

# 2019 BBRSDA Processor Survey

*Prepared for*

**Bristol Bay Regional Seafood  
Development Association**

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**Northern  
Economics**

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**PROFESSIONAL CONSULTING SERVICES IN APPLIED ECONOMICS AND SOCIAL SCIENCES**

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## Abbreviations

|        |  |
|--------|--|
| ADF&G  | Alaska Department of Fish and Game                   |
| BBEDC  | Bristol Bay Economic Development Corporation         |
| BBRSDA | Bristol Bay Regional Seafood Development Association |
| COAR   | Commercial Operator's Annual Report                  |
| H&G    | Head and Gut   |
| MMlb   | Million pounds                                       |
| RSW    | Refrigerated Sea Water                               |

# Introduction and Summary Conclusions

The Bristol Bay Regional Seafood Development Association (BBRSDA) contracted with Northern Economics, Inc. to conduct a survey of processors who operated in the 2019 Bristol Bay salmon fishery. This report summarizes the results of the study and is the twelfth iteration of the Processor Survey Report.

As in prior surveys, the survey instrument consisted of a series of questions about processor operations in Bristol Bay. The 2019 survey captured raw product data, fleet information, ice production volumes, chilling methods, and respondents' opinions of quality practices and priorities within the fishery. The survey response rate remained consistent with what has been observed in prior years.

The 2019 survey collected a fifth year of responses to a series of questions introduced in 2015 to collect data on the quality of chilled raw product and preferred chilling practices as well as a third year of responses to a question about floating practices that was added to the 2017 survey. The 2019 survey also collected a second year of responses to a question that asked for the proportion of processor purchases by fish grade. This question supplements the analysis by relating chilling practices and other handling methods to product quality.

The operational questions focused on processors' purchases of chilled raw product and the distribution of their raw product purchases among the four major product forms (canned, head and gut [H&G] frozen, H&G fresh, and fillet).<sup>1</sup> The 2019 analysis includes Commercial Operator Annual Report (COAR) data, which includes production and wholesale value by product, that was first added to this report in 2018. The COAR data confirms observations from the processor survey and also provides information on product value, which is not collected in the survey.

The 2019 Bristol Bay sockeye run, the fourth largest, was 45 percent above the average run over the last 20 years and 46 percent above the Alaska Department of Fish and Game (ADF&G) preseason forecast (ADF&G 2019). ADF&G estimates the total Bristol Bay salmon harvest at 234.9 million pounds (MMLb) for 2019, the largest harvest recorded since 1995 and the second largest harvest in the history of the fishery (ADF&G 2019). This year's processor survey captured 88 percent of the ADF&G estimate as respondent processors reported processing 207 MMLb of raw (round weight) product from all sources (drift and set permits) in 2019.

## **This year's key takeaways are:**

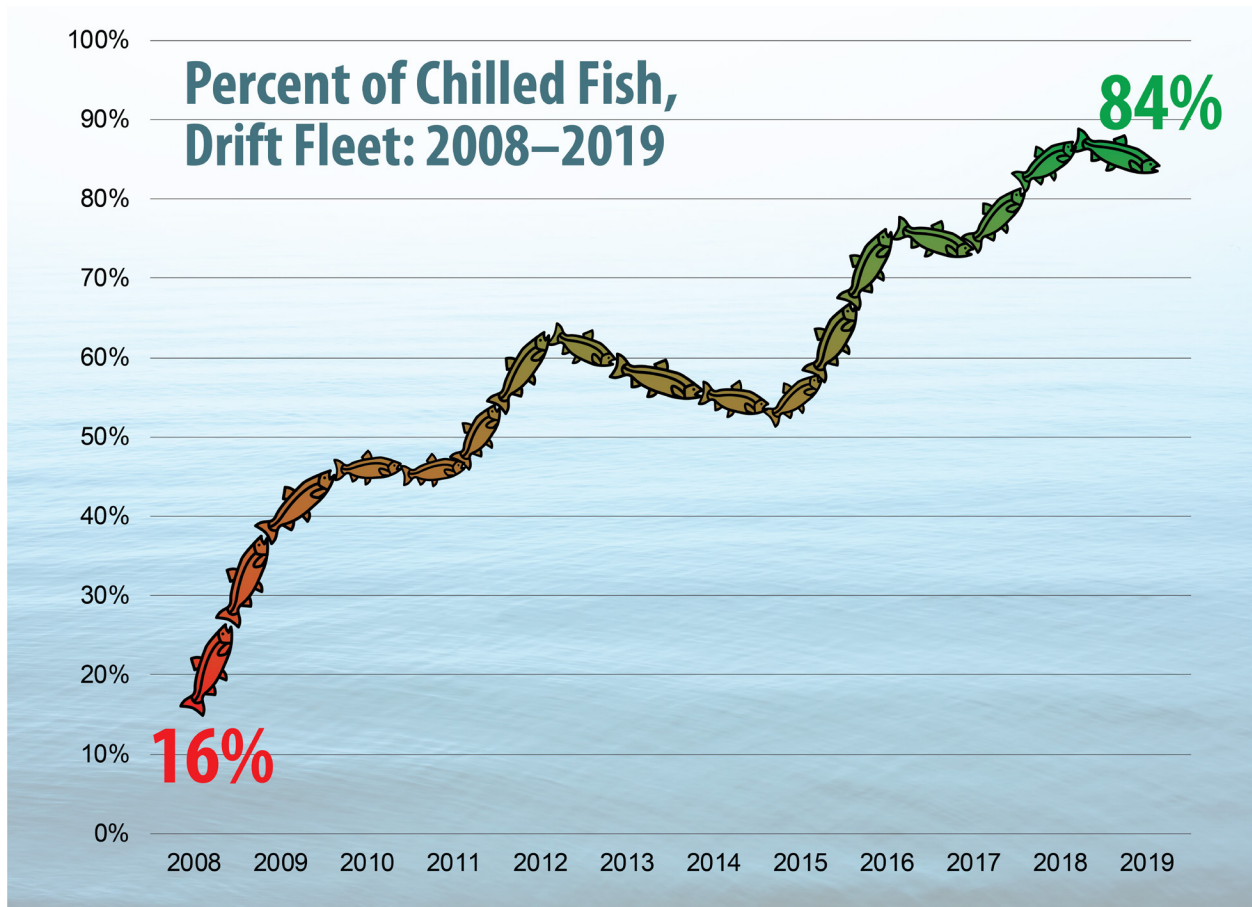
- The harvest in 2019 was the largest in the last 24 years and harvesters responded by chilling the second largest amount of raw product ever in the history of the survey. Product chilled prior to delivery reached 160.6 MMLb in the aggregate fishery, with 146.7 MMLb in the drift net fishery and 13.9 MMLb in the set net fishery. The drift net fleet chilled three percent less than in 2018 and the set net fleet chilled 46 percent more than in 2018.
- The 146.7 MMLb of drift fleet chilled product purchases is the second highest volume recorded by the survey, surpassed only by the 2018 record of 151.6 MMLb of chilled product. Overall, 84.4 percent of drift fleet deliveries were chilled, down slightly from the record 86.3 percent in 2018, but still more than five times the percent of drift fleet chilled product purchases in 2008 (Figure 1). It is important to consider the potential impact of variables such as run timing or duration and intensity (which vary among fishing districts) that can have significant impacts on the chilling practices in a given year within the region. Warm water temperatures have also challenged the capabilities of onboard chilling systems and strained the ice distribution network.

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<sup>1</sup> The full survey instrument is contained in an appendix to this report.

- After the sixth consecutive year of increasing harvests, and the second largest portion of chilled product delivered, this year’s survey continues to illuminate the chilling capacity in Bristol Bay. The 2019 survey results also reemphasize the drastic shift in chilling practices over the past 12 years with chilled purchases from the drift fleet growing from 16 percent in 2008 to 84 percent in 2019. The overall increase in chilling percentage and volume since 2008 appear to be driven by new processor requirements and bonuses for chilled fish, supported by efforts from BBRSDA, the Bristol Bay Economic Development Corporation (BBEDC), and the processors themselves to make sure that permit holders are supported in this transition.

**Figure 1. Percent of Chilled Raw Product Purchased from the Drift Fleet**



Source: Northern Economics analysis

- The distribution of raw product flowing into each product form continued to evolve in 2019, with a record-high estimated 61.5 percent of raw product purchases used to produce H&G frozen products. Conversely, the survey data analysis shows that the percent of raw product purchases used to produce fillets decreased to an estimated 19.6 percent in 2019 and the percent used to produce “other” and H&G fresh products, decreased to an estimated 9.6 percent in 2019. The analysis also shows that the portion of raw product purchases used for canned products slightly increased to an estimated 9.3 percent in 2019, which is the second lowest recorded by the survey.
- In 2019, Refrigerated Sea Water (RSW) systems chilled 132.2 MMLb of fish, or 76.1 percent of the drift fleet’s total deliveries—the highest portion of RSW chilled fish recorded by the survey. Slush

ice chilled 8.3 percent of total drift deliveries and the remaining 15.6 percent were dry (unchilled). When asked if there are any notable quality improvements gained from chilled floated fish (RSW) compared to chilled non-floated fish (slush ice), 100 percent of respondents indicated that the quality of chilled floated fish is better, with 88 percent of respondents indicating that it is significantly better.

- The 2019 survey asked respondents to score six best practices in terms of their impact on the quality of delivered product. Those practices included: consistent chilling (RSW or slush ice), fish bleeding, shorter sets, salmon slides and/or deck mats, lower brailer weights (500–600 lb or less per brailer bag), and vessel cleanliness/proper sanitation. Consistent chilling was, again, the practice that scored as having the biggest impact on quality. Lower brailer weights and vessel cleanliness/proper sanitation scored second and third in this year's survey.



## Raw Product Purchases and Chilling

The combined raw product purchases (chilled and unchilled) from the set and drift net fleets increased by 2.9 MMLb (1.4 percent) in 2019 to 207.1 MMLb—the highest total purchase amount recorded by this survey (see Table 1). This increase in raw product purchases in 2019 mirrors the six-year trend of increasing harvests in Bristol Bay. Chilled raw product purchases slightly decreased by 0.6 MMLb (less than 1 percent) while unchilled raw product purchases increased by 3.4 MMLb (7.9 percent). In 2019, the percent portion of chilled product purchases out of total aggregate raw product was 77.6 percent, just below the 2018 level of 78.9 percent. Although this represents a small increase, the 2019 portion of unchilled product purchases (22.4 percent) is still the second lowest ever recorded by the survey.

It is also worth noting that the portion of chilled raw product purchases has increased in every year except 2014 and 2019. Even with the slight decrease observed in 2019, the portion of total aggregate raw product being chilled has almost doubled from 40 percent in 2010 to over 77 percent in 2019. This provides evidence of a continuing shift in chilling practices and a resulting increase in the quality of raw product purchases in the region.

**Table 1. Total Raw Product (Drift and Set) Purchases, 2010–2019**

| Catch                              | 2010         | 2011         | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | 2019         | Year-over-Year Change | Average, 2010–2019 |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|--------------------|
| <b>Round Weight (MMLb)</b>         |              |              |              |              |              |              |              |              |              |              |                       |                    |
| Chilled                            | 66.2         | 61.7         | 49.4         | 49.5         | 71.8         | 98.1         | 128.0        | 141.6        | 161.2        | 160.6        | -0.6                  | 98.8               |
| Unchilled                          | 99.7         | 67.3         | 40.7         | 39.9         | 67.7         | 79.6         | 55.7         | 54.0         | 43.1         | 46.5         | 3.4                   | 59.4               |
| <b>Total</b>                       | <b>165.9</b> | <b>129.0</b> | <b>90.1</b>  | <b>89.3</b>  | <b>139.5</b> | <b>177.7</b> | <b>183.7</b> | <b>195.6</b> | <b>204.2</b> | <b>207.1</b> | <b>2.9</b>            | <b>158.2</b>       |
| <b>Percent of Round Weight (%)</b> |              |              |              |              |              |              |              |              |              |              |                       |                    |
| Chilled                            | 39.9         | 47.9         | 54.9         | 55.4         | 51.5         | 55.2         | 69.7         | 72.4         | 78.9         | 77.6         | -1.4                  | 60.3               |
| Unchilled                          | 60.1         | 52.1         | 45.1         | 44.6         | 48.5         | 44.8         | 30.3         | 27.6         | 21.1         | 22.4         | 1.4                   | 39.7               |
| <b>Total</b>                       | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>N/A</b>            | <b>N/A</b>         |

