

**Special Publication No. 24-09**

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# **Run Forecasts and Harvest Projections for 2024 Alaska Salmon Fisheries and Review of the 2023 Season**

**Edited by**

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**and**

**Andrew R. Munro**

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**April 2024**

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**Alaska Department of Fish and Game**

**Divisions of Sport Fish and Commercial Fisheries**



## Symbols and Abbreviations

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| Weights and measures (metric)           |                       | General                                   |  | Mathematics, statistics                                    |  |                |
|---|-----------------------|---|--|--|--|----------------|
| centimeter                              | cm                    | Alaska Administrative Code                | AAC  | all standard mathematical signs, symbols and abbreviations |  |                |
| deciliter                               | dL                    | all commonly accepted abbreviations       | e.g., Mr., Mrs., AM, PM, etc.                    | alternate hypothesis                                       | H <sub>A</sub>                                 |                |
| gram                                    | g                     | all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc.                     | base of natural logarithm                                  | <i>e</i>                                       |                |
| hectare                                 | ha                    |   |  | catch per unit effort                                      | CPUE   |                |
| kilogram                                | kg                    |   |  | coefficient of variation                                   | CV   |                |
| kilometer                               | km                    | at  | @  | common test statistics                                     | (F, t, $\chi^2$ , etc.)                        |                |
| liter                                   | L                     |   |  | confidence interval  | CI   |                |
| meter                                   | m                     |   |  | correlation coefficient                                    | (multiple)                                     | R              |
| milliliter                              | mL                    | compass directions:                       |  | correlation coefficient                                    | (simple)                                       | r              |
| millimeter                              | mm                    | east                                      | E  | covariance   | cov  |                |
| Weights and measures (English)          |                       | north                                     | N  | degree (angular)   | °  |                |
|   | cubic feet per second | ft³/s                                     | south  | S  | degrees of freedom                             | df             |
|   | foot                  | ft  | west   | W  | expected value                                 | <i>E</i>       |
|   | gallon                | gal                                       | copyright  | ©  | greater than                                   | >              |
|   | inch                  | in  | corporate suffixes:                              |  | greater than or equal to                       | ≥              |
|   | mile                  | mi  | Company  | Co.  | harvest per unit effort                        | HPUE           |
|   | nautical mile         | nmi                                       | Corporation                                      | Corp.  | less than                                      | <              |
|   | ounce                 | oz  | Incorporated                                     | Inc.   | less than or equal to                          | ≤              |
|   | pound                 | lb  | Limited  | Ltd.   | logarithm (natural)                            | ln             |
|   | quart                 | qt  | District of Columbia                             | D.C.   | logarithm (base 10)                            | log            |
| yard                                    | yd                    | et alii (and others)                      | et al.   | logarithm (specify base)                                   | log <sub>2</sub> , etc.                        |                |
| Time and temperature                    |                       | et cetera (and so forth)                  | etc.   | minute (angular)   | '  |                |
|   |                       | exempli gratia                            | e.g.   | not significant  | NS   |                |
|   | day                   | d   | Federal Information Code                         | FIC  | null hypothesis                                | H <sub>0</sub> |
|   | degrees Celsius       | °C  | id est (that is)                                 | i.e.   | percent  | %              |
|   | degrees Fahrenheit    | °F  | latitude or longitude                            | lat or long  | probability                                    | P              |
|   | degrees kelvin        | K   | monetary symbols                                 |  | probability of a type I error                  |                |
|   | hour                  | h   | (U.S.)   | \$, ¢  | (rejection of the null hypothesis when true)   | $\alpha$       |
|   | minute                | min                                       | months (tables and figures): first three letters | Jan,...,Dec  | probability of a type II error                 |                |
|   | second                | s   | registered trademark                             | ®  | (acceptance of the null hypothesis when false) | $\beta$        |
|   | Physics and chemistry |   | trademark  | ™  | second (angular)                               | "              |
| all atomic symbols                      |                       |   | United States                                    |  | standard deviation                             | SD             |
| alternating current                     |                       | AC  | (adjective)                                      | U.S.   | standard error                                 | SE             |
| ampere                                  |                       | A   | United States of America (noun)                  | USA  | variance                                       |                |
| calorie                                 |                       | cal                                       | U.S.C.   | United States Code   | population                                     | Var            |
| direct current                          |                       | DC  | U.S. state                                       | use two-letter abbreviations                               | sample   | var            |
| hertz                                   |                       | Hz  |  | (e.g., AK, WA)   |  |                |
| horsepower                              |                       | hp  |  |  |  |                |
| hydrogen ion activity (negative log of) |                       | pH  |  |  |  |                |
| parts per million                       |                       | ppm                                       |  |  |  |                |
| parts per thousand                      | ppt, ‰                |   |  |  |  |                |
| volts                                   | V                     |   |  |  |  |                |
| watts                                   | W                     |   |  |  |  |                |

***SPECIAL PUBLICATION NO. 24-09***

**RUN FORECASTS AND HARVEST PROJECTIONS FOR 2024 ALASKA  
SALMON FISHERIES AND REVIEW OF THE 2023 SEASON**

Edited by

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April 2024

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*This document should be cited as follows:*

*Donnellan, S. J., and A. R. Munro, editors. 2024. Run forecasts and harvest projections for 2024 Alaska salmon fisheries and review of the 2023 season. Alaska Department of Fish and Game, Special Publication No. 24-09, Anchorage.*

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## DEFINITION OF TERMS

|  |   |
|--|---|
| Biological escapement goal                     | The number of salmon in a particular stock that the Alaska Department of Fish and Game has determined should be allowed to escape the fishery to spawn to achieve the maximum yield (human use). This determination is based on biological information about the fish stock in question. See 5 AAC 39.222(f)(3). (Also see <i>optimum escapement goal</i> .)  |
| Commercial common property harvest             | Harvests taken by traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and sale of confiscated fish.  |
| Commercial harvest                             | Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.   |
| Common property harvest                        | Harvests taken by the commercial common property fisheries, as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost-recovery harvests.  |
| Cost-recovery harvest                          | Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.  |
| Enhanced salmon stock, runs                    | Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques. See 5 AAC 39.222(f)(9).  |
| Escapement, spawning population, or broodstock | The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery. See 5 AAC 39.222(f)(10)).   |
| Harvest projections or harvest outlooks        | Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.   |
| Optimal escapement goal                        | The number of salmon in a particular stock that should be allowed to spawn to both achieve sustainable runs based on biological needs of the stock and meet social and allocative needs. See 5 AAC 39.222(f)(25).   |
| Return   | Return refers to an aggregation of salmon over several or more years that represent the surviving adult offspring from a single brood year. See 5 AAC 39.222(f)(30).  |
| Run forecast                                   | Forecasts of a run (harvest + escapement) are estimates of the fish that will return in a given year based on such information as parent-year escapements, subsequent fry abundance, and spring seawater temperatures. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.   |
| Salmon run                                     | Run refers to the total number of mature fish returning in a given year from ocean-rearing areas to spawn. See 5 AAC 39.222(f)(31).   |
| Sustainable escapement goal                    | Sustainable escapement goal is defined as a level of escapement, indicated by an index or a range of escapement estimates, that is known to have provided for sustained yield over a 5- to 10-year period. A sustainable escapement goal is used in situations where a biological escapement goal cannot be estimated due to the absence of a stock-specific catch estimate. See 5 AAC 39.222(f)(36). |

## ABSTRACT

This report contains salmon run forecasts and harvest projections for 2024 as well as a detailed review of Alaska's 2023 commercial salmon season. The Alaska all-species salmon harvest for 2023 totaled approximately 232.4 million fish, about 43.0 million more fish than the preseason forecast of 189.4 million fish. This combined harvest was composed of approximately 236,000 Chinook (*Oncorhynchus tshawytscha*), 51.9 million sockeye (*O. nerka*), 2.6 million coho (*O. kisutch*), 154.9 million pink (*O. gorbuscha*), and 22.7 million chum salmon (*O. keta*). The Alaska Department of Fish and Game is expecting a decrease in commercial salmon harvests in 2024. The 2024 total commercial salmon harvest (all species) projection of 135.7 million fish is expected to include approximately 169,000 Chinook salmon, 39.5 million sockeye salmon, 2.6 million coho salmon, 69.0 million pink salmon, and 24.3 million chum salmon. Compared to 2023 commercial harvests, the projected 2024 commercial harvests are expected to be as follows: 85.8 million fewer pink salmon, 12.4 million fewer sockeye salmon, 15,000 more coho salmon, and 1.6 million more chum salmon.

Keywords: pink salmon, *Oncorhynchus gorbuscha*, sockeye salmon, *O. nerka*, chum salmon, *O. keta*, Chinook salmon, *O. tshawytscha*, coho salmon, *O. kisutch*, catch projection, run forecast, harvest projection, smolt outmigrations, sibling age classes, hatchery releases, fishing effort, salmon management

## INTRODUCTION

This report contains salmon run forecasts and harvest projections for 2024 as well as a review of Alaska's 2023 commercial salmon season. Salmon escapement and harvest estimates reported in this document were summarized from the Alaska Department of Fish and Game (ADF&G) escapement and fish ticket databases. Data provided in this report supersede any data previously published. Detailed area specific harvest and escapement summaries can be found in Area Management Reports.

ADF&G is expecting a decrease in overall commercial salmon harvest in 2024, mostly due to a decrease in pink salmon *Oncorhynchus gorbuscha* harvests compared to 2023. The 2024 total commercial salmon harvest (all species) projection of 135.7 million fish is expected to include approximately 169,000 Chinook salmon *O. tshawytscha*, 39.5 million sockeye salmon *O. nerka*, 2.6 million coho salmon *O. kisutch*, 69.0 million pink salmon, and 24.3 million chum salmon *O. keta*. Compared to 2023 commercial harvests, the projected 2024 commercial harvests are expected to be as follows: 85.8 million fewer pink salmon, 12.4 million fewer sockeye salmon, 15,000 more coho salmon, and 1.6 million more chum salmon.

There is a great deal of uncertainty in forecasting pink salmon returns due to their fixed 2-year life history and therefore limited information to serve as the basis for predictions (i.e., no siblings returning during prior years). As a result, pink salmon harvest forecasts are generally based on harvests from previous brood years. A notable exception is Southeast Alaska where a joint ADF&G and National Oceanic and Atmospheric Administration (NOAA) survey and juvenile pink salmon outmigration index is the basis for predicting harvests the following year. During recent decades, Alaska-wide pink salmon returns have tended to be larger during odd years than during adjacent even years, although there is much regional variation to this trend.

Table 1 shows specific harvest projection numbers by species and fishing area, and the "Preliminary Forecasts" section of this document provides forecast details for specific runs by area. When the appropriate data were available, harvest forecasts were arrived at through quantitative projections based on information of previous spawning levels, smolt outmigrations, returns of sibling age classes, and survival rates for hatchery releases. Other projections were based on averages of recent harvests. Fishing effort influences harvests, and effort is partly determined

by market conditions in addition to the size of salmon runs. Therefore, these projections may not be indicative of actual harvests.

Except for the Southeast Alaska Chinook salmon fisheries, the South Peninsula June fisheries, and salmon fisheries in the Exclusive Economic Zone (EEZ) of Cook Inlet, Alaska salmon management will be based on inseason estimates of salmon run strength. Alaska fishery managers have the primary goal of maintaining spawning population sizes, not of reaching preseason harvest projections.

Salmon productivity, survival, and resulting returns are probably influenced by many freshwater and marine drivers including spawning escapements, hatchery releases, temperature, and complex trophic interactions such as prey availability, predation, and competition. Although a review of this topic is well beyond the scope of this report, NOAA's Ecosystem Status Reports provide a summary of recent physical and ecological conditions encountered by a variety of species in the North Pacific, including salmon during their marine phase (Ferriss 2023, Siddon 2023; available at <https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands>).

Table 1.—Projections of 2024 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

| Region & Area                    | Species          |                     |                  |                  |                    | Total                |
|----------------------------------|------------------|---------------------|------------------|------------------|--------------------|----------------------|
|                                  | Chinook          | Sockeye             | Coho             | Pink             | Chum               |                      |
| Southeast Alaska                 |                  |                     |                  |                  |                    |                      |
| Natural production               |                  | 814 <sup>a</sup>    | 931 <sup>a</sup> | 19,000           | 1,470              | 22,215               |
| Hatchery production <sup>b</sup> |                  | 115                 | 603              | 739              | 14,859             | 16,316               |
| Southeast Region total           | 169 <sup>c</sup> | 929                 | 1,534            | 19,739           | 16,329             | 207,431              |
| Prince William Sound             |                  |                     |                  |                  |                    |                      |
| Natural production               | 20               | 1,596 <sup>d</sup>  | 144 <sup>a</sup> | 6,447            | 639                | 8,845                |
| Hatchery production <sup>e</sup> |                  | 875                 | 109              | 26,472           | 3,739              | 31,195               |
| Lower Cook Inlet                 |                  |                     |                  |                  |                    |                      |
| Natural production               | 0 <sup>a</sup>   | 158 <sup>a</sup>    | 1                | 552              | 35 <sup>a</sup>    | 746                  |
| Hatchery production              |                  | 207 <sup>f</sup>    | 9                | 517              |                    | 733                  |
| Upper Cook Inlet                 | NA <sup>g</sup>  | NA <sup>h</sup>     | 127 <sup>a</sup> | 320 <sup>a</sup> | 91 <sup>a</sup>    | NA <sup>h</sup>      |
| Bristol Bay                      | 13 <sup>a</sup>  | 26,110              | 56 <sup>a</sup>  | 500 <sup>i</sup> | 508 <sup>a</sup>   | 27,187               |
| Central Region total             | 34               | 28,949 <sup>h</sup> | 446              | 34,808           | 5,011              | 69,248 <sup>h</sup>  |
| Kodiak                           |                  |                     |                  |                  |                    |                      |
| Natural production               | 10 <sup>a</sup>  | 2,775 <sup>j</sup>  | 226 <sup>a</sup> | 5,416            | 455 <sup>a</sup>   | 8,882                |
| Hatchery production <sup>k</sup> |                  | 206                 | 55               | 3,410            | 138                | 3,809                |
| Chignik                          | 2 <sup>a</sup>   | 1,582 <sup>l</sup>  | 85 <sup>a</sup>  | 307 <sup>i</sup> | 76 <sup>a</sup>    | 2,053                |
| South Peninsula                  | 17 <sup>a</sup>  | 2,688 <sup>a</sup>  | 257 <sup>a</sup> | 5,307            | 1,260 <sup>a</sup> | 9,529                |
| North Peninsula                  | 2 <sup>a</sup>   | 2,363 <sup>a</sup>  | 26 <sup>a</sup>  | 20 <sup>i</sup>  | 84 <sup>a</sup>    | 2,495                |
| Westward Region total            | 31               | 9,614               | 649              | 14,460           | 2,013              | 26,767               |
| Arctic-Yukon-Kuskokwim total     | 0                | 0                   | 15               | 75               | 938                | 1,028                |
| Statewide total                  | 233              | 39,492 <sup>g</sup> | 2,644            | 69,082           | 24,291             | 135,573 <sup>g</sup> |

Note: En dashes indicate no projection and zeros indicate projection of <500 fish. Columns and rows may not total exactly due to rounding.

<sup>a</sup> Average harvest of the previous 5 years (2019–2023).

<sup>b</sup> Hatchery salmon projections made by Southern Southeast Regional Aquaculture Association, Northern Southeast Regional Aquaculture Association, Douglas Island Pink and Chum, Armstrong-Keta Inc., and Metlakatla Indian Community less broodstock (5-year average), and excess. Wild chum salmon catch estimated as 9% of total catch.

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Table 1.—Page 2 of 2.

- <sup>c</sup> The allowable catch of Chinook salmon in Southeast Alaska is determined by the Pacific Salmon Commission.
- <sup>d</sup> Includes formal natural harvest estimates for Prince William Sound and Copper/Bering River Districts.
- <sup>e</sup> Hatchery salmon projections made by Prince William Sound Aquaculture Corporation and Valdez Fisheries Development Association. Gulkana Hatchery projection made by ADF&G, less broodstock (5-year average).
- <sup>f</sup> Hatchery salmon projections made by Cook Inlet Aquaculture Corporation minus broodstock (5-year average).
- <sup>g</sup> An Upper Cook Inlet Chinook salmon harvest forecast is not available for 2024.
- <sup>h</sup> Upper Cook Inlet commercial harvest forecast for sockeye salmon is not available. Central Region and Statewide totals include 3.72 million fish available for harvest to all user groups.
- <sup>i</sup> Average of previous 5 even-year harvests (2014–2022).
- <sup>j</sup> Total Kodiak harvest of natural run sockeye salmon includes projected harvests from formally forecasted systems, projected Chignik harvest at Cape Igvak, and projected harvest from additional minor systems.
- <sup>k</sup> Hatchery projections made by Kodiak Regional Aquaculture Association (KRAA), minus estimates of broodstock. Sockeye salmon hatchery projections include enhanced Spiridon Lake sockeye salmon run harvest forecast and other KRAA projections.
- <sup>l</sup> Chignik sockeye salmon harvest estimate based on a formal forecast with projected harvest at Igvak and Southeastern District Mainland excluded.

The Alaska all-species salmon harvest for 2023 totaled approximately 232.4 million fish, about 43.0 million more fish than the preseason forecast of 189.4 million fish. This combined harvest was composed of approximately 236,000 Chinook, 51.9 million sockeye, 2.6 million coho, 154.9 million pink, and 22.7 million chum salmon. Table 2 shows 2023 harvest numbers by salmon species and fishing area in units of thousands of fish harvested, and Table 3 provides this information in units of thousands of whole pounds harvested. Tables 4–7 provide detailed information on the 2023 harvest by area and species.

Table 2.—2023 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

| Fishing area                                       | Species |         |       |         |        | Total   |
|--|---------|---------|-------|---------|--------|---------|
|  | Chinook | Sockeye | Coho  | Pink    | Chum   |         |
| Southeast Region Total <sup>a,b,c</sup>            | 189     | 937     | 1,807 | 47,863  | 15,821 | 66,618  |
| Prince William Sound <sup>a,d</sup>                | 11      | 1,956   | 192   | 60,304  | 4,065  | 66,528  |
| Lower Cook Inlet <sup>e,f</sup>                    | 0       | 350     | 1     | 2,664   | 39     | 3,056   |
| Upper Cook Inlet <sup>f,g</sup>                    | 1       | 1,574   | 84    | 66      | 126    | 1,851   |
| Bristol Bay <sup>g</sup>                           | 8       | 40,579  | 18    | 3       | 342    | 40,950  |
| Central Region Total                               | 20      | 44,460  | 294   | 63,037  | 4,573  | 112,385 |
| Kodiak Area <sup>f,g</sup>                         | 11      | 2,558   | 266   | 24,744  | 828    | 28,408  |
| Chignik <sup>g</sup>                               | 2       | 1,070   | 53    | 2,144   | 110    | 3,378   |
| South Peninsula <sup>f,g</sup>                     | 11      | 1,741   | 198   | 17,100  | 1,131  | 20,181  |
| North Peninsula                                    | 1       | 1,148   | 6     | 25      | 92     | 1,272   |
| Westward Region Total                              | 26      | 6,517   | 523   | 44,013  | 2,161  | 53,240  |
| Arctic-Yukon-Kuskokwim Region Total <sup>f,g</sup> | —       | 0       | 5     | 4       | 158    | 167     |
| Total Alaska                                       | 236     | 51,915  | 2,629 | 154,917 | 22,712 | 232,409 |

Note: En dashes indicate no harvest, and zeros indicate harvest activity but <500 fish. Columns may not total exactly due to rounding. Confidential data omitted.

- <sup>a</sup> Chinook salmon adults and jacks are totaled.
- <sup>b</sup> Catch accounting period for the 2023 Chinook salmon troll season spans from October 1, 2022, to September 30, 2023.
- <sup>c</sup> Total includes fish that were confiscated, harvested in sport fisheries derbies and later sold, and harvested in test fisheries.
- <sup>d</sup> Total includes hatchery sales for operating expenses and broodstock harvests.
- <sup>e</sup> Total includes hatchery sales for operating expenses and hatchery donated fish but not broodstock.
- <sup>f</sup> Total includes commercially harvested fish retained for personal use.
- <sup>g</sup> Total includes commercial harvest that was discarded, confiscated, seized, or donated.

Table 3.—2023 Alaska commercial salmon harvests, by fishing area and species, in thousands of whole lb.

| Fishing area                                       | Species |         |        |         |         | Total   |
|--|---------|---------|--------|---------|---------|---------|
|  | Chinook | Sockeye | Coho   | Pink    | Chum    |         |
| Southeast Region Total <sup>a,b,c</sup>            | 2,537   | 5,300   | 10,440 | 146,538 | 102,263 | 267,077 |
| Prince William Sound <sup>a,d</sup>                | 180     | 10,711  | 1,453  | 176,716 | 33,550  | 222,610 |
| Lower Cook Inlet <sup>e,f</sup>                    | 3       | 1,668   | 4      | 7,903   | 245     | 9,823   |
| Upper Cook Inlet <sup>a,f,g</sup>                  | 10      | 8,671   | 436    | 233     | 836     | 10,187  |
| Bristol Bay <sup>g</sup>                           | 85      | 228,126 | 103    | 10      | 2,037   | 230,361 |
| Central Region Total                               | 279     | 249,175 | 1,997  | 184,862 | 36,668  | 472,981 |
| Kodiak Area <sup>f,g</sup>                         | 60      | 12,153  | 1,674  | 77,600  | 5,644   | 97,131  |
| Chignik <sup>g</sup>                               | 19      | 6,422   | 271    | 6,244   | 725     | 13,680  |
| South Peninsula <sup>f,g</sup>                     | 102     | 9,466   | 1,109  | 53,316  | 7,314   | 71,307  |
| North Peninsula                                    | 17      | 5,986   | 33     | 87      | 640     | 6,764   |
| Westward Region Total                              | 197     | 34,027  | 3,087  | 137,247 | 14,323  | 188,881 |
| Arctic-Yukon-Kuskokwim Region Total <sup>f,g</sup> | —       | 0       | 5      | 4       | 158     | 167     |
| Total Alaska                                       | 3,013   | 288,502 | 15,529 | 468,651 | 153,412 | 929,107 |

Note: Dashes indicate no harvest, and zeros indicate harvest activity but <500 fish. Columns may not total exactly due to rounding.

Confidential data omitted.

<sup>a</sup> Chinook salmon adults and jacks are totaled.

<sup>b</sup> Catch accounting period for the 2023 Chinook salmon troll season goes from October 1, 2022, to September 30, 2023.

<sup>c</sup> Total includes fish that were confiscated, harvested in sport fish derbies and later sold, and harvested in test fisheries.

<sup>d</sup> Total includes hatchery sales for operating expenses and broodstock harvests.

<sup>e</sup> Total includes hatchery sales for operating expenses and hatchery donated fish but not broodstock.

<sup>f</sup> Total includes commercially harvested fish retained for personal use.

<sup>g</sup> Total includes harvest that was discarded, confiscated, seized, or donated.

Inseason harvest information, postseason statistics, and other information about salmon in Alaska can be found online on at <http://www.adfg.alaska.gov/index.cfm?adfg=fishingCommercial.main>.

ADF&G's 4 major commercial fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) are shown in Figure 1. These regions supersede any references to ADF&G's former statistical regions.



Figure 1.—The 4 ADF&G fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Division of Commercial Fisheries.

# REVIEW OF THE 2023 ALASKA COMMERCIAL SALMON FISHERIES

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## SOUTHEAST REGION

### SOUTHEAST ALASKA AND YAKUTAT AREAS

The combined 2023 Southeast Alaska and Yakutat (SEAK) Area cumulative commercial salmon harvest, including hatchery cost recovery, was more than 66.6 million fish (Table 4). Of this total, commercial common property harvest contributed approximately 59.2 million fish (89% of the total harvest). The overall harvest in numbers of salmon was more than double the 2022 harvest and 7.7 million fish larger than the 2021 harvest. The total commercial harvest proportions by species were: <1% Chinook, 1% sockeye, 3% coho, 72% pink, and 24% chum salmon. The all-species total harvest was 46% greater than the recent 10-year average (2013–2022) of 45.6 million fish and 50% larger than the long-term average (1962–2022) of 40.3 million fish.

#### Chinook Salmon

*Harvest Summary:* The 2023 Chinook salmon harvest of 189,000 fish was below both recent 10-year (258,000 fish) and long-term (292,000 fish) averages. Preliminary harvest estimates of coastwide Chinook salmon accountable under the Pacific Salmon Treaty included 136,300 fish by troll gear, 9,200 fish by purse seine gear, and under 2,000 fish by gillnet gear. In 2023, a total of 33,800 Alaska hatchery-origin Chinook salmon were commercially harvested in SEAK common property fisheries and approximately 4,000 hatchery-origin Chinook salmon were harvested in private hatchery cost-recovery fisheries.

#### Sockeye Salmon

*Harvest Summary:* The 2023 commercial harvest of sockeye salmon of about 937,000 fish was below both recent 10-year and long-term averages. The SEAK purse seine fishery harvest of 505,000 fish accounted for approximately 54% of the regional total sockeye salmon harvest. The drift gillnet fishery harvest of 316,000 fish accounted for 34% of the regional total sockeye salmon harvest. The set gillnet fishery harvest of 40,000 fish accounted for 4% of the regional total sockeye salmon harvest.

#### Coho Salmon

*Harvest Summary:* The 2023 coho salmon harvest of approximately 1.8 million fish was below both recent 10-year and long-term averages. The coho salmon harvest in the troll fishery was approximately 1.1 million fish and accounted for 58% of the regional coho salmon harvest. The total drift gillnet harvest of 150,000 fish accounted for approximately 8% of the regional coho salmon harvest, and the set gillnet harvest of 80,000 fish accounted for 4% of the regional coho salmon harvest. The total purse seine harvests of 253,000 fish accounted for 14% of the regional coho salmon harvest.



## **Pink Salmon**

*Harvest Summary:* The 2023 commercial pink salmon harvest was just over 47.8 million fish and was more than 2.5 times the preseason forecast of 19 million fish. Approximately 72% of the total regional salmon harvest was comprised of pink salmon. Most of the commercially harvested pink salmon in the SEAK Area were harvested in the purse seine fishery (44.8 million fish, 94%). The 2023 SEAK pink salmon harvest was limited by processor capacity and market conditions, otherwise it likely would have been higher.

## **Chum Salmon**

*Harvest Summary:* The 2023 SEAK chum salmon harvest was 15.8 million fish, 65% greater than the recent 10-year average of 9.5 million fish. Most commercial chum salmon fishing opportunity in the SEAK Area is attributable to hatchery production. During the 2023 commercial fishing season, just under 7.2 million chum salmon were harvested in the purse seine fishery (45% of the regional total), 3.5 million fish were harvested in the drift gillnet fishery (22%), and 4.4 million chum salmon were harvested through hatchery cost recovery efforts.

Summary by Troy Thynes, Southeast Region Salmon/Herring Fisheries Management Coordinator, ADF&G, Petersburg.

Table 4.—2023 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

| Fishery                          | Species                |         |       |        |        | Total  |
|----------------------------------|------------------------|---------|-------|--------|--------|--------|
|                                  | Chinook <sup>a,b</sup> | Sockeye | Coho  | Pink   | Chum   |        |
| Purse seine                      |                        |         |       |        |        |        |
| Southern purse seine traditional | 11                     | 422     | 199   | 33,357 | 3,472  | 37,461 |
| Northern purse seine traditional | 0                      | 72      | 49    | 10,976 | 961    | 12,058 |
| Hatchery terminal                | 11                     | 11      | 5     | 426    | 2,722  | 3,175  |
| Total purse seine                | 23                     | 505     | 253   | 44,759 | 7,155  | 52,694 |
| Drift gillnet                    |                        |         |       |        |        |        |
| Tree Point                       | 1                      | 23      | 22    | 157    | 418    | 621    |
| Prince of Wales                  | 1                      | 42      | 42    | 126    | 179    | 391    |
| Stikine                          | 1                      | 6       | 21    | 29     | 105    | 162    |
| Taku-Snettisham                  | 1                      | 80      | 21    | 130    | 623    | 853    |
| Lynn Canal                       | 0                      | 153     | 25    | 109    | 695    | 982    |
| Drift gillnet hatchery terminal  | 13                     | 12      | 19    | 87     | 1,469  | 1,599  |
| Total drift gillnet              | 16                     | 316     | 150   | 637    | 3,490  | 4,609  |
| Set gillnet (Yakutat)            | 0                      | 40      | 80    | 10     | 0      | 130    |
| Troll                            |                        |         |       |        |        |        |
| Hand troll                       |                        |         |       |        |        |        |
| Traditional                      | 4                      | 0       | 26    | 2      | 1      | 32     |
| Hatchery terminal                | 1                      | 0       | 2     | 9      | 88     | 99     |
| Spring areas                     | 1                      | 0       | 1     | 6      | 8      | 16     |
| Total hand troll                 | 5                      | 0       | 28    | 16     | 97     | 147    |
| Power troll                      |                        |         |       |        |        |        |
| Traditional                      | 120                    | 1       | 1,024 | 74     | 259    | 1,478  |
| Hatchery terminal                | 2                      | 0       | 2     | 9      | 88     | 101    |
| Spring areas                     | 16                     | 0       | 1     | 6      | 8      | 31     |
| Total power troll                | 137                    | 2       | 1,026 | 88     | 355    | 1,609  |
| Total troll                      | 143                    | 2       | 1,055 | 104    | 453    | 1,756  |
| Annette Island Reservation       |                        |         |       |        |        |        |
| Seine                            | 1                      | 8       | 5     | 1,350  | 144    | 1,508  |
| Drift gillnet                    | 1                      | 6       | 18    | 131    | 116    | 272    |
| Troll                            | 1                      | 0       | 3     | 1      | 0      | 4      |
| Hand troll                       | 0                      | 0       | 2     | 0      | 0      | 3      |
| Power troll                      | 1                      | —       | 0     | 0      | 0      | 1      |
| Trap                             | —                      | —       | —     | —      | —      | —      |
| Total Annette Island Reservation | 2                      | 14      | 28    | 1,482  | 260    | 1,788  |
| Hatchery cost recovery           | 4                      | 59      | 237   | 843    | 4,436  | 5,579  |
| Miscellaneous <sup>c</sup>       | 1                      | 2       | 3     | 30     | 28     | 63     |
| Southeast Region Total           | 189                    | 937     | 1,807 | 47,863 | 15,821 | 66,618 |

Note: En dashes indicate no harvest, and zeros indicate harvest activity but <500 fish. Columns may not total exactly due to rounding.

<sup>a</sup> Chinook salmon adults and jacks are totaled.

<sup>b</sup> Catch accounting period for the 2023 Chinook salmon troll season spans from October 1, 2022, to September 30, 2023.

<sup>c</sup> Includes fish that were confiscated, harvested in sport fishery derbies and later sold, and harvested in test fisheries.

## CENTRAL REGION

### PRINCE WILLIAM SOUND AREA

The 2023 cumulative Prince William Sound (PWS) Area commercial common property fishery (CCPF) and hatchery cost recovery salmon harvest was 66.5 million fish (Table 5). Overall harvest was composed of approximately 11,000 Chinook, 2.0 million sockeye, 192,000 coho, 60.3 million pink, and 4.0 million chum salmon. The CCPF accounted for 79% (52.9 million fish) of the total harvest; the remaining 21% of the harvest (13.6 million fish) was attributed to hatchery cost recovery fisheries and broodstock collection.

#### Chinook Salmon

*Run and Escapement Summary:* The 2023 preseason common property fishery (CPF) harvest forecast for the Copper River District was 25,000 Chinook salmon. Preliminary Chinook salmon abundance estimates indicated spawning escapement was above the upper bound of the sustainable escapement goal (SEG) range of 31,000 fish.

*Harvest Summary:* The CCPF harvest of 11,000 Chinook salmon in the Copper River District was approximately 9% below the 10-year (2013–2022) average harvest of 12,000 fish.

#### Sockeye Salmon

*Run and Escapement Summary:* The 2023 preseason CCPF harvest forecast for the Copper River District was 716,000 sockeye salmon. Gulkana Hatchery was projected to contribute 31,000 fish to this CCPF harvest projection.

The 2023 Miles Lake sonar passage was under 992,000 salmon, which was within the inriver run goal range of 656,000–1,046,000 fish. Considering preliminary projections of inriver harvest, the Upper Copper River sockeye salmon SEG range of 360,000–750,000 fish was likely achieved. Sockeye salmon escapement to the Copper River Delta was approximately 66,000 fish, which was within the SEG range of 55,000–130,000 fish.

The 2023 forecast of the sockeye salmon run to Coghill Lake was 453,000 fish, with 423,000 fish available for CPF harvest. Approximately 64,000 sockeye salmon passed through the Coghill River weir, which was within the SEG range of 20,000–75,000 fish.

Prince William Sound Aquaculture Corporation (PWSAC) forecasted a run of approximately 934,000 Main Bay Hatchery enhanced sockeye salmon in 2023.

*Harvest Summary:* The 2023 Copper River District CCPF sockeye salmon harvest of 862,000 fish was approximately 10% less than the recent 10-year average harvest of 961,000 fish. Wild sockeye salmon accounted for 94% (810,000 fish) of the CCPF harvest in the Copper River District. Of the remainder, 5% (43,000 fish) were from the Gulkana Hatchery, and more than 1% (9,400 fish) were from the Main Bay hatchery. The Gulkana Hatchery CCPF harvest was the 6th lowest harvest in the last 10 years.

