

# **Economic Impact of the Pacific Salmon Treaty on the Alaska Troll Fleet**

PREPARED FOR:

**Northern Southeast Regional Aquaculture Association**

December 5, 2019

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# Executive Summary

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This report provides an analysis of the economic impact of 2019 provisions in the Pacific Salmon Treaty on the Southeast Alaska troll fleet. Under the January 2019 version of the Pacific Salmon Treaty (PST), the revised Southeast Alaska Chinook harvest limits include quota reductions ranging between 1.5% and 7.5%, depending on abundance levels. The actual reduction is likely to be larger than indicated by those percentages, as described in this report and summarized below.

## Overview of the SE Troll Fishery

- In 2018, Southeast's power troll fishery accounted for a harvest of 13.4 million pounds of salmon (all species) with a total ex-vessel value of \$28.4 million. That same year, 669 permits were fished, representing 70% of all permits held.
- Troll harvest volume and value vary significantly year-to-year. Over the 10-year period from 2009 to 2018, annual harvest volume ranged from a low of 14.8 million pounds to a high of 26.3 million pounds. Harvest value ranged from \$21.5 million to \$44.1 million.
- Alaska resident power troll permit holders accounted for 85% of the harvest value in 2018. Residents of Washington State accounted for 8% of the 2018 harvest value.
- Just under 10 percent of active permit holders (62 permit holders) generated 25% of total gross earnings, averaging \$114,233 in 2018, compared to the fleet average of \$42,448. More than half of active trollers were in the bottom quartile, averaging \$18,941 in gross earnings.
- The poundage of Chinook harvested by trollers in 2017 and 2018 were the lowest since at least 1984. Trollers caught 1.55 million pounds of Chinook in 2017 and 1.42 million pounds in 2018. Over the five years preceding 2017 and 2018, the annual average harvest was 3.26 million pounds, while the preceding 10-year average was 3.18 million.
- The ex-vessel value of troll-caught Chinook averaged \$14.8 million over the 2014 to 2018 period, ranging between \$11.7 million and \$18.0 million. The 2000 to 2018 annual average was \$11.7 million (in nominal dollars), ranging from \$5.2 million to \$18.0 million.
- Chinook accounted for 44% of the power troll fleet's total ex-vessel value over the 2014 to 2018 period.

## Economic Impacts of the SE Power Troll Fishery

- Approximately 1,450 fishermen earn income directly from the fishery, including skippers (permit holders) and crew. Total labor income is estimated at \$20.4 million. Total direct, indirect, and induced labor income is estimated at \$28.5 million. Total annual output is estimated at \$44 million.
- Processing of troll-caught salmon generates approximately \$12 million in annual labor income for plant workers. Annualized troll-related processing employment is estimated at 250 jobs, though the number of processing workers is actually much higher, as most of the processing activity occurs in the summer.

- Including fishing, processing, and all related multiplier effects, the troll fleet has a total economic impact in Southeast Alaska of approximately \$85 million annually, as measured in terms of total output.
- With Chinook accounting for about 44% of the power troll fleet’s total ex-vessel value over the 2014 to 2018 period, with all other factors held equal, Chinook also account for about the same percentage of the total economic impact of the troll fleet, or approximately \$37 million annually in total output.

### Impact of the 2019 PST on the SE Power Troll Fishery

As summarized in Table E1, if the 2019 PST had been in place during the 2009 to 2018 period, total volume reductions to trollers of between 6.7% and 13.4% would have resulted, depending on the basis of comparison (pre-season allocation, post-season limit, or actual harvest). Based on actual ex-vessel prices over the 2009-2018 period, the 10-year total value (or cost) in 2018 dollars of those reductions ranges between \$8.7 million and \$15.4 million, again depending on the basis of comparison.

**Table E1. Summary of Impacts of the 2019 PST Provisions on the Troll Fleet, Based on 2009-2018 Quotas, Abundance Indexes, and Harvests**

	Measure
Actual 2009 - 2018 Total Troll Treaty Harvest (no. of fish)	1,965,859
Actual 2009 - 2018 Total Troll Treaty Pre-season Allocation (Based on Pre-season AI)	1,895,810
Actual 2009 - 2018 Total Troll Treaty Catch Limit (Based on Post-season AI)	1,851,119
<b>If 2019 PST Troll allocation formula had been in place in 2009 - 2018</b>	
Total Pre-season Limit Under New CPUE Tier	1,702,048
% Change from Actual Pre-season Allocation	10.2%
Total Ex-vessel Value of Change (2018\$)	-\$12.5 million
% Change from Actual Harvest	13.4%
Total Ex-vessel Value of Change (2018\$)	-\$15.4 million
Total Limit Under New Post-season AI Tier	1,726,496
% Change from Actual Post-season Limit	6.7%
Total Ex-vessel Value of Change (2018\$)	-\$8.7 million
% Change from Actual Harvest	12.2%
Total Ex-vessel Value of Change (2018\$)	-\$14.9 million

Source: McDowell Group estimates.

It is important to note that these results are based on quota, Abundance Indexes, harvests, prices and other conditions observed over the 2009 to 2018 period. That timeframe may or may not be representative of future conditions.

The figures in Table ES-1 do not include potential effects of the 2019 PST provision requiring SE Chinook catches in excess of the pre-season catch limit be paid back the following year, without accumulation of under-harvests. This provision of the PST will have a cost for trollers, mainly in terms of the value of any unfilled quota that cannot be carried forward to the next season. ADF&G is overlaying a 2% reduction on the Treaty harvest limit as a measure to reduce the risk of exceeding the pre-season limit while maximizing the catch. Had such a buffer been in place over the 2009 to 2018 period, costs to trollers would have been higher than indicated in Table ES-1, to the extent that quota was left unfilled.

## Purpose and Scope of Work

In late 2018, Canada and the United States agreed to renew the Pacific Salmon Treaty—originally implemented in 1985—for an additional 10-year period beginning January 1, 2019 and extending through December 31, 2028. Following a 15% reduction in chinook harvest levels for Southeast Alaska in the 2008 treaty (beginning January 1 in 2009), the most recent Treaty version includes additional reductions for Southeast of between 1.5% and 7.5%, depending on abundance levels. In practice, however, the reductions will be greater. In contrast to prior agreements, there are now penalties for exceeding harvest caps. Any amount of salmon harvested in excess of the cap will now be deducted from the following year’s cap. Additionally, there is no carry-over provision during years when fishermen do not meet the harvest limit. To reduce the likelihood of exceeding harvest limits, the Alaska Department of Fish and Game plans to maintain a 2% buffer under the cap, further constraining harvest levels.

The purpose of this study is to assess the impact of 2019 provisions in the Pacific Salmon Treaty on the Southeast Alaska troll fleet. The troll fleet has experienced a sharp decline in Chinook salmon harvests, which have fallen to historic lows. Pacific Salmon Treaty-related measures coupled with low abundance have cost trollers millions of dollars in lost revenue. This report includes the following elements:

- Troll fleet profile, including:
  - Number and residency composition of troll vessels/permits
  - Trends in annual gross earnings
  - Volume and value of harvest, by species
- Direct, indirect, and induced economic activity associated with the commercial troll fishery
- Analysis of potential effects on Southeast trollers of Chinook-related provisions of 2019 Pacific Salmon Treaty renewal.

## Key Data Sources

This study relies on data from several sources, including the Commercial Fisheries Entry Commission, Alaska Department of Fish and Game Division of Commercial Fisheries, Pacific Salmon Commission, and various McDowell Group studies of the economic impact of the seafood industry in Southeast Alaska.

## Report Organization

This report includes four chapters. Chapter 1 provides a detailed profile of the Southeast Alaska troll fishery including catch history (volume and value by salmon species), permit ownership and harvest by place of residence. Chapter 2 provides measures of the importance of Chinook harvests in the troll fishery. Chapter 3 describes the overall economic impact of the troll fleet in Southeast Alaska, including direct, indirect, and induced impacts, and Chapter 4 provides an analysis of the estimated economic impact of the 2019 Pacific Salmon Treaty on the troll fleet.

# Chapter 1. Profile of the Southeast Alaska Troll Fishery and Fleet

## Fishery Overview

In 2018, Southeast’s power troll fishery accounted for a harvest of 13.4 million pounds of salmon (all species) with a total ex-vessel value of \$28.4 million. In the same year, 669 permits were fished, representing 70% of all permits held.

Troll harvest volume and value varies significantly year-to-year. Over the 10-year period from 2009 to 2018, harvest volume ranged from a low of 14.8 million pounds (2016) to a high of 26.3 million pounds (2013). Harvest value ranged from \$21.5 million (2009) to \$44.1 million (2014).

The value of power troll permits has trended lower over the past several years, after peaking at \$38,300 in 2015. In 2018, permits were valued at approximately \$30,500, 20% below the peak.