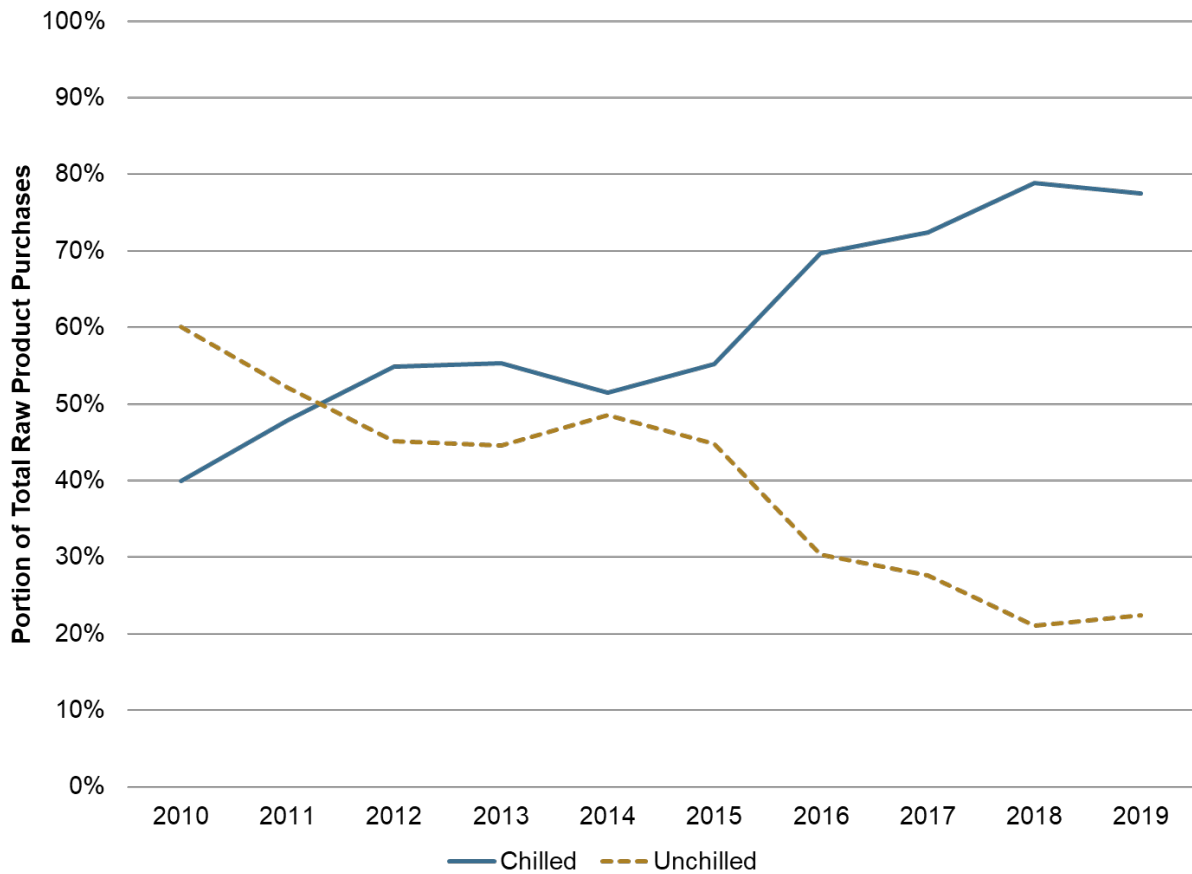
Note: Column totals may not sum due to rounding.

Source: Northern Economics analysis

Figure 2 displays the portion of the total raw product purchases that were chilled or unchilled from the set and drift net fleets from 2010 through 2019. Apart from 2014 and 2019, the survey has recorded year-over-year increases in the percentage of chilled raw product purchases each year, and a corresponding decrease in the percentage of unchilled raw product purchases.



Figure 2. Total Chilled and Unchilled Product



Source: Northern Economics analysis

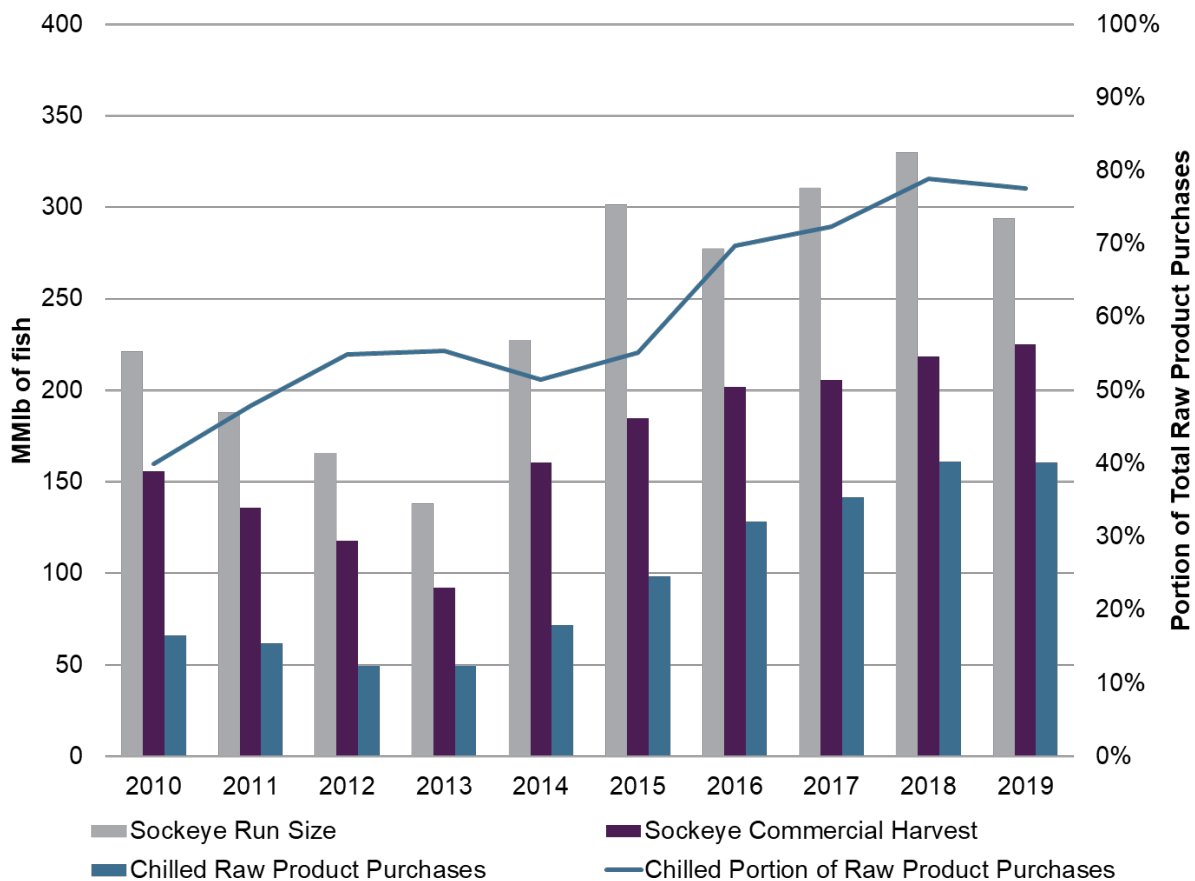
Figure 3 displays the percentage of chilled raw product purchases recorded by the survey, the Bristol Bay sockeye salmon run size, and the Bristol Bay sockeye salmon commercial harvest from 2010 through 2019. In 2014, a significant increase in run size, relatively high base prices compared to bonuses, and compressed run timing are thought to have caused the decrease in the portion of chilled raw product purchases recorded by the survey that year. Since then, it appears that the region has been able to adjust to the larger run sizes. This suggests that the size of the run may have less of an impact on the portion of raw product purchases that are chilled.

In 2019, the sockeye run size decreased, but the commercial harvest slightly increased from 2018. The increased harvest in 2019 could have contributed, at least partly, to the slight decrease in the portion of chilled raw product purchases recorded in this year's survey. The fleet's chilling capacity likely remained about the same from 2018 to 2019, as demonstrated by the less than one percent difference in the quantity of chilled raw product purchases. However, there were more fish caught in 2019, causing the percentage portion of chilled product out of total raw product purchases to decrease by 1.4 percent. Additionally, most of the growth in the fleet's chilling capacity appears to have happened between 2015 and 2018.

It is also possible that other variables, such as run timing or duration and intensity (which vary among fishing districts), have significant impacts on the chilling practices in a given year within the region. Harvest has been increasing over the past six years and the fleet has been accommodating larger catches and more intense runs in some districts.

Warming water temperatures can also have dramatic effects on the fishery. Research indicates that warmer winters can be favorable for the growth of juvenile salmon, but hot summers have caused die offs as adult fish return to the spawning grounds (KDLG [2019], National Fisherman [2019]). Furthermore, the unusually warm 2019 fishing season challenged the capabilities of onboard chilling systems and strained the bay’s ice distribution network. These factors may have contributed to the slight decrease in chilled raw product purchases in 2019, but the 2019 portion of chilled raw product purchases remains almost double the 2010 level (see Table 1).

**Figure 3. Chilled Raw Product Purchases, Bristol Bay Sockeye Inshore Run Size, and Bristol Bay Sockeye Commercial Harvest, 2010–2019**



Note: Bristol Bay sockeye run size is derived from ADF&G Season Summaries (2010–2019) by multiplying the number of fish in the Bristol Bay sockeye run by the sockeye average weight for each year. Bristol Bay sockeye commercial harvest is reported in ADF&G Season Summaries (2010–2019). Chilled raw product purchases and the chilled portion of raw product purchases are recorded by the processor survey and are also represented in Table 1.

Sources: ADF&G annual Bristol Bay Salmon Season Summaries 2010–2019 and Northern Economics analysis.

Table 2 displays the raw product purchases from the drift fleet alone (excludes set net permit holders). Total purchases of raw product (chilled and unchilled) from the drift fleet decreased by 2 MMlb, or about one percent, in 2019 to 173.7 MMlb. Chilled raw product purchases from the drift fleet decreased by 5.0 MMlb (roughly three percent), from the record high of 151.6 MMlb in 2018 to the second highest volume of 146.7 MMlb in 2019. The overall portion of chilled fish purchases from the drift fleet decreased from 86.3 percent in 2018 to 84.4 percent in 2019.

The total volume and portion of unchilled raw product purchases from the drift fleet increased in 2019. Processors reported a total of 27.0 MMLb of unchilled raw product purchases from the drift fleet, accounting for 15.6 percent of the total drift fleet raw product purchases. This is the second lowest portion of unchilled raw product purchases from the drift fleet recorded by this survey.

While the decrease in the portion of purchases that were chilled in 2014 was attributed to a significant increase in run size, it appears that the drift fleet was able to increase its chilling capacity to accommodate even larger runs in 2015, 2016, 2017 and 2018. Anecdotal evidence suggests that the small decrease in the portion of chilled product purchases in the 2019 season could be due, in part, to climatic factors and highly concentrated fishing efforts in certain districts, as previously discussed.

**Table 2. Drift Fleet Raw Product Purchases, 2010–2019**

| Catch                              | 2010         | 2011         | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | 2019         | Year-over-Year Change | Average, 2010–2019 |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|--------------------|
| <b>Round Weight (MMLb)</b>         |              |              |              |              |              |              |              |              |              |              |                       |                    |
| Chilled                            | 63.0         | 50.7         | 45.1         | 45.4         | 64.3         | 80.3         | 118.1        | 124.6        | 151.6        | 146.7        | -5.0                  | 89.0               |
| Unchilled                          | 73.6         | 59.4         | 27.4         | 32.9         | 52.0         | 66.2         | 38.6         | 43.8         | 24.1         | 27.0         | 2.9                   | 44.5               |
| <b>Total</b>                       | <b>136.6</b> | <b>110.1</b> | <b>72.5</b>  | <b>78.4</b>  | <b>116.3</b> | <b>146.5</b> | <b>156.7</b> | <b>168.4</b> | <b>175.7</b> | <b>173.7</b> | <b>-2.0</b>           | <b>133.5</b>       |
| <b>Percent of Round Weight (%)</b> |              |              |              |              |              |              |              |              |              |              |                       |                    |
| Chilled                            | 46.1         | 46.0         | 62.2         | 58.0         | 55.3         | 54.8         | 75.3         | 74.0         | 86.3         | 84.4         | -1.9                  | 64.3               |
| Unchilled                          | 53.9         | 54.0         | 37.8         | 42.0         | 44.7         | 45.2         | 24.7         | 26.0         | 13.7         | 15.6         | 1.9                   | 35.7               |
| <b>Total</b>                       | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>N/A</b>            | <b>N/A</b>         |

Note: Column totals may not sum due to rounding.

Source: Northern Economics analysis

While chilled raw product purchases from the drift fleet slightly decreased, processors reported a 46 percent increase to 13.9 MMLb of total chilled raw product purchases coming from the set net fleet in 2019, which was 9.5 percent of total chilled raw product purchases (see Table 3). The portion of chilled raw product coming from the set net fleet has fluctuated since 2010, peaking at about 22 percent in 2011 and 2015, and with lows of about 5 to 6 percent in 2010 and 2018. The 4.4 MMLb increase in chilled product purchases from the set net fleet in 2019 almost offset the 5.0 MMLb decrease in chilled product purchases from the drift net fleet in 2019. The 2019 chilled product purchase volumes for both the drift and set net fleets are well above each fleet’s 2010–2019 average.

