A MARK-RECAPTURE EXPERIMENT TO ESTIMATE THE ABUNDANCE OF KUSKOKWIM RIVER SOCKEYE, CHUM, AND COHO SALMON, 2003

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OEO/ADA STATEMENT

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ABSTRACT

Abundance of sockeye, chum and coho salmon was estimated in 2003 representing salmon upstream from Kalskag (approximately 309 river km (rkm)) on the Kuskokwim River using a two-part mark recapture experiment. Fish wheels and drift gillnets were used to capture, tag and recapture fish. Salmon were tagged with uniquely numbered spaghetti tags while a secondary mark was used to assess tag loss. At the Kalskag site, 1,349 sockeye, 8,395 chum, and 6,771 coho salmon were tagged. At the Aniak site, a total of 1,567 sockeye, 18,748 chum, and 17,251 coho salmon were inspected for tags or secondary marks of those 23 sockeye, 332 chum, and 170 coho salmon were recaptured, and 1,010 sockeye, 11,716 chum, and 11,374 coho salmon were tagged. Abundance estimates were 90,449 sockeye salmon (95% CI=54,842, 126,056; SE=18,167) using the Petersen estimator, 412,443 chum salmon (95% CI=351,765, 473,121; SE=30,958) using the Darroch estimator, and 849,494 coho salmon (95% CI=654,182, 1,044,806; SE=99,649) using the Darroch estimator.

Tags were recovered or observed at six escapement projects located upstream and downstream of the tagging sites. A total of 77 sockeye, 482 chum, and 1,511 coho tagged salmon were observed upstream of the tag sites and 6 sockeye, 14 chum, and 336 coho salmon were observed downstream of the tag sites. Cumulative percentages for tagged sockeye, chum, and coho salmon recovered at escapement projects above the tagging sites indicate that fish tagged earlier traveled further upstream than fish tagged later in the season. Travel speed of tagged sockeye, chum, and coho salmon recovered at upstream escapement projects were progressively faster for fish traveling further upstream.

KEY WORDS: Kuskokwim River, sockeye salmon, chum salmon, coho salmon, mark-recapture, abundance estimate, run timing, travel speed

INTRODUCTION

Kuskokwim River salmon stocks have been difficult to manage because numerous mixed stock assemblages among different salmon species overlap in run timing; and the drainage is large, remote, and geographically diverse. Although the river is the second largest in Alaska (Moody et al. 1986) and supports one of the largest and most important subsistence fisheries in the state (ADF&G 2001), research and management tools have been limited. A subsistence fishery occurs along nearly 1,174 river km (rkm) and includes approximately 1,011 households from 29 communities. Commercial fishing occurs in the lower 234 rkm of the river where 840 permits were issued under the state's limited entry program. Salmon spawn in over 28 navigable tributaries (Brown 1983) including the Kialik River, which is 3 km from the Kuskokwim River mouth to the uppermost headwaters approximately 1,498 rkm away (Burkey et al. 2001).

Ideally, fishery managers have preseason knowledge of salmon run abundance and can accurately assess stock specific run strength. From that knowledge they identify if there is a harvestable surplus above spawning requirements, then provide for the priority use of subsistence fishers throughout the drainage, and allow any remaining surplus to be allocated to other fishers (sport, commercial, and personal use). The gauntlet nature of this fishery, the necessity to spread harvest opportunity over much of the river, and the potential of differential exploitation especially between upper and lower river stocks increases the challenge to sustain the fisheries for all users. Currently, fishery managers do not forecast run abundance, monitor actual abundance in season, or have sufficient knowledge of run timing differences among stocks to evaluate the need to selectively target or protect individual stocks. Decisions to open and close fisheries are based on catch per unit effort (CPUE) trends from a gillnet test fishery operated near Bethel, CPUE and catch trends from commercial and subsistence fisheries, and select tributary escapement counts. Escapement requirements according to the state's Policy for Statewide Salmon Escapement Goals (5 AAC 39.223) have been identified for eight spawning locations for Chinook salmon *Oncorhynchus tshawytscha*, two spawning locations for chum salmon *O. keta*, and one spawning location for coho salmon *O. kisutch* (Buklis 1993). These escapement goals are generally the average escapement observed for each system in the past. Since catch by stock is unknown, traditional spawner-recruit analyses are not possible for individual tributaries.

To meet the challenge of sustainable management of salmon fisheries in the Kuskokwim River, drainagewide abundance and stock specific migratory timing is needed. Abundance estimates are needed pre-season, in-season, and as representative of actual spawning abundance (i.e. total abundance minus total harvest equals spawning escapement). Drainagewide abundance, when coupled with a drainagewide escapement goal, would allow managers to identify a harvestable surplus. Stock specific migratory timing information is also needed to evaluate stock timing differences and to determine if stocks may be differentially harvested through time. Harvest strategies must be evaluated and exploitation rates calculated. A goal of sustainable management is to include escapement counts with adequate distribution throughout the drainage.

This project was designed to provide additional information necessary for managing the fisheries by estimating the total abundance of sockeye, chum, and coho salmon in the Kuskokwim River upstream from Kalskag using mark-recapture techniques and is a continuation of a project began in 2001. Fish wheels and drift gillnets were used to capture adult salmon for marking near the middle river villages of Kalskag and Aniak. Marked fish were recovered at the Aniak fishing site and at upriver tributary escapement projects (Figure 1). Use of uniquely numbered spaghetti tags provided information on migratory timing in the mainstem for salmon stocks spawning in tributaries with existing salmon enumeration projects.

Background

The following narrative reviews the background and history of fisheries within the Kuskokwim River, previous salmon mark-recapture experiments, current methods used to evaluate salmon escapement and the results and present funding status of the current Kuskokwim River mark-recapture project.

Targeted Species: Chum salmon is the second most important species in the commercial and subsistence harvest. Coho salmon is the most important commercial species (Burkey et al. 2001) and Chinook salmon is the most important subsistence species (Coffing et al. 2001). In 2000, Kuskokwim River chum salmon were listed as a stock of concern under the Policy for Management of Sustainable Salmon Fisheries (5 AAC 39.222) because of the chronic inability of managers to maintain expected harvest and escapements levels (Burkey et al. 2000). No commercial fishing has occurred for chum salmon since 1999 and a subsistence-fishing schedule of 4-days per week was established in 2001. The United States Congress identified Kuskokwim River coho salmon in the fishery disasters declared in 1997 and 1998. Although sockeye salmon *O. nerka* were not listed as a stock of concern, escapement levels for these species are virtually unknown and remain a concern to managers.

Escapement Monitoring: Weirs are currently operated on six major tributaries of the Kuskokwim River and a sonar-counting project is operated on a seventh (Figure 1). A weir on the Kogrukluk River indexes the Holitna River stock, and has annual escapement data dating back to 1976 (Baxter 1976, Gilk et al. 2004). The Kogrukluk River weir is approximately 88 rkm upriver from the mouth of the Holitna River and 750 rkm from the mouth of the Kuskokwim River. Adult salmon take approximately three to four weeks to pass the weir from the mouth of the Kuskokwim River. The Kogrukluk River drainage is the only system with a weir escapement goal for chum, coho, and Chinook salmon. However, because of the lag time between their arrival at the weir and the commercial and subsistence fisheries, its value to managers for opening and closing fisheries is limited during the early portion of each run.

In addition to the Kogrukluk River weir, a Chinook, chum and coho radio telemetry study was initiated near the Holitna River mouth in 2001 (Chythlook and Evenson 2003), but in 2003, coho salmon were eliminated from the study (Stroka and Brase *In press*). Since the mid 1990s, five additional weirs were established to better quantify escapement and run strength. These weirs are located on the following tributaries: Kwethluk River (Harper and Watry 2001), Tuluksak River (Harris and Harper 2001), George River (Linderman et al. 2004b), Tatlawiksuk River (Linderman et al. 2004a), and Takotna River (Gilk and Molyneaux 2004). A sonar project on the Aniak River is used to index chum salmon escapement, the dominant salmon species migration during this period (Sandall *In press*). An escapement goal has been set for chum salmon in the Aniak River.

Abundance Estimates: For many years researchers and managers recognized the importance of migratory timing information, travel speed, and abundance estimates for adult salmon returning to spawn. Numerous tagging projects have been conducted on large river systems such as the Kuskokwim and Yukon Rivers where gauging run strength is complex. Early mainstem tagging projects on the Kuskokwim and Yukon Rivers were not designed to estimate abundance and had limited success. In the 1960s, tagging studies were conducted on the Kuskokwim River (ADF&G 1961a, 1962a, 1966) and the Yukon River (ADF&G 1961b, 1962b, 1964, 1969). Distance traveled by tagged fish and the number of days between release and recapture were calculated from these data, but stock-specific information was lacking. The primary deficiencies of these studies were the inability to tag adequate numbers of fish and the absence of tributary projects to recover tags. No stock-specific mark and recovery data were available. The greatest number of tags deployed during this period was 362 Chinook salmon tags on the Kuskokwim River (ADF&G 1966).

More recently, researchers tried to characterize migration-timing differences among chum salmon stocks in the Kuskokwim River. In 1995, the Bering Sea Fishermen's Association funded a radio telemetry study for chum salmon (Parker and Howard 1995) with the objective of identifying temporal differences in the migration timing as they passed through the lower river commercial fishing districts. The project fell short in reaching this objective because too few chum salmon were tagged and receiver stations failed.

Progress has been made over the years with mark-recapture techniques. From 1982 to 1985 on the Susitna River, Barrett et al. (1984a and 1984b) demonstrated that large numbers of adult salmon could be tagged and recovered using fish wheels, supplemented by tributary monitoring for mark to unmarked data. The Susitna River is the fifth largest river in Alaska and supports large runs of Chinook, chum, sockeye, coho, and pink salmon.

Improvements in tagging techniques, fish handling and capture gear, coupled with advances in estimation modeling and model testing (Schwarz and Seber 1999) allow researchers to effectively estimate the population size of adult salmon migrating up large rivers. Population estimates were calculated for Chinook salmon in the lower Yukon River (Spencer et al. 2002) and the Yukon River at the border with Canada (Johnson et al. 2002), Keta River (Brownlee et al. 1999), Kenai River (Hammarstrom and Hasbrouck 1998, 1999), Taku River (McPherson et al. 1998), Stikine River (Pahlke and Etherton 2000), Copper River (Evanson and Wuttig 2000), and recently the Holitna River (Wuttig and Evenson 2002, Chythlook and Evenson 2003, Stroka and Brase *In press*). Chum salmon abundance was estimated for the upper Tanana River (Cappiello and Bruden 1997, Cappiello and Bromaghin 1997, Cleary and Bruden 2000, Cleary and Hamazaki 2002), the upper Yukon River (Underwood et al. 1998), and the Yukon River at the border with Canada (JTC 2002). These Yukon River projects provide inseason estimates of chum salmon and use fish wheel release and recovery methods. Coho salmon abundance has been estimated using mark-recapture techniques on the Kenai River (Carlon 2000), Chilkat River (Ericksen 1999), Steep Creek (Jones and McPherson 1997), Unuk River (Jones et al. 2001), and Holitna River (Wuttig and Evenson 2002, Chythlook and Evenson 2003, Stroka and Brase *In* *press*). This list is not meant to be exhaustive but reflective of the successful application of the technique in large rivers in Alaska.

Kuskokwim River Mark-Recapture Project: Following declaration of the 1997 and 1998 fisheries as disasters in Bristol Bay, and in the Kuskokwim and Yukon Rivers, Congress appropriated $7 million to develop a disaster research and prevention plan. The resulting Western Alaska Salmon Fisheries Disaster Mitigation Research Plan (WASFDP) (ADF&G 1999) recognized the critical importance of healthy western Alaska salmon runs to area residents. Chum, Chinook and coho salmon of the Kuskokwim River were all considered vitally important. Through the WASFDP grant, $495,000 was awarded to the ADF&G to specifically estimate abundance and migratory timing characteristics of Kuskokwim River coho salmon using mark-recapture techniques.

The WASFDP was revised in 2001 and redirected Kuskokwim River mainstem sonar project funds (Eggers 2001) toward additional mark-recapture studies for Chinook, chum, and sockeye salmon. These species were included because of their importance to subsistence and commercial fishers, their recent declines in abundance, and the shortage of information available to fisheries managers. ADF&G Division of Sport Fish has been responsible for estimating the abundance of Chinook salmon in the mainstem, and the Commercial Fisheries Division has been responsible for chum, coho, and sockeye salmon. In 2002, the state's general funds designated for the *Kuskokwim River Sonar* were redirected to support the coho, sockeye, and chum salmon mark recapture project. In June of 2003, funding from the WASFD grant ended, but replacement funds were awarded through the Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative (AYK-SSI) and United States Fish and Wildlife Service (USFWS) Office of Subsistence Management (OSM).

The first year of operation (2001) assessed the feasibility of the project. ADF&G and the Kuskokwim Native Association worked together to design and construct four fish wheels, select fish wheel sites, select a field campsite near Aniak, and organize logistics for tag recovery. In this feasibility year, we successfully tested the success of various fish wheel sites, configurations, and gillnet drift locations (Kerkvliet and Hamazaki 2003). We investigated tag recovery methods at weir sites and conducted a tag recovery lottery. During the first year, 3,027 coho salmon were tagged at both sites 1,291 at Kalskag and 1,736 at the Aniak site (Figure 2). Only 13 coho salmon tagged at Kalskag were recovered upriver at the Aniak site. Personnel at the George, Kogrukluk, Tatlawiksuk, and Takotna River weirs recovered 214 tags. A coho salmon abundance estimate was not calculated from the Kalskag/Aniak data set because of low tag recoveries, or the pooled Kalskag/Aniak data set and upriver escapement projects because recovery rates were significantly different among weir recapture sites. Run timing results using cumulative percentage of recovered coho salmon above the tag sites suggested fish entering the river early enter tributaries further upstream than fish entering later. This result supported Traditional and Ecological Knowledge (TEK). Differences in travel time were also detected from tag recoveries at escapement projects. A significant difference in travel speed was found between coho salmon tagged earlier, which traveled slower than those tagged later in the run.

In 2002, the scope of the project increased to include sockeye, and chum salmon (Kerkvliet et al. 2003). Because we were unable to estimate abundance of coho salmon in 2001, we increased our drift gillnet effort in 2002 to improve the project design. Only 270 sockeye salmon were tagged at the Kalskag site compared to 7,822 chum, and 2,824 coho salmon, while 404 sockeye, 12,504 chum, and 4,148 coho salmon were tagged at the Aniak site. Of the fish tagged at Kalskag 5 sockeye, 279 chum, and 51 coho salmon were recovered at the Aniak site. The criteria of sampling in proportion to the run were met using the Kalskag/Aniak data set for chum and coho salmon but were undetermined for sockeye salmon. The small sockeye salmon run is considered the leading cause in our inability to recover adequate numbers of tagged salmon to estimate the population size. Similar to 2001 results, we could not use the pooled Kalskag/Aniak data set and upriver escapement projects to estimate abundance because recovery rates were significantly different among weir recapture sites.

Temporal differences in tag recovery were observed at the Aniak site in 2002 for chum and coho salmon using the Kalskag/Aniak data set. Through use of the Darroch estimator and data stratified through time an acceptable estimate was achieved. The population estimate of chum salmon upstream from Kalskag was 675,659 (95% CI=559,564, 791,755; SE=59,232). The population estimate of coho salmon upstream from Kalskag was 316,068 (95% CI=193,877, 438,259; SE=62,342).

Similar to 2001, in 2002 run timing results using cumulative percentages of tagged sockeye, chum, and coho salmon recovered at escapement projects indicated fish tagged earlier traveled further upstream than fish tagged later in the season (Kerkvliet et al. 2003). Furthermore, in 2002 data showed that chum and coho salmon traveling speed increased as distance from the tag site increased.

Objectives

The 2003 project builds on the work conducted in prior years. In 2003, we made improvements in field operations based on past results. The 2003 objectives were selected to provide managers a tool in making informed decisions toward sustainable fisheries management.

1. Estimate abundance of sockeye, chum, and coho salmon in the Kuskokwim River upstream of Kalskag, (rkm 309) with a relative precision (coefficient of variation) of +/- 20% or less.
2. Estimate run timing of stocks passing the Kalskag and Aniak sites using recaptures from tributary escapement projects.
3. Estimate mean travel speed of sockeye, chum, and coho salmon tagged at the Kalskag and Aniak sites through recoveries at the upstream escapement projects.

METHODS

Study Design: This study was designed to allow two opportunities to estimate the population size using mark recapture methods. The first mark-recapture opportunity was between marking at Kalskag (309 rkm) and recovery at Aniak (336 rkm) on the Kuskokwim River (Figure 1). The second opportunity for estimation was between the Kalskag/Aniak tag sites and upstream escapement projects. The approximate rkm from the Kalskag/Aniak tagging sites to upstream escapement projects are: Aniak River Sonar (78/51), George River weir (166/139), Kogrukluk River weir (423/396), Tatlawiksuk River weir (283/256), and Takotna Rivers weir (564/537).

The Kalskag and Aniak tagging sites were selected because: (1) they were located far enough inland (approximately 300 rkm) where anadromous fish should be physiologically adjusted to the freshwater environment; therefore, more tolerant of capture and tagging stresses; (2) harvest of tagged fish would be reduced, because they were located above Bethel, where approximately one-third of the drainagewide harvest occurs; (3) the sites are below many salmon spawning streams; (4) the water velocity was adequate for fish wheel operation; and (5) the distance between the two sites was assumed to be far enough that the tagged fish would mix with untagged fish.

Project Dates: Fish wheels and drift gillnets were used for capturing salmon from June 6 to September 8 at the Kalskag site and from June 6 to September 10 at the Aniak site. Tag recovery at upstream escapement projects occurred from June 27 to July 31 at the Aniak River sonar site, July 1 to September 19 at the George River weir, June 22 to September 20 at the Kogrukluk River weir, and from July 5 to September 20 at the Takotna River weir. The Tatlawiksuk River weir did not operate in 2003 because high water washed it out in early July.

The start and end dates of field operations were selected to ensure sampling occurred throughout the migration of sockeye, chum, and coho salmon past the Aniak and Kalskag tagging sites. The start date needed to be before significant passage of chum and sockeye salmon whose run timing precedes that of coho salmon. The 2003 project was started earlier than in 2002. In 2002, we began fishing on June 14 at the Aniak site and June 18 at the Kalskag site, and expected low catches based on historic Bethel Test Fish data (Ward et al. 2003) and on local TEK. However, when fishing began, chum salmon had already been passing the tagging sites and their numbers were building (Kerkvliet et al. 2003). Because of the catches observed initially in 2002, we started 8 days earlier (June 6) in 2003.

The end dates for field operation were selected to sample coho salmon near the end of the run, while allowing ample time for coho salmon to reach upstream escapement projects. Researchers are aware that estimating the entire coho salmon return was unrealistic because coho salmon continue their migration into the fall perhaps even after the river has froze, which is a typical characteristic for coho salmon (Carlon 2000; Jones and McPherson 1997; Jones et al 2001; Ericksen 1999). However estimating coho salmon stocks vulnerable to harvest was considered an achievable goal. To this end, we selected project end dates (September 8, 10) to encompass coho salmon stocks vulnerable to harvest by using ending dates at upriver escapement projects, travel speed, and harvest pressures. Upriver weir operations generally cease by September 20 because it is thought most of the coho salmon escapement has been counted by that time. In years when weirs have operated beyond September 20, the counts of coho salmon have accounted for only 0.1 to 2.1% of the return (Ward et. al. 2003). To allow enough time for tagged coho salmon to reach upriver escapement projects, we used travel time information from 2001 and 2002 results (Kerkvliet and Hamazaki 2003; Kerkvliet et. al. 2003). Subsistence, commercial, and sport fisher activities decline in September when most subsistence needs are met, commercial openings are rare, and sport fishing activities are reduced.

Capture Methods

Fish Wheels

Four fish wheels were used to capture salmon for tagging. One pair (right and left bank) was anchored upstream from Kalskag (309 rkm) and the second pair downstream from Aniak (336 rkm). Right bank wheels were defined as wheels anchored on the right side of the river when facing downstream. Each fish wheel consisted of three aluminum capture baskets measuring 2.4 × 3.0 m (length, width), a perforated plywood live box measuring 2.4 × 1.2 × 0.6 m (length, width, depth) attached to the offshore side of each wheel, and a weir (length ~ 5 m) positioned perpendicular to the bank along the onshore side of each fish wheel.

Fish wheels were operated continuously, except for periods of maintenance, re-adjustment, or re-location. Two crews, consisting of two people, were assigned to work a 7.5-hour shift each day. During each shift, a crew sampled fish from each wheel approximately every 2 hours. However, between shifts, fish were held longer than 2 hours. Initially, two shifts ran from 0600 to 1400 hours and from 1800 to 0020 hours. As the season progressed and daylight hours shortened, the schedule was progressively adjusted until by the end of the season they ran from 0800 to 1600 hours and 1600 to 2400 hours.

Drift Gillnets

Drift gillnets were used for tag deployment at the Kalskag and Aniak site to intercept stocks less vulnerable to fish wheel capture. For tag deployment, drifting was conducted between fish wheel checks at the Kalskag and Aniak sites. At the Kalskag site, gillnetting for tag deployment was conducted from June 11 to September 8. At the Aniak site, tags were deployed intermittently because of high fish wheel catch rates. Tags were deployed from June 15 to July 8, July 10 to July 15, July 27 to July 30, and on August 15, 18, and 29.

Drift gillnets were used for tag recovery at the Aniak site to intercept stocks less vulnerable to fish wheel capture and to mitigate the sampling bias created by the sites proximity to the Aniak River. A fulltime drift gillnet crew was stationed at the Aniak site specifically to recover tags. Drifting for tag recovery was conducted from June 11 to September 8. However, from July 21 to July 24, and August 20 and 24 gillnetting was suspended so the crew could assist fish wheel crews. The tag recovery crew worked a 7.5-hour shift each day. Initially their shift ran from 1800 to 0020 hours, but as the season progressed and daylight hours shortened, the schedule progressively adjusted until at the end of the season the two shifts ran from 0800 to 1600 hours and 1500 to 2400 hours.

Drift gillnet locations were identified at the Kalskag and Aniak site. Locations were chosen based on capture success and to characterize salmon not vulnerable to fish wheels. Therefore drifting typically occurred further offshore from fish wheels. At both sites, 6 drift locations were primarily used. A mesh size of 4-in (10.16 cm) was used for gillnetting. Gillnets measured 45 meshes deep and were either 15 fathoms or 25 fathoms in length. The net length was based on catch rates; 15-fathom nets were used when catch rates were high. Crews deployed the nets from an 18-ft or 20-ft skiff, and immediately began retrieving the net at the first sign a fish was entangled.

Fish captured by the tag deployment crews were processed in the following way. Species other than chum, sockeye, or coho salmon were immediately released. Target species were freed from the net and lifted into the skiff where they were placed into a tub of fresh river water, then tagged, and released. When too many target species were caught, excess fish were immediately released without tagging. Target species captured by the recovery crew at the Aniak site were placed into a tub and were inspected for tags and secondary marks, and then released.

Tagging

Tagging consisted of one primary and one secondary mark. The primary mark was a 36-cm spaghetti tag reinforced with jeweler wire. Each tag had a unique identification number and the phone number of the ADF&G Anchorage office. Four tag colors were used on this project: fluorescent pink for salmon caught by fish wheels and blue for salmon caught by drifting at the Kalskag site, fluorescent green for fish caught by fish wheels and white for fish caught by drifting at the Aniak site. Each tag was sewn through the back just below the dorsal fin and about four rays up from the posterior side of the dorsal fin. It was secured by crimping both ends of the spaghetti tag together in a brass sleeve.

The secondary mark was a hole-punch through the adipose fin. The secondary mark was a paper punch to cut a hole in the adipose fin. Secondary marks were used to assess tag loss. Non-salmon bycatch and unhealthy salmon were identified, counted, and then released without a tag.

Salmon selected for tagging were placed in a padded aluminum cradle suspended in a tub filled with river water. The amount of data collected on each tagged fish depended on catch rates. Initially crews recorded lengths on each target species, but as catches increased, only lengths on every n^{th} fish were taken. When catch rates were low, the following data were recorded: mid-eye to–fork (MEF) length measured to the nearest 5 mm, sex (determined from external characteristics), injuries (e.g., snout damage, split fins, net marks, lamprey wounds, and seal bites), and skin color which indicated spawning condition (i.e., bright silver, silver-pink, dark-pink, dark red). As catches increased, fewer lengths were collected and sex determination was eliminated. On July 16, lengths from only five fish for each target species were taken. The purpose of eliminating length measurements was to increase the number of fish tagged within the two-hour sampling block.

At the Kalskag site, all sockeye, chum, and coho salmon were tagged with spaghetti tags with the exception of fish that escaped during handling, were determined unhealthy, close to spawned out, or spawned out. Crews at the Aniak site also tagged only healthy sockeye, chum, or coho salmon. However, when catches were high, crews at the Aniak site were unable to empty a live box within two hours. The fish remaining in the live box were inspected for tags and secondary marks, counted, and then released untagged.

Tag Recovery

Tagging Site

Tag recovery occurred at the Kalskag and Aniak tagging site using fish wheels and gillnets. However, the Aniak site was identified as the recovery event for the Kalskag and Aniak data set. Crews recorded date, tag number and tag color for all recovered fish. Tag loss was assessed at the Kalskag and Aniak sites by examining untagged salmon for secondary marks.

Escapement Projects

Six escapement projects within the drainage recovered tags from the Kalskag and Aniak sites (Figure 1). Of the escapement projects, two were located downstream of the tagging sites, and four were located upstream. The downstream escapement projects were located on the Tuluksak and Kwethluk Rivers (lower basin), and the upstream escapement projects were located on the Aniak, George, and Kogrukluk Rivers (middle basin), and the Takotna River (upper basin). The Aniak River sonar crew captured tagged fish in gillnets while weir crews captured tagged fish as they passed through the weir. Fish were described as “recovered” when crews were able to capture the fish and record the tag number, or “observed” when crews could not capture tagged fish because of high water or capture difficulties; they recorded tag color and date observed. Crews recorded recapture date and tag number from each recaptured fish. Tag loss was identifiable by an untagged salmon with a secondary mark. Tag loss was assessed at the weir sites by inspecting untagged fish during routine age-sex-length sampling (ASL). For further details of the weir and sonar operations, see Linderman et al. (2004a, 2004b); Gilk and Molyneaux (2004); and Sandall (*In press*).

Volunteer Tag Recoveries

Tagged fish were often caught by subsistence, commercial and sport fishers who were encouraged to return tags through a tag lottery reward system advertised through posters, radio announcements, and public meetings. Fishers willing to participate in the lottery could provide tag information by calling an Anchorage ADF&G Regional Office toll free phone number, call or visit the ADF&G Bethel office, any Kuskokwim River tribal offices, the Kuskokwim Native Association, or the Yukon Delta National Wildlife Refuge office. Recovery data were recorded on paper forms then entered into an Access database postseason. Tag numbers were matched to the 2003 data set, but if a tag number did not match the 2003 data set, it was checked against the 2002 data set. Tag returns from the 2002 data set were censured from further data analysis.

Data Analysis

Mark Recapture Assumptions

Equality of marked proportions was tested between right and left bank fish wheels using a two-sample binomial test. A non-significant binomial test would indicate equal recapture rates and the data from the wheels could be pooled. The combined marked proportion was then compared to the marked proportion in gillnets using a two-sample binomial test. Again, a non-significant binomial test would indicate the data from the fish wheels and gillnets could be pooled.

The general requirements for an unbiased estimate from a two-event mark-recapture experiment on a closed population are:

1. handling and holding of salmon in fish wheel live boxes did not affect recapture success;

2. tagged fish did not lose their marks between sampling events;

3. no immigration of unmarked fish; and,

4. every fish had an equal probability of being tagged during the first sampling event, or every fish had an equal probability of being recaptured during the second sampling event, or marked fish mixed completely with unmarked fish between sampling events.

Assumption 1

The number of fish in the live box at time of sampling was evaluated to determine if crowding had an effect on recapture success. For this analysis, two different explanatory variables were calculated. First, a variable called crowding was calculated as the total number of fish removed from the live box during a sampling period. Second, a variable called crowding time was calculated as the ratio of crowding and holding time with holding time calculated as the difference between the time (hour/minute) the crew started and finished sampling the live box during one sampling period. The effect of each explanatory variable on probability of recapture for tagged salmon was evaluated independently. Probability of recapture was modeled as a binomial random variable. The parameters of each model were estimated using the Logistic procedure of SAS version 8.02 (SAS Institute Inc. 1999).

Assumption 2

Tag loss was evaluated at the Kalskag and Aniak site by visual inspection for secondary marks on all salmon. This same procedure was incorporated into the age-sex-length (ASL) protocol at upriver escapement projects where ASL sampled salmon were examined for secondary marks. To increase sample size, 2002 and 2003 data were pooled.

Assumption 3

To meet the third assumption and ensure that all fish had a non-zero probability of being tagged at Kalskag and recaptured at Aniak or upriver escapement projects, tagging was conducted between June 6 and September 10. The beginning date was chosen so that few or no salmon would be caught initially and the ending date was chosen so that salmon catches would have waned to no or to a few fish daily. This is consistent with a salmon life history centered about a seasonal migration. These range of dates ensured that nearly all sockeye and chum salmon had a non-zero probability of capture at project tagging sites. This was not the case for coho salmon because of the prolonged coho salmon migration. Therefore determining the abundance of the entire coho salmon is not feasible; however, the abundance of vulnerable coho salmon stocks is feasible.

Assumption 4

To ensure equal probability of capture in the first tagging event fish must be tagged in proportion to daily abundance. If this goal is achieved the tagged-untagged ratio in the second sampling event would be constant over time. A chi-squared test of homogeneity was used to test the hypothesis that marked proportion recaptured in the second sampling event was constant over time.

To examine the assumption of equal recapture probability for an abundance estimate using tributary recovery data, the tagged-untagged ratios were compared among upriver tributary recovering sites (weirs and sonar). A Chi-square test of homogeneity was used to test the hypothesis that probability of recapture was constant among recovery sites.

To evaluate the hypothesis that all tagged fish mix equally with untagged fish a Chi-squared test of independence was used to test the assumption of equal mixing between gillnets and right and left bank fish wheels.

Mark-recapture models assume homogeneous probabilities of capture in at least one of the capture events (Seber 1982). Since fish wheels are often thought to be selective for fish length, a logistic regression model was used to examine the presence of statistical association between fish length and probability of recapture.

Logistic regression model was constructed as:

$$p = e^y/(1 + e^y)$$

where p is a recapture events (1: recapture, 0: non-recapture) and
$y = a_0 + a_1$*body length (mm).

In this analysis, all tag and recapture (right bank, left bank, gillnet) data were combined, and Proc Logistic procedure of SAS (SAS Institute Inc. 1999) was used.

Abundance Estimate

To determine if data from fish wheels and gillnets could be pooled equality of recapture proportions were tested between right and left bank fish wheels using a two-sample binomial test. A non-significant binomial test would indicate equal recapture rates and the data could be pooled. First, data from the wheels was evaluated and pooled where appropriate. The combined marked proportion was then compared to the marked proportion in gillnets using a two-sample binomial test. Again, a non-significant binomial test would indicate data from the fish wheels and gillnets could be pooled.

If the above assumptions were met, a modification of the Petersen estimator (Seber 1982) was used to estimate abundance and estimate its variance:

$$\hat{N} = \frac{(C+1)(M+1)}{R+1} - 1$$

$$v[\hat{N}] = \frac{(M+1)(C+1)(M-R)(C-R)}{(R+1)^2 (R+2)}$$

where:
$\hat{N}$ = estimated abundance of salmon in the Kuskokwim River upstream from Kalskag;
M = the number of salmon tagged at Kalskag;
C = the number of salmon examined at Aniak; and,
R = the number of tagged salmon recovered at Aniak.

When the tagged-untagged ratio differed temporally, a Darroch Estimator (Seber 1982) was used instead with "Darroch's" estimates of abundance, SE, and 95% CI were obtained by using the Maximum Likelihood estimates of the SPAS (Arnason et al. 1996).

$$\hat{U} = u' M^{-1} a ,$$

$$u = \begin{bmatrix} u_1 \\ \vdots \\ u_j \\ \vdots \\ u_t \end{bmatrix} \qquad a = \begin{bmatrix} a_1 \\ \vdots \\ a_i \\ \vdots \\ a_s \end{bmatrix} \qquad M = \begin{bmatrix} m_{11} & \cdots & m_{1j} & \cdots & m_{1t} \\ \vdots & \ddots & & \iddots & \vdots \\ m_{i1} & & m_{ij} & & m_{it} \\ \vdots & \iddots & & \ddots & \vdots \\ m_{s1} & \cdots & m_{sj} & \cdots & m_{st} \end{bmatrix}$$

where:
$\hat{U}$ = the estimated abundance of untagged fish in the population at the Kalskag site;
u_j = the number of untagged fish in the j-th stratum at the Aniak;
a_i = the number of tagged fish released in the i-th stratum at Kalskag; and,
m_{ij} = the number of tagged fish released in i-th stratum at Kalskag and recaptured in the j-th stratum at the Aniak

Run Timing

During periods of peak migration the sampling crews were not able to tag all healthy salmon captured in fish wheels. To account for these temporal differences in the tagging rate each recapture fish was weighted. Weights were calculated by dividing the daily total catch for a species by the daily number of target species tagged. By using the weighted value for each recaptured salmon, the value of a recapture salmon would be greater for days when not every fish was tagged. The weight for each recaptured was used to calculate median tag dates and cumulative catch curves.

$$Weight = \frac{x_i}{t_i}$$

where:
i = day
x = the number of fish captured by species.
t = the number of fish tagged by species.

Travel Speed

Travel speed (rkm/day) for each tagged salmon was calculated as the difference in rkm between the location of capture for tag placement and location of tag recovery divided by the number days between time of release from the tagging site and recapture event. Travel speeds were calculated from the Kalskag fish wheel to Aniak fish wheel, and from each tagging site to upriver escapement projects, this ratio was calculated for the purpose of stock comparison. Travel speed does not presume salmon actually travel this speed. It assumes a point-to-point path to the recovery location and no response to handling, downstream or meandering movements. Again, by comparing between recovery locations any non-point to point travel is assumed constant among stocks.

Modeling travel speed as a gamma random variable using a generalized linear model completed evaluation of variables effecting travel speed. Both fish tagged from fish wheels and gillnets were used in this analysis. Explanatory variables considered for inclusion in the model included Julian date, total travel distance and length. The parameters of the model were estimated using the Genmod procedure of SAS version 8.02 (SAS Institute Inc. 1999). Analysis began by fitting a full model including all the explanatory variables and interactions. The non-significant terms were eliminated in a stepwise fashion starting with the highest order interactions. This procedure continued until all remaining terms were statistically significant. If an interaction was found to be significant, the main effects related to that interaction were not removed from the model.

RESULTS

Sockeye Salmon

Tag Deployment

Fishing for sockeye salmon with gillnets and fish wheels began June 6th but the first sockeye salmon was not captured until June 13th (Appendix A). A total of 2,359 sockeye salmon were tagged; 1,349 fish were tagged at Kalskag and 1,010 at the Aniak site (Table 1; Appendix A). At both sites, more sockeye salmon were caught in the left bank fish wheels. The peak catch per unit effort (CPUE) occurred from July 1 to July 5 at Kalskag, and July 9 to July 13 at Aniak (Figures 3, 4, 5). Daily catches dropped to less than five sockeye salmon per day at Kalskag in August. Though sockeye salmon were present until September 7th, the catch after July 31st represented only 3.7% of the season's total. Sockeye salmon were present in catches at Aniak through mid-August.

Crews tagged 92% (1,349/1,462) of the sockeye salmon captured in fish wheels and gillnets at the Kalskag site (Table 1; Figure 6). At the Aniak site, crews were unable to tag all healthy sockeye salmon captured in fish wheels because of increasing chum salmon catches. Even so, crews tagged 89% (841/947) of the sockeye salmon caught in fish wheels (Table 1; Figure 7). The tag deployment gillnet crew tagged 89% (169/189) of the sockeye salmon captured in drift gillnets at the Aniak site (Table 1).

Tag Recovery

Tagging Sites

A total of 16-tagged sockeye salmon were recaptured at Kalskag, 8 of these fish originated from Kalskag and 8 from the Aniak site (Table 1; Appendix A1). There were 49-tagged sockeye salmon recaptured at the Aniak site, 23 originated from the Kalskag site and 26 from the Aniak site (Table 1; Appendix A2). Of the sockeye salmon tagged in Kalskag then recaptured at the Aniak site, 65% (n= 15) were captured and recaptured in fish wheels on the same bank, 17% (n=4) were captured and recaptured on the opposite bank, 13% (n=3) were captured and recaptured in gillnets, and 4% (n=1) were captured and recaptured using a combination of gillnets and fish wheels (Figure 8).

Weir Sites

A total of 83-tagged sockeye salmon were recovered or observed at escapement projects (Table 2). Of the 2,359 tags deployed, 0.3% (n=6) were recaptured/observed downstream of the tagging sites, and 3.4% (n=77) upstream with the Kogrukluk River weir accounting for 74 of the recaptured/observed fish. A higher percentage of sockeye salmon tagged at the Kalskag site (3.5%) were recovered at the Kogrukluk River weir than from the Aniak site (1.8%; Table 3).

Bank orientation of sockeye salmon at the tagging sites is indicated through recoveries at the weirs (Table 3; Figure 9, 10). Tag recoveries were lowest at the Kogrukluk River weir for fish tagged from left bank fish wheels at both tag sites. Most noticeable are zero recoveries from the left bank Aniak site. At the Kogrukluk River weir the high recoveries of sockeye salmon originated from Kalskag's right bank fish wheel (4%), gillnets (4%), and from Aniak's right bank fish wheel (4.7%).

Voluntary Tag Recoveries

There were 37 tags returned from subsistence, commercial and sport fisheries (Table 4; Appendix B). Of the 2,359 tags deployed, <1% (n=11) were recovered below the tagging site and 1% (n=22) above. Most of the 22 tags returned above the tagging sites were recovered on or near the Aniak River (n=11) and from the Stony River drainage (n=6). Of those recovered downstream, two were from the commercial fishery outside the Kuskokwim River near Quinhagak.