**Table 1. Overview of Power Troll Permits Held and Fished, 2000-2018**

Year	Permits Held	Permits Fished	Permit Value	Estimated Gross Earnings	Pounds Landed	Earnings (Pounds) per Active Permit
2000	961	713	\$14,600	\$13,961,039	14,694,868	\$19,608 (20,639)
2001	965	701	\$13,000	\$16,175,055	18,894,291	\$23,074 (26,953)
2002	965	666	\$14,000	\$12,527,264	16,496,668	\$18,810 (24,770)
2003	965	638	\$12,700	\$13,955,033	16,875,497	\$21,907 (26,492)
2004	961	689	\$16,400	\$27,314,421	20,715,087	\$39,674 (30,084)
2005	961	716	\$27,900	\$25,133,821	19,083,033	\$35,095 (26,645)
2006	961	738	\$31,500	\$32,634,180	15,507,790	\$44,279 (21,041)
2007	961	741	\$36,200	\$28,928,309	14,549,312	\$39,059 (19,644)
2008	961	745	\$35,200	\$33,639,740	13,036,784	\$45,154 (17,499)
2009	961	745	\$34,200	\$21,457,493	15,451,336	\$28,802 (20,740)
2010	961	729	\$29,000	\$29,825,714	16,571,480	\$40,913 (22,732)
2011	962	760	\$32,600	\$30,178,610	18,084,126	\$39,709 (23,795)
2012	961	743	\$35,300	\$28,077,771	15,550,919	\$37,785 (20,930)
2013	961	722	\$32,000	\$38,372,518	26,323,176	\$53,147 (36,460)
2014	962	756	\$37,000	\$44,081,724	21,977,346	\$58,308 (29,071)
2015	962	741	\$38,300	\$24,479,927	15,910,202	\$33,075 (21,511)
2016	961	745	\$35,000	\$33,156,198	14,838,970	\$44,509 (19,935)
2017	961	722	\$33,400	\$34,232,927	17,383,618	\$47,417 (24,102)
2018	961	669	\$30,500	\$28,397,751	13,362,777	\$42,448 (19,974)

Source: CFEC, 2019.

Notes: Data from 2018 are preliminary. Earnings and pounds shown are for all salmon species.

Southeast’s 2018 hand troll fishery accounted for a harvest of 414,000 pounds with a total ex-vessel value of \$1.1 million. In 2018, 235 permits were fished, representing only 25% of the 946 permits owned.



In parallel with the power troll fishery, hand troll harvest volume and value vary widely year-to-year. Over the 10-year period from 2009 to 2018, harvest volume ranged from a low of 414,000 pounds (2018) to a high of 1.6 million pounds (2013). Harvest value ranged from \$1.1 million (2018) to \$2.9 million (2013). Hand troll permits were valued at \$9,400 in 2018, down from a peak of \$11,000 in 2015.

**Table 2. Overview of Hand Troll Permits Held and Fished, 2000-2018**

Year	Permits Held	Permits Fished	Permit Value	Estimated Gross Earnings	Pounds Landed	Earnings (Pounds) per Active Permit
2000	1,329	315	\$4,100	\$825,476	688,615	\$2,621 (2,186)
2001	1,295	307	\$4,100	\$1,016,462	1,041,309	\$3,311 (3,392)
2002	1,247	253	\$3,700	\$637,210	831,319	\$2,519 (3,286)
2003	1,189	265	\$3,500	\$857,588	862,633	\$3,236 (3,255)
2004	1,139	324	\$4,100	\$1,721,276	1,164,685	\$5,313 (3,595)
2005	1,108	353	\$7,200	\$1,677,969	1,200,513	\$4,753 (3,401)
2006	1,104	372	\$8,600	\$2,013,881	841,186	\$5,423 (2,266)
2007	1,082	376	\$9,500	\$2,081,334	911,408	\$5,550 (2,430)
2008	1,065	376	\$9,900	\$2,950,801	973,162	\$7,806 (2,567)
2009	1,055	365	\$10,500	\$1,541,412	956,265	\$4,079 (2,516)
2010	1,044	340	\$9,900	\$2,129,707	1,018,438	\$6,252 (2,996)
2011	1,037	373	\$10,400	\$2,232,440	1,079,361	\$5,992 (2,895)
2012	1,019	354	\$10,900	\$1,779,149	825,675	\$5,036 (2,336)
2013	1,002	362	\$10,300	\$2,939,614	1,560,442	\$8,120 (4,311)
2014	992	347	\$10,800	\$2,489,670	1,159,023	\$7,146 (3,316)
2015	978	316	\$11,000	\$1,315,661	683,950	\$4,162 (2,169)
2016	959	270	\$10,200	\$1,369,477	560,293	\$5,094 (2,090)
2017	950	256	\$10,100	\$1,815,455	763,075	\$7,092 (2,981)
2018	946	235	\$9,400	\$1,106,015	414,385	\$4,706 (1,763)

Source: CFEC, 2019. Notes: Data from 2018 are preliminary. Earnings and pounds shown are for all salmon species.

## Fleet Residency

Alaska resident power troll permit holders contributed 85% of the harvest value in 2018, the same share as in 2010. Residents of Washington State accounted for 8% of the 2018 harvest value, slightly below the 2010 share of 10%.

Among Alaska resident power troll permit holders, Sitka residents are predominant, accounting for 40% of the Alaska resident harvest and 35% of the total troll harvest in 2018. Residents of the Prince of Wales Island-Hyder Census Area, which includes the communities of Craig, Klawock, Thorne Bay, Coffman Cove, Hydaburg, Metlakatla, and Kake, among other smaller communities, accounted for 17% of the Alaska resident harvest and 15% of the total 2018 harvest value.

Alaskans accounted for 94% of the total hand troll harvest value in 2018. Income from the hand troll fishery is distributed widely across Southeast Alaska.

**Table 3. Power Troll Harvest and Estimated Gross Earnings by Permit Holder Residency, 2000, 2010 and 2018**

Residency	2000		2010		2018	
	Pounds Landed	Estimated Gross Earnings	Pounds Landed	Estimated Gross Earnings	Pounds Landed	Estimated Gross Earnings
<b>All fishermen</b>	<b>14,694,868</b>	<b>\$13,961,039</b>	<b>16,571,480</b>	<b>\$29,825,714</b>	<b>13,362,777</b>	<b>\$28,397,751</b>
Alaska	11,946,184	\$11,352,900	13,775,117	\$25,278,116	11,326,353	\$24,275,467
Washington	1,884,377	\$2,025,528	1,648,604	\$2,865,108	956,331	\$2,131,761
Oregon	281,774	\$128,620	276,476	\$452,075	221,963	\$456,602
All other	582,533	\$453,991	871,283	\$1,230,415	858,130	\$1,533,921
<b>Alaska Residents</b>	<b>11,946,184</b>	<b>\$11,352,900</b>	<b>13,775,117</b>	<b>\$25,278,116</b>	<b>11,326,353</b>	<b>\$24,275,467</b>
Sitka	5,404,737	\$4,785,324	5,210,933	\$9,276,483	4,834,009	\$9,700,966
POW-Hyder	1,086,549	\$1,187,073	1,942,985	\$3,935,749	1,486,247	\$4,133,992
Juneau	980,791	\$1,069,610	1,181,982	\$2,205,167	965,911	\$2,243,167
Petersburg	1,158,793	\$1,257,645	1,384,616	\$2,510,750	1,012,868	\$1,843,389
Hoonah-Angoon	1,496,680	\$1,347,214	1,293,435	\$2,370,818	793,322	\$1,814,377
Ketchikan	696,111	\$746,071	901,978	\$1,585,157	915,337	\$1,789,505
Wrangell	419,351	\$454,424	840,038	\$1,384,554	635,293	\$1,080,179
Haines	257,314	\$207,322	423,942	\$797,898	354,341	\$942,954
Yakutat	(D)	(D)	308,109	\$674,439	136,787	\$357,452
Kenai Peninsula	(D)	(D)	117,225	\$226,617	45,156	\$119,603
Anchorage	204,602	\$132,133	(D)	(D)	(D)	(D)
Fairbanks	160,912	\$71,512	(D)	(D)	(D)	(D)
All other	80,344	\$94,572	169,874	\$310,484	147,082	\$249,883

Source: CFEC, 2019. Note: Data from 2018 are preliminary. (D): Data are suppressed due to confidentiality.