**Table 3. Set Net and Drift Fleet Chilled Product Purchases, 2010–2019**

| Catch               | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016  | 2017  | 2018  | 2019  | Year-over-Year Change | Average, 2010–2019 |
|---------------------|------|------|------|------|------|------|-------|-------|-------|-------|-----------------------|--------------------|
| Chilled Drift MMLb  | 63.0 | 50.7 | 45.1 | 45.4 | 64.3 | 80.3 | 118.1 | 124.6 | 151.6 | 146.7 | -5.0                  | 89.0               |
| Chilled Set MMLb    | 3.2  | 11.0 | 4.2  | 4.0  | 7.6  | 17.8 | 9.9   | 17.0  | 9.5   | 13.9  | 4.4                   | 9.8                |
| Set Net Portion (%) | 5.1  | 21.8 | 9.4  | 8.9  | 11.8 | 22.2 | 8.4   | 13.6  | 6.3   | 9.5   | N/A                   | N/A                |

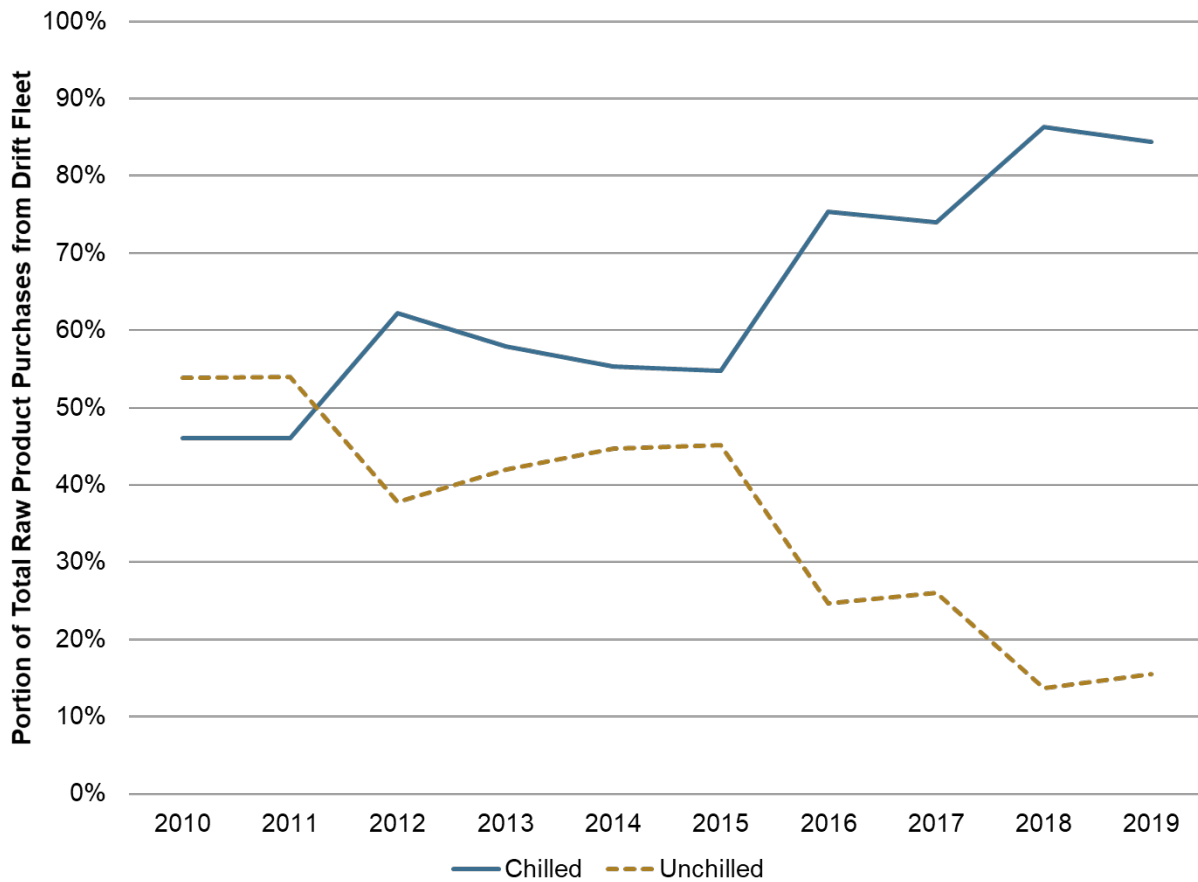
Source: Northern Economics analysis

Figure 4 displays the chilled and unchilled portions of the raw product purchases from the drift fleet between 2010 and 2019. During the first five years of this survey, the portion of chilled drift net purchase consistently

increased, but in 2013 and 2014 the trend reversed and the share of raw product that drift permit holders were chilling declined. The reversal of the trend was not surprising, considering the 2012 BBRSDA survey finding that easier conversions to RSW largely had been completed and that future conversions would be limited to smaller and older vessels.

Since 2015, the drift fleet has returned to its initial upward trend, with the portion of chilled raw product purchases from the drift fleet increasing or staying about the same in most years. During the 2019 season, 84.4 percent of drift fleet purchases were chilled, a 1.9 percent decrease from the 2018 survey record of 86.3 percent. The 2019 portion of chilled product purchases from the drift fleet was the second highest portion recorded by the survey.

**Figure 4. Drift Fleet Chilled and Unchilled Product**



Source: Northern Economics analysis

An incentive that is likely influencing the drift fleet’s chilling practices is ex-vessel price bonuses offered by processors. The bonuses can include quality premiums like chilling, bleeding, and mat bonuses; production bonuses; and retro-payments. These incentives reinforce the importance and value placed on high quality raw product purchases, which in turn allow processors the flexibility to direct raw product to the most profitable product forms. Permit holders and processors appear to be collaborating to ensure that all the stakeholders in the system (i.e., permit holders, processors, the community, and state government) maximize the value of the fishery, aligning with BBRSDA’s stated mission.

Table 4 shows the differences between average base and final prices received by Bristol Bay fishermen, as well as the range of chilling bonuses that were offered each year. Chilling bonuses, as reported in Bristol Bay Fishermen’s Association (BBFA) newsletters, remained relatively constant from 2011 through 2018, with an average chilling bonus of \$0.14-\$0.17 per pound each year. In 2019, the average chilling bonus offered by processors increased to about \$0.20 per pound. It is worth noting that four processors in 2019 required floating as part of their chilling bonus—compared to only one processor in 2018—and many processors continue to offer separate floating bonuses. There is also one processor that has offered a “best fish” combined bonus for chilling, floating, and low brailer weights (<500 lb) since 2013. In 2019, an additional processor added a similar combined bonus that included low brailer weights (<750 lb). For bleeding, six processors either required bleeding or offered a bleeding bonus in 2019, up from five processors in 2017–2018 and a peak of three processors in the years prior to 2017.

Nominal differences between the average final and base prices account for all bonuses, including those which were retroactively paid to fishermen after adjustments at the end of the season. The largest nominal difference to date was 34 cents in 2018, which was 27.0 percent of the \$1.26 per pound base price. 2017 had the largest difference as a percent of the base price (28.4 percent of the \$1.02 base price). Bonus incentives were also strong in 2015 and 2016, especially compared to 2013 where the difference was only about seven percent of the base price. Generally, the differences between adjusted final prices and base prices have increased over time, which is consistent with the observed improvement in chilling practices and a shift away from canned products.

**Table 4. Bristol Bay Ex-Vessel Sockeye Salmon Prices and Chilling Bonuses (2010–2019)**

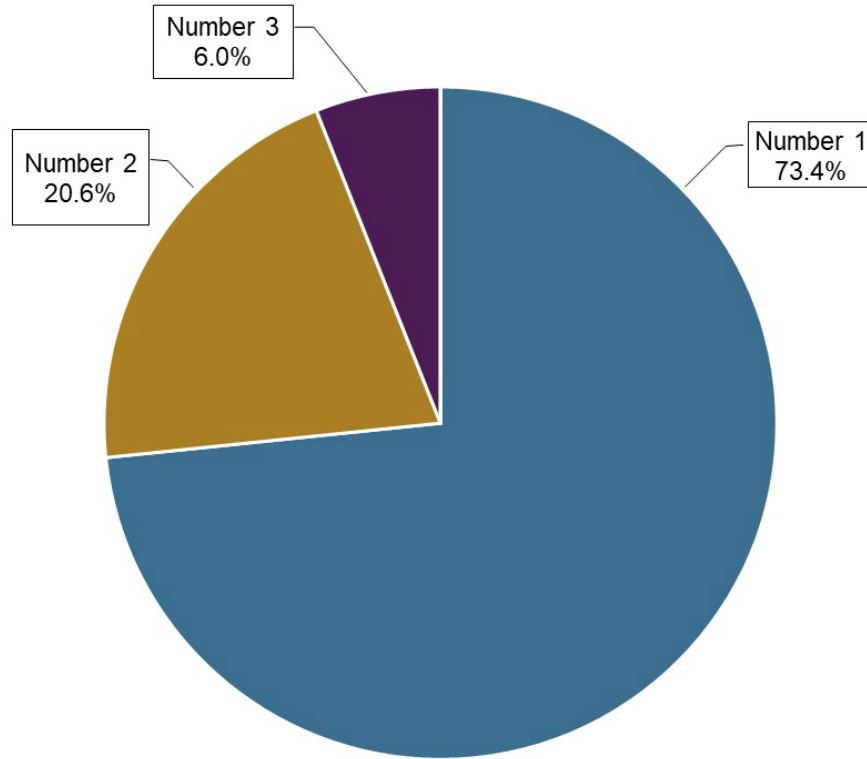
| Year                | Average Nominal Base Price \$/lb | Average Nominal Final Price \$/lb | Nominal Difference (\$Final-\$Base) | Difference as % of Base Price | Nominal Chilling Bonus Range (\$) | % of Total Drift Purchases Chilled |
|---------------------|----------------------------------|-----------------------------------|-------------------------------------|-------------------------------|-----------------------------------|------------------------------------|
| 2010                | 0.95                             | 1.07                              | 0.12                                | 12.6                          | \$0.10 - \$0.16                   | 46.1                               |
| 2011                | 1.00                             | 1.17                              | 0.17                                | 17.0                          | \$0.12 - \$0.15                   | 46.0                               |
| 2012                | 1.00                             | 1.18                              | 0.18                                | 18.0                          | \$0.15                            | 62.2                               |
| 2013                | 1.50                             | 1.61                              | 0.11                                | 7.3                           | \$0.15                            | 58.0                               |
| 2014                | 1.20                             | 1.35                              | 0.15                                | 12.5                          | \$0.10 - \$0.15                   | 55.3                               |
| 2015                | 0.50                             | 0.64                              | 0.14                                | 28.0                          | \$0.15                            | 54.8                               |
| 2016                | 0.76                             | 0.96                              | 0.20                                | 26.3                          | \$0.15 - \$0.25                   | 75.3                               |
| 2017                | 1.02                             | 1.31                              | 0.29                                | 28.4                          | \$0.15 - \$0.20                   | 74.0                               |
| 2018                | 1.26                             | 1.60                              | 0.34                                | 27.0                          | \$0.10 - \$0.23                   | 86.3                               |
| 2019                | 1.35                             | N/A                               | N/A                                 | N/A                           | \$0.15 - \$0.25                   | 84.4                               |
| <b>Data Source:</b> | *ADFG Season Summary             | **ADFG Ex-Vessel Price data       | Calculation                         | Calculation                   | ***BBFA Newsletter                | Processor Survey                   |

Sources: \*ADF&G (2019), \*\*ADF&G (2020b), \*\*\*Bristol Bay Fishermen’s Association (2020)

Since 2018, a question about the quality of fish purchased in Bristol Bay has been included in the survey. Respondents are asked to estimate their proportional purchases of number 1, 2, 3, and “other” grade fish. Number 1 quality grade in Bristol Bay includes the Alaska Seafood Marketing Institute’s “Premium Grade” and “Grade A” salmon categories, number 2 quality grade is the “Grade B” category, and number 3 quality grade is the “Grade C” category (Buckley 2017; ASMI 2015). In 2019, number 1 grade fish made up most of the purchases at 73.4 percent, followed by number 2 grade fish at 20.6 percent (Figure 5). The 2019 purchases represent a slight increase in product quality from the 2018 survey, which reported 72.1 percent number 1 grade fish and 17.7 number 2 grade fish. The portion of Number 3 grade fish decreased from 7.7

percent in 2018 to 6.0 percent in 2019. There were no “other” grade fish reported in 2019, compared to 2.4 percent in 2018.

