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DIVISION OF COMMERCIAL FISHERIES

ANNUAL MANAGEMENT REPORT

-1991-

BRISTOL BAY AREA



Regional Information Report¹ No. 2A92-08

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PREFACE

The 1991 Bristol Bay Management Report is the thirty-second consecutive annual volume reporting on management activities of the Division of Commercial Fisheries staff in Bristol Bay. The report emphasizes a descriptive account of the information, decisions, and rationale used to manage the Bristol Bay commercial salmon and herring fisheries, and outlines basic management objectives and procedures. We have included all information deemed necessary to fully explain the rationale behind management decisions formulated in 1991. All narrative and data tabulations in this volume are combined under separate SALMON and HERRING sections to aid in the use of this document as a reference source. The extensive set of tables has been updated to record previously unlisted data for easy reference. Fisheries data in this report supersedes information in previous reports. Corrections or comments should be directed to the Dillingham area office, Attention: Editor.

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Togiak Area Management Biologist
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BRISTOL BAY

SALMON

FISHERY

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INTRODUCTION

Management Area Description

The Bristol Bay management area includes all coastal waters and inland drainages east of a line from Cape Newenham to Cape Menshikof (Figure 1). The area includes six major river systems: Naknek, Kvichak, Egegik, Ugashik, Nushagak, and Togiak. Collectively, these rivers are home to the largest commercial sockeye salmon fishery in the world. Sockeye salmon are by far the most abundant salmon species that return to Bristol Bay each year, but chinook, chum, coho, and (in even-years) pink runs are important to the fisheries as well.

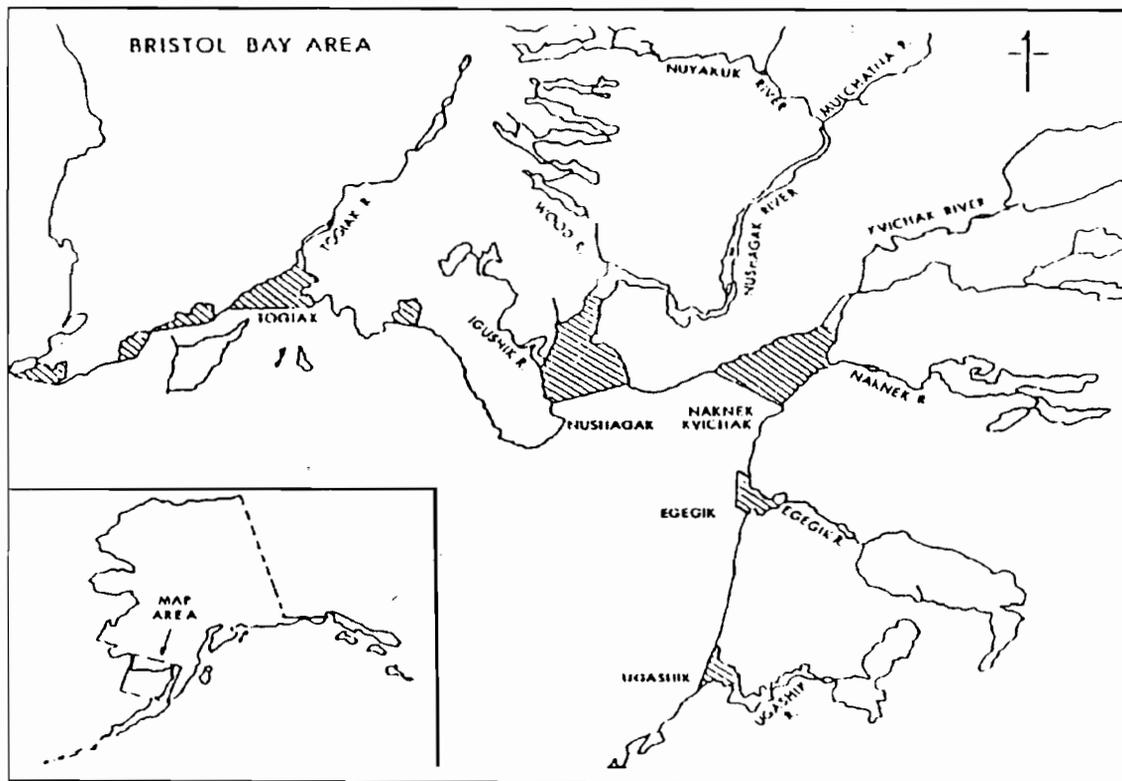


Figure 1. BRISTOL BAY Area Commercial Fisheries Salmon Management Districts.

The Bristol Bay management area is divided into five management districts (Naknek-Kvichak, Egegik, Ugashik, Nushagak, and Togiak) that correspond to the major river drainages. The management objective for each river is to achieve desired escapement goals for the major salmon species while at the same time harvesting all fish in excess of the escapement requirement through orderly fisheries. In addition, regulatory management plans have been adopted by species for some management districts.

Overview of the Bristol Bay Salmon Fisheries

The five species of Pacific salmon found in Bristol Bay are the focus of commercial, subsistence and sport fisheries.

Legal gear for the commercial salmon fishery includes both drift (150f) and set (50f) gillnets. Drift fishermen are the most numerous, and approximately 1,887 drift permits were registered in 1991. Setnet permits registered in 1991 totaled 1,005 (Appendix Table 3). Annual commercial catches (1972-1991) average 16.8 million sockeye salmon, 108,000 chinook, 1.2 million chum, 187,000 coho, and 1.7 million (even years only) pink salmon (Appendix Tables 5-9). The value of the annual commercial salmon harvest in Bristol Bay has averaged \$141 million since 1981, and sockeye salmon are the most valuable, worth an average \$134 million.

Annual subsistence catches average approximately 63,000 salmon and are also comprised primarily of sockeye salmon (Appendix Table 45). Sport fisheries operate to varying degrees of intensity on all species of salmon, with most effort directed toward chinook and coho stocks.

1991 COMMERCIAL SALMON FISHERY

Fishery Run Strength Indicators

Fishery managers in Bristol Bay have several early indicators of sockeye run size, including: the preseason forecast, the False Pass fishery, the Port Moller test boat, the district test program, and the early performance of the commercial fishery. Evaluated individually, each of these pieces of information may not give a correct assessment of run size, but collectively they form patterns such as missing year classes, or those that are stronger than predicted, or variances in run timing that can be important in the successful management of the commercial fishery. Management success is easily measured after the season by comparing actual escapements to the goals published for the individual river systems.

Preseason Forecasts

Total inshore sockeye salmon production for Bristol Bay in 1991 was forecasted to be 31.9 million fish (Table 1). A run of that size would have been well above the 20-year (1972-1991) mean inshore run (28.8 million), and approximately 10% less than the 10-year mean inshore run (35.5 million) (Appendix Table 20). The inshore sockeye harvest, was forecasted to be approximately 21.2 million fish.

Every district expected a good inshore run, and every river system had an indicated harvestable surplus. The projected inshore harvest for sockeye salmon in 1991 of 21.2 million fish, was slightly less than recent sockeye catch levels in Bristol Bay (Appendix Table 5).

The 1991 forecast was based on spawner-recruit, sibling, and smolt data for each district where that data was available. Returns prior to 1978 were omitted from the database in forecasting runs to the east side river systems, but were included in calculating projected runs to the Nushagak and Togiak River systems. Although using recent-year data significantly reduced prediction errors for eastside rivers during the years 1984 to 1990, this method of forecasting would nevertheless have under-forecasted eastside returns in 5 of the 7 years. To

further correct this under-forecasting tendency, the research staff increased the 1991 eastside forecast by the 1984-1990 average prediction error (30.38%).

Large sockeye runs in recent years and a higher forecast by Fisheries Research Institute (FRI) at the University of Washington contributed to considerable uncertainty over the ADF&G forecast by the industry in 1991. Many of the processors were prepared for a run larger than the ADF&G forecast. Catches by the industry-sponsored test boat at Port Moller through June 30 indicated a harvestable surplus of sockeye very similar to the ADF&G forecast.

The 1991 preseason forecast for Nushagak chinook salmon was 119,700. With an inriver goal of 75,000 which includes spawners as well as the fish taken in the sport and subsistence fisheries above the sonar site, a subsistence harvest below the sonar site of approximately 10,000, and an expected incidental catch during the sockeye fishery of 15-20,000, the harvestable surplus was quite small. Forecast accuracy for chinook salmon in the Nushagak District has been quite good and has an average error rate of less than 20%. However, the stock has been on a declining trend since 1986 (Appendix Table 31). Therefore, with the anticipated low return in 1991, fishery managers had no choice but to adopt a conservative approach to the season.

Formal run forecasts for salmon species other than sockeye and Nushagak River chinook salmon are not generally available because long-term escapement data are limited. However, catch projections were calculated based on recent 5-year average harvests for the other species. Potential and actual harvests for all species in 1991 are listed below:

<u>Species</u>	<u>Potential</u>	<u>Actual</u>
Sockeye	21,211,000 ^a	26,233,000
Chinook	81,000 ^b	36,000
Chum	1,283,000	1,273,000
Pink	1,800	400
Coho	<u>157,000</u>	<u>118,000</u>
<u>Total</u>	<u>22,743,800</u>	<u>27,661,000</u>

^a 1991 Bristol Bay forecasted catch.

^b Includes actual forecast for Nushagak District, and 20-year average chinook catches for Naknek/Kvichak, Egegik, Ugashik, and Togiak.

South Unimak/Shumagin Island Fishery

The inseason development of the South Unimak/Shumagin Island intercept sockeye fishery is closely monitored by Bristol Bay fishery managers for indications of migration timing, relative abundance, age composition and fish size in the incoming Bristol Bay run. Indications from these fisheries give the terminal fisheries managers notice of what to expect, as well as provide advanced warning of any potential differences that may exist between actual and forecasted run statistics. However, data obtained from these two fisheries have not always given an accurate picture of the Bristol Bay run size. Variables such as unusual fish size or run timing, on-shore winds (which tend to move the fish into areas more accessible to the fleet and result in a higher catch per unit of effort), and high winds that affect fleet's ability to harvest their quota can make the information difficult to interpret.

These fisheries are managed under a guideline harvest (quota) policy, the South Unimak/Shumigan Islands June Fishery Management Plan SAAC 09.365, initially adopted in 1974 by the Alaska Board of Fisheries. The original intent of the Alaska Board of Fisheries was to prevent over-harvest of sockeye runs bound for individual river systems in Bristol Bay.

The management plan was brought before the Board for review in February, 1988. At that time the Board elected to maintain a traditional harvest pattern, and set maximum allowable harvest levels for the South Unimak and Shumigan Island fisheries at 6.8% and 1.5% of the forecasted inshore harvest for Bristol Bay. In addition, a maximum allowable harvest level of 500,000 chum salmon was

instituted. The amendment stated that if the maximum allowable harvest level was reached, the June fishery would be terminated for the season, regardless of the sockeye harvest at the time.

The Board of Fisheries again changed the management plan in 1990. First, allocated catches for both fisheries were apportioned by week. Second, the Board allowed a 5% carry-over harvest from the first weekly period to the second. For example, if the catch in the Shumigan Island and/or South Unimak fisheries should fall below the guidelines in the first weekly period, those unharvested sockeye salmon, up to a maximum of 5% of the total guideline harvest level for that fishery, will be added to the weekly guideline for the second period. Third, the maximum allowable chum catch was increased to 600,000 fish for both fisheries combined. Lastly, a "window" regulation, allowing no more than 96-hours of fishing time in a 7-day period, or no more than 72 consecutive hours of fishing, was removed.

The sockeye harvest allocation for the South Peninsula June fishery was 1,920,000 (1,573,000 for South Unimak and 347,000 for Shumigan Islands), based on the 1991 projected harvest in Bristol Bay. Weekly harvest levels for 1991 were scheduled as follows:

<u>Weekly Period</u>	<u>South Unimak</u>	<u>Shumagin Islands</u>
13 - 18 June	550,000 (35%)	122,000 (35%)
19 - 25 June	708,000 (45%)	156,000 (45%)
26 - 30 June	<u>315,000 (20%)</u>	<u>69,000 (20%)</u>
Total	1,573,000 (100%)	347,000 (100%)

South Unimak/Shumagin Island intercept fisheries actually landed 1,549,000 sockeye salmon of North Peninsula/Bristol Bay origin in 1991, and were closed prematurely due to the large bycatch of chum salmon (771,000), which exceeded the allowable cap of 600,000 (Appendix Table 44).

Port Moller Test Fishery

For many years the Department of Fish and Game ran a test fish program out of the community of Port Moller. A large vessel fished specific loran stations on a transect line across the migration path of sockeye on route to Bristol Bay. Data collected was used to estimate run strength, and age and size composition. Due

to the high cost of the operation and inconsistency of the results, the department dropped the project. Even though the performance was not always good, the project was very popular with the salmon processors as it gave an additional indication of run size, which heavily influences production capacity and the price paid to fishermen. Through voluntary funding from the industry, the Port Moller test fish project was resumed and has been recently operated by staff from the Fisheries Research Institute, University of Washington. When the project changed hands a newer more modern type of gear was employed, and a slightly different method of fishing was utilized. Though the program is still plagued with gaps in the data due to unfishable weather and equipment breakdowns, recent data collected has provided a more accurate assessment of run size. Information concerning the project is shared with the department on a daily basis in season and it is analyzed extensively by the department's research staff in King Salmon.

Economics and Market Production

Price disputes had not been a factor in the Bristol Bay salmon fishery for many years due to the large increase in the number of floating fish processors and the establishment of individual market agreements with small groups of fishermen. However, a large reduction expected in the sockeye price in 1991 resulted in a major price dispute between fishermen and processors. For the past several years, neither of the two major fishermen's groups in Bristol Bay, Alaska Independent Fishermen's Marketing Association (AIFMA) or Western Alaska Fishermen's Marketing Association (WACMA), have negotiated for salmon price. Instead, both organizations have elected to concentrate on other issues such as boat storage and support services.

Widespread dissatisfaction by the fishermen over the decline in the price paid for salmon for the past several years, concern over the concept of fishing for "an open ticket" with the final price to be determined at a later time, and the low initial payments by buyers for the first deliveries of the season lead to a major boycott of the salmon fishery in 1991. The boycott spread to other regions of the state and fishing virtually came to a halt in several areas.

Fishermen in Bristol Bay organized themselves into umbrella groups consisting of individual members elected to represent the group with each buyer. Price

negotiations were conducted until the evening of July 3, when most of the fleet settled for \$.70/lb. By July 4, virtually all districts were fishing simultaneously because of strong sockeye runs and escapements well ahead of schedule due to low fishing effort prior to that date.

By the time the price dispute was settled, several rivers had already exceeded their escapement goals and the remaining rivers were approaching theirs, so fishing time had to be very liberal to balance the catch to escapement ratio. Large harvests resulted and many of the companies were forced to limit or suspend buying operations until they could process the fish on hand.

Even after the boycott, salmon prices dropped significantly in comparison to 1990 (Table 38). The price for sockeye salmon dropped from \$1.93/lb. in 1988 to \$1.07/lb. in 1989, to \$1.04/lb. in 1990, to \$.70/lb. in 1991. Chinook salmon prices fluctuated from \$0.80 in 1989 to \$0.91/lb. in 1990, to \$0.68/lb. in 1991, chum salmon prices remained the same at \$0.22/lb., and coho salmon prices increased from \$0.67 in 1989 to \$0.74/lb. in 1990, then declined in 1991 to \$0.58/lb.. These figures do not include post-season bonuses, but as of February 1992, no companies are known to have paid additional amounts to their fishermen for the 1991 catch.

The first directed commercial fishery for chinook salmon in the Nushagak District since 1987 took place during the 1991 season, but due to the price dispute, few fishermen elected to participate. The majority of the 23,000 chinook salmon that were commercially harvested in the Nushagak District this season were taken incidentally in the sockeye fishery (Table 18). Consequently, many of the fish landed were blushed and did not command top prices.

The value of the combined commercial salmon inshore harvest in 1991 was estimated at \$109.2 million to participating fishermen, a substantial reduction from the record \$200.4 million paid during the 1990 season (Table 38 and Appendix Table 37). This was the ninth consecutive year that the exvessel value has exceeded \$100 million.

During the 1991 season in Bristol Bay, 10 companies canned, 31 companies froze and no companies cured salmon. In addition, 10 companies exported fresh fish by air, and 11 companies shipped salmon out by sea in refrigerated sea water (RSW)

or brine (Table 35) A total of 36 processors/buyers reported catches in Bristol Bay 1991 compared with 72, 62, 59, 59, 48, 30, 57, 42, 37, and 36 in the years 1982-1991 (ADF&G 1982-91).

Run and Harvest Performance by Species

The combined commercial salmon harvest in Bristol Bay totaled 27.7 million fish (Appendix Table 10). That catch is the seventh largest in the past 20 years (1972-91) and ranks in the top ten in the 99-year history of the commercial fishery.

Sockeye Salmon

The 1991 inshore sockeye run of 42.3 million fish was 41% greater than the preseason forecast (Table 1 and 4). The actual run was also 19% greater than the 10-year average (35.5 million fish) (Appendix Table 20). The total run of sockeye salmon exceeded the preseason forecast in all districts in 1991 (Table 1). Runs to individual districts were: 32% greater than the forecast for the Naknek/Kvichak District; 9% greater than the forecast for the Egegik District; 57% greater than the forecast for the Ugashik District; 104% greater than the forecast for the Nushagak District; and 116% greater than the forecast for the Togiak District.

Sockeye salmon dominated the inshore commercial harvest, and totaled 26.2 million fish (Table 4). The 1991 harvest was 56% greater than the 20-year average (16.8 million)(Appendix Table 5). Sockeye escapement goals were met or exceeded in 1991 in all river systems where spawning requirements have been defined except the Nushagak River, which came in at 90% of its goal of (495,000 of 550,000) (Table 1).

Chinook Salmon

A new management approach was taken by the Alaska Board of Fisheries for the 1988 season due to concern for the future of chinook stocks in Nushagak and several other districts. Several regulations were adopted by the Board to provide a better opportunity to achieve viable escapements. The season opening date was changed to June 1 for all districts, the "king line" in Nushagak was abolished,

Egegik and Ugashik Districts went to a 4-day fishing schedule before and after the emergency order period, the emergency order period in the Nushagak District was adjusted to begin on June 1, and the management staff was given emergency order authority to reduce mesh size in Nushagak District (if necessary). These regulations are still in effect and were used by staff to reduce both directed and incidental chinook harvests. In addition, the commercial fishing schedule in the Naknek-Kvichak District was reduced from 5 days to 4 days per week prior to June 23, and a sport angling harvest reduction in portions of the Naknek River was implemented to encourage escapement. Very conservative early season commercial fishing schedules were also followed in the Egegik and Togiak Districts to provide extra protection to escapement. Each of these measures proved helpful.

Chinook catches in all districts were far below recent averages (Appendix Table 6). The 1991 bay-wide commercial harvest of 36,000 chinook was the third smallest since 1950, and comprised only 34% of the 20-year average (1972-91) harvest of 108,000. This was the sixth consecutive year that the chinook harvest has fallen below the 20-year average.

The Nushagak District is the primary producer of chinook salmon in Bristol Bay, and is the only district for which a chinook salmon forecast is generated. The 1991 preseason forecast for the Nushagak District chinook run was 119,700 fish (Appendix Table 1). With an escapement goal of 75,000, a small harvestable surplus was anticipated. The actual commercial harvest in the Nushagak District totaled 23,000, up from the extremely low catch of only 14,000 in 1990. In light of a stronger than expected run, the first directed opening for chinook since 1987 was announced on June 24. However, due to the price dispute, only a small number of permit holders elected to participate in the harvest. By the time a price settlement was reached on the evening of July 3, the chinook run was nearly over and escapement in Nushagak River totaled over 135,000 fish, 80% greater than the desired goal of 75,000 (Table 27).

The Togiak District harvest of 7,000 chinook salmon was only 31% of the 20-year average of 22,600 (Appendix Table 6). Chinook escapement in Togiak drainage was estimated at approximately 8,400 salmon, slightly below the goal of 10,000, despite a prolonged closure of the commercial fishery during the last two weeks of June, and an extended boycott by the fishermen.

Chum Salmon

The inshore commercial harvest of 1.3 million chum salmon was slightly above the 20-year average of 1.2 million (Appendix Table 7). Chum catches in the Nushagak, Togiak, Egegik and Ugashik Districts were slightly above the 20-year averages for those districts, while the chum catch in the Naknek-Kvichak District was 61% greater than the long-term average.

Escapements to the Nushagak and Togiak systems were 252,000 and 149,000 fish, respectively (Appendix Table 31). The provisional escapement goal is 350,000 fish for the Nushagak River and 200,000 fish for the Togiak. Extensive fishing authorized to harvest excess sockeye was at least partially responsible for relatively weak chum escapements in most districts.

Pink Salmon

Bristol Bay has a dominant even-year pink run, and runs in all districts in 1991 were orders of magnitude lower than the 1990 run (Appendix Table 8). The bay-wide harvest of only 401 pink salmon was considered normal for this year in the cycle.

Coho Salmon

The bay-wide commercial harvest totaled 118,000 fish, considerably less than the long-term average catch of 187,000 fish, and only 49% of the 10-year average (239,000 fish) (Appendix Table 9). Coho runs were disappointingly small in both the Nushagak and Togiak Districts (Appendix Table 35). The Nushagak District, which normally produces 43% of Bristol Bay's coho harvest, accounted for less than 5% of the total inshore harvest in 1991. Coho catches were slightly above the recent 10-year average in the Naknek-Kvichak, Egegik, and Ugashik Districts (Appendix Table 9).

Due to the extremely poor run of coho in 1987 in the Nushagak District, the primary producer in Bristol Bay, a less than average run was expected in 1991 (Appendix Table 35). Therefore, fishermen were warned prior to the season to expect a total closure of the fishery in late July, until the strength of the run could be determined. Production was even poorer than anticipated, and in

addition to the closure in the commercial fishery, the sport fish bag limit was reduced from 5 per day to 1 per day, and the subsistence fishery was reduced from 7 day per week fishing to three 24-hour periods per week. Coho escapement estimated at the Portage Creek sonar project totaled 41,000 fish, only 27% of the provisional goal of 150,000 fish (Table 27).

Fishing time in the Togiak District was reduced by emergency order in the beginning of the coho run, and ultimately closed completely in an attempt to attain the provisional escapement goal of 50,000 fish for that river. The estimated total coho escapement in the Togiak River for 1991 was 25,560 fish, just over one half of the season end goal (ADF&G 1992). The coho return to the Kulukak Section was also a poor one, but due to the absence of a buyer, no commercial harvest was reported in that section in 1991. Despite the fact that there was not a fishery, the escapement in that drainage (12,600 fish) was still less than the provisional goal of 15,000 fish.

Commercial fishing time was reduced by emergency order at times in all of the east-side districts in an effort to secure desired coho escapement.

Season Summary by District

Naknek-Kvichak District

The total run of sockeye salmon to the Naknek-Kvichak District was projected at nearly 14.1 million fish (Table 1). Escapement goals were set at 4.0 million (range 4.0-6.0 million) for the Kvichak River and 1.0 million (range 0.8-1.4 million) for the Naknek River. The district harvest forecast totaled nearly 9.0 million sockeye. The actual run to the district totaled more than 18.6 million sockeye, and the actual harvest totaled over 10.6 million. The 1991 catch was the eighth largest in the Naknek-Kvichak District over a 20-year period from 1972-1991 (Appendix Table 13).

Preseason management strategy for sockeye salmon called for several openings early in the run to monitor both run size and age class in the district. Catches and age composition at False Pass and Port Moller would be monitored for any marked differences from the forecast. Commercial catches and age class in the Egegik and Ugashik Districts would also be closely monitored.

No forecast is made for chinook salmon in the Naknek-Kvichak District. King catches have been declining in the district over recent years even though effort levels have been increasing (Appendix Table 6). A 500% increase in effort over the last twenty years prior to the emergency order period resulted in a reduction in the weekly fishing schedule from five to four days a week. In addition gillnet mesh sizes larger than 6.75 inches were prohibited.

The 1991 salmon season in the Naknek-Kvichak District started on June 3. The first recorded commercial landings occurred on June 10, and were comprised of small catches of sockeye and chinook salmon (Table 15). Effort was lower than normal during the second week of the season due mainly to a price dispute between fisherman and the processors. The first significant catches occurred on June 17 after the 3-day weekend closure. Catches at this time were very similar to the 20-year average for the district. Fishing ended for the week at 9 a.m. Friday June 21, with the harvest totaling 92,000 sockeye, 1,950 chinook and 3,500 chum salmon. The sockeye catch for the pre-emergency order period was below average, while the chinook and chum catches were average, based on the 10-year district average.

The emergency order period started at 9 a.m. on June 23. Prior to this on June 22 the Kvichak Tower project started counting. The Naknek River tower started their counts on June 23. A district test boat was sent into the Naknek Section on June 24 to assess the run strength that could be building (Table 8). With such a strong run being forecasted to return to the Naknek River it was felt that keeping on top of the run from the very beginning was important to prevent overescapement. The test boat had its highest indices in front of Pederson Point and at the Ships Anchorage. The indices showed some strength but not enough to warrant an opening. On June 26 a second testboat was sent out into the Naknek Section to access run strength. The highest index occurred at the mouth of the Naknek River, the indices elsewhere in the section were low (Table 8). By this point in the season the fishermans boycott was in full swing with both gear types participating. Concern for public safety if a commercial fishery was to occur prompted action by the state's top level officials. At approximately 9:00 a.m. on June 26, Carl Rosier, the Commissioner of the Department of Fish and Game, canceled the impending Egegik District opening and all Bristol Bay commercial fishery openings until further notice.

The Port Moller test fishery on June 26 estimated that 20.4 million fish had passed enroute to Bristol Bay. The Naknek River escapement was three days ahead of schedule with the Kvichak escapement five days behind. It was still to early in the run to become concerned about the Kvichak, and the concern was focused on the rapid rate of escapement in the Naknek River. The district test boat went out again on June 27 and had a strong showing of fish at the buoy on the Johnson Hill line. With the commercial fishery closed, no catch information was available to evaluate the run strength, the only management tool that was available was district test fishing. With that in mind another test boat was sent out on June 28. This trip turned up the highest indices to date, at the mouth of the Naknek River and in the area around the Johnson Hill line (Table 8). Kvichak inside test had a daily index of 1500, three times that of the day before (Table 28). At this point the majority of the run strength in the district was centered around the Naknek River with some fish showing in the Kvichak. The Naknek River escapement was at 30% of its point goal as of 1800 hours on June 28, while the Kvichak escapement was at slightly less than 1% of its point goal.

By 10:00 a.m. June 29, the cumulative sockeye count past Naknek Tower totaled 370,000 fish. Kvichak Tower had counted 75,000 fish as of 10:00 a.m. with

another 200,000 fish estimated in the river below the tower. An injunction that was filed challenging the governors authority to close the fishery for non-biological reasons was ruled on and passed. At 3:00 p.m. fisherman were notified of a 12-hour period starting at 2:30 p.m. June 30, for the entire district. An aerial survey was flown of the district and 160 boats and 21 setnets were observed fishing. Of the boats that were registered for the Naknek-Kvichak district the number seen fishing constituted approximately 20%. A river survey of the Kvichak yielded a count of 400,000 fish, and inside test indices picked up on the evening drifts with the highest cumulative for two drifts so far this season (Table 28). The June 30 opening yielded a catch of 355,000 sockeye, bringing the cumulative sockeye harvest to 455,000 (Table 15).

The count past the Naknek Tower as of 6:00 p.m. June 30 was approximately 1 million fish, with an hourly passage rate of 21,000 fish/hour. This was ten days ahead of the long-term average. The Naknek Section was extended for an additional 25.5 hours until 4:00 a.m. July 2, and the Kvichak Section was left closed to allow for additional fish to move into the river. An aerial survey of the Kvichak River was flown on July 1, and resulted in a count of 700,000 fish. At 6:00 p.m. an announcement was made extending the Naknek Section 12.5 hours and opening the Kvichak Section to both gear types for the same time period. The catch for July 1 was 740,000 fish, the catch for July 2 was 850,000 fish (Table 15)

The fishing period for both sections was extended 25 hours until 5:30 p.m. July 3. This action was taken based on the following: the count past the Naknek Tower was two million fish as of 10:00 a.m. on July 2, with a passage rate of 26,000 fish/hour. The count past the Kvichak Tower was 700,000 with an estimated 1.2 million in the river, bringing the total escapement to 1.9 million, which was one day ahead of the long-term average. The catch for this period was 710,000 fish. Port Moller as of July 3 estimated a passage of 35 million sockeye headed toward Bristol Bay (Table 6). To date, 10.3 million had been accounted for in the catch and escapement. A 25-hour extension for the Naknek Section was announced at 12:00 noon on July 3, and an 11.5-hour extension was announced in the Kvichak Section for setnets only. The Naknek Section was extended due to excessive escapement, which at 10:00 a.m. totaled 2.4 million fish (1.0 million past the upper range of the escapement goal). The Kvichak Section was opened to setnets only because of the substantial drop in test fish indices on the morning tide.

Without a large push of fish, fishing both gear types could jeopardize the escapement, while allowing only setnets would not. A district survey was attempted, but due to extensive fog banks only 20% of the district could be flown; we could not fly the Johnson Hill line where the majority of the boats were fishing, but the boats and setnets that could be seen had decent catches. In addition to the district survey a Kvichak River survey was flown. Large numbers of fish were observed moving in the lower half of the river, above Egg island the band of fish moving upstream was six to seven fish wide. The survey yielded a inriver estimate of 1.0 million fish. The tower had counted 1.0 million by 2:00 p.m. giving a total escapement of 2.0 million, two days ahead of the long-term average. Based on this a 13.5-hour extension was announced for the Kvichak Section for both gear types until 6:30 p.m. July 4.

Price negotiations were continuing while the peak of fish movement was occurring bay-wide. The numbers of fisherman that were leaving the beach to fish were steadily increasing. Late in the evening of July 3 an agreement was reached between the processors and the fisherman on the price of \$0.70 per pound, and the entire fleet then went fishing. The catch for the July 4 period was the largest of the season totalling 1.4 million sockeye (Table 15). Several of the processors in the district suspended buying for 24 hours and several more put their fisherman on limits. The Naknek Section was again extended, this time until 7:00 p.m. July 5. The Kvichak Section was extended to setnet only until 12:00 noon July 5. The drift fleet was not allowed in the Kvichak Section due to declining test fish indices that signalled a slow down in the movement of fish into the river.

The July 5 Kvichak River survey estimated 500,000 fish inriver with 1.7 million past the tower as of 2:00 p.m.. This put the Kvichak escapement one day behind schedule. The catch for July 5 dropped dramatically from the previous days high of 1.4 million to 500,000. This is partly due to the drift fleet being kept just in the Naknek Section and that on July 4 a large push of fish came through the district. The Naknek Section was extended again for 25 hours until 8:00 p.m. July 6. The Kvichak Section was extended for setnet only until 6:00 a.m. July 6. The catch of 475,000 fish was lower than the previous days. Yet again on July 6 the Naknek Section was extended an additional 25 hours until 9:00 p.m. July 7, while the Kvichak Section was left closed. A district survey on July 7 revealed approximately 525 boats fishing, the majority of which were at the

Johannon Hill line with the rest of the fleet spread out along the Ships Anchorage. The best catches seemed to be occurring just north of the buoy. We flew for five minutes south of the district looking for signs of fish movement and counted 27 jumpers out of both sides of the plane. The section's catch for July 7 of 700,000 fish was up from the previous day (Table 15).

A 15-hour extension for the Naknek Section was announced at noon on July 7 until 12:00 noon July 8. This was necessary to harvest the fish in excess of the escapement which, as of 11:00 a.m. July 7, was 2.9 million fish, (1.9 million over the point escapement goal). The Kvichak Section was not opened to either gear group for fear of jeopardizing the escapement which was lagging one day behind schedule. The Naknek Section was allowed to close at noon on July 8 after eight continuous days of fishing. The catch for the period was 750,000, actually higher than the previous day's catch with 24-hours of fishing compared to just 12 hours on July 8. The closure was needed to allow for a portion of the late run to escape into the Naknek River since the continuous fishing had cut off the escapement to a rate of just 340 fish/hour.

A Kvichak River survey during the afternoon of July 8 turned up very few fish in the river. A district test boat was sent out into the Kvichak Section to try and locate some sign of fish movement, they were not successful. That evening an aerial survey was flown of the entire Kvichak Section. The only signs of fish that were observed were in the Deadman Sands area. The inside test fishery did pick up on the evenings tide with a 2-drift average of 5,000 index points. The Naknek Section was reopened at 8:00 a.m. July 9 for 25.5 hours. The Kvichak Section remained closed to facilitate escapement into the Kvichak River. A river survey was flown in the afternoon of July 9 and 350,000 fish were observed in the Kvichak. The district test boat in the Kvichak Section had the lowest test fishing indices of the season. A district survey showed good catches around the Libbyville area for both gear types. The boats fishing just north of the buoy and along the "Y" were doing well. The catch for the Naknek Section on July 9 was 650,000 fish, bringing the district catch to 6.8 million (Table 15).

The Naknek Section was extended until 11:30 p.m. July 10, the Kvichak Section was opened to setnet only from 9:30 a.m. until 11:30 p.m. July 10. A survey of the Kvichak River was done early in the day of July 10, and showed approximately 800,000 fish in river. 2.5 million had passed the tower as of 3:00 p.m.. Based

on these numbers, a 6.5-hour opening for the Kvichak Section was announced for both gear types. This opening would relieve some of the overcrowding problems of the entire fleet having to fish in the Naknek Section but would only give the drifters the ebb tide. With just the ebb tide to fish the impact to the potential escapement of the Kvichak should be minimal. The Naknek Section was extended until 3:00 p.m. July 11. The July 10 opening produced a catch 770,000 sockeye.

A midmorning survey of the Kvichak River turned up approximately 600,000 fish in the river, which, combined with the tower count through 12:00 noon, totaled 3.4 million fish. This put the escapement on schedule but with no wiggle room whatsoever. Additionally, the early morning inside test fish drifts were down from the previous day. With these factors in mind the Kvichak Section was extended for setnets only until 12:00 midnight, July 12, and the same extension time was given for the Naknek Section for both gear types. The district catch for the period was 350,000 fish which brought the cumulative catch to 8.7 million sockeye (Table 15).

The Naknek Section was extended 18 hours until 6:00 p.m. July 13. The Naknek River tower counts through noon on July 13 was 3.2 million fish, 1.8 million more than the upper range of the escapement goal. The inside test fish indices stayed low in the Kvichak. With only 3.7 million past the Kvichak Tower and very few fish left in the river and even fewer moving in on the day's tide, the Kvichak Section would remain closed. The Naknek Section was allowed to close at 6:00 p.m. on July 13. This closure was necessary to facilitate later escapement into the Naknek River for sockeye, chum and kings. Some of the drift boats started to pack it up for the season with this closure.

A 25-hour opening for Naknek Section was announced that would start at 2:30 p.m. July 14 and run until 3:30 p.m. July 15. An aerial survey of the Kvichak River was conducted early in the day of July 14, and 80,000 fish were observed from the test fishery to the tower. Added to what had already passed the tower as of 12:00 noon gave us a cumulative escapement of 3.7 million fish. The inside test fishing indices were still low, showing very little movement of fish into the lower river. The catch for the Naknek Section for July 14 was 140,000 sockeye and 6,000 chums (Table 15).

The Naknek Section was extended 41.5 hours which would bring it to the end of the emergency order period. The Kvichak Section was opened at 4 a.m. July 16 for a 28-hour period, which would also end at the end of the emergency order period. The Kvichak River escapement was 3.75 million, just over 200,000 fish short of the 4.0 million escapement goal. Historically, 13% of the escapement has entered the river after July 15, which left as many as 400,000 additional fish that could enter the escapement. The catch in the district up to the end of the emergency order period totaled 9.9 million sockeye (Table 15).

The emergency order period expired at 9:00 a.m. July 17 and the district fishery reverted to a weekly fishing schedule of four days per week. Sockeye catches continued through July and August with a cumulative district harvest of 10,558,304 fish. The last fish was bought in the district on August 28. A total of 26 buyers purchased fish in the Naknek-Kvichak district. The coho harvest numbered 16,517, slightly below the 4-year average since the development of the fall fishing coop (Appendix Table 9). The chum harvest totaled 430,453 fish, the third highest in the past 20 years (Appendix Table 7). The chinook run was weak throughout Bristol Bay and the run to Naknek-Kvichak District provided no exception. The commercial harvest of 4,528 chinook was the third lowest since 1978 (Appendix Table 6). Subsistence catches are shown in Table 39 and do not reflect anything out of the ordinary.

Egegik District

The 1991 sockeye salmon run to the Egegik District totaled 9.6 million fish, the third largest run on record trailing only runs of 12.3 million in 1990 and 10.3 million in 1989. It exceeded the preseason forecast of 8.2 million and yielded the fourth largest commercial harvest on record over the 97-year history of the fishery, 6.8 million fish (Table 1). The 1991 escapement of 2.8 million fish is the largest on record and far exceeded the point goal of 1.0 million fish. Total sockeye runs during comparable cycle-years dating back to 1956 have ranged from 1.8 to 6.0 million fish and averaged 3.3 million, thus the 1991 run ranks as the largest on record for this cycle-year (almost three times the cycle-year average).

The preseason forecast projected the Egegik District to have the second largest harvestable surplus of sockeye salmon in Bristol Bay, roughly 7.2 million fish,

trailing only the 8.9 million harvest predicted for the Naknek-Kvichak District (Table 1). Thus the fishing public was very interested in the management philosophy to be employed in the district for the season. Since regulations remained the same as those in effect in 1990, the only real management questions from the fleet as the season approached concerned: 1) the amount of early-season fishing time to be authorized after the onset of the emergency order Period (June 16) and, 2) how management would respond to any conservation problems in adjacent districts in spite of a strong Egegik sockeye run. Fishermen were informed that early-season chinook run strength indicators and sockeye escapement indices would influence mid-June fishing time. They were also advised of the Board of Fisheries recommendation in 1990 concerning how to respond to a run crisis in an adjacent district (moving the west Egegik line shoreward from the 9990-Z-45135 line to the 9990-Z-45110 line) provided that Egegik interception was documented as contributing directly to the problem (the west Egegik boundary would revert back to the 9990-Z-45135 line when the crisis in the adjoining district abated to the point that commercial fishing resumed in that district).

The 1991 salmon season began in the Egegik District on June 3 and initial salmon landings were recorded June 10, with small catches of sockeye, chinook, and chum salmon represented (Table 16). Due to an unsettled controversy over fish prices very few fishermen participated in the initial days of the fishery. Notably absent from the early-season fishing effort were the setnet fishermen. Small daily catches were recorded through June 14 as only a few buyers were present; the fleet was just getting geared-up, and the price dispute was getting more intense. The fishery went on emergency order management at 9:00 a.m. June 16 and the fleet was notified that at least one commercial opening would occur during the interval known previously as "Free Week" (June 16-23). As of 9:00 a.m. June 16, the harvest totaled just 700 sockeye, 40 chinook, and 25 chum salmon, far below normal for all three species (historic catch records from 1960-1987 indicated cumulative district harvests through June 15 generally averaged 2,200 sockeye, 400 chinook, and 160 chums).

Test fishing to provide daily estimates of sockeye passage into Egegik River began June 15 in the lower river near Wolverine Creek (Table 29). The Egegik River salmon counting tower, which provides daily estimates of sockeye passage into Becharof Lake, began operation on June 23 (Table 26).

Following the onset of the emergency order Period, commercial fishing in the district remained closed until June 21 as sockeye numbers in the lower portion of Egegik River increased slowly. This closure provided needed protection for chinook salmon entering the Egegik escapement as it was apparent (judging from the June 10-14 catch data) that the chinook run was not strong. It also provided an opportunity for early run sockeye to enter the escapement. By June 19 the inriver test fishing results (Table 29) indicated approximately 31,000 sockeye had entered the lower portions of Egegik River. With only an estimated 1,100 sockeye already accounted for in the harvest through June 19 (commercial plus test fish catches), this level of early escapement was sufficient to justify an early fishing opening (the sockeye catch to escapement ratio was 1:28). Thus an 11-hour fishing period was announced for June 21 (Table 16).

The June 21 fishery lasted from 6:30 a.m. until 5:30 p.m. and yielded commercial catches of approximately 21,000 sockeye, less than 100 chinook, and 300 chum salmon. This level of sockeye catch was far below that taken on the same day during the last three years (69,000 in 1990, 171,000 in 1989, and 292,000 in 1988), and slightly below the 1960-87 (28-year) average of 28,000 fish. The lower than usual catch was due in part to a smaller than normal fishing effort (a total of 208 drift and only 17 set gillnets were fished during this opening), as well as a lack of run strength in the outer district. The drift effort was about normal but setnet effort was far below usual (normal would have been approximately 130 setnets). The setnet fishermen met with buyers prior to the opening and were reportedly offered prices in the \$0.47-\$0.55 per pound range for their sockeye harvest so they decided to boycott the opening as these prices were much lower than prices the past three years. Some drift fishermen also joined the boycott while others went fishing on an "open ticket" (no declared price). Those that fished experienced a lower than usual catch per drift delivery (90 sockeye/landing versus the historic average of 245/landing) indicating the run had not really arrived in strength in outer district drift lanes. Given the lower than expected sockeye and chinook harvests on June 21 the fishery remained closed to promote early escapement.

Sockeye harvest results through June 22 from the South Unimak and Shumagin Islands intercept fisheries were providing mixed signals to inshore managers. The Shumagin Islands fishermen had achieved their harvest quota without much difficulty, but South Unimak fishermen were having a difficult time as they had

not yet reached half their sockeye quota. Meanwhile, through June 22 the Port Moller test fishery indicated the highest sockeye catch indices since 1985, suggesting a large run was headed for the inshore waters of Bristol Bay. Given these mixed signals, and the considerable controversy that was increasing daily among the fleet and processing industry concerning fish prices, managers were faced with some tough strategy decisions. If the Port Moller test indices were correct in predicting a strong run, and if the fishing boycott movement continued to grow, it was quite probable the remaining fleet committed to fish would not be able to stop the fish when they began to migrate into the rivers in force. Thus liberal fishing time would be the preferred approach to prevent under harvest. On the other hand, if the South Unimak results were more indicative of the sockeye run strength, liberal fishing might not be the best approach inshore until run strengths to the individual districts of the bay became more apparent. After considering these circumstances and the apparent weakness of the chinook run, and given the management goal of obtaining at least 10% of the sockeye escapement goal from the early portion of the run, the Egegik District fishery remained closed for the next several days.

Approximately 2,100 sockeye were counted that first day of operation (June 23) at the Egegik River counting tower (Table 26). Small numbers of fish passed the towers for the next couple of days, and inriver test fishing results farther downstream began to improve (Table 29). By 12:00 noon June 25 the estimate of cumulative sockeye passage into Egegik River, based on inriver test fishing, exceeded 100,000 fish (9,600 of which had been counted past the towers). Since it appeared fairly certain that 10% of the desired escapement from the early part of the run was safely in the river a 12-hour commercial fishery opening was announced for June 26 (10:30 a.m.-10:30 p.m.).

By this point in the season the fishermen's boycott had spread to both gear groups across all districts in Bristol Bay. Major processors and their fleets were still far from accord with regard to fish prices. To show support for boycotting fishermen and to call attention to local economic impacts of low fish prices many merchants in communities around the bay area staged a one day business closure on June 25. With fisheries closed throughout the bay June 25 to obtain early escapements and with nearly all businesses closed many fishermen spent the day at various rallies and strategy sessions in local ports. Lieutenant Governor Jack Coghill made a fact finding trip to the area, addressed

the fishermen in Naknek, met with the Fish and Game commercial fisheries staff in King Salmon, and then left late in the day June 25 to take his findings back to the Governor's office.

By late evening June 25 there began to be indications that some consideration was being given by top level advisors in the State administration to canceling the June 26 Egegik opening. Concern for public safety in the event the fishery was allowed to proceed was a main element in the discussions. It was recognized that a portion of the fleets would try to fish in spite of the informal boycott while others would try to interfere with or prevent them from fishing...a volatile situation. At approximately 9:00 a.m. on June 26 the commercial fisheries management staff in King Salmon received notification from Department of Fish and Game Commissioner Carl Rosier to cancel the 10:30 a.m. opening. A news release was issued from Governor Walter Hickel's office explaining the cancellation decision. Its text read as follows:

"The team I sent out yesterday, which was led by Lieutenant Governor Coghill, reported back to me that Bristol Bay is a volatile situation. The people of the region and its fishermen are frustrated with the silence of the processors, the uncertainty of a price, and the large number of salmon now beginning to enter the rivers. I understand that emotions run high at a time like this."

"To help relieve the tension, get to the bottom of the problem, and to ensure an orderly fishery, I am having the Egegik opening scheduled for 10:30 a.m. today postponed. We have made arrangements to schedule a meeting of representatives of all the processors and the fishermen to exchange information on the market, the expected run, and on existing inventory levels. Price will not be discussed as required by law. I have sent Commissioner of Labor Nancy Usera to chair this meeting."

"The people of the Bristol Bay region need to know the facts, and the only immediate solution is to talk. We must lift the veil of silence which divides the industry, both fishermen and the processors."

Per the above instructions the fishing period was canceled without delay. News media broadcasts, telephone calls, and radio broadcasts were made to fleet and processors to alert them of the action and prevent unauthorized fishing. In addition to the above instructions the area commercial fisheries management staff was advised to clear any future openings through the headquarters staff until notified otherwise.

Commissioner Nancy Usera & Deputy Commissioner John Abshire (Dept of Labor) arrived June 26. They brought a labor mediator (Mr. Jerry Thorn) with them and met with fishermen and a few processors in a public forum at Naknek. No immediate resolution of the impasse was forthcoming and the commercial fishery remained closed baywide. Commissioners Carl Rosier (Dept of Fish and Game) and Richard Burton (Dept of Public Safety) arrived in King Salmon June 27 to oversee the conduct of the fishery and enforcement programs.

The fishery remained closed through June 29 as the sockeye escapement into Egegik River continued to increase (Table 29). The increase at the counting tower was a little slower than expected, however, and provided some uncertainty in identifying the appropriate multiplier to apply to inriver test fishing indices. The historic multiplier (70 fish per index point) seemed to provide abundance estimates higher than subsequent tower counts while using lag time estimators yielded multipliers that seemed too small.

By 10:00 a.m. June 29, the cumulative sockeye count past Egegik River tower totaled 68,000 fish. Another 200,000 fish were estimated downstream in Egegik River. These estimates suggested the escapement was well ahead of schedule. Similar circumstances were occurring in rivers of the Naknek-Kvichak and Nushagak Districts.

A legal challenge to the Governor's authority to close the fishery for other than biological reasons resulted in an injunction against such closures, and clearance was rendered to resume scheduling fishing periods even though the price dispute had still not been resolved. At 3:00 p.m. June 29, fishermen were informed that a 10.5-hour fishing period would be authorized for the district commencing at 1:30 p.m. June 30. A daylight opening with plenty of notice was chosen so that all gear groups wishing to participate would have ample opportunity to get in position and enforcement personnel would have the best chance to keep order.

The June 30 fishery opened under light NW winds and foggy conditions. No effort count was possible due to the fog but a partial aerial survey of the inner district waters at 3:30 p.m. documented few setnets or drift boats fishing inside Egegik Bay. Those that were fishing were making large catches. A total of 170 drift boats were noted anchored in Egegik Bay boycotting the opening. Survey conditions inland from the coast were good and a survey of Egegik River yielded estimates of 119,000 sockeye in Egegik Lagoon and another 170-200,000 in the river. Inriver test fishing June 30 yielded the highest index values of the season suggesting a large movement of fish into the lower river. This test fishing data, the visual confirmation of large numbers of fish present in clear portions of the river, and the fact that escapement past the counting tower was already ahead of normal, provided justification for extending the fishing period another 14 hours until 2:00 p.m. July 1.

The June 30 opening yielded a catch of 250,000 sockeye from approximately 200 drift boats and 13 setnets, based on delivery data. This brought the cumulative harvest to date to 296,000 sockeye, 100 chinook, and 2,200 chum salmon. Inriver test fishing results remained high on July 1 in spite of the fishery, so at 9:00 a.m. July 1 an announcement was made extending the fishery another 11 hours, until 1:00 a.m. July 2.