Abundance Estimate Diagnostics

Assumption 1, Effects of Crowding and Crowding/Time

There was an increased recapture probability for sockeye salmon tagged at the Kalskag site and recaptured at the Aniak site as the number of fish held in the live box increased (Chi-square=4.6228, df=1, P =0.0315) but there was no significant difference in recapture probability for crowding/time (Chi-square=0.1127, df=1, P =0.7371).

Assumption 2, Tag Loss

No tag loss was detected in the 65 sockeye salmon inspected for secondary marks at the Aniak River sonar site during 2003. In pooled 2002 and 2003 tag loss samples, no tag loss was observed in the 109 sockeye salmon inspected for secondary marks at escapement projects (Table 5).

Assumption 4, Tag Recovery Ratios and Fish Size

The recovery ratio (tagged: total) of sockeye salmon tagged at Kalskag and recovered at the Aniak site was 0.020 (19/990) in fish wheels and 0.007 (4/557) in gillnets representing incomplete mixing between fish wheels and gillnets (Chi-square =2.9, df=1, P=0.089). The recovery ratio at upstream escapement projects were different (Chi-square=9.8, df=2, P=0.007) Aniak River was 0.031(2/65), George River weir was 0.071 (1/14) and the Kogrukluk River weir was 0.008 (74/8,986). Given the difference in tag ratio among weir sites (Table 2) an abundance estimate using recovery data from the weirs was not calculated.

The logistic model showed that the length of sockeye salmon was not significantly associated with recapture probability (Wald χ^2 = 0.0842, df =1, P = 0.7717), indicating that not enough evidence exists to reject the null hypothesis of homogeneous capture probability. Therefore, sockeye mark and recapture data were not censured or stratified by fish size for the abundance estimate.

Abundance Estimate

An estimate of sockeye salmon abundance upstream from Kalskag was calculated using the Kalskag and Aniak fish wheel-gillnet data set. To evaluate the hypothesis of consistent recapture over time the data were stratified into weeklong segments (Sunday-Saturday). Because sampling did not begin on a Sunday or end on a Saturday extra days were added to the first and last stratum. Within each stratum, no significant difference was found between the right and left fish wheel recapture ratios so the data were pooled. There was a significant difference between the pooled fish wheel recapture ratios and the gillnet recapture ratios for the third (z=2.016,P=0043 and fourth strata (z=2.019,P= .043), therefore, gillnet catches in those strata were not used in calculating the abundance estimate. The sockeye salmon abundance upstream of Kalskag using the pooled Petersen estimator was 90,449 fish (95% CI=54,842, 126,056; SE=18,168; Table 6).

Run Timing

The median capture date of sockeye salmon at the Kalskag site was July 3 (n=1,478), and at the Aniak site July 7 (n=1,567; Appendix A). Of the sockeye salmon tagged at the Kalskag site and recaptured at the Aniak site (n=23), fifty percent were tagged by July 16. Half were recaptured 4 days later on July 20th at the Aniak site.

Fifty percent of the sockeye salmon recovered at the Kogrukluk River weir were tagged by July 2 (n=47) at Kalskag and July 3 (n=18) at Aniak (Table 7; Figure 11; Appendix C). Half of the sockeye salmon passed through Kogrukluk River weir were counted by July 16, which was earlier than the median recapture date of fish originating from Kalskag (July 19) and Aniak (July 20).

Travel Speed and Travel Days

Travel speed of tagged sockeye salmon to the Aniak site and to the Kogrukluk River weir differed significantly. This difference was related to distance traveled (Chi-square=4.18, df=1, P < 0.0410), length (Chi-square=7.72, df=1, P < 0.0055) and the interaction of travel distance and length (Chi-square=7.00, df=1, P < 0.0082). The mean travel speed for sockeye salmon tagged at Kalskag and recaptured at the Aniak site was 12 rkm/day (n=23, SD=8.9). The number of days between tagging at Kalskag and recapture at the Aniak site averaged 6 days and ranged from 1 to 57 days (n=23) (Table 8).

Tag recoveries from upstream escapement projects showed an increase in travel speed with an increase in distance from the tag site (Table 8; Figure 12). The mean travel speed of fish recovered at the Aniak River sonar site was 14 rkm/day (n=2, SD =2.0), and at the Kogrukluk River weir 25 rkm/day (n=65, SD=5.9).

Chum Salmon

Tag Deployment

The period of tag deployment appears to encompass the chum salmon run in 2003. Even though chum salmon were present, the first day of operation daily catches remained under 20 chum salmon per day through June 19 at Kalskag and June 20 at Aniak (Appendix D). Chum salmon were captured through September 8th at the Kalskag site and September 10th at the Aniak site. The highest daily CPUE at Kalskag occurred on July 19, and on July 22 at the Aniak site (Figures 13, 14, 15). Daily catches were less than 10 chum salmon per day at the Kalskag site after August 31 and at the Aniak site after August 30 representing less than 1% of the season total. Tag deployment is assumed to have occurred throughout the chum salmon run past the tagging sites.

A total of 20,111 chum salmon were tagged between June 6 and September 10 using a combination of fish wheels and drift gillnets; 8,395 chum salmon were tagged at Kalskag and 11,716 at the Aniak site (Table 9; Appendix D). More chum salmon were caught in the right bank fish wheel at the Kalskag site (Table 9; Appendix D1). In contrast, more chum salmon were caught in the left bank fish wheel at the Aniak site (Table 9; Appendix D2).

Crews tagged 90% (8,395/9,372) of the chum salmon captured in fish wheels and gillnets at the Kalskag site (Table 9; Figure16). The chum salmon released untagged were either unhealthy (injured, spawned out, nearly spawned out) or escaped during handling. As the number of nearly spawned out chum salmon increased later in the run, a lower percentage of the chum salmon catch was tagged. At the Aniak site, 77% (11,093/14,430) of the chum salmon captured in fish wheels were tagged because crews could not keep up with the high CPUE's (Figures 17). From July 16 to August 11, only 75% (7,961/10,579) of the chum salmon captured in fish wheels at the Aniak site were tagged (Figure 17). The tag deployment gillnet crew tagged 91% (623/682) of the chum salmon captured (Table 9).

Tag Recovery

Tagging Sites

A total of 361-tagged chum salmon were recaptured at Kalskag; of these fish, 355 were tagged at the Kalskag site and 6 from the Aniak site (Table 9; Appendix D1). There were 799 chum salmon recaptured at the Aniak site of which 332 originated from Kalskag and 467 from Aniak (Appendix D2). Three chum salmon that were tagged in Kalskag, recaptured at the Aniak site, then were later recovered downstream of the tagging sites. Of the 332 chum salmon tagged in Kalskag then recaptured at the Aniak site, 56% (n=187) were captured and recaptured on the same bank, 39% (n=131) were captured and recaptured on the opposite bank, 4% (n=13) were tagged and recaptured using a combination of gillnet and fish wheel, and 1% (n=1) was tagged and recaptured from gillnets (Figure 18).

Weir Sites

A total of 496-tagged chum salmon were recovered or observed at escapement projects (Table 10). Of the 20,111 tags deployed at the tagging sites <0.01% (n=14) were recovered at weirs below the tagging sites and 2.4% from escapement projects above the tagging sites (Table 9, 10).

Of the chum salmon tagged at the Kalskag (n=8,395) and Aniak site (n=11,716), the percent recovered varied among escapement projects above the tagging sites (Table 10): Aniak River sonar crews recovered 0.1% (n=7) from Kalskag and 0.2% (n=28) from Aniak, George River weir crews recovered 2.8% (n=239) and 1.0% (n=116) respectively, Kogrukluk River weir crews 0.6% (n=47) and 0.3% (n=39) respectively, and Takotna River weir crews <0.1% from Kalskag (n=1) and from the Aniak site (n=6; Table 10).

Bank orientation of migrating chum salmon at the tagging sites was indicated through recoveries at escapement projects (Table 11; Figure 19, 20). Overall for each weir site most recovered chum salmon were tagged at the right bank fish wheel at Kalskag (Figure 19) or the right bank fish wheel or from gillnets at the Aniak site. Very few chum salmon were observed for tags at the Aniak sonar project but those recovered tended to be from left bank fish wheels at the Kalskag or Aniak site. Of the chum salmon tagged from left bank fish wheels at the Kalskag (n=5,178) and Aniak site (7,461), tag recoveries from upstream weirs were lowest at the George 0.8% and 0.2% (n=40 and 15 respectively), the Kogrukluk <0.1% (n=2 and 3 respectively), and Takotna River weir where no chum salmon from left bank fish wheels were recovered. The highest percent of chum salmon recaptured at the George River weir (3.6%; n=100) originated from Kalskag's right bank fish wheel (n=2,780). In contrast at the Kogrukluk River weir, the highest percent recoveries (1.8%; n=11) originated from only the 623 chum salmon tagged from gillnets at the Aniak site (Table 11; Figure 19, 20).

Voluntary Tag Recoveries

There were only 220 tags returned from subsistence, commercial and sport fisheries (Table 12; Appendix E). Of the 20,111 chum salmon tagged, 0.4% (n=88) was recovered below the tagging sites and 0.6% (n=128) was recovered above. Approximately 66% (n=77) of the tags recovered above the tagging site were collected near the Aniak River. Furthermore 53 of the Aniak River tag recoveries originated from fish tagged from left bank fish wheels at the Aniak site (48%; n=37) and the Kalskag site (21%; n=16).

Abundance Estimate Diagnostics

Assumption 1, Effects of Crowding and Crowding/Time

There was an increase recapture probability for chum salmon tagged at the Kalskag site and recaptured at the Aniak site as the number of fish held in the live box increased (Chi-square=8.2724, df=1, P =0.0040) but there was no significant difference in recapture probability for crowding/time (Chi-square=2.3656, df=1, P =0.1240).

Assumption 2, Tag Loss

A total of 2,848 chum salmon were inspected for secondary marks in 2003 from the Aniak Sonar site (n=1,080), the George River weir (n=600), the Kogrukluk River weir (n=567), and the

Takotna River weir (n=601), of which no tag loss was observed. Only 1 chum salmon was observed with a secondary mark and without a tag in the 16,386 chum salmon sampled for tag loss in 2002 and 2003 (Table 5).

Assumption 4, Tag Recovery Ratios and Fish Size

Overall, the recovery ratio (tagged: total) of chum salmon at upriver escapement projects ranged from 0.002 (6/3,020) to 0.031 (35/1,120; Table 9, 10). Ratios at escapement projects above the tagging sites were significantly different (Chi-square=210.192, df=3, P=<0.0001). Because of the significant difference among escapement recovery sites, we did not use these data to estimate chum salmon abundance. Recovery of Kalskag tagged chum salmon was significantly different between Aniak gillnets (0.004) and Aniak fish wheels (0.0022) (Chi-square=7241.02, df=1, P=<0.0001). Therefore, the fish recovered in gillnets were not pooled with the fish recovered in the fish wheels. The abundance estimate was calculated using only the fish recaptured in the Aniak fish wheels.

The logistic model showed that the length of chum salmon was not significantly associated with recapture probability (Wald $\chi^2 = 0.0097$, df =1, P = 0.9217), indicating that not enough evidence exists to reject the null hypothesis of homogeneous capture probability. Therefore, chum salmon mark and recapture data were not censured or stratified by fish size for the abundance estimate.

Abundance Estimate

An estimate of chum salmon abundance upstream from Kalskag was calculated using the Kalskag and Aniak fish wheel data set. Nineteen recaptured chum salmon were censured from the 318 fish wheel recaptures at the Aniak site because they were recaptured multiple times. Recaptures at weirs below the tagging sites were not censured from the data set because of the low recoveries (<0.01%). Furthermore, volunteer tag recoveries below the tagging site were not censured because of the negative bias fell within the confidence interval of the estimate. The abundance estimate was calculated by pooling the right and left bank Aniak fish wheels. The marked proportion at the right bank fish wheel (84/4104=0.0205) and at the left bank fish wheel (215/10326=0.0208) were not significantly different (z=0.2022, P=0.8414). Data from fish wheels were pooled and compared to gillnet data. Recapture ratios for the pooled fish wheels (299/14,430=0.0207) and gillnets (13/3519=0.0037) were significantly different (z=11.28, P<0.0001) so the recapture information from gillnets was not used in the abundance estimate.

Failure to meet the assumption that the marking proportion was equal through time (Chi-square=40.77, df=6, P=<0.0001) suggested the need for temporal stratification. Failure to meet the assumption of consistent marking ratio (Chi-square=52.95, df=5, P=<0.0001) through time suggested the need for temporal stratification and use of the Darroch estimator (Table 13; Figure 21). Data were stratified into two week time periods with the first stratum beginning 06 June and the last stratum beginning 29 August. The Darroch estimator for stratified populations was used to produce the abundance estimate. Two-week periods were chosen to maximize stratification while maintaining a minimum sample size. When sample sizes within a two-week period were too low to produce an estimate further pooling was done. An estimate of chum salmon abundance upstream of Kalskag using the Darroch estimator was 412,443 fish (95% CI=351,765; 473,121; SE=30,958; Table 14).

Run Timing

Cumulative percentages of tagged chum salmon recovered at escapement projects indicate chum salmon tagged earlier traveled further upstream than fish tagged later in the season (Figure 22). This trend is also suggested when the following comparisons are made between median capture dates at the tagging sites and escapement projects, and median tag and recapture dates. Fifty percent of the chum salmon were captured at the Kalskag site by July 19 (n=9,732) and at the Aniak site by July 21 (n=17,251; Appendix D). Fifty percent of the chum salmon tagged at the Kalskag site that were later recaptured (n=332) at the Aniak site were tagged by July 21. These median capture dates and tag dates at the Kalskag site are later than the tag dates of the chum salmon recovered at the George River and Kogrukluk River weirs which are detailed below.

Fifty percent of the escapement was counted by July 19 at the George River (25,005/2) and Kogrukluk River weirs (22,514/2; Table 15; Appendix F and G). Median dates of release at Kalskag and Aniak sites for tagged chum salmon recaptured at upriver weir projects was: July 16 (n=148) and July 14 (n=72) for George River weir recaptures, and July 5th for releases at both tag sites (n=35 and n=30 respectively) for Kogrukluk River weir recaptures. Median recapture dates of chum salmon originating from the Kalskag and Aniak sites were: July 20th for both tag sites at the George River weir and July 18th and July 17th respectively at the Kogrukluk River weir.

Travel Speed and Travel Days

The mean travel speed and days traveled for chum salmon tagged at Kalskag and recaptured at the Aniak site was 21 rkm/day (n=332, SD=8.5) and 2 days respectively (Table 16; Figure 23). There were 17 fish recaptured at the Aniak site on the same day they were tagged at Kalskag. One chum salmon was recaptured 23 days after being tagged in Kalskag.

Travel speed of tagged chum salmon differed significantly between the Aniak tag site, Aniak River sonar, George River weir, Kogrukluk River weir, and Takotna River weir. Speed increased as distance from the tag site increased (Chi-square=40.40, df=1, $P < 0.0001$; Table 16; Figure 23). Mean travel speed of fish recovered at the Aniak River was 18 rkm/day (n=33, SD=9.4), at the George River weir 27 rkm/day (n=216, SD=8.2), Kogrukluk River weir 34 rkm/day (n=69, SD=11.5), and the Takotna River weir 35 rkm/day (n=4, SD=5.8).

Coho Salmon

Tag Deployment

It is not clear whether the period of tag deployment fully encompassed the coho salmon run in 2003. The beginning of the coho migration was sampled as the first coho salmon was caught June 20 at Kalskag and catches did not exceed 10 per day until July 22 (Appendix H1). Similarly, at the Aniak site, the first coho salmon was caught June 23 not exceeding 10 per day until July 19 (Appendix H2). In contrast, catches were still strong during September when the project ended averaging over 100 coho salmon per day at both Kalskag and Aniak sites. At the Kalskag and Aniak sites, fifty percent of the total coho salmon caught were captured by August 18 and August 20 respectively. Peak fish wheel CPUE's at Kalskag occurred from August 10 to August 17 with catches exceeding 250 per day. At the Kalskag site, the peak gillnet CPUE occurred on September 8 on the last day of fishing (Figures 24, 25, 26). At the Aniak site, peak CPUE's occurred from August 15 to August 28 with catches exceeding 500 per day.

Between June 20 and September 10, 18,145 coho salmon were tagged using a combination of fish wheels and drift gillnets; 6,771 fish were tagged at Kalskag and 11,374 at the Aniak site (Table 17; Appendix H). Most coho salmon were captured with the right bank fish wheel at Kalskag. At the Aniak site coho salmon captures were similar between the right and left bank fish wheels.

Crews tagged 95% (6,771/7,153) of coho salmon caught at the Kalskag site (Table 17; Figure 27). The coho salmon released untagged were either unhealthy (injured, spawned out or nearly spawned out) or escaped during handling. At the Aniak site, 86% (11,337/13,237) of the coho salmon captured in fish wheels were tagged since crews were unable to tag all healthy coho salmon caught because of high CPUE's (Table 17; Figure 28). The crew at the Aniak site tagged 80% (27/46) of the coho salmon captured with gillnets.

Tag Recovery

Tagging Sites

A total of 135 tagged coho salmon were recaptured at the Kalskag site of which 124 originated from Kalskag and 11 from the Aniak site (Table 17; Appendix H1). At the Aniak site, 170 tags were recovered from fish tagged at the Kalskag site and 283 from the Aniak site (Table 17; Appendix H2). One coho salmon was tagged at Kalskag, recaptured at the Aniak site, then later was recovered downstream of the tagging sites. Of the 170 coho salmon tagged in Kalskag that were recaptured at the Aniak site, 39% (n=67) were captured and recaptured on the same bank, 31% (n=53) were captured and recaptured on the opposite bank, 6% (n=11) were captured and recaptured in gillnets, and 23% (n=39) were captured and recaptured using a combination of gillnets and fish wheels (Figure 29).

Weir Sites

A total of 1,847-tagged coho salmon were observed at escapement projects (Table 18). Of the 18,145 coho salmon tagged at the tagging sites 1.8% (n=330) were recovered at weirs below the tagging site and 8.3% (n=1,510) above (Table 18). Six-tagged coho salmon were recovered in a tributary whose confluence is between the tagging sites. These six coho salmon were recovered at the Whitefish weir located at the lake outlet of Whitefish River, which joins the Kuskokwim River between the tagging sites.

Of the coho salmon tagged at the Kalskag (n=6,771) and Aniak site (n=11,374), the percent recoveries varied at escapement projects above the tagging sites (Table 18): George River weir crews recovered 1.7% (n=116) from Kalskag and 0.8% (n=95) from Aniak, Kogrukluk River weir crews recovered 5.1% (n=343) and 3.5% (n=402) respectively, and Takotna River weir crews 0.5% (n=34) and 0.3% (n=33) respectively (Table 19).

Bank orientation of coho salmon at the tagging sites is indicated through recoveries at the weirs (Table 19, Figure 30, 31). At the George River weir, the percent recoveries from Kalskag's right (n=4,610) and left bank fish wheel (n=1,551) and Aniak's right bank fish wheel (n=5,523) were similar (1.8%, n=81; 2.0%, n=31; and 1.5%, n=85 respectively). At the Kogrukluk River weir, percent recoveries from the right bank fish wheel were highest (5.9%; n=274) for Kalskag releases. In contrast, percent recoveries from the Aniak site at the Kogrukluk River weir was highest (8.1%, n=3) from gillnet caught fish. Only 37 coho salmon were tagged by Aniak's gillnet crew and 3 were recovered at Kogrukluk River weir. At the Takotna River weir, the percent recoveries from Kalskag's right and left bank fish wheel and Aniak's right bank fish wheel were similar (0.6%, n=26; 0.5%, n=8; and 0.5%, n=29 respectively).

Voluntary Tag Recoveries

There were 262 tags returned from subsistence, commercial and sport fisheries (Table 20; Appendix I). Of the 18,145 coho salmon tagged at the tagging sites, 0.4% (n=70) were recovered downstream of the tagging site, and 0.9% (n=175) upstream. Approximately 64% (n=112) of the tags recovered upstream from the tagging sites were captured near the Aniak River. Of the 112 tag recoveries near or on the Aniak River, most were from fish tagged from the left bank fish wheel at the Aniak site (61%; n=68) and the right bank fish wheel at the Kalskag site (16%; n=18).

Abundance Estimate Diagnostics

Assumption 1, Effects of Crowding and Crowding/Time

Neither number of fish held in the live box (Chi-square=1.0917, df=1, P =0.2961) or crowding/time (Chi-square=1.4773, df=1, P =0.2242) affected the recapture success for coho salmon.

Assumption 2, Tag Loss

In 2003, 441 coho salmon were inspected for secondary marks at the George River weir (n=70), Kogrukluk River weir (n=157) and Takotna River weir (n=210). Furthermore, no tag loss was observed in the 5,655 coho salmon inspected for secondary marks at escapement projects in combined samples from 2002 and 2003 (Table 5).

Assumption 4, Tag Recovery Ratios and Fish Size

The tag ratio of coho salmon tagged at the Kalskag site and recovered at the Aniak site was 0.0097 in fish wheels and 0.0118 in gillnets (Table 17) and are significantly different (Chi-square=52.95, df=5, P=<0.0001). Yet the tag ratio from the right bank fish wheel at Aniak (0.0117) was not significantly different (Chi-square 7.10, df=2, P≈0.03) to the tag ratio of gillnet recoveries (0.0118). The difference is attributed to the tag ratio from the left bank fish wheel at the Aniak site (0.0076). The result of this significance test indicates Kalskag's right bank fish wheel was more effective in capturing coho salmon then the left bank fish wheel, and spatial mixing was incomplete by the time the fish reach the Aniak site. Overall, the recovery ratio (tagged: total) of coho salmon at the weirs above the tagging sites ranged from 0.010 to 0.015, which were significantly different (Chi-square=46.877, df=2, P=<0.0001). Because of the significant difference among escapement recovery sites, we did not use these data to estimate coho salmon abundance. If data from Kalskag releases only are used, the difference among tag ratios from George (0.0070), Kogrukluk (0.0073), and Takotna (0.0053) were not significant (Chi-square=3.62, df=2, P≈0.15).

The logistic model showed that the length of coho salmon was not significantly associated with recapture probability (Table 3, Wald χ^2 = 0.1775, df =1, P = 0.6735), indicating that not enough evidence exists to reject the null hypothesis of homogeneous capture probability. Therefore, coho mark and recapture data were not censured or stratified by fish size for the abundance estimate.

Abundance Estimate

An estimate of coho salmon abundance upstream from Kalskag was calculated using the Kalskag and Aniak fish wheel-gillnet data set. One coho salmon tagged at Kalskag and recaptured at Aniak was then recovered in the volunteer recover efforts. Even though this coho salmon was eventually recovered downstream of the tagging site, it's recovery at the Aniak site was used in the estimation of abundance. Furthermore, this tag recovery indicates that not all downstream migrants traveled downstream immediately after tagging. Because of the uncertainty in the proportion of coho salmon that may have traveled through the Kalskag and Aniak sites before migrating downstream, and because less than 2% (118/6,771) of the tagged population from Kalskag was recovered downstream of the Kalskag site, downstream recoveries were not censured from the analysis. It is considered that the negative bias of the downstream migrants to the estimates is low and falls within the bounds of the estimate's confidence interval. The effect of tag loss was considered insignificant, and not incorporated into the analysis.

Failure to meet the assumption of consistent marking ratio (Chi-square=52.95, df=5, P=<0.0001) through time suggested the need for temporal stratification and use of the Darroch estimator. Data were stratified into two week time periods with the first stratum beginning August 1 and the last stratum beginning August 29. Recapture ratios for the right and left bank fish wheels and gillnets were not significantly different except for one stratum. In the last stratum, tagged proportion between the right fish wheel (61/3778=0.016) and the left fish wheel (48/5270 =0

.0091) were significantly different (z=2.89 p=0.0038). This difference is due to the large sample size and does not represent an important biological difference. Given the need to maintain a minimum sample size for the stratified abundance estimate the two wheels were pooled for the abundance estimate. When sample sizes within a two-week period were too low to produce an estimate further pooling was done. The final stratification resulted in two time periods to maximizing stratification while maintaining a minimum sample size (Table 21, Figure 32). An estimate of the total coho salmon abundance upstream of Kalskag using the Darroch estimator was 849,494 (95% CI=654,182, 1,044,806; SE=99,649; Table 22).

Run Timing

Cumulative percentages of tagged coho salmon recovered at escapement projects indicate coho salmon tagged earlier traveled further upstream than fish tagged later in the season (Figure 33). This trend is also suggested when the following comparisons are made between median dates at of all coho salmon captured at the tagging sites and counted at escapement projects, and median dates at release and recapture of tagged coho salmon. Fifty percent of the coho salmon were captured at the Kalskag site by August 18 (n=7,288) and at the Aniak site by August 20 (n=17,251; Appendix H). Fifty percent of the coho salmon tagged at the Kalskag site that were later recaptured (n=170) at the Aniak site were tagged by August 20 at Kalskag and recaptured by August 23 at Aniak. These median tag dates are closer to the tag dates of the coho salmon recovered at the George River weir than those recovered from the Kogrukluk or Takotna River weirs, which are described below.

Fifty percent of the escapement was reached by August 28 (31,925/2) at the George River weir, September 1 (68,831/2) at the Kogrukluk River weir, and August 28 (7,147/2) at the Takotna River weir (Table 23; Appendix J, K, and L). Median tag release dates at the Kalskag and Aniak sites of coho salmon recaptured at upriver weir projects was: August 21 (n=116) and August 22 (n=95) for George River weir recaptures, August 16 for both sites (n=343 and n=402) for Kogrukluk River weir recaptures, and August 12 (n=34) and August 10 (n=33) for Takotna River weir recaptures. Median recapture dates of coho salmon tagged at the Kalskag and Aniak sites was September 5th and 4th at the George River weir, September 4th from both sites at the Kogrukluk River weir, and August 31st and August 30th at the Takotna River weir.

Travel Speed and Travel Days

The mean travel speed and days traveled for coho salmon tagged at Kalskag and recaptured at the Aniak site was 15 rkm/day (n=170, SD=9.5) and 4 days respectively (Table 24; Figure 34). There were six fish recaptured at the Aniak site on the same day they were tagged at Kalskag. One fish was recaptured at the Aniak site thirty days after being tagged in Kalskag. Differences in travel speed of tagged coho salmon among weirs were significantly related to the date (Chi-square=72.2, df=1, P < 0.0001) and travel distance to weirs (Chi-square=572.62, df=1, P < 0.0001). Travel speed increased as both distance from the tag site increased and as the season progressed. The coho salmon entering the river later in the season traveled at a faster rate than those entering the river earlier. The mean travel speed of fish recovered at the Aniak River sonar site was 15 rkm/day (n=2; SD=15.8), the George River weir, 15 rkm/day (n=207, SD=5.5), the Kogrukluk River weir, 25 rkm/day (n=740, SD=4.9), and the Takotna River weir, 31 rkm/day (n=66, SD=5.0).

Overall, fish traveled faster as the season progressed, so results are described in terms of early season (fished tagged before 14 August) and late season (fished tagged on 14 August or later). Mean fish speeds for early and late season coho salmon were significantly different. Mean fish speed for the Aniak tag site early season was 7.5 rkm/day (n=39; SD=7.2) and late season was 16.6 rkm/day (n=131; SD=9.1; t-test: t=5.81, df=168, P<0.001). For George River weir recoveries, the early season mean fish speed was 11.16 rkm/day (n=37; SD=3.3) and the late season was 14.5 rkm/day (n=174; SD=5.6; t-test: t=3.50, df=209, P<0.001). For the Kogrukluk River weir the early season mean fish speed was 21.98 rkm/day (n=270; SD=4.2) and the late season was 23.9 rkm/day (n=474; SD=4.6; t-test: t=5.63, df=742, P<0.001). For the Takotna River weir, early season mean fish speed was 30.44 rkm/day (n=44; SD=4.2) and the late season was 33.44 rkm/day (n=23; SD=6.9; t-test: t= 2.40, df=65, P<0.019).

DISCUSSION

Capture rates of sockeye and chum salmon at the Kalskag and Aniak sites suggest sampling occurred throughout their migration. This was not true for coho salmon judging by capture rates at the end of the coho salmon run. Field operations ended at the tagging sites on September 8th and 10th because of budget constraints and to allow time for tagged salmon to reach upriver escapement projects before they ceased operation the third week of September.

In 2003 as in 2002, the Aniak and Kalskag fish wheel and gillnet data set was used to estimate abundance (Kerkvliet et al. 2003). We were unable to use the escapement projects as the recovery event because model assumptions were not fulfilled. The Aniak/Kalskag data set was stratified through time for chum and coho salmon data to meet the assumptions of the Darroch estimator. Because of the small sample sizes, we were unable to stratify and used the Peterson estimator for sockeye abundance. Our sockeye salmon abundance estimate was, 90,449 fish (95% CI=54,842, 126,056; SE=18,167; Table 6), chum salmon estimate was 412,443 fish (95% CI=351,765, 473,121; SE=30,958; Table 14), and coho salmon estimate was 849,494 fish (95% CI=654,182, 1,044,806; SE=99,649; Table 22).

Tag recovery efforts at the Aniak site generally improved in 2003 compared to 2002 (Kerkvliet et al. 2003). The tag recovery drift gillnet crew at the Aniak site increased the number of sockeye salmon sampled from gillnets from 2002 (2%) to 2003 (37%), and of chum salmon from 2002 (<1%) to 2003 (19%). However, the percentage of coho salmon sampled in gillnets was approximately the same in 2002 (23%) and 2003 (21%). Even with the increased sampling effort, temporal differences in tag recoveries required us to stratify data to generate abundance estimates for chum and coho salmon.

Although escapement project data were not used to estimate sockeye, chum, or coho salmon abundance, interesting results were gained from the following comparisons between tag deployment at the tagging sites and tag recoveries at escapement projects: 1) comparing the number of sockeye, chum, and coho salmon tagged at the Kalskag and Aniak sites with the percent recovered at escapement projects; 2) comparing tag release location (gillnet, right bank or left bank fish wheel) of sockeye, chum, or coho salmon with the percent recovered at escapement projects. With respect to the first comparison, more chum and coho salmon were tagged at the Aniak site than the Kalskag site, yet a higher percent of the chum and coho salmon from the Kalskag site were recovered at the George and Kogrukluk River weirs. In addition, a higher percentage of sockeye salmon originating from Kalskag was recovered at the Kogrukluk River weir. This trend was not true for chum salmon recoveries at the Aniak River sonar site, where a higher percentage of chum salmon released from Aniak's left bank fish wheel were recovered. With respect to the second comparison, sockeye, chum and coho salmon originating from Kalskag's right bank fish wheel were recaptured in higher percentages at the George and Kogrukluk River weirs than fish originating from other Kalskag tag locations. In contrast percent tag recoveries were higher at the Kogrukluk River weir for chum and coho salmon originating from Aniak's gillnets than fish originating from other Aniak tag locations.

Tag recoveries from escapement projects suggest chum, sockeye, and coho salmon stocks are better mixed at the Kalskag site than the Aniak site. At weir sites above the Aniak River, recaptures from Kalskag's gillnets, and fish wheels (right and left) were better represented than from Aniak's gillnets, or fish wheels (right and left). This is not too surprising considering the possible effect of the Aniak River on migratory behavior. Furthermore of the tag recoveries from Kalskag releases the highest percentages originated from the right bank fish wheel, which may represent homing behaviors towards river flows that are less influenced by the Aniak River, which is a left bank tributary. Recoveries rates of coho salmon did not differ among weirs when comparing recovery of Kalskag tagged fish only (Chi-square=7.10, df=2, $P \approx 0.03$).

We believe the sockeye, chum, and coho salmon abundance estimates based on the Kalskag/Aniak data sets are biased but are uncertain of the extent of the bias. There were numerous sources of bias. We considered the bias due to downstream sockeye, chum, and coho salmon recoveries to be small and fall within the 95% confidence interval of our estimate. The magnitude of the bias due to the increased probability of sockeye and chum salmon recapture probability is unknown. Nevertheless, the effect of a higher recapture probability would bias our estimates low. Our estimates are also biased due to incomplete mixing between mark and recapture events for sockeye and chum salmon. Differences in marking rates were found between sockeye and chum salmon captured with fish wheels and gillnets. In neither instance were gillnet data used to estimate abundance which biased the estimate downward.

This was the first year that probability of recapture was analyzed using two methods (crowding, and crowding time). Only the analysis of crowding tested significant for an increase recapture probability of chum and sockeye salmon. In 2001 and 2002 we did not detect and increase probability of recapture using crowding time, which was identified in earlier reports as "holding density" (Kerkvliet and Hamazaki 2003, Kerkvliet et al. 2003). Comparisons between our results and Bromaghin and Underwood's (2003) results showing a correlation in increased probability of recapture in Yukon River fall chum salmon as a function of how long a fish was held, is difficult with out further investigations.

We evaluated the accuracy of our estimates by using escapement data from 2003 and relevant historical data. Escapement projects (Aniak River, George River, Kogrukluk River, and Takotna River) upstream from Kalskag estimated 9,184 sockeye salmon, 423,866 chum salmon (Table 25) and 115,205 coho salmon in 2003 (Table 26; Whitmore et al. *In press*). The Holitna River radio telemetry study suggests a minimum of 400,000 chum salmon in the drainage (Stroka and Brase *In press*). However, because the Holitna project ended when run strength was strong, and because the proportion of radio tagged chum salmon that passed the Kogrukluk River weir was low, they did not report a standard error for the estimate.

The sockeye salmon run was strong in 2003, with an escapement at the Kogrukluk River weir of 9,164, which exceeded the escapement goal of 2,000 (Whitmore et al. *In press*). We captured approximately 3 times more sockeye salmon in 2003 than in 2002 (Kerkvliet et al. 2003). It is difficult to fully evaluate the sockeye salmon estimate because of the lack of drainagewide indicators for sockeye salmon. This is the first year sockeye salmon abundance was estimated, and difficulties arose due to small sample sizes and our inability to pool fish wheel and gillnet data.

The chum salmon abundance estimate is low when compared to escapement estimates above Kalskag and the Holitna River radio telemetry project. Our estimate was 1.3 times lower in 2003 than in 2002. We are uncertain to the extent the following factors affect the estimate: tagging in proportion to the run at the Kalskag site, in recovering in proportion at the Aniak site or incomplete mixing. In an attempt to mitigate for these biases, we increased sampling at the Aniak site with a full time drift gillnet crew. The significant difference of tagged and untagged ratios between gillnets and fish wheels at the Aniak site suggest the possibility of all three biases. Furthermore, the result of the increase probability of recapture of tagged chum salmon as the number of fish in the live box increases introduces a negative bias to the estimate. Ignoring the differences between fish wheel and gillnet data and using a pooled dataset would result in a larger population estimate.

The coho salmon return exceeded escapement goals on all monitored tributaries (Whitmore et al. *In press*). Within the 95% confidence intervals, the 2003 abundance estimate ranged from 1.5 to 5.4 times higher than the 2002 estimate (Kerkvliet et al. 2003). The increase in escapement from 2002 to 2003 on the George and Kogrukluk River were approximately 5 times higher and the Takotna River, 2 times higher than in 2002 (Table 26; Figure 35). Considering the magnitude of increase between 2002 and 2003, the upper bound of the 95% confidence interval is likely a better estimate of the abundance of coho salmon upstream of Kalskag.

Managers, researchers and native groups have asked whether the 2003 and 1996 coho salmon run sizes are similar because of the record escapement in 2003 and the record commercial harvest in 1996. The coho salmon estimate at the Kogrukluk River weir and the coho salmon commercial harvest are the only data available for both years. In 2003, the Kogrukluk River weir estimate was approximately 2 times higher than in 1996 (Table 26; Figure 36), and the 2003 commercial harvest took 3 times fewer fish than the 1996 commercial harvest (Table 27; Whitmore et al. *In press*). Although speculative, we used the proportional reduction of commercial harvest from 1996 to 2003 to back calculate the 1996 escapement and abundance of coho salmon upstream of Kalskag (Table 27). These results project an escapement of 22,794 at the George River, 51,200 at the Kogrukluk River, and 4,911 at the Takotna River and an abundance estimate of 715,599 coho salmon upstream of Kalskag. The projected Kogrukluk River estimate is close to the actual 2003 coho salmon escapement; In addition, the abundance estimate is within the bounds documented in this study. Based on this, we conclude that the 1996 run size was similar to the 2003 coho salmon run.

Tag recovery data from escapement projects allowed us to assess run timing and travel speed of monitored stocks. In fully understanding this type of data, one needs to be aware of potential biases when the behavior of tagged fish is not the same as untagged fish. There is ample literature that initially after tagging, fish "sulk" (Jones et al. 2001, Bernard et al. 1999). When sulking behavior is considered in run timing and travel speed the travel time of tagged fish would likely be slower than untagged fish. Furthermore, run timing of tagged fish at escapement projects would lag behind that of untagged fish. Differences between the median dates of escapement at the George, Kogrukluk, and Takotna river weirs and median recapture dates, suggests sulking behavior for sockeye, chum, and coho salmon.

Run timing data in 2003 have again confirmed traditional knowledge of salmon returning to the Kuskokwim River and shows similar results to 2002 run timing patterns, where earlier tagged fish traveled further upstream than fish tagged later in the season (Kerkvliet et al. 2003). The run timing trends observed on the Kuskokwim is consistent with results of coho salmon run timing in the Chilkat River (Ericksen et al. 1999) and Chinook salmon in the Stikine River (Der Hovanisian et al. 2003, Pahlke and Etherton 1999). The median tag dates between the Kalskag and Aniak sites for a given upriver stock (Tables 6, 13, and 21) suggests that run strength at the tagging sites can help assess escapement of these monitored stocks. For example, fifty percent of the sockeye salmon recaptured at the Kogrukluk River weir from Kalskag were tagged on July 3, which was also the date when the capture of sockeye salmon at the Kalskag site reached fifty percent. By comparing cumulative percentages of capture at the tagging sites to median tag dates of salmon recaptured at escapement projects these data can be used as a tool to assess upriver escapement.

