

# ECONOMIC IMPACT OF ALASKA'S SALMON HATCHERIES

OCTOBER 2018



## PREPARED FOR

- Southern Southeast Regional Aquaculture Association
- Armstrong-Keta
- Douglas Island Pink and Chum, Inc.
- Northern Southeast Regional Aquaculture Association
- Prince William Sound Aquaculture Corporation
- Valdez Fisheries Development Association, Inc.
- Cook Inlet Aquaculture Association
- Kodiak Regional Aquaculture Association

PREPARED BY

  
**McDowell**  
GROUP

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# Table of Contents

<b>Executive Summary</b> .....	<b>1</b>
<b>Introduction and Methodology</b> .....	<b>4</b>
Scope of Work .....	4
Methodology.....	5
<b>Profile of Alaska’s Salmon Hatcheries</b> .....	<b>8</b>
History.....	8
Current Hatchery Operations.....	9
Other North Pacific Hatchery Releases .....	14
<b>Hatchery Contributions to Commercial Harvests</b> .....	<b>15</b>
Hatchery-Impacted Commercial Salmon Fishing Fleets.....	15
Commercial Harvest of Hatchery-Produced Salmon .....	16
Hatchery Contributions as a Percentage of Overall Alaska Salmon Harvests .....	19
<b>Hatchery Contributions to the Seafood Processing Sector</b> .....	<b>20</b>
Total First Wholesale Value.....	20
Hatchery Contributions as a Percentage of Overall First Wholesale Value.....	21
<b>Hatchery Contributions to Sport Fishing, Personal Use, and Subsistence in Alaska</b> .....	<b>22</b>
Sport Fishing.....	22
Personal Use and Subsistence .....	25
<b>Economic Impacts of Hatchery Produced Salmon in Alaska</b> .....	<b>26</b>
Commercial Fishing Impacts .....	27
Seafood Processing Impacts .....	27
Hatchery Management and Operations .....	28
Sport Fishing.....	29
Summary of Statewide and Regional Economic Impacts.....	31
Southeast Alaska Hatchery Impacts.....	32
Prince William Sound Hatchery Impacts .....	33
<b>Tax Revenue Impacts of Alaska’s Salmon Hatcheries</b> .....	<b>34</b>

## List of Tables

Table 1. Smolts Released in 2017, By Species and Region .....	11
Table 2. Hatchery-Impacted Salmon Fisheries in Alaska, 2012-2017 Average .....	15
Table 3. Hatchery-Produced Harvest Volume and Value (millions), 2012-2017 .....	17
Table 4. Hatchery-Produced Harvest Value, by Gear Type and Species (000s), 2012-2017 Averages .....	17
Table 5. Hatchery-Produced Harvest Value, by Species and Region (000s), 2012-2017 Averages .....	18
Table 6. Sport and Related Harvest of Hatchery Salmon, by Species, 2012-2016 Annual Average.....	22
Table 7. Top Hatchery Sport Harvests, by Hatchery Association and Species, 2012-2016 Annual Average .....	23
Table 8. Sport Salmon Harvests, by Region and Saltwater/Freshwater, 2012-2016 Annual Averages .....	24
Table 9. Top Hatchery Personal Use and Subsistence Harvests, by Hatchery Association and Species,.....	25
Table 10. Total Employment and Labor Income Associated with Commercial Harvest of Hatchery-Produced Salmon, 2012-2017 Averages.....	27

Table 11. Total Employment and Labor Income Associated with Processing Hatchery-Produced Salmon, 2012-2017 Averages .....	28
Table 12. Total Employment and Labor Income Associated with Hatchery Operations, 2012-2017 Averages ..	29
Table 13. Total Employment and Labor Income Associated with Non-Resident Sport Harvest of Hatchery-Produced Salmon .....	30
Table 14. Total Annual Statewide Economic Impact of Alaska Salmon Hatcheries .....	31
Table 15. Economic Impact of Salmon Hatcheries in Southeast Alaska .....	32
Table 16. Economic Impact of Prince William Sound Salmon Hatcheries .....	33
Table 17. Estimated Fisheries Business Tax Revenue from Hatchery-Produced Salmon by Component, 2012-2017 .....	34

## List of Figures

Figure 1. Commercial Salmon Harvests in Alaska, Wild versus Hatchery-Origin, 1900-2017 .....	8
Figure 2. Regions of Alaska with Salmon Hatchery Programs (in yellow) .....	9
Figure 3. Release Sites by Association (color) and Number of Smolt Released (size of circle), 2017 .....	10
Figure 4. Alaska PNP Hatchery Association Funding Sources, 2017 .....	12
Figure 5. Hatchery Salmon Releases in the North Pacific, by Country, 2012-2017 .....	14
Figure 6. Hatchery-Produced Salmon Harvest Volume and Value, 2012-2017 .....	16
Figure 7. Hatchery-Produced Harvest Value, by Region, 2012-2017 .....	18
Figure 8. Hatchery Contribution to Ex-Vessel Value of Alaska's Salmon Harvests, 2012-2017 .....	19
Figure 9. Hatchery Contribution to Total Salmon Ex-Vessel Value, by Region, 2012-2017 .....	19
Figure 10. First Wholesale Value of Alaska Hatchery Salmon Products (\$ millions), 2012-2017 .....	20
Figure 11. Hatchery Contribution to First Wholesale Value of Alaska Salmon Products, 2012-2017 .....	21

# Executive Summary

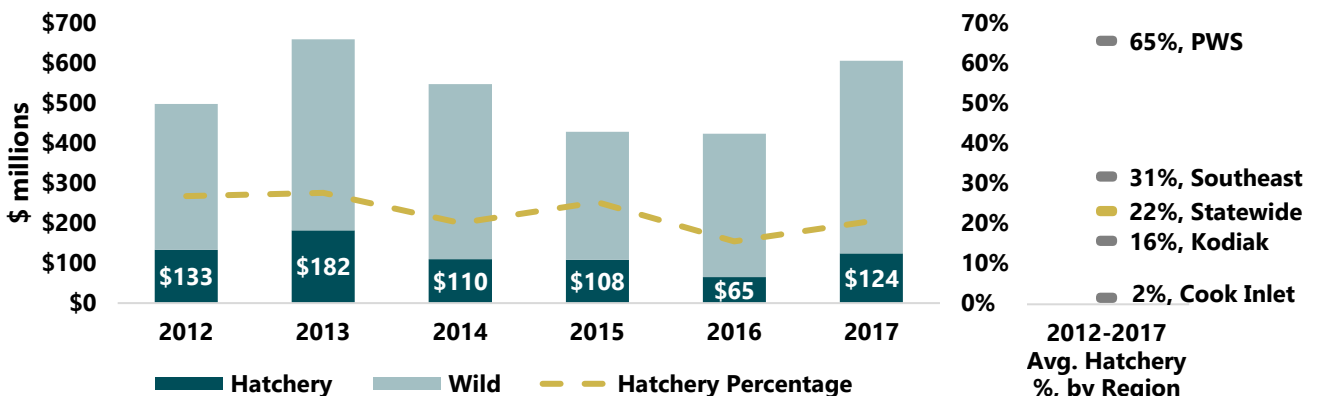
Alaska's salmon hatcheries contribute nearly a quarter of the value of our state's salmon harvests and generate \$600 million in economic output, with impacts throughout the economy. The scope of this report includes Alaska's eight private, nonprofit hatchery associations, including impacts resulting from hatchery-produced salmon as well as hatchery operations. Data sources include ADF&G, hatcheries, CFEC, DOLWD, and IMPLAN. Commercial harvest and processing data presented reflect annual averages across the six-year period 2012-2017. Sport harvest and related data reflect 2012-2016 averages due to a lag in ADF&G data availability.

## Common Property Ex-Vessel Volume and Value

- Over the study period, commercial fishermen harvested an annual average of 222 million pounds of hatchery-produced salmon worth \$120 million in ex-vessel value.
- Chum and pink salmon are the most important species – responsible for 39 and 38 percent of ex-vessel value, respectively – followed by sockeye (16 percent), coho (4 percent), and Chinook (2 percent).
- More than half of hatchery salmon ex-vessel value went to seiners (57 percent). Gillnetters pulled in 38 percent, while trollers caught 5 percent of hatchery ex-vessel value over the study period.
- Regionally, Prince William Sound (PWS) harvests of hatchery salmon generated \$69 million in ex-vessel value annually. Southeast harvests earned fishermen \$44 million on average, followed by Kodiak (\$7 million) and Cook Inlet (\$0.5 million) harvests. It should be noted that Cook Inlet Aquaculture Association (CIAA) is currently building up their pink production and the full impact of these additional investments will not be seen for several more years. In addition, CIAA maintains several flow control structures and a fish ladder – efforts that lead to additional (though unquantifiable) salmon production.
- As a percentage of statewide harvest value, hatchery-derived salmon represents 22 percent of total salmon ex-vessel value over the study period. This percentage ranged from a high of 28 percent in 2013 to a low of 15 percent in 2016. Hatchery contribution was highest in PWS (65 percent) over the study period, followed by Southeast (31 percent), Kodiak (16 percent), and Cook Inlet (2 percent).



**Hatchery Contribution to Ex-Vessel Value of Alaska's Salmon Harvests, 2012-2017**

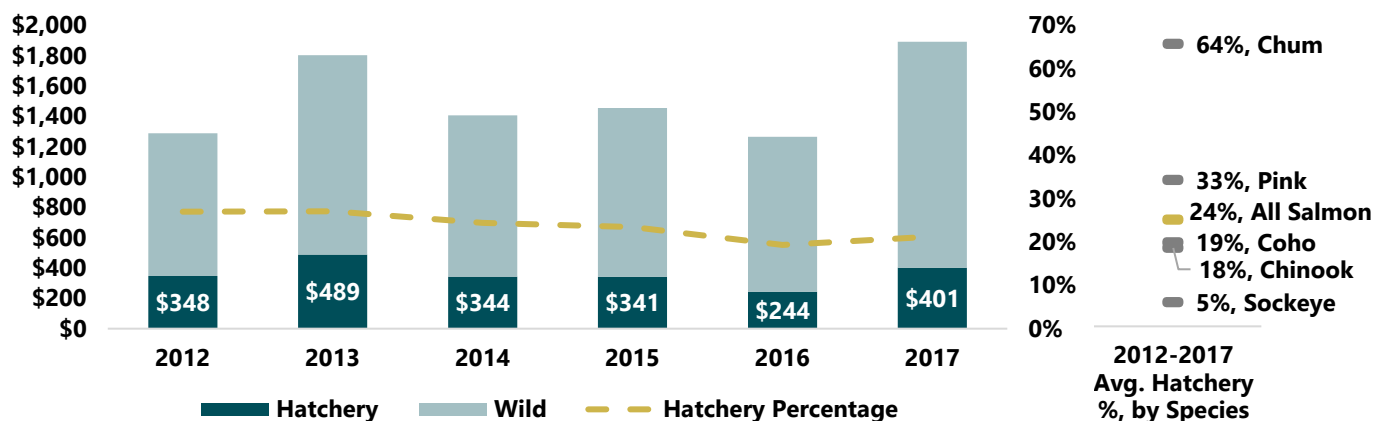


## First Wholesale Value

- The first wholesale value – the value of raw fish plus the value added by the first processor – of hatchery-produced salmon averaged \$361 million annually across the study period.
- Nearly four-fifths (79 percent) of hatchery-produced first wholesale value is estimated to come from common property fisheries, with the remainder going to cost recovery harvests.
- Hatchery-derived first wholesale value represents 24 percent of total statewide salmon first wholesale value over the study period. By species, nearly two-thirds of chum, one-third of pink, and close to two-fifths of coho (19 percent) and Chinook (18 percent) wholesale production value was derived from hatchery salmon over the study period.

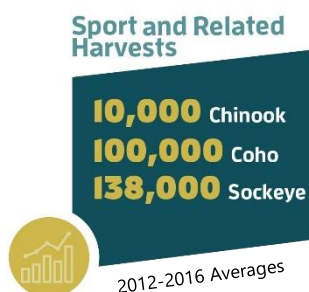


### Hatchery Contribution to First Wholesale Value of Alaska Salmon Products, 2012-2017



## Sport/Personal Use/Subsistence

- Coho, Chinook, and sockeye salmon are the most important hatchery-produced species for sport, personal use, and subsistence harvests. These species are produced in smaller numbers compared to pink and chum but are much more valuable on a per fish basis.
- On average, about 10,000 hatchery-origin Chinook, 5,000 chum, 100,000 coho, 19,000 pink, and 138,000 sockeye salmon were harvested annually in sport and related fisheries over the study period. These numbers are considered conservative due to limited sampling of sport and related harvests for origin (hatchery/non-hatchery), among other factors.