The July 1 harvest totaled 807,000 sockeye, the largest daily catch of the season. An aerial survey of the district at 8:00 p.m. July 1 yielded an effort count of 192 drift boats and 11 setnets fishing while another 179 drift boats were noted anchored. A survey of the river and lagoon yielded estimates of 215,000 and 110,000 sockeye respectively, while the cumulative tower count through 6:00 p.m. stood at 196,000. In total approximately 520,000 sockeye were visually estimated in the escapement past the fishery.

The pace of activity between fishermen and processors regarding sockeye prices seemed to increase at about this point in the season. Some of the smaller processors with fleets continuing to fish were working at near capacity levels. Those fishermen not boycotting were making very good catches and this was increasing the frustration of those that were boycotting. There were widespread rumors circulating of a concerted effort being readied by boycotting fishermen to disrupt continued fishing through occupation of drift lanes during openings,

cutting driftnets, and other forms of intimidation.

By July 2 the Port Moller test fishery was indicating that 30 million sockeye had passed, headed for Bristol Bay and additional fish were continuing to arrive at the test transect location. This was already in excess of the inshore preseason forecast (29.9 million). It was becoming quite evident that a strong run was in progress and building rapidly.

The fishery closed for 14 hours on July 2 to permit catch evaluation, allow processing to catch up with product volume, and provide a brief rest period to those policing the district. However, with escapement past the counting tower through midnight July 1 totaling 250,000 fish (a level normally reached July 4) and continuing strong inriver test fish indices suggesting heavy entry of fish into the lower river any pauses in activity would have to be short, thus at 9:00 a.m. an announcement was made re-opening the fishery for 24 hours effective at 3:00 p.m. July 2.

The July 2 opening commenced under light SW winds and foggy conditions. An aerial survey of the district was attempted at 7:00 p.m., but fog prevented coverage of most of the district. A survey of Egegik River yielded estimates of 195,000 sockeye in Egegik Lagoon and 187,000 in downstream areas. When added to the 374,000 fish already counted past the counting towers through 6:00 p.m. a total of 756,000 fish were visually confirmed in the escapement (approximately three quarters of the desired point goal).

The July 2 catch at Egegik totaled 527,000 sockeye and 2,500 chum salmon, bringing the cumulative sockeye harvest from the district to 1.6 million fish. By this point in the season fishermen in the neighboring Naknek-Kvichak District had achieved a harvest of 2.0 million sockeye, and the Ugashik District harvest had not yet gotten underway (28,000 fish). No stock separation results of Egegik sockeye catches were available but it was apparent the runs to the north were not experiencing a conservation problem. The Naknek River escapement goal had already been exceeded and the Kvichak River escapement was progressing ahead of schedule so there was not a compelling reason to move Egegik District boundaries from their normal configuration.

By 6:00 a.m. July 3 the Egegik River tower counts reached a cumulative total of

410,000 sockeye (a level historically reached July 8 on the average) so at 9:00 a.m. the fishery was extended for another 12 hours, until 3:00 a.m. July 4.

Price negotiations between fishermen and processors were ongoing as the historic peak of the run (July 4) approached. Fishermen of both gear groups were breaking away from the boycott in increasing numbers and beginning to fish as various price offers were offered and voted down by company fleets or the "fishermen's steering committee". Finally, late in the evening of July 3 the major processors and fishermen settled the price dispute agreeing to \$0.70 per pound for sockeye, and the full fleet went fishing.

The July 3 catch from the district totaled 658,000 sockeye, bringing the cumulative catch to 2.3 million (32% of the preseason harvest projection). The escapement count at Egegik River tower increased rapidly on July 3 reaching a cumulative total of 707,000 fish by midnight. The fishery closed for 14 hours on July 4 (after 36-hours of continuous fishing) and then re-opened at 5:00 p.m. for 23 hours (until 4:00 p.m. July 5). The short break was ordered to evaluate catch data, and process the July 3 catch. For several companies with fleets that had completely boycotted earlier openings the night of July 3 was their initial shakedown shift for the processing crew, so efficiency was not at peak levels yet. Three major companies announced they were suspending buying operations July 4 until they could get caught up with processing operations. By 7:00 p.m. July 4 there were 408 drift boats and 228 setnets fishing the district. They caught 522,000 sockeye.

The escapement point goal of 1.0 million sockeye for Egegik River was reached at the counting tower at midnight July 4, tying 1990 as the earliest on record this level of escapement has been recorded in the district. Therefore, effective at 9:00 a.m. July 5, the 48-hour transfer period for fishermen entering the Egegik District was waived per regulation 5AAC 06.370 (f).

Inriver test fishing indices dropped significantly on July 4 and again July 5 indicating full fleet operations were harvesting the available fish and curtailing fish movement into Egegik River. At this point in the run, due to achievement of the sockeye escapement point goal, the provisions of 5AAC 06.365, the Egegik District Allocation Plan, went into effect. These provisions require "to the extent practical, given the biological factors of the run, ... the

department manage the Egegik District to provide necessary closures after the point escapement goal has been reached to disperse fish throughout the district". Given the better performance in 1990 of 2-tide cycle closures in distributing fish to users throughout the district as compared to 1-tide cycle closures, a 2-tide cycle closure (27-hours) was effected following the close of fishing at 4:00 p.m. July 5. However, fishermen were notified that short notice announcements could be forthcoming if indicators from the district suggested rapid movements of large fish volumes were developing in the district. Otherwise the next opening was scheduled for 10 hours beginning at 7:00 p.m. July 6. The July 5 sockeye catch totaled 559,000 fish, bringing the cumulative catch to 3.4 million (47% of the preseason harvest projection). At least four major fish processors reportedly maintained purchasing suspension status through July 5, and at least one other imposed catch limits on its fishing fleet as companies struggled to catch up with the volume of fish now available for processing throughout Bristol Bay.

In an attempt to more closely assess fish movement through inner district waters during 2-tide cycle closures, two test boats were dispatched to fish a couple of short drifts inside Egegik Bay at 6:00 a.m. on the morning of July 6 (Table 9). One boat was assigned the channel on the north side of the bay near Wards Cove Fisheries cannery while the other fished the channel on the south side of the bay just off the Nelbro Fisheries dock at Egegik village. These drifts suggested only moderate levels of fish passage into the inner bay (average index = 668 fish/100 f/hr) and included some fish apparently backing out of inner bay waters, so a short notice opening was not authorized. Instead the fishery opened as scheduled at 7:00 p.m. July 6.

The July 6 opening occurred under sunny skies and near calm conditions. An aerial survey of the district at 8:00 p.m. yielded counts of 412 drift boats and 239 setnets fishing. Catches appeared to be good along outer district beaches and in outer district driftnets. Inner district setnets were experiencing poor to moderate catch success. The fishery closed on schedule at 5 a.m. July 7. Subsequent to the opening local residents and fishermen reported that fish had been seen finning in good numbers in inner bay waters earlier in the day and had probably gotten into the river prior to the opening. Inriver test fish indices July 6 bumped up a little but not to a large extent. The opening yielded a catch of 461,000 sockeye, while the cumulative escapement count at Egegik River tower

through midnight July 6 totaled 1.7 million fish.

Another 2-tide cycle "window" closure was scheduled for the remainder of July 7 to distribute fish throughout the district. At noon July 7 the next opening was announced for 11 hours to commence at 6:30 a.m. July 8. At 3:00 p.m. July 7 the fleet was put on "short notice" status in case a surge of fish into the inner bay developed before the next morning. They were informed two test boats would again be dispatched to check fish abundance from inner district waters during the evening and any decision to fish on short notice would be forthcoming by 9:00 p.m. At 5:00 p.m. a report was received from a processor that his fishermen were seeing lots of jumpers outside Coffee Point in the outer district. An aerial survey was quickly scheduled to investigate the situation and the entire district was surveyed under good viewing conditions at 6:30 p.m. with very little "jumper" activity noted. A second processor dispatched a tender to cruise portions of the outer district using a sounder to seek out schooling fish and reported finding no significant build-ups at 8:15 p.m.. By 9:00 p.m. only one of the test boats had reported results from one short drift on the south side of the inner bay yielding an index of 587. The tide was low enough that there was uncertainty as to whether the other test boat had been able to reach its fishing station and after not hearing from it by 9:00 p.m. the fleet was told the "short notice" alert was being canceled. At 9:15 p.m. the second test boat reported in with a very large index (4,540 fish/100 f/hr) from the Scow Chute on the north side of the inner bay. However, after having just released the fleet from short notice a little earlier it was not deemed possible to redirect everyone into an immediate fishing mode and get word of a decision reversal circulated adequately, so fishing remained on hold until the following morning.

The July 8 opening occurred under light SE winds and foggy skies. The fog precluded surveying the district but reportedly inner district set and drift gillnets did well at the beginning of the period. Most of Egegik River was surveyable at 8:30 a.m. and an estimated 200,000 fish were seen migrating upstream through the lower half of the river. Another 70,000 were estimated present in Egegik Lagoon. It was apparent a good sized volume of fish had entered the lower river recently, although inriver test fishing indices did not increase as dramatically as expected, given the visual confirmation of these fish. The abundance of fish in the lower river was sufficient to indicate that a shift from 2-tide to 1-tide cycle closures was necessary at this point if

additional large escapement increments were not desired during "window" closures. Thus the period closed on schedule and at noon July 8, an announcement was broadcast scheduling the next opening for 7:30 a.m. to 5:30 p.m. July 9.

The July 8 catch totaled 482,000 sockeye bringing the cumulative catch to 4.3 million fish. Escapement past Egegik Tower through midnight July 8 totaled 2.2 million sockeye (twice the escapement goal) and daily counts were dropping. To the north the Naknek-Kvichak catch totaled 6.6 million sockeye and the escapements were ahead of long-term average rates. To the south, the Ugashik District cumulative sockeye catch totaled 711,000 fish and escapement past Ugashik River tower totaled 209,000 fish, with 300,000 more indicated in the Ugashik River downstream. Thus there was no justification at this time to make adjustments in the Egegik District for conservation reasons.

The district fishery re-opened as scheduled July 9 after a 1-tide cycle closure. This opening occurred on a 7.6 ft holdover low tide coming back to a 16.9 ft small flood. Winds at the opening were SW 15 and the district was again fogged in. At noon July 9 an announcement was made extending the open period another 14 hours until 7:30 a.m. July 10, to allow the next opening to be scheduled on a big flood tide (alternating big and small flood tide openings has proven to be a method of insuring that setnet fishermen throughout the district get a chance at fish migrating along the beaches). The July 9 catch totaled 481,000 sockeye and was mainly comprised of fish caught from outer district areas.

Over the next several days (July 10-17) the district was managed on a similar basis with a schedule that alternated 1-tide cycle "window" closures with five openings. The fishing periods were staggered such that big flood tide openings were alternated with small flood openings. The escapement was continuing to receive small to moderate increments each day throughout this interval, reaching 2.7 million fish by midnight July 17, so the only reason continuous fishing was not in effect was due to the directive of 5AAC 06.365.

The emergency order Period expired at 9:00 a.m. July 17 and the district fishery reverted to a fixed four days per week fishing schedule (9:00 a.m. Monday through 9:00 a.m. Friday). As July 17 fell on a Wednesday and as the sockeye escapement achieved by that date was nearly triple the point goal an emergency order was issued extending fishing through the scheduled weekend closure of July 19-21.

Thus the fishery ran uninterrupted from 4:00 a.m. July 17 through 9:00 a.m. July 26.

Sockeye landings continued in the district throughout July and August (Table 16), reaching a seasonal cumulative total of 6,800,798 fish. Sockeye escapement counts at Egegik River tower continued through July 22 reaching a total of 2,786,880. Aerial surveys of King Salmon River added another 45 fish to this total, bringing the Egegik drainage sockeye escapement total to 2,786,925 fish. The peak passage period at Egegik Tower was the interval from July 3-7 with daily average passages of 324,000 fish. Each segment of the run was well represented in the escapement. The sex ratio in the escapement was 46% males to 54% females.

The age composition of the 1991 Egegik District sockeye run was as follows:

<u>Age Group</u>	<u>Catch</u>	<u>Escapement</u>
1.2	9%	8%
2.2	36%	48%
1.3	40%	31%
2.3	14%	10%
Other	<u>1%</u>	<u>3%</u>
Totals	100%	100%

Most of the run were progeny of the 1986 escapement of 1.15 million fish.

Egegik District fishermen harvested 71% of the Egegik inshore sockeye run, just below the 39-year average of 73% (1952-90). Preliminary catch data indicates drift gillnets took 90% of the sockeye harvest while set gillnets took 10%. Historically (1960-90), drift gillnets have taken an average of 88% of the catch while set gillnets have averaged 12%. Peak day in the harvest based on volume landed (807,000 sockeye), and catch per unit effort was July 1. Peak catch per hour occurred July 2.

During the emergency order Period (June 16-July 17), a total of 245 hours were fished in the district, 33% of the 744 hours available. This total was up slightly from the 212 hours fished in 1990.

The commercial harvest of other salmon species totaled 118,000 fish, 2% of the

total district harvest. The chinook harvest was less than 500 fish, the lowest catch since 1975 and far below the 20-year (1971-90) average harvest of 3,000. Part of this drop in chinook harvest was due to the reduction in fishing time during the June 16-23 period. Historically, 31% of the chinook harvest occurred during days that were closed to fishing during this time period in 1991. Even accounting for these missed fish however, the chinook run was very weak. The district chum harvest totaled 71,000 fish, the weakest catch since 1979 and slightly below the 1971-1990 average of 83,000. Heavy fishing during mid-July in recent years to harvest excess sockeye has negatively impacted chum escapements and this lower than usual catch may be reflective of that situation. The pink salmon harvest totaled approximately 100 fish, normal for an off-cycle year. The district coho salmon harvest totaled 46,000 fish, just above the 1981-90 ten-year average.

Aerial surveys were conducted in the Egegik and King Salmon River drainages to provide escapement indices for chinook and chum salmon. The resultant escapement indices totaled 553 chinook and 3,420 chums. These survey indices compared quite closely to ground level counts of these same species by personnel of the U.S. Fish & Wildlife Service conducting rainbow trout research in the King Salmon River drainage. The chinook index was the second lowest recorded since surveys were begun in 1982 while the chum index was the lowest on record. Funding was not available to conduct coho escapement surveys. These data indicate the chinook run is still struggling (very low catch and low escapement). The chum run is beginning to show signs of stress as emphasis on harvesting the large sockeye run that overlaps its peak results in less than desired chum escapement levels.

A total of 28 buyers operated in the district during the season, down from 32 in 1990 (Table 35). Most of the harvest was taken aboard floating freezer processors or tendered to other districts for processing. There were no additional shore-based buyers. There were several instances during the July 3-6 time period when individual buyers reached processing capacity limits leading to at least four companies suspending buying for short periods and at least one other company fleet being placed on daily delivery limits. This was inconvenient for fishermen but it did not result in any known wastage of fish as other buyers were able to handle the extra volume.

Research activities were again conducted in the Egegik District to provide stock separation data and test different sectors of the district for stock composition proportions and temporal trends. Results of these studies are still being analyzed and will be reported separately in the spring of 1992 by the investigators. Hopefully, the results will provide a better understanding of interception patterns in the district and yield a basis for future management actions targeting reduction of interception problems.

In retrospect the season was a productive one for sockeye but not for chinook or chum salmon. Additional management protection will need to be afforded to the chinook run in the future to reverse its declining trend. More emphasis on obtaining chum salmon escapement will be necessary at the possible cost of foregoing some sockeye harvest in the future if this species declines further in numbers. The record sockeye escapement in 1991 (2.8 million) and a 2.2 million fish escapement in 1990 are causes for concern in some quarters as both are well above the range of previous data points generating return figures and both are far above the present optimal escapement goal of 1.0 million. Two limited limnological sampling efforts in Becharof Lake were conducted by a joint team (University of Alaska Juneau, ADF&G, and U.S. Fish & Wildlife Service) during late summer. The purpose of the visits were to gather baseline water chemistry and productivity data to assess conditions influencing current sockeye production, but the results are not yet available.

From a management perspective the partial fishermen's boycott contributed greatly to the large sockeye escapement in the district. By the time the full fleet went fishing on the evening of July 3, a total of 27,084 index points had been accumulated at the Egegik inriver test fishery (Table 29). Using the season's average rate of 85 fish in the escapement count at Egegik Tower for each index point at the inriver test fishery, approximately 2.3 million fish had entered the river and passed the reach of the fleet by that date. The remaining 486,000 fish in the escapement were the result of fish moving through the district during "window closures" and those few that escaped through the fishery over the 23 day interval from July 4-26. A total of 4,496,000 sockeye were commercially harvested in the district during that time period, so the management actions taken after the price dispute resulted in the harvest of approximately 90% of the sockeye available in the district (not counting any fish that passed through Egegik enroute elsewhere). That level of exploitation allowed roughly half of

the desired escapement goal to occur from the latter half of the run.

Ugashik District

The 1991 sockeye salmon run to the Ugashik District totaled 5.5 million fish, well above the preseason forecast of 3.5 million (Table 1). Fishermen harvested 3.0 million sockeye, the fifth largest harvest recorded over the 99-year history of the fishery. An escapement of 2.5 million fish was attained, the second largest on record trailing only the 3.3 million escapement in 1980. Comparable cycle-year sockeye runs dating back to 1951 have ranged from 0.5 to 6.0 million fish with an average of 1.8 million, so the 1991 run was approximately three times the cycle-year average.

The preseason forecast for the Ugashik District was quite optimistic, projecting a harvest of 2.8 million sockeye. Compared to the much larger expected harvests in the Naknek-Kvichak and Egegik districts, this was not an attractive enough harvest projection to generate a large amount of early-season effort in the district. Fishermen were aware that management of the district would be similar to that employed since 1987 (few openings until fish arrived in force in the lower portions of Ugashik River). Thus, most chose to begin the season elsewhere with the option of transferring back to Ugashik as conditions warranted.

Initial landings occurred in the district June 4 (Table 17). Small catches were reported for the remainder of that week and the following week (June 10-14) as only a few fishermen worked their gear due to the price dispute. Chinook catches were smaller than usual for the historic peak week of abundance in the district, suggesting either a small run, few fishermen employing king gear, or a combination of both.

By the fishing week of June 17-21 sockeye were exceeding chinook in the catch and the fleet had grown to an estimated 65 boats and 5 setnets. This increase was due to the transfer of some fishermen from Egegik to Ugashik, those uncertain about the Egegik District fishing schedule under its earlier emergency order management. With the increased effort came increased harvests of sockeye salmon passing through the district. By the onset of the emergency order Period at 9:00 a.m. June 23, the cumulative district harvest totaled approximately 28,000 sockeye, 1,200 chinook, and 600 chum salmon, well below 1990 levels for the same

date.

The inriver test fishery began operations June 21 about three miles upstream of Ugashik village, providing a daily estimate of sockeye passage into the lower section of Ugashik River (Table 30). Initial drifts were mostly "water-hauls". Daily inriver test fishing over the next several days documented a very low level of fish entry into the Ugashik River system so the commercial fishery remained closed. During this time nearly all the drift gillnet fleet transferred from the Ugashik District to other areas to take advantage of early season fishing prior to the arrival of the main Ugashik run.

The fishery remained closed through the end of June as inriver test fishing (Table 30) showed little evidence of sockeye moving into inner district waters. There were no drift fishermen available in the district to test fish outer district waters and no processors available to handle any test fish catches.

As the price dispute heated up in other districts on June 30, several of the local Ugashik drift fishermen returned to the district rather than fishing elsewhere in defiance of the developing boycott. This made test fishing in the Ugashik District waters feasible and a test round was scheduled for July 1 (Table 10). Strong SW winds prevented the test boat from venturing outside the inner bay where testing revealed very few sockeye were available. A second attempt at test fishing on July 2 encountered the same weather-related problems and was confined again to the inner bay. However, the test indices obtained were higher than on July 1 indicating an increase in fish migration through the inner bay. The Ugashik River counting tower began operations July 3 with no fish seen during the first day of counting.

Inriver test fish indices picked up strength noticeably on July 3. Deployment of the district test boat to outer district waters also finally proved successful and the test indices obtained were quite high, particularly from Smoky Point to Cape Grieg (Table 10). With these indications of fish arrival both in the river and in the district, a 12-hour commercial opening was announced for the afternoon of July 4. Ample lead time was given to provide time for processors to deploy tenders to the district as there was only one present on July 3.

The July 4 period commenced at 4:00 p.m. under overcast skies and west winds at

10 kn. An aerial survey conducted at 7:00 p.m. confirmed 61 drift gillnets and 69 setnets fishing, with 10 tenders in attendance. Catches appeared to be very good from inner bay areas with only a few boats venturing outside Smoky Point. All the inner district setnets appeared to be doing well. Ugashik village setnets were also doing well indicating that a good abundance of fish was continuing to move upriver and easing concern that some of yesterday's fish might have backed out of the river. The fishery closed on schedule at 4:00 a.m. July 5 to allow evaluation of catches, fleet effectiveness, and processing. This opening yielded a catch of 73,000 sockeye, and only a trace of chum salmon (Table 17).

Inriver test fish indices more than tripled on the morning of July 5, which indicated the front end of the pulse of fish had pushed upriver beyond Ugashik village. Using the historic conversion rate of 37 fish at the counting tower per index point at the inside test fish site, approximately 85,000 sockeye were estimated in the river as of midnight July 4. On the morning of July 5 fishermen at Pilot Point reported fish still jumping in front of the village so another 12-hour fishing period was quickly scheduled commencing at 5:00 that afternoon.

The July 5 opening occurred under foggy skies and SW winds at 15 kn. These conditions prevented an aerial survey of the fishery. However, early reports from fishermen and processors indicated catch success was again good from inner and outer bay areas. The opening yielded a catch of 205,000 sockeye, bringing the cumulative catch to 308,000 fish, 11% of the preseason harvest projection for the district.

By midnight July 5, less than 1,000 sockeye had been counted past Ugashik River counting tower, but inriver test fishing suggested 206,000 had gotten past the fishery into the river. Based on this relatively good showing of fish in both the river and the harvest, another 13-hour fishing period was announced to commence at 5:00 p.m. July 6.

The fishery opened on the evening of July 6 under partly sunny skies and near calm conditions. A survey of the district test at 6:00 p.m. yielded an effort count of 130 drift boats and 54 setnets, with 18 tenders in attendance. Fishing appeared to be slow in inner district waters and most boats were working the outer district after an hour into the period. Ugashik village setnets were also

quiet, which indicated an apparent lull in fish movement into the lower river. Surveys of Ugashik River and Ugashik Lagoon yielded estimates of 140,000 and 1,200 sockeye. With these factors in mind the fishing period was allowed to close on schedule at 6:00 a.m. July 7. The July 6-7 catch of 403,000 sockeye brought the cumulative catch to 711,000.

The escapement past Ugashik Tower through midnight July 7 totaled 2,100 sockeye, well below the historic average of 33,000 for this date. However, inriver test fishing suggested that acceptable escapement into the lower river was occurring with an estimate of 433,000 fish in the river. These fish were in the muddy intertidal portion of Ugashik River, however, and not readily quantifiable from aircraft unless viewing conditions were optimal. Such viewing conditions were not present July 7 or July 8 so the fishery remained closed to allow fish abundance in the inner district to rebuild. A district test boat was dispatched once again to test the inner district entrance waters on the evening of July 7 and morning of July 8 (Table 10). No fish were caught off the Pilot Point village station but a building volume of fish was documented right at the entrance to Ugashik Bay (both north and south sides). Based on the evidence of additional fish concentrating near the bay entrance, the arrival of the first surge of fish at Ugashik Tower, and continued moderately high inriver test fish indices, an announcement was made re-opening the fishery for 12 hours commencing at 7:30 a.m. July 9.

The July 9 fishery opened under SW winds at 20 kn and foggy skies, preventing an aerial assessment of initial catch success. Reports from the fleet indicated initial fishing success was very good for both gear types fishing inner and outer Ugashik Bay waters, but catches were poor upriver at Ugashik village. Later catches at Ugashik village improved, indicating that a surge of fish had apparently been progressing into the river at the opening of the period. The vanguard of this pulse reached Ugashik village later in the day. Sockeye escapement past Ugashik Tower was increasing rapidly and reached 357,000 fish by 2:00 p.m. July 9. Historically, the escapement count through July 9 at Ugashik Tower has averaged 61,000 fish and the 360,000 level has normally been reached on approximately July 16. It was now apparent the escapement into Ugashik River was well ahead of schedule and for that reason the fishery was extended 13 hours until 8:30 a.m. July 10. Later, an aerial survey of the inner district and river at 6:00 p.m. confirmed strong catches continuing and another 140,000 fish were

visually documented in the upper river below the counting tower. The fishery was extended again another 12 hours until 8:30 p.m. July 10.

The July 9 catch totaled 523,000 sockeye, the peak daily catch in the district during the season. The cumulative catch at that time was 1.2 million, 44% of the preseason sockeye harvest projection. The escapement past Ugashik Tower through midnight July 9 totaled 413,000. This recent surge of fish past the counting tower provided the first good chance to begin forecasting inriver fish based on lagtime analysis, rather than simply by historic fish per index values. Initial analyses at this point suggested a best-fit lagtime of 4 days and a total inriver passage to date of approximately 1.1 million sockeye. However, it was noted that historically initial surge lagtime analyses generally over-estimated fish abundance. The fish per index value with a 4 day lagtime was 73 fish at the tower for every index point generated at inriver test, twice the historic value of 37 in use to this point. This data was the first inseason indication that more fish were entering the escapement than originally anticipated. Another day or two of passage at the counting tower would be necessary before it could be validated.

After 37-hours of continuous fishing the period was allowed to close at 8:30 p.m. July 10. The weather had worsened in the district with sea conditions developing that were reportedly hindering movement of tendering vessels into and out of Ugashik Bay, thus interfering with the processing capabilities. So processors in the district welcomed a short closure. However, the historic peak of the fishery has generally occurred on July 11 so only one tide-cycle closure was permitted and the next opening was announced for 25 hours, commencing at 9:30 a.m. July 11. The July 10 catch totaled 418,000 sockeye.

The July 11 opening commenced under continued difficult sea conditions, winds SW at 20 kn and fog, thus no survey could be conducted of initial fleet success. Escapement counts at Ugashik Tower had dropped off significantly July 10 and were continuing at even lower levels July 11, so lagtime analysis of the inriver fish abundance suggested returning to a 3-day lag. This yielded fish per index values in the 36-40 range, similar to the historic value of 37. This yielded an estimate of 777,000 fish past the fishery July 10, increasing to 824,000 July 11. Since the escapement point goal was 700,000 sockeye, it was felt by management at this point that escapement was in good shape, a few days ahead of schedule,

and that subsequent commercial fishing would curtail much additional entry of fish into the river.

The July 11 catch totaled 217,000 sockeye, well below catches on July 9 and 10, suggesting the peak of the run may have occurred a couple of days earlier than normal. However, as the escapement goal appeared to be pretty much assured the fishery was extended another 24.5 hours until 11:00 a.m. July 13.

Escapement past Ugashik Tower on July 11 totaled 497,000 sockeye (Table 30), far above the historic average of 110,000 for this date. Passage rates at the counting towers July 12 increased dramatically over levels recorded the past two days indicating the second surge of fish into the river had now reached the towers. This second surge was thought to be fish that had passed through the district July 9, so a 3-day lagtime was still assumed. Given the escapement strength and the expectation, based on historic run timing, that a large portion of the run remained to be dealt with, an announcement was made at 8:00 p.m. July 12 extending the fishery another 25 hours until 12:00 noon July 14. By midnight July 12 the 700,000 fish escapement point goal for sockeye had been reached at the counting tower.

The July 12 sockeye catch totaled 224,000 fish bringing the cumulative catch up to 2.1 million fish, 75% of the preseason harvest projection. Peak fishing effort of the season was documented that day with 237 drift boats and 69 setnets participating in the harvest.

The 48-hour waiting period for fishermen transferring into the Ugashik District was waived effective at 9:00 a.m. July 13 in response to attainment of the escapement point goal. At noon July 13 commercial fishing in the district was extended through the end of the emergency order period (until 9:00 a.m. July 17) for the same reason.

Escapement past Ugashik Tower increased by 570,000 sockeye July 13 and reached a cumulative total of 1.3 million by midnight. The daily count of 570,000 fish was the second largest single day's count ever recorded at Ugashik River, trailing only a count of 621,000 on July 17, 1980. It was only the fourth time in 50 years of counting that a daily count has exceeded 500,000 fish.

An aerial survey of the district and river on July 14 yielded an effort count of 230 drift and 66 setnets fishing. At least 98,000 sockeye were observed in the upper third of Ugashik River, and although finners could be seen periodically, waters were murky enough that counts in other portions of the river were not possible. The most significant aspect of this survey was the observation of several large schools of very red sockeye milling in slow water areas of the upper river, fish that had obviously spent more than 3 days in the river. After discussing this aspect of the survey with research personnel it was apparent we had been using too short a lagtime between the inriver test fishery and the counting towers in making our estimates of "river fish". We had been matching the tower passage curve to the wrong "bump" on the inriver test fishing curve and thus underestimating fish abundance in the river. Instead of 36-40 fish per index (close to the historic mean of 37), perfect matching would have given a value closer to 85 (Table 30). Thus at this point management became aware that there were many more fish in the river than the 1.0 million fish expected at 37 fish per index (fpi) or even the 1.3 million possible at the higher range of 50 fpi. As these fish were colored up there was nothing to be gained by moving fishing boundaries upriver to harvest them. With continuous fishing already authorized in the district and transfer regulations waived a maximum effort was being made to harvest newly arriving sockeye and preclude further significant entry into the escapement.

Daily commercial catches over the period July 13-16 continued at levels in excess of 100,000 sockeye per day, and then fell below that threshold July 17 (Table 17). The emergency order Period expired July 17 and the fishery reverted to a 4-day per week fishing schedule, but with such a large sockeye escapement already assured, the weekend closure July 19-21 was waived to keep harvest pressure directed on the sockeye run. Thus the fishery continued uninterrupted until it closed for the weekend at 9:00 a.m. July 26.

Sockeye landings in the district continued through September 3 and resulted in a total catch of 3,039,696 fish, the fifth largest harvest on record. Sockeye escapement counts continued through July 28 and eventually totaled 2,457,306. An additional 12,515 and 12,195 sockeye were counted in the Dog Salmon and King Salmon rivers during aerial surveys on August 12, bringing the Ugashik drainage escapement total to 2,482,016. Peak day at the counting tower was July 13 with a daily tally of 570,000 sockeye. Based on approximately 3,700 fish sampled at

the counting tower, the sex ratio in the escapement was 46% males to 54% females.

Fishermen in the Ugashik District harvested 55% of the sockeye run in 1991, a slightly below the 1949-90 mean exploitation rate of 59%. Peak day in the fishery was July 9, based on volume landed and catch per hour, (approximately 523,000 sockeye landed in 16.5 hours = 31,700 hour). Peak catch per unit effort in the district occurred July 7 for drift gillnets (1,950 sockeye per delivery) and July 4 for set gillnets (595 sockeye per delivery). Based on preliminary catch totals it appears drift gillnets took 89% of the sockeye harvest while set gillnets took 11%. The 31-year (1960-90) average percentages of the sockeye harvest by gear type are 91% drift and 9% set gillnet. The fishery was open 217.5 hours (38%) of the 576 hours available during the emergency order Period.

Age composition of the Ugashik District sockeye run was as follows:

<u>Age Group</u>	<u>Catch</u>	<u>Escapement</u>
1.2	11%	19%
2.2	29%	38%
1.3	47%	38%
2.3	12%	4%
Other	<u>1%</u>	<u>1%</u>
Totals	100%	100%

Most of the 1991 run (Table 3) was progeny of the 1986 escapement of 1.0 million fish (Appendix Table 16).

The commercial harvest of other salmon species totaled 103,000 fish, approximately 3% of the total district harvest. The chinook harvest of approximately 1,400 fish was the smallest taken since the 1976 harvest of only 300 fish (Appendix Table 6). It was less than half the 1971-90 average harvest of 3,500. The reasons for the decreased harvest were the weaker than average chinook run and the price dispute between fishermen and processors, which led to less fishing effort in early June. The chum harvest totaled 57,000 fish, close to the 1971-90 average harvest of 53,000. The pink salmon harvest was negligible, normal for an off-cycle year, and the coho harvest totaled 45,000 fish, slightly greater than the 1981-90 average harvest of 38,000 (Appendix Table 9).

Escapement index surveys were flown August 12 yielding total indices of 2,400 chinook, 13,820 chums, and 660 pinks. The chinook index was below the 1980-90 mean of 5,400 fish and the lowest since 1982. The chum index was approximately one third of the 1980-90 mean of 43,000 fish, largely due to a weaker than normal run. The pink salmon index was actually higher than usual for a non-cycle year. Aerial surveys were not flown this season to document coho abundance in the mainstem Ugashik and King Salmon rivers due to budget constraints.

A total of 22 buyers operated in the district during 1991, two less than during the 1990 season (Table 35). Nearly all the catch was either frozen on floating processors or tendered to other districts for processing. No new canning operations or freezer plants were operated in the district. There were instances in early July of processors putting catch limits on their fleets for short intervals but no wastage of fish was reported from the district this season.

In retrospect, the major management problem in Ugashik district during the season involved the assessment of the abundance of sockeye in the muddy intertidal waters of Ugashik River. The inriver test fishery results were relied on extensively to provide estimates of relative passage strength and worked well in showing when major pulses of fish moved by. However, due to the milling behavior of sockeye in Ugashik River and their variable migration timing between the test fish site and the counting tower, quantifying the actual number of fish in the pulses passing the test site was not accurate this year. In 1990 the test fishery was quite accurate and its performance in other recent years was good, so perhaps 1990 was an anomaly. Fortunately it occurred in a manner that didn't undercut the escapement, but those fishermen trying to maximize their poundage were frustrated and ultimately were not allowed to harvest the extra 1.7 million sockeye that ended up in the escapement. Ideally, some form of sonar that could be operated downstream of the Dog Salmon River mouth might give the manager a better picture of escapement and lead to greater precision in managing the harvest. Production from this large escapement is a topic of concern to some. It follows a 730,000 fish escapement into Ugashik Lakes in 1990, so brood year interaction should not be a particularly negative influence. The largest return ever documented in the Ugashik District occurred in 1985, the progeny of a 3.3 million fish escapement in 1980.

Members of the Ugashik fishing fleet suggested that Egegik, Naknek-Kvichak, and

possibly North Peninsula fisheries may have intercepted some Ugashik bound sockeye, but it will not be possible to analyze the validity of this viewpoint until the stock separation personnel finish their scale pattern analysis work in the spring of 1991.

Nushagak District

The preseason inshore forecast for the Nushagak District in 1991 totaled 3.8 million sockeye salmon. The forecast included 2.1 million for Wood River, 600,000 for Igushik River, and 1.1 million for Nuyakuk River (Table 1). The projected inshore harvest totaled 2.1 million sockeye, well below the 10-year average of 3.4 million and considerably less than the 20-year average of 2.8 million (Appendix Table 5).

A variable escapement policy is in place for the Wood River system that allows fishery managers to adjust the sockeye escapement goal to optimize spawner distribution. Analysis of past age compositions have demonstrated that 3-ocean sockeye tend to spawn primarily in the rivers and large creeks of the Wood River system, while 2-ocean sockeye spawn primarily on lake beaches and small creeks. However, it appears that this relationship may be starting to break down in recent years. The variable escapement policy sets the desired escapement range at 800,000 to 1.2 million fish. Where the 3-ocean component is projected or found to actually comprise 60% or more of the age composition of the escapement, the goal may be reduced to 800,000 fish. If most of the escapement age composition is comprised of 2-ocean sockeye, the department may adjust the goal upward to 1.2 million. Age composition in the Wood River system in 1991 was projected to be roughly 50% 2-ocean and 50% 3-ocean sockeye (Table 2). Therefore, fishery managers left the escapement goal at 1.0 million.

The forecast for chinook salmon in Nushagak District totaled 119,700 fish, considerably less than the 20-year average inshore run of 165,000 to this district (Appendix Table 30). The inriver goal of chinook salmon for the Nushagak River is 75,000 fish and accounts for spawners and fish harvested in subsistence and sport fisheries above the sonar enumeration site at Portage Creek. In recent years the total subsistence harvest has averaged over 11,000 fish (Appendix Table 45). With an additional harvest of 15-20,000 chinook incidental to the directed fishery for sockeye salmon, there was little

likelihood that a directed commercial fishery could be allowed for chinook. However, chinook escapement rates were to be intensively monitored in season using subsistence catches on local beaches and at Lewis Point, and sonar enumeration counts at the Portage Creek site.

Since a commercial chinook fishery in early June was unlikely, an emergency order was issued on May 24 allowing residents the opportunity to harvest subsistence salmon in the commercial district from May 27 until June 17 (Table 13). On May 27 the first chinook were reported in the subsistence nets on the Dillingham beaches. Catch numbers were not large, but fish in the nets as far up as Dillingham indicated that some escapement had occurred.

We received several reports in the spring about an unusually large bycatch of chinook salmon in the Gulf of Alaska and the Bering Sea. The total catch as of June 4 was approaching 73,000. We were not sure how to quantify these reports because the observer coverage had been increased above previous levels. The large catch may have been a function of better reporting, or it could be a signal that an unusually large number of chinook salmon are present this year.

On June 11, Arne Shaul called to inform us that "lots of chums heading somewhere are passing through the False Pass area". With a low escapement in the Nushagak River in 1988, it would take unusually good production to produce a large return to this district in 1991. Chum salmon cannot be managed in Nushagak District due to their complete overlap with the sockeye run.

By June 14, there was still no indication that the chinook run was larger than forecasted, so the subsistence fishery in the commercial district was extended from June 17 until June 23. At 6:00 p.m. the evening of June 14, staff made a long general announcement concerning a variety of items including: the subsistence fishing schedule and regulations, district maps, processor registration, and several errors that were discovered in the current regulation book.

The strength of the chinook catches in the subsistence fishery changed dramatically on the evening tide on June 14, when large subsistence catches of chinook were reported at Scandanavian and Kakanak Beaches (Table 12). On the morning tide on June 15 several additional large catches were documented near the

mouth of Wood River and at Tule Point on the Nushagak River, near Lewis Point. Typically, a strong inshore movement of chinook will produce large catches in the subsistence nets for one or two tides and then drop off to almost nothing. In this instance, that was not the case and catches held up on the Dillingham beaches and at Lewis Point for over 24 hours, with most nets averaging 10 to 30 fish each tide. Reports of strong chinook catches also came in from Igushik Beach, and Ralph Slough near Nushagak Point. A large subsistence catch of chinook (35) at Igushik Beach is very unusual, and 100 in a single net at Nushagak Point is also much higher than normal for any year.

June 18 the Wood River crew was deployed and began to observe sockeye passing as soon as the towers were erected. Two reports of a strong showing of sockeye in the subsistence nets at Igushik Beach were also called in on that date. An individual reported catching 40 chinook in a subsistence net near the mouth of Wood River on June 19, and on June 20 one net caught 67 reds, 10 chinook, and 10 chums using small mesh gear. Many families had harvested so many chinook salmon by that time that they had quit fishing or switched to smaller mesh gear to harvest early sockeye.

By June 20, the chinook escapement at the Portage Creek sonar site was approximately six days ahead of the rate necessary to reach the season-end goal of 75,000. Combined with the strong showing of fish in the subsistence harvest, it was evident that the run was stronger than forecast. To consider a commercial fishery on chinook, it was necessary to first close the on-going subsistence fishery in the commercial district, and an emergency order was issued at 6:00 p.m. Friday, June 21, closing that fishery effective at 9:00 a.m. the following day.

Within 24 hours a storm from the southeast occurred, with winds from 20-30 knots, and yet another wave of chinook salmon entered the escapement, as evidenced by the large showing of fish on the Dillingham beaches, across Wood River, and at Lewis Point. By the afternoon of June 23, the hourly passage rate of chinook past the Portage Creek site had increased dramatically, and the cumulative total was expected to reach 50% of the point escapement goal by midnight. With chinook salmon surplus to escapement needs, a commercial opening was announced for 11:00 a.m. on June 24. That was to have been the first directed commercial fishery for chinook salmon in the Nushagak District since 1987.

Unfortunately, fishermen were involved in a price dispute with the processors at the time, and only 15 boats and 26 setnets participated in the opening (Table 18). After June 25, department test boats were sent out to monitor the buildup of sockeye in the district. Catches by those vessels remained low until the afternoon tide on June 26, when they measurably increased (Table 11). On the same day, we received reports of "heavy fish" movement along the beach at Clark's Point. The morning of June 26, Governor Hickel intervened in the price dispute and closed commercial fishing in all of Bristol Bay in the interest of public safety. By doing that, he removed all options from the fishery managers until he rescinded his action.

Intensive meetings were in progress throughout Bristol Bay between fishermen, processors, and the heads of various state agencies (Department of Commerce, Department of Labor, ADF&G, and even the Lt. Governor). Fishery managers were assigned to write up scenarios giving a tide-by-tide description of actions we would take if the ban on fishing was lifted. At 6:00 p.m. June 28, we received unofficial word that the courts had put a temporary restraining order on the state lifting the closure by the Governor. We were notified later that evening that the Attorney General's office and the Governor were reviewing the judges order, and that we would be notified when to proceed. On June 29, staff was re-authorized to manage the fishery and was also advised to announce at 12:00 noon for the fleet to standby at 3:00 p.m. for fishing announcements in Bristol Bay.

A 12-hour fishing period for Nushagak Section and a 25-hour period for Igushik Section was announced at 3:00 p.m. Saturday to begin at 3:30 p.m., Sunday, June 30. Test fish indices from Nushagak Point to Clark's Point were very large on the morning tide on June 29, but on the evening tide they had dropped off considerably (Table 11). At 9:00 a.m. June 30, residents at the fish camp at Lewis Point reported that a large volume of salmon were visible passing their camp. The boycott by the fishermen remained in effect, and only 28 boats and 10 setnets participated in the opening. With very little harvest taken by the small fleet that elected to participate in the opening, the department had no biological justification not to extend the fishing opportunity, and an additional 13-hours of fishing time was announced for the Nushagak Section.

When we flew the fishery on the morning and the evening of July 1, many signs of fish were visible in the area from Grassy Island to Clark's Point. Three or four

setnets were fishing on the Combine, and were sunk constantly, with the vessels loaded with fish. A 12.5-hour extension was announced at noon on Monday July 1. A morning aerial survey on July 2 documented a slight increase in the number of fish in Wood River and in the Nushagak River as well, but viewing conditions were extremely poor due to fog.

By noon on July 2, the sockeye escapement at the Portage Creek sonar site was about one day ahead of schedule, and the escapement past Wood River was exactly on schedule. However, the Igushik River was approaching 80% of its season-end sockeye goal and climbing rapidly, with 4-5 days of fish in the river below the tower. Fishing time was extended for an additional 12.5-hour period at 12:00 noon on July 2. On the 5:00 p.m. aerial survey under very poor conditions, signs of heavy fish movement were visible from Picnic Point to Black Point, and large catches by the small fleet fishing in the upper part of the commercial district were a further indication that additional sockeye were continuing to move into the escapement.

Around noon on July 2 there was rumored to be a price settlement, and more of the setnet fleet started fishing. Fish and Wildlife Protection officers report that on the Combine 36 nets were "doing well" and 10 were sunk, with their skiffs awash. Nineteen setnets on Coffee Point were "doing OK", and Igushik Beach nets were "doing well". The expected settlement did not take place and setnetters were pulling their nets again during the night of July 2, or the early morning of July 3.

The 8:00 a.m. aerial survey on July 3 was awe inspiring, and the sockeye were in a continuous band from below Belt Creek on the Wood River all the way to the towers on both banks. We estimated 66,000 in sight, and that only accounted for the upper half of the river. The actual daily tower count at Wood River totaled over 410,000 for the 24-hour period ending at midnight July 3 (Table 26). The boycott was back in effect, and we estimated the fishing effort in the Nushagak District on that 8:00 a.m. survey at 18 setnets and 19 drift boats. Due to high muddy water, the survey of the Nushagak River was almost impossible, but signs of fish migrating upstream were visible from the top of the fishing district to the sonar site at Portage Creek.

Finally, a price settlement was reached on the evening of July 3 and the entire

fleet was fishing by 9:00 p.m.. On the morning aerial survey on July 4 visibility was poor due to the stage of the tide, but we counted approximately 30,000 sockeye in the upper portion of Wood River, and estimated that there could be in excess of 100,000 in the entire river. Viewing conditions were also poor in the lower Nushagak River, but a band of fish 6-8 wide was visible at Black Point, and the number of fish appeared to be similar to the previous day when the sockeye escapement totaled 92,000 (Table 27). With the cumulative escapement well ahead of the rate necessary to reach the season-end goal in both the Wood and Nushagak Rivers, the goal already achieved for the Igushik River, and a strong showing of fish in the commercial catch, the fishery was extended at 3:00 p.m. July 4, for an additional 25-hour period until 8:00 p.m. July 5.

The strong runs and large escapements in all river systems put all districts in Bristol Bay fishing at the same time, immediately after the settlement. Processors were inundated with salmon, and most of the buyers were forced to suspend operations or put their fleets on limits to handle the glut of fish. With the escapements building, large catches occurring throughout Bristol Bay, and at least a portion of the fleet unable to fish due to capacity problems, additional fish continued to move past the commercial district, and an additional 24.5-hour extension was announced at 3:00 p.m., July 5.

Fishing actually improved on July 6, with boats on the west side of the district doing extremely well. By 3:00 p.m. July 6, the Wood River sockeye escapement had reached 89% of its goal, the Nushagak River escapement had reached 79% of its goal, and the Igushik River escapement had reached over 150% of its goal. With fish surplus to escapement needs, an additional 25-hour extension was announced, effective at 8:30 p.m. July 6.

Good fishing continued on July 7, especially on Igushik Beach and the west side of the district. Wood River was at 92% of the sockeye goal, and Igushik had already more than doubled its goal, but the daily passage rate into the Nushagak River had fallen off considerably. Another 24.5-hour extension was announced at 6:00 p.m. July 7.

Fishing remained strong in the commercial district on July 8, but the rate of passage into the rivers was slowing. With the Wood River goal of 1,000,000 assured, and Igushik well over its goal, the only concern by July 8 was for the

Nushagak River. There was some discussion among the staff about closing the Nushagak Section for one tide in the hope of putting additional escapement into the Nushagak River, but the age composition contained few 0.3 sockeye which had been very abundant in earlier samples, and those fish were felt to be mainly of Nushagak River origin. Additional escapement into the Wood was not desirable, so we elected to extend the entire district for an additional 25 hours, effective at 10:00 p.m. July 8.

On July 9, it was clear that the point escapement goal of 550,000 at Portage Creek could not be achieved at the present daily rate. The commercial harvest had fallen off considerably by that time, so a huge and undesirable push of fish into the escapement in Wood River was unlikely. Therefore, we elected to leave the Igushik Section open and to close the Nushagak Section for a 12-hour period. At the closure most of the fleet elected to quit fishing entirely and rest rather than move over to Igushik. A very slight increase in the daily sockeye passage at Portage Creek was evident on July 11 and 12 (Table 27), but the Wood River count also increased as expected (Table 26).

The sockeye travel time to the Portage Creek sonar site is approximately 48 hours from the commercial district, so the fishery was extended for two additional periods until the results of the closure could be evaluated. Because a slight improvement in the escapement on the Nushagak River was achieved without a major loss of harvestable fish into the Wood River, it was decided to attempt an additional short closure of the Nushagak Section to secure more fish into the main river. Eventually, an emergency order issued on July 13 extended fishing in the entire Nushagak District until 9:00 a.m. on July 17, when the regular weekly fishing schedule resumed. Because the Nushagak River had not reached its point escapement goal, the 48-hour waiting period remained in effect until the end of the emergency order period.

Landings of sockeye and chum salmon remained relatively high, so we elected to extend the commercial fishery through the weekend. By that point, coho catches were beginning to increase. In the preseason outlook, the staff had expressed their intent to close the fishery to protect coho at some point, when concern over the bycatch of that species outweighed the potential benefit of harvesting surplus sockeye and chum salmon. That "point" was reached at 10:30 a.m. July 23, and the entire commercial fishery was closed for the remainder of the season.

Subsistence fishing in the commercial district was allowed again on July 24. However, the extremely poor escapement of coho salmon through August 16 prompted an unprecedented reduction of even the subsistence fishery on that species in the Nushagak and lower Wood River to only three days per week, effective at 12:01 a.m. August 19. By that date most of the coho run is over, but it was felt that even a small amount of additional escapement would be of benefit. The final escapement of 41,153 coho was the second lowest ever documented on the Nushagak River. Only the parent year escapement (20,220 in 1987) was lower.

