value ($Millions)	Average Gross Earnings per Active Permit	Final Average Sockeye Price
2000	104.7	1,823	$68.4	$37,527	$0.67
2001	80.6	1,566	32.4	20,699	0.42
2002	54.2	1,184	25.4	21,480	0.49
2003	78.5	1,424	38.0	26,685	0.51
2004	131.2	1,411	65.7	46,541	0.51
2005	135.6	1,447	80.6	55,673	0.62
2006	153.5	1,475	96.1	65,128	0.66
2007	153.9	1,468	98.1	66,836	0.67
2008	139.1	1,469	100.1	68,169	0.75
2009	156.5	1,444	122.0	84,492	0.80
2010	147.2	1,494	134.1	89,784	1.07
2011	114.3	1,524	131.6	86,325	1.17
2012	103.8	1,513	117.9	77,954	1.18
2013	84.4	1,488	127.5	85,687	1.61
2014	140.5	1,541	182.2	118,241	1.35
2015	165.0	1,545	104.9	67,885	0.63
2016P	169.7	1,538	157.8	102,620	0.95
2017P	178.0	*N/A*	206.4	134,000	1.21

Note: 2016 and 2017 figures are preliminary estimates.
Sources: CFEC, ADF&G, and McDowell Group estimates.

Table 19. Estimated Market Value of Bristol Bay Salmon Driftnet Permits

Month & Year	Estimated Market Value
September 2014	$156,400
October 2014	165,500
November 2014	164,200
December 2014	162,400
January 2015	166,100
February 2015	168,100
March 2015	169,900
April 2015	163,000
May 2015	156,800
June 2015	150,500
July 2015	145,000
August 2015	145,100
September 2015	136,300
October 2015	122,000
November 2015	114,600
December 2015	112,500
January 2016	109,000
February 2016	104,200
March 2016	96,100
April 2016	98,800
May 2016	103,600
June 2016	110,000
July 2016	113,900
August 2016	117,100
September 2016	120,200
October 2016	122,400
November 2016	123,000
December 2016	132,200
January 2017	130,900
February 2017	131,100
March 2017	131,700
April 2017	133,700
May 2017	131,600
June 2017	130,600
July 2017	129,500
August 2017	131,500
September 2017	138,100

Note: Permit values based on value of permits sold during listed month and prior two months.
Source: CFEC.



Outreach material developed as part of BBRSDA's 2017 Quality Campaign promoting best practices to the fleet.