**Figure 5. Proportion of Raw Product Purchases by Grade, 2019**



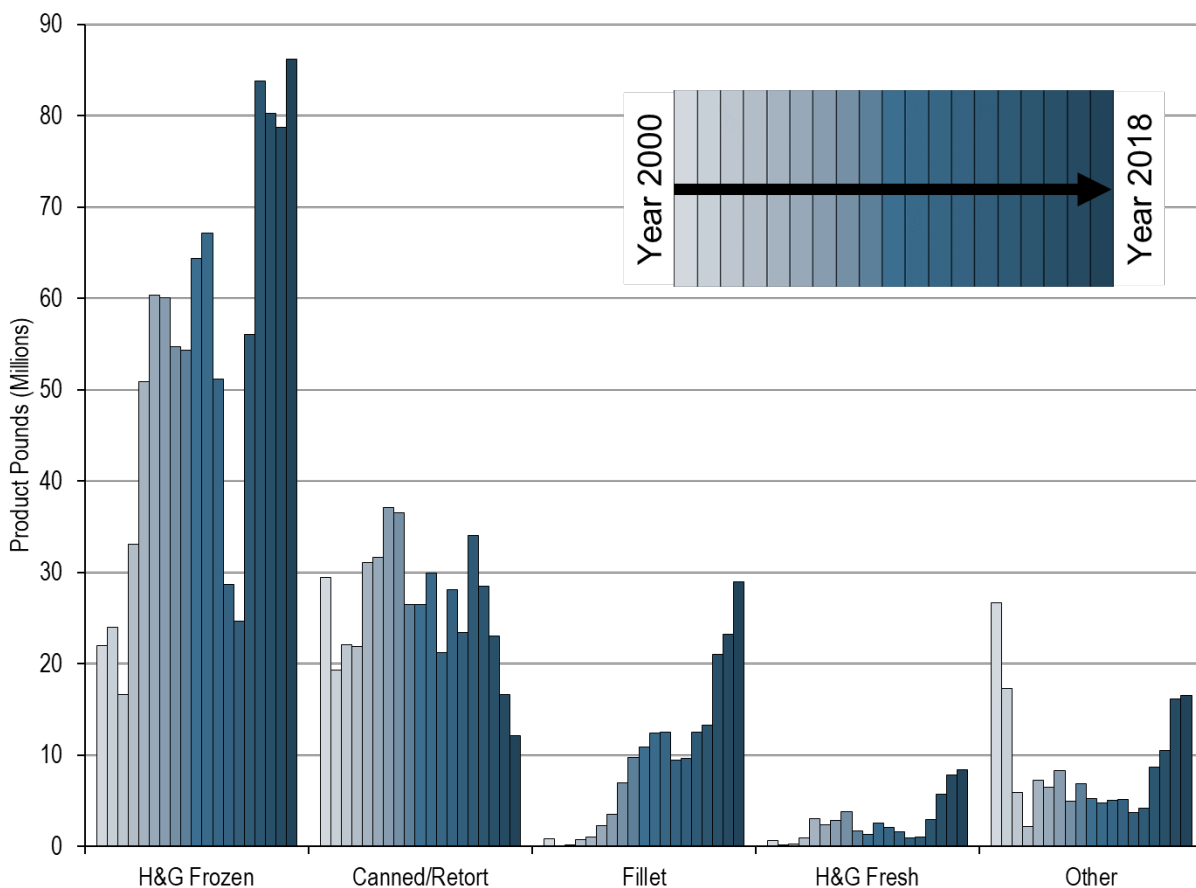
Source: Northern Economics analysis

## Finished Product Forms

Historical sockeye salmon production and revenue data are available by request through the commercial operator annual report (COAR) database maintained by ADF&G. While our survey captures a detailed sample of the activity in the fishery, the COAR data represent total production over all Bristol Bay processors and provide validity to the survey estimates. COAR data can be used to supplement the survey analysis by providing a longer data series and comparing trends in production to revenue, which is not collected through the survey. Collection of COAR data by ADF&G from processors occurs in the spring, so COAR data will always lag one year behind the BBRSDA Survey. From this perspective, the survey provides a one year forecast of industry trends not yet available in public data.

In 2018, COAR data show that the quantity of fillets and fresh products continued to increase, at the expense of lower canned salmon production levels (Figure 6). H&G frozen production increased to a record high production in 2018 after small decreases in the previous three years, and the production of fillets also set a record high in 2018 following the sixth year of consecutive growth. Consecutive increases in production of the “other” product category from 2015 to 2019 could be related to new or emerging markets.

**Figure 6. Bristol Bay Commercial Operator Sockeye Salmon Annual Production by Form**



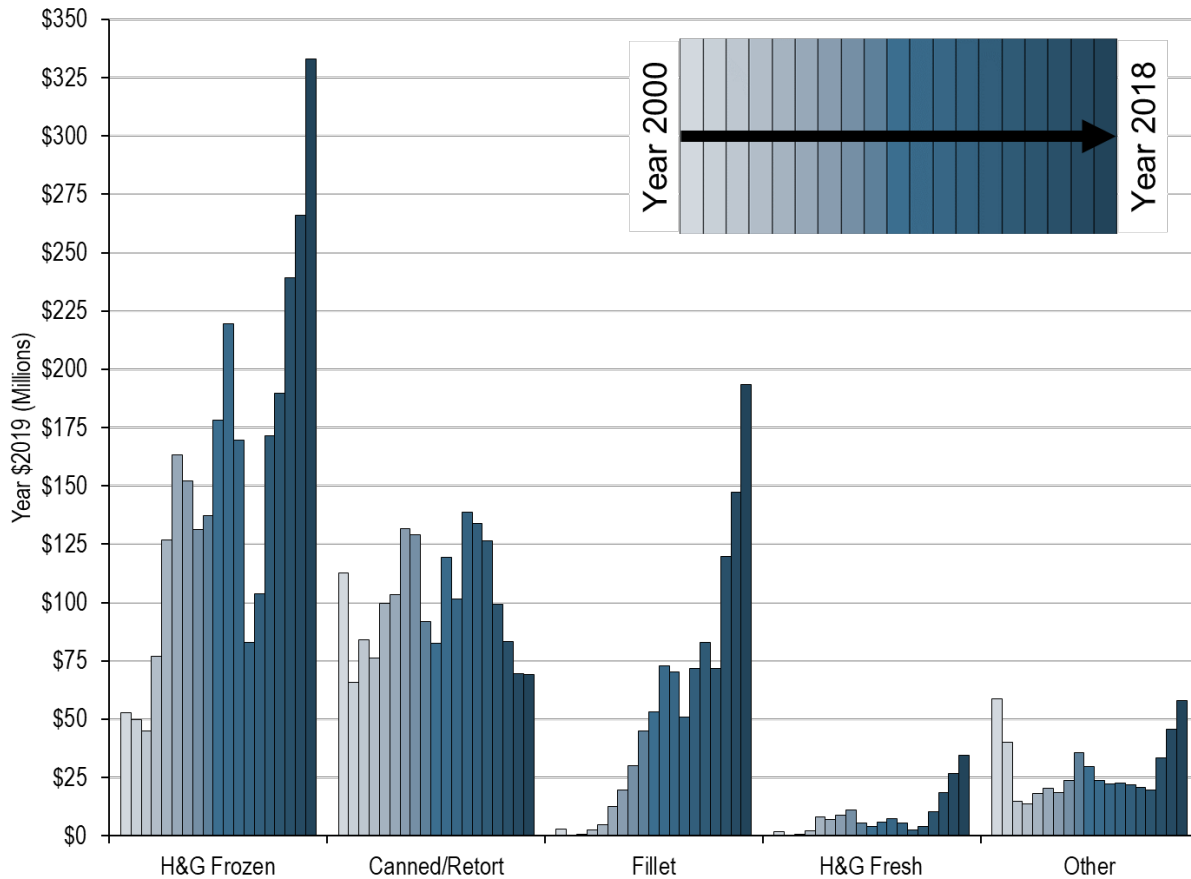
Source: ADF&G (2020a)

COAR data show that wholesale production values increased in 2018 across all product types except for canned products (Figure 7). Wholesale value for H&G frozen products increased for the sixth consecutive



year and recorded an increase of over \$50 million in 2018. The wholesale values from production of fillets also increased significantly, along with smaller increases from H&G fresh and other product forms. From 2000 to 2018, the product mix has become increasingly diverse and the industry has shifted away from canned salmon toward raw consumer products. There is anecdotal evidence to suggest that processors of canned salmon are also utilizing chilled fish, indicating an improvement to all product forms from chilling practices.

**Figure 7. Bristol Bay Commercial Operator Sockeye Salmon Wholesale Values by Product Form**



Source: ADF&G (2020a)

Table 5 contains purchase weight by wholesale product form for 2010–2018 based on COAR data and salmon product recovery rates (DCCED 2020) and provides an estimate for the 2019 season using survey responses. Since the survey does not capture all sockeye purchases in Bristol Bay, the 2019 estimates are proportionally inflated using the total catch volume from the ADF&G 2019 season summary. The survey data analysis shows that the product mix in 2019 has both similarities and differences from the 2018 product mix. Similar to the high levels of H&G frozen product produced in recent years, the percent of raw product purchases used to produce H&G frozen products in 2019 (estimated 61.5 percent) is the highest level recorded by this survey and is an 11 percent increase from 2018. Conversely, the survey data analysis shows that the percent of raw product purchases used to produce fillets decreased to an estimated 19.6 percent in 2019, the first decrease in the percent of raw product purchases used for fillets since 2015. The analysis also shows that the portion of raw product purchases used for canned products slightly increased to an estimated 9.3 percent in 2019, the first increase in the percent of raw product purchases used for canned

products since 2012. Despite this slight increase from the 2018 record low portion of raw product purchases used for canned products (7.9 percent), the 2019 portion used for canned products is still the second lowest recorded by the survey.

Additionally, the portion of raw product purchases used to produce “other” and H&G fresh products, which includes fresh or frozen head-on fish and whole fish, decreased from 13.5 to an estimated 9.6 percent in 2019—a 3.9 percent year-over-year decrease from 2018 (Table 5). This decrease is a reversal of the increasing trend observed in the COAR data for both H&G fresh and “other” products in recent years. These categories were reported separately in the survey data analysis prior to 2018, but the 2018 and 2019 response values had to be combined to protect confidential responses from the survey. The 2017 values were also combined into a single group to allow for calculation of a year-over-year change.