Togiak District

The 1991 total run forecast for the Togiak River totaled 371,000 sockeye salmon, of which 71% were projected to be 3-ocean fish and 29% 2-ocean fish (Table 2). With an escapement goal of 150,000 at Togiak Lake, 221,000 sockeye were potentially available as harvestable surplus in the Togiak River Section. Smaller sockeye runs to other drainages in the district (primarily Kulukak Section) do occur, but these are not included in the forecast because age composition and escapement data are not complete.

Togiak District is managed differently than other areas of Bristol Bay, using a fixed fishing schedule of three days per week in the Kulukak Section, four days per week in Togiak Section, and five days per week in the Osviak, Matogak, and Cape Pierce Sections, although the schedule may be adjusted by emergency order as necessary to achieve the desired escapement.

Because the projected sockeye harvest was below the average (1971-1990) harvest of 300,000 fish in Togiak Section, a conservative management approach was necessary for that species. More alarming was the recent trend in the run size of chinook salmon returning to the Togiak District. The chinook runs to the Togiak River have steadily declined since 1985 and declined further in 1990. 1985 is also the most recent year that the spawning goal for chinook escapement in Togiak River was reached. Similarly, runs to the Osviak, Matogak, and Kulukak Rivers have declined to levels below average in recent years.

Given the biological concern over chinook salmon within the Togiak District, a more conservative approach to chinook management was needed. Currently the only method used to estimate run strength of chinook salmon in season is through

commercial catch data; aerial surveys are flown for sockeye salmon, however the smaller number of chinook in the river are not distinguishable until spawning begins in late July. Based on years in which fishing occurred on a standard weekly schedule, the average (1970-1988) daily chinook catch in the Togiak Section peaks well before the sockeye run begins in earnest. The peak chinook catch, on the average, occurs on June 31, and the midpoint of the catch typically falls on July 1. Using data from the same years, the sockeye catch averages 10% of the season total on July 1, and does not reach 50% of the total catch until July 14. Chinook catches typically do not begin until the second week in June, and 48% of the total chinook catch is caught, on the average, during the period from June 16 to June 31. Assuming an annual chinook catch typical of recent years of 10,000 chinook in Togiak Section, reductions in fishing time could potentially reduce the catch by 4,800 fish. Since 1985, the chinook escapement has averaged over 3,000 fish less than the desired goal, thus attaining the escapement goal appeared to be feasible by reducing the exploitation on chinook salmon during the period June 16 to June 30.

Through several winter meetings with the Togiak Advisory Committee, several other public meetings in Togiak, and at the Bristol Bay Fisheries Conference in Dillingham, department staff relayed the concern with chinook stocks within the district. Staff announced that fishermen in Togiak District should anticipate a mesh size reduction effective the entire season and, primarily in Togiak Section, a severe reduction in fishing time prior to July 1, specifically in the last two weeks of June, to reduce the exploitation of that species. Staff also announced that, since no inseason indicators of chinook escapement are available and the sockeye catch typically begins in earnest during the week before or after July 1, the management focus would shift at that time to sockeye salmon. The regular schedule, or possibly a slightly reduced schedule, would take effect again on July 1, given no indications of a weak sockeye run.

Prior to the season, the maximum allowable gillnet mesh size was reduced by emergency order to 6 3/4 in in all sections of the Togiak District, but on June 1 fishing opened on the regular weekly schedule. Although the status of chinook salmon warranted cautious management, chinook catches prior to June 15 are typically very low throughout the district, and early catches of chinook, sockeye, and chum salmon were anticipated as potential indicators of run strength for those species.

The first landings of the 1991 season occurred on June 4 (Table 20) and only small numbers of sockeye and chinook were harvested throughout the first two weeks. By the close of fishing on June 15, the cumulative chinook catch in Togiak Section (113 fish) was at or slightly less than the historical average for that date, but no indication of run strength was evident based on the catch. Indications of sockeye run strength were not obvious from the catch by that date either.

Since no obvious signs of a strong chinook run were evident, a reduction in fishing time was necessary at this point to minimize the chinook catch. Potential fishing effort was low, with roughly 40 boats registered in Togiak District on June 16, and fishing was permitted for 48 hours in all sections of the Togiak District. The 48-hour period was scheduled to begin on Tuesday, June 18, due to southwest winds (20-30 knots) forecasted for June 16 and 17. The resulting district catch of over 900 chinook was average for a 2-day period during this time, and appeared to indicate an average or above average chinook run, since effort was low. The district sockeye catch during the 2-day period totaled over 1,900 fish; this date, however, is still early in the season to gain much of an impression of the sockeye run size from commercial catches.

The resulting chinook catch in Osviak Section was average; virtually no effort existed in the Matogak Section. Only six setnets fished in Kulukak Section; the sockeye catch for the period totaled approximately 600 fish and chinook catches were low. In the Togiak Section, total chinook catches were below average due, at least partially, to low effort and the reduction in fishing time.

With an objective of reducing the chinook catch during the June 15 - June 31 period by 3,000 out of a potential catch of 4,800 during that period, 1,800 chinook were theoretically available as catch in Togiak Section, assuming a run strength similar to the previous five years. Since the total catch in Togiak Section at that time stood just below 900 chinook salmon, it appeared that, if the run strength was indeed similar to recent years, a reduction in the catch of approximately 3,000 fish was very likely.

The Osviak and Matogak Sections were closed by emergency order the following week for the protection of chinook salmon. Fishing was permitted in Kulukak and Togiak Sections for a 12-hour period, beginning at 1:00 p.m. Tuesday, June 25;

fishing time was held to a minimum to reduce the exploitation of chinook salmon, but was permitted to provide an indication of sockeye and chum run strength in both sections. Additionally, effort was low (25 boats in Togiak), which decreased the potential for a significant chinook catch. On June 24 fishermen met in Togiak, the fishing period on the following day was boycotted, and the processor in Togiak reported no catch.

On June 29, the department announced a revised weekly schedule, by emergency order, to remain in effect until September 30. Effective July 1, fishing would be permitted in all sections of Togiak District from 9:00 a.m. Monday to 9:00 a.m. Thursday. Daily sockeye catches prior to this time had not been significantly larger or smaller than normal in any section, so the run strength at this time did not appear to be much different than average. However, below average runs in 1989 and 1990 resulted in lengthy closures during the traditional peak of the sockeye run, and reducing the schedule to three days per week in all sections was implemented to avoid a similar closure in 1991.

The first aerial survey was flown to observe fishing effort in Togiak and Kulukak Sections in the evening of July 1. Apparently at this time the boycott was still largely in effect; only one drift boat and five setnets were observed fishing in Kulukak Section, and one drift boat and 13 setnets were fishing in Togiak Section. The lower portion of Togiak River was surveyed on this flight, but high, turbid water conditions prevented an adequate survey.

Commercial deliveries increased on the evening of Tuesday, July 2 and most of the fleet was reported fishing on the afternoon tide. Number of fish delivered per boat from that tide and several thereafter were average, which was a potential indication of an average run, as opposed to the low forecast. The chinook catch in Togiak Section totaled 1,300 for July 2, and subsided somewhat on July 3. The total district chinook catch then stood at 3,800 fish, well below average for that date. The second survey of the season was flown July 3, however water conditions and visibility in the Togiak River again precluded any reasonable estimate of escapement there. Conditions on the Kulukak River, however, were excellent; 3,500 sockeye were counted already in Kulukak Lake, and an additional 1,900 mixed sockeye and chums in Kulukak River. That evening, the department announced a 24-hour extension in fishing time in all sections of the Togiak District, to close at 9:00 a.m. Friday, July 5.

Sockeye catches in Togiak Section on July 5 had slightly exceeded the forecasted cumulative catch for that date based on average run timing, and although sockeye catches in Kulukak were slightly below average for this time, number of fish per delivery was actually above average. Sockeye escapement at the counting tower on Togiak River had exceeded the average on July 5, and was well above average by July 7. Fishing resumed on the revised 3-day schedule on July 8 in all sections.

Sockeye counts at the tower continued to increase through the following week, and daily catches in Togiak Section continued at above both average and forecasted levels. A survey of Togiak River on July 8, under generally poor conditions, seemed to indicate a fair to good abundance inriver, but again a reasonable estimate was not obtained. A survey of Kulukak River on the same date resulted in an improved aerial count of 7,200 sockeye. Both rivers were surveyed again on July 10; visibility was improving but still poor on Togiak River, and the volume of fish sighted in the upper river indicated that present passage rates at the tower would continue for at least several days. Although the aerial count for Kulukak River had not improved over the July 8 survey, fish were just beginning to enter the Tithe Creek Ponds at the head of Kanik River. No effort existed in the Matogak, Osviak, and Cape Peirce Sections at this time. On July 10, following the aerial survey, a 24-hour extension was announced for all sections, to close at 9:00 a.m. Friday, July 12.

Tower counts continued to increase through July 11, and it appeared that the Togiak River sockeye escapement would reach 50% of the desired goal that evening, seven days earlier than normal. Commercial sockeye catches remained strong at 18,000 fish per day in Togiak Section for July 9-11, and the department announced another 24-hour extension on July 11, for Togiak Section only, to close at 9:00 a.m. Saturday, July 13.

At that point it became apparent that 1) a significant early escapement of fish had resulted from the reduced fishing time in late June, and 2) based on the Togiak Section catch to date of 140,000 sockeye, the actual run was stronger than forecast. Although tower counts had subsided to 6,000 fish per day on July 14, they began to increase again the next day. Through July 16, the tower count had reached 120,000 sockeye, or 86% of the escapement goal, and although conditions on most of the Togiak River were poor, heavy concentrations of fish observed on

a survey conducted July 17 again indicated a continuation of high daily tower counts over the next several days. Conversely, Kulukak River escapement did not appear to have improved, and more importantly, Tithe Creek Ponds had showed no improvement.

A storm on Monday and Tuesday, July 15 and 16, had kept fishing effort and catches low. As the weather improved so did catches, and on July 17, the District sockeye catch exceeded 27,000 fish. That evening, the department announced additional fishing time for Togiak Section, effectively extending fishing time from 9:00 a.m. Thursday, July 18 through the weekend until the next weekly schedule took effect at 9:00 a.m. Monday, July 22. Sockeye escapement at the tower had exceeded the desired point goal of 150,000 on July 19.

Due to low escapement in Kulukak River and Tithe Creek Ponds, the fishing schedule in Kulukak Section was not extended. Several people fishing in Kulukak Section had called the area office and expressed a desire to move out to the Matogak and Osviak Sections; these sections had received very little fishing effort since the sockeye season began, and as a result sockeye stocks in these areas had not been exploited. Fishing was extended in the Matogak, Osviak, and Cape Pierce Sections from 9:00 a.m. Thursday, July 18 to 9:00 a.m. Saturday, July 20.

The sockeye catch in Togiak Section on July 20 (39,200 sockeye) was the highest daily catch of the entire season. Several days prior, an increase in effort was evident from reports in Togiak, and a district survey was flown on July 22; five drift boats and two setnets were fishing in Kulukak Section, and 84 drift boats and 58 setnets were observed in Togiak Section. Daily catches continued at greater than 30,000 fish through July 23. On that date, 311 deliveries, the most out of any day of the season, were made in Togiak Section alone.

Also on July 22, observations from an aerial survey of the Kulukak River included an improved escapement in Tithe Creek Ponds. The combined escapement for Kulukak River and Tithe Creek Ponds now totaled 20,000 compared to the combined escapement goal of 35,000 fish. The sockeye catch in Kulukak through July 22 totaled 32,000 fish, and based on the low effort, recent fishing success was poor. In the evening of July 22 the department announced an early closure in Kulukak Section, effective at 9:00 a.m. Wednesday, July 24.

On Wednesday, July 24, fishing in the Togiak Section was again extended from 9:00 a.m. July 25 through the weekend. Fishing in the Matogak, Osviak, and Cape Pierce Section was also extended again from 9:00 a.m. July 25 to 9:00 a.m. Saturday, July 27. On July 25 the only remaining company in the district notified the department that they were plugged with the large recent catches and had stopped receiving deliveries the evening before, but were resuming that morning.

An aerial survey flown on July 27 confirmed that Kulukak escapement would not reach the goal, and a closure was announced for Kulukak Section on July 28 for the upcoming week. The processor in Togiak notified the department on July 29 that they had shut down buying operations over the weekend, from Friday afternoon to that Monday morning, due to a tender breakdown. On Wednesday, July 31, another extension was announced similar to previous weeks: Fishing in Togiak Section was extended through the weekend and the western sections (Matogak, Osviak, and Cape Pierce) would remain open to commercial fishing through 9:00 a.m. Saturday, August 3.

Although no formal forecast is produced for coho salmon in the Togiak District, parent year escapement levels can provide a very general indication of return size. However, coho escapement estimate for the parent year (1987) of the 1991 run was not clearly estimated. Aerial surveys flown by USFWS staff resulted in an escapement estimate of 18,000 coho for the entire district, compared with an estimate from a hydroacoustic sonar project for the Togiak River of 68,000 that year (ADF&G 1992, *in press*). Commercial catch rates in 1987 indicated a poor coho run, and reports from sport fishing guides and anglers also indicated a relatively poor escapement. These discrepancies in the parent year precluded a meaningful indication of run size; management of the upcoming coho run was based on the premise that run size was completely unknown, and a cautious approach was required.

Typically during the first week of August sockeye catches taper off and coho catches begin to build; management emphasis at this time usually turns to coho salmon. Fishing resumed on the revised 3-day schedule in all sections of the district on August 5, including the Kulukak Section, to obtain early coho catches and possibly gain an indication of run strength. Although resulting coho catches were low, daily sockeye (and chum) catches were still well above average, and on

August 7, the department announced a 48-hour extension in fishing time for all sections, to close at 9:00 a.m. Saturday, August 10.

The processor in Togiak District notified the department on August 8 that their buying operations would cease at the close of the extension on August 10. The weekly coho catch totaled only 600 fish, well below average. Although no buyer was present on the grounds, an announcement was aired August 11 that, due to the low coho catch, the weekly schedule would be further reduced to two days for all sections of the district, effective August 12. Therefore, fishing was permitted in the Togiak District from 9:00 a.m. August 12 to 9:00 a.m. August 14, but no buyer participated.

Still having little indication of the coho run strength, an announcement was made on August 16 that the 2-day fishing schedule would again be in effect for the upcoming week. Fishing was permitted from 9:00 Monday, August 19 to 9:00 Wednesday, August 21. A buyer participated in the fishing period, and resulting coho catches were lower than average, which, combined with the fact that no fishing had occurred in the recent weeks, indicated a lower than average return of coho salmon. A survey was flown on August 22 with excellent conditions, and resulted in coho escapement estimates of 5,000 in Togiak River and 1,400 in the Kulukak River. These estimates confirmed that the coho return at this point was weak, and on August 23, the department announced that all sections of Togiak District would close until further notice. Aerial surveys flown on August 27 and 30, and September 6 all indicated poor or below average levels of escapement, and the district remained closed.

The preliminary district sockeye catch totalled 561,952 fish (Table 20), well over the 1972-1991 average (Appendix Table 5). Escapement enumeration at Togiak Lake was discontinued on August 6, and a post-season adjustment was applied to the final tower count to compensate for late run timing and passage rates of 3,000 fish per day still occurring when the tower project was pulled. Togiak Lake escapement was estimated at 254,683 sockeye, well above the escapement goal (Table 26). Combining the final tower escapement with the escapement estimate for the tributaries and main river stem of 23,720 sockeye (Appendix Table 19) resulted in a Togiak Drainage escapement of 278,403 sockeye. This escapement plus the Togiak Section catch yielded a total run to Togiak Section of 800,493 sockeye, more than double the preseason forecast. Escapement into the Kulukak

Section totalled 23,940, 64% of the 1982-1991 average of 37,200 fish (ADF&G 1992). Combining the escapement and catch in Kulukak Section resulted in a total run of 57,365 sockeye to that system. Total runs to Osviak and Matogak combined totalled 13,217 sockeye.

The 1991 Togiak District catch of 7,088 chinook was approximately 33% of the 1982-1991 average due in part to reduced fishing time throughout the district (Appendix Table 6). Post-season aerial escapement estimates of chinook on the spawning grounds were again below average in every system, with the exception of the Negukthlik River, but improved for the first time since 1985. The Togiak River escapement estimate of 8,380 was 84% of the escapement goal, and exploitation of that stock was less than 50% for the first time in the history of the fishery. Escapement estimates totalled 710 for Kulukak River (goal: 1,000), and an additional 3,580 were estimated in the Quigmy, Osviak, Matogak, Negukthlik, and Ungalikthluk Rivers. The total district escapement of 12,670 chinook is considered relatively low, but is the highest district-wide escapement since 1985. The combined total run to Togiak District of 19,760 chinook salmon, however, was the lowest since 1975 (Appendix Table 30).

The Togiak District chum harvest of 249,113 was slightly above the 1972-1991 average (Appendix Table 7). The commercial catch combined with the district-wide aerial escapement estimate of 149,210 fish produced a total run of 398,323 chum, approximately 80% of the 1972-1991 mean (Appendix Table 31).

Pink salmon do not return in strength to the Togiak District in odd-numbered years such as 1991, and very few were caught in the commercial fishery or observed in the rivers.

The commercial catch of coho salmon in the Togiak District (4,262 fish) was well below the 1972-1991 average (49,000 fish), due largely to the reduced fishing schedule. However, low escapement estimates based on aerial surveys of the spawning grounds in the Togiak and Kulukak River verified that the returns to these rivers were well below average. The coho escapement estimate in the Togiak River and its tributaries (25,560) is roughly 50% of the escapement goal for that system (50,000), and the Kulukak River escapement estimate (12,600) comprises 85% of the goal for that river (15,000). Comparative counts from previous years are provided in Appendix Table 35.

1991 SUBSISTENCE SALMON FISHERY

In spite of numerous social, economic, and technological changes, Bristol Bay residents continue to depend on salmon and other fish species as an important source of food. Residents have relied on fish to provide nourishment and sustenance for thousands of years. Subsistence harvests still provide important nutritional, economic, social, and cultural benefits to most Bristol Bay households. All five species of salmon are utilized for subsistence purposes in Bristol Bay, but the most popular are sockeye, chinook, and coho. Many residents continue to preserve large quantities of fish through traditional methods such as drying and smoking and fish are also frozen, canned, salted, pickled, fermented, and eaten fresh. In some communities, significant numbers of fish are put up for dog teams as well.

Regulations

Permits are required to harvest salmon for subsistence purposes in Bristol Bay. During 1991, all Alaska residents were eligible to participate in subsistence salmon fishing in all Bristol Bay drainages. Only gillnets were recognized as legal subsistence gear. In the Togiak district, spear fishing was also allowed. Net lengths were limited to 10 fathoms in Naknek, Egegik, Ugashik, Dillingham, and within the Nushagak commercial district. Up to 25 fathoms could be used in the remaining areas.

In Dillingham, Egegik, and Ugashik, subsistence fishing was limited to several fishing periods per week during the peak of the sockeye run. The commercial districts were generally open for subsistence fishing only during commercial openings. The exception is the Nushagak commercial district which, starting in 1988, has been opened for subsistence fishing by emergency order during extended commercial closures.

Inseason Management

Four emergency orders related to subsistence fishing were issued, all in the Nushagak drainage (Table 13). In recent years, declining chinook and coho stocks resulted in longer commercial closures and some residents had an increasingly difficult time obtaining fish for home use. Within the commercial district,

subsistence fishing was allowed by emergency order from 12:01 a.m. May 27 until 9:00 a.m. June 22. Beginning July 24, when the district was closed to commercial fishing, subsistence fishing was again authorized.

The last emergency order restricted subsistence fishing for coho salmon in most of the Nushagak drainage to three 24-hour periods per week beginning August 19. This adjustment was in response to poor coho returns. The emergency order affected subsistence fishing in all waters of the Nushagak River and in the Wood River downstream from the Dragnet dock. Most of the subsistence effort directed at coho salmon had already occurred, however, and subsistence harvests of coho salmon were the highest ever recorded in the Nushagak.

Permit System

A permit system was gradually introduced throughout the region in the late 1960s to document the harvest of salmon for subsistence. Much of the increase in the number of permits issued during these years reflect: 1) greater compliance with the permitting and reporting requirements, 2) increased the level of effort expended by the department in making permits available, contacting individuals, and reminding them to return the harvest forms, and 3) a growing regional population. Most fishermen are obtaining permits and reporting their catches and overall permit returns have averaged between 85 and 90%. However, fish removed for home use from commercial catches are not included in most reported subsistence harvest totals. Also, fish caught later in the season, such as coho and spawning salmon are probably not documented as consistently as chinook and sockeye.

In 1991, a total of 1,197 permits were issued (Table 39) for Bristol Bay; the largest number were for the Nushagak and Naknek/Kvichak Districts. All districts issued more permits in 1991 than the average for the past ten years and Nushagak, Ugashik, and Egegik issued more permits in 1991 than in any previous year. This is due to permits being available to all state residents as well as increased local effort because of a poor economic season for commercial fishermen.

Harvest

The total Bristol Bay subsistence salmon harvest in 1991 was 176,544 fish. This number is somewhat higher than the 20-year average but very close to the more recent 10-year average of 172,651.

Most of the harvests were taken in the Naknek/Kvichak (58%) and the Nushagak (36%) Districts. Harvests in those two districts were within the historical range, with Naknek/Kvichak slightly above and Nushagak slightly below their most recent 10-year average. Within the Nushagak District, both chinook and coho salmon harvests were recorded at an all-time high. The Nushagak chinook harvest was 13,627 fish, second to 1986 when totals were documented at 12,600. Nushagak coho tallied 10,784, and the next highest subsistence coho catch was also in 1986 when the harvest was 9,400. Harvests in the Togiak and Ugashik Districts have remained stable over the past six years while those in Egegik increased substantially in 1991.

In 1991, the subsistence salmon harvest was composed of 79.1% sockeye, 8.8% chinook, 3.8% chum, 8.0% coho, and 0.3% pink. This harvest represents .004% of the total 1991 salmon run, and .007% of the total Bristol Bay harvest.

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BRISTOL BAY SALMON FISHERY

Tables 1-39

Table 1. Comparison of inshore sockeye salmon forecast versus actual run, escapement goals versus actual escapements, and projected versus actual commercial catch, by river system and district, in thousands of fish, Bristol Bay, 1991.^a

District and River System	Inshore Run			Escapement			Inshore Catch			
	Forecast	Actual ¹	Percent Deviation	Goal	Range	Actual ¹	Percent Deviation	Projected Harvest	Actual ¹	Percent Deviation
<u>NAKNEK-KVICHAK DISTRICT</u>										
Kvichak River ⁵	7,640	8,060	-5	4,000	4,000-8,000	4,223	-5	3,640	3,838	-5
Branch River ²	484	607	-20	185	170-200	278	-33	299	329	-9
Naknek River	6,001	9,970	-40	1,000	800-1,400	3,579	-72	5,001	6,391	-22
Total	14,125	18,637	-24	5,185	4,970-9,600	8,080	-36	8,940	10,558	-15
<u>EGEGIK DISTRICT</u>										
	8,183	9,588	-15	1,000	800-1,200	2,787	-64	7,183	6,801	6
<u>UGASHIK DISTRICT</u>										
	3,494	5,522	-37	700	500-900	2,482 ^b	-72	2,794	3,040	-8
<u>NUSHAGAK DISTRICT</u>										
Wood River	2,064	3,423	-40	1,000	700-1,200	1,160	-14	1,064	2,263	-53
Igushik River	578	2,478	-77	200	150-250	756	-74	378	1,722	-78
Nush/Mul River ²	1,131	1,783	-37	500	340-760	495	1	631	1,288	-51
Total	3,773	7,684	-51	1,700	1,190-2,210	2,411	-29	2,073	5,273	-61
<u>TOGIAK DISTRICT</u>										
	371	800	-54	150	140-250	278	10	221	522	-58
TOTAL BRISTOL BAY	29,946	42,232	-29	8,735	7,600-14,160	16,013	-45	21,211	26,195	-19

^a The Bristol Bay inshore forecast does not include several minor river systems, including the Snake River drainage in Nushagak District, and the Kulukak, Osviak, Matogak, and Slug River systems in Togiak District. Catches, escapements, and total runs for these smaller systems are not included in this table for the sake of comparison. Therefore, actual District totals reported here may represent only a portion of the District, and actual Bristol Bay totals reported here include only a portion of the Bristol Bay catch, escapement, and inshore run. Totals may not equal column sums due to rounding.

^b Includes Mother Goose and Dog Salmon River systems.

¹ Unless otherwise noted, inshore total runs and catches are preliminary, while escapement data is final.

² These systems cannot be managed separately from the major system in the district.

Table 2. Inshore forecast of sockeye salmon returns by age class, river system and district, in thousands of fish, Bristol Bay, 1991.

District and River System	Age Class (Brood Year)			Age Class (Brood Year)			Total
	1.2 (1987)	2.2 (1986)	2-Ocean	1.3 (1986)	2.3 (1985)	3-Ocean	
NAKNEK-KVICHAK DISTRICT							
Kvichak River	4,820	868	5,688	839	1,113	1,952	7,640
Branch River	256	32	288	172	24	196	484
Naknek River	955	961	1,916	2,862	1,223	4,085	6,001
Total	6,031	1,861	7,892	3,873	2,360	6,233	14,125
EGEGIK DISTRICT							
	497	4,203	4,700	1,684	1,799	3,483	8,183
UGASHIK DISTRICT							
	788	1,245	2,033	895	566	1,461	3,494
NUSHAGAK DISTRICT							
Wood River	972	72	1,044	977	43	1,020	2,064
Igushik River	78	39	117	421	40	461	578
Nuyakuk River	52	24	76	1,036	19	1,055	1,131
Total	1,102	135	1,237	2,434	102	2,536	3,773
TOGIK DISTRICT							
	86	23	109	238	24	262	371
TOTAL BRISTOL BAY¹							
Number	8,504	7,467	15,971	9,124	4,851	13,975	29,946
Percent	28	25	53	30	16	47	100

¹ Sockeye salmon of several minor age classes are expected to contribute an additional 1-2% to the total return.

Table 3. Inshore run of sockeye salmon by age class, river system and district, in thousands of fish, Bristol Bay, 1991.^a

District and River System	1.2	2.2	2-ocean	1.3	2.3	3-Ocean	Total
<u>NAKNEK-KVICHAK DISTRICT</u>							
Kvichak River							
Number	4,040	1,343	5,383	1,046	1,514	2,560	7,943
Percent	51	17	68	13	19	32	100
Branch River							
Number	152	187	339	259	8	267	606
Percent	25	31	56	43	1	44	100
Naknek River							
Number	324	1,233	1,557	6,951	1,398	8,349	9,906
Percent	3	12	16	70	14	84	100
Total							
Number	4,516	2,763	7,279	8,256	2,920	11,176	18,455
Percent	25	15	39	45	16	61	100
<u>EGEGIK DISTRICT</u>							
Number	857	3,787	4,644	3,587	1,217	4,804	9,448
Percent	9	40	49	38	13	51	100
<u>UGASHIK DISTRICT</u>							
Number	805	1,824	2,629	2,375	462	2,837	5,466
Percent	15	33	48	44	8	52	100
<u>NUSHAGAK DISTRICT</u>							
Wood River							
Number	1,361	69	1,430	1,943	12	1,955	3,385
Percent	40	2	42	57	0	58	100
Igushik River							
Number	160	26	186	2,195	76	2,271	2,457
Percent	7	1	8	89	3	92	100
Nush-Mulchat. River							
Number	37	0	37	670	16	686	723
Percent	5	0	5	93	2	95	100
Total							
Number	1,558	95	1,653	4,808	104	4,912	6,565
Percent	24	1	25	73	2	75	100
<u>TOGIAK DISTRICT</u>							
Number	192	83	275	441	76	517	792
Percent	24	1	25	73	2	75	100
<u>TOTAL BRISTOL BAY¹</u>							
Number	7,928	8,552	16,480	19,467	4,779	24,246	40,726
Percent	20	21	41	48	12	60	100

¹ Approximately 1,491,000 additional sockeye salmon of several minor age classes returning in 1991 are not included in this total.

^a The inshore run data does not include the 1991 high seas catch of maturing Bristol Bay sockeye or the 1990 catch of immatures.

Table 4. Inshore commercial catch and escapement of sockeye salmon, Bristol Bay, in numbers of fish, 1991.^a

District and River System	Catch	Escapement	Total Run
<u>NAKNEK-KVICHAK DISTRICT</u>			
Kvichak River	3,837,923	4,222,788	8,060,711
Branch River	328,996	277,589	606,585
Naknek River	6,391,385	3,578,508	9,969,893
Total	10,558,304	8,078,885	18,637,189
<u>EGEGIK DISTRICT</u>	6,800,798	2,786,925 ^b	9,587,723
<u>UGASHIK DISTRICT</u>	3,039,696	2,482,016	5,521,712
<u>NUSHAGAK DISTRICT</u>			
Wood River	2,263,046	1,159,920	3,422,966
Igushik River	1,721,688	756,126	2,477,814
Nushagak/Mul. System	1,287,985	495,106	1,783,091
Snake River		10,920	10,920
Total	5,272,719	2,422,072	7,694,791
<u>TOGIAK DISTRICT</u>			
Togiak Lake	522,090	254,683	776,773
Togiak River and Tributaries		23,720	23,720
Kulukak System	33,425	23,940	57,365
Other Systems ¹	6,437	18,370	24,807
Total	561,952	320,713	882,665
TOTAL BRISTOL BAY	26,233,469	16,089,967	42,323,436

¹ Catch includes Matogak and Osviak Sections; escapement includes Negukthlik, Ungalikthluk, Osviak, Matogak and Slug River systems.

^a Inshore catch apportionment by river system is preliminary until results from scale pattern analysis become available; escapements are final unless noted otherwise.

^b Includes Egegik River tower count and peak aerial counts for King Salmon River and Shosky Creek.

Table 5. Inshore commercial catch and escapement of pink salmon, in numbers of fish, Bristol Bay, 1991.^a

District and River System	Catch	Escapement ¹	Total Run
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Bristol Bay produces insignificant numbers of pink salmon in odd numbered years; only small numbers were taken incidental to other species in 1991.

Table 6. Offshore test fishing catch indices and estimated inshore daily passage rate of sockeye salmon, Port Moller, Bristol Bay, 1991.

Date	No. of Stations Fished	Sockeye Catch	Running Mean		Passage Rate ²		
			Length (mm)	Index ¹ Daily Cum.	Daily Cum.	Cum.	
6/11	4	13	544	6.71	6.7	143	143
12	4	23	557	9.40	16.1	200	343
13	4	12	555	6.62	22.7	141	484
14	4	10	555	5.68	28.4	121	605
15	4	33	559	17.49	45.9	373	978
16	1	65	557	(33.94)	79.8	723	1,701
17	4	97	553	47.24	127.1	1,006	2,707
8	4	115	554	58.10	185.2	1,238	3,945
19	4	189	553	91.20	276.4	1,943	5,888
20	4	133	555	68.80	345.2	1,466	7,353
21	0	200	555	(100.00)	445.2	2,130	9,484
22	4	345	553	169.90	615.1	3,619	13,103
23	4	133	554	70.24	685.3	1,496	14,599
24	4	346	556	157.55	842.9	3,356	17,956
25	4	108	556	56.52	899.4	1,204	19,160
26	4	112	556	59.43	958.8	1,266	20,426
27	4	307	554	149.81	1108.6	3,191	23,617
28	4	152	554	83.82	1192.5	1,786	25,403
29	4	233	553	(110.28)	1302.7	2,349	27,752
30	4	56	552	29.65	1332.4	632	28,384
7/01	3	188	552	89.97	1422.4	1,917	30,300
02	4	131	552	61.43	1483.8	1,309	31,609
03	4	360	552	181.81	1665.6	3,873	35,482
04	4	170	552	79.38	1745.0	1,691	37,173
05	4	338	551	144.60	1889.6	3,080	40,254
06	4	129	551	81.08	1970.7	1,727	41,981
07	4	99	552	58.14	2028.8	1,239	43,220
08	4	121	552	79.48	2108.3	1,693	44,913
09	2	97	552	58.92	2167.2	1,255	46,168

¹ Indices expressing in fish/100 fathom hours and include interpolations for missed days and stations (in parentheses).

² Estimated passage rate is expressed in thousands of fish and is adjusted throughout the season based on catchability and/or lag time. Passage rate is based on the mean inshore return per Port Moller index (1985, 1987, 1988, 1989, and 1990) of 21,855 fish multiplied by the daily index.

Table 7. Offshore test fishing catch indices and estimated inshore daily passage rate of chum salmon, Port Moller, Bristol Bay, 1991.

Date	No. of Stations Fished	Chum Catch	Index ¹		Passage Rate ²	
			Daily	Cum.	Daily	Cum.
6/11	4	2	1.03	1	14	14
12	4	3	1.39	2	19	33
13	4	1	.47	3	6	39
14	4	5	2.90	6	39	76
15	4	24	12.74	19	173	251
16	1	11	(5.88)	24	80	331
17	4	19	10.02	34	136	467
18	4	9	4.41	39	60	527
19	4	49	23.82	63	323	850
20	4	2	1.07	64	14	865
21	0	2	(1.00)	65	14	879
22	4	4	2.11	67	29	907
23	4	2	1.01	68	14	921
24	4	8	3.53	71	48	969
25	4	2	1.04	72	14	983
26	4	4	2.18	75	30	1,012
27	4	5	2.48	77	34	1,046
28	4	12	6.94	84	94	1,140
29	4	15	7.10	91	96	1,237
30	4	6	(3.34)	94	45	1,282
7/01	3	30	14.73	109	200	1,482
02	4	122	10.32	120	140	1,622
03	4	24	11.77	131	160	1,782
04	4	12	6.00	137	81	1,863
05	4	28	12.60	150	171	2,034
06	4	4	2.51	152	34	2,068
07	4	18	9.87	163	134	2,202
08	4	16	10.71	173	145	2,348
09	2	24	14.65	188	199	2,546

¹ Indices expressing in fish/100 fathom hours and include interpolations for missed days and stations (in parentheses).

² Estimated passage rate is expressed in thousands of fish and is adjusted throughout the season based on catchability and/or lag time. Passage rate is based on the mean inshore return per Port Moller index (1985, 1987, 1988, 1989, and 1990) of 21,855 fish multiplied by the daily index.

Table 8. Summary of district sockeye salmon test fishing indices in the Naknek-Kvichak District, by index area and date, Bristol Bay, 1991.^a

Index Area	Date ¹								
	June 24	June 26	June 27	June 28	June 29	July 8	July 9	July 10	July 14
Naknek River Mouth	166 ^h	415 ^g	183 ^d	1,167 ^c	486 ^b	51			
Pederson Point	849	110 ^e	427 ^c	285 ^c	921 ^c				
Cutbank & Graveyard		0 ^b	4		93				
Salmon Flats		14 ^b				89			
Gravel Spit		3 ^b				636	41	170	
Ships Anchorage		182 ^c	93 ^c	5 ^b					97
Half Moon Bay			52		0	53	58	227	289
Middle Naknek	39 ^c			3,671 ^c	577 ^b				
Johnson Hill				1,933 ^b	945 ^b				236
Division Buoy	170 ^b		1,012	1,135	211 ^b				
Deadman Sands				9	0		99	410	
Low Point									347
Coffee Creek						693			

- ¹ Two test boats fished simultaneously on June 26, June 27, June 28 and June 29.
^a All indices expressed in number of fish/100 fathom-hours to the nearest full index point.
^b Average of two drifts in the same general index area.
^c Average of three drifts in the same general index area.
^d Average of four drifts in the same general index area.
^e Average of five drifts in the same general index area.
^f Average of six drifts in the same general index area.
^g Average of seven drifts in the same general index area.
^h Average of eight drifts in the same general index area.

Table 9. Summary of district sockeye salmon test fishing indices in the Egegik District, by index area and date, Bristol Bay, 1991.^a

Index Area	Date	
	July 6	July 7
One Mile Upstream of Woodbine Dock	680	
Offshore of Nelbro Dock	495	587
Offshore of CWF Dock	830	
Scow Chute (1.5 Miles SW of CWF Dock)		4,540

^a All indices expressed in number of fish/100 fathom-hours to the nearest full index point.

Table 10. Summary of district sockeye salmon test fishing in the Ugashik District, by index area and date, Bristol Bay, 1991.^a

Index Area	July				
	1	2	3	7	8
Two mi. N. of Cape Grieg					
Cape Grieg			1,837		
Four mi. N. Smoky Pt., Inshore			2,273		
Four mi. N. Smoky Pt., Offshore					
Two mi. N. Smoky Pt., Outer Line			463		
Smoky Pt. Bar N. Side Inshore			1,895		
Smoky Pt. Entrance					1,142
Mid Outer Line			323		
Bell Buoy					
Four mi. N. Cape Menshikof, Inshore					
Two mi. N. Cape Menshikof, W. Line					
Three mi. S. South Spit, Inshore				1,098	
South Spit				751	369
Dago Creek Mouth	14	80			
Pilot Point				0	
Muddy Point	9	144			
South Channel					
Dog Salmon River	22	582			
Bend Below Ugashik					

^a All indices expressed in number of fish/100 fathom-hours to the nearest index point.

Table 11. Summary of district sockeye salmon test fishing indices in the Nushagak District, by index area and date, Bristol Bay, 1991.^a

Index Area	June 22	June 25	June 26	June 26	June 27	June 27	June 28	June 28	June 29
	P.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.
Nushagak River: Picnic Point		0	0	8219	741 ^b	1103 ^b	0 ^b	0 ^b	0
Wood River ¹									
A		1382	0	0	0	0	748 ^b	2,800	461
B		1597	772	0	307	1519	1,139	3,831 ^b	379
Snag Point									
Peter Pan									
Grassy Island	0	0	0	1029	370	1802 ^b	0	3,234 ^c	8,400 ^b
Nushagak Point	0					3,471	0	0	44,000
Nushagak Pt. Offshore									
Combine Flats	0	1067	355 ^b	17,746	0	17,760	1,862 ^b	8,515 ^c	28,181
Queen Slough	0		266	7200			1,828	706	10,800
Clarks Point			240		0	4,320	628 ^b	2,174	
Ekuk	23		0	3288				4,315 ^b	5,391 ^b
Ekuk Bluff	389		37	228					
Ships Ch. N.W.	44		27		0			90	
Middle Ch. N.W.	6		46		51		0	629	
West Ch. N.W.			397 ^b		0			0	
Schooner Ch. N.W.	12		0					669 ^b	
Dead Man's Spit									
Nichols Spit									
Igushik (Gravel Spit)									
Igushik No. Bank									
Igushik So. Bank									
Tule Point		252	0	4,200	1,213 ^b	10,080	8,100	10,560	1,481
Round Sand									
Coffee Point			0		1,317 ^b		78 ^b		

¹ Wood River: A = Hansen Point (west side of river); B = across from Hansen's Point (east side of river).
^a All indices expressed in number of fish/100 fathom-hours to the nearest full index point.
^b Average of two drifts in the same index area.
^c Average of three drifts in the same index area.
^d Average of four or more drifts in the same index area.

Table 12. Daily chinook salmon catch per unit of effort in subsistence nets on Dillingham beaches, 1991.^a

Date	Wind ¹		Kanakanak Beach		Scandanavian Beach		Comments:
	Direction	Knots	CPUE	Effort ²	CPUE	Effort ²	
6/14					No Counts		P.M. tide all nets had 20-30 kings each.
14	SSW	5	10	?			P.M. tide -- nets lighter than on Scandanavian Beach.
15				20			310+ kings, likely more. For the past 2 tides, most nets held 10-15 each, some held over 100.
15	SSW	5			12		Nets averaged 20-25 each.
17				0			Water too high to set nets.
17					5		Observed only 1 net, with 6 kings and 5 reds.
24				?			Mixed red and king gear. Some nets had 110 reds in red gear. Mostly small fish.
24					8		Mixed fish, mainly reds. Some nets had 50+ reds, 10+ kings. People working gear all day. Lots of fish!!
25				?			A.M. tide, fewer nets out and catch down, but it appeared that the fish started hitting as the tide went out.
Average		(Not calculated during the 1991 season due to the low number of data points.)					

¹ As recorded on Kanakanak Beach at time of survey.

² Total subsistence nets fishing.

^a Catches recorded at low water when nets are picked.

Table 13. Emergency order commercial salmon fishing periods, by district, Bristol Bay, 1991.

Emergency Orders					
Number ¹		Date and Time			Hours/Days Open
NAKNEK-KVICHAK DISTRICT					
AKN. 01	June 10	9:00 a.m.	to Sept 30	MIDNIGHT ²	
AKN. 05	June 30	3:00 p.m.	to July 01	2:30 a.m.	12 hrs
AKN. 11	July 02	4:30 p.m.	to July 03	5:30 p.m.	25 hrs
AKN. 27	July 10	9:30 a.m.	to July 11	11:30 p.m.	14 hrs
AKN. 35	July 11	3:00 p.m.	to July 12	MIDNIGHT ³	33 hrs
AKN. 44	July 17	9:00 a.m.	to Sept 30	MIDNIGHT ³	
Naknek Section					
AKN. 07	July 01	2:30 a.m.	to July 02	4:00 a.m.	25.5 hrs
AKN. 09	July 02	4:00 a.m.	to July 02	4:30 p.m.	12.5 hrs
AKN. 13	July 03	5:30 p.m.	to July 04	6:30 p.m.	25 hrs
AKN. 16	July 04	6:30 p.m.	to July 05	7:00 p.m.	24.5 hrs
AKN. 18	July 05	7:00 p.m.	to July 06	8:00 p.m.	25 hrs
AKN. 21	July 06	8:00 p.m.	to July 07	9:00 p.m.	25 hrs
AKN. 23	July 07	9:00 p.m.	to July 08	NOON	15 hrs
AKN. 25	July 09	8:00 a.m.	to July 10	9:30 a.m.	25.5 hrs
AKN. 37	July 12	MIDNIGHT	to July 13	6:00 p.m.	18 hrs
AKN. 40	July 14	2:30 p.m.	to July 15	3:30 p.m.	25 hrs
AKN. 42	July 15	3:30 p.m.	to July 17	9:00 a.m.	41.5 hrs
Kvichak Section					
AKN. 09	July 02	4:00 a.m.	to July 02	4:30 p.m.	12.5 hrs ⁴
AKN. 13	July 03	5:30 p.m.	to July 04	5:00 a.m.	11.5 hrs ⁴
AKN. 14	July 04	4:30 p.m.	to July 04	6:30 p.m.	13.5 hrs ⁵
AKN. 16	July 04	6:30 p.m.	to July 05	NOON	17.5 hrs ⁵
AKN. 18	July 05	NOON	to July 06	6:00 a.m.	18 hrs ⁶
AKN. 31	July 10	5:00 p.m.	to July 10	11:30 p.m.	6.5 hrs ⁷
AKN. 42	July 16	4:00 a.m.	to July 17	9:00 a.m.	28 hrs
EGEGIK DISTRICT					
AKN. 02	June 21	6:30 a.m.	to June 21	5:30 p.m.	11 hrs
AKN. 03	June 26	10:30 a.m.	to June 26	10:30 p.m.	12 hrs
AKN. 04	June 26	Recinds Emergency Order # AKN. 03			
AKN. 05	June 30	1:30 p.m.	to June 30	MIDNIGHT	10.5 hrs
AKN. 06	June 30	12:01 a.m.	to July 01	2:00 p.m.	14 hrs
AKN. 08	July 01	2:00 p.m.	to July 02	1:00 a.m.	11 hrs
AKN. 10	July 02	3:00 p.m.	to July 03	3:00 p.m.	24 hrs
AKN. 12	July 03	3:00 p.m.	to July 04	3:00 a.m.	12 hrs
AKN. 15	July 04	5:00 p.m.	to July 05	4:00 p.m.	23 hrs
AKN. 19	July 06	7:00 p.m.	to July 07	5:00 a.m.	10 hrs
AKN. 22	July 08	6:30 a.m.	to July 08	5:30 p.m.	11 hrs
AKN. 24	July 09	7:30 a.m.	to July 09	5:30 p.m.	10 hrs
AKN. 26	July 09	5:30 p.m.	to July 10	7:30 a.m.	14 hrs
AKN. 30	July 10	11:00 p.m.	to July 11	8:00 p.m.	22 hrs
AKN. 33	July 12	10:30 a.m.	to July 13	10:30 a.m.	24 hrs
AKN. 38	July 14	1:30 a.m.	to July 14	MIDNIGHT	22.5 hrs
AKN. 41	July 15	3:00 p.m.	to July 16	1:00 p.m.	22 hrs
AKN. 43	July 17	4:00 a.m.	to July 17	9:00 a.m.	5 hrs
AKN. 45	July 19	9:00 a.m.	to July 22	9:00 a.m.	72 hrs

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Emergency Orders					
Number ¹	Date and Time		Hours/Days Open		
<u>UGASHIK DISTRICT</u>					
AKN. 12	July 04	8:00 a.m. to July 05	4:00 a.m.	12 hrs	⁸
AKN. 17	July 05	5:00 p.m. to July 06	5:00 a.m.	12 hrs	⁸
AKN. 20	July 06	5:00 p.m. to July 07	6:00 a.m.	13 hrs	
AKN. 24	July 09	7:30 a.m. to July 09	7:30 p.m.	12 hrs	
AKN. 28	July 09	7:30 p.m. to July 10	8:30 a.m.	13 hrs	
AKN. 29	July 10	8:30 a.m. to July 10	8:30 p.m.	12 hrs	
AKN. 32	July 11	9:30 a.m. to July 12	10:30 a.m.	25 hrs	
AKN. 34	July 12	10:30 a.m. to July 13	11:00 a.m.	23.5 hrs	
AKN. 36	July 13	11:00 a.m. to July 14	NOON	25 hrs	
AKN. 39	July 14	NOON to July 17	9:00 a.m.	69 hrs	
AKN. 45	July 19	9:00 a.m. to July 22	9:00 a.m.	72 hrs	
<u>NUSHAGAK DISTRICT</u>					
DLG. 01	May 27	12:01 a.m. to June 17	9:00 a.m.	SUBSISTENCE	
DLG. 03	June 17	9:00 a.m. to June 23	9:00 a.m.	SUBSISTENCE	
DLG. 05	June 22	9:00 a.m. to June 23	9:00 a.m.	SUBSISTENCE CLOSURE	
DLG. 07	June 24	11:00 a.m. to June 24	6:00 p.m.	7 hrs	
DLG. 09	June 30	3:30 p.m. to July 01	3:30 a.m.	12 hrs	
DLG. 11	July 01	3:30 a.m. to July 01	4:30 p.m.	13 hrs	
DLG. 12	July 01	4:30 p.m. to July 02	5:00 a.m.	12.5 hrs	
DLG. 13	July 02	5:00 a.m. to July 02	5:00 p.m.	12 hrs	
DLG. 14	July 02	5:00 p.m. to July 03	5:30 a.m.	12.5 hrs	
DLG. 15	July 03	5:30 a.m. to July 03	6:00 p.m.	12.5 hrs	
DLG. 16	July 03	6:00 p.m. to July 04	6:00 a.m.	12 hrs	
DLG. 18	July 04	6:00 a.m. to July 04	7:00 p.m.	13 hrs	
DLG. 19	July 04	7:00 p.m. to July 05	8:00 p.m.	25 hrs	
DLG. 20	July 05	8:00 p.m. to July 06	8:30 p.m.	24.5 hrs	
DLG. 21	July 06	8:30 p.m. to July 07	9:30 p.m.	25 hrs	
DLG. 22	July 07	9:30 p.m. to July 08	10:00 p.m.	24.5 hrs	
DLG. 23	July 08	10:00 p.m. to July 09	11:00 p.m.	25 hrs	
DLG. 24	July 10	10:30 a.m. to July 10	MIDNIGHT	13.5 hrs	
DLG. 25	July 10	MIDNIGHT to July 11	MIDNIGHT	24 hrs	
DLG. 27	July 11	MIDNIGHT to July 13	2:00 a.m.	26 hrs	
DLG. 29	July 13	2:00 a.m. to July 14	2:30 a.m.	24.5 hrs	
DLG. 30	July 14	2:30 a.m. to July 17	9:00 a.m.	78.5 hrs	
DLG. 32	July 20	9:00 a.m. to July 22	9:00 a.m.	48 hrs	
DLG. 33	July 24	9:00 a.m. to Sept 30	MIDNIGHT	SUBSISTENCE	
DLG. 34	July 22	9:00 a.m. to July 23	10:30 a.m.	25.5 hrs	
DLG. 41	Aug 19	12:01 a.m. to Sept 30	MIDNIGHT	SUBSISTENCE ⁹	
<u>Iqushik Section</u>					
DLG. 09	June 30	3:30 p.m. to July 01	4:30 p.m.	25 hrs	
DLG. 24	July 09	11:00 p.m. to July 10	Midnight	25 hrs	
<u>TOGIAK DISTRICT</u>					
DLG. 02	June 01	12:01 a.m. to Sept 30	MIDNIGHT ¹⁰		
DLG. 04	June 17	9:00 a.m. to June 24	9:00 a.m. ¹¹		
DLG. 10	July 01	9:00 a.m. to Sept 30	MIDNIGHT ¹²		
DLG. 17	July 04	9:00 a.m. to July 05	9:00 a.m.	24 hrs	
DLG. 26	July 11	9:00 a.m. to July 12	9:00 a.m.	24 hrs	
DLG. 39	Aug 08	9:00 a.m. to Aug 10	9:00 a.m.	48 hrs	
DLG. 40	Aug 12	9:00 a.m. to Aug 14	9:00 a.m.	48 hrs ¹³	
DLG. 42	Aug 19	9:00 a.m. to Aug 21	9:00 a.m.	48 hrs ¹³	
DLG. 43	Aug 26	9:00 a.m. to Sept 30	9:00 a.m.	CLOSURE	

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Emergency Orders					
Number ¹	Date and Time		Hours/Days Open		
<u>Togiak Section</u>					
DLG. 06	June 25	10:00 a.m. to	June 25	10:00 p.m.	12 hrs ¹⁴
DLG. 08	June 25	1:00 p.m. to	June 26	1:00 a.m.	12 hrs ¹⁴
DLG. 28	July 12	9:00 a.m. to	July 13	9:00 a.m.	24 hrs
DLG. 31	July 18	9:00 a.m. to	July 22	9:00 a.m.	4 days
DLG. 36	July 25	9:00 a.m. to	July 29	9:00 a.m.	4 days
DLG. 38	Aug 01	9:00 a.m. to	Aug 05	9:00 a.m.	4 days
<u>Kulukak Section</u>					
DLG. 06	June 25	10:00 a.m. to	June 25	10:00 p.m.	12 hrs ¹⁴
DLG. 08	June 25	1:00 p.m. to	June 26	1:00 a.m.	12 hrs ¹⁴
DLG. 35	July 22	9:00 a.m. to	July 24	9:00 a.m.	48 hrs ¹³
DLG. 37	July 29	9:00 a.m. to	Aug 01	9:00 a.m.	CLOSURE
<u>Osviak, Matogak, and Cape Pierce Sections</u>					
DLG. 06	June 23	Closed for the week.			
DLG. 31	July 18	9:00 a.m. to	July 20	9:00 a.m.	48 hrs
DLG. 36	July 25	9:00 a.m. to	July 27	9:00 a.m.	48 hrs
DLG. 38	Aug 01	9:00 a.m. to	Aug 03	9:00 a.m.	48 hrs

- ¹ Prefix code on emergency orders indicate where announcements originated ("AKN" for King Salmon field office and "DLG." for Dillingham field office).
- ² Reduces the weekly fishing schedule to 4 days from 9:00 a.m., Mondays thru 9:00, Fridays, before June 23 and after July 17.
- ³ Reduces the weekly fishing schedule to 4 days from 9:00 a.m., Mondays thru 9:00, Fridays.
- ⁴ Set net only extended from 5:30 p.m., July 03 to 5:00 a.m., July 04.
- ⁵ Set net only extended from 6:30 p.m., July 04 to 12:00 noon, July 05.
- ⁶ Set net only extended from 12:00 noon, July 05 to 6:00 a.m., July 06.
- ⁷ Allows drift net only from 5:00 p.m., July 10 to 11:30 p.m., July 10 and set net only from 11:30 p.m., July 10 to 3:00 p.m., July 11.
- ⁸ Also waives Egegik 48 hour transfer period.
- ⁹ Restricts subsistence fishing in the Nushagak District to 3 days per week.
- ¹⁰ Prohibits the use of large mesh gill nets.
- ¹¹ Reduces the weekly fishing schedule to 2 days from 9:00 a.m., Tuesday until 9:00 a.m., Thursday for one week only.
- ¹² Reduces the weekly fishing schedule in all sections to 3 days from 9:00 a.m., Monday until 9:00 a.m., Thursday.
- ¹³ Reduces the weekly fishing schedule to 2 days.
- ¹⁴ Amended start time, Dlg 06.