- Sport harvests accounted for over 99 percent of the sport/personal use/subsistence harvest of hatchery-produced coho and Chinook. By contrast, most non-commercial hatchery sockeye were harvested by personal use and subsistence fishermen (80 percent), with only 20 percent caught by sport fishermen.
- As a percentage of statewide sport-caught fish, hatchery-origin salmon accounted for 17 percent of sport coho harvests, 5 percent of sport sockeye harvests, and 8 percent of sport Chinook harvests.

## Economic Impacts

- Alaska's salmon hatcheries account for the annual equivalent of 4,700 jobs and \$218 million in total labor income, including all direct, indirect, and induced economic impacts. A total of \$600 million in annual economic output is connected to Alaska salmon hatchery production.
- The employment impact of 4,700 jobs is an annualized estimate. The number of people who earn some income from the harvest of hatchery-produced salmon is several times the annual average. More than 16,000 fishermen, processing employees, and hatchery workers can attribute some portion of their income to Alaska's salmon hatchery production. Thousands of additional support sector workers earn wages connected to Alaska hatchery production.
- The economic footprint of Alaska's hatcheries includes \$95 million in labor income associated with commercial fishing, \$82 million in labor income associated with processing, and \$25 million connected to hatchery operations.
- Non-resident sport harvest of hatchery salmon accounts for \$16 million in annual labor income created directly or indirectly by Alaska's hatcheries. This number is limited to impacts resulting from non-resident sport harvest of hatchery salmon and should be considered conservative. Clearly, resident sport/personal use/subsistence harvests of hatchery salmon have additional economic impacts as well as very significant social and cultural impacts in Alaska.
- Southeast Alaska hatcheries account for 2,000 jobs (annualized), \$90 million in labor income, and \$237 million in total annual output, including all multiplier effects.
- Prince William Sound hatcheries account for 2,200 jobs, \$100 million in labor income, and \$315 million in total annual output, including all direct, indirect, and induced effects.

### Annual Economic Impacts

**4,700** Jobs  
**\$218** million  
 labor Income  
**\$600** million  
 economic output



### Total Annual Statewide Economic Impact of Alaska Salmon Hatcheries

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Commercial Fishing</b>			
Employment	1,040	500	1,540
Labor Income	\$70.9 million	\$23.6 million	\$94.5 million
<b>Seafood Processing</b>			
Employment	1,360	820	2,180
Labor Income	\$52.2 million	\$29.6 million	\$81.8 million
<b>Hatchery Operations</b>			
Employment	345	270	615
Labor Income	\$15.5 million	\$9.4 million	\$24.9 million
<b>Non-resident Sport Fishing</b>			
Employment	285	90	375
Labor Income	\$10.5 million	\$5.7 million	\$16.2 million
<b>Total Economic Impact</b>			
<b>Employment</b>	<b>3,030</b>	<b>1,680</b>	<b>4,710</b>
<b>Labor Income</b>	<b>\$149.1 million</b>	<b>\$68.3 million</b>	<b>\$217.5 million</b>
<b>Output</b>	<b>\$386.1 million</b>	<b>\$216.0 million</b>	<b>\$602.1 million</b>

# Introduction and Methodology

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Hatchery-produced salmon are caught in commercial, sport, personal use, and subsistence fisheries throughout Southeast, Southcentral, and Kodiak – totaling more than 68 million fish annually in recent years. This study is the first comprehensive report detailing the economic impacts of these harvests and the hatchery activities that support them.

Alaska's salmon hatchery program was developed by the Alaska Department of Fish & Game (ADF&G) to enhance fisheries while protecting wild stocks. Since the 1970s, Alaska's salmon hatcheries have been increasingly operated by private non-profit (PNP) corporations that fund their operations through cost recovery harvests and other sources. ADF&G still operates two sport fish hatcheries (in Anchorage and Fairbanks) and remains involved in PNP hatchery operations in an oversight role to ensure that wild stocks are protected, among other goals.

## Scope of Work

This study estimates and describes the economic impacts of Alaska's eight non-profit salmon hatchery associations (listed below along with the acronyms used in this report). Educational, research, ADF&G-run sport fish, and other small hatcheries fall outside the scope of this report.

- Southern Southeast Regional Aquaculture Association (SSRAA)
- Armstrong-Keta (AKI)
- Douglas Island Pink and Chum, Inc. (DIPAC)
- Northern Southeast Regional Aquaculture Association (NSRAA)
- Prince William Sound Aquaculture Corporation (PWSAC)
- Valdez Fisheries Development Association, Inc. (VFDA)
- Cook Inlet Aquaculture Association (CIAA)
- Kodiak Regional Aquaculture Association (KRAA)

This report concentrates on five primary subjects:

1. **Commercial Harvest** – The overall economic benefits of commercially caught, common property hatchery salmon are presented using ex-vessel value – the price paid to fishermen for their catch. The geographic distribution of these earnings is also reported.
2. **Seafood Processing** – The overall economic impact resulting from processing hatchery salmon in Alaska (including common property and cost recovery harvests) is estimated using first wholesale value data from ADF&G. First wholesale value represents the first sale of fish by a processor to a buyer outside their affiliate network.
3. **Sport/Personal Use/Subsistence Harvest** – Contributions of hatchery salmon to regional sport, personal use, and subsistence harvests are addressed, including impacts resulting from guided and unguided non-resident harvests.



4. **Economic Impacts** – This section summarizes the total economic impacts of hatchery fish on the various sectors described above, along with the economic impacts resulting from the operations of Alaska’s eight hatchery associations.
5. **Tax Revenue** – Hatchery salmon support a variety of economic activities that are taxed, providing revenue to the State and local governments throughout Alaska.

## Methodology

Hatchery contributions to Alaska’s salmon fisheries are tracked via ADF&G and hatchery-run sampling programs that collect salmon heads at seafood processors, on board fishing vessels, at docks and harbors frequented by sport fishermen, and at other locations. Otoliths and coded wire tags are collected and reviewed to determine the percentage of harvests attributable to hatchery production.<sup>1</sup> ADF&G uses this and other data to estimate the number of hatchery-produced salmon contributed by each hatchery association to various fisheries – data that form the basis of the annual enhancement reports produced by ADF&G.<sup>2</sup> For this report, hatchery associations were given the opportunity to update tables based on the enhancement report data described above. All data updates/edits provided by hatchery associations were minor in scale.

In general, data presented in this report are based on **six-year (2012 to 2017) averages** to avoid results influenced by particularly good or bad years for salmon survival. The exception is data related to sport/personal use/subsistence which is based on 2012 to 2016 averages due to a lag in data availability from ADF&G. Economic impact modeling is based on a combination of averages over the study period and 2017 financial data, as described in more detail below.

Ex-vessel and first wholesale value data are not adjusted for inflation in the report, due to the short time spans presented.

### Ex-Vessel Volume and Value Calculations

Hatchery contribution data (numbers of fish) were combined with average weight per fish and price per pound data obtained from the Commercial Fisheries Entry Commission (CFEC) to calculate ex-vessel value, as follows:

$$\text{ex-vessel value} = \text{number of fish} * \text{average weight per fish} * \text{average price per pound}$$

Number of fish, average weight, and average price data were broken down by species, area of harvest (Southeast, Prince William Sound, Cook Inlet, and Kodiak), and gear type (seine, gillnet, and troll).

### First Wholesale Value Calculations

Data available at the processing level – ADF&G Commercial Operator Annual Report or COAR data – is less detailed than data available at the ex-vessel level. Notably, it is not possible to specifically trace hatchery salmon through the processing stage. The simplifying assumption is made that, for each species in each region,

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<sup>1</sup> Information contained in otoliths and coded wire tags indicate the species/variety, hatchery that produced the fish, and release year.

<sup>2</sup> Stopha, M. 2018. Alaska salmon fisheries enhancement annual report 2017. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J18-02.

hatchery salmon (including both common property and cost recovery harvests) are processed and valued similarly as non-hatchery salmon.

Estimates of first wholesale value attributable to hatchery salmon are calculated by applying a price multiplier to hatchery ex-vessel volumes. The multipliers vary by region and species and are based on first wholesale value divided by ex-vessel volume calculated from ADF&G data. These multipliers introduce a potential source of noise because they combine different datasets created for different purposes. The degree of noise is judged to be minimal by the project team.

## **Sport/Personal Use/Subsistence**

Data from ADF&G's annual enhancement reports provide estimates of the number of hatchery salmon, by species and hatchery association, caught by sport, personal use, and subsistence fishermen in Alaska. Harvest numbers reported in this section are considered conservative due to limited sampling of sport and related harvests for origin (hatchery/non-hatchery), among other factors.

Overall hatchery-produced sport harvest numbers presented in this report include hatchery salmon produced by ADF&G's sport fish hatchery in Anchorage, as these fish are caught alongside PNP hatchery salmon throughout Southcentral Alaska. However, all economic impact numbers consider only the contributions of Alaska's eight PNP hatchery associations.

Sport and related data presented in this report are generally based on 2012 to 2016 averages. Data from 2017 are not used due to a lag in reporting by ADF&G. This lag is due in part to anglers not returning personal use and subsistence harvest surveys in a timely fashion. In addition, the process to develop the state's estimates of sport harvests is complex – based on a statewide harvest survey. As of the writing of this report, 2017 sport harvest data is not available on ADF&G's website.

While not discussed in detail in this report, ADF&G charter logbook data (only available through 2014) was analyzed, along with various other sources of sport fish data, to inform the economic impact analysis.

## **Economic Impact Modeling**

Employment and labor income are estimated for four aspects of Alaska's salmon hatchery program: commercial fishing, seafood processing, hatchery administration and operations, and sport fishing. Annual average (2012 to 2017) ex-vessel value forms the basis of the commercial fishing analysis. Models were developed for the seine, gillnet, and troll fisheries, where standard crewing and crew compensation practices were used to estimate labor participation, annualized employment, and total earnings (labor income). Assumptions about in-state spending on goods and services in support of fishing operations were made to estimate indirect effects. Analysis of induced effects (those stemming from fishermen spending their labor income in Alaska) includes adjustment for non-resident permit holder and crew participation in the various fisheries.

Employment and labor income related to processing of hatchery-produced salmon were based on the labor cost component of total first wholesale value (again measured for the period 2012 through 2017). Annual average employment was calculated by dividing total labor income by average annual wages in the seafood processing industry, as measured by the Alaska Department of Labor and published in the Quarterly Census of

Employment and Wages. With methods similar to those used in the commercial fishing analysis, non-resident participation in seafood processing was factored into the analysis of induced economic impacts.

Direct, indirect, and induced employment and labor income estimates associated with hatchery management and operations were based on financial statements and employee counts provided by each hatchery associations. The estimates are based on 2017 data alone.

Estimates of employment and labor income related to sport harvest of hatchery produced salmon are based on a variety of harvest data, non-resident visitor spending data, and previous McDowell Group research on the economic impacts of individual hatchery associations. Further discussion of sport fish methodology is provided in the body of this report.

# Profile of Alaska's Salmon Hatcheries

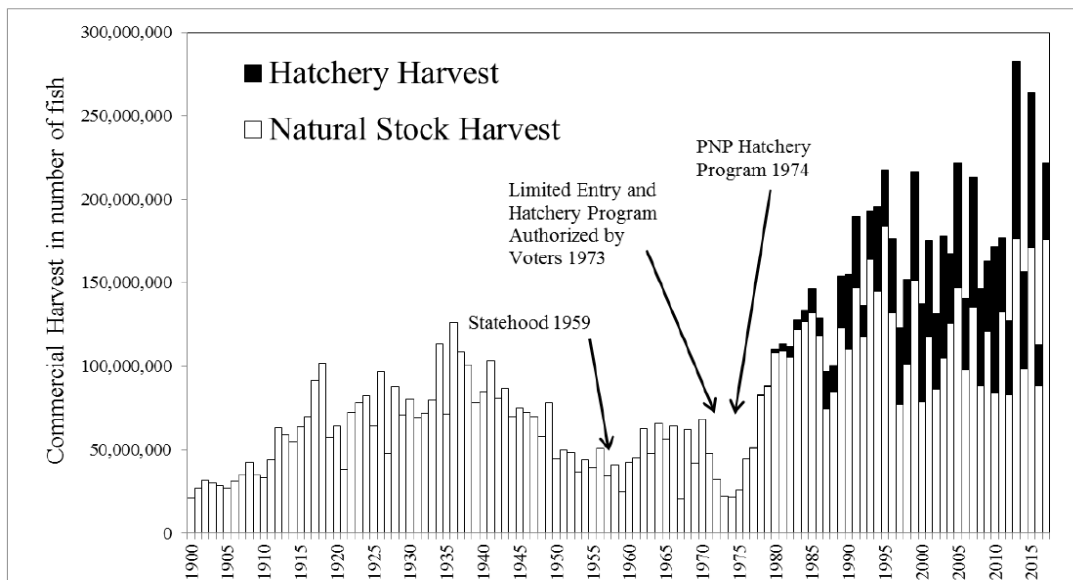
## History

ADF&G's 2017 Alaska Salmon Fisheries Enhancement Annual Report describes the genesis and early history of our state's hatchery program:

*Alaska's salmon hatcheries were developed in response to historically low salmon abundance in the early 1970s. In 1971, the Alaska Legislature established the Division of Fisheries Rehabilitation Enhancement and Development (FRED) within the Alaska Department of Fish and Game (ADF&G) for hatchery development. In 1972, Alaska voters approved an amendment to the state Constitution (Article 8, section 15), providing for an exemption to the "no exclusive right of fishery" clause, enabling limited entry to Alaska's state fisheries and allowing harvest of salmon for broodstock and cost recovery for hatcheries. In 1974, the Alaska Legislature expanded the hatchery program, authorizing private nonprofit (PNP) corporations to operate salmon hatcheries. Alaska's salmon hatchery program developed under this authority and was designed to supplement – not replace – sustainable natural production.*

The ADF&G report also includes the following chart of wild and hatchery-origin commercial salmon harvests in Alaska, making the point that development of Alaska's hatchery program has coincided with the rebounding of Alaska's wild salmon populations and harvests to all-time highs.

