SoF-UW-2004
May 2000

SCHOOL OF FISHERIES
University of Washington
Seattle, Washington 98195

# Alaska Peninsula Salmon

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## ACKNOWLEDGMENTS

Jennifer Bahrke and Kai Chamberlin collected scales and took length measurements at King Cove and Brenda Rogers aged the scales and examined for scale holes. Thanks also to Arnie Shaul, Chris Hicks, and Dan Gray of the Alaska Department of Fish and Game for providing preliminary 1999 catch and escapement statistics.

This project was funded jointly by seafood processors (Peter Pan, Trident, Icicle, and Crusader), the Aleutian East Borough, Alaska Peninsula Coop, and Concerned Area M Fishermen.

## KEY WORDS

Bear Lake, Bristol Bay, chum salmon, False Pass, sockeye salmon

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## INTRODUCTION

The salmon fisheries on the Alaska Peninsula have a long history dating back to the early 1900s. The June fisheries in the Shumagin Islands and south of Unimak Island, which are collectively called the False Pass fishery or South Peninsula June fishery, target on non-local sockeye salmon (*Oncorhynchus nerka*) primarily bound for Bristol Bay (Fig. 1) (Eggers et al. 1991, Rogers 1990). Non-local chum salmon (*O. keta*) are also caught by the purse seine and gillnet fleets. In recent years, the June fisheries have been restricted by quotas on both species. After June, most of the gillnet fleet moves to the north side of the Peninsula to target on local stocks of sockeye while the seine fleet targets primarily on pink (*O. gorbuscha*) salmon in August.

The salmon fisheries on the Alaska Peninsula have frequently been subject to proposed restrictions at annual meetings of the Alaska Board of Fisheries by fishermen from other areas of Alaska. Claims are often made that catches of non-targeted salmon, chum salmon in the June fishery, sockeye and coho (*O. kisutch*) salmon in the post-June fishery, and Bristol Bay sockeye in the north side fishery have significantly impacted other coastal fisheries.

Since 1992, we have (1) sampled the chum salmon catches in the False Pass fisheries to measure biological attributes (age, length, weight, condition), (2) estimated the annual runs of sockeye and chum salmon in the North Pacific, and (3) estimated the relative impact of the False Pass catches on coastal stocks. Since 1995, we have (1) examined the spatial and temporal distribution of Bristol Bay sockeye off the coast of the north side of the Alaska Peninsula, (2) compared the biological characteristics between local North Peninsula stocks and Bristol Bay stocks, (3) compared the age compositions in the two fisheries, and (4) investigated the salmon productivity of the North Peninsula with studies of the Bear Lake and Ilnik system sockeye salmon stocks.

This report summarizes the results of investigations in 1999. For the most part, this means adding one more line to existing datasets (Rogers 1999); however, our recent studies of the North Peninsula stocks were completed in 1998 as Master of Science theses (Ramstad 1998, Witteveen 1998) and distributed to sponsors under separate cover. A new study was started in Bear Lake in 1999.

## METHODS

### False Pass

The accuracy of estimates of the annual runs (catch and escapement) of sockeye and chum salmon to major North Pacific regions varies considerably. Annual catch statistics for sockeye and chum salmon since the 1950s are fairly accurate (probably within 10%) for most North American regions and Japan, but less so for Russia. There are accurate annual escapement estimates for sockeye salmon for most runs since the mid-1950s, but estimates for chum salmon escapements are either lacking, inaccurate, or only available for recent years. For most regions of Alaska, except the Arctic-Yukon-Kuskokwim (A-Y-K), chum salmon runs coincide with more valuable sockeye or more numerous pink salmon runs and therefore receive less monitoring for escapement. However, chum salmon runs can be estimated in these situations from the chum salmon catch and the rate of exploitation on the targeted species (Rogers 1987). The most important statistics for management are usually the most recent statistics, and these are only available in preliminary form or in-house reports. This report relies heavily on 1998 and 1999 catch and escapement statistics provided by Alaska Department of Fish & Game (ADFG) area management biologists.

Annual runs of chum salmon to North Pacific regions from 1970 to 1999 were estimated primarily from catch and escapement statistics that were presented in Rogers (1999). Sockeye salmon exploitation rates were utilized in Bristol Bay even though some aerial and sonar estimates of chum salmon escapement were available (Nushagak and Togiak). Sonar estimates of chum salmon escapement were not available for the Yukon River, but the total run was estimated to be the smallest recorded by ADFG. Expanded aerial survey and weir counts from selected spawning areas were used to estimate escapements in the Kotzebue, Norton Sound, and Kuskokwim regions. Aerial survey estimates were used for most estimates of chum salmon escapements to central Alaska; otherwise, assumed exploitation rates and chum salmon catches were used to estimate chum salmon runs.

Chum salmon from the 1999 False Pass catches (June 11–21) were sampled at the Peter Pan processing plant in

King Cove. Fish were selected randomly from the processing line and measured for length (mid-eye to tail fork). Weights were not taken in 1999 because the crew also had to collect scales from sockeye salmon as ADFG was unable to do so. Sex was determined from external appearance, and two scales were collected from the preferred region. The first samples were collected from the June 15 catches and the last samples collected from the June 21 catches. Data from the field forms (date, location, scale card number, fish number, sex, and length) were entered on a computer file.

Scales were aged and examined for focal scale resorbtion (holes) by an experienced scale reader who had been tutored by Mr. Brian Bigler (Wards Cove Packing Co., Seattle, Washington) on identification techniques (Bigler 1988, 1989). Ages and occurrences of scale holes were then added to the computer database. Data were stratified by location (South Unimak and Shumagin Is.), date, sex, and age.

Catch statistics for the False Pass fisheries of past years were obtained from Campbell et al. (1998). Mr. A.R. Shaul (ADFG, Kodiak) provided preliminary catches by gear, area, and date for 1999. These preliminary catches were used to weight stratified means (length and age compositions) to obtain the annual means for 1999.

## *North Peninsula*

Bristol Bay run timing past Port Moller was estimated annually (1987–99) by combining inshore run statistics collected by ADFG (e.g., Stratton and Crawford 1994) with Port Moller test boat catches collected by Fisheries Research Institute (Rogers 1995). The test boat catches were also used to examine annual variation in the onshore–offshore distribution of the Bristol Bay run along the North Peninsula, the age composition of sockeye, and the sockeye/chum species composition. The onshore–offshore distribution was measured by the percentage that the index catch at station 2 (the innermost station) contributed to the total daily index (the sum of the catches at stations 2, 4, 6, and 8)

The annual age compositions of sockeye caught in the North Peninsula fisheries were provided weekly for two subdistricts: Bear River (Harbor Point to Cape Seniavin) and Ilnik/Three Hills (Cape Seniavin to Strogonof Point). Age compositions from the subdistricts were averaged through July 11 by weighting the subdistrict compositions by the catch (Murphy et al 1998). Age compositions for North Peninsula escapements were estimated by weighting the individual river age compositions by the number in the escapement, and age compositions in the Bristol Bay catches were calculated from annual run statistics provided by D. Gray (ADFG Anchorage).

During 1999 our study of Bear Lake sockeye salmon continued with the beginning of a thesis by Chris Boatright. This work will follow up the work of Kristina Ramstad to understand the apparent high productivity of Bear Lake sockeye compared with the Bristol Bay lakes by comparing the life history and marine survival of early and late spawning stocks with productivity and environmental measures. Mr. Boatright and one technician made two visits to Bear Lake in 1999.

Remote temperature sensing units were deployed about 20–25 cm below the gravel surface on seven spawning grounds. These temperature units will be recovered in spring 2000. The data will be downloaded with Onset HOBO software and the units will be redeployed. This should allow us to examine thermal regimes and incubation times of Bear Lake's spawning grounds to determine when and why the early and late runs spawn where they do. This study will proceed with an adult return tagging study beginning in 2000.

# RESULTS

## *False Pass*

### Abundance

The False Pass sockeye salmon catch is regulated by a quota set at 8.3% of the forecasted Bristol Bay catch. Since the inception of a chum salmon cap in 1986, the quota had been caught only 50% of the time and the catch did not reach 8.3% of the actual Bristol Bay catch until 1997 (Table 1). Three factors contribute to the inability of the fishery to achieve an allotment of 8.3% of the Bristol Bay catch: (1) a tendency for underestimating preseason forecasts, (2) a high abundance of chum salmon with a low chum salmon cap (quota), and (3) the availability of migratory Bristol Bay sockeye. During 1994–96, the low availability of Bristol Bay sockeye was likely the main factor. While fishing occurred nearly every day, the 1994–96 catches were about 2 million fish short of the quotas. In 1997 and 1998, Bristol Bay sockeye appeared to be more available than usual as the catches exceeded 8.3% of the Bristol Bay catches, although they were still below the pre-season quotas. The 1999 run of 40 million was close to the recent 10-year average and much higher than the ADFG preseason forecast (25 million), and the quota was reached by June 21. The False Pass fishery depends only on those Bristol Bay sockeye that are returning from ocean rearing in the Gulf of Alaska (Rogers 1987). Most Bristol Bay sockeye begin their homeward migration west of the fishery (south of the Aleutian Islands). A shift in the oceanic distribution from east to west or a shift from a nearshore to an offshore migratory route would result in variable availability to the Shumagin and South Unimak fisheries from year to year. Low chum salmon abundance has also improved the catches in the False Pass fisheries.

Omitting the 1990 and 1994–96 observations as outliers, the catch-per-unit-effort (CPUE) of sockeye salmon at South Unimak explained 61% of the annual variation in the Western Alaska runs. This correlation was very good and provided a method of forecasting the Bristol Bay run about 2 weeks in advance of their arrival in the bay (Eggers and Shaul 1987). Recent changes in the South Unimak fleet (effort by gear) may also have contributed to the recent poor correlation between CPUE and the size of the Bristol Bay run (Table 2). Purse seine effort was greatly reduced relative to drift gillnet effort in 1996–99 largely because purse seines did not fish in the early part of the season. Although the sockeye CPUE no longer appears reliable as a forecast tool, the age composition of the sockeye salmon catch at False Pass has been useful in forecasting the Bristol Bay runs (Table 3). The ages in 1999 were very close to the ages in Bristol Bay.

The chum salmon percentages in the False Pass catches of 1997–99 were well below average whereas the chum salmon percentages in Western Alaska were a little above average in 1997–98 but below average in 1999 (Table 4). Runs were exceptionally small in 1997–98 for both species. but the sockeye run in 1999 was relatively large combined with a very small chum run to most of Western Alaska. The Arctic/Yukon runs of chum salmon were again very small in 1999 (Tables 5–8); however, a preliminary estimate of the Japanese chum salmon return in 1999 indicates that the run was only a little below average. No estimate was yet available for the 1999 Russian chum salmon run .