Travel speed was similar in 2002 and 2003 for sockeye salmon to the Kogrukluk River weir (t-test: $t=1.706$; $df=75$; $P=0.092$), and for chum salmon at the Aniak tag site (t-test: $t=0.948$; $df=609$; $P=0.344$), Aniak River sonar site (t-test: $t=0.320$; $df=103$; $P=0.749$), George River weir (t-test: $t=1.829$; $df=323$; $P=0.068$), Kogrukluk River weir (t-test: $t=0.253$; $df=133$; $P=0.800$), and Takotna River weir (t-test: $t=0.104$; $df=8$; $P=0.920$).

Travel speed of coho salmon was similar in 2002 and 2003 at the Aniak tag site (t-test: $t=1.614$; $df=218$; $P=0.108$), but not at the George River weir (t-test: $t=2.055$; $df=270$; $P=0.041$), Kogrukluk River weir (t-test: $t=2.807$; $df=951$; $p=0.005$), and Takotna River weir (t-test: $t=2.430$; $df=114$; $P=0.017$). Comparisons of travel speed between early and late season coho salmon among years (2001, 2002 and 2003) was not possible. Difficulties occur when travel speeds are grouped as early run or late run fish, which do not provide the clear resolution between the two groups across all years. However, graphically displayed data and statistical analysis by year shows a difference between early and late run coho salmon, and the travel speed of later returning coho salmon increased. Differences in travel speed between early and late may be attributed to milling behavior similar to the findings of McPherson et al. (1996). In this mark recapture study, results showed those coho salmon that entered the stream early in the season exhibited milling behavior longer at the marking site than those that entered the stream later in the season.

CONCLUSIONS

Tag Deployment and Recovery: The period of tag deployment encompassed the sockeye and chum salmon run in 2003. In contrast, catches of coho salmon were still strong when tag deployment ceased September 7th at Kalskag and 10th at Aniak. Tag recoveries from escapement projects suggest that salmon are better mixed at the Kalskag site than the Aniak site.

Abundance Estimate Diagnostics:
Assumption 1. Crowding increases the probability of recapture in sockeye and chum salmon, but not coho salmon.

Assumption 2. Tag loss has not been significant for any target species during the duration of the project.

Assumption 3. The affect on the chum, sockeye, and coho salmon abundance estimate from tag recoveries below the tag site was considered small, and falling within the 95% confidence interval. Sampling occurred throughout the sockeye and chum run, but not the coho salmon run.

Assumption 4. Stock specific bank orientation and unequal mixing between fish wheel catches and gillnet catches represented spatial stratification and lack of mixing for sockeye, chum salmon, and less so for coho salmon. Tag ratios at the weirs were significantly different for chum and coho salmon when all releases were pooled. The tag rations at weirs were not significantly different when viewing recaptures of coho salmon tagged at Kalskag.

Abundance Estimates: Abundance estimates were calculated for sockeye, chum, and coho salmon. This is the first year a sockeye salmon estimate was calculated for the Kuskokwim River and is thought to be biased low. The chum salmon estimate was low based on comparisons with upriver escapement estimates and the Holitna River abundance estimate. The coho salmon estimate is thought to be a reasonable estimate of abundance above Kalskag based on comparisons between escapement projects and the 2002 abundance estimate, representing that portion of the run vulnerable to significant harvest.

Run Timing: Earlier tagged chum and coho salmon traveled further upstream than fish tagged later in the season.

Travel Speed: Travel speeds were similar between 2002 and 2003 for chum and sockeye salmon and during 2001, 2002 and 2003 for coho salmon. Travel speed characteristics may provide insights into behavior characteristics such as milling and homing behaviors.

RECOMMENDATIONS

- Relocate the Kalskag tagging site downstream of the village of Lower Kalskag because: 1) it will allow additional mixing time between sampling events, 2) the downstream site is located in a single channel while there is a dual channel at the current Kalskag tag site, 3) since the downstream site is in a single channel, the sample size of fish tagged at the first sampling event should increase as more fish will be migrating past, 4) the influence of the Aniak River on the migration of salmon stocks may be reduced.

- Omit tagging at the Aniak site because: 1) in the three years this project has operated we have been unable to use these data to estimate abundance because the ratios of tagged to untagged salmon were significantly different among weir sites, violating an assumption of the mark recapture model; 2) tagging at the Aniak site reduces the time available for the recovery effort; 3) when data from the Aniak site are removed the difference in tag ratios among weirs is not detected for coho salmon, and 4) the percent of Aniak tagged fish recaptured at weirs is much lower than at Kalskag. The time used to tag fish at Aniak can be used to increase the time spent drift gillnetting for tag recovery only.

- Expend consistent effort in gillnetting for tag deployment and recovery. Do not decrease the time spent drift gillnetting if fish wheel catches increase to a point beyond which staff can clear live boxes and need help from those gillnetting. Instead, decrease the time spent capturing salmon with fish wheels. Given the differences in stock composition between the two gear types, sample sizes need to remain high in the gill net component.

- Mitigate the crowding effect on recapture probability, we recommend our sampling schedule be adjusted to decrease the number of fish held in live boxes. Further assessment is needed to better define the upper limits in the number of fish that corresponds to this effect.

- Compare 2001, 2002, and 2003 data sets using insights gain in probability of recapture, run timing, and bank orientation.

- Review 2001, 2002 and 2003 data sets to determine if abundance estimations are possible using an alternative type of analysis. Design an abundance estimate that stratifies temporally and spatially.

- Conduct additional design work for the sockeye salmon mark-recapture experiment. Opportunities to sample sockeye salmon upriver are spare with most recaptures occurring at the Kogrukluk weir. Stock differences were detected in the fish wheel versus gillnet caught sockeye salmon at the tagging sites. Knowledge of another upstream location where large numbers of sockeye salmon could be sampled would be helpful as would more information from gillnets at the tagging site. Recommend that radio transmitters be fitted to sockeye salmon captured at Kalskag in order to better understand spawning distribution and more off-bank prospecting with gillnets occur downstream at Kalskag and Aniak.

LITERATURE CITED

ADF&G (Alaska Department of Fish and Game). 1961a. Kuskokwim River salmon tagging studies, Arctic Yukon Kuskokwim Region Area 1961 Annual Management Report, Kuskokwim Stock Separation Report #1. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1961b. Yukon River salmon tagging studies 1961, Arctic Yukon Kuskokwim Region Area 1961 Annual Management Report, Yukon Stock Separation Report #1. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1962a. Kuskokwim River salmon tagging studies, Arctic Yukon Kuskokwim Region Area 1962 Annual Management Report, Kuskokwim Stock Separation Report #2. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1962b. Yukon River salmon tagging studies 1962, Arctic Yukon Kuskokwim Region Area 1962 Annual Management Report, Yukon Stock Separation Report #2. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1964. Yukon River king salmon tagging studies 1963-1964, Arctic Yukon Kuskokwim Region Area 1994 Annual Management Report, Yukon Stock Separation Report #3. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1966. Kuskokwim River salmon tagging studies, Arctic Yukon Kuskokwim Region Area 1966 Annual Management Report, Kuskokwim Stock Separation Report #3. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1969. Yukon River king salmon tagging studies 1963-1964, Arctic Yukon Kuskokwim Area Anadromous Fish Investigations, 1969 Annual Technical Report, Yukon Stock Separation Report #7. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

ADF&G (Alaska Department of Fish and Game). 1999. Research and prevention relative to the 1998 Bristol Bay, Kuskokwim, and Yukon River fishery resource disasters. Alaska Department of Fish and Game, Division of Commercial Fisheries, NOAA (National Oceanic and Atmospheric Administration) Cooperative Agreement NA96W0196. Juneau.

LITERATURE CITED (Continued)

ADF&G (Alaska Department of Fish and Game). 2001. Research and prevention relative to the 1998 Bristol Bay, Kuskokwim, and Yukon River fishery resource disasters, Revised scope of work. Alaska Department of Fish and Game, Division of Commercial Fisheries, NOAA Cooperative Agreement NA96W0196, Juneau.

Arnason, A.N., and three coauthors. 1996. Computer analysis of marking data from stratified populations for estimation of salmonid escapements and the size of other populations. Canadian Technical Report of Fisheries and Aquatic Sciences 2106: 37p. Software downloaded from http://www.cs.umanitoba.ca/~popan/ (Accessed 09/10/2003).

Barrett, B.M., F.M. Thompson and S. N. Wick. 1984a. Adult anadromous fish investigations: May-October 1983. Susitna Hydro Aquatic Studies. Report No. 1. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document # 1450.

Barrett, B.M., F.M. Thompson, and S.N. Wick. 1984b. Adult anadromous fish investigations: May-October 1984. Susitna Hydro Aquatic Studies. Report No. 6. Alaska Department of Fish and Game, Anchorage, Alaska. APA Document # 2748.

Baxter, R. 1976. Holitna weir developmental project, 1976. AYK Region Kuskokwim Salmon Escapement Report No. 11. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

Bernard, D. R., J. J. Hasbrouck, and S. J. Fleischman. 1999. Handling-induced delay and downstream movement of adult chinook salmon in rivers. Fisheries Research 44:37-46

Bromaghin, J.F., and T.J. Underwood. 2003. Evidence of residual effects from tagging Yukon River fall chum salmon in 2001. U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report Number 67, Anchorage.

Brown, C.M. 1983. Alaska's Kuskokwim River region: a history. Bureau of Land Management, Anchorage.

Brownlee, K.M., S.A. McPherson, and D.L. Magnus. 1999. A mark-recapture experiment to estimate the escapement of Chinook salmon in the Blossom and Keta Rivers in 1998. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 99-45, Anchorage.

Burkey, Jr., C.E., and three coauthors. 2000. Kuskokwim River chum salmon stock status and development of management / action plan options, report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 3A00-41, Anchorage.

Burkey, Jr., C.E., and five coauthors. 2001. Annual management report for the subsistence and commercial fisheries of the Kuskokwim River, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A01-34, Anchorage.

Buklis, L.S. 1993. Documentation of Arctic-Yukon-Kuskokwim Region salmon escapement goals in effect as of the 1992 fishing season. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 3A93-03, Anchorage.

Cappiello, T.A., and J.F. Bromaghin. 1997. Mark-recapture abundance estimate of fall chum salmon in the upper Tanana River, Alaska, 1995. Alaska Fishery Research Bulletin 4(1): 12-35. Juneau.

Cappiello, T.A., and D.L. Bruden. 1997. Mark-recapture abundance estimate of fall-run chum salmon in the upper Tanana River, Alaska, 1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 3A97-37, Anchorage.

Carlon, J.A. 2000. Assessment of coho salmon from the Kenai River, Alaska, 1997. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 00-15, Anchorage.

Chythlook, J.S., and M.A. Evenson. 2003. Assessment of chinook, chum, and coho salmon escapements in the Holitna River Drainage using radio telemetry, 2002. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 03-23.

Cleary, P.M. and D.L. Bruden. 2000. Estimation of fall chum salmon abundance in the upper Tanana River using mark recapture techniques, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A00-03. Anchorage.

Cleary, P.M. and T. Hamazaki. 2002. Estimation of Fall Chum Salmon Abundance on the Tanana and Kantishna Rivers Using Mark-Recapture Techniques, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-17, Anchorage.

Coffing, M., and three coauthors. 2001. The subsistence and harvest use of wild resources in Achiachak, Alaska, 1998. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 258, Juneau.

Der Hovanisian, J. A., K. A. Pahlke, P. Etherton. 2003. Abundance of the chinook salmon escapement on the Stikine River, 2001. Alaska Department of Fish and Game, Fishery Data Series No. 03-09, Anchorage.

Eggers, D.M. 2001. Research and prevention relative to the 1998 Bristol Bay, Kuskokwim, and Yukon River fishery resource disasters, Revised scope of work. Alaska Department of Fish and Game, Division of Commercial Fisheries, NOAA Cooperative Agreement NA96W0196. Juneau.

Ericksen, R.P. 1999. Abundance of coho salmon in Chilkat River in 1998. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 99-29, Anchorage.

Evenson, M.J. and K.G. Wuttig. 2000. Inriver abundance, spawning distribution, and migratory timing of Copper River chinook salmon in 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-32, Anchorage.

Gilk, S.E., and D.B. Molyneaux. 2004. Takotna River salmon studies and upper Kuskokwim River aerial surveys, 2003. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 3A04-23, Anchorage.

Hammarstrom, S.L., and J.J. Hasbrouck. 1998. Estimation of the abundance of late-run chinook salmon in the Kenai River based on exploitation rate and harvest, 1996. Alaska Department of Fish and Game, Fishery Data Series No.98-6, Anchorage.

Hammarstrom, S.L., and J.J. Hasbrouck. 1999. Estimation of the abundance of late-run chinook salmon in the Kenai River based on exploitation rate and harvest, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-8, Anchorage.

Harris, F.G. and K.C. Harper. 2001. Summary of run timing and abundance of adult pacific salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 2001. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Preliminary Summary Report, Project FIS-01-053, Kenai.

Harper, K.C. and C.B. Watry. 2001. Run timing and abundance of adult salmon in the Kwethluk River, Yukon Delta National Wildlife Refuge, Alaska, 2000. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Technical Report Number 2001-4. Kenai.

Johnson, Y., I. Boyce, and B. Waugh. 2002. Estimation of the abundance of chinook salmon (Oncorhynchus tshawytscha) in the Upper Yukon River Basin using mark-recapture methods: 1990 – 1995. Fisheries and Oceans Canada Science Branch, Canadian Technical Report of Fisheries and Aquatic Sciences 2378, Canada.

JTC (Joint Technical Committee, US/Canada Yukon River Panel). 2002. Yukon River salmon season review for 2002 and technical committee report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-44, Anchorage.

Jones, E.L. and S.A. McPherson. 1997. Relationship between observed counts on abundance of coho salmon in Steep Creek, Northern Southeast Alaska in 1996. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 97-25, Anchorage.

Jones, E.L., J.L. Weller, and A. B. Holms. 2001. Production of coho salmon from the Unuk River, 1999-2000. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 01-14, Anchorage.

Kerkvliet, C.M., and T. Hamazaki. 2003. A mark-recapture experiment to estimate the total population of Kuskokwim River coho salmon (Oncorhynchus kisutch), 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A02-15, Anchorage.

Kerkvliet, C.M., and three coauthors. 2003. A mark-recapture experiment to estimate the abundance of Kuskokwim River sockeye, chum and coho salmon, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-25, Anchorage.

Linderman, J.C. Jr., D.J. Cannon and D.B. Molyneaux. 2004a. Tatlawiksuk River weir salmon studies, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region, Regional Information Report 3A04-16, Anchorage.

Linderman, J.C. Jr., D.B. Molyneaux, and D.J. Cannon. 2004b. George River weir salmon studies, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, AYK Region, Regional Information Report 3A04-17, Anchorage.

McPherson, S.A., and four coauthors. 1998. Spawning abundance of chinook salmon in the Taku River in 1997. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 98-41, Anchorage.

Moody, D.W., E.B. Chase, and D.A. Aronson, (compilers). 1986. National water summary 1985—hydrologic events and surface-water resources: USGS Water-Supply Paper 2300, 506 p.

Pahlke, K.A. and P. Etherton. 2000. Abundance of the chinook salmon escapement on the Stikine River, 1998. Alaska Department of Fish and Game, Fishery Data Series No. 00-24, Anchorage.

Pahlke, K.A. and P. Etherton. 1999. Abundance and distribution of the chinook salmon escapement on the Stikine River, 1997. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 99-6, Anchorage.

Parker, S.J. and R.L. Howard. 1995. Migratory behavior of adult chum salmon in the Kuskokwim River, 1995. Final Report. Bering Sea Fishermen's Association, Anchorage.

SAS Institute Inc. 1999. SAS/STAT User's Guide, Version 8. SAS Institute Inc., Cary, North Carolina.

Sandall, H. D. *In press*. Sonar estimation of chum salmon passage in the Aniak River, 2002 to 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A04-21, Anchorage.

Schwarz, C.J., and G.A.F. Seber. 1999. Estimating animal abundance: review III Statistical Science 14, 427-456.

Seber, G.A.F. 1982. The estimation of animal abundance and related parameters, second edition. Edward Arnold, London.

Spencer, T., and three coauthors. 2002. Estimation of abundance and distribution of chinook salmon in the Yukon River using mark-recapture and radio telemetry in 2000 and 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries Regional Information Report 3A02-37, Anchorage.

Stroka, S.M. and A.L. Brase. *In press.* Assessment of chinook and chum, and coho salmon escapements in the Holitna River Drainage using radio telemetry, 2001-2003. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series, Anchorage.

Underwood, T.J., and three coauthors. 1998. Estimate of abundance of adult fall chum salmon in the upper Yukon River, Alaska, 1997. U. S. Fish and Wildlife Service, Alaska Fisheries Technical Report No. 56, Fairbanks.

Ward, T.C., and four coauthors. 2003. Annual management report for the subsistence and commercial fisheries of the Kuskokwim River, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-27, Anchorage.

Whitmore D.C., and four coauthors. *In press.* Annual management report for the subsistence and commercial fisheries of the Kuskokwim River, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report, Anchorage.

Wuttig, K.G. and M.A. Evenson. 2002. Assessment of chinook, chum, and coho salmon escapements in the Holitna River drainage using radio telemetry, 2001. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 02-05, Anchorage.

Table 1. Number of sockeye salmon tagged and recovered at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

Tag Site	Sockeye Salmon				
Kalskag	Tagged	Untagged	Recaptures from: Kalskag[3/]	Recaptures from: Aniak[4/]	Total Catch
Left Bank[1/]	603	56	4	3	666
Right Bank[2/]	570	51	4	5	630
Gillnet	176	6	0	0	182
Total	1,349	113	8	8	1,478
Aniak	Tagged	Untagged	Recaptures from: Kalskag[3/]	Recaptures from: Aniak[4/]	Total Catch
Left Bank[1/]	563	88	17	19	687
Right Bank[2/]	278	18	2	5	303
Gillnet (Tag)[5/]	169	20	1	1	191
Gillnet (Rec.)[6/]	0	382	3	1	386
Total	1,010	508	23	26	1,567
Combined	Tagged	Untagged	Recaptures from: Kalskag[3/]	Recaptures from: Aniak[4/]	Total Catch
Total	2,359	621	31	34	3,045

[1/] Fish wheel anchored on left bank
[2/] Fish wheel anchored on right bank
[3/] Fish tagged at the Kalskag site
[4/] Fish tagged at the Aniak site
[5/] Drift gillnet for tag deployment
[6/] Drift gillnet for tag recovery

Table 2. Number of tagged sockeye salmon recovered at escapement projects located downstream and upstream from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

Escapement Project				Tags Recovered and Observed									
				Tag Site									
River Section	Distance from Tag Sites [1/]	Location	Total Count	Kalskag				Aniak				Tag Summary	
				F [2/]	G [3/]	U [4/]	Total	F [2/]	G [3/]	U [4/]	Total	Total	Ratio [5/]
Lower	-198	Kwethluk R.	2,928	1	0	0	1	1	0	0	1	2	<0.001
	-166	Tuluksak R.	282	3	0	0	3	1	0	0	1	4	0.014
Middle	78	Aniak R.	65	1	0	0	1	1	0	0	1	2	0.031
	162	George R.	14	0	0	0	0	1	0	0	1	1	0.071
	423	Kogrukluk R.	8,986	40	7	9	56	13	5	0	18	74	0.008
Total			12,275	45	7	9	61	17	5	0	22	83	0.007

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from fish wheels
[3/] Tagged from gillnets
[4/] Capture gear unknown
[5/] Ratio = Total number of tags recovered and observed/Total count at escapement project

Table 3. Number and percent of tagged sockeye salmon recovered at escapement projects by the gear used at the Kalskag and Aniak site for capture on the Kuskokwim River, 2003.

Escapement Project		Kalskag								Aniak							
Location	Distance from Tag Sites [1/]	Gear						Total		Gear						Total	
		Fish Wheel [2/]				GN [3/]				Fish Wheel [2/]				GN [3/]			
		Right (n=570)		Left (n=603)		(n=176)		(n=1,349)		Right (n=278)		Left (n=563)		(n=169)		(n=1,010)	
		n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]
Kwethluk R.	-198	0	**0.0**	1	**0.2**	0	**0.0**	1	**0.1**	0	**0.0**	1	**0.2**	0	**0.0**	1	**0.1**
Tuluksak R.	-166	1	**0.2**	2	**0.3**	0	**0.0**	3	**0.2**	0	**0.0**	1	**0.2**	0	**0.0**	1	**0.1**
Aniak R.	78	1	**0.2**	0	**0.0**	0	**0.0**	1	**0.1**	0	**0.0**	1	**0.2**	0	**0.0**	1	**0.1**
George R.	162	0	**0.0**	0	**0.0**	0	**0.0**	0	**0.0**	0	**0.0**	1	**0.2**	0	**0.0**	1	**0.1**
Kogrukluk R.	423	23	**4.0**	17	**2.8**	7	**4.0**	47	**3.5**	13	**4.7**	0	**0.0**	5	**3.0**	18	**1.8**

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from right and left bank fish wheels
[3/] Tagged from gillnets
[4/] % = number of recaptures/number of tags deployed

Table 4. Number of tagged sockeye salmon recovered by subsistence, commercial and sport fishers in relation to the distance from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

River Section	Distances from tag sites (rkm) [1/, 2/]	Tags Recovered				
		Subsistence	Commercial	Sport	Found	Total
Downstream	-91 to -336	8	2	1	0	11
Near Tag Site	0	3	0	0	0	3
Upstream	26 to 431	12	0	7	3	22
Unknown		0	0	0	1	1
Total		23	2	8	4	37

[1/] Negative distance means downstream from the tag sites
[2/] Range of distances of recaptured fish

Table 5. Number of sockeye, chum, and coho salmon examined for secondary marks at the Aniak River sonar project and at the George, Kogrukluk, Tatlawiksuk, and Takotna River weirs on the Kuskokwim River, from 2002 and 2003 combined.

Escapement Project	Sockeye Salmon		Chum Salmon		Coho Salmon		Total	
	Examined 1/	Tag Loss 2/	Examined 1/	Tag Loss 2/	Examined 1/	Tag Loss 2/	Examined 1/	Tag Loss 2/
Aniak River sonar	70	0	4,657	0	4	0	4,731	0
George River weir	0		2,741	0	429	0	3,170	0
Kogrukluk River weir	39	0	2,643	0	875	0	3,557	0
Tatlawiksuk River weir	0		3,499	1	1,799	0	5,298	1
Takotna River weir	0		2,846	0	2,548	0	5,394	0
Total	109	0	16,386	1	5,655	0	22,150	1

1/ Number of fish examined for secondary marks.
2/ Fish examined that had a secondary mark and were untagged.

Table 6. Sockeye salmon estimate from the Petersen model, Kuskokwim River, 2003.

Initial marked population	Kalskag	Fish Wheel	1173			
		Gillnet	176			
Effective marked population		M =	1349			
Recovery Site	Number Examined[1/]	Number Unmarked	Number Marked [2/]	Petersen Estimator	SE	Tag Ratio
Aniak	1,541	1,519	22	90,449	18,167	0.0142
			95% CI	54,842; 126,056		

[1/] The 26 sockeye salmon that were tagged and recovered at the Aniak site were added only one time to the total.
[2/] One sockeye salmon censured because it was recaptured two times.

Table 7. Run timing of sockeye salmon tagged at the Kalskag and Aniak tag site (median tag date) and recaptured (median recapture date) at the Kogrukluk River weir on the Kuskokwim River, 2003.

Location	Total Count	Median Date	Kalskag Recaptures			Aniak Recaptures		
			n	Median Dates [2/]		n	Median Dates [2/]	
				Tag	Recap.		Tag	Recap.
Kogrukluk R (423 [1/])	8,986	7/16	47	7/2	7/19	18	7/3	7/20

[1/] Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.

[2/] Calculated using tag returns weighted by the number of sockeye salmon captured on the day of release divided by the number of sockeye salmon tagged on the day of release.

Table 8. Sockeye salmon travel speed (rkm/day) based on recoveries from the Aniak tag site and at escapement projects on the Kuskokwim River, 2003.

Tag Recoveries	Tag Dates	N	Travel Speed (rkm/day)		Travel Days	
			Mean	SD	Mean	Range
Aniak Tag Site	Jun. 21 - Aug. 21	23	12	8.9	6	1-57
Aniak R. Sonar	Jul. 5 - Jul. 21	2	14	2.0	5	4-5
George R. Weir	Jul. 16	1	33		5	5
Kogrukluk R. Weir	Jun. 16- Jul. 22	65	25	5.9	19	10-37

Table 9. Number of chum salmon tagged and recovered at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

Tag Site	Chum Salmon				
Kalskag	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Left Bank[1/]	2,780	416	142	3	3,341
Right Bank[2/]	5,178	547	208	3	5,936
Gillnet	437	13	5	0	455
Total	8,395	976	355	6	9,732
Aniak	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Left Bank[1/]	7,461	2,865	230	394	10,950
Right Bank[2/]	3,632	472	88	59	4,251
Gillnet (Tag)[5/]	623	59	0	4	686
Gillnet (Rec.)[6/]	0	2,837	14	10	2,861
Total	11,716	6,233	332	467	18,748
Combined	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Total	20,111	7,209	687	475	28,482

[1/] Fish wheel anchored on left bank
[2/] Fish wheel anchored on right bank
[3/] Fish tagged at the Kalskag site
[4/] Fish tagged at the Aniak site
[5/] Drift gillnet for tag deployment
[6/] Drift gillnet for tag recovery

Table 10. Number of tagged chum salmon recovered at escapement projects located downstream and upstream from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

Escapement Project				Tags Recovered and Observed									
				Tag Site									
River Section	Distance From Tag Sites (km) [1/]	Location	Total Count	Kalskag				Aniak				Tag Summary	
				F [2/]	G [3/]	U [4/]	Total	F [2/]	G [3/]	U [4/]	Total	Total	Ratio [5/]
Lower	-198	Kwethluk R.	41,812	0	0	0	0	0	0	1	1	1	<0.001
	-166	Tuluksak R.	11,625	6	0	2	8	2	0	3	5	13	0.001
Middle	78	Aniak R.	1,120	7	0	0	7	25	1	2	28	33	0.031
	166	George R.	25,005	140	8	91	239	68	4	44	116	355	0.014
	423	Kogrukluk R.	22,514	32	3	12	47	19	11	9	39	86	0.004
Upper	564	Takotna R.	3,020	1	0	0	1	2	1	2	5	6	0.002
Total			105,096	186	11	105	302	116	17	61	194	496	0.005

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from fish wheels
[3/] Tagged from gillnets
[4/] Capture gear unknown
[5/] Ratio = Total number of tags recovered and observed/Total count at escapement project

Table 11. Number and percent of tagged chum salmon recovered at escapement projects by the gear used at the Kalskag and Aniak site for capture on the Kuskokwim River, 2003.

Escapement Project		Kalskag								Aniak							
Location	Distance from Tag Sites [1/]	Gear						Total		Gear						Total	
		Fish Wheel [2/]				GN [3/]				Fish Wheel [2/]				GN [3/]			
		Right (n=2,780)		Left (n=5,178)		(n=437)		(n=8,395)		Right (n=3,632)		Left (n=7,461)		(n=623)		(n=11,716)	
		n	**%** [4/]	n	**%** [4/]	n	**%** [4/]	n	**%** [4/]	n	**%** [4/]	n	**%** [4/]	n	**%** [4/]	n	**%** [4/]
Tuluksak R.	-166	4	**0.1**	2	**<0.1**	0	**0.0**	6	**0.1**	1	**<0.1**	1	**<0.1**	0	**0.0**	2	**<0.1**
Aniak R.	78	1	**<0.1**	6	**0.0**	0	**0.0**	7	**0.1**	3	**0.1**	22	**0.3**	1	**0.2**	26	**0.2**
George R.	166	100	**3.6**	40	**0.8**	8	**1.8**	148	**1.8**	53	**1.5**	15	**0.2**	4	**0.6**	72	**0.9**
Kogrukluk R.	423	30	**1.1**	2	**<0.1**	3	**0.7**	35	**0.4**	16	**0.4**	3	**<0.1**	11	**1.8**	30	**0.4**
Takotna R.	564	1	**<0.1**	0	**0.0**	0	**0.0**	1	**<0.1**	2	**<0.1**	0	**0.0**	1	**0.2**	3	**<0.1**

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from right and left bank fish wheels
[3/] Tagged from gillnets
[4/] % = number of recaptures/number of tags deployed

Table 12. Number of tagged chum salmon recovered by subsistence, commercial and sport fishers in relation to the distance from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

River Section	Distances from tag sites (rkm) [1/, 2/]	Tags Recovered				
		Subsistence	Commercial	Sport	Found	Total
Downstream	-91 to -253	51	28	7	2	88
Near Tag Site	0	11	0	0	0	11
Upstream	26 to 948	31	0	60	26	117
Unknown		2	0	1	1	4
Total		95	28	68	29	220

[1/] Negative distance means downstream from the tag sites
[2/] Range of distances of recaptured fish

Table 13. Number of chum salmon tagged at the Kalskag site and recaptured at the Aniak site by stratum on the Kuskokwim River, 2003.

Tagging Stratum	Recovery Stratum [1/]				Total Recovered	Tags Released
	06/06-07/17	07/18-07/31	08/01-08/14	08/15-09/11		
06/06-07/03	8	2	0	0	9	702
07/04-07/17	75	33	0	0	108	3,269
07/18-07/31	0	147	10	0	157	3,554
08/01-08/14	0	0	21	9	30	668
08/15-09/11	0	0	0	4	4	202
Total [2/]	6,835	7,398	3,510	554		
Unmarked Catch	6,752	7,216	3,479	541		

[1/] There were 19 chum salmon censured because they were recapture multiple times.
[2/] The 469 chum salmon that were tagged and recovered at the Aniak site were added only one time to the total.

Table 14. Chum salmon strata by abundance and probability of capture estimates from the Darroch model based on the Kalskag-Aniak data set, 2003.

Strata	Abundance Estimate	Standard Error	Probability of Capture	Standard Error
6/06-07/17	263,709	30,932	0.0259	0.0030
07/17-07/31	169,122	14,477	0.0437	0.0037
07/31-08/14	56,524	30,613	0.0621	0 .0336
08/14-09/11	18,417	7,375	0.0300	0.0120
Total	412,443	30,958		
95% CI	351,765, 443,121			

Table 15. Run timing of chum salmon tagged at the Kalskag and Aniak tag site (median tag date) and recaptured (median recapture date) at the George and Kogrukluk River weirs on the Kuskokwim River, 2003.

Location [1/]	Catch	Median Date	Kalskag Recaptures			Aniak Recaptures		
			n	Median Dates [2/]		n	Median Dates [2/]	
				Tag	Recap.		Tag	Recap.
George R. (166)	25,005	7/19	148	7/16	7/20	72	7/14	7/20
Kogrukluk R (423)	22,514	7/19	35	7/5	7/18	30	7/5	7/17

[1/] Distance indicated is from the Kalskag site
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.

[2/] Calculated using tag returns weighted by the number of chum salmon captured on the day of release divided by the number of chum salmon tagged on the day of release.

Table 16. Chum salmon travel speed (rkm/day) based on recoveries at the Aniak tag site and at escapement projects on the Kuskokwim River, 2003.

Tag Recoveries	Tag Dates	N	Travel Speed (rkm/day)		Travel Days	
			Mean	SD	Mean	Range
Aniak Tag Site	Jun. 25 – Aug. 31	332	21	8.5	2	0-23
Aniak Sonar	Jun. 26 - Jul. 30	33	18	9.4	4	1-10
George R.	Jun. 20 - Aug. 29	216	27	8.2	7	3-28
Kogrukluk R.	Jun. 15 - Jul. 25	69	34	11.5	14	5-24
Takotna R.	Jun. 21 - Jul. 21	4	35	5.8	17	14-22

Table 17. Number of coho salmon tagged and recovered at the Kalskag and the Aniak tagging sites on the Kuskokwim River, 2003.

Tag Site	Coho Salmon				
Kalskag	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Left Bank[1/]	1,551	128	39	5	1,723
Right Bank[2/]	4,610	223	73	5	4,911
Gillnet	610	31	12	1	654
Total	6,771	382	124	11	7,288

Aniak	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Left Bank[1/]	5,814	1,234	54	174	7,276
Right Bank[2/]	5,523	666	74	95	6,358
Gillnet (Tag)[5/]	37	9	0	0	46
Gillnet (Rec.)[6/]	0	3515	42	14	3,571
Total	11,374	5,424	170	283	17,251

Combined	Tagged	Untagged	Recaptures from:		Total Catch
			Kalskag[3/]	Aniak[4/]	
Total	18,145	5,806	294	294	24,539

[1/] Fish wheel anchored on left bank
[2/] Fish wheel anchored on right bank
[3/] Fish tagged at the Kalskag site
[4/] Fish tagged at the Aniak site
[5/] Drift gillnet for tag deployment
[6/] Drift gillnet for tag recovery

Table 18 Number tagged coho salmon recovered at escapement projects located downstream and upstream from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

Escapement Project				Tags Recovered and Observed — Tag Site									
River Section	Distance From Tag Sites [1/]	Location	Total Count	Kalskag				Aniak				Tag Summary	
				F [2/]	G [3/]	U [4/]	Total	F [2/]	G [3/]	U [4/]	Total	Total	Ratio [5/]
Lower	-198	Kwethluk R.	107,789	18	0	41	59	41	0	101	142	201	0.002
	-166	Tuluksak R.	39,627	0	0	27	27	5	0	97	102	129	0.003
Middle	11	Whitefish Lk.	409	1	1	0	2	4	0	0	4	6	0.015
	78	Aniak R.	58	0	1	0	1	0	0	0	0	1	0.017
	166	George R.	31,925	112	4	106	222	95	0	96	191	413	0.013
	423	Kogrukluk R.	68,831	334	9	158	501	399	3	121	523	1,024	0.015
Upper	564	Takotna R.	7,147	34	0	4	38	33	0	2	35	73	0.010
Total			255,786	499	15	336	850	577	3	417	997	1,847	0.007

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from fish wheels
[3/] Tagged from gillnets
[4/] Capture gear unknown
[5/] Ratio = Total number of tags recovered and observed/Total count at escapement project

Table 19. Number and percent of tagged coho salmon recovered at escapement projects by the gear used at the Kalskag and Aniak site for capture on the Kuskokwim River, 2003.

Escapement Project		Kalskag								Aniak							
Location	Distance from Tag Sites [1/]	Gear						Total		Gear						Total	
		Fish Wheel [2/]				GN [3/]				Fish Wheel [2/]				GN [3/]			
		Right (n=4,610)		Left (n=1,551)		(n=610)		(n=6,771)		Right (n=5,523)		Left (n=5,814)		(n=37)		(n=11,374)	
		n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]	n	% [4/]
Kwethluk R.	-198	11	**0.2**	7	**0.5**	0	**0.0**	18	**0.3**	14	**0.3**	27	**0.5**	0	**0.0**	41	**0.4**
Tuluksak R.	-166	0	**0.0**	0	**0.0**	0	**0.0**	0	**0.0**	1	**<0.1**	4	**0.1**	0	**0.0**	5	**<0.1**
Whitefish Lk.	11	0	**0.0**	1	**0.1**	1	**0.2**	2	**<0.1**	1	**<0.1**	3	**<0.1**	0	**0.0**	4	**<0.1**
Aniak R.	78	0	**0.0**	0	**0.0**	1	**0.2**	1	**<0.1**	0	**0.0**	1	**<0.1**	0	**0.0**	1	**<0.1**
George R.	166	81	**1.8**	31	**2.0**	4	**0.7**	116	**1.7**	85	**1.5**	10	**0.2**	0	**0.0**	95	**0.8**
Kogrukluk R.	423	274	**5.9**	60	**3.9**	9	**1.5**	343	**5.1**	341	**6.2**	58	**1.0**	3	**8.1**	402	**3.5**
Takotna R.	564	26	**0.6**	8	**0.5**	0	**0.0**	34	**0.5**	29	**0.5**	4	**0.1**	0	**0.0**	33	**0.3**

[1/] Negative distance means downstream from the tag sites.
Distance indicated is from the Kalskag site.
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.
[2/] Tagged from right and left bank fish wheels
[3/] Tagged from gillnets
[4/] % = number of recaptures/number of tags deployed

Table 20. Number of tagged coho salmon recovered by subsistence, commercial and sport fishers in relation to the distance from the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

River Section	Distances from tag sites (rkm) [1/, 2/]	Tags Recovered				
		Subsistence	Commercial	Sport	Found	Total
Downstream	-91 to -232	29	32	7	2	70
Near Tag Site	0	9	0	0	0	9
Upstream	26 to 948	85	0	88	2	175
Unknown		4	1	2	1	8
Total		127	33	97	5	262

[1/] Negative distance means downstream from the tag sites
[2/] Range of distances of recaptured fish

Table 21. Number of coho salmon tagged at the Kalskag site and recaptured at the Aniak site by stratum on the Kuskokwim River, 2003.

Tagging Stratum	Recovery Stratum [1/]		Total Recovered	Tags Released
	06/20-08/14	08/15-09/11		
06/20-07/31	4	1	5	347
08/01-08/14	20	14	34	2,064
08/15-09/11	0	123	123	4,198
Unmarked Catch		5,615	11,183	
Total [2/]		5,639	11,321	

[1/] One coho salmon censured because it was recapture two times.
[2/] The 283 coho salmon that were tagged and recovered at the Aniak site were added only 1 time to the total.

Table 22. Coho salmon strata by abundance and probability of capture estimates from the Darroch model, Kuskokwim River, 2003.

Strata	Abundance Estimate	Standard Error	Probability of Capture	Standard Error
06/20-8/14	451,760	97,480	0.0125	.0027
08/15-09/11	397,734	35,333	0.0285	.0025
Total	849,494	99,649		
95% CI	654,182; 1,044,806			

Table 23. Run timing of coho salmon tagged at the Kalskag and Aniak tag site (median tag date) and recaptured (median recapture date) at the George, Kogrukluk, and Takotna River weirs on the Kuskokwim River, 2003.

Location [1/]	Catch	Median Date	Kalskag Recaptures			Aniak Recaptures		
			n	Median Dates [2/]		n	Median Dates [2/]	
				Tag	Recap.		Tag	Recap.
George R. (166)	31,925	8/28	116	8/21	9/5	95	8/22	9/04
Kogrukluk R (423)	68,831	9/1	343	8/16	9/4	402	8/16	9/4
Takotna R. (564)	7,147	8/28	34	8/12	8/31	33	8/10	8/30

[1/] Distance indicated is from the Kalskag site
Add 27 rkm to calculate distance from the Aniak site to lower river escapement projects, and subtract 27 rkm to calculate distance from the Aniak site to middle and upper river escapement projects.