**Table 5. Total Raw Product Consumed by First Wholesale Product Form, 2010–2019**

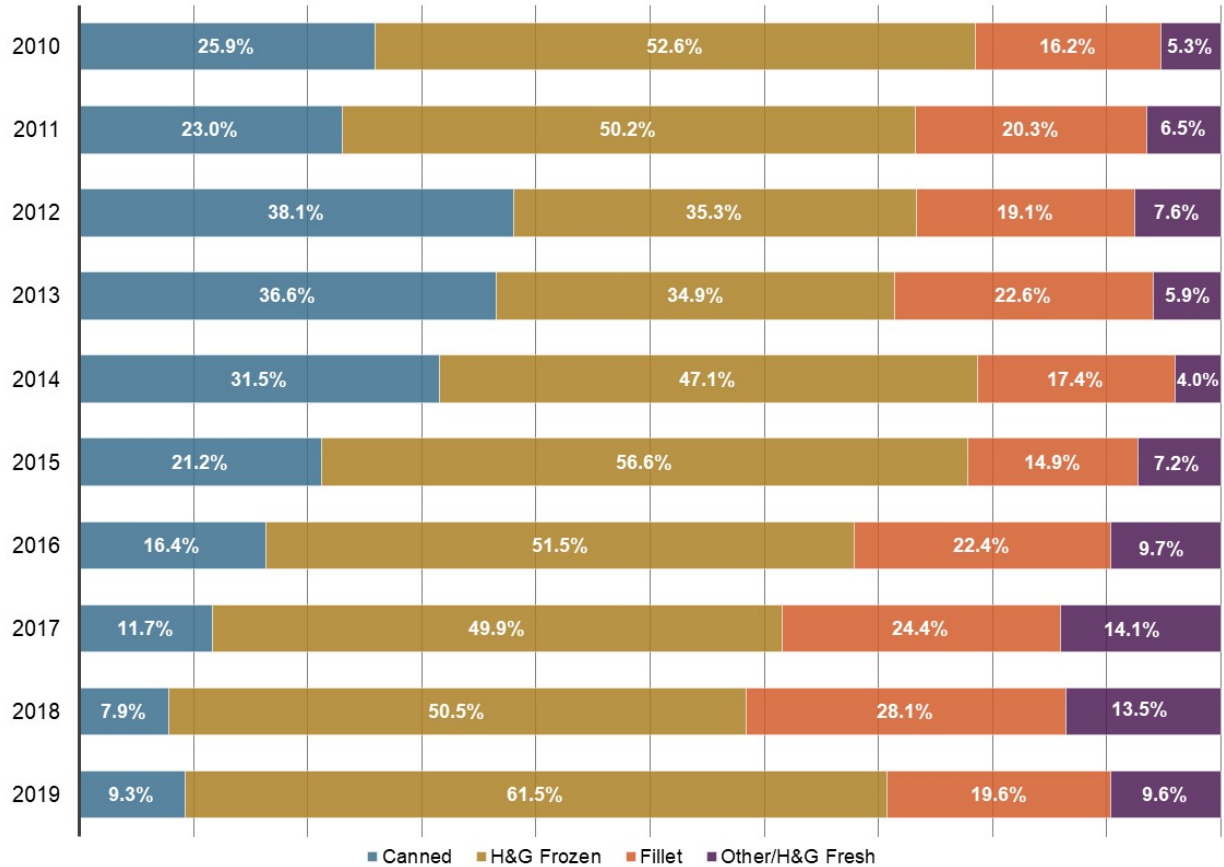
| Product Form                             | 2010         | 2011         | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | *2019 Estimate | Year-over-Year Change | Average, 2010–2019 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|-----------------------|--------------------|
| <b>Round Weight (MMlb)</b>               |              |              |              |              |              |              |              |              |              |                |                       |                    |
| Canned                                   | 44.6         | 31.7         | 41.9         | 34.9         | 50.8         | 42.5         | 34.4         | 24.9         | 18.2         | 20.9           | 2.7                   | 34.5               |
| H&G Frozen                               | 90.7         | 69.2         | 38.8         | 33.3         | 75.8         | 113.3        | 108.4        | 106.4        | 116.5        | 138.4          | 21.9                  | 89.1               |
| H&G Fresh                                | 3.4          | 2.8          | 2.2          | 1.2          | 1.4          | 4.0          | 7.7          | N/A          | N/A          | N/A            | N/A                   | 3.2                |
| Fillet                                   | 27.9         | 28.1         | 21.1         | 21.6         | 27.9         | 29.8         | 47.1         | 52.0         | 64.8         | 44.1           | -20.7                 | 36.4               |
| Other                                    | 5.7          | 6.1          | 6.1          | 4.4          | 5.1          | 10.4         | 12.7         | N/A          | N/A          | N/A            | N/A                   | 7.2                |
| Other/H&G Fresh                          | N/A          | N/A          | N/A          | N/A          | N/A          | N/A          | N/A          | 30.0         | 31.2         | 21.7           | -9.5                  | 27.6               |
| <b>Total</b>                             | <b>172.3</b> | <b>137.9</b> | <b>110.1</b> | <b>95.6</b>  | <b>160.9</b> | <b>200.1</b> | <b>210.4</b> | <b>213.2</b> | <b>230.7</b> | <b>225.1</b>   | <b>-5.6</b>           | <b>175.6</b>       |
| <b>Percent of Total Round Weight (%)</b> |              |              |              |              |              |              |              |              |              |                |                       |                    |
| Canned                                   | 25.9         | 23.0         | 38.1         | 36.6         | 31.5         | 21.2         | 16.4         | 11.7         | 7.9          | 9.3            | 1.4                   | 22.1               |
| H&G Frozen                               | 52.6         | 50.2         | 35.3         | 34.9         | 47.1         | 56.6         | 51.5         | 49.9         | 50.5         | 61.5           | 11.0                  | 49.0               |
| H&G Fresh                                | 2.0          | 2.0          | 2.0          | 1.3          | 0.8          | 2.0          | 3.7          | N/A          | N/A          | N/A            | N/A                   | 2.3                |
| Fillet                                   | 16.2         | 20.3         | 19.1         | 22.6         | 17.4         | 14.9         | 22.4         | 24.4         | 28.1         | 19.6           | -8.5                  | 20.5               |
| Other                                    | 3.3          | 4.4          | 5.6          | 4.6          | 3.1          | 5.2          | 6.0          | N/A          | N/A          | N/A            | N/A                   | 4.7                |
| Other/H&G Fresh                          | N/A          | N/A          | N/A          | N/A          | N/A          | N/A          | N/A          | 14.1         | 13.5         | 9.6            | -3.9                  | 12.4               |
| <b>Total</b>                             | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b>   | <b>N/A</b>            | <b>N/A</b>         |

Note: Column totals may not sum due to rounding. \*Estimates derived from survey data and ADF&G (2019a)

Sources: ADF&G (2019), ADF&G (2020a), DCCED (2020), Northern Economics analysis

During the 2019 season, it appears that processors reallocated raw product previously used to produce fillets, H&G fresh, and other products to produce a greater volume (11 percent increase) of frozen product forms (Figure 8). Prior to 2019, the portion of raw product purchases used to produce canned product had decreased each year from a peak of 38.1 percent in 2012 to the record low of 7.9 percent in 2018. The 2019 percent of raw product used to produce canned product (9.3 percent) is the second lowest level recorded by the survey. Over the past decade, raw product previously allocated for canned product now appears to be used to produce higher quantities of other products, most notably H&G frozen product forms. The change in product mix could be the result of changing market demands and preferences, increased processing capacity for fresher products, or a more efficient supply chain that can move perishable products to market more reliably.

Figure 8. Raw Product Forms of Product Processed in Bristol Bay, 2010–2019



Sources: ADF&G (2019), ADF&G (2020a), DCCED (2020), Northern Economics analysis

The changes in final product form between 2010 and 2019 (Table 6) mirror those exhibited among raw product forms in terms of both volume and raw product share. Using the 2019 ADF&G season summary report, the responses from the processor survey, and product recovery rates (DCCED 2020), the study team estimates that 153.2 MMLb of first wholesale product was produced from the 2019 run. This is an estimated increase of 1.0 MMLb from the previous year. This slight increase could be attributed to the slight increase in total raw product purchases in 2019 and the increase in H&G frozen products, which have a higher product recovery rate than fillets. Fillets and other/H&G fresh product forms saw estimated decreases in the volume of first wholesale product produced in 2019 with decreases of 9.2 and 7.8 MMLb, respectively. The total volume of canned first wholesale products increased slightly to an estimated 14.0 MMLb, or about 9.1 percent of the total estimated first wholesale products—the second lowest canned product volume and portion of the time series. The continued low share of canned product suggests that the region continues to support a larger processing capacity for other product categories, which may continue to be an indication of changes in market preferences, shifting from more processed products to fresh products.

Table 6. First Wholesale Product Form of Product Processed in Bristol Bay, 2010–2019

| Product Form                               | 2010         | 2011        | 2012        | 2013        | 2014         | 2015         | 2016         | 2017         | 2018         | *2019 Estimate | Year-over-Year Change | Average, 2010–2019 |
|--|--------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|----------------|-----------------------|--------------------|
| <b>Product Weight (MMlb)</b>               |              |             |             |             |              |              |              |              |              |                |                       |                    |
| Canned                                     | 29.9         | 21.3        | 28.1        | 23.4        | 34.0         | 28.4         | 23.1         | 16.7         | 12.2         | 14.0           | 1.8                   | 23.1               |
| H&G Frozen                                 | 67.1         | 51.2        | 28.7        | 24.7        | 56.1         | 83.9         | 80.2         | 78.7         | 86.2         | 102.4          | 16.2                  | 65.9               |
| H&G Fresh                                  | 2.5          | 2.1         | 1.6         | 0.9         | 1.0          | 3.0          | 5.7          | N/A          | N/A          | N/A            | N/A                   | 2.4                |
| Fillet                                     | 12.4         | 12.5        | 9.4         | 9.7         | 12.5         | 13.3         | 21.0         | 23.2         | 29.0         | 19.7           | -9.2                  | 16.3               |
| Other                                      | 4.7          | 5.1         | 5.1         | 3.7         | 4.2          | 8.7          | 10.5         | N/A          | N/A          | N/A            | N/A                   | 6.0                |
| Other/H&G Fresh                            | N/A          | N/A         | N/A         | N/A         | N/A          | N/A          | N/A          | N/A          | 24.9         | 17.1           | -7.8                  | 22.0               |
| <b>Total</b>                               | <b>116.7</b> | <b>92.1</b> | <b>72.9</b> | <b>62.3</b> | <b>107.8</b> | <b>137.3</b> | <b>140.6</b> | <b>142.6</b> | <b>152.2</b> | <b>153.2</b>   | <b>1.0</b>            | <b>117.8</b>       |
| <b>Percent of Total Product Weight (%)</b> |              |             |             |             |              |              |              |              |              |                |                       |                    |
| Canned                                     | 25.6         | 23.1        | 38.5        | 37.6        | 31.5         | 20.7         | 16.4         | 11.7         | 8.0          | 9.1            | 1.1                   | 22.2               |
| H&G Frozen                                 | 57.5         | 55.6        | 39.4        | 39.6        | 52.1         | 61.1         | 57.1         | 55.2         | 56.6         | 66.8           | 10.2                  | 54.1               |
| H&G Fresh                                  | 2.2          | 2.2         | 2.2         | 1.5         | 0.9          | 2.2          | 4.1          | N/A          | N/A          | N/A            | N/A                   | 2.2                |
| Fillet                                     | 10.7         | 13.6        | 12.9        | 15.5        | 11.6         | 9.7          | 15.0         | 16.3         | 19.0         | 12.9           | -6.2                  | 13.7               |
| Other                                      | 4.1          | 5.5         | 7.0         | 5.9         | 3.9          | 6.3          | 7.5          | N/A          | N/A          | N/A            | N/A                   | 5.7                |
| Other/H&G Fresh                            | N/A          | N/A         | N/A         | N/A         | N/A          | N/A          | N/A          | N/A          | 16.3         | 11.2           | -5.2                  | 14.8               |
| <b>Total</b>                               | <b>100</b>   | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>   | <b>100</b>   | <b>100</b>   | <b>100</b>   | <b>100</b>   | <b>100</b>     | <b>N/A</b>            | <b>N/A</b>         |

Note: Column totals may not sum due to rounding. \*Estimates derived from survey data and ADF&G (2019)

Sources: ADF&G (2019), ADF&G (2020a), DCCED (2020), Northern Economics analysis

The amount of raw product canned in Bristol Bay (as recorded by the survey) was 19.0 MMlb in 2019, a decrease of 9.3 MMlb from 2018 (see Table 7). The amount of raw product canned outside the Bay slightly increased in 2019 to 0.3 MMlb, which is still much lower than the 2010–19 average of 0.9 MMlb. In terms of the percent of total production, raw product canned within the Bay accounted for only nine percent of total production and raw product canned outside the Bay accounted for less than one percent. The results of the 2019 survey show a continued overall shift away from canned products, with a smaller portion of raw product purchases being allocated towards canning within the region from 2010 to 2019.

Table 7. Canning Location, 2010–2019

| Product Form                           | 2010        | 2011        | 2012        | 2013        | 2014        | 2015        | 2016        | 2017        | 2018        | 2019        | Year-over-Year Change | Average, 2010–2019 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------------|--------------------|
| <b>Round Weight (MMlb)</b>             |             |             |             |             |             |             |             |             |             |             |                       |                    |
| Reported Canned in the Bay             | 51.6        | 42.2        | 40.9        | 40.3        | 60.2        | 59.3        | 49.5        | 27.1        | 28.2        | 19.0        | -9.3                  | 41.8               |
| Assumed Canned Outside the Bay         | 1.1         | 0.4         | 0.5         | 0.5         | 3.6         | 1.6         | 0.1         | 0.8         | 0.2         | 0.3         | 0.1                   | 0.9                |
| <b>Total</b>                           | <b>52.7</b> | <b>42.6</b> | <b>41.5</b> | <b>40.8</b> | <b>63.8</b> | <b>60.8</b> | <b>49.6</b> | <b>27.9</b> | <b>28.4</b> | <b>19.2</b> | <b>-9.2</b>           | <b>42.7</b>        |
| <b>Percent of Total Production (%)</b> |             |             |             |             |             |             |             |             |             |             |                       |                    |
| Reported Canned in the Bay             | 31.1        | 32.7        | 45.5        | 45.2        | 43.2        | 33.3        | 27.0        | 13.9        | 13.8        | 9.2         | -4.7                  | 29.5               |
| Assumed Canned Outside the Bay         | 0.7         | 0.3         | 0.6         | 0.5         | 2.5         | 0.9         | 0.0         | 0.4         | 0.1         | 0.1         | 0.0                   | 0.6                |
| <b>Total</b>                           | <b>31.8</b> | <b>33.0</b> | <b>46.0</b> | <b>45.7</b> | <b>45.7</b> | <b>34.2</b> | <b>27.0</b> | <b>14.3</b> | <b>13.9</b> | <b>9.3</b>  | <b>-4.6</b>           | <b>30.1</b>        |

Note: Column totals may not sum due to rounding.

Source: Northern Economics analysis

## Product Chilled Prior to Delivery

As in prior years, the 2019 survey asked processors about the use of RSW and slush ice systems within the drift fleet. RSW and slush ice systems were used to chill an estimated 146.7 MMlb of raw product in 2019, the second largest volume of chilled raw product recorded by the survey and only 4.9 MMlb below the record high in 2018 (see Table 8). The majority of raw product in 2019, 76 percent, was chilled using RSW systems and 8.3 percent was chilled using slush ice. The remaining 15.6 percent was unchilled.