The Coghill District sockeye salmon CCPF harvest of 233,000 fish was 83% wild fish, which was 43% above the recent 10-year average of 163,000 wild fish.

The CCPF harvest of sockeye salmon in the Eshamy District gillnet fishery (drift gillnet and setnet) was 527,000 fish. The proportion of wild sockeye salmon harvested in the Eshamy District CCPF was 15%. PWSAC harvested approximately 228,000 sockeye salmon for cost recovery.

The Unakwik District CCPF gillnet harvest (drift and set) of sockeye salmon was approximately 19,000 fish, more than 3 times the 10-year average harvest of 5,600 fish.

## **Coho Salmon**

*Run and Escapement Summary:* The Copper River District's 2023 preseason CCPF harvest forecast was 213,000 coho salmon. The Copper River Delta sum of peak escapement counts of approximately 44,000 fish was within the SEG range of 32,000–50,000 fish. The Bering River District coho salmon spawning escapement estimate of almost 21,000 fish was within the SEG range of 13,000–25,000 fish.

PWSAC forecasted a 2023 run of 122,000 coho salmon to Wally Noerenberg Hatchery.

The Valdez Fisheries Development Association (VFDA) enhanced coho salmon forecast was 79,900 fish, which yields a projected CCPF harvest of 35,000 fish.

*Harvest Summary:* The season total CCPF drift gillnet coho salmon harvest in the Copper River District of 134,000 fish was 37% below the 10-year average of almost 213,000 fish. Similarly, the Bering River District CCPF drift gillnet harvest of approximately 25,000 coho salmon was 58% below the 10-year average harvest of 60,000 fish.

The Coghill District coho salmon CCPF harvest (purse seine and drift gillnet) of 8,200 fish was approximately 81% below the 10-year average of under 43,000 fish. Coho salmon harvest in the Eastern District was just under 5,000 fish, much lower than the VFDA preseason forecasted harvest of 35,000 fish.

Enhanced coho salmon from VFDA are managed primarily through a recreational fishery, but the commercial fleet inadvertently harvests them throughout PWS. The CCPF harvest of VFDA coho salmon is unknown due to the absence of otolith sampling. However, it is assumed that VFDA coho salmon compose a significant proportion of coho salmon harvest in the Eastern District purse seine fishery.

## **Pink Salmon**

*Run and Escapement Summary:* The 2023 pink salmon season consisted of a strong PWSAC run, a VFDA run that came in as forecasted, and a wild stock run that came in significantly lower than anticipated. The pink salmon forecast was for a total run of 64.8 million fish, apportioned among 3 returns: 31% VFDA, 37% PWSAC, and 31% wild. The projected harvest after accounting for wild escapement, cost recovery, and broodstock was 55.3 million pink salmon.

The total observed run in 2023 was 60.7 million pink salmon, 6% below forecast. The run composition was as follows: 36% VFDA, 44% PSWAC, and 20% wild. Composition estimates are based on otolith contributions. Pink salmon escapement goals were met in 7 of 8 PWS districts.

Combined with an aerial escapement index of 1.9 million fish, the estimated wild pink salmon return in 2023 was approximately 12.2 million fish, which is above the 5-year, odd-year (2013–2021) average return of 4.6 million wild fish. The total run of 26.9 million PSWAC pink salmon was 11% above the forecast and 3.8% below the odd-year average of 27.9 million fish. In total, 32% (approximately 8.6 million fish) of the PWSAC run was collected for cost recovery and broodstock. The total run of nearly 21.6 million VFDA pink salmon was 6% above forecast and 21% above the odd-year average of approximately 17.8 million fish. In total, 15% (3.2 million fish) of the VFDA run was collected for cost recovery and broodstock.

*Harvest Summary:* The 2023 PWS pink salmon harvest (including all CCPF harvest, hatchery cost recovery, broodstock, and raceway sales) was 60.3 million fish, 4% above the odd-year average of 58.1 million fish. Approximately 46.4 million fish were harvested in the purse seine CCPF compared to the odd-year average CCPF purse seine harvest of 49.3 million fish. The number of permits fished in the PWS purse seine fishery increased from 205 permits in 2022 to 213 permits in 2023. This season was also the second season dual permits were allowed to operate in PWS. Under a dual permit operation, 2 PWS purse seine permit holders may concurrently fish from the same vessel and jointly operate up to 250 fathoms, in aggregate, of seine and lead. There were an estimated 27 dual permit operations in PWS for the 2023 season.

Pink salmon CCPF drift gillnet harvest in the Coghill District was 213,000 fish. The proportion of wild pink salmon in the Coghill District CCPF harvest was 6%.

In the Eshamy District, approximately 140,000 pink salmon were harvested in the CCPF gillnet (drift gillnet and setnet) fishery. The proportion of wild pink salmon in the Eshamy District CCPF harvest was 100%.

## **Chum Salmon**

*Run and Escapement Summary:* The 2023 chum salmon total run forecast was approximately 3.4 million fish, with a commercial harvest forecast of under 2.3 million fish. Most of the total run forecast, 3.0 million fish (88%), was attributed to PWSAC hatchery production. Approximately 190,000 fish returned to the Armin F. Koernig hatchery (AFK) and 650,000 fish returned to Port Chalmers Subdistrict to be available for drift gillnet fisheries. Based on the department's wild stock chum salmon forecast of 389,000 fish, there was a total commercial harvest forecast of 220,000 wild chum salmon. Managing for each district's escapement goal, the department's objective was to secure a combined escapement total of 228,000 wild chum salmon to all 5 districts.

Chum salmon escapement was met in the Eastern and Northern Districts and was below the lower bound SEGs in the Coghill, Northwestern, and Southeastern Districts. Poor weather conditions impacted aerial surveys and prevented later season surveys to the districts that did not make their SEGs.

*Harvest Summary:* The 2023 CCPF harvest of chum salmon was approximately 2.6 million fish, 13% above the preseason harvest forecast of 2.3 million fish and similar to the 10-year average harvest of 2.6 million fish. PWSAC harvested 1.4 million chum salmon for cost recovery and broodstock.

Based on contribution estimates, the CCPF harvest of enhanced chum salmon at the Port Chalmers remote release site was 1.1 million fish, which is well above the preseason forecast of 650,000 fish. In the Southwestern District, the CCPF harvest of enhanced chum salmon at AFK was 126,000 fish, 34% below the preseason forecast of 190,000 fish.

Summary by Heather Scannell, Jeremy Botz, and Matt Olson, Area Management Biologists, ADF&G, Cordova.

## LOWER COOK INLET AREA

The 2023 Lower Cook Inlet (LCI) Area commercial salmon harvest was 3.1 million fish. The harvest was composed of approximately 300 Chinook, 350,000 sockeye, 1,000 coho, 2.7 million pink, and 39,000 chum salmon (Table 5). Approximately 979,000 fish (32%) were harvested in the commercial fishery, and 2.1 million fish (68%) were harvested through hatchery cost recovery.

### Chinook Salmon

*Harvest Summary:* The 2023 harvest was approximately 300 Chinook salmon, which was below the 10-year average harvest of just under 550 fish. The set gillnet harvest for the Southern District (including homepack) was almost 200 fish, which was less than the 10-year average harvest of 380 fish. An additional 130 Chinook salmon were harvested by purse seine gear in the Southern and Outer Districts.

### Sockeye Salmon

*Run and Escapement Summary:* Cook Inlet Aquaculture Association (CIAA) forecasted a run of 32,000 sockeye salmon to the Kirschner Lake remote release site. CIAA also forecasted a total run of 89,900 sockeye salmon to Resurrection Bay facilities with all but 15,500 of these fish anticipated to be used for broodstock or cost-recovery purposes. An additional 75,400 fish were forecast to return to Kachemak Bay release sites with 64,500 of these fish anticipated to be used for cost recovery or brood harvest.

Sockeye salmon escapement in the Kamishak District was within the SEG ranges for Chenik Lake, and the Amakdedori River, and below the SEG range at Mikfik Lake.

Sockeye salmon escapements were within the SEG range for Delight Lake and above the SEG range for Desire Lake in the Outer District.

The estimated escapement of sockeye salmon through the Bear Creek weir of 10,000 fish was within the desired inriver passage goal range of 5,620–13,220 fish. This goal is the combination of the SEG range (700–8,300 fish) and the estimated 4,920 fish required for broodstock for the CIAA Resurrection Bay sockeye salmon program at the Trail Lakes Hatchery. CIAA harvested fewer broodstock than anticipated (over 2,000 fish), allowing approximately 8,000 sockeye salmon to remain in the lake and spawn naturally. This estimate is within the SEG range of 700–8,300 fish for this system. The only other index stock in the Eastern District is Aialik Lake, where the final escapement of approximately 6,500 fish was above the SEG range of 3,200–5,400 fish.

*Harvest Summary:* The 2023 CCPF purse seine harvest (including homepack) for the Southern District was under 76,000 sockeye salmon, which was higher than the 10-year average harvest of 54,000 fish. The set gillnet harvest (including homepack) for the Southern District was almost 20,000 fish, which was below the previous 10-year average harvest of just under 26,000 fish.

The Kamishak Bay District CCPF sockeye salmon harvest was confidential due to fewer than 3 permit holders reporting deliveries. The 10-year average harvest is 41,000 fish.

The Outer District harvest was less than 48,000 sockeye salmon, which was above the 10-year average harvest of almost 6,000 fish.

Due to small runs during the previous 10 years, no wild sockeye salmon were forecast to be available for commercial harvest from the Eastern District. Portions of Resurrection Bay were

open for commercial harvest from June 26 through July 14. The Eastern District commercial harvest was confidential due to fewer than 3 permit holders reporting deliveries.

### **Coho Salmon**

*Harvest Summary:* The 2023 purse seine harvest (including homepack) for the Southern District was less than 200 coho salmon, which is below the 10-year average harvest of 1,400 fish. The set gillnet harvest (including homepack) for the Southern District was 600 fish, which is less than the 10-year average harvest of 2,700 fish.

The Kamishak Bay District CCPF coho salmon harvest was confidential due to fewer than 3 permit holders reporting deliveries. The 10-year average harvest is 1,300 fish.

The Outer District harvest was less than 10 coho salmon, which was lower than the 10-year average harvest of 380 fish.

### **Pink Salmon**

*Run and Escapement Summary:* In the Southern District, the pink salmon SEGs for China Poot and Humpy Creeks were not achieved. The Tutka, Barabara, and Seldovia Creek SEGs were all achieved as was pink salmon escapement at the Port Graham River.

In the Kamishak Bay District, pink salmon escapement was above the SEG ranges for Sunday and Brown's Peak Creeks, and within the SEG range for the Bruin River.

In the Outer District, pink salmon escapement was above the upper bound SEG ranges for Dogfish Bay Creeks, Port Chatham Creeks, Windy Bay Creek Right, Windy Bay Creek Left, Port Dick and Island Creeks. Index systems within SEG ranges were Rocky River, South Nuka Creek, and Desire Lake Creek.

*Harvest Summary:* The 2023 purse seine harvest (including homepack) for the Southern District was 543,000 pink salmon, less than the 10-year average harvest of 130,000 fish. The set gillnet harvest (including homepack) for the Southern District was approximately 6,000 fish, less than the previous 10-year average harvest of approximately 21,000 fish.

The Kamishak Bay District CCPF pink salmon harvest was confidential due to fewer than 3 permit holders reporting deliveries. The 10-year average for pink salmon harvest from this district is approximately 47,000 fish.

The Outer District pink salmon harvest was 158,000 fish, which was lower than the 10-year average harvest of 1.3 million fish.

### **Chum Salmon**

*Run and Escapement Summary:* The chum salmon SEG was met at the Port Graham River in the Southern District. Chum salmon escapement in the Outer District was above the SEG range for Rocky River, Island, and Port Dick Creeks. The escapement estimate for Dogfish Lagoon Creek was below the SEG range. In the Kamishak District, chum salmon escapement was within the SEG range at the McNeil River, Big Kamishak River, and Cottonwood Creek; and above the SEG range at Little Kamishak, and Bruin Rivers as well as Ursus Cove and Iniskin Bay Creeks.

*Harvest Summary:* The 2023 purse seine harvest (including homepack) for the Southern District was almost 400 chum salmon, which was lower than the 10-year average harvest of 1,200 fish.

The set gillnet harvest (including homepack) for the Southern District was over 2,000 chum salmon, which was less than the 10-year average harvest of approximately 4,500 fish.

The Kamishak Bay District CCPF chum salmon harvest was confidential due to fewer than 3 permit holders reporting deliveries. The 10-year average annual chum salmon harvest from this district is 10,000 fish.

The Outer District harvest was 33,000 chum salmon, which was lower than the 10-year average harvest of 55,000 fish.

Summary by Glenn Hollowell, Area Management Biologist, ADF&G, Homer.

## **UPPER COOK INLET AREA**

The 2023 Upper Cook Inlet (UCI) Area commercial salmon fishery harvest of almost 1.9 million salmon was 17% less than the recent 10-year average harvest of 2.3 million fish. The harvest was composed of approximately 700 Chinook, 1.5 million sockeye, 84,000 coho, 66,000 pink, and 126,000 chum salmon (Table 5).

### **Chinook Salmon**

*Run and Escapement Summary:* In UCI, there are 2 commercial fisheries where most Chinook salmon are harvested. These include the set gillnet fisheries in the Northern District and in the Upper Subdistrict of the Central District. Chinook salmon runs were expected to be below average across Southcentral Alaska for the 2023 season. As expected, the Chinook salmon run was below average and was even lower than the preseason forecasts. This led to preseason conservation measures in all fisheries to reduce the harvest of Chinook salmon.

The preseason run forecast for Deshka River Chinook salmon of approximately 7,000 fish was below the biological escapement goal (BEG) range of 9,000–18,000 fish. The department issued preseason restrictions, closing sport fishing for Chinook salmon in the Susitna River drainage, except for the Yentna River (unit 4 of the Susitna River). Unit 4 was restricted to catch-and-release angling only, with single unbaited hooks (Emergency Order (EO) 2-KS-2-05-23). In accordance with the *Northern District King Salmon Management Plan*, the directed commercial Chinook salmon fishery in the Northern District was also closed preseason (EO 2S-02-23) after the Deshka River Chinook salmon sport fishery was closed. The final escapement estimate of Chinook salmon in the Deshka River was approximately 3,700 fish, which did not fall within the BEG range of 9,000–18,000 fish. The Little Susitna River Chinook salmon SEG range of 2,100–4,300 fish was not achieved in 2023 with the incomplete weir count of under 800 Chinook salmon. Results of the aerial escapement goals for the various other Susitna drainage Chinook salmon systems are still preliminary and are pending data analysis to determine whether goals have been achieved.

Kasilof River and Kenai River late-run Chinook salmon are the primary Chinook salmon stocks harvested in the eastside set gillnet (ESSN) fishery; however, the ESSN fishery was closed to commercial salmon fishing in 2023 (EO 2S-01-23). Kenai River late-run Chinook salmon were managed to meet the optimal escapement goal (OEG) range of 15,000–30,000 large Chinook salmon ( $\geq 75$ cm mid eye to tail fork length). By regulation, if restrictions are implemented in the sport fishery to achieve the OEG, restrictive “paired” actions are also required in the ESSN fishery.

The total estimated passage at the river mile 14 sonar through August 27 was just under 14,000 large Chinook salmon. The department applies harvest, catch-and-release mortality estimates, and



spawning downstream of the sonar estimates to generate a preliminary spawning escapement estimate. Both the preliminary spawning escapement estimate, and total run estimate were approximately 14,500 large fish. The midpoint of the run occurred on July 28, which is near the mean historical midpoint. The OEG range of 15,000–30,000 large fish was not achieved and the SEG range of 13,500–27,000 large fish was achieved. While the SEG has been achieved in 4 of the last 7 years, the lower bound of the OEG goal has not been achieved since it was established in 2020. The 2023 preseason forecast was for a total run of approximately 16,600 large Kenai River late-run Chinook salmon.

Of the 3 southern Kenai Peninsula Chinook salmon systems, the SEG was not achieved for 2 systems and not assessed in the third. The Anchor River preliminary escapement estimate was approximately 2,300 fish (SEG range 3,800–7,600 fish). The Ninilchik River wild run count was 330 fish (SEG range 750–1,300 fish). The Deep Creek Chinook salmon run was not assessed due to lack of funding. The recreational fisheries at Deep Creek and Anchor River were closed preseason. The Ninilchik River was closed for sport fishing for wild Chinook salmon but was open to fishing for hatchery Chinook salmon during the entire season.

*Harvest Summary:* The 2023 UCI commercial harvest of Chinook salmon was approximately 700 fish, which was 87% less than the previous 10-year average of 5,400 fish. The drift gillnet fishery harvested just over 100 Chinook salmon of all sizes and all stocks. The estimated harvest of Chinook salmon in the set gillnet fishery of the Western, Kustatan and Kalgin Island Subdistricts was just over 350 fish.

In the Northern District, the directed Chinook salmon set gillnet fishery was closed preseason (EO 2S-02-23). However, approximately 250 Chinook salmon were harvested in the Northern District during other fisheries.

## **Sockeye Salmon**

*Run and Escapement Summary:* The 2023 UCI preseason total run forecast of 5.1 million sockeye salmon included a harvest estimate (sport, personal use, and commercial) of 3.1 million fish, with a commercial fisheries harvest of 1.5 million fish. The 2023 preliminary total run estimate (harvest and escapement) of 6.5 million sockeye salmon was 1.4 million fish greater, or 27% more than the preseason forecast. Sockeye salmon run abundance to the Kenai River was more than forecasted by 1.0 million fish; the run abundance to the Kasilof River exceeded the preseason forecast by 267,000 fish. The number of sockeye salmon returning to Fish Creek was 6,000 fish less than forecasted (incomplete escapement count of just under 145,000 fish exceeds the 15,000–45,000 fish SEG range). The Susitna River sockeye salmon run estimate was 47,000 less fish than forecasted. For all other systems combined (minor systems), inseason abundance was 153,000 fish more than forecasted. The final passage estimated at the river mile 19 sonar of approximately 2.3 million sockeye salmon exceeded the Kenai River sockeye salmon middle tier inriver goal range (1,100,000–1,400,000 fish). The peak day of sockeye salmon passage in the Kenai River occurred on July 26 with a count of over 195,000 fish. During the previous 20 years, the average date when 50% of the sonar passage occurred in the Kenai River was July 27. In 2023, the midpoint of total sockeye salmon passage occurred on July 29 which is 2 days later than the previous 10-year average. Approximately 45% of the sockeye salmon run arrived in the Kenai River during the month of August.

The Kasilof River sockeye salmon sonar count of approximately 933,000 fish exceeded the Kasilof River BEG range of 140,000–320,000 fish and the OEG range of 140,000–370,000 fish. The passage midpoint for Kasilof River sockeye salmon occurred on July 22, which was 5 days later than the average midpoint of July 17. Peak daily Kasilof River sockeye salmon passage of under 60,000 fish occurred on July 16.

*Harvest Summary:* The UCI commercial combined-gear harvest of approximately 1.5 million sockeye salmon was 11% less than the 10-year average annual harvest of 1.7 million fish.

From June 19 through August 14, the drift gillnet fleet fished a total of 29 days broken up as follows: 3 days in the Expanded Kasilof Section only; 8 days in the Expanded Kenai, Expanded Kasilof, and Anchor Point sections only; 9 days in Drift Gillnet Area 1 with some or all the expanded sections open; and 9 days districtwide. Beginning August 15, all Monday/Thursday regulatory drift gillnet fishing periods were restricted to Drift Gillnet Areas 3 and 4. The total UCI drift gillnet harvest of approximately 1.3 million sockeye salmon was below the 20-year (2003–2022) average harvest of 1.4 million fish. In 2023, 356 drift gillnet permits made deliveries for a season average harvest of approximately 3,800 sockeye salmon per permit. The peak day of harvest for the drift gillnet fleet occurred on Thursday, July 13, with a total of 200,000 sockeye salmon harvested.

Approximately 47,000 sockeye salmon were harvested by set gillnetters in the Western Subdistrict. This was 34% more than the 10-year average annual harvest of approximately 35,000 fish during the previous 10 years.

Approximately 23,000 sockeye salmon were harvested in the Kustatan Subdistrict, of which almost 5,000 fish were harvested during the Big River fishery. The 2023 sockeye salmon harvest for the Kustatan Subdistrict was much larger than the recent 10-year average harvest of over 4,600 fish.

In 2023, approximately 78,000 sockeye salmon were harvested from the Kalgin Island Subdistrict, with 18,000 fish taken during the Big River sockeye salmon fishery. The average annual sockeye salmon harvest in the Kalgin Island Subdistrict during the previous 10 years was approximately 44,000 fish.

In 2023, approximately 62,000 sockeye salmon were harvested in the Northern District. This harvest was 20% greater than the 10-year average annual harvest of almost 52,000 sockeye salmon. As in past years, restrictions to the Northern District limited the number of nets allowed from July 20 until the end of the season on August 24.

## **Coho Salmon**

*Run and Escapement Summary:* In UCI, there are 4 coho salmon systems with escapement goals. Weirs are used to assess escapement on Fish Creek, Little Susitna River, and Deshka River; McRoberts Creek is assessed using foot surveys.

The Little Susitna weir was inundated by floodwaters for the majority of the coho salmon season. Projected escapement was below the SEG range when the weir was removed on August 26. Even though the season total escapement is incomplete, the SEG range of 9,200–17,700 fish likely would not have been attained. The weir count of approximately 3,700 fish is considered an incomplete and minimum count.

The Deshka weir was taken out by high-water conditions on August 30. Through this date, just over 1,800 coho salmon were counted, which is considered an incomplete and minimum count. The weir at Fish Creek was pulled on September 12. The SEG range for Jim Creek of 250–700 coho salmon is assessed postseason by a foot survey of McRoberts Creek, a small spawning tributary within the Jim Creek system. The survey resulted in almost 380 coho salmon, which is within the SEG range.

*Harvest Summary:* The 2023 commercial harvest estimate of approximately 84,000 coho salmon was 55% less than the previous 10-year average of 185,000 fish. The drift gillnet harvest of almost 50,000 coho salmon was 52% less than the 10-year average of 105,000 fish. The Northern District set gillnet fishery harvested 23,500 coho salmon, which was 49% less than the recent 10-year average of 46,000 fish.

## **Pink Salmon**

*Harvest Summary:* Pink salmon runs in UCI are even-year dominant, with odd-year average harvests typically less than one-sixth of even-year harvests. The 2023 UCI commercial pink salmon harvest was estimated to be 66,000 fish, which was 27% lower than the average annual harvest of 91,000 fish from the 10-year, odd-year (2003–2021) average harvest.

## **Chum Salmon**

*Run and Escapement Summary:* An aerial survey of Chinitna River and Clearwater Creek was conducted on August 8. This survey produced an estimate of approximately 6,400 chum salmon, which was within the SEG range (3,500–8,000 fish). With the escapement goal being met, Chinitna Bay was opened to set and drift gillnet fishing on Tuesdays and Fridays. Regularly scheduled Monday and Thursday drift gillnet fishing periods for Drift Gillnet Areas 3 and 4 began August 16.

*Harvest Summary:* The 2023 harvest of 126,000 chum salmon was 6% lower than the 10-year average annual harvest of 134,000 fish.

Summary by Colton Lipka and Lucas Stumpf, Area Management Biologists, ADF&G, Soldotna.

## **BRISTOL BAY AREA**

The 2023 commercial salmon harvest in the Bristol Bay Area totaled almost 41.0 million salmon (Table 5). Sockeye salmon accounted for most of this harvest at 40.6 million fish. Harvest for the other species were approximately 8,000 Chinook, 342,000 chum, 3,000 pink, and 18,000 coho salmon.

### **Chinook Salmon**

*Run and Escapement Summary:* The Nushagak River Chinook salmon inriver run estimate at Portage Creek Sonar was approximately 31,500 fish, which does not meet the SEG range of 55,000–120,000 fish. However, it is probable that some Chinook salmon went undetected at the sonar because they were masked by the high sockeye salmon passage. High sockeye salmon passage saturates the test fishing nets at the sonar project; a situation shown to bias the Chinook salmon count low in previous years. This is supported by reported inseason sport fishery catch rates, along with postseason aerial surveys indicating that the run was larger than the final sonar count.

*Harvest Summary:* Chinook salmon harvested in Bristol Bay were incidentally caught during directed sockeye salmon fishing periods. The Nushagak District is the main contributor of Chinook salmon in Bristol Bay; the intent of the department is to actively manage the district to reduce Chinook salmon harvest and ensure escapement goals were achieved. Overall, the 2023 Chinook salmon harvests were below average in all districts of Bristol Bay. A total of almost 8,000 Chinook salmon were harvested, which is below the 20-year average of under 41,000 fish, and the third lowest harvest in the last 20 years. The Nushagak District Chinook salmon harvest was approximately 6,000 fish, which is well below the 20-year average harvest of 32,000 fish.

### **Sockeye Salmon**

*Run and Escapement Summary:* The 2023 inshore Bristol Bay sockeye salmon run of 54.5 million fish was the 8th largest inshore run since 2003, and was 17% above the 46.7 million average run for the latest 20-year period. All sockeye salmon escapement goals were met or exceeded, with a total baywide escapement of 14.0 million fish. The 2023 Bristol Bay inshore sockeye salmon run was 10% above the preseason forecast of 49.7 million fish.

*Harvest Summary:* The commercial harvest of approximately 40.6 million sockeye salmon was above the preseason forecast of 36.7 million fish. The 2023 harvest was the 5th time in the last 6 years harvest has exceeded 40.0 million fish.

### **Coho Salmon**

*Harvest Summary:* The commercial harvest of coho salmon was approximately 18,000 fish, which was below the 20-year average of under 98,000 fish. The Nushagak District is typically the largest producer of coho salmon and accounted for 8,000 of the coho salmon harvested in 2023. Approximately 8,000 coho salmon were also harvested in the Egegik District. Harvests of coho salmon can be variable from year to year depending on processor availability, market conditions, and overall fishing effort. In 2023, fishing ended early due in part to bad weather and low market interest in purchasing coho salmon. Coho salmon escapement is not monitored in Bristol Bay.

## **Pink Salmon**

*Harvest Summary:* Pink salmon in Bristol Bay are more prevalent during even years than in odd years. Since 2023 was an odd year, pink salmon were not abundant and there were no directed pink salmon fisheries in Bristol Bay. However, approximately 3,000 pink salmon were harvested incidentally to the sockeye salmon fishery. Pink salmon escapement is not monitored in Bristol Bay.

## **Chum Salmon**

*Escapement Summary:* The Nushagak River sonar project is the only chum salmon escapement assessment project in Bristol Bay. The escapement of 110,000 fish was below the lower-bound SEG of 200,000 fish.

*Harvest Summary:* In 2023, the baywide commercial harvest of 342,000 chum salmon was well below the recent 20-year average of 1.1 million fish.

Summary by Tim Sands, Travis Elison, and Aaron Tiernan, Area Management Biologists, Stacy Vega Area Research Biologist, ADF&G, Dillingham and Anchorage.

Table 5.—2023 Central Region commercial salmon harvests, by area and species, in thousands of fish.

| Fishing area                            | Species |         |      |        |       | Total   |
|---|---------|---------|------|--------|-------|---------|
|   | Chinook | Sockeye | Coho | Pink   | Chum  |         |
| Drift gillnet                           |         |         |      |        |       |         |
| Bering River District                   | 0       | 11      | 25   | —      | 0     | 36      |
| Coghill District                        | 0       | 233     | 8    | 213    | 1,494 | 1,947   |
| Copper River District                   | 11      | 862     | 134  | 15     | 19    | 1,041   |
| Eshamy District                         | 0       | 352     | 1    | 103    | 88    | 545     |
| Montague District                       | 0       | 1       | 1    | 1,558  | 13    | 1,574   |
| Unakwik District                        | —       | 6       | —    | 0      | 0     | 6       |
| Purse seine                             |         |         |      |        |       |         |
| Coghill District                        | 0       | 7       | 0    | 1,185  | 83    | 1,275   |
| Eastern District                        | 0       | 17      | 5    | 20,638 | 612   | 21,272  |
| Montague District                       | 0       | 1       | 1    | 1,558  | 13    | 1,574   |
| Northern District                       | 0       | 9       | 3    | 7,789  | 49    | 7,849   |
| Northwestern District                   | —       | 2       | 0    | 329    | 4     | 336     |
| Southwestern District                   | 0       | 39      | 9    | 14,357 | 200   | 14,604  |
| Southeastern District                   | 0       | 0       | 0    | 557    | 19    | 576     |
| Unakwik District                        | 0       | 13      | —    | 1      | 0     | 14      |
| Set Gillnet                             |         |         |      |        |       |         |
| Eshamy District                         | 0       | 175     | 0    | 37     | 27    | 239     |
| Hatchery <sup>a</sup>                   | —       | 228     | 4    | 11,964 | 1,444 | 13,639  |
| Prince William Sound total <sup>b</sup> | 11      | 1,956   | 192  | 60,304 | 4,065 | 66,528  |
| Southern District purse seine           | 0       | 76      | 0    | 543    | 0     | 619     |
| Southern District set gillnet           | 0       | 20      | 1    | 6      | 2     | 29      |
| Southern District total                 | 0       | 95      | 1    | 549    | 3     | 648     |
| Kamishak and Eastern Districts          | —       | 38      | —    | 51     | 3     | 92      |
| Outer District                          | 0       | 48      | 0    | 158    | 33    | 239     |
| Hatchery <sup>c</sup>                   | —       | 170     | 0    | 1,906  | 0     | 2,076   |
| Lower Cook Inlet total <sup>d,e</sup>   | 1       | 350     | 1    | 2,664  | 39    | 3,056   |
| Central District drift gillnet          | 0       | 1,362   | 50   | 58     | 113   | 1,582   |
| Central District set gillnet            | 0       | 148     | 11   | 1      | 7     | 167     |
| Central District total                  | 0       | 1,512   | 60   | 59     | 120   | 1,751   |
| Northern District                       | 0       | 62      | 24   | 7      | 7     | 100     |
| Upper Cook Inlet total <sup>d,e</sup>   | 1       | 1,574   | 84   | 66     | 126   | 1,851   |
| Naknek-Kvichak District                 | 1       | 13,265  | 1    | 0      | 55    | 13,323  |
| Nushagak District                       | 6       | 11,967  | 8    | 1      | 173   | 12,155  |
| Egegik District                         | 0       | 12,621  | 8    | 0      | 43    | 12,672  |
| Ugashik District                        | 0       | 2,282   | 0    | 0      | 17    | 2,300   |
| Togiak District                         | 1       | 444     | 0    | 2      | 53    | 500     |
| Bristol Bay total <sup>e</sup>          | 8       | 40,579  | 18   | 3      | 342   | 40,950  |
| Central Region total                    | 20      | 44,460  | 294  | 63,037 | 4,573 | 112,385 |

Notes: En dashes indicate no harvest, and zeros indicate harvest activity but <500 fish. Columns may not total exactly due to rounding. Confidential data omitted.

<sup>a</sup> Total includes hatchery sales for operating expenses and broodstock harvests.

<sup>b</sup> Chinook salmon adults and jacks are totaled.

<sup>c</sup> Total includes cost recovery and hatchery donated fish but not broodstock.

<sup>d</sup> Total includes commercially harvested fish retained for personal use.

<sup>e</sup> Total includes harvest that was discarded, confiscated, seized, or donated.

## ARCTIC-YUKON-KUSKOKWIM REGION

The Arctic-Yukon-Kuskokwim (AYK) Region 2023 harvests totaled approximately 167,000 fish (Table 6). Cumulative all-gear commercial harvest included approximately 400 sockeye, 5,000 coho, 158,000 chum, and 4,000 pink salmon all harvested in the Norton Sound and Kotzebue areas.

### KUSKOKWIM AREA

The 2023 Kuskokwim River Chinook salmon forecast was for a range of 115,000–170,000 fish. The drainagewide Chinook salmon SEG range was 65,000–120,000 fish. If the run came in as projected, the drainagewide and tributary escapement goals were expected to be achieved with a limited subsistence harvest. The 2023 season was managed in accordance with the *Kuskokwim River Salmon Management Plan* (5 AAC 07.365) with input from the Kuskokwim River Salmon Management Working Group (Working Group). It was the intent of the department to manage all Kuskokwim River salmon stocks in a conservative manner, consistent with the *Policy for the Management of Sustainable Salmon Fisheries* under 5 AAC 39.222, to meet escapement goals and the subsistence priority. Preseason management actions that were intended to achieve escapement goals included early season subsistence fishing closures, tributary closures, time and area restrictions, gillnet mesh size and length restrictions, and live-release requirements.

Between June 1 and August 13, a Federal Special Action (FSA) closed the Kuskokwim River subsistence gillnet fishery to federally qualified users within the boundary of the Yukon Delta National Wildlife Refuge (YDNWR). The U.S. Fish and Wildlife Service (USFWS) determined that adopting the FSA was warranted due to the expectation that Chinook and coho salmon runs had been forecast to be below average, and that the chum salmon run forecast indicated a poor run.