[2/] Calculated using tag returns weighted by the number of coho salmon captured on the day of release divided by the number of coho salmon tagged on the day of release.

Table 24. Coho salmon travel speed (rkm/day) based on recoveries at the Aniak tag site and at escapement projects on the Kuskokwim River, 2003.

Tag Recoveries	Tag Dates	N	Travel Speed (rkm/day)		Travel Days	
			Mean	SD	Mean	Range
Aniak Tag Site	Jul. 28 – Sept. 8	170	15	8.5	9.5	4
Aniak Sonar	Jul. 22 – Jul. 31	2	15	15.8	9	3-14
George R.	Jul. 22 - Sept. 7	207	15	5.5	14	4-32
Kogrukluk R.	Jul. 8- Sept. 7	740	25	4.9	19	11-47
Takotna R.	Jul. 25- Aug. 28	66	31	5.0	19	12-29

Table 25. Estimates of chum salmon at various tributary projects on the Kuskokwim River, and the Kuskokwim River mark recapture project for 2002 and 2003.

Project	Distance from Tag sites (rkm)	2002 Estimates	2003 Estimates
Kwethluk R. weir	-198	35,854	41,812
Tuluksak R. weir	-166	9,958	11,724
Kuskokwim R. [1/]	0	675,659 (95% CI: 559,564; 797,955)	412,443 (95% CI: 351,765; 473,121)
Aniak R. sonar	78	360,075	363,396
George R. weir	166	6,543	33,666
Kogrukluk R. weir	204	51,570	23,411
Takotna R. weir	564	4,366	3,393

[1/] Kuskokwim River mark recapture project

Table 26. Estimates of coho salmon at various tributary projects of the Kuskokwim River and the Kuskokwim River Mark/Recapture project for 2002 and 2003.

Project	Distance from Tag sites (rkm)	2002 Estimates	2003 Estimates
Kwethluk R. weir	-198	23,298	107,789
Tuluksak R. weir	-166	11,487	41,071
Kuskokwim R. [1/]	0	316,068 (95% CI: 193,877; 438,259)	849,494 (95% CI: 654,182; 1,044,806)
George R. weir	166	6,759	33,280
Kogrukluk R. weir	204	14,516	74,754
Takotna R. weir	564	3,984	7,171

[1/] Kuskokwim River mark recapture project

Table 27. Projected estimates of coho salmon at various tributary projects of the Kuskokwim River and the Kuskokwim River Mark/Recapture project based on the proportional reduction harvest from 1996 and 2003.

Project	Distance from Tag sites (rkm)	1996	2003	Proportional Factor [2/]	1996 Projected Estimates [3/]
Commercial Harvest		1,099,865	346,555	0.3151	
Kwethluk R. weir	-198	-	107,789	0.3151	73,826
Tuluksak R. weir	-166	-	41,071	0.3151	28,130
Kuskokwim R. [1/]	0	-	1,044,806	0.3151	715,599
George R. weir	166	-	33,280	0.3151	22,794
Kogrukluk R. weir	204	50,555	74,754	0.3151	51,200
Takotna R. weir	564	-	7,171	0.3151	4,911

[1/] Kuskokwim River mark recapture project upper 95% confidence interval of the abundance of coho salmon upstream of Kalskag

[2/] Proportional decrease of 0.3151= 346,555/1,099,865

[3/] Projected estimates based on the proportion commercial harvest.

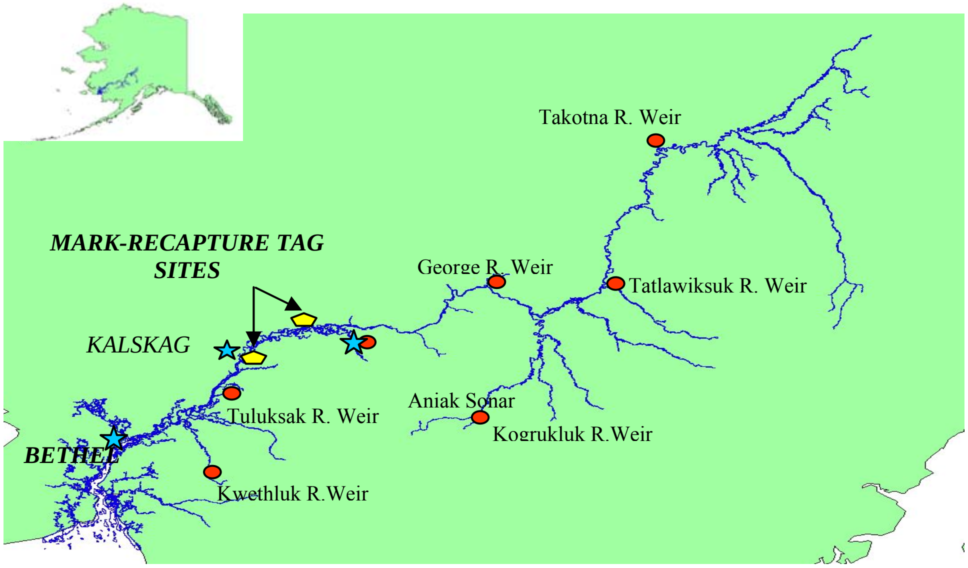


Figure 1. Locations of tagging and weir sites on the Kuskokwim River, 2003.

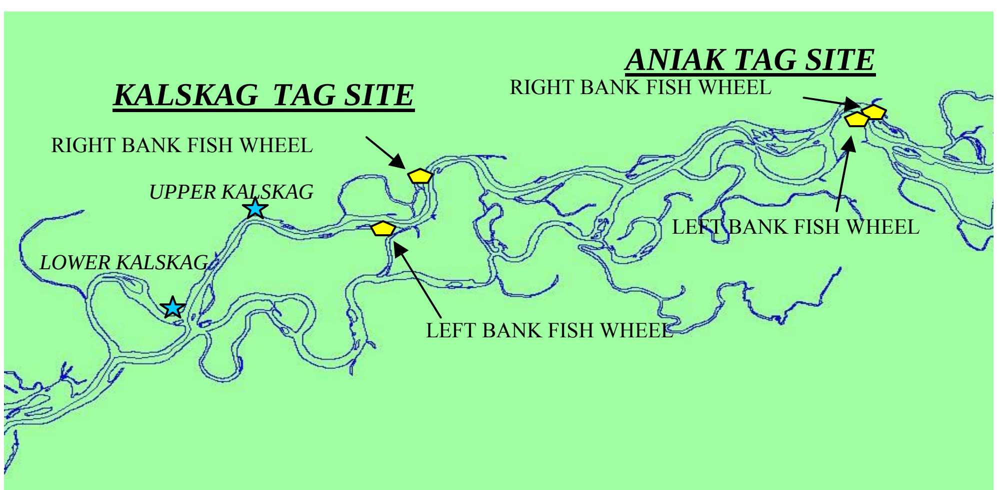


Figure 2. Location of fish wheels at tagging sites on the Kuskokwim River, 2003.

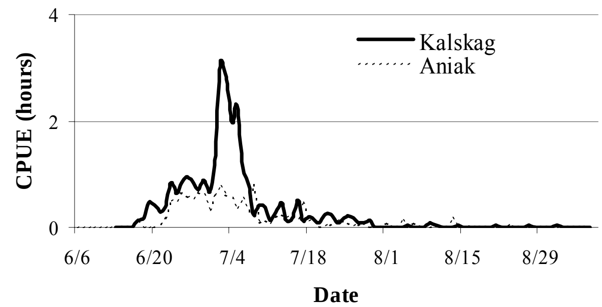


Figure 3. Catch per unit effort (CPUE) of sockeye salmon from right bank fish wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

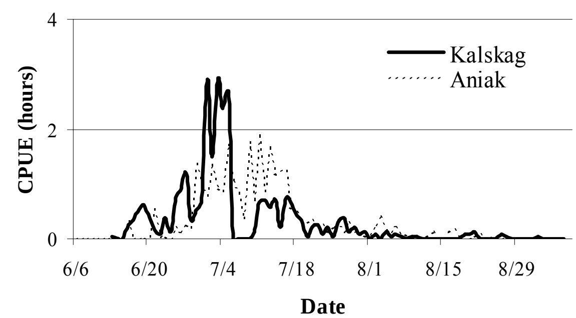


Figure 4. Catch per unit effort (CPUE) of sockeye salmon from left bank fish wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

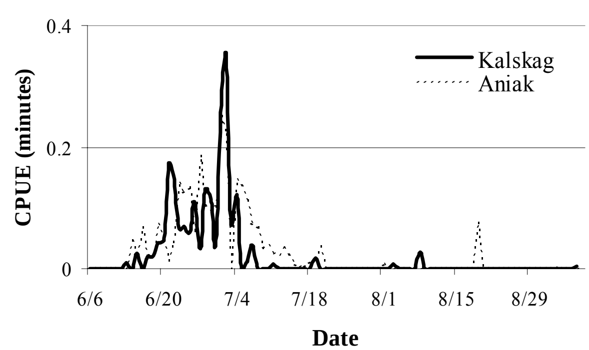
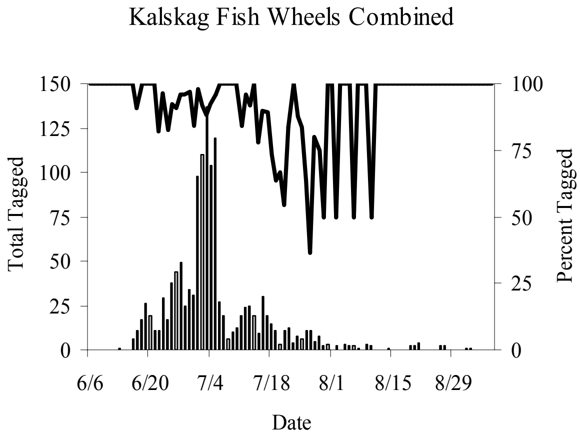


Figure 5. Catch per unit effort (CPUE) of sockeye salmon from gillnets at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.



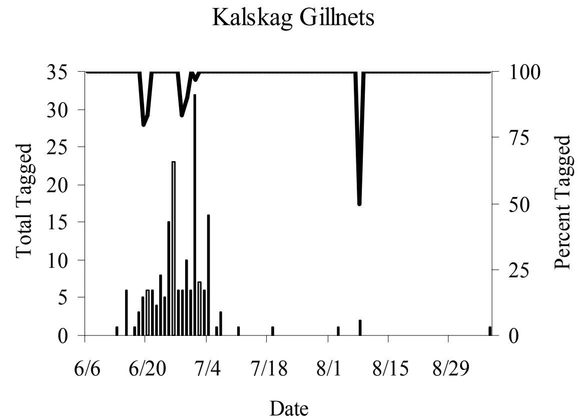


Figure 6. Number of sockeye salmon tagged by date compared to the percent of sockeye salmon tagged at the Kalskag site on the Kuskokwim River, 2003.

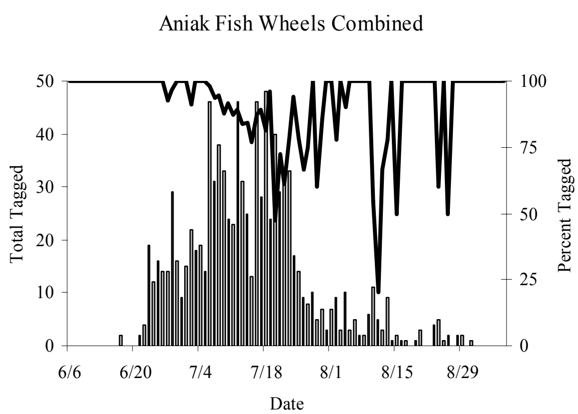


Figure 7. Number of sockeye salmon tagged by date compared to the percent of sockeye salmon tagged at the Aniak site on the Kuskokwim River, 2003.

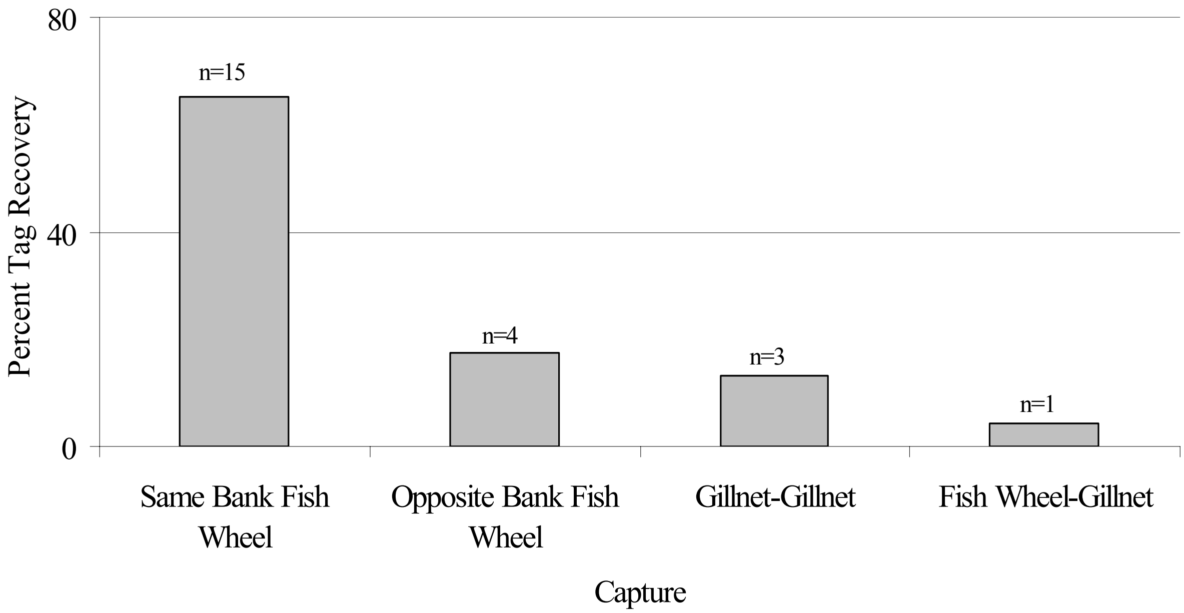


Figure 8. Percentage of sockeye salmon tagged at the Kalskag site and recovered in fish wheels or gillnets at the Aniak site on the Kuskokwim River, 2003.

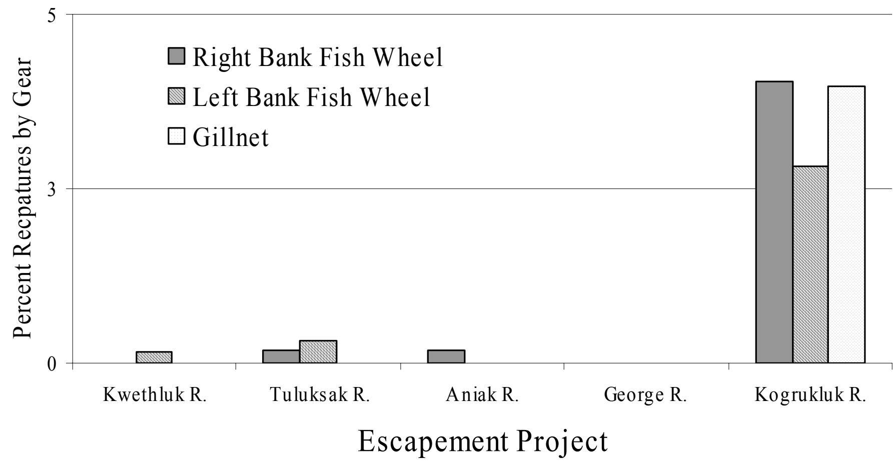


Figure 9. Percent recaptures of sockeye salmon tagged at the Kalskag site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

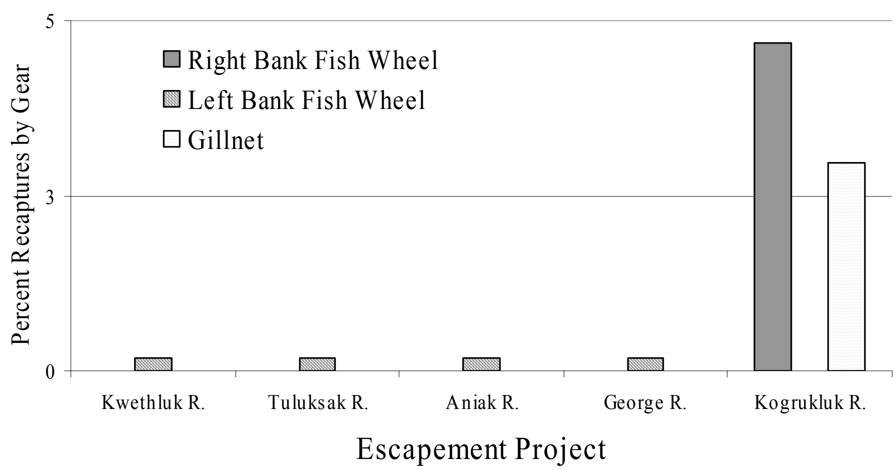


Figure 10. Percent recaptures of sockeye salmon tagged at the Aniak site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

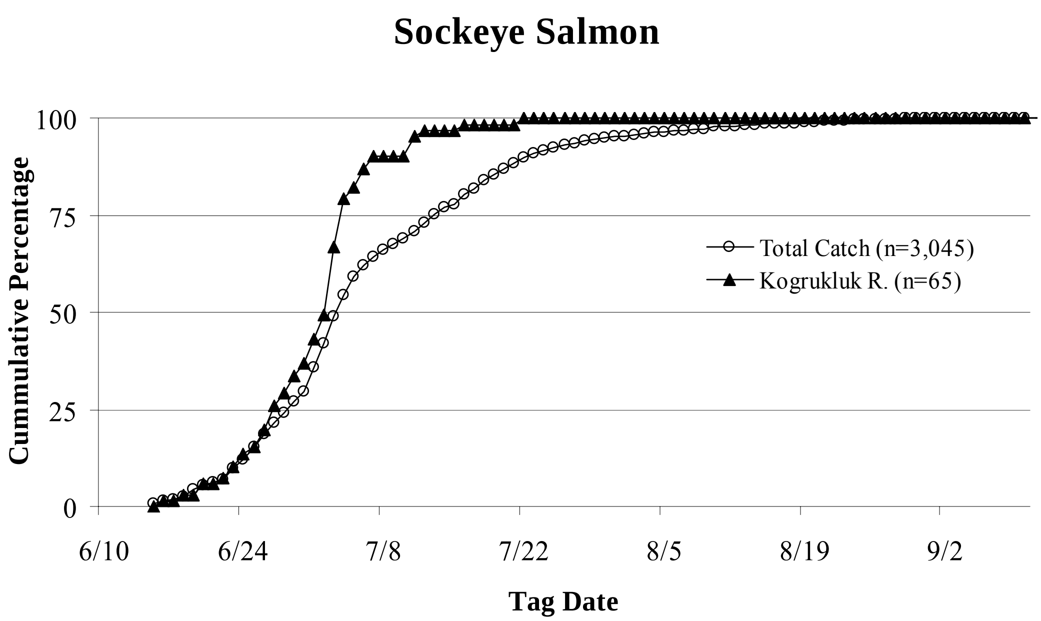


Figure 11. Cumulative percentage of recaptured sockeye salmon (weighted by daily percentage tags deployed at tagging sites) at the Kogrukluk River weir, and the total number of sockeye salmon captured at the Kalskag-Aniak tag sites on the Kuskokwim River, 2003.

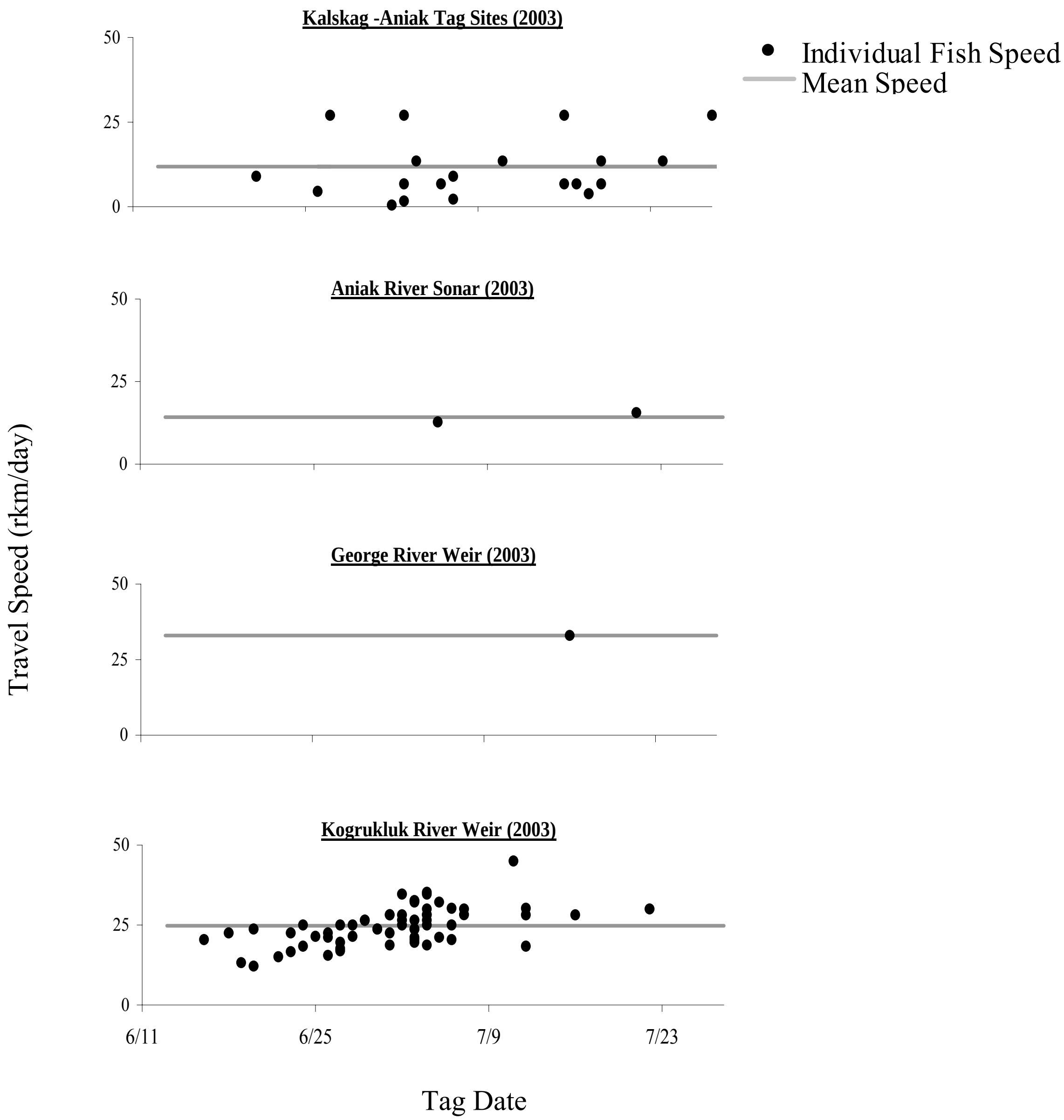


Figure 12. Travel speed (rkm/day) of tagged sockeye salmon from the Kalskag and Aniak tagging sites to the Aniak sonar site and the George and Kogrukluk River weirs on the Kuskokwim River, 2003.

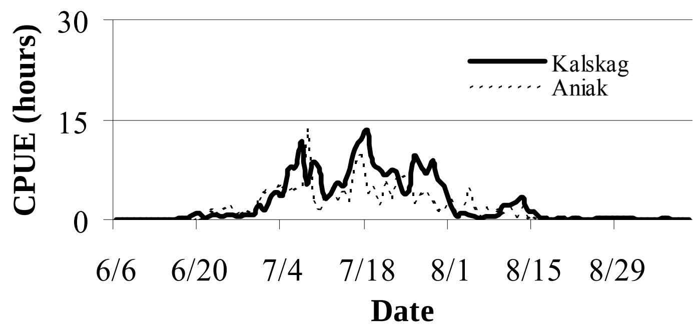


Figure 13. Catch per unit effort (CPUE) of chum salmon from right bank fish wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

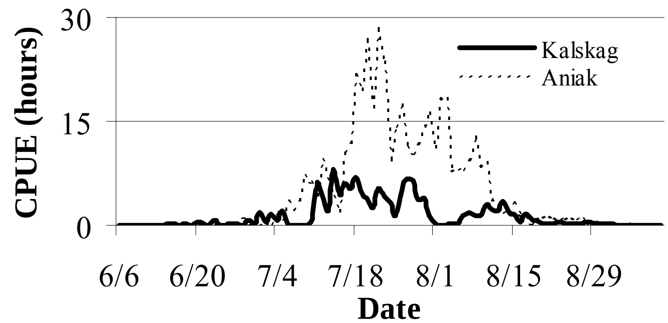


Figure 14. Catch per unit effort (CPUE) of chum salmon from left bank fish wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

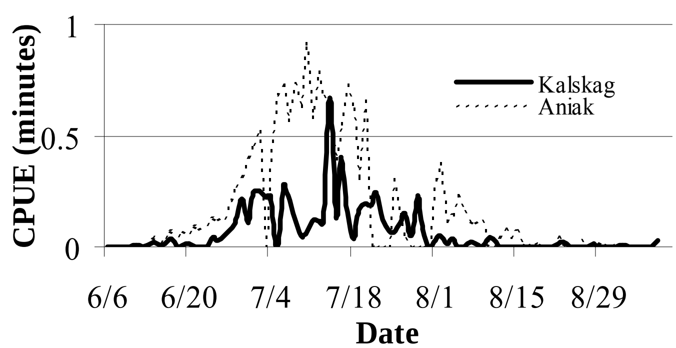


Figure 15. Catch per unit effort (CPUE) of chum salmon from gillnets at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

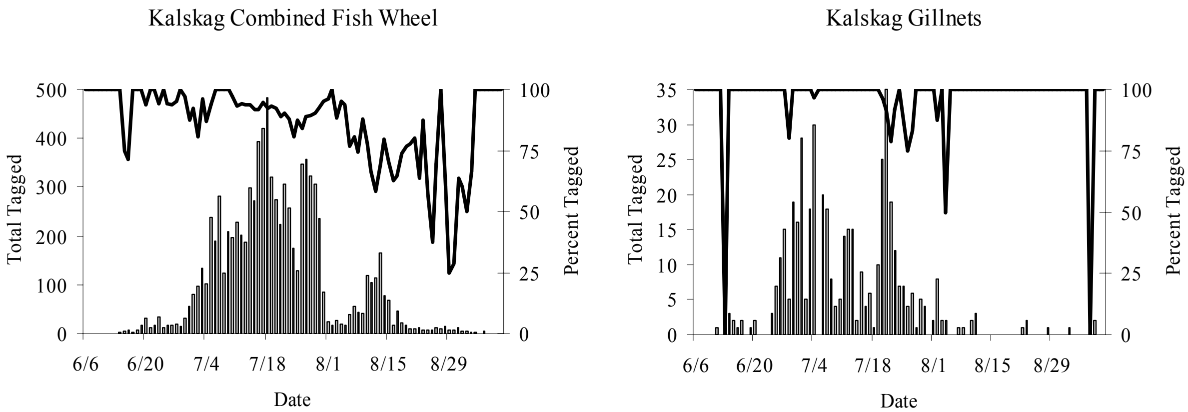


Figure 16. Number of chum salmon tagged by date compared to the percent of chum salmon tagged at the Kalskag site on the Kuskokwim River, 2003.

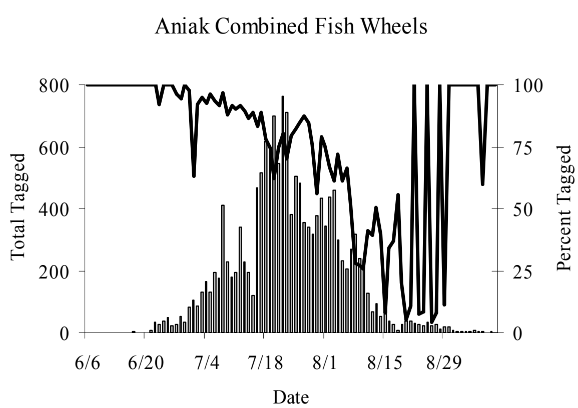


Figure 17. Number of chum salmon tagged by date compared to the percent of chum salmon tagged at the Aniak site on the Kuskokwim River, 2003.

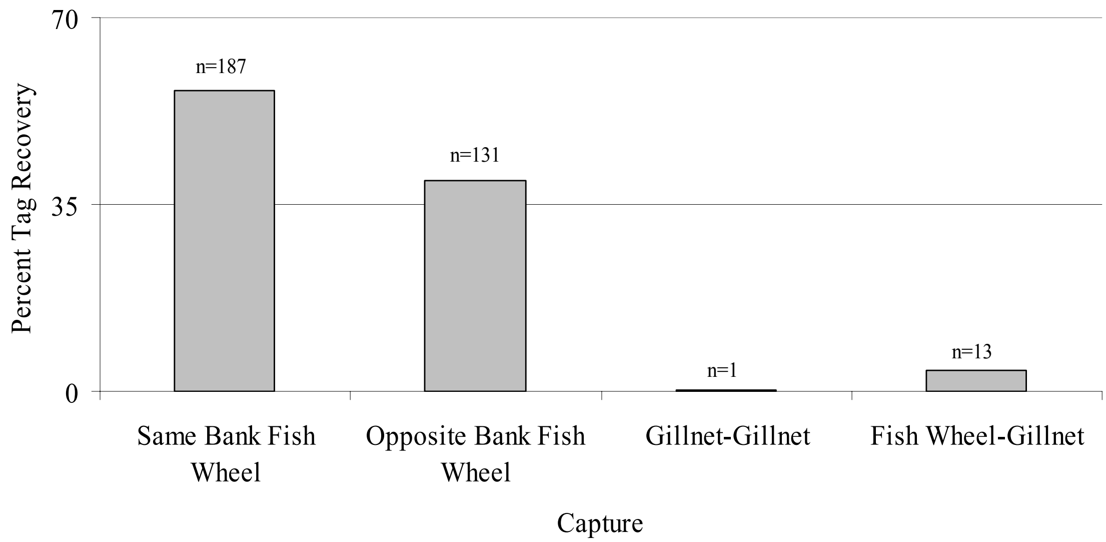


Figure 18. Percentage of chum salmon tagged at the Kalskag site and recovered in fish wheels or gillnets at the Aniak site on the Kuskokwim River, 2003.

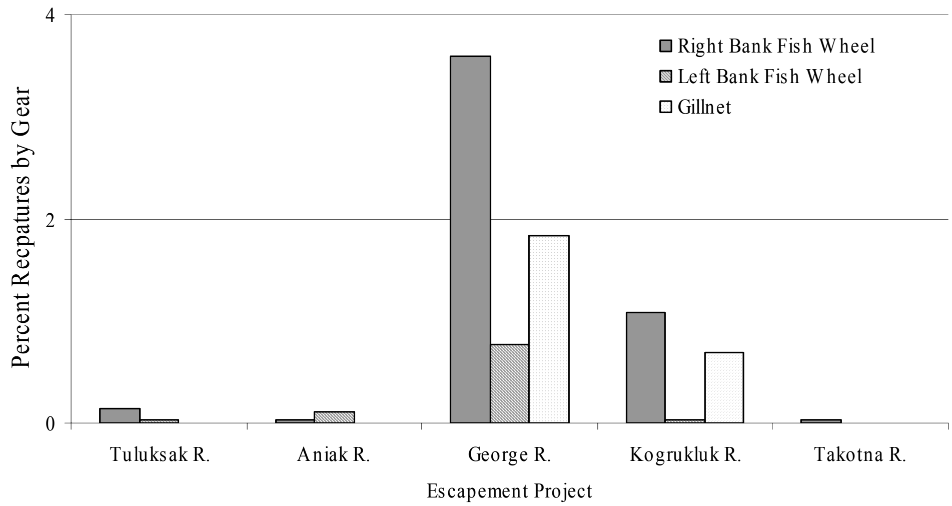


Figure 19. Percentage of chum salmon tagged at the Kalskag site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

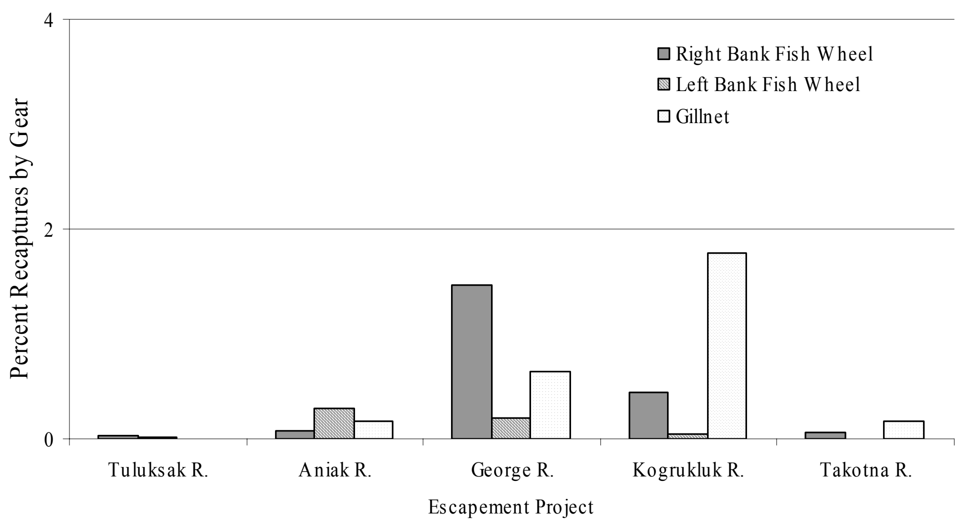


Figure 20. Percentage of chum salmon tagged at the Aniak site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

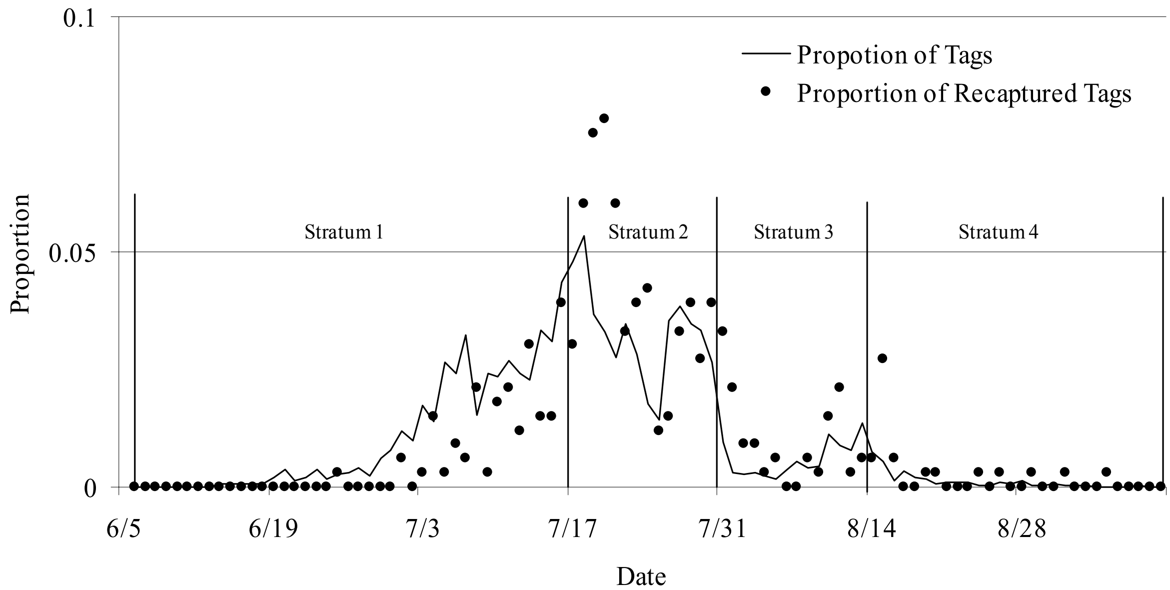


Figure 21. Proportion of the total chum salmon tagged daily at the Kalskag site compared to proportion of total daily recaptures at the Aniak site and strata used in estimating abundance of chum salmon upstream of Kalskag on the Kuskokwim River, 2003.

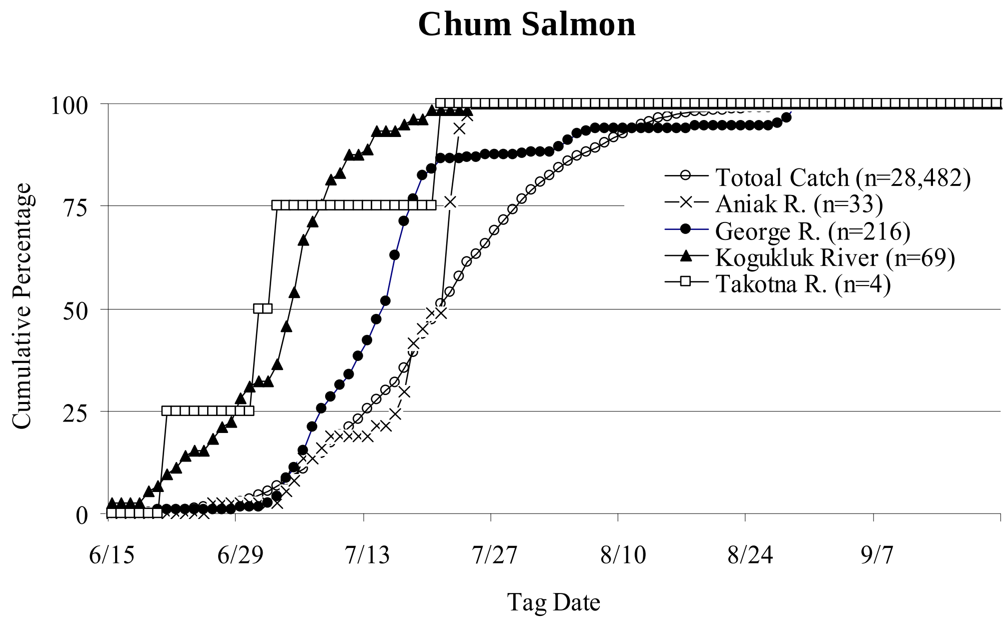


Figure 22. Cumulative percentage of recaptured chum salmon (weighted by daily percentage tags deployed at tagging sites) at the Takotna River weir, Kogrukluk River weir, George River weir, Aniak River sonar site, and of the total number of chum salmon captured at the Kalskag-Aniak tag sites on the Kuskokwim River, 2003.