**Figure 1. Commercial Salmon Harvests in Alaska, Wild versus Hatchery-Origin, 1900-2017**



Source: ADF&G 2017 Annual Enhancement Report.

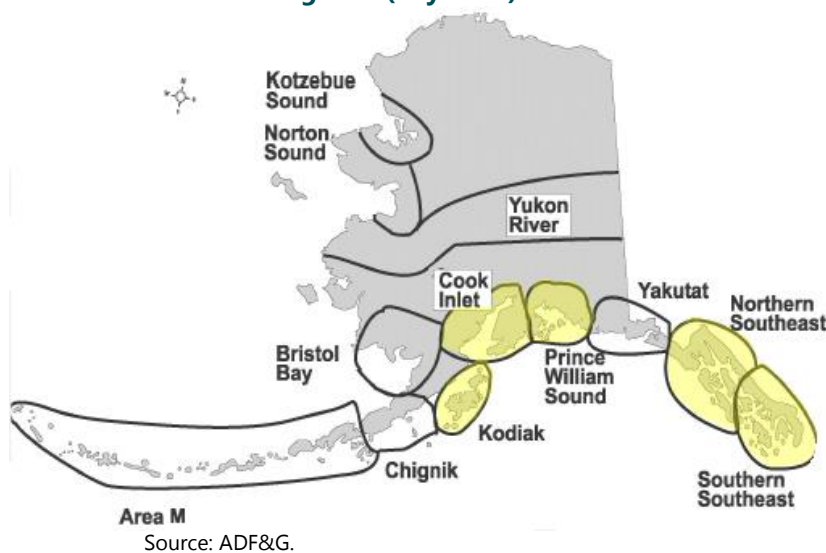
## Controls

Alaska's salmon hatcheries are required to be located away from major natural salmon stocks, to use local sources of broodstock, and to mark their releases so that fishery managers can distinguish wild stocks and manage them conservatively. Alaska's genetic policy for hatcheries also forbids breeding of hatchery fish for size or other specific traits and requires the use of large numbers of broodstock to maintain genetic diversity in hatchery-produced salmon. These controls are a hallmark of Alaska's approach to salmon hatcheries and are an essential component of the overall program's success.

## Current Hatchery Operations

Alaska's eight private nonprofit (PNP) hatchery associations operate a total of 25 hatcheries throughout Southeast Alaska, Southcentral Alaska, and Kodiak. As shown in Figure 2 below, hatcheries are active in five of Alaska's twelve major salmon regions. More detail on the production of these hatcheries is provided below, including key species and total releases. Hatchery associations also provide a variety of other benefits to their communities through educational, tourism, and restoration activities.

**Figure 2. Regions of Alaska with Salmon Hatchery Programs (in yellow)**



## Production and Releases

Alaska's PNP hatchery associations operated a total of 25 hatcheries and 88 release sites in 2017. Each hatchery is typically associated with an adjacent release site, but smolts are also transported to remote release sites by boat, road, or plane.<sup>3</sup>

The map on the next page shows the location of hatchery release sites, color-coded by association. The size of the circles correspond to the number of smolts (all species) released at each site in 2017. A total of 1.7 billion salmon smolts were released in 2017 by Alaska's PNP hatchery associations.

## Key Hatchery Terms

**Hatchery:** a facility in which salmon eggs are incubated and reared to early juvenile stage.

**Release Site:** location where smolt are released. Smolts are typically held for a short period of time in net pens to imprint to location, followed by release.

**Raceway:** salmon returning to hatcheries enter raceways – concrete swimming pools – for sorting and holding until needed for eggtake or other uses.

**Broodstock:** Salmon used to produce the next generation.

**Eggtake:** The process of collecting eggs from female salmon for incubation in the hatchery. Milt is also taken from male salmon.

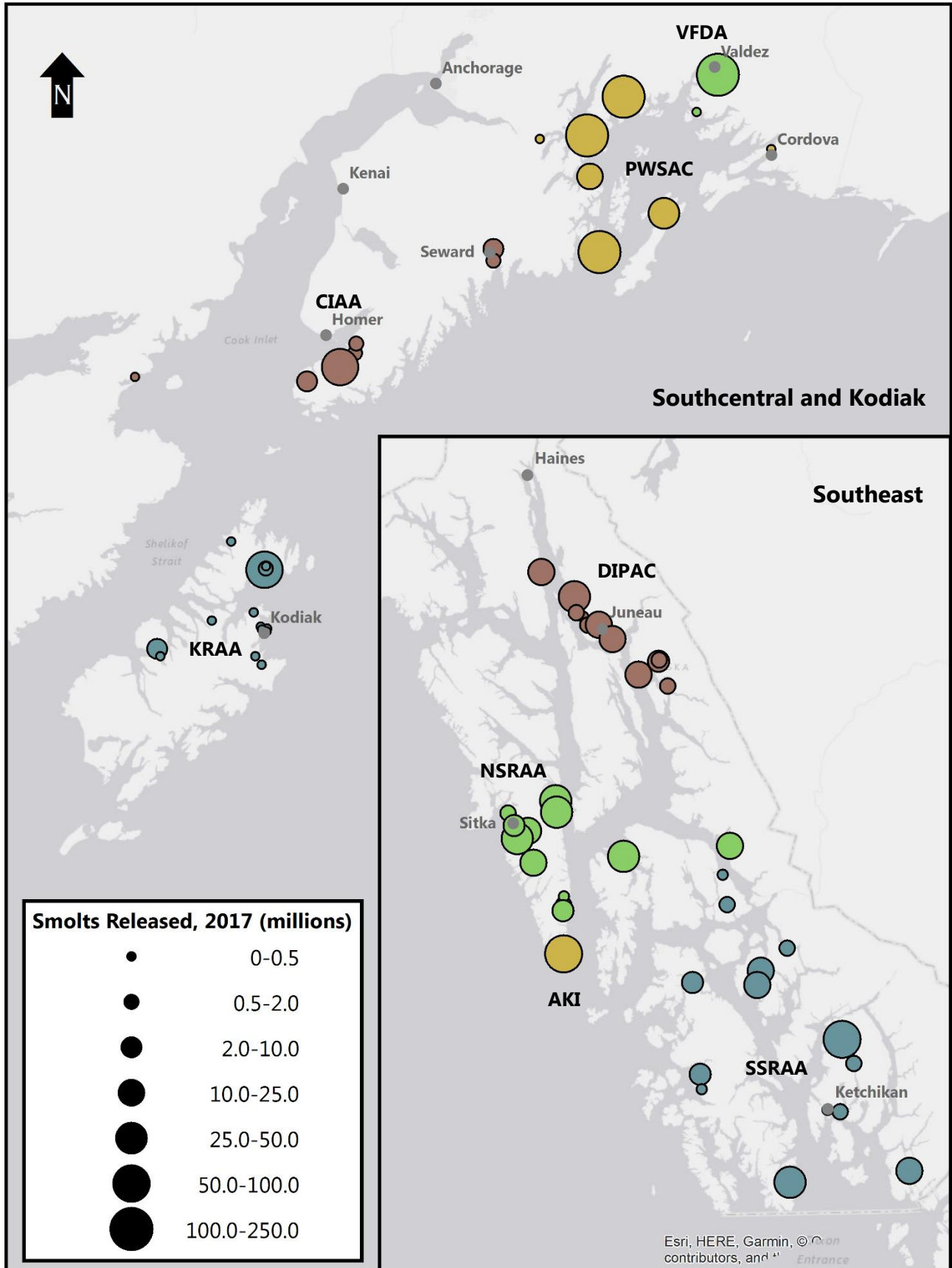
**Smolt:** early stage juvenile fish that are ready to enter the ocean.

**Common Property:** fish available to all permitted harvesters in a fishery.

**Cost Recovery:** Salmon harvested for the purposes of generating revenue to cover hatchery operations.

<sup>3</sup> Transfers are tracked by ADF&G to ensure accountability to annual management plans developed for each hatchery.

**Figure 3. Release Sites by Association (color) and Number of Smolt Released (size of circle), 2017**



Source: ADF&G and hatchery associations. Note: Some release sites combined if located in close proximity.

## Species Produced

A total of 841 million **pink** smolts were released in 2017, representing more than half of Alaska hatchery releases in 2017 (53 percent). Pink salmon, with a short two-year life cycle, are the smallest of Alaska's salmon species. Odd and even-year populations are genetically distinct and survival rates and harvests are typically higher for odd-year populations. Over the study period, more than three-quarters (78 percent) of pink salmon releases occurred in PWS. Pink salmon are also produced in Kodiak, Cook Inlet, and Southeast Alaska. Cook Inlet pink production is expected to increase in the near future, as CIAA builds up their pink program. In Southeast Alaska, pink salmon are produced at just one hatchery (AKI's Port Armstrong hatchery).

**Chum** salmon accounted for 41 percent of hatchery releases in 2017, with more than three-quarters of those releases occurring in Southeast Alaska. Nearly 650 million chum smolts were released in 2017, including 503 million in Southeast Alaska, 131 million in PWS, and 14 million in Kodiak. Chum salmon return 2 to 4 years after release.

**Sockeye, coho,** and **Chinook** salmon made up just 3, 2, and 0.4 percent, respectively, of total hatchery releases in 2017. Whereas chum and pink salmon can be moved to release sites the spring following eggtake, sockeye, coho, and Chinook require another year of rearing to develop into smolts ready to be released into the wild. This adds greatly to the expense of raising these species, requiring subsidies from pink and chum production or other sources.

Sockeye are produced in all four of Alaska's hatchery regions, with a total of 50 million smolts released in 2017. Hatchery production in Cook Inlet is currently dominated by sockeye production, the only region where the species dominates. In addition to CIAA's Trail Lakes Hatchery, DIPAC's Snettisham Hatchery in Southeast Alaska, PWSAC's Main Bay and Gulkana hatcheries, and KRAA's Pillar Creek Hatchery are important producers of sockeye.

As shown in Table 1, Southeast Alaska dominates Chinook production, though this table does not include production at ADF&G's Anchorage sport fish hatchery, which produced and released 1.3 million Chinook in 2017. See additional discussion of Chinook and coho production in the sport/personal use/subsistence section of this report.

**Table 1. Smolts Released in 2017, By Species and Region**

	Chinook	Sockeye	Coho	Pink	Chum	All Species Combined
<b>Number of Smolts Released (thousands), By Region</b>						
Southeast	6,871	13,096	22,660	55,327	502,580	<b>600,534</b>
PWS	32	26,194	3,175	658,943	131,100	<b>819,444</b>
Cook Inlet	0	7,207	155	60,305	0	<b>67,667</b>
Kodiak	73	3,746	1,293	66,579	14,193	<b>85,884</b>
<b>Statewide</b>	<b>6,976</b>	<b>50,243</b>	<b>27,283</b>	<b>841,154</b>	<b>647,873</b>	<b>1,573,529</b>
<b>Percent of Total</b>	<b>0.4%</b>	<b>3.2%</b>	<b>1.7%</b>	<b>53.5%</b>	<b>41.2%</b>	<b>100%</b>

Note: Does not include releases of fish reared in ADF&G, research, and other hatcheries outside the scope of this report.  
Source: ADF&G 2017 Annual Enhancement Report.

## Funding Sources

Alaska private nonprofit hatcheries are financially self-sufficient, funding their operations largely through cost recovery activities and enhancement taxes paid by commercial fishermen. These two sources make up 79 percent and 11 percent, respectively, of the \$57 million in combined income collected in 2017, according to financial statements reviewed for this report. Other sources of funding include state and federal grants, tourism activities, and other miscellaneous sources.