Upstream of the YDNWR boundary at Aniak to the Kuskokwim River headwaters, subsistence Sections 4 (from the refuge boundary at Aniak to the Holitna River mouth) and 5 (Holitna River mouth to headwaters), fishing was not subject to the FSA. Beginning June 1, subsistence fishing in Sections 4 and 5 was closed to gillnets (drift and set) with additional restrictions that required live release of Chinook and chum salmon captured in selective gears. On June 7, fishing with set gillnets was opened in Sections 4 and 5 with live release of Chinook and chum salmon captured in selective gears required. Beginning June 12, subsistence Sections 4 and 5 were opened to subsistence fishing until further notice with 6-inch or less mesh gillnets (set or drift), 25 fathoms in length, and live release of chum salmon caught in selective gears.

On August 13, the USFWS rescinded the FSA and the associated fishing closures that had been in place in the Kuskokwim River within the YDNWR boundaries. On August 14, the department resumed management of Sections 1–3 and subsequently opened subsistence fishing with gillnets until further notice from the mouth of the Kuskokwim River upstream to its headwaters. Based on preliminary inseason run assessment data, the department determined that ending restrictions to fishing with gillnets was warranted. The Bethel Test Fishery (BTF) cumulative catch per unit effort (CPUE) on August 10 for coho salmon was almost 2,000 fish and the total coho salmon passage past the sonar was 198,000 fish. These BTF and sonar data indicated that the coho salmon escapement goals at the Kwethluk River and Kogruluk River weirs would likely be met. On average, approximately 58% of the coho salmon run has passed through Bethel by August 10. By August 10, an average of 100% of the Chinook salmon run, 100% of the sockeye salmon run, and 99% of the chum salmon run will have passed through Bethel. The tributary restrictions were kept

in place beyond the mainstem restrictions for the purpose of conservation while Chinook and chum salmon were on their spawning grounds.

## **Chinook Salmon**

*Run and Escapement Summary:* The preliminary Kuskokwim River total run estimate was 123,000 Chinook salmon (95% CI = 97,000–158,000 fish), and an estimated 97,000 Chinook salmon (95% CI = 70,000–131,000 fish) escaped Kuskokwim River fisheries, which met the drainagewide SEG range of 65,000–120,000 fish.

Two escapement goals for Chinook salmon were assessed within the Kuskokwim River drainage in 2023 and both were met. Escapement at the George River weir was approximately 2,800 Chinook salmon, which fell within the SEG range of 1,800–3,300 fish. Chinook salmon escapements at the remaining weir projects were slightly below average. Eight aerial surveys were carried out for Chinook salmon in 2023. The Chinook salmon aerial survey estimate at the Salmon (Pitka Fork) River was 670 fish, which was within the SEG range of 470–1,600 fish.

Two escapement goals for Chinook salmon were assessed within Kuskokwim Bay drainages in 2023. The Chinook salmon aerial survey SEG range of 3,900–12,000 fish at the Kanektok River (District 4) was achieved with an estimate of almost 6,700 fish. The Chinook salmon aerial survey SEG range of 640–3,300 fish at the North Fork Goodnews River was exceeded with a count of 4,300 fish.

*Harvest Summary:* Postseason subsistence harvest surveys are presently being conducted. An assessment of subsistence salmon harvest in 2023 will not be available until after postseason harvest surveys have been completed, data have been analyzed, and preliminary harvest estimates are produced. Final subsistence harvest estimates are anticipated to be available in spring 2024. The 10-year average subsistence Chinook salmon harvest on the Kuskokwim River was 28,000 fish.

## **Sockeye Salmon**

*Run and Escapement Summary:* Sockeye salmon escapement was estimated at 2 weirs in 2023. Sockeye salmon escapement at the Salmon (Aniak) River weir (approximately 2,700 fish) was above average. The Telaquana River weir observed the largest escapement of sockeye salmon since the project was established in 2010 with a count of over 283,000 fish. No escapement goals for Kuskokwim River sockeye salmon were assessed in 2023.

Two escapement goals for sockeye salmon were assessed within Kuskokwim Bay drainages in 2023. The sockeye salmon aerial survey SEG range of 15,300–41,000 fish at the Kanektok River (District 4) was exceeded with 90,000 fish counted. The sockeye salmon aerial survey SEG range of 9,600–18,000 fish at the North Fork Goodnews River (District 5) was exceeded with 33,000 fish counted.

*Harvest Summary:* Postseason subsistence harvest surveys are being conducted. An assessment of subsistence sockeye salmon harvest in 2023 will not be available until after postseason harvest surveys have been completed, data have been analyzed, and preliminary harvest estimates are produced. The 10-year average subsistence sockeye salmon harvest on the Kuskokwim River was 44,000 fish.



## **Coho Salmon**

*Run and Escapement Summary:* Coho salmon escapement was estimated at 3 weirs in 2023. The escapement estimate at the George River weir was approximately 33,000 coho salmon, which was above average. The escapement estimate of 28,000 coho salmon at the Kogrukluk River weir was above average and slightly above the SEG range of 13,000–28,000 fish. The escapement estimate of 36,000 coho salmon at the Kwethluk River weir was near average and met the lower bound SEG of at least 19,000 fish.

*Harvest Summary:* Postseason subsistence harvest surveys are being conducted. An assessment of subsistence salmon harvest in 2023 will not be available until after postseason harvest surveys have been completed, data have been analyzed, and preliminary harvest estimates are produced. The 10-year average subsistence coho salmon harvest on the Kuskokwim River is 31,000 fish.

## **Chum Salmon**

*Run and Escapement Summary:* Chum salmon escapement was estimated at 3 weirs in 2023. Chum salmon escapement at all weir projects was poor but a marked improvement over escapements observed from 2020–2022. No escapement goals for Kuskokwim River chum salmon were assessed in 2023.

*Harvest Summary:* Postseason subsistence harvest surveys are being conducted. An assessment of subsistence salmon harvest in 2023 will not be available until after postseason harvest surveys have been completed, data have been analyzed, and preliminary harvest estimates are produced. The 10-year average subsistence chum salmon harvest on the Kuskokwim River was 39,000 fish.

Summary by Chuck Brazil, Arctic-Yukon-Kuskokwim Regional Management Coordinator, and Sean Larson, Kuskokwim Area Research Biologist, ADF&G, Anchorage.

## **YUKON AREA**

No commercial fishing occurred in the Yukon Management Area during the summer or fall seasons in 2023 (Table 6).

The Yukon River summer season spans from early May through July 15 in District 1. On July 16, management in District 1 transitions to the fall season and becomes focused on fall chum and coho salmon entering the mouth of the Yukon River. However, summer season management continues beyond this date in upper river districts as Chinook and summer chum salmon migration progresses upstream. The subsequent transition of upriver districts to the fall season is based on the migration timing of fall chum salmon.

### **Summer Season**

#### ***Chum Salmon***

*Run and Escapement Summary:* Approximately 846,000 summer chum salmon were estimated to have passed Pilot Station sonar (90% CI = 810,015–881,961 fish), which was within the Yukon River Drainage SEG range of 500,000–1,200,000 fish. The estimated run size was also within the preseason forecast of 280,000–900,000 fish.

Four pulses of summer chum salmon passed the sonar project this season; the largest group consisted of approximately 329,000 fish passing the sonar between July 10 and July 18. The first quarter point, midpoint, and third quarter point of the summer chum salmon run at Pilot Station

sonar were June 23, July 5, and July 12, respectively. This indicated the summer chum salmon run was likely 7 days later than average and was the second latest on record based on the midpoint at the sonar project.

The 2023 total summer chum salmon passage estimated at Pilot Station sonar through July 18 was a conservative estimate consistent with historical data; however, the true total run size in 2023 was probably somewhat larger. Genetic mixed stock analyses in 2023 indicated summer chum salmon continued to pass Pilot Station sonar beyond the administrative summer season cutoff date of July 18. In 2023, 73% (CI = 65–85%) of chum salmon arriving at the Pilot Station sonar from July 19 to July 31 were genetically summer chum salmon. Overall, an estimated 9% of the summer chum salmon run came in during the fall season.

There are 3 established escapement goals for summer chum salmon in the Yukon area: the drainagewide BEG range of 500,000–1,200,000 fish, the East Fork Andreafsky River lower bound SEG of 40,000 fish, and the Anvik River BEG range of 350,000–700,000 fish. The estimated drainagewide escapement was 869,000 summer chum salmon, meeting the drainagewide BEG. Passage estimates for the Andreafsky River weir (operated by the USFWS) and the Anvik Sonar could not be estimated due to persistent high-water conditions throughout the operational period.

*Harvest Summary:* No commercial fishing occurred in the Yukon Management Area during the summer or fall seasons. Subsistence fishing for summer chum salmon opened with selective gear types during a portion of the summer chum salmon run in District 1 through Subdistrict 5-C. Fishing remained closed in Subdistrict 5-D because summer chum salmon do not migrate that far upriver. Subsistence fishers were permitted to retain summer chum, pink, and sockeye salmon, and nonsalmon species, but were required to release Chinook salmon alive.

### ***Chinook Salmon***

*Run and Escapement Summary:* The cumulative passage estimate at the Pilot Station sonar was approximately 58,500 Chinook salmon (90% CI = 44,191–72,867 fish). This passage was the second lowest recorded for the project and was below the lower end of the forecast range (62,000–104,000 fish). Most Chinook salmon entered the river in 4 pulses, and the run appears to have been 7 days later than average based on the midpoint passage through the sonar project.

Many assessment projects were affected by high water during the summer season and there were several late starts or missed days of counts. Aerial surveys of the East and West Forks of the Andreafsky River, Anvik River, Nulato River, Henshaw Creek, and Alatna River were conducted under various conditions but very few fish were observed. Overall counts were well below average this season.

Passage estimates for Andreafsky River weir (operated by the USFWS) are unavailable due to the number of missed days attributed to persistent high-water conditions throughout the operational period.

Conditions in the Chena and Salcha Rivers were favorable for project operations and Chinook salmon passage was estimated using counting towers. Over 1,000 Chinook salmon were estimated in the Chena River, which was below the BEG range of 2,800–5,700 fish. In the Salcha River, under 1,400 Chinook salmon were counted, which was below the BEG range of 3,300–6,500 fish.

Less than 28,000 Canada-origin salmon were estimated to have passed the Pilot Station sonar in 2023. This total was estimated using genetic stock identification. The preliminary cumulative passage estimate at the Eagle sonar was almost 14,800 Chinook salmon (90% CI = 14,533–14,971

fish). This estimate did not meet the lower end of the most recently approved bilateral U.S./Canada interim management escapement goal (IMEG) range of 42,500–55,000 salmon. Fishing for Chinook salmon remained closed all season throughout the Yukon Area; however, a small number of Chinook salmon were harvested through test fisheries or retained as incidental harvest using nonsalmon gear.

*Harvest Summary:* For the 16th consecutive year, no commercial periods targeting Chinook salmon were allowed in the Yukon Management Area during the summer season.

## **Fall Season**

### ***Fall Chum Salmon***

*Run and Escapement Summary:* In 2023, the preliminary estimate of the drainagewide total run size was over 318,000 fall chum salmon. The drainagewide escapement (after preliminary harvest estimates from U.S. and Canada were removed) was estimated to be almost 312,000 fall chum salmon, which was within the SEG range of 300,000–600,000 fish. The 2023 run was the 5th lowest fall chum salmon run on record with 4 consecutive low years from 2020–2023.

Three fall chum salmon escapement goals were assessed in the Yukon Area during the 2023 fall season. Approximately 137,000 fall chum salmon were estimated to have passed through the Teedriinjik sonar project (estimate includes expansion beyond project termination), which is within the SEG range of 85,000–234,000 fish. The Delta River, a tributary of the Tanana River drainage, was monitored using replicate ground (foot) surveys. The surveys resulted in an escapement estimate of over 13,000 fall chum salmon, which is within the SEG range of 7,000–20,000 fish. The Sheenjek River sonar project, which was reestablished in 2022, resulted in an estimated passage of almost 16,000 fall chum salmon (estimate includes expansion beyond project termination). The Sheenjek River was previously monitored from 1974–2012 with an average passage of 96,000 fall chum salmon.

Several escapement monitoring projects were also operated in Canada. On the Porcupine River, approximately 15,600 fall chum salmon passed the sonar. Although there is no established escapement goal for this location, this escapement did not meet treaty obligations for the upper Porcupine River. In the Fishing Branch River, a weir/sonar project produced an escapement estimate of over 11,500 fall chum salmon. This level of escapement in the Fishing Branch River was well below the lower end of the IMEG range of 22,000–49,000 fish.

The largest component of Canada-origin fall chum salmon pass into Canada via the mainstem Yukon River. The fall chum salmon passage estimate at the mainstem Yukon River sonar project near Eagle was under 21,000 fish (SE = 187 fish) for the dates September 1 through October 6. Due to continued passage after the termination of the project, the fall chum salmon estimate was subsequently adjusted to approximately 22,000 fish. The preliminary escapement for the mainstem Yukon River in Canada is derived by subtracting the upstream U.S. and Canadian harvests from the expanded sonar estimate. The preliminary mainstem Yukon River escapement estimate (22,000 fall chum salmon), which is the 2nd lowest on record and was below the IMEG range (70,000–104,000 fish). Additionally, the mainstem Yukon River escapement estimate did not meet the treaty obligations with Canada.

Stock composition estimates, provided by USFWS Conservation Genetics Laboratory, were determined using tissue samples collected from chum salmon captured in the mainstem Yukon River sonar test net fishery. Chum salmon genetic samples processed from 4 strata between July 19

and September 7 (fall season) indicated stocks represented approximately 22% summer fish. Within the fall components, the 3 main stock groupings were 41% Border U.S. (Teedriinjik/Sheenjek/Draanjik), 17% Canadian, and 42% Tanana. In 2023, the upper Yukon U.S. and the Tanana River stocks were higher, whereas the Canadian component was lower when compared to the 2004–2022 averages (36% Border U.S., 31% Canadian, and 33% Tanana).

*Harvest Summary:* No commercial fishing occurred in the Yukon Management Area during the summer or fall seasons. Subsistence fishing for fall chum salmon remained closed in the Yukon Area except in the Teedriinjik River drainage. However, fall chum salmon were caught in test fisheries or as incidental harvest in nonsalmon gear. The preliminary 2023 harvest estimate from these sources was almost 7,000 fall chum salmon.

### ***Coho Salmon***

*Run and Escapement Summary:* There are few coho salmon spawning escapement assessment projects in the Yukon River drainage because of funding limitations and late timing relative to onset of winter. The sonar in the mainstem Yukon River near Pilot Station was operated through September 7. The project estimated passage through Pilot Station was under 50,000 coho salmon (90% CI = 42,088–57,306 fish), which is well below the historical average of 150,500 fish. A boat survey conducted on the Delta Clearwater River in late October resulted in an escapement estimate of 1,800 coho salmon which is the 4th lowest count since monitoring began in 1972. Aerial surveys of the other monitored Tanana River drainage systems were unable to be conducted in 2023 due to inclement weather in late October into early November.

*Harvest Summary:* No commercial fishing occurred in the Yukon Management Area during the summer or fall seasons. Subsistence fishing for coho salmon in the Yukon Area closed September 2 due to poor returns. A small number of coho salmon were caught in test fisheries, in selective gear such as dip nets before the closure, or as incidental harvest in nonsalmon gear.

Summary by Deena Jallen and Christy Gleason, Area Management Biologists, and Bonnie Borba, Research Biologist, ADF&G, Fairbanks.

## **NORTON SOUND AREA**

Poor runs of salmon, especially in southern Norton Sound, resulted in low volumes of commercial salmon harvest this season. Escapement goals were achieved for 3 of 5 chum salmon stocks, 2 of 3 coho salmon stocks, and all 3 pink salmon stocks. Escapement goals were not achieved for Chinook or sockeye salmon. Total commercial salmon harvests were approximately 400 sockeye, 5,000 coho, 4,000 pink, and 16,000 chum salmon (Table 6).

### **Chinook Salmon**

*Harvest Summary:* Commercial fishing targeting Chinook salmon was prohibited in the Norton Sound Area during the 2023 season.

### **Sockeye Salmon**

*Harvest Summary:* Sockeye salmon harvest accounts for a small portion of the overall harvest in Norton Sound. Despite higher harvest totals in recent years, the 2023 commercial harvest of approximately 400 fish was well below the recent 5-year (2018–2022) average harvest of just under 3,000 sockeye salmon.

### **Coho Salmon**

*Harvest Summary:* The 2023 coho salmon harvest of 5,000 fish was 6% of the recent 5-year average (87,000 fish).

### **Pink Salmon**

*Harvest Summary:* The 2023 pink salmon run was weak, unlike the record runs experienced in Norton Sound in recent years. Small runs resulted in a harvest of almost 4,000 pink salmon, which was 4% of the 5-year, odd-year average of almost 92,000 pink salmon.

### **Chum Salmon**

*Harvest Summary:* The 2023 chum salmon harvest of approximately 16,000 fish was 17% of the recent 5-year average (under 92,000 fish).

Summary by Kevin Clark, Area Management Biologist, ADF&G, Nome.

## KOTZEBUE SOUND AREA

There were 54 permit holders that commercially harvested fish in the Kotzebue Sound Area in 2023. The highest fishing effort this season occurred on August 9 when 32 permit holders made landings. Total commercial salmon harvests were approximately 15 sockeye, and 142,000 chum salmon (Table 6).

### Chum Salmon

*Run and Escapement Summary:* No aerial surveys were conducted in 2023. The Kobuk River test fish project was ineffective in catching fish because of high water conditions.

*Harvest Summary:* The Kotzebue Sound chum salmon harvest of 142,000 fish was lower than typical due to fewer buyers operating in the area.

Summary by Kevin Clark, Area Management Biologist, ADF&G, Nome.

Table 6.—2023 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

| Fishing area                | Species |         |      |      |      | Total |
|-----------------------------|---------|---------|------|------|------|-------|
|                             | Chinook | Sockeye | Coho | Pink | Chum |       |
| Kuskokwim River             | —       | —       | —    | —    | —    | —     |
| Kuskokwim Bay               | —       | —       | —    | —    | —    | —     |
| Kuskokwim Area Total        | —       | —       | —    | —    | —    | —     |
| Lower Yukon River           | —       | —       | —    | —    | —    | —     |
| Upper Yukon River           | —       | —       | —    | —    | —    | —     |
| Yukon River Total           | —       | —       | —    | —    | —    | —     |
| Norton Sound <sup>a</sup>   | —       | 0       | 5    | 4    | 16   | 25    |
| Kotzebue Sound <sup>a</sup> | —       | 0       | —    | —    | 142  | 142   |
| AYK Region Total            | —       | 0       | 5    | 4    | 158  | 167   |

*Note:* En dashes indicate no harvest, and zeros indicate harvest activity but <500 fish. Columns may not total exactly due to rounding.

<sup>a</sup> Total includes commercial harvest that was discarded, confiscated, seized, or donated.

## WESTWARD REGION

### KODIAK AREA

The 2023 commercial harvest in the Kodiak Management Area (KMA) was approximately 11,000 Chinook salmon, 2.6 million sockeye salmon, 266,000 coho salmon, 24.7 million pink salmon, and 828,000 chum salmon (Table 7). The total KMA salmon harvest of 28.4 million fish was slightly below the 2023 forecast but above the previous 10-year average of approximately 23.9 million fish.

Commercial fishing effort was below average compared to recent years. Of the 585 eligible commercial salmon permits, 289 permits were used, including 165 purse seine and 122 set gillnet permits.

#### Chinook Salmon

*Run and Escapement Summary:* The total Chinook salmon escapement (less than 1,000 fish) was a record low, and below the previous 10-year average of 5,400 fish. Escapement goals for Chinook salmon have been developed for the Karluk and Ayakulik Rivers, and escapements are estimated using fish counting weirs.

Chinook salmon escapement through the Karluk River weir was a record low (under 400 fish) and below the BEG range of 3,000–6,000 fish. Chinook salmon escapement through the Ayakulik River weir was also a record low (under 600 fish) and below the BEG range of 4,800–8,400 fish.

*Harvest Summary:* There are no directed Chinook salmon commercial fisheries in the KMA, but incidental commercial harvest occurs during targeted sockeye and pink salmon fisheries. The Karluk and Ayakulik Rivers both support small populations of Chinook salmon. By regulation, nonretention of Chinook salmon over 28 inches was implemented for the purse seine fleet areawide from June 1 through July 5. Due to a poor Chinook salmon run to both Karluk and Ayakulik Rivers, nonretention of Chinook salmon was extended for the purse seine fleet from July 6 until the end of the season along the westside of Kodiak Island from the latitude of Cape Kuliuk to the latitude of Low Cape. The 2023 commercial harvest of Chinook salmon in the KMA totaled just over 11,000 fish, which was above the previous 10-year average (10,500 fish) and the 2023 forecast (8,000 fish).

#### Sockeye Salmon

*Run and Escapement Summary:* Sockeye salmon runs in many systems in the KMA were average to above average. All sockeye salmon systems met their established escapement goals except Buskin Lake. The entire KMA estimated sockeye salmon escapement of 1.6 million fish was above the previous 10-year average of 1.4 million fish.

*Harvest Summary:* The commercial harvest of sockeye salmon was approximately 2.6 million fish. The harvest was above the recent 10-year average (2.5 million fish) and the preseason forecast (1.8 million fish).

Early-season management for much of the westside of Kodiak Island is driven by Karluk River early-run sockeye salmon. The 2023 Karluk River early run was weak, but escapement was adequate to allow for several weekly fishing periods along much of the westside of Kodiak Island until the management focus turned to pink salmon. A total of approximately 246,000 sockeye salmon were harvested in early-season westside areas based on Karluk River early-run sockeye

salmon and the beginning of the pink salmon fishery (June 1–July 15). Westside sockeye salmon numbers include an estimated contribution of 60,000 sockeye salmon from the enhanced Spiridon Lake sockeye salmon run harvested outside of the Spiridon Bay Special Harvest Area (SHA).

Late-season management for much of the west side of Kodiak is driven by the Kodiak Island pink and chum salmon runs and the Karluk River late-run sockeye salmon run. Most of the wild pink salmon runs to the west side of Kodiak Island were average, and weekly fishing time was allowed in July and early August. The Karluk River late-run sockeye salmon run was very strong, and liberal fishing time was allowed in August and September. A near record total of just under 1.3 million sockeye salmon were commercially harvested in late-season westside areas that were opened based on Karluk River late-run sockeye salmon and westside Kodiak pink and chum salmon abundance. Westside sockeye salmon numbers include an estimated contribution of 93,000 sockeye salmon from the enhanced Spiridon Lake sockeye salmon run harvested outside of the Spiridon Bay SHA.

The Ayakulik River early-run sockeye salmon run was weak, and very few fishing days were allowed in the Outer Ayakulik and Halibut Bay Sections of the Southwest Kodiak District during early-run sockeye salmon management. Under 95,000 sockeye salmon were harvested in areas managed based on abundance of Ayakulik River early-run sockeye salmon.

The Ayakulik River late-run sockeye salmon run was weak, and despite liberal fishing time, effort was extremely low in the Outer Ayakulik Section of the Southwest Kodiak District. A total of 89,000 sockeye salmon were harvested in areas managed based on Ayakulik River late-run sockeye salmon. Approximately 180,000 sockeye salmon were harvested from Westside sections managed based on abundance of Ayakulik River sockeye salmon.

Upper Station early-run sockeye salmon escapement was above average, and the traditional fishing areas of the Alitak District (i.e., purse seine and set gillnet sections) were open for several weekly fishing periods in June. The Frazer Lake sockeye salmon escapement was below average, but escapement was adequate to allow for Alitak District early-run sockeye salmon commercial salmon openings through July 15. The Alitak District early-run sockeye salmon harvest was approximately 103,000 fish.

The Upper Station late-run sockeye salmon run was below average. The Alitak District late-run sockeye salmon harvest was under 181,000 fish. The total harvest of the Alitak District sockeye salmon was approximately 284,000 fish.

## **Coho Salmon**

*Run and Escapement Summary:* Although substantial coho salmon runs occur in the KMA, the department no longer has funds to monitor most stocks. The only established coho salmon escapement goals exist in the Northeast Kodiak District and Eastside Kodiak District. Coho salmon runs in many systems in the KMA were strong in 2022. All escapement goals were met.

*Harvest Summary:* The commercial coho salmon harvest of 266,000 fish was below both the forecast and the previous 10-year average (approximately 338,000 fish). The majority of the coho salmon were harvested around Kitoi Bay Hatchery and the Westside Kodiak fishery in August and September.



## **Pink Salmon**

*Run and Escapement Summary:* The KMA pink salmon escapement of approximately 5.2 million fish was slightly below the previous 10-year average of 5.5 million fish. However, this should be seen as a minimal estimate given the lack of aerial surveys conducted. Pink salmon escapement goals have been established as aggregate goals for the entire Kodiak Archipelago and the Mainland District. The 2023 escapement for the Kodiak Archipelago (4.4 million fish) was within the SEG range of 2,000,000 to 5,000,000 million fish. However, given how late the pink salmon run was this season, and the lack of aerial survey coverage, there is a strong likelihood that the Kodiak Archipelago exceeded the upper bound of the escapement goal range. The Mainland District pink salmon escapement of under 730,000 fish was above average and within the established SEG range (250,000 to 1,000,000 fish).

*Harvest Summary:* The 2023 KMA pink salmon harvest of 24.7 million fish was below the forecast but above the previous 10-year average harvest of 20.4 million fish. However, the 2023 KMA pink salmon run was late this year, and processors stopped buying pink salmon near the end of August. Pink salmon harvested in the areas managed on KMA wild stocks totaled 13.8 million fish, which was below forecast.

The Kitoi Bay Hatchery pink salmon run was above average and above forecast with 10.9 million pink salmon harvested in sections near the hatchery, which was well above the forecast (5.3 million fish). Kitoi-bound pink salmon are probably harvested along the west and east sides of Kodiak and Afognak Islands. Likewise, additional wild stock salmon are likely harvested in areas associated with Kitoi Bay Hatchery. The department does not have a stock separation program for pink salmon and is unable to differentiate the KMA wild and hatchery stocks. Cost-recovery fish and carcass sales harvested by Kodiak Regional Aquaculture Association accounted for 18% of the harvest (1.9 million) fish.

## **Chum Salmon**

*Run and Escapement Summary:* The overall KMA chum salmon escapement of 482,000 fish was stronger than the past several seasons and above the previous 10-year average (365,000 fish). Chum salmon escapement was particularly strong in the Mainland District due to newly restrictive management plans and lack of effort. A peak indexed escapement goal based on 17 streams on Kodiak Island has been established; the 2023 peak indexed escapement estimate of almost 128,000 fish was above the lower bound SEG of 101,000 fish.

*Harvest Summary:* Most of the KMA wild chum salmon are harvested during the directed pink and chum salmon fisheries in July. Several KMA chum salmon runs were above average this season. The 2023 KMA chum salmon harvest of 828,000 fish was well above the 2023 forecast (under 457,000 fish). Additionally, the Kitoi Bay Hatchery chum salmon harvest of 239,000 fish was well above the forecast (60,000 fish).

Summary by James Jackson Area Management Biologist, ADF&G, Kodiak.

## CHIGNIK AREA

Commercial salmon fishing effort in the Chignik Management Area (CMA) was below average, with 35 permits participating. From 2018 to 2021, the early run of sockeye salmon into the Chignik River watershed failed to develop, and both the early and late runs failed to develop in 2018 and 2020. Despite the stronger run in 2023, the recent weak CMA sockeye salmon runs are the major contributing factor to low participation. Prior to 2018, between 50 and 70 permits participated in CMA commercial fisheries on any given year.

The 2023 commercial harvest in the CMA was approximately 2,000 Chinook, 1.1 million sockeye, 53,000 coho, 2.1 million pink, and 110,000 chum salmon (Table 7).

On June 29, commercial salmon fishing was allowed in the Eastern, Central, Chignik Bay, Western, and Perryville Districts for 48 hours to assess the development of incoming sockeye salmon. This initial commercial salmon fishing period was continuously extended throughout the season in all districts due to the small fleet size being unable to significantly slow the passage of salmon, barring mandatory regulatory closures in the Central and Chignik Bay Districts after July. Harvest effort ceased on August 25 when processors concluded fish purchasing operations.

### Chinook Salmon

*Run and Escapement Summary:* The Chignik River is the only major Chinook salmon producing stream within the CMA, and one of the largest Chinook salmon streams on the South Alaska Peninsula. The BEG range for Chinook salmon into the Chignik River watershed is 1,300–2,700 fish. The Chinook salmon run has failed to consistently develop since 2017 and was declared a stock of concern in 2023. The Chignik River Chinook salmon escapement (above the weir) of almost 270 fish in 2023 did not meet the escapement goal, was below recent escapement averages, and was the lowest recorded escapement in history. State subsistence and sport fishery harvest of Chinook salmon will not be known until permits and questionnaires are returned and tabulated.

*Harvest Summary:* A total of approximately 2,000 Chinook salmon were harvested during the 2023 season, which was below recent 5- and 10-year averages. Most of the harvest occurred in the Western District with Chinook salmon harvest being incidental to fisheries targeting other species. Chinook salmon escapements into the Chignik River system was lowest in history throughout the season, despite restrictions on commercial salmon harvest opportunities. Throughout the entire commercial salmon fishing season, Chinook salmon 28 inches or greater could not be retained in the commercial salmon fishery in the Chignik Bay and Central Districts, as well as the Inner Castle Cape Subsection of the Western District.

### Sockeye Salmon

*Run and Escapement Summary:* The Chignik River watershed supports 2 genetically distinct sockeye salmon runs that traditionally provide most directed harvest opportunities within the CMA: an early run and a late run. The early run starts in May, continues through June, and decreases in July, whereas the late run of sockeye salmon starts in June, continues through July, and decreases throughout August and into September. The early-run escapement was approximately 431,000 fish and was above the early-run OEG range of 300,000–400,000 fish. The

late-run estimated escapement of 457,000 fish also exceeded the late-run OEG range of 240,000–360,000 fish.

*Harvest Summary:* Harvest opportunity targeting sockeye salmon in the CMA is based upon the escapement of both early and late-run sockeye salmon in the Chignik River watershed. Due to the significant overlap of early and late runs of sockeye salmon, management must allow opportunity to harvest surplus fish without jeopardizing either run.

The 2023 Chignik River early run of sockeye salmon did not develop until late June and no directed sockeye salmon commercial fishing periods were scheduled until June 29. The 2023 CMA sockeye salmon harvest of approximately 1.1 million fish was above the recent 5-, 10-, and 20-year average sockeye salmon harvests. Most sockeye salmon harvest came from the Chignik Bay District. Sockeye salmon harvest in the CMA occurred primarily in July and August with the majority occurring within July.

## **Coho Salmon**

*Run and Escapement Summary:* Coho salmon start to enter CMA drainages in mid-August and generally continue through November. In 2023, the weir ceased operations after August 26 at which point approximately 1,300 coho salmon had passed the weir. Late season coho salmon stream surveys were not conducted in the CMA in 2023 due to staff departure from Chignik.

Due to late season run timing and limited directed effort, escapement goals for coho salmon have not been established in the CMA.

*Harvest Summary:* A total of approximately 53,000 coho salmon were harvested during the 2023 commercial salmon fishing season. Coho salmon harvest was incidental to efforts targeting sockeye and pink salmon. The most recent 10-year average harvest of coho salmon in the CMA is approximately 105,000 fish.

## **Pink Salmon**

*Run and Escapement Summary:* The CMA has an odd-year areawide aggregate pink salmon SEG range of 260,000–450,000 fish. The aggregate pink salmon escapement is the sum of pink salmon escapement into 8 different area index streams. In 2023, the aggregate pink salmon escapement was 629,000 fish, which exceeded the SEG range. Escapements into most other CMA streams were monitored via aerial surveys to assess areawide run timing and distribution.

Pink salmon were observed migrating past the Chignik River weir starting in mid-June. Substantial numbers of pink salmon continued to migrate past the weir until August 27 when the weir was removed. The pink salmon escapement should be considered a minimum because runs continue through August and into September. A total of over 79,000 pink salmon were observed migrating past the Chignik River weir in 2023.

## **Chum Salmon**

*Run and Escapement Summary:* Chum salmon escaping into CMA streams were estimated via aerial surveys, except for the Chignik River, which was enumerated using the Chignik River weir. The chum salmon SEG range of 45,000–110,000 fish is based on escapement of 6 total index streams within 4 of the 5 districts. The 2023 estimated total peak chum salmon escapement for the 6 index streams was 183,000 fish, which was above the established SEG.

At the Chignik River weir, a total of 26 chum salmon were observed passing in 2023.

*Harvest Summary:* Approximately 110,000 chum salmon were harvested in the CMA, below the recent 10-year average of 146,000 fish. The majority of chum salmon harvest occurred in the Western District.

Summary by Carl Burnside, Area Management Biologist, ADF&G, Kodiak.

## **ALASKA PENINSULA, ALEUTIAN ISLANDS, AND ATKA-AMLIA ISLANDS AREAS**

The 2023 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management areas (Area M) totaled approximately 13,000 Chinook, 6.5 million sockeye, 523,000 coho, 44.0 million pink, and 2.2 million chum salmon (Table 7).

### **Chinook Salmon**

*Run and Escapement Summary:* Nelson River is the only river in Area M with a Chinook salmon escapement goal. At the Nelson River weir, a total of approximately 4,000 Chinook salmon escaped, meeting the BEG range of 2,400–5,000 fish. The total Northern District Chinook salmon escapement of over 5,000 fish was below the most recent 10-year average of approximately 12,000 fish.