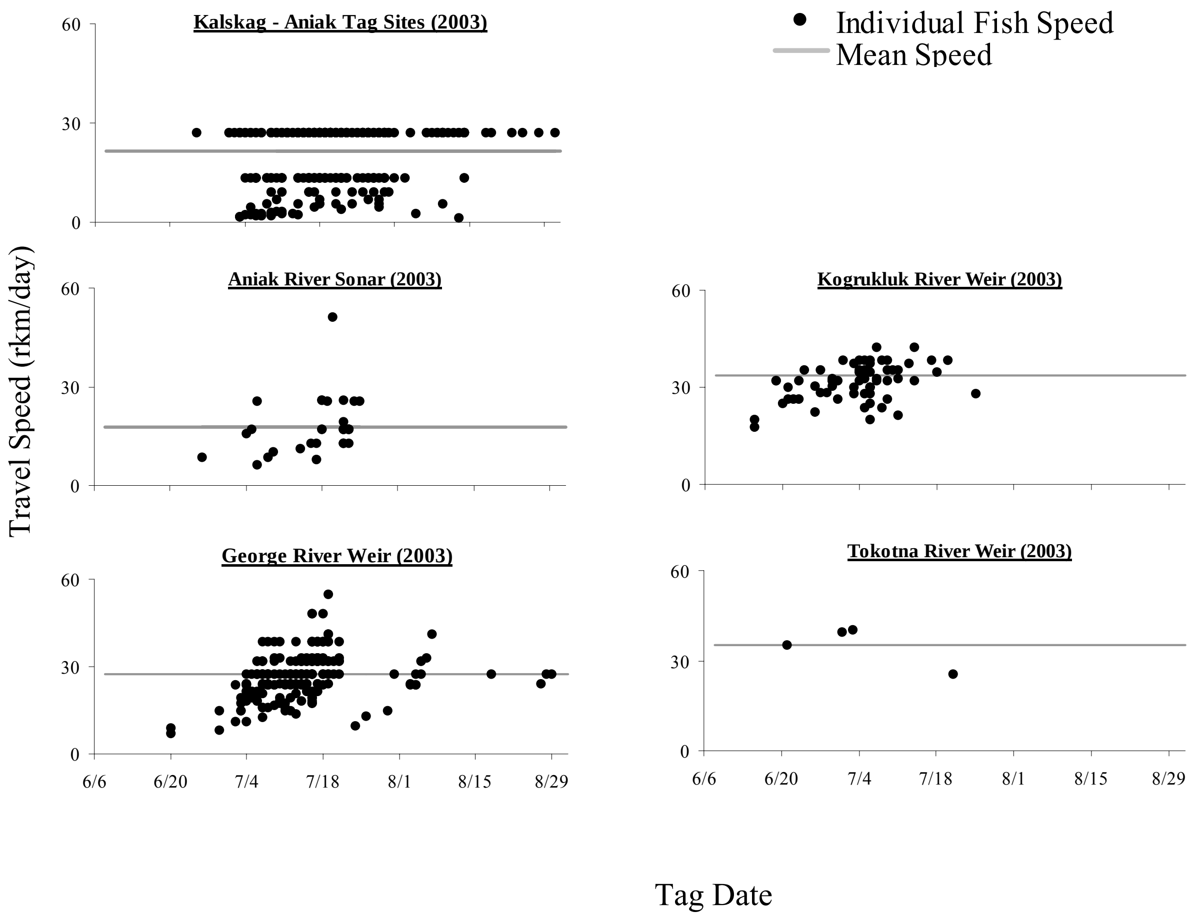


Figure 23. Travel speed (rkm/day) of tagged chum salmon from the Kalskag and Aniak tag sites to the Aniak River sonar site and the George, Kogrukluk, and Takotna River weirs on the Kuskokwim River, 2003.

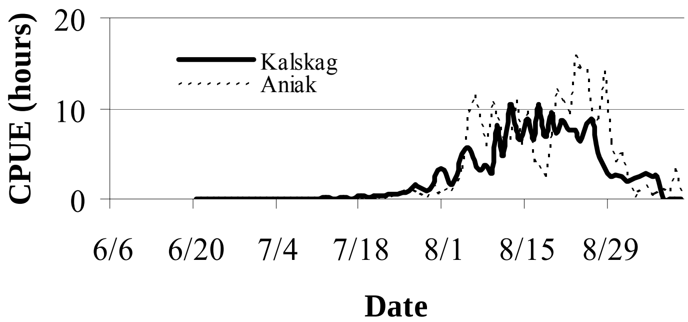


Figure 24. Catch per unit effort (CPUE) of coho salmon from right bank fish-wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

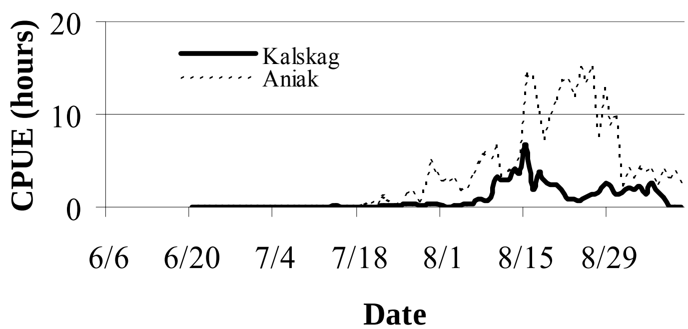


Figure 25. Catch per unit effort (CPUE) of coho salmon from left bank fish wheels at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.

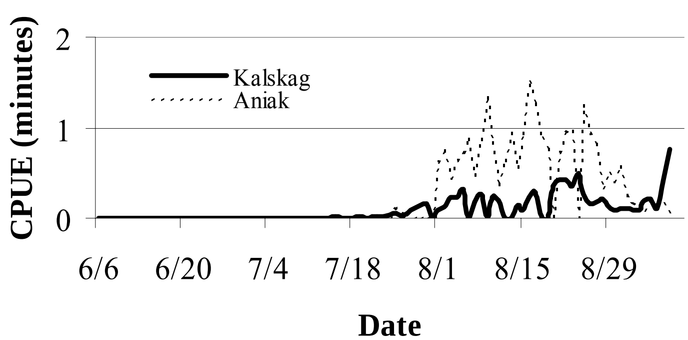
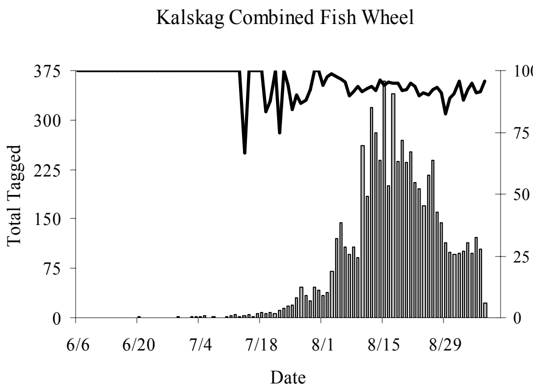


Figure 26. Catch per unit effort (CPUE) of coho salmon from gillnets at the Kalskag and Aniak tagging sites on the Kuskokwim River, 2003.



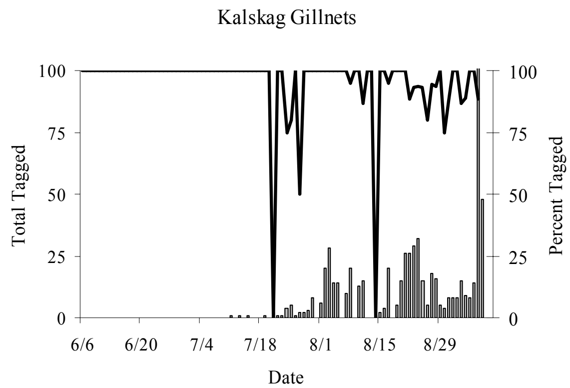


Figure 27. Number of coho salmon tagged by date compared to the percent of coho salmon tagged at the Kalskag site on the Kuskokwim River, 2003.

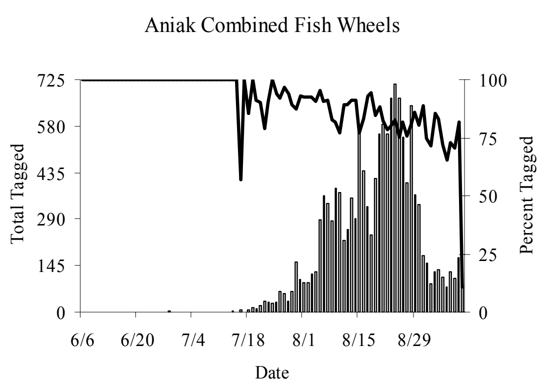


Figure 28. Number of coho salmon tagged by date compared to the percent of coho salmon tagged at the Aniak site on the Kuskokwim River, 2003.

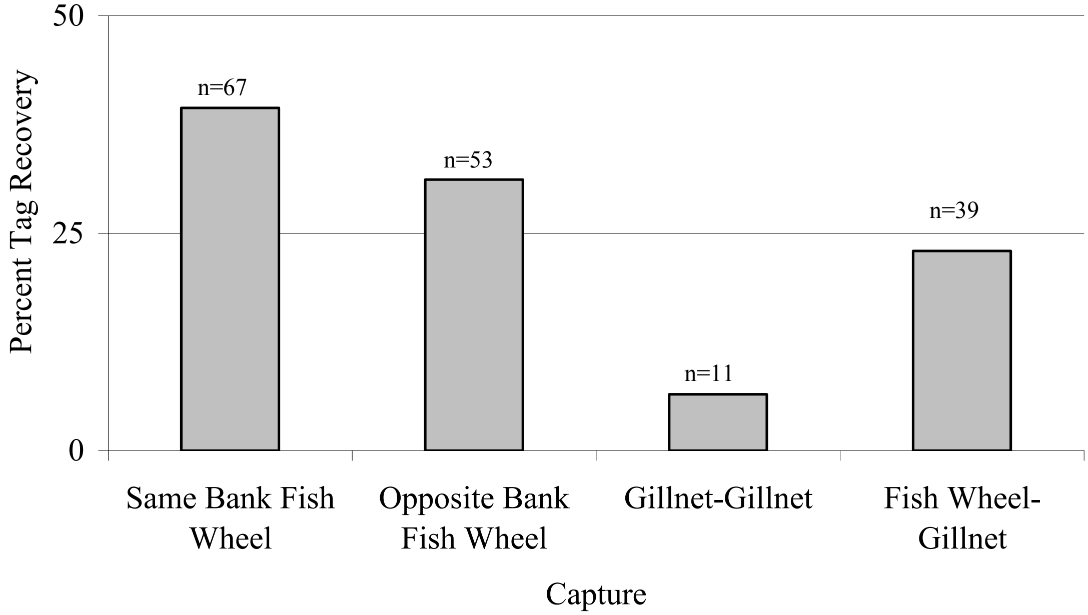


Figure 29. Percentage of coho salmon tagged at the Kalskag site and recovered in fish wheels or gillnets at the Aniak site on the Kuskokwim River, 2003.

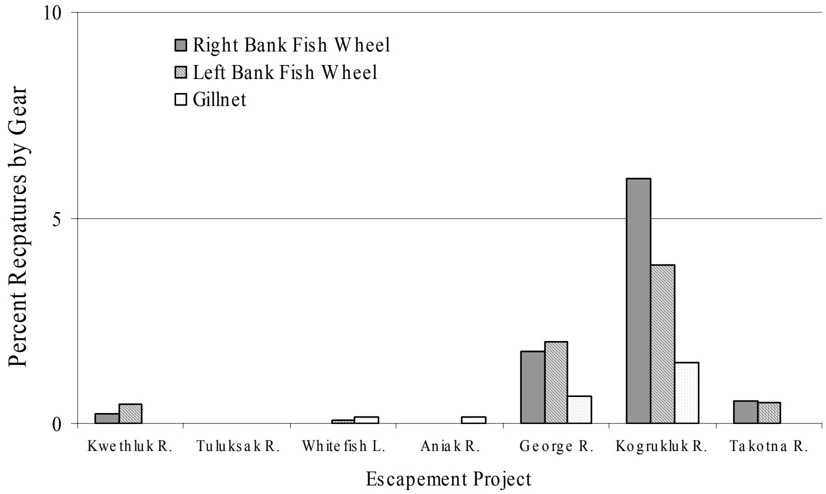


Figure 30. Percentage of coho salmon tagged at the Kalskag site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

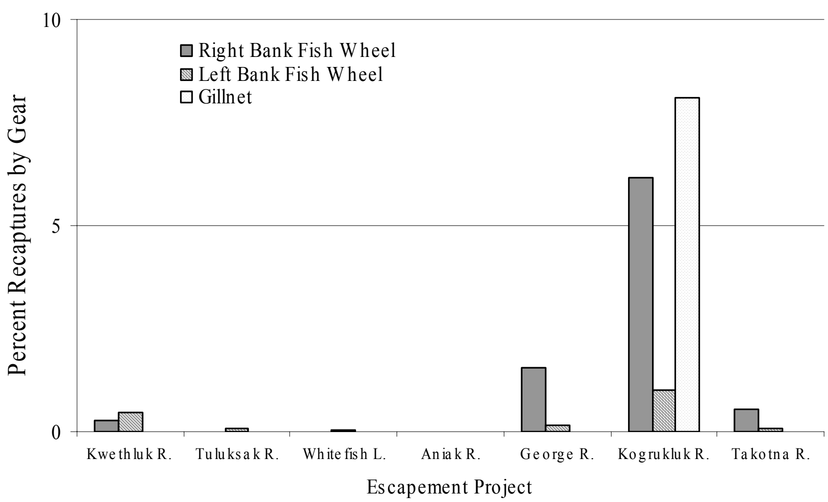


Figure 31. Percentage of coho salmon tagged at the Aniak site from gillnets, right and left bank fish wheels that were recovered at escapement projects on the Kuskokwim River, 2003.

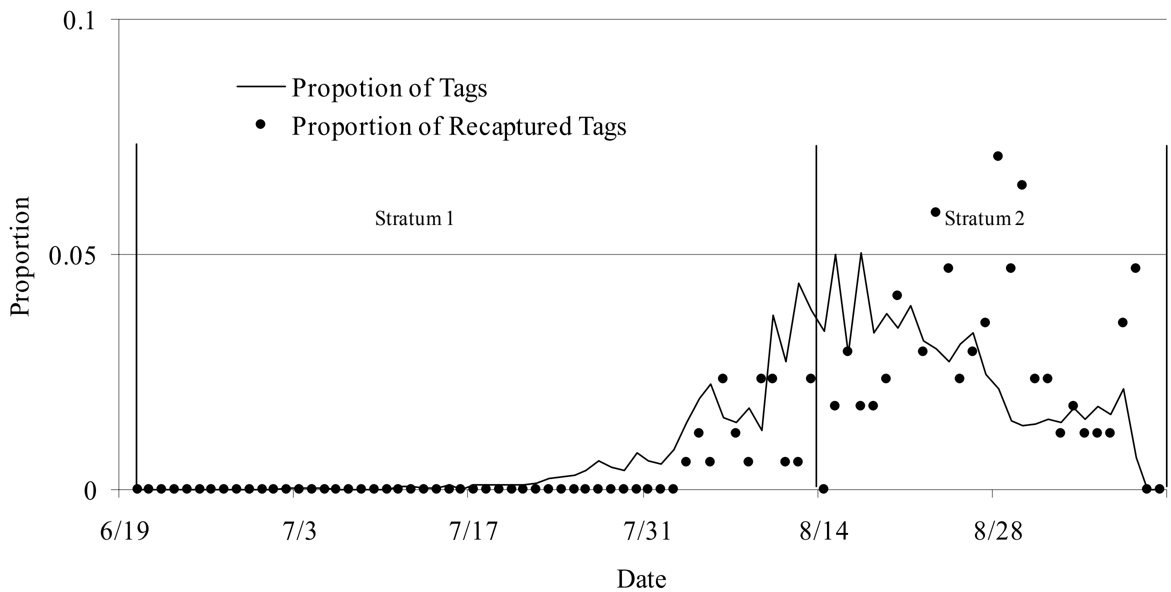


Figure 32. Proportion of the total coho salmon tagged daily at the Kalskag site compared to proportion of total daily recaptures at the Aniak site and strata used in estimating abundance of coho salmon upstream of Kalskag on the Kuskokwim River, 2003.

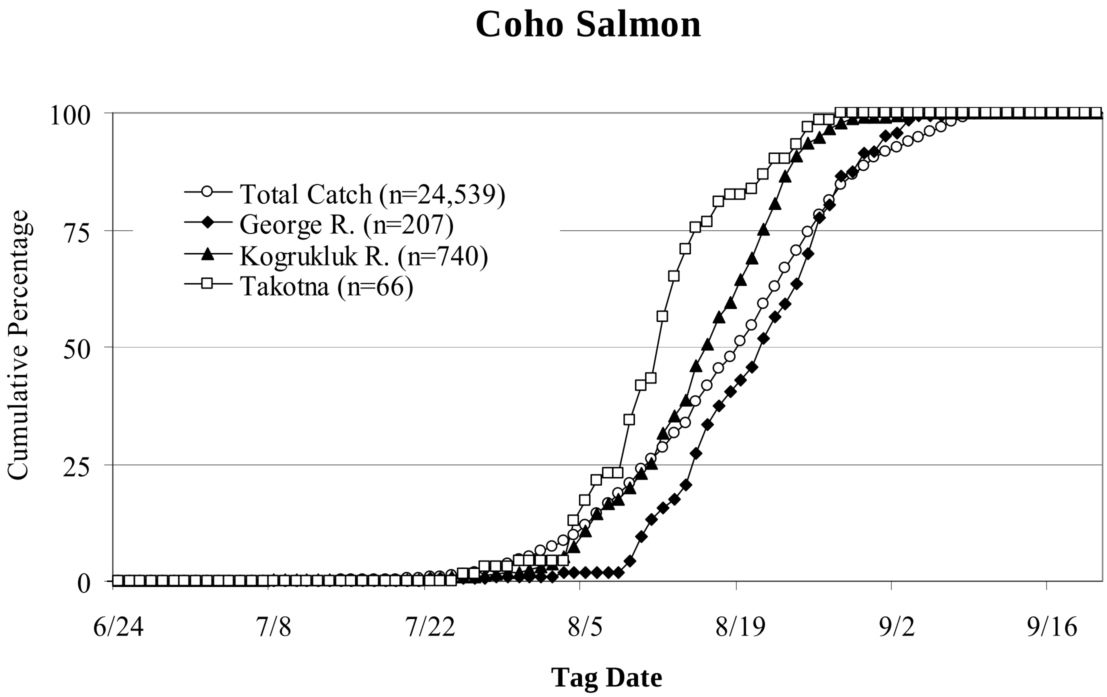


Figure 33. Cumulative percentage of recaptured coho salmon (weighted by daily percentage tags deployed at tagging sites) at the Takotna River weir, Kogrukluk River weir, and George River weir, and of the total number of coho salmon captured at the Kalskag-Aniak tag sites on the Kuskokwim River, 2003.

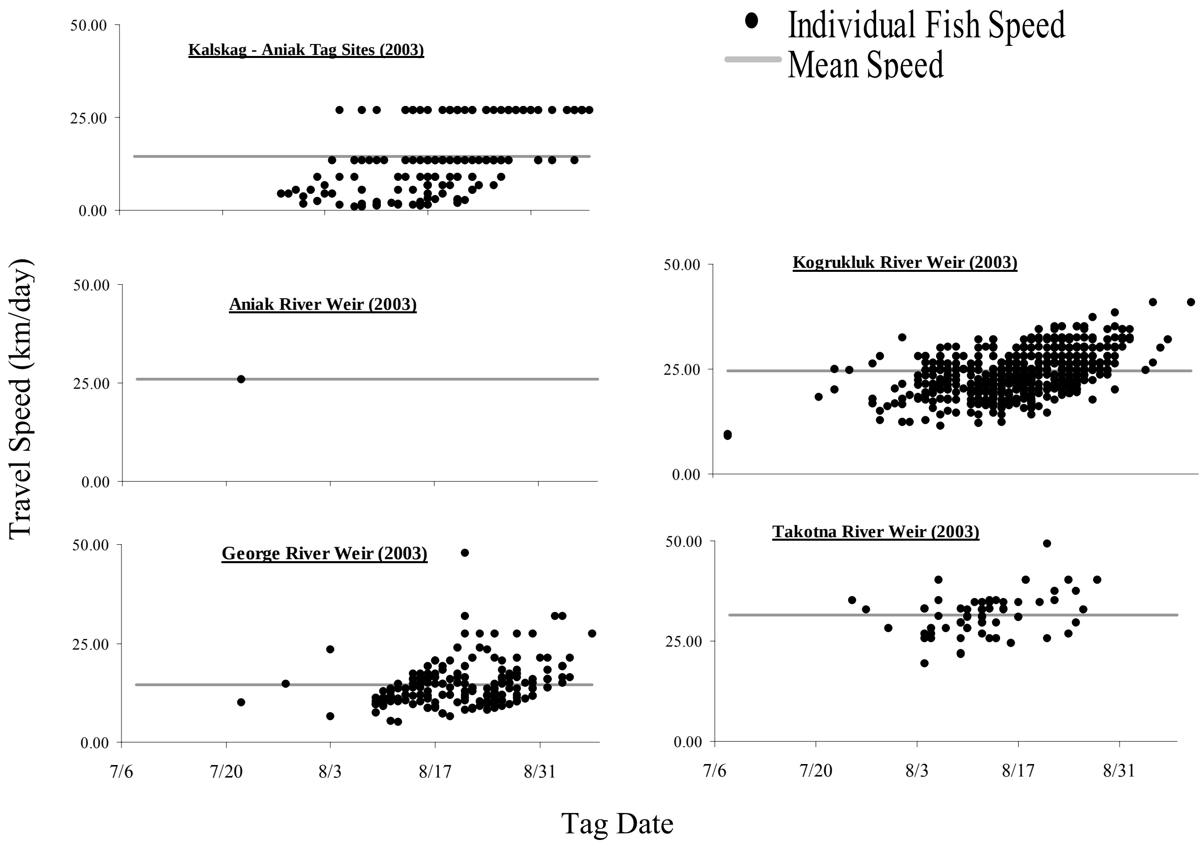


Figure 34. Travel speed (rkm/day) of tagged coho salmon from the Kalskag and Aniak tag sites to the Aniak River sonar site and the George, Kogrukluk, and Takotna River weirs on the Kuskokwim River, 2003.

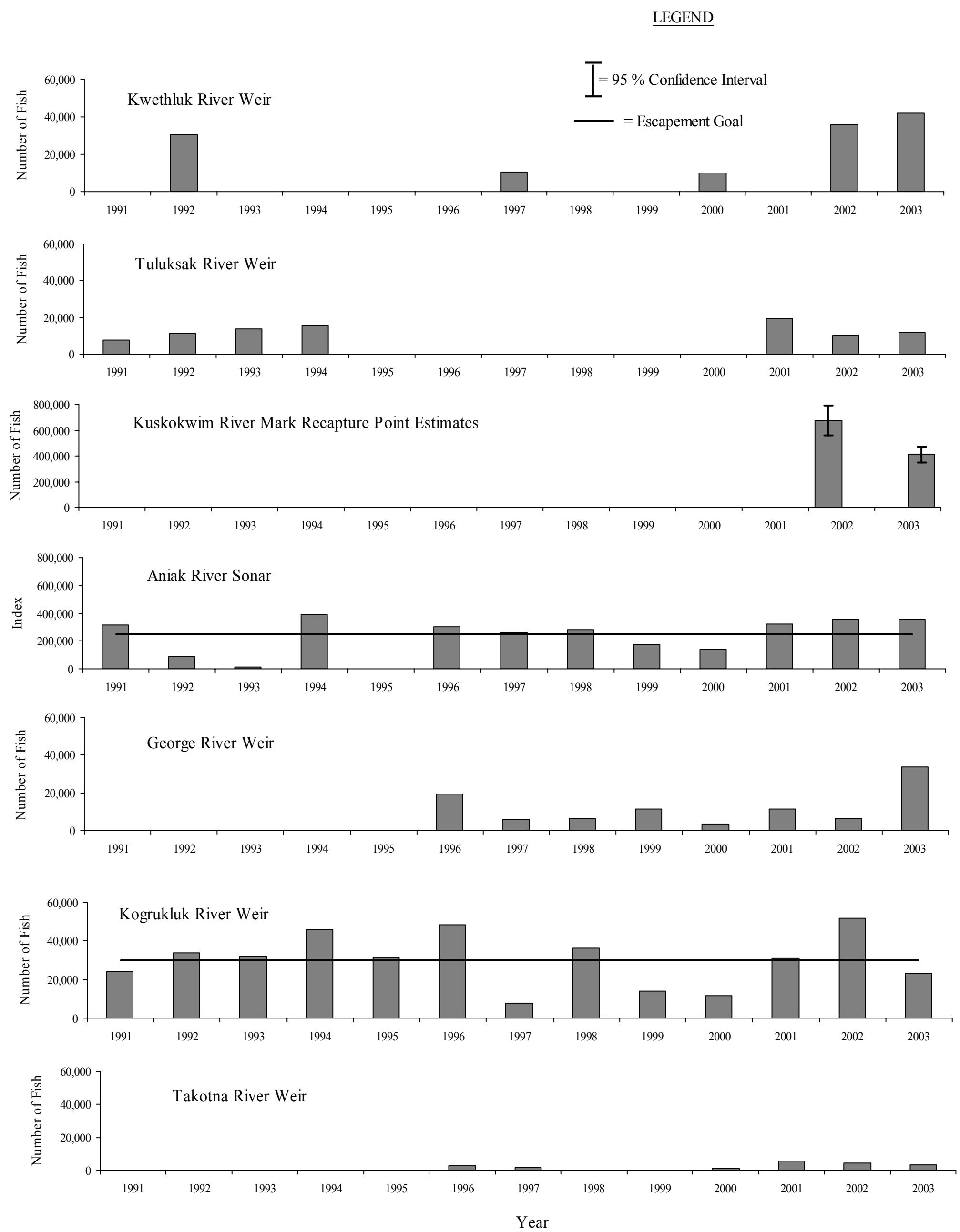


Figure 35. Chum salmon escapement into six Kuskokwim River tributaries, 1991-2003, compared to the Kuskokwim River mark and recapture point estimate 2002 & 2003.

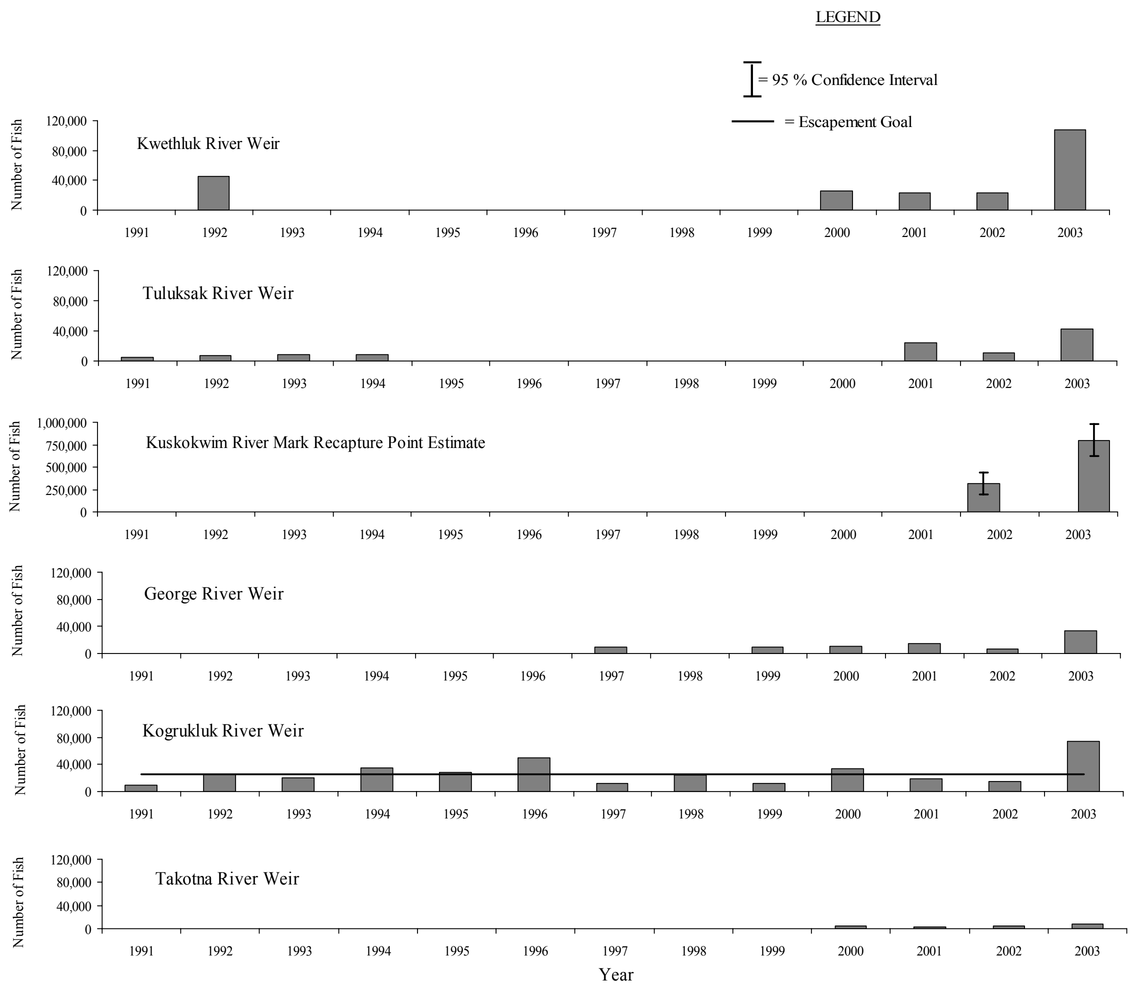


Figure 36. Coho salmon escapement into five Kuskokwim River tributaries, 1991-2003, compared to the Kuskokwim River mark and recapture point estimate 2002 & 2003.

APPENDICES

Appendix A:

A1. Daily summary of tagged, untagged, and recaptured sockeye salmon at the Kalskag site on the Kuskokwim River, 2003.

Kalskag										
	Capture Gear						Tag Site/ Recapture Site [3]			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag		
	RB[1]	LB[2]	RB[1]	LB[2]						
6/13	0	0	0	1	1	0	0	0	2	0.14
6/14	0	0	0	0	0	0	0	0	0	0.14
6/15	0	0	0	0	6	0	0	0	6	0.54
6/16	0	6	0	0	0	0	0	0	6	0.95
6/17	3	7	0	1	1	0	0	0	12	1.76
6/18	4	13	0	0	3	0	0	0	20	3.11
6/19	11	15	0	0	4	1	0	0	31	5.21
6/20	10	9	0	0	5	1	0	0	25	6.90
6/21	7	4	0	0	6	0	0	0	17	8.05
6/22	8	1	1	1	4	0	0	0	15	9.07
6/23	19	9	1	0	8	0	0	0	37	11.57
6/24	11	3	2	0	5	0	1	0	22	13.06
6/25	19	16	1	2	15	0	0	0	53	16.64
6/26	21	19	1	2	23	0	0	1	67	21.18
6/27	19	28	1	1	6	0	0	0	55	24.90
6/28	17	7	0	1	5	1	0	0	31	27.00
6/29	21	12	0	1	9	1	0	0	44	29.97
6/30	13	13	1	2	6	0	1	1	37	32.48
7/1	27	69	1	1	31	1	0	0	130	41.27
7/2	68	33	6	3	7	0	0	0	117	49.19
7/3	58	63	9	6	6	0	1	0	143	58.86
7/4	43	53	4	4	16	0	0	0	120	66.98
7/5	54	60	0	4	0	0	0	1	119	75.03
7/6	25	0	2	0	1	0	0	0	28	76.93
7/7	16	0	2	0	3	0	1	0	22	78.42
7/8	6	0	0	0	0	0	0	0	6	78.82
7/9	7	0	3	0	0	0	0	0	10	79.50
7/10	9	3	0	0	0	0	0	0	12	80.31
7/11	3	13	0	3	1	0	0	0	20	81.66
7/12	7	16	0	1	0	0	0	0	24	83.29
7/13	11	12	0	2	0	0	0	0	25	84.98
7/14	3	16	0	0	0	0	0	0	19	86.27
7/15	3	4	0	0	0	0	1	1	9	86.87
7/16	9	18	2	0	0	0	0	1	30	88.90
7/17	2	15	1	1	0	0	0	0	19	90.19
7/18	3	8	2	1	0	0	1	0	15	91.20
7/19	2	5	1	1	1	0	1	1	12	92.02
7/20	1	1	1	0	0	0	0	0	3	92.22
7/21	3	3	2	2	0	0	1	0	11	92.96
7/22	5	5	1	1	0	0	0	0	12	93.78
7/23	2	2	0	0	0	0	0	0	4	94.05
7/24	3	4	0	1	0	0	0	0	8	94.59
7/25	4	1	1	0	0	0	0	0	6	94.99
7/26	3	4	1	3	0	0	0	0	11	95.74

Appendix A1. (Continued)

Kalskag										
	Capture Gear						Tag Site/ Recapture Site [3]			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag		
	RB[1]	LB[2]	RB[1]	LB[2]						
7/28	1	3	1	0	0	0	0	0	5	96.82
7/29	2	4	1	1	0	0	0	0	8	97.36
7/30	0	1	0	1	0	0	0	0	2	97.50
7/31	0	3	0	0	0	0	0	0	3	97.70
8/1	0	0	0	0	0	0	0	0	0	97.70
8/2	0	1	0	1	0	0	0	0	2	97.83
8/3	0	0	0	0	1	0	0	0	1	97.90
8/4	0	3	0	0	0	0	0	0	3	98.11
8/5	1	1	0	0	0	0	0	0	2	98.24
8/6	0	1	0	1	0	0	0	0	2	98.38
8/7	0	0	0	1	0	0	0	0	1	98.44
8/8	0	0	0	0	1	1	0	0	2	98.58
8/9	2	1	0	0	0	0	0	0	3	98.78
8/10	0	1	1	0	0	0	0	0	2	98.92
8/11	0	0	0	0	0	0	0	0	0	98.92
8/12	0	0	0	0	0	0	0	0	0	98.92
8/13	0	0	0	0	0	0	0	0	0	98.92
8/14	0	0	0	0	0	0	0	1	1	98.99
8/15	0	0	0	0	0	0	0	0	0	98.99
8/16	0	0	0	0	0	0	0	0	0	98.99
8/17	0	0	0	0	0	0	0	0	0	98.99
8/18	0	0	0	0	0	0	0	0	0	98.99
8/19	0	2	0	0	0	0	0	0	2	99.12
8/20	0	2	0	0	0	0	0	0	2	99.26
8/21	1	3	0	0	0	0	0	0	4	99.53
8/22	0	0	0	0	0	0	0	0	0	99.53
8/23	0	0	0	0	0	0	0	0	0	99.53
8/24	0	0	0	0	0	0	0	0	0	99.53
8/25	0	0	0	0	0	0	0	0	0	99.53
8/26	0	2	0	0	0	0	0	0	2	99.66
8/27	1	1	0	0	0	0	0	0	2	99.80
8/28	0	0	0	0	0	0	0	0	0	99.80
8/29	0	0	0	0	0	0	0	0	0	99.80
8/30	0	0	0	0	0	0	0	0	0	99.80
8/31	0	0	0	0	0	0	0	0	0	99.80
9/1	1	0	0	0	0	0	0	0	1	99.86
9/2	0	1	0	0	0	0	0	0	1	99.93
9/3	0	0	0	0	0	0	0	0	0	99.93
9/4	0	0	0	0	0	0	0	0	0	99.93
9/5	0	0	0	0	0	0	0	0	0	99.93
9/6	0	0	0	0	0	0	0	0	0	99.93
9/7	0	0	0	0	1	0	0	0	1	100.00
Total	**570**	**603**	**51**	**56**	**176**	**6**	**8**	**8**	**1,478**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix A2. Daily summary of tagged, untagged, and recaptured sockeye salmon at the Aniak site on the Kuskokwim River, 2003.