### Age, Weight, and Length

About 97% of the chum salmon caught in the 1999 South Unimak and Shumagin fisheries were ages 0.3 and 0.4; however, age 0.3 chum salmon were especially prominent (Table 9). The age 0.3 chum salmon in 1999 were also about average in length. The Nushagak catch of 170,000 was the smallest recorded, and biological data (ages and lengths) were not yet available from ADFG.

### Focal Scale Resorbtion

Murphy (1993) presented a summary of the incidence of focal scale resorbtion for chum salmon in the False Pass fisheries, including our preliminary results for 1992. Scales had only been examined from South Unimak in 1990 (600) and from the Shumagins in 1989 (302) and 1990 (298). The final results for 1999 are given in Table 10. For the combined samples, 1.08% of the 1999 chum salmon had holes. During 1992–97, the mean was 1.66% with a range of 1.15% to 2.25%. In 1998 it was a record low of 0.64%. Thus, the 1999 samples marked the second lowest observed and indicated a lower than usual contribution of Asian chum salmon to the False Pass fishery in 1998 and 1999.

If we assume that the incidence of focal scale resorbtion is zero in Alaskan stocks and approximately 11.8% in Asian stocks (Murphy 1993), then the Asian stock contribution has been close to the estimated 20% from the 1987 tagging. To obtain more precise estimates of Asian stock contribution, we need a measure of the year-to-year variation in the incidence in Asian stocks. From the tagging results in 1987, we would expect the incidence of “holes” to be much greater in the Shumagin samples than in the South Unimak samples. Unfortunately, we had only three small scale samples from the Shumagins in 1999

## *North Peninsula*

During 1999 our study of Bear Lake sockeye salmon was greatly reduced from the past 2 years as only two short trips to Bear Lake were made to study the distribution of spawning and install temperature recorders.

### Abundance and Distribution

Rogers (1996) described the sockeye salmon fisheries along the north side of the Alaska Peninsula and the offshore migration of Bristol Bay salmon into the bay and the inshore migration out of the bay for Ugashik and North Peninsula stocks. The 1999 sockeye runs to the North Peninsula were below average but an improvement from 1998, especially for the late run to Bear Lake (Fig. 2). As usual, most of the early catch was made during the first half of July. The runs to the north side of the Alaska Peninsula show some correlation as all runs were low in 1997 and 1998, and came back up in 1999 (Fig. 3).

The vulnerability of Bristol Bay sockeye to the North Peninsula fisheries from Port Moller to Ilnik may be dependent on the offshore distribution and timing of the Bristol Bay run. The run past Port Moller was 1 day later than average in 1999, yet 80% had passed Port Moller by July 4 (Tables 11 and 12). The water temperatures in June off Port Moller were the coldest observed since 1972 and the Bristol Bay run was late in starting. The Port Moller test fishery offers some measure of offshore distribution. Throughout the 1999 migration past Port Moller, the sockeye were concentrated well offshore as the catches were consistently highest at stations 4 and 6 and lowest at station 2 (the innermost station) (Table 13). There has been no correlation between the distribution off Port Moller and the North Peninsula catches (Rogers 1999). We also have seen no correlation in the ages of sockeye off Port Moller and in Bristol Bay with the ages in the North Peninsula catch. The 1999 ages were not available from ADFG.

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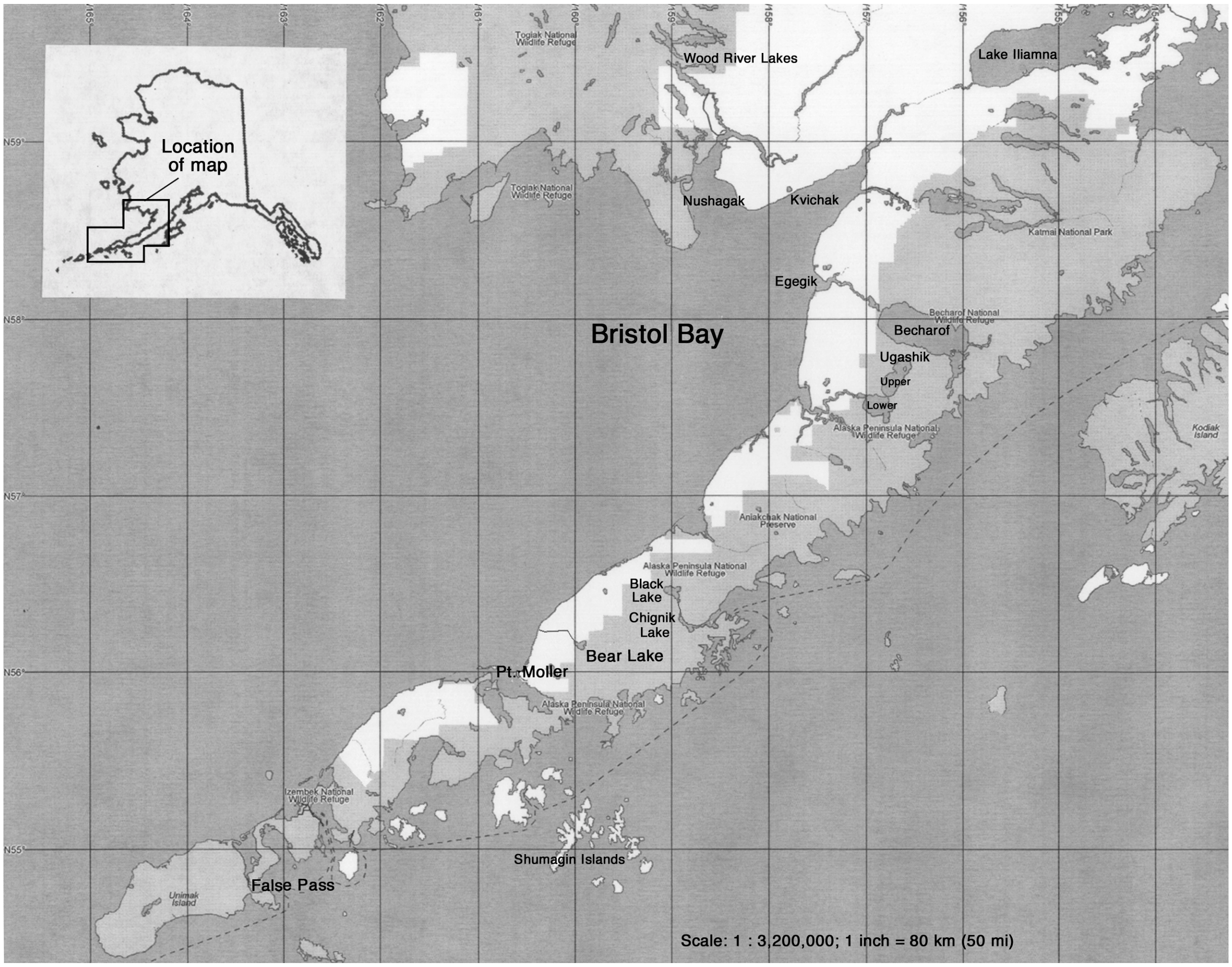


FIGURE 1. Map of Alaska Peninsula and Bristol Bay.

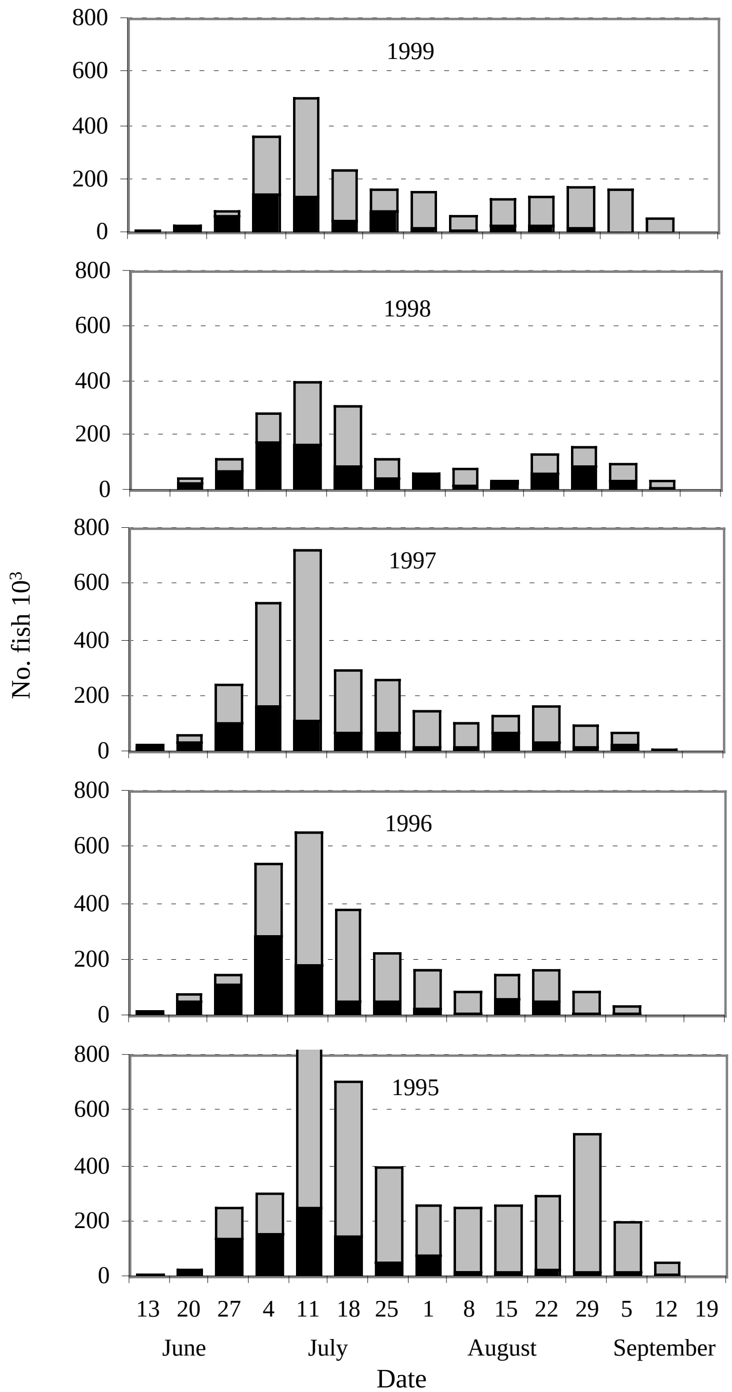


FIGURE 2. Northern District sockeye salmon (*Oncorhynchus nerka*) catches and escapements, 1996–99. Solid bars = escapement; striped bars = catch.