*Harvest Summary:* On the North Alaska Peninsula, approximately 1,200 Chinook salmon were harvested, which was below the 10-year average harvest of over 1,800 fish. The total commercial harvest for the South Peninsula fishery (including the Southeastern District Mainland [SEDM] from July 26 to October 31) was approximately 11,000 Chinook salmon.

### **Sockeye Salmon**

*Run and Escapement Summary:* The Orzinski Lake sockeye salmon escapement of approximately 19,500 fish was within the SEG range of 14,000–28,000 fish.

The South Peninsula sockeye salmon escapement of almost 70,000 fish was within the management objective range of 48,200–86,400 fish. Escapement into Mortensen Lagoon (5,100 fish) was within the SEG range of 3,200–6,400 fish. Escapement into Thin Point Lagoon (just under 28,000 fish) was within the SEG range of 14,000–28,000 fish.

The 2023 sockeye salmon escapement in the Northwestern District was within the escapement objective range of 52,600–106,000 fish, with a total escapement of almost 95,000 fish.

In the Northern District, the 2023 North Creek escapement estimate of over 11,000 sockeye salmon met the SEG range of 7,500–10,000 fish.

The Nelson Lagoon Section was open for all regularly scheduled weekly fishing periods and was opened continuously starting on June 26. The Nelson (Sapsuk) River total run of approximately 364,000 sockeye salmon (including harvest and escapement) was above the estimated forecast of 177,000 fish. From the total run, just over 101,000 fish were harvested in Nelson Lagoon and almost 263,000 fish escaped in the Nelson River. The 2023 escapement met the BEG range of 97,000–219,000 fish.

The Bear River early-run (through July 31) sockeye salmon escapement of under 281,000 fish exceeded the SEG range of 176,000–293,000 fish. The Bear River late-run (after July 31) sockeye salmon escapement of approximately 129,000 fish was within the SEG range of 117,000–195,000

fish. The Bear River season sockeye salmon escapement was just over 409,000 fish, within the combined early- and late-run sockeye salmon SEG range of 293,000–488,000 fish.

The Sandy River sockeye salmon escapement of almost 49,000 fish met the escapement goal range of 34,000–74,000 fish.

The Ilnik River system sockeye salmon escapement through the weir was approximately 109,000 fish, exceeding the Ilnik River SEG range of 40,000–60,000 fish.

The McLees Lake sockeye salmon escapement through the weir was under 27,000 fish, meeting the lower bound SEG of 10,000 sockeye salmon.

Aerial escapement surveys of the Meshik River began on June 20. Subsequent surveys occurred throughout the season and the final sockeye salmon escapement into the Meshik River system was just over 79,000 fish, and within the SEG range of 48,000–86,000 fish. This estimate includes escapement into the Meshik River and tributaries, as well as Red Bluff and Yellow Bluff Creeks.

The total Cinder River (including Mud Creek) sockeye salmon escapement estimate of almost 60,000 fish was within the SEG range of 36,000–94,000 fish.

*Harvest Summary:* The total commercial harvest for the South Peninsula fishery (including the SEDM from July 26–October 31) was approximately 1.7 million fish.

On the North Peninsula, approximately 1.1 million sockeye salmon were harvested, which was below the 10-year average of 2.2 million fish.

## **Coho Salmon**

*Run and Escapement Summary:* There were no coho salmon surveys flown on the South Peninsula streams in 2023. A lack of escapement information for coho salmon is due to the departure of management staff from the South Peninsula region prior to peak coho salmon runs and poor weather conditions preventing aerial surveys from being conducted.

Coho salmon surveys were conducted on most Northern District streams in early September before the peak of the run. Although coho salmon runs continue through September and October, budgetary and logistic constraints do not permit coho salmon surveys to take place later in the fall. Escapement estimates that are tabulated from aerial surveys are considered minimum estimates. The total coho salmon escapement in the Northern District was approximately 17,000 fish. Both the Nelson and Ilnik Rivers have coho salmon lower bound SEGs. The Nelson River escapement of 5,000 coho salmon was below the lower-bound SEG of 18,000 fish. The Ilnik and Ocean Rivers were surveyed twice in August and zero coho salmon were observed during these surveys because water conditions were extremely poor during each survey. It is unknown if the lower bound escapement goal of 9,000 fish was achieved. It is expected that more coho salmon entered the Ilnik and Nelson River systems during September and October. Coho salmon escapement into the Cinder River was about 5,000 fish, and approximately 7,000 fish were observed escaping into the Meshik River system.

*Harvest Summary:* The total commercial harvest for the South Peninsula fishery (including the SEDM from July 26–October 31) was almost 198,000 coho salmon. A total of approximately 6,000 coho salmon were harvested in the North Peninsula.

## Pink Salmon

*Run and Escapement Summary:* The South Peninsula pink salmon total indexed escapement of 5.9 million fish was above the SEG range of 1,750,000–4,000,000 million fish.

There are no escapement goals for pink salmon on the North Peninsula. In some years, depending on market conditions, a directed pink salmon fishery may occur; however, this did not happen in 2023. A total of almost 40,000 pink salmon were observed in the Northern District in 2023, and over 30,000 pink salmon were observed in the Northwestern District.

*Harvest Summary:* The total commercial harvest for the South Peninsula fishery (including the July 26 to October 31 SEDM fishery) was 17.1 million fish. A total of 25,000 pink salmon were commercially harvested in the North Peninsula Area fisheries.

## Chum Salmon

*Run and Escapement Summary:* The South Peninsula chum salmon indexed total escapement of over 331,000 fish was within the cumulative district SEG range of 218,300–410,600 fish.

In the Northwestern District, the chum salmon escapement of 47,200 fish was below the SEG range of 100,000–215,000 fish.

The Northern District escapement goal is determined by an aggregate of 18 index streams. In 2023, the Northern District chum salmon escapement could not be accurately assessed due to poor aerial survey conditions on 3 streams. However, approximately 136,000 chum salmon were observed in the remaining streams, exceeding the escapement goal range of 49,000–132,000 fish. A total of almost 153,000 chum salmon escaped into Northern District streams in 2023.

*Harvest Summary:* The total commercial harvest for the South Peninsula fishery (including the SEDM from July 26 to October 31) was 1.1 million fish. During the 2023 commercial chum salmon fishery, over 91,000 fish were harvested in the North Peninsula.

Summary by Matt Keyse, Geoff Spalinger, Charles Russell, and William Middleton Area Management Biologists, ADF&G, Kodiak.

Table 7.—2023 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

| Fishing area                   | Species |         |      |        |       | Total  |
|--------------------------------|---------|---------|------|--------|-------|--------|
|                                | Chinook | Sockeye | Coho | Pink   | Chum  |        |
| Kodiak <sup>a</sup>            | 11      | 2,558   | 266  | 24,744 | 828   | 28,408 |
| Chignik <sup>a</sup>           | 2       | 1,070   | 53   | 2,144  | 110   | 3,378  |
| South Peninsula <sup>a,b</sup> | 11      | 1,741   | 198  | 17,100 | 1,131 | 20,181 |
| North Peninsula                | 1       | 1,148   | 6    | 25     | 92    | 1,272  |
| Alaska Peninsula total         | 13      | 2,889   | 204  | 17,125 | 1,223 | 21,454 |
| Westward Region total          | 26      | 6,517   | 523  | 44,013 | 2,161 | 53,240 |

*Note:* Columns may not total exactly due to rounding.

<sup>a</sup> Total includes commercial harvest that was discarded, confiscated, seized, or donated.

<sup>b</sup> Total includes commercially harvested fish retained for personal use.

## SALMON SPECIES CATCH AND PROJECTIONS

Figures 2–6 show actual catch and projected catch for Chinook, sockeye, coho, pink, and chum salmon.

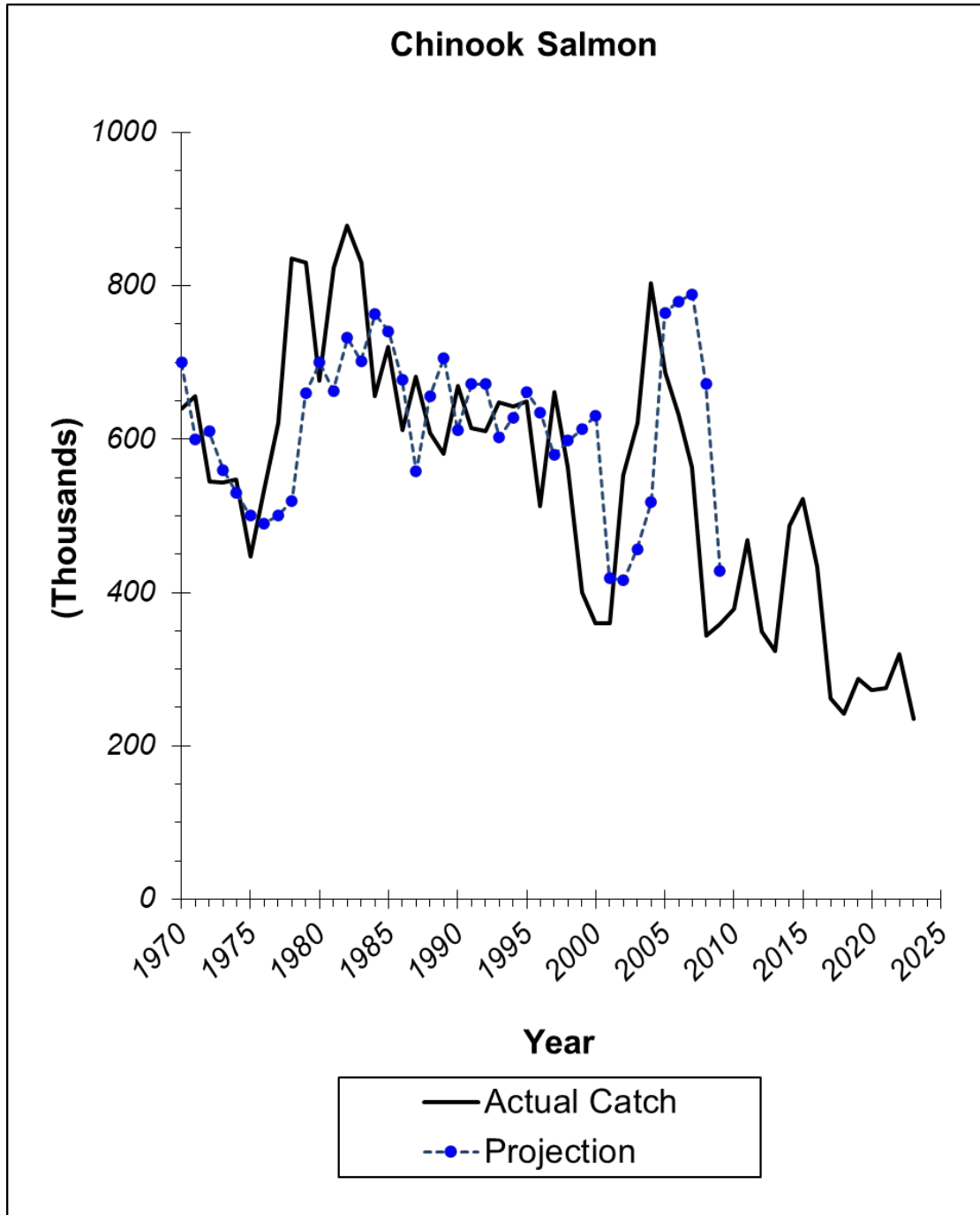


Figure 2.—Relationship between actual catch and projected catch in thousands, for Alaska Chinook salmon fisheries from 1970 to 2023; 2010–2024 projections are not available.

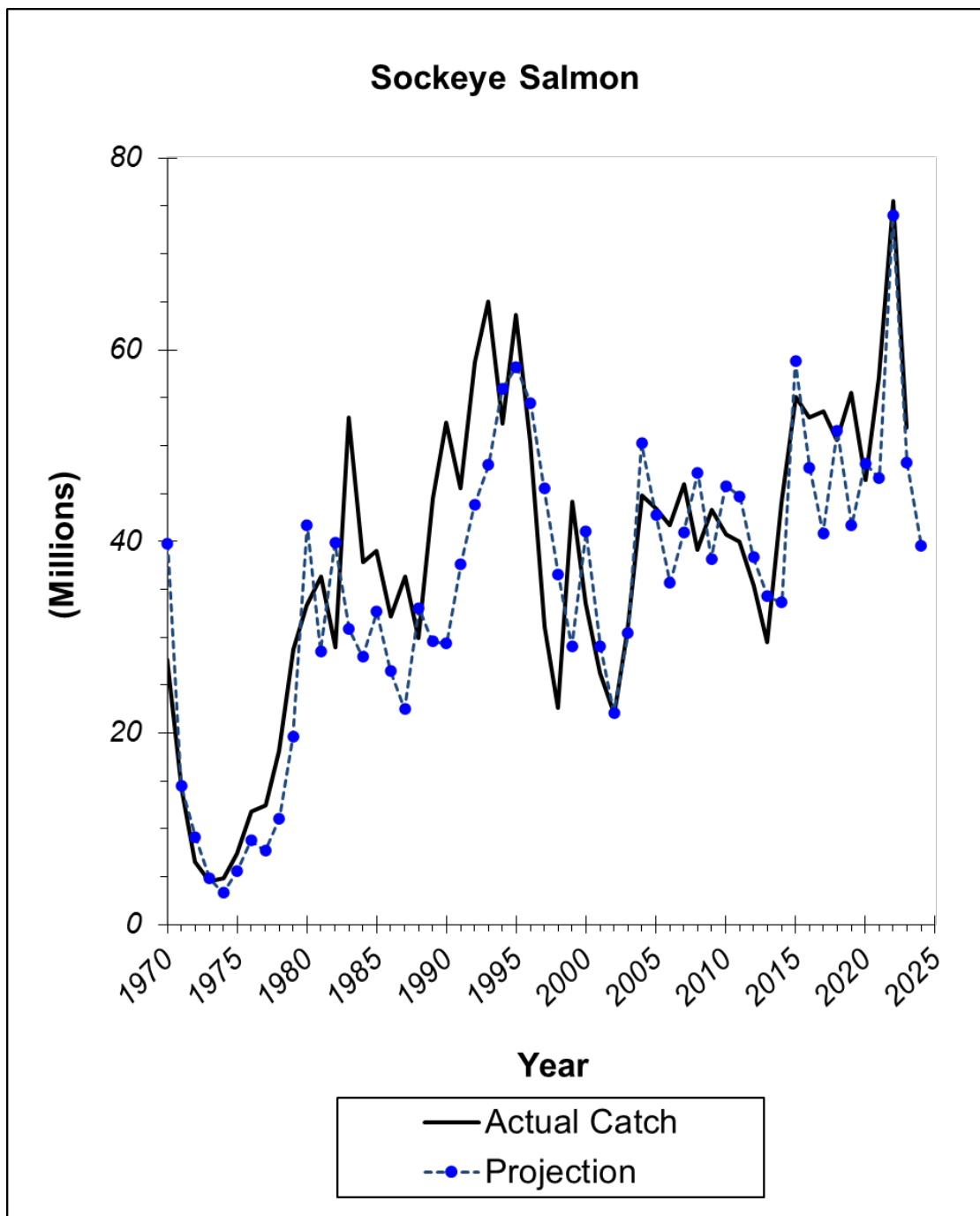


Figure 3.—Relationship between actual catch and projected catch in millions, for Alaska sockeye salmon fisheries from 1970 to 2023, with the 2024 projection.



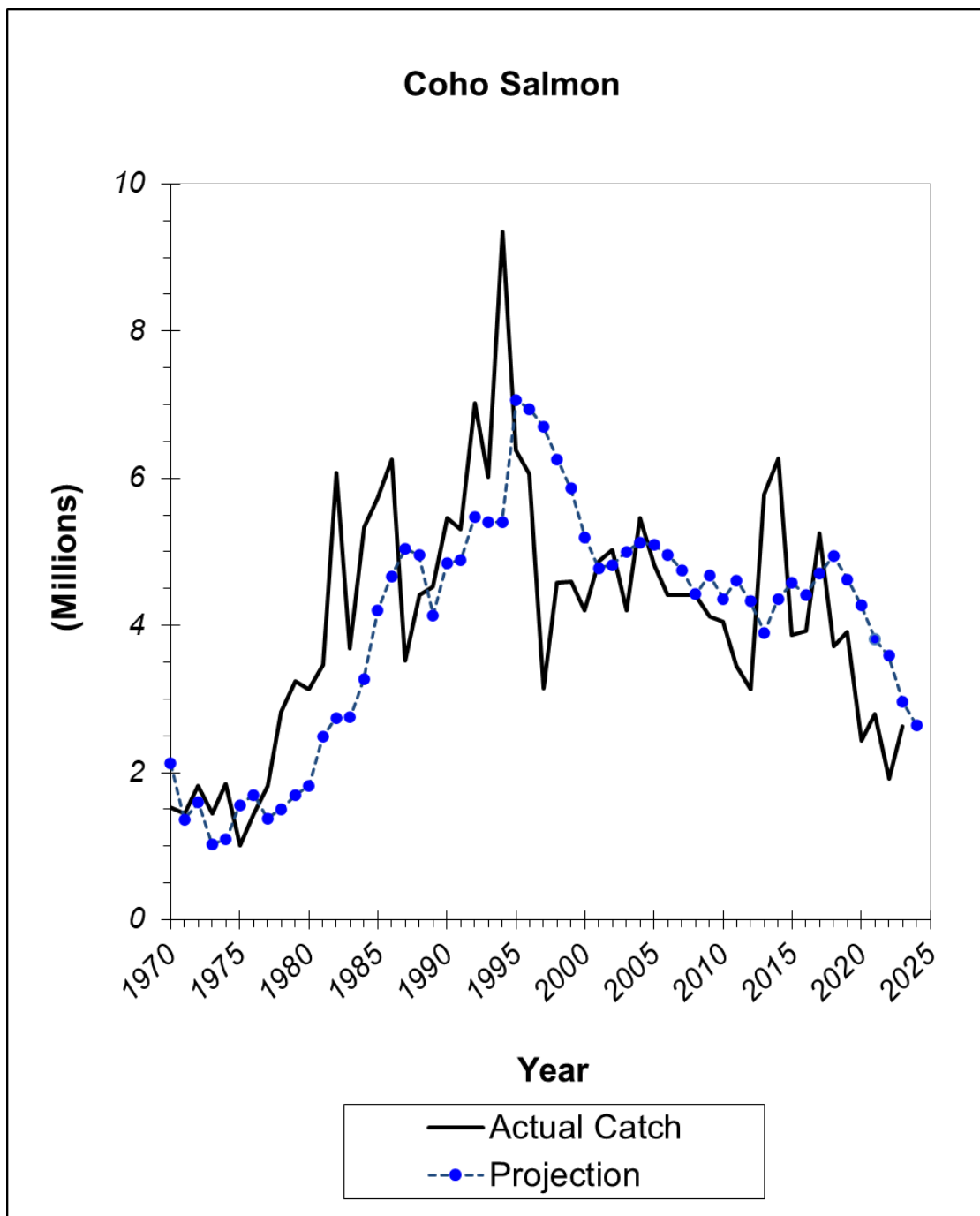


Figure 4.—Relationship between actual catch and projected catch in millions, for Alaska coho salmon fisheries from 1970 to 2023, with the 2024 projection.

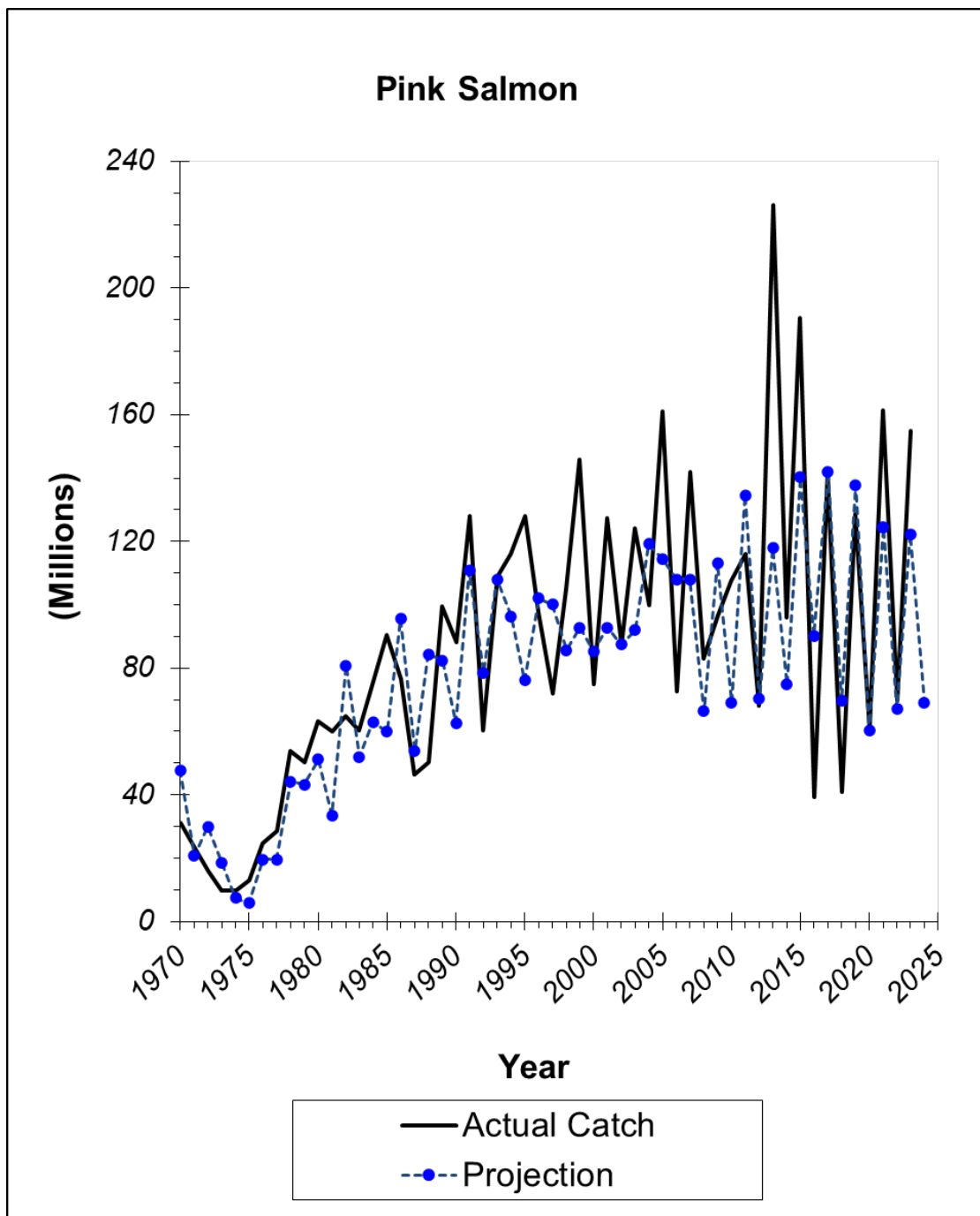


Figure 5.—Relationship between actual catch and projected catch in millions, for Alaska pink salmon fisheries from 1970 to 2023, with the 2024 projection.

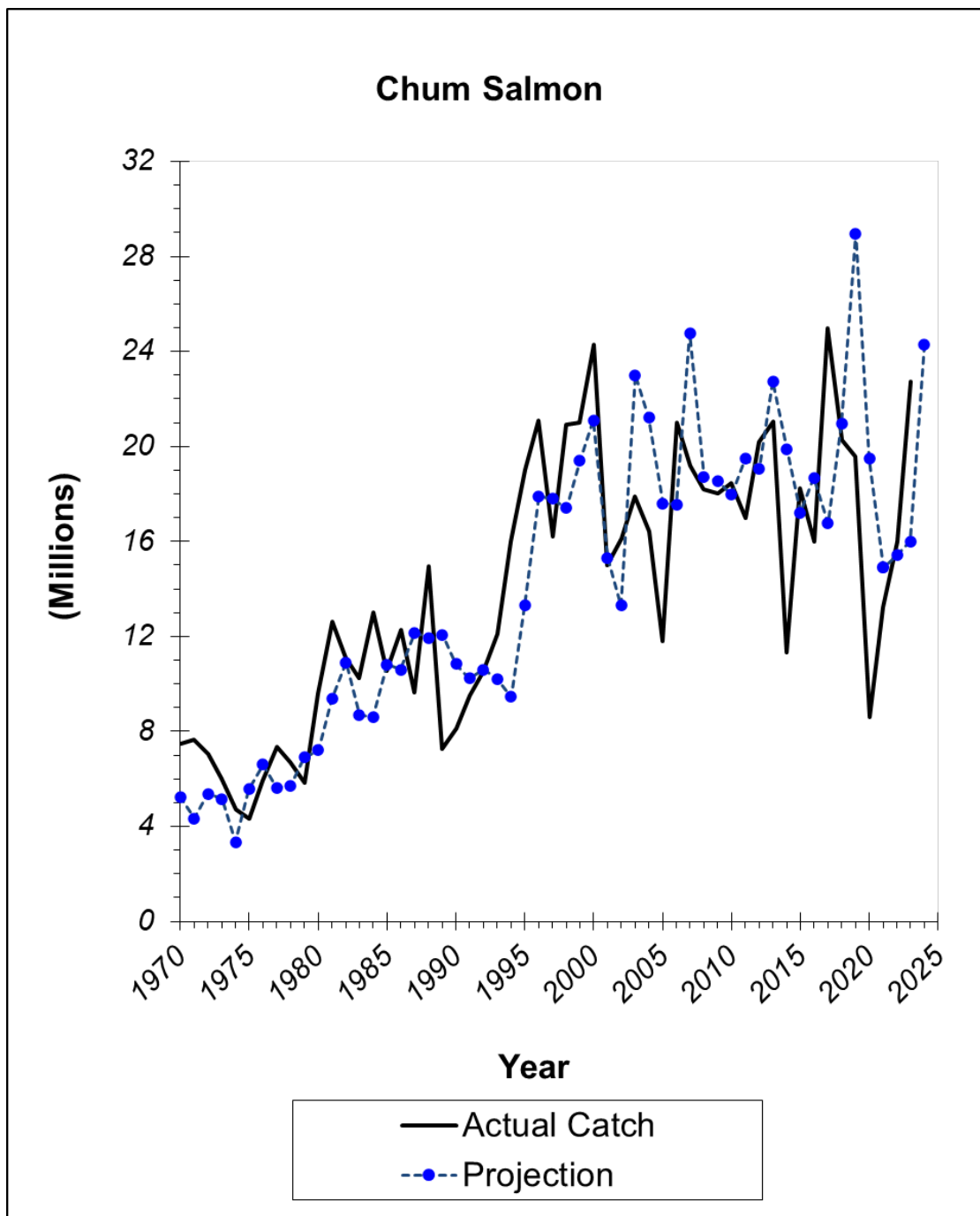


Figure 6.—Relationship between actual catch and projected catch in millions, for Alaska chum salmon fisheries from 1970 to 2023, with the 2024 projection.

# PRELIMINARY FORECASTS OF 2024 SALMON RUNS TO SELECTED ALASKA FISHERIES

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ADF&G prepares forecasts for salmon runs that affect major fisheries around the state. Salmon runs to be forecasted are selected using several criteria, including economic importance, feasibility, compatibility with existing programs, and management needs (Table 8).

Table 8.—Forecast fisheries for the 2024 fishing year.

| Fishing area                                    | Targeted species                             |
|---|--|
| Southeast Region                                | pink salmon<br>Chinook salmon                |
| Central Region                                  |  |
| Copper River and Prince William Sound           | wild Chinook, sockeye, pink, and chum salmon |
| Upper Cook Inlet                                | sockeye salmon                               |
| Lower Cook Inlet                                | pink salmon                                  |
| Bristol Bay                                     | sockeye salmon                               |
| Arctic-Yukon-Kuskokwim Region                   |  |
| Yukon Management Area                           | fall chum salmon                             |
| Westward Region                                 |  |
| Kodiak Management Area                          | pink salmon                                  |
| Ayakulik River                                  | sockeye salmon                               |
| Karluk River                                    | sockeye salmon                               |
| Alitak District (Frazer Lake and Upper Station) | sockeye salmon                               |
| Spiridon Lake                                   | sockeye salmon                               |
| Chignik Management Area                         | sockeye salmon (early and late runs)         |
| Alaska Peninsula/Aleutian Islands               | sockeye salmon                               |
| Bear Lake                                       | sockeye salmon (late run)                    |
| Nelson River                                    | sockeye salmon                               |
| South Alaska Peninsula aggregate                | pink salmon                                  |

A variety of information is used to forecast salmon runs and associated harvests. The escapement of parental stocks is an important first determinant of future run strength potential; however, other information that might be considered in forecasts includes outmigrating smolt numbers, returns from sibling age classes of the projected return, and environmental conditions. A range of run possibilities are predicted for each forecasted fishery. In general, the actual run can be expected to fall within the range (between the lower and upper limits) less than half the time.

Harvest projections based on quantitative forecasts of salmon runs generally reflect potential harvests and are made for most of the major sockeye salmon fisheries and pink salmon fisheries in SEAK, PWS, Cook Inlet, Kodiak, and the Alaska Peninsula. Forecasts for large hatchery runs including sockeye, pink, and chum salmon runs to the SEAK, PWS, and Kodiak areas are provided by private nonprofit operators. For other fisheries, the harvest projections are made based on harvests levels from previous years and are reflective of fishing effort; thus, harvests are reflective of both market conditions and salmon run strength.

## SOUTHEAST REGION

### CHINOOK SALMON

*Forecast Methods:* Chinook salmon forecasts are typically produced for 5 stocks returning to SEAK rivers. The stocks of Chinook salmon originating in the Situk, Chilkat, and Unuk Rivers have annual forecasts of total run, and terminal run forecasts are produced for stocks originating in the Taku and Stikine Rivers. However, due to data limitations, 2024 forecasts were only possible for the stocks from Chilkat, Taku, and Unuk Rivers. Methods described in Bernard and Jones (2014) are used to create forecasts of ocean-age-3 and ocean-age-4 fish. Ocean-age-5 fish are not forecasted because these fish are rarely observed in escapements or harvests in SEAK. The age-specific forecasts use brood year data that is estimated for each stock annually. For example, the forecast of ocean-age-3 fish in year  $t$ , and from brood year  $(t-5)$ , is based on the return of ocean-age-2 fish in year  $t-1$ ; the forecast of ocean-age-4 fish in year  $t$ , from brood year  $(t-6)$ , is based on the returns of ocean-age-2 fish in year  $t-2$  and ocean-age-3 fish in year  $t-1$ . The brood year forecasting method incorporates more data for older age classes than a straight sibling regression and recognizes that previous returns from a given brood year have proven to be a good indicator of overall strength of an age class and early life-stage survival (Bernard and Jones 2014).

Run projections are created for the 2 principal brood years returning as ocean-age-3 and ocean-age-4 fish in the forecast year by applying previous abundance estimates at age to recently observed maturation rates. Once a brood year run projection is created, recent brood year return at age estimates are applied to the run projection to forecast the return of ocean-age-3 or ocean-age-4 fish. Using the previous 8 or 9 years of brood year information has proven to be the most accurate in forecasting, as described and investigated by the Chinook Technical Committee of the Pacific Salmon Commission (PSC 2016).

The uncertainty in return-at-age estimates is incorporated into the forecast, by creating a normal distribution around the year  $(t-1)$ , ocean-age-2 abundance estimates and standard error, which is then sampled 10,000 times to create a year  $(t)$  projection of ocean-age-3 fish. Similarly, a normal distribution using the year  $(t-2)$ , ocean-age-2 abundance estimate, and year  $(t-1)$ , ocean-age-3 abundance estimate, and standard errors, is created and sampled 10,000 times to create a year  $(t)$  projection of ocean-age-4 fish. A 5-year hindcast is then analyzed to determine forecast errors using the geometric mean, mean percent error (MPE), or mean absolute percent error (MAPE).

Most Chinook salmon systems in SEAK have been experiencing maturation rate changes for recent brood years and this current trend includes a loss of older age fish (i.e., reduction of ocean-age-4 fish) in escapements and harvests. The loss of ocean-age-4 Chinook salmon has resulted in a slight increase of ocean-age-3 fish, and an even greater increase in the ocean-age-2 fish. Because hindcast error for a specific year is calculated as  $(\text{forecast}-\text{actual})/\text{actual}$ , hindcast errors of ocean-age-4 fish are generally greater than errors in forecasts of ocean-age-3 fish; however, this is quite variable among Chinook salmon systems. Overall, the 2024 forecasts are for total or terminal runs near the midpoint of the escapement goal range for the Chilkat stock and slightly below or at the lower bound of the escapement goal range for the Taku and Unuk stocks, respectively (Table 9).