Aniak										
	Capture Gear						Tag Site/ Recapture Site			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
6/13	0	0	0	0	0	0	0	0	0	0.00
6/14	0	0	0	0	0	2	0	0	2	0.13
6/15	0	0	0	0	3	4	0	0	7	0.57
6/16	0	0	0	0	5	12	0	0	17	1.66
6/17	2	0	0	0	1	2	0	0	5	1.98
6/18	0	0	0	0	6	0	0	0	6	2.36
6/19	0	0	0	0	4	10	0	0	14	3.25
6/20	0	0	0	0	6	7	0	0	13	4.08
6/21	1	0	0	0	2	0	0	1	4	4.34
6/22	4	0	0	0	6	0	0	0	10	4.98
6/23	12	7	0	0	5	22	0	0	46	7.91
6/24	11	0	1	0	8	31	1	1	53	11.30
6/25	15	0	1	0	12	18	0	0	46	14.23
6/26	14	0	0	0	9	4	0	0	27	15.95
6/27	12	1	1	0	9	20	0	0	43	18.70
6/28	15	13	0	0	15	0	1	0	44	21.51
6/29	15	1	0	0	15	13	0	0	44	24.31
6/30	8	1	0	0	13	13	0	0	35	26.55
7/1	15	0	0	0	8	38	0	0	61	30.44
7/2	15	5	2	0	12	43	1	0	78	35.42
7/3	15	3	0	0	7	39	0	0	64	39.50
7/4	13	6	0	0	15	16	1	0	51	42.76
7/5	9	5	0	0	1	5	0	0	20	44.03
7/6	13	32	0	0	1	14	1	0	61	47.93
7/7	7	22	0	1	0	10	1	0	41	50.54
7/8	18	18	1	1	1	15	0	0	54	53.99
7/9	2	27	0	4	0	6	0	0	39	56.48
7/10	2	20	0	0	0	8	2	0	32	58.52
7/11	2	18	0	2	0	6	0	1	29	60.37
7/12	5	36	0	4	1	4	0	1	51	63.62
7/13	5	21	1	3	2	7	1	0	40	66.18
7/14	2	19	3	0	2	4	0	0	30	68.09
7/15	4	6	0	0	0	2	0	0	12	68.86
7/16	2	38	1	4	0	1	0	2	48	71.92
7/17	9	16	1	1	0	1	1	3	32	73.96
7/18	2	37	0	6	0	2	0	3	50	77.15
7/19	3	20	0	1	0	2	2	1	29	79.00
7/20	0	19	0	18	0	4	1	3	45	81.88
7/21	1	20	0	4	0	0	2	2	29	83.73
7/22	1	18	0	12	0	0	0	0	31	85.71
7/23	2	24	1	1	0	0	1	4	33	87.81
7/24	3	13	0	1	0	0	0	0	17	88.90
7/25	1	10	1	1	0	0	1	0	14	89.79
7/26	1	5	0	2	0	0	1	0	9	90.36
7/27	1	5	0	2	0	0	0	0	8	90.87
7/28	2	8	0	0	0	1	0	0	11	91.58
7/29	0	3	0	1	0	2	1	0	7	92.02
7/30	1	5	0	1	0	0	0	0	7	92.47

Appendix A2. (Continued)

Aniak									
Date	Capture Gear						Tag Site/ Recapture Site [3/]		Total	Cumm. % Catch
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
7/31	0	3	0	0	0	0	0	0	3	92.66
8/1	2	5	0	0	0	2	0	0	9	93.24
8/2	1	6	0	1	0	0	1	0	9	93.81
8/3	0	3	0	0	0	0	0	0	3	94.00
8/4	3	6	0	1	0	0	0	0	10	94.64
8/5	0	3	0	0	0	0	0	0	3	94.83
8/6	2	3	0	0	0	0	0	0	5	95.15
8/7	0	0	1	0	0	0	0	1	2	95.28
8/8	0	2	0	0	0	0	0	0	2	95.41
8/9	0	6	0	0	0	0	0	0	6	95.79
8/10	0	6	1	3	0	0	1	0	11	96.49
8/11	0	1	1	3	0	0	0	0	5	96.81
8/12	0	2	0	1	0	0	0	0	3	97.00
8/13	3	4	0	1	0	0	0	1	9	97.57
8/14	0	1	0	0	0	0	0	0	1	97.64
8/15	0	1	0	1	0	0	0	0	2	97.77
8/16	0	0	0	0	0	0	0	1	1	97.83
8/17	0	0	0	1	0	0	0	0	1	97.89
8/18	0	0	0	0	0	0	0	0	0	97.89
8/19	0	1	0	0	0	11	0	0	12	98.66
8/20	0	0	0	3	0	0	0	0	3	98.85
8/21	0	0	0	0	0	0	0	0	0	98.85
8/22	0	0	0	0	0	0	0	0	0	98.85
8/23	1	0	0	2	0	0	1	0	4	99.11
8/24	0	3	1	0	0	0	0	1	5	99.43
8/25	0	1	0	0	0	0	0	0	1	99.49
8/26	0	1	0	1	0	0	0	0	2	99.62
8/27	0	0	0	0	0	0	0	0	0	99.62
8/28	1	0	0	0	0	0	1	0	2	99.74
8/29	0	2	0	0	0	0	0	0	2	99.87
8/30	0	0	0	0	0	0	0	0	0	99.87
8/31	0	1	0	0	0	0	0	0	1	99.94
9/1	0	0	0	0	0	0	0	0	0	99.94
9/2	0	0	0	0	0	0	0	0	0	99.94
9/3	0	0	0	0	0	1	0	0	1	100.00
9/4	0	0	0	0	0	0	0	0	0	100.00
9/5	0	0	0	0	0	0	0	0	0	100.00
9/6	0	0	0	0	0	0	0	0	0	100.00
9/7	0	0	0	0	0	0	0	0	0	100.00
Total	**278**	**563**	**18**	**88**	**169**	**402**	**23**	**26**	**1,567**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix B. Number of recovered tags from sockeye salmon by subsistence, commercial, and sport fishing at locations downstream and upstream from the Kalskag and Aniak tag sites on the Kuskokwim River, 2003.

Community	Fishery Type								
	Subsistence		Commercial		Sport		Found		Grand Total
	Tag Site		Tag Site		Tag Site		Tag Site		
Downstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Quinhagak	0	0	0	2	0	0	0	0	2
Tuntutuliak	1	0	0	0	0	0	0	0	1
Napakiak	1	2	0	0	0	1	0	0	4
Bethel	0	1	0	0	0	0	0	0	1
Akiachak	0	1	0	0	0	0	0	0	1
Kwethluk	1	0	0	0	0	0	0	0	1
Tuluksak	1	0	0	0	0	0	0	0	1
Total	4	4	0	2	0	1	0	0	11
Near Tag Sites	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Kalskag	1	0	0	0	0	0	0	0	1
Aniak	2	0	0	0	0	0	0	0	2
Total	3	0	0	0	0	0	0	0	3
Upstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Aniak	3	3	0	0	1	4	0	0	11
Crooked Creek	0	1	0	0	0	0	0	0	1
Georgetown	1	1	0	0	0	0	0	0	2
Holitna	0	0	0	0	1	0	0	0	1
Stony River	1	1	0	0	1	0	3	0	6
Vinasale	1	0	0	0	0	0	0	0	1
Total	6	6	0	0	3	4	3	0	22
Unknown	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	0	0	0	0	0	0	1	0	1
Combined	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	13	10	0	2	3	5	4	0	37

Appendix C.

Appendix C.1. Number of sockeye salmon observed through the Kogrukluk River weir, number of tagged sockeye salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Sockeye Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6/14	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/16	0	0.00	0	0.0	0.00	0.00	1.0	1.00	1.96
6/17	0	0.00	0	0.0	0.00	0.00	0.0	1.00	1.96
6/18	0	0.00	0	0.0	0.00	0.00	1.0	2.00	3.91
6/19	0	0.00	0	0.0	0.00	0.00	0.0	2.00	3.91
6/20	0	0.00	0	0.0	0.00	0.00	2.0	4.00	7.83
6/21	0	0.00	0	0.0	0.00	0.00	0.0	4.00	7.83
6/22	0	0.00	0	0.0	0.00	0.00	0.0	4.00	7.83
6/23	0	0.00	0	0.0	0.00	0.00	2.1	6.07	11.88
6/24	0	0.00	0	0.0	0.00	0.00	1.2	7.29	14.26
6/25	0	0.00	0	0.0	0.00	0.00	1.1	8.37	16.38
6/26	0	0.00	0	0.0	0.00	0.00	2.2	10.57	20.69
6/27	1	0.01	0	0.0	0.00	0.00	2.1	12.66	24.77
6/28	2	0.02	0	0.0	0.00	0.00	2.1	14.74	28.85
6/29	3	0.03	0	0.0	0.00	0.00	2.1	16.80	32.88
6/30	14	0.16	0	0.0	0.00	0.00	2.4	19.19	37.55
7/01	18	0.20	0	0.0	0.00	0.00	3.1	22.25	43.54
7/02	38	0.42	0	0.0	0.00	0.00	4.4	26.60	52.07
7/03	87	0.97	0	0.0	0.00	0.00	9.1	35.66	69.79
7/04	124	1.38	0	0.0	0.00	0.00	6.5	42.16	82.52
7/05	173	1.93	0	0.0	0.00	0.00	1.0	43.21	84.56
7/06	444	4.94	0	0.0	0.00	0.00	2.2	45.37	88.79
7/07	617	6.87	0	0.0	0.00	0.00	1.2	46.55	91.11
7/08	1,083	12.05	2	2.0	2.00	3.60	0.0	46.55	91.11
7/09	1,745	19.42	1	1.0	3.00	5.40	0.0	46.55	91.11
7/10	1,965	21.87	0	0.0	3.00	5.40	0.0	46.55	91.11
7/11	2,054	22.86	0	0.0	3.00	5.40	1.2	47.74	93.43
7/12	2,474	27.53	1	1.2	4.21	7.58	1.0	48.78	95.48
7/13	2,923	32.53	1	1.0	5.25	9.44	0.0	48.78	95.48
7/14	3,681	40.96	0	0.0	5.25	9.44	0.0	48.78	95.48
7/15	4,386	48.81	2	2.1	7.38	13.28	0.0	48.78	95.48
7/16	4,888	54.40	5	5.3	12.67	22.79	1.1	49.90	97.65
7/17	5,354	59.58	3	3.2	15.91	28.62	0.0	49.90	97.65
7/18	5,823	64.80	1	1.1	17.00	30.58	0.0	49.90	97.65
7/19	6,527	72.64	6	11.1	28.13	50.60	0.0	49.90	97.65
7/20	7,065	78.62	6	6.5	34.64	62.32	0.0	49.90	97.65
7/21	7,513	83.61	3	3.3	37.94	68.25	0.0	49.90	97.65
7/22	7,823	87.06	5	5.7	43.60	78.44	1.2	51.10	100.00
7/23	7,926	88.20	0	0.0	43.60	78.44	0.0	51.10	100.00
7/24	8,101	90.15	1	1.1	44.68	80.38	0.0	51.10	100.00
7/25	8,422	93.72	3	3.3	47.94	86.24	0.0	51.10	100.00
7/26	8,553	95.18	1	1.1	49.07	88.27	0.0	51.10	100.00
7/27	8,665	96.43	1	1.0	50.07	90.07	0.0	51.10	100.00
7/28	8,765	97.54	3	3.2	53.27	95.84	0.0	51.10	100.00
7/29	8,765	97.54	0	0.0	53.27	95.84	0.0	51.10	100.00
7/30	8,779	97.70	0	0.0	53.27	95.84	0.0	51.10	100.00
7/31	8,825	98.21	0	0.0	53.27	95.84	0.0	51.10	100.00
8/01	8,866	98.66	1	1.1	54.39	97.84	0.0	51.10	100.00
8/02	8,900	99.04	0	0.0	54.39	97.84	0.0	51.10	100.00
8/03	8,905	99.10	0	0.0	54.39	97.84	0.0	51.10	100.00
8/04	8,908	99.13	0	0.0	54.39	97.84	0.0	51.10	100.00

Appendix C.1 (Continued)

Date	Kogrukluk R. Weir		Recaptured Sockeye Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/05	8,926	99.33	0	0.0	54.39	97.84	0.0	51.10	100.00
8/06	8,933	99.41	1	1.2	55.59	100.00	0.0	51.10	100.00
8/07	8,950	99.60	0	0.0	55.59	100.00	0.0	51.10	100.00
8/08	8,955	99.66	0	0.0	55.59	100.00	0.0	51.10	100.00
8/09	8,960	99.71	0	0.0	55.59	100.00	0.0	51.10	100.00
8/10	8,965	99.77	0	0.0	55.59	100.00	0.0	51.10	100.00
8/11	8,967	99.79	0	0.0	55.59	100.00	0.0	51.10	100.00
8/12	8,968	99.80	0	0.0	55.59	100.00	0.0	51.10	100.00
8/13	8,969	99.81	0	0.0	55.59	100.00	0.0	51.10	100.00
8/14	8,972	99.84	0	0.0	55.59	100.00	0.0	51.10	100.00
8/15	8,975	99.88	0	0.0	55.59	100.00	0.0	51.10	100.00
8/16	8,976	99.89	0	0.0	55.59	100.00	0.0	51.10	100.00
8/17	8,977	99.90	0	0.0	55.59	100.00	0.0	51.10	100.00
8/18	8,977	99.90	0	0.0	55.59	100.00	0.0	51.10	100.00
8/19	8,977	99.90	0	0.0	55.59	100.00	0.0	51.10	100.00
8/20	8,979	99.92	0	0.0	55.59	100.00	0.0	51.10	100.00
8/21	8,979	99.92	0	0.0	55.59	100.00	0.0	51.10	100.00
8/22	8,979	99.92	0	0.0	55.59	100.00	0.0	51.10	100.00
8/23	8,980	99.93	0	0.0	55.59	100.00	0.0	51.10	100.00
8/24	8,982	99.96	0	0.0	55.59	100.00	0.0	51.10	100.00
8/25	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/26	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/27	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/28	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/29	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/30	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
8/31	8,983	99.97	0	0.0	55.59	100.00	0.0	51.10	100.00
9/01	8,984	99.98	0	0.0	55.59	100.00	0.0	51.10	100.00
9/02	8,984	99.98	0	0.0	55.59	100.00	0.0	51.10	100.00
9/03	8,984	99.98	0	0.0	55.59	100.00	0.0	51.10	100.00
9/04	8,985	99.99	0	0.0	55.59	100.00	0.0	51.10	100.00
9/05	8,985	99.99	0	0.0	55.59	100.00	0.0	51.10	100.00
9/06	8,985	99.99	0	0.0	55.59	100.00	0.0	51.10	100.00
9/07	8,985	99.99	0	0.0	55.59	100.00	0.0	51.10	100.00
9/08	8,986	100.00	0	0.0	55.59	100.00	0.0	51.10	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix C.2. Number of sockeye salmon observed through the Kogrukluk River weir, number of tagged sockeye salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Sockeye Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
14-Jun	0	0.00	0	0.0	0.00	0.00	0	0	0.00
15-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
16-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
17-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
18-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
19-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
20-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
21-Jun	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
22-Jun	0	0.00	0	0.0	0.00	0.00	1.0	1.00	5.67
23-Jun	0	0.00	0	0.0	0.00	0.00	0.0	1.00	5.67
24-Jun	0	0.00	0	0.0	0.00	0.00	1.1	2.09	11.86
25-Jun	0	0.00	0	0.0	0.00	0.00	0.0	2.09	11.86
26-Jun	0	0.00	0	0.0	0.00	0.00	1.0	3.09	17.53
27-Jun	1	0.01	0	0.0	0.00	0.00	2.2	5.24	29.74
28-Jun	2	0.02	0	0.0	0.00	0.00	0.0	5.24	29.74
29-Jun	3	0.03	0	0.0	0.00	0.00	1.0	6.24	35.41
30-Jun	14	0.16	0	0.0	0.00	0.00	0.0	6.24	35.41
1-Jul	18	0.20	0	0.0	0.00	0.00	1.0	7.24	41.08
2-Jul	38	0.42	0	0.0	0.00	0.00	0.0	7.24	41.08
3-Jul	87	0.97	0	0.0	0.00	0.00	3.0	10.24	58.09
4-Jul	124	1.38	0	0.0	0.00	0.00	2.0	12.24	69.43
5-Jul	173	1.93	0	0.0	0.00	0.00	1.0	13.24	75.10
6-Jul	444	4.94	0	0.0	0.00	0.00	1.0	14.27	80.90
7-Jul	617	6.87	0	0.0	0.00	0.00	1.1	15.34	86.96
8-Jul	1,083	12.05	0	0.0	0.00	0.00	0.0	15.34	86.96
9-Jul	1,745	19.42	0	0.0	0.00	0.00	0.0	15.34	86.96
10-Jul	1,965	21.87	0	0.0	0.00	0.00	0.0	15.34	86.96
11-Jul	2,054	22.86	0	0.0	0.00	0.00	2.3	17.64	100.00
12-Jul	2,474	27.53	0	0.0	0.00	0.00	0.0	17.64	100.00
13-Jul	2,923	32.53	0	0.0	0.00	0.00	0.0	17.64	100.00
14-Jul	3,681	40.96	0	0.0	0.00	0.00	0.0	17.64	100.00
15-Jul	4,386	48.81	1	1.0	1.00	4.91	0.0	17.64	100.00
16-Jul	4,888	54.40	5	5.0	6.00	29.44	0.0	17.64	100.00
17-Jul	5,354	59.58	1	2.0	8.00	39.25	0.0	17.64	100.00
18-Jul	5,823	64.80	1	0.0	8.00	39.25	0.0	17.64	100.00
19-Jul	6,527	72.64	2	1.0	9.00	44.16	0.0	17.64	100.00
20-Jul	7,065	78.62	2	2.2	11.22	55.06	0.0	17.64	100.00
21-Jul	7,513	83.61	2	2.8	13.99	68.65	0.0	17.64	100.00
22-Jul	7,823	87.06	1	2.1	16.14	79.18	0.0	17.64	100.00
23-Jul	7,926	88.20	0	1.0	17.14	84.08	0.0	17.64	100.00
24-Jul	8,101	90.15	0	0.0	17.14	84.08	0.0	17.64	100.00
25-Jul	8,422	93.72	1	1.0	18.14	88.99	0.0	17.64	100.00
26-Jul	8,553	95.18	1	1.1	19.26	94.50	0.0	17.64	100.00
27-Jul	8,665	96.43	0	0.0	19.26	94.50	0.0	17.64	100.00
28-Jul	8,765	97.54	0	0.0	19.26	94.50	0.0	17.64	100.00
29-Jul	8,765	97.54	0	0.0	19.26	94.50	0.0	17.64	100.00
30-Jul	8,779	97.70	0	0.0	19.26	94.50	0.0	17.64	100.00
31-Jul	8,825	98.21	0	0.0	19.26	94.50	0.0	17.64	100.00
1-Aug	8,866	98.66	0	0.0	19.26	94.50	0.0	17.64	100.00
2-Aug	8,900	99.04	0	0.0	19.26	94.50	0.0	17.64	100.00
3-Aug	8,905	99.10	0	0.0	19.26	94.50	0.0	17.64	100.00
4-Aug	8,908	99.13	1	1.1	20.38	100.00	0.0	17.64	100.00
5-Aug	8,926	99.33	0	0.0	20.38	100.00	0.0	17.64	100.00

Appendix C.2 (Continued)

Date	Kogrukluk R. Weir		Recaptured Sockeye Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6-Aug	8,933	99.41	0	0.0	20.38	100.00	0.0	17.64	100.00
7-Aug	8,950	99.60	0	0.0	20.38	100.00	0.0	17.64	100.00
8-Aug	8,955	99.66	0	0.0	20.38	100.00	0.0	17.64	100.00
9-Aug	8,960	99.71	0	0.0	20.38	100.00	0.0	17.64	100.00
10-Aug	8,965	99.77	0	0.0	20.38	100.00	0.0	17.64	100.00
11-Aug	8,967	99.79	0	0.0	20.38	100.00	0.0	17.64	100.00
12-Aug	8,968	99.80	0	0.0	20.38	100.00	0.0	17.64	100.00
13-Aug	8,969	99.81	0	0.0	20.38	100.00	0.0	17.64	100.00
14-Aug	8,972	99.84	0	0.0	20.38	100.00	0.0	17.64	100.00
15-Aug	8,975	99.88	0	0.0	20.38	100.00	0.0	17.64	100.00
16-Aug	8,976	99.89	0	0.0	20.38	100.00	0.0	17.64	100.00
17-Aug	8,977	99.90	0	0.0	20.38	100.00	0.0	17.64	100.00
18-Aug	8,977	99.90	0	0.0	20.38	100.00	0.0	7	100.00
19-Aug	8,977	99.90	0	0.0	20.38	100.00	0.0	7	100.00
20-Aug	8,979	99.92	0	0.0	20.38	100.00	0.0	7	100.00
21-Aug	8,979	99.92	0	0.0	20.38	100.00	0.0	7	100.00
22-Aug	8,979	99.92	0	0.0	20.38	100.00	0.0	7	100.00
23-Aug	8,980	99.93	0	0.0	20.38	100.00	0.0	7	100.00
24-Aug	8,982	99.96	0	0.0	20.38	100.00	0.0	7	100.00
25-Aug	8,983	99.97	0	0.0	20.38	100.00	0.0	7	100.00
26-Aug	8,983	99.97	0	0.0	20.38	100.00	0.0	7	100.00
27-Aug	8,983	99.97	0	0.0	20.38	100.00	0	7	100.00
28-Aug	8,983	99.97	0	0.0	20.38	100.00	0	7	100.00
29-Aug	8,983	99.97	0	0.0	20.38	100.00	0	7	100.00
30-Aug	8,983	99.97	0	0.0	20.38	100.00	0	7	100.00
31-Aug	8,983	99.97	0	0.0	20.38	100.00	0	7	100.00
1-Sep	8,984	99.98	0	0.0	20.38	100.00	0	7	100.00
2-Sep	8,984	99.98	0	0.0	20.38	100.00	0	7	100.00
3-Sep	8,984	99.98	0	0.0	20.38	100.00	0	7	100.00
4-Sep	8,985	99.99	0	0.0	20.38	100.00	0	7	100.00
5-Sep	8,985	99.99	0	0.0	20.38	100.00	0	7	100.00
6-Sep	8,985	99.99	0	0.0	20.38	100.00	0	7	100.00
7-Sep	8,985	99.99	0	0.0	20.38	100.00	0	7	100.00
8-Sep	8,986	100.00	0	0.0	20.38	100.00	0	7	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix D:

Appendix D1. Daily summary of tagged, untagged, and recaptured chum salmon at the Kalskag site on the Kuskokwim River, 2003.

Kalskag										
Date	Capture Gear						Tag Site/ Recapture Site [3/]		Total	Cumm. % Catch
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
6/6	1	0	0	0	0	0	0	0	1	0.01
6/7	1	0	0	0	0	0	0	0	1	0.02
6/8	1	0	0	0	0	0	0	0	1	0.03
6/9	0	0	0	0	0	0	0	0	0	0.03
6/10	0	0	0	0	0	0	0	0	0	0.03
6/11	0	0	0	0	1	0	0	0	1	0.04
6/12	0	0	0	0	0	0	0	0	0	0.04
6/13	0	0	0	0	0	1	0	0	1	0.05
6/14	0	2	0	0	3	0	0	0	5	0.10
6/15	0	3	0	1	2	0	0	0	6	0.16
6/16	1	4	1	1	1	0	0	0	8	0.25
6/17	3	0	0	0	2	0	0	0	5	0.30
6/18	4	3	0	0	0	0	0	0	7	0.37
6/19	15	2	0	0	1	0	0	0	18	0.55
6/20	20	9	1	0	2	0	1	0	33	0.89
6/21	8	4	0	0	0	0	0	0	12	1.02
6/22	16	0	0	0	0	0	2	0	18	1.20
6/23	15	16	2	0	0	0	0	0	33	1.54
6/24	11	0	1	0	3	0	0	0	15	1.70
6/25	15	1	0	1	7	0	0	0	24	1.94
6/26	11	4	0	0	11	0	1	0	27	2.22
6/27	11	8	1	0	15	0	0	0	35	2.58
6/28	15	0	0	0	4	1	0	0	20	2.78
6/29	17	14	1	0	19	0	0	0	51	3.31
6/30	44	5	4	3	16	0	0	0	72	4.05
7/1	33	40	3	3	28	0	0	0	107	5.15
7/2	70	8	12	2	5	0	5	0	102	6.20
7/3	94	35	3	2	18	0	1	0	153	7.77
7/4	74	14	10	3	29	1	0	0	131	9.11
7/5	177	46	9	5	0	0	4	0	241	11.59
7/6	182	0	7	0	20	0	1	0	210	13.75
7/7	252	0	30	0	18	0	1	0	301	16.84
7/8	120	0	2	0	8	0	3	0	133	18.21
7/9	199	0	9	0	4	0	4	0	216	20.43
7/10	184	7	3	3	5	0	3	0	205	22.53
7/11	76	136	6	3	14	0	9	0	244	25.04
7/12	87	102	7	5	15	0	5	0	221	27.31
7/13	128	47	7	5	15	0	8	0	210	29.47
7/14	105	174	6	13	2	0	9	0	309	32.64
7/15	153	97	12	10	9	0	9	0	290	35.62
7/16	231	131	20	12	4	0	16	0	414	39.88
7/17	275	123	15	7	6	0	21	0	447	44.47
7/18	302	145	23	14	1	0	23	1	509	49.70
7/19	193	106	15	6	10	0	17	0	347	53.27
7/20	171	82	12	10	24	1	8	0	308	56.43
7/21	145	53	16	9	32	3	15	2	275	59.26
7/22	163	114	16	13	15	2	11	0	334	62.69
7/23	135	92	22	9	11	1	13	0	283	65.60

Appendix D1. (Continued)

Kalskag										
	Capture Gear						Tag Site/ Recapture Site [3]			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag		
	RB[1]	LB[2]	RB[1]	LB[2]						
7/24	75	66	23	11	7	0	4	0	186	67.51
7/25	86	27	8	8	6	1	8	1	145	69.00
7/26	199	94	28	27	3	0	21	1	373	72.83
7/27	172	146	24	16	5	1	10	0	374	76.67
7/28	148	142	19	15	1	0	22	0	347	80.24
7/29	195	80	19	11	5	0	14	0	324	83.57
7/30	131	87	12	6	4	0	4	0	244	86.08
7/31	47	34	3	1	0	0	1	0	86	86.96
8/1	21	3	1	0	2	0	1	0	28	87.25
8/2	14	2	0	0	7	0	2	0	25	87.51
8/3	21	2	3	0	2	0	1	0	29	87.80
8/4	13	6	1	0	1	0	1	0	22	88.03
8/5	12	3	1	0	0	0	1	1	18	88.21
8/6	6	24	2	7	0	0	0	0	39	88.61
8/7	9	37	3	7	1	0	2	0	59	89.22
8/8	9	23	1	8	1	0	2	0	44	89.67
8/9	11	26	3	2	0	0	3	0	45	90.14
8/10	38	55	10	14	2	0	6	0	125	91.42
8/11	32	38	17	18	3	0	12	0	120	92.65
8/12	34	33	29	19	0	0	8	0	123	93.92
8/13	56	59	27	24	0	0	19	0	185	95.82
8/14	26	36	9	7	0	0	3	0	81	96.65
8/15	25	22	3	17	0	0	4	0	71	97.38
8/16	4	6	1	5	0	0	2	0	18	97.56
8/17	6	23	1	15	0	0	5	0	50	98.08
8/18	1	16	1	5	0	0	0	0	23	98.31
8/19	2	11	1	3	0	0	0	0	17	98.49
8/20	4	3	0	2	0	0	1	0	10	98.59
8/21	2	6	0	2	0	0	0	0	10	98.70
8/22	2	5	1	3	1	0	2	0	14	98.84
8/23	0	7	0	1	2	0	0	0	10	98.94
8/24	0	4	1	1	0	0	1	0	7	99.01
8/25	0	3	2	3	0	0	0	0	8	99.10
8/26	4	5	2	2	0	0	0	0	13	99.23
8/27	5	0	0	3	0	0	1	0	9	99.32
8/28	2	7	1	4	1	0	1	0	16	99.49
8/29	1	1	4	2	0	0	0	0	8	99.57
8/30	1	1	2	3	0	0	0	0	7	99.64
8/31	3	4	2	1	0	0	1	0	11	99.75
9/1	0	3	1	1	0	0	0	0	5	99.80
9/2	1	1	0	0	1	0	2	0	5	99.86
9/3	0	2	1	0	0	0	0	0	3	99.89
9/4	1	0	1	1	0	0	0	0	3	99.92
9/5	0	0	1	0	0	0	0	0	1	99.93
9/6	1	0	2	1	0	0	0	0	4	99.97
9/7	0	0	0	0	0	1	0	0	1	99.98
9/8	0	0	0	0	2	0	0	0	2	100.00
Total	**5178**	**2780**	**547**	**416**	**437**	**13**	**355**	**6**	**9732**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix D2. Daily summary of tagged, untagged, and recaptured chum salmon at the Aniak on the Kuskokwim River, 2003.

Aniak										
	Capture Gear						Tag Site/ Recapture Site [3/]			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
6/6	1	0	0	0	0	0	0	0	1	0.01
6/7	0	0	0	0	0	0	0	0	0	0.01
6/8	0	0	0	0	0	0	0	0	0	0.01
6/9	0	0	0	0	0	0	0	0	0	0.01
6/10	1	0	0	0	0	0	0	0	1	0.01
6/11	1	0	0	0	0	0	0	0	1	0.02
6/12	0	0	0	0	0	0	0	0	0	0.02
6/13	1	0	0	0	0	0	0	0	1	0.02
6/14	0	0	0	0	0	2	0	0	2	0.03
6/15	1	0	0	0	3	3	0	0	7	0.07
6/16	1	0	0	0	5	6	0	0	12	0.13
6/17	2	0	0	0	12	2	0	0	16	0.22
6/18	0	0	0	0	14	0	0	0	14	0.29
6/19	0	0	0	0	8	5	0	0	13	0.36
6/20	0	0	0	0	9	10	0	0	19	0.46
6/21	7	0	0	0	12	1	0	0	20	0.57
6/22	29	0	2	0	11	0	0	1	43	0.80
6/23	20	3	2	0	5	14	0	0	44	1.03
6/24	37	0	2	0	15	28	0	0	82	1.47
6/25	44	0	3	0	11	17	1	0	76	1.88
6/26	20	0	1	0	19	8	0	0	48	2.13
6/27	24	2	1	0	15	18	0	0	60	2.45
6/28	31	18	0	1	38	1	0	2	91	2.94
6/29	31	1	0	0	54	39	0	0	125	3.61
6/30	76	4	1	1	73	29	0	2	186	4.60
7/1	65	2	1	0	48	36	2	0	154	5.42
7/2	72	8	5	2	68	64	0	1	220	6.59
7/3	116	8	6	0	37	117	1	0	285	8.11
7/4	110	42	8	1	28	63	5	1	258	9.49
7/5	105	21	4	0	5	25	1	0	161	10.35
7/6	105	76	5	4	8	89	3	1	291	11.90
7/7	107	55	11	1	7	68	2	1	252	13.24
7/8	316	84	5	3	7	164	7	0	586	16.37
7/9	55	144	8	19	0	108	1	1	336	18.16
7/10	36	128	2	7	2	188	6	0	369	20.13
7/11	82	93	5	4	9	124	7	5	329	21.88
7/12	101	209	8	15	6	166	4	3	512	24.61
7/13	62	142	7	7	13	159	10	2	402	26.76
7/14	84	85	6	14	39	115	5	3	351	28.63
7/15	62	43	5	3	20	85	5	0	223	29.82
7/16	172	216	28	28	0	127	13	10	594	32.99
7/17	197	261	12	14	0	154	10	23	671	36.57
7/18	88	394	3	85	0	140	20	30	760	40.62
7/19	103	335	8	89	0	59	25	32	651	44.09
7/20	32	401	24	183	0	90	26	33	789	48.30
7/21	119	289	11	77	0	0	20	28	544	51.20
7/22	71	540	7	79	0	0	11	54	762	55.26
7/23	139	360	8	153	0	0	13	37	710	59.05
7/24	135	167	16	32	0	0	14	16	380	61.08
7/25	147	268	14	62	0	53	4	11	559	64.06

Appendix D2. (Continued)

Aniak										
	Capture Gear						Tag Site/ Recapture Site [3/]			
Date	Fish Wheel				Gillnet				Total	Cumm. % Catch
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
7/26	43	364	15	42	0	21	5	12	502	66.74
7/27	76	236	8	22	5	0	11	4	362	68.67
7/28	68	218	12	25	13	46	13	3	398	70.79
7/29	55	184	1	62	3	95	9	5	414	73.00
7/30	32	181	5	142	1	60	13	6	440	75.34
7/31	42	299	1	58	0	0	11	21	432	77.65
8/1	50	208	13	51	0	68	7	16	413	79.85
8/2	10	283	1	123	0	58	3	17	495	82.49
8/3	17	264	5	142	0	15	3	28	474	85.02
8/4	85	129	22	56	0	15	1	5	313	86.69
8/5	24	117	11	69	0	30	2	8	261	88.08
8/6	10	126	1	63	0	18	0	5	223	89.27
8/7	15	124	22	101	0	16	0	7	285	90.79
8/8	6	83	6	210	0	12	2	9	328	92.54
8/9	3	62	30	140	0	7	1	5	248	93.86
8/10	8	53	13	153	0	2	5	5	239	95.14
8/11	17	35	13	47	0	0	7	7	126	95.81
8/12	5	21	5	34	0	5	1	0	71	96.19
8/13	39	9	6	37	0	4	2	3	100	96.72
8/14	3	18	4	25	0	2	2	1	55	97.01
8/15	1	6	2	72	0	12	9	0	102	97.56
8/16	1	12	0	23	0	2	2	0	40	97.77
8/17	1	9	1	16	0	1	0	0	28	97.92
8/18	2	3	0	4	0	3	0	0	12	97.98
8/19	0	5	0	19	0	2	1	0	27	98.13
8/20	0	2	11	24	0	0	1	0	38	98.33
8/21	1	3	1	31	0	2	0	3	41	98.55
8/22	0	0	1	28	0	7	0	0	36	98.74
8/23	0	2	6	17	0	1	0	1	27	98.89
8/24	1	1	1	20	0	0	1	0	24	99.01
8/25	3	0	4	24	0	0	0	1	32	99.18
8/26	0	1	3	19	0	4	1	0	28	99.33
8/27	1	1	0	23	0	0	0	0	25	99.47
8/28	1	0	5	5	0	0	0	0	11	99.53
8/29	1	1	3	12	0	2	1	0	20	99.63
8/30	0	0	2	17	0	2	0	0	21	99.74
8/31	0	0	6	1	0	2	0	0	9	99.79
9/1	1	0	0	1	0	1	1	0	4	99.81
9/2	0	0	0	4	0	1	0	0	5	99.84
9/3	1	0	0	2	0	2	0	0	5	99.87
9/4	0	0	0	4	0	0	0	0	4	99.89
9/5	0	0	1	7	0	0	1	0	9	99.94
9/6	0	0	0	2	0	1	0	0	3	99.95
9/7	1	2	0	2	0	0	0	0	5	99.98
9/8	0	0	0	0	0	0	0	0	0	99.98
9/9	0	0	1	2	0	0	0	0	3	99.99
9/10	0	0	1	0	0	0	0	0	1	100.00
Total	**3,632**	**7,461**	**472**	**2,865**	**623**	**2,896**	**332**	**469**	**18,750**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix E. Number of recovered tags from chum salmon by subsistence, commercial, and sport fishers at locations downstream and upstream from the Kalskag and Aniak tag sites on the Kuskokwim River, 2003.

Community	Fishery Type								
	Subsistence		Commercial		Sport		Found		Grand Total
	Tag Site		Tag Site		Tag Site		Tag Site		
Downstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Tuntutuliak	0	0	2	0	0	0	0	0	2
Johnson River	1	2	0	0	0	0	0	0	3
Napakiak	2	4	0	1	4	1	0	0	12
Napaskiak	0	1	0	0	0	0	0	0	1
Bethel	0	8	6	6	0	0	0	0	20
Gweek River	2	2	0	0	0	0	0	0	4
Kwethluk	3	0	0	2	0	0	0	0	5
Akiachak	8	11	7	3	0	1	0	1	31
Akiak	3	1	0	1	0	0	0	0	5
Tuluksak River	2	1	0	0	1	0	1	0	5
Total	21	30	15	13	5	2	1	1	88
Near Tag Sites	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Kalskag	6	5	0	0	0	0	0	0	11
Aniak	0	0	0	0	0	0	0	0	0
Total	6	5	0	0	0	0	0	0	11
Upstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Aniak	7	12	0	0	18	23	5	12	77
Kolmakof	0	0	0	0	0	1	0	0	1
Chuathbaluk	2	0	0	0	0	0	0	0	2
Holokuk River	0	0	0	0	0	0	8	0	8
Oskawalik	0	0	0	0	0	1	0	0	1
Crooked Creek	0	2	0	0	0	0	0	0	2
George River	0	1	0	0	0	0	0	1	2
Red Devil	3	0	0	0	0	0	0	0	3

Appendix E. (Continued)

Community	Fishery Type								
	Subsistence		Commercial		Sport		Found		Grand Total
	Tag Site		Tag Site		Tag Site		Tag Site		
Upstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Sleetmute	1	2	0	0	0	0	0	0	3
Holitna River	0	0	0	0	11	4	0	0	15
Stony River	0	0	0	0	1	0	0	0	1
Fish Creek	0	0	0	0	0	0	0	0	0
McGrath	1	0	0	0	0	0	0	0	1
Fish Creek	0	0	0	0	0	1	0	0	1
Total	14	17	0	0	30	30	13	13	117

Unknown	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	0	2	0	0	0	1	0	1	4

Combined	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	41	54	15	13	35	33	14	15	220

Appendix F.