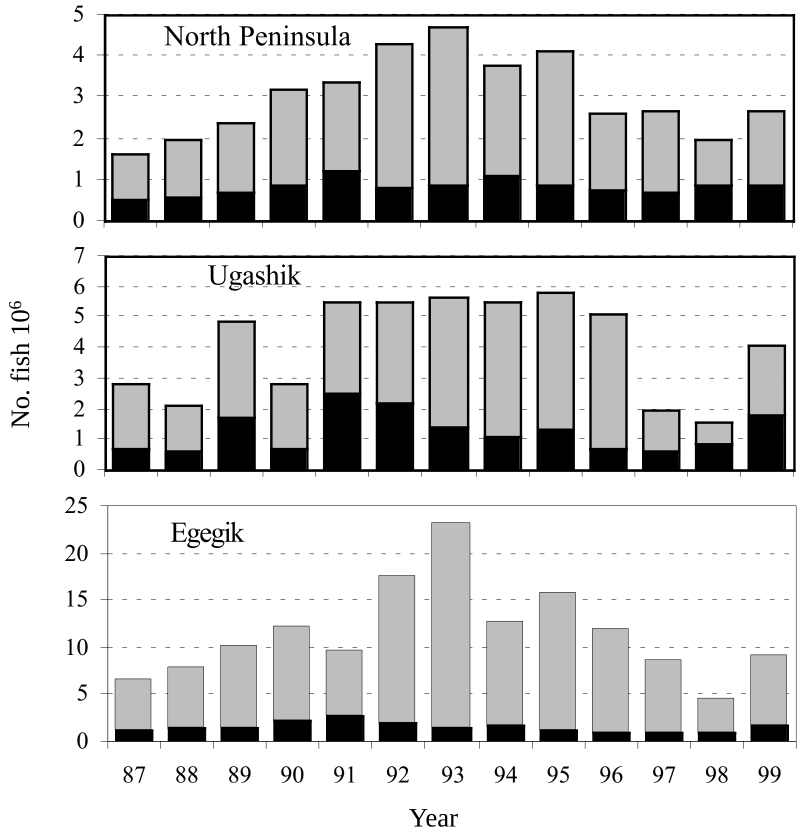


FIGURE 3. Annual sockeye salmon runs to Egegik, Ugashik, and the North Peninsula. Solid bars = escapement; striped bars = catch.

TABLE 1. False Pass fishery catches, the preseason quotas, and the actual Bristol Bay catches.

| | Sockeye salmon ($10^6$) | | | | | | | Chum salmon ($10^3$) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bristol Bay | | False Pass | | | | | | | |
| Year | Run | Catch | Catch | Quota | 8.3% | C-Q | C-8.3% | Catch | Cap | Catch-cap |
| 77 | 9.72 | 4.88 | .24 | .24 | .42 | .00 | -.19 | 116 | | |
| 78 | 19.92 | 9.93 | .49 | .52 | .86 | -.04 | -.38 | 122 | | |
| 79 | 39.90 | 21.43 | .85 | 1.10 | 1.85 | -.25 | -1.00 | 104 | | |
| 80 | 62.49 | 23.76 | 3.21 | 3.07 | 2.24 | .14 | .97 | 509 | | |
| 81 | 34.47 | 25.60 | 1.82 | 1.76 | 2.28 | .06 | -.46 | 564 | | |
| 82 | 22.21 | 15.10 | 2.12 | 2.26 | 1.43 | -.14 | .69 | 1095 | | |
| 83 | 45.91 | 37.37 | 1.96 | 1.79 | 3.26 | .17 | -1.30 | 786 | | |
| 84 | 41.11 | 24.71 | 1.39 | 1.36 | 2.17 | .03 | -.78 | 337 | | |
| 85 | 36.86 | 23.70 | 1.79 | 1.69 | 2.12 | .11 | -.33 | 434 | | |
| 86 | 23.74 | 15.78 | .47 | 1.11 | 1.35 | -.64 | -.88 | 352 | 400 | -48 |
| 87 | 27.52 | 16.07 | .79 | .78 | 1.40 | .02 | -.61 | 443 | 0 | |
| 88 | 23.42 | 13.99 | .76 | 1.54 | 1.22 | -.79 | -.47 | 527 | 500 | 27 |
| 89 | 44.05 | 28.74 | 1.74 | 1.46 | 2.53 | .28 | -.79 | 455 | 500 | -45 |
| 90 | 48.12 | 33.52 | 1.35 | 1.33 | 2.89 | .02 | -1.55 | 519 | 600 | -81 |
| 91 | 41.91 | 25.82 | 1.55 | 1.92 | 2.27 | -.37 | -.72 | 773 | 600 | 173 |
| 92 | 45.22 | 31.88 | 2.46 | 2.39 | 2.85 | .07 | -.39 | 426 | 700 | -274 |
| 93 | 52.22 | 40.46 | 2.97 | 2.90 | 3.60 | .07 | -.63 | 532 | 700 | -168 |
| 94 | 50.58 | 35.22 | 1.46 | 3.59 | 3.04 | -2.13 | -1.58 | 582 | 700 | -118 |
| 95 | 60.89 | 44.43 | 2.11 | 3.65 | 3.86 | -1.54 | -1.76 | 537 | 700 | -163 |
| 96 | 37.00 | 29.65 | 1.03 | 3.13 | 2.55 | -2.10 | -1.52 | 360 | 700 | -340 |
| 97 | 18.89 | 12.26 | 1.63 | 2.25 | 1.15 | -.62 | .48 | 322 | 700 | -378 |
| 98 | 18.35 | 9.98 | 1.29 | 1.87 | .94 | -.58 | .35 | 246 | 375 | -129 |
| 99 | 39.50 | 25.3 | 1.38 | 1.30 | 2.21 | .08 | -.83 | 245 | 375 | -130 |
| 87-96 average | 43.09 | 29.98 | 1.62 | 2.27 | 2.62 | -0.65 | -1.00 | 523 | 633 | -110 |

TABLE 2. Sockeye catch-per-unit-effort (CPUE) by gear in the South Unimak fishery.

| | Effort (boat days) | | Catch ($10^3$) | | CPUE (catch/boat days) | | |
|---|---|---|---|---|---|---|---|
| Year | Purse seine | Drift gillnet | Purse seine | Drift gillnet | Purse seine | Drift gillnet | PS/GN |
| 77 | 59 | 501 | 30 | 159 | 508 | 317 | 1.60 |
| 78 | 70 | 1000 | 77 | 333 | 1100 | 333 | 3.30 |
| 89 | 157 | 926 | 473 | 182 | 3013 | 197 | 15.33 |
| 80 | 408 | 946 | 2074 | 630 | 5083 | 666 | 7.63 |
| 81 | 481 | 1027 | 682 | 627 | 1418 | 611 | 2.32 |
| 82 | 581 | 1273 | 918 | 699 | 1580 | 549 | 2.88 |
| 83 | 280 | 533 | 798 | 392 | 2850 | 735 | 3.88 |
| 84 | 85 | 151 | 385 | 199 | 4529 | 1318 | 3.44 |
| 85 | 199 | 360 | 761 | 401 | 3824 | 1114 | 3.43 |
| 86 | 193 | 410 | 145 | 135 | 751 | 329 | 2.28 |
| 87 | 270 | 734 | 235 | 321 | 870 | 437 | 1.99 |
| 88 | 107 | 431 | 141 | 307 | 1318 | 712 | 1.85 |
| 89 | 159 | 351 | 735 | 434 | 4623 | 1236 | 3.74 |
| 90 | 482 | 1292 | 619 | 452 | 1284 | 350 | 3.67 |
| 91 | 280 | 549 | 650 | 539 | 2321 | 982 | 2.36 |
| 92 | 340 | 657 | 1192 | 766 | 3506 | 1166 | 3.01 |
| 93 | 392 | 657 | 1397 | 903 | 3564 | 1374 | 2.59 |
| 94 | 458 | 862 | 573 | 371 | 1251 | 430 | 2.91 |
| 95 | 498 | 1367 | 611 | 793 | 1227 | 580 | 2.11 |
| 96 | 289 | 1237 | 127 | 422 | 439 | 341 | 1.29 |
| 97 | 297 | 1544 | 175 | 897 | 589 | 581 | 1.01 |
| 98 | 137 | 1816 | 70 | 856 | 511 | 471 | 1.08 |
| 99 | 188 | 1166 | 233 | 837 | 1236 | 718 | 1.72 |

TABLE 3. Comparison of the age compositions of sockeye salmon in Bristol Bay runs with age compositions from the False Pass fishery, inseason Port Moller test fishery, and the ADFG preseason forecast, 1987–99.