Table 9.—The 2024 run forecasts, average runs from 2014–2023, and 2023 runs and escapements for 3 Southeast Alaska Chinook stocks originating in the Chilkat, Taku, and Unuk Rivers.

| Run type                | Chinook stock | Situk total        | Chilkat total | Taku Terminal | Stikine Terminal | Unuk total |
|-------------------------|---------------|--------------------|---------------|---------------|------------------|------------|
| 2024 Run forecast       |               | n/a                | 2,850         | 17,350        | n/a              | 1,800      |
| Average run (2014–2023) |               | 684                | 2,150         | 14,927        | 14,482           | 3,114      |
| 2023 Run                |               | 144                | 2,318         | 15,785        | 13,004           | 3,184      |
| 2023 Escapement         |               | 144                | 2,234         | 14,571        | 12,864           | 2,072      |
| 5-year hindcast error   | 3-ocean       | n/a                | 25.2%         | -2.3%         | n/a              | 22.4%      |
|                         | 4-ocean       | n/a                | 1.0%          | 20.1%         | n/a              | 28.7%      |
| Escapement goal range   | Lower         | 450 <sup>a</sup>   | 1,750         | 19,000        | 14,000           | 1,800      |
|                         | Upper         | 1,050 <sup>a</sup> | 3,500         | 36,000        | 28,000           | 3,800      |

Note: “n/a” pertains to information that was not available due to data limitations and/or ongoing analysis.

<sup>a</sup> ADF&G goal; PSC CTC escapement goal range is 500 to 1,000 fish.

*Forecast Discussion:* Previous forecasting methods used traditional sibling regressions, which failed to capture current trends in return-at-age and resulted in inaccurate forecasts. Inaccurate forecasts impaired management’s ability to properly manage mixed stock and terminal area fisheries to pass adequate numbers of Chinook salmon to escapement. Over forecasting resulted in some very high harvest rates in poor run years and therefore several stocks failed to meet management objectives (Figure 7, Table 10). The use of methods outlined in Bernard and Jones (2014) helped improve forecast accuracy and has resulted in more conservative management in recent years.

Forecasts for SEAK Chinook salmon are produced by December 1, annually. The quality of data used in these forecasts is paramount in creating accurate and precise run projections. Reliable age data was not collected on the Situk and Stikine Rivers in run year 2023, and therefore, 2024 forecasts are not being produced for those 2 stocks. Overall, the department conducts full stock assessment projects on the Chilkat, Taku, Stikine, and Unuk Rivers, which includes marking emigrating Chinook salmon smolt with adipose fin clips and tagging with coded-wire; estimating escapement either through mark–recapture experiments, index surveys, or both; and estimating stock-specific harvests in mixed stock fisheries using coded wire tag or genetic stock identification methodologies. The high-quality stock assessment data used to generate annual forecasts directly leads to more accurate forecasts.

Return year 2023 escapement and run estimates came in below forecast expectations for all stocks except for the Unuk River; the Chilkat and Unuk stocks were forecast to achieve the lower bound of the BEG and that occurred despite errors of 23% and -12%, respectively. The Taku River failed to achieve the lower bound (error 46%) despite an above goal forecast, and the Situk River came in approximately 300 fish lower than the forecast.

Run year 2023 generally showed a mediocre presence of ocean-age-2 fish from the 2019 brood year, which is a principal driver in the 2024 forecast, and expectations are down relative to the prior year. Production continues to be poor, and management of sport, commercial, and subsistence fisheries in Southeast Alaska will take a conservative approach in 2024.

Table 10.—Estimated harvests, escapements, total runs, annual harvest percentages, 2014–2023, along with the 2024 forecasts for the Situk, Chilkat, Taku, Stikine, and Unuk stocks of Chinook salmon in Southeast Alaska.

| Stock        | 2014   | 2015   | 2016   | 2017   | 2018  | 2019   | 2020   | 2021   | 2022   | 2023   | Average | Forecast 2024 |
|--------------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|---------|---------------|
| HARVEST      |        |        |        |        |       |        |        |        |        |        |         |               |
| Situk        | 138    | 21     | 64     | 25     | 2     | –      | –      | 70     | 12     | –      | 33      |               |
| Chilkat      | 1,090  | 706    | 416    | 239    | 196   | 87     | 79     | 73     | 42     | 84     | 301     |               |
| Taku         | 5,755  | 5,297  | 3,758  | 2,706  | 1,777 | 421    | 1,145  | 846    | 1,056  | 1,215  | 2,398   |               |
| Stikine      | 6,646  | 7,039  | 6,244  | 2,421  | 260   | 1,656  | 995    | 1,181  | 1,703  | 1,288  | 2,943   |               |
| Unuk         | 1,423  | 3,632  | 1,471  | 544    | 856   | 955    | 597    | 577    | 731    | 1,112  | 1,190   |               |
| ESCAPEMENT   |        |        |        |        |       |        |        |        |        |        |         |               |
| Situk        | 475    | 174    | 329    | 1,187  | 420   | 623    | 1,197  | 1,064  | 890    | 144    | 650     |               |
| Chilkat      | 1,534  | 2,456  | 1,386  | 1,173  | 873   | 2,028  | 3,180  | 2,038  | 1,582  | 2,234  | 1,848   |               |
| Taku         | 23,532 | 23,567 | 9,177  | 8,214  | 7,271 | 11,558 | 15,593 | 11,341 | 12,722 | 14,755 | 13,773  |               |
| Stikine      | 24,374 | 21,597 | 10,554 | 7,335  | 8,603 | 13,817 | 9,753  | 8,376  | 9,090  | 12,864 | 12,636  |               |
| Unuk         | 1,691  | 2,623  | 1,463  | 1,203  | 1,971 | 3,115  | 1,135  | 2,666  | 1,304  | 2,072  | 1,924   |               |
| RUN          |        |        |        |        |       |        |        |        |        |        |         |               |
| Situk        | 613    | 195    | 393    | 1,212  | 422   | 623    | 1,197  | 1,134  | 902    | 144    | 684     | n/a           |
| Chilkat      | 2,624  | 3,162  | 1,802  | 1,412  | 1,069 | 2,115  | 3,259  | 2,111  | 1,624  | 2,318  | 2,150   | 2,850         |
| Taku         | 29,287 | 28,864 | 12,935 | 10,920 | 9,048 | 11,979 | 16,738 | 12,187 | 13,778 | 15,970 | 16,171  | 17,350        |
| Stikine      | 31,020 | 28,636 | 16,798 | 9,756  | 8,863 | 15,473 | 10,748 | 9,557  | 10,793 | 14,152 | 15,580  | 12,900        |
| Unuk         | 3,114  | 6,255  | 2,934  | 1,747  | 2,827 | 4,070  | 1,732  | 3,244  | 2,035  | 3,184  | 3,114   | 1,800         |
| HARVEST RATE |        |        |        |        |       |        |        |        |        |        |         |               |
| Situk        | 23%    | 11%    | 16%    | 2%     | 0%    | 0%     | 0%     | 6%     | 1%     | 0%     | 5%      |               |
| Chilkat      | 42%    | 22%    | 23%    | 17%    | 18%   | 4%     | 2%     | 3%     | 3%     | 4%     | 14%     |               |
| Taku         | 20%    | 18%    | 29%    | 25%    | 20%   | 4%     | 7%     | 7%     | 8%     | 8%     | 15%     |               |
| Stikine      | 21%    | 25%    | 37%    | 25%    | 3%    | 11%    | 9%     | 12%    | 16%    | 9%     | 19%     |               |
| Unuk         | 46%    | 58%    | 50%    | 31%    | 30%   | 23%    | 34%    | 18%    | 36%    | 35%    | 38%     |               |

Note: En dashes indicate no harvest; “n/a” = not applicable.

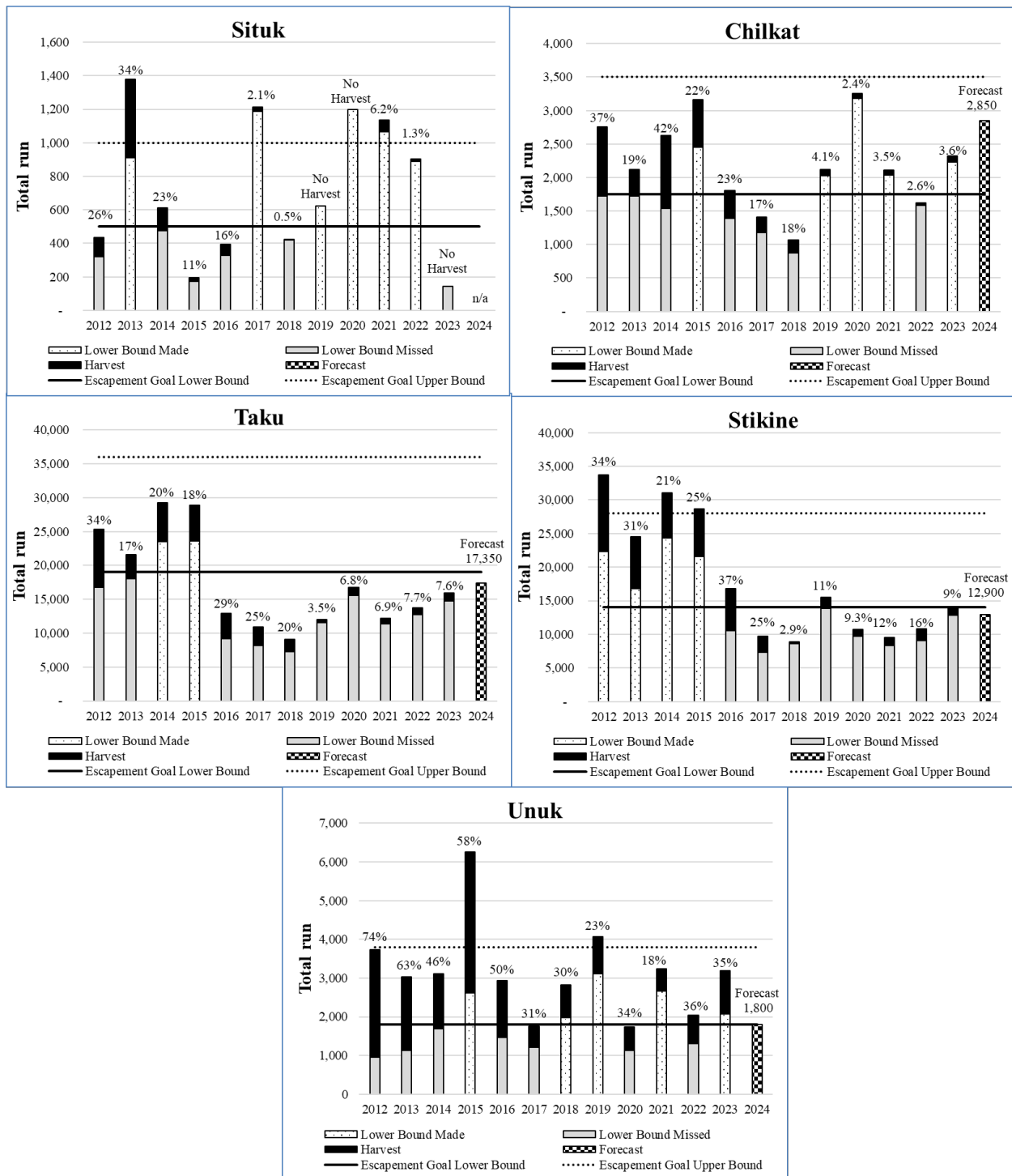


Figure 7.—Escapement estimates in relation to escapement goals, harvest estimates, and harvest percentages, as expressed as a calendar year harvest rate of the total run, for the Situk, Chilkat, Taku, Stikine, and Unuk stocks. Escapement estimates in relation to escapement goals, harvest estimates, and harvest percentages, as expressed as a calendar year harvest rate of the total run, for the Situk, Chilkat, Taku, Stikine, and Unuk stocks of Chinook salmon in Southeast Alaska, 2014–2023, with 2024 forecasts depicted with checkered bars.



## PINK SALMON

The SEAK pink salmon harvest in 2024 is predicted to be in the *average* range with a point estimate of 19 million fish (80% prediction interval: 12–32 million fish). The categorical ranges of pink salmon harvest in SEAK were formulated from the 20th, 40th, 60th, and 80th percentiles of historical harvest over the 63-year period 1960–2022 (Table 11):

Table 11.—Southeast Region pink salmon harvest categories

| Category  | Range (millions) | Percentile        |
|-----------|------------------|-------------------|
| Poor      | Less than 11     | Less than 20th    |
| Weak      | 11 to 19         | 20th to 40th      |
| Average   | 19 to 33         | 40th to 60th      |
| Strong    | 33 to 48         | 60th to 80th      |
| Excellent | Greater than 48  | Greater than 80th |

*Forecast Methods:* The NOAA Alaska Fisheries Science Center, Auke Bay Laboratories initiated the Southeast Alaska Coastal Monitoring (SECM) project in 1997 to better understand the effects of climate and nearshore ocean conditions on year-class strength of salmon and ecologically related species (Orsi et al. 2000). Since 2018, the SECM project has been conducted cooperatively by NOAA and ADF&G using the ADF&G research vessel *Medeia*, and the 2 agencies have combined efforts to produce a joint pink salmon harvest forecast using SECM data (Piston et al. 2019). We plan to continue working toward increased coordination between agencies and will continue to look for ways to focus and expand the SECM survey to provide a wide variety of valuable information to the fishing industry.

The 2024 SEAK pink salmon harvest forecast (Figures 8 and 9) was primarily based on juvenile pink salmon abundance indices collected by the SECM project in northern SEAK inside waters. These data were obtained from systematic surface trawl surveys conducted annually in June and July in upper Chatham and Icy Straits and are highly correlated with the harvest of adult pink salmon in the following year (Wertheimer et al. 2011). The 2023 juvenile pink salmon abundance index (natural log of monthly peak juvenile CPUE + 1; standardized catch based on 20-minute trawl sets) of 1.22 was below average for an odd-year juvenile index but was higher than the past 3 odd-year juvenile indices.

Forecasts were developed using an approach originally described by Wertheimer et al. (2006) and modified by Orsi et al. (2016) and Murphy et al. (2019), but assuming a log-normal error structure (Miller et al. 2022). This approach is based on a multiple regression model with juvenile pink salmon CPUE (a proxy for abundance), along with potential biophysical variables including temperature data from the SECM survey (Piston et al. 2021) or from satellite sea surface temperature (SST) data (Huang et al. 2017); the parent-year SEAK pink salmon escapement index; juvenile pink salmon condition in June and July; juvenile pink salmon energy density in June and July; average zooplankton in the total water column in May, June, or July; zooplankton density in May, June, or July; and the North Pacific Index (NPI) that were investigated. There were 37 individual models considered for the 2024 forecast. The general model used was:

$$E(y) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

where  $E(y)$  is the expected value for  $y$ , the natural log of SEAK pink salmon harvest,  $\beta_1$  is the coefficient for the natural log of CPUE +1, and  $\beta_n$  is the coefficient for the biophysical parameter  $X$ . A one-step-ahead MAPE model performance metric for the most recent 10-year period was used to evaluate and compare the forecast accuracy of the models. Based upon the 10-year MAPE, AICc (Akaike Information Criterion corrected for small sample sizes; Burnham and Anderson 2004) values, significant parameters in the models, and the adjusted R-squared values, a model that included CPUE and the satellite SST variable from northern SEAK (Figure 10) in May was the best performing model. Using this model, the 2024 forecast would be in the average range with a point estimate of 19.2 million fish (80% prediction interval: 11.7 to 31.6 million fish).

*Forecast Discussion:* The 2024 harvest forecast of 19 million pink salmon is just below the recent 10-year, even-year (2004–2022) average harvest of 21 million pink salmon. A harvest of 19 million pink salmon would be near the parent year harvest in 2022 (18.3 million fish) and would be higher than the last 4 even-year harvests (mean = 13.2 million fish). The 2023 peak June–July juvenile pink salmon index value (1.22) ranked 22nd out of the 27 years that SECM information has been collected. Pink salmon harvests associated with juvenile indices below 2.0 have ranged from 8 to 48 million fish (mean = 20 million fish). The low juvenile abundance index in 2023 was not unexpected given recent even-year harvests and poor escapements in much of northern SEAK in 2022. In SEAK, escapement indices did not meet management targets in 13 of 46 stock groups. Juvenile pink salmon caught in 2023 SECM survey trawls were below average in size (length) and energy density for the 27-year time series. Any further growth and survival will depend on favorable resources in the Gulf of Alaska.

Although forecast performance has been relatively good for even years, odd-year forecast performance has been poor recently and the SEAK pink salmon harvest of nearly 48 million fish in 2023 greatly exceeded the preseason harvest forecast of 19 million fish. One possible explanation for the under forecast for 2023 may have been related in part to exceptional marine survival once juvenile pink salmon left SEAK inside waters. Pink salmon runs were generally large from Puget Sound in Washington, through the Gulf of Alaska, and extending to Russia, and runs exceeded forecasts in some other regions throughout the species range, including the Fraser River in southern British Columbia and Russia. In adjacent northern British Columbia, the Nass River saw a record return of nearly 3 million pink salmon, which greatly exceeded the forecast. If marine survival in the open ocean is much higher than average, we are likely to under forecast the return because our trawl survey only provides an index of what survived the freshwater and early marine environments.

Another potential reason considered for the poor performance of the 2023 forecast was the timing of the 2022 trawl surveys. In 2022, the June survey midpoint on June 19 was the earliest on record and 7 days earlier than average (survey dates range from June 18 to July 3 from 1997 to 2022). The July survey midpoint on July 31 was the latest on record but only 2 days later than average (survey dates range from July 19 to August 1 from 1997 to 2022), and the dates have been remarkably consistent through most of the time series. It is unlikely that these slight deviations from average survey dates would result in a large proportion of the juvenile pink salmon migration going undetected, but it is worth acknowledging, and we are taking steps to ensure future surveys occur as close to the mean survey dates as possible. We also examined whether variable tidal currents could influence migration or the catchability of juvenile salmon passing through Icy Strait. After examining 25 years of tidal data from an adjacent location, we found no difference in the

distribution of juvenile pink salmon catch by tidal state. Many other potential factors may affect juvenile pink salmon CPUE including changes in juvenile salmon migration patterns.

Despite the uncertainties that surround every salmon forecast, the track record of our pink salmon harvest forecasts has been relatively good (Figure 9), especially considering the difficulties unique to forecasting pink salmon runs (Haeseker et al. 2005). The department will manage the 2024 commercial purse seine fisheries in season based on the strength of salmon runs. Aerial escapement surveys and fishery performance data will continue, as always, to be essential in making inseason management decisions.

Forecast by Teresa Fish, Andy Piston and Sara Miller, ADF&G; and Wesley Strasburger and Emily Fergusson, NOAA, Auke Bay Lab, Alaska Fisheries Science Center.

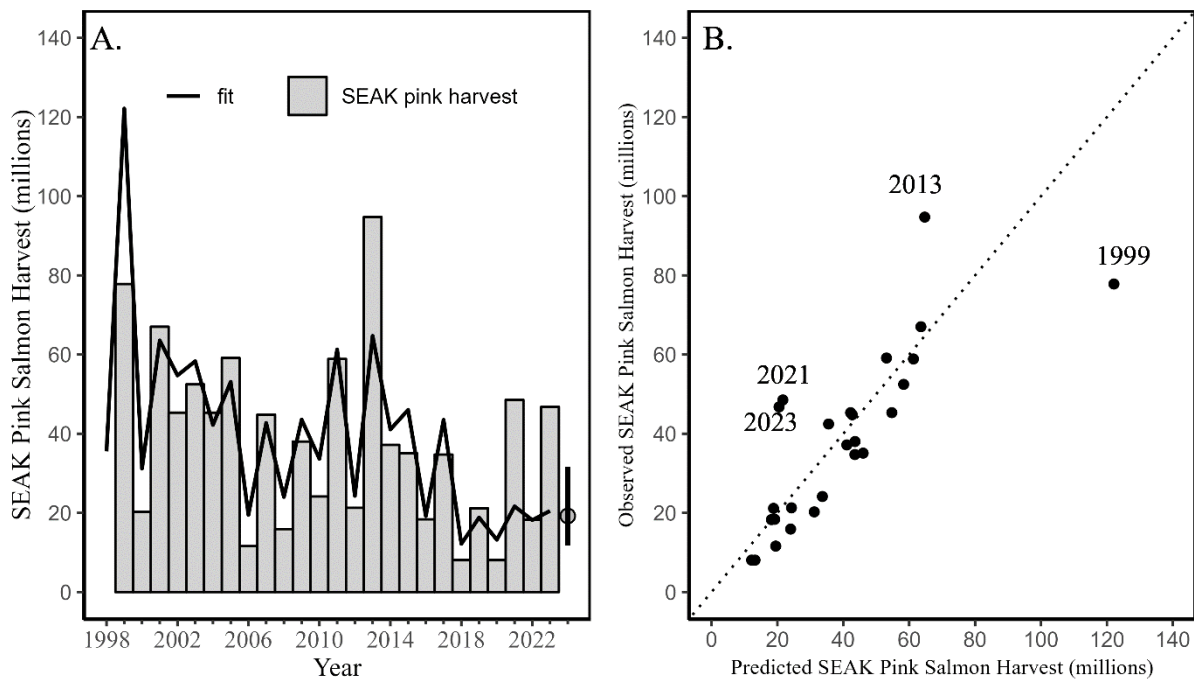


Figure 8.—Forecast model fit (hindcasts) for total Southeast Alaska (SEAK) pink salmon harvest, 1998–2023 by year (A) and by the fitted values (B) for the model based on CPUE and May satellite sea surface temperature readings in northern SEAK inside waters. In panel A, the 2024 forecast is shown as a grey circle with the 80% prediction interval as a black vertical line. The observed SEAK pink salmon harvest is represented by the grey bars and the model fit is shown by the black line in panel A. In panel B, the dotted line represents a one-to-one line; circles above the line represent hindcasts that produced a point estimate lower than the actual harvest and circles below the line represent hindcasts that produced a point estimate higher than the actual harvest.

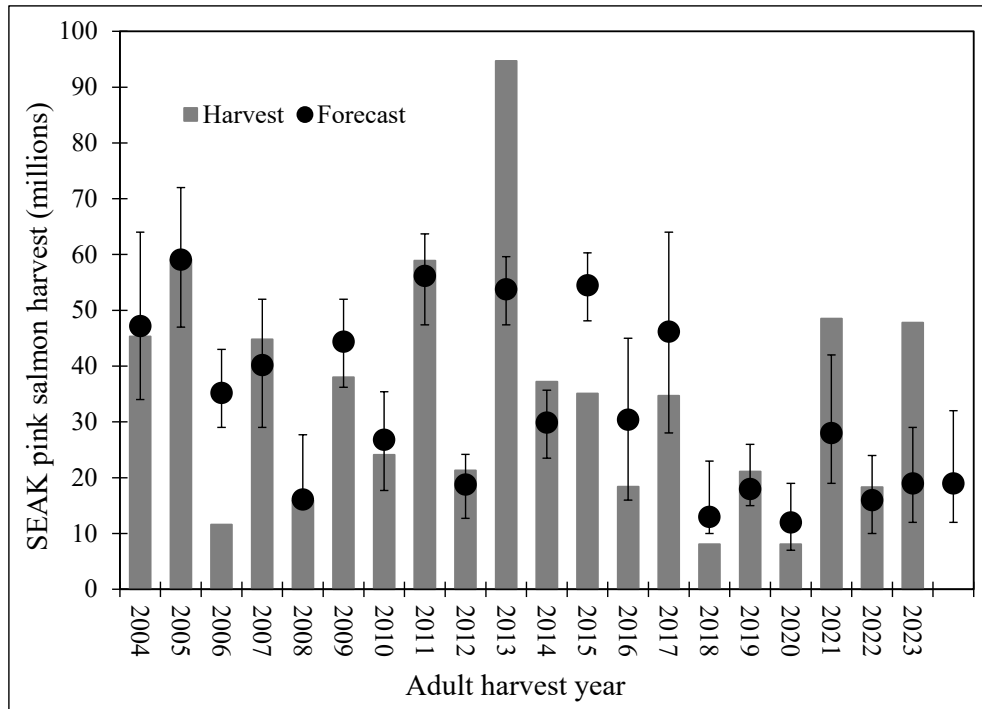


Figure 9.—Preseason forecasts compared to the annual SEAK pink salmon harvest, 2004–2024. The error bars represent either 80% confidence or 80% prediction intervals of the forecasts, depending on the modeling method used.

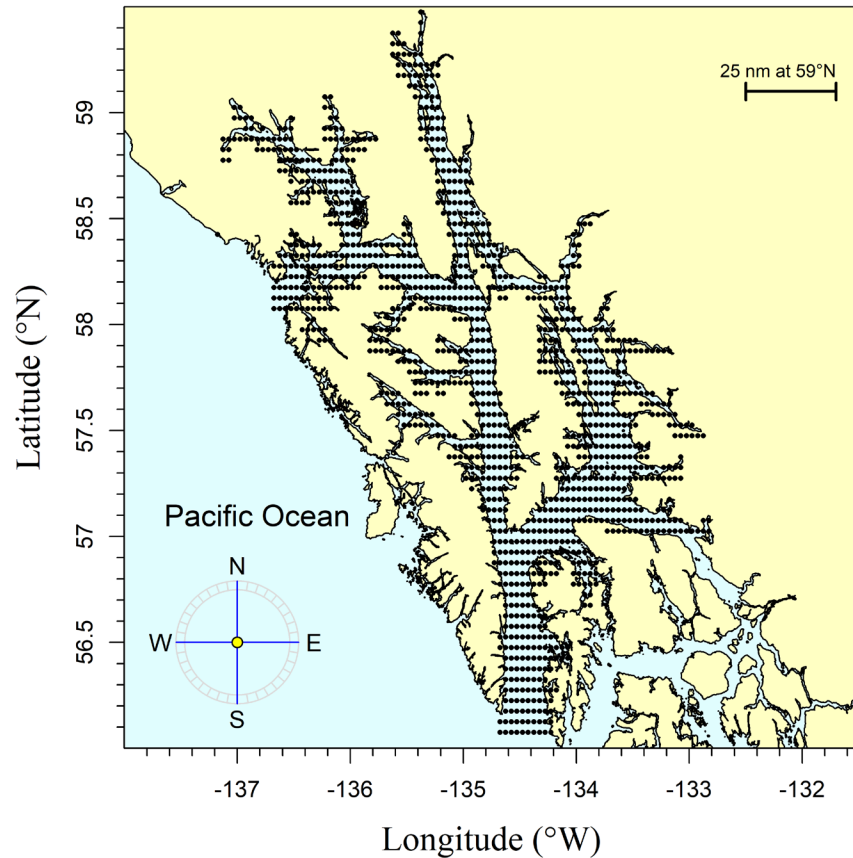


Figure 10.—The northern Southeast Alaska (NSEAK) region encompasses northern Southeast Alaska inside waters from 59.475° to 56.075° north latitude and from -137.175 to -132.825° west longitude. There are 1,344 satellite sea surface temperature points (black circles) in the NSEAK region.

## CENTRAL REGION

### COPPER RIVER AND PRINCE WILLIAM SOUND

Forecasts of total run were calculated for Copper River Chinook salmon, Copper River wild sockeye salmon, Gulkana Hatchery sockeye salmon, Coghill Lake sockeye salmon, and for wild PWS pink and chum salmon (Table 12). PWSAC and VFDA provide additional forecasts for hatchery-specific stocks. The categorical ranges of total run strength for forecasts were formulated for each stock from the 20th, 40th, 60th, and 80th percentiles of the recent 10 years for Chinook, chum, and sockeye salmon, and 10 even-years (2004–2022) for pink salmon (Table 13). Salmon forecasts are inherently uncertain and are primarily used to gauge the general magnitude of expected runs and set early-season harvest management strategy. The department will continue to manage PWS and Copper River area commercial salmon fisheries in season based primarily on the strength of salmon abundance indices including sonar counts, weir passage, aerial escapement surveys, and fishery performance data.

Table 12.—2024 Prince William Sound Area salmon run forecast summary (thousands of fish) and percentile category.

| Area/run type           | Salmon species | Forecast point estimate | Forecast range | % Above/below 10-year average | Total run 10-year average | Category |
|-------------------------|----------------|-------------------------|----------------|-------------------------------|---------------------------|----------|
| Copper River            |                |                         |                |                               |                           |          |
| <i>Wild</i>             | Chinook        | 47                      | 34–66          | 2% Below                      | 48                        | Average  |
| <i>Wild</i>             | Sockeye        | 1,965                   | 1,572–2,358    | 13% Above                     | 1,740                     | Strong   |
| <i>Gulkana Hatchery</i> | Sockeye        | 36                      | 29–44          | 69% Below                     | 117                       | Weak     |
| <i>Total Run</i>        | Sockeye        | 2,001                   | 1,601–2,400    | 8% Above                      | 1,852                     | Average  |
| Coghill Lake            |                |                         |                |                               |                           |          |
| <i>Wild</i>             | Sockeye        | 273                     | 152–395        | 38% Above                     | 197                       | Strong   |
| Prince William Sound    |                |                         |                |                               |                           |          |
| <i>Wild</i>             | Pink           | 6,447                   | 2,219–18,729   | 50% Above                     | 4,302                     | Strong   |
| <i>Wild</i>             | Chum           | 639                     | 401–877        | 27% Above                     | 503                       | Strong   |

Table 13.—Copper River and Prince William Sound categorical ranges of total run.

| Category  | Percentile        |
|-----------|-------------------|
| Poor      | Less than 20th    |
| Weak      | 20th to 40th      |
| Average   | 40th to 60th      |
| Strong    | 60th to 80th      |
| Excellent | Greater than 80th |

## Copper River Chinook Salmon

The 2024 Copper River Chinook salmon total run forecast point estimate is *average* at 47,000 fish (80% prediction interval: 34,000–66,000 fish). This is 2% below the recent 10-year average (2014–2023) total run of 48,000 fish (Figure 11). The SEG for Copper River Chinook salmon is 21,000–31,000 fish.

*Forecast Methods:* For 2024, the Copper River Chinook salmon state-space model was chosen as the forecast method. This model simultaneously reconstructs runs and fits a spawner-recruit model to estimate total return, escapement, and recruitment of Copper River Chinook salmon from 1999 to 2023. Methods and details of this analysis are covered in separate reports (Joy et al. 2021; Saveriede et al. 2018). The model uses harvest, age composition, and direct measures of inriver run abundance to estimate parameters that describe the spawner-recruit relationship for this stock. Uncertainty from the run reconstruction is passed through to the spawner-recruit analysis and all relevant data are considered and weighted by their precision. The model accommodates missing data, measurement error in the data, and changes in age at maturity.

Several forecast methods were examined for the 2024 Copper River Chinook salmon total run forecast including exponential smoothing, 2-, 3-, and 5-year running averages of total run, and projections from the Copper River Chinook salmon state-space model. The state-space model performed similarly when compared retrospectively to the simple average-based methods historically used to forecast this stock, while using more biological information to predict future

runs (Table 14). The state-space model outperformed the average-based models by having a lower MAPE and MPE when compared retrospectively. Total run size in prior years was calculated as the sum of commercial and subsistence harvests of Chinook salmon below Miles Lake, and the mark-recapture point estimate of Chinook salmon inriver abundance. There are currently 25 years (1999–2023) of inriver abundance estimates available for this analysis. The 80% prediction intervals were calculated from the posterior distributions of the model parameters, including the predicted run-size for 2024.

Table 14.—2024 Copper River Chinook salmon forecast model performance summary. Model selected as the run forecast, lowest mean absolute percentage error (MAPE), is bold.

| Stock/model        | Prediction point estimate | 80% prediction interval | MAPE       |
|--------------------|---------------------------|-------------------------|------------|
| <b>State-space</b> | <b>47,347</b>             | <b>33,824–65,944</b>    | <b>31%</b> |
| Exponential        | 53,053                    | 37,004–69,103           | 36%        |
| 2-year             | 56,741                    | 31,701–81,781           | 38%        |
| 3-year             | 47,856                    | 23,097–72,615           | 40%        |
| 5-year             | 48,135                    | 27,109–69,161           | 33%        |

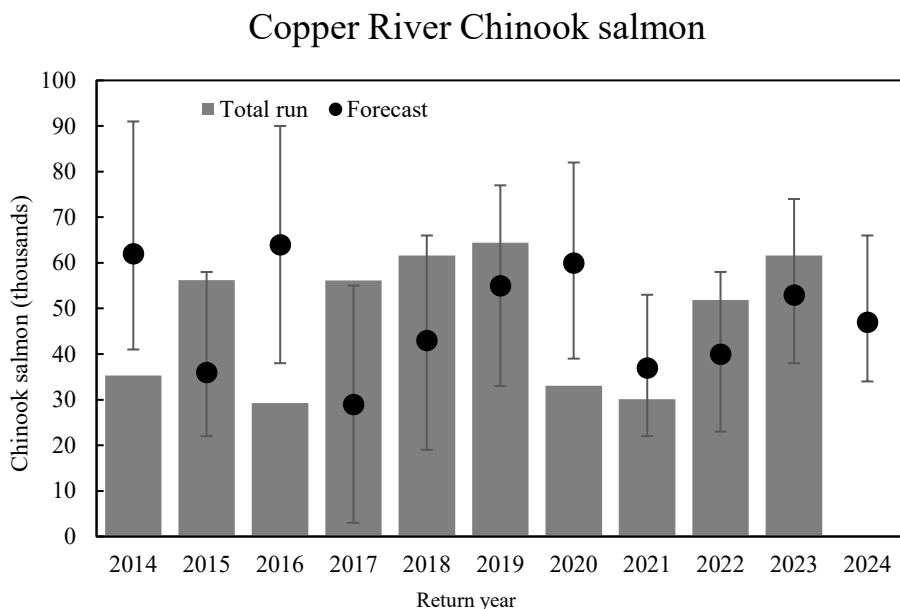


Figure 11.—Total run of Copper River Chinook salmon compared to preseason total run forecasts, 2014–2023, and the 2024 forecast. Error bars represent 80% prediction intervals of forecasts.