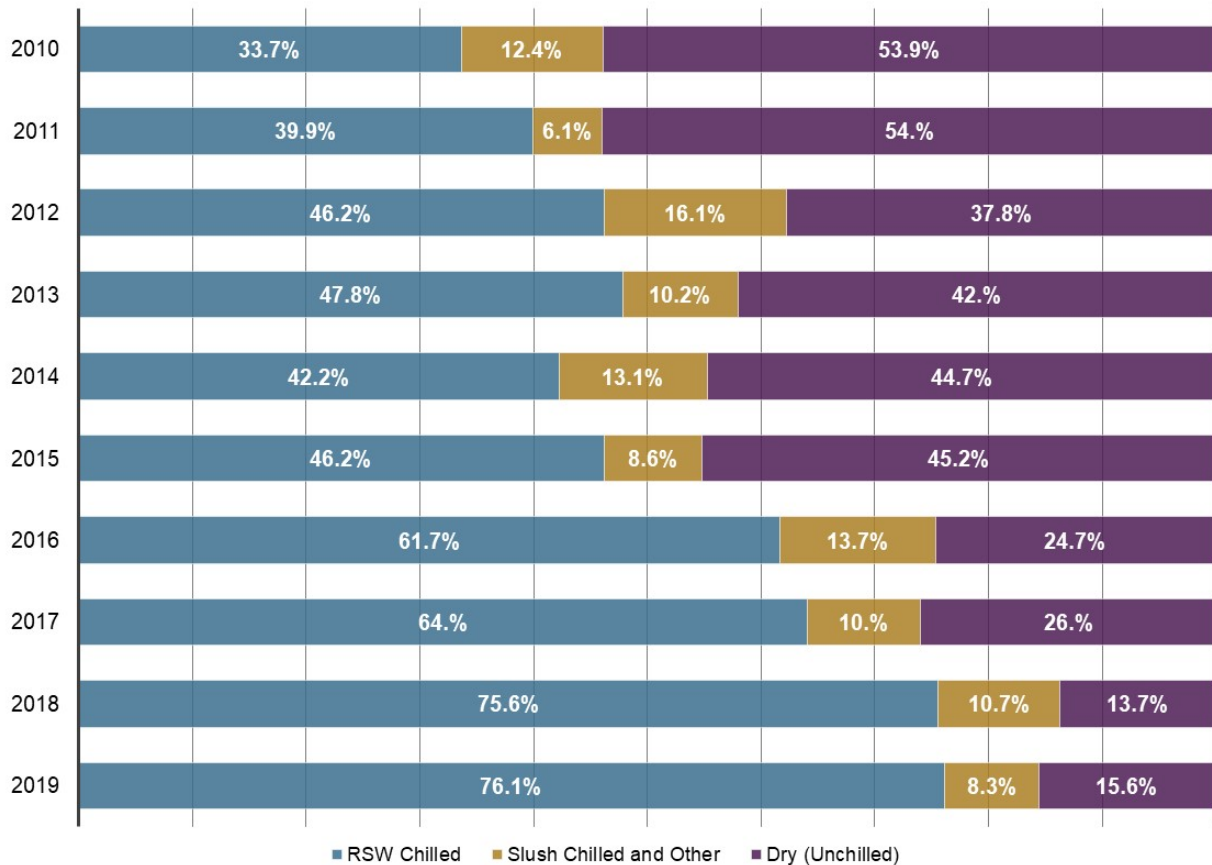
**Table 8. Drift Fleet Chilling Methods 2010–2019**

| Chilling Method                    | 2010         | 2011         | 2012         | 2013         | 2014         | 2015         | 2016         | 2017         | 2018         | 2019         | Year-over-Year Change | Average, 2010–2019 |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------|--------------------|
| <b>Round Weight (MMlb)</b>         |              |              |              |              |              |              |              |              |              |              |                       |                    |
| RSW Chilled                        | 46.0         | 44.0         | 33.5         | 37.5         | 49.1         | 67.6         | 96.7         | 107.9        | 132.8        | 132.2        | -0.7                  | 74.7               |
| Slush Chilled and Other            | 17.0         | 6.7          | 11.6         | 8.0          | 15.2         | 12.7         | 21.4         | 16.8         | 18.8         | 14.5         | -4.3                  | 14.3               |
| Dry (Unchilled)                    | 73.6         | 59.4         | 27.4         | 32.9         | 52.0         | 66.2         | 38.6         | 43.8         | 24.1         | 27.0         | 2.9                   | 44.5               |
| <b>Total</b>                       | <b>136.6</b> | <b>110.1</b> | <b>72.5</b>  | <b>78.4</b>  | <b>116.3</b> | <b>146.5</b> | <b>156.7</b> | <b>168.4</b> | <b>175.7</b> | <b>173.7</b> | <b>-2.0</b>           | <b>133.5</b>       |
| <b>Percent of Round Weight (%)</b> |              |              |              |              |              |              |              |              |              |              |                       |                    |
| RSW Chilled                        | 33.7         | 39.9         | 46.2         | 47.8         | 42.2         | 46.2         | 61.7         | 64.0         | 75.6         | 76.1         | 0.5                   | 53.3               |
| Slush Chilled and Other            | 12.4         | 6.1          | 16.1         | 10.2         | 13.1         | 8.6          | 13.7         | 10.0         | 10.7         | 8.3          | -2.4                  | 10.9               |
| Dry (Unchilled)                    | 53.9         | 54.0         | 37.8         | 42.0         | 44.7         | 45.2         | 24.7         | 26.0         | 13.7         | 15.6         | 1.9                   | 35.7               |
| <b>Total</b>                       | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>N/A</b>            | <b>N/A</b>         |

Source: Northern Economics analysis

The survey results show that the portion of fish deliveries chilled with RSW has more than doubled between 2010 and 2019 (Figure 9). In the first several years of the survey, it appeared that the run size impacted the chilling method with the portion of raw product chilled by RSW systems decreasing during the large run in 2014, but results from the 2015, 2016, 2017, and 2018 surveys directly contradict that perceived trend. Processors and permit holders have commented that steady and consistent run intensity allows more time for chilling fish as they are harvested. Thus, run intensity appears to be a factor as well as the size of the run. Although the portion of raw product chilled by RSW systems did increase in 2019, the portion of raw product chilled by slush ice decreased and the portion of unchilled fish slightly increased. This aligns with the slight decrease in the portion of raw product purchases that were chilled in 2019 (Table 1). As previously mentioned, harvest has been increasing for the past six years and the fleet has been accommodating larger catches and more intense runs in some districts, which can strain onboard chilling systems and requires more ice.

Figure 9. Chilling Methods in the Drift Fleet, 2010–2019



Source: Northern Economics analysis

The 2019 survey recorded an increase in the portion of raw product chilled by the drift fleet using RSW systems for the fifth consecutive year. Except for the slight dip in 2014, the survey has consistently recorded year-over-year increases in the percent of total drift fleet chilled product that was chilled using an RSW system. The opposite can be seen in the portion of the raw product that was unchilled by the drift fleet, which has steadily decreased since 2009 except for 2013–2015 and 2019, which recorded slight increases. The 2019 portion of unchilled raw product is still the second lowest recorded by the survey and the lowest portion of unchilled product was recorded in 2018. Over the life of the survey, the portion of the total raw product purchased from the drift fleet being chilled with slush ice has remained relatively stable, ranging between 6 and 16 percent, and it appears that the increase in raw product chilled by RSW systems is driving the overall change in chilling practices in the region.

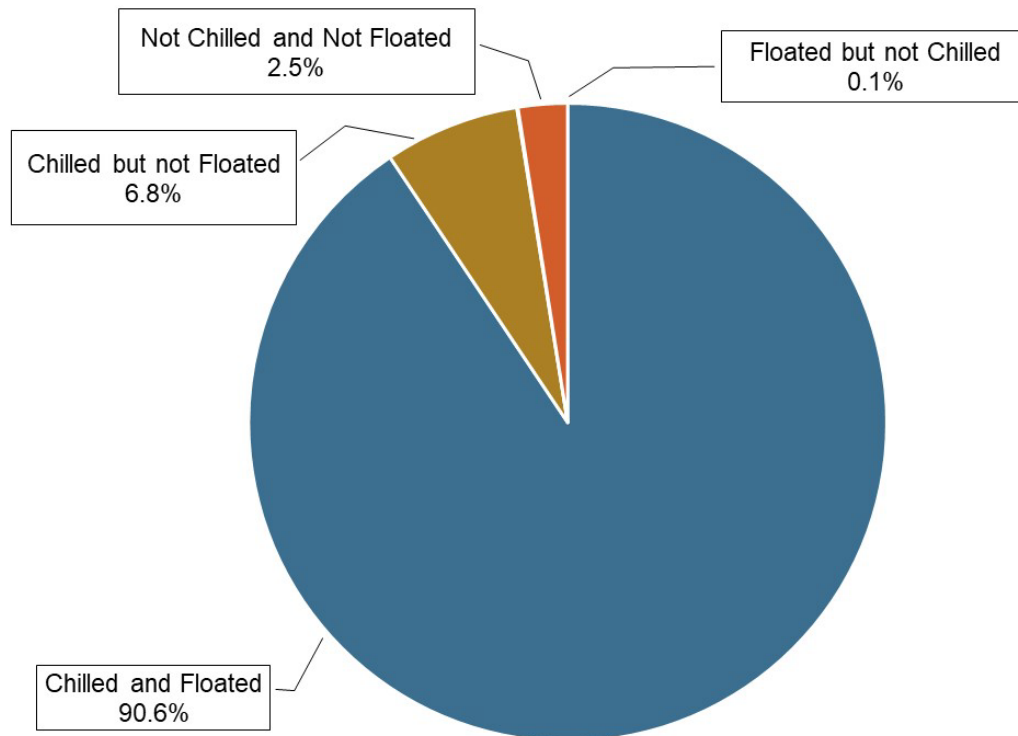
The data collected by this survey show a distinct shift in the chilling practices in Bristol Bay, from most of the drift fleet delivering unchilled raw product in 2010 (53.9 percent unchilled), to the majority of the drift fleet delivering chilled raw product in 2019 (84.4 percent chilled).

## Quality of Chilled Raw Product

New to the 2017 survey, and continued in the 2018 and 2019 surveys, were questions inquiring about the percentage of raw product being purchased from the drift net fleet that is chilled and/or floated, processor employment of third-party quality assurance contractors, and best practices that have the biggest impact on the quality of delivered raw product. In 2019, 100 percent of respondents reported that the quality of chilled floated RSW fish is better than the quality of slush chilled, non-floated fish. Eight respondents answered that chilled floated RSW fish is 'significantly better' and one respondent answered that it is 'slightly better'.

The survey asked respondents to specifically report the total raw product purchased from the drift fleet in four categories of fish: floated and chilled (RSW), chilled but non-floated (slush ice), floated and not chilled, and non-floated/non-chilled. The breakdown of total raw product purchases made from the drift fleet in 2019 is shown in Figure 10, indicating that over 90 percent of chilled raw product purchased from the drift fleet was floated and chilled.

**Figure 10. Proportion of Drift Fleet Raw Product Chilled and/or Floated, 2019**



Source: Northern Economics analysis

The survey also asked processors how many fish their tenders are required to sample in a delivery to determine the chilled temperature and possibly qualify for a chilling bonus. Eight out of nine respondents required testing, and of those that required it, the samples ranged from 3 to 20 fish per delivery. Among those who require testing, the most common response was 3 fish (50 percent of respondents) with an average of 7 fish.



The 2019 survey also included questions regarding the hiring of quality assurance contractors:

- 1) *Do you use any of the following quality assurance protocols for your tender fleet: third-party quality assurance contractor, quality assurance staff employed by your company, or other?*
- 2) *Please estimate the overall percentage of tender vessels trips that utilized one of the quality assurance protocols from the previous question*
- 3) *If you employed a third-party quality assurance contractor, what percentage of your tenders had a third-party quality assurance contractor on board during the 2019 season?*

Seven processors responded to these questions about quality assurance contractors. Of those, four processors reported having hired a third-party quality assurance contractor in 2019 and three processors reported having quality assurance staff employed by their company in 2019. The average percentage of tender trips that had a quality assurance contractor or in-house employee on board was 78 percent. Of the four processors that hired a third-party contractor, an average of 83 percent of their tenders had a third-party quality assurance contractor onboard during the 2019 season.