| Year | | Age composition (%) | | | | | | Bristol Bay |
|---|---|---|---|---|---|---|---|---|
| | | 1.2 | 2.2 | 1.3 | 2.3 | all .2 | all .3 | run ($10^6$) |
| 1987 | ADF&G pre-f'cast | 26 | 24 | 33 | 17 | 50 | 50 | 16.1 |
| | Moller in-f'cast | 49 | 19 | 19 | 12 | 68 | 31 | 26.0 |
| | False Pass catch | 35 | 13 | 33 | 14 | 49 | 51 | |
| | Bristol Bay run | 49 | 12 | 24 | 13 | 61 | 39 | 27.3 |
| 1988 | ADF&G pre-f'cast | 30 | 27 | 34 | 9 | 57 | 43 | 26.5 |
| | Moller in-f'cast | 17 | 20 | 48 | 12 | 37 | 60 | 22.0 |
| | False Pass catch | 23 | 42 | 23 | 9 | 66 | 33 | |
| | Bristol Bay run | 20 | 22 | 41 | 13 | 43 | 55 | 23.0 |
| 1989 | ADF&G pre-f'cast | 22 | 45 | 24 | 9 | 67 | 33 | 28.9 |
| | Moller in-f'cast | 13 | 45 | 22 | 17 | 58 | 39 | 37.0 |
| | False Pass catch | 8 | 62 | 13 | 15 | 70 | 28 | |
| | Bristol Bay run | 11 | 62 | 16 | 9 | 73 | 26 | 43.8 |
| 1990 | ADF&G pre-f'cast | 19 | 42 | 26 | 13 | 61 | 39 | 25.4 |
| | Moller in-f'cast | 10 | 37 | 24 | 26 | 48 | 52 | 56.0 |
| | False Pass catch | 16 | 37 | 20 | 25 | 53 | 45 | |
| | Bristol Bay run | 14 | 41 | 21 | 20 | 56 | 43 | 47.8 |
| 1991 | ADF&G pre-f'cast | 28 | 25 | 31 | 16 | 53 | 47 | 30.0 |
| | Moller in-f'cast | 12 | 14 | 55 | 13 | 28 | 71 | 37.0 |
| | False Pass catch | 21 | 33 | 36 | 6 | 54 | 46 | |
| | Bristol Bay run | 19 | 20 | 46 | 11 | 39 | 60 | 42.1 |
| 1992 | ADF&G pre-f'cast | 19 | 39 | 27 | 13 | 58 | 42 | 37.1 |
| | Moller in-f'cast | 8 | 35 | 31 | 22 | 43 | 53 | 45.0 |
| | False Pass catch | 6 | 35 | 25 | 30 | 42 | 58 | |
| | Bristol Bay run | 13 | 34 | 27 | 22 | 47 | 50 | 44.9 |
| 1993 | ADF&G pre-f'cast | 23 | 41 | 21 | 14 | 64 | 35 | 41.8 |
| | Moller in-f'cast | 7 | 27 | 19 | 44 | 34 | 65 | 42.0 |
| | False Pass catch | 14 | 46 | 14 | 23 | 61 | 38 | |
| | Bristol Bay run | 13 | 33 | 18 | 33 | 46 | 53 | 51.9 |
| 1994 | ADF&G pre-f'cast | 14 | 43 | 19 | 22 | 57 | 43 | 52.5 |
| | Moller in-f'cast | 7 | 42 | 20 | 28 | 50 | 50 | 46.0 |
| | False Pass catch | 8 | 34 | 33 | 22 | 42 | 57 | |
| | Bristol Bay run | 8 | 56 | 14 | 18 | 65 | 34 | 50.1 |
| 1995 | ADF&G pre-f'cast | 16 | 53 | 17 | 13 | 69 | 31 | 55.1 |
| | Moller in-f'cast | 14 | 51 | 15 | 19 | 65 | 34 | 49.2 |
| | False Pass catch | 19 | 57 | 12 | 11 | 76 | 24 | |
| | Bristol Bay run | 16 | 56 | 12 | 15 | 72 | 27 | 60.7 |
| 1996 | ADF&G pre-f'cast | 18 | 36 | 26 | 19 | 54 | 48 | 43.4 |
| | Moller in-season | 8 | 13 | 51 | 24 | 21 | 79 | 41.0 |
| | False Pass catch | 15 | 24 | 38 | 20 | 39 | 61 | |
| | Bristol Bay run | 10 | 13 | 51 | 24 | 23 | 76 | 36.9 |

TABLE 3—cont.

| Year | | Age composition (%) 1.2 | 2.2 | 1.3 | 2.3 | all .2 | all .3 | Bristol Bay run ($10^6$) |
|---|---|---|---|---|---|---|---|---|
| 1997 | ADF&G pre-f'cast | 22 | 31 | 25 | 20 | 53 | 47 | 33.6 |
| | Moller in-season | 9 | 26 | 33 | 27 | 36 | 62 | 35.0 |
| | False Pass catch | 19 | 44 | 23 | 11 | 64 | 36 | |
| | Bristol Bay run | 20 | 34 | 26 | 18 | 54 | 44 | 18.9 |
| 1998 | ADF&G pre-f'cast | 25 | 32 | 24 | 18 | 57 | 43 | 30.2 |
| | Moller in-season | 19 | 9 | 38 | 33 | 28 | 72 | 30.7 |
| | False Pass catch | 14 | 9 | 39 | 37 | 24 | 76 | |
| | Bristol Bay run | 34 | 13 | 29 | 22 | 47 | 52 | 18.2 |
| 1999 | ADF&G pre-f'cast | 26 | 41 | 25 | 8 | 67 | 34 | 24.9 |
| | Moller in-season | 43 | 26 | 21 | 8 | 69 | 30 | 35.3 |
| | False Pass catch | 56 | 18 | 22 | 3 | 74 | 25 | |
| | Bristol Bay run | 51 | 24 | 17 | 7 | 75 | 24 | 39.5 |
| Means | ADF&G pre-f'cast | 22 | 37 | 26 | 15 | 58 | 42 | 35.1 |
| | Moller in-season | 14 | 28 | 31 | 23 | 43 | 56 | 38.9 |
| | False Pass catch | 17 | 36 | 26 | 19 | 53 | 46 | |
| | Bristol Bay run | 19 | 33 | 27 | 18 | 52 | 47 | 38.8 |

Age composition for Port Moller is for June 11-30 only, whereas the forecast is the one issued about July 2-3. Forecasts and runs do not include jacks (1-ocean fish).

TABLE 4. Percent chums in chum and sockeye salmon catches and runs, 1977–99.

| | Bristol Bay run | | | Western Alaska run | | | South Peninsula June catch | | | Port Moller test boat CPUE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Sockeye | Chum | % C | Sockeye | Chum | % C | Sockeye | Chum | % C | Sockeye | Chum | % C |
| 77 | 9.6 | 4.0 | 29.4 | 10.8 | 9.0 | 45.5 | 0.24 | 0.12 | 32.4 | 6.9 | 2.3 | 25.0 |
| 78 | 19.8 | 2.3 | 10.4 | 22.1 | 7.2 | 24.6 | 0.49 | 0.12 | 19.7 | 3.2 | 0.8 | 20.0 |
| 79 | 39.8 | 1.7 | 4.0 | 43.6 | 7.4 | 14.5 | 0.85 | 0.10 | 10.5 | 9.6 | 0.2 | 2.0 |
| 80 | 62.4 | 3.3 | 5.1 | 65.4 | 12.0 | 15.5 | 3.21 | 0.51 | 13.7 | 4.6 | 1.6 | 25.8 |
| 81 | 34.3 | 2.1 | 5.8 | 37.9 | 11.6 | 23.4 | 1.82 | 0.56 | 23.5 | 7.6 | 2.0 | 20.8 |
| 82 | 22.1 | 1.3 | 5.7 | 24.6 | 7.4 | 23.1 | 2.12 | 1.09 | 34.0 | 5.1 | 1.1 | 17.7 |
| 83 | 45.7 | 2.2 | 4.5 | 48.8 | 8.0 | 14.1 | 1.96 | 0.78 | 28.5 | 4.4 | 0.4 | 8.3 |
| 84 | 40.7 | 3.5 | 7.8 | 43.9 | 11.4 | 20.6 | 1.39 | 0.34 | 19.7 | 27.1 | 5.0 | 15.6 |
| 85 | 36.6 | 2.0 | 5.3 | 40.7 | 8.8 | 17.8 | 1.79 | 0.43 | 19.4 | 15.9 | 0.9 | 5.4 |
| 86 | 23.6 | 2.2 | 8.6 | 27.1 | 8.9 | 24.7 | 0.47 | 0.35 | 42.7 | | | |
| 87 | 27.3 | 2.9 | 9.5 | 29.7 | 8.0 | 21.2 | 0.79 | 0.44 | 35.8 | 11.1 | 0.8 | 6.7 |
| 88 | 23.2 | 2.5 | 9.8 | 26.0 | 10.8 | 29.3 | 0.76 | 0.53 | 41.1 | 7.0 | 1.1 | 13.6 |
| 89 | 43.9 | 2.2 | 4.9 | 46.8 | 9.0 | 16.1 | 1.75 | 0.46 | 20.8 | 18.9 | 1.0 | 5.0 |
| 90 | 47.8 | 1.8 | 3.6 | 51.6 | 6.2 | 10.7 | 1.35 | 0.52 | 27.8 | 23.4 | 1.3 | 5.3 |
| 91 | 42.2 | 2.1 | 4.7 | 46.3 | 7.6 | 14.1 | 1.55 | 0.77 | 33.2 | 17.5 | 1.6 | 8.4 |
| 92 | 45.0 | 1.5 | 3.2 | 49.9 | 6.2 | 11.1 | 2.46 | 0.43 | 14.7 | 24.4 | 1.7 | 6.4 |
| 93 | 52.1 | 1.1 | 2.1 | 57.2 | 3.9 | 6.4 | 2.97 | 0.53 | 15.1 | 30.3 | 1.4 | 4.5 |
| 94 | 50.3 | 1.5 | 2.9 | 54.7 | 7.5 | 12.1 | 1.46 | 0.58 | 28.4 | 23.3 | 1.6 | 6.2 |
| 95 | 60.7 | 1.4 | 2.3 | 65.5 | 10.6 | 13.9 | 2.11 | 0.54 | 20.4 | 30.0 | 0.8 | 2.6 |
| 96 | 37.0 | 1.2 | 3.1 | 40.1 | 8.6 | 17.7 | 1.03 | 0.36 | 25.9 | 22.5 | 1.6 | 6.4 |
| 97 | 18.9 | 0.6 | 2.9 | 22.1 | 4.9 | 18.1 | 1.63 | 0.32 | 16.2 | 20.8 | 3.2 | 13.3 |
| 98 | 18.4 | 0.9 | 4.7 | 20.6 | 4.7 | 18.6 | 1.29 | 0.25 | 16.2 | 13.8 | 1.7 | 11.0 |
| 99 | 39.4 | 1.1 | 2.7 | 43.5 | 3.2 | 6.9 | 1.38 | 0.25 | 15.3 | 21.2 | 1.4 | 6.2 |
| Means 83-99 | 38.4 | 1.8 | 4.9 | 42.0 | 7.5 | 16.1 | 1.54 | 0.46 | 24.8 | 19.5 | 1.6 | 7.8 |

TABLE 5. Annual sockeye salmon runs ($10^6$) to the eastern Bering Sea, 1970–99.