Table 14. Daily district registration of drift gill net fishermen by district, Bristol Bay, 1991.^a

Date	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
6/14	269	157	26	54	42	548
16	300	149	26	53	44	572
17	439	156	38	55	41	729
18	728	171	69	53	41	1,062
19	739	176	64	54	41	1,074
20	740	238	64	56	41	1,139
21	746	351	57	58	41	1,253
22	693	393	10	80	38	1,214
23	708	471	6	94	37	1,316
24	709	489	6	126	38	1,368
25	715	481	8	145	38	1,387
26	738	482	8	164	38	1,430
27	753	484	8	179	37	1,461
28	741	469	8	199	32	1,449
29	747	473	7	232	32	1,491
30	766	468	7	232	32	1,505
7/01	831	479	8	258	32	1,608
02	848	480	8	295	32	1,663
03	843	470	18	332	32	1,695
04	854	462	64	377	34	1,791
05	825	451	85	379	34	1,774
06	794	438	129	383	34	1,778
07	739	440	219	380	34	1,812
08	723	449	229	378	34	1,813
09	722	441	253	381	33	1,830
10	722	443	268	377	33	1,843
11	717	443	275	371	33	1,839
12	711	436	277	360	33	1,817
13	693	451	283	365	34	1,826
14	716	436	296	369	34	1,851
15	699	451	292	374	35	1,851
Mean	709	399	101	233	36	1,477

^a Total indicates number of drift gill net permit holders legal to fish each day in the districts (transferees not included). There were 1,878 permit holders actually registered for the season.

Table 15. Commercial salmon catch by date and species, in numbers of fish, Naknek-Kvichak District, Bristol Bay, 1991.

Date	Time	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
6/03	24 hrs.								
6/04	24 hrs.								
6/05	24 hrs.								
6/06	24 hrs.								
6/07	24 hrs.								
6/10 ^a	15 hrs.			10	6	0	0	0	16
6/11	24 hrs.			47	15	0	0	0	62
6/12	24 hrs.			161	21	5	0	0	187
6/13	24 hrs.			357	112	13	0	0	482
6/14	9 hrs.			320	53	16	0	0	389
6/17	15 hrs.			14,455	564	571	0	0	15,590
6/18	24 hrs.			9,102	321	342	0	0	9,765
6/19	24 hrs.			14,206	273	569	0	0	15,048
6/20	24 hrs.			24,263	346	766	0	0	25,375
6/21	9 hrs.			29,846	236	1,076	0	0	31,158
6/22 ^b				1,024	0	38	0	0	1,062
6/25 ^b				700	0	26	0	0	726
6/27 ^b				1,713	5	28	0	0	1,746
6/28 ^b				1,998	0	48	0	0	2,046
6/29 ^b				2,104	0	52	0	0	2,156
6/30	9.5 hrs.			355,107	183	2,543	0	0	357,833
7/01 ^c	24 hrs.			741,406	50	7,726	0	0	749,182
7/02 ^d	24 hrs.			850,782	130	12,774	0	0	863,686
7/03 ^e	24 hrs.			709,441	291	12,273	0	0	722,005
7/04 ^f	24 hrs.			1,407,958	356	21,938	0	0	1,430,252
7/05 ^g	24 hrs.			516,291	113	3,966	0	0	520,370
7/06 ^h	24 hrs.			474,838	82	8,196	0	0	483,116
7/07 ⁱ	24 hrs.			709,686	33	5,882	0	0	715,601
7/08 ^j	12 hrs.			743,208	44	12,525	0	0	755,777
7/09 ^k	16 hrs.			651,586	24	6,483	0	0	658,093
7/10 ^l	24 hrs.			770,710	106	7,240	0	0	778,056
7/11 ^m	24 hrs.			773,418	197	14,956	0	0	788,571
7/12 ⁿ	24 hrs.			349,683	175	9,421	0	0	359,279
7/13 ^o	18 hrs.			227,666	41	3,528	0	0	231,235
7/14 ^p	24 hrs.			139,048	17	6,111	0	0	145,176
7/15 ^q	24 hrs.			155,049	34	10,270	0	0	165,353
7/16 ^r	24 hrs.			283,549	87	28,214	0	0	311,850
7/17	24 hrs.			247,370	65	16,220	0	0	263,655
7/18	24 hrs.			147,449	35	14,156	0	0	161,640
7/19	9 hrs.			61,165	34	4,411	0	0	65,610
7/22	15 hrs.			47,600	62	42,565	3	26	90,256
7/23	24 hrs.			52,278	105	53,373	4	17	105,777
7/24	24 hrs.			18,149	67	27,423	6	59	45,704
7/25	24 hrs.			6,445	69	11,635	13	356	18,518
7/26	9 hrs.			4,133	32	7,054	6	166	11,391

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Table 15. (page 2 of 2)

Date	Time	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
7/29	15 hrs.			2,261	8	11,397	6	306	13,978
7/30	24 hrs.			3,119	28	15,242	15	408	18,812
7/31	24 hrs.			2,215	32	11,799	5	522	14,573
8/01	24 hrs.			1,617	10	7,768	2	996	10,393
8/02	9 hrs.			2,053	17	3,312	8	1,271	6,661
8/05	15 hrs.			679	5	7,085	5	350	8,124
8/06	24 hrs.			519	12	6,727	5	1,298	8,561
8/07	24 hrs.			367	6	3,781	3	1,646	5,803
8/08	24 hrs.			209	5	1,674	1	866	2,755
8/09	9 hrs.			412	2	1,604	8	718	2,744
8/12	15 hrs.			32	1	306	0	268	607
8/13	24 hrs.			159	2	1,388	0	650	2,199
8/14	24 hrs.			75	2	1,072	0	448	1,597
8/15	24 hrs.			44	2	1,471	0	1,322	2,839
8/16	9 hrs.			106	2	658	2	1,075	1,843
8/19	15 hrs.			15	2	155	0	505	677
8/20	24 hrs.			19	2	99	0	616	736
8/21	24 hrs.			20	3	315	0	1,300	1,638
8/22	24 hrs.			22	2	55	0	469	548
8/23	9 hrs.			10	0	49	1	320	380
8/26	15 hrs.			3	0	13	0	313	329
8/27	24 hrs.			19	1	48	1	145	214
8/28	24 hrs.			8	0	1	0	81	90
Total				10,558,304	4,528	430,453	94	16,517	11,009,895
% of District Catch				96	0	4	0	0	100

1 Effort based on aerial surveys and IBM runs.

a Weekly period reduced by one day.

b Test fishing only.

c Naknek Section open entire day; Kvichak Section open for 2.5 hours.

d Naknek Section open entire day; Kvichak Section open for 12.5 hours.

e Naknek Section open entire day; Kvichak Section, set gill net, open for 6.5 hours.

f Naknek Section open entire day; Kvichak Section, set gill net, open for 5 hours; Kvichak Section, both set and gill net, open for 13.5 hours; Kvichak section, set gill net, open for 5.5 hours.

g Naknek Section open entire day; Kvichak Section, set gill net, open for 24 hours.

h Naknek Section open entire day; Kvichak Section, set gill net, open for 6 hours.

i Naknek Section only, open for entire period.

j Naknek Section only, open for 12 hours.

k Naknek Section only, open for 16 hours.

l Naknek Section open for entire period, Kvichak Section, set gill net, open for 14.5 hours; Kvichak Section, drift gill net, open for 6.5 hours.

m Naknek Section open for entire period; Kvichak Section, open for 20 hours.

n Naknek Section open for entire period; Kvichak Section, open for 9 hours.

o Naknek Section only, open for 18 hours.

p Naknek Section only, open for 9.5 hours.

q Naknek Section only, open for 24 hours.

r Naknek Section open for 24 hours; Kvichak Section, drift and set gill net open for 20 hours.

Table 16. Commercial salmon catch by date and species, in numbers of fish, Egegik District, Bristol Bay, 1991.

Date	Hrs.	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
6/10	15.0			7	6	1	0	0	14
11	24.0			46	12	0	0	0	58
12	24.0			110	10	6	0	0	126
13	24.0			390	9	15	0	0	414
14	9.0			152	4	3	0	0	159
17 ^a	0.0			50	0	0	0	0	50
18 ^a	0.0			17	0	0	0	0	17
19 ^a	0.0			356	10	0	0	0	366
20 ^a	0.0			143	0	0	0	0	143
21	11.0	208	17	20,506	16	321	0	0	20,843
22 ^a	0.0			37	1	0	0	0	38
24 ^a	0.0			2,867	2	20	0	0	2,889
25 ^a	0.0			2,165	2	21	0	0	2,188
26 ^b	0.0			2,730	2	23	0	0	2,755
27 ^a	0.0			3,747	1	4	0	0	3,752
28 ^a	0.0			2,424	0	41	0	0	2,465
29 ^a	0.0			10,031	0	137	0	0	10,168
30	10.5			250,066	27	1,651	0	0	251,744
7/01	24.0	192	11	806,668	29	4,913	0	0	811,610
02	10.0			527,421	26	2,512	0	0	529,959
03	24.0			658,486	39	4,409	0	0	662,934
04	10.0	408	228	522,159	13	3,583	0	0	525,755
05	16.0			558,555	40	3,812	0	0	562,407
06	5.0	412	239	96,867	8	1,642	0	0	98,517
07	5.0			364,209	29	2,098	0	0	366,336
08	11.0			482,004	35	4,193	0	0	486,232
09	16.5			481,426	8	3,734	0	0	485,168
10	8.5			311,095	15	3,305	0	0	314,415
11	20.0			532,603	17	6,174	0	0	538,794
12	13.5	372	231	226,834	10	2,858	0	0	229,702
13	10.5			165,859	10	1,972	0	0	167,841
14	22.5	290	209	197,498	17	2,068	0	0	199,583
15	9.0			95,798	8	1,163	0	0	96,969
16	13.0			113,229	3	3,119	0	0	116,351
17	20.0			44,986	6	1,473	0	0	46,465
18	24.0			62,922	6	1,873	0	0	64,801
19	24.0			63,840	1	2,158	1	0	66,000
20	24.0			43,597	4	1,818	0	7	45,426
21	24.0			44,321	2	1,584	3	18	45,928
22	24.0			32,259	7	1,097	4	15	33,382
23	24.0			26,758	7	506	0	12	27,283
24	24.0			17,057	4	497	0	46	17,604
25	24.0			9,933	3	206	113	245	10,500
26	9.0			1,948	4	230	0	96	2,278
29	15.0			3,672	1	808	0	720	5,201
30	24.0			5,869	2	1,712	0	1,413	8,996
31	24.0			2,451	0	386	0	966	3,803
8/01	24.0			1,174	1	336	0	929	2,440
02	9.0			445	0	152	0	273	870
05	15.0			721	1	354	0	1,779	2,855
06	24.0			670	2	416	0	1,765	2,853
07	24.0			349	0	252	0	1,395	1,996
08	24.0			190	1	197	0	1,615	2,003

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Table 16. (Page 2 of 3)

Date	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
	Hrs.	Drift Set						
09	9.0		76	0	78	0	411	565
12	15.0		240	1	408	0	4,139	4,788
13	24.0		272	0	342	0	3,277	3,891
14	24.0		75	0	157	0	2,272	2,504
15	24.0		106	0	138	0	2,122	2,366
16	9.0		39	0	35	0	488	562
19	15.0		103	0	104	0	5,554	5,761
20	24.0		48	0	66	0	3,662	3,776
21	24.0		63	0	57	0	3,630	3,750
22	24.0		25	2	31	0	3,152	3,210
23	9.0		3	0	5	0	725	733
26	15.0		11	1	11	0	2,078	2,101
27	24.0		15	0	15	0	1,347	1,377
28	24.0		0	0	11	0	1,171	1,182
29	24.0		4	0	1	0	831	836
30	9.0		1	0	1	0	334	336
Total			6,800,798	465	71,313	121	46,487	6,919,184
% of District Catch			98	0	1	0	1	100

¹ Estimated fishing effort based on aerial surveys.

^a ADF&G test fishing catches.

Table 17. Commercial salmon catch by date and species, in numbers of fish, Ugashik District, Bristol Bay, 1991.

Date	Hrs.	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
6/04	24.0			0	7	0	0	0	7
05	24.0			0	16	0	0	0	16
06	24.0			0	49	0	0	0	49
10	15.0			0	7	0	0	0	7
11	24.0			30	18	0	0	0	48
12	24.0			143	219	0	0	0	362
13	24.0			59	72	0	0	0	131
14	9.0			248	23	0	0	0	271
17	15.0			459	133	16	0	0	608
18	24.0			5,092	253	128	0	0	5,473
19	24.0			6,283	210	175	0	0	6,668
20	24.0			12,039	130	208	0	0	12,377
21	9.0			3,978	29	117	0	0	4,124
7/03 ^a	0.0			1,743	0	8	0	0	1,751
04	8.0	61	69	73,380	0	61	0	0	73,441
05	11.0			204,971	4	393	0	0	205,368
06	12.0	130	54	134,822	20	905	0	0	135,747
07	6.0			268,101	6	2,467	0	0	270,574
08 ^a	0.0			97	0	1	0	0	98
09	16.5			523,405	11	3,716	0	0	527,132
10	20.5			418,018	9	4,282	0	0	422,309
11	14.5			217,230	7	3,482	0	0	220,719
12	24.0	237	69	223,803	20	3,960	0	0	227,783
13	24.0			160,996	9	3,072	0	0	164,077
14	24.0	230	66	196,454	13	4,528	1	0	200,996
15	24.0			125,805	14	3,302	1	0	129,122
16	24.0			111,599	4	3,153	0	0	114,756
17	24.0			27,058	0	987	0	0	28,045
18	24.0			72,434	2	2,741	0	0	75,177
19	24.0			48,228	13	2,639	0	0	50,880
20	24.0			34,087	4	2,343	0	0	36,434
21	24.0			47,767	9	2,740	0	0	50,516
22	24.0			37,056	9	2,222	0	0	39,287
23	24.0			27,247	5	2,471	0	5	29,728
24	24.0			18,281	5	654	0	7	18,947
25	24.0			17,105	7	712	0	4	17,828
26	9.0			3,774	0	253	0	2	4,029
7/29	15.0			6,977	25	1,112	0	129	8,243
30	24.0			5,009	0	473	0	82	5,564
31	24.0			2,889	0	440	0	58	3,387
8/01	24.0			1,074	0	97	0	10	1,181
02	9.0			359	0	43	0	14	416
05	15.0			326	1	142	0	385	854
06	24.0			113	0	81	0	138	332
07	24.0			590	0	248	0	344	1,182
08	24.0			235	1	532	0	391	1,159
09	9.0			0	0	0	0	0	0
12	15.0			113	0	150	0	743	1,006
13	24.0			82	0	278	0	1,371	1,731
14	24.0			20	0	137	0	1,566	1,723
15	24.0			33	0	321	0	2,204	2,558
16	9.0			5	0	90	0	1,723	1,818

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Table 17. (Page 2 of 2)

Date	Hrs.	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
19	15.0			15	0	238	0	3,165	3,418
20	24.0			20	0	273	0	3,947	4,240
21	24.0			3	1	142	0	3,254	3,400
22	24.0			17	0	91	0	5,340	5,448
23	9.0			0	0	0	0	787	787
26	15.0			8	0	31	0	2,500	2,539
27	24.0			3	0	3	0	2,581	2,587
28	24.0			2	0	8	0	3,625	3,635
29	24.0			7	0	26	0	2,679	2,712
30	9.0			0	0	2	0	196	198
9/02	15.0			1	0	0	0	1,424	1,425
03	24.0			3	0	3	0	1,044	1,050
04	24.0			0	0	1	0	903	903
05	24.0			0	0	2	0	2,146	2,148
06	9.0			0	0	0	0	295	295
09	15.0			0	0	0	0	478	478
10	24.0			0	0	0	0	767	767
11	24.0			0	0	0	0	579	579
12	24.0			0	0	0	0	143	143
13	9.0			0	0	0	0	20	20
Total				3,039,696	1,365	56,700	2	45,048	3,142,811
% of District Catch				97	0	2	0	1	100

¹ Estimated fishing effort based on aerial surveys.
^a ADF&G test fishing catches.

Table 18. Commercial salmon catch by date and species, in numbers of fish, Nushagak District, Bristol Bay, 1991.^a

Date	Time Hrs.	Effort ¹		Sockeye	Chinook	Chum	Pink	Coho	Total
		Drift	Set						
6/22 ^a				21	12	3	0	0	36
24	7	15	26	16,274	1,602	1,227	0	0	19,103
25				1,325	26	85	0	0	1,436
29 ^a				23,507	64	1,833	0	0	25,404
30	24	28	10						
7/01	24			104,476	772	6,813	0	0	112,061
02	24			338,300	2,671	21,944	0	0	362,915
03	24	17	20	262,720	1,068	14,958	0	0	284,746
04	24	359	242	807,819	2,930	65,255	0	0	876,004
05	24			469,647	1,158	37,993	1	0	508,799
06	24			370,128	1,069	27,026	0	0	398,223
07	24			316,463	1,172	30,520	0	0	348,155
08	24			408,926	1,764	44,836	1	0	455,527
09	24			505,895	1,616	38,183	3	5	545,702
10 ^b	24			488,452	1,365	22,734	3	0	512,554
11	24			341,430	1,755	36,805	2	2	379,994
12	24			282,394	1,160	32,208	0	15	315,777
13 ^c	24			114,039	1,736	13,636	2	16	129,429
14	24			150,029	384	20,970	7	93	171,483
15	24			100,814	274	15,685	5	247	117,026
16	24			37,882	55	4,763	2	248	42,950
17	24			43,689	59	7,112	1	236	51,097
18	24			42,740	47	7,771	3	376	50,937
19	24			31,756	60	6,095	5	992	38,908
20	24			18,358	37	1,961	2	597	20,955
21	24			12,336	18	1,457	6	515	14,332
22	24			8,896	20	2,756	18	1,762	13,452
23	10.5			4,403	3	953	2	295	5,656
Total	569.5			5,272,719	22,898	465,582	63	5,399	5,766,661
% of District Catch				91.4	0.4	8.1	0.0	0.1	100.0

¹ Estimated fishing effort based on aerial survey count. Effort prior to July 3 influenced by price dispute.

^a Includes fish landed in district test fish project.

^b Igushik Section only extended, Nushagak Section closed 11.5 hours.

^c Igushik section only extended, Nushagak Section closed 12 hours.

Table 19. Commercial sockeye salmon catch by date in numbers of fish, from set net areas, Nushagak District, Bristol Bay, 1991.

Date	Time (hrs)	Nushagak Beaches ¹	Clark's Point Beach ²	Ekuk Beach ³	Igushik Beach ⁴	Snake River Beach ⁵	Daily Total
6/24	7	5,102	800	90	5,321	0	11,313
30	8.5	4,258	0	101	4,332	0	8,691
7/01	24	27,542	797	345	11,821	0	40,505
02	24	167,250	0	7,230	14,578	0	189,058
03	24	58,053	3,156	14,925	29,656	0	105,790
04	24	47,928	2,646	57,198	49,221	0	156,993
05	24	16,462	3,143	4,776	33,509	0	57,890
06	24	7,346	3,276	10,088	42,149	0	62,859
07	24	8,650	2,816	7,695	25,120	0	44,281
08	24	10,820	8,765	12,365	14,811	0	46,761
09	24	29,869	2,766	28,836	41,051	0	102,522
10 ^a	24	36,174	2,676	13,194	38,076	0	90,120
11	24	16,677	2,322	21,788	18,811	0	59,598
12 ^b	24	16,100	2,319	16,091	26,726	0	61,236
13 ^b	24	30,347	1,005	11,662	7,103	0	50,117
14	24	4,872	1,162	15,474	12,165	0	33,673
15	24	9,760	1,290	15,131	6,364	0	32,545
16	24	1,619	1,252	10,041	6,144	0	19,056
17	24	8,744	444	5,079	4,184	0	18,451
18	24	5,512	445	10,017	5,140	0	21,114
19	24	5,302	804	4,765	5,101	0	15,972
20	24	3,969	715	7,817	1,707	0	14,208
21	24	2,409	825	6,014	628	0	9,876
22	24	1,572	427	4,554	1,043	0	7,596
23	10.5	485	135	2,845	542	0	4,007
Total	554	526,822	43,986	288,121	405,303	0	1,264,232

¹ Includes Combine Flats, Queen Slough, and Coffee Point. Sockeye salmon accounted for 94% of the total beach catch. Other species landed included 9,005 Chinook; 24,786 Chums; 32 Pinks; and 277 Cohos.

² Sockeye salmon accounted for 91% of the total beach catch. Other species landed included 211 Chinook; 4,377 Chums; 0 Pinks; and 32 Cohos.

³ Sockeye salmon accounted for 97% of the total beach catch. Other species landed included 303 Chinook; 7,287 Chums; 27 Pinks; and 1,846 Cohos.

⁴ Sockeye salmon accounted for 99% of the total beach catch. Other species landed included 1,028 Chinook; 505 Chums; 0 Pinks; and 1 Coho.

⁵ No commercial catch.

^a Igushik section only extended, Nushagak section closed 11.5 hours.

^b Igushik section only extended, Nushagak section closed 12 hours.

Table 20. Commercial salmon catch by date and species, in numbers of fish, Togiak District, Bristol Bay, 1991.

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
6/04	0	2	0	0	0	2
06	2	2	0	0	0	4
07	0	2	0	0	0	2
10	21	7	42	0	0	70
11	108	70	46	0	0	224
12	149	78	107	0	0	334
13	155	69	79	0	0	303
14	38	60	59	0	0	157
15	31	63	43	0	0	137
18	559	270	435	0	0	1,264
19	1,007	498	625	0	0	2,130
20	354	159	384	0	0	897
7/01	4,224	136	729	0	0	5,089
02	16,084	1,330	5,923	2	0	23,339
03	20,188	1,009	7,602	1	0	28,800
04	19,932	549	4,883	0	0	25,364
05	8,083	76	2,317	0	0	10,476
08	14,959	604	6,078	3	0	21,644
09	20,859	470	8,732	2	0	30,063
10	20,491	307	9,762	1	0	30,561
11	22,043	199	7,029	3	0	29,274
12	17,656	119	3,150	0	0	20,925
13	4,485	61	904	1	0	5,451
15	13,498	214	5,497	2	0	19,211
16	5,064	44	2,891	1	0	8,000
17	27,392	95	10,398	6	0	37,891
18	25,095	69	9,162	1	0	34,327
19	30,289	70	12,659	6	0	43,024
20	39,217	69	13,254	8	0	52,548
21	32,604	51	9,810	9	0	42,474
22	38,572	63	18,809	5	0	57,449
23	37,142	61	23,966	1	0	61,170
24	25,770	37	15,674	2	1	41,484
25	15,459	25	9,291	1	0	24,776
26	13,249	22	10,734	0	4	24,009
27	536	0	72	0	0	608
29	12,140	10	5,706	7	4	17,867
30	12,789	17	9,802	3	11	22,622
31	10,163	14	7,347	7	11	17,542
8/01	8,530	16	5,003	4	26	13,579
02	7,403	11	2,285	11	22	9,732
03	6,230	12	3,137	3	40	9,422
04	2,420	7	994	2	7	3,430
05	7,588	11	4,145	7	64	11,815
06	6,849	9	3,672	11	92	10,633
07	4,767	13	2,427	3	94	7,304
08	2,647	6	1,779	3	127	4,562

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Table 20. (Page 2 of 2)

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
8/09	2,230	0	851	1	75	3,157
10	1,667	2	573	4	140	2,386
14	22	0	0	0	3	25
19	346	0	49	0	753	1,148
20	645	0	130	0	1,922	2,697
21	201	0	67	0	875	1,143
Total	561,952	7,088	249,113	121	4,271	822,545
% of District Total	68.3	0.9	30.3	0.0	0.5	100.0

¹ See Table 13 for inseason adjustments to the regular weekly fishing schedule.

Table 21. Commercial salmon catch by date and species, in numbers of fish, Togiak Section, Bristol Bay, 1991.

6/07	0	2	0	0	0	2
11	7	38	5	0	0	50
12	10	33	16	0	0	59
13	12	28	11	0	0	51
14	8	12	12	0	0	32
18	252	233	89	0	0	574
19	400	438	293	0	0	1,131
20	89	101	73	0	0	263
7/01	1,610	90	393	0	0	2,093
02	11,788	1,289	5,458	2	0	18,537
03	15,809	991	7,338	1	0	24,139
04	14,510	525	4,414	0	0	19,449
05	6,530	69	2,145	0	0	8,744
08	13,724	592	5,242	3	0	19,561
09	18,125	455	8,048	2	0	26,630
10	17,353	296	9,522	1	0	27,172
11	18,941	187	6,378	3	0	25,509
12	16,168	114	3,034	0	0	19,316
13	4,485	61	904	1	0	5,451
15	13,051	209	5,076	2	0	18,338
16	4,840	42	2,690	1	0	7,573
17	26,664	89	9,620	6	0	36,379
18	24,478	66	8,808	1	0	33,353
19	29,090	65	12,548	6	0	41,709
20	39,217	69	13,254	8	0	52,548
21	32,604	51	9,810	9	0	42,474
22	38,572	63	18,809	5	0	57,449
23	36,041	61	23,829	1	0	59,932
24	23,779	36	15,418	2	1	39,236
25	15,459	25	9,291	1	0	24,776
26	13,249	22	10,734	0	4	24,009
27	536	0	72	0	0	608
29	12,140	10	5,706	7	4	17,867
30	12,409	16	9,763	3	11	22,202
31	9,363	12	7,091	6	9	16,481
8/01	8,202	15	4,829	4	26	13,076
02	7,177	7	2,168	8	20	9,380
03	6,068	12	3,013	3	37	9,133
04	2,420	7	994	2	7	3,430
05	7,588	11	4,145	7	64	11,815
06	6,797	9	3,620	11	90	10,527
07	4,767	13	2,427	3	94	7,304
08	2,647	6	1,779	3	127	4,562

-continued-

Table 21. (Page 2 of 2)

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
7/09	2,230	0	851	1	75	3,157
10	1,667	2	573	4	140	2,386
14	22	0	0	0	3	25
19	346	0	49	0	753	1,148
20	645	0	130	0	1,922	2,697
21	201	0	67	0	875	1,143
Total	522,090	6,472	240,539	117	4,262	773,480
% of Section						
Total	67.5	0.8	31.1	0.0	0.6	100.0

¹ Togiak River Section open four days per week. See Table 13 for inseason adjustments to the weekly fishing schedule.

Table 22. Commercial salmon catch by date and species, in numbers of fish, Kulukak Section, Bristol Bay, 1991.

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
6/06	2	2	0	0	0	4
11	60	6	19	0	0	85
12	72	7	13	0	0	92
13	20	2	9	0	0	31
18	146	6	33	0	0	185
19	316	14	82	0	0	412
20	79	7	43	0	0	129
7/01	2,614	46	336	0	0	2,996
02	4,296	41	465	0	0	4,802
03	4,379	18	264	0	0	4,661
04	5,422	24	469	0	0	5,915
05	1,464	6	99	0	0	1,569
08	1,235	12	836	0	0	2,083
09	2,734	15	684	0	0	3,433
10	3,138	11	240	0	0	3,389
11	3,102	12	651	0	0	3,765
12	1,488	5	116	0	0	1,609
15	447	5	421	0	0	873
16	224	2	201	0	0	427
17	728	6	778	0	0	1,512
18	161	3	318	0	0	482
24	1,298	1	182	0	0	1,481
Total	33,425	251	6,259	0	0	39,935
% of Section						
Total	83.7	0.6	15.7	0.0	0.0	100.0

¹ Kulukak Section open three days per week. See Table 13 for inseason adjustments to the weekly fishing schedule.

Table 23. Commercial salmon catch by date and species, in numbers of fish, Matogak Section, Bristol Bay, 1991.

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
6/18	23	8	100	0	0	131
7/18	456	0	36	0	0	492
19	1,199	5	111	0	0	1,315
23	1,101	0	137	0	0	1,238
24	693	0	74	0	0	767
30	380	1	39	0	0	420
31	800	2	256	1	2	1,061
8/01	74	0	43	0	0	117
02	226	4	117	3	2	352
03	58	0	78	0	3	139
06	52	0	52	0	2	106
Total	5,062	20	1,043	4	9	6,138
% of Section						
Total	82.5	0.3	17.0	0.1	0.1	100.0

¹ Matogak Section open five days per week. See Table 13 for inseason adjustments to the weekly fishing schedule.

Table 24. Commercial salmon catch by date and species, in numbers of fish, Osviak Section, Bristol Bay, 1991.

Date ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
6/04	0	2	0	0	0	2
10	10	7	42	0	0	70
11	41	26	22	0	0	89
12	67	38	78	0	0	183
13	123	39	59	0	0	221
14	30	48	47	0	0	125
15	31	63	43	0	0	137
18	138	23	213	0	0	374
19	291	46	250	0	0	587
20	186	51	268	0	0	505
7/05	89	1	73	0	0	163
8/01	254	1	131	0	0	386
03	104	0	46	0	0	150
Total	1,375	345	1,272	0	0	2,992
% of Section						
Total	46.0	11.5	42.5	0.0	0.0	100.0

¹ Osviak Section open five days per week. See Table 13 for inseason adjustments to the weekly fishing schedule.

Table 25. Commercial salmon catch by district and species, in numbers of fish, Bristol Bay, 1991.

District and River System	Sockeye	Chinook	Chum	Pink	Coho	Total
<u>NAKNEK-KVICHAK DISTRICT</u>						
Kvichak River	3,837,923					
Branch River	328,996					
Naknek River	6,391,385					
Total	10,558,304	4,528	430,453	94	16,517	11,009,896
<u>EGEGIK DISTRICT</u>	6,800,798	465	71,313	121	46,487	6,919,184
<u>UGASHIK DISTRICT</u>	3,039,696	1,365	56,700	2	45,048	3,142,811
<u>NUSHAGAK DISTRICT</u>						
Wood River	2,263,046					
Igushik River	1,721,688					
Nushagak-Mulchatna	1,287,985					
Total	5,272,719	22,898	465,582	63	5,399	5,766,661
<u>TOGIAK DISTRICT</u>						
Togiak Section	522,090	6,472	240,539	117	4,262	773,480
Kulukak Section	33,425	251	6,259	0	0	39,935
Matogak Section	5,062	20	1,043	4	0	6,129
Osviak Section	1,375	345	1,272	0	0	2,992
Total	561,952	7,088	249,113	121	4,262	822,536
TOTAL BRISTOL BAY	26,233,469	36,344	1,273,161	401	117,713	27,661,088
PERCENT	94.8	0.1	4.6	+	0.4	100

Table 26. Daily sockeye salmon escapement tower counts by river system, Bristol Bay, 1991.

Date	Kvichak River		Naknek River		Egegik River		Ugashik River		Wood River		Igushik River		Togiak River	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/18									168	168				
19									84	252				
20									90	342				
21									246	588				
22	42	42							90	678				
23	30	72	588	588	2,142	2,142			918	1,596				
24	0	72	792	1,380	7,452	9,594			5,262	6,858	54	54		
25	60	132	96	1,476	1,728	11,322			14,136	20,994	0	54		
26	594	726	104,316	105,792	24,210	35,532			4,164	25,158	4,602	4,656		
27	2,844	3,570	102,576	208,368	10,974	46,506			2,580	27,738	26,238	30,894		
28	45,960	49,530	113,226	321,594	16,866	63,372			14,778	42,516	51,342	82,236		
29	75,210	124,740	326,316	647,910	23,352	86,724			18,594	61,110	29,220	111,456		
30	152,598	277,338	504,216	1,152,126	47,358	134,082			9,360	70,470	22,680	134,136		
7/1	310,830	588,168	669,858	1,821,984	115,764	249,846			53,478	123,948	20,724	154,860		
2	312,918	901,086	517,218	2,339,202	156,450	406,296			46,158	170,106	15,702	170,562		
3	354,504	1,255,590	295,194	2,634,396	300,438	706,734	186	186	410,964	581,070	18,594	189,156	12	12
4	325,824	1,581,414	244,176	2,878,572	305,238	1,011,972	114	300	252,624	833,694	48,234	237,390	396	408
5	343,572	1,924,986	30,366	2,908,938	326,586	1,338,558	246	546	58,338	892,032	105,132	342,522	4,206	4,614
6	215,718	2,140,704	8,274	2,917,212	345,588	1,684,146	204	750	18,072	910,104	115,884	458,406	7,530	12,144
7	66,822	2,207,526	8,220	2,925,432	343,284	2,027,430	1,344	2,094	16,398	926,502	60,162	518,568	7,512	19,656
8	69,090	2,276,616	12,132	2,937,564	142,194	2,169,624	206,874	208,968	10,914	937,416	51,186	569,754	4,656	24,312
9	77,946	2,354,562	132,282	3,069,846	68,844	2,238,468	203,916	412,884	15,858	953,274	33,810	603,564	11,124	35,436
10	278,598	2,633,160	73,836	3,143,682	37,368	2,275,836	63,720	476,604	17,004	970,278	18,174	621,738	16,914	52,350
11	446,826	3,079,986	25,224	3,168,906	45,756	2,321,592	20,352	496,956	21,258	991,536	16,218	637,956	18,876	71,226
12	379,860	3,459,846	25,398	3,194,304	85,896	2,407,488	264,186	761,142	20,550	1,012,086	14,220	652,176	9,990	81,216
13	179,508	3,639,354	16,050	3,210,354	54,942	2,462,430	570,204	1,331,346	20,070	1,032,156	11,148	663,324	7,578	88,794
14	83,712	3,723,066	39,258	3,249,612	151,068	2,613,498	224,910	1,556,256	18,972	1,051,128	10,062	673,386	6,180	94,974
15	97,656	3,820,722	151,968	3,401,580	96,612	2,710,110	484,884	2,041,140	12,264	1,063,392	11,568	684,954	7,800	102,774
16	86,838	3,907,560	18,012	3,419,592	12,366	2,722,476	139,578	2,180,718	11,976	1,075,368	10,308	695,262	16,314	119,088
17	89,874	3,997,434	28,032	3,447,624	8,688	2,731,164	31,296	2,212,014	28,200	1,103,568	13,488	708,750	14,394	133,482
18	64,428	4,061,862	27,102	3,474,726	10,326	2,741,490	22,488	2,234,502	21,630	1,125,198	12,564	721,314	16,434	149,916
19	53,070	4,114,932	10,920	3,485,646	11,118	2,752,608	20,754	2,255,256	10,548	1,135,746	13,962	735,276	12,774	162,690
20	30,270	4,145,202	26,256	3,511,902	11,358	2,763,966	33,942	2,289,198	8,844	1,144,590	9,348	744,624	9,000	171,690
21	24,432	4,169,634	41,844	3,553,746	10,488	2,774,454	24,816	2,314,014	6,834	1,151,424	5,916	750,540	6,786	178,476
22	26,520	4,196,154	24,762	3,578,508	12,426	2,786,880	46,530	2,360,544	4,272	1,155,696	2,130	752,670	6,630	185,106

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Table 26. (Page 2 of 2)

Date	Kvichak River		Naknek River		Egegik River		Ugashik River		Wood River		Igushik River		Togiak River	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
23	26,634	4,222,788					51,000	2,411,544	4,224	1,159,920	3,708	756,378	5,790	190,896
24							16,236	2,427,780			(252)	756,126	4,014	194,910
25							9,996	2,437,776					6,114	201,024
26							7,446	2,445,222					3,366	204,390
27							5,910	2,451,132					1,884	206,274
28							6,174	2,457,306					480	206,754
29													3,606	210,360
30													5,454	215,814
31													10,062	225,876
8/1													6,204	232,080
2													4,446	236,526
3													2,010	238,536
4													3,204	241,740
5													2,634	244,374
6													3,828	248,202
													6,481 ^a	254,683 ^a
Total	4,222,788		3,578,508		2,786,880		2,457,306		1,159,920		756,126		254,683	

^a An adjustment of 6,481 was applied to the final tower count because the daily passage rate was greater than 1,000 fish when the tower was discontinued. The adjustment was calculated by dividing the total passage through August 6 by 97.5%, the percent of escapement that normally passes the tower through that date (1961-1990).

Table 27. Daily salmon escapement estimates, Nushagak River sonar, Nushagak River, 1991.

Date	Chinook		Sockeye		Chum		Pink		Coho	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/05	290	290	0	0	0	0	0	0	0	0
06	473	763	0	0	0	0	0	0	0	0
07	356	1,119	0	0	0	0	0	0	0	0
08	322	1,441	0	0	0	0	0	0	0	0
09	314	1,755	0	0	0	0	0	0	0	0
10	443	2,198	0	0	0	0	0	0	0	0
11	342	2,540	0	0	0	0	0	0	0	0
12	386	2,926	0	0	0	0	0	0	0	0
13	330	3,256	0	0	0	0	0	0	0	0
14	303	3,559	0	0	0	0	0	0	0	0
15	2,184	5,743	411	411	696	696	0	0	0	0
16	7,492	13,235	855	1,266	2,118	2,814	0	0	0	0
17	3,375	16,610	247	1,513	716	3,530	0	0	0	0
18	2,985	19,595	219	1,732	598	4,128	0	0	0	0
19	1,747	21,342	137	1,869	387	4,515	0	0	0	0
20	1,682	23,024	314	2,183	545	5,060	0	0	0	0
21	1,384	24,408	867	3,050	965	6,250	0	0	0	0
22	2,196	26,604	1,565	4,615	1,743	7,768	0	0	0	0
23	4,807	31,411	3,407	8,022	3,751	11,519	0	0	0	0
24	24,266	55,677	8,830	16,852	33,521	45,040	0	0	0	0
25	11,349	67,026	11,476	28,328	12,433	57,473	0	0	0	0
26	9,022	76,048	10,667	38,995	11,476	68,949	0	0	0	0
27	5,098	81,146	5,084	44,079	12,388	81,337	0	0	0	0
28	5,515	86,661	13,962	58,041	8,244	89,561	0	0	0	0
29	2,379	89,040	54,173	112,214	3,466	93,027	0	0	0	0
30	7,422	96,462	16,097	128,311	8,773	101,800	0	0	0	0
7/01	2,866	99,328	60,848	189,159	6,592	108,392	0	0	0	0
02	9,686	109,014	17,820	206,979	8,728	117,120	0	0	0	0
03	965	109,979	91,915	298,894	17,840	134,960	0	0	0	0
04	2,927	112,906	97,608	396,502	59,888	194,848	0	0	0	0
05	1,636	114,542	34,640	431,142	18,440	213,288	0	0	0	0
06	1,894	116,436	3,670	434,812	1,403	214,691	0	0	0	0
07	977	117,413	2,024	436,836	835	215,526	0	0	0	0
08	780	118,193	1,492	438,328	635	216,161	0	0	0	0
09	561	118,754	1,189	439,517	499	216,660	0	0	0	0
10	580	119,334	1,676	441,193	734	217,394	0	0	0	0
11	1,142	120,476	3,068	444,261	1,296	218,690	0	0	0	0
12	1,970	122,446	4,318	448,579	1,632	220,322	0	0	0	0
13	919	123,365	2,324	450,903	975	221,297	0	0	0	0
14	1,166	124,531	3,346	454,249	1,429	222,736	0	0	0	0
15	897	124,428	2,302	456,551	1,084	223,810	0	0	127	127
16	1,350	126,778	3,926	460,477	1,844	225,654	0	0	221	348
17	1,564	128,342	6,548	467,025	3,478	229,132	0	0	570	918
18	920	129,262	9,526	476,551	3,018	232,150	0	0	706	1,624
19	1,150	130,412	8,750	485,301	3,901	236,051	0	0	1,133	2,757
20	1,180	131,592	3,205	488,506	2,922	238,973	0	0	515	3,272

-continued-

Table 27. (Page 2 of 2)

Date	Chinook		Sockeye		Chum		Pink		Coho	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
7/21	676	132,268	1,840	490,346	1,756	240,729	0	0	736	4,008
22	683	132,951	1,886	492,232	3,732	244,461	0	0	2,261	6,269
23	490	133,441	1,402	493,634	2,394	246,855	0	0	978	7,247
24	144	133,585	298	493,932	567	247,422	0	0	256	7,503
25	73	133,658	176	494,108	344	247,766	0	0	99	7,602
26	64	133,722	179	494,287	322	248,088	0	0	159	7,761
27	26	133,748	36	494,323	122	248,210	0	0	568	8,329
28	111	133,859	101	494,424	406	248,616	0	0	1,959	10,288
29	456	134,315	367	494,791	1,588	250,204	0	0	7,552	17,840
30	517	134,832	152	494,943	756	250,960	0	0	3,117	20,957
31	90	134,922	64	495,007	269	251,229	0	0	1,211	22,168
8/01	48	134,970	65	495,072	263	251,492	0	0	1,242	23,410
02	0	134,970	0	495,072	327	251,819	0	0	3,016	26,426
03	0	134,970	0	495,072	137	251,956	0	0	1,385	27,811
04	0	134,970	0	495,072	118	252,074	0	0	1,115	28,926
05	0	134,970	0	495,072	76	252,150	0	0	745	29,671
06	0	134,970	0	495,072	158	252,308	0	0	1,424	31,095
07	0	134,970	0	495,072	87	252,395	0	0	812	31,907
08	0	134,970	0	495,072	41	252,436	0	0	445	32,352
09	15	134,985	5	495,077	0	252,436	0	0	591	32,943
10	22	135,077	7	495,084	0	252,436	0	0	764	33,707
11	20	135,027	10	495,094	0	252,436	0	0	1,224	35,802
12	18	135,045	9	495,103	0	252,436	0	0	1,224	35,802
13	9	135,054	3	495,106	0	252,436	0	0	1,083	36,855
14	0	135,054	0	495,106	0	252,436	0	0	1,526	38,411
15	0	135,054	0	495,106	0	252,436	0	0	1,618	40,029
16	0	135,054	0	495,106	0	252,436	0	0	377	40,406
17	0	135,054	0	495,106	0	252,436	0	0	164	40,570
18	0	135,054	0	495,106	0	252,436	0	0	268	40,838
19	0	135,054	0	495,106	0	252,436	0	0	128	40,966
20	0	135,054	0	495,106	0	252,436	0	0	144	41,110
21	0	135,054	0	495,106	0	252,436	0	0	43	41,153

Table 28. Comparison of daily sockeye salmon escapement estimates by tower count, aerial survey and river test fishing enumeration methods, in thousands of fish, Kvichak River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey				River Test Fishing			Cumulative Escapement
	Daily	Cum.	Nakeen to Index	Index to Index	Tower	Total	Fish Per Index Pt. ¹	Index Points Daily	Index Points Cum.	
6/20							119	0	0	0
21							119	0	0	0
22							119	0	0	0
23							119	7	7	
24							119	11	18	
25							119	20	38	
26							119	12	51	
27	3	4					119	560	611	
28	46	50					119	1,545	2,156	
29	75	125	105	68	20	193	119	4,743	6,899	
30	153	277	320	195	55	569	119	6,025	12,924	
7/01	311	588	350	407	103	860	119	6,052	18,977	
02	313	901					119	5,261	24,238	
03	355	1,256	452	520	104	1,077	119	3,598	27,836	
04	326	1,581					70	3,133	30,969	
05	344	1,925	167	310	129	606	69	191	31,160	1,925
06	216	2,141					69	206	31,336	2,141
07	67	2,208					73	2,172	33,538	2,207
08	68	2,277						5,056	38,595	2,280
09	78	2,355	152	186	22	360	70	6,215	44,810	2,355
10	279	2,633	435	304	89	827	68	6,183	50,993	2,633
11	447	3,080	215	255	160	630	68	1,500	52,493	3,080
12	380	3,460	49	128	110	286		767	53,260	
13	180	3,369					69	1,024	54,283	3,639
14	84	3,723	31	29	24	83	69	723	55,007	3,723
15	98	3,821					70	878	55,885	3,821
16	87	3,908					71			
17	90	3,997					71			
18	64	4,062								
19	53	4,115								
20	30	4,146								
21	24	4,170								
22	27	4,196								
23	27	4,223								
24										
25										
Total		4,223							55,885	8,148

¹ Fish per index point was based on lag time and/or catchability factors.