**Table 4. Hand Troll Harvest and Estimated Gross Earnings by Permit Holder Residency, 2000, 2010 and 2018**

Residency	2000		2010		2018	
	Pounds Landed	Estimated Gross Earnings	Pounds Landed	Estimated Gross Earnings	Pounds Landed	Estimated Gross Earnings
<b>All fishermen</b>	<b>688,615</b>	<b>\$825,476</b>	<b>1,018,438</b>	<b>\$2,129,707</b>	<b>414,385</b>	<b>\$1,106,015</b>
Alaska	591,224	\$711,121	917,153	\$1,953,288	385,312	\$1,037,866
Washington	28,487	\$33,273	35,701	\$54,667	20,780	\$47,699
Oregon	7,045	\$6,688	(D)	(D)	(D)	(D)
All other	61,859	\$74,394	65,584	\$121,752	8,293	\$20,450
<b>Alaska residents</b>	<b>591,224</b>	<b>\$711,121</b>	<b>917,153</b>	<b>\$1,953,288</b>	<b>385,312</b>	<b>\$1,037,866</b>
POW-Hyder	58,525	\$61,427	91,544	\$171,270	86,487	\$196,112
Wrangell	46,095	\$52,724	69,957	\$157,143	78,429	\$181,148
Petersburg	59,945	\$92,568	61,075	\$163,106	50,493	\$180,009
Ketchikan	20,590	\$19,608	155,673	\$331,987	50,938	\$152,906
Yakutat	56,053	\$89,116	197,979	\$467,154	29,345	\$106,934
Sitka	169,564	\$173,855	117,918	\$282,791	25,316	\$68,322
Juneau	68,537	\$76,390	(D)	(D)	25,845	\$54,672
Hoonah-Angoon	107,397	\$139,769	171,231	\$287,103	19,436	\$45,499
All other	4,518	\$5,664	51,776	\$92,734	19,023	\$52,264

Source: CFEC, 2019. Note: Data from 2018 are preliminary. (D): Data are suppressed due to confidentiality.

## Chapter 2. Role of Chinook in the Southeast Troll Fishery

Chinook salmon are of vital importance to the financial performance of the Southeast troll fleet. This section details the role of the species over time, in weight and value.

### Troll Harvest by Species

Chinook harvest volume in 2018 was the smallest annual production since at least 1984 (the earliest year data is readily available). The fleet sold 1.20 million pounds in 2018 (based on preliminary 2018 data). Over the five years preceding 2017 and 2018, the annual average harvest was 2.80 million pounds, while the preceding 10-year average was 3.18 million. The 19-year average (since 2000) was 3.02 million pounds (including the 2018 harvest). Peak harvests occurred in the 2002 to 2005 period, with each year between 4 million and 5 million pounds.

**Table 5. Power Troll Harvest by Species, Pounds (Net Weight), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye	Total
2000	4,454,690	6,876,689	2,304,149	681,205	23,276	<b>14,340,009</b>
2001	4,296,366	10,578,360	2,361,299	934,222	47,760	<b>18,218,007</b>
2002	1,060,290	8,565,918	5,035,050	290,346	6,835	<b>14,958,439</b>
2003	2,214,286	7,482,035	4,732,299	575,135	23,194	<b>15,026,949</b>
2004	1,398,856	11,974,212	4,944,674	207,133	26,521	<b>18,551,396</b>
2005	1,451,247	10,772,611	4,421,504	373,635	62,728	<b>17,081,725</b>
2006	1,459,752	8,235,880	3,840,731	226,457	38,562	<b>13,801,382</b>
2007	1,481,123	7,486,694	3,586,749	379,566	34,411	<b>12,968,543</b>
2008	547,602	8,947,777	2,026,860	106,300	6,638	<b>11,635,177</b>
2009	2,792,398	8,682,320	2,254,614	231,554	15,342	<b>13,976,228</b>
2010	3,431,009	8,673,824	2,573,166	331,244	9,871	<b>15,019,114</b>
2011	5,479,778	6,489,221	2,843,819	1,829,869	26,789	<b>16,669,476</b>
2012	4,723,509	6,470,075	2,443,601	557,463	16,770	<b>14,211,418</b>
2013	8,171,040	12,271,832	1,744,082	2,177,320	22,955	<b>24,387,229</b>
2014	1,821,287	13,536,285	4,016,894	285,620	35,755	<b>19,695,841</b>
2015	3,433,074	7,027,117	3,016,512	976,055	27,131	<b>14,479,889</b>
2016	1,397,452	8,784,558	2,788,559	198,538	30,782	<b>13,199,889</b>
2017	3,747,874	10,437,314	1,344,135	192,471	24,122	<b>15,745,916</b>
2018	4,453,343	6,285,100	1,204,833	209,364	21,882	<b>12,174,522</b>

Source: ADFG, 2019.

Note: 2018 data are preliminary.

In terms of poundage sold, coho typically account for the largest share of the troll harvest. Trollers sold an average of 9.6 million pounds between 2014 and 2018, and an average of 8.9 million pounds over the 2000 to 2018 period. Coho accounted for an average of 60% of total troll poundage over the 2014 to 2018 period, ranging from 49% to 69%. The 19-year average (2000 to 2018) was 57%, ranging from 39% (in 2011) to 77% (in 2008).

Chum harvests are more variable year-to-year, averaging about 3 million pounds over the 2000 to 2018 timeframe but ranging from a low of about 500,000 pounds (in 2008) to a high of 8.2 million pounds (in 2013).

The ex-vessel value of the Chinook harvest averaged \$14.8 million over the 2014 to 2018 period, ranging between \$11.7 million and \$18.0 million. The 2000 to 2018 annual average was \$11.7 million (in nominal dollars), ranging from \$5.2 million (2001) to \$19.5 million (2014).

Coho typically account for more ex-vessel earnings than Chinook. Coho brought in an annual average of \$15.4 million between 2014 and 2018, and an average of \$13.3 million over the 2000 to 2018 period.

In recent years, chum harvest values have been highest when total Chinook harvest values have been low, and vice versa. Chum ex-vessel value averaged \$2.4 million between 2014 and 2018, including a low of about \$900,000 in 2016. That year (2016) the Chinook harvest was valued at \$18 million. The 2018 chum harvest value of \$4.4 million was the highest in five years and was accompanied by a \$10.7 million Chinook harvest.

**Table 6. Ex-Vessel Value of the Power Troll Harvest by Species (nominal \$), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye	Total
2000	\$1,095,903	\$6,871,777	\$5,838,614	\$92,660	\$31,283	<b>\$13,938,411</b>
2001	\$1,525,216	\$9,248,204	\$5,194,354	\$110,243	\$50,431	<b>\$16,141,582</b>
2002	\$198,372	\$5,917,201	\$6,345,886	\$26,712	\$6,220	<b>\$12,500,170</b>
2003	\$410,512	\$7,011,299	\$6,404,277	\$39,604	\$37,872	<b>\$13,907,269</b>
2004	\$288,897	\$14,468,270	\$12,475,763	\$16,868	\$23,092	<b>\$27,272,890</b>
2005	\$523,077	\$12,488,993	\$11,946,016	\$45,550	\$66,173	<b>\$25,069,809</b>
2006	\$577,563	\$16,279,883	\$15,550,789	\$38,508	\$59,577	<b>\$32,506,320</b>
2007	\$605,679	\$12,675,953	\$15,351,375	\$74,021	\$45,639	<b>\$28,752,667</b>
2008	\$427,872	\$19,684,090	\$13,405,108	\$27,176	\$10,125	<b>\$33,554,588</b>
2009	\$1,430,942	\$11,800,762	\$8,110,048	\$45,089	\$18,859	<b>\$21,405,700</b>
2010	\$2,663,471	\$14,626,046	\$12,330,689	\$112,575	\$15,729	<b>\$29,748,510</b>
2011	\$5,051,988	\$10,577,278	\$13,680,929	\$711,001	\$42,712	<b>\$30,063,908</b>
2012	\$4,208,314	\$11,554,752	\$11,942,796	\$225,678	\$25,943	<b>\$27,957,483</b>
2013	\$5,306,964	\$21,556,749	\$10,464,279	\$948,462	\$38,320	<b>\$38,314,774</b>
2014	\$1,263,332	\$23,034,980	\$19,547,060	\$86,329	\$61,891	<b>\$44,001,411</b>
2015	\$1,859,116	\$8,059,486	\$14,199,852	\$234,236	\$28,567	<b>\$24,381,257</b>
2016	\$909,884	\$14,039,918	\$17,988,129	\$49,886	\$45,321	<b>\$33,033,261</b>
2017	\$3,457,327	\$18,791,785	\$11,710,742	\$79,706	\$41,272	<b>\$34,081,628</b>
2018	\$4,434,188	\$13,071,671	\$10,659,662	\$80,846	\$39,214	<b>\$28,286,717</b>

Source: ADFG, 2019.

Note: 2018 data are preliminary.

Table 7 provides ex-vessel values in inflation-adjusted 2018 dollars. This gives a more accurate measure of how total harvest values have changed over the long-term. For example, the ex-vessel value of the Chinook harvest in 2000 totaled \$5.8 million in nominal (unadjusted) dollars. The value of the 2000 harvest in 2018 dollars is \$8.7 million.<sup>1</sup>

<sup>1</sup> The Consumer Price Index for Urban Alaska – All Items was used to convert to 2018 dollars.