The 2019 survey was the third year that included a question asking respondents to score six best practices based on the magnitude of impact the practice has on the quality of the delivered raw product. Respondents were asked to score the practices from 1 to 5, with 1 having no impact on quality and 5 having maximum impact. The practices included:

- consistent chilling (RSW or slush ice)
- fish bleeding
- shorter sets
- salmon slides and/or deck mats
- lower brailer weights (500–600 lb. or less per brailer bag)
- vessel cleanliness/proper sanitation

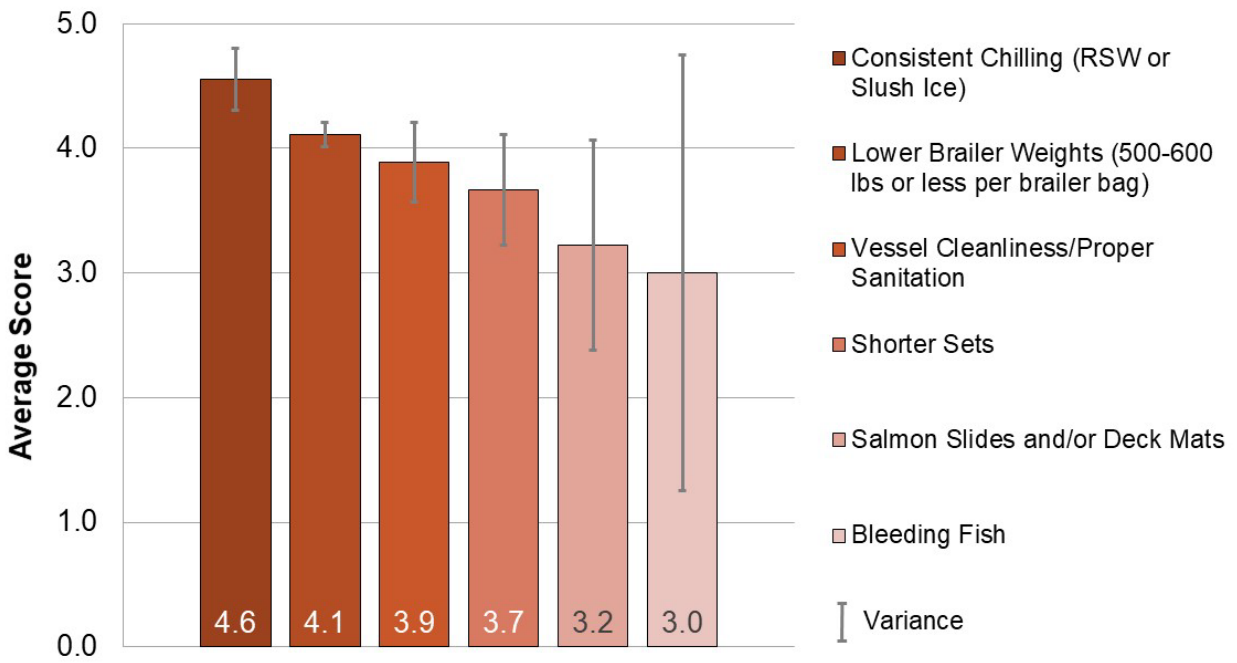
Consistent chilling scored the highest in 2019 (Figure 11), as it also did in the 2017 and 2018 surveys. The fact that chilling has long been the principal focus of the survey may have some influence on its being of utmost importance to respondents. It is also possible that chilling scored the highest because without that practice, many of the other best practices would have reduced impact.

Lower brailer weights and vessel cleanliness/proper sanitation scored second and third, respectively. Interestingly, these practices also scored in the top three best practices in the 2018 survey, but the score for lower brailer weights increased in 2019 to overtake vessel cleanliness/proper sanitation for the second highest score. As in 2018, shorter sets, salmon slides and/or deck mats, and bleeding fish all scored lower, respectively.

Figure 11 also shows the statistical variance among the respondents for each practice.<sup>2</sup> It is worth noting that the variance among scores was relatively small (less than or equal to 0.5) for the top four practices (consistent chilling, lower brailer weights, vessel cleanliness/proper sanitation, and shorter sets). However, variance for the lowest scoring practices, salmon slides and/or deck mats and bleeding fish, were 0.8 and 1.75, respectively. This indicates that there was less consensus around the importance of those practices, particularly bleeding fish. BBRSDA may want to convey any new knowledge from recent research on these topics or focus on studying these practices in the future to improve understanding of their impact on quality. Moving forward, it will also be important to continue tracking how these survey scores change or remain consistent over time, especially as new research on these practices is completed.

<sup>2</sup> Statistical variance is a common tool for describing data distributions and reflects the relative level of consensus among the survey respondents. Mathematically, standard deviation ( $\sigma$ ) is equivalent to the square root of variance ( $\sigma^2$ ).

Figure 11. Average Score of Best Practices Impacting the Quality of Delivered Product, 2019



Note: 1=no impact, 5= maximum impact

Source: Northern Economics analysis

## Drift Fleet Size and Chilling

The number of vessels in the drift fleet fishing for surveyed Bristol Bay processors in 2019 increased by 9 vessels to 1,337 (see Table 9). This represents a slightly higher number of vessels than the average reported since 2010 (1,292). The survey asked processors to consider a boat as part of their fleet if it was contractually obligated to deliver to them or if they felt that it made more than 50 percent of its deliveries to them. The average number of vessels per surveyed processor increased slightly in 2019 to 149 vessels. It is important to note that the data reported here should not be taken to be an accurate estimate of the total number of active vessels in the fishery—not all processors are included in or responded to the BBRSDA survey.

**Table 9. Number of Vessels in the Drift Fleet, 2010–2019**

|  | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | Year-over-Year Change | Average, 2010–2019 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|--------------------|
| Total Vessels in Survey Processor's Drift Fleets                   | 1,343 | 1,358 | 1,076 | 1,253 | 1,251 | 1,397 | 1,258 | 1,327 | 1,328 | 1,337 | 9                     | 1,292.8            |
| Percent Change in Survey Processor's Fleet Size from Previous Year | N/A   | 1.1   | -26.2 | 14.1  | -0.2  | 10.5  | -11.0 | 5.2   | 0.1   | 0.7   | 0.6                   | -0.3               |
| Average Vessels per Surveyed Processor                             | 122   | 123   | 135   | 157   | 156   | 155   | 140   | 147   | 148   | 149   | 1                     | 143.1              |

Source: Northern Economics analysis

As in prior years, the 2019 survey asked processors to categorize vessels by the portion of the vessel's deliveries that were chilled. The total number of vessels in the drift fleets of surveyed processors that chilled more than 75 percent of their deliveries reached 1,091, the largest number ever to be recorded in this category (Table 10). The number of vessels that delivered chilled raw product 50–75 percent of the time decreased, which could be attributed to the increase in vessels chilling 75 percent or more of their deliveries. The number of vessels that delivered chilled raw product none of the time dropped by more than half: from 125 vessels in 2018 to 61 vessels in 2019. This coincides with slight increases in the number of vessels that delivered chill raw product less than 25 percent of the time and 25–50 percent of the time.

This suggests that conversions from dry vessels to vessels with RSW systems are still occurring or that the drift fleet is using slush ice to properly chill product more consistently. As more vessels convert to RSW systems, there is also less pressure on the ice supply and distribution network in Bristol Bay, and more ice is available to permit holders who choose to chill their product deliveries using slush ice. The shift in chilling practices could soon be approaching a tipping point where delivering chilled product is no longer seen as a preference, but rather a requirement in Bristol Bay. There are already multiple processors operating in Bristol Bay that mandate raw product deliveries be chilled.

Table 10. Consistency of Chilling, 2010–2019

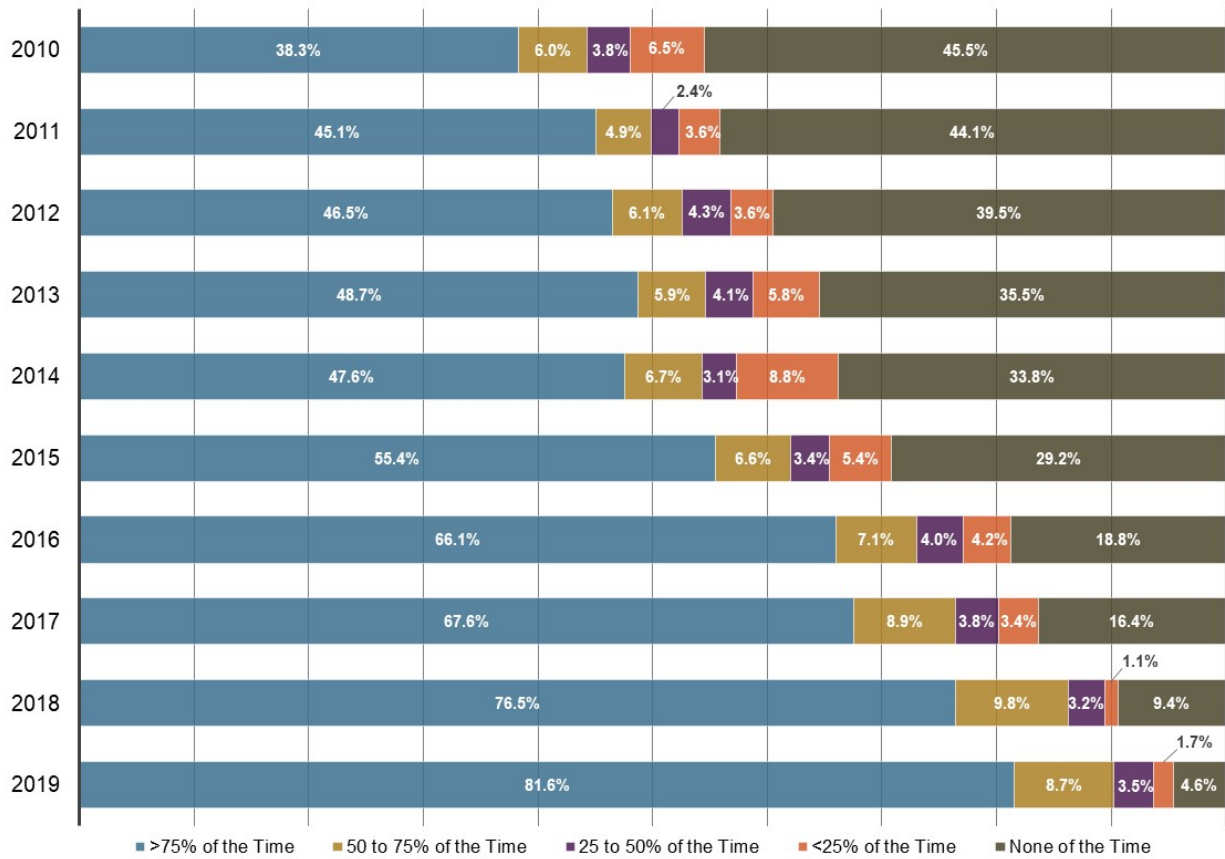
| Year                          | Percent of Deliveries that Were Chilled |                       |                       |                  |                  |
|-------------------------------|---|-----------------------|-----------------------|------------------|------------------|
|                               | >75% of the Time                        | 50 to 75% of the Time | 25 to 50% of the Time | <25% of the Time | None of the Time |
| <b>Number of Vessels</b>      |   |                       |                       |                  |                  |
| 2010                          | 514                                     | 81                    | 51                    | 87               | 611              |
| 2011                          | 612                                     | 66                    | 32                    | 48               | 599              |
| 2012                          | 500                                     | 66                    | 46                    | 39               | 425              |
| 2013                          | 611                                     | 74                    | 51                    | 72               | 445              |
| 2014                          | 595                                     | 84                    | 38                    | 111              | 423              |
| 2015                          | 775                                     | 92                    | 48                    | 75               | 408              |
| 2016                          | 831                                     | 89                    | 51                    | 53               | 236              |
| 2017                          | 896                                     | 118                   | 50                    | 45               | 217              |
| 2018                          | 1,015                                   | 130                   | 42                    | 15               | 125              |
| 2019                          | 1,091                                   | 116                   | 46                    | 23               | 61               |
| <b>Percent of Vessels (%)</b> |   |                       |                       |                  |                  |
| 2010                          | 38.3                                    | 6.0                   | 3.8                   | 6.5              | 45.5             |
| 2011                          | 45.1                                    | 4.9                   | 2.4                   | 3.6              | 44.1             |
| 2012                          | 46.5                                    | 6.1                   | 4.3                   | 3.6              | 39.5             |
| 2013                          | 48.7                                    | 5.9                   | 4.1                   | 5.8              | 35.5             |
| 2014                          | 47.6                                    | 6.7                   | 3.1                   | 8.8              | 33.8             |
| 2015                          | 55.4                                    | 6.6                   | 3.4                   | 5.4              | 29.2             |
| 2016                          | 66.1                                    | 7.1                   | 4.0                   | 4.2              | 18.8             |
| 2017                          | 67.6                                    | 8.9                   | 3.8                   | 3.4              | 16.4             |
| 2018                          | 76.5                                    | 9.8                   | 3.2                   | 1.1              | 9.4              |
| 2019                          | 81.6                                    | 8.7                   | 3.5                   | 1.7              | 4.6              |

Note: Totals may not match the table above because of rounding.