### Copper River Sockeye Salmon

The 2024 wild Copper River sockeye salmon total run forecast point estimate is *strong* at 1,965,000 fish (80% prediction interval: 1,572,000–2,358,000 fish). Gulkana Hatchery sockeye salmon total run is predicted to be *weak* at 36,000 fish (80% prediction interval: 29,000–44,000 fish), for a total Copper River sockeye salmon run (wild + hatchery production) of 2,001,000 fish (80% prediction interval: 1,601,000–2,402,000 fish). This is 8% above the recent 10-year average

(2014–2023) total run of 1,852,000 fish (Figure 12). Total Copper River sockeye salmon harvest estimate (all fisheries) is predicted to be *average* at 1,503,000 fish (80% prediction interval: 1,198,000–1,808,000 fish) with a commercial harvest of 1,297,000 fish (80% prediction interval: 992,000–1,602,000 fish).

*Forecast Methods:* The 2024 forecast of wild sockeye salmon to the Copper River is the sum of individual forecasts for 6 age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2, -1.3, -2.2, and -2.3 sockeye salmon. Forecasts of these 4 age classes were developed from the relationship between returns of each age class and returns of the age class one year younger from the same brood year (sibling model; Table 15). The predicted return of age-1.1 and -0.3, sockeye salmon were calculated as the 5-year (2019–2023) mean return of these age classes. The 2024 run to Gulkana Hatchery was estimated as the recent 5-year weighted average fry-to-adult survival estimate (0.33%) from all Gulkana I and Gulkana II hatchery releases combined (onsite and remote). The Gulkana Hatchery run was apportioned to brood year using a maturity schedule of 30% age-4 and 70% age-5.

The total harvest point estimate (all fisheries) was calculated by subtracting the Gulkana Hatchery broodstock, hatchery surplus, and wild stock escapement goal needs (upriver and Copper River Delta) from the total run forecast. The commercial harvest estimate was calculated by subtracting Copper River inriver goal categories (5 AAC 24.360(b)) and the lower bound of the Copper River Delta spawning escapement goal, from the total run forecast. An estimated exploitation rate of 70% was used to project the total harvest of Gulkana Hatchery stocks in 2024. There are currently 59 years (1965–2023) of harvest, escapement, and age composition data available for this analysis. Total run 80% prediction intervals were calculated from the mean squared error of the retrospective forecast predictions.



Table 15.—2024 Prince William Sound wild sockeye salmon forecast model summary. Models selected for inclusion in the run forecast (lowest MAPE) are bold.

| Stock/age class           | Brood year | Model                    | Prediction       | MAPE        |
|---------------------------|------------|--------------------------|------------------|-------------|
| Copper River wild sockeye |            |                          |                  |             |
| 0.3                       | 2020       | <b>5-year mean</b>       | <b>72,416</b>    |             |
| 1.1                       | 2021       | <b>5-year mean</b>       | <b>3,448</b>     |             |
| 1.2                       | 2020       | log 1.2 R/S x BYE        | 220,596          | 65%         |
|                           |            | <b>log 1.2 x log 1.1</b> | <b>309,838</b>   | <b>57%</b>  |
| 1.3                       | 2019       | 1.3 x BYE                | 1,239,972        | 49%         |
|                           |            | log 1.3R/S x BYE         | 1,048,799        | 41%         |
|                           |            | <b>log 1.3 x log 1.2</b> | <b>1,396,299</b> | <b>32%</b>  |
|                           |            | log 1.3 x log 0.3        | 1,034,199        | 43%         |
|                           |            | 1.3 x 1.2                | 1,549,482        | 48%         |
| 2.2                       | 2019       | log 2.2 x BYE            | 31,237           | 69%         |
|                           |            | <b>log 2.2 x log 1.2</b> | <b>36,903</b>    | <b>64%</b>  |
| 2.3                       | 2018       | <b>log 2.3 x log 2.2</b> | <b>146,320</b>   | <b>61%</b>  |
|                           |            | log 2.3 x log 1.3        | 104,265          | 70%         |
| Total                     |            |                          | 1,965,225        |             |
| Coghill Lake sockeye      |            |                          |                  |             |
| 1.1                       | 2021       | <b>10-year mean</b>      | <b>7,390</b>     |             |
| 1.2                       | 2020       | log 1.2 R/S x BYE        | 32,603           | 179%        |
|                           |            | <b>log 1.2 x log 1.1</b> | <b>109,336</b>   | <b>131%</b> |
| 1.3                       | 2019       | log R/S 1.3 x BYE        | 77,399           | 194%        |
|                           |            | <b>log 1.3 x log 1.2</b> | <b>137,933</b>   | <b>75%</b>  |
| 2.2                       | 2019       | <b>10-year mean</b>      | <b>9,936</b>     |             |
| 2.3                       | 2018       | <b>10-year mean</b>      | <b>8,472</b>     |             |
| Total                     |            |                          | 273,067          |             |

Note: R/S = Return per spawner; BYE = Brood year escapement.

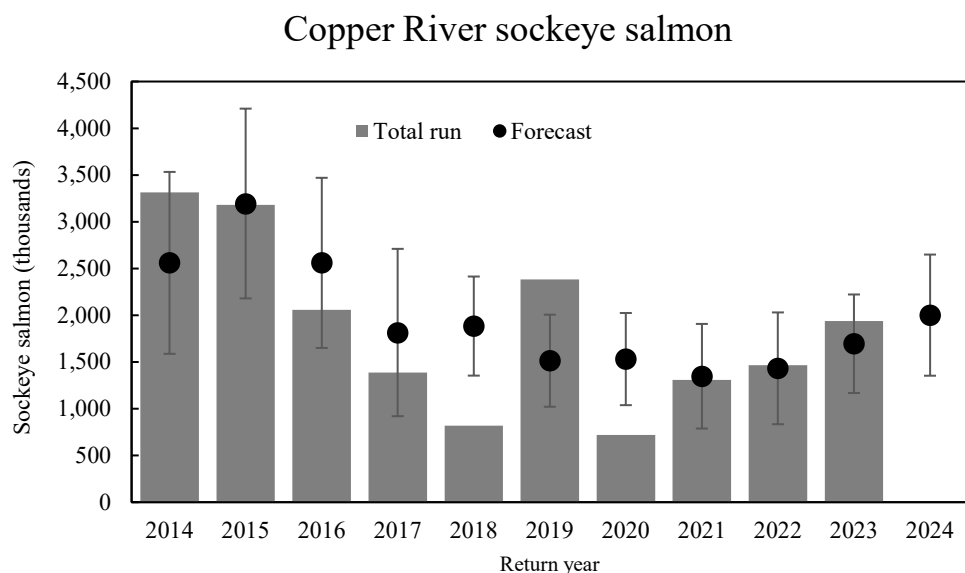


Figure 12.—Total run of Copper River sockeye salmon compared to preseason total run forecasts, 2014–2023, and the 2024 forecast. Error bars represent 80% prediction intervals of forecasts.

## Coghill Lake Sockeye Salmon

The 2024 Coghill Lake sockeye salmon total run forecast point estimate is *strong* at 273,000 fish (80% prediction interval: 152,000–395,000 fish). This is 38% above the 10-year average (2014–2023) total run of 197,000 fish (Figure 13). Subtracting the escapement target of 30,000 fish from the total run forecast results in a harvest point estimate (all fisheries) of 243,000 fish (range: 122,000–365,000 fish).

*Forecast Methods:* The 2024 sockeye salmon run forecast to Coghill Lake is the total of estimates for 5 age classes. Linear regression models with log-transformed data were used to predict returns of age-1.3 and -1.2 sockeye salmon (Table 15). These linear regression models were parameterized using the historical relationship between returns of age-1.3 sockeye salmon and returns of age-1.2 fish one year previous and returns of age-1.2 sockeye salmon and returns of the age-1.1 fish one year previous (sibling models). For example, the model chosen to predict the return of age-1.3 sockeye salmon in 2024 used the return of age-1.2 fish in 2023 as the input parameter. Predicted returns of age-1.1, -2.2, and -2.3 sockeye salmon were calculated as the 2014–2023 mean return of that age class.

Harvest, escapement, and age composition data are available for Coghill Lake sockeye salmon runs since 1962; however, inclusion of escapements prior to the installation of a full weir in 1974 reduce forecast reliability. Therefore, only data collected since 1974 were used. Total run by year was estimated as the total commercial harvest contribution combined with the Coghill River weir escapement count. The 80% prediction intervals for the Coghill Lake sockeye salmon total run were calculated using the squared deviations between the 2014–2023 forecasts and actual runs as the forecast variance.

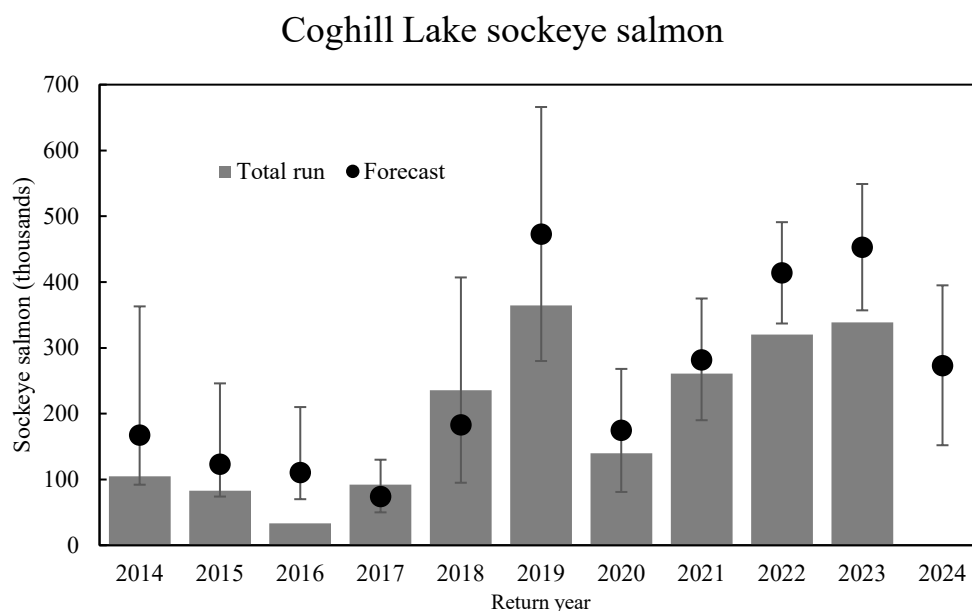


Figure 13.—Total run of Coghill Lake sockeye salmon compared to preseason total run forecasts, 2014–2023, and the 2024 forecast. Error bars represent 80% prediction intervals of forecasts.

## PWS Even-Year Wild Pink Salmon

The 2024 PWS wild pink salmon total run forecast point estimate is *strong* at 6,447,000 fish (80% prediction interval: 2,219,000–18,729,000 fish). This is 50% above the recent 10-year, even-year average PWS wild pink salmon total run of 4,302,000 fish (Figure 14). Subtracting the midpoint of the even-year SEG range, 783,500 fish, from the total run forecast results in a harvest point estimate of 5,663,000 fish (range: 1,436,000–17,946,000 fish).

*Forecast Methods:* Several models were examined for the 2024 PWS wild pink salmon total run forecast including exponential smoothing and 2-, 3-, and 5-year running averages of past even-year total runs. The 3-year running average forecast was selected for 2024 because it outperformed other forecast models by having the lowest MAPE and median symmetrical accuracy (Table 16). The 80% prediction intervals were calculated from the mean squared error of the retrospective forecast predictions.

Total wild run of pink salmon by year was estimated as the total wild (non-hatchery) contribution to commercial harvests combined with stream escapement indices. The stream escapement index is calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. Hatchery and wild stock contributions were determined from thermal marked otolith recoveries (1997–2023), coded wire tag recoveries (1985–1996), or average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates (1977–1984).

Table 16.–2024 Prince William Sound wild pink and chum salmon forecast model performance summary. Models selected as the run forecast (lowest MAPE) are bold.

| Run           | Prediction       | MAPE       |
|---------------|------------------|------------|
| PWS wild pink |                  |            |
| Exponential   | 6,572,594        | 5%         |
| 2-year        | 6,679,267        | 4%         |
| <b>3-year</b> | <b>6,446,846</b> | <b>4%</b>  |
| 5-year        | 4,693,849        | 4%         |
| PWS wild chum |                  |            |
| Exponential   | 452,778          | 37%        |
| <b>2-year</b> | <b>639,038</b>   | <b>31%</b> |
| 3-year        | 529,972          | 35%        |
| 5-year        | 520,984          | 36%        |

### Prince William Sound pink salmon

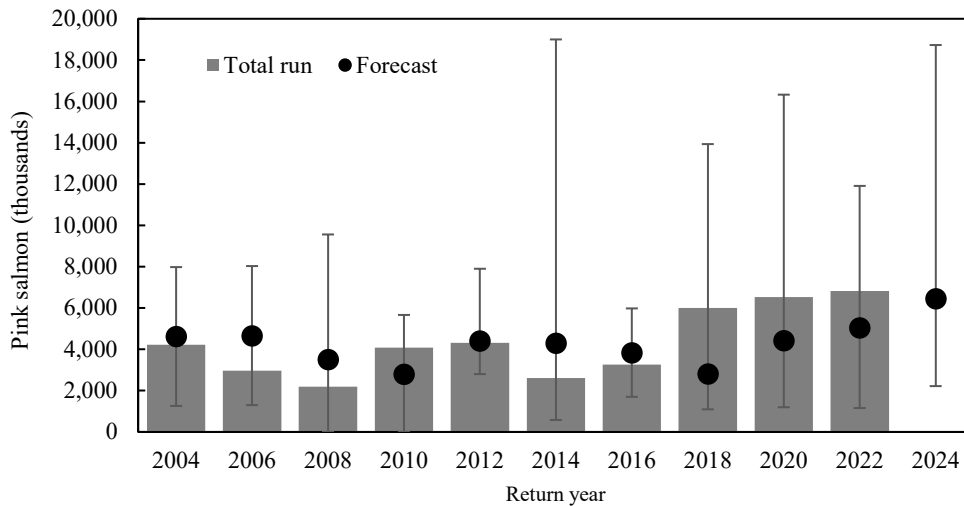


Figure 14.—Total run of Prince William Sound wild pink salmon compared to preseason total run forecasts, 2004–2022, and the 2024 forecast. Error bars represent 80% prediction intervals of forecasts.

### PWS Wild Chum Salmon

The 2024 PWS wild chum salmon total run forecast point estimate is *strong* at 639,000 fish (80% prediction interval: 401,000–877,000 fish). This is 27% above the recent 10-year average (2014–2023) PWS wild chum salmon total run of 503,000 fish (Figure 15). Subtracting the 10-year average escapement, 170,000 fish, from the total run forecast results in a harvest point estimate of 469,000 fish (range: 231,000–707,000 fish).

*Forecast Methods:* The 2024 PWS wild chum salmon total run forecast uses the 2-year running average method. Several models were examined for the 2024 PWS wild chum total run forecast including exponential smoothing and 2-, 3-, and 5-year running averages of past total runs (Table 16). For 2024, the 2-year running average outperformed the other models by having the lowest MAPE, mean absolute squared error (MASE) and median symmetrical accuracy. The 80% prediction intervals were calculated from the mean squared error of the retrospective forecast predictions.

Total wild run of chum salmon by year was estimated as the total wild (non-hatchery) contribution to commercial harvests combined with the stream escapement index. The stream escapement index is calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. Hatchery and wild stock contributions were estimated using pre-hatchery average natural runs (1998–2003) or thermally marked otolith estimates (2004–2023) for each district in PWS.

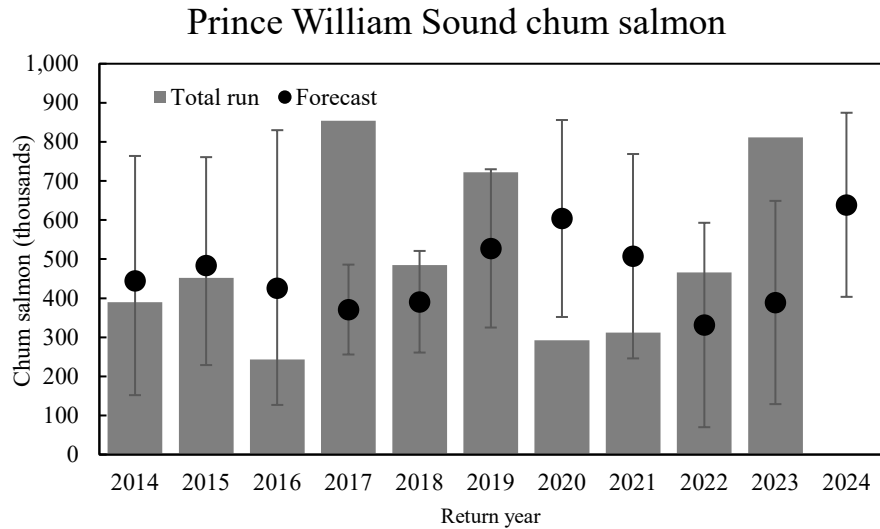


Figure 15.—Total run of Prince William Sound wild chum salmon compared to preseason total run forecasts, 2014–2023, and the 2024 forecast. Error bars represent 80% prediction intervals of forecasts.

Forecast by Jenni Morella and Matthew Olson, Area Finfish Research Biologists, ADF&G, Cordova.

## UPPER COOK INLET

### Sockeye Salmon

The UCI sockeye salmon total run forecast of 5.72 million fish (Table 17, Figure 16) is predicted to be *average*. The categorical ranges of sockeye salmon total run strength were developed from the 20th, 40th, 60th, and 80th percentiles of historical runs (Table 18). Forecasts of salmon fisheries are inherently uncertain and are primarily used to gauge the general magnitude of expected runs and guide early-season management strategies.

Table 17.—2024 Upper Cook Inlet sockeye salmon run, escapement, and harvest forecasts. Forecast range is indicated in parentheses.

| Production component | Forecast estimate (millions) |
|----------------------|------------------------------|
| Total run            | 5.72 (4.21–7.22)             |
| Escapement           | 2.00                         |
| Available harvest    | 3.72                         |

Table 18.—Categorical ranges of Upper Cook Inlet sockeye salmon runs. 2024 forecast in bold.

| Category       | Range (million)   | Percentile          |
|----------------|-------------------|---------------------|
| Poor           | Less than 2.0     | Less than 20th      |
| Weak           | 2.0 to 4.0        | 20th to 40th        |
| <b>Average</b> | <b>4.0 to 6.0</b> | <b>40th to 60th</b> |
| Strong         | 6.0 to 8.0        | 60th to 80th        |
| Excellent      | Greater than 8.0  | Greater than 80th   |

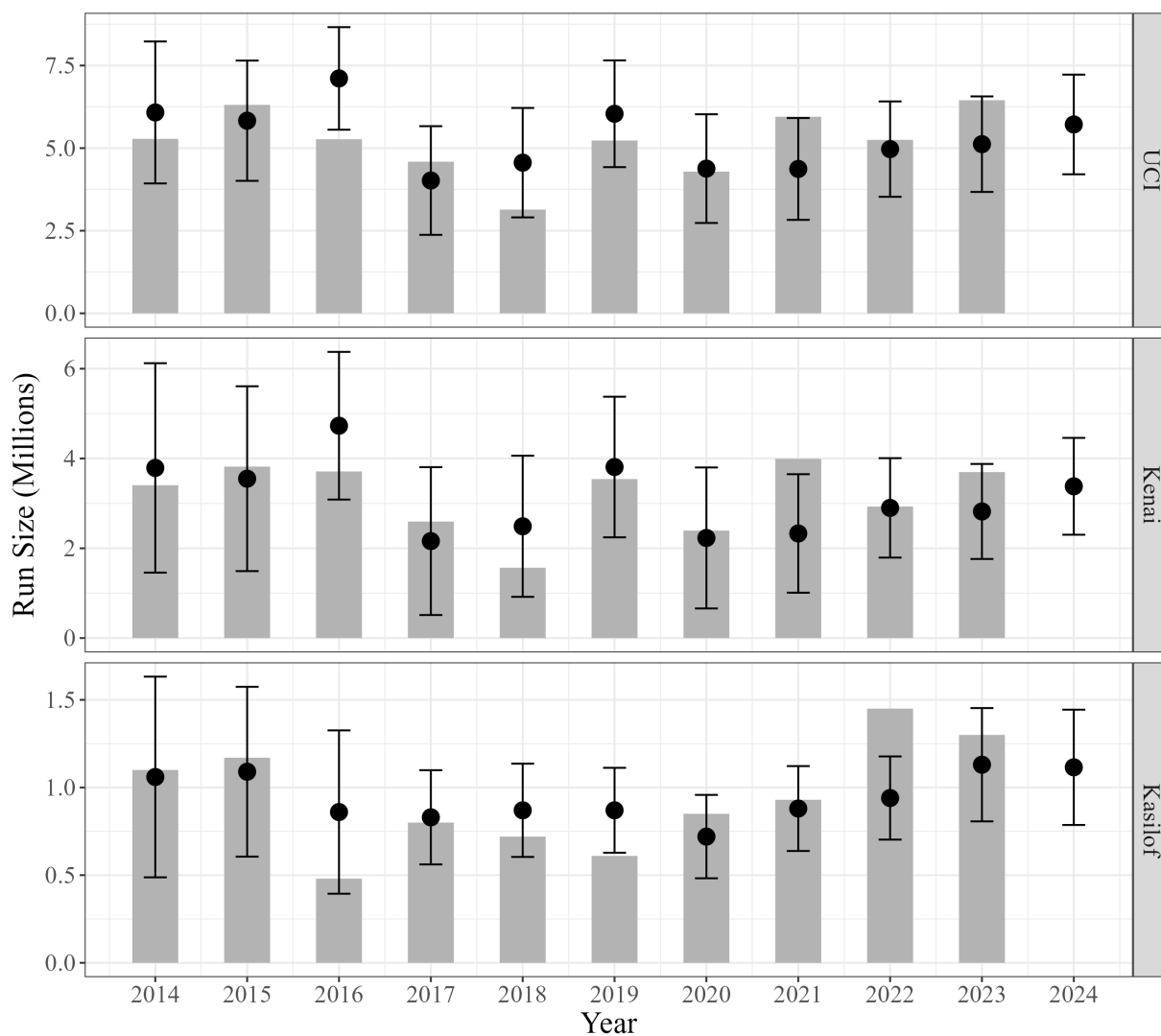


Figure 16.—Actual observed total run (grey bars) of Upper Cook Inlet (UCI; top panel), Kenai River (middle panel), and Kasilof River (bottom panel) sockeye salmon compared to total run forecasts (black points), 2014–2023 and 2024 forecast. Error bars represent 80% confidence intervals of forecasts.

*Forecast Methods:* The major sockeye salmon systems in UCI are the Kenai, Kasilof, and Susitna Rivers, and Fish Creek. Five models were evaluated to forecast the total run of sockeye salmon to the Kenai and Kasilof Rivers in 2024: (1) brood-year spawners, (2) emigrating smolt, (3) fall fry, (4) sibling returns, and (5) average returns (Table 19). Forecast model performance was assessed using the mean arctangent absolute percent error (MAAPE) between the forecasts and actual runs over the past 10 years (Table 20). The top 3 models with the lowest MAAPE and statistically significant parameters were selected for each age class and a weighted hybrid model approach was applied (Table 19). Model weights were assigned based on the MAAPE of each selected model, with a lower MAAPE receiving a greater weight towards the forecast estimate. Weighted forecast estimates were summed across age classes for stock specific run estimates.

For Susitna River sockeye salmon, returns of age-0.3, -1.2, -1.3, -2.2, and -2.3 fish in 2024 were forecasted using mean return per spawner by age class for brood years 2013–2019. Mark–recapture estimates of inriver run and genetic estimates of commercial harvest were available for these brood years.

The 2024 forecast for Fish Creek sockeye salmon was estimated using the recent 5-year (2018–2023) average of total runs to the system. Total run estimates for Fish Creek sockeye salmon in 2021 and 2022 are assumed to be biased low because weir operations were stopped early, and escapement estimates for these years were not expanded to account for unmonitored passage. Additionally, total run estimates for Fish Creek sockeye salmon do not account for personal use harvest.

The sockeye salmon forecast for unmonitored systems in UCI was estimated as 17% of the aggregate forecast for the 4 monitored stocks. Unmonitored stocks include Crescent River, Big River, McArthur River, Chilligan River, Coal Creek, Cottonwood Creek, Wasilla Creek, Eagle River, Packers Creek, and many other smaller systems in the area. The fraction of the total run destined for unmonitored systems was calculated using genetic estimates of the stock composition of offshore test fishery harvests.

The estimated available harvestable surplus of sockeye salmon was calculated by subtracting the aggregate escapement from the total run forecast for all stocks. Aggregate escapement was estimated as the sum of the midpoints of the escapement goal ranges for each of the monitored sockeye salmon producing systems and the escapement into unmonitored systems.

Table 19.—Description of models used to forecast returns of sockeye salmon to the Kasilof and Kenai Rivers, 2024.

| Model                 | Description  |
|-----------------------|--|
| 5-year moving average | Unweighted average of the previous 5-year's returns $r$ for the specified age class.   |
| Exponential smoothing | An exponential function used to assign exponentially decreasing weights over time for the specified age class.   |
| Standard Ricker       | Regression between the ratio of recruits of the specified age class and spawners from the same brood year and the number of spawners from the same brood year.   |
| Sibling               | Regression between the returns of a specified age class and the most recent returns from the same brood year.  |
| Fry                   | Regression between the returns of a specified age class and the aggregate total abundance of sockeye salmon fry in Kenai and Skilak Lakes from the same brood year.                                      |
| Fry CFSWT             | Regression between the returns of a specified age class and the aggregate total abundance of age-0 sockeye salmon fry and their average total weight in Kenai and Skilak Lakes from the same brood year. |
| S AR1                 | Autoregressive integrated moving average (ARIMA) analysis on the returns of the specified age class with a covariate for the abundance of spawners from the same brood year.                             |
| Smolt                 | Regression between the returns of a specified age class and the abundance of smolt from the same brood year.   |
| Smolt AR1             | Autoregressive integrated moving average (ARIMA) analysis on the returns of the specified age class with a covariate for the abundance of smolt from the same brood year.                                |

*Note:* Log transformation may be needed to meet assumptions of a linear regression.



Table 20.—Kenai and Kasilof River sockeye salmon forecast estimates, 2024.

| River   | Age class | Model                 | MAAPE | Weight | Prediction | Weighted prediction | Subtotal  | Total     |
|---------|-----------|-----------------------|-------|--------|------------|---------------------|-----------|-----------|
| Kenai   | 1.2       | 5-Year moving Average | 45.16 | 0.35   | 578,135    | 204,746             |           |           |
|         |           | Exponential Smoothing | 49.15 | 0.33   | 555,666    | 180,795             |           |           |
|         |           | Standard Ricker       | 49.90 | 0.32   | 404,720    | 129,706             | 515,248   |           |
|         | 1.3       | Log Sibling           | 17.32 | 0.46   | 1,854,690  | 845,398             |           |           |
|         |           | Log Fry CFSWT         | 27.74 | 0.28   | 3,052,480  | 868,783             |           |           |
|         |           | Exponential Smoothing | 30.42 | 0.26   | 1,655,623  | 429,747             | 2,143,928 |           |
|         | 2.2       | Log S AR1             | 20.26 | 0.40   | 202,188    | 80,143              |           |           |
|         |           | Log Sibling           | 24.58 | 0.33   | 260,087    | 84,992              |           |           |
|         |           | Log Sibling AR1       | 29.01 | 0.28   | 302,218    | 83,665              | 248,800   |           |
|         | 2.3       | Fry                   | 39.51 | 0.38   | 394,046    | 150,045             |           |           |
|         |           | Exponential Smoothing | 42.35 | 0.36   | 636,693    | 226,163             |           |           |
|         |           | 5-Year Moving Average | 56.98 | 0.26   | 364,675    | 96,276              | 472,484   | 3,380,460 |
| Kasilof | 1.2       | Log S AR1             | 38.15 | 0.34   | 350,832    | 120,648             |           |           |
|         |           | Exponential Smoothing | 38.33 | 0.34   | 629,000    | 215,311             |           |           |
|         |           | 5-Year Moving Average | 41.81 | 0.31   | 541,872    | 170,041             | 506,000   |           |
|         | 1.3       | Log Sibling           | 32.07 | 0.41   | 355,305    | 146,107             |           |           |
|         |           | Log Smolt             | 44.51 | 0.30   | 253,616    | 75,147              |           |           |
|         |           | Exponential Smoothing | 45.09 | 0.29   | 379,387    | 110,964             | 332,218   |           |
|         | 2.2       | Log Sibling           | 31.23 | 0.42   | 238,446    | 99,154              |           |           |
|         |           | Log S AR1             | 42.81 | 0.30   | 198,464    | 60,197              |           |           |
|         |           | Sibling AR1           | 46.24 | 0.28   | 222,799    | 62,573              | 221,924   |           |
|         | 2.3       | Log Smolt AR1         | 53.71 | 0.34   | 63,541     | 21,916              |           |           |
|         |           | Sibling               | 54.39 | 0.34   | 73,073     | 24,886              |           |           |
|         |           | Exponential Smoothing | 58.90 | 0.31   | 26,126     | 8,217               | 55,019    | 1,115,161 |

*Forecast Results and Discussion:* In 2024, a run of approximately 5.72 million sockeye salmon is forecast to return to UCI with an estimate of 3.72 million available for harvest (Table 15). Based on the absolute percentage error (APE) for the recent 10-year (2014–2023) forecasted UCI runs compared with the estimated runs, there is an 80% probability that the 2024 UCI forecast range falls between 4.21 million and 7.22 million fish (Table 18). This UCI forecast is average compared to historical total run estimates from 1986 to present. The UCI forecast has overestimated the total run by an average of 4% over the past 10 years with a range of -27% to 45% (Figure 16).

The Kenai River sockeye salmon forecast is approximately 3.38 million fish (Table 20). The 2024 Kenai River forecast is 500,000 (14%) fish less than the historical (1986–2023) average run of 3.88 million fish, but 215,000 (6%) fish more than the recent 10-year (2014–2023) average run of 3.17 million (Figure 16). The Kenai River forecast has overestimated the total run by an average of 0.8% over the past 10 years with a range of -42% to 59%.

The Kasilof River sockeye salmon run forecast is approximately 1.12 million fish (Table 20). The Kasilof River forecast has overestimated the total run by an average of 7% over the past 10 years with a range of -35% to 79%. The 2024 forecast is 201,000 fish (20%) greater than the historical (1986–2023) average run of 0.91 million fish and 174,000 fish (17%) greater than the recent 10-year (2014–2023) average run.

Approximately 303,400 and 86,690 sockeye salmon are forecast to return to the Susitna River and Fish Creek, respectively, in 2024. The 2024 Susitna River sockeye salmon forecast is 127,400 fish (35%) below the historical (2002–2023) average run and 71,600 fish (21%) below the recent 10-year (2014–2023) average run. The 2024 Fish Creek sockeye salmon forecast is 25,450 fish (26%) below the historical average but the same as the recent 10-year average run size (0.26% difference).

Forecast by Kyle Gatt, ADF&G Area Research Biologist, Soldotna, and Jack Erickson, ADF&G, Regional Research Coordinator, Anchorage.

## **LOWER COOK INLET**

### **Pink Salmon**

The LCI wild pink salmon commercial harvest in 2024 is predicted to be *average*, with a point estimate of 552,000 fish and a range of 119,000–2,567,000 fish (80% confidence interval). The categorical ranges of wild pink salmon harvest were formulated from the 20th, 40th, 60th, and 80th percentiles of historical harvests over the 64-year period 1960–2023 (Table 21). Since adopting new forecast methods in 2018, the point forecasts have, on average, over forecast the harvest by 1%. However, forecasts have ranged from 88% below the observed harvest in 2020 to 238% above the observed harvest in 2022 (Figure 17), highlighting the uncertainties that surround all salmon forecasts (Adkison and Peterman 2000), and pink salmon in particular (Adkison 2002; Haeseker et al. 2005).