Table 29. Comparison of daily sockeye salmon escapement estimates by tower count, aerial survey, and river test fishing enumeration methods, in thousands of fish, Egegik River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey		River Test Fishing			
	Daily	Cum.	Lagoon	Total	Fish per Index Pt. ¹	Index Points Daily	Index Points Cum.	Cumulative Escapement
6/12								
13								
14								
15					70	4	4	0
16					70	44	48	3
17					70	58	106	7
18					70	146	252	18
19					70	190	442	31
20					70	243	685	48
21			2	3	70	131	816	57
22					70	165	981	69
23	2	2			70	260	1,241	87
24	7	9			70	495	1,736	122
25	2	11			70	804	2,540	178
26	24	35	5	5	70	133	2,673	187
27	11	46			70	474	3,147	220
28	17	63			24	1,786	4,933	118
29	24	87	41	155	34	2,689	7,622	259
30	47	134	119	306	17	6,114	13,736	234
7/01	116	250	110	315	18	3,053	16,789	302
02	156	406	195	382	29	5,246	22,035	639
03	300	706			51	5,049	27,084	1,381
04	305	1,011	140	168	60	1,016	28,100	1,686
05	327	1,338			61	104	28,204	1,720
06	346	1,684	191	275	76	702	28,906	2,197
07	343	2,027			75	234	29,140	2,186
08	142	2,169	70	270	77	710	29,850	2,298
09	69	2,238	94	102	79	463	30,313	2,395
10	37	2,275			79	174	30,487	2,408
11	46	2,321			79	1,018	31,505	2,489
12	86	2,407			79	294	31,799	2,512
13	55	2,462						
14	151	2,613	116	117				
15	97	2,710						
16	12	2,722						
17	9	2,731						
18	10	2,741						
19	11	2,752						
20	11	2,763						
21	11	2,774						
22	12	2,786						
Total		2,787			86 ^a		31,799	2,512

¹ The 1985-90 mean fish per index point relationship was used until June 28 when lag-time relationships proved more accurate.

^a Calculated using the tower count through July 16 as there was generally a 4-day lag between inside test passage and tower passage.

Table 30. Comparison of daily sockeye salmon escapement estimates by tower count, aerial survey, and river test fishing enumeration methods, in thousands of fish, Ugashik River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey		River Test Fishing		
	Daily	Cum.	Lagoon	Total	Fish per Index Pt. ¹	Index Points Daily	Cumulative Escapement
6/20							
21					37	5	5
22					37	0	5
23					37	7	12
24					37	6	18
25					37	33	51
26					37	46	97
27					37	31	128
28					37	32	160
29					37	48	208
30					37	102	310
7/01					37	141	451
02					37	191	642
03	0	0			37	903	1,545
04	0	0	3	3	37	862	2,407
05	0	1			37	3,159	5,566
06	0	1	1	73	37	2,891	8,457
07	1	2			37	3,237	11,694
08	207	209			37	1,974	13,668
09	204	413	40	140	73	1,355	15,023
10	64	477			40	4,392	19,415
11	20	497			36	3,460	22,875
12	264	761	27	91	54	2,202	25,077
13	570	1,331			67	1,604	26,681
14	225	1,556	16	98	79	480	27,161
15	485	2,041			104	220	27,381
16	140	2,181					
17	31	2,212					
18	22	2,234					
19	21	2,255					
20	34	2,289					
21	25	2,314					
22	47	2,361					
23	51	2,412					
24	16	2,428					
25	10	2,438					
26	7	2,445					
27	6	2,451					
28	6	2,457					
Total		2,457			85 ^a		27,381
							2,848

¹ The 1985-90 mean fish per index point relationship was used until July 9 when lag-time relationships proved more accurate.
^a Calculated using the tower count through July 21 as there was generally a 6-day lag between inside test an tower passage.

Table 31. Inseason comparison of ocean age composition of sockeye salmon escapement using length frequency and scale analysis methods, Wood River, Bristol Bay, 1991.

Date	2-Ocean (%)		3-Ocean (%)		LF Sample Size	Scale Sample Size ¹
	Length Frequency	Scales	Length Frequency	Scales		
6/25-7/2	285	166	264	310	549	476
7/3-7/4	315	179	472	500	787	679
7/5-7/11	372	238	238	280	610	518
7/12-7/25	508	374	147	182	655	556
FINAL	370	239	280	318	2,601	2,229
ADF&G FORECAST		51		49		

¹ Actual number of readable scales.

Table 32. Comparison of daily sockeye salmon escapement estimates by tower count and aerial survey enumeration methods, in thousands of fish, Wood River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey ¹	
	Daily	Cum.	Number	Comments
6/18	+	+		
19	+	+		
20	+	+		
21	+	1		
22	+	1		
23	1	2		
24	5	7		
25	14	21	4	Visibility poor to v. poor.
26	4	25		
27	3	28	0	Very poor visibility.
28	15	43	1	Visibility poor to fair in places.
29	19	61	1	Overcast skies, and muddy water.
30	9	70	+	Good conditions, no fish!
7/01	53	124	8	Sign visible, wrong stage of tide on survey.
02	46	170	11	Good vis. Good sign below. 3 jumpers at once at Belt cr.
03	411	581	66	10-15 wide on left bank. 5-6 on right bank.
04	253	834	30	Wrong stage of tide.
05	58	892		
06	18	910		
07	16	927		
08	11	937		
09	16	953		
10	17	970		
11	21	992		
12	21	1,012		
13	20	1,032		
14	19	1,051		
15	12	1,063		
16	12	1,075		
17	28	1,104		
18	22	1,125		
19	11	1,136		
20	9	1,145		
21	7	1,151		
22	4	1,156		
23	4	1,160		
Total		1,160		

¹ Estimated number of fish in clear water index areas immediately below the counting tower at the time of the survey.

Table 33. Comparison of daily sockeye salmon escapement estimates by tower count and aerial survey enumeration methods, in thousands of fish, Igushik River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey ¹			Comments
	Daily	Cum.	Lagoon	River	Total	
6/24	+	+				
25	+	+		+		Fair vis. above the lagoon.
26	5	5	+	+		V. poor vis. Rain and fog.
27	26	31	1	1	2	Water high but clearing.
28	51	82	2	3	5	Nearly continuous in river.
29	29	111	3	1	4	More mud/more glare today.
30	23	134	3	2	5	Clearer than yesterday.
7/01	21	155				
02	16	171				
03	19	189				
04	48	237				
05	105	343				
06	116	458				
07	60	519				
08	51	570				
09	34	604				
10	18	622				
11	16	638				
12	14	652				
13	11	663				
14	10	673				
15	12	685				
16	10	695				
17	13	709				
18	13	721				
19	14	735				
20	9	745				
21	6	751				
22	2	753				
23	4	756				
24	+	756				
Total		756				

¹ Includes estimates of fish in clear water index areas immediately below the counting tower at the time of the survey.

Table 34. Comparison of daily sockeye salmon escapement estimates by tower count and aerial survey enumeration methods, in thousands of fish, Togiak River, Bristol Bay, 1991.

Date	Tower Count		Aerial Survey ¹				Comments
	Daily	Cum.	Togiak to Gech.	Gechiak to Ongi.	Ongivinuck to tower	Total	
7/01			0				
03	+	+	0	240	160	400	very poor vis. mixed reds/chums
04	+	+					very high water
05	4	5					poor visibility.
06	8	12					
07	8	20					
08	5	24	560	2,150		2,710	poor/fair
09	11	35					
10	17	52	360	3,480	2,300	6,140	poor/fair
11	19	71					
12	10	81					
13	8	89					
14	6	95					
15	8	103					
16	16	119					
17	14	133	80	4,720	1,580	6,380	poor/fair
18	16	150					
19	13	163					
20	9	172					
21	7	178					
22	7	185					
23	6	191					
24	4	195					
25	6	201					
26	3	204					
27	2	206					
28	+	207					
29	4	210					
30	5	216					
31	10	226					
8/01	6	232					
02	4	237					
03	2	239					
04	3	242					
05	3	244					
06	4	248					
	6 ^a	255 ^a					
Total		255 ^a					

¹ Includes estimates of fish in clear water index areas immediately below the counting tower at the time of the survey. These are unexpanded counts, and are not rounded to the nearest thousand fish.

^a An adjustment of 6,481 was applied to the final tower count because the daily passage rate was greater than 1,000 fish when the tower was discontinued. The adjustment was calculated by dividing the total passage through August 6 by 97.5%, of the percent of escapement that normally passes the tower through that date (1961-1990).

Table 35. Commercial salmon processors and buyers operating in Bristol Bay, 1991.^a

Name of Operator/Buyer	Base of Operations	District ¹	Method ²	Export	Comments
1. All Alaskan Seafoods	Seattle, WA	K,E,U,N,T	F	Sea	F/V All Alaskan
2. Anpac, Inc.	Anchorage,	AKU,T	F	Sea	M/V Nushagak
3. Bering Pacific Co-op	Everett, WA	K,E,U	F	Sea	Cons./Lafayette
4. Big Creek Fish, Inc.	Kent, WA	E	F	Air	
5. Briggsway Co.	Pilot Point, AK	U	C	Air	
6. Clark Fish Co.	Cathlamet, WA	E,U	T	Sea	
7. Cogdell & Assoc.	Poulsbo, WA	N	EF	Air	
8. Dragnet Fisheries Co.	Kenai, AK	K,E,N	EF,F	Air	
9. Farwest Fisheries Inc.	Seattle, WA	K,E,U	C,F	Air	
10. Favco	Anchorage, AK	U	EF	Air	
11. Icicle Seafoods	Dillingham, AK	K,E,U,N	F	Sea/Air	Arctic Star/Bering Star
10. Inlet Fisheries	Anchorage, AK	K,E,U,N	F	Air	Cons./Clark's & K.Crab
11. International Seaf.	Kodiak, AK	E	F	Air	
12. King Crab	Seattle, WA	K,E,U	C,F	Air	
13. Lafayette Fisheries	Seattle, WA	K,E,U	C,F	Sea/Air	Cons./Bering Pacific
14. Melbro Packing Co.	Kenmore, WA	K,E	C,F	Sea/Air	
15. New West Fish, Inc.	Bellingham, WA	K,E,U	F	Sea	
16. North Coast Seafoods	Seattle, WA	K,E,U,N	F	Sea	
17. Northland Fisheries	Seattle, WA	E,K	F	Sea	
18. Pan Pacific Seafoods	Seattle, WA	K,E,U	F	Sea	
19. Pederson Point	Seattle, WA	K,E	F	Sea	Cons./No. Pacific
20. Peter Pan Seafoods	Seattle, WA	K,E,U,N,T	C,F	Sea/Air	
21. Queen Fisheries	Seattle, WA	K,E,U,N	C,F	Sea/Air	
22. Red Salmon	Seattle, WA	K,E	C,EF,F	Air	
23. Schenk Seafoods Inc.	Bellingham, WA	K,E,U	F	Sea	
24. Silver Streak	Dillingham, AK	N	F		
25. Snopac	Seattle, WA	K,E,U,N	F	Air	
26. Sonny's	Anchorage, AK	E	F	Sea	
27. S. Naknek Seafoods	Seattle, WA	K	F	Air	Cons./Wards Cove, R.S.
28. Tenth and M	Anchorage, AK	K	EF	Air	
29. Togiak Fisheries	Togiak, AKN,	T	F	Air	
30. Trident Seafoods	Seattle, WA	K,E,U,N	C,F	Air	Br.Mon., Bount., Neptune,
31. Unisea, Inc.	Redmond, WA	K,E,U,N	F	Air	
32. Wards Cove Co. (Ekuk)	Seattle, WA	K,E,N	C,F	Sea	Cons./R.S., S.N.S.
33. Woodbine	Seattle, WA	K,E,U	F	Air	
34. YAK, Inc.	Seattle, WA	K,E,U,N	F	Sea	No. Ak., Ak. Command

Number of processors: Canning = 10; Freezing = 31; Curing = 0; Air transport = 10; Sea transport = 11

^a Indicates operators with either a physical plant or processing facility in a district or those operators from other areas buying fish and/or providing tender and support service for fishermen in districts away from the facility.

¹ K=Naknek-Kvichak; E=Egegik; U=Ugashik; N=Nushagak; T=Togiak.

² Type of processing: c=canned; ef=export fresh; f=frozen; s=cured; t=tendered.

Table 36. Commercial production of salmon in Bristol Bay and salmon transported out of the area for processing, in pounds, 1991.^a

Category/ District	No. Operators	Sockeye	Chinook	Chum	Pink	Coho	Total
I. <u>CASE PACK (48 - 1 lb. talls)</u>							
	10	564,143	960	35,537	0	464	601,104
II. <u>FROZEN (lbs.)</u>							
	31	83,058,900	353,725	4,557,074	1,295	710,659	88,681,653
III. <u>CURED (lbs.)</u>							
	0	0	0	0	0	0	0
IV. <u>FRESH EXPORT BY AIR (lbs.)</u>							
	10	3,091,287	17,186	31,750	285	20,003	3,160,511
V. <u>BRINE EXPORT BY SEA (lbs.)</u>							
	11	13,284,068	23,874	156,085	0	0	13,464,027

^a Includes only fish processed in Bristol Bay. Data extracted primarily from "Final Operations Reports" (BB-CF/303), and from catch and production reports or fish tickets if unavailable in final report form.

Table 37. Mean round weight of the commercial salmon catch, by species and district, in pounds, Bristol Bay, 1991.^a

District	Sockeye	Chinook	Chum	Pink	Coho	Total
Naknek/Kvichak	5.84	13.84	6.25	3.60	6.33	
Egegik	5.67	8.76	6.14	3.00	6.73	
Ugashik	5.76	17.48	6.10		7.30	
Nushagak	5.80	17.10	6.08	4.00	6.23	
Togiak	6.53	13.53	6.91	4.46	7.63	
Mean Weight	5.74	15.86	6.37	3.83	7.31	
Total Catch, All Districts	153,543	518	4,581	1	821	159,464

^a Data is preliminary and was extracted from the fish ticket system.

Table 38. Price paid per pound and total exvessel value of the commercial salmon catch by species, Bristol Bay, 1991.^a

Sockeye	Chinook	Chum	Pink	Coho	Total
<u>Price Paid per Pound¹</u>					
\$0.70	\$0.68	\$0.22	\$0.11	\$0.58	
<u>Total Exvessel Value²</u>					
\$106,914	\$356	\$1,459	\$0	\$455	\$109,184

- ¹ Average price per pound derived from individual company price schedules and weighted for each processor.
- ² Preliminary catch (in pounds) times weighted average price. Numbers expressed in thousands.
- ^a Data extracted from "Bristol Bay Final Operations Reports" (BB-CF/303). Numbers reported here reflect on-ground exvessel values; price changes and bonuses may occur later.

Table 39. Subsistence salmon catch by species, in number of fish, by district and location fished, Bristol Bay, 1991.^a

Area/ River System	Permits, Issued ¹	Sockeye	Chinook	Chum	Pink	Coho	Total
NAKNEK-KVICHAK DISTRICT							
Naknek River ²	347	30,948	1,008	985	140	922	34,003
Kvichak River							
Chekok	1	600	0	0	0	0	600
Igiugig	4	123	0	0	0	0	123
Iliamna Lake	24	10,369	4	53	49	10	10,485
Kokhanok	23	19,248	10	2	0	5	19,265
Kvichak River	8	1,920	110	37	2	69	2,138
Lake Clark	43	5,099	0	0	0	0	5,099
Levelock	5	439	19	28	0	50	536
Newhalen River	22	15,493	0	0	0	0	15,493
Nondalton	19	3,995	0	0	0	0	3,995
Pedro Bay	20	8,780	1	0	0	0	8,781
Pile Bay	1	87	0	0	0	0	87
Port Alsworth	1	0	0	0	0	0	0
Subtotal	171	66,153	144	120	51	134	66,602
Total N/K	518	97,101	1,152	1,105	191	1,056	100,605
EGEGIK DISTRICT³	70	4,549	82	141	32	430	5,234
UGASHIK DISTRICT⁴	38	1,403	121	168	42	614	2,348
NUSHAGAK DISTRICT							
Wood River ⁵	66	4,569	1,512	286	2	689	7,058
Lower Nushagak River ⁶	51	1,878	1,945	436	24	170	4,453
Upper Nushagak River ⁷	47	5,378	3,139	2,306	115	1,354	12,292
Dillingham Beaches ⁸	249	12,789	4,302	1,235	104	6,330	24,760
Nushagak Bay Comm ⁹	81	3,872	2,082	410	36	1,768	8,168
Igushik	34	4,675	647	15	11	473	5,821
Total Nushagak	528	33,161	13,627	4,688	292	10,784	62,552
TOGIK DISTRICT¹⁰	43	3,517	470	553	27	1,238	5,805
TOTAL BRISTOL BAY	1,197	139,731	15,452	6,655	584	14,122	176,544

¹ Numbers reflect actual fishing sites first noted on permit.

² Includes Mile 5 North, Naknek Beach-North, Naknek River General, Naknek-Kvichak Commercial, Powerline-North, Savonoski-North, Savonoski-South, South Naknek Beach, Telephone Point-North.

³ Includes Egegik and North Egegik.

⁴ Includes Pilot Point, Pilot Point Village, Ugashik, Ugashik River, Ugashik Village and Dog-King Salmon River.

⁵ Includes Dagnet, Hansen Point, Red Bluff, Lake Aleknagik, and Muklung River.

⁶ Includes Black Point, Grassy Island, and Lewis Point.

⁷ Includes Ekwook, Klutuk River, Kokwok River, Koliganek Area, Mulchatna River, New Stuyahok Area, and the Portage Creek Area.

⁸ Includes Bradford Point, City Dock, Icicle, Kakanak, Scandanavia, Snag Point and Squaw Creek.

⁹ Includes Clark's Point, Coffee Point, Ekuk, Etolin Point, Flounder Flats, Nushagak Point, Protection Point, and Queen's Slough.

¹⁰ Includes Togiak and Togiak River.

^a Catches are extrapolated for all permits issued, based on those returned.

BRISTOL BAY SALMON FISHERY

Appendix Tables 1-48

Appendix Table 1. Forecast and inshore chinook salmon run, in thousands of fish, Nushagak District, Bristol Bay, 1973-91.

Year	Forecast			Inshore Run ¹	Forecast Error ² (%)		
	Spawner Recruit	Mean Percent	Sibling		Spawner Recruit	Mean Percent	Sibling
1973	328	195	90	72	356	171	25
74	266	164	77	110	142	49	-30
75	284	131	68	99	187	32	-31
76	249	126	118	168	48	-25	-30
77	211	107	146	155	36	-31	-6
1978	254	105	111	255	0	-59	-56
79	348	147	182	261	33	-44	-30
80	329	206	162	218	51	-6	-26
81	339	230	198	355	-5	-35	-44
82	319	256	213	354	-10	-28	-40
1983	322	266	224	311	4	-14	-28
84	236	319	165	152	55	110	9
85	308	434	162	192	60	126	-16
86	299	543	168	122	145	345	38
87	353	366	125	143	147	156	-13
1988			139	84			65
89			129	104			24
90			116	90 ^a			29
91 ³			120	172 ^a			-30
Mean Percent Error					83	50	-10

¹ Inshore Nushagak River commercial catch, subsistence catch, and escapement (does not include sport harvest).

² Spawner recruit and mean % forecasts are no longer used.

³ 1991 forecast adjusted (reduced) by the average forecast error (-19.75 %) from 1984-90.

^a Preliminary.

(Sources: 1, 5, 6, 7, and 16)

Appendix Table 2. Forecast and inshore pink salmon run, in thousands of fish, Nushagak District, Bristol Bay, 1966-91.^a

Year	Forecast ¹	Inshore Run ²	Forecast Error ³ (%)
1966	2,300	3,779	(39)
68	4,500	3,866	16
1970	2,500	570	339
72	1,400	126	1,011
74	307	999	(69)
76	3,047	1,603	90
78	3,193	13,735	(77)
1980	15,700	4,988	215
82	9,200	2,996	207
84	1,710	6,054	(72)
86	4,067	339	1,100
88	b	739	
1990	b	855 ^c	
Mean Absolute Percent Error			247

¹ Based on escapement/return data from Nushagak/Nuyakuk Rivers.

² Inshore Nushagak district catch plus escapement.

³ Percent error = (Forecast-Actual/Actual)x100.

^a Includes even-years only.

^b No forecast generated.

^c Preliminary.

(Sources: 1, 5, and 6)

Appendix Table 3. Salmon fishing license and entry permit registration by gear type and residency, Bristol Bay, 1972-91.^a

Year	Drift Net ¹			Set Net ¹			Total
	Resident	Non-resident	Total	Resident	Non-resident	Total	
1972	993	771	1,764	722	132	854	2,618
73 ^b	2,041	1,162	3,203	902	108	1,010	4,213
74 ^b	634 (634)	238 (238)	872	530 (530)	95 (95)	625	1,497
75	1,217 (450)	843 (194)	2,060	751 (159)	169 (45)	920	2,980
76	987 (69)	734 (30)	1,721	625 (5)	139 (0)	764	2,485
1977	999 (52)	729 (13)	1,728	684 (15)	156 (1)	840	2,568
78	1,039 (66)	738 (11)	1,777	749 (16)	161 (3)	910	2,687
79	1,046 (73)	754 (10)	1,800	764 (19)	170 (5)	934	2,734
80	1,060 (92)	767 (18)	1,827	760 (29)	187 (5)	947	2,774
81	1,056 (89)	771 (18)	1,827	754 (37)	202 (5)	956	2,783
1982	1,050 (85)	774 (15)	1,824	744 (36)	213 (5)	957	2,781
83	1,071 (79)	750 (16)	1,821	740 (33)	220 (3)	960	2,781
84	1,050 (73)	768 (16)	1,818	744 (28)	218 (3)	962	2,780
85	1,061 (83)	772 (13)	1,833	733 (24)	217 (4)	950	2,783
86	1,059 (78)	775 (17)	1,834	727 (18)	223 (4)	950	2,784
1987 ^c	1,054 (76)	782 (16)	1,836	730 (14)	220 (4)	950	2,786
88 ^d	1,035 (78)	802 (12)	1,837	727 (14)	222 (3)	949	2,786
89 ^e	1,031 (77)	830 (14)	1,861	772 (14)	235 (4)	1,007	2,868
90 ^f	1,039 (78)	841 (15)	1,880	773 (10)	243 (5)	1,016	2,896
91 ^g	948 (74)	841 (14)	1,877	752 (8)	241 (4)	1,005	2,882
20-Year Ave.	1,074	772	1,850	734	189	923	2,768
1972-81 Ave.	1,107	751	1,858	724	152	876	2,734
1982-91 Ave.	1,040	794	1,842	744	225	971	2,805

¹ Allowable gear per license/permit is 150 fathoms for drift and 50 fathoms for set with the following exceptions: 1968 and 1975 - 75 F. drift and 25 F. set; 1969 - 125 F. drift; 1973 - 25 F. drift and 12 1/2 F. set.

^a Total license/permit registration; not all license/permittee's actually fished.

^b Limited Entry went into effect. Figures in parenthesis are interim-use permits, and are included in the totals.

^c Does not include 2 drift and 11 set net permits available but not renewed for 1987.

^d Does not include 2 drift and 9 set net permits available but not renewed in 1988.

^e Does not include 5 drift and 20 set net permits available but not renewed in 1989.

^f Does not include 3 drift and 14 set net permits available but not renewed in 1990.

^g Does not include 4 drift and 20 setnet permits available but not renewed in 1991.

(Sources: 2 and 15)

Table Sockeye salmon forecast, escapement goals, and projected commercial harvest by river system, Bristol Bay, 1992.

District River	Numbers of Sockeye Salmon (thousands)				
	Forecasted Total Production	Shumagin Islands- S. Unimak Harvest	Total Run	Bristol Bay Inshore Run Spawning Goal	Estimated Harvest
NAKNEK-KVICHAK:					
Kvichak	12,956	782	12,174	6,000	6,174
Branch	578	35	543	185	358
Naknek	4,498	272	4,226	1,000	3,226
Total	18,032	1,089	16,943	7,185	9,758
EGEGIK	11,376	687	10,689	1,000	9,689
UGASHIK	4,608	278	4,330	700	3,630
NUSHAGAK:					
Wood	2,737	165	2,572	1,000	1,572
Igushik	721	44	677	200	477
Nushagak/ Mulchatna	1,488	90	1,398	550	848
Total	4,946	299	4,647	1,750	2,897
TOGIAK	636	38	598	150	448
TOTAL BRISTOL BAY	39,598	2,391	37,207	10,785	26,422

Table . Forecasted production, spawning escapement goals, and total projected harvests of major age classes of sockeye salmon returning to Bristol Bay, Alaska, river systems in 1992.

Thousands of Sockeye Salmon									
District River	1.2 4(2)	2.2 5(3)	1.3 5(2)	2.3 6(3)	Other ^a	Total	Spawning Goal	Catch	
NAKNEK-KVICHAK:									
Kvichak	3,451	6,738	2,343	424		12,956	6,000	6,956	
Branch	250	46	254	28		578	185	393	
Naknek	602	866	1,586	1,444		4,498	1,000	3,498	
Total	4,303	7,650	4,183	1,896		18,032	7,185	10,847	
EGEGIK	961	5,998	2,078	2,339		11,376	1,000	10,376	
UGASHIK	1,078	1,699	1,087	744		4,608	700	3,908	
NUSHAGAK:^b									
Wood	1,006	139	1,524	68		2,737	1,000	1,737	
Igushik	117	38	516	50		721	200	521	
Nushagak/ Mulchatna	91	3	664	8		1,488	550	938	
Total	1,214	180	2,704	126		4,946	1,750	3,196	
TOGLAK ^c	120	35	437	44		636	150	486	
TOTAL BAY	7,676	15,562	10,489	5,149	722	39,598	10,785	28,813	

^a Other age classes include zero freshwater ages (0.2, 0.3, 0.4) which are only forecasted for Nushagak/Mulchatna Rivers.

^b Forecast for Snake River was not included (1971-1991 average escapement was 15 thousand).

^c Forecasts for Kulukak, Kanik, Osviak, and Matogak Rivers were not included. These systems may contribute an additional 102 thousand (1978-91 mean return) to Togliak District.

Appendix Table 4. Salmon fishing interim-use and permanent entry permits actually fished, by gear type, Bristol Bay, 1975-91.

Year	Permits Issued			Permits Fished	
	Int. Use	Permanent	Total	Number	Percent
<u>DRIFT GILL NET</u>					
1975	644	1,416	2,060	1,235	60
76	99	1,622	1,721	1,353	79
77	65	1,663	1,728	1,355	78
78	77	1,700	1,777	1,569	88
79	83	1,717	1,800	1,711	95
1980	110	1,717	1,827	1,762	96
81	107	1,720	1,827	1,783	98
82	100	1,724	1,824	1,791	98
83	95	1,726	1,821	1,797	99
84	89	1,729	1,818	1,798	99
1985	96	1,738	1,834	1,813	99
86	95	1,743	1,838	1,800	98
87	93	1,745	1,838	1,799	98
88	90	1,749	1,839	1,839	100
89	91	1,770	1,861	1,860	100
90	93	1,787	1,880		
91 ^a	88	1,789	1,887		
Average	124	1,709	1,834		
<u>SET GILL NET</u>					
1975	204	716	920	445	48
76	5	759	764	501	66
77	16	824	840	495	59
78	19	891	910	650	71
79	24	910	934	768	82
1980	34	913	947	804	85
81	42	914	956	841	88
82	41	916	957	859	90
83	36	924	960	861	90
84	31	931	962	866	90
1985	28	922	950	872	92
86	22	928	950	872	92
87	18	943	950	872	92
88	17	932	949	922	97
89	18	989	1,007	973	97
90	15	1,001	1,016		
91 ^a	12	993	1,005		
Average	34	826	935		

^a Preliminary.

(Source: 15)

Appendix Table 5. Sockeye salmon commercial catch by district,
in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek- Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	1,102,365	839,820	17,440	381,347	75,261	2,416,233
73	168,249	221,337	3,920	272,093	95,723	761,322
74	538,163	172,253	2,151	510,571	139,341	1,362,479
75	3,085,416	964,024	14,558	645,902	188,914	4,898,814
76	2,547,276	1,329,788	174,923	1,265,422	301,883	5,619,292
1977	2,167,214	1,780,567	92,623	619,025	218,451	4,877,880
78	5,123,668	1,207,294	7,995	3,137,166	452,016	9,928,139
79	14,991,826	2,257,332	391,118	3,327,346	460,984	21,428,606
80	15,120,457	2,623,066	885,875	4,497,787	634,561	23,761,746
81	10,992,809	4,361,406	2,116,066	7,493,093	639,707	25,603,081
1982	5,005,802	2,447,514	1,139,192	5,916,187	595,696	15,104,391
83	21,559,372	6,755,256	3,349,451	5,119,744	588,208	37,372,031
84	14,546,710	5,190,413	2,658,376	1,992,681	322,126	24,710,306
85	8,179,093	7,537,273	6,468,862	1,307,889	209,766	23,702,883
86	2,892,171	4,852,935	5,002,949	2,719,313	308,688	15,776,056
1987	4,986,002	5,356,669	2,128,652	3,254,720	342,732	16,068,775
88	3,480,836	6,456,598	1,523,520	1,706,716	822,087	13,989,757
89	13,809,956	8,901,994	3,146,239	2,788,185	88,932	28,735,306
90 ^a	17,126,625	10,086,953	2,144,268	3,569,308	237,499	33,164,653
91 ^a	10,558,304	6,800,798	3,039,696	5,272,719	561,952	26,233,469
20-Year Ave.	7,899,116	4,007,165	1,715,394	2,789,861	364,226	16,775,761
1972-81 Ave.	5,583,744	1,575,689	370,667	2,214,975	320,684	10,065,759
1982-91 Ave.	10,214,487	6,438,640	3,060,121	3,364,746	407,769	23,485,763

^a Preliminary.

(Sources: 1 and 5)

Appendix Table 6. Chinook salmon commercial catch by district,
in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek- Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	2,262	1,097	166	46,045	19,976	69,546
73	951	1,475	292	30,470	10,856	44,044
74	480	1,133	1,200	32,053	10,798	45,664
75	964	237	111	21,454	7,226	29,992
76	4,064	1,138	338	60,684	29,744	95,968
1977	4,373	3,694	2,167	85,074	35,218	130,526
78	6,930	3,126	5,935	118,548	57,000	191,539
79	10,415	5,547	9,568	157,321	30,022	212,873
80	7,517	5,610	4,900	64,958	12,543	95,528
81	11,048	5,468	3,416	193,461	23,911	237,304
1982	12,425	4,834	7,170	195,287	33,786	253,502
83	8,955	4,758	9,276	137,123	38,497	198,609
84	8,972	4,680	4,767	61,378	22,179	101,976
85	5,697	4,015	5,840	67,783	37,106	120,441
86	3,188	1,883	2,982	65,783	19,880	93,716
1987	5,175	2,959	4,065	45,983	17,217	75,399
88	6,538	3,103	3,444	16,648	15,606	45,339
89	6,611	2,034	2,112	17,637	11,366	39,760
90 ^a	3,749	1,048	1,690	14,092	12,241	32,820
91 ^a	4,528	465	1,365	22,898	7,088	36,344
20-Year Ave.	5,742	2,915	3,540	72,734	22,613	107,545
1972-81 Ave.	4,900	2,853	2,809	81,007	23,729	115,298
1982-91 Ave.	6,584	2,978	4,271	64,461	21,497	99,791

^a Preliminary.

(Sources: 1 and 5)

Appendix Table 7. Chum salmon commercial catch by district, in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	115,737	42,172	9,689	310,126	178,885	656,609
73	123,610	23,034	6,092	336,331	195,431	684,498
74	41,347	4,022	2,334	157,941	80,710	286,354
75	79,740	4,094	1,634	152,891	87,058	325,417
76	317,550	46,955	9,924	801,064	153,559	1,329,052
1977	340,228	83,121	4,465	899,701	270,649	1,598,164
78	185,451	44,480	1,449	651,743	274,967	1,158,090
79	196,398	38,004	12,174	440,279	219,942	906,797
80	204,515	78,556	36,343	681,930	299,682	1,301,026
81	355,943	87,581	36,275	795,143	229,886	1,504,828
1982	198,019	84,329	53,204	434,817	151,000	921,369
83	351,769	127,490	105,171	725,060	322,691	1,632,181
84	447,259	178,096	210,611	850,114	336,660	2,022,740
85	210,107	126,736	131,576	396,740	203,302	1,068,461
86	262,925	94,666	111,112	488,375	270,057	1,227,135
1987	446,908	145,259	101,074	416,476	419,425	1,529,142
88	295,571	237,888	94,545	371,196	470,132	1,469,332
89	310,869	136,185	84,673	523,903	203,178	1,258,808
90 ^a	425,493	128,229	32,078	306,452	115,711	1,007,963
91 ^a	430,453	71,313	56,700	465,582	249,113	1,273,161
20-Year Ave.	266,995	89,111	55,056	510,293	236,602	1,158,056
1972-81 Ave.	196,052	45,202	12,038	522,715	199,077	975,084
1982-91 Ave.	337,937	133,019	98,074	497,872	274,127	1,341,029

^a Preliminary.

(Sources: 1 and 5)

Appendix Table 8. Pink salmon commercial catch by district, in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	57,074	12	0	67,953	1,984	127,023
73	109	0	1	61	216	387
74	508,534	4,405	340	413,613	13,086	939,978
75	6	9	2	126	279	422
76	264,631	4,121	116	739,590	28,085	1,036,543
1977	19	0	5	3,017	1,476	4,517
78	734,880	11,430	530	4,348,336	57,524	5,152,700
79	134	6	9	1,787	1,913	3,849
80	288,363	2,476	51	2,202,545	70,033	2,563,468
81	194	222	29	345	6,490	7,280
1982	127,560	1,997	170	1,339,272	23,417	1,492,416
83	51	92	0	137	204	484
84	211,306	5,759	2,387	3,127,153	19,468	3,366,073
85	39	51	3	48	316	457
86	106,919	2,749	98	267,117	24,404	401,287
1987	5	0	30	2	20	57
88	648,569	4,485	218	243,890	58,084	955,246
89	75	6	29	156	172	438
90 ^a	447,757	7,149	260	53,286	9,014	517,466
91 ^a	94	121	2	63	121	401
20-Year Ave. ¹	339,559	4,458	417	1,280,276	30,510	1,655,220
1972-81 Ave. ¹	370,696	4,489	207	1,554,407	34,142	1,963,942
1982-91 Ave. ¹	308,422	4,428	627	1,006,144	26,877	1,346,498

¹ Includes even-numbered years only.

^a Preliminary.

(Sources: 1 and 5)

Appendix Table 9. Coho salmon commercial catch by district,
in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek- Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	402	1,249	0	3,654	8,652	13,957
73	255	2,701	2,307	28,709	23,070	57,042
74	916	1,156	4,055	12,569	25,049	43,745
75	43	951	4,595	7,342	33,350	46,281
76	1,195	2,321	3,561	6,778	12,791	26,646
1977	2,883	2,685	3,884	52,562	45,201	107,215
78	913	2,256	2,024	44,740	44,338	94,271
79	12,355	15,148	17,886	129,607	119,403	294,399
80	7,802	22,537	19,419	147,726	151,000	348,484
81	1,229	32,759	30,220	220,290	29,207	313,705
1982	10,586	74,989	50,803	349,669	133,765	619,812
83	7,282	25,954	7,816	81,338	5,711	128,101
84	3,209	66,589	68,451	260,310	176,053	574,612
85	10,474	32,667	60,815	20,230	38,636	162,822
86	5,824	33,607	25,770	68,568	48,306	182,075
1987	5,274	30,789	14,785	13,263	1,292	65,403
88	29,988	48,981	52,355	52,698	18,468	202,490
89	22,668	49,175	33,942	77,077	56,972	239,834
90 ^a	13,403	44,275	31,731	7,447	2,719	99,575
91 ^a	16,517	46,487	45,048	5,399	4,262	117,713
20-Year Ave.	7,661	26,864	23,973	79,499	48,912	186,909
1972-81 Ave.	2,799	8,376	8,795	65,398	49,206	134,575
1982-91 Ave.	12,523	45,351	39,152	93,600	48,618	239,244

^a Preliminary.

(Sources: 1 and 5)

Appendix Table 10. Total salmon commercial catch by district, in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	1,277,840	884,350	27,295	809,125	284,758	3,283,368
73	293,174	248,547	12,612	667,664	325,296	1,547,293
74	1,089,440	182,969	10,080	1,126,747	268,984	2,678,220
75	3,166,169	969,315	20,900	827,715	316,827	5,300,926
76	3,134,716	1,384,323	188,862	2,873,538	526,062	8,107,501
1977	2,514,717	1,870,067	103,144	1,659,379	570,995	6,718,302
78	6,051,842	1,268,586	17,933	8,300,533	885,845	16,524,739
79	15,211,128	2,316,037	430,755	4,056,340	832,264	22,846,524
80	15,628,654	2,732,245	946,588	7,594,946	1,167,819	28,070,252
81	11,361,223	4,487,436	2,186,006	8,702,332	929,201	27,666,198
1982	5,354,392	2,613,663	1,250,539	8,235,232	937,664	18,391,490
83	21,927,429	6,913,550	3,471,714	6,063,402	955,311	39,331,406
84	15,217,456	5,445,537	2,944,592	6,291,636	876,486	30,775,707
85	8,405,410	7,700,742	6,667,096	1,792,690	489,126	25,055,064
86	3,271,027	4,985,840	5,142,911	3,609,156	671,335	17,680,269
1987	5,443,364	5,535,676	2,248,606	3,730,444	780,686	17,738,776
88	4,461,502	6,751,055	1,674,082	2,391,148	1,384,377	16,662,164
89	14,150,179	9,089,394	3,266,995	3,406,958	360,620	30,274,146
90 ^a	18,017,027	10,267,654	2,210,027	3,950,585	377,184	34,822,477
91 ^a	11,009,896	6,919,184	3,142,811	5,766,661	822,536	27,661,088
20-Year Ave.	8,349,329	4,128,309	1,798,177	4,092,812	688,169	19,056,796
1972-81 Ave.	5,972,890	1,634,388	394,418	3,661,832	610,805	12,274,332
1982-91 Ave.	10,725,768	6,622,230	3,201,937	4,523,791	765,533	25,839,259

¹ Preliminary.

(Sources: 1 and 5)

Appendix Table 11. Commercial sockeye salmon catch, in percent, by gear type and district, Bristol Bay, 1972-91.

Year	<u>Naknek- Kvichak</u>		<u>Egegik</u>		<u>Ugashik</u>		<u>Nushagak</u>		<u>Togiak</u>		<u>Total</u>	
	Drift Set		Drift Set		Drift Set		Drift Set		Drift Set		Drift Set	
1972	94	6	91	9	28	72	92	8	100	0	93	7
73	88	12	90	10	75	25	93	7	99	1	92	8
74	82	18	78	22	50	50	73	27	91	9	79	21
75	94	6	90	10	80	20	80	20	92	8	91	9
76	93	7	91	9	90	10	85	15	92	8	90	10
1977	90	10	88	12	90	10	85	15	89	11	89	11
78	91	9	84	16	88	12	85	15	84	16	88	12
79	90	10	78	22	84	16	82	18	82	18	87	13
80	88	12	69	31	87	13	85	15	83	17	86	14
81	86	14	77	23	89	11	81	19	79	21	84	16
1982	87	13	83	17	87	13	90	10	84	16	87	13
83	92	8	86	14	93	7	86	14	80	20	89	11
84	89	11	92	8	92	8	83	17	77	23	90	10
85	87	13	93	7	96	4	65	35	75	25	90	10
86	70	30	89	11	94	6	76	24	68	32	84	16
1987	86	14	91	9	93	7	80	20	66	34	87	13
88	86	14	90	10	91	9	75	25	64	36	86	14
89	89	11	90	10	87	13	58	42	55	45	86	14
90a	88	12	91	9	91	9	67	33	67	33	87	13
91a	89	11	90	10	89	11	76	24	59	41	86	14
20-Year Ave.	88	12	87	13	84	16	80	20	79	21	88	12
1972-81 Ave.	90	10	84	16	76	24	84	16	89	11	88	12
1982-91 Ave.	86	14	89	11	91	9	76	24	70	30	87	13

^a Preliminary Data.

(Source: 5)

Appendix Table 12. Sockeye salmon escapement by district, in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek-Kvichak ¹	Egegik ²	Ugashik ³	Nushagak ⁴	Togiak ⁵	Total
1972	1,747,668	546,402	79,428	528,650	81,970	2,984,118
73	618,510	328,842	38,988	581,307	114,930	1,682,577
74	5,889,750	1,275,630	61,854	2,267,468	108,492	9,603,194
75	15,267,616	1,173,840	429,336	2,273,038	189,162	19,332,992
76	3,367,854	509,160	356,308	1,486,276	200,590	5,920,188
1977	2,527,000	692,514	201,520	1,220,056	202,634	4,843,724
78	5,192,066	895,698	82,434	3,485,532	340,076	9,995,806
79	12,437,996	1,032,042	1,706,904	3,073,571	224,838	18,475,351
80	25,447,866	1,060,860	3,335,284	8,310,438	572,450	38,726,898
81	3,632,788	694,680	1,327,699	2,850,637	365,910	8,871,714
1982	2,529,692	1,034,628	1,185,551	2,012,742	341,424	7,104,037
83	4,554,496	792,282	1,001,364	1,948,492	239,610	8,536,244
84	11,948,514	1,165,320	1,270,318	1,814,686	200,778	16,399,616
85	9,179,014	1,095,192	1,006,407	1,684,796	190,082	13,155,491
86	3,387,147	1,151,750	1,015,582	2,133,398	271,184	7,959,061
87	7,281,896	1,273,553	686,894	1,895,961	316,076	11,454,380
88	5,297,708	1,612,745	654,412	1,524,752	340,712	9,430,329
89	9,676,244	1,611,566	1,713,287	2,189,501	125,080	15,315,678
90	9,231,358	2,191,582	749,478	2,144,498	278,202	14,595,118
91	8,078,885	2,786,925	2,482,016	2,422,072	320,713	16,090,611
20-Year Ave.	7,364,703	1,146,261	969,253	2,292,394	251,246	12,023,856
1972-81 Ave.	7,612,911	820,967	761,976	2,607,697	240,105	12,043,656
1982-91 Ave.	7,116,495	1,471,554	1,176,531	1,977,090	262,386	12,004,057

¹ Includes Kvichak, Branch and Naknek Rivers.

² Includes Egegik River. Also includes King Salmon River in 1986-91.

³ Includes Ugashik River. Also includes Mother Goose River system 1976-91 and Dog Salmon River system in 1984-91.

⁴ Includes Wood, Igushik, Nuyakuk, Nushagak-Mulchatna and Snake Rivers.

⁵ Includes Togiak River, Lake and tributaries, Kulukak system and other miscellaneous river systems.

(Sources: 1 and 7)

Appendix Table 13. Inshore commercial catch and escapement of sockeye salmon in the Naknek-Kvichak District by river system, in numbers of fish, Bristol Bay, 1972-91.

Year	Catch	Escapement			Total	Total Run
		Kvichak ¹	Branch ²	Naknek ¹		
1972	1,102,365	1,009,962	151,188	586,518	1,747,668	2,850,033
73	168,249	226,554	35,280	356,676	618,510	786,759
74	538,163	4,433,844	214,848	1,241,058	5,889,750	6,427,913
75	3,085,416	13,140,450	100,480	2,026,686	15,267,616	18,353,032
76	2,547,276	1,965,282	81,822	1,320,750	3,367,854	5,915,130
1977	2,167,214	1,341,144	100,000	1,085,856	2,527,000	4,694,214
78	5,123,668	4,149,288	229,400	813,378	5,192,066	10,315,734
79	14,991,826	11,218,434	294,200	925,362	12,437,996	27,429,822
80	15,120,457	22,505,268	297,900	2,644,698	25,447,866	40,568,323
81	10,992,809	1,754,358	82,210	1,796,220	3,632,788	14,625,597
1982	5,005,802	1,134,840	239,300	1,155,552	2,529,692	7,535,494
83	21,559,372	3,569,982	96,220	888,294	4,554,496	26,113,868
84	14,546,710	10,490,670	215,370	1,242,474	11,948,514	26,495,224
85	8,179,093	7,211,046	118,030	1,849,938	9,179,014	17,358,107
86	2,892,171	1,179,322	230,180	1,977,645	3,387,147	6,279,318
1987	4,986,002	6,065,880	154,210	1,061,806	7,281,896	12,267,898
88	3,480,836	4,065,216	194,630	1,037,862	5,297,708	8,778,544
89	13,809,956	8,317,500	196,760	1,161,984	9,676,244	23,486,200
90	17,126,625 ^a	6,970,020	168,760	2,092,578	9,231,358	26,357,983 ^a
91	10,558,304	4,222,788	277,589	3,578,508	8,078,885	18,637,189 ^a
20-Year Ave.	7,899,116	5,748,592	173,910	1,442,192	7,364,703	15,263,819
1972-81 Ave.	5,583,744	6,174,458	158,733	1,279,720	7,612,911	13,196,656
1982-91 Ave.	10,214,487	5,322,726	189,105	1,604,664	7,116,495	17,330,983

¹ Tower count.

² Tower count 1972-76 and aerial survey estimates 1977-91.

^a Preliminary.

(Sources: 1, 7, 13 and 14)

Appendix Table 14. Inshore sockeye salmon total run by river system, Naknek-Kvichak District, in thousands of fish, Bristol Bay, 1972-91.

Year	Kvichak		Branch		Naknek		Total Run ¹
	Number	%	Number	%	Number	%	
1972	1,352	47	183	6	1,315	46	2,850
73	248	32	37	5	501	64	787
74	4,582	71	225	4	1,621	25	6,428
75	14,746	80	114	1	3,493	19	18,353
76	3,423	58	137	2	2,354	40	5,915
1977	2,081	44	150	3	2,463	52	4,694
78	7,965	77	455	4	1,896	18	10,316
79	24,637	90	573	2	2,219	8	27,430
80	35,248	87	561	1	4,759	12	40,568
81	6,989	48	311	2	7,326	50	14,626
1982	2,993	40	772	10	3,770	50	7,535
83	20,105	77	557	2	5,452	21	26,114
84	23,014	87	555	2	2,926	11	26,495
85	13,394	77	264	2	3,699	21	17,358
86	1,966	31	399	6	3,913	62	6,279
1987	9,593	78	297	2	2,378	19	12,268
88	6,720	76	320	4	1,739	20	8,779
89	19,774	84	534	2	3,179	14	23,487
90 ^a	17,439	66	550	2	8,369	32	26,358
91 ^a	8,061	43	607	3	9,970	53	18,637
20-Year Ave.	11,216	67	380	4	3,667	30	15,264
1972-81 Ave.	10,127	69	275	3	2,795	28	13,197
1982-91 Ave.	12,306	66	486	3	4,539	30	17,331

¹ Due to rounding, the district total runs may not equal the sum of the rows.

^a Preliminary apportionment.

(Sources: 1 and 7)

Appendix Table 15. Inshore commercial catch and escapement of sockeye salmon in the Egegik District by river system, Bristol Bay, 1972-91.

Year	Catch	Escapement		Total Run
		Egegik ¹	King Salmon ²	
1972	839,820	546,402		1,386,222
73	221,337	328,842		550,179
74	172,253	1,275,630		1,447,883
75	964,024	1,173,840		2,137,864
76	1,329,788	509,160		1,838,948
1977	1,780,567	692,514		2,473,081
78	1,207,294	895,698		2,102,992
79	2,257,332	1,032,042		3,289,374
80	2,623,066	1,060,860		3,683,926
81	4,361,406	694,680		5,056,086
1982	2,447,514	1,034,628		3,482,142
83	6,755,256	792,282		7,547,538
84	5,190,413	1,165,320	25	6,355,758
85	7,537,273	1,095,192		8,632,465
86	4,852,935	1,151,320	430	6,005,115
1987	5,356,669	1,272,978	575	6,630,222
88	6,456,598	1,612,745 ^b		8,069,343
89	8,901,994	1,610,966 ^b	600	10,513,560
90	10,086,953 ^a	2,191,362 ^b	220	12,278,535 ^a
91	6,800,798 ^a	2,786,880 ^b	45	9,587,723 ^a
20-Year Average	4,007,165	1,146,189		5,153,448
1972-81 Average	1,575,689	820,967		2,396,656
1982-91 Average	6,438,640	1,471,410	316	7,910,240

¹ Tower count.