### *Cost Recovery Operations*

Alaska's hatchery program was designed to allow hatchery associations to allocate a certain amount of the salmon they produce to fund their operations. A variety of cost recovery approaches are employed to this end, most commonly competitive contracts with processors (under this model processors subcontract fishermen to harvest the fish and pay a royalty to hatchery associations). Other cost recovery models include direct sales of fish harvested by fishing vessels working for the hatchery association and direct sales of fish (including roe) that return to hatchery sites but are not required as broodstock.

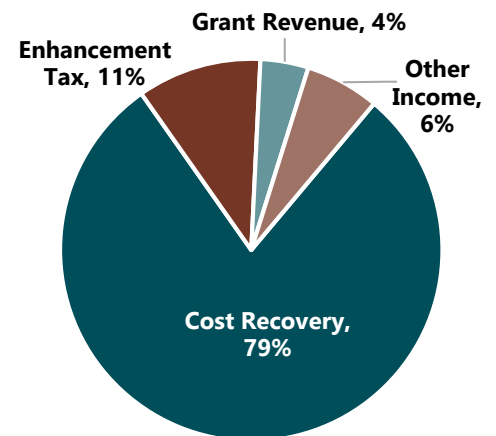
On average over the 2012 to 2017 period, 14 percent of the total hatchery-produced salmon returns were used for cost recovery activities. Most returns were used to supply common property commercial and sport fisheries (80 percent), with the rest used as broodstock (4 percent), and for other uses (1 percent).

### *Enhancement Taxes*

In regions of the state where commercial fishermen have elected to tax themselves, a salmon enhancement tax of 1, 2, or 3 percent is collected on the ex-value of all salmon harvested by commercial fishermen in the region (except cost recovery harvests). Tax revenues are collected by the Alaska Department of Revenue and then dispersed by the legislature to qualified regional aquaculture associations.



**Figure 4. Alaska PNP Hatchery Association Funding Sources, 2017**



Of Alaska's eight private nonprofit hatcheries, five are organized as regional aquaculture associations (SSRAA, NSRAA, PWSAC, CIAA, and KRAA) and receive enhancement tax revenue. Two additional associations operate in Alaska (in the Chignik and Yakutat areas) but currently do not operate hatcheries and use the funds for salmon research and other related purposes.



## Grants

Alaska's PNP hatchery associations receive grants from local, state, federal, and other sources. State grant funds – primarily from the Legislature's capital budget - typically support improvements to state-owned hatchery facilities operated by PNP's, but state funds also support production of sport fish, and other miscellaneous projects.



Examples of other grant funds include federal disaster relief funds and funds from various sources supporting salmon habitat enhancement activities.

*The Paint River fish ladder installed by CIAA with federal grants and association funds. The remote ladder (near Katmai National Park) has allowed pink, coho, and chum salmon to start colonizing Paint River. Photo credit: CIAA*

### *Tourism Activities and Other Sources of Income*

Nearly all hatcheries provide tours to locals and visitors interested in learning more about the salmon life cycle, hatcheries, and Alaska's marine and freshwater environments. Salmon returning to hatchery raceways and fish ladders provide up-close viewing opportunities and are timed well to match the peak of Alaska's visitor industry.

Hatcheries that have invested heavily in their ability to host visitors include DIPAC's Macaulay Salmon Hatchery in Juneau. In addition to salmon viewing opportunities (see photo below), the Ladd Makaulay Visitor Center offers guided tours of hatchery facilities and maintains a large aquarium, touch tanks, and a salmon-themed gift shop. Approximately 67,000 visitors paid to visit the Macaulay hatchery in 2017.

Hatcheries in remote locations receive fewer visitors but play an important role in providing unique tour opportunities for Alaska's visitor industry. Alaska's PNP hatchery associations regularly work with small cruise ship and other tour companies to meet visitor industry needs in locations with few other tour options.

Other sources of funds include investment income, rental income, and other miscellaneous sources.



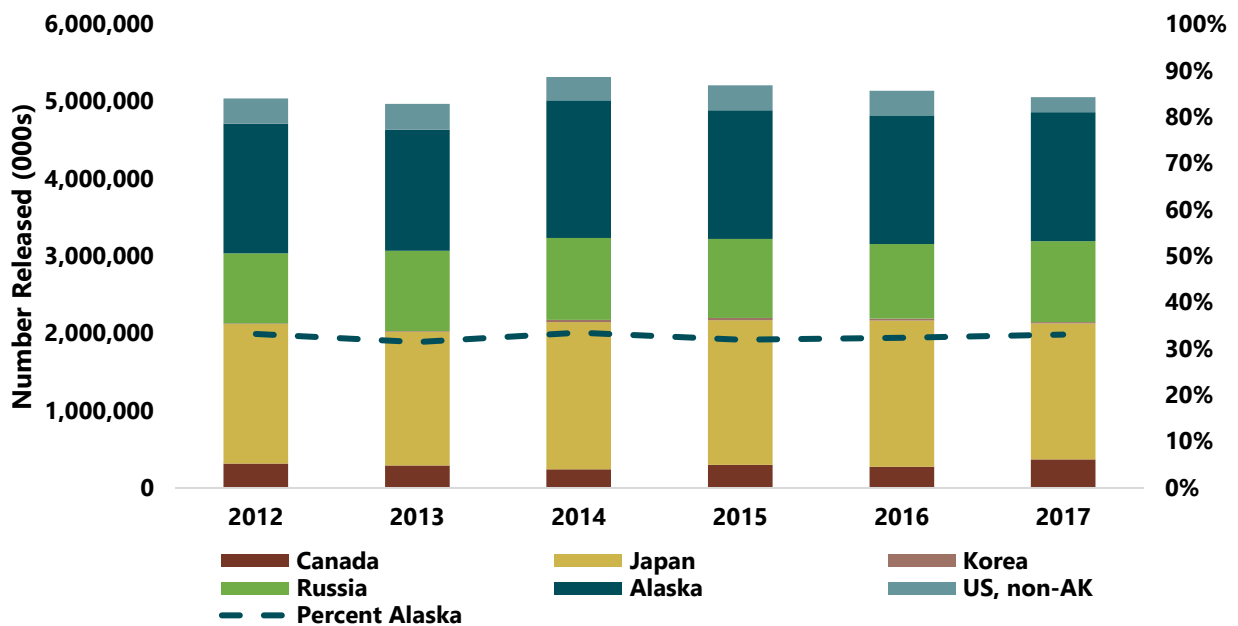
*Photo credit: DIPAC*

## Other North Pacific Hatchery Releases

In addition to production in Alaska, major salmon hatchery programs operating in the North Pacific include those in other US states, Canada’s British Columbia, Russia, South Korea, and Japan. As show in the chart below – based on data from the North Pacific Anadromous Fish Commission and ADF&G – Alaska consistently produces one third of total North Pacific hatchery salmon releases.

By species, Alaska dominates pink salmon production (67 percent of North Pacific releases in 2017), but other regions/countries dominate production of all other species. In 2017, Japan and Russia were responsible for 50 and 23 percent of chum releases (Alaska produced 22 percent). Other US states dominate production of Chinook and coho. Canada had the largest production of sockeye with 72 percent of North Pacific releases of the species in 2017.

**Figure 5. Hatchery Salmon Releases in the North Pacific, by Country, 2012-2017**



Source: North Pacific Anadromous Fish Commission (country level releases) and ADF&G (Alaska releases).

# Hatchery Contributions to Commercial Harvests

On average, 52 million hatchery-produced salmon are caught annually in **common property** commercial fisheries throughout Alaska. This section details the fishing fleets that catch these fish, the value of hatchery-produced salmon to these fishermen, and the percentage of overall harvests attributable to hatchery production. The data presented reflect annual averages over a six-year study period (2012 through 2017).

## Hatchery-Impacted Commercial Salmon Fishing Fleets

Hatchery-produced salmon are caught by nearly all commercial salmon fishermen operating in Southeast Alaska, Prince William Sound, Kodiak, and Cook Inlet. Over the study period an annual average of 3,840 permit holders and an estimated 4,860 crew – for a combined 8,700 fishermen – benefited from hatchery production.<sup>4</sup> These fishermen pulled in annual catches of more than 538 million pounds worth \$322.8 million, on average.

Some fishermen rely more on hatchery-produced salmon than others. For example, PWS seiners generally source most of their annual harvest from hatchery fish while Kodiak set gillnet fishermen have a much weaker direct connection to hatchery salmon.

**Table 2. Hatchery-Impacted Salmon Fisheries in Alaska, 2012-2017 Average**

	Permits Fished	Pounds Harvested (million lbs.)	Ex-Vessel Value (\$ millions)	Ex-Vessel Value per Active Permit
<b>Southeast</b>				
Drift Gillnet	432	37.8	\$28.2	\$65,000
Purse Seine	261	167.5	\$75.5	\$290,000
Power Troll	738	18.7	\$33.4	\$45,000
Hand Troll	317	0.9	\$1.9	\$6,000
<b>Prince William Sound</b>				
Drift Gillnet	519	35.0	\$46.5	\$90,000
Purse Seine	219	165.9	\$57.9	\$265,000
Set Gillnet	29	1.6	\$2.6	\$92,000
<b>Cook Inlet</b>				
Drift Gillnet	483	12.7	\$18.7	\$38,500
Purse Seine	17	5.9	\$2.3	\$133,500
Set Gillnet	506	6.6	\$10.8	\$21,500
<b>Kodiak</b>				
Purse Seine	170	76.1	\$37.3	\$218,000
Set Gillnet	149	9.5	\$7.7	\$51,000
<b>Total</b>	<b>3,840</b>	<b>538.2</b>	<b>\$322.8</b>	<b>\$84,000</b>

Source: CFEC.

<sup>4</sup> Crew estimates based on the conservative assumption that drift gillnet, power troll, and set gillnet operations have one crew while seiners hire three crew members. No crew are assumed for hand troll operations.

Average earnings (from all salmon harvests) were highest in Prince William Sound, Southeast, and Kodiak – while earnings in Cook Inlet were considerably lower.

Overall, the average active salmon permit holder across these regions earned \$84,000 annually from harvest of wild and hatchery-produced salmon.

Seiners earned considerably more – averaging \$290,000 per boat in Southeast, \$265,000 in Prince William Sound, \$218,000 in Kodiak, and \$133,500 in Cook Inlet. In general, drift

gillnetters earned more than set gillnet and troll operations. Prince William Sound set gillnetters, though, earned an impressive \$92,000 annually – more than drift gillnetters in all other hatchery-influenced regions.

It should be noted that, due to data limitations, subsequent discussions of gear type will lump set and drift gillnetters into a gillnet category as well as power and hand trollers into a troll category.



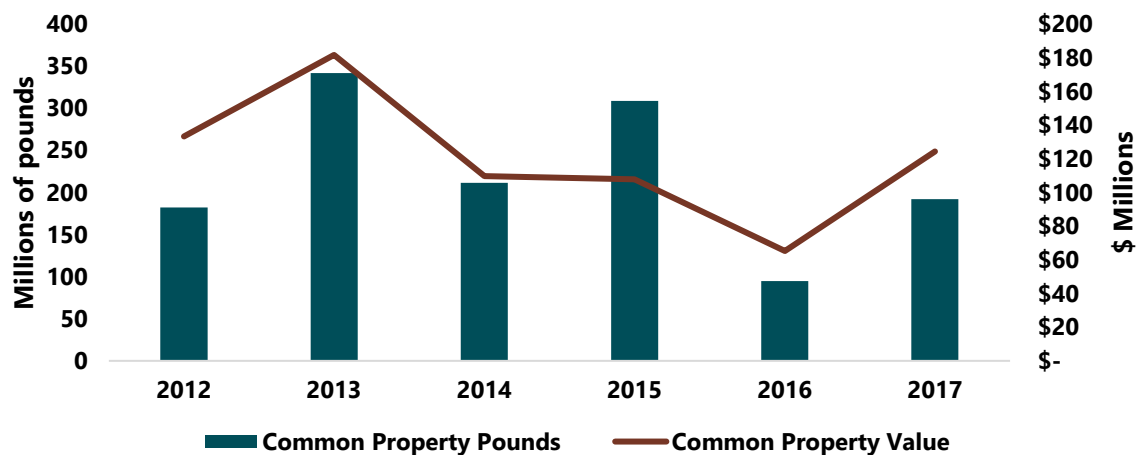
*Seine opening near Juneau. Photo credit: DIPAC*

## Commercial Harvest of Hatchery-Produced Salmon

Hatchery production adds to the total salmon catch, as well as helps insulate fishermen and processors from dramatic swings in wild salmon production. From 2012 through 2017, hatcheries contributed a total of 1,332 million pounds worth an ex-vessel value of \$722 million to common property fisheries.

An average of 222 million pounds of hatchery salmon – worth \$120 million – were caught by common property commercial fishermen annually over the study period. The value of these harvests varied from \$65 million in 2016 to more than \$180 million in 2013. The even-year average was \$103 million, while odd-year harvests averaged \$138 million in value over the study period.