Table 21.—Categorical ranges of pink salmon commercial harvest (wild run) and this year’s forecast in bold.

| Category       | Range (thousands)  | Percentile          |
|----------------|--------------------|---------------------|
| Poor           | Less than 200      | Less than 20th      |
| Weak           | 200 to 360         | 20th to 40th        |
| <b>Average</b> | <b>360 to 700</b>  | <b>40th to 60th</b> |
| Strong         | 700 to 1,260       | 60th to 80th        |
| Excellent      | Greater than 1,670 | Greater than 80th   |

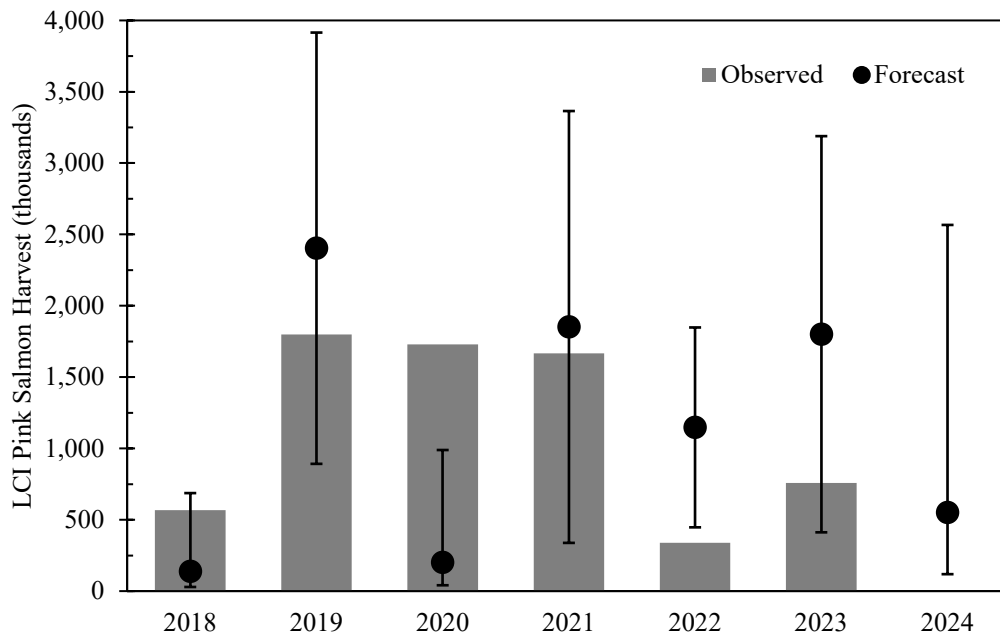


Figure 17.—Annual observed commercial harvest of wild pink salmon in LCI compared to preseason harvest forecasts, 2018–2024. Error bars represent 80% confidence intervals of forecasts.

*Forecast Methods:* A naïve forecast based on historical odd- and even-year pink salmon harvests (1960–2023) was used to predict the 2024 wild pink salmon commercial harvest in LCI. Several trend forecast models were evaluated to determine which best fit the data, including exponential smoothing and 2-, 3-, and 5-year running averages of historical harvests. Exponential smoothing and running average models using log-transformed and non-logged data inputs produced point forecasts ranging from 365,000 to 1,258,000 fish. The exponential smoothing model using odd- and even-year log-transformed data inputs outperformed the other models this year based on comparison of several performance metrics (e.g., bias, MPE, mean square error [MSE], and MAPE). The 80% confidence intervals were calculated from the MSE of the retrospective forecast predictions.

*Forecast Discussion:* The 2024 harvest forecast of 552,000 pink salmon has a forecast range of 119,000–2,567,000 fish. If realized, a harvest of 552,000 pink salmon would be approximately 7%

lower than the recent 5-year average harvest of 596,000 fish for even-year runs between 2014 and 2022.

Prior to 2018, the even-year LCI pink salmon forecast consisted of a wild stock total run forecast based on a logarithmic regression of total run and escapement from over 50 years of observations on 10 index streams, and a hatchery production forecast provided by CIAA. However, preliminary results from otolith sampling in LCI during 2014–2017 suggested high proportions of hatchery-marked fish in harvest (Otis and Hollowell 2023) and escapement (Otis et al. 2018) samples may confound the viability of spawner-recruit based run forecasts. Consequently, the decision was made to produce a harvest forecast in lieu of the total run forecast.

Because pink salmon exhibit a 2-year life cycle, comparisons of run size are typically stratified by odd and even years to account for dominance of one line over the other. In LCI overall, dominance of one line is typically short lived, lasting 2–6 generations before the opposing line becomes dominant. Odd/even year dominance is not synchronous across individual stocks and line dominance can persist up to 9 generations (18 years) in some stocks. Overall, odd- and even-year runs across all stocks and years are only moderately dissimilar (odd-year runs approximately 19% higher). However, areawide total runs exhibit 4–13 year periods during which production from one line is 19–56% higher than the other, on average. So, despite the relative parity between odd- and even-year pink salmon runs in LCI over broad time scales, we continue to stratify run size comparisons by odd and even years to account for these short term dominance cycles. The odd-year brood line has been dominant in LCI since 2011 (6 generations).

In 2022, the parent year for the upcoming 2024 return, LCI experienced weak escapements to many pink salmon index streams. Nine of 18 stocks (50%) with SEGs failed to achieve the low end of their respective escapement goal ranges, some by a substantial amount, including all 3 major producers in the Kamishak District (Bruin, Sunday, Brown’s Peak). Four stocks (22%) exceeded their SEG range, including 3 major producers in the Outer District (Dogfish, Windy Bay Right, and Windy Bay Left Creeks). It is difficult to predict shifts in dominance between odd- and even-year lines of pink salmon before they occur. After a decade of odd-year dominance, an unexpectedly large 2020 run suggested a shift to even-year dominance was forthcoming. However, the 2021 and 2023 total runs were both greater than the preceding even year, implying odd-year dominance is persisting. If so, the 2024 run of wild pink salmon is unlikely to produce a harvest greater than the point forecast of 552,000 fish.

## **Other Salmon Species**

*Forecast Methods:* Naïve forecasts based on historical harvests (1960–2023) were used to predict the 2024 harvest of other, less abundant salmon species in LCI. Several trend forecast models were evaluated to determine which best fit the data, including exponential smoothing and 2-, 3-, and 5-year running averages of past harvests. Log-transformed and non-logged historical harvest datasets were evaluated with each model and the final forecast for each species was selected based on comparison of several performance metrics (e.g., bias, MSE, root mean square error [RMSE], MPE, MAPE, and MASE).

*Forecast Discussion:* Prior to 2018, the recent 5-year average harvest was used to forecast the LCI sockeye, chum, coho, and Chinook salmon harvest for the coming year. Beginning in 2018, for consistency, we transitioned to the same trend forecast methods we used for LCI pink salmon. Context for the relative strength of the current harvest forecast and how it compares to the recent

10-year average harvest for each species is provided in Table 22. Context for the relative performance of sockeye and chum salmon forecasts since 2018 are provided in Figures 18 and 19.

Table 22.—Preliminary forecast of the 2024 LCI harvest of other, less abundant salmon species.

| Species        | Model                  | Forecast (point) | Forecast (range) | % Above/below 10-yr average | Forecast category |
|----------------|------------------------|------------------|------------------|-----------------------------|-------------------|
| Sockeye salmon | 5-year running average | 157,600          | 48,100–267,100   | 12% higher                  | Average           |
| Chum salmon    | 5-year running average | 35,000           | 7,700–159,200    | 50% lower                   | Weak              |
| Coho salmon    | 2-year running average | 750              | 130–4,380        | 86% lower                   | Poor              |
| Chinook salmon | Exponential smoothing  | 310              | 120–780          | 42% lower                   | Weak              |

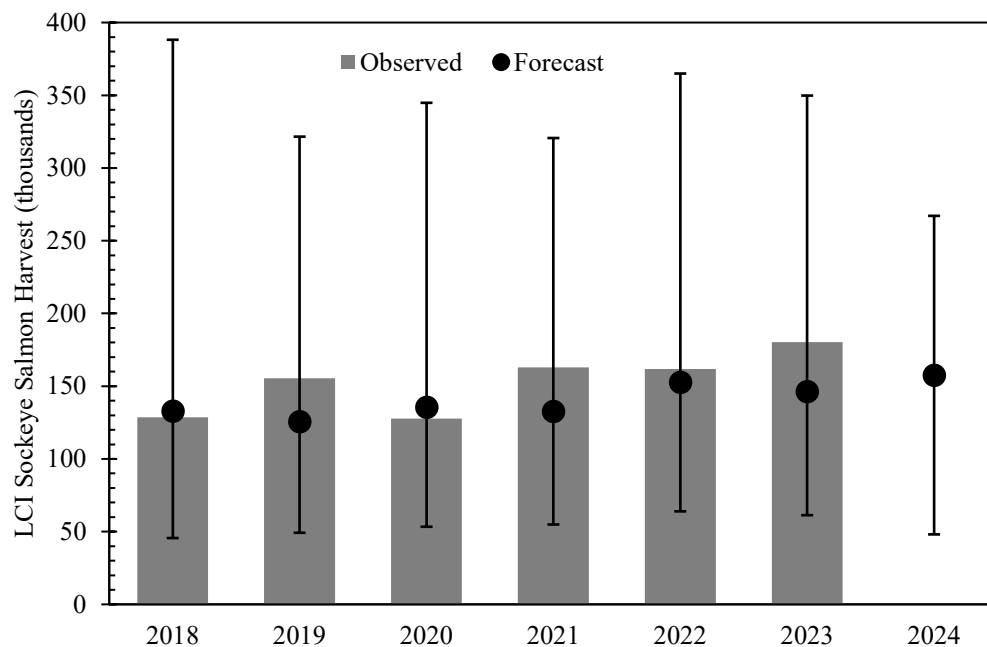


Figure 18.—Annual observed commercial harvest of sockeye salmon in LCI compared to preseason harvest forecasts, 2018–2024. Error bars represent 80% confidence intervals of forecasts.

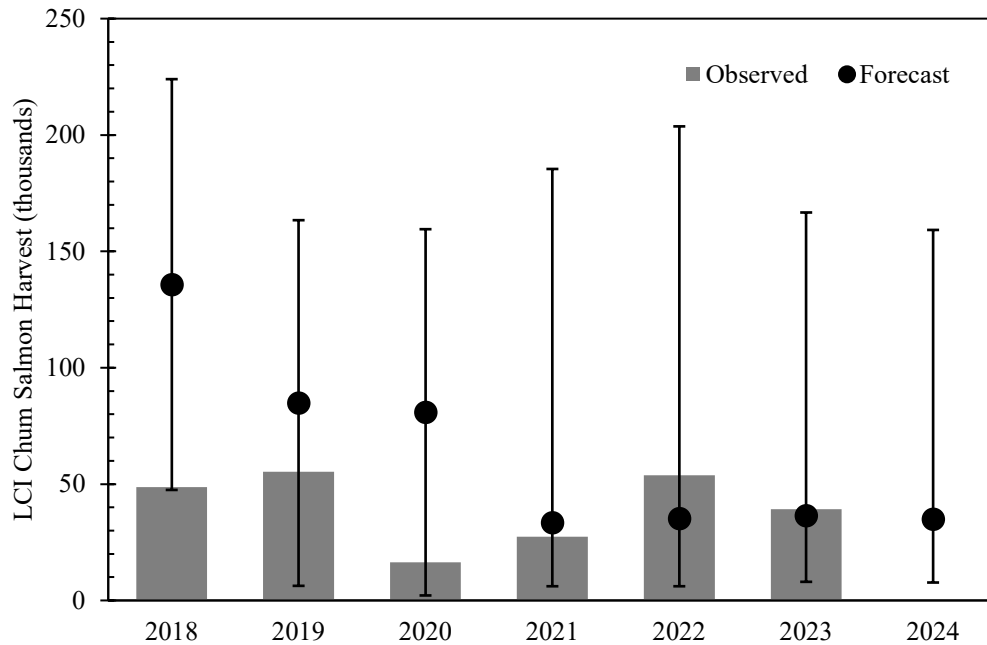


Figure 19.—Annual observed commercial harvest of chum salmon in LCI compared to preseason harvest forecasts, 2018–2024. Error bars represent 80% confidence intervals of forecasts.

Forecast by Edward O. Otis, Area Finfish Research Biologist, Homer; and Glenn J. Hollowell, Area Finfish Management Biologist, Homer.

## BRISTOL BAY AREA

### Sockeye Salmon

The sockeye salmon total run forecast for Bristol Bay in 2024 is predicted to be *average* with a point estimate of 39.00 million fish and a range of 24.89–53.12 million fish (80% confidence interval; Table 23). The categorical ranges of sockeye salmon total run strength were formulated from the percentiles of total runs from 1961–2023; Table 24). Since 2001, our preseason forecasts have under-forecast the actual run by 15%, on average, ranging from 36% below in 2014 to 21% above in 2011 (Figure 20).

Table 23.—Preliminary forecast of the 2024 Bristol Bay area sockeye salmon run.

|                                 | Forecast   | Forecast range |
|---------------------------------|------------|----------------|
| Total production:               | (millions) | (millions)     |
| Total run                       | 39.00      | 24.89–53.12    |
| Escapement                      | 12.89      |                |
| Total harvestable surplus       | 26.11      |                |
| Bristol Bay harvestable surplus | 25.01      |                |
| South Peninsula                 | 1.10       |                |
| Inshore Run                     | 37.90      |                |

Table 24.—Categorical ranges of sockeye salmon total run and this year’s forecast in bold.

| Category       | Range (millions) | Percentile          |
|----------------|------------------|---------------------|
| Poor           | Less than 20     | Less than 20th      |
| Weak           | 20 to 28         | 20th to 40th        |
| <b>Average</b> | <b>28 to 42</b>  | <b>40th to 60th</b> |
| Strong         | 42 to 53         | 60th to 80th        |
| Excellent      | Greater than 53  | Greater than 80th   |

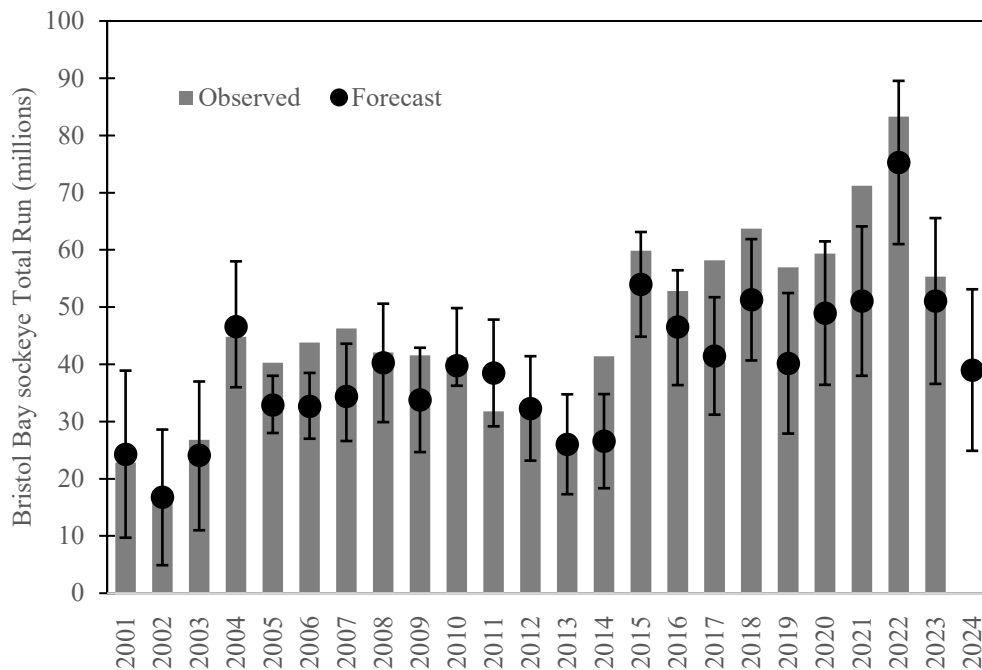


Figure 20.—Annual observed total run of sockeye salmon in Bristol Bay compared to preseason total run forecasts, 2001–2024. Error bars represent 80% confidence intervals of forecasts.

*Forecast Methods:* The 2024 Bristol Bay sockeye salmon forecast is the sum of individual predictions from 9 river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak, and Togiak Rivers) and 4 age classes (ages 1.2, 1.3, 2.2, and 2.3). Adult escapement and return data from brood years 1972–2020 were used in the analyses for most rivers.

Forecasts for each age class returning to a river system were derived from models based on the relationship between adult returns of that age class and either total returns or sibling returns from the same brood years. The average return over the last 5 years was also considered as a forecast model and in certain cases, competing models were averaged in a weighted hybrid model approach. In general, models with statistically significant parameters or best past performance metrics were chosen. Performance was evaluated using mean absolute deviation, MAPE, mean arctangent absolute percent error, and MPE between forecasted and observed returns measured across the most recent 3- and 5-year time frames.

Where practical, the department will manage escapements proportional to the run size and relative to the historical record (5 AAC 06.355 (d)(1)). In the Nushagak District, the Wood and Nushagak Rivers escapement goals will be modified by the *Nushagak District King Salmon Stock of Concern Management Plan* (5 AAC 06.391). Based on this regulation, the upper ends of the OEG ranges in 2024 will be 2.98 and 1.43 million sockeye salmon for the Wood and Nushagak Rivers, respectively, and escapements are projected as the 75th percentile of the OEGs. For the other systems in Bristol Bay, escapement is projected as the 50th percentile of the escapement goal range if the forecast is in the mid-range of historical run sizes (Ugashik River in 2024), and as the 25th percentile of the escapement goal range if the forecast is in the lower range of historical run sizes (Kvichak, Naknek, Egegik, Igushik, and Togiak Rivers in 2024; Table 24). Because it is passively managed, the Alagnak River exploitation rate is assumed to be the same as that of the Kvichak River, and therefore, the escapement is projected to be the total run forecast minus expected harvestable surplus.

Over the past 5 years, an average of 2.8% of the Bristol Bay return is thought to have been harvested in the South Peninsula fisheries in June. Preseason harvestable surplus projections are provided to aid industry in planning for the upcoming season.

*Forecast Results:* A total of 39.00 million sockeye salmon (with a range of 24.89–53.12 million fish) are expected to return to Bristol Bay in 2024 (Table 25). This is 35% smaller than the most recent 10-year average of 60.20 million fish and 6% greater than the long-term (1963–2023) average of 36.83 million fish. All systems are expected to meet their spawning escapement goals in 2024. The forecast range is the upper and lower values of the 80% confidence interval for the total run forecast. The confidence bounds were calculated from the difference between actual runs and run forecasts from 2005 through 2023.

A run of 39.00 million sockeye salmon would allow for a potential harvestable surplus of 26.11 million fish: 25.01 million fish in Bristol Bay and 1.10 million fish in the South Peninsula June fishery. A Bristol Bay harvest of this size is 39% less than the most recent 10-year average harvest of 40.72 million fish (ranging from 28.75 to 60.52 million fish), and 8% greater than the long-term (1963 to 2022) average harvest of 23.15 million fish.

Age-specific forecasts for the 2024 run consists of 19.61 million age-1.2 fish (50% of the total run), 5.17 million age-2.2 fish (13% of the total run), 12.06 million age-1.3 fish (31% of the total run), and 2.07 million age-2.3 fish (5% of the total run; Table 23).



Table 25.–Forecast of total run, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay (BB) river systems in 2024.

|                  |          | Millions of sockeye salmon         |      |       |      |                   |            |         |                        |            |
|------------------|----------|------------------------------------|------|-------|------|-------------------|------------|---------|------------------------|------------|
|                  |          | Forecasted production by age class |      |       |      | Forecasted        |            | South   |                        |            |
| DISTRICT / River |          | 1.2                                | 2.2  | 1.3   | 2.3  | Total             | Escapement | Surplus | Peninsula <sup>a</sup> | BB Inshore |
| NAKNEK-KVICHAK   |          |                                    |      |       |      |                   |            |         |                        |            |
|                  | Kvichak  | 4.39                               | 0.92 | 1.12  | 0.25 | 6.68              | 4.00       | 2.50    | 0.19                   | 6.50       |
|                  | Alagnak  | 1.30                               | 0.17 | 1.46  | 0.08 | 3.02              | 1.81       | 1.13    | 0.08                   | 2.93       |
|                  | Naknek   | 2.55                               | 0.41 | 2.38  | 0.37 | 5.70              | 1.10       | 4.44    | 0.16                   | 5.54       |
|                  | Total    | 8.23                               | 1.50 | 4.96  | 0.71 | 15.40             | 6.91       | 8.06    | 0.43                   | 14.97      |
| EGEGIK           |          |                                    |      |       |      |                   |            |         |                        |            |
|                  |          | 1.81                               | 2.46 | 0.61  | 0.82 | 5.70              | 1.10       | 4.44    | 0.16                   | 5.54       |
| UGASHIK          |          |                                    |      |       |      |                   |            |         |                        |            |
|                  |          | 3.08                               | 0.81 | 0.69  | 0.20 | 4.78              | 0.95       | 3.69    | 0.13                   | 4.64       |
| NUSHAGAK         |          |                                    |      |       |      |                   |            |         |                        |            |
|                  | Wood     | 4.81                               | 0.24 | 2.52  | 0.27 | 7.84              | 2.41       | 5.21    | 0.22                   | 7.62       |
|                  | Igushik  | 0.39                               | 0.01 | 0.66  | 0.02 | 1.08              | 0.21       | 0.83    | 0.03                   | 1.05       |
|                  | Nushagak | 1.04                               | 0.13 | 2.18  | 0.04 | 3.50 <sup>b</sup> | 1.16       | 2.24    | 0.10                   | 3.40       |
|                  | Total    | 6.24                               | 0.39 | 5.36  | 0.34 | 12.42             | 3.78       | 8.29    | 0.35                   | 12.07      |
| TOGIAC           |          |                                    |      |       |      |                   |            |         |                        |            |
|                  |          | 0.25                               | 0.00 | 0.44  | 0.01 | 0.70 <sup>c</sup> | 0.16       | 0.52    | 0.02                   | 0.68       |
| BRISTOL BAY      |          |                                    |      |       |      |                   |            |         |                        |            |
|                  |          | 19.61                              | 5.17 | 12.06 | 2.07 | 39.00             | 12.89      | 25.01   | 1.10                   | 37.90      |
|                  |          | 50%                                | 13%  | 31%   | 5%   | 100%              |            |         |                        |            |

Note: This table is a summary. Slight differences may appear due to rounding.

<sup>a</sup> Projected harvest is based on the current 5-year running average exploitation rate of 2.8%.

<sup>b</sup> Nushagak River forecast total includes approximately 93,000 age-1.4 fish.

<sup>c</sup> Forecasts for Kulukak, Kanik, Osviak, and Matogak River systems are not included. These systems contribute approximately 50,000 sockeye salmon to Togiak District harvest each year.

*Forecast Discussion:* Forecasting future salmon returns is inherently difficult and uncertain. The department has used similar methods since 2001 to produce the Bristol Bay sockeye salmon forecasts, which have performed well when applied to Bristol Bay as a whole. Since 2001, our forecasts have, on average, under forecast the run by 15% and have ranged from 36% below the actual run in 2014 to 21% above the actual run in 2011. Forecasted harvestable surplus has had a MAPE of 15% since 2001.

Individual river forecasts have greater uncertainty compared to the baywide forecast. Since 2001, the department has, on average, under forecast returns to the Alagnak (-31%), Togiak (-10%), Kvichak (-22%), Wood (-20%), Nushagak (-24%), Ugashik (-3%), and Naknek (-12%) Rivers, and over forecast returns to the Igushik (7%) and Egegik Rivers (8%). Over forecasting returns to some rivers while under forecasting returns to other rivers means that the overall Bristol Bay forecast is often more accurate than the forecast to any individual river.

Forecast by Stacy Vega, Bristol Bay Research Biologist ADF&G, Anchorage.

## ARCTIC-YUKON-KUSKOKWIM REGION

### ALL SALMON

The department prepares formal run forecasts annually for the following stocks in the AYK Region: Kuskokwim River Chinook salmon, Yukon River Chinook salmon, Canadian-origin Yukon River Chinook salmon, Yukon River summer chum salmon, and Yukon River fall chum salmon. A summary of forecast methods and 2024 run size projections is provided.

The Kuskokwim River Chinook salmon run forecast is based on the estimated run size from the prior year (midpoint), and uncertainty is represented as the recent 7-year average percent error between forecasted and actual run estimates. The preliminary 2024 Kuskokwim River Chinook salmon forecast is for a range of 98,000–149,000 fish. The drainagewide Chinook salmon escapement goal is 65,000–120,000 fish. If the run comes back as projected, the drainagewide escapement goal is expected to be achieved and subsistence harvest opportunity provided. There is currently no commercial buyer in the Kuskokwim Area, and commercial harvest of Chinook salmon is not expected during the 2024 season.

Separate forecasts are prepared for Canadian-origin Yukon River Chinook salmon and total run. The Canadian-origin run forecast is produced by a U.S./Canada Joint Technical Committee and presented to the Yukon River Panel. The 2024 forecast is based on projections of brood year returns, sibling relationships, and juvenile abundance estimates from marine trawl surveys conducted in the northeastern Bering Sea. A Bayesian integrated forecast was produced, such that the model components that best fit the observed historical run sizes are given more weight. The 2024 Canadian-origin Chinook salmon forecast will be available in February, but early expectations are for a run of similar size to 2023. The IMEG for this stock component has been 42,500–55,000 fish from 2010 to 2022, but is currently under review by the Yukon River Panel. The Canadian-origin forecast is used to develop the drainagewide Chinook salmon outlook (all stocks), based on the assumption that the Canadian-origin run represents approximately 42% of the total run. The drainagewide forecast for Yukon River Chinook salmon is also unavailable at this time. Yukon River Chinook salmon is classified as a stock of yield concern under the *Policy for the Management of Sustainable Salmon Fisheries*. Harvest of Yukon River Chinook salmon is not expected during the 2024 season, in any fishery.

The 2024 Yukon River summer chum salmon run forecast is developed by projecting the age-5 return based on sibling relationships and expanding the age-5 return estimate to total run based on the recent 10-year average age at maturity. The drainagewide summer chum salmon forecast is for a below-average run size of 550,000–1,780,000 fish (80% confidence interval). High forecast uncertainty is largely due to the 2019 elevated marine and inriver water temperatures that were linked to large-scale pre-spawn mortality of Yukon summer chum salmon. The strength of the 2019 brood year component that will return in 2024 as age-5 fish is a bit uncertain. The sibling return of age-4 fish in 2023 was higher than the last 4 years which is suggestive that the age-5 return in 2024 may also be improved compared to recent years. The drainagewide BEG for this stock is 500,000–1,200,000 fish. If the 2024 summer chum salmon run is near the lower end of the forecast range, there would be no surplus available above escapement and subsistence harvest needs for a directed summer chum salmon commercial fishery. However, if the run size exceeds 750,000 fish, commercial fishery opportunity would be warranted as per the *Yukon River Summer Chum Salmon Management Plan*. Regardless of run size, fishing opportunities for summer chum salmon in 2024 will likely be limited by the low predicted Chinook salmon run size and be

restricted to selective gear types (dip nets, beach seines, human operated fish wheels) with release of Chinook salmon required.

The 2024 Yukon River fall chum salmon run forecast is based on drainagewide projections of brood year returns and age class proportions (age-3 through age-6) using a spawner-recruit analysis. The drainagewide fall chum salmon forecast point estimate is 369,000 fish which is below the average run size of 950,000 fish. The forecast range is 263,000–474,000 fall chum salmon, based on the upper and lower values of the 80% confidence bounds of the total run forecast. Confidence bounds are calculated using deviation of the run projection point estimates and the observed returns from 1987–2023. The drainagewide SEG is 300,000–600,000 fall chum salmon. If the 2024 run materializes on the lower end of the forecast range, the minimum drainagewide escapement will not be met and there will not be any surplus to support directed fishing opportunity. However, if the run comes in above the point estimate and the lower end of the escapement goal there is potential for some limited subsistence fisheries. Given the forecasted run size and associated uncertainties, commercial fisheries would most likely remain closed.

The department does not produce formal run forecasts for other salmon stocks returning to the Kuskokwim Area or Yukon Area, or any salmon stocks returning to the Norton Sound Area or Kotzebue Management Area. Consequently, commercial harvest outlooks for these stocks are typically based upon available parent-year spawning escapement indicators, age composition information, recent year trends, and the level of commercial harvest that can be expected given the fishery management plans in place and commercial processing capacity. Currently, southeastern Norton Sound Chinook salmon stocks are classified as *stocks of yield concern*. In general, low Chinook and chum salmon abundance is anticipated throughout the AYK Region in 2024, while Yukon River coho salmon are also expected to be poor. Low run sizes for multiple species throughout the AYK Region combined with (currently) no commercial processor registered in the Kuskokwim Management Area is expected to result in well below average commercial harvest (Table 26).

Forecasts by Sean Larson, Kuskokwim Area Research Biologist, ADF&G, Anchorage/Bethel; Bonnie Borba, Yukon Area Research Biologist, ADF&G, Fairbanks; and Fred West, Yukon Area Research Biologist, ADF&G, Anchorage.

Table 26.—The 2024 Arctic-Yukon-Kuskokwim area all-salmon commercial harvest outlook by management area, in thousands of fish.

| Management area                   | Salmon species |         |      |        |             |           |
|-----------------------------------|----------------|---------|------|--------|-------------|-----------|
|                                   | Chinook        | Sockeye | Coho | Pink   | Summer chum | Fall chum |
| Kuskokwim River                   | 0              | 0       | 0    | 0      | 0           | 0         |
| Kuskokwim Bay                     | 0              | 0       | 0    | 0      | 0           | 0         |
| Kuskokwim Area total <sup>a</sup> | 0              | 0       | 0    | 0      | 0           | 0         |
| Yukon                             | 0              | 0       | 0    | 0      | 0–1,100     | 0         |
| Norton Sound                      | 0              | 0       | 5–25 | 50–100 | 25–50       | 0         |
| Kotzebue Sound                    | 0              | 0       | 0    | 0      | 0           | 300–400   |

<sup>a</sup> There is not currently a confirmed commercial buyer in the Kuskokwim area for 2024.

## WESTWARD REGION

### KODIAK MANAGEMENT AREA

#### Pink Salmon

The 2023 KMA predicted pink salmon harvest is expected to be in the *weak* category with a point estimate of 8.8 million fish combining the wild stock and Kitoi Bay Hatchery harvest estimates (Tables 27 and 28). Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest in the KMA from 1988 to 2023.

*Forecast Methods:* The KMA wild stock pink salmon harvest forecast is derived from a total run forecast minus the estimated KMA escapement (5.0 million fish). The total run estimates were derived from a combination of weir counts, aerial survey index, and harvest estimates.

For the 2024 KMA wild stock pink salmon forecast, a generalized Ricker model (Quinn and Deriso 1999) was fit to the even-year KMA returns from 1988 to 2022 utilizing Karluk River, Ayakulik River, and Dog Salmon Creek pink salmon escapement counts for the spawner index. Four additional terms were included in this generalized Ricker model: (1) KMA pink salmon aerial survey indexed escapement (non-weir systems), (2) Western Gulf of Alaska May SST, (3) previous year (lag-1) Westward Region pink salmon return, and (4) an environmental composite created from a series of forecast indices affecting pink salmon returns. The environmental variables used to create the composite included monthly mean air temperature, total precipitation, and peak precipitation total run correlation anomalies from July to June of freshwater life history.

In constructing and evaluating the regression model standard regression diagnostic procedures were used. Forecast range was estimated using the 80% confidence intervals of the absolute percent error of the composite model hindcast estimates.

Table 27.—The 2024 Kodiak Management Area (KMA) predicted pink salmon harvest categories.

| KMA harvest category | Range (millions)  | Percentile     |
|----------------------|-------------------|----------------|
| Poor                 | Less than 8.2     | Less than 20th |
| Weak                 | 8.2 to 14.3       | 21st to 40th   |
| Average              | 14.3 to 21.4      | 41st to 60th   |
| Strong               | 21.4 to 27.7      | 61st to 80th   |
| Excellent            | Greater than 27.7 | 81st to 100th  |

Table 28.—Preliminary forecast of the 2024 Kodiak Management Area (KMA) pink salmon run.

| Total production                        | Forecast estimate (millions) | Forecast range (millions) |
|---|------------------------------|---------------------------|
| KMA Wild stock total run                | 10.4                         | 5.0–15.9                  |
| KMA Escapement goal <sup>a</sup>        | 5.0                          |                           |
| KMA Wild stock harvest                  | 5.4                          | 0–10.9                    |
| Kitoi Bay Hatchery harvest <sup>b</sup> | 3.4                          | 2.4–4.4                   |
| Total KMA Pink salmon harvest           | 8.8                          | 2.4–15.2                  |

*Note:* Column numbers may not total or correspond exactly with numbers in text due to rounding.

<sup>a</sup> The 2024 estimated escapement is within the range of the even-year aggregate escapement goals for the Kodiak Archipelago (3.0–5.0 million fish) and the Mainland District (0.25–1.0 million fish).

<sup>b</sup> This figure is the total expected return (3.8 million fish) minus the broodstock collection goal of 0.43 million fish; the Kitoi Bay Hatchery has yet to determine cost-recovery goals (if any) for 2024.

The 2024 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survival from even brood years 1994–2020 when releases from the facility were in excess of 100 million fry (excludes 2016). These brood years are particularly important to the forecasting model because all pink salmon fry were released on the same day to saturate the release area with fry (predator satiation). This release strategy has proven to significantly improve fry-to-adult survival.

The pink salmon return to Kitoi Bay Hatchery is an odd-year dominant return that experiences exceptional marine survival every fourth year dating back to the first releases in 1977 (with the exception of 1997). The primary forecasting consideration for 2024 relates to this 4-year cyclical return, which is below average and is the weaker of the 2 even-year cycles. The midpoint estimate of 3.8 million fish reflects a marine survival of 2.0% for the 196 million fry released (0.57 g), which was below the traditional target size (0.8 g). The average survival was calculated using the last 4-year cyclical returns (parent class 2006, 2010, 2014, and 2018). The range was calculated as (+/-) 25% of the predicted marine survival.