**Table 7. Ex-Vessel Value of the Power Troll Harvest by Species (2018 \$), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye	Total
2000	\$1,638,008	\$10,271,007	\$8,726,774	\$138,496	\$46,758	<b>\$20,833,260</b>
2001	\$2,216,526	\$13,439,988	\$7,548,715	\$160,211	\$73,289	<b>\$23,457,816</b>
2002	\$282,818	\$8,436,126	\$9,047,300	\$38,083	\$8,868	<b>\$17,821,434</b>
2003	\$569,778	\$9,731,467	\$8,888,939	\$54,969	\$52,565	<b>\$19,302,861</b>
2004	\$390,877	\$19,575,561	\$16,879,700	\$22,822	\$31,243	<b>\$36,900,204</b>
2005	\$686,714	\$16,395,983	\$15,683,144	\$59,800	\$86,874	<b>\$32,912,515</b>
2006	\$734,723	\$20,709,793	\$19,782,305	\$48,986	\$75,788	<b>\$41,351,596</b>
2007	\$753,753	\$15,774,913	\$19,104,410	\$92,117	\$56,797	<b>\$35,781,989</b>
2008	\$509,266	\$23,428,593	\$15,955,161	\$32,346	\$12,051	<b>\$39,937,675</b>
2009	\$1,683,191	\$13,881,023	\$9,539,703	\$53,037	\$22,184	<b>\$25,179,138</b>
2010	\$3,078,407	\$16,904,601	\$14,251,656	\$130,113	\$18,179	<b>\$34,382,957</b>
2011	\$5,656,891	\$11,843,756	\$15,319,024	\$796,133	\$47,826	<b>\$33,663,631</b>
2012	\$4,609,473	\$12,656,212	\$13,081,246	\$247,191	\$28,416	<b>\$30,622,538</b>
2013	\$5,635,905	\$22,892,900	\$11,112,886	\$1,007,250	\$40,695	<b>\$40,689,637</b>
2014	\$1,320,350	\$24,074,626	\$20,429,284	\$90,225	\$64,684	<b>\$45,987,342</b>
2015	\$1,933,135	\$8,380,366	\$14,765,204	\$243,562	\$29,704	<b>\$25,351,971</b>
2016	\$942,110	\$14,537,177	\$18,625,224	\$51,653	\$46,926	<b>\$34,203,217</b>
2017	\$3,562,718	\$19,364,623	\$12,067,726	\$82,136	\$42,530	<b>\$35,120,553</b>
2018	\$4,434,188	\$13,071,671	\$10,659,662	\$80,846	\$39,214	<b>\$28,286,717</b>

Source: McDowell Group calculations based on ADFG harvest data.

Note: 2018 data are preliminary.

From 2014 through 2018, Chinook accounted for an annual (unweighted) average of 46% of the troll fleet's total ex-vessel earnings. Longer-term (2000 to 2018) Chinook accounted for an average of 44% of annual average ex-vessel value. The lowest year was in 2013 when Chinook accounted for only 27% of trollers' total ex-vessel earnings. The highest year was in 2015, at 58%. Over the 2000 to 2018 period, Chinook accounted for highest percentage of ex-vessel earnings in six of 19 years, among all species. Coho accounted for the most earnings in all other years (13 of 19 years).

(see Table 8 on next page)

**Table 8. Power Troll Harvest Percent of Total Ex-Vessel Value by Species, 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye
2000	7.9%	49.3%	41.9%	0.7%	0.2%
2001	9.4%	57.3%	32.2%	0.7%	0.3%
2002	1.6%	47.3%	50.8%	0.2%	0.0%
2003	3.0%	50.4%	46.0%	0.3%	0.3%
2004	1.1%	53.1%	45.7%	0.1%	0.1%
2005	2.1%	49.8%	47.7%	0.2%	0.3%
2006	1.8%	50.1%	47.8%	0.1%	0.2%
2007	2.1%	44.1%	53.4%	0.3%	0.2%
2008	1.3%	58.7%	40.0%	0.1%	0.0%
2009	6.7%	55.1%	37.9%	0.2%	0.1%
2010	9.0%	49.2%	41.4%	0.4%	0.1%
2011	16.8%	35.2%	45.5%	2.4%	0.1%
2012	15.1%	41.3%	42.7%	0.8%	0.1%
2013	13.9%	56.3%	27.3%	2.5%	0.1%
2014	2.9%	52.4%	44.4%	0.2%	0.1%
2015	7.6%	33.1%	58.2%	1.0%	0.1%
2016	2.8%	42.5%	54.5%	0.2%	0.1%
2017	10.1%	55.1%	34.4%	0.2%	0.1%
2018	15.7%	46.2%	37.7%	0.3%	0.1%

Source: McDowell Group calculations based on ADFG harvest data.  
Note: 2018 data are preliminary.

## Ex-Vessel Prices by Species

In terms of pounds, the troll Chinook harvest declined by 70% between 2014 and 2018 (falling from 4 million pounds to 1.2 million pounds). Total ex-vessel value fell by less (45%, from \$19.5 million to \$10.7 million) because of a substantial increase in ex-vessel prices. The 2018 average price paid to trollers of \$8.85 per pound was 82% above the 2014 price of \$4.87 per pound.

Table 9 provides nominal ex-vessel prices by species for 2000 through 2018. Table 10 provides inflation-adjusted prices for the same period.

**Table 9. Power Troll Harvest Ex-Vessel Value Per Pound by Species (nominal \$), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye
2000	\$0.25	\$1.00	\$2.53	\$0.14	\$1.34
2001	0.36	0.87	2.20	0.12	1.06
2002	0.19	0.69	1.26	0.09	0.91
2003	0.19	0.94	1.35	0.07	1.63
2004	0.21	1.21	2.52	0.08	0.87
2005	0.36	1.16	2.70	0.12	1.05
2006	0.40	1.98	4.05	0.17	1.54
2007	0.41	1.69	4.28	0.20	1.33

**Table 9. (cont.). Power Troll Harvest Ex-Vessel Value Per Pound by Species (nominal \$), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye
2008	\$0.78	\$2.20	\$6.61	\$0.26	\$1.53
2009	0.51	1.36	3.60	0.19	1.23
2010	0.78	1.69	4.79	0.34	1.59
2011	0.92	1.63	4.81	0.39	1.59
2012	0.89	1.79	4.89	0.40	1.55
2013	0.65	1.76	6.00	0.44	1.67
2014	0.69	1.70	4.87	0.30	1.73
2015	0.54	1.15	4.71	0.24	1.05
2016	0.65	1.60	6.45	0.25	1.47
2017	0.92	1.80	8.71	0.41	1.71
2018	1.00	2.08	8.85	0.39	1.79

Source: McDowell Group calculations based on ADFG volume and total value data, 2019.  
 Note: 2018 data are preliminary.

**Table 10. Power Troll Harvest Ex-Vessel Value Per Pound by Species (2018 \$), 2000-2018**

Year	Chum	Coho	Chinook	Pink	Sockeye
2000	\$0.37	\$1.49	\$3.79	\$0.20	\$2.01
2001	0.52	1.27	3.20	0.17	1.53
2002	0.27	0.98	1.80	0.13	1.30
2003	0.26	1.30	1.88	0.10	2.27
2004	0.28	1.63	3.41	0.11	1.18
2005	0.47	1.52	3.55	0.16	1.38
2006	0.50	2.51	5.15	0.22	1.97
2007	0.51	2.11	5.33	0.24	1.65
2008	0.93	2.62	7.87	0.30	1.82
2009	0.60	1.60	4.23	0.23	1.45
2010	0.90	1.95	5.54	0.39	1.84
2011	1.03	1.83	5.39	0.44	1.79
2012	0.98	1.96	5.35	0.44	1.69
2013	0.69	1.87	6.37	0.46	1.77
2014	0.72	1.78	5.09	0.32	1.81
2015	0.56	1.19	4.89	0.25	1.09
2016	0.67	1.65	6.68	0.26	1.52
2017	0.95	1.86	8.98	0.43	1.76
2018	1.00	2.08	8.85	0.39	1.79

Source: McDowell Group calculations based on ADFG volume and total value data, 2019.  
 Note: 2018 data are preliminary.

## Distribution of the Chinook Troll Harvest

Table 11 provides data on the distribution of the Chinook troll catch across harvest volume categories. For example, in 2018 (a low abundance year, with 1.2 million pounds sold), only six power trollers caught more than 11,500 pounds of Chinook. In comparison, in 2014 (with 4 million pounds sold), 128 trollers caught more than 11,500 pounds.

This data suggests that a segment of the power troll fleet does not focus on targeting Chinook. In 2018, 25% of the fleet caught 500 pounds or less of Chinook.