| | Kuskokwim | | Bristol Bay runs | | | | | Bristol Bay | North Penin. | Total | South Peninsula June catch | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Catch | Run | Togiak | Nushagak | Nak/Kvi | Egegik | Ugashik | Total | Run | Run | Number | % |
| 70 | .013 | .03 | .37 | 3.15 | 32.65 | 2.32 | .91 | 39.40 | .64 | 40.1 | 1.65 | 3.4 |
| 71 | .006 | .02 | .42 | 2.61 | 9.37 | 1.94 | 1.48 | 15.82 | .79 | 16.6 | .46 | 2.3 |
| 72 | .004 | .01 | .16 | .91 | 2.85 | 1.39 | .10 | 5.41 | .37 | 5.8 | .50 | 6.8 |
| 73 | .005 | .01 | .21 | .85 | .79 | .55 | .04 | 2.44 | .35 | 2.8 | .25 | 7.0 |
| 74 | .028 | .07 | .25 | 2.78 | 6.43 | 1.45 | .06 | 10.97 | .58 | 11.6 | .00 | 0.0 |
| 75 | .018 | .05 | .38 | 2.92 | 18.35 | 2.14 | .44 | 24.23 | .75 | 25.0 | .24 | 0.8 |
| 76 | .014 | .04 | .50 | 2.75 | 5.92 | 1.84 | .53 | 11.54 | 1.17 | 12.7 | .31 | 2.0 |
| 77 | .019 | .05 | .42 | 1.84 | 4.69 | 2.47 | .29 | 9.71 | 1.01 | 10.8 | .24 | 1.9 |
| 78 | .014 | .04 | .79 | 6.62 | 10.32 | 2.10 | .09 | 19.92 | 2.11 | 22.1 | .49 | 1.9 |
| 79 | .039 | .10 | .69 | 6.40 | 27.43 | 3.29 | 2.10 | 39.91 | 3.55 | 43.6 | .85 | 1.6 |
| 80 | .043 | .11 | 1.21 | 12.81 | 40.57 | 3.68 | 4.22 | 62.49 | 2.78 | 65.4 | 3.21 | 4.0 |
| 81 | .106 | .27 | 1.01 | 10.34 | 14.63 | 5.06 | 3.44 | 34.48 | 3.19 | 37.9 | 1.82 | 3.9 |
| 82 | .096 | .24 | .94 | 7.93 | 7.54 | 3.48 | 2.32 | 22.21 | 2.15 | 24.6 | 2.12 | 6.8 |
| 83 | .089 | .22 | .83 | 7.07 | 26.11 | 7.55 | 4.35 | 45.91 | 2.67 | 48.8 | 1.96 | 3.3 |
| 84 | .081 | .20 | .52 | 3.81 | 26.50 | 6.36 | 3.93 | 41.12 | 2.56 | 43.9 | 1.39 | 2.6 |
| 85 | .121 | .30 | .40 | 2.99 | 17.36 | 8.63 | 7.48 | 36.86 | 3.50 | 40.7 | 1.79 | 3.6 |
| 86 | .142 | .36 | .58 | 4.85 | 6.28 | 6.01 | 6.02 | 23.74 | 3.04 | 27.1 | .47 | 1.5 |
| 87 | .171 | .43 | .66 | 5.15 | 12.27 | 6.63 | 2.82 | 27.53 | 1.77 | 29.7 | .79 | 2.2 |
| 88 | .150 | .38 | 1.16 | 3.23 | 8.85 | 8.01 | 2.19 | 23.44 | 2.14 | 26.0 | .76 | 2.4 |
| 89 | .080 | .20 | .21 | 5.05 | 23.56 | 10.31 | 4.90 | 44.03 | 2.53 | 46.8 | 1.74 | 3.1 |
| 90 | .204 | .41 | .52 | 5.71 | 26.36 | 12.28 | 2.89 | 47.76 | 3.45 | 51.6 | 1.35 | 2.2 |
| 91 | .202 | .40 | .80 | 7.69 | 18.64 | 9.59 | 5.50 | 42.22 | 3.71 | 46.3 | 1.55 | 2.8 |
| 92 | .194 | .39 | .80 | 5.19 | 15.89 | 17.62 | 5.53 | 45.03 | 4.44 | 49.9 | 2.46 | 4.0 |
| 93 | .167 | .33 | .70 | 7.62 | 14.78 | 23.34 | 5.67 | 52.11 | 4.87 | 57.3 | 2.97 | 4.2 |
| 94 | .191 | .38 | .50 | 5.86 | 25.83 | 12.70 | 5.45 | 50.34 | 3.96 | 54.7 | 1.46 | 2.2 |
| 95 | .198 | .40 | .73 | 6.69 | 31.78 | 15.73 | 5.81 | 60.74 | 4.35 | 65.5 | 2.11 | 2.7 |
| 96 | .120 | .24 | .67 | 8.30 | 11.02 | 11.92 | 5.10 | 37.01 | 2.88 | 40.1 | 1.03 | 2.1 |
| 97 | .123 | .25 | .24 | 4.64 | 3.36 | 8.67 | 1.99 | 18.90 | 2.97 | 22.1 | 1.63 | 5.9 |
| 98 | .129 | .26 | .36 | 5.40 | 6.30 | 4.67 | 1.62 | 18.35 | 1.98 | 20.6 | 1.29 | 5.1 |
| 99 | .080 | .16 | .61 | 8.49 | 17.23 | 9.15 | 3.92 | 39.40 | 2.70 | 42.3 | 1.40 | 2.7 |

TABLE 6. North Pacific runs (catch + escapement, $10^6$) of sockeye salmon, 1970–99.

| Year | Bristol Bay run | Alaska runs Western | Alaska runs Central | Japan high seas catch | Russian run | N. Pacific total run | SE Alaska BC and Wash. | Total Pacific run | Percent Western Alaska |
|---|---|---|---|---|---|---|---|---|---|
| 70 | 39 | 42 | 7 | 10 | 3 | 62 | 9 | 71 | 59 |
| 71 | 16 | 17 | 6 | 7 | 2 | 32 | 12 | 44 | 39 |
| 72 | 5 | 6 | 5 | 7 | 1 | 19 | 8 | 27 | 22 |
| 73 | 2 | 3 | 4 | 6 | 1 | 14 | 15 | 29 | 10 |
| 74 | 11 | 12 | 4 | 5 | 1 | 22 | 14 | 36 | 33 |
| 75 | 24 | 25 | 3 | 5 | 2 | 35 | 7 | 42 | 60 |
| 76 | 12 | 13 | 7 | 6 | 1 | 27 | 10 | 37 | 35 |
| 77 | 10 | 11 | 10 | 3 | 3 | 27 | 13 | 40 | 28 |
| 78 | 20 | 22 | 9 | 3 | 4 | 38 | 14 | 52 | 42 |
| 79 | 40 | 44 | 7 | 3 | 3 | 57 | 12 | 69 | 64 |
| 80 | 62 | 68 | 8 | 3 | 4 | 83 | 7 | 90 | 76 |
| 81 | 34 | 40 | 10 | 3 | 4 | 57 | 15 | 72 | 56 |
| 82 | 22 | 26 | 14 | 3 | 3 | 46 | 20 | 66 | 39 |
| 83 | 46 | 51 | 15 | 2 | 5 | 73 | 10 | 83 | 61 |
| 84 | 41 | 45 | 14 | 2 | 7 | 68 | 11 | 79 | 57 |
| 85 | 37 | 42 | 15 | 1 | 8 | 66 | 23 | 89 | 47 |
| 86 | 24 | 27 | 17 | 1 | 6 | 51 | 18 | 69 | 39 |
| 87 | 27 | 30 | 22 | 1 | 8 | 61 | 11 | 72 | 42 |
| 88 | 23 | 27 | 17 | <1 | 5 | 49 | 10 | 59 | 46 |
| 89 | 44 | 48 | 17 | <1 | 6 | 71 | 24 | 95 | 51 |
| 90 | 48 | 53 | 18 | <1 | 12 | 83 | 24 | 107 | 50 |
| 91 | 42 | 48 | 19 | <1 | 8 | 75 | 20 | 95 | 51 |
| 92 | 45 | 52 | 23 | 0 | 10 | 85 | 18 | 103 | 50 |
| 93 | 52 | 60 | 19 | 0 | 10 | 89 | 29 | 118 | 51 |
| 94 | 50 | 56 | 16 | 0 | 8 | 80 | 20 | 100 | 56 |
| 95 | 61 | 67 | 17 | 0 | 10 | 94 | 12 | 106 | 63 |
| 96 | 37 | 41 | 20 | 0 | 13 | 74 | 15 | 89 | 46 |
| 97 | 19 | 24 | 18 | 0 | 9 | 51 | 22 | 73 | 33 |
| 98 | 18 | 22 | 14 | 0 | 8 | 44 | 7 | 51 | 43 |
| 99 | 40 | 42 | 19 | 0 | 12 | 73 | 5 | 78 | 54 |
| Means | | | | | | | | | |
| 70-79 | 18 | 20 | 6 | 6 | 2 | 33 | 11 | 45 | 39 |
| 80-89 | 36 | 40 | 15 | 2 | 6 | 63 | 15 | 77 | 51 |
| 90-98 | 41 | 47 | 18 | 0 | 10 | 75 | 19 | 94 | 49 |

Western Alaska includes Bristol Bay, North Peninsula and 85% of South Peninsula catch.
Japan high seas catches since1992 are included in Russian run.

TABLE 7. Estimated runs (catch + escapement, $10^6$) of chum salmon to the eastern Bering Sea, 1970–99.