Appendix F1. Number of chum salmon observed through the George River weir, number of tagged chum salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	George R. Weir		Recaptured Chum Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6/18	0	0.00	0	0.0	0	0.00	0.0	0.00	0.00
6/19	0	0.00	0	0.0	0	0.00	0.0	0.00	0.00
6/20	0	0.00	0	0.0	0	0.00	2.1	2.14	1.33
6/21	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/22	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/23	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/24	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/25	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/26	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/27	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/28	0	0.00	0	0.0	0	0.00	0.0	2.14	1.33
6/29	0	0.00	0	0.0	0	0.00	1.0	3.17	1.97
6/30	0	0.00	0	0.0	0	0.00	0.0	3.17	1.97
7/1	89	0.36	0	0.0	0	0.00	0.0	3.17	1.97
7/2	264	1.06	0	0.0	0	0.00	1.2	4.41	2.74
7/3	264	1.06	0	0.0	0	0.00	2.1	6.49	4.04
7/4	264	1.06	0	0.0	0	0.00	5.7	12.23	7.61
7/5	264	1.06	0	0.0	0	0.00	6.4	18.63	11.59
7/6	264	1.06	0	0.0	0	0.00	6.2	24.86	15.46
7/7	264	1.06	0	0.0	0	0.00	10.1	34.94	21.72
7/8	1,088	4.35	0	0.0	0	0.00	3.1	38.06	23.67
7/9	2,450	9.80	0	0.0	0	0.00	2.1	40.15	24.97
7/10	3,110	12.44	0	0.0	0	0.00	5.2	45.31	28.17
7/11	3,334	13.33	0	0.0	0	0.00	4.3	49.59	30.84
7/12	4,135	16.54	7	8.7	9	8.66	6.4	55.97	34.81
7/13	5,991	23.96	10	9.8	18	18.47	6.4	62.38	38.79
7/14	8,011	32.04	9	9.7	28	28.21	7.5	69.86	43.44
7/15	9,550	38.19	6	5.3	34	33.50	8.7	78.56	48.86
7/16	10,018	40.06	1	1.0	35	34.54	25.0	103.60	64.42
7/17	10,693	42.76	1	1.0	36	35.58	17.9	121.54	75.58
7/18	11,539	46.15	3	4.2	40	39.81	10.8	132.36	82.31
7/19	13,119	52.47	6	6.7	46	46.50	9.6	142.00	88.30
7/20	14,724	58.88	12	12.8	59	59.28	2.2	144.17	89.65
7/21	15,954	63.80	13	14.0	73	73.30	3.4	147.55	91.75
7/22	17,076	68.29	17	18.2	92	91.54	0.0	147.55	91.75
7/23	18,096	72.37	19	20.4	112	111.91	0.0	147.55	91.75
7/24	18,684	74.72	6	6.5	118	118.38	1.2	148.79	92.53
7/25	19,433	77.72	13	14.0	132	132.33	0.0	148.79	92.53
7/26	20,183	80.72	7	7.6	140	139.94	1.2	149.98	93.26
7/27	20,944	83.76	6	6.6	147	146.50	0.0	149.98	93.26
7/28	20,944	83.76	0	0.0	147	146.50	0.0	149.98	93.26
7/29	20,944	83.76	0	0.0	147	146.50	0.0	149.98	93.26
7/30	20,944	83.76	0	0.0	147	146.50	1.1	151.06	93.94
7/31	20,944	83.76	0	0.0	147	146.50	0.0	151.06	93.94
8/1	20,944	83.76	0	0.0	147	146.50	0.0	151.06	93.94
8/2	20,944	83.76	0	0.0	147	146.50	0.0	151.06	93.94
8/3	20,944	83.76	0	0.0	147	146.50	1.1	152.19	94.64
8/4	21,047	84.17	0	0.0	147	146.50	0.0	152.19	94.64
8/5	21,649	86.58	0	0.0	147	146.50	2.1	154.32	95.97
8/6	22,240	88.94	0	0.0	147	146.50	0.0	154.32	95.97

Appendix F1. (Continued)

Date	George R. Weir		Recaptured Chum Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/7	22,827	91.29	0	0.0	147	146.50	0.0	154.32	95.97
8/8	23,193	92.75	0	0.0	147	146.50	0.0	154.32	95.97
8/9	23,578	94.29	0	0.0	147	146.50	0.0	154.32	95.97
8/10	23,916	95.64	1	1.2	148	147.75	0.0	154.32	95.97
8/11	24,200	96.78	3	3.3	151	151.01	0.0	154.32	95.97
8/12	24,344	97.36	1	1.1	152	152.09	0.0	154.32	95.97
8/13	24,571	98.26	1	1.2	153	153.33	0.0	154.32	95.97
8/14	24,759	99.02	0	0.0	153	153.33	0.0	154.32	95.97
8/15	24,776	99.08	0	0.0	153	153.33	0.0	154.32	95.97
8/16	24,776	99.08	0	0.0	153	153.33	0.0	154.32	95.97
8/17	24,776	99.08	0	0.0	153	153.33	0.0	154.32	95.97
8/18	24,792	99.15	0	0.0	153	153.33	0.0	154.32	96.81
8/19	24,835	99.32	0	0.0	153	153.33	0.0	154.32	96.81
8/20	24,869	99.46	0	0.0	153	153.33	0.0	154.32	96.81
8/21	24,899	99.58	0	0.0	153	153.33	0.0	154.32	96.81
8/22	24,934	99.72	0	0.0	153	153.33	0.0	154.32	96.81
8/23	24,949	99.78	0	0.0	153	153.33	0.0	154.32	96.81
8/24	24,962	99.83	0	0.0	153	153.33	0.0	154.32	96.81
8/25	24,965	99.84	1	1.4	155	154.69	0.0	154.32	96.81
8/26	24,972	99.87	0	0.0	155	154.69	0.0	154.32	96.81
8/27	24,975	99.88	0	0.0	155	154.69	0.0	154.32	97.93
8/28	24,979	99.90	0	0.0	155	154.69	0.0	154.32	100.00
8/29	24,982	99.91	0	0.0	155	154.69	0.0	154.32	100.00
8/30	24,983	99.91	0	0.0	155	154.69	0.0	154.32	100.00
8/31	24,988	99.93	0	0.0	155	154.69	0.0	154.32	100.00
9/1	24,993	99.95	0	0.0	155	154.69	0.0	154.32	100.00
9/2	24,997	99.97	0	0.0	155	154.69	0.0	154.32	100.00
9/3	24,998	99.97	0	0.0	155	154.69	0.0	154.32	100.00
9/4	25,001	99.98	2	3.5	158	158.15	0.0	154.32	100.00
9/5	25,003	99.99	1	1.2	158	158.15	0.0	154.32	100.00
9/6	25,003	99.99	0	0.0	158	158.15	0.0	154.32	100.00
9/7	25,003	99.99	0	0.0	158	158.15	0.0	154.32	100.00
9/8	25,003	99.99	0	0.0	158	158.15	0.0	154.32	100.00
9/9	25,004	100.00	0	0.0	158	158.15	0.0	154.32	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix F2. Number of chum salmon observed through the George River weir, number of tagged chum salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	George R. Weir		Recaptured Chum Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6/18	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/19	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/20	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/21	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/22	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/23	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/24	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/25	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/26	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/27	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/28	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
6/29	0	0.00	0	0.0	0.00	0.00	1.0	1.00	1.08
6/30	0	0.00	0	0.0	0.00	0.00	0.0	1.00	1.08
7/1	89	0.36	0	0.0	0.00	0.00	0.0	1.00	1.08
7/2	264	1.06	0	0.0	0.00	0.00	1.1	2.09	2.25
7/3	264	1.06	0	0.0	0.00	0.00	2.1	4.20	4.53
7/4	264	1.06	0	0.0	0.00	0.00	5.4	9.60	10.35
7/5	264	1.06	0	0.0	0.00	0.00	0.0	9.60	10.35
7/6	264	1.06	0	0.0	0.00	0.00	4.3	13.88	14.97
7/7	264	1.06	0	0.0	0.00	0.00	4.4	18.25	19.68
7/8	1,088	4.35	0	0.0	0.00	0.00	8.3	26.51	28.59
7/9	2,450	9.80	1	1.1	1.09	1.30	5.7	32.22	34.74
7/10	3,110	12.44	1	1.1	2.17	2.59	2.2	34.40	37.09
7/11	3,334	13.33	2	2.2	4.33	5.17	2.2	36.62	39.48
7/12	4,135	16.54	1	1.1	5.40	6.44	4.4	40.99	44.20
7/13	5,991	23.96	2	2.2	7.57	9.04	3.4	44.34	47.81
7/14	8,011	32.04	9	9.6	17.12	20.44	5.8	50.14	54.07
7/15	9,550	38.19	9	8.5	25.63	30.60	2.2	52.39	56.49
7/16	10,018	40.06	2	2.3	27.91	33.32	3.6	55.99	60.38
7/17	10,693	42.76	1	1.1	29.02	34.64	3.4	59.37	64.02
7/18	11,539	46.15	4	4.4	33.41	39.88	2.6	61.94	66.78
7/19	13,119	52.47	7	7.7	41.07	49.03	5.4	67.32	72.58
7/20	14,724	58.88	5	5.6	46.68	55.73	1.6	68.93	74.33
7/21	15,954	63.80	4	4.6	51.24	61.17	2.7	71.60	77.20
7/22	17,076	68.29	5	5.9	57.18	68.26	0.0	71.60	77.20
7/23	18,096	72.37	4	5.0	62.16	74.21	0.0	71.60	77.20
7/24	18,684	74.72	0	0.0	62.16	74.21	0.0	71.60	77.20
7/25	19,433	77.72	3	3.8	65.99	78.78	0.0	71.60	77.20
7/26	20,183	80.72	2	2.7	68.67	81.98	0.0	71.60	77.20
7/27	20,944	83.76	1	1.6	70.28	83.91	0.0	71.60	77.20
7/28	20,944	83.76	0	0.0	70.28	83.91	0.0	71.60	77.20
7/29	20,944	83.76	0	0.0	70.28	83.91	0.0	71.60	77.20
7/30	20,944	83.76	0	0.0	70.28	83.91	0.0	71.60	77.20
7/31	20,944	83.76	0	0.0	70.28	83.91	1.3	72.86	78.57
8/1	20,944	83.76	0	0.0	70.28	83.91	0.0	72.86	78.57
8/2	20,944	83.76	0	0.0	70.28	83.91	0.0	72.86	78.57
8/3	20,944	83.76	0	0.0	70.28	83.91	1.6	74.50	80.33
8/4	21,047	84.17	0	0.0	70.28	83.91	4.2	78.68	84.83
8/5	21,649	86.58	0	0.0	70.28	83.91	1.6	80.31	86.59
8/6	22,240	88.94	1	1.3	71.61	85.50	1.5	81.81	88.22
8/7	22,827	91.29	0	0.0	71.61	85.50	1.9	83.74	90.30

Appendix F2. (Continued)

Date	George R. Weir		Recaptured Chum Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/8	23,193	92.75	0	0.0	71.61	85.50	0.0	83.74	90.30
8/9	23,578	94.29	0	0.0	71.61	85.50	0.0	83.74	90.30
8/10	23,916	95.64	2	2.7	74.27	88.67	0.0	83.74	90.30
8/11	24,200	96.78	5	7.6	81.83	97.70	0.0	83.74	90.30
8/12	24,344	97.36	0	0.0	81.83	97.70	0.0	83.74	90.30
8/13	24,571	98.26	0	0.0	81.83	97.70	0.0	83.74	90.30
8/14	24,759	99.02	0	0.0	81.83	97.70	0.0	83.74	90.30
8/15	24,776	99.08	0	0.0	81.83	97.70	0.0	83.74	90.30
8/16	24,776	99.08	0	0.0	81.83	97.70	0.0	83.74	90.30
8/17	24,776	99.08	0	0.0	81.83	97.70	0.0	83.74	90.30
8/18	24,792	99.15	0	0.0	81.83	97.70	0.0	83.74	90.30
8/19	24,835	99.32	0	0.0	81.83	97.70	0.0	83.74	90.30
8/20	24,869	99.46	0	0.0	81.83	97.70	0.0	83.74	90.30
8/21	24,899	99.58	0	0.0	81.83	97.70	0.0	83.74	90.30
8/22	24,934	99.72	0	0.0	81.83	97.70	0.0	83.74	90.30
8/23	24,949	99.78	0	0.0	81.83	97.70	0.0	83.74	90.30
8/24	24,962	99.83	0	0.0	81.83	97.70	0.0	83.74	90.30
8/25	24,965	99.84	0	0.0	81.83	97.70	0.0	83.74	90.30
8/26	24,972	99.87	0	0.0	81.83	97.70	0.0	83.74	90.30
8/27	24,975	99.88	0	0.0	81.83	97.70	0.0	83.74	90.30
8/28	24,979	99.90	0	0.0	81.83	97.70	0.0	83.74	90.30
8/29	24,982	99.91	0	0.0	81.83	97.70	9.0	92.74	100.00
8/30	24,983	99.91	0	0.0	81.83	97.70	0.0	92.74	100.00
8/31	24,988	99.93	0	0.0	81.83	97.70	0.0	92.74	100.00
9/1	24,993	99.95	0	0.0	81.83	97.70	0.0	92.74	100.00
9/2	24,997	99.97	0	0.0	81.83	97.70	0.0	92.74	100.00
9/3	24,998	99.97	0	0.0	81.83	97.70	0.0	92.74	100.00
9/4	25,001	99.98	1	1.9	83.76	100.00	0.0	92.74	100.00
9/5	25,003	99.99	0	0.0	83.76	100.00	0.0	92.74	100.00
9/6	25,003	99.99	0	0.0	83.76	100.00	0.0	92.74	100.00
9/7	25,003	99.99	0	0.0	83.76	100.00	0.0	92.74	100.00
9/8	25,003	99.99	0	0.0	83.76	100.00	0.0	92.74	100.00
9/9	25,004	100.00	0	0.0	83.76	100.00	0.0	92.74	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix G.

Appendix G1. Number of chum salmon observed through the Kogrukluk River weir, number of tagged chum salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Chum Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6/18	0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.00
6/19	0	0.00	0	0.0	0.0	0.00	2.0	2.00	4.96
6/20	0	0.00	0	0.0	0.0	0.00	1.1	3.07	7.60
6/21	0	0.00	0	0.0	0.0	0.00	2.0	5.07	12.56
6/22	2	0.01	0	0.0	0.0	0.00	1.1	6.19	15.35
6/23	4	0.02	0	0.0	0.0	0.00	1.1	7.26	17.99
6/24	14	0.06	0	0.0	0.0	0.00	0.0	7.26	17.99
6/25	16	0.07	0	0.0	0.0	0.00	0.0	7.26	17.99
6/26	18	0.08	0	0.0	0.0	0.00	1.1	8.33	20.63
6/27	25	0.11	0	0.0	0.0	0.00	0.0	8.33	20.63
6/28	59	0.26	0	0.0	0.0	0.00	0.0	8.33	20.63
6/29	107	0.48	0	0.0	0.0	0.00	2.1	10.39	25.75
6/30	135	0.60	0	0.0	0.0	0.00	1.1	11.53	28.58
7/1	216	0.96	0	0.0	0.0	0.00	0.0	11.53	28.58
7/2	283	1.26	0	0.0	0.0	0.00	0.0	11.53	28.58
7/3	555	2.47	2	2.0	2.0	4.95	3.1	14.65	36.30
7/4	946	4.20	0	0.0	2.0	4.95	3.4	18.09	44.83
7/5	1,311	5.82	0	0.0	2.0	4.95	3.2	21.29	52.77
7/6	2,023	8.99	1	1.0	3.0	7.43	7.3	28.56	70.78
7/7	2,712	12.05	1	1.1	4.1	10.07	1.1	29.68	73.55
7/8	3,338	14.83	2	2.1	6.1	15.20	2.1	31.77	78.71
7/9	3,918	17.40	1	1.1	7.3	17.98	2.1	33.86	83.89
7/10	4,576	20.33	0	0.0	7.3	17.98	0.0	33.86	83.89
7/11	5,143	22.84	0	0.0	7.3	17.98	1.1	34.93	86.55
7/12	5,295	23.52	0	0.0	7.3	17.98	0.0	34.93	86.55
7/13	5,839	25.93	2	3.1	10.4	25.69	1.1	36.00	89.19
7/14	6,328	28.11	1	1.1	11.5	28.52	2.1	38.13	94.49
7/15	7,465	33.16	1	1.0	12.6	31.09	0.0	38.13	94.49
7/16	8,535	37.91	1	1.1	13.6	33.73	0.0	38.13	94.49
7/17	9,592	42.60	1	2.3	15.9	39.43	0.0	38.13	94.49
7/18	10,547	46.85	4	4.3	20.2	50.06	1.1	39.21	97.17
7/19	11,614	51.59	2	2.1	22.3	55.21	0.0	39.21	97.17
7/20	13,036	57.90	0	0.0	22.3	55.21	0.0	39.21	97.17
7/21	14,393	63.93	5	6.4	28.7	70.99	0.0	39.21	97.17
7/22	15,976	70.96	1	1.0	29.7	73.56	0.0	39.21	97.17
7/23	17,054	75.75	1	1.0	30.7	76.15	0.0	39.21	97.17
7/24	17,593	78.14	2	2.1	32.9	81.38	0.0	39.21	97.17
7/25	18,077	80.29	1	1.1	33.9	84.02	1.1	40.36	100.00
7/26	18,935	84.10	1	1.0	35.0	86.61	0.0	40.36	100.00
7/27	19,470	86.48	1	1.0	36.0	89.19	0.0	40.36	100.00
7/28	19,836	88.11	1	1.1	37.1	91.84	0.0	40.36	100.00
7/29	20,192	89.69	0	0.0	37.1	91.84	0.0	40.36	100.00
7/30	20,192	89.69	0	0.0	37.1	91.84	0.0	40.36	100.00
7/31	20,373	90.49	1	1.1	38.2	94.52	0.0	40.36	100.00
8/1	20,688	91.89	1	1.1	39.2	97.17	0.0	40.36	100.00
8/2	21,067	93.57	0	0.0	39.2	97.17	0.0	40.36	100.00
8/3	21,359	94.87	0	0.0	39.2	97.17	0.0	40.36	100.00
8/4	21,428	95.18	0	0.0	39.2	97.17	0.0	40.36	100.00
8/5	21,464	95.34	0	0.0	39.2	97.17	0.0	40.36	100.00

Appendix G1. (Continued)

Date	Kogrukluk R. Weir		Recaptured Chum Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/6	21,589	95.89	0	0.0	39.2	97.17	0.0	40.36	100.00
8/7	21,741	96.57	0	0.0	39.2	97.17	0.0	40.36	100.00
8/8	21,918	97.35	0	0.0	39.2	97.17	0.0	40.36	100.00
8/9	22,031	97.85	0	0.0	39.2	97.17	0.0	40.36	100.00
8/10	22,168	98.46	1	1.1	40.4	100.00	0.0	40.36	100.00
8/11	22,256	98.85	0	0.0	40.4	100.00	0.0	40.36	100.00
8/12	22,290	99.01	0	0.0	40.4	100.00	0.0	40.36	100.00
8/13	22,332	99.19	0	0.0	40.4	100.00	0.0	40.36	100.00
8/14	22,369	99.36	0	0.0	40.4	100.00	0.0	40.36	100.00
8/15	22,381	99.41	0	0.0	40.4	100.00	0.0	40.36	100.00
8/16	22,419	99.58	0	0.0	40.4	100.00	0.0	40.36	100.00
8/17	22,439	99.67	0	0.0	40.4	100.00	0.0	40.36	100.00
8/18	22,455	99.74	0	0.0	40.4	100.00	0.0	40.36	100.00
8/19	22,464	99.78	0	0.0	40.4	100.00	0.0	40.36	100.00
8/20	22,468	99.80	0	0.0	40.4	100.00	0.0	40.36	100.00
8/21	22,472	99.81	0	0.0	40.4	100.00	0.0	40.36	100.00
8/22	22,475	99.83	0	0.0	40.4	100.00	0.0	40.36	100.00
8/23	22,477	99.84	0	0.0	40.4	100.00	0.0	40.36	100.00
8/24	22,479	99.84	0	0.0	40.4	100.00	0.0	40.36	100.00
8/25	22,482	99.86	0	0.0	40.4	100.00	0.0	40.36	100.00
8/26	22,483	99.86	0	0.0	40.4	100.00	0.0	40.36	100.00
8/27	22,488	99.88	0	0.0	40.4	100.00	0.0	40.36	100.00
8/28	22,492	99.90	0	0.0	40.4	100.00	0.0	40.36	100.00
8/29	22,492	99.90	0	0.0	40.4	100.00	0.0	40.36	100.00
8/30	22,494	99.91	0	0.0	40.4	100.00	0.0	40.36	100.00
8/31	22,495	99.92	0	0.0	40.4	100.00	0.0	40.36	100.00
9/1	22,497	99.92	0	0.0	40.4	100.00	0.0	40.36	100.00
9/2	22,499	99.93	0	0.0	40.4	100.00	0.0	40.36	100.00
9/3	22,500	99.94	0	0.0	40.4	100.00	0.0	40.36	100.00
9/4	22,501	99.94	0	0.0	40.4	100.00	0.0	40.36	100.00
9/5	22,501	99.94	0	0.0	40.4	100.00	0.0	40.36	100.00
9/6	22,504	99.96	0	0.0	40.4	100.00	0.0	40.36	100.00
9/7	22,505	99.96	0	0.0	40.4	100.00	0.0	40.36	100.00
9/8	22,505	99.96	0	0.0	40.4	100.00	0.0	40.36	100.00
9/9	22,507	99.97	0	0.0	40.4	100.00	0.0	40.36	100.00
9/10	22,510	99.98	0	0.0	40.4	100.00	0.0	40.36	100.00
9/11	22,510	99.98	0	0.0	40.4	100.00	0.0	40.36	100.00
9/12	22,511	99.99	0	0.0	40.4	100.00	0.0	40.36	100.00
9/13	22,512	99.99	0	0.0	40.4	100.00	0.0	40.36	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix G2. Number of chum salmon observed through the Kogrukluk River weir, number of tagged chum salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Chum Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
6/18	0	0.00	0	0.0	0.0	0.00	0.0	2.00	5.95
6/19	0	0.00	0	0.0	0.0	0.00	0.0	2.00	5.95
6/20	0	0.00	0	0.0	0.0	0.00	0.0	2.00	5.95
6/21	0	0.00	0	0.0	0.0	0.00	0.0	2.00	5.95
6/22	2	0.01	0	0.0	0.0	0.00	0.0	2.00	5.95
6/23	4	0.02	0	0.0	0.0	0.00	1.1	3.09	9.19
6/24	14	0.06	0	0.0	0.0	0.00	1.1	4.14	12.33
6/25	16	0.07	0	0.0	0.0	0.00	0.0	4.14	12.33
6/26	18	0.08	0	0.0	0.0	0.00	1.1	5.19	15.45
6/27	25	0.11	0	0.0	0.0	0.00	2.1	7.27	21.64
6/28	59	0.26	0	0.0	0.0	0.00	1.1	8.33	24.80
6/29	107	0.48	0	0.0	0.0	0.00	2.0	10.33	30.75
6/30	135	0.60	0	0.0	0.0	0.00	1.0	11.35	33.80
7/1	216	0.96	0	0.0	0.0	0.00	1.0	12.38	36.86
7/2	283	1.26	0	0.0	0.0	0.00	0.0	12.38	36.86
7/3	555	2.47	0	0.0	0.0	0.00	0.0	12.38	36.86
7/4	946	4.20	0	0.0	0.0	0.00	3.2	15.62	46.50
7/5	1,311	5.82	0	0.0	0.0	0.00	3.1	18.74	55.79
7/6	2,023	8.99	2	2.1	2.1	6.11	2.1	20.88	62.17
7/7	2,712	12.05	0	0.0	2.1	6.11	2.2	23.07	68.67
7/8	3,338	14.83	0	0.0	2.1	6.11	1.0	24.10	71.75
7/9	3,918	17.40	3	4.2	6.3	18.62	2.3	26.38	78.54
7/10	4,576	20.33	1	1.1	7.3	21.74	1.1	27.47	81.79
7/11	5,143	22.84	0	0.0	7.3	21.74	2.2	29.69	88.39
7/12	5,295	23.52	3	3.1	10.4	30.89	0.0	29.69	88.39
7/13	5,839	25.93	2	2.1	12.4	37.02	0.0	29.69	88.39
7/14	6,328	28.11	0	0.0	12.4	37.02	1.2	30.85	91.84
7/15	7,465	33.16	1	1.1	13.5	40.24	0.0	30.85	91.84
7/16	8,535	37.91	3	3.1	16.6	49.59	0.0	30.85	91.84
7/17	9,592	42.60	3	3.2	19.8	59.12	1.1	31.98	95.19
7/18	10,547	46.85	1	1.0	20.9	62.22	0.0	31.98	95.19
7/19	11,614	51.59	1	1.0	21.9	65.29	0.0	31.98	95.19
7/20	13,036	57.90	2	2.2	24.2	71.93	1.6	33.59	100.00
7/21	14,393	63.93	1	1.1	25.3	75.33	0.0	33.59	100.00
7/22	15,976	70.96	1	1.1	26.4	78.58	0.0	33.59	100.00
7/23	17,054	75.75	1	1.1	27.5	81.88	0.0	33.59	100.00
7/24	17,593	78.14	2	2.3	29.8	88.64	0.0	33.59	100.00
7/25	18,077	80.29	0	0.0	29.8	88.64	0.0	33.59	100.00
7/26	18,935	84.10	0	0.0	29.8	88.64	0.0	33.59	100.00
7/27	19,470	86.48	1	1.1	30.8	91.84	0.0	33.59	100.00
7/28	19,836	88.11	1	1.1	32.0	95.19	0.0	33.59	100.00
7/29	20,192	89.69	0	0.0	32.0	95.19	0.0	33.59	100.00
7/30	20,192	89.69	0	0.0	32.0	95.19	0.0	33.59	100.00
7/31	20,373	90.49	1	1.6	33.6	100.00	0.0	33.59	100.00
8/1	20,688	91.89	0	0.0	33.6	100.00	0.0	33.59	100.00
8/2	21,067	93.57	0	0.0	33.6	100.00	0.0	33.59	100.00
8/3	21,359	94.87	0	0.0	33.6	100.00	0.0	33.59	100.00
8/4	21,428	95.18	0	0.0	33.6	100.00	0.0	33.59	100.00
8/5	21,464	95.34	0	0.0	33.6	100.00	0.0	33.59	100.00
8/6	21,589	95.89	0	0.0	33.6	100.00	0.0	33.59	100.00

Appendix G2. (Continued)

Date	Kogrukluk R. Weir		Recaptured Chum Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/7	21,741	96.57	0	0.0	33.6	100.00	0.0	33.59	100.00
8/8	21,918	97.35	0	0.0	33.6	100.00	0.0	33.59	100.00
8/9	22,031	97.85	0	0.0	33.6	100.00	1.1	33.59	100.00
8/10	22,168	98.46	0	0.0	33.6	100.00	1.1	33.59	100.00
8/11	22,256	98.85	0	0.0	33.6	100.00	0.0	33.59	100.00
8/12	22,290	99.01	0	0.0	33.6	100.00	1.1	33.59	100.00
8/13	22,332	99.19	0	0.0	33.6	100.00	2.1	33.59	100.00
8/14	22,369	99.36	0	0.0	33.6	100.00	1.1	33.59	100.00
8/15	22,381	99.41	0	0.0	33.6	100.00	2.0	33.59	100.00
8/16	22,419	99.58	0	0.0	33.6	100.00	1.0	33.59	100.00
8/17	22,439	99.67	0	0.0	33.6	100.00	1.0	33.59	100.00
8/18	22,455	99.74	0	0.0	33.6	100.00	0.0	33.59	100.00
8/19	22,464	99.78	0	0.0	33.6	100.00	0.0	33.59	100.00
8/20	22,468	99.80	0	0.0	33.6	100.00	3.2	33.59	100.00
8/21	22,472	99.81	0	0.0	33.6	100.00	3.1	33.59	100.00
8/22	22,475	99.83	0	0.0	33.6	100.00	2.1	33.59	100.00
8/23	22,477	99.84	0	0.0	33.6	100.00	2.2	33.59	100.00
8/24	22,479	99.84	0	0.0	33.6	100.00	1.0	33.59	100.00
8/25	22,482	99.86	0	0.0	33.6	100.00	2.3	33.59	100.00
8/26	22,483	99.86	0	0.0	33.6	100.00	1.1	33.59	100.00
8/27	22,488	99.88	0	0.0	33.6	100.00	2.2	33.59	100.00
8/28	22,492	99.90	0	0.0	33.6	100.00	0.0	33.59	100.00
8/29	22,492	99.90	0	0.0	33.6	100.00	0.0	33.59	100.00
8/30	22,494	99.91	0	0.0	33.6	100.00	1.2	33.59	100.00
8/31	22,495	99.92	0	0.0	33.6	100.00	0.0	33.59	100.00
9/1	22,497	99.92	0	0.0	33.6	100.00	0.0	33.59	100.00
9/2	22,499	99.93	0	0.0	33.6	100.00	1.1	33.59	100.00
9/3	22,500	99.94	0	0.0	33.6	100.00	0.0	33.59	100.00
9/4	22,501	99.94	0	0.0	33.6	100.00	0.0	33.59	100.00
9/5	22,501	99.94	0	0.0	33.6	100.00	1.6	33.59	100.00
9/6	22,504	99.96	0	0.0	33.6	100.00	0.0	33.59	100.00
9/7	22,505	99.96	0	0.0	33.6	100.00	0.0	33.59	100.00
9/8	22,505	99.96	0	0.0	33.6	100.00	0.0	33.59	100.00
9/9	22,507	99.97	0	0.0	33.6	100.00	0.0	33.59	100.00
9/10	22,510	99.98	0	0.0	33.6	100.00	0.0	33.59	100.00
9/11	22,510	99.98	0	0.0	33.6	100.00	0.0	33.59	100.00
9/12	22,511	99.99	0	0.0	33.6	100.00	0	33.59	100.00
9/13	22,512	99.99	0	0.0	33.6	100.00	0	33.59	100.00
9/14	22,514	100.00	0	0.0	33.6	100.00	0	33.59	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix H:

Appendix H1. Daily summary of tagged, untagged, and recaptured coho salmon at the Kalskag site on the Kuskokwim River, 2003.

Kalskag										
	Capture Gear						Tag Site/ Recapture Site [3/]			
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged							
Date	RB[1/]	LB[2/]	RB[1/]	LB[2/]	Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag	Total	Cumm. % Catch
6/20	0	0	0	1	0	0	0	0	1	0.01
6/21	0	0	0	0	0	0	0	0	0	0.01
6/22	0	0	0	0	0	0	0	0	0	0.01
6/23	0	0	0	0	0	0	0	0	0	0.01
6/24	0	0	0	0	0	0	0	0	0	0.01
6/25	0	0	0	0	0	0	0	0	0	0.01
6/26	0	0	0	0	0	0	0	0	0	0.01
6/27	0	0	0	0	0	0	0	0	0	0.01
6/28	0	0	0	0	0	0	0	0	0	0.01
6/29	0	1	0	0	0	0	0	0	1	0.03
6/30	0	0	0	0	0	0	0	0	0	0.03
7/1	0	0	0	0	0	0	0	0	0	0.03
7/2	2	0	0	0	0	0	0	0	2	0.05
7/3	0	2	0	0	0	0	0	0	2	0.08
7/4	1	1	0	0	0	0	0	0	2	0.11
7/5	2	1	0	0	0	0	0	0	3	0.15
7/6	0	0	0	0	0	0	0	0	0	0.15
7/7	1	0	0	0	0	0	0	0	1	0.16
7/8	0	0	0	0	0	0	0	0	0	0.16
7/9	0	0	0	0	0	0	0	0	0	0.16
7/10	0	1	0	0	0	0	0	0	1	0.18
7/11	1	2	0	0	1	0	0	0	4	0.23
7/12	3	2	0	0	0	0	0	0	5	0.30
7/13	1	0	0	0	1	0	0	0	2	0.33
7/14	0	2	0	1	0	0	0	0	3	0.37
7/15	3	2	0	0	1	0	0	0	6	0.45
7/16	1	0	0	0	0	0	0	0	1	0.47
7/17	6	0	0	0	0	0	0	0	6	0.55
7/18	7	0	1	0	0	0	0	0	8	0.66
7/19	4	1	0	1	1	0	0	0	7	0.75
7/20	6	1	1	0	0	0	0	0	8	0.86
7/21	6	0	1	0	0	2	0	0	9	0.99
7/22	7	2	1	2	1	0	0	0	13	1.17
7/23	12	3	0	0	1	0	0	0	16	1.39
7/24	12	4	0	0	3	1	1	0	21	1.67
7/25	12	4	3	0	4	1	0	0	24	2.00
7/26	19	8	3	0	1	0	0	0	31	2.43
7/27	34	6	3	2	1	1	1	0	48	3.09
7/28	26	4	4	0	2	0	0	0	36	3.58
7/29	20	4	1	0	3	0	1	0	29	3.98
7/30	39	7	0	0	8	0	0	0	54	4.72
7/31	32	9	0	0	0	0	0	0	41	5.28
8/1	29	3	1	0	6	0	1	0	40	5.83
8/2	37	1	1	0	20	0	0	0	59	6.64
8/3	63	6	1	0	28	0	0	0	98	7.99
8/4	112	5	2	0	14	0	1	0	134	9.82
8/5	133	6	3	0	14	0	2	0	158	11.99
8/6	96	7	4	1	0	0	0	0	108	13.47

Appendix H1. (Continued)

Kalskag										
Date	Capture Gear						Tag Site/ Recapture Site 3/		Total	Cumm. % Catch
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Kalskag	Aniak/ Kalskag		
	RB1/	LB2/	RB1/	LB2/						
8/7	70	16	3	2	10	0	4	1	106	14.93
8/8	82	16	6	0	19	1	3	0	127	16.67
8/9	66	19	2	4	0	0	0	0	91	17.92
8/10	172	67	14	5	13	0	3	0	274	21.68
8/11	110	61	4	7	13	0	4	0	199	24.41
8/12	237	61	11	6	0	0	4	0	319	28.79
8/13	164	93	15	4	0	0	4	0	280	32.63
8/14	146	83	2	5	0	1	2	0	239	35.91
8/15	191	146	8	9	2	0	5	0	361	40.86
8/16	148	43	6	0	4	0	3	0	204	43.66
8/17	242	81	6	8	19	1	3	0	360	48.60
8/18	160	65	4	4	0	0	4	0	237	51.85
8/19	198	50	7	8	5	0	7	0	275	55.63
8/20	164	54	6	3	15	0	8	1	251	59.07
8/21	199	40	5	4	26	0	4	0	278	62.88
8/22	174	18	7	3	23	3	2	1	231	66.05
8/23	157	19	16	1	27	2	0	0	222	69.10
8/24	141	14	6	1	30	2	3	0	197	71.80
8/25	173	22	15	1	14	1	8	1	235	75.03
8/26	193	28	9	2	4	0	6	1	243	78.36
8/27	117	32	5	3	17	1	6	1	182	80.86
8/28	77	54	8	2	15	1	3	0	160	83.05
8/29	50	43	5	9	5	0	6	0	118	84.67
8/30	60	28	4	5	3	1	1	1	103	86.09
8/31	55	32	5	2	7	0	4	0	105	87.53
9/1	46	47	2	2	8	0	0	0	105	88.97
9/2	54	35	2	8	8	0	2	0	109	90.46
9/3	57	48	3	3	13	0	4	1	129	92.23
9/4	62	31	4	1	8	0	1	0	107	93.70
9/5	58	53	3	3	8	0	4	1	130	95.49
9/6	60	35	0	4	14	0	3	2	118	97.10
9/7	0	22	0	1	124	11	5	0	163	99.34
9/8	0	0	0	0	46	1	1	0	48	100.00
9/9	0	0	0	0	0	0	0	0	0	100.00
9/10	0	0	0	0	0	0	0	0	0	100.00
Total	**4,610**	**1,551**	**223**	**128**	**610**	**31**	**124**	**11**	**7,288**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix H2. Daily summary of tagged, untagged, and recaptured coho salmon at the Aniak site on the Kuskokwim River, 2003.

Aniak										
	Capture Gear						Tag Site/ Recapture Site [3/]			
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged							
Date	RB[1/]	LB[2/]	RB[1/]	LB[2/]	Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak	Total	Cumm. % Catch
6/20	0	0	0	0	0	0	0	0	0	0.00
6/21	0	0	0	0	0	0	0	0	0	0.00
6/22	0	0	0	0	0	0	0	0	0	0.00
6/23	0	0	0	1	0	0	0	0	1	0.01
6/24	0	0	1	0	0	0	0	0	1	0.01
6/25	0	0	1	0	1	0	0	0	2	0.02
6/26	0	0	0	0	0	0	0	0	0	0.02
6/27	0	0	0	0	0	0	0	0	0	0.02
6/28	1	1	0	0	0	0	0	0	2	0.03
6/29	0	0	0	0	0	0	0	0	0	0.03
6/30	0	0	0	0	0	0	0	0	0	0.03
7/1	0	0	0	0	0	0	0	0	0	0.03
7/2	0	0	0	0	0	0	0	0	0	0.03
7/3	0	0	0	0	0	0	0	0	0	0.03
7/4	0	0	0	0	0	0	0	0	0	0.03
7/5	0	0	0	0	0	0	0	0	0	0.03
7/6	0	0	0	0	0	0	0	0	0	0.03
7/7	0	0	0	0	0	0	0	0	0	0.03
7/8	0	1	0	0	0	2	0	0	3	0.05
7/9	0	0	0	0	0	0	0	0	0	0.05
7/10	0	0	0	0	0	0	0	0	0	0.05
7/11	0	0	0	0	0	0	0	0	0	0.05
7/12	0	0	0	0	0	0	0	0	0	0.05
7/13	0	0	0	0	0	0	0	0	0	0.05
7/14	0	2	0	0	0	0	0	0	2	0.06
7/15	0	1	0	0	1	0	0	0	2	0.08
7/16	2	2	3	0	0	0	0	0	7	0.12
7/17	0	0	0	0	0	4	0	0	4	0.14
7/18	1	5	0	1	0	1	0	0	8	0.19
7/19	3	9	0	0	0	5	0	0	17	0.28
7/20	0	10	0	1	0	2	0	0	13	0.36
7/21	6	12	0	1	0	0	0	1	20	0.48
7/22	3	23	0	5	0	0	0	2	33	0.67
7/23	10	17	0	3	0	0	0	0	30	0.84
7/24	19	7	0	0	0	0	0	0	26	0.99
7/25	20	10	1	0	0	21	0	1	53	1.30
7/26	23	36	2	3	0	11	0	0	75	1.73
7/27	23	34	0	2	5	1	0	0	65	2.11
7/28	17	15	1	1	8	40	0	0	82	2.59
7/29	7	52	1	6	6	74	0	0	146	3.43
7/30	34	102	3	14	4	54	0	3	214	4.67
7/31	15	78	0	5	0	0	0	2	100	5.25
8/1	22	63	1	4	0	142	0	2	234	6.61
8/2	25	59	0	7	0	116	0	0	207	7.81
8/3	45	66	3	3	0	56	1	2	176	8.83
8/4	79	36	4	7	0	63	2	1	192	9.94
8/5	226	47	8	2	0	96	1	4	384	12.17
8/6	248	82	15	6	0	98	4	10	463	14.85

Appendix H2. (Continued)

Aniak										
Date	Capture Gear						Tag Site/ Recapture Site [3/]		Total	Cumm. % Catch
	Fish Wheel				Gillnet					
	Tagged		Un-Tagged		Tagged	Un-Tagged	Kalskag/ Aniak	Aniak/ Aniak		
	RB[1/]	LB[2/]	RB[1/]	LB[2/]						
8/7	206	104	14	11	0	71	2	4	412	17.24
8/8	125	109	19	26	0	92	1	4	376	19.42
8/9	218	97	37	31	0	73	4	3	463	22.10
8/10	170	117	39	40	0	137	4	4	511	25.07
8/11	138	60	11	7	0	50	1	5	272	26.64
8/12	150	79	12	15	0	76	1	0	333	28.57
8/13	234	92	18	6	0	59	4	5	418	31.00
8/14	138	129	9	13	0	57	0	4	350	33.02
8/15	203	241	23	101	4	155	3	4	734	37.28
8/16	93	274	11	57	0	186	5	3	629	40.93
8/17	81	223	1	16	0	187	3	4	515	43.91
8/18	63	164	1	10	5	156	3	3	405	46.26
8/19	147	205	23	28	0	111	4	11	529	49.32
8/20	254	237	21	24	0	0	7	12	555	52.54
8/21	205	277	42	34	0	265	18	18	859	57.52
8/22	169	267	57	46	0	147	5	16	707	61.62
8/23	306	228	65	48	0	83	10	13	753	65.98
8/24	311	277	26	76	0	0	8	13	711	70.11
8/25	287	216	43	97	0	51	4	21	719	74.27
8/26	163	284	16	63	0	124	5	16	671	78.16
8/27	184	121	20	58	0	138	6	15	542	81.31
8/28	282	238	36	61	0	39	12	14	682	85.26
8/29	130	184	10	25	3	46	8	10	416	87.67
8/30	86	183	11	38	0	49	11	9	387	89.91
8/31	101	55	12	3	0	106	4	1	282	91.55
9/1	45	68	5	23	0	57	4	7	209	92.76
9/2	8	54	2	18	0	46	2	4	134	93.54
9/3	21	87	0	11	0	35	3	5	162	94.48
9/4	34	75	2	15	0	9	2	3	140	95.29
9/5	13	66	1	24	0	44	2	5	155	96.19
9/6	13	38	2	17	0	39	2	7	118	96.87
9/7	26	65	3	24	0	26	6	3	153	97.76
9/8	20	54	5	19	0	24	8	6	136	98.55
9/9	70	67	5	24	0	0	0	2	168	99.52
9/10	0	9	20	53	0	0	0	1	83	100.00
Total	**5,523**	**5,814**	**666**	**1,234**	**37**	**3,524**	**170**	**283**	**17,251**	

1/ Right Bank Fish Wheel
2/ Left Bank Fish Wheel
3/ Multiple Recaptures Included

Appendix I. Number of recovered tags from coho salmon by subsistence, commercial, and sport fishers at locations downstream and upstream from the Kalskag and Aniak tag sites on the Kuskokwim River, 2003.