**Table 11. Number of Trollers with Chinook Landings by Annual Poundage Category, 2000-2018**

Year	1 to 500 lbs	501 to 1,500	1,501 to 3,000	3,001 to 4,500	4,501 to 6,000	6,001 to 7,500	7,501 to 9,000	9,001 to 11,500	More than 11,500	Avg. lbs.
2000	120	140	142	81	69	43	37	27	40	3,296
2001	102	112	134	101	82	59	30	30	32	3,462
2002	75	58	76	63	60	48	36	48	190	7,699
2003	76	64	82	51	53	29	38	35	175	7,848
2004	60	55	89	52	47	53	59	70	187	7,358
2005	74	78	87	66	63	59	49	66	157	6,325
2006	64	81	102	93	80	69	52	64	111	5,364
2007	70	83	101	105	83	61	56	71	94	4,954
2008	105	118	193	102	77	59	31	17	13	2,835
2009	91	140	152	121	81	41	41	31	25	3,118
2010	99	117	148	102	70	43	45	34	49	3,640
2011	122	108	125	91	76	72	34	47	58	3,880
2012	130	127	145	86	63	64	35	35	42	3,361
2013	123	146	146	84	51	45	30	28	10	2,631
2014	70	77	118	110	63	65	45	55	128	5,495
2015	90	114	112	96	73	66	37	48	72	4,261
2016	110	121	120	100	74	54	30	44	70	3,857
2017	145	175	143	105	46	24	19	5	4	2,018
2018	170	164	130	71	37	27	9	15	6	1,915

Source: CFEC, 2019.

**Table 12. Power Trollers with Chinook Landings, 2000-2018**

Year	Total Permits Fished	Permits with Recorded Chinook Landings	% of Permits with Recorded Chinook Landings
2000	713	699	98%
2001	701	682	97%
2002	666	654	98%
2003	638	603	95%
2004	689	672	98%
2005	716	699	98%
2006	738	716	97%
2007	741	724	98%
2008	745	715	96%



**Table 12 (cont.). Power Trollers with Chinook Landings, 2000-2018**

<i>Year</i>	Total Permits Fished	Permits with Recorded Chinook Landings	% of Permits with Recorded Chinook Landings
2009	745	723	97%
2010	729	707	97%
2011	760	733	96%
2012	743	727	98%
2013	722	663	92%
2014	756	731	97%
2015	741	708	96%
2016	745	723	97%
2017	722	666	92%
2018	669	629	94%

Source: CFEC, 2019.

## Seasonal Troll Fishery Chinook Landings and Values

Tables 13, 14, and 15 provide troll Chinook harvest data for the winter, spring, and summer fisheries, 2009 through 2018.

**Table 13. Southeast Spring Troll Fishery Chinook Harvest Volume and Value, 2009-2018**

<b>Year</b>	<b>Permits Fished</b>	<b>Landings</b>	<b>No. of Fish</b>	<b>Avg Price</b>	<b>Avg Wt</b>	<b>Total Value</b>
2009	550	3,001	32,581	4.10	14.37	\$1,917,312
2010	544	2,862	28,617	4.86	14.42	\$2,006,266
2011	582	3,069	38,936	4.77	13.95	\$2,590,313
2012	544	2,652	24,771	5.88	12.79	\$1,861,634
2013	578	2,885	37,308	5.88	12.80	\$2,808,112
2014	562	2,962	42,548	5.45	12.64	\$2,929,062
2015	592	3,615	53,692	5.23	12.70	\$3,569,336
2016	574	4,126	42,502	8.09	11.78	\$4,050,875
2017	417	1,664	17,606	9.08	11.84	\$1,891,957
2018	270	1,103	7,701	11.35	12.68	\$1,108,951

Source: ADFG, 2019.

(see Tables 14 and 15 on next page)

**Table 14. Southeast Winter Troll Fishery Chinook Harvest Volume and Value, 2009-2018**

Year	Permits Fished	Landings	No. of Fish	Avg Price	Avg Wt	Total Value
2009	430	2,827	24,889	6.75	13.82	\$2,322,971
2010	459	3,827	42,536	7.17	13.16	\$4,010,531
2011	464	3,878	50,826	6.97	12.54	\$4,442,190
2012	507	4,057	47,900	7.03	11.91	\$4,012,861
2013	442	3,411	26,612	8.67	12.58	\$2,901,956
2014	464	3,923	56,538	7.43	11.45	\$4,807,994
2015	407	3,605	50,673	8.68	11.54	\$5,077,209
2016	429	3,957	52,291	8.02	10.24	\$4,293,379
2017	434	3,736	43,889	9.83	10.75	\$4,641,477
2018	328	1,887	11,967	11.31	11.31	\$1,530,741

Source: ADFG, 2019.

**Table 15. Southeast Summer Troll Fishery Chinook Harvest Volume and Value, 2009-2018**

Year	Permits Fished	Landings	No. of Fish	Avg Price	Avg Wt	Total Value
2009	921	3,228	117,587	2.40	13.54	\$3,819,976
2010	864	2,709	123,167	3.52	14.09	\$6,098,559
2011	874	2,955	150,652	3.70	12.80	\$7,141,825
2012	923	4,905	135,594	3.66	12.90	\$6,405,563
2013	713	1,312	84,650	4.61	12.12	\$4,729,740
2014	887	2,772	255,084	3.54	11.61	\$10,496,144
2015	768	1,790	164,647	2.85	11.41	\$5,350,030
2016	833	3,910	180,952	5.10	11.55	\$10,654,401
2017	700	1,150	64,423	7.33	11.09	\$5,238,976
2018	710	2,772	86,758	8.51	11.91	\$8,791,255

Source: ADFG, 2019.

# Chapter 3.

## Regional Economic Impact of the Troll Fleet

The troll fleet is an important source of economic activity in Southeast Alaska. The fleet has direct, indirect, and induced impacts.

- Direct impacts include the skippers and crew that earn income from trolling.
- Indirect impacts include the jobs and wages generated when trollers purchase goods and services in support of their fishing operations.
- Induced impacts include the jobs and wages generated when skippers and crew spend their fishing income in support of their households.

Together these impacts are termed “multiplier effects.” Alaska resident trollers (86% of the fleet) have greater multiplier effects than non-resident fishermen, as residents are much more likely than non-residents to purchase goods and services in Southeast Alaska.

A troll fleet economic impact model was developed for purposes of this study. The model incorporates five-year (2014 to 2018) averages for permits fished and total gross earnings to estimate average annual employment and total annual labor income. Over the 2014 to 2018 period, an average of 729 permits were fished and ex-vessel earnings averaged \$32.9 million.

Approximately 1,400 fishermen earn income directly from the fishery, including skippers (permit holders) and crew. Direct annual average employment is estimated at 545 jobs (based on six months of employment annually for skippers and three months for crew). Total direct, indirect, and induced employment is estimated at 735 jobs. Direct labor income (the amount skippers and crew take home) is estimated at \$20.4 million. Total direct, indirect, and induced labor income is estimated at \$28.5 million.

**Table 16. Economic Impact of the Southeast Power Troll Fleet**

Economic Activity	Impact
<b>Employment</b>	
<b>Total participation (skippers and crew)</b>	<b>1,400 people</b>
Direct annual average employment	545 jobs
Indirect and Induced employment	190 jobs
<b>Total annual average employment</b>	<b>735 jobs</b>
<b>Income</b>	
Direct annual labor income	\$20.4 million
Indirect and induced labor income	\$8.1 million
<b>Total annual labor income</b>	<b>\$28.5 million</b>
<b>Output</b>	
Direct output	\$32.9 million
Indirect and induced output	\$7.7 million
<b>Total annual output</b>	<b>\$44.1 million</b>

Source: McDowell Group estimates.

Output is a measure of total spending related to the commercial troll fleet. It includes the total amount trollers are paid for their catch plus all the secondary spending in Southeast that occurs as fishermen purchase goods and services. Total annual output is estimated at \$44.1 million.

This measure of troller-related economic impact does not include effects of processing troll-caught fish. Processors add value to the troll catch, generating total average annual first wholesale value of the troll harvest totaling about \$70 million (based on statewide relationship between ex-vessel and first wholesale values for species harvested by trollers). Though it is difficult to attribute specific seafood processing jobs to the troll catch (as employees process fish from other commercial fisheries at the same time), approximately one-third of the added value is the cost of labor, or about \$12 million annually. Based on an average monthly wage of \$3,938 (the average in Sitka's processing sector), an annual average of 250 jobs can be attributed to processing the troll catch. The number of individual processing workers is greater than the annual average, as most of the processing activity occurs in the summer.

Including fishing, processing, and all related multiplier effects, the troll fleet has a total annual economic impact of approximately \$85 million, as measured in terms of total output.

Chinook accounted for about 44% of the power troll fleet's total ex-vessel value over the 2014 to 2018 period. All other factors held equal, Chinook account for about the same percentage of the total economic impact of the troll fleet, or approximately \$37 million in annual economic output in Southeast Alaska.