| Year | Kotz-ebue | Norton Sound | Yukon River | | Arctic/ Yukon region | Kusko-kwim | Togiak | Nush-agak | Naknek/ Kvichak | Ege-gik | Uga-shik | Bristol Bay total | North Alaska Pen. | S.P. June catch | Total run |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Summer | Fall | | | | | | | | | | | |
| 70 | .60 | .75 | .92 | .82 | 3.09 | .60 | .22 | 1.14 | .22 | .07 | .09 | 1.74 | .22 | .44 | 6.0 |
| 71 | .37 | .44 | .82 | .80 | 2.43 | .42 | .24 | .75 | .24 | .04 | .02 | 1.29 | .17 | .51 | 4.7 |
| 72 | .50 | .30 | .74 | .59 | 2.13 | .43 | .38 | .74 | .30 | .07 | .06 | 1.55 | .21 | .52 | 4.7 |
| 73 | .55 | .35 | 1.36 | .90 | 3.16 | .69 | .44 | 1.06 | .59 | .06 | .07 | 2.22 | .28 | .20 | 6.5 |
| 74 | 1.27 | .37 | 1.45 | .99 | 4.08 | .92 | .14 | .89 | .51 | .03 | .07 | 1.64 | .14 | .00 | 6.8 |
| 75 | .97 | .44 | 2.87 | 1.78 | 6.06 | .78 | .18 | .68 | .47 | .01 | .07 | 1.41 | .12 | .10 | 8.4 |
| 76 | .34 | .19 | 1.82 | .74 | 3.09 | .90 | .25 | 1.74 | .74 | .07 | .03 | 2.83 | .37 | .41 | 7.5 |
| 77 | .30 | .44 | 1.49 | .97 | 3.20 | .97 | .52 | 2.65 | .74 | .12 | .01 | 4.04 | .81 | .12 | 9.1 |
| 78 | .27 | .47 | 2.04 | .87 | 3.65 | .79 | .47 | 1.38 | .37 | .08 | .01 | 2.31 | .47 | .12 | 7.3 |
| 79 | .23 | .27 | 1.71 | 1.63 | 3.84 | 1.57 | .33 | .85 | .36 | .06 | .06 | 1.66 | .37 | .10 | 7.5 |
| 80 | .92 | .44 | 2.44 | .98 | 4.78 | 2.45 | .57 | 1.94 | .55 | .11 | .17 | 3.34 | 1.47 | .51 | 12.4 |
| 81 | 1.10 | .48 | 3.79 | 1.28 | 6.65 | 1.62 | .36 | 1.11 | .47 | .10 | .06 | 2.10 | 1.24 | .56 | 12.0 |
| 82 | .61 | .40 | 2.13 | .76 | 3.90 | 1.38 | .23 | .57 | .30 | .12 | .11 | 1.33 | .79 | 1.10 | 8.2 |
| 83 | .53 | .62 | 2.14 | 1.05 | 4.34 | .79 | .45 | 1.01 | .42 | .14 | .14 | 2.16 | .74 | .79 | 8.6 |
| 84 | .57 | .54 | 2.88 | .86 | 4.85 | 1.31 | .55 | 1.63 | .81 | .22 | .31 | 3.52 | 1.67 | .34 | 11.6 |
| 85 | .70 | .35 | 2.85 | 1.15 | 5.05 | .74 | .38 | .91 | .45 | .15 | .15 | 2.04 | 1.01 | .43 | 9.2 |
| 86 | .68 | .34 | 3.41 | .90 | 5.33 | .89 | .51 | .88 | .57 | .12 | .13 | 2.21 | .51 | .35 | 9.2 |
| **87** | **.18** | **.25** | **1.72** | **1.00** | **3.15** | **1.02** | **.81** | **.67** | **1.09** | **.18** | **.13** | **2.88** | **.88** | **.44** | 8.3 |
| 88 | .57 | .20 | 3.59 | .75 | 5.11 | 2.24 | .66 | .70 | .74 | .30 | .14 | 2.54 | .89 | .53 | 11.2 |
| 89 | .46 | .21 | 3.23 | 1.14 | 5.04 | 1.34 | .49 | .93 | .53 | .16 | .13 | 2.24 | .37 | .46 | 9.3 |
| 90 | .31 | .20 | 1.56 | .90 | 2.97 | 1.00 | .22 | .71 | .65 | .16 | .04 | 1.78 | .35 | .52 | 6.5 |
| 91 | .56 | .28 | 2.00 | 1.02 | 3.86 | 1.17 | .38 | .75 | .77 | .10 | .10 | 2.10 | .49 | .77 | 8.2 |
| 92 | .44 | .19 | 1.92 | .63 | 3.18 | .79 | .23 | .62 | .38 | .13 | .09 | 1.45 | .69 | .43 | 6.4 |
| 93 | .25 | .26 | 1.19 | .38 | 2.08 | .26 | .22 | .63 | .07 | .05 | .09 | 1.06 | .54 | .53 | 4.3 |
| 94 | .33 | .28 | 2.68 | 1.01 | 4.30 | 1.23 | .35 | .67 | .32 | .07 | .06 | 1.47 | .56 | .58 | 8.0 |
| 95 | .88 | .38 | 3.66 | 1.54 | 6.46 | 1.82 | .31 | .58 | .37 | .07 | .08 | 1.41 | .86 | .54 | 11.0 |
| 96 | 1.27 | .29 | 2.79 | 1.23 | 5.58 | .96 | .30 | .55 | .17 | .09 | .12 | 1.23 | .89 | .36 | 8.9 |
| 97 | .40 | .28 | 1.68 | .89 | 3.25 | .55 | .11 | .32 | .05 | .06 | .02 | .56 | .49 | .32 | 5.1 |
| 98 | .32 | .35 | 1.10 | .42 | 2.19 | .79 | .18 | .54 | .12 | .03 | .02 | .89 | .80 | .25 | 4.9 |
| 99 | | | | | 1.00 | .50 | .27 | .17 | .47 | .09 | .12 | 1.12 | .40 | .25 | 3.2 |
| Means | | | | | | | | | | | | | | | |
| 70-79 | .54 | .40 | 1.52 | 1.01 | 3.47 | .81 | .32 | 1.19 | .45 | .06 | .05 | 2.07 | .32 | .25 | 6.9 |
| 80-89 | .63 | .38 | 2.82 | .99 | 4.82 | 1.38 | .50 | 1.04 | .59 | .16 | .15 | 2.44 | .96 | .55 | 10.0 |
| 90-98 | .53 | .28 | 2.06 | .89 | 3.76 | .95 | .26 | .60 | .32 | .08 | .07 | 1.33 | .63 | .48 | 7.0 |

Total run includes 75% of South Peninsula June catch.

TABLE 8. North Pacific runs (catch + escapement, $10^6$) of chum salmon, 1970–99.

| Year | Bristol Bay run | Alaska runs Western | Alaska runs Central | Japan catch High seas | Japan catch Coastal | Russian run (catch/.5) | North Pacific total run | SE Alaska B.C. and Wash. | Total Pacific run | % Asia |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 1.7 | 6.0 | 5.2 | 17 | 7 | 7 | 43 | 11 | 54 | 59 |
| 71 | 1.3 | 4.7 | 6.6 | 17 | 10 | 7 | 45 | 7 | 52 | 65 |
| 72 | 1.6 | 4.7 | 4.5 | 22 | 9 | 4 | 45 | 17 | 62 | 57 |
| 73 | 2.2 | 6.5 | 3.5 | 16 | 12 | 3 | 41 | 15 | 56 | 56 |
| 74 | 1.6 | 6.8 | 1.9 | 22 | 13 | 5 | 48 | 10 | 58 | 68 |
| 75 | 1.4 | 8.4 | 2.1 | 19 | 20 | 4 | 54 | 5 | 59 | 74 |
| 76 | 2.8 | 7.5 | 3.4 | 22 | 12 | 8 | 53 | 9 | 62 | 68 |
| 77 | 4.0 | 9.1 | 5.9 | 12 | 15 | 9 | 51 | 5 | 56 | 64 |
| 78 | 2.3 | 7.3 | 4.3 | 7 | 18 | 11 | 47 | 9 | 56 | 63 |
| 79 | 1.7 | 7.5 | 4.0 | 6 | 28 | 12 | 58 | 4 | 62 | 75 |
| 80 | 3.3 | 12.4 | 5.1 | 6 | 26 | 7 | 57 | 11 | 68 | 58 |
| 81 | 2.1 | 12.0 | 8.3 | 6 | 34 | 9 | 70 | 6 | 76 | 65 |
| 82 | 1.3 | 8.2 | 8.9 | 7 | 30 | 7 | 61 | 9 | 70 | 63 |
| 83 | 2.2 | 8.6 | 7.0 | 6 | 37 | 12 | 71 | 6 | 77 | 72 |
| 84 | 3.5 | 11.6 | 6.5 | 6 | 38 | 7 | 70 | 13 | 83 | 62 |
| 85 | 2.0 | 9.2 | 5.5 | 4 | 51 | 12 | 82 | 17 | 99 | 68 |
| 86 | 2.2 | 9.2 | 8.1 | 3 | 49 | 14 | 83 | 17 | 100 | 66 |
| 87 | 2.9 | 8.3 | 6.2 | 3 | 43 | 13 | 73 | 12 | 85 | 69 |
| 88 | 2.5 | 11.2 | 8.7 | 2 | 51 | 13 | 86 | 20 | 106 | 62 |
| 89 | 2.2 | 9.3 | 4.9 | 1 | 55 | 13 | 83 | 9 | 92 | 74 |
| 90 | 1.8 | 6.5 | 4.6 | 1 | 68 | 13 | 94 | 13 | 107 | 77 |
| 91 | 2.1 | 8.2 | 5.2 | 1 | 60 | 10 | 84 | 11 | 95 | 74 |
| 92 | 1.5 | 6.4 | 4.4 | 0 | 46 | 17 | 73 | 16 | 89 | 70 |
| 93 | 1.1 | 4.3 | 3.8 | 0 | 61 | 21 | 90 | 21 | 111 | 74 |
| 94 | 1.5 | 8.0 | 6.0 | 0 | 69 | 26 | 109 | 21 | 130 | 73 |
| 95 | 1.4 | 11.0 | 6.5 | 0 | 78 | 24 | 120 | 20 | 140 | 73 |
| 96 | 1.2 | 8.9 | 6.0 | 0 | 87 | 25 | 127 | 30 | 157 | 71 |
| 97 | 0.6 | 5.1 | 5.6 | 0 | 74 | 18 | 103 | 18 | 121 | 76 |
| 98 | 0.9 | 4.9 | 4.1 | 0 | *61* | *16* | 86 | *27* | 113 | 68 |
| 99 | 1.1 | 3.2 | 9.0 | 0 | *70* | *18* | 100 | *25* | 125 | 70 |
| Means | | | | | | | | | | |
| 70-79 | 2.1 | 6.9 | 4.1 | 16 | 14 | 7 | 48 | 9 | 58 | 65 |
| 80-89 | 2.4 | 10.0 | 6.9 | 4 | 41 | 11 | 74 | 12 | 86 | 66 |
| 90-97 | 1.4 | 7.3 | 5.3 | 0 | 68 | 19 | 100 | 19 | 119 | 74 |

Western Alaska includes Bristol Bay, North Peninsula, Yukon-Kuskokwim regions and 75% of June catch south of the Alaska Peninsula.
Japan high seas catches since 1992 included in Russian runs.
Japan coastal catch includes in-river catch (hatchery returns).