**Figure 6. Hatchery-Produced Salmon Harvest Volume and Value, 2012-2017**



Source: McDowell Group estimates based on data from ADF&G, CFEC, and hatchery associations.

Chum and pink salmon are the most important species – responsible for 39 and 38 percent of ex-vessel value, respectively – followed by sockeye (16 percent), coho (4 percent), and Chinook (2 percent). Especially large pink harvests in 2013 led to a peak of \$182 million in hatchery-produced ex-vessel value. That year, pinks made up over half (52 percent) of the value of hatchery harvests.

Pink salmon dominate hatchery production volumes – accounting for nearly two-thirds (62 percent) of ex-vessel volume – but are the least valuable per pound (\$0.34/pound on average across the study period). The most valuable hatchery-produced species are Chinook (\$3.56/pound), sockeye (\$2/pound), and coho (\$1.20/pound). As mentioned previously, these more valuable species are produced in lower numbers due to greatly increased costs of production. Chum value averaged \$0.67/pound from 2012 through 2017.

**Table 3. Hatchery-Produced Harvest Volume and Value (millions), 2012-2017**

	2012	2013	2014	2015	2016	2017	2012-2017 Average	2012-2017 Percent of Total
<b>Ex-Vessel Volume (millions of pounds)</b>								
Chinook	0.6	1.0	0.8	1.0	0.5	0.4	0.7	<b>0.3%</b>
Chum	76.5	89.4	47.0	67.0	56.6	86.3	70.5	<b>32%</b>
Coho	2.3	6.5	8.5	3.5	3.5	2.7	4.5	<b>2%</b>
Pink	89.6	235.6	143.9	227.2	27.3	96.3	136.6	<b>62%</b>
Sockeye	13.5	9.6	11.3	10.3	6.9	6.5	9.7	<b>4%</b>
<b>Total</b>	<b>182.5</b>	<b>342.1</b>	<b>211.5</b>	<b>309.0</b>	<b>94.8</b>	<b>192.2</b>	<b>222.0</b>	
<b>Ex-Vessel Value (\$ millions)</b>								
Chinook	\$2	\$3	\$3	\$3	\$2	\$2	\$2	<b>2%</b>
Chum	\$61	\$54	\$30	\$36	\$34	\$66	\$47	<b>39%</b>
Coho	\$3	\$9	\$10	\$3	\$5	\$4	\$5	<b>4%</b>
Pink	\$43	\$95	\$42	\$48	\$10	\$38	\$46	<b>38%</b>
Sockeye	\$23	\$21	\$25	\$18	\$14	\$14	\$19	<b>16%</b>
<b>Total</b>	<b>\$133</b>	<b>\$182</b>	<b>\$110</b>	<b>\$108</b>	<b>\$65</b>	<b>\$124</b>	<b>\$120</b>	

Note: Values have been rounded.

Source: McDowell Group estimates based on data from ADF&G, CFEC, and hatchery associations.

More than half of hatchery salmon ex-vessel value went to seiners (57 percent). Gillnetters pulled in 38 percent, while trollers caught 5 percent of hatchery ex-vessel value over the study period. Trollers are only active in Southeast Alaska; in that region, troll harvests accounted for 15 percent of hatchery-derived harvest value.

Nearly all hatchery pinks were caught by seiners. Gillnetters dominated the harvest of hatchery sockeye and caught the majority of hatchery chum. The troll fleet caught more hatchery Chinook and coho than other gear groups.

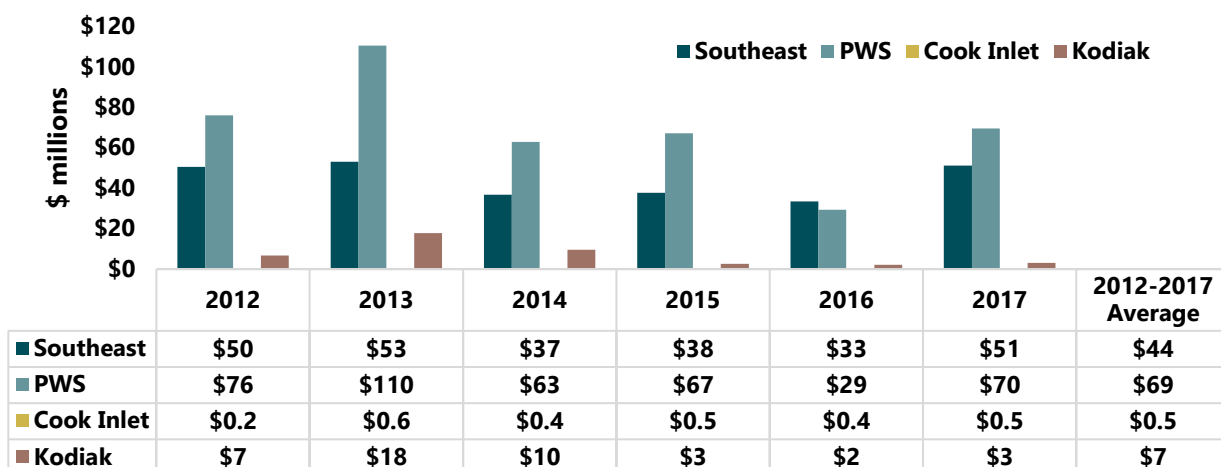
**Table 4. Hatchery-Produced Harvest Value, by Gear Type and Species (000s), 2012-2017 Averages**

	Chinook	Chum	Coho	Pink	Sockeye	All Species Combined	% of Total
<b>By Gear Type</b>							
Gillnet	\$938	\$25,577	\$1,246	\$616	\$17,062	\$45,439	<b>38%</b>
Seine	\$466	\$19,529	\$843	\$45,360	\$2,280	\$68,478	<b>57%</b>
Troll	\$1,092	\$2,044	\$3,323	\$33	\$0	\$6,492	<b>5%</b>
<b>Total</b>	<b>\$2,496</b>	<b>\$47,149</b>	<b>\$5,412</b>	<b>\$46,010</b>	<b>\$19,341</b>	<b>\$120,409</b>	

Source: ADF&G, hatchery associations, CFEC. Note: Totals may not sum due to rounding.

Prince William Sound typically tops other regions in hatchery production and value. Over the study period, PWS harvests generated \$69 million in ex-vessel value annually. Southeast harvests earned fishermen \$44 million on average, followed by Kodiak harvests (\$7 million), and Cook Inlet harvests (\$0.5 million). In the particularly bad pink year of 2016, Southeast Alaska edged out PWS for highest hatchery ex-vessel value.

**Figure 7. Hatchery-Produced Harvest Value, by Region, 2012-2017**



PWS hatchery harvests vary substantially from year to year due to a focus on pink salmon, which made up an average of 60 percent of PWS hatchery-derived ex-vessel value over the study period, followed by sockeye (23 percent) and chum (17 percent). Kodiak hatchery harvest value is also dominated by pink salmon (57 percent over the study period), though sockeye is also important (33 percent).

Chum salmon is the main hatchery focus in Southeast Alaska, with 81 percent of hatchery ex-vessel value over the study period. As chum salmon survival does not generally vary wildly from year to year, Southeast Alaska hatchery production provides a significant stabilizing force for seafood processors and fishermen in the region.

Sockeye salmon is the main focus of hatchery operations in Cook Inlet, though CIAA is currently working to build up the association’s pink salmon program.<sup>5</sup> The full impact of these additional investments will not be seen for several more years. Currently, sockeye salmon make up 91 percent of the hatchery-produced ex-vessel value in Cook Inlet.

**Table 5. Hatchery-Produced Harvest Value, by Species and Region (000s), 2012-2017 Averages**

	Chinook	Chum	Coho	Pink	Sockeye	All Species Combined
Southeast	\$2,496	\$35,281	\$4,422	\$631	\$925	\$43,756
PWS	\$0	\$11,487	\$664	\$41,368	\$15,685	\$69,204
Cook Inlet	\$0	\$0	\$0	\$41	\$412	\$453
Kodiak	\$0	\$381	\$315	\$3,970	\$2,319	\$6,985

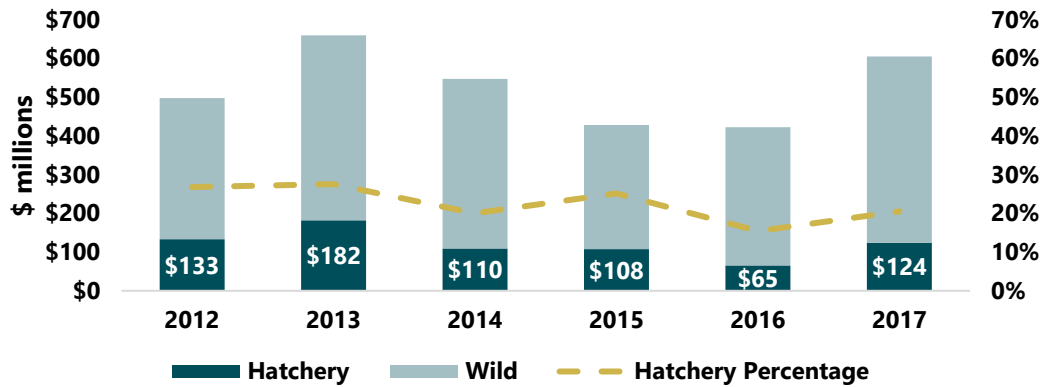
Source: ADF&G, hatchery associations, CFEC.

<sup>5</sup> Although CIAA is permitted for an annual eggtake of 309 million, realized egg take has been much lower than the total. In 2017, the organization’s eggtake was 173 million.

# Hatchery Contributions as a Percentage of Overall Alaska Salmon Harvests

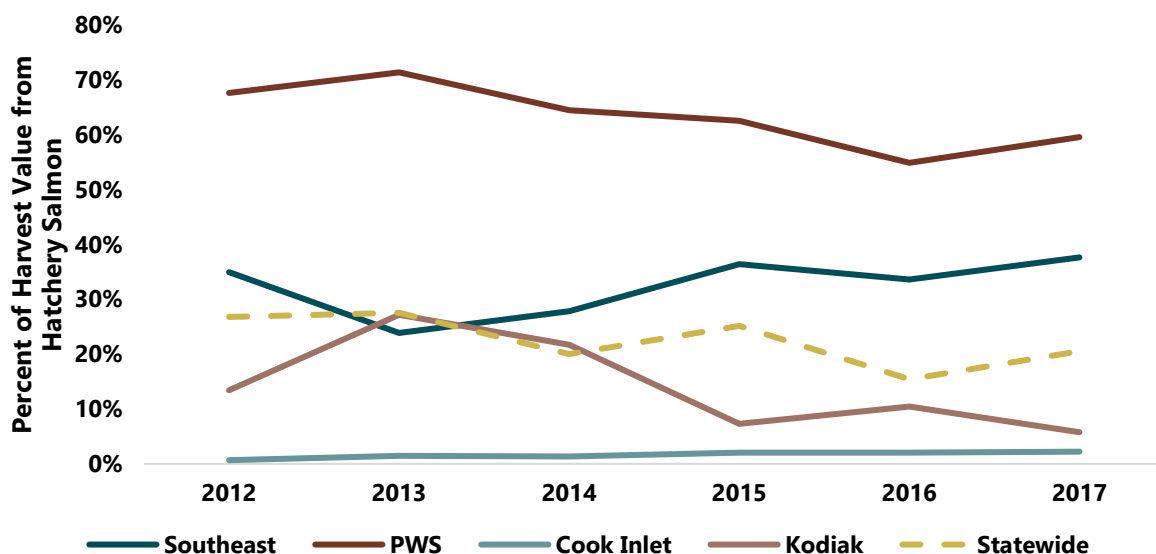
Hatchery-derived salmon represented 22 percent of Alaska’s total common property salmon ex-vessel value over the study period. This percentage ranged from a high of 28 percent in 2013 to a low of 15 percent in 2016. Bristol Bay catches made up a third of this total salmon over the study period – more than any other region – due to several particularly strong years.

**Figure 8. Hatchery Contribution to Ex-Vessel Value of Alaska’s Salmon Harvests, 2012-2017**



Hatchery contribution was highest in PWS (65 percent) over the study period, followed by Southeast (31 percent), Kodiak (16 percent), and Cook Inlet (2 percent). Over the study period, hatchery contribution percentages generally trended downward, though likely for different reasons depending on the region. Southeast was the exception, growing from 35 percent in 2012 to 38 percent in 2017. Key factors influencing regional hatchery contribution percentage include the relative strength of salmon runs and hatchery production levels for each salmon species, especially pink versus chum.

**Figure 9. Hatchery Contribution to Total Salmon Ex-Vessel Value, by Region, 2012-2017**



Source: McDowell Group estimates based on data from ADF&G, hatchery associations, and CFEC.