While hand trolling is an important source of income to some Southeast residents, particularly residents of smaller communities, its overall economic impact is small relative to power trolling and therefore was not incorporated into the detailed troll economic impact model. Total ex-vessel value of the hard troll harvest averaged \$1.6 million between 2014 and 2018. An average of 285 permit holders fished over that same period. The hand troll fleet's total regional economic impact, as measured in terms of total output, is approximately \$3.3 million annually.

# Chapter 4. Economic Impact of the 2019 Treaty on the Troll Fleet

## Historical Treaty Allocations and Catches

Table 17 provides a 20-year history (1999 to 2018) of Southeast Alaska chinook allowable and actual catch under the PST. The table includes:

- Pre-season and post-season allowable catch – all gear groups. These are based on pre-season and first post-season Abundance Index (AI) and includes the allowable catch for troll, net and sport fisheries.
- Treaty catch for all gear groups. This is the actual catch of Treaty Chinook in the troll, net, and sport fisheries.
- Troll pre-season and post-season limits and actual troll catch of Treaty Chinook.

**Table 17. Southeast Alaska PST Chinook Allocations and Catches, 1999-2018**

Year	Pre-season Allowable Catch - All Gear	Post-season Allowable - All Gear Catch	Treaty Catch All Gear	Troll Treaty Pre-season Allocation	Troll Treaty Post-season Limit	Troll Treaty Catch
1999	192,800	184,200	198,842	140,728	134,415	132,741
2000	189,900	178,500	186,493	138,507	130,144	133,963
2001	189,900	250,300	186,919	138,507	182,816	128,692
2002	356,500	371,900	357,133	266,056	277,584	298,132
2003	366,100	439,600	380,152	273,406	328,457	307,380
2004	383,500	418,300	417,019	286,728	312,818	321,876
2005	416,400	387,400	388,640	311,916	290,137	304,891
2006	346,800	354,500	360,094	256,664	262,381	263,980
2007	329,400	259,200	328,268	243,747	191,630	240,474
2008	170,000	152,900	172,905	125,408	112,713	126,352
2009	218,800	176,300	227,954	161,637	130,086	159,126
2010	221,800	215,800	230,611	163,864	159,410	177,982
2011	294,800	283,300	291,161	218,060	209,522	220,787
2012	266,800	205,100	242,821	197,272	151,467	191,553
2013	176,000	284,900	191,388	129,862	210,710	134,580
2014	439,400	378,600	435,195	325,411	280,273	340,015
2015	237,000	337,500	335,026	175,149	249,760	251,086
2016	355,600	288,200	350,704	263,197	213,160	266,048
2017	209,700	215,800	175,414	154,881	159,410	123,691
2018	144,500	118,700	127,776	106,477	87,322	101,469

Source: ADFG, 2019.

Since 2006, 4.3% of the Southeast Alaska Treaty Chinook allowable catch has been allocated to the seine fleet, 2.9% to the gillnet fleet, and 1,000 Chinook to setnet fishermen. The balance is split 80/20 between trollers and sport fisheries.

## 2019 Treaty Annual Catch Limit Formula for SE Alaska

As described in Chapter 3 of the PST, the Southeast Alaska AABM fishery annual Treaty catch limits are now based on catch per unit effort (CPUE) in the winter troll fishery in District 13 during statistical weeks 41-48. A tier framework dictates the annual catch limit at various CPUE and AI levels, as presented in Table 18.

**Table 18. 2019 Catch Limits for the PST Southeast Alaska AABM Fishery and the CPUE-based Tiers**

CPUE-based Tier	AI-Based Tier	Catch Limit
Less than 2.0	Less than 0.875	Commission Determination
2.0 to less than 2.6	Between 0.875 and 1.0	111,833
2.6 to less than 3.8	Between 1.005 and 1.2	140,323
3.8 to less than 6.0	Between 1.205 and 1.5	205,165
6.0 to less than 8.7	Between 1.505 and 1.8	266,585
8.7 to less than 20.5	Between 1.805 and 2.2	344,465
20.5 and greater	Greater than 2.2	372,921

Source: 2019 Pacific Salmon Treaty.

The new catch limits include reductions in total catch relative to the 2009 agreement of 7.5% when Abundance Index (AI) is less than 1.805, 3.25% when the AI is between 1.805 and 2.2, and 1.5% when the AI is greater than 2.2. Another important change from the 2009 agreement is that there is now an upper limit on Alaska's quota (372,921 Chinook). No limit was specified in the 2009 treaty.

Table 19 illustrates the effect of the CPUE- tiered troll catch limits relative to actual catch limits for the 2001 to 2018 period. Over that period, the CPUE tier-based troll allocation would have averaged 32,041 fewer fish, though ranging widely from 140,371 fewer Chinook to 72,358 more Chinook. Over the 18-year period, 14 years would have had lower troll limits under the terms of the 2019 PST.

**Table 19. Effect of 2019 PST CPUE Tier-Basis on Troll Catch Limits, 2001-2018**

Year	SE Alaska CPUE	All Gear Catch Limit Under 2019 PST	Troll Catch Limit Under 2019 PST	Troll Pre-season Catch Limit Under 2009 PST	Difference, No. of Fish	% Difference
2001	8.3	266,585	197,113	138,507	58,606	42%
2002	16.9	334,465	247,507	266,056	-18,549	-7%
2003	20.4	334,465	247,507	273,406	-25,899	-9%
2004	8.0	266,585	197,113	286,728	-89,615	-31%
2005	8.3	266,585	197,113	311,916	-114,803	-37%
2006	10.3	334,465	247,507	256,664	-9,157	-4%
2007	3.4	140,323	103,376	243,747	-140,371	-58%
2008	2.3	111,833	82,225	125,408	-43,183	-34%
2009	3.46	140,323	103,376	161,637	-58,261	-36%
2010	4.34	205,165	151,514	163,864	-12,350	-8%
2011	6.17	266,585	197,113	218,060	-20,947	-10%
2012	4.76	205,165	151,514	197,272	-45,758	-23%

Source: McDowell Group and ADFG, 2019 (CPUE values and 2009 catch limit). CPUE is for the winter fishery.

**Table 19 (cont). Effect of 2019 PST CPUE Tier-Basis on Troll Catch Limits, 2001-2018**

Year	SE Alaska CPUE	All Gear Catch Limit Under 2019 PST	Troll Catch Limit Under 2019 PST	Troll Pre-season Catch Limit Under 2009 PST	Difference, No. of Fish	% Difference
2013	4.4	205,165	151,514	129,862	21,652	17%
2014	7.44	266,585	197,113	325,411	-128,298	-39%
2015	13.43	334,465	247,507	175,149	72,358	41%
2016	11.05	334,465	247,507	263,197	-15,690	-6%
2017	4.18	205,165	151,514	154,881	-3,367	-2%
2018	3.53	140,323	103,376	106,477	-3,101	-3%

Source: McDowell Group and ADFG, 2019 (CPUE values and 2009 catch limit). CPUE is for the winter fishery.

The same analysis, using first post-season AI figures and the AI-based catch limit tiers, produces generally the same results, though with more consistency (see Table 20). The troll allocation averages 27,201 fewer fish, ranging from 80,951 fewer Chinook to 48 more Chinook.

**Table 20. Effect of 2019 PST AI Tier-Basis on Troll Catch Limits, 2001-2018**

Year	1 <sup>st</sup> Post-season AI	All Gear Post-seasons Catch Limit Under 2019 PST	Troll Post-season Catch Limit Under 2019 PST	Troll Post-season Catch Limit Under 2009 PST	Difference, No. of Fish	% Difference
2001	1.29	205,165	151,514	182,816	-31,301	-17%
2002	1.82	334,465	247,507	277,584	-30,077	-11%
2003	2.17	334,465	247,507	328,457	-80,951	-25%
2004	2.06	334,465	247,507	312,818	-65,312	-21%
2005	1.9	334,465	247,507	290,137	-42,630	-15%
2006	1.73	266,585	197,113	262,381	-65,269	-25%
2007	1.34	205,165	151,514	191,630	-40,115	-21%
2008	1.01	140,323	103,376	112,713	-9,337	-8%
2009	1.2	140,323	103,376	130,086	-26,710	-21%
2010	1.31	205,165	151,514	159,410	-7,896	-5%
2011	1.62	266,585	197,113	209,522	-12,410	-6%
2012	1.24	205,165	151,514	151,467	48	0%
2013	1.63	266,585	197,113	210,710	-13,597	-6%
2014	2.2	334,465	247,507	280,273	-32,766	-12%
2015	1.95	334,465	247,507	249,760	-2,253	-1%
2016	1.65	266,585	197,113	213,160	-16,047	-8%
2017	1.31	205,165	151,514	159,410	-7,896	-5%
2018	0.92	111,833	82,225	87,322	-5,097	-6%

Source: McDowell Group and ADFG, 2019 (1<sup>st</sup> post-season AI and troll post-season catch limit under 2009 PST).