Source: Northern Economics analysis

In 2019, 90.3 percent of vessels delivered chilled raw product more than 50 percent of the time (note that this is an aggregation of the 50 to 75 percent and over 75 percent categories shown in Table 10), which represents the most consistent chilling practices recorded by this survey to date (Figure 12). The portion of vessels who chilled their deliveries less consistently (less than 25 percent or none of the time) decreased in 2019 to just 6.3 percent. This is the lowest portion of vessels making unchilled or dry deliveries recorded by the survey.

Figure 12. Chilling Consistency among the Drift Fleet, 2010–2019



Source: Northern Economics analysis

## Processor Ice-Making Capability

Total ice production capacity increased by 18 percent in 2019, from 732 tons per day in 2018 to 865 tons per day (Table 11). However, the amount of ice available to permit holders from processors decreased by six percent, from 199 tons in 2018 to 187 tons in 2019. Despite this decrease, these 2019 levels are above the average reported over the last 10 years of the survey. Barge ice production comes from two vessels operated and subsidized by BBEDC, and production capacity has remained constant at about 200 tons per day.

When barge ice is included in the calculation, the total amount of daily ice available to permit holders slightly decreased to 387 tons per day in 2019. Although this is a roughly three percent decrease from the previous year, this 2019 level is the third highest level recorded by the survey. The above-average amount of ice being made available to permit holders from processors in recent years signifies the responsiveness of processors in providing ice to the drift fleet as well as the importance of ice to the drift fleet's chilling practices. While the increased use of RSW systems to chill product may have taken some of the pressure off processors to provide their fleets with ice, 8.3 percent of the raw product delivered by the drift fleet was still chilled using slush ice and 15.6 percent of raw product delivered by the drift fleet was unchilled in 2019 (see Figure 9). There is anecdotal evidence to suggest that some unchilled deliveries could be attributed to RSW systems that failed while vessels were fishing, and deliveries had to be made prior to being able to repair the systems.

**Table 11. Ice Production in Tons per Day, 2010–2019**

|   | 2010       | 2011       | 2012       | 2013       | 2014       | 2015       | 2016       | 2017       | 2018       | 2019       | Avg        |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Total Ice Production Capacity                       | 775        | 735        | 645        | 535        | 635        | 775        | 705        | 665        | 732        | 865        | 677        |
| Available to permit holders from processors         | 250        | 130        | 137        | 27         | 59         | 113        | 104        | 149        | 199        | 187        | 126        |
| Percent available to permit holders from processors | 32         | 18         | 21         | 5          | 9          | 15         | 15         | 22         | 27         | 22         | 18         |
| Barge Ice   | 200        | 200        | 200        | 200        | 200        | 200        | 200        | 200        | 200        | 200        | 200        |
| <b>Total ice available to permit holders</b>        | <b>450</b> | <b>330</b> | <b>337</b> | <b>227</b> | <b>259</b> | <b>313</b> | <b>304</b> | <b>349</b> | <b>399</b> | <b>387</b> | <b>326</b> |

Source: BBEDC (2020), Northern Economics analysis

BBEDC (2019) noted how ice sales on their two dedicated ice barges in Bristol Bay can be impacted by run size and local intensity. Ice sales from BBEDC's ice barge located in the Nushagak district increased in 2018, while sales from their ice barge located in the Naknek/Kvichak district significantly decreased that same year. BBEDC noted that fishing vessels may have moved out Naknek/Kvichak district in 2018 to fish the large run in the Nushagak, potentially contributing the decrease in ice sales in the Naknek/Kvichak district (BBEDC 2019). This adds to the anecdotal evidence that run timing and intensity can affect the ice distribution network and chilling capacity of the drift fleet.

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## Appendix: Survey Instrument

## Introduction

**Welcome to the 2019 Bristol Bay Salmon Fishery Processing Survey! We're glad to be conducting this survey again after successful 2008-2018 surveys. The 2019 survey builds on the data in prior surveys and will allow you to see aggregate changes in the fishery that have occurred between 2008 and 2019.**

**As with the prior surveys:**

**The purpose of the survey is to collect information on the chilling of fish by fishermen and the distribution of finished product among four dominant product forms (excluding roe).**

**Unless specifically stated and verified, all of the data reported by individual respondents will be held in confidence by Northern Economics and will only be reported in aggregate.**

**The aggregated survey results will be submitted to the survey sponsor, the Bristol Bay Regional Seafood Development Association (BBRSDA). Northern Economics will also distribute the same report that it delivers to BBRSDA to each participant who completes the survey.**

**If you experience problems while completing the survey, please call Terri McCoy at 907-274-5600.**

**PLEASE MAKE SURE YOU HIT NEXT AT THE BOTTOM OF EACH PAGE.**

1. What is the name of your processing company?

2. What is your name?

3. What is your primary contact phone number?

4. Please enter your email so that we may send you a copy of the survey results.

5. Please list the processing facilities and/or floating processors included in your response

## Raw Product

**This section asks questions about a processor's purchase of raw product (round weight fish) in 2019. Please ensure that all answers are for the 2019 season.**

**Please note that some questions refer to all of your operations in 2019 while other questions refer specifically to the DRIFT NET fleet.**

**The survey form does not accept commas, \$ signs, decimals, or % symbols. Please enter whole numbers only. For example \$1,254, would be entered as 1254 while 50% would be entered as 50.**

**NOTE: THE PAGE WILL NOT ADVANCE IF A REQUIRED SUM TO 100 DOES NOT SUM TO 100 OR IF A % SYMBOL IS INCLUDED IN THE ENTRY.**

6. In 2019, how many pounds of raw product (round weight fish) did your company purchase from the Bristol Bay salmon fishery?

2019 Raw Product Weight

7. In 2019, how many pounds of previously chilled raw product (using ice or refrigerated sea water [RSW]) did your company purchase in the Bristol Bay salmon fishery?

2019 Chilled Raw Product Weight

8. What percentage of each of the following categories came from the DRIFT NET fleet in 2019?

For example, if the DRIFT NET fleet accounted for 75% of your purchases you would enter 75 below. The survey form does not accept % symbols or decimals.

Portion of Total Raw Product from the Drift Net Fleet

Portion of Total Chilled Raw Product from the Drift Net Fleet

9. What percentage of your 2019 purchases in the Bristol Bay salmon fishery was shipped long-haul for processing at a plant outside of Bristol Bay?

Percentage Processed Outside Bristol Bay

10. Of the raw product (round weight fish) that your company purchased in 2019, and processed INSIDE Bristol Bay, please estimate the percent that your company used for each of the following product forms. The total should equal 100. ENTER ONLY NUMBERS. DO NOT ENTER PERCENT SYMBOLS (%).

Canned Product

H&G Frozen

H&G Fresh

Fillet

Other

11. If your plant produced canned sockeye in 2019, did you process chilled and un-chilled fish separately?

- Always
- Never
- Sometimes

If you answered "sometimes" please indicate the conditions when you do or don't separate chilled and un-chilled fish.

12. What percentage of the chilled raw product your company purchased from drift net fleet boats in 2019 was from each of the following categories? The total of your answer should be 100.

RSW

Slush Ice

Other

13. What percentage of the raw product purchases your company purchased from the drift net fleet in 2019 were chilled and/or floated? The total of your answer should be 100.

Chilled and Floated

Chilled but not Floated

Floated but not Chilled

Not Chilled and Not Floated

## Your Fleet

### This page asks questions about drift net boats that you consider to be part of "your fleet."

14. In 2019, how many drift net boats did you consider to be part of "your fleet"? A boat would be counted as part of your fleet if they were contractually obligated to deliver to your company or if you felt they made more than 50% of their deliveries to your company in 2019.

Number of Drift Fleet Vessels

15. Please estimate the percentage of the drift net boats in your fleet that fit into the following categories. Please make sure your answers sum to 100.

75% to 100% of their 2019 deliveries were chilled

50% to 75% of their 2019 deliveries were chilled

25% to 50% of their 2019 deliveries were chilled

1% to 25% of their 2019 deliveries were chilled

None of their 2019 deliveries were chilled

## Processor Ice Production

**This section of the survey asks about chilling in the bay including your company's production of ice in 2019 and its availability to your fleet.**

16. In 2019, what was your company's total daily ice making capacity in Bristol Bay in tons? Please exclude any ice produced by the BBEDC ice barges.

Daily Ice Production Capacity (tons)

17. What percentage of your 2019 daily ice making capacity located in Bristol Bay is available for use by your drift boat fleet? Please exclude any ice produced by the BBEDC ice barges.

Portion Available to Your Drift Boat Fleet (%)

18. Which statement do you think best describes how the amount of ice available to permit holders from ALL processors in aggregate is likely to change in the next five years? Please check one box.

- Substantially more ice will be available from processors
- Marginally more ice will be available from processors
- There will be no change in the amount of ice will be available from processors
- Marginally less ice will be available from processors
- Substantially less ice will be available from processors

## Quality of Chilled Product

**This section of the survey asks about the quality of the chilled product purchased in the Bristol Bay driftnet salmon fishery during the 2019 season.**

19. On average, are there any notable quality improvements gained from chilled floated fish compared to chilled non-floated fish?

...significantly worse...    ...slightly worse...    ...not different....    ...slightly better...    ...significantly better...

On average, the quality of chilled floated product is... ..than the average quality of non-floated chilled product.

20. How many fish are the tenders required to sample in a delivery to determine the chilled temperature and possibly qualify for a chilling bonus?

Number of fish required

21. Do you use any of the following quality assurance protocols for your tender fleet?

- third-party quality assurance contractor
- quality assurance staff employed by your company
- Other (please specify)

22. Please estimate the overall percentage of tender vessels trips that utilized one of the quality assurance protocols from the previous question

Percentage of tenders

23. If you employed a third-party quality assurance contractor, what percentage of your tenders had a third-party quality assurance contractor on board during the 2019 season?

Percentage of tenders



24. Please rate each of these best practices in terms of their impact on the quality of delivered product (1 = no impact on quality and 5 = maximum impact on quality).

|   | No Impact             | Slight Impact         | Moderate Impact       | Considerable Impact   | Maximum Impact        |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Consistent Chilling (RSW or Slush Ice)                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bleeding Fish   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Shorter Sets  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Salmon Slides and/or Deck Mats                              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lower Brailer Weights (500-600 lbs or less per brailer bag) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Vessel Cleanliness/Proper Sanitation                        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

25. Please estimate the percentages of your total fish purchases for each of the following quality grades. Percentages must sum to 100.

Number 1

Number 2

Number 3

Other

BBRSDA would like your help in identifying more accurately where they should direct efforts to help fishermen who may not be providing top-quality fish. Therefore, we are requesting, **FOR QUESTION 25 ONLY** your permission to release your company's responses directly to BBRSDA. BBRSDA will not release data for individual companies, and will only use the data to identify areas of need regarding fish quality. If you do not authorize your company's responses' release to BBRSDA, they will only be reported in the aggregate within the summary report.

26. Authorization to release responses to Question 25 to BBRSDA.

- YES**, I authorize Northern Economics to release our response to Question 25 ONLY to Andy Wink of BBRSDA.
- Do **NOT** release our response to BBRSDA.

If you grant permission, please restate your name and company

27. Please estimate the percentage by which the total wholesale value of your 2019 product would increase if all of the fish you purchased in 2019 were #1's.

Increase over expected product value for 2019

0 100

**Please enter your estimated % here**

## Processor Input

**BBRSDA believes that increased communication between processors and permit holders will lead to cooperative opportunities that benefit both groups. The distribution of our survey results are an example of this concept in action. BBRSDA is interested in knowing if the processing industry believes there are certain actions BBRSDA can take or promote that will benefit both groups. We're interested in knowing what you would like our role to be in the fishery.**

28. BBRSDA is authorized to spend money in four areas to improve the overall health and value of the Bristol Bay salmon fishery. These areas include: Infrastructure, Research, Quality, and Marketing. BBRSDA is interested in knowing which area you think it is most important for BBRSDA's focus. Thinking back on the last 5 years of BBRSDA work, and thinking ahead to future work, what areas are most important for BBRSDA to focus on?

|                | 1-Very Low<br>Importance | 2-Low Importance      | 3-Moderate<br>Importance | 4-High Importance     | 5-Very High<br>Importance |
|----------------|--------------------------|-----------------------|--------------------------|-----------------------|---------------------------|
| Infrastructure | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>     |
| Research       | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>     |
| Quality        | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>     |
| Marketing      | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>    | <input type="radio"/> | <input type="radio"/>     |

29. Please describe what you think is the single most important project that BBRSDA could undertake in the coming year. If you were BBRSDA, what project would you undertake?

Thank You!

**Thank you for completing the survey. As always, we greatly appreciate your time and efforts. A copy of the survey results will be available from BBRSDA in the first half of 2020. BBRSDA will email a copy of the results to you using the contact information you provided with the survey.**