*Forecast Discussion:* The 2024 KMA wild stock pink salmon total run (10.4 million fish) is predicted to be a weak return (Figure 21). Although the escapement indicators were good, average environmental conditions, below average SST, and a strong previous year return (2023) indicate a more dampened return in 2024 is likely to occur.

The 2024 Kitoi Bay Hatchery pink salmon production is expected to be 3.8 million fish (Figure 22). The broodstock collection goal is 425,000 fish, resulting in a total hatchery harvest projection of about 3.4 million fish.

Confidence in the 2024 forecast estimate is only fair considering the unpredictable nature of pink salmon returns. Despite the strength of the forecast model, the authors recognize that return corollaries are often fleeting due to the dynamic nature of the Gulf of Alaska. This forecast level should allow an initial weekly fishing period length of 57 hours (2½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2024). By the third week of July, fishing time likely will be restricted, by section or district, to ensure escapement goals will be met.

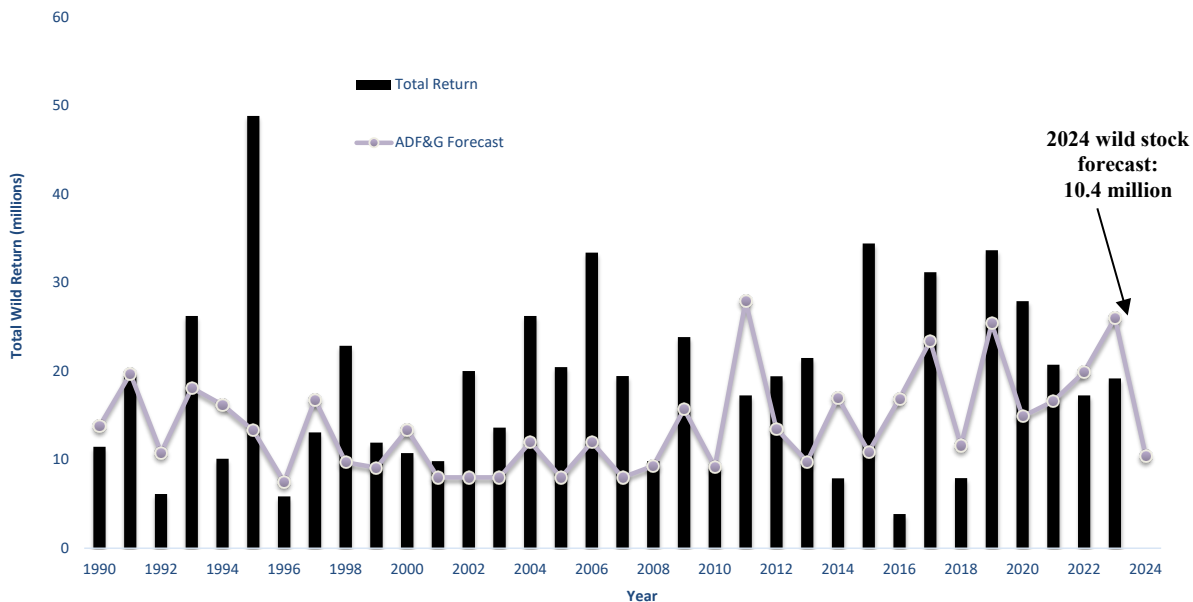


Figure 21.—Kodiak pink salmon wild stock total return compared to ADF&G forecasts, 1990 to 2023, and 2024 forecast.

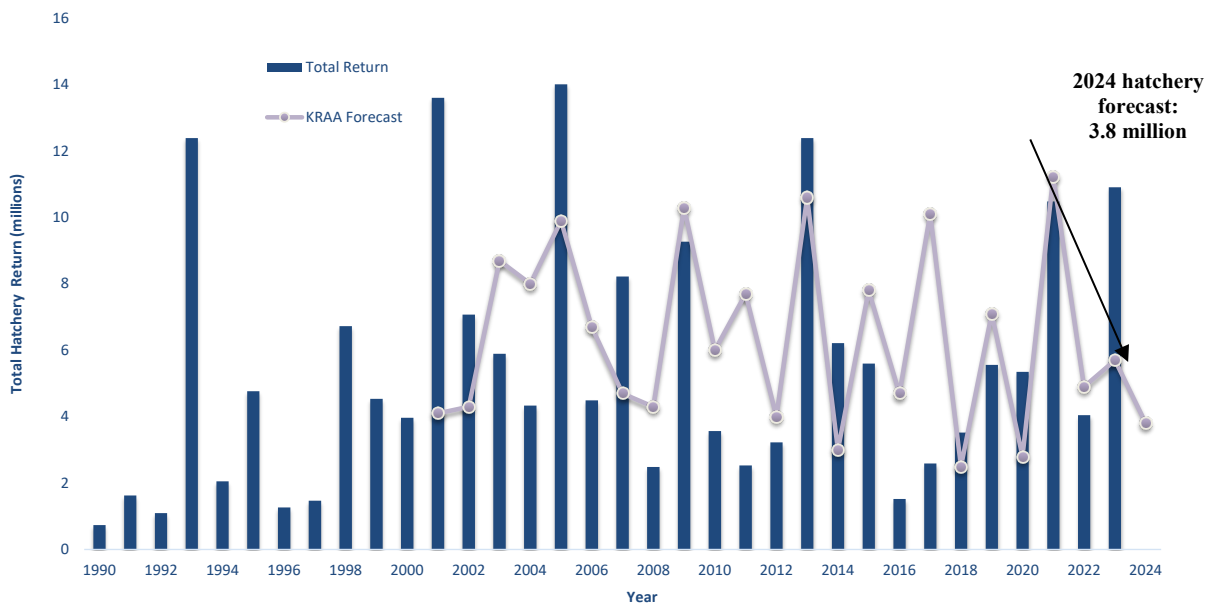


Figure 22.—Kitoi Bay Hatchery pink salmon total return compared to Kodiak Regional Aquaculture Association (KRAA) forecasts, 1990 to 2023, and 2024 forecast.

Forecast by M. Birch Foster, Finfish Research Biologist, Westward Region; and Lauren Deal, Kitoi Bay Hatchery Manager, Kodiak Regional Aquaculture Association.

## Ayakulik River

### *Sockeye Salmon*

*Forecast Methods:* The 2024 Ayakulik River sockeye salmon forecast (Table 29) was prepared primarily by investigating simple linear regression models utilizing recent outmigration year age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

Table 29.—Preliminary forecast of the 2024 Ayakulik River sockeye salmon run.

| Total production             | Forecast estimate (thousands) | Forecast range (thousands) |
|------------------------------|-------------------------------|----------------------------|
| Total run estimate           | 1,050                         | 704–1,438                  |
| Escapement goal <sup>a</sup> | 400                           | 200–400                    |
| Harvest estimate             | 650                           |                            |

<sup>a</sup> The escapement estimate is the sum of the upper end of escapement goals for the early (140,000–280,000) and late run (60,000–120,000).

The ocean-age-2 sockeye salmon were predicted from prior year ocean-age-1 returns (1992–present). Ocean-age-3 sockeye salmon were predicted from prior year ocean-age-2 returns (1992–present). Ocean-age-1 and all other age classes were predicted by the 20-year median return. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2023. The range was estimated as the sum of the individual 80% prediction intervals.

*Forecast Discussion:* The 2024 Ayakulik forecast of 1,050,000 sockeye salmon is about 521,000 more fish than the actual 2023 run estimate of approximately 529,000 fish, and about 395,000 fish more than the most recent 10-year average of approximately 655,000 fish. The 2024 run is estimated to be composed of approximately 83% ocean-age-2 fish. The Ayakulik sockeye salmon runs in 2021 and 2022 were the largest since 1998, and we are anticipating another large run in 2024, but confidence is only fair. The projected harvest of 650,000 fish is based on the achievement of the upper end of the combined escapement goal ranges (400,000 fish). Ayakulik is managed based on both early- and late-run (post July 15) components. Based on brood-year escapement proportions from what will be the major contributing brood years (2018–2021), approximately 70% of the total run will occur in the early portion of the run.

Forecast by M. Birch Foster, Finfish Research Biologist, Westward Region.

## Karluk River

### *Sockeye Salmon*

*Forecast Methods:* The 2024 Karluk River sockeye salmon forecast (Table 30) was prepared primarily by investigating escapement, sibling age class relationships, moving average, and exponential smoothing methods.



Table 30.—Preliminary forecast of the 2024 Karluk River sockeye salmon run.

| Total production             |                              | Forecast estimate<br>(thousands) | Forecast range<br>(thousands) |
|------------------------------|------------------------------|----------------------------------|-------------------------------|
| Early Run                    | Total run estimate           | 227                              | 23–435                        |
|                              | Escapement goal <sup>a</sup> | 200                              | 150–250                       |
|                              | Harvest estimate             | 27                               |                               |
| Late Run                     | Total run estimate           | 1,195                            | 660–1,768                     |
|                              | Escapement goal <sup>a</sup> | 450                              | 200–450                       |
|                              | Harvest estimate             | 745                              |                               |
| Total Karluk River<br>System | Total run estimate           | 1,422                            | 683–2,204                     |
|                              | Escapement goal <sup>a</sup> | 650                              | 350–700                       |
|                              | Harvest estimate             | 772                              |                               |

Note: Column numbers may not total or correspond exactly with numbers in text due to rounding.

<sup>a</sup> The escapement estimates are based on the midpoints of the early-run and late-run escapement goals and summed for the total run.

Karluk River sockeye salmon production demonstrates strong positive autocorrelation (i.e., good years followed by good years and bad years followed by bad years). As a result, recent year trends have been a good prognosticator of the near future at Karluk River. Utilizing sibling age-class relationships and regression models has been the preferred method since 1994. An exponential smoothing model was also fit to recent year early- and late-run total returns. Parameter estimates (early run  $\alpha = 0.84$ ; and late run  $\alpha = 0.56$ ) placed heavy weight on recent returns and outperformed 2-, 3-, and 5-year moving averages. However, the sibling age class forecasts for the early, late, and total runs outperformed the exponential smoothing model hindcast estimates (1994 to present) in terms of MSE. Therefore, the sibling age class methods were used for the 2024 forecast.

For the early run, ocean-age-2 sockeye salmon returns were predicted based on the abundance of the prior-year return of ocean-age-1, and ocean-age-3 sockeye salmon returns were predicted based on the abundance of the prior-year return of ocean-age-2 sockeye salmon (2005–present). The ocean-age-1 and -4 return predictions were calculated using their pooled median contribution since 2005.

For the late run, ocean-age-2 sockeye salmon returns were predicted based on the abundance of the prior-year return of ocean-age-1 sockeye salmon (2005–present). The ocean-age-1, -3, and -4 return predictions were calculated using their pooled median contribution since 2005.

Regression and median estimates were summed to estimate the total Karluk sockeye salmon run for 2024. The range was estimated as the overall 80% prediction intervals. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the 2 runs.

*Forecast Discussion:* The total 2024 sockeye salmon run to the Karluk River using sibling relationships is predicted to be approximately 1,422,000 fish. The early run is expected to be approximately 227,000 fish, which is about 47,000 fish below the recent 10-year average (274,000 fish) and 37,000 fish below the 2023 run (264,000 fish). The late run is expected to be approximately 1,195,000 fish, which is 265,000 fish above the recent 10-year average (930,000 fish) and 309,000 fish less than the 2023 run (1,504,000 fish). The combined exponential smoothing estimates for the early and late runs is 1,391,000 fish for comparison.

The projected harvest estimate for the early run (27,000 fish) is based on achievement of the midpoint of the early-run escapement goal range. The projected harvest estimate for the late run (745,000 fish) is based on achievement of the midpoint of the late-run escapement goal. The Karluk sockeye salmon run is expected to be predominated by ocean-age-2 fish (79%). The overall confidence in the Karluk River sockeye salmon forecast is fair.

Forecast by M. Birch Foster, Finfish Research Biologist, Westward Region.

## Alitak District (Frazer Lake and Upper Station)

### *Sockeye Salmon*

*Forecast Methods:* The 2024 sockeye salmon run to the Alitak District (Table 31) was forecasted with linear regression models using ocean-age-class relationships by system from recent outmigration years and environmental indices. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimate.

Table 31.—Preliminary forecast of the 2024 Alitak District sockeye salmon run.

| Total production      |                               | Forecast estimate<br>(thousands) | Forecast range<br>(thousands) |
|-----------------------|-------------------------------|----------------------------------|-------------------------------|
| Early Upper Station   | Total run estimate            | 71                               | 31–164                        |
|                       | Escapement goal <sup>a</sup>  | 65                               | 43–93                         |
|                       | Harvest estimate <sup>b</sup> | 6                                |                               |
| Late Upper Station    | Total run estimate            | 267                              | 136–466                       |
|                       | Escapement goal               | 186                              | 120–265                       |
|                       | Harvest estimate <sup>b</sup> | 81                               |                               |
| Frazer Lake           | Total run estimate            | 247                              | 77–506                        |
|                       | Escapement goal <sup>c</sup>  | 143                              | 95–190                        |
|                       | Harvest estimate <sup>b</sup> | 104                              |                               |
| Total Alitak District | Total run estimate            | 585                              | 244–1,136                     |
|                       | Escapement goal               | 394                              | 258–548                       |
|                       | Harvest estimate <sup>b</sup> | 191                              |                               |

*Note:* Column numbers may not total or correspond exactly with numbers in text due to rounding.

<sup>a</sup> The Alaska Board of Fisheries removed the Upper Station early-run optimal escapement goal (OEG) of 30,000 fish in 2017; the Upper Station early run is now managed for a biological escapement goal (BEG) of 43,000–93,000 fish.

<sup>b</sup> The harvest of Upper Station-bound sockeye salmon is concurrent with the harvest of Frazer Lake-bound sockeye salmon and predominantly occurs within the Alitak District.

<sup>c</sup> The Frazer Lake escapement goal (75,000–170,000) is increased here by an additional 20,000 fish, which is the 20-year median of the number of fish that escape the Dog Salmon weir but do not ascend the fish pass to reach Frazer Lake. The value of 143,000 fish is  $S_{MSY}$  plus 20,000 fish.

Upper Station early-run ocean-age-2 returns were forecasted using prior year ocean-age-1 returns (outmigration years: 2003–2022). Upper Station early-run ocean-age-2 salmon were used to predict log transformed ocean-age-3 fish data from outmigration years 1992 to 2021. Upper Station late-run ocean-age-2 and log-transformed ocean-age-3 salmon returns were each predicted using their respective prior year ocean-age-1 and -2 returns (late-run outmigration years: 1998–2022 and 1983–2021, respectively). Upper Station early- and late-run ocean-age-1 and -4 returns were calculated using the pooled median contributions by stock and ocean age from the last 10 years. Frazer ocean-age-2 salmon were predicted using prior year ocean-age-1 returns (outmigration years: 1998–2022). Frazer ocean-age-3 salmon were predicted using prior year ocean-age-2 returns (outmigration years: 2003–2021). Frazer ocean-age-1 and -4 returns were calculated using the pooled median contributions from the last 15 years.

Regression and median estimates were summed to estimate the total Alitak District sockeye salmon run for 2024. The combined Alitak District prediction interval was calculated by summing the lower and upper prediction bounds of the 3 runs.

*Forecast Discussion:* The 2024 sockeye salmon run to the Alitak District is expected to be approximately 585,000 fish, approximately 128,000 less fish than the recent 10-year average run (712,000 fish) and 36,000 fish less than the 2023 run. The Upper Station early run is expected to be approximately 71,000 fish, which is less than the recent 10-year average run (91,000 fish). The Upper Station late run is expected to be approximately 267,000 fish, which is also less than the recent 10-year average run (298,000 fish). The Frazer Lake run is expected to be approximately 247,000 fish, which is less than the recent 10-year average (323,000 fish). The 2024 Alitak District sockeye salmon run should be composed of approximately 70% ocean-age-2 fish, 21% ocean-age-3 fish, and 9% ocean-age-1 fish. Overall, our confidence in the forecast is fair based on the strength of the regression models and the large prediction intervals.

The projected harvest estimate of 191,000 fish is based on achieving the  $S_{MSY}$  estimates for Upper Station early and late runs and  $S_{MSY}$  plus an additional 20,000 fish (20-year median of the number of fish that pass through the Dog Salmon weir but do not ascend the Frazer Lake fish pass) for the Frazer run.  $S_{MSY}$  is an estimate of the escapement that has the largest expectation of subsequent surplus production.

Forecast by Heather Finkle, Finfish Research Biologist, Westward Region.

## **Spiridon Lake**

### ***Sockeye Salmon***

*Forecast Methods:* The 2024 Spiridon Lake sockeye salmon forecast (Table 32) is estimated by multiplying the estimated number of smolt released for both net pen and lake combined, by the mean smolt-to-adult survival proportions by ocean age and mean return by age proportion of each age class for completed brood years 2012–2016. The Spiridon Lake and Telrod Cove range estimates the 95% confidence intervals created using the Goodman’s variance equation (Goodman 1960).

Table 32.—Preliminary forecast of the 2024 Spiridon Lake sockeye salmon run.

| Total production    | Forecast estimate (thousands) | Forecast range (thousands) |
|---------------------|-------------------------------|----------------------------|
| Total run estimate  | 184                           | 26–342                     |
| Spiridon            | 99                            | 16–182                     |
| Telrod Cove net pen | 85                            | 10–160                     |
| Escapement goal     | n/a                           |                            |

*Note:* Column numbers may not total or correspond exactly with numbers in text due to rounding. “n/a” = not applicable.

*Forecast Discussion:* Sockeye salmon are prevented from returning to Spiridon Lake due to barrier falls blocking upstream migrations in the outlet creek (Telrod Creek). Therefore, all returning adult sockeye salmon are available for harvest, primarily in the Central Section of the Northwest Kodiak District and in the Spiridon Bay SHA in Telrod Cove. The point estimate forecast of 184,000 fish in 2024 is greater than the 2023 forecast (125,000 fish). A significant increase in harvest of sockeye salmon bound for Telrod Cove during common property fishing within the Spiridon Bay Section (statistical area 254-41) was recently discovered. Production estimates now incorporate the combined harvests of Spiridon Bay and Telrod Cove sections to better approximate the run strength and total enhancement production.

The majority of the 2024 run will likely be composed of 3 major age classes: 68.2% age-1.2 fish, 14.9% age-1.3 fish, and 5.4% age-2.2 fish. All other age classes will compose 12.5% of the remaining run estimate. If realized, this run will be below the recent 10-year average (2014 to 2023) run of 230,769 fish. The peak of the Spiridon Lake sockeye salmon run timing through the westside fishery is typically in early to mid-July.

The 2024 season will mark the 11th year of adult returns to Telrod Cove originating from net-pen releases. Of the returning fish to Telrod Cove in 2024, age-1.1, -1.2, -1.3, and -1.4 sockeye salmon will be apportioned between lake and net pen production through evaluation of differential otolith marks created during hatchery incubation.

Forecast by Gannon Pratt, Research and Monitoring Manager, Kodiak Regional Aquaculture Association.

## CHIGNIK AREA

### Sockeye Salmon

*Forecast Methods:* Simple linear regression models using age class relationships were used to forecast the 2024 Chignik River sockeye salmon total run (Table 33).

Each regression model was assessed with standard regression diagnostic procedures. Data were log transformed to address non-normality or unequal variance. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. Age class returns not estimated with statistical models utilized pooled medians with data from 2000 to the present; median prediction intervals were calculated from the 10th and 90th percentiles of the data.

The 2024 total Chignik River sockeye salmon run was forecasted by modeling returns of stock components and summing those results by age. Early-run prior year log-transformed ocean-age-2

returns predicted early-run log-transformed ocean-age-3 returns using data from the 2000 outmigration year to the present. Prior year early-run ocean-age-1 returns predicted log-transformed ocean-age-2 returns (outmigration years 2000 to present). Late-run age-2.2 returns predicted late-run age-2.3 returns using data from the 2000 brood year to the present.

The early- and late-run regression and median estimates were summed to estimate the total Chignik River sockeye salmon run for 2024. The total run 80% prediction interval was calculated by summing the lower and upper prediction bounds of the 2 runs.

Table 33.—Preliminary Forecast of the 2024 Chignik area sockeye salmon run.

| Total production     |   | Forecast estimate<br>(thousands) | Forecast range<br>(thousands) |
|----------------------|---|----------------------------------|-------------------------------|
| Early run            | Total run estimate                      | 984                              | 417–2,332                     |
|                      | Optimal escapement goal <sup>a</sup>    | 350                              | 300–400                       |
|                      | Harvest estimate <sup>b</sup>           | 634                              |                               |
| Late run             | Total run estimate                      | 1,096                            | 456–2,537                     |
|                      | Optimal escapement goal <sup>a</sup>    | 300                              | 240–360                       |
|                      | Harvest estimate <sup>b</sup>           | 796                              |                               |
| Total Chignik System | Total run estimate                      | 2,080                            | 873–4,869                     |
|                      | Biological escapement goal <sup>c</sup> | 625                              | 450–800                       |
|                      | Combined OEG                            | 650                              | 540–760                       |
|                      | Chignik Area <sup>b</sup>               | 1,365                            |                               |
|                      | SEDM <sup>d</sup>                       | 65                               |                               |
|                      | Cape Igvak <sup>d</sup>                 | 0                                |                               |

*Note:* Column numbers may not total or correspond exactly with numbers in text due to rounding.

<sup>a</sup> During the February 2023 Board of Fisheries meeting, the board instituted optimal escapement goals (OEGs) for the early run (300,000 to 400,000 sockeye salmon) and late run (240,000 to 360,000 sockeye salmon).

<sup>b</sup> Harvest represents the surplus achieved beyond the midpoint of the escapement goal. An additional 217,000 fish transiting through the Chignik Management Area (CMA) are forecasted to be harvested beyond the 1.37 million fish that are considered Chignik-bound fish in the CMA.

<sup>c</sup> The biological escapement goal is for the single, total run goal. Targeting the midpoints of the early- and late-run OEGs is estimated to reduce the harvest by 25,000 fish.

<sup>d</sup> Based on historical run size and timing, a harvestable surplus of Chignik River system sockeye salmon is not forecast to exceed 600,000 fish by July 5 in the Chignik Management Area; therefore, as outlined in regulation, no commercial fisheries were forecasted in Cape Igvak during the regulatory timeframe thru July 5, thus the harvest of Chignik-bound sockeye salmon in the Cape Igvak section is expected to be zero. A harvestable surplus of 300,00 fish by July 8 and 600,000 fish greater than the early- and late-run OEGs after July 8 were forecast to be achieved for Chignik River sockeye salmon, thus a harvest of ~65,000 fish was estimated for Southeastern District Mainland (SEDM) up to the July 25 regulatory time frame.

*Forecast Discussion:* The 2024 Chignik River sockeye salmon total run is forecasted to be 2.08 million fish, which is 752,000 fish more than the 10-year average run of 1.33 million fish and almost 114,000 fish more than the 2023 total run of 1.96 million fish. The Chignik River sockeye salmon total run is predicted to be composed of approximately 83% ocean-age-3 and 17% ocean-age-2 fish with the early and late runs composing 47% and 53% of the total run, respectively.

The projected 2024 harvest estimate of almost 1.43 million Chignik-bound fish is based on achievement of the midpoints of the OEG ranges. The harvest estimate does not include other stocks caught while transiting through the CMA, which is estimated to be an additional 217,000 fish. The harvestable surplus of Chignik-bound sockeye salmon in the CMA was forecast to not

exceed 600,000 fish by July 5, which would preclude a commercial fishery in the Cape Igvak Section of the KMA. A harvestable surplus of Chignik-bound sockeye salmon in the CMA was forecast to exceed 600,000 fish after July 8 and by July 25; sockeye salmon harvest estimates for both runs include Chignik-bound sockeye salmon harvested in the Southeastern District Mainland (SEDM) of the Alaska Peninsula Management Area.

The wide confidence intervals around the point estimate of the 2024 forecasts reflect the uncertainty inherent in the forecast models. Given the sibling relationships used for forecasting the run and the variability in returns, the 2024 forecast may over or underestimate returns if environmental variables, which are unknown at this time, remain spurious. Due to the range of variation in the relationships used in these forecasts and their historical accuracy, our confidence in the forecast is fair.

Forecast by Heather Finkle, Finfish Research Biologist, Westward Region.

## ALASKA PENINSULA/ALEUTIAN ISLANDS AREA

### Bear Lake (Late Run)

#### *Sockeye Salmon*

*Forecast Methods:* The 2024 forecast of the Bear Lake sockeye salmon late run (Table 34) was prepared using simple linear regressions of sibling age classes. Models were evaluated with standard regression diagnostics. Prediction intervals (80%) for the regression estimates were calculated using variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the 80% prediction interval of the medians.

Table 34.—Preliminary forecast of the 2024 Bear Lake (late run) sockeye salmon run.

| Total production             | Forecast estimate (thousands) | Forecast range (thousands) |
|------------------------------|-------------------------------|----------------------------|
| Total run estimate           | 332                           | 88–638                     |
| Escapement goal <sup>a</sup> | 156                           | 117–195                    |
| Harvest estimate             | 176                           |                            |

<sup>a</sup> The escapement estimate is the midpoint of the escapement goal range (117,000–195,000) in 2024.

Ocean-age-3 sockeye salmon were predicted from prior year ocean-age-2 returns from outmigration years 1990 to present. Remaining age-class components of the run were predicted by calculating median returns from the most recent 10 years.

Regression and median estimates were summed to estimate the total Bear Lake late-run sockeye salmon run for 2024. The forecast range was estimated using the sum of the 80% prediction intervals and 10th and 90th percentiles intervals for each age class forecasted.

*Forecast Discussion:* The 2024 Bear Lake late-run forecast of 332,000 sockeye salmon is roughly 72,000 fish less than the 10-year average of approximately 404,000 fish and 126,000 fish more than the 2023 run of 205,000 sockeye salmon. The 2024 late run is expected to be composed of 5% ocean-age-1, 72% ocean-age-2, and 23% ocean-age-3 fish. The projected harvest of 176,000 fish is based on achieving the midpoint (156,000 fish) of the late-run escapement goal range and

adequate run strength. Bear River late-run sockeye salmon returns have shown a general decline in the total run since 1990. The wide range around the point forecast is a result of large fluctuations in age-2.2 and age-2.3 sockeye salmon returns. Based on uncertainty associated with the variable predictive capabilities of sibling age class, our confidence in this forecast is fair.

Forecast by Lisa Fox, Finfish Research Biologist, and Heather Finkle, Finfish Research Biologist, Westward Region.

## Nelson River

### *Sockeye Salmon*

*Forecast Methods:* The 2024 Nelson River sockeye salmon run (Table 35) was forecasted using simple linear regression of ocean-age-class and parental escapement data from the past 20 years. Standard regression diagnostics were used to evaluate each model. Prediction intervals (80%) for regression estimates were calculated using the variances of the regression models. Age classes that could not be estimated with modeling were estimated using pooled medians, and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

Table 35.—Preliminary forecast of the 2024 Nelson River sockeye salmon run.

| Total production             | Forecast estimate (thousands) | Forecast range (thousands) |
|------------------------------|-------------------------------|----------------------------|
| Total run estimate           | 444                           | 237–638                    |
| Escapement goal <sup>a</sup> | 158                           | 97–219                     |
| Harvest estimate             | 286                           |                            |

*Note:* Column numbers may not total or correspond exactly with numbers in text due to rounding.

<sup>a</sup> The escapement estimate is the midpoint of the escapement goal range (97,000–219,000) in 2024.

Ocean-age-2 sockeye salmon returns corresponding to the year of outmigration between 1999/2000 and 2018/2019 were forecasted with a simple linear regression. The returns of 2-ocean fish were predicted using the average of the parental escapement from the age-2.2 brood year and the preceding brood year to reflect the impact of the overlap in freshwater rearing conditions. The ocean-age-1, -3, and -4 returns were calculated from median estimates for each ocean age class using run data from the previous 20 years.

Regression and median estimates were summed to estimate the total Nelson River sockeye salmon run for 2024. The range was estimated as an overall 80% prediction interval and calculated from the sum of the 80% prediction intervals for each age class forecasted.

*Forecast Discussion:* The 2024 Nelson River forecast of 444,000 sockeye salmon is about 53,000 fish more than the most recent 10-year average (2014–2023) of 391,000 fish and is approximately 112,000 fish more than the 2023 run of about 332,000 fish. The 2024 run should be composed mainly of ocean-age-2 (77%) and -3 (18%) fish. The projected harvest of 286,000 fish is based on achieving the midpoint (158,000 fish) of the escapement goal range.

The Nelson River sockeye salmon run has been notoriously unpredictable. Therefore, confidence in this forecast is fair.

Forecast by Lisa Fox, Finfish Research Biologist, and Heather Finkle, Finfish Research Biologist, Westward Region.

## South Alaska Peninsula Aggregate

### *Pink Salmon*

The 2024 South Alaska Peninsula predicted pink salmon harvest is expected to be in the *average* category with a point estimate of 5.3 (0–9.6) million fish (Tables 36 and 37). Harvest categories were calculated from the 20th, 40th, 60th, and 80th percentiles of historical post-June commercial harvest on the South Alaska Peninsula from 1984 to 2023.

Table 36.—Preliminary forecast of the 2024 South Alaska Peninsula aggregate pink salmon run.

| Total production                | Forecast estimate<br>(millions) | Forecast range<br>(millions) |
|---------------------------------|---------------------------------|------------------------------|
| Total run estimate <sup>a</sup> | 7.6                             | 1.5–13.6                     |
| Escapement goal <sup>b</sup>    | 2.25                            | 1.75–4.0                     |
| Post-June harvest estimate      | 5.3                             | 0–9.6                        |

<sup>a</sup> Post-June harvest and escapement.

<sup>b</sup> The escapement estimate is the minimum of the aggregate goal range (1.75–4.0 million) in 2024.

Table 37.—The 2024 South Alaska Peninsula pink salmon harvest categories, calculated from the 20th, 40th, 60th, and 80th percentiles of historical post-June commercial harvest on the South Alaska Peninsula from 1984 to 2023.

| South Peninsula harvest category | Range (millions)  | Percentile     |
|----------------------------------|-------------------|----------------|
| Poor                             | Less than 2.0     | Less than 20th |
| Weak                             | 2.0 to 4.2        | 20th to 40th   |
| Average                          | 4.2 to 7.1        | 40th to 60th   |
| Strong                           | 7.1 to 10.1       | 60th to 80th   |
| Excellent                        | Greater than 10.1 | 80th to 100th  |

*Forecast Methods:* The 2024 South Alaska Peninsula pink salmon harvest forecast is derived from a total run forecast minus the midpoint (2.25 million fish) of the annual South Alaska Peninsula escapement goal range. Based on best model fit, the total run was forecasted fitting a Holt model using the South Peninsula even-year run size from 1962 to 2022.

*Forecast Discussion:* June harvest of pink salmon has been omitted from the South Alaska Peninsula aggregate pink salmon forecast due to the variability of pink salmon harvest that occurs during the June fishery and the origin of these fish are unknown. The 5-year odd-year average harvest of pink salmon in June is approximately 1.2 million fish, with a range of 0.2–2.5 million fish.

The estimated 2024 South Alaska Peninsula pink salmon total harvest (5.3 million fish) is predicted to be average. Spawning escapement in 2022 was good and there was harvestable surplus. There were favorable fresh water spawning environmental conditions for adults and winter and spring temperature rearing conditions for juvenile pinks were close to the recent 10-year average for even years. Since South Peninsula pink salmon forecasting began in 2011, even-year forecasts have been less accurate than odd years. Accounting for uncertainty surrounding environmental conditions, confidence in the forecast is fair.

Forecast by Lisa Fox, Finfish Research Biologist, and Heather Finkle, Finfish Research Biologist, Westward Region.



## ACKNOWLEDGMENTS

This report is based on information contributed by ADF&G Division of Commercial Fisheries biologists located in field offices throughout the state. Contributing regional and area biologists, statistical technicians, research analysts, and analyst programmers include Andy Piston, Teresa Fish, Justin Priest, Sara Miller, Troy Thynes, Jeremy Botz, Heather Scannell, Matt Olson, Jenni Morella, Tim Sands, Travis Elison, Aaron Tiernan, Stacy Vega, Kyle Gatt, Anna Peele-Freedman, Jack Erickson, Ethan Ford, Glenn Hollowell, Ted Otis, Colton Lipka, Lucas Stumpf, Aaron Poetter, Matthew Nemeth, Bonnie Borba, Charles Brazil, Christine Gleason, Brad Kalb, Holly Krenz, Zachary Liller, Kevin Clark, Luke Henslee, Deena Jallen, Fred West, Sean Larson, Amanda Dorner, Heather Finkle, Lisa Fox, M. Birch Foster, James Jackson, Carlton Burnside, Tyler Lawson, William Middleton, Charles Russell, Jeff Wadle, Kevin Schaberg, and Lorna Wilson.

The department would like to acknowledge the Bristol Bay Fisheries Collaborative (BBFC) for its support of Bristol Bay fisheries. The collaborative is an agreement between the department and the Bristol Bay Science and Research Institute (BBSRI) to work together and with stakeholders to maintain the management system for this world class fishery. A list of organizations that committed financial support to the BBFC, as well as additional information about this agreement can be found at <https://www.bbsri.org/bbfc>.

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