Table 20 also illustrates a much greater differential in troll harvest limits in the period affected by the 1999 PST agreement, compared to the period affected by the 2009 agreement. This of course indicates that the 2019 agreement continues a trend of reduced Southeast Alaska Chinook allocations with parallel reductions in troller catch limits. The changing relationship between Abundance Index and catch in different generations of the PST is tabulated and illustrated graphically in the appendix.

## Analysis of Economic Impact

To quantify the potential future earnings impact of this new allocation method on the troll fleet (compared to the previous method and catch), two key assumptions are made. One is that chinook abundance levels will remain variable, including years of low abundance and years of relatively high abundance. Another assumption is that ex-vessel prices will also be variable and responsive to harvest volume. Historical AIs and prices observed over the 2009 to 2018 period are used as a proxy for future AIs and prices.

Within Southeast Alaska, the Chinook allocation plan is assumed to be unchanged going forward, reserving 1,000 fish for set gillnet fisheries with 4.3% and 2.9% of the remaining all-gear catch allocated to the purse seine and drift gillnet fisheries. After net allocations are subtracted, 80% of the remainder is allocated to the commercial troll fishery and 20% to sport fisheries.

Table 21 provides the actual Troll Treaty Quota (TTQ; based on pre-season AIs) and the actual Troll Treaty Harvest (TTH) for the period 2009 through 2018. It also provides what the Troll Treaty Limit would have been using the new CPUE tier-based method.

The average annual difference between the actual Troll Treaty pre-season allocation and what the limit would have been under the CPUE tier method is 19,376 fewer Chinook, including a range of 128,298 fewer to 72,358 more Chinook. The average annual difference between the pre-season allocation under the new formula and the actual 2009 to 2018 harvest is 26,381 fewer Chinook, ranging from 142,894 fewer to 27,852 more.

**Table 21. Comparison of Actual Troll Treaty Pre-season Allocation and Actual Harvest with New CPUE Tier-Based Limits (Number of Fish) and Ex-vessel Value of Change in 2018 Dollars**

Year	Actual Troll Treaty Pre-season Allocation (TTA)	Troll Treaty Harvest (TTH)	Troll Limit Under New CPUE Tier Method	Under/Over TTA	Ex-vessel Value of Change (2018\$)	Under/Over from TTH	Ex-vessel Value of Change (2018\$)
2009	161,637	159,166	103,376	-58,261	-\$3,377,151	-55,790	-\$3,233,918
2010	163,864	178,023	151,514	-12,350	-\$950,960	-26,509	-\$2,041,259
2011	218,060	220,317	197,113	-20,947	-\$1,443,782	-23,204	-\$1,599,345
2012	197,272	191,519	151,514	-45,758	-\$3,101,358	-40,005	-\$2,711,430
2013	129,862	134,600	151,514	21,652	\$1,689,688	16,914	\$1,319,950
2014	325,411	340,007	197,113	-128,298	-\$7,559,514	-142,894	-\$8,419,531
2015	175,149	251,088	247,507	72,358	\$4,094,280	-3,581	-\$202,637
2016	263,197	266,008	247,507	-15,690	-\$1,199,457	-18,501	-\$1,414,347
2017	154,881	123,662	151,514	-3,367	-\$332,108	27,852	\$2,747,664
2018	106,477	101,469	103,376	-3,101	-\$326,965	1,907	\$201,036
<b>2009-18 Total</b>	<b>1,895,810</b>	<b>1,965,859</b>	<b>1,702,048</b>	<b>-193,762</b>	<b>-\$12,507,326</b>	<b>-263,811</b>	<b>-\$15,353,815</b>
<b>2009-18 Avg.</b>	<b>189,581</b>	<b>196,586</b>	<b>170,205</b>	<b>-19,376</b>	<b>-\$1,250,733</b>	<b>-26,381</b>	<b>-\$1,535,382</b>
<b>% Change</b>	<b>-</b>	<b>-</b>		<b>-10.2%</b>		<b>-13.4%</b>	

Source: McDowell Group and ADFG, 2019 (actual pre-season allocation and treaty harvest).



Based on ex-vessel values over that period, adjusted to 2018 dollars, the total 10-year value of the change in pre-season allocation is \$12.5 million. The total 10-year value of the change relative to the actual harvest is \$15.4 million.

The 2009 to 2018 period includes one year (2015) when the actual troll harvest was well above the pre-season quota. In 2015 the pre-season AI of 1.45 was substantially below the post-season AI 1.95.

As shown in Table 22, the average annual difference between the actual Troll Treaty post-season limit and what the limit would have been under the new AI tier method is 12,462 fewer Chinook, including a range of 32,766 fewer to 48 more Chinook. The average annual difference between the AI tier-based allocation under the new formula and the actual harvest is 23,936 fewer Chinook, ranging from 92,500 fewer to 62,513 more.

The total 10-year value of the change in post-season limit is \$8.7 million. The total 10-year value of the change relative to the actual harvest is \$14.9 million.

**Table 22. Comparison of Actual Troll Treaty Post-season Limits and Actual Harvest with AI Tier-Based Limits (Number of Fish)**

Year	Actual Troll Treaty Limit (TTL) Based on Post-season AI	Troll Treaty Harvest (TTH)	Troll Limit Under New AI Tier Method*	Under/Over from TTL	Ex-vessel Value of Change (2018\$)	Under/Over from TTH	Ex-vessel Value of Change (2018\$)
2009	130,086	159,166	103,376	-26,710	-\$1,548,247	-55,790	-\$3,233,918
2010	159,410	178,023	151,514	-7,896	-\$608,015	-26,509	-\$2,041,259
2011	209,522	220,317	197,113	-12,410	-\$855,331	-23,204	-\$1,599,345
2012	151,467	191,519	151,514	48	\$3,246	-40,005	-\$2,711,430
2013	210,710	134,600	197,113	-13,597	-\$1,061,069	62,513	\$4,878,281
2014	280,273	340,007	247,507	-32,766	-\$1,930,600	-92,500	-\$5,450,240
2015	249,760	251,088	247,507	-2,253	-\$127,494	-3,581	-\$202,637
2016	213,160	266,008	197,113	-16,047	-\$1,226,742	-68,895	-\$5,266,791
2017	159,410	123,662	151,514	-7,896	-\$778,920	27,852	\$2,747,664
2018	87,322	101,469	82,225	-5,097	-\$537,42	-19,244	-\$2,028,945
<b>2009-18 Total</b>	<b>1,851,119</b>	<b>1,965,859</b>	<b>1,726,496</b>	<b>-124,624</b>	<b>-\$8,670,599</b>	<b>-239,363</b>	<b>-\$14,908,618</b>
<b>2009-18 Avg.</b>	<b>185,112</b>	<b>196,586</b>	<b>172,650</b>	<b>-12,462</b>	<b>-\$867,060</b>	<b>-23,936</b>	<b>-\$1,490,862</b>
<b>% Change</b>	<b>-</b>	<b>-</b>		<b>-6.7%</b>		<b>-12.2%</b>	

\*Based on first post season AI. Source: McDowell Group and ADFG, 2019 (actual post-season limit and treaty harvest).

Tables 21 and 22 illustrate that the 2019 PST, if in place during the 2009 to 2018 period, would have resulted in total volume reductions to trollers of between 6.7% and 13.4%, depending on the basis of comparison (pre-season allocation, post-season limit, or actual harvest). Based on actual ex-vessel prices over the 2009-2018 period, the 10-year total value (or cost) in 2018 dollars of those reductions ranges between \$8.7 million and \$15.4 million, again depending on the basis of comparison.

Table 23 provides the nominal and inflation-adjusted per-fish values used in the value-change calculations presented in Tables 21 and 22.

**Table 23. Nominal and Inflation Adjusted Per-Chinook Ex-vessel Values, 2009 to 2018**

Year	Nominal Ex-vessel Value Per Fish	Inflation Adjustment*	Inflation-Adjusted Ex-vessel Value Per Fish (2018\$)
2009	\$49.28	1.176	\$57.97
2010	\$66.62	1.156	\$77.00
2011	\$61.55	1.120	\$68.92
2012	\$61.88	1.095	\$67.78
2013	\$73.48	1.062	\$78.04
2014	\$56.38	1.045	\$58.92
2015	\$54.42	1.040	\$56.58
2016	\$73.83	1.035	\$76.45
2017	\$95.73	1.030	\$98.65
2018	\$105.43	1.176	\$105.43

Source: McDowell Group. \*From Anchorage/Urban Alaska Consumer Price Index

## Overage Penalty

One other important aspect of the 2019 PST Treaty is related to harvest overages. The Treaty states:

“the following actions in AABM fisheries shall be taken if the actual catch differs from the pre-season limit (management error);

(i) if the actual catch exceeds the pre-season catch limit (overage) then the overage shall be paid back in the fishing year after the overage occurs, and

(ii) if the actual catch is lower than the pre-season catch limit (underage) then the underage shall not be accumulated;”

The main cost to trollers of this provision of the 2019 PST is the foregone value of the unutilized quota. It is not possible to know if, when, or the scale of “management error” in the future. ADF&G is overlaying a 2% reduction to the Treaty harvest limit for SE Alaska to avoid exceeding the all-gear limit established by the 2019 PST. This suggests that a 2% reduction is the buffer that will best optimize the harvest, in terms of maximizing the catch without exceeding the limit.