² Aerial survey.

^a Preliminary.

^b Includes aerial count of Shosky Creek.

(Source: 1, 7, and 13)

Appendix Table 16. Inshore commercial catch and escapement of sockeye salmon in the Ugashik District by river system, Bristol Bay, 1972-91.

Year	Catch	Escapement			Total Run
		Ugashik ¹	King Salmon ²	Dog Salmon ²	
1972	17,440	79,428			96,868
73	3,920	38,988			42,908
74	2,151	61,854			64,005
75	14,558	429,336			443,894
76	174,923	341,808	14,500		531,231
1977	92,623	201,486	34		294,143
78	7,995	70,434	12,000		90,429
79	391,118	1,700,904	6,000		2,098,022
80	885,875	3,321,384	13,900		4,221,159
81	2,116,066	1,326,762	937		3,443,765
1982	1,139,192	1,157,526	28,025		2,324,743
83	3,349,451	1,000,614	750		4,350,815
84	2,658,376	1,241,418	17,100	11,800	3,928,694
85	6,468,862	998,232	7,400	775	7,475,269
86	5,002,949	1,001,492	4,310	9,780	6,018,531
1987	2,128,652	668,964	15,855	2,075	2,815,546
88	1,523,520	642,972	8,360	3,080	2,177,932
89	3,146,239	1,681,302	25,480	6,505	4,859,526
90	2,144,268 ^a	730,038	11,340	8,100	2,893,746 ^a
91	3,039,696 ^a	2,457,321 ^c	12,195	12,500	5,521,712 ^a
20-Year Ave.	1,715,395	957,613			2,684,647
1972-81 Ave.	370,670	757,238			1,132,642
1982-91 Ave.	3,060,121	1,157,988	13,082	6,827 ^b	4,236,651

¹ Tower count.

² Aerial survey.

^a Preliminary.

^b 1984-91 only.

^c Includes Grassy Creek.

(Source: 1, 7 and 13)

Appendix Table 17. Inshore commercial catch and escapement of sockeye salmon in the Nushagak District by river system, in numbers of fish, Bristol Bay, 1972-91.

Year	Catch	Escapement						Total	Total Run
		Wood ¹	Igushik ¹	Nuyakuk ¹	Nush/Mul ²	Nushagak ³	Snake ⁴		
1972	381,347	430,602	60,018	28,596	7,434		2,000	528,650	909,997
73	272,093	330,474	59,508	110,016	80,394		915	581,307	853,400
74	510,571	1,708,836	358,752	154,614	30,000		15,266	2,267,468	2,778,039
75	645,902	1,270,116	241,086	669,918	82,400		9,518	2,273,038	2,918,940
76	1,265,422	817,008	186,120	425,220	45,200		12,728	1,486,276	2,751,698
1977	619,025	561,828	95,970	232,554	320,400		9,304	1,220,056	1,839,081
78	3,137,166	2,267,238	536,154	576,666	87,400		18,074	3,485,532	6,622,698
79	3,327,346	1,706,352	859,560	360,120	139,100		8,439	3,073,571	6,400,917
80	4,497,787	2,969,040	1,987,530	3,026,568	290,800		36,500	8,310,438	12,808,225
81	7,493,093	1,233,318	591,144	834,204	177,400		14,571	2,850,637	10,343,730
1982	5,916,187	976,470	423,768	537,864	63,000		11,640	2,012,742	7,928,929
83	5,119,744	1,360,968	180,438	318,606	85,400		3,080	1,948,492	7,068,236
84	1,992,681	1,002,792	184,872	472,596	120,586		33,840	1,814,686	3,807,367
85	1,307,889	939,000	212,454	429,162	69,300		34,880	1,684,796	2,992,685
86	2,719,313	818,652	307,728	821,898	168,340		16,780	2,133,398	4,852,711
1987	3,254,720	1,337,172	169,236	163,000	225,033		1,520	1,895,961	5,150,681
88	1,706,716	866,778	170,454	319,992	163,208		4,320	1,524,752	3,231,468
89	2,788,185	1,186,410	461,610			513,421	28,060	2,189,501	4,977,686
90	3,569,308 ^a	1,069,440	365,850			680,368	28,840	2,144,498	5,713,806
91	5,272,719 ^a	1,159,920	756,126			495,106	10,920	2,422,072	7,694,791
20-year Ave.	2,789,861	1,200,621	410,419	2,598,059 ^b	1,211,567 ^b		15,060	2,292,394	5,082,104
1972-81 Ave.	2,214,975	1,329,481	497,584	641,848	126,053		12,732	2,607,697	4,822,673
1982-91 Ave.	3,364,746	1,071,760	323,254	437,588 ^b	127,838 ^b	562,965 ^c	17,388	1,977,090	5,341,836

¹ Tower count.

² Tower counts 1973-74, aerial survey estimates 1977-83, 1985, and 1987; sonar counts 1984 and 1988. Tower not operated in 1971-72 and 1975-76; escapement estimates for these years and 1986 were based on the average ratio of Nuyakuk/Nushagak-Mulchatna River system in years when data was available.

³ Escapement to Nuyakuk and Nushagak-Mulchatna rivers can not be calculated after 1988; therefore, total run from 1989 on will be determined for the entire Nushagak River drainage using Portage Creek escapement numbers and age composition.

⁴ Aerial survey estimate 1971-72, 1980, 1982-86, 1989-1991; weir count 1973-79 and 1981.

^a Preliminary.

^b Average thru 1988.

^c Average 1989 thru 1991.

(Sources: 1, 7, and 13)

Appendix Table 18. Inshore sockeye salmon total run by river system, in thousands of fish and percent, Nushagak District, Bristol Bay, 1972-91.

Year	<u>Wood</u> Number %	<u>Igushik</u> Number %	<u>Nuyakuk</u> Number %	<u>Nush-Mul</u> Number %	<u>Nushagak</u> ¹ Number %	<u>Snake</u> Number %	Total Run ²
1972	718 79	117 13	65 7	7 1		2 0	910
73	479 56	88 10	162 19	124 15		1 0	853
74	2,099 76	442 16	187 7	34 1		15 1	2,778
75	1,640 56	319 11	868 30	82 3		10 0	2,919
76	1,438 52	345 13	845 31	100 4		24 1	2,752
1977	834 45	146 8	358 19	488 27		12 1	1,839
78	4,117 62	1,084 16	1,302 20	87 1		33 0	6,622
79	3,638 57	1,842 29	764 12	138 2		18 0	6,622
80	4,529 35	3,126 24	4,826 38	291 2		37 0	12,808
81	4,568 44	2,229 22	3,318 32	177 2		52 1	10,344
1982	3,471 44	1,818 23	2,079 26	550 7		12 0	7,929
83	4,272 60	813 12	1,379 20	601 9		3 0	7,068
84	1,982 52	435 11	906 24	451 12		34 1	3,808
85	1,593 53	460 15	697 23	208 7		35 1	2,993
86	1,772 37	877 18	1,762 36	425 9		17 0	4,853
1987	2,828 55	617 12	589 11	1,116 22		2 0	5,151
88	1,749 54	406 13	649 20	424 13		4 0	3,231
89	2,519 51	1,214 24			1,217 24	28 1	4,978
90 ²	2,647 46	1,267 22			1,771 31	29 1	5,714
91 ²	3,423 44	2,478 32			1,783 23	11 0	7,695
20-Year Ave.	2,516 53	1,006 17	1,221 22	312 8		19 0	5,082
1972-81 Ave.	2,406 56	974 16	1,270 21	153 6		20 0	4,823
1982-91 Ave.	2,626 50	1,039 18	1,152 23	539 11	1,588 26	18 0	5,340

¹ Due to rounding, the district total runs may not equal the sum of the rows.

² Preliminary apportionment.

(Sources: 1 and 7)

Appendix Table 19. Inshore commercial catch and escapement of sockeye salmon in the Togiak District, by river system, in numbers of fish, Bristol Bay, 1972-91.

Year	Catch				Escapement						Total Run
	Togiak			Total	Togiak					Total	
	Togiak	Kulukak	Os/Mat ¹		Lake ²	River ³	Tribu- taries ⁴	Kulukak ⁵	Other ⁶		
1972	51,354	17,244	6,663	75,261	74,070		4,500	3,400		81,970	157,231
73	75,694	15,551	4,478	95,723	95,730		11,200	8,000		114,930	210,653
74	110,886	13,615	14,840	139,341	82,992	12,000	8,600	4,900		108,492	247,833
75	184,856	3,821	237	188,914	160,962	12,200	7,400	8,600		189,162	378,076
76	293,016	4,822	4,045	301,883	158,190	15,000	16,200	11,200		200,590	502,473
77	201,004	16,252	1,195	218,451	133,734	4,400	24,400	40,100		202,634	421,085
78	422,100	29,668	248 ^a	452,016	273,576	15,000	17,600	33,900		340,076	792,092
79	393,337	66,629	1,018	460,984	171,138	14,200	12,900	26,600		224,838	685,822
80	591,470	42,811	280	634,561	461,850	27,900	37,000	45,700		572,450	1,207,011
81	620,288	19,246	173	639,707	208,080	21,150	77,900	58,780		365,910	1,005,617
82	581,718	13,952	26	595,696	244,824	3,450	40,400	52,750		341,424	937,120
83	529,775	55,906	2,527	588,208	191,520	7,200	13,920	26,970		239,610	827,818
84	213,213	96,709	12,204	322,126	95,448	15,830	39,700	49,800		200,778	522,904
85	133,263	44,120	32,383	209,766	136,542	3,600	13,340	36,600		190,082	399,848
86	191,158	100,466	17,064	308,688	168,384	20,000	15,000	42,800	25,000	271,184	579,872
87	274,613	45,401	22,718	342,732	249,676	10,400	18,200	37,800	----	316,076	658,808
88	673,408	143,112	5,567	822,087	276,612	18,800	13,600	31,700	----	340,712	1,162,799
89	68,375	14,116	6,441	88,932	84,480	15,200	4,560	20,840	----	125,080	214,012
90	184,285 ^b	41,698 ^b	11,516 ^b	237,499 ^b	141,977	17,540	29,605	49,600	39,480	278,202	515,701
91	522,090 ^b	33,425 ^b	6,437 ^b	561,952 ^b	254,683	15,980	7,740	23,940	18,370	320,713	882,665
20-Year Ave.	315,795	40,928	7,503	364,226	183,223	13,881	20,688	30,699		251,246	615,472
1972-81 Ave.	294,401	22,966	3,318	320,684	182,032	15,231	21,770	24,118		240,105	560,789
1982-91 Ave.	337,190	58,891	11,688	407,769	184,415	12,800	19,607	37,280	27,617	262,386	670,155

1 Catches in the Osviak and Matogak sections were combined.
2 Lower count.
3 Aerial survey estimate.
4 Aerial survey estimate includes Gechiak, Pungokepuk, Kemuk, Nayorurun, and Ongivinuck River systems. Aerial survey estimates prior to 1986 also include Ungalikthluk, Negukthlik, Matogak, Osviak, and other miscellaneous river systems when surveyed.
5 Aerial survey estimate includes Kulukak River and Lake and Tithe Creek ponds.
6 Aerial survey estimate includes Matogak, Osviak, Slug, Negukthlik, Ungalikthluk, and Quigmy Rivers. Prior to 1986 estimates for these systems were included under tributaries when surveyed.
a Includes 248 fish from Cape Peirce Section.
b Preliminary.

(Source: 1, 7, and 13)

Appendix Table 20. Inshore total run of sockeye salmon by district, in numbers of fish, Bristol Bay, 1972-91.

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Total
1972	2,850,033	1,386,222	96,868	909,997	157,231	5,400,351
73	786,759	550,179	42,908	853,400	210,653	2,443,899
74	6,427,913	1,447,883	64,005	2,778,039	247,833	10,965,673
75	18,353,032	2,137,864	443,894	2,918,940	378,076	24,231,806
76	5,915,130	1,838,948	531,231	2,751,698	502,473	11,539,480
1977	4,694,214	2,473,081	294,143	1,839,081	421,085	9,721,604
78	10,315,734	2,102,992	90,429	6,622,698	792,092	19,923,945
79	27,429,822	3,289,374	2,098,022	6,400,917	685,822	39,903,957
80	40,568,323	3,683,926	4,221,159	12,808,225	1,207,011	62,488,644
81	14,625,597	5,056,086	3,443,765	10,343,730	1,005,617	34,474,795
1982	7,535,494	3,482,142	2,324,743	7,928,929	937,120	22,205,428
83	26,113,868	7,547,538	4,350,815	7,068,236	827,818	45,908,275
84	26,495,224	6,355,758	3,928,694	3,807,367	522,904	41,109,947
85	17,358,107	8,632,465	7,475,269	2,992,685	399,848	36,858,374
86	6,279,318	6,005,115	6,018,531	4,852,711	579,872	23,735,547
1987	12,267,898	6,630,222	2,815,546	5,150,681	658,808	27,523,155
88	8,778,544	8,069,343	2,177,932	3,231,468	1,162,799	23,420,086
89	23,486,200	10,513,560	4,859,526	4,977,686	214,012	44,050,984
90 ^a	26,357,983	12,278,535	2,893,746	5,713,806	515,701	47,759,771
91 ^a	18,637,189	9,587,723	5,521,712	7,694,791	882,665	42,324,080
20-Year Ave.	15,263,819	5,153,448	2,684,647	5,082,104	615,472	28,799,490
1972-81 Ave.	13,196,656	2,396,656	1,132,642	4,822,673	560,789	22,109,415
1982-91 Ave.	17,330,983	7,910,240	4,236,651	5,341,536	670,155	35,489,565

^a Preliminary.

(Sources: 1 and 7)

Appendix Table 21. Kvichak River sockeye salmon escapement and return by brood year, Bristol Bay, 1955-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1955	251	0	265	689	550	0	1,504	5.99
56	9,433	14	24,280	13,425	1,308	0	39,027	4.14
57	2,843	8	243	3,577	261	2	4,091	1.44
58	535	0	77	183	26	3	289	0.54
59	680	0	213	323	11	0	547	0.80
1960	14,630	0	1,449	47,306	6,493	6	55,254	3.78
61	3,706	1	334	2,483	684	0	3,502	0.94
62	2,581	0	106	4,825	420	4	5,355	2.07
63	339	0	52	689	369	9	1,119	3.30
64	957	8	2,337	2,748	655	3	5,751	6.01
1965	24,326	25	10,337	33,421	1,240	1	45,024	1.85
66	3,775	15	513	5,347	385	1	6,261	1.66
67	3,216	0	356	1,084	87	0	1,527	0.47
68	2,557	0	293	112	137	2	544	0.21
69	8,394	0	137	4,543	613	11	5,304	0.63
1970	13,935	1	83	14,480	1,261	7	15,832	1.14
71	2,387	0	263	2,263	305	0	2,831	1.19
72	1,010	0	256	1,365	319	0	1,940	1.92
73	227	0	580	1,303	574	0	2,457	10.82
74	4,434	9	6,639	18,734	915	5	26,302	5.93
1975	13,140	5	5,984	31,432	625	0	38,046	2.90
76	1,965	5	5,374	4,926	277	0	10,582	5.39
77	1,341	54	1,940	1,144	99	0	3,237	2.41
78	4,149	0	1,851	2,474	828	6	5,159	1.24
79	11,218	58	18,406	20,164	3,511	0	42,139	3.76
1980	22,505	2	2,915	9,716	415	0	13,048	0.58
81	1,754	0	801	1,161	166	0	2,128	1.21
82	1,135	25	448	1,063	145	0	1,681	1.48
83	3,570	1	8,583	4,239	581	4	13,408	3.76
84	10,491	0	2,597	18,932	2,454	3	23,986	2.29
1985	7,211	10	1,086	14,654	1,548			
86	1,179	10	720	2,504				
87	6,066	33	4,308					
88	4,065	15						
89	8,318							
1990	6,970							
91	4,223							
Average ¹	5,716	8	3,257	8,472	857	2	12,596	2.20
Percent ¹		0	26	67	7	0	100	

¹ Averages and percentages computed from years with complete returns, 1955-84.

^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 22. Branch River sockeye salmon escapement and return by brood year, Bristol Bay, 1955-91.^a

Brood Year	Escapement ¹	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1955	172	0	788	263	44	0	1,095	6.37
56	784	5	1,885	458	41	0	2,389	3.05
57	127	0	5	66	13	1	85	0.67
58	95	0	43	53	52	0	148	1.56
59	825	0	301	387	76	2	766	0.93
1960	1,241	0	105	320	31	0	456	0.37
61	90	10	90	192	0	0	292	3.24
62	91	19	129	94	19	0	261	2.87
63	203	0	200	174	2	0	376	1.85
64	249	5	102	211	17	0	335	1.35
1965	175	6	104	171	17	0	298	1.70
66	174	13	282	274	11	0	580	3.33
67	203	9	301	97	7	0	414	2.04
68	194	8	127	43	3	0	181	0.93
69	182	0	5	160	25	0	190	1.04
1970	177	0	73	77	2	0	152	0.86
71	187	2	26	59	37	2	126	0.67
72	151	1	91	24	14	0	130	0.86
73	35	0	98	148	2	0	248	7.09
74	215	4	297	146	8	0	455	2.12
1975	100	15	415	333	2	0	765	7.65
76	82	26	211	188	55	0	480	5.85
77	100	27	142	699	12	0	880	8.80
78	229	1	102	107	147	0	357	1.56
79	294	3	464	329	3	0	799	2.72
1980	298	0	104	224	11	1	340	1.14
81	82	0	55	223	12	0	290	3.54
82	239	0	173	145	3	0	321	1.34
83	96	0	148	165	3	0	316	3.29
84	215	1	161	188	23	0	373	1.73
1985	118	3	358	204	8			
86	230	1	346	464				
87	154	0	159					
88	195	1						
89	197							
1990	169							
91	278							
Average ²	244	5	234	201	23	0	463	1.90
Percent ²		1	51	43	5	0	100	

¹ Lower counts 1955-75. Aerial survey estimates 1976-91.

² Averages and percentages computed from years with complete returns, 1955-84.

^a Includes estimates of False Pass and Japanese high seas catches of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 23. Naknek River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	285	0	24	316	248	1	589	2.07
54	799	0	104	2,431	587	16	3,138	3.93
55	279	0	722	1,035	90	6	1,853	6.64
56	1,773	1	474	1,703	321	1	2,500	1.41
57	635	0	55	834	678	3	1,570	2.47
1958	278	0	116	749	172	2	1,039	3.74
59	2,232	0	355	1,093	704	0	2,152	0.96
60	828	1	1,418	1,322	1,279	3	4,023	4.86
61	351	0	242	1,060	642	8	1,952	5.56
62	723	0	80	581	412	1	1,074	1.49
1963	905	0	145	1,223	634	1	2,003	2.21
64	1,350	1	472	1,399	188	1	2,061	1.53
65	718	5	584	1,093	438	1	2,121	2.95
66	1,016	5	731	2,471	630	1	3,838	3.78
67	756	0	334	1,026	356	1	1,717	2.27
1968	1,023	3	152	317	271	2	745	0.73
69	1,331	0	50	1,283	1,214	3	2,550	1.92
70	733	1	173	2,163	382	0	2,719	3.71
71	936	1	422	1,987	1,847	17	4,274	4.57
72	587	3	248	402	611	1	1,265	2.16
1973	357	0	494	1,143	598	0	2,235	6.26
74	1,241	2	234	1,254	911	5	2,406	1.94
75	2,027	1	436	3,090	1,707	8	5,242	2.59
76	1,321	4	1,091	5,572	1,513	29	8,209	6.21
77	1,086	12	642	2,368	465	6	3,493	3.22
1978	813	1	334	2,816	542	0	3,693	4.54
79	925	4	2,443	1,765	423	3	4,638	5.01
80	2,645	1	737	2,695	837	2	4,272	1.62
81	1,796	4	791	3,038	946	3	4,782	2.66
82	1,156	3	188	1,358	484	9	2,042	1.77
1983	888	0	170	827	487	1	1,485	1.67
84	1,242	1	495	2,132	1,825	6	4,459	3.59
85	1,850	2	684	4,808	1,472			
86	1,979	3	2,008	8,465				
87	1,062	3	353					
1988	1,038	0						
89	1,162							
90	2,093							
91	3,579							
Average ¹	1,032	2	467	1,642	701	4	2,817	2.73
Percent ¹		0	17	58	25	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.

^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 24. Egegik River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	519	0	26	475	591	12	1,104	2.13
54	507	0	15	1,202	728	45	1,990	3.93
55	271	1	21	835	402	7	1,266	4.67
56	1,104	6	2,026	4,110	687	12	6,841	6.20
57	391	0	37	1,139	996	62	2,234	5.71
1958	246	0	45	890	324	3	1,262	5.13
59	1,072	0	75	1,201	481	25	1,782	1.66
60	1,799	8	469	4,775	2,609	51	7,912	4.40
61	702	0	85	675	819	10	1,589	2.26
62	1,027	0	22	1,019	403	30	1,474	1.44
1963	998	0	18	652	581	7	1,258	1.26
64	850	1	132	1,524	315	12	1,984	2.33
65	1,445	0	139	2,088	854	21	3,102	2.15
66	804	0	251	1,352	898	10	2,511	3.12
67	637	0	64	922	624	3	1,613	2.53
1968	339	0	41	143	260	14	458	1.35
69	1,016	0	13	1,208	1,418	115	2,754	2.71
70	920	0	59	885	270	25	1,239	1.35
71	634	0	46	1,586	1,044	56	2,732	4.31
72	546	0	60	1,570	1,311	18	2,959	5.42
1973	329	0	76	713	887	4	1,680	5.11
74	1,276	0	149	2,324	626	3	3,102	2.43
75	1,174	0	158	2,683	842	3	3,686	3.14
76	509	2	676	3,779	850	0	5,307	10.43
77	693	2	824	2,657	721	13	4,217	6.09
1978	896	0	406	6,581	2,209	12	9,208	10.28
79	1,032	3	721	3,558	1,664	0	5,946	5.76
80	1,061	1	843	6,800	952	0	8,596	8.10
81	695	0	615	4,349	1,465	7	6,436	9.26
82	1,035	4	1,029	3,687	1,646	4	6,370	6.15
1983	792	3	1,763	5,957	2,801	38	10,562	13.34
84	1,165	1	696	7,371	5,063	56	13,187	11.32
85	1,095	4	596	5,638	1,262			
86	1,151	2	1,870	7,711				
87	1,274	2	965					
1988	1,613	1						
89	1,612							
90	2,192							
91	2,787							
Average ¹	828	1	363	2,460	1,104	21	3,949	4.77
Percent ¹		0	9	62	28	1	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.
^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. Escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 25. Ugashik River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	1,056	0	216	668	224	0	1,108	1.05
54	459	0	28	423	61	0	512	1.12
55	77	0	19	151	7	0	177	2.30
56	425	13	3,167	916	37	0	4,133	9.72
57	215	0	38	459	105	2	604	2.81
1958	280	0	64	549	66	0	679	2.43
59	219	0	18	347	132	1	498	2.27
60	2,341	0	685	1,859	487	1	3,032	1.30
61	366	0	245	747	121	0	1,113	3.04
62	274	0	81	315	28	0	424	1.55
1963	397	0	13	112	23	0	148	0.37
64	483	0	41	262	19	2	324	0.67
65	998	0	87	287	164	0	538	0.54
66	715	1	725	1,568	22	0	2,316	3.24
67	244	0	56	94	34	0	184	0.75
1968	71	0	14	22	3	0	39	0.55
69	160	0	4	58	28	2	92	0.58
70	735	0	5	258	30	1	294	0.40
71	530	0	178	511	131	1	821	1.55
72	79	0	34	177	37	3	251	3.18
1973	39	0	17	22	50	0	89	2.28
74	62	0	20	615	97	0	732	11.81
75	429	3	1,483	2,270	340	1	4,097	9.55
76	356	0	2,088	2,754	438	3	5,283	14.84
77	202	2	603	1,859	202	5	2,671	13.22
1978	82	0	255	1,276	528	0	2,059	25.11
79	1,707	19	3,083	2,304	575	5	5,986	3.51
80	3,335	1	1,225	5,674	850	2	7,752	2.32
81	1,328	2	1,615	4,837	930	1	7,385	5.56
82	1,186	1	432	1,308	745	2	2,488	2.10
1983	1,001	0	657	974	325	1	1,957	1.96
84	1,270	0	530	4,211	716	5	5,462	4.30
85	1,006	2	514	1,683	476			
86	1,015	5	549	4,381				
87	687	7	858					
1988	654	2						
89	1,713							
90	749							
91	2,482							
Average ¹	660	1	554	1,184	236	1	1,977	2.99
Percent ¹		0	28	60	12	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.
^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 26. Wood River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	516	0	301	471	36	1	809	1.57
54	571	0	1,237	1,225	67	0	2,529	4.43
55	1,383	0	2,407	1,235	147	0	3,789	2.74
56	773	0	822	650	0	0	1,472	1.90
57	289	0	177	291	0	0	468	1.62
1958	960	1	2,146	463	32	0	2,642	2.75
59	2,209	0	988	757	56	2	1,803	0.82
60	1,016	6	1,474	1,146	108	0	2,734	2.69
61	461	0	266	1,209	21	1	1,497	3.25
62	874	2	994	459	49	0	1,504	1.72
1963	721	0	537	844	46	0	1,427	1.98
64	1,076	1	458	685	74	2	1,220	1.13
65	675	3	481	1,089	213	1	1,787	2.65
66	1,209	7	1,004	1,034	76	1	2,122	1.76
67	516	3	663	344	82	0	1,092	2.12
1968	649	1	514	570	23	0	1,108	1.71
69	604	0	61	646	126	0	833	1.38
70	1,162	2	1,539	1,235	26	0	2,802	2.41
71	851	3	475	774	50	0	1,302	1.53
72	431	4	801	663	46	0	1,514	3.51
1973	330	2	213	1,223	48	0	1,486	4.50
74	1,709	3	2,965	2,119	90	0	5,177	3.03
75	1,270	60	1,606	2,328	765	0	4,759	3.75
76	817	3	2,290	3,129	275	0	5,697	6.97
77	562	20	1,028	2,213	28	0	3,289	5.85
1978	2,267	0	1,367	1,813	108	0	3,288	1.45
79	1,706	10	2,643	1,514	14	0	4,181	2.45
80	2,969	0	453	1,050	102	0	1,605	0.54
81	1,233	0	626	1,197	86	0	1,909	1.55
82	976	4	522	886	26	0	1,438	1.47
1983	1,361	1	1,945	1,171	77	0	3,194	2.35
84	1,003	0	586	1,393	37	0	2,016	2.01
85	939	10	1,155	1,448	14			
86	819	9	1,241	2,012				
87	1,337	26	1,391					
1988	867	6						
89	1,186							
90	1,069							
91	1,160							
Average ¹	1,036	4	1,050	1,120	92	0	2,265	2.19
Percent ¹		0	46	49	4	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.

^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 27. Kushik River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	100	0	98	20	68	1	187	1.87
54	80	0	175	473	113	1	762	9.53
55	500	0	454	896	94	0	1,444	2.89
56	400	0	169	534	39	0	742	1.86
57	130	0	2	54	20	0	76	0.58
1958	107	0	15	91	28	0	134	1.25
59	644	0	101	248	22	0	371	0.58
60	495	0	62	355	57	0	474	0.96
61	294	0	34	386	17	0	437	1.49
62	16	0	28	290	9	0	327	20.44
1963	92	0	257	225	25	0	507	5.51
64	129	0	163	718	49	0	930	7.21
65	181	0	371	638	79	0	1,088	6.01
66	206	0	66	390	15	0	471	2.29
67	282	0	59	103	12	0	174	0.62
1968	195	0	43	121	12	0	176	0.90
69	512	0	1	432	104	0	537	1.05
70	371	0	27	211	71	0	309	0.83
71	211	0	48	225	30	0	303	1.44
72	60	0	93	115	21	0	229	3.82
1973	60	0	19	676	30	0	725	12.08
74	359	0	449	1,096	35	0	1,580	4.40
75	241	0	783	2,622	525	0	3,930	16.31
76	186	0	556	1,587	235	0	2,378	12.78
77	96	0	300	1,697	17	0	2,014	20.98
1978	536	0	96	414	17	0	527	0.98
79	860	0	423	419	5	0	847	0.98
80	1,988	0	20	296	56	0	372	0.19
81	591	0	188	787	50	0	1,025	1.73
82	424	0	64	443	12	0	519	1.22
1983	180	1	151	361	31	0	544	3.02
84	185	0	41	708	39	1	789	4.26
85	212	0	530	1,018	83			
86	308	3	253	2,223				
87	169	2	171					
1988	170	0						
89	462							
90	366							
91	756							
Average ¹	335	0	167	551	61	0	779	2.33
Percent ¹		0	21	71	8	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.
^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 28. Nuyakuk River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-88.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	189	0	55	433	1	0	489	2.59
54	29	0	53	27	0	0	80	2.76
55	16	0	52	20	0	0	72	4.50
56	30	0	217	162	0	0	379	12.63
57	67	0	4	13	1	0	18	0.27
1958	196	0	93	338	11	0	442	2.26
59	49	0	62	60	9	0	131	2.67
60	146	5	154	403	12	0	574	3.93
61	80	1	74	319	1	0	395	4.94
62	38	0	21	37	2	0	60	1.58
1963	167	0	29	197	6	0	232	1.39
64	103	2	18	65	2	0	87	0.84
65	203	0	79	639	61	0	779	3.84
66	161	1	123	531	7	0	662	4.11
67	20	1	11	64	7	0	83	4.15
1968	97	0	20	211	7	0	238	2.45
69	70	2	27	95	9	0	133	1.90
70	365	0	99	877	93	0	1,069	2.93
71	224	1	104	813	41	1	960	4.29
72	29	0	59	309	167	0	535	18.45
1973	110	0	50	1,104	2	0	1,156	10.51
74	155	0	117	256	0	0	373	2.41
75	670	7	531	4,621	247	1	5,406	8.07
76	425	4	431	2,998	276	0	3,709	8.73
77	233	0	341	1,943	109	0	2,393	10.27
1978	577	0	100	807	6	1	914	1.58
79	360	1	531	860	19	0	1,411	3.92
80	3,027	3	84	507	159	0	753	0.25
81	834	0	202	1,480	42	0	1,724	2.07
82	538	14	181	350	15	0	560	1.04
1983	319	7	224	568				
84	473	0	67					
85	429	12						
86	822							
87 ^b	388							
1988	320							
Average ¹	307	2	131	685	43	0	861	2.80
Percent ¹		0	15	80	5	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-82.

^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

^b Includes Nushagak-Mulchatna fish; Nuyakuk River escapement count incomplete in 1987.

(Sources: 1, 7, and 20)

Appendix Table 29. Togiak River sockeye salmon escapement and return by brood year, Bristol Bay, 1953-91.^a

Brood Year	Escapement	Return by Year					Total	Return Per Spawner
		3	4	5	6	7		
1953	102	0	33	93	16	2	144	1.41
54	77	0	20	157	17	0	194	2.52
55	112	0	136	195	39	0	370	3.30
56	225	0	107	328	14	0	449	2.00
57	25	2	58	90	37	0	187	7.48
1958	72	2	71	173	25	0	271	3.76
59	210	0	142	147	7	0	296	1.41
60	192	0	194	299	52	0	545	2.84
61	122	1	88	231	20	0	340	2.79
62	62	0	55	107	8	0	170	2.74
1963	116	0	44	84	24	0	152	1.31
64	105	0	44	125	6	0	175	1.67
65	96	0	156	212	37	0	405	4.22
66	104	1	205	424	11	1	642	6.17
67	81	1	24	115	41	0	181	2.23
1968	50	0	50	196	16	0	262	5.24
69	117	0	33	167	16	0	216	1.85
70	203	0	55	282	71	1	409	2.01
71	200	0	111	379	69	2	561	2.81
72	79	1	95	172	101	0	369	4.67
1973	107	1	161	409	15	0	586	5.48
74	104	0	258	343	56	3	660	6.35
75	181	0	258	912	60	0	1,230	6.80
76	189	0	191	676	166	0	1,033	5.47
77	163	0	256	650	15	0	921	5.65
1978	306	1	154	500	26	0	681	2.23
79	198	2	267	416	7	0	692	3.49
80	527	0	51	310	11	0	372	0.71
81	307	0	61	299	16	0	376	1.22
82	289	0	96	257	31	0	384	1.33
1983	213	0	267	936	23	0	1,226	5.76
84	151	0	36	113	21	0	170	1.13
85	145	0	43	254	76			
86	203	0	111	524				
87	278	0	199					
1988	305	1						
89	104							
90	189							
91	278							
Average ¹	159	0	118	306	34	0	458	2.88
Percent ¹		0	26	67	7	0	100	

¹ Averages and percentages computed from years with complete returns, 1953-84.
^a Includes estimates of False Pass and Japanese high seas catch of Bristol Bay sockeye. All escapements and returns are rounded to the nearest thousand fish.

(Sources: 1, 7, and 20)

Appendix Table 30. Inshore commercial catch and escapement of chinook salmon in the Nushagak and Togiak Districts, in numbers of fish, Bristol Bay, 1972-91.^a

Year	Nushagak District			Togiak District		
	Catch	Escapement ¹	Total Run	Catch	Escapement ²	Total Run
1972	46,045	25,000	71,045	19,976	14,000	33,976
73	30,470	35,000	65,470	10,856	11,000	21,856
74	32,053	70,000	102,053	10,798	15,000	25,798
75	21,454	70,000	91,454	7,226	11,000	18,226
76	60,684	100,000	160,684	29,744	14,000	43,744
1977	85,074	65,000	150,074	35,218	20,000	55,218
78	118,548	130,000	248,548	57,000	40,000	97,000
79	157,321	95,000	252,321	30,022	20,000	50,022
80	64,958	141,000	205,958	12,543	12,000	24,543
81	193,461	150,000	343,461	23,911	27,000	50,911
1982	195,287	147,000	342,287	33,786	17,000	50,786
83	137,123	162,000	299,123	38,497	22,000	60,497
84	61,378	81,000	142,378	22,179	26,000	48,179
85	67,783	116,000	183,783	37,106	14,000	51,106
86	65,783	43,434	109,217	19,880	8,000 ^b	27,880
87	45,983	84,309	130,292	17,217	11,000	28,217
88	16,648	56,905	73,553	15,606	10,000	25,606
89	17,637	78,302	95,939	11,366	10,739	22,105
90	14,092 ^c	63,955	78,047	12,241 ^c	9,107	21,348
91	22,898 ^c	135,054	157,952	7,088 ^c	12,670	19,758
20-Year Ave.	72,734	92,448	165,182	22,613	16,226	38,839
1972-81 Ave.	81,007	88,100	169,107	23,729	18,400	42,129
1982-91 Ave.	64,461	96,796	161,257	21,497	14,052	35,548

¹ Escapements were estimated from the following:

1972-81 - comprehensive aerial surveys.

1982-85 - correlation between index counts and total escapement estimates when aerial surveys were complete.

1986-91 - sonar estimate.

Estimates for 1972-85 are rounded to the nearest thousand fish.

² Escapement estimates based on comprehensive aerial surveys.

Estimates for 1972-88 are rounded to the nearest thousand fish.

^a Escapement estimates supersede those previously reported.

^b Minimal estimate based on incomplete data.

^c Preliminary.

(Sources: 1, 5 and 13)

Appendix Table 31. Inshore commercial catch and escapement of chum salmon in the Nushagak and Togiak Districts, in numbers of fish, Bristol Bay, 1972-91.^a

Year	Nushagak District			Togiak District		
	Catch	Escapement ¹	Total Run	Catch	Escapement ²	Total Run
1972	310,126	195,000	505,126	178,885	170,000	348,885
73	336,331	200,000	536,331	195,431	163,000	358,431
74	157,941	100,000	257,941	80,710	161,000	241,710
75	152,891	80,000	232,891	87,058	114,000	201,058
76	801,064	500,000	1,301,064	153,559	392,000	545,559
1977	899,701	609,000	1,508,701	270,649	496,000	766,649
78	651,743	293,000	944,743	274,967	396,000	670,967
79	440,279	166,000	606,279	219,942	293,000	512,942
80	681,930	969,000	1,650,930	299,682	415,000	714,682
81	795,143	177,000	972,143	229,886	331,000	560,886
1982	434,817	256,000	690,817	151,000	86,000	237,000
83	725,060	164,000	889,060	322,691	165,000	487,691
84	850,114	362,000	1,212,114	336,660	204,000	540,660
85	396,740	288,000	684,740	203,302	212,000	415,302
86	488,375	168,275	656,650	270,057	330,000	600,057
1987	416,476	147,433	563,909	419,425	361,000	780,425
88	371,196	186,418	557,614	470,132	412,000	882,132
89	523,903	377,512	901,415	203,178	143,890	347,068
90	306,452 ^b	329,793	636,245	115,711 ^b	67,460	183,171
91	465,582 ^b	252,436	718,018	249,113 ^b	149,210	398,323
20-Year Ave.	510,293	291,043	801,337	236,602	253,078	489,680
1972-81 Ave.	522,715	328,900	851,615	199,077	293,100	492,177
1982-91 Ave.	497,872	253,187	751,058	274,127	213,056	487,183

- ¹ Escapements were estimated from the following:
1972 - average catch/escapement ratio for 1968-69 and 1973-81;
1973-74 - tower enumeration and aerial survey data;
1975-78 - aerial survey data;
1979-91 - adjusted sonar estimate from Portage Creek site.
Estimates for 1972-85 are rounded to the nearest thousand fish.
- ² Escapement estimates based on aerial surveys; however, surveys were not conducted in 1986 due to budget constraints. Estimate based on catch/escapment proportion using most recent 10-year average data.
Estimates for 1972-88 rounded to the nearest thousand fish.
- ^a Escapement estimates supersede those previously reported.
- ^b Preliminary.

(Sources: 1, 5 and 13)

Appendix Table 32. Escapement and inshore return of chinook salmon by brood year, in thousands of fish, in the Nushagak District, Bristol Bay, 1966-91.^a

Brood Year	Escapement ²	Return by Year ¹					Total Return ³	Return per Spawner
		1.1	1.2	1.3	1.4	1.5		
1966	40 ^b	0	14	27	39	5	99	2.48
67	65 ^c	0	10	16	46	25	100	1.54
68	70	0	13	18	68	8	110	1.57
69	35	0	1	15	29	2	49	1.40
1970	50	0	1	57	74	4	139	2.78
71	40 ^d	0	2	56	95	13	175	4.38
72	25	0	33	52	125	7	229	9.16
73	35	0	2	82	106	13	203	5.80
74	70	0	24	42	51	2	125	1.79
1975	70	1	96	147	137	10	400	5.71
76	100	2	8	111	144	6	281	2.81
77	65	0	96	152	208	15	476	7.32
78	130	2	28	47	56	22	155	1.19
79	95	3	49	71	87	12	223	2.34
1980	141	0	11	48	55	3	119	0.84
81	150	1	34	46	83	7	172	1.15
82	147	1	4	36	32	6	79	0.54
83	162	0	17	20	52	1	91	0.56
84	81	1	17	27	22	2	70	0.86
1985	116	3	18	37	56			
86	35	0	27	63				
87	79	1	46					
88	51	1						
89	74							
1990	59							
91	130							
Average ⁴	81	1	24	54	75	8	168	2.96
Percent		0	13	31	43	5		

- 1 Escapement age composition for 1966-1980 and 1986 estimated from commercial catch age composition. Subsistence catch age composition from 1966-1981 and 1990 estimated from commercial catch age composition.
- 2 Escapements for 1968-1970 and 1972-1981 were estimated from comprehensive aerial surveys. Escapements for 1982-1985 were estimated from the correlation between index counts and total escapement when aerial surveys were complete. Escapements for 1986-1991 are sonar estimates less the sport and subsistence harvest above the sonar site.
- 3 Total return estimates include all age classes, not just 1.1, 1.2, 1.3, 1.4, and 1.5.
- 4 Mean escapement calculated from all escapements from 1966-1991. Mean total return calculated from 1963-1985. Mean return per spawner calculated from 1966-1985.
- a Estimates of inshore return include estimates of escapement, commercial catch, and subsistence catch.
- b Escapement for 1966 estimated from a counting tower on the Nushagak River. Tower counts expanded to account for the proportion of the total escapement not included in the tower count.
- c Escapement for 1967 estimated from a combination of tower counts, minimal aerial surveys, and run strength.
- d Escapement for 1971 estimated from average mean exploitation rates 1960-1970 and 1972-1976.

(Sources: 1 and 13)

Appendix Table 33. Inshore commercial catch and escapement of pink salmon in the Nushagak District, by river system, in numbers of fish, Bristol Bay, 1958-91.^a

Year	Catch	Escapement						Total	Total Run
		Wood ¹	Igushik ²	Nuyakuk ³	Nush/Mul ⁴	Nushagak ⁵	Snake ⁶		
1958	1,113,794			4,000,000				4,000,000	5,113,794
60	289,781			146,359				146,359	436,140
62	880,424	25,000	12,000	493,914	6,100		6,000	543,014	1,423,438
64	1,497,817	1,560	450	883,500	25,000		50	910,560	2,408,377
66	2,337,066			1,442,424				1,442,424	3,779,490
1968	1,705,150			2,161,116				2,161,116	3,866,266
70	417,834			152,580				152,580	570,414
72	67,953			58,536				58,536	126,489
74	413,613	44,800	7,500	529,216	3,100		900	585,516	999,129
76	739,580	21,986	5,070	794,478	41,800		100	863,434	1,603,014
1978	4,348,336	205,000	16,210	8,390,184	771,600		3,483	9,386,477	13,734,813
80	2,202,545	31,150	3,500	2,626,746	123,000		800	2,785,196	4,987,741
82	1,339,272	36,100	8,430	1,592,096	19,130		900	1,656,656	2,995,928
84	3,127,153	81,400	6,190	2,760,312	73,050		5,500	2,926,452	6,053,605
86	267,117					72,189		72,189	339,306
1988	243,390					494,610		494,610	738,500
90	53,286 ^b					801,725		801,725	855,011 ^b
Average ⁷	1,237,918	55,375	7,419	1,859,390	132,848	456,175	2,217	1,705,108	2,943,027

¹ Aerial survey estimate 1962 and 1974-84; tower count 1964.

² Aerial survey estimate 1962-80; aerial survey estimate and tower count 1976 and 1982-84.

³ Tower count 1960-84; aerial survey estimate 1958, and below counting tower 1962-64 and 1974-84.

⁴ Aerial survey estimate.

⁵ Sonar estimate from Portage Creek; no tower count conducted; Nush/Mul included in the estimate.

⁶ Aerial survey estimate 1962-64, 1974-76 and 1980-84, and weir count 1978.

⁷ Only years and systems with escapement data were included in averages.

^a Includes even-years only.

^b Preliminary.

(Sources: 1, 5, 13, and 20)

Appendix Table 34. Nushagak District pink salmon escapement and return by brood year, in numbers of fish, Bristol Bay, 1958-91.^a

Brood Year	Escapement	Return	Return Per Spawner
1958	4,000	436	0.11
1960	146	1,423	9.75
62	543	2,408	4.43
64	911	3,779	4.15
66	1,442	3,866	2.68
68	2,161	570	0.26
1970	153	126	0.82
72	59	999	16.93
74	586	1,603	2.74
76	863	13,735	15.92
78	9,386	4,988	0.53
1980	2,785	2,996	1.08
82	1,657	6,054	3.65
84	2,926	339	0.12
86	72	739	10.26
88	495	855 ^b	1.73
1990	802		
Average	1,705	2,807	4.70

^a Includes even-years only. All escapements and returns are reported to the nearest thousand fish.

^b Preliminary.

(Sources: 1, 5, 13 and 20)

Appendix Table 35. Inshore commercial catch and escapement of coho salmon in the Nushagak and Togiak Districts, in numbers of fish, Bristol Bay, 1980-91.^a

Year	Nushagak District			Togiak District		
	Catch	Escapement ¹	Total Run	Catch	Escapement	Total Run
1980	147,726	232,000	379,726	151,000	96,000 ^c	247,000
81	220,290	130,000 ^b	400,290	29,207	61,000 ^d	90,207
82	349,669	234,000	583,669	133,765	81,000 ^c	214,765
83	81,338	51,000	132,338	5,711	12,000 ^e	17,711
84	260,310	171,000	431,310	176,053	104,000 ^f	280,053
1985	20,230	89,500	109,730	38,636	61,300 ^g	99,936
86	68,568	42,772	111,340	48,306	30,200 ^c	78,506
87	13,263	20,220	33,483	1,292	64,900 ⁱ	66,192
88	52,698	131,101	183,799	18,468	86,330 ^j	104,798
89	77,077	84,707	161,784	56,972	^k	
1990 ^h	7,447	162,853 ^l	170,300	2,719	67,449 ^j	70,168
91 ^h	5,399	41,153	46,552	4,262	38,160 ^c	42,422
Average	108,668	120,026	228,693	55,533	63,849	119,251

¹ Sonar enumeration has not always covered the complete season; in these cases a proportional method was used to estimate escapement after the sonar operation terminated.

^a Escapement estimates based on data collected from sonar enumeration and on aerial surveys of the spawning grounds; these escapement estimates supersede previously reported escapements.

^b Sonar enumeration precluded by lack of funding; escapement was estimated from mean exploitation rates from 1980 and 1982-84.

^c Includes Togiak and Kulukak River drainages.

^d Includes Togiak, Kulukak, Ungalikthluk/Kukayachagak and Nunavachak drainages.

^e Aerial escapement precluded by adverse weather and water conditions; estimate based on exploitation rate.

^f Togiak, Kulukak, Slug, Osviak, and Matogak River drainages.

^g Togiak, Kulukak, Quigmy, Matogak, and Osviak drainages.

^h Preliminary.

ⁱ Estimate of Togiak River drainage derived from sonar enumeration (USFWS) in conjunction with aerial surveys of Kulukak, Osviak, Matogak, Quigmy, and Ungalikthluk drainages.

^j Togiak, Kulukak, Slug, Osviak, Matogak, Quigmy, Negukthlik, and Ungalikthluk.

^k No escapement estimate available due to adverse weather and water conditions.

^l Special funding enabled the sonar project to operate until 9/12.