# Hatchery Contributions to the Seafood Processing Sector

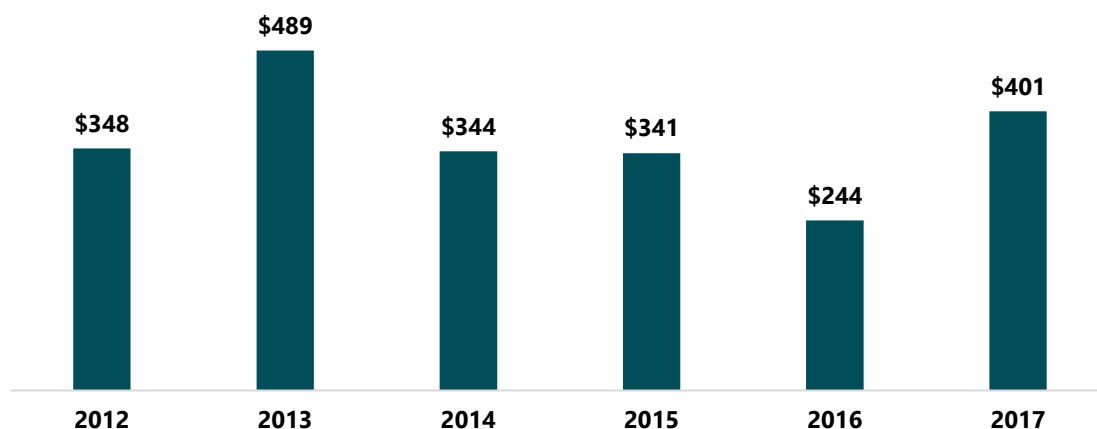
Salmon produced by Alaska’s hatcheries and caught commercially are processed into a variety of products, generating significant benefits for Alaska’s seafood processing industry. Over the study period, the first wholesale value of products produced with hatchery-produced salmon is estimated to average \$361 million annually. First wholesale value (FWV) is defined as the price received at sale of product by a processor to a buyer outside their affiliate network.

First wholesale value includes payments to commercial fishermen (ex-vessel value) as well as the value-added by processors as they convert raw fish into various seafood products. The value added by processors supports the full spectrum of processor expenditures – including labor, local utilities, packaging and warehousing, tender vessel operations, expediting, and maintenance and mechanical services, among others – as well as processor profits.

## Total First Wholesale Value

Over the 2012-2017 period, the first wholesale value of hatchery-produced salmon — including both common property and cost recovery fish — averaged \$361 million annually. In the peak year of 2013, hatchery-derived FWV reached close to half a billion dollars (\$489 million). Nearly four-fifths (79 percent) of hatchery-produced first wholesale value is estimated to come from common property fisheries, with the remainder deriving from cost recovery harvests.

**Figure 10. First Wholesale Value of Alaska Hatchery Salmon Products (\$ millions), 2012-2017**



Similar to the relative contribution of each species to hatchery ex-vessel value, hatchery FWV is dominated by pink and chum salmon products (44 and 39 percent, respectively). Sockeye is responsible for 10 percent of hatchery-derived FWV, while coho (5 percent) and Chinook (2 percent) play smaller roles.



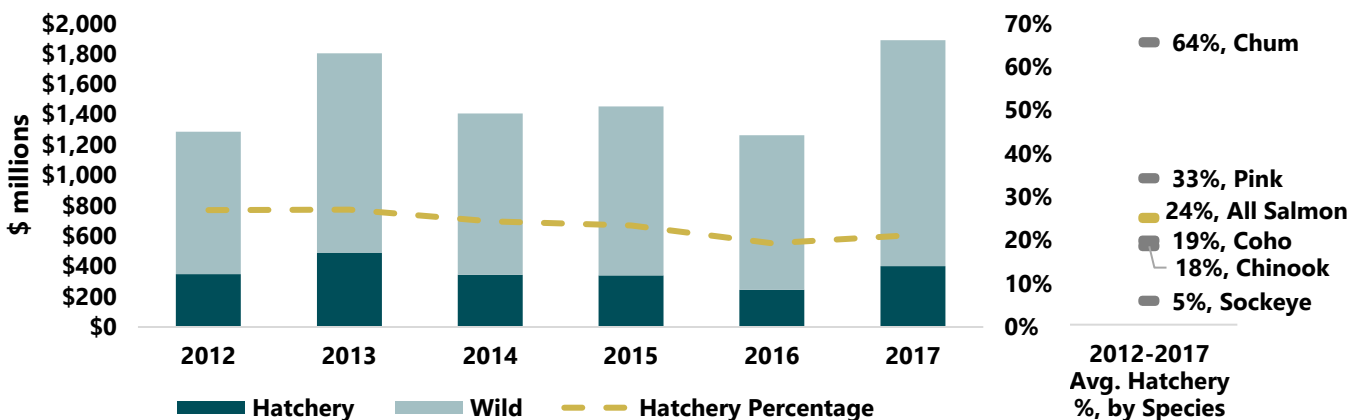
Another way to consider hatchery contributions to Alaska’s processing sector is to examine the gross margin, or the value remaining after payments to fishermen. After paying harvesters an estimated \$146 million for raw fish, Alaska’s salmon processors earned an estimated gross margin of \$216 million from hatchery-derived salmon products. This figure is not to be confused with profit margin as processors incur significant costs handling and producing salmon products.

## Hatchery Contributions as a Percentage of Overall First Wholesale Value

Hatchery production is responsible for an estimated 24 percent of total statewide salmon first wholesale value over the study period. This percentage ranged from 19 to 27 percent over the study period. Massive salmon harvests in Bristol Bay – combined with relatively weak pink runs – in recent years drive lower hatchery contribution percentages in the latter half of the study period.

By species, nearly two-thirds of chum wholesale value, one-third of pink wholesale value, and close to two-fifths of coho (19 percent) and Chinook (18 percent) wholesale value was derived from hatchery salmon over the study period. Due to the dominance of Bristol Bay fish, hatchery-derived sockeye products – despite being the third most valuable hatchery species – only make up 5 percent of sockeye FWV statewide.

**Figure 11. Hatchery Contribution to First Wholesale Value of Alaska Salmon Products, 2012-2017**



Considering only the regions of the state with hatchery production (Southeast, PWS, Kodiak, and Cook Inlet), hatchery salmon are responsible for 40 percent of ex-vessel value and 37 percent of first wholesale value. By species, hatchery-derived wholesale value made up 73 percent of chum value, 35 percent of pink value, 21 percent of coho value, 19 percent of Chinook value, and 17 percent of sockeye value.

# Hatchery Contributions to Sport Fishing, Personal Use, and Subsistence in Alaska

Hatchery production contributes substantially to the availability of salmon for resident and non-resident sport fishing, as well as personal use and subsistence harvest by Alaskans. Over the 2012 – 2016 period, an estimated 10,000 hatchery-reared Chinook, 5,000 chum, 100,000 coho, 19,000 pink, and 138,000 sockeye were caught annually in sport/personal use/subsistence fisheries in Alaska.

Harvest numbers reported in this section are considered conservative due to limited sampling of sport and related harvests for origin (hatchery/non-hatchery), among other factors. Harvest numbers include hatchery salmon produced by ADF&G’s sport fish hatchery in Anchorage, as these fish are caught alongside PNP hatchery salmon throughout Southcentral Alaska. Production at Alaska’s eight PNP hatcheries account for 94 percent of all hatchery-origin sport salmon harvests over the study period.

**Table 6. Sport and Related Harvest of Hatchery Salmon, by Species, 2012-2016 Annual Average**

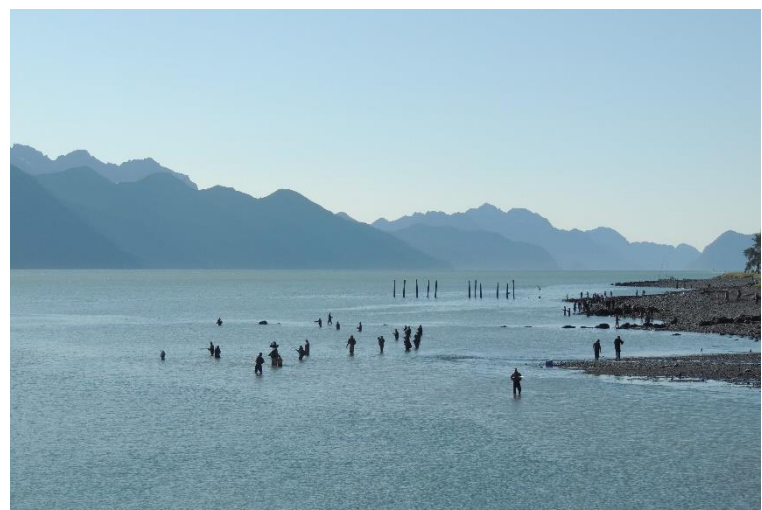
	2012-2016 Average (Number of Fish)
Chinook	10,000
Chum	5,000
Coho	100,000
Pink	19,000
Sockeye	138,000

Source: ADF&G. Note: Numbers have been rounded to reflect the imprecise nature of these estimates.

Sport harvests accounted for nearly all the sport/personal use/subsistence harvest of hatchery-produced coho and Chinook over the study period. By contrast, most non-commercial hatchery sockeye were harvested by personal use and subsistence fishermen (80 percent), with only 20 percent caught by sport fishermen.

## Sport Fishing

Hatchery releases – primarily in Valdez, Seward, Juneau, Ketchikan, Wrangell, lower Kenai Peninsula, and Kodiak – support extensive shore-based and saltwater fishing opportunities. The top fifteen hatchery sport harvests, by species and hatchery association, are listed below, along with the communities or regions in which most of each harvest occurs.



*Silver fishing near Seward. Photo credit: CIAA*

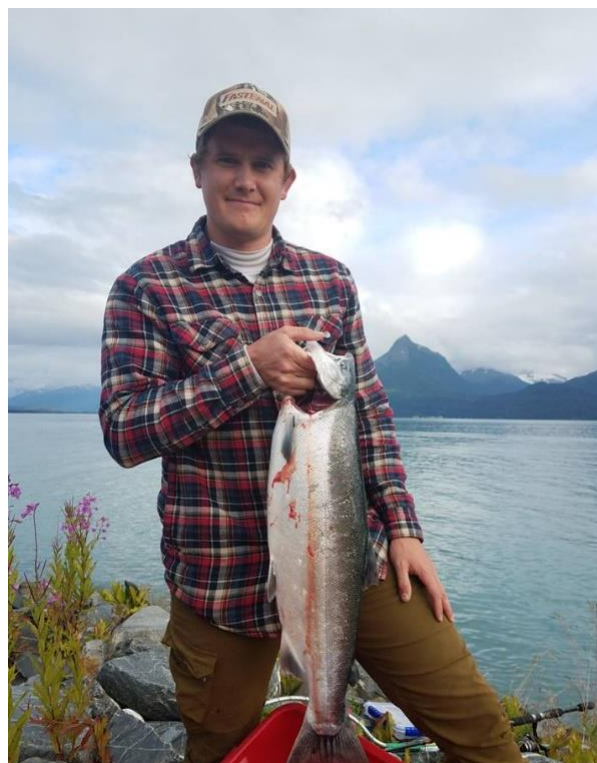
**Table 7. Top Hatchery Sport Harvests, by Hatchery Association and Species, 2012-2016 Annual Average**

Hatchery Association	Species	2012-2016 Avg. Annual Harvest	Primary Harvest Regions/Communities
SSRAA	Coho	30,825	Ketchikan, Wrangell
CIAA	Sockeye	25,683	Kenai Peninsula, Lower Cook Inlet
VFDA	Coho	24,893	Valdez
VFDA	Pink	16,678	Valdez
PWSAC	Coho	7,385	Whittier
NSRAA	Coho	7,080	Sitka, Angoon
DIPAC	Coho	6,830	Juneau
KRAA	Coho	4,218	Kodiak
CIAA	Coho	3,584	Seward
SSRAA	Chinook	2,641	Ketchikan
DIPAC	Chum	2,622	Juneau
CIAA	Pink	2,400	Homer, Seldovia, Nanwalek, Port Graham
KRAA	Chinook	2,017	Kodiak
DIPAC	Chinook	1,954	Juneau
NSRAA	Chinook	1,585	Sitka

The harvest numbers presented above are annual average harvests over the study period. Actual hatchery-origin harvests vary year to year depending on hatchery release numbers, local sport bag limits, fishing effort, and other factors. For instance, DIPAC’s revitalized coho program has created significant fishing opportunities in the Juneau area in recent years; in 2018, ADF&G managers doubled the sport bag limit for coho in Juneau area waters as a result of exceptionally strong returns.

Coho and pink returns to the Valdez area – which can be caught from the shore as well as by boat – have long supported a series of annual salmon derbies as well as significant charter fishing activity and both resident and non-resident visitation to the community. (See photo at right.)