TABLE 9. Summary of ages and lengths for chum salmon in the False Pass catches.

| | | | Sex/age percent | | | | | | | | Mean length (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Sex | Age | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
| South Unimak | Male | 0.2 | 0.4 | 1.0 | 0.4 | 1.6 | 0.1 | 0.5 | 0.6 | 0.1 | 491 | 488 | 498 | 538 | 548 | 484 | 523 | 534 |
| | | 0.3 | 26.9 | 31.4 | 23.6 | 21.2 | 26.4 | 25.2 | 28.2 | 23.5 | 550 | 557 | 568 | 580 | 588 | 571 | 591 | 581 |
| | | 0.4 | 21.8 | 17.0 | 26.7 | 18.5 | 15.0 | 15.9 | 9.0 | 14.0 | 579 | 591 | 589 | 602 | 619 | 604 | 611 | 597 |
| | | 0.5 | 0.1 | 0.6 | 2.0 | 2.0 | 0.5 | 0.7 | 0.4 | 0.5 | 628 | 599 | 611 | 619 | 634 | 618 | 634 | 617 |
| | | 0.6 | | | 0.1 | | 0.1 | 0.2 | | | | | 652 | | 651 | 686 | | |
| | Female | 0.2 | 0.1 | 1.2 | 0.3 | 1.2 | 0.1 | 1.0 | 0.5 | 0.0 | 514 | 514 | 507 | 517 | 525 | 468 | 542 | |
| | | 0.3 | 29.7 | 35.4 | 26.8 | 30.6 | 40.0 | 34.1 | 48.8 | 40.9 | 543 | 545 | 546 | 556 | 567 | 558 | 564 | 565 |
| | | 0.4 | 20.8 | 13.3 | 19.2 | 23.9 | 16.0 | 21.6 | 11.9 | 20.7 | 568 | 574 | 563 | 581 | 594 | 589 | 586 | 577 |
| | | 0.5 | 0.2 | 0.1 | 0.9 | 1.0 | 1.7 | 0.8 | 0.6 | 0.3 | 573 | 582 | 587 | 615 | 610 | 627 | 602 | 614 |
| | | 0.6 | | | | | 0.1 | | | | | | | | 629 | 644 | | |
| | Comb. | 0.2 | 0.5 | 2.2 | 0.7 | 2.8 | 0.2 | 1.5 | 1.5 | 0.1 | 496 | 502 | 502 | 529 | 536 | 473 | 531 | 534 |
| | | 0.3 | 56.6 | 66.8 | 50.4 | 51.8 | 66.4 | 59.3 | 77.0 | 64.4 | 546 | 551 | 556 | 566 | 575 | 564 | 574 | 571 |
| | | 0.4 | 42.6 | 30.3 | 45.9 | 42.4 | 31.0 | 37.5 | 20.9 | 34.7 | 574 | 584 | 578 | 590 | 606 | 595 | 597 | 585 |
| | | 0.5 | 0.3 | 0.7 | 2.9 | 3.0 | 2.2 | 1.5 | 1.5 | 1.5 | 591 | 597 | 604 | 618 | 615 | 623 | 615 | 615 |
| | | 0.6 | | | 0.1 | | 0.2 | 0.2 | | | | | 652 | | 644 | 665 | | |
| Shum-agin | Male | 0.2 | 0.0 | 0.7 | 0.3 | 1.0 | 0.0 | 0.0 | 2.2 | 0.0 | | 519 | 567 | 561 | | | 563 | |
| | | 0.3 | 23.7 | 27.6 | 27.1 | 22.6 | 24.7 | 16.9 | 37.1 | 24.0 | 547 | 554 | 575 | 588 | 600 | 575 | 594 | 588 |
| | | 0.4 | 21.6 | 20.7 | 28.8 | 23.4 | 20.2 | 19.3 | 6.7 | 14.1 | 589 | 586 | 589 | 604 | 637 | 615 | 632 | 616 |
| | | 0.5 | 0.2 | 1.0 | 1.2 | 2.0 | 1.6 | 1.6 | 1.1 | 1.3 | 651 | 632 | 618 | 610 | 635 | 645 | 712 | 648 |
| | | 0.6 | | | | | 0.1 | | | | | | | | 658 | | | |
| | Female | 0.2 | 0.0 | 0.1 | 0.1 | 0.6 | 0.0 | 0.5 | 0.0 | 0.3 | | 534 | 532 | 527 | | 530 | | 567 |
| | | 0.3 | 32.0 | 33.2 | 21.2 | 28.4 | 31.9 | 34.0 | 41.6 | 40.4 | 543 | 547 | 550 | 563 | 577 | 573 | 571 | 569 |
| | | 0.4 | 21.7 | 15.4 | 20.5 | 20.1 | 18.3 | 25.1 | 10.1 | 18.8 | 574 | 577 | 572 | 587 | 616 | 595 | 598 | 581 |
| | | 0.5 | 0.8 | 1.3 | 0.8 | 1.7 | 3.0 | 2.6 | 1.1 | 1.0 | 609 | 662 | 595 | 604 | 630 | 618 | 678 | 582 |
| | | 0.6 | | | | 0.2 | 0.2 | | | | | | | 595 | 664 | | | |
| | Comb. | 0.2 | 0.0 | 0.8 | 0.4 | 1.6 | 0.0 | 0.5 | 2.2 | 0.3 | | 521 | 558 | 548 | | 530 | 563 | 567 |
| | | 0.3 | 55.7 | 60.8 | 48.3 | 50.0 | 56.6 | 49.9 | 78.7 | 64.4 | 545 | 550 | 564 | 586 | 587 | 574 | 582 | 576 |
| | | 0.4 | 43.3 | 36.1 | 49.3 | 43.5 | 38.5 | 44.4 | 16.8 | 32.9 | 581 | 582 | 582 | 596 | 627 | 604 | 612 | 596 |
| | | 0.5 | 1.0 | 2.3 | 2.0 | 3.7 | 4.6 | 4.2 | 2.2 | 2.3 | 617 | 649 | 609 | 607 | 632 | 628 | 695 | 615 |
| | | 0.6 | | | | 0.2 | 0.3 | | | | | | | 595 | 662 | | | |

TABLE 10 Frequencies of focal scale resorbtion on chum salmon scales from the 1999 False Pass fisheries.

| Location | Date | No. normal scales (2) | Number with holes: one scale | Number with holes: both scales | % with holes (1 or 2) | No. with questionable holes (1 or 2) | % with holes including questionable | No. normal scales (1) | No. with holes | % with holes | No. with question. | % including question. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unimak | 6/15 | 137 | 3 | 0 | 2.14 | 0 | 2.14 | 17 | 0 | 0.00 | 0 | 0.00 |
| | 6/16 | 160 | 1 | 1 | 1.23 | 1 | 1.84 | 28 | 0 | 0.00 | 0 | 0.00 |
| | 6/17 | 121 | 1 | 1 | 1.63 | 2 | 3.20 | 27 | 0 | 0.00 | 0 | 0.00 |
| | 6/18 | 134 | 1 | 0 | 0.74 | 0 | 0.74 | 22 | 0 | 0.00 | 0 | 0.00 |
| | 6/19 | 72 | 0 | 0 | 0.00 | 1 | 1.37 | 7 | 0 | 0.00 | 0 | 0.00 |
| | 6/20 | 67 | 0 | 0 | 0.00 | 1 | 1.47 | 9 | 0 | 0.00 | 0 | 0.00 |
| | 6/21 | 127 | 1 | 0 | 0.78 | 3 | 3.05 | 16 | 0 | 0.00 | 0 | 0.00 |
| | Totals | 818 | 7 | 2 | 1.09 | 8 | 2.04 | 126 | 0 | 0.00 | 0 | 0.00 |
| Shumagin Is. | 6/16 | 65 | 2 | 0 | 2.99 | 0 | 2.99 | 10 | 0 | 0.00 | 0 | 0.00 |
| | 6/17 | 63 | 0 | 0 | 0.00 | 0 | 0.00 | 8 | 0 | 0.00 | 0 | 0.00 |
| | 6/18 | 62 | 0 | 0 | 0.00 | 2 | 3.13 | 10 | 0 | 0.00 | 0 | 0.00 |
| | Totals | 190 | 2 | 0 | 1.04 | 2 | 2.06 | 28 | 0 | 0.00 | 0 | 0.00 |
| False Pass | Combined | 1008 | 9 | 2 | 1.08 | 10 | 2.04 | 154 | 0 | 0.00 | 0 | 0.00 |

TABLE 11. Timing of Bristol Bay sockeye runs between Bristol Bay and Port Moller.

| Year | Mean run date (July) | | | | Mean date at P.M.* | Days P.M. to B.B. | P.M. mean temp. (°C) 6/11 to 7/5 |
|---|---|---|---|---|---|---|---|
| | Egegik | Nak/Kvi | Nush. | Wt'd mean | | | |
| 85 | 2.1 | 3.0 | 4.3 | 2.9 | 27.1 | 5.8 | 5.8 |
| 86 | 6.6 | 6.4 | 8.3 | 7.0 | | | |
| 87 | 3.4 | 5.5 | 4.3 | 4.7 | 25.5 | 9.2 | 5.7 |
| 88 | 1.5 | 2.0 | 5.1 | 2.3 | 26.8 | 5.5 | 7.5 |
| 89 | 3.4 | 1.4 | 3.0 | 2.1 | 27.0 | 5.1 | 6.3 |
| 90 | 6.0 | 5.0 | 6.4 | 5.5 | 28.0 | 7.5 | 7.3 |
| 91 | 4.1 | 3.6 | 5.4 | 4.1 | 25.8 | 8.3 | 5.3 |
| 92 | 5.4 | 5.0 | 6.0 | 5.3 | 26.7 | 8.6 | 7.6 |
| 93 | 0.3 | 0.6 | 1.4 | 0.6 | 25.3 | 5.3 | 7.7 |
| 94 | 6.4 | 7.0 | 8.0 | 7.0 | 28.0 | 9.0 | 6.6 |
| 95 | 4.4 | 5.0 | 4.0 | 4.7 | 26.3 | 8.4 | 7.3 |
| 96 | 1.4 | 3.6 | 3.6 | 2.8 | 25.9 | 6.9 | 6.1 |
| 97 | 2.6 | 4.4 | 5.4 | 3.7 | 27.1 | 6.6 | 9.5 |
| 98 | 4.4 | 7.8 | 6.0 | 6.2 | 28.2 | 8.0 | 7.7 |
| 99 | 3.8 | 4.5 | 6.4 | 4.8 | 27.5 | 7.3 | 4.7 |
| Means 1987-96 | 3.6 | 3.9 | 4.7 | 3.9 | 26.5 | 7.4 | 6.7 |

*Date in June of 50% of index through July 5.