(Sources: 1, 5 and 13)

Appendix Table 36. Average round weight of the commercial salmon catch by district and species, in pounds, Bristol Bay, 1972-91.^a

Year	Naknek-Kvichak	Egegik	Ugashik	Nushagak	Togiak	Average Bristol Bay
<u>SOCKEYE SALMON</u>						
1972	6.1	6.0	6.1	6.0	6.4	6.0
73	6.7	7.1	7.3	7.1	7.9	7.1
74	5.5	5.7	5.2	5.7	7.0	5.8
75	5.2	5.7	5.2	6.1	6.7	5.5
76	5.8	5.9	6.2	6.6	7.5	6.1
1977	6.6	6.3	6.8	7.5	7.9	6.7
78	5.5	6.3	6.2	6.3	7.3	5.9
79	5.8	6.0	6.0	6.1	7.2	5.9
80	5.4	5.6	5.5	6.1	6.8	5.6
81	6.1	6.0	6.3	6.4	6.8	6.2
1982	6.3	6.4	6.5	6.4	7.4	6.4
83	5.5	5.8	5.7	5.9	6.7	5.7
84	5.4	5.8	5.6	6.2	6.8	5.6
85	5.6	5.8	5.8	5.9	6.5	5.8
86	6.1	5.9	6.1	5.9	6.7	6.0
1987	5.8	5.9	6.1	6.0	6.9	6.0
88	6.0	6.2	6.2	6.2	7.4	6.2
89	5.5	5.7	5.6	6.0	6.6	5.6
90	5.7	5.7	5.8	5.7	6.6	5.7
91	5.8	5.7	5.8	5.8	6.5	5.7
<u>CHINOOK SALMON</u>						
1972	25.5	21.6	17.3	19.8	21.1	20.3
73	23.5	21.4	21.0	22.6	24.1	23.0
74	20.8	18.6	20.7	23.2	21.0	22.4
75	25.0	19.5	18.1	18.8	14.0	17.8
76	27.6	18.6	13.5	18.7	12.1	17.0
1977	30.5	22.1	23.8	23.4	20.8	22.9
78	28.3	23.6	29.2	22.3	26.1	23.9
79	21.8	21.2	22.7	21.1	22.2	21.3
80	20.5	21.0	21.9	19.6	18.0	19.7
81	20.8	18.6	18.9	19.6	13.1	19.0
1982	19.4	18.5	20.1	20.4	15.4	19.6
83	20.8	20.2	21.5	21.0	20.7	20.9
84	20.0	18.7	19.5	20.8	20.3	20.5
85	19.0	17.3	19.1	16.9	19.3	17.9
86	15.6	16.8	18.6	19.9	16.3	18.8
1987	23.2	20.0	20.2	19.7	19.4	20.5
88	20.4	21.5	20.6	18.2	17.7	18.7
89	22.3	19.2	17.9	18.0	19.1	19.1
90	16.1	15.3	16.6	17.4	16.9	16.9
91	13.8	8.8	17.5	17.1	13.5	15.9
<u>CHUM SALMON</u>						
1972	6.5	6.4	5.7	6.5	6.6	6.5
73	7.3	6.9	7.7	7.0	7.3	7.1
74	6.4	6.4	7.2	6.2	7.4	6.6
75	6.3	6.2	6.1	6.1	6.6	6.3
76	5.9	5.8		6.9	7.1	6.8

-continued-

Appendix Table 36. (Page 2 of 2)

Year	Naknek- Kvichak	Egegik	Ugasnik	Nushagak	Togiak	Average Bristol Bay
1977	7.3	6.5	6.7	7.3	8.2	7.4
78	6.6	6.7	6.2	7.1	8.1	7.2
79	6.8	7.2	7.5	6.2	7.8	6.8
80	6.2	6.6	6.3	5.9	6.7	6.2
81	6.5	6.8	7.2	6.6	7.4	6.7
1982	6.3	6.6	6.3	6.7	7.3	6.7
83	6.1	6.7	6.3	6.4	7.6	6.6
84	6.4	6.9	6.5	6.5	7.8	6.8
85	6.6	6.6	6.3	6.3	7.5	6.8
86	6.5	6.2	6.6	6.5	7.4	6.7
1987	6.0	6.1	6.4	6.4	7.4	6.5
88	6.0	6.5	6.5	6.3	8.1	7.0
89	5.9	6.2	6.2	6.0	7.6	6.3
90	6.1	6.1	6.0	5.9	8.0	6.3
91	6.3	6.1	6.1	6.1	6.9	6.4
<u>PINK SALMON</u>						
1972	3.4			3.1	3.8	3.1
74	4.3	3.9	4.1	3.6	4.4	4.0
76	3.7	3.8		3.3	4.1	3.4
78	3.6	3.2	3.5	3.1	3.8	3.2
80	3.6	3.4		3.4	3.8	3.4
1982	3.6		4.1	3.5	3.5	3.5
84	3.6	3.8	3.1	3.2	3.8	3.2
86	4.0	3.8	3.4	3.3	3.9	3.5
88	3.7	3.9	3.7	3.4	3.5	3.6
90	3.9	3.6	3.8	3.5	3.5	3.8
<u>COHO SALMON</u>						
1972		6.1		6.3	7.6	7.0
73	5.6	6.3	6.8	6.0	7.5	6.7
74	6.7	6.5	7.2	6.7	8.6	7.9
75	6.7	7.2	7.2	6.1	9.2	8.6
76	5.5	6.9		6.0	8.3	7.6
1977				6.5	9.4	7.8
78	6.4	6.3		6.8	8.2	7.5
79	5.2	7.3	8.4	6.7	9.0	7.8
80	6.8	6.3	7.8	6.1	8.0	7.0
81	6.2	6.3	7.6	6.0	7.8	6.4
1982	7.2	7.1	7.7	6.8	8.7	7.3
83		6.7	7.2	6.5	7.1	6.6
84	6.0	6.9	7.7	6.6	8.9	7.5
85	7.0	7.7	7.9	7.3	9.1	8.0
86	5.5	6.7	7.1	5.9	7.8	6.7
1987	6.7	6.3	7.7	6.6	7.1	7.0
88	7.2	8.3	8.3	7.1	7.7	7.8
89	7.5	7.6	7.3	7.0	7.7	7.4
90	6.1	7.7	8.1	6.9	7.7	7.5
91	6.3	6.7	7.3	6.2	7.6	7.3

^a Prior to 1991, averages are weighted by the number of fish reported by each buyer. 1991 data is preliminary and extracted from the fish ticket system.

(Sources: 1, 4 and 10)

Appendix Table 37. Exvessel value of the commercial salmon catch by species, in thousands of dollars, Bristol Bay, 1972-91.^a

Year	Sockeye	Chinook	Chum	Pink	Coho	Total
1972	3,914	339	512	47	20	4,832
73	1,892	284	829		115	3,120
74	3,793	460	567	1,053	142	6,015
75	11,047	214	615		151	12,027
76	17,139	742	2,892	1,093	82	21,948
1977	19,434	1,940	4,275		445	26,094
78	40,034	3,206	3,173	5,424	435	52,272
79	128,992	4,541	2,480		2,387	138,400
80	76,118	1,881	2,738	2,173	1,392	84,302
81	120,907	5,557	4,106		1,461	132,031
1982	68,122	6,088	2,145	1,111	3,199	80,665
83	129,900	2,853	3,216		337	136,306
84	94,681	2,158	4,040	2,414	3,072	106,365
85	115,402	2,188	2,218		923	120,731
86	135,689	1,819	2,522	207	826	141,063
1987	130,847	1,912	2,594		314	135,667
88	168,586	891	4,418	1,171	1,792	176,858
89	173,963	609	2,029		1,186	177,787
90 ^b	197,114	502	1,668	530	555	200,369
91 ^b	106,914	356	1,459		455	109,184
20-Year Ave.	87,224	1,927	2,425	1,522 ^c	964	93,302
1972-81 Ave.	42,327	1,916	2,219	1,958 ^c	663	48,104
1982-91 Ave.	132,122	1,938	2,631	1,087 ^c	1,266	138,500

^a Value paid to the fishermen. Derived from price per fish or pound times commercial catch.

^b Preliminary.

^c Includes even-years only.

(Sources: 1, 5, 9, and 10)

Appendix Table 38. Salmon case pack by species, Bristol Bay, 1972-91.^a

Year	Sockeye	Chinook	Chum	Pink ¹	Coho	Total
1972	197,495	9,666	53,756	5,002	547	266,466
73	61,429	1,946	42,044		1,456	106,875
74	87,723	6,461	23,789	39,550	7,012	164,535
75	290,646	1,920	22,667		373	315,606
76	393,698	6,889	104,935	36,616	1,068	543,206
1977	353,133	3,119	137,838		2,383	496,473
78	551,648	6,982	76,926	163,230	2,916	801,702
79	688,882	3,058	34,517		1,236	727,693
80	571,347	820	63,616	48,055	3,767	687,605
81	783,222	5,304	66,430		943	855,899
1982	193,321	1,700	17,320	26,789	7,510	246,640
83	800,390	6,178	47,227		705	854,500
84	649,315	1,740	69,026	108,206	9,765	838,052
85	297,884	2,257	18,367		430	318,938
86	205,015	1,037	11,168	2,024	502	219,746
1987	274,130	1,952	21,967			298,049
88	108,503	745	12,880	5,357	310	127,795
89	402,397	1,311	30,286		324	434,318
90	552,194	2,242	41,481	1,754	357	598,028
91	564,143	960	35,537		464	601,104
20-Year Ave.	401,326	3,314	46,589	39,689	2,214	475,162
1972-81 Ave.	397,922	4,617	62,652	58,491	2,170	496,606
1982-91 Ave.	404,729	2,012	30,526	24,022	2,263	453,717

¹ Includes even-years only.

^a Includes only fish canned in Bristol Bay, in number of cases. Each case contains 48 1-lb. cans.

(Sources: 1, 4, and 17).

Appendix Table 39. Commercial production of frozen salmon by species, in pounds, Bristol Bay, 1972-91.^a

Year	Sockeye	Chinook	Chum	Pink ¹	Coho	Total
1972	54,571	362,653	60,466	790	24,308	502,788
73	186,663	557,422	307,790		98,115	1,149,990
74	147,475	281,821	7,212	113,241	582	550,331
75	101,751	230,045	133,339		444,344	909,479
76	883,620	570,837	163,030	215,176	117,603	1,950,266
1977	586,098	1,155,791	336,283		235,607	2,313,779
78	6,306,661	1,848,951	761,029	1,580,236	145,355	10,642,232
79	38,031,872	2,291,378	1,231,334		1,350,300	42,904,884
80	31,855,642	1,189,870	1,391,797	3,040,765	828,114	38,306,188
81	49,613,633	2,602,066	1,371,467		1,065,573	54,652,739
1982	57,636,789	3,045,713	2,183,075	2,346,198	2,746,413	67,958,188
83	103,432,084	2,723,637	2,372,852		415,890	108,944,463
84	67,355,538	1,256,414	1,898,387	1,939,511	2,219,281	74,669,131
85	91,318,967	1,238,975	2,569,767		467,440	95,595,149
86	75,010,887	1,421,379	6,130,639	1,175,236	1,072,983	84,811,124
1987	63,149,457	1,071,656	5,985,150		86,243	70,292,506
88	73,476,123	718,081	9,420,130	4,517,077	1,215,901	89,347,312
89	109,839,707	587,226	4,691,196		1,368,576	116,486,705
90	129,699,551	415,467	3,772,026	1,517,621	712,714	136,117,379
91	83,058,900	353,725	4,557,074		710,659	88,680,358
20-Year Ave.	49,087,299	1,196,155	2,467,202	1,495,195	766,300	54,339,250
1972-81 Ave.	12,776,799	1,109,083	576,375	990,042	430,990	15,388,268
1982-91 Ave.	85,397,800	1,283,227	4,358,030	1,916,156	1,101,610	93,290,232

¹ Includes even-years only.

^a Includes only fish processed in Bristol Bay.

(Source: 3)

Appendix Table 40. Commercial production of cured salmon by species, in pounds, Bristol Bay, 1972-91.^a

Year	Sockeye	Chinook	Chum	Pink ¹	Coho	Total
1972	10,526	3,959	8,614	32	28,547	51,678
73	23,851	4,617	27,768		17,539	73,775
74	24,977	5,402	2,505	65	4,530	37,479
75	11,863	20,660	81		0	32,604
76	4,210	62	90	0	0	4,362
1977	3	20	90		3,171	3,284
78	680,402	4,664	17,388	97,390	3,410	803,254
79	3,651,146	16,824	136,585		1,000	3,805,555
80	4,242,063	9,603	286,113	9,649	6,653	4,554,081
81	4,956,561	23,663	148,051		6,526	5,134,801
1982	3,222,798	75,752	277,013	12,780	1,466	3,589,809
83	5,045,048	22,259	266,005		595	5,333,907
84	1,608,948	12,200	131,915	8,545	79,540	1,841,148
85	2,059,078	5,344	50,612		0	2,115,034
86	1,447,014	1,231	42,453	0	2,185	1,492,883
1987	648,792	0	526		0	649,318
88	610,377	0	0	0	0	610,377
89	825,638	2,406	18,209		0	846,253
90	928,440	589	3,612	0	0	932,641
91	0	0	0		0	0
20-Year Ave.	1,500,087	10,463	70,882	10,705	7,758	1,595,612
1972-81 Ave.	1,360,560	8,947	62,729	17,856	7,138	1,450,087
1982-91 Ave.	1,639,613	11,978	79,035	3,554	8,379	1,741,137

¹ Includes even-years only.

^a Includes only fish processed in Bristol Bay.

(Source: 3)

Appendix Table 41. Fresh export of salmon by air transportation, by species, in pounds, Bristol Bay, 1972-91.^a

Year	Sockeye	Chinook	Chum	Pink ¹	Coho	Total
1972	20,754	359,533	6,442	0	4,837	391,566
73	163,447	326,372	238,851		134,260	862,930
74	253,879	253,695	35,102	104,230	15,116	662,022
75	374,588	128,032	71,744		10,313	584,677
76	498,014	445,386	213,118	96,038	22,559	1,275,115
1977	997,899	1,134,791	961,537		409,058	3,503,285
78	5,149,427	1,548,439	984,408	1,967,420	341,212	9,990,906
79	22,838,654	1,652,904	1,176,549		933,539	26,601,646
80	23,284,065	514,638	617,989	612,276	1,196,502	26,225,470
81	25,943,037	1,302,979	817,991		800,432	28,864,439
1982	20,416,684	2,056,650	1,027,817	166,672	1,576,761	25,244,584
83	26,641,032	978,050	552,536		248,582	28,420,200
84	7,487,073	565,038	713,898	92,837	1,351,689	10,210,535
85	12,282,823	789,267	1,094,089		518,574	14,684,753
86	3,604,592	286,482	281,327	6,357	104,724	4,283,482
1987	2,496,702	272,358	1,128,880		209,799	4,107,739
88	3,378,714	95,093	140,212	890,239	391,562	4,895,820
89	10,883,368	58,966	442,727		271,434	11,656,495
90	20,202,025	55,430	706,893	283,398	31,695	21,279,441
91	3,091,287	17,186	31,750		20,003	3,160,226
20-Year Ave.	9,533,374	611,490	535,422	351,622	429,633	11,854,906
1972-81 Ave.	7,229,433	766,677	512,373	463,327	386,783	9,896,206
1982-91 Ave.	12,067,708	470,411	556,375	239,917	472,482	13,813,606

¹ Includes even-years only.

^a Includes all fish exported out of Bristol Bay by air in fresh condition regardless of final processing method.

(Source: 3)

Appendix Table 42. Brine export of salmon by sea-going transportation, Bristol Bay, 1972-91.^a

Year	Number		Number	Pounds
	Operators	Tenders		
1972	1	1	59,750	365,386
73	0	0	0	0
74	2	2	78,620	456,430
75	5	20	933,728	5,135,799
76	5	21	728,420	4,466,126
1977	5	15	623,523	3,603,382
78	9	33	1,602,224	9,304,376
79	12	61	2,987,456	17,557,354
80	14	101	4,987,000	27,780,210
81	18	80	3,300,118	20,512,734
1982	8	27	565,891	3,582,904
83	13	85	4,428,741	25,199,944
84	9	55	2,672,519	14,919,944
85	9	26	973,826	5,521,739
86	4	17	715,646	4,349,044
1987	6	27	1,010,438	5,963,716
88	1	3	12,954	82,663
89	7	36	1,806,489	9,551,828
90	16	49	3,041,050	17,543,569
91	11	68	2,270,393	13,464,027
20-Year Ave.	8	38	1,639,939	9,468,059
1972-81 Ave.	7	37	1,530,084	8,918,180
1982-91 Ave.	8	39	1,749,795	10,017,938

^a Includes mixed species of chinook, sockeye, pink, chum, and coho salmon exported from Bristol Bay for eventual processing. Fish are transported in brine or chilled sea water by tenders.

(Source: 3)

Appendix Table 43. Commercial production and disposition of salmon, in thousands of pounds, Bristol Bay, 1972-91.^a

Year	Canned		Frozen		Cured		Export				Total
	Pounds	%	Pounds	%	Pounds	%	Fresh		Brine ¹		
							Pounds	%	Pounds	%	
1972	14,045	97	55	0	11	0	21	0	365	3	14,497
73	5,030	93	187	3	24	0	163	3	0	0	5,404
74	7,020	89	147	2	25	0	254	3	456	6	7,902
75	21,319	79	102	0	12	0	375	1	5,136	19	26,944
76	28,426	83	884	3	4	0	498	1	4,466	13	34,278
1977	27,495	84	586	2	0	0	988	3	3,603	11	32,672
78	37,136	63	6,307	11	680	1	5,149	9	9,304	16	58,576
79	44,350	35	38,032	30	3,651	3	22,839	18	17,557	14	126,429
80	46,379	35	31,856	24	4,242	3	23,284	17	27,780	21	133,541
81	57,456	36	49,614	31	4,957	3	25,943	16	20,513	13	158,483
1982	11,808	12	57,637	60	3,223	3	20,417	21	3,583	4	96,668
83	54,571	25	103,432	48	5,045	2	26,641	12	25,200	12	214,889
84	46,787	34	67,356	49	1,609	1	7,487	5	14,920	11	138,159
85	23,730	18	91,319	68	2,059	2	12,283	9	5,522	4	134,913
86	11,536	12	75,011	78	1,447	2	3,605	4	4,349	5	95,948
1987	15,191	17	63,149	72	649	1	2,497	3	5,964	7	87,450
88	6,677	8	73,476	87	610	1	3,379	4	83	0	84,225
89	32,574	20	109,840	67	826	1	10,883	7	9,552	6	163,675
90	30,581	15	129,700	65	928	0	20,202	10	17,544	9	198,955
91	40,607	29	83,059	59	0	0	3,091	2	13,464	10	140,221
20-Year Ave.	28,136	29	49,087	50	1,500	2	9,500	10	9,468	10	97,691
1972-81 Ave.	28,866	48	12,777	21	1,361	2	7,951	13	8,918	15	59,873
1982-91 Ave.	27,406	20	85,398	63	1,640	1	11,049	8	10,018	7	135,510

¹ Brine export primarily includes sockeye salmon exported from Bristol Bay, regardless of final processing method. However, some mixed fish are included in some years.

^a Canned, frozen, cured, and fresh export includes all sockeye exported out of Bristol Bay regardless of final processing method.

(Sources: 1, 3, and 4)

Appendix Table 44. South Unimak and Shumigan Island sockeye and chum salmon preseason quota and actual commercial catch, in thousands of fish, Alaska Peninsula, 1972-91.^a

Year	South Unimak			Shumigan Island			Total		
	Sockeye		Chum	Sockeye		Chum	Sockeye		Chum
	Actual	Quota ¹		Actual	Quota ¹		Actual	Quota ¹	
1972	443		468	76		108	519		576
73	239		189	23		23	262		212
74	60	50	15		25		60	75	15
75	190	165	65	49	50	36	239	215	101
76	235	350	327	72	75	74	307	425	401
1977	193	195	93	46	42	22	239	237	115
78	419	428	105	68	94	18	487	522	123
79	683	900	64	179	200	41	862	1,100	105
80	2,731	2,513	457	572	555	71	3,303	3,068	528
81	1,474	1,442	521	351	318	54	1,825	1,760	575
1982	1,670	1,850	934	451	408	160	2,121	2,258	1,094
83	1,545	1,469	615	416	324	169	1,961	1,793	784
84	1,131	1,111	228	257	245	109	1,388	1,356	337
85	1,495	1,380	345	367	305	134	1,862	1,685	479
86	314	907	252	156	200	99	470	1,107	351
87	652	635	406	141	140	37	793	775	443
88	474	1,263	465	282	279	62	756	1,542	527
89	1,348	1,199	408	397	264	48	1,745	1,463	456
90	1,091	1,087	455	256	240	64	1,347	1,327	519
91	1,216	1,573	669	333	347	102	1,549	1,920	771
20-yr avg.	880	1,029	354	236	228	75	1,105	1,257	426
72-81 avg.	667	755	230	160	170	50	810	925	275
82-91 avg.	1,094	1,247	478	306	275	98	1,399	1,523	576

^a South Unimak includes statistical area 284 in June and July, while Shumigan Islands includes statistical area 282 in June only.

¹ The sockeye quota management system was initiated in 1974, and is based on the final Bristol Bay projected inshore harvest and traditional harvest patterns.

(Source: 12)

Appendix Table 45. Subsistence salmon catch by district and species, Bristol Bay, 1972-91.^a

Year	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Total
<u>NAKNEK-KVICHAK DISTRICT</u>							
1972	170	52,200	400	400	700	100	53,800
73	219	41,600	600	300		500	43,000
74	263	102,600	1,000	1,100	1,600	200	106,500
75	301	122,600	700	300		200	123,800
76	346	82,200	900	900	1,500	600	86,100
1977	352	81,400	1,300	600	100	300	83,700
78	392	93,000	1,200	1,000	1,400	300	96,900
79	424	75,000	1,200	600		1,200	78,000
80	759	88,200	1,500	1,200	2,100	800	93,800
81	649	85,100	1,000	400	100	1,100	87,700
1982	350	71,400	1,100	600	900	1,000	75,000
83	385	107,900	1,000	400	300	900	110,500
84	382	115,200	900	600	1,300	600	118,600
85	544	107,543	1,179	540	27	1,103	110,392
86	412	77,283	1,295	695	2,007	650	81,930
1987	407	86,706	1,289	756	490	1,106	90,347
88	391	88,145	1,057	588	917	813	91,520
89	411	87,103	970	693	277	1,927	90,970
90	466	92,326	985	861	1,032	726	95,930
91	518	97,101	1,152	1,105	191	1,056	100,605
20-Year Ave.	407	87,730	1,036	682	1,346 ^b	759	90,955
1982-91 Ave.	427	93,071	1,093	684	1,231 ^b	988	96,579
<u>EGEGIK DISTRICT</u>							
1972	2					100	100
73	3					100	100
74	7	300					300
75	3	200					200
76 ^c	2						
1977	20	100		100		200	400
78	13	200		100		200	500
79	8	300				100	400
80	3	100					100
81 ^c	4						
1982	19	2,400					2,400
83	14	700					700
84	24	500		100		300	900
85	23	582	14	21	1	203	821
86	41	1,052	69	58	21	319	1,519
1987	49	3,350	87	139	2	284	3,862
88	52	1,405	97	87	54	333	1,976
89	50	1,636	50	33	1	414	2,134
90	61	1,105	53	85	39	331	1,613
91	70	4,549	82	141	32	430	5,234
20-Year Ave.	23	1,155	57	86	29 ^b	255	1,292
1982-91 Ave.	40	1,728	57	83	29 ^b	327	2,116

-continued-

Appendix Table 45. (page 2 of 3)

Year	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Tota
<u>UGASHIK DISTRICT</u>							
1972	13	200	100	100		300	700
73	14	200		100		600	900
74	8	200	100			500	800
75	1	700				1,200	1,900
76	21	1,200	100	100	100	300	1,800
1977	19	1,000	100	300		500	1,900
78	8	500	100	100		900	1,600
79	8	200				100	300
80	10	200				200	400
81	12	600				200	800
1982	11	400				300	700
83	8	500				100	600
84	8	500				200	700
85	9	233	17	7		143	400
86	27	1,080	83	48	21	335	1,567
1987	22	892	104	51	29	272	1,348
88	23	1,400	84	55	35	330	1,904
89	22	1,309	32	35	2	214	1,592
90	37	1,578	51	143	120	280	2,172
91	38	1,403	121	168	42	614	2,348
20-Year Ave.	16	715	83	101	69 ^b	379	1,222
1981-91 Ave.	21	930	70	72	59 ^b	279	1,333
<u>NUSHAGAK DISTRICT</u>							
1972	168	24,100	4,000	8,200	1,200	1,000	38,500
73	216	28,000	6,600	7,600	100	2,200	44,500
74	261	41,200	7,900	10,200	4,300	4,700	68,300
75	340	47,300	7,100	5,600	1,300	4,300	65,600
76	317	34,700	6,900	7,200	2,700	2,100	53,600
1977	306	43,300	5,200	7,300	200	4,500	60,500
78	331	33,200	6,600	14,300	11,100	2,500	67,700
79	364	40,200	8,900	6,800	500	5,200	61,600
80	425	76,800	11,800	11,700	7,600	5,100	113,000
81	395	44,600	11,500	10,200	2,300	8,700	77,300
1982	376	34,700	12,100	11,400	7,300	8,900	74,400
83	389	38,400	11,800	9,200	500	5,200	65,100
84	438	43,200	9,800	10,300	6,600	8,100	78,000
85	406	38,000	7,900	4,000	600	6,100	56,600
86	424	49,000	12,600	10,000	5,400	9,400	86,400
87	474	40,900	12,200	6,000	200	6,200	65,500
88	441	31,086	10,079	8,234	6,316	5,223	60,938
89	432	34,535	8,122	5,704	407	8,679	57,447
90	441	33,003	12,407	7,808	3,183	5,919	62,320
91	528	33,161	13,627	4,688	292	10,784	62,552
20-Year Ave.	374	39,469	9,357	8,322	7,710 ^b	5,740	65,993
1982-91 Ave.	435	37,599	11,064	7,733	5,760 ^b	7,451	66,926

-continued-

Appendix Table 45. (page 3 of 3)

Year	Permits Issued	Sockeye	Chinook	Chum	Pink	Coho	Total
TOGIK DISTRICT							
1974	68	7,400	1,200	2,000	500	1,800	12,900
75	41	4,600	800	1,600		2,800	9,800
76	30	2,800	500	900	100	500	4,800
77	41	2,100	400	800		1,100	4,400
78	29	900	300	700	300	500	2,700
1979	25	800	200	300		700	2,000
80	46	3,600	900	300	300	1,200	6,300
81	52	1,900	400	800	100	2,200	5,400
82	50	1,900	400	300	400	1,300	4,300
83	38	1,900	700	900	200	800	4,500
1984	41	3,600	600	1,700	500	3,800	10,200
85	51	3,400	600	1,000	100	1,500	6,600
86	29	2,400	700	800	100	500	4,500
87	46	3,600	700	1,000		1,600	6,900
88	29	2,413	429	716	45	792	4,395
1989	40	2,825	551	891	112	976	5,355
90	37	3,689	480	786	60	1,111	6,126
91	43	3,517	470	553	27	1,238	5,805
18-Year Ave.	41	2,964	574	891	256 ^b	1,357	5,943
1982-91 Ave.	40	2,924	563	865	221 ^b	1,362	5,868
TOTAL BRISTOL BAY							
72	353	76,500	4,500	8,700	1,900	1,400	93,000
73	452	69,800	7,200	8,000	100	3,300	88,400
74	607	151,700	10,200	13,300	6,400	7,200	188,800
75	686	175,400	8,600	7,500	1,300	8,500	201,300
76	716	120,900	8,400	9,100	4,400	3,500	146,300
1977	738	127,900	7,000	9,100	300	6,600	150,900
78	773	127,600	8,100	16,200	12,700	4,400	169,000
79	829	116,500	10,300	7,700	500	7,300	142,300
80	1,243	168,600	14,100	13,100	10,000	7,300	213,100
81	1,112	132,100	13,000	11,500	2,600	12,200	171,400
1982	806	110,800	13,700	12,400	8,600	11,500	157,000
83	834	149,400	13,500	10,500	900	7,100	181,400
84	893	163,000	11,300	12,700	8,400	13,000	208,400
85	1,033	149,758	9,710	5,568	728	9,049	174,813
86	933	130,815	14,747	11,601	7,549	11,204	175,916
1987	998	135,493	14,356	7,895	689	9,453	167,886
88	936	124,449	11,746	9,680	7,367	7,491	160,733
89	955	127,408	9,725	7,356	799	12,210	157,498
90	1,042	131,701	13,976	9,683	4,434	8,367	168,161
91	1,197	139,731	15,452	6,655	584	14,122	176,544
20-Year Ave.	857	131,478	10,981	9,912	6,790 ^b	8,260	164,643
1972-81 Ave.	751	126,700	9,140	10,420	7,080 ^b	6,170	156,450
1982-91 Ave.	963	136,256	12,821	9,404	6,500 ^b	10,350	172,835

^a Permit and catch estimates prior to 1989 are based on where permit was issued; estimates from 1989 to present are based on area the permit was fished, as initially recorded on the permit. Catches prior to 1985 rounded to the nearest hundred fish.

^b Includes even years only.

^c No permits returned.

(Sources: 1 and 8).

Appendix Table 46. Subsistence catch of sockeye salmon by village area, in numbers of fish, Kvichak River drainage, Bristol Bay, 1972-91.^a

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna- Newhalen	Nondalton	Port Alsworth	Other ¹	Total
1972	1,600 ^b	2,200	4,000	8,300	10,000	24,100			50,200
73	4,800	2,200	2,900	9,200	10,200	8,500	1,300		39,100
74	8,600	6,200	14,400	21,500	16,400	29,500	1,500		98,100
75	5,300	6,400	8,300	18,000	26,700	48,700	2,100		115,500
76	5,300	6,800	4,400	17,100	16,300	20,500	5,500		75,900
1977	2,600	6,000	5,600	14,300	11,400	27,200	4,900		72,000
78	8,900	8,800	11,200	23,700	11,000	17,300	3,000		83,900
79	4,400	6,600	3,500	16,200	15,900	14,700	4,200		65,500
80	6,100	8,100	7,400	22,600	11,100	11,300	6,000		72,600
81	6,600	5,400	9,700	16,500	15,400	15,200	6,800		75,600
1982	5,400	1,900	8,200	16,600	13,500	11,200	4,500		61,300
83	4,800	3,300	10,400	20,100	23,800	29,400	4,700		96,500
84	8,100	6,300	12,100	24,400	15,900	29,100	4,600		100,500
85	6,600	3,400	12,900	21,900	22,300	14,900	4,500		86,500
86	6,400	1,600	6,700	18,300	17,000	6,600	3,300		59,900
1987	5,700	^c	7,300	16,500	27,500	11,800	3,200		72,000
88	3,500	^c	5,500	14,400	29,800	20,700	3,200		77,100
89	5,100	2,000	6,700	13,000	24,700	18,500	2,200		72,200
90	4,700	2,200	6,600	12,400	18,800	27,300	3,200	1,400	76,600
91	1,029	1,712	9,739	17,184	29,094	4,163	2,755	1,110	66,786
20-Year Ave.	5,276	4,506	7,877	17,109	18,340	19,533	3,761		75,889
1972-81 Ave.	5,420	5,870	7,140	16,740	14,440	21,700	3,922		74,840
1982-91 Ave.	5,133	2,802	8,614	17,478	22,239	17,366	3,616		76,939

^a Catches prior to 1991 rounded to nearest hundred fish. Prior to 1990, harvests are reported by location of permit registration, and include catches by all subsistence permit holders fishing in each village area, regardless of residency. For 1990 to present, harvests are reported by village of residency, and include fish caught only in the Kvichak District.

^b Catches are interpolated.

^c No permits issued.

¹ Catch by non-local fishermen issued a permit in one of the above villages. Prior to 1990, these catches were included under the village in which the permit was issued.

(Sources: 1 and 8)

Appendix Table 47. Subsistence salmon catch by village area, Nushagak District, Bristol Bay, 1972-91.^a

Year	Dillingham ¹	Manokotak	Aleknagik	New			Other ²	Total
				Ekwok	Stuyahok	Koliganek		
1972	12,600	3,900	800	6,700	7,000	7,500	38,500	
73	19,700	4,700	1,100	8,600	6,800	3,600	44,500	
74	23,900	11,600	2,300	10,500	11,800	8,200	68,300	
75	22,100	7,100	2,300	6,800	19,200	8,100	65,600	
76	17,700	8,400	2,000	9,000	11,100	5,400	53,600	
1977	15,700	8,100	1,500	8,000	20,900	6,300	60,500	
78	27,700	3,200	2,700	12,900	14,200	7,000	67,700	
79	20,600	7,400	1,000	7,200	17,200	8,200	61,600	
80	47,900	8,200	3,500	10,400	22,200	20,800	113,000	
81	23,900	6,700	2,900	8,800	23,600	11,400	77,300	
1982	24,700	2,900	2,400	7,500	22,600	14,300	74,400	
83	20,100	5,300	1,900	5,800	18,700	13,300	65,100	
84	30,500	4,100	2,600	7,200	16,500	17,100	78,000	
85	22,900	3,600	1,600	7,000	14,500	6,800	56,400	
86	31,900	5,500	6,900	7,800	26,400	8,200	86,700	
1987	33,500	5,900	3,100	6,400	11,400	4,900	65,200	
88	29,600 ^b	5,500	2,400	6,100	11,700	5,700	61,000	
89	31,800 ^b	5,800	2,000	4,700	9,700	3,800	57,800	
90	28,860 ^b	6,600	2,300	4,900	9,900	8,000	61,260	
91	34,399 ^b	5,873	3,043	4,532	8,326	5,438	63,774	
20-Year Ave.	26,003	6,019	2,417	7,542	15,186	8,702	66,012	
1972-81 Ave.	23,180	6,930	2,010	8,890	15,400	8,650	65,060	
1982-91 Ave.	28,826	5,107	2,824	6,193	14,973	8,754	66,963	

¹ Includes the village of Portage Creek.

² Catch by non-local fishermen issued a permit in one of the above villages. Prior to 1990, these catches were included under the village in which the permit was issued.

^a Catches prior to 1991 rounded to the nearest hundred fish. Prior to 1990, harvest are reported by location of permit registration, regardless of residency. For 1990 - present, harvests are reported by village of residency, and include fish caught only in the Nushagak District.

^b Includes permits issued in Clark's Point and Ekuk.

^c Only persons domiciled in the Nushagak drainage could obtain subsistence permits.

BRISTOL BAY SALMON FISHERY

APPENDIX

Appendix A. Bristol Bay Tide Tables, June - September, 1991.

**NUSHAGAK BAY DISTRICT
CORRECTION TABLE**

To correct the TIME and HEIGHT for HIGH or LOW tides for the points given below, add or subtract TIME and FEET from the NUSHAGAK District Tide Table.

	TIME		FEET	
	HIGH	LOW	HIGH	LOW
NUSHAGAK BAY				
Port Moller	+33	-48	.36	.36
(Eastward Point)				
Port Roberts	+88	-73	.42	.84
ROBBIE BAY				
Eastward	+130	-113	.91	.89
South	+104	-93	.66	.32
North Bay	+93	-99	.64	.69
RAJESKI BAY				
Eastward	+910	-938	-1.9	.83
Westward	+911	-127	.68	.38
Onward Point	+912	-328	.37	.13
North Bay	+967	-446	.13	.08
HEBERGAK BAY				
Providence Point	+911	-932	-1.6	.99
Star Point	+899	-107	.92	.84
Black Point				
White Island	+907	-999	1.01	.72
ELLSBERGAK BAY AND BAY				
Goodwin Bay Eastward	+905	-939	.36	.34
Carroll Bay	+904	-908	.49	.35
Gr. Channel	+124	-119	.37	.38
Gr. Channel				
Westward	+134	-336	.39	.39
Eastward				
Eastward	+169	-246	.37	.39
Providence	+181	-219	.48	.39
Arctic Creek Eastward	+138	-114	.34	.39
South	+148	-347	.15	.14
ST. LAURENCE ISLAND				
Northward Cape	+151	-132	.17	.08
South Bay Eastward	+149	-134	.08	.08
Northward				
Eastward	+139	-247	.08	.08

* No Low water falls below -1 foot.
* Missing lengths of tides. This is given rate to nearest length of high or low tide.

**HIGH Tides NUSHAGAK District
JUNE 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Sat	728	198	6:46	12:2	
2 SUN	802	196	7:32	12:3	
3 Mon	836	194	8:25	12:6	
4 Tues	908	191	9:17	13:1	
5 Wed	943	187	10:13	14:0	
6 Thur	10:15	182	11:07	15:1	
7 Fri	10:53	178			
8 Sat	004	165	11:29	17:3	
9 SUN	100	179	12:12	16:9	
10 Mon	154	194	12:59	16:5	
11 Tues	250	208	1:47	16:3	
12 Wed	343	220	2:47	16:1	
13 Thur	439	228	3:47	16:1	
14 Fri	531	234	4:52	16:1	
15 Sat	623	237	5:59	16:1	
16 SUN	715	236	7:09	16:3	
17 Mon	808	231	8:19	16:7	
18 Tues	857	224	9:30	17:2	
19 Wed	947	214	10:37	17:8	
20 Thur	10:35	202	11:45	18:5	
21 Fri	11:24	189			
22 Sat	048	191	12:13	17:6	
23 SUN	147	196	12:58	16:3	
24 Mon	243	199	1:47	15:2	
25 Tues	334	200	2:32	14:2	
26 Wed	421	200	3:15	13:5	
27 Thur	506	199	4:00	12:9	
28 Fri	544	197	4:43	12:5	
29 Sat	620	196	5:29	12:3	
30 SUN	652	194	6:17	12:3	

**LOW Tides NUSHAGAK District
JUNE 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Sat	025	12	1:53	6:8	
2 SUN	107	18	2:35	6:3	
3 Mon	149	25	3:13	5:7	
4 Tues	235	32	3:51	4:8	
5 Wed	320	41	4:27	3:7	
6 Thur	409	50	5:06	2:5	
7 Fri	503	58	5:44	1:2	
8 Sat	600	66	6:24	-0:1	
9 SUN	657	71	7:07	-1:5	
10 Mon	757	74	7:55	-2:6	
11 Tues	855	74	8:45	-3:6	
12 Wed	955	72	9:37	-4:2	
13 Thur	1051	66	10:32	-4:3	
14 Fri	1149	57	11:31	-4:0	
15 Sat			12:45	4:6	
16 SUN	027	-31	1:40	3:3	
17 Mon	126	-18	2:33	1:8	
18 Tues	225	-0:2	3:29	0:5	
19 Wed	328	1:5	4:21	-0:7	
20 Thur	429	3:2	5:12	-1:5	
21 Fri	532	4:7	6:02	-1:9	
22 Sat	635	5:9	6:50	-2:0	
23 SUN	735	6:7	7:39	-1:7	
24 Mon	831	7:3	8:24	-1:3	
25 Tues	927	7:6	9:08	-0:9	
26 Wed	1022	7:8	9:50	-0:2	
27 Thur	1111	7:8	10:32	0:4	
28 Fri	1157	7:6	11:14	1:0	
29 Sat	1239	7:3	11:56	1:6	
30 SUN			1:21	6:7	

**HIGH Tides NUSHAGAK District
JULY 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Mon	724	191	7:08	12:6	
2 Tues	756	189	8:01	13:1	
3 Wed	828	185	8:55	13:9	
4 Thur	900	182	9:50	15:0	
5 Fri	933	178	10:43	16:3	
6 Sat	1009	175	11:38	17:7	
7 SUN	1053	172			
8 Mon	034	190	11:35	17:0	
9 Tues	130	203	12:30	16:9	
10 Wed	225	213	1:27	16:8	
11 Thur	319	221	2:28	16:8	
12 Fri	415	227	3:34	16:7	
13 Sat	508	230	4:42	16:8	
14 SUN	559	229	5:51	16:9	
15 Mon	651	226	7:01	17:2	
16 Tues	740	220	8:09	17:7	
17 Wed	828	211	9:19	18:2	
18 Thur	917	201	10:23	18:7	
19 Fri	1006	189	11:23	19:1	
20 Sat	1055	178			
21 SUN	024	193	11:42	16:7	
22 Mon	120	194	12:29	15:7	
23 Tues	214	194	1:14	14:9	
24 Wed	301	193	2:00	14:2	
25 Thur	345	192	2:45	13:7	
26 Fri	427	191	3:31	13:3	
27 Sat	506	189	4:18	13:1	
28 SUN	542	187	5:07	13:1	
29 Mon	614	184	5:58	13:3	
30 Tues	643	181	6:48	13:8	
31 Wed	716	177	7:41	14:6	

**LOW Tides NUSHAGAK District
JULY 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Mon	038	24	1:59	6:0	
2 Tues	120	32	2:35	5:0	
3 Wed	206	41	3:10	3:9	
4 Thur	252	50	3:49	2:7	
5 Fri	345	58	4:27	1:3	
6 Sat	438	66	5:06	-0:1	
7 SUN	535	72	5:50	-1:5	
8 Mon	632	75	6:36	-2:7	
9 Tues	732	76	7:28	-3:7	
10 Wed	829	74	8:22	-4:3	
11 Thur	928	69	9:18	-4:4	
12 Fri	1025	60	10:15	-4:0	
13 Sat	1121	48	11:12	-3:1	
14 SUN			12:19	3:4	
15 Mon	012	-19	1:14	1:9	
16 Tues	111	-03	2:08	0:6	
17 Wed	213	13	3:00	-0:5	
18 Thur	312	29	3:52	-1:3	
19 Fri	414	43	4:42	-1:7	
20 Sat	514	55	5:33	-1:7	
21 SUN	611	64	6:19	-1:5	
22 Mon	707	70	7:08	-1:2	
23 Tues	801	75	7:54	-0:7	
24 Wed	856	78	8:37	-0:2	
25 Thur	943	78	9:21	0:4	
26 Fri	1032	77	10:03	1:0	
27 Sat	1117	73	10:45	1:7	
28 SUN	1159	68	11:31	2:5	
29 Mon			12:38	6:0	
30 Tues	013	33	1:17	5:0	
31 Wed	058	41	1:52	4:1	

**HIGH Tides NUSHAGAK District
AUGUST 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Thur	748	174	8:33	15:6	
2 Fri	821	172	9:25	16:7	
3 Sat	857	170	10:21	17:9	
4 SUN	939	170	11:13	18:9	
5 Mon	1025	170			
6 Tues	009	199	11:19	17:1	
7 Wed	104	207	12:15	17:1	
8 Thur	159	213	1:15	17:2	
9 Fri	255	216	2:21	17:3	
10 Sat	348	218	3:29	17:4	
11 SUN	441	217	4:38	17:7	
12 Mon	531	213	5:45	18:0	
13 Tues	622	207	6:52	18:5	
14 Wed	710	200	7:58	18:9	
15 Thur	800	191	9:00	19:2	
16 Fri	848	182	9:59	19:4	
17 Sat	937	173	10:54	19:4	
18 SUN	1026	165	11:50	19:3	
19 Mon	1111	158			
20 Tues	042	190	11:58	15:2	
21 Wed	131	188	12:44	14:8	
22 Thur	217	185	1:31	14:4	
23 Fri	259	183	2:20	14:2	
24 Sat	339	180	3:09	14:1	
25 SUN	416	177	3:58	14:2	
26 Mon	452	174	4:51	14:6	
27 Tues	524	170	5:41	15:2	
28 Wed	559	167	6:33	16:0	
29 Thur	632	164	7:22	16:9	
30 Fri	707	162	8:14	17:8	
31 Sat	746	161	9:03	18:8	

**LOW Tides NUSHAGAK District
AUGUST 1991**

DATE	DOY'S	TIME	TIME	TIME	TIME
DAY	GAUGE	AM	PM	AM	PM
1 Thur	147	49	2:29	2:9	
2 Fri	236	57	3:08	1:6	
3 Sat	328	63	3:48	0:2	
4 SUN	421	68	4:34	-1:0	
5 Mon	517	71	5:22	-2:2	
6 Tues	611				

Appendix B. Alaska Board of Fisheries regulatory action and management policy changes for the commercial salmon fishery in Bristol Bay, 1990.

<u>Proposal #</u>	<u>Action</u>
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No regulation changes were made during the 1990/1991 winter.

BRISTOL BAY

HERRING

FISHERY

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INTRODUCTION

Pacific herring (*Clupea harangus pallasii*) have been reported throughout Bristol Bay, but the major concentration returns to the Togiak area each spring as the focus of two commercial fisheries (Figure 1). The herring sac roe fishery began in Bristol Bay in 1967 and was followed by a fishery for herring spawn on rockweed kelp (*Fucus spp.*) in 1968. For the first 10 years of the fishery, effort levels and the number of processors remained small, and in 1971 and 1976, the herring sac roe fishery did not operate due to poor market conditions. However, favorable market conditions and additional incentives provided by the Fishery Conservation and Management Act of 1976 (the 200-mile limit) resulted in a major expansion of the Togiak herring fishery in 1977.

Commercial sac roe and spawn-on-kelp fishing in the Togiak District has been regulated by emergency order since 1981 to achieve exploitation mandates by the Alaska Board of Fisheries and address problems with wastage. In 1984 the Bristol Bay Herring Management Plan (5 AAC 27.865) was adopted by the board. That regulatory management plan and other directives from the board set the policies by which these fisheries are prosecuted. The current management plan was modified at a recent meeting of the Alaska Board of Fisheries, and is included as Appendix 1 in this report.

The Bristol Bay Herring Management Plan specifically states that the maximum exploitation of the Bristol Bay herring stock is 20%. Before opening the sac roe fishery, 1,500 st must be set aside for the spawn-on-kelp fishery, and 7% of the remaining available harvest is allocated to the Dutch Harbor food and bait fishery. After the spawn-on-kelp and the Dutch Harbor food and bait harvests have been subtracted, the remaining harvestable surplus is allocated to the Togiak sac roe fishery: 25% to the gillnet fleet, and 75% to the purse seine fleet.

In October of 1989, the Alaska Board of Fisheries reduced the legal size of purse seines to 100 fathoms in length and 16 fathoms in depth. Gillnets were also reduced to a maximum of 100 fathoms in length per permit holder with only one compliment of gear allowed to operate from a single vessel. The department was also given emergency order authority to further reduce the length of gillnet fished by a single vessel to 50 fathoms, if it was deemed necessary. The line

that previously divided the gillnet and seine fisheries was eliminated, but the board declared that the gillnet fleet must fish on the first opening of the season. There was no change in the existing allocation between the two gear types, and the herring spawn-on-kelp harvest methods remained the same.

1990 was the first season that limited entry was in effect for the Togiak spawn-on-kelp fishery. Prior to 1990, people were told that they must have a permit to participate in the harvest, since their hands were considered harvest gear. Any person that applied for a permit and paid the appropriate fee was issued one. In 1990 an interim-use permit was required: only participants who possessed a permit and could document participation in one of the three years from 1986-1988 were eligible to apply.

In 1991 an interim-use permit was again required as limited entry had not yet taken effect. As in the 1988 spawn-on-kelp fishery, the legal restrictions that applied to crewmembers were undefined. Prior to the 1991 fishery, department staff announced that crewmembers may assist permit holders by transporting spawn on kelp, but may not actually pick or rake the kelp from the beds.

A 2- or 3-year rotation of the harvest areas is incorporated in the spawn-on-kelp harvest to protect the plant community.

METHODS

Abundance Estimates

Aerial surveys are conducted daily, when possible, throughout the herring season to estimate daily abundance and distribution of herring and spawn distribution in the Togiak District. Procedures for abundance estimation follow those documented in Lebida and Whitmore (1985), and have not changed in recent years. Surface area of each school is estimated, to which standard factors of 1.52 (water depths of 16 ft or less), 2.56 (water depths between 16 and 26 ft) and 2.83 st/538 ft² (water depths greater than 26 ft) are applied. The resulting biomass of the individual schools are summed to obtain an estimate of biomass present in each section. Location and extent of milt, numbers of fishing vessels, and visibility factors affecting survey quality are also recorded.

Point estimate test fishing after the 1991 commercial harvest, and closer examination of the most current bathymetric maps of the Togiak area after the season revealed that the water is significantly deeper than previously believed in the area along the east side of Hagemeister Island. Large numbers of schools are often observed moving into the area in that vicinity and it is now felt that due to the deeper water that the use of a higher conversion factor would be appropriate. This knowledge could tend to increase the herring biomass on future aerial surveys.

Age, Size, and Sex Sampling

Test fishing is conducted with variable mesh gillnets and commercial seine gear to determine age, size, and sex of herring escapement. Test fishing is conducted from department skiffs stationed at remote field camps at Metervik Bay, Tongue Point, and Summit Island, and by volunteer gillnet and purse seine vessels. Fixed mesh commercial gillnets are avoided for this sampling because of their mesh selectivity. Samples of the sac roe harvest are obtained from commercial seine and gillnet vessels and are processed at one of the locations above to determine age, size, and sex of the harvest.

Roe Maturity Sampling

Extensive test fishing is conducted by volunteer purse seine and gillnet vessels throughout the season to monitor the roe maturity of herring concentrations on the grounds. Samples are delivered from the fishing vessels to processors, where testing for roe recovery is conducted by industry technicians. When possible, samples are delivered from vessel to processor via the department helicopter. Bagged samples are placed in a brailer attached to a longline, and slung to processing vessels. An effort is made by the helicopter pilot to distribute samples from one fishing vessel to several companies to reduce bias associated with any one company. Testing conducted in this manner places responsibility with the industry and reduces public concerns associated with potential differences in testing procedures. Roe recoveries are relayed by VHF to the department within minutes after the tests are complete.

1991 INSEASON HERRING/KELP MANAGEMENT

Spring weather conditions were fairly "normal" in 1991 and on April 12, maps of the Bering Sea indicated that Bristol Bay was mostly ice free. An average size pack was present for that time of year. On April 19, the staff flew the first aerial survey of the 1991 season (Table 1). No herring were sighted, but several rafts of birds and three sea lions were observed. Dillingham experienced light snow and 38°F on April 29, and one of the local pilots reported that conditions at Togiak still looked "like the dead of winter". The second aerial survey was flown on April 24 and again no fish were sighted. Viewing conditions were excellent, and by that time several of the local pilots had joined the department staff in the search for fish.