In addition to adding to overall harvests, hatchery fish can provide crucial fishing opportunities in certain times of year or weather conditions – an especially important factor for charter fishing businesses. In May and June in the Ketchikan area, for instance, the local charter fleet (primarily serving cruise visitors) is largely dependent on SSRAA Chinook returning to nearby release sites. This was especially true in 2018 due to low wild Chinook runs. SSRAA coho are also crucial during the late coho run (late August through September) for certain charter operators in the region.



*Silver fishing in Valdez. Photo: Garrett Evridge*

Based on data from annual ADF&G harvest surveys, anglers in Alaska spent about 2.1 million angler-days sport fishing for all types of species annually (2012-2016 average). These anglers caught about 120,000 Chinook, 22,000 chum, 583,000 coho, 135,000 pink, and 556,000 sockeye annually over the period.

Harvests in Southeast and Southcentral combined accounted for between 90 and 99 percent of the total statewide sport harvest, depending on the species of salmon. The relative importance of saltwater and freshwater sport salmon fishing varies considerably between the two regions, with most Southeast sport harvests occurring in saltwater but roughly equal harvests in saltwater and freshwater in Southcentral. In both regions, most sockeye harvests are in freshwater. An impressive 94 percent of statewide sport sockeye harvests occurred in Southcentral, with nearly all of that harvest occurring in freshwater.

**Table 8. Sport Salmon Harvests, by Region and Saltwater/Freshwater, 2012-2016 Annual Averages**

	Sport Harvest	% Saltwater	Hatchery Harvest	% Hatchery
<b>Southeast</b>				
Chinook	67,587	98%	6,227	9%
Chum	12,254	95%	3,425	28%
Coho	274,979	89%	45,772	17%
Pink	73,940	90%	45	0%
Sockeye	18,230	40%	0	0%
<b>Southcentral</b>				
Chinook	50,039	54%	3,700	7%
Chum	8,059	31%	1,263	16%
Coho	297,344	45%	54,592	18%
Pink	57,552	49%	17,880	31%
Sockeye	519,765	5%	27,593	5%
<b>Statewide</b>				
Chinook	118,612	79%	9,936	8%
Chum	22,517	63%	4,687	21%
Coho	583,303	65%	100,364	17%
Pink	135,643	70%	17,925	13%
Sockeye	555,762	6%	27,593	5%

Source: ADF&G.

As a percentage of statewide sport-caught fish, hatchery-origin salmon accounted for 17 percent of sport coho harvests, 5 percent of sport sockeye harvests, and 8 percent of sport Chinook harvests. Unknown, but likely similar, percentages of Alaska's guided charter harvests are of hatchery origin.

Hatchery contributions by region were similar to the statewide percentages for Chinook and coho. Compared to Southeast, hatchery salmon made up higher percentages of Southcentral sockeye (5 percent) and pink (31 percent) sport harvests. In Southeast Alaska, hatchery salmon were especially important to sport chum harvests (28 percent) – perhaps due in part to a charter fishing operation in Juneau specializing in family friendly chum salmon fishing opportunities from a dock adjacent to DIPAC's Juneau hatchery (Chum Fun Charters).

## Personal Use and Subsistence

Personal use and subsistence salmon fishing in Alaska is largely focused on sockeye salmon; a variety of gear are used including dip nets, cast nets, gillnets, and other gear types. Major hatchery-supported personal use/subsistence fisheries include three Copper River fisheries near Chitina, the Sweetheart Creek fishery near Juneau, various sockeye fisheries on Kodiak Island, and the China Poot fishery across Kachemak Bay from Homer.

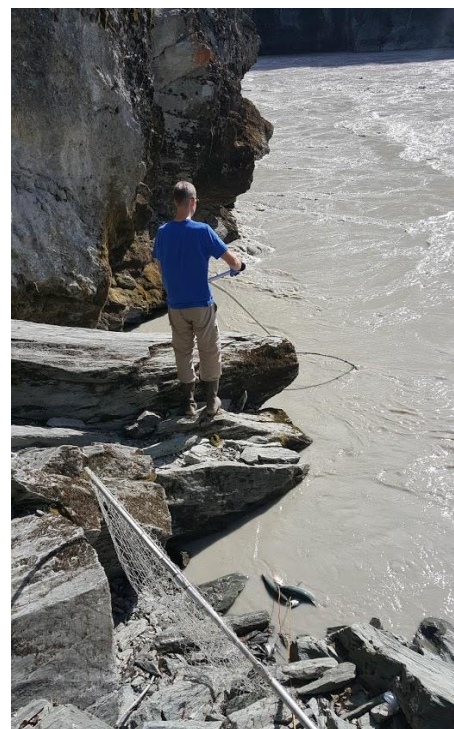
**Table 9. Top Hatchery Personal Use and Subsistence Harvests, by Hatchery Association and Species, 2012-2016 Annual Averages**

Hatchery Association	Species	2012-2016 Avg. Annual Harvest	Primary Affected Communities
PWSAC	Sockeye	102,500	Fairbanks, Anchorage, Mat-Su, Copper River Valley
DIPAC	Sockeye	3,725	Juneau
KRAA	Sockeye	2,900	Kodiak, Ouzinkie
CIAA	Sockeye	1,355	Homer, Seldovia

The relative importance of hatchery fish to each of the fisheries listed above varies. Roughly 20 percent of Copper River subsistence/personal use sockeye harvests are produced by PWSAC’s Gulkana hatchery. By contrast, the Sweetheart Creek personal use fishery near Juneau – which supports 220 households annually – is exclusively based on hatchery fish. Roughly a third of Copper River harvests are caught by households in Fairbanks, a quarter by Anchorage households, 18 percent by Mat-Su households, and 16 percent by Copper Valley area residents. Hatchery-supported subsistence fisheries on Kodiak Island include Telrod Creek and Ouzinkie fisheries.



*China Poot dipnet fishing. Photo credit: CIAA*



*Copper River dipnet fishing*

# Economic Impacts of Hatchery Produced Salmon in Alaska

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This analysis considers the full spectrum of economic impacts associated with salmon production at Alaska's eight private nonprofit hatchery associations. It includes analysis of direct, indirect, and induced economic impacts associated with:

- Commercial harvest of common property hatchery-produced salmon
- Processing of common property and cost-recovery hatchery salmon
- Hatchery operations and management
- Sport harvest of hatchery-produced salmon.

The economic impact model used for this analysis is based on the ex-vessel and first wholesale values described elsewhere in this report. The model incorporates industry characteristics that affect the magnitude of multiplier effects, including:

- The residency of permit holders and crew who harvest hatchery-produced salmon. Alaska resident fishermen are likely to spend a greater share of their earnings in Alaska — with greater multiplier effect — than non-Alaskans
- The residency of workers who process hatchery-produced salmon. Alaska's seafood processing sector has high non-resident labor participation. Non-resident workers spend less of their wages in Alaska than resident workers.
- In-state versus out-of-state purchases in support of fishing, processing, and hatchery operations. A significant portion of purchases made in support of seafood industry activity occur out of state (mainly Puget Sound).

Regional and statewide economic impacts associated with Alaska's salmon hatchery production are described in more detail below.

## ***A Note on Annualized versus Total Job Estimates***

Describing the economic impact of Alaska's salmon hatcheries in terms of employment is complicated by the highly seasonal nature of Alaska's salmon fishing and seafood processing industries. This study focuses on annualized employment. While understating the number of people that earn some income due to hatchery production, annualized employment numbers allow for comparisons to other sectors of the economy.

As an example, three crewmen (peak employment) each working a four-month season would be the equivalent one annualized (12 month) job. Where possible, annualized job estimates are supplemented with data that better illustrates the total number of people earning some income resulting from hatchery production and operations.

## Commercial Fishing Impacts

The direct impact of hatcheries on commercial fishing includes income fishermen earn from the harvest of hatchery-produced salmon. Indirect and induced (multiplier) impacts occur when these fishermen spend hatchery salmon-related income in Alaska in support of their fishing operations and in support of their own households.

Alaska commercial fishermen harvested an annual average of \$120 million (ex-vessel) worth of hatchery-produced salmon over the 2012-2017 period. Nearly 60 percent of this total (\$71 million) went to permit holders and crew in the form of labor income. Additional labor income was generated indirectly when fishermen purchased supplies, gear, equipment, and services locally in support of their fishing operations. Induced labor income was created when permit holders and crew spend their income in Alaska. Including these indirect and induced effects, total commercial fishing-related labor income associated with harvest of hatchery-produced salmon is estimated at an annual average of \$94.5 million.

Statewide, employment directly associated with commercial harvest of hatchery-produced salmon is measured at 1,040 jobs annually over the study period. Including direct, indirect, and induced employment, commercial harvest of hatchery-produced salmon accounted for an annual average of 1,540 jobs.

**Table 10. Total Employment and Labor Income Associated with Commercial Harvest of Hatchery-Produced Salmon, 2012-2017 Averages**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Commercial Fishing</b>			
Annualized Employment	1,040	500	1,540
Total Annual Labor Income	\$70.9 million	\$23.6 million	\$94.5 million

Though not possible to quantify precisely, the number of people earning some income from commercial harvest of hatchery-produced salmon is several times larger than the annualized average. For example, virtually all seine and gillnet permit holders in Prince William Sound harvest some amount of hatchery produced fish. In 2017 there were 763 seine, drift net and set net permits fished in Prince William Sound. Based on standard crew sizes in these fisheries, it is evident that approximately 2,000 permit holders and crew can attribute some portion of their income to harvest of hatchery produced salmon. Similarly, in Southeast Alaska, a total of 1,657 troll, gillnet and seine permits were fished in 2017, with total participation estimated at approximately 3,500 permit holders and crew. Statewide, it is estimated that approximately 8,000 fishermen (permit holders and crew) earned some measure of income from harvest of hatchery-produced salmon.

## Seafood Processing Impacts

The economic impact of salmon hatcheries on the seafood processing sector in Alaska includes jobs and wages for workers who handle and add value to hatchery-produced salmon. Multiplier effects result from in-state spending in support of plant operations (utilities, supplies, taxes, transportations services, etc.) and from in-state spending of processing workers' wages (consumer goods, groceries, entertainment, etc.).

Estimates of processing-related employment and wages connected to hatchery-produced salmon are based on the total first wholesale value of those salmon. First wholesale value includes the amount processors paid to fishermen for their catch (the ex-vessel value of the fish), the amount spent on wages for processing plant employees, purchases of the goods and services required to process the fish, taxes, and other costs of doing business.

Based on McDowell Group estimates, hatchery-produced salmon were processed into products worth an annual average of \$362 million over the study period. Of this total, approximately \$52 million per year went to processing workers in the form of labor income. With monthly wages of about \$3,200 in sectors of the seafood processing industry most closely connected to hatchery salmon, direct employment can be estimated at about 1,360 jobs, on an annualized basis, over the 2012-2017 period.

Including multiplier effects, total statewide employment associated with processing of hatchery-produced salmon is estimated at 2,180 jobs and \$82 million in total annual labor income.

**Table 11. Total Employment and Labor Income Associated with Processing Hatchery-Produced Salmon, 2012-2017 Averages**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Seafood Processing</b>			
Annualized Employment	1,360	820	2,180
Total Annual Labor Income	\$52.2 million	\$29.6 million	\$81.8 million

Similar to the distribution of commercial fishing income associated with harvest of hatchery-produced salmon, the total number of processing workers who can attribute some portion of their wages to processing of these salmon is much larger than the annual average. For example, in 2017, an annual average 526 workers were employed in Prince William Sound’s seafood processing sector. Peak employment totaled 1,906. All of these workers owe some portion of their wages to processing of hatchery salmon, which account for about 65 percent of the total salmon harvest in the region. In Southeast, seafood processing accounts for an average of 1,350 jobs, with peak season employment at approximately 3,400. Most of these workers are handling hatchery salmon at some point in the season. In the Southeast, Prince William Sound, Cook Inlet, and Kodiak regions, employment in seafood processing peaked at approximately 8,400 jobs in 2017. The large volumes of hatchery-produced salmon harvested during the summer played an important role in supporting this employment and the \$154 million in total annual wages associated with those jobs.

## Hatchery Management and Operations

The economic impact of hatcheries includes their own employment, wages, and spending with Alaska businesses. Hatcheries maintain a core group of year-round employees, supplemented by seasonal workers as necessary.

Vendor spending information provided by hatchery associations indicates that approximately \$22 million is spent in-state annually on a range of goods and services. This spending supports additional jobs and income in the Alaska economy. Examples of in-state purchases include utilities, fuel, groceries, lodging, and building



supplies. Hatcheries hire local construction companies for capital improvements and maintenance, contract with transportation businesses, and use a wide variety of Alaska-based professional services firms.

Based on data provided by hatchery managers, annualized employment associated with hatchery operations is estimated at 345 jobs statewide. Annual payroll totaled \$15.5 million. Including multiplier effects, the total economic impact associated with hatchery employment and spending is estimated at 615 jobs and \$25 million in total annual labor income.