TABLE 12. Estimates of the daily passage of sockeye salmon off Port Moller, 1987–99.

| Date | | Daily passage 0-70 mi off coast ($10^6$) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
| June | 11 | .08 | .07 | .26 | .07 | .05 | .26 | .22 | .04 | .10 | .15 | .09 | .05 | .00 |
| | 12 | .07 | .12 | .33 | .03 | .04 | .12 | .19 | .07 | .12 | .20 | .11 | .02 | .01 |
| | 13 | .08 | .19 | .48 | .05 | .07 | .21 | .29 | .09 | .36 | .20 | .11 | .04 | .00 |
| | 14 | .11 | .30 | .59 | .10 | .12 | .34 | .58 | .10 | .61 | .21 | .13 | .08 | .01 |
| | 15 | .11 | .45 | .83 | .10 | .18 | .64 | 1.09 | .07 | .91 | .18 | .19 | .17 | .02 |
| | 16 | .19 | .56 | .97 | .12 | .30 | .68 | 1.50 | .10 | .87 | .34 | .34 | .17 | .03 |
| | 17 | .39 | .69 | .97 | .17 | .50 | .92 | 1.31 | .09 | 1.40 | .65 | .46 | .24 | .03 |
| | 18 | .72 | .74 | 1.29 | .36 | .74 | .69 | 1.33 | .26 | 1.99 | .90 | .50 | .17 | .04 |
| | 19 | .89 | .73 | 1.53 | .72 | 1.01 | .97 | 1.53 | .74 | 2.49 | 1.18 | .36 | .28 | .09 |
| | 20 | 1.16 | .82 | 1.98 | 1.00 | 1.28 | .98 | 2.12 | 1.42 | 2.44 | 1.37 | .49 | .31 | .26 |
| | 21 | 1.08 | .94 | 2.72 | 1.44 | 1.72 | 1.50 | 2.46 | 1.76 | 2.29 | 1.82 | .58 | .45 | .50 |
| | 22 | .99 | .93 | 2.87 | 1.99 | 2.08 | 1.72 | 2.69 | 2.15 | 2.75 | 2.22 | .81 | .75 | .94 |
| | 23 | 1.28 | 1.07 | 2.92 | 1.87 | 2.36 | 2.00 | 2.84 | 2.77 | 2.96 | 2.79 | .79 | 1.08 | 1.78 |
| | 24 | 1.51 | 1.30 | 2.62 | 1.95 | 2.54 | 1.94 | 3.02 | 2.88 | 3.09 | 2.92 | 1.03 | 1.21 | 3.08 |
| | 25 | 1.97 | 1.72 | 2.79 | 2.61 | 2.64 | 2.25 | 3.57 | 2.89 | 3.14 | 2.69 | 1.07 | 1.13 | 4.38 |
| | 26 | 1.62 | 1.45 | 2.71 | 3.55 | 2.97 | 2.93 | 4.03 | 2.95 | 3.42 | 2.02 | 1.27 | 1.02 | 3.93 |
| | 27 | 1.63 | 1.19 | 2.19 | 4.06 | 2.82 | 3.34 | 4.08 | 3.48 | 3.68 | 1.92 | 1.35 | 1.27 | 3.21 |
| | 28 | 1.35 | 1.00 | 1.93 | 3.32 | 2.66 | 3.17 | 3.51 | 3.97 | 3.16 | 2.05 | 1.46 | 1.29 | 2.50 |
| | 29 | 1.19 | .97 | 1.94 | 3.28 | 2.19 | 2.51 | 2.86 | 3.48 | 2.80 | 2.18 | 1.27 | 1.31 | 2.70 |
| | 30 | 1.06 | .98 | 1.54 | 2.78 | 2.15 | 2.47 | 2.47 | 3.38 | 2.54 | 2.10 | 1.10 | 1.15 | 2.27 |
| July | 1 | .91 | .81 | 1.24 | 2.87 | 2.13 | 2.42 | 2.22 | 2.62 | 2.59 | 1.67 | .92 | .94 | 1.66 |
| | 2 | 1.00 | .76 | 1.02 | 2.07 | 2.14 | 2.54 | 1.97 | 2.17 | 2.56 | 1.39 | .89 | .73 | 1.40 |
| | 3 | 1.15 | .71 | 1.18 | 2.36 | 1.99 | 2.16 | 1.60 | 1.59 | 2.39 | 1.02 | .63 | .64 | 1.36 |
| | 4 | 1.29 | .66 | 1.37 | 1.75 | 1.73 | 1.76 | 1.20 | 1.51 | 2.13 | .89 | .55 | .72 | 1.50 |
| | 5 | 1.31 | .70 | 1.37 | 1.84 | 1.39 | 1.35 | .83 | 1.60 | 1.94 | .81 | .46 | .73 | 1.46 |
| | 6 | 1.11 | .59 | 1.14 | 1.28 | .99 | 1.13 | .59 | 1.57 | 1.84 | .66 | .46 | .56 | 1.51 |
| | 7 | .86 | .68 | .84 | 1.38 | .73 | 1.08 | .44 | 1.51 | 1.65 | .54 | .36 | .50 | 1.16 |
| | 8 | .65 | .58 | .52 | 1.16 | .58 | .94 | .34 | 1.31 | 1.27 | .42 | .26 | .40 | .85 |
| | 9 | .42 | .55 | .48 | .99 | .56 | .73 | .25 | 1.03 | .85 | .35 | .22 | .32 | .54 |
| | 10 | .38 | .35 | .38 | .67 | .48 | .49 | .18 | .64 | .75 | .32 | .17 | .18 | .40 |
| | 11 | .22 | .27 | .34 | .58 | .35 | .24 | .14 | .45 | .61 | .25 | .13 | .13 | .40 |
| | 12 | .17 | .17 | .25 | .41 | .21 | .16 | .11 | .40 | .45 | .15 | .09 | .10 | .37 |
| | 13 | .13 | .11 | .14 | .28 | .13 | .10 | .09 | .35 | .24 | .07 | .04 | .07 | .26 |
| | 14 | .12 | .08 | .07 | .17 | .10 | .07 | .08 | .24 | .07 | .04 | .04 | .05 | .20 |
| | 15 + | .29 | .18 | .21 | .34 | .38 | .16 | .18 | .39 | .23 | .21 | .20 | .08 | .16 |
| Totals | | 27 | 23 | 44 | 48 | 42 | 45 | 52 | 50 | 61 | 37 | 19 | 18 | 39 |

TABLE 13. Catches of sockeye at Port Moller index stations in 1999.

| Date | 1999 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 2 | 4 | 6 | 8 | 10 | 12 | Total | Cum. |
| 6/11 | | 3.4 | 0.5 | 0.5 | 7.7 | | | 15.8 | 16 |
| 12 | | 12.4 | 5.3 | 2.1 | 1.0 | | | 17.4 | 33 |
| 13 | | 1.0 | 15.3 | 0.5 | 0.0 | | | 13.4 | 47 |
| 14 | | 0.0 | 0.0 | 0.5 | 3.9 | | | 6.6 | 53 |
| 15 | | 9.4 | 1.5 | 1.0 | 2.6 | 0.0 | | 13.7 | 67 |
| 16 | | 2.9 | 17.5 | 0.0 | 0.0 | 0.0 | | 16.3 | 83 |
| 17 | | 1.0 | 0.0 | 7.6 | 0.5 | 9.0 | | 7.7 | 91 |
| 18 | | 7.6 | 18.3 | 3.5 | 1.0 | 5.2 | | 25.1 | 116 |
| 19 | | 13.3 | 51.2 | 5.7 | 7.1 | 0.5 | | 67.5 | 184 |
| 20 | | 9.8 | 24.1 | 14.8 | 21.5 | 7.9 | | 73.4 | 257 |
| 21 | | 9.3 | 55.7 | 2.1 | 6.7 | 0.0 | | 64.4 | 321 |
| 22 | | 7.3 | 6.4 | 37.8 | 1.0 | 5.1 | | 42.8 | 364 |
| 23 | | 5.5 | 14.8 | 26.0 | 34.6 | 24.7 | | 92.4 | 457 |
| 24 | | 11.5 | 41.6 | 54.0 | 47.5 | 2.5 | | 161.7 | 618 |
| 25 | | 10.5 | 35.7 | 47.8 | 23.1 | 59.1 | | 112.2 | 730 |
| 26 | | 2.0 | 12.4 | 34.8 | 35.9 | 34.9 | 20.2 | 96.8 | 827 |
| 27 | | 14.3 | 16.2 | 37.3 | 3.6 | 7.5 | 8.0 | 60.0 | 887 |
| 28 | | 4.1 | 35.7 | 61.0 | 51.8 | 50.0 | 23.4 | 163.5 | 1051 |
| 29 | | 7.6 | 26.6 | 49.1 | 9.2 | 17.0 | 11.4 | 81.4 | 1132 |
| 30 | | 48.0 | 57.4 | 35.6 | 8.0 | 35.4 | 20.8 | 125.6 | 1258 |
| 1 | | 27.2 | 60.4 | 41.5 | 13.0 | 0.0 | 14.7 | 124.1 | 1382 |
| 2 | | 53.6 | 26.1 | 38.9 | 22.9 | 15.5 | 21.4 | 131.5 | 1513 |
| 3 | | 14.5 | 56.4 | 54.8 | 35.5 | 39.3 | 4.7 | 157.4 | 1671 |
| 4 | 11.3 | 11.4 | 75.7 | 24.9 | 24.0 | 18.5 | | 128.0 | 1799 |
| 5 | 17.4 | 10.7 | 76.0 | 20.5 | 22.1 | 23.4 | | 121.1 | 1920 |
| 6 | 28.4 | 35.4 | 114.3 | 46.0 | 19.7 | 5.6 | | 188.1 | 2108 |
| 7 | 0.0 | 8.5 | 67.6 | 57.1 | 22.0 | 37.9 | | 141.8 | 2250 |
| 8 | 0.0 | 10.9 | 37.1 | 31.9 | 23.1 | 26.1 | | 100.9 | 2351 |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| Means | | | | | | | | | |
| -15 | | 5.2 | 4.5 | 0.9 | 3.0 | 0.0 | | 13.4 | 3.4 |
| -20 | | 6.9 | 22.2 | 6.3 | 6.0 | 4.5 | | 38.0 | 9.5 |
| -25 | | 8.8 | 30.8 | 33.5 | 22.6 | 18.3 | | 94.7 | 23.7 |
| -30 | | 15.2 | 29.7 | 43.6 | 21.7 | 29.0 | 16.8 | 105.5 | 26.4 |
| -5 | 14.4 | 23.5 | 58.9 | 36.1 | 23.5 | 19.3 | 13.6 | 132.4 | 33.1 |
| -10 | 9.5 | 18.3 | 73.0 | 45.0 | 21.6 | 23.2 | | 143.6 | 35.9 |
| to 7/5 | | 11.9 | 29.2 | 24.1 | 15.4 | 14.2 | | 76.8 | 19.2 |