Table 24 provides an example of the effect of the 2019 PST allocation formula and a 2% buffer on the troll allocation, based on 2009 through 2018 pre-season CPUE tiers, in comparison to the actual pre-season allocations over that period. Assuming the 2% buffer resulted in (on average) a harvest 2% below the limit, the analysis indicates an annual average reduction of 22,780 fish, ranging from 132,241 fewer Chinook to 67,408 more Chinook. The total dollar value of the 10-year reduction is \$15.0 million, in 2018 dollars, about 20% higher than without the 2% buffer. It is important to note that this represents a high-end measure of costs associated with a buffer. If such a buffer was consistently resulting in significant under-harvest, it presumably would be modified to further optimize the catch, with respect to the requirements of the PST.

**Table 24. Comparison of Troll Allocation under 2019 Treaty CPUE-Tiers with Actual Troll Treaty Pre-season Allocation, Including 2% ADFG Buffer**

Year	Troll Allocation Under 2019 PST*	New Troll Allocation Less 2% Buffer Reduction	Actual Troll Treaty Pre-season Allocation	% Change	Total Difference	Ex-vessel Value of Difference (2018\$)
2009	103,376	101,308	161,637	-36%	-60,329	-\$3,496,996
2010	151,514	148,484	163,864	-8%	-15,380	-\$1,184,305
2011	197,113	193,171	218,060	-10%	-24,890	-\$1,715,500
2012	151,514	148,484	197,272	-23%	-48,788	-\$3,306,745
2013	151,514	148,484	129,862	17%	18,622	\$1,453,214
2014	197,113	193,171	325,411	-39%	-132,241	-\$7,791,797
2015	247,507	242,557	175,149	41%	67,408	\$3,814,183
2016	247,507	242,557	263,197	-6%	-20,640	-\$1,577,876
2017	151,514	148,484	154,881	-2%	-6,397	-\$631,047
2018	103,376	101,308	106,477	-3%	-5,169	-\$544,946
<b>10-year Totals</b>	<b>1,702,048</b>	<b>1,668,007</b>	<b>1,895,810</b>	<b>-</b>	<b>-227,802</b>	<b>-\$14,981,816</b>
<b>2009-2018 Avg.</b>	<b>170,205</b>	<b>166,801</b>	<b>189,581</b>	<b>-12.0%</b>	<b>-22,780</b>	<b>-\$1,498,182</b>

\*Based on CPUE tiers. Note: Average % change is weighted. Source: McDowell Group.

## Summary

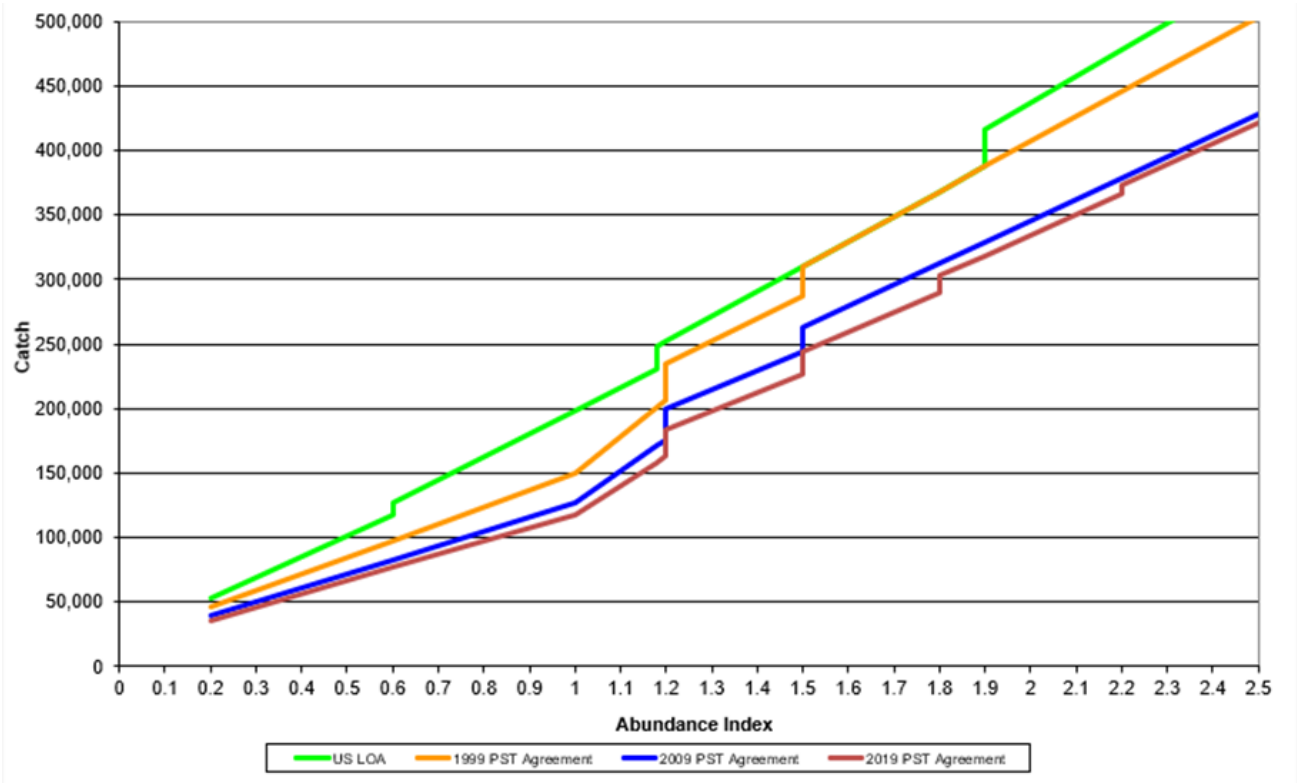
In summary, if provisions in the 2019 PST had been in place during the 2009 to 2018 period, the number of Chinook available to trollers for harvest (and harvested) would have been between 6.7% and 13.4% lower, depending on the basis of comparison (pre-season allocation, post-season limit, or actual harvest). Based on ex-vessel prices over the 2009-2018 period, the 10-year total value (or cost) in 2018 dollars of those reductions ranges between \$8.7 million and \$15.4 million, again depending on the basis of comparison.

**Table 25. Summary of Impacts of the 2019 PST Provisions on the Troll Fleet, Based on 2009-2018 Quotas, Abundance Indexes, and Harvests**

	Measure
Actual 2009 - 2018 Total Troll Treaty Harvest (no. of fish)	1,965,859
Actual 2009 - 2018 Total Troll Treaty Pre-season Allocation (Based on Pre-season AI)	1,895,810
Actual 2009 - 2018 Total Troll Treaty Catch Limit (Based on Post-season AI)	1,851,119
<b>If 2019 PST Troll allocation formula had been in place in 2009 - 2018</b>	
Total Pre-season Limit Under New CPUE Tier	1,702,048
% Change from Actual Pre-season Allocation	10.2%
Total Ex-vessel Value of Change (2018\$)	-\$12.5 million
% Change from Actual Harvest	13.4%
Total Ex-vessel Value of Change (2018\$)	-\$15.4 million
Total Limit Under New Post-season AI Tier	1,726,496
% Change from Actual Post-season Limit	6.7%
Total Ex-vessel Value of Change (2018\$)	-\$8.7 million
% Change from Actual Harvest	12.2%
Total Ex-vessel Value of Change (2018\$)	-\$14.9 million

Not quantified in Table 25 is any measure of the value of unfilled quota that could not have been carried forward to the next season.

**Graphic Depiction of “Broken stick” Relationship between Chinook AI and Catch for the Current PST Agreement Compared to Previous PST Agreements**



**Table 26. SE Alaska All-Gear Chinook Quota Under Current and Previous Pacific Salmon Treaties, at Abundance Index (AI) Levels of 1.0, 1.5, and 2.0**

Abundance Index	Quota (No. of Chinook)		
	AI 1.0	AI 1.5	AI 2.0
<b>1979-82 Base Period Harvest</b>	332,583	-	-
<b>Treaty Year</b>			
1999	150,000	287,700	406,700
2009	127,500	244,600	345,700
2019	117,900	226,200	334,500
2019 Reduction from Base Period (%)	-64.6%	-32.0%	+0.6%

Source: Drawn from Pacific Salmon Treaty and ADFG data.