**Table 12. Total Employment and Labor Income Associated with Hatchery Operations, 2012-2017 Averages**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Hatchery Operations</b>			
Employment	345	270	615
Labor Income	\$15.5 million	\$9.4 million	\$24.9 million

Direct seasonal employment is higher than average employment. Its estimated that peak seasonal employment is about 50 percent above the annual average, or over 500 workers.

## Sport Fishing

Sport harvest of hatchery-produced salmon has a range of economic impacts, though those impacts are difficult to fully quantify. Alaska residents and visitors alike spend significant amounts of time and money for the opportunity to sport fish in Alaska. Among non-residents, some visitors come to Alaska for the primary purpose of sport fishing, spending thousands of dollars on transportation, lodging, food, gear, and charter or guiding services. Other non-resident visitors may purchase a half-day, a full day, or several days of guided fishing while seeing Alaska on a cruise or independent vacation. In these cases, the opportunity to fish may be one of several reasons for their trip to Alaska.

Estimates of spending by visitors who sport fish while in Alaska are available from the Alaska Visitors Statistics Program (AVSP). However, the challenge with measuring the role of hatchery-produced salmon in this spending is, first, isolating the value of all salmon in visitors' sport fishing-related spending, when visitors may also be pursuing halibut or other species as part of their charter fishing experience. The next complication is to determine the economic role of hatchery fish in visitors' salmon fishing experience. Availability of hatchery fish can vary from area to area – being the primary target in some areas and a secondary target (after natural runs) in other areas.

Finally, it is not necessarily the number of fish harvested that drives the economic impact of sport fishing — just as much money might be spent for sport harvest of five salmon as for ten. The experiential (qualitative) value of sport fishing is an important aspect to sport fishing in Alaska, and what brings visitors to the state.

Measuring the economic impact of resident spending in pursuit of sport fishing activities is equally complex. Residents buy boats, gear, fuel, licenses, and other items for the opportunity to catch fish and pursue other marine activities. As described elsewhere in this report, hatchery salmon are an important part of the sport

harvest, but allocating an appropriate share of all resident spending in Alaska on sport fishing (let alone salmon fishing) to hatchery salmon is practically impossible.

Finally, personal use and subsistence-related harvest of hatchery salmon also have significant economic impacts. In addition to economic impacts related to spending on boats and fishing gear, personal use and subsistence fishing have important household food budget implications (not to mention important social and cultural values).

This study focuses on the economic impact of spending by non-Alaskan sport fishermen, in their guided and unguided efforts to catch salmon. In 2016, Alaska hosted 192,000 guided non-resident fishermen and 146,000 unguided fishermen (these numbers include some overlap; approximately 300,000 non-resident sportfishing licenses were sold in 2016). These fishermen brought new money to Alaska, in the same manner that commercially harvested hatchery salmon are sold to outside markets and draw new money into the state’s economy.

Non-residents who fished in Alaska in 2016 spent a total of \$600 million while in the state, including guided and unguided fishermen, based on AVSP data. Recognizing the high level of uncertainty around the estimate, McDowell Group analysis suggests that approximately \$25 million of this spending can reasonably be attributed to hatchery-produced salmon, with about 40 percent of that spending in Southeast, 40 percent in Prince William Sound, with the balance elsewhere in the state. This estimate is intended to capture spending on lodging, food, transportation, charter/guides, licenses, gear (for unguided fishermen), and incidentals for visitors whose primary trip purpose is to fish in Alaska, and who fish in areas where hatchery fish are prominent. It is also intended to capture an appropriate share of spending by visitors whose primary trip purpose may not be fishing but is nevertheless a part of their Alaska experience.

The economic impact of \$25 million in visitor spending is estimated at 375 (annualized) jobs and just over \$16 million in total labor income, including all multiplier effects.

**Table 13. Total Employment and Labor Income Associated with Non-Resident Sport Harvest of Hatchery-Produced Salmon**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Non-Resident Sport Harvest</b>			
Employment	285	90	375
Labor Income	\$10.5 million	\$5.7 million	\$16.2 million

As measures of the economic impact of sport harvest of hatchery-produced salmon, these estimates are conservative. The estimates do not include any economic activity associated with Alaska resident spending on sportfishing for hatchery salmon, which is substantial in Valdez, Seward, Juneau, Ketchikan, and other communities.

## Summary of Statewide and Regional Economic Impacts

In total, including commercial fishing, processing, hatchery operations, and non-resident sport harvest of hatchery-produced salmon, Alaska's salmon hatcheries together accounted for an average of 4,710 jobs and \$218 million in labor income in Alaska, including direct, indirect, and induced effects. The total economic footprint of hatchery salmon, measured as economic output, is estimated at \$600 million annually.

**Table 14. Total Annual Statewide Economic Impact of Alaska Salmon Hatcheries**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Commercial Fishing</b>			
Employment	1,040	500	1,540
Labor Income	\$70.9 million	\$23.6 million	\$94.5 million
<b>Seafood Processing</b>			
Employment	1,360	820	2,180
Labor Income	\$52.2 million	\$29.6 million	\$81.8 million
<b>Hatchery Operations</b>			
Employment	345	270	615
Labor Income	\$15.5 million	\$9.4 million	\$24.9 million
<b>Non-resident Sport Fishing</b>			
Employment	285	90	375
Labor Income	\$10.5 million	\$5.7 million	\$16.2 million
<b>Total Economic Impact</b>			
<b>Employment</b>	<b>3,030</b>	<b>1,680</b>	<b>4,710</b>
<b>Labor Income</b>	<b>\$149.1 million</b>	<b>\$68.3 million</b>	<b>\$217.5 million</b>
<b>Output</b>	<b>\$386.1 million</b>	<b>\$216.0 million</b>	<b>\$602.1 million</b>

The employment impact estimate of 4,700 jobs is an annualized figure. The number of people who earn some income from the harvest of hatchery-produced salmon in Alaska is several times the annual average. More than 16,000 fishermen, processing employees, and hatchery workers can attribute some portion of their income to Alaska's salmon hatchery production. Thousands of additional support sector workers earn wages connected to Alaska hatchery production.

## Southeast Alaska Hatchery Impacts

The economic impacts of hatchery produced salmon in Southeast Alaska are detailed in the following table. In total, salmon hatcheries account for just under 2,000 jobs in the region and just over \$90 million in annual wages, including all multiplier effects.

**Table 15. Economic Impact of Salmon Hatcheries in Southeast Alaska**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Commercial Fishing</b>			
Employment	365	210	575
Labor Income	\$26.2 million	\$9.2 million	\$35.4 million
<b>Seafood Processing</b>			
Employment	585	375	960
Labor Income	\$22.1 million	\$14.4 million	\$36.5 million
<b>Hatchery Operations</b>			
Employment	165	125	290
Labor Income	\$7.8 million	\$4.5 million	\$12.3 million
<b>Non-resident Sport Fishing</b>			
Employment	115	35	150
Labor Income	\$4.2 million	\$2.3 million	\$6.5 million
<b>Total Economic Impact</b>			
<b>Employment</b>	<b>1,230</b>	<b>745</b>	<b>1,975</b>
<b>Labor Income</b>	<b>\$60.4 million</b>	<b>\$30.3 million</b>	<b>\$90.7 million</b>
<b>Output</b>	<b>\$152.5 million</b>	<b>\$84.8 million</b>	<b>\$237.3 million</b>

## Prince William Sound Hatchery Impacts

Hatcheries in Prince William Sound generated economic activity that includes an annualized total of 2,200 jobs and \$104 million in annual labor income. Annual economic output totaled \$316 million. These economic impacts are spread throughout the Southcentral region, not just in PWS.

**Table 16. Economic Impact of Prince William Sound Salmon Hatcheries**

	Direct Impacts	Indirect & Induced Impacts	Total Economic Impacts
<b>Commercial Fishing</b>			
Employment	590	260	850
Labor Income	\$40.4 million	\$12.8 million	\$53.1 million
<b>Seafood Processing</b>			
Employment	630	365	995
Labor Income	\$24.7 million	\$11.7 million	\$36.4 million
<b>Hatchery Operations</b>			
Employment	115	95	210
Labor Income	\$5.0 million	\$3.1 million	\$8.1 million
<b>Non-resident Sport Fishing</b>			
Employment	115	35	150
Labor Income	\$4.2 million	\$2.3 million	\$6.5 million
<b>Total Economic Impact</b>			
<b>Employment</b>	<b>1,450</b>	<b>755</b>	<b>2,205</b>
<b>Labor Income</b>	<b>\$74.2 million</b>	<b>\$29.8 million</b>	<b>\$104.1 million</b>
<b>Output</b>	<b>\$203.4 million</b>	<b>\$112.9 million</b>	<b>\$316.3 million</b>

# Tax Revenue Impacts of Alaska's Salmon Hatcheries

Harvesting and processing activity connected to hatchery salmon generate local and state tax revenue. This section describes the key sources of tax revenue directly and indirectly supported by hatchery-produced salmon.

## Fisheries Business Tax

Hatchery-produced salmon commercially harvested and landed in Alaska are subject to the State of Alaska Fisheries Business Tax — a 3.0 to 5.0 percent levy on the ex-vessel value of the fish. Half of revenue generated from this tax is retained by the State and the other half is shared with the community and/or borough where the salmon are landed.

Over the 2012 to 2017 period, harvest of hatchery-produced salmon generated an annual average of \$3.6 million in Fisheries Business Tax revenue, or nearly \$22 million in total. The State of Alaska received about \$1.8 million annually and local governments received an equal amount. The cities and/or boroughs of Kodiak, Valdez, Cordova, Seward, Sitka, Petersburg, Ketchikan, Haines, and Juneau are among the largest local government beneficiaries of hatchery-supported tax revenue.

Tax receipts fluctuate as harvest volumes and prices change year to year. The largest estimated annual revenue over the study period was \$5.5 million generated from a record-breaking season in 2013. These estimates are conservative as they exclude volume associated with cost recovery harvest and assume a rate of 3.0 percent: it is likely some hatchery salmon are subject to a slightly higher rate.

**Table 17. Estimated Fisheries Business Tax Revenue from Hatchery-Produced Salmon by Component, 2012-2017**

	2012	2013	2014	2015	2016	2017	Total	Average
State	\$2.0	\$2.7	\$1.7	\$1.6	\$1.0	\$1.9	\$10.8	\$1.8
Local	\$2.0	\$2.7	\$1.7	\$1.6	\$1.0	\$1.9	\$10.8	\$1.8
<b>Total</b>	<b>\$4.0</b>	<b>\$5.5</b>	<b>\$3.3</b>	<b>\$3.2</b>	<b>\$2.0</b>	<b>\$3.7</b>	<b>\$21.7</b>	<b>\$3.6</b>

Note: Values have been rounded. Includes only common property harvested salmon. Assumes a 3.0 percent tax rate.  
Source: McDowell Group estimates based on ADF&G and DOR data and information.

## Local Taxes

Though difficult to quantify, hatchery salmon generate additional local revenue through raw fish, property, and sales taxes paid by commercial fishermen, charter fishermen, seafood processors, hatchery associations, and support sector businesses and employees.

Communities with a raw fish tax generate revenue from local landings of hatchery salmon. For example, hatchery salmon delivered to processors within the Kodiak Island Borough are subject to a 1.075 percent raw fish tax. In 2017, this tax generated \$1.3 million from all species, including hatchery salmon.<sup>6</sup>

<sup>6</sup> <https://www.commerce.alaska.gov/web/Portals/4/pub/Alaska%20Taxable%20Supplement%2019.18%20Reduced.pdf?ver=2018-01-11-150658-867>

Seafood processing plants generate property tax revenue in communities across Alaska. In 2017, four of the top five property tax payers in the city of Kodiak were processing companies.<sup>7</sup> Silver Bay Seafood's new plant in Valdez (valued at more than \$40 million) is among the city's largest non-oil property tax payer; the company is also the largest property tax payer in Sitka.<sup>8</sup> Other processing plants in Seward, Cordova, Ketchikan, and elsewhere use hatchery salmon as part of their annual production. The availability of hatchery salmon helps preserve the financial viability of processing operations, which maintains tax revenue flowing each year to local communities.

Additional revenue is supported when fishermen and processors that handle hatchery salmon purchase goods and services subject to sales tax. The communities of Kodiak (7 percent sales tax), Cordova (6 percent), Seward (4 percent), Sitka (5 to 6 percent), Juneau (5 percent), and Ketchikan (4 percent) are among the Alaska cities benefiting indirectly from hatchery salmon.

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<sup>7</sup> [https://www.city.kodiak.ak.us/sites/default/files/fileattachments/finance/page/352/kodiak\\_city\\_of\\_cafr\\_final\\_2017.pdf](https://www.city.kodiak.ak.us/sites/default/files/fileattachments/finance/page/352/kodiak_city_of_cafr_final_2017.pdf)

<sup>8</sup> <http://www.cityofsitka.com/government/departments/finance/documents/CityandBoroughofSitkaFY2016CAFR.pdf>