Heavy river ice in front of the Dillingham docks required that the gear for the three field camps be sling loaded onto the tender, with the aid of the departments chartered helicopter. The four work skiffs were shipped via a second tender at a later time. A serious delay in setting up the camps can affect the efficiency of managing the fishery if the herring arrive early. Therefore every effort is made to get the three field facilities operational as quickly as possible so that the crew can concentrate on test fishing and sampling when the time comes, rather than survival. All three field camps were finally deployed on April 29.

On May 1 several tiny schools of fish were observed on the west side of Tongue Point spit, but they appeared to be smelt. At the same time, Togiak villagers were reportedly catching good numbers of smelt for subsistence.

On the afternoon of April 30 the water temperature in the surf line had reached 5°C at Metervik Bay, 3°C at Summit Island, and 4.0-4.5°C at Tongue Point. The indicated optimum spawning temperature in the Bering Sea is reportedly 4-5°C. A minor storm (SE 35-40) the night of May 1 muddied the water so that aerial surveys were not possible until May 3, but no herring were observed. Finally, approximately 65 st of herring were observed in the Hagemeister area on May 6.

All companies who intend to purchase herring or spawn on kelp are required to

register with the department in-person on the grounds prior to receiving any product. The first processor of the 1991 season registered with the department at Togiak early on May 2, and by evening three more had arrived. Vessels were arriving on the grounds every hour, and by the evening of May 3, 43 purse seiners, 30 tenders, 6 processors, and 3 gillnet vessels had arrived. The lack of gillnet vessels was disconcerting because the regulatory management plan for the fishery required that they fish first on the first opening of the season. A fishing vessel reported large schools of herring in Nunavachak Bay "on the meter, at a depth of about two fathoms" on the evening of May 4. However, the morning of May 5 brought another wind storm, with gusts near Tongue Point reported at over 50 knots. Vessels were seeking shelter around the district, and several reportedly lost an anchor. With the wind stirring the water, the surface temperature dropped down to 3°C at all three camps. Due to the high winds, aerial survey conditions were extremely poor.

On the morning of May 6, the Tongue Point crew caught the first two herring of the season, and by 4:00 p.m. they reported that they had between 50 and 60. A total of 7 of the first 12 males checked were ripe, and 2 of the first 12 female herring were in a "ripe" condition. By the evening of May 6, schools of herring were visible in the Tongue Point area, and two purse seine samples were obtained. Both proved to be quite "green" (0% mature and .9% mature) when tested by roe technicians on one of the processors.

May 7 brought cold, wind, and rain, with few schools of herring visible. However, four bags of gillnet samples obtained in Nunavachak Bay tested 3.4%, 3.2%, and two were 0% mature. By evening, the wind had dropped and the water temperature had reached 9°C in the surf at Tongue Point. The crew there caught 19 female herring, 14 of which were green, and 5 ripe. Several other sets proved to be a mixture of maturities in the same school, from ripe to "white eggs" which are usually several days from spawning. One set near Aeolis Mountain proved to be smelt, and 100 were collected, frozen, and sent to Canada for DNA sampling, as per their request.

Another minor storm was predicted for May 8, and by 10:00 a.m. winds had reached 15-30 knots. By late afternoon winds had increased from 35-50 knots and the aerial surveyors reported that the water had become so turbid that they couldn't see fish even if they were present. On May 9 the wind had moderated, but viewing

conditions were very poor. However, the first spawning of the season was documented in Ungalikthluk Bay, and encompassed approximately 1 mile of shoreline.

A total of 22 test boats were deployed on the morning of May 10, but overall coverage of the district was very poor. Some vessels did not start fishing until 9:00 a.m. and some of the spotter aircraft did not arrive on time. Therefore, the number of herring samples that could be examined were few. Spawning was visible in many areas, and spot spawns were starting up continuously throughout the morning. Some of the gillnet samples that were tested showed good roe recoveries, and ranged from a low of 8.3% to a high of 10.8%. Few of the samples tested contained immature herring, and almost no spawned out fish. The regulatory management plan for the Togiak sac roe fishery mandates that the gillnet fleet must fish on the first opening, and the management staff didn't feel that they could delay fishing any longer.

At 12:00 noon, May 10, a gillnet opening was announced for 1:00 p.m. that same day, in the three areas that produced the best samples: from the western most tip of Anchor Point south to the tip of Rocky Point; from the headland at the south entrance of Mud Bay south to the southern most tip of Right Hand Point; and from the north marker at the northern entrance of Metervik Bay north to the mouth of the Kulukak River. Due to the small number of samples that were available prior to the fishery and the intent of achieving the best quality harvest, the staff elected to allow a long opening (10 hours), and strongly encouraged the fishermen to test their herring before loading their boats.

Throughout the day of May 10 test fishing continued with purse seines in the areas that the gillnet fleet was not present, and many of the samples proved to be of good quality. The weather was excellent, and even though the aerial surveyors could only see herring in a few locations due to the residual turbidity from the previous storms, they did document intensive spawning in many areas, and estimated the total milt sighted at almost 20 miles. With the good weather, high roe recoveries in the samples that were tested, and major spawning throughout the district, the staff felt that a further delay in the purse seine fishery would likely result in a loss in roe recovery. The fleet was put on notice to standby at 4:00 and 5:00 p.m., and at approximately 5:30 p.m. we announced a 1-hour opening for the purse seine fleet for 8:00 p.m. May 10 (Table 2). A provision

in the regulatory management plan prohibits the two gear types from fishing in the same area at the same time, so the purse seine fleet was prohibited from fishing in the three areas that were open to gillnetting.

Due to the turbid water conditions from the numerous wind storms, it was not possible to determine herring biomass on the grounds. In that event, the regulatory management plan requires that the resource be exploited based on the preseason projected biomass. In 1991, the preseason projection was for an inshore return of 55,000 st, which would equate to a sac roe harvest of less than 10,000 st.

During and immediately following the initial gillnet and seine openings, the staff quickly collected samples from throughout the district, and attempted to document the quantity of fish harvested. However, with a long gillnet opening, and a purse seine catch late in the day, it was not possible to estimate the harvest before the next morning. The fleet was advised to standby at 9:00 a.m. on May 11 for the next update. By morning, approximately 44% of the purse seine allocation (2,900 st at 10.5%) and approximately 80% of the gillnet allocation (1,800 st at 8.5%) had been landed (Table 3). The gillnet roe recoveries were disappointingly low and though they averaged approximately 8.5%, many tons were delivered in the 7.5 - 8.0% range. The fish were reportedly still slightly immature and many purse seine sets were tested and released.

Major spawning had occurred overnight and over 43 linear miles of milt had been observed by mid-day on May 11. Milt was visible on the early morning aerial survey in a nearly continuous band from Metervik Bay to Nunavachak Bay. With additional herring yet to harvest, and many spawned-out fish present on the grounds, it was necessary to sample intensively with a test boat fleet to locate marketable fish before additional fishing time could be announced.

Weather continued to hamper aerial surveys and test fishing efforts on May 11. Status reports were broadcast to the fleet every three hours concerning the results of samples collected by the test boat fleet, and the potential for additional fishing time. Only four gillnet boats volunteered to test fish all day, and finally at the 3:00 p.m. announcement the fleet was told that if adequate samples could not be obtained to make a good decision as to when and where to allow the next gillnet fishery to occur, no further fishing time would

be allowed.

Most of the samples obtained were either of good quality, or spawned- out herring, with little mixing present. That was surprising, considering the amount of spawning that had occurred, and a condition that was certain not to last long, making it even more urgent to complete the fishery as soon as possible. Later in the afternoon of May 11, gillnet samples obtained from the east side of Right Hand point proved to be of good quality. That stimulated the interest of the fleet, and additional vessels volunteered to test fish. Roe recoveries from the test samples ranged from a low of 8.6% to a high of 10.8%. At the 6:30 p.m. report to the fleet, the staff was still waiting for a report on the last samples to be called in from a roe technician, so the fleet was asked to standby at 7:00 p.m.. At that time a 4-hour gillnet opening was announced for that same evening, to begin at 8:00 p.m.. The purse seine samples from the western part of the district, where most of the herring were visible, were generally of poorer quality, so we elected to delay the remainder of the purse seine harvest until more sampling could be conducted the next morning.

On May 12 a major purse seine test fishing effort was mobilized at first light. Low ceilings and fog prevented several of the vessels from obtaining any samples, but most of the boats that could fish found high quality herring in some areas. With approximately 3,700 st of fish remaining on the seine allocation, and good quality herring present in fishable areas, an opening was announced at 10:00 a.m., to begin at 11:30 a.m.. Part of the district was obscured by low ceilings and fog. To provide an additional measure of safety to the spotter pilots and the fleet, a 2-hour opening was announced to reduce the urgency of the fishery. As luck would have it, the weather improved in the late morning, and some vessels were able to make two sets during the opening.

By the 6:30 p.m. report on May 12, it was clear that both the gillnet and purse seine fleets had greatly exceeded their respective allocations based on the preseason forecast (Table 3), and that further fishing time would be dependent upon documenting a major increase in the herring biomass on the grounds. In the report to the fleet, kelp harvesters were alerted that sampling of the product would be conducted that evening, and that a commercial harvest could be conducted as early as the next evening tide. Kelpers were invited to examine the spawn-on-kelp samples at Summit Island on the morning of May 13, and to standby at 1:00

p.m. for a possible announcement for a harvest on the evening tide if the product quality was acceptable to the buyers.

Of all the areas sampled, the quality of the kelp samples from area K-4 proved to be the most acceptable to the buyers and their technicians. That area had not been harvested since 1989 and therefore met the 2 to 3-year rotation provision in the management directive from the Board of Fisheries for the kelp fishery. At 1:00 p.m., a 2.5-hour opening for the harvest of herring spawn on kelp was announced for 7:00 p.m., May 13. The weather improved throughout the day and an estimated 532 pickers and crewmembers harvested just under the entire 350,000 lb. quota in the one brief opening (Table 4).

By the evening of May 13, only about 50,000 st of herring had been documented on the grounds, and the commercial harvest was estimated at close to 15,000 st. The fleet was advised that it would be necessary to observe in excess of 85,000 st of herring on the grounds before we would be under the 20% exploitation rate, and that even more biomass would be required before additional fishing time could be considered. At that point, most of the fleet elected to take advantage of the good weather for traveling, and departed the grounds.

The helicopter charter was used to great advantage again this season, collecting samples both before and during the fisheries. The utility of the helicopter allowed us to quickly assess the fishery and direct department skiffs to specific areas to procure samples. In addition, a brailer bag was attached to the helicopter via a 50-ft longline to collect samples from specific fishing boats in areas of herring concentration. By collecting samples directly from the decks of fishing boats and department skiffs, we were able to deliver them to the processing vessels very frequently, where the samples were tested and the results quickly transmitted to the department. To reduce potential bias on the part of the samplers, an effort was made to distribute individual bags from each test boat to technicians from different companies.

Samples were collected during the first gillnet fishery, but with the long opening, uncertainty about the volume of the catch, and mixed quality of the herring that were tested, no extension was considered. Sampling mid period, especially during a gillnet fishery, is an excellent management tool in that it allows the staff to anticipate what the quality of the harvest will be prior to

the closure, and announce an extension in fishing time if it appears that the entire quota will not be taken.

SEASON SUMMARY

Spawning Population

Twenty five aerial surveys were flown on 23 days during the season, from April 19 - June 8 (Table 1). Survey conditions, although quite variable, were generally poor throughout much of the season. A series of wind storms caused the water to remain turbid in much of the district for many days, allowing only partial surveys and preventing a complete assessment of the entire population. During several days surveying was impossible due to low cloud ceilings, fog, high winds, or extreme water turbidity. Only a limited number of complete (end-to-end) district surveys were conducted.

The first herring were observed May 6, although significant volume did not appear until May 9. A number of small schools of smelt were also present on the grounds in the early part of the season and it was extremely difficult to distinguish them from herring as viewed from the air.

The peak herring biomass was observed May 16, three days after the final fishing period, and totaled 51,498 st (Table 1). Postseason data analysis from aerial surveys, test fishing, and commercial harvests resulted in a total spawning biomass estimate of 83,229 st (Table 5). The final biomass estimate was over 28,000 st greater than the preseason forecast of 54,772 st.

Age composition was very similar to the preseason projection. Approximately 57% of the total biomass (by weight) was composed of age 9-16 herring (Table 5). Ages 7-8 accounted for 34%, ages 5-6 2%, and newly recruited age 3 and 4 herring represented 7% of the total spawning population, the largest showing for this age group in many years. Typically there is a measurable shift to smaller herring during the course of the season, but until this year the lack of recruit herring in the spawning population has been very evident for quite some time (Appendix Table 4). How significant this apparent influx of new fish will be in future generations is yet to be determined.

Spawning was observed from May 9 - June 5 throughout the district with nearly 70 linear miles of milt documented over the season (Table 1). Most of the observed

spawn was recorded during the 3-day period from May 10-12. The peak of spawning began only 24 hours after the first "significant" sighting of biomass on the grounds (Table 1). Observed spawn distribution was again fairly widespread, with areas of spawn concentration documented in the traditional spawning areas, from Anchor Point to Rocky Point, Metervik Bay, Barge Beach, Right Hand Point, Asigyukpak Spit, Hagemeister Spit, and inside Ungalikthluk Bay.

Sac Roe Fishery

Ice in the offshore areas did not play a significant factor in the arrival of the fleet this season, but river ice near Dillingham delayed the deployment of the departmental camps by several days. Peak counts of 200 purse seine and 170 gillnet vessels were documented (Appendix Table 2). This level of participation in the fishery matches the recent 10-year average for purse seiners, but was 32% less in the number of gillnet vessels. A total of 16 processors/buyers purchased herring this season, identical to the 1990 season (Table 6, Appendix Table 2).

One 1-hour fishing period was permitted for the purse seine fleet on May 10, and one 2-hour period on May 12. The first opening for the gillnet fleet was for 10 hours on May 10, and a second 4-hour period was conducted on May 11 (Table 2). The sac roe harvest totaled 14,970 st for both gear types combined (Table 3). This year's harvest was a 19% increase over the 12,253 st harvested in 1990, which was nearly identical to the 1989 catch (Appendix Table 2). The 1991 sac roe harvest comprised 84% of the 1982-91 average for Togiak District, and was the highest reported in Alaska for 1991.

The Bristol Bay Herring Management Plan allocates 75% and 25% of the harvestable surplus to the seine and gillnet fleet, respectively. The final purse seine (11,788 st) and gillnet (3,182 st) harvests comprised 78.7% and 21.3% of the total sac roe harvest. Over 70% of the purse seine catch was taken in areas west of Togiak Bay, while 58% of the gillnet catch was taken in the Kulukak Section.

Weighted roe recoveries averaged 9.9% for both gear types combined, but the roe recoveries for the gillnet harvest averaged 8.8%, a drop from the Togiak gillnet record of 9.1% set in 1990 (Appendix Table 3). Roe recoveries averaged 10.1% for the purse seine harvest. Normally herring with roe recoveries below 6% are designated as food or bait on the fish tickets, but fish tickets with roe

recoveries below 6% and listed as sac roe were tallied as sac roe purchases and included in calculating average roe recoveries.

Almost no waste was observed in the gillnet fishery this season and only a few small pieces of net were observed lost or abandoned. To our knowledge, there were no nets left in the water in late May. However, two purse seine sets in shallow water in Togiak Bay could not be recovered. Approximately 100 st were lost in total, and that was based on the average size of the purse seine landings in Togiak Bay this season.

Spawn-on-Kelp Fishery

The 1991 effort level for the spawn-on-kelp fishery was the largest on record, estimated at 532 participants via an aerial count (Appendix Table 5). Although the kelp fishery was limited in 1990, everyone participates on an interim-use permit. The issue of what crewmembers could legally do to assist the permit holder was still in question prior to the 1991 season. Crewmembers were advised not to pick kelp, but many non-permitted fishermen were present making enforcement difficult. It was difficult to estimate the effort under the circumstances, and everyone on the beach was counted as participating. The sharp increase in effort levels during recent years has resulted in very short intense openings and a reduction in the staff's ability to control harvests within specified levels. Hopefully, effort will reduce to a more manageable level when limited entry takes effect.

For the fourth year in a row, the entire quota for spawn-on-kelp (350,000 lbs) was taken or exceeded during one brief harvest period. The 2.5-hour period, permitted in area K-4 on May 13, comprised the least amount of fishing time ever allowed, and resulted in the sixth largest harvest in the 23-year history of this fishery. A total of 348,357 lbs of herring spawn-on-kelp were harvested, 1,643 lbs less than the quota of 350,000 lbs (Table 4). This year's harvest was 8% less than the 10-year (1982-91) average of 378,347 lbs (Appendix Table 5). The harvest occurred during the 2.5 hours prior to a -1.7-ft low tide, during daylight hours, and under fair weather conditions.

Using the formula adopted by the Board of Fisheries in 1984, the spawn-on-kelp harvest was converted to a herring equivalent of 1,310 st (Table 4). This amount

was added to the herring harvest to compute total exploitation.

Dutch Harbor Food/Bait Fishery

The 1991 harvest allocation for the Dutch Harbor food/bait fishery was 931 st, and was based on the inseason biomass estimate of 74,000 st in the Togiak District. Eight purse seine vessels participated in the fishery, and the entire harvest was obtained in 6.5 hours of fishing time (ADF&G 1991). The actual Dutch Harbor food/bait harvest totaled 1,325 st.

Exvessel Value

Value of the Togiak District herring harvest to fishermen was estimated at \$6.6 million, based on fish tickets submitted to the department from processors¹ (Appendix Table 7). Sac roe prices were estimated at \$430/st for 10% roe, plus or minus \$50 for each 1.0% change. Using the estimated average roe recovery of 9.9% for the sac roe harvest yielded an exvessel price slightly less than \$430/st. Average price for food/bait herring was \$50/st in the Togiak District. Approximately 14,500 st of herring landed was purchased for sac roe, while less than 450 st was taken for food or bait (Appendix Table 2). Exvessel value of the spawn-on-kelp harvest was estimated to be \$383,000 based on the 1991 price of \$1.10/lb (Appendix Table 7).

Prices paid for food/bait herring in Dutch Harbor averaged \$300/st, for an exvessel value of \$397,500 for the Dutch Harbor fishery (ADF&G 1991).

¹ Price information listed on fish tickets for sac roe herring is minimal and may be misleading. Most companies pay an "on grounds" base price, with additional post-season settlements after price finalization with the foreign market.

DISCUSSION

Weather proved to be a significant factor in the management of the 1991 Togiak herring fishery because it limited aerial surveys at times, created a tremendous amount of anxiety about safety on the second purse seine opening, hindered test fishing efforts, and limited the departments ability to acquire samples on several occasions.

The Togiak District herring fishery was managed with the intent of harvesting 10-20% of the available biomass, as directed in the Bering Sea Herring Management Plan. The overall exploitation was 21.3% of the estimated return, based on a total harvest of 17,705 st and a total biomass estimate of 83,229 st (Appendix Table 3). Total harvest includes the Dutch Harbor harvest (1,325 st), the biomass of herring that produces the spawn on kelp product (1,310 st), the sac roe harvest (14,970 st), and waste (100 st).

Pacific herring returning to the Togiak District are the focus of the largest herring fishery within state waters. However, declines in annual catch and biomass estimates and the recurring lack of a significant recruitment are evidence of a continuation in the decline in abundance of Togiak herring. Although the cause of this apparent decline has yet to be identified, continuation of this trend may precipitate a significantly reduced harvest in the future. It should be noted that the documented history of this fishery is short, and the size of a "normal population" is not known at this time.

BRISTOL BAY HERRING FISHERY

Tables 1-6

Table 2. Emergency order commercial herring sac roe and herring spawn-on-kelp fishing periods, Togiak District, Bristol Bay, 1991.

<u>Emergency Orders</u> ¹						
Number	Area	Date, Time, and Gear			Duration	
<u>I. HERRING SAC ROE</u>						
DLG-01		May 10	1:00 p.m. - May 10	11:00 p.m.	G/N	10.0 hours
DLG-02		May 10	8:00 p.m. - May 10	9:00 p.m.	P/S	1.0 hour
DLG-03		May 11	8:00 p.m. - May 11	12:00 mid.	G/N	4.0 hours
DLG-04		May 12	11:30 a.m. - May 12	1:30 p.m.	P/S	2.0 hours
<u>II. HERRING SPAWN-ON-KELP</u>						
DLG-05	K-4	May 13	7:00 p.m. - May 13	9:30 p.m.		2.5 hours

¹ Prefix code on emergency orders indicate where announcement originated ("DLG" for Dillingham).

Table 4. Commercial herring spawn-on-kelp harvest, by date, Togiak District, Bristol Bay, 1991.^a

Date	Time	Hrs.	Harvest		Equivalent Herring Biomass(st) ^b
			Pounds	Short Tons	
5/13	7:00 p.m. - 9:30 p.m.	2.5	348,357	174.2	1310

^a Spawn-on-kelp was harvested only in Kelping Area K-4.

^b Using a formula adopted by the 1984 Board of Fisheries, herring spawn-on-kelp harvest is converted to represent herring as follows:

$$\text{Herring Equivalent} = \frac{100 (\text{Harvested Egg Biomass})}{\text{Average Roe Recovery (in percent)}}$$

where;

$$\text{Harvested Egg Biomass} = 0.75 (\text{Spawn-on-kelp biomass})$$

For 1991;

$$\text{Herring Equivalent} = \frac{100 (0.75 (174.2 \text{ st}))}{10.0}$$

$$= 1310 \text{ tons}$$

1310 tons is included in the herring harvest to calculate total exploitation.

Table 5. Herring total run and commercial catch by year class, Togiak District, Bristol Bay, 1991.

Year Class	Age	Total Run		Catch		Escapement	
		Short Tons	%	Short Tons	%	Short Tons	%
1974	17+	28	0.0	3	0.0	26	0.0
	75	192	0.2	138	0.9	55	0.1
	76	524	0.6	144	1.0	380	0.6
	77	5,484	6.6	967	6.5	4,517	6.6
	78	11,322	13.6	3,116	20.8	8,206	12.0
1979	12	10,018	12.0	2,536	16.9	7,483	11.0
	80	5,065	6.1	1,150	7.7	3,915	5.7
	81	10,102	12.1	2,681	17.9	7,421	10.9
	82	4,603	5.5	690	4.6	3,913	5.7
	83	14,920	17.9	2,130	14.2	12,788	18.7
1984	7	13,272	16.0	1,230	8.2	12,042	17.6
	85	997	1.2	75	0.5	923	1.4
	86	663	0.8	12	0.1	650	1.0
	87	6,028	7.2	98	0.7	5,929	8.7
	88	11	0.0	0	0.0	11	0.0
1989	2	0	0.0	0	0.0	0	0.0
	90	0	0.0	0	0.0	0	0.0
		83,229		14,970 ^a		68,259	

^a Final harvest does not include 100 tons of wasted product.

Table 6. Commercial herring sac roe and herring spawn-on-kelp processors and buyers operating in Togiak District, Bristol Bay, 1991.^a

Name of Operator/Buyer	Base of Operations	Processing Method		Brine Export	Comments
		Frozen	Cured		
A. HERRING SAC ROE					
1. Anderson Seafoods	P/V Snopac		Floater		
2. Dagnet Fisheries, Inc.			Shore		
3. Golden Age Fisheries	F/T Rebecca Irene		Floater		
4. Icicle Seafoods	P/V Bering Star		Floater		
5. King Crab, Inc.	M/V Viva Yo		Shore/Floater		
6. Lafayette, Inc.	M/V Pribilof		Floater		
7. New West Fisheries, Inc.	M/V New West		Floater		
8. Northcoast Seaf. Proc.	P/V Polar Bear		Floater		
9. Oceanic Seafood Co.	M/V Pacific Harvester		Floater		
10. Pan Pacific Seafoods	M/V Pacific Producer		Floater		
11. Peter Pan Seafoods Inc.	M/V Nushagak		Shore/Floater		
12. Snopac Products, Inc.	P/V Snopac		Floater		
13. Togiak Fisheries, Inc.			Shore		
14. Trident Seafoods	P/V Neptune		Floater		
15. Wards Cove Packing Co.	M/V Tuxedni		Shore/Floater		
16. Woodbine Ak. Fish Co.	M/V Woodbine		Floater		
	TOTAL		16		
B. HERRING SPAWN-ON-KELP					
1. Anpac, Inc.				Floater	
2. Camando Kelpers				Floater	
3. Northcoast Seaf. Proc.				Floater	
4. Peter Pan Seafoods, Inc.				Shore/Floater	
5. Togiak Fisheries, Inc.				Shore	
6. Whitney Foods, Inc.				Floater	
7. Woodbine Ak. Fish Co.				Floater	
	TOTAL			7	

^a Operators that registered from the Togiak Herring District.

BRISTOL BAY HERRING FISHERY

Appendix Tables 1-7

Appendix Table 1. Aerial estimates of surface area and tonnage conversion of herring schools, Togiak District, Bristol Bay, 1978-91.

Year	Date	Estimated Tons per 538 sq ft. ¹	School Size	Weight of Catch (Tons)	Actual or Est. Weight of Catch	Fish Maturity	Location of Purse Seine Set	Water Depth (ft)	
1978	5/13	7.39	a	a	Estimated	a	Nunavachak Bay	a	
	18	12.13	80 X 60	110	Estimated	a	Nunavachak Bay	a	
1979	5/ 4	2.65	40 dia.	6	Actual	Ripe	Ungalikthluk Bay	20	
1980	5/15	1.32	60 X 40	6	Actual	Ripe	Ungalikthluk Bay	10	
	15	1.76	40 X 30	4	Estimated	Spawn-outs	Ungalikthluk Bay	26	
	16	1.21 ^b	220 X 50	21	Actual	Spawn-outs	Nunavachak Bay	16	
	16	1.32	65 X 20	3	Estimated	Fish Lost	1 Mile West Ungalikthluk Bay	16	
	20	3.31	70 X 70	30	Estimated	Ripe	East of Eagle Bay	20	
	20	2.87	150 X 75	59	Estimated	Fish Lost	Eagle Bay	20	
1981	5/ 3	1.21	400 X200	88	Actual	Ripe	West Side, Tongue Pt.	7	
	8	1.87	80 X 30	8	Actual	Spawn-outs	Togiak Bay, Mouth	20	
	10	4.41	150 X 60	44	Actual	Ripe	Asigyupak Spit Bight	26	
1982	5/15	2.09	200 X150	110	Estimated	Green	Kulukak Bay	26	
1983	4/30	1.21	150 X180	60	Estimated	Green	Togiak Bay	13	
	30	1.10	350 X143	100	Estimated	Green	Togiak Bay	10	
	30	1.65	60 X 30	3	Estimated	Green	Togiak Bay	26	
	5/11	1.98	200 X200	140	Estimated	Ripe and Spawn-outs	Togiak Bay	10	
	18	1.87	300 X 50	50	Estimated	Spawn-outs	Nushagak Peninsula	13	
18	2.43	60 X 60	15	Estimated	Spawn-outs	Nushagak Peninsula	13		
1986	5/17	2.15	100 X100	40	Estimated	Spawn-outs	Togiak Bay	13	
	17	5.38	100 X 30	30	Estimated	Spawn-outs	West Side Tongue Pt.	17	
	19	1.15	100 X 50	11	Actual	Ripe	West Side, Kulukak Bay	8	
	19	1.12	100 X100	21	Actual	Ripe	West Side, Kulukak Bay	10	
	20	1.08	100 X100	20	Estimated	Spawn-outs/Immature	East Side, Tip of Hagemeister Island	12	
	21	11.86	70 X 70	108	Actual	Ripe	Gravel Beach, Nunavachak Section	5	
1987	5/ 9	5.49	70 X 70	released			Asigyupak Spit	10	
	11	3.40	70 X 70	31	Actual	Ripe	Tongue Point	13	
	11	1.26	100 X100	24	Actual	Ripe	Tongue Point	11	
1988	5/24	2.69	50 X 50		Actual	Ripe	Gravel Beach, Nunavachak Section,	12	
1989	No point estimates were conducted							North of Summit Island	
1990	5/12	0.26	75 X 75	5 ^c	Actual	Ripe	Asigyupak Spit	12	
	14	1.55	51 X 61	5 ^d	Actual	Ripe	Rocky Bay	12	
	14	0.80	100 X 54	8	Actual	Ripe	Rocky Bay	18	
	18	2.73	100 X 70	10	Actual	Mixed	Nunavachak-Airport	20	
1991	5/16	2.08	80 X 50	16	Actual	Ripe	3/4 mi E. Matogak R.	12	
	5/16	1.38	100 X120 + 50 X 20 ^e	30	Actual	Ripe	1 mi W of Tongue Pt.	8	
	5/16	4.30	150 X100 ^f	92	Actual	Ripe	2 mi W of Estus Pt.	27	

¹ Surface area for each school is expressed as a multiple of 538 sq ft. or 50 sq.m. This is the maximum area of a "small" school and is equal to one relative abundance index (RAI). Water and depth and weight of catch are rounded figures.

a Incomplete data.

b Average of two observers' estimates.

c School partially capelin, only herring were pumped.

d Adjusted to 100% capture would total 11 tons.

e Small percentage of fish in the captured school escaped.

f Fish equating to 3,500 ft² surface area escaped and were subtracted from total surface area.

Appendix Table 2. Commercial herring catch by gear type and product, Togiak District, Bristol Bay, 1972-91.

Year	Number of Processors	Units of Gear ¹		Percent Catch				Inshore Catch ² (tons)
		Gill-Net	Purse Seine	Gear		Product		
				Gill-Net	Purse Seine	Sac Roe	Food/Bait	
1972	1	18	1	40	60	100	0	80
73	2	26	1	100	0	100	0	51
74	3	10	1	16	84	100	0	123
75	2	39	0	100	0	100	0	56
76 ^a								
1977	6	43	6	11	89	100	0	2,795
78	16	40	25	8	92	100	0	7,734
79	33	350	175	40	60	92	8	11,558
80	27	363	140	16	84	85	15	18,886
81	28	106	83	18	82	99	1	12,542
1982	33	200	135	31	69	93	7	21,489
83	23	250	150	19	81	97	3	26,287
84	25	300	196	25	75	98	2	19,300
85	23	302	155	17	83	99	1	25,616
86	23	209	209	21	79	99	1	16,260
1987	18	148	111	17	83	98	2	15,204
88	22	300	239	26	74	99	1	14,382
89	19	320	310	24	76	97	3	12,258
90	16	277	221	25	75	99	1	12,253
91	16	170	200	21	79	97	3	14,970
20-Year Ave.	18	183	124	30	70	97	3	12,202
1972-81 Ave.	13	111	48	39	61	97	3	5,981
1982-91 Ave.	22	248	193	23	77	98	2	17,802

¹ Units of gear derived from fish tickets in years prior to 1979. From 1979 to present, units of gear equals peak aerial count.

² Data for some years includes ADF&G harvests and waste. Catch prior to 1973 reflects sorted females only.

^a Fishery not conducted..

Appendix Table 3. Estimated total run biomass and inshore commercial catch, in tons, Togiak District, Bristol Bay, 1978-91.

Year	Total Run Biomass ¹	Inshore Catch	Roe Recovery (%)			Percent Exploitation ²
			Gill-Net	Purse Seine	Mean	
1978	190,292	7,734			8.2	4
79	239,022	11,558			8.6	5
80	68,686	18,886			9.2	35
81	158,650	12,542	6.7	10.1	9.1	8
82	97,902	21,489	7.4	9.5	8.8	22
1983	141,782	26,287	6.9	9.3	8.9	19
84	114,880	19,300	8.4	10.2	9.8	18
85	131,400	25,616	7.4	10.0	9.6	20
86	94,700	16,260	8.8	9.9	9.7	19
87	88,400	15,204	8.6	8.9	8.8	19
1988	134,717	14,382	8.3	10.9	10.3	13
89	98,965	12,258	8.0	8.6	8.4	18
90	88,105	12,253	9.1	9.7	9.6	17
91 ³	83,229	14,970	8.8	10.1	9.9	21

¹ The total run biomass represents the revised estimate of the inshore spawning biomass for each year in the Togiak District.

² The percent exploitation is calculated by dividing the adjusted commercial harvest, which includes all commercial landings (Togiak sac roe fishery and Dutch Harbor food/bait fishery), all documented waste, and the equivalent herring harvest of the spawn-on-kelp removal, by the total run biomass.

³ Waste totaling 100 tons was not included in the catch or total run biomass estimate for the 1991 season.

Appendix Table 4. Age composition of the total inshore herring biomass, Togiak District, Bristol Bay, 1977-1991.

Year	Age Composition(%) ¹							Total Biomass (st) ²
	3 ^a	4	5	6	7	8	9+	
1977	4	49	37	3	3	3	1	
78		47	36	11	1	3	2	190,292
79	1	4	48	31	13	1	2	239,022
80	8	5	1	37	35	12	2	68,686
81	1	50	7	1	22	14	5	158,650
1982		16	51	3	1	17	12	97,902
83		5	37	45	2	2	9	141,782
84			2	28	42	4	24	114,880
85		1	1	8	35	42	13	131,400
86			1	2	15	44	38	94,770
1987				8	10	28	54	88,400
88		2	5	1	13	5	74	134,717
89			5	11	4	15	65	98,965
90 ^b				6	11	3	80	88,105
91		7	1	1	16	18	57	83,329

¹ Age composition in 1978-90 is weighted by area based on aerial survey data and by weight at age; age composition in 1977 is not weighted by area.

² Includes commercial catch, escapement, and documented waste.

^a Includes age 1, 2 and 3.

^b Contribution of age 1, 2, 3, 4 and 5, is less than 5%.

Appendix Table 5. Commercial harvest of herring spawn-on-kelp, Togiak District, Bristol Bay, 1972-91.

Year	Processors	Permit Holders	Deliveries	Harvest (lbs)
1972	1	12	32	64,165
73	1	10	11	11,596
74	3	26	49	125,646
75	2	44	98	111,087
76	5	49	118	295,780
1977	5	75	266	275,774
78	11	160	349	329,858
79	16	100	228	414,727
80	21	78	186	189,662
81	7	108	277	378,207
1982	8	214	167	234,924
83	4	125	257	270,866
84	6	330	412	406,587
85 ^a				
86	3	204	351	374,142
1987	5	187	334	307,307
88	10	259	330	489,320
89	11	487	330	559,780
90	7	481 ^b	286	413,844
91	7	532 ^b	248	348,357
20-Year Ave.	7	183	228	294,823
1972-81 Ave.	7	66	161	219,650
1982-91 Ave.	7	313	302	378,347

^a Fishery not conducted.

^b Estimated via aerial survey during the harvest; includes both limited-entry interim-use permit holders and crew members.

Appendix Table 6. Aerial observations of herring spawn in the Togiak District, Bristol Bay, 1978-1991.^a

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	No. Miles													
4/24										15				
25										17				
26										15				
27										24				
28										0				
29										0				
30										7				
5/1	1	0.4		9	3.0	0				0				
2				6	2.3	0				0				
3	1	0.4	11	4.0	12	1.9				10	3.6			
4			8	3.0	12	6.8				21	10.7			
5			8	3.1	4	2.9				15	6.3			
6			1	1.3	6	2.5				21	23.9			
7			3	0.6	0					9	8.4			
8	2	1.8	3	1.2	3	1.0				7	3.3			
9			2	0.4	1	0.2				0				
10			0		5	1.4	1 +			2	0.4			
11	9	7.7	0		0					6	4.7			
12	3	1.5	0	15	4.8	3	3.5			0				
13	12	8.6	0	6	3.8	9	5.4			0				
14	11	5.6	0	2	2.3	0				0				
15			6	4.0	2	1.0				1	0.6			
16			4	1.2	0					0				
17			0		1	0.1	1	0.3		0				
18	11	4.2		4	0.7	9	2.0	1	0.5	24	11.7			
19	3	2.5		29	7.3	19	6.1	24	17.6	3	0.6			
20			1	0.3	16	5.2	7	1.7	1	0.6				
			4	0.9	19	14.0	0	8	1.3	3	0.6			
21			0		3	2.0	0	8	2.0	11	3.5	1	0.8	
22			2	0.5	3	1.5	5	1.2	13	2.3	20	22.8	0	
23					11	3.3	0	3	1.4	9	4.1	0		
24					5	1.4	6	2.2	48	14.2	1	3.5		
25	8	4.2			1	0.3	1	0.1	25	11.7	5	2.8	18	5.9
					1	0.3	3	1.4	17	5.2	2	0.2	0	

-continued-

Appendix Table 6. (Page 2 of 2)

Date	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991														
	No. Miles																											
26	2	2.2	1	0.7	3	0.2	0	1	0.1	14	4.1	23	7.3	0														
27	0		3	0.3	0	0	8	1.2	0																			
28	0		8	1.6	0	0	3	0.1					1	7.0														
29	0				0	0	2	0.2	0					0														
30	6	1.6			0	0	4	0.5	3	0.3																		
31			2	0.8	0	0	12	4.1					1	0.7														
6/1	1	0.5			7	2.6	3	0.5	4	0.5				2	0.5													
2					0	0																						
3				1	0.8	1+	2	0.2																				
4																												
5														1	0.5													
6			6	3.1					0																			
7																												
8														0														
Total	70	41.2	52	21.9	64	24.3	106	40.1	103	38.6	189	59.7	171	61.4	141	43.4	182	66.5	160	75.8	107	61.1	69	52.5	94	65.7	90	69.5

^a Survey area covers Mushagak Peninsula to Cape Newenham.

Appendix Table 7. Exvessel value of the commercial herring and spawn-on-kelp harvest, in thousands of dollars, Togiak District, Bristol Bay, 1972-91.^a

Year	Herring		Spawn on Kelp	Total
	Sac Roe	Food/Bait		
1972	4	0	9	13
73	2	0	2	4
74	24	0	19	43
75	9	0	22	31
76	b	b	127	127
1977	447	0	116	563
78	2,635	0	120	2,755
79	6,561	180	249	6,990
80	3,055	150	95	3,300
81	3,988	1	250	4,239
1982	6,070	105	176	6,351
83	10,450	67	284	10,801
84	7,178	33	203	7,414
85	13,696	41	b	13,737
86	8,648	12	187	8,847
1987	8,614	49	166	8,829
88	14,103	3	346	14,452
89	4,983	19	448	5,450
90	6,494	9	360	6,863
91	6,172	21	383	6,577
20-Year Ave.	5,422	36	187	5,369
1972-81 Ave.	1,858	37	101	1,807
1982-91 Ave.	8,641	36	284	8,932

^a Exvessel value (value paid to the fisherman) is derived by multiplying price per pound by the commercial harvest.

^b Fishery not conducted.

BRISTOL BAY HERRING FISHERY

Figures

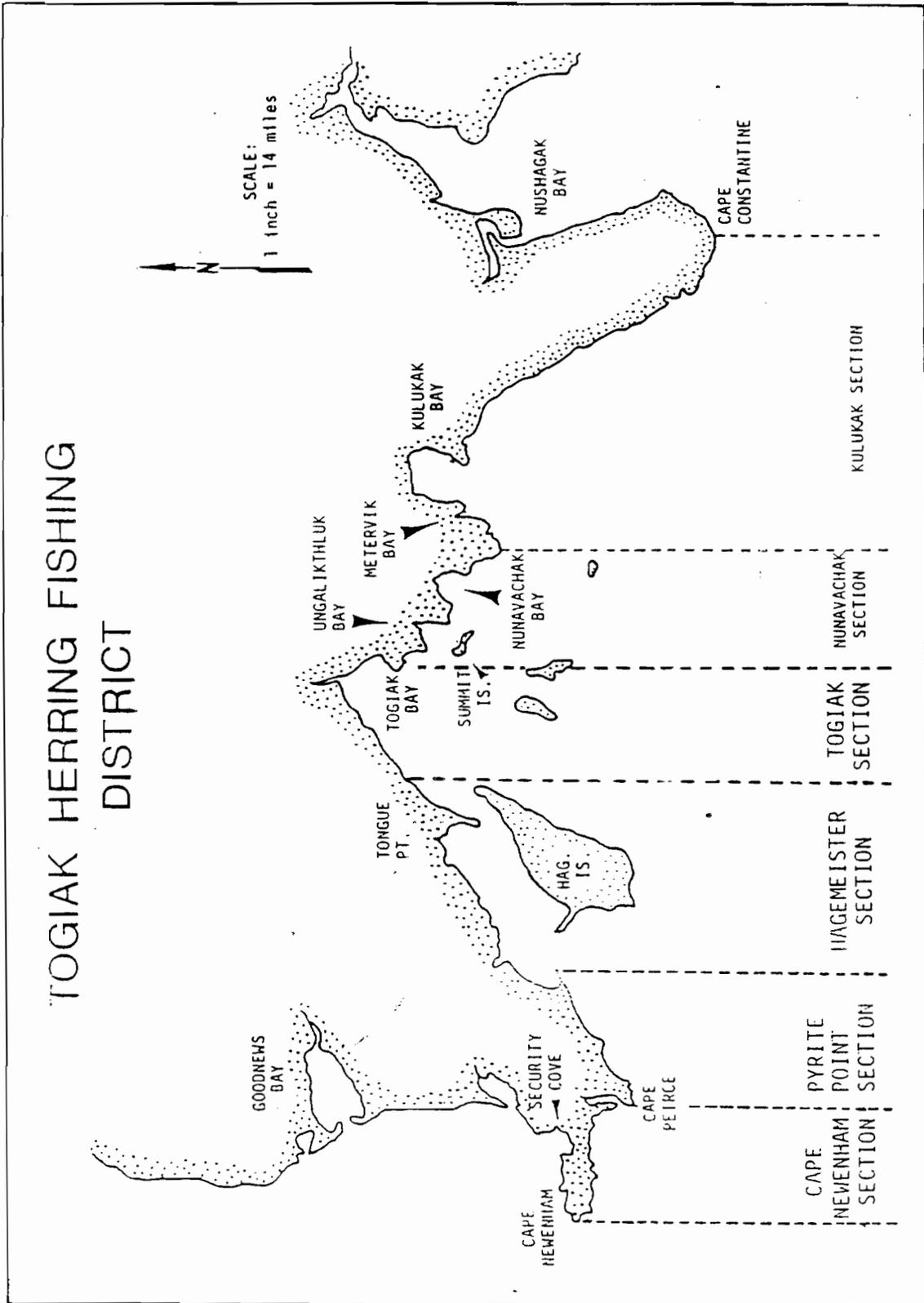


Figure 1. Togiak Herring Fishing District.

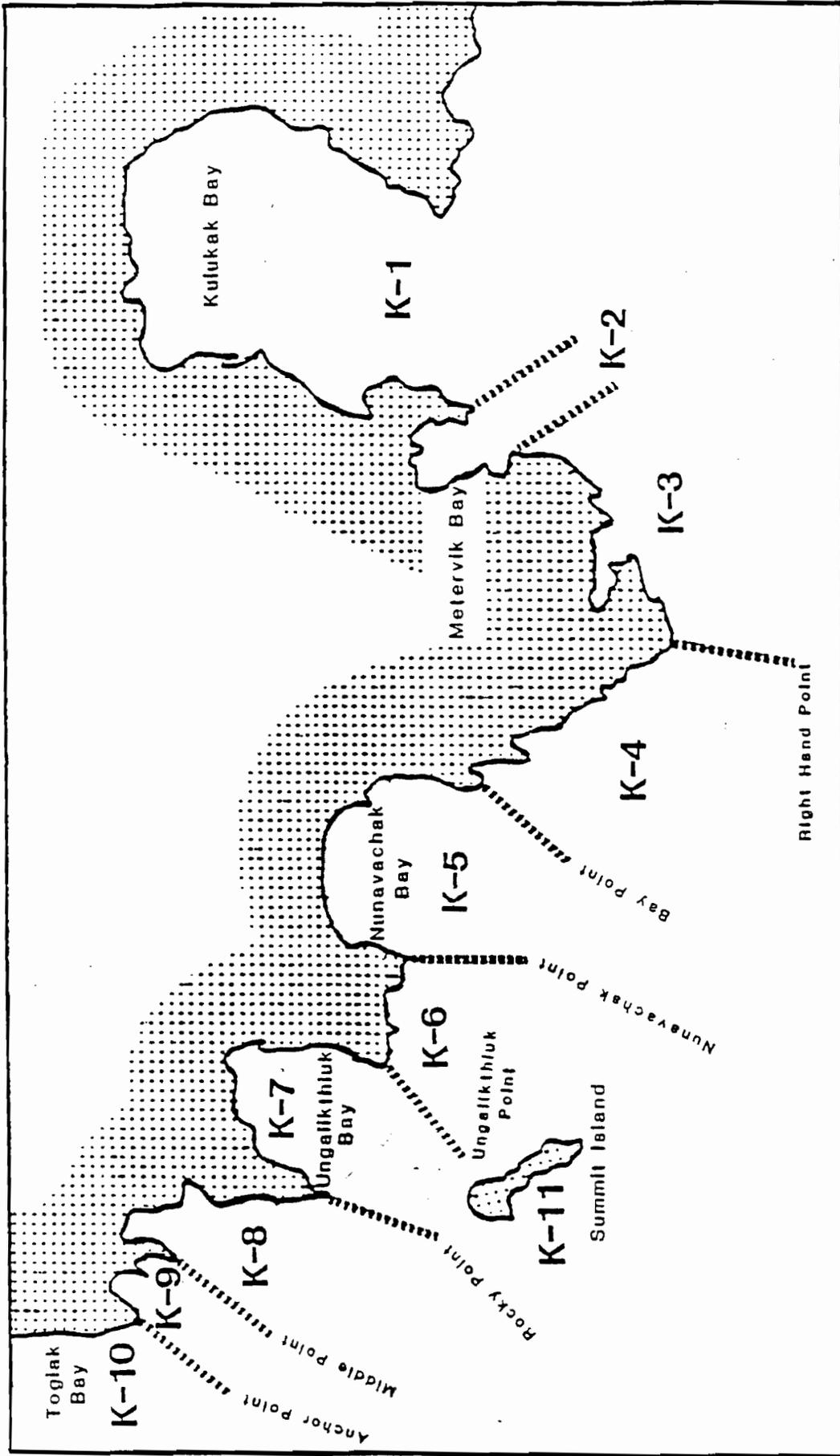


Figure 2. Togiak District Spawn on Kelp Management Areas, Bristol Bay (K-1 through K-11).

BRISTOL BAY
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APPENDIX

APPENDIX A. 5 AAC 27.865. BRISTOL BAY HERRING MANAGEMENT PLAN.

(a) When managing the Bristol Bay commercial herring fishery, the primary objectives of the department will be to prosecute an orderly and manageable fishery, while striving for the highest level of product quality with a minimum of waste.

(b) To ensure that no gear group is totally disadvantaged, the Board of Fisheries directs the department to take the following actions given the specified circumstances.

(1) when circumstances preclude the department from adequately assessing the biomass, the fishery shall be managed for an exploitation based on the pre-season projected return.

(2) The first commercial opening of the sac roe fishery must be for herring gill nets.

(3) Whenever possible, openings for both gear types must begin during the hours of daylight, and special consideration will be given to afford the maximum amount of daylight.

(4) The department may allow only one gear type to operate in an area during any open period.

(7) The maximum exploitation rate for the Bristol Bay herring stock is 20 percent. Before opening the sac-roe fishery, the department shall set aside approximately 1,500 short tons for the Togiak District herring spawn-on-kelp fishery, and seven percent of the remaining available harvest for the Dutch harbor food and bait fishery.

(8) After the spawn-on-kelp harvest and the Dutch Harbor food and bait fishery have been subtracted, the remaining harvestable surplus is allocated to the sac-roe fishery. The department shall manage for the removal of 25 percent of the surplus by the gill net fleet and 75 percent by the purse seine fleet.

(9) If a manageable separation of the year classes occurs, an exploitation rate of up to 20 percent may be allowed on the younger age herring (4 years or less), and no fishery will be considered if this recruit population is less than 20,000 short tons.

(10) Late season (post-peak) sac-roe openings must be based on one or more of the following criteria:

(A) a definable increase in the biomass of herring present on the fishing grounds;

(B) a major shift in the age composition of the herring in a definable biomass that is large enough to allow a harvest; and

(C) a major improvement in the roe maturity of fish sampled over a broad area, indicating the arrival of a quantity of new herring.

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