Community	Fishery Type								
	Subsistence		Commercial		Sport		Found		Grand Total
	Tag Site		Tag Site		Tag Site		Tag Site		
Downstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Johnson River	0	0	1	0	0	0	0	0	1
Napakiak	1	0	2	1	1	0	0	0	5
Oscarville	1	0	0	0	0	0	0	0	1
Napaskiak	0	0	0	1	0	0	0	0	1
Bethel	2	0	1	3	0	1	0	0	7
Kwethluk	5	6	1	2	1	1	0	0	16
Akiachak	1	2	4	4	0	0	0	1	12
Kasigluk River	0	0	0	1	0	0	0	0	1
Akiak	2	3	4	6	0	1	0	0	16
Tuluksak	4	2	0	1	0	1	1	0	9
Kisaralik River	0	0	0	0	0	1	0	0	1
Total	16	13	13	19	2	5	1	1	70
Near Tag Sites	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Kalskag	3	6	0	0	0	0	0	0	9
Aniak	0	0	0	0	0	0	0	0	0
Total	3	6	0	0	0	0	0	0	9
Upstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Aniak	16	34	0	0	9	52	0	1	112
Napaimiut	0	0	0	0	0	1	0	0	1
Holokuk River	0	0	0	0	1	0	0	0	1
Oskawalik R.	0	0	0	0	0	1	0	0	1
Crooked Creek	4	2	0	0	0	0	0	0	6
Red Devil	5	2	0	0	0	0	0	0	7

Appendix I. (Continued).

Community	Fishery Type								
	Subsistence		Commercial		Sport		Found		Grand Total
	Tag Site		Tag Site		Tag Site		Tag Site		
Upstream	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Sleetmute	2	3	0	0	1	2	0	0	8
Holitna River	1	1	0	0	8	7	0	0	17
Stony River	3	3	0	0	1	0	0	0	7
McGrath	2	2	0	0	0	0	0	0	4
Takotna River	2	0	0	0	0	0	0	0	2
Nikolai Village	2	1	0	0	2	0	0	0	5
Swift River	0	0	0	0	0	1	0	1	2
Fish Creek	0	0	0	0	0	2	0	0	2
Total	37	48	0	0	22	66	0	2	175

Unknown	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	3	1	0	1	1	1	0	1	8

Combined	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	Kalskag	Aniak	
Total	59	68	13	20	25	72	1	4	262

Appendix J.

Appendix J1. Number of coho salmon observed through the George River weir, number of tagged coho salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	George R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/18	1	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/19	2	0.01	0	0.0	0.00	0.00	0.0	0.00	0.00
7/20	4	0.01	0	0.0	0.00	0.00	0.0	0.00	0.00
7/21	12	0.04	0	0.0	0.00	0.00	0.0	0.00	0.00
7/22	13	0.04	0	0.0	0.00	0.00	1.3	1.33	1.07
7/23	23	0.07	0	0.0	0.00	0.00	0.0	1.33	1.07
7/24	28	0.09	0	0.0	0.00	0.00	0.0	1.33	1.07
7/25	39	0.12	0	0.0	0.00	0.00	0.0	1.33	1.07
7/26	58	0.18	0	0.0	0.00	0.00	0.0	1.33	1.07
7/27	80	0.25	0	0.0	0.00	0.00	0.0	1.33	1.07
7/28	80	0.25	0	0.0	0.00	0.00	1.1	2.47	1.97
7/29	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
7/30	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
7/31	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
8/1	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
8/2	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
8/3	80	0.25	0	0.0	0.00	0.00	0.0	2.47	1.97
8/4	96	0.30	0	0.0	0.00	0.00	0.0	2.47	1.97
8/5	158	0.49	0	0.0	0.00	0.00	0.0	2.47	1.97
8/6	256	0.80	0	0.0	0.00	0.00	0.0	2.47	1.97
8/7	412	1.29	0	0.0	0.00	0.00	0.0	2.47	1.97
8/8	525	1.64	0	0.0	0.00	0.00	0.0	2.47	1.97
8/9	1,032	3.23	0	0.0	0.00	0.00	1.1	3.54	2.83
8/10	1,372	4.30	2	2.5	2.47	1.99	5.5	9.00	7.19
8/11	1,558	4.88	0	0.0	2.47	1.99	3.2	12.23	9.78
8/12	1,862	5.83	0	0.0	2.47	1.99	3.2	15.44	12.34
8/13	2,008	6.29	0	0.0	2.47	1.99	4.4	19.79	15.83
8/14	3,628	11.36	0	0.0	2.47	1.99	4.2	23.95	19.15
8/15	3,673	11.51	0	0.0	2.47	1.99	9.6	33.54	26.82
8/16	3,673	11.51	0	0.0	2.47	1.99	7.3	40.87	32.68
8/17	3,673	11.51	0	0.0	2.47	1.99	5.3	46.13	36.89
8/18	3,701	11.59	0	0.0	2.47	1.99	6.3	52.45	41.94
8/19	3,917	12.27	0	0.0	2.47	1.99	2.2	54.63	43.69
8/20	4,270	13.38	0	0.0	2.47	1.99	3.2	57.88	46.28
8/21	6,334	19.84	0	0.0	2.47	1.99	10.5	68.42	54.71
8/22	7,189	22.52	0	0.0	2.47	1.99	8.5	76.96	61.54
8/23	7,860	24.62	0	0.0	2.47	1.99	2.2	79.19	63.33
8/24	8,334	26.10	0	0.0	2.47	1.99	3.3	82.48	65.96
8/25	11,006	34.47	6	6.4	8.88	7.16	7.8	90.23	72.16
8/26	13,238	41.47	8	8.5	17.37	14.00	7.6	97.81	78.21
8/27	15,243	47.75	10	10.7	28.02	22.59	2.1	99.95	79.93
8/28	16,212	50.78	8	8.5	36.55	29.47	8.8	108.75	86.96
8/29	16,656	52.17	1	1.1	37.64	30.34	0.0	108.75	86.96

Appendix J1. (Continued).

Date	George R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
8/30	17,052	53.41	1	1.1	38.69	31.19	4.5	113.25	90.56
8/31	19,986	62.60	14	15.0	53.69	43.29	1.1	114.35	91.44
9/1	25,645	80.33	0	0.0	53.69	43.29	4.2	118.52	94.78
9/2	27,151	85.05	0	0.0	53.69	43.29	1.1	119.66	95.68
9/3	27,392	85.80	3	3.2	56.91	45.88	4.3	124.00	99.16
9/4	27,582	86.40	2	2.2	59.10	47.65	1.1	125.05	100.00
9/5	27,989	87.67	5	5.3	64.40	51.92	0.0	125.05	100.00
9/6	28,623	89.66	6	6.5	70.91	57.17	0.0	125.05	100.00
9/7	29,424	92.17	7	7.5	78.42	63.22	0.0	125.05	100.00
9/8	29,816	93.39	8	8.7	87.14	70.25	0.0	125.05	100.00
9/9	30,028	94.06	4	3.3	90.43	72.90	0.0	125.05	100.00
9/10	30,176	94.52	3	3.2	93.65	75.50	0.0	125.05	100.00
9/11	30,407	95.25	5	5.5	99.12	79.91	0.0	125.05	100.00
9/12	30,466	95.43	0	0.0	99.12	79.91	0.0	125.05	100.00
9/13	31,725	99.37	19	20.6	119.67	96.48	0.0	125.05	100.00
9/14	31,875	99.84	4	4.4	124.04	100.00	0.0	125.05	100.00
9/15	31,889	99.89	0	0.0	124.04	100.00	0.0	125.05	100.00
9/16	31,890	99.89	0	0.0	124.04	100.00	0.0	125.05	100.00
9/17	31,918	99.98	0	0.0	124.04	100.00	0.0	125.05	100.00
9/18	31,925	100.00	0	0.0	124.04	100.00	0.0	125.05	100.00
9/19	31,925	100.00	0	0.0	124.04	100.00	0.0	125.05	100.00
9/20	31,925	100.00	0	0.0	124.04	100.00	0.0	125.05	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix J2. Number of coho salmon observed through the George River weir, number of tagged coho salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	George R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/18	1	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/19	2	0.01	0	0.0	0.00	0.00	0.0	0.00	0.00
7/20	4	0.01	0	0.0	0.00	0.00	0.0	0.00	0.00
7/21	12	0.04	0	0.0	0.00	0.00	0.0	0.00	0.00
7/22	13	0.04	0	0.0	0.00	0.00	0.0	0.00	0.00
7/23	23	0.07	0	0.0	0.00	0.00	0.0	0.00	0.00
7/24	28	0.09	0	0.0	0.00	0.00	0.0	0.00	0.00
7/25	39	0.12	0	0.0	0.00	0.00	0.0	0.00	0.00
7/26	58	0.18	0	0.0	0.00	0.00	0.0	0.00	0.00
7/27	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
7/28	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
7/29	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
7/30	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
7/31	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
8/1	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
8/2	80	0.25	0	0.0	0.00	0.00	0.0	0.00	0.00
8/3	80	0.25	0	0.0	0.00	0.00	2.2	2.16	1.87
8/4	96	0.30	0	0.0	0.00	0.00	0.0	2.16	1.87
8/5	158	0.49	0	0.0	0.00	0.00	0.0	2.16	1.87
8/6	256	0.80	0	0.0	0.00	0.00	0.0	2.16	1.87
8/7	412	1.29	0	0.0	0.00	0.00	0.0	2.16	1.87
8/8	525	1.64	0	0.0	0.00	0.00	0.0	2.16	1.87
8/9	1,032	3.23	0	0.0	0.00	0.00	4.9	7.05	6.10
8/10	1,372	4.30	1	1.1	1.08	0.94	6.5	13.55	11.73
8/11	1,558	4.88	0	0.0	1.08	0.94	5.6	19.16	16.58
8/12	1,862	5.83	0	0.0	1.08	0.94	3.4	22.51	19.48
8/13	2,008	6.29	0	0.0	1.08	0.94	0.0	22.51	19.48
8/14	3,628	11.36	0	0.0	1.08	0.94	3.3	25.80	22.33
8/15	3,673	11.51	0	0.0	1.08	0.94	6.5	32.28	27.94
8/16	3,673	11.51	0	0.0	1.08	0.94	7.2	39.47	34.16
8/17	3,673	11.51	0	0.0	1.08	0.94	4.3	43.77	37.89
8/18	3,701	11.59	0	0.0	1.08	0.94	1.1	44.83	38.80
8/19	3,917	12.27	0	0.0	1.08	0.94	3.6	48.39	41.88
8/20	4,270	13.38	0	0.0	1.08	0.94	3.4	51.78	44.82
8/21	6,334	19.84	0	0.0	1.08	0.94	4.9	56.64	49.02
8/22	7,189	22.52	0	0.0	1.08	0.94	2.6	59.20	51.24
8/23	7,860	24.62	0	0.0	1.08	0.94	3.8	62.96	54.49
8/24	8,334	26.10	0	0.0	1.08	0.94	7.3	70.21	60.77
8/25	11,006	34.47	7	8.2	9.29	8.04	8.0	78.18	67.66
8/26	13,238	41.47	8	9.8	19.05	16.49	11.0	89.17	77.18
8/27	15,243	47.75	10	11.7	30.70	26.57	4.0	93.14	80.61
8/28	16,212	50.78	4	4.6	35.30	30.55	6.2	99.31	85.95
8/29	16,656	52.17	1	1.3	36.55	31.64	2.3	101.64	87.97
8/30	17,052	53.41	2	2.3	38.88	33.65	5.0	106.62	92.28
8/31	19,986	62.60	12	14.5	53.40	46.22	0.0	106.62	92.28
9/1	25,645	80.33	0	0.0	53.40	46.22	4.0	110.63	95.75
9/2	27,151	85.05	0	0.0	53.40	46.22	0.0	110.63	95.75
9/3	27,392	85.80	3	3.8	57.18	49.49	2.3	112.96	97.77
9/4	27,582	86.40	2	2.4	59.60	51.59	1.2	114.17	98.81
9/5	27,989	87.67	2	2.4	62.04	53.70	0.0	114.17	98.81

Appendix J2. (Continued).

Date	George R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
9/6	28,623	89.66	7	8.6	70.68	61.18	0.0	114.17	98.81
9/7	29,424	92.17	5	6.3	76.98	66.63	1.4	115.54	100.00
9/8	29,816	93.39	2	2.5	79.48	68.79	0.0	115.54	100.00
9/9	30,028	94.06	3	3.7	83.18	71.99	0.0	115.54	100.00
9/10	30,176	94.52	6	7.5	90.64	78.45	0.0	115.54	100.00
9/11	30,407	95.25	1	1.3	91.97	79.60	0.0	115.54	100.00
9/12	30,466	95.43	0	0.0	91.97	79.60	0.0	115.54	100.00
9/13	31,725	99.37	17	21.2	113.17	97.95	0.0	115.54	100.00
9/14	31,875	99.84	2	2.4	115.54	100.00	0.0	115.54	100.00
9/15	31,889	99.89	0	0.0	115.54	100.00	0.0	115.54	100.00
9/16	31,890	99.89	0	0.0	115.54	100.00	0.0	115.54	100.00
9/17	31,918	99.98	0	0.0	115.54	100.00	0.0	115.54	100.00
9/18	31,925	100.00	0	0.0	115.54	100.00	0.0	115.54	100.00
9/19	31,925	100.00	0	0.0	115.54	100.00	0.0	115.54	100.00
9/20	31,925	100.00	0	0.0	115.54	100.00	0.0	115.54	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix K.

Appendix K1. Number of coho salmon observed through the Kogrukluk River weir, number of tagged coho salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/18	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/19	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/20	6	0.01	0	0.0	0.00	0.00	0.0	0.00	0.00
7/21	14	0.02	0	0.0	0.00	0.00	0.0	0.00	0.00
7/22	26	0.04	0	0.0	0.00	0.00	1.3	1.33	0.36
7/23	29	0.04	0	0.0	0.00	0.00	0.0	1.33	0.36
7/24	32	0.05	0	0.0	0.00	0.00	0.0	1.33	0.36
7/25	46	0.07	0	0.0	0.00	0.00	0.0	1.33	0.36
7/26	50	0.07	0	0.0	0.00	0.00	0.0	1.33	0.36
7/27	58	0.08	0	0.0	0.00	0.00	1.2	2.48	0.68
7/28	85	0.12	0	0.0	0.00	0.00	1.1	3.62	0.99
7/29	85	0.12	0	0.0	0.00	0.00	1.1	4.70	1.28
7/30	98	0.14	0	0.0	0.00	0.00	1.0	5.70	1.56
7/31	123	0.18	0	0.0	0.00	0.00	3.0	8.70	2.38
8/1	170	0.25	0	0.0	0.00	0.00	2.1	10.83	2.96
8/2	237	0.34	0	0.0	0.00	0.00	2.1	12.88	3.52
8/3	250	0.36	0	0.0	0.00	0.00	5.1	17.95	4.91
8/4	263	0.38	0	0.0	0.00	0.00	7.2	25.13	6.87
8/5	300	0.44	0	0.0	0.00	0.00	11.4	36.53	9.98
8/6	353	0.51	0	0.0	0.00	0.00	6.3	42.82	11.70
8/7	488	0.71	0	0.0	0.00	0.00	2.2	45.05	12.31
8/8	555	0.81	0	0.0	0.00	0.00	7.6	52.69	14.40
8/9	824	1.20	1	1.3	1.33	0.36	5.4	58.04	15.86
8/10	1,148	1.67	0	0.0	1.33	0.36	10.9	68.97	18.85
8/11	1,175	1.71	0	0.0	1.33	0.36	9.7	78.65	21.50
8/12	2,130	3.09	0	0.0	1.33	0.36	27.8	106.48	29.10
8/13	2,677	3.89	1	1.1	2.47	0.67	16.3	122.82	33.57
8/14	3,683	5.35	0	0.0	2.47	0.67	20.8	143.61	39.25
8/15	4,883	7.09	0	0.0	2.47	0.67	22.4	165.98	45.36
8/16	5,728	8.32	0	0.0	2.47	0.67	18.8	184.83	50.51
8/17	6,361	9.24	0	0.0	2.47	0.67	32.6	217.46	59.43
8/18	6,598	9.59	1	1.0	3.49	0.95	16.9	234.31	64.04
8/19	7,040	10.23	1	1.0	4.51	1.23	20.7	255.00	69.69
8/20	8,185	11.89	2	2.1	6.56	1.79	21.7	276.65	75.61
8/21	10,371	15.07	5	5.2	11.77	3.22	12.7	289.30	79.07
8/22	11,801	17.14	2	2.1	13.83	3.78	19.2	308.52	84.32
8/23	12,812	18.61	1	1.0	14.86	4.06	10.0	318.55	87.06
8/24	14,405	20.93	4	4.3	19.11	5.22	14.3	332.80	90.96
8/25	16,170	23.49	12	12.6	31.68	8.66	6.6	339.45	92.77
8/26	19,341	28.10	16	17.0	48.66	13.30	7.6	347.02	94.84
8/27	22,710	32.99	5	5.2	53.84	14.72	5.4	352.39	96.31
8/28	22,710	32.99	0	0.0	53.84	14.72	1.1	353.49	96.61
8/29	24,055	34.95	0	0.0	53.84	14.72	3.6	357.13	97.61
8/30	28,155	40.90	30	32.0	85.84	23.46	2.3	359.38	98.22
8/31	31,817	46.22	26	27.6	113.47	31.01	0.0	359.38	98.22

Appendix K1. (Continued).

Date	Kogrukluk R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
9/1	35,518	51.60	15	15.9	129.41	35.37	0.0	359.38	98.22
9/2	38,308	55.66	11	10.7	140.15	38.31	2.3	361.65	98.84
9/3	40,409	58.71	11	11.7	151.88	41.51	1.1	362.74	99.14
9/4	44,910	65.25	39	41.6	193.46	52.88	2.1	364.85	99.71
9/5	49,571	72.02	31	33.1	226.55	61.92	0.0	364.85	99.71
9/6	52,444	76.19	27	28.8	255.37	69.80	0.0	364.85	99.71
9/7	54,131	78.64	9	9.6	264.99	72.42	1.0	365.89	100.00
9/8	56,038	81.41	12	13.0	277.96	75.97	0.0	365.89	100.00
9/9	58,995	85.71	24	25.9	303.90	83.06	0.0	365.89	100.00
9/10	60,997	88.62	10	10.8	314.66	86.00	0.0	365.89	100.00
9/11	62,306	90.52	10	11.1	325.79	89.04	0.0	365.89	100.00
9/12	64,163	93.22	14	15.3	341.04	93.21	0.0	365.89	100.00
9/13	65,883	95.72	7	7.7	348.69	95.30	0.0	365.89	100.00
9/14	66,570	96.72	4	4.3	352.99	96.48	0.0	365.89	100.00
9/15	67,071	97.44	3	3.2	356.23	97.36	0.0	365.89	100.00
9/16	67,427	97.96	0	0.0	356.23	97.36	0.0	365.89	100.00
9/17	67,760	98.44	0	0.0	356.23	97.36	0.0	365.89	100.00
9/18	68,312	99.25	6	6.4	362.61	99.11	0.0	365.89	100.00
9/19	68,493	99.51	2	2.2	364.83	99.71	0.0	365.89	100.00
9/20	68,831	100.00	1	1.1	365.89	100.00	0.0	365.89	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix K2. Number of coho salmon observed through the Kogrukluk River weir, number of tagged coho salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	Kogrukluk R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	2.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	2.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	2.00	0.00
7/18	0	0.00	0	0.0	0.00	0.00	0.0	2.00	0.00
7/19	0	0.00	0	0.0	0.00	0.00	0.0	2.00	0.00
7/20	6	0.01	0	0.0	0.00	0.00	1.1	3.10	0.00
7/21	14	0.02	0	0.0	0.00	0.00	0.0	3.10	0.00
7/22	26	0.04	0	0.0	0.00	0.00	1.3	4.37	0.00
7/23	29	0.04	0	0.0	0.00	0.00	0.0	4.37	0.00
7/24	32	0.05	0	0.0	0.00	0.00	1.0	5.37	0.00
7/25	46	0.07	0	0.0	0.00	0.00	0.0	5.37	0.00
7/26	50	0.07	0	0.0	0.00	0.00	0.0	5.37	0.00
7/27	58	0.08	0	0.0	0.00	0.00	2.1	7.44	0.00
7/28	85	0.12	0	0.0	0.00	0.00	2.1	9.56	0.00
7/29	85	0.12	0	0.0	0.00	0.00	0.0	9.56	0.00
7/30	98	0.14	0	0.0	0.00	0.00	1.1	10.71	0.00
7/31	123	0.18	0	0.0	0.00	0.00	2.2	12.86	0.00
8/1	170	0.25	0	0.0	0.00	0.00	1.1	13.94	0.00
8/2	237	0.34	0	0.0	0.00	0.00	5.4	19.36	0.00
8/3	250	0.36	0	0.0	0.00	0.00	7.6	26.93	0.00
8/4	263	0.38	0	0.0	0.00	0.00	8.8	35.76	0.00
8/5	300	0.44	0	0.0	0.00	0.00	16.8	52.58	0.00
8/6	353	0.51	0	0.0	0.00	0.00	26.5	79.06	0.00
8/7	488	0.71	0	0.0	0.00	0.00	14.3	93.31	0.00
8/8	555	0.81	0	0.0	0.00	0.00	0.0	93.31	0.00
8/9	824	1.20	0	0.0	0.00	0.00	15.9	109.20	0.00
8/10	1,148	1.67	1	1.0	1.00	0.21	15.6	124.80	0.21
8/11	1,175	1.71	0	0.0	1.00	0.21	9.0	133.77	0.21
8/12	2,130	3.09	3	3.4	4.40	0.93	24.6	158.36	0.93
8/13	2,677	3.89	1	1.1	5.48	1.15	15.3	173.69	1.15
8/14	3,683	5.35	0	0.0	5.48	1.15	7.7	181.38	1.15
8/15	4,883	7.09	0	0.0	5.48	1.15	40.1	221.52	1.15
8/16	5,728	8.32	0	0.0	5.48	1.15	20.4	241.90	1.15
8/17	6,361	9.24	0	0.0	5.48	1.15	14.0	255.89	1.15
8/18	6,598	9.59	1	1.1	6.56	1.38	9.6	265.44	1.38
8/19	7,040	10.23	1	1.1	7.64	1.61	20.1	285.58	1.61
8/20	8,185	11.89	7	7.5	15.17	3.19	18.1	303.67	3.19
8/21	10,371	15.07	9	9.7	24.83	5.23	37.7	341.36	5.23
8/22	11,801	17.14	9	9.8	34.63	7.29	29.4	370.74	7.29
8/23	12,812	18.61	4	4.4	39.03	8.22	38.8	409.58	8.22
8/24	14,405	20.93	15	16.2	55.25	11.63	21.8	431.34	11.63
8/25	16,170	23.49	12	13.5	68.70	14.47	15.9	447.28	14.47
8/26	19,341	28.10	18	20.7	89.38	18.82	3.7	450.94	18.82
8/27	22,710	32.99	8	9.1	98.52	20.74	9.2	460.19	20.74
8/28	22,710	32.99	0	0.0	98.52	20.74	8.6	468.83	20.74
8/29	24,055	34.95	0	0.0	98.52	20.74	3.5	472.33	20.74
8/30	28,155	40.90	30	35.7	134.26	28.27	1.2	473.58	28.27
8/31	31,817	46.22	19	22.3	156.54	32.96	0.0	473.58	32.96
9/1	35,518	51.60	25	28.7	185.21	39.00	1.3	474.91	39.00
9/2	38,308	55.66	11	12.8	198.02	41.70	0.0	474.91	41.70
9/3	40,409	58.71	15	17.4	215.45	45.37	0.0	474.91	45.37

Appendix K2. (Continued).

Date	Kogrukluk R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
9/4	44,910	65.25	45	54.4	269.88	56.83	0.0	474.91	56.83
9/5	49,571	72.02	23	27.1	296.94	62.53	0.0	474.91	62.53
9/6	52,444	76.19	23	28.0	324.90	68.41	0.0	474.91	68.41
9/7	54,131	78.64	16	19.3	344.20	72.48	0.0	474.91	72.48
9/8	56,038	81.41	8	9.9	354.11	74.56	0.0	474.91	74.56
9/9	58,995	85.71	40	48.6	402.67	84.79	0.0	474.91	84.79
9/10	60,997	88.62	12	15.0	417.69	87.95	0.0	474.91	87.95
9/11	62,306	90.52	17	21.0	438.69	92.37	0.0	474.91	92.37
9/12	64,163	93.22	9	10.8	449.51	94.65	0.0	474.91	94.65
9/13	65,883	95.72	16	20.2	469.71	98.91	0.0	474.91	98.91
9/14	66,570	96.72	1	1.3	471.01	99.18	0.0	474.91	99.18
9/15	67,071	97.44	0	0.0	471.01	99.18	0.0	474.91	99.18
9/16	67,427	97.96	0	0.0	471.01	99.18	0.0	474.91	99.18
9/17	67,760	98.44	0	0.0	471.01	99.18	0.0	474.91	99.18
9/18	68,312	99.25	3	3.9	474.91	100.00	0.0	474.91	100.00
9/19	68,493	99.51	0	0.0	474.91	100.00	0.0	474.91	100.00
9/20	68,831	100.00	0	0.0	474.91	100.00	0.0	474.91	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix L.

Appendix L1. Number of coho salmon observed through the Takotna River weir, number of tagged coho salmon recovered from the Kalskag tag site by the date of recapture at the weir and date tagged at the Kalskag site on the Kuskokwim River, 2003.

Date	Takotna R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighte d Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/18	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/19	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/20	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/21	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/22	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/23	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/24	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/25	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/26	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/27	4	0.06	0	0.0	0.00	0.00	1.2	1.15	3.16
7/28	7	0.10	0	0.0	0.00	0.00	0.0	1.15	3.16
7/29	7	0.10	0	0.0	0.00	0.00	0.0	1.15	3.16
7/30	7	0.10	0	0.0	0.00	0.00	1.0	2.15	5.91
7/31	7	0.10	0	0.0	0.00	0.00	0.0	2.15	5.91
8/1	7	0.10	0	0.0	0.00	0.00	0.0	2.15	5.91
8/2	7	0.10	0	0.0	0.00	0.00	0.0	2.15	5.91
8/3	11	0.15	0	0.0	0.00	0.00	0.0	2.15	5.91
8/4	19	0.27	0	0.0	0.00	0.00	2.1	4.20	11.55
8/5	32	0.45	0	0.0	0.00	0.00	1.0	5.24	14.40
8/6	47	0.66	0	0.0	0.00	0.00	0.0	5.24	14.40
8/7	74	1.04	0	0.0	0.00	0.00	1.1	6.35	17.47
8/8	99	1.39	0	0.0	0.00	0.00	0.0	6.35	17.47
8/9	147	2.06	0	0.0	0.00	0.00	1.1	7.42	20.41
8/10	187	2.62	0	0.0	0.00	0.00	4.4	11.79	32.43
8/11	237	3.32	0	0.0	0.00	0.00	1.1	12.87	35.38
8/12	322	4.51	0	0.0	0.00	0.00	7.5	20.36	55.99
8/13	461	6.45	0	0.0	0.00	0.00	4.4	24.72	67.97
8/14	611	8.55	1	1.2	1.15	3.16	1.0	25.76	70.83
8/15	823	11.52	0	0.0	1.15	3.16	2.1	27.89	76.69
8/16	963	13.47	0	0.0	1.15	3.16	1.0	28.94	79.57
8/17	1,094	15.31	0	0.0	1.15	3.16	3.2	32.09	88.25
8/18	1,215	17.00	0	0.0	1.15	3.16	0.0	32.09	88.25
8/19	1,375	19.24	0	0.0	1.15	3.16	0.0	32.09	88.25
8/20	1,723	24.11	1	1.0	2.15	5.91	1.1	33.18	91.23
8/21	1,920	26.86	0	0.0	2.15	5.91	2.1	35.29	97.03
8/22	2,276	31.85	0	0.0	2.15	5.91	0.0	35.29	97.03
8/23	2,530	35.40	0	0.0	2.15	5.91	0.0	35.29	97.03
8/24	2,706	37.86	0	0.0	2.15	5.91	0.0	35.29	97.03
8/25	2,895	40.51	0	0.0	2.15	5.91	0.0	35.29	97.03
8/26	3,112	43.54	1	1.0	3.18	8.73	1.1	36.37	100.00
8/27	3,411	47.73	2	2.1	5.25	14.42	0.0	36.37	100.00
8/28	3,840	53.73	3	3.3	8.53	23.44	0.0	36.37	100.00
8/29	4,175	58.42	2	2.2	10.69	29.38	0.0	36.37	100.00
8/30	4,463	62.45	6	6.5	17.17	47.19	0.0	36.37	100.00
8/31	4,682	65.51	3	3.3	20.42	56.12	0.0	36.37	100.00
9/1	4,949	69.25	3	3.2	23.63	64.95	0.0	36.37	100.00

Appendix L1. (Continued).

Date	Takotna R. Weir		Recaptured Coho Salmon from Kalskag Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
9/2	5,234	73.23	2	2.1	25.75	70.78	0.0	36.37	100.00
9/3	5,511	77.11	1	1.1	26.80	73.67	0.0	36.37	100.00
9/4	5,703	79.80	0	0.0	26.80	73.67	0.0	36.37	100.00
9/5	5,794	81.07	4	4.3	31.07	85.41	0.0	36.37	100.00
9/6	6,056	84.73	2	2.1	33.19	91.24	0.0	36.37	100.00
9/7	6,265	87.66	0	0.0	33.19	91.24	0.0	36.37	100.00
9/8	6,453	90.29	0	0.0	33.19	91.24	0.0	36.37	100.00
9/9	6,653	93.09	1	1.0	34.24	94.12	0.0	36.37	100.00
9/10	6,784	94.92	0	0.0	34.24	94.12	0.0	36.37	100.00
9/11	6,854	95.90	0	0.0	34.24	94.12	0.0	36.37	100.00
9/12	6,932	96.99	0	0.0	34.24	94.12	0.0	36.37	100.00
9/13	7,015	98.15	2	2.1	36.38	100.00	0.0	36.37	100.00
9/14	7,094	99.26	0	0.0	36.38	100.00	0.0	36.37	100.00
9/15	7,122	99.65	0	0.0	36.38	100.00	0.0	36.37	100.00
9/16	7,132	99.79	0	0.0	36.38	100.00	0.0	36.37	100.00
9/17	7,141	99.92	0	0.0	36.38	100.00	0.0	36.37	100.00
9/18	7,145	99.97	0	0.0	36.38	100.00	0.0	36.37	100.00
9/19	7,146	99.99	0	0.0	36.38	100.00	0.0	36.37	100.00
9/20	7,147	100.00	0	0.0	36.38	100.00	0.0	36.37	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.

Appendix L2. Number of coho salmon observed through the Takotna River weir, number of tagged coho salmon recovered from the Aniak tag site by the date of recapture at the weir and date tagged at the Aniak site on the Kuskokwim River, 2003.

Date	Takotna R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
7/15	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/16	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/17	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/18	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/19	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/20	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/21	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/22	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/23	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/24	0	0.00	0	0.0	0.00	0.00	0.0	0.00	0.00
7/25	0	0.00	0	0.0	0.00	0.00	1.1	1.07	2.77
7/26	0	0.00	0	0.0	0.00	0.00	0.0	1.07	2.77
7/27	4	0.06	0	0.0	0.00	0.00	0.0	1.07	2.77
7/28	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
7/29	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
7/30	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
7/31	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
8/1	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
8/2	7	0.10	0	0.0	0.00	0.00	0.0	1.07	2.77
8/3	11	0.15	0	0.0	0.00	0.00	0.0	1.07	2.77
8/4	19	0.27	0	0.0	0.00	0.00	4.4	5.48	14.26
8/5	32	0.45	0	0.0	0.00	0.00	2.1	7.59	19.72
8/6	47	0.66	0	0.0	0.00	0.00	3.3	10.90	28.32
8/7	74	1.04	0	0.0	0.00	0.00	0.0	10.90	28.32
8/8	99	1.39	0	0.0	0.00	0.00	0.0	10.90	28.32
8/9	147	2.06	0	0.0	0.00	0.00	7.3	18.23	47.39
8/10	187	2.62	1	1.1	1.07	2.77	1.3	19.53	50.77
8/11	237	3.32	0	0.0	1.07	2.77	0.0	19.53	50.77
8/12	322	4.51	0	0.0	1.07	2.77	2.2	21.76	56.58
8/13	461	6.45	0	0.0	1.07	2.77	2.2	23.95	62.27
8/14	611	8.55	0	0.0	1.07	2.77	3.3	27.25	70.83
8/15	823	11.52	0	0.0	1.07	2.77	1.3	28.54	74.20
8/16	963	13.47	0	0.0	1.07	2.77	0.0	28.54	74.20
8/17	1,094	15.31	0	0.0	1.07	2.77	0.0	28.54	74.20
8/18	1,215	17.00	0	0.0	1.07	2.77	1.1	29.60	76.96
8/19	1,375	19.24	0	0.0	1.07	2.77	0.0	29.60	76.96
8/20	1,723	24.11	1	1.1	2.17	5.64	0.0	29.60	76.96
8/21	1,920	26.86	2	2.2	4.37	11.36	0.0	29.60	76.96
8/22	2,276	31.85	2	2.2	6.57	17.08	2.6	32.16	83.60
8/23	2,530	35.40	0	0.0	6.57	17.08	0.0	32.16	83.60
8/24	2,706	37.86	1	1.1	7.67	19.95	2.4	34.58	89.89
8/25	2,895	40.51	1	1.1	8.72	22.68	2.7	37.23	96.79
8/26	3,112	43.54	1	1.2	9.95	25.86	0.0	37.23	96.79
8/27	3,411	47.73	1	1.1	11.00	28.59	0.0	37.23	96.79
8/28	3,840	53.73	4	5.0	15.97	41.52	1.2	38.47	100.00
8/29	4,175	58.42	1	1.1	17.06	44.36	0.0	38.47	100.00
8/30	4,463	62.45	3	3.3	20.37	52.97	0.0	38.47	100.00
8/31	4,682	65.51	1	1.2	21.59	56.15	0.0	38.47	100.00
9/1	4,949	69.25	2	2.4	23.95	62.28	0.0	38.47	100.00
9/2	5,234	73.23	3	3.3	27.27	70.91	0.0	38.47	100.00
9/3	5,511	77.11	0	0.0	27.27	70.91	0.0	38.47	100.00
9/4	5,703	79.80	1	1.2	28.50	74.09	0.0	38.47	100.00

Appendix L2. (Continued).

Date	Takotna R. Weir		Recaptured Coho Salmon from Aniak Tag Site						
			By Recovery Date [1/]				By Tag Date [2/]		
	Cumm. Counts	Cumm. % Catch	No. Rec. [3/]	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.	No. Rec. Weighted [4/]	Cumm. Weighted Rec.	Cumm. % Weighted Rec.
9/5	5,794	81.07	1	1.1	29.59	76.94	0.0	38.47	100.00
9/6	6,056	84.73	1	1.3	30.87	80.27	0.0	38.47	100.00
9/7	6,265	87.66	2	2.5	33.36	86.74	0.0	38.47	100.00
9/8	6,453	90.29	0	0.0	33.36	86.74	0.0	38.47	100.00
9/9	6,653	93.09	1	1.3	34.69	90.19	0.0	38.47	100.00
9/10	6,784	94.92	0	0.0	34.69	90.19	0.0	38.47	100.00
9/11	6,854	95.90	1	1.2	35.92	93.40	0.0	38.47	100.00
9/12	6,932	96.99	0	0.0	35.92	93.40	0.0	38.47	100.00
9/13	7,015	98.15	1	1.3	37.25	96.86	0.0	38.47	100.00
9/14	7,094	99.26	1	1.2	38.46	100.00	0.0	38.47	100.00
9/15	7,122	99.65	0	0.0	38.46	100.00	0.0	38.47	100.00
9/16	7,132	99.79	0	0.0	38.46	100.00	0.0	38.47	100.00
9/17	7,141	99.92	0	0.0	38.46	100.00	0.0	38.47	100.00
9/18	7,145	99.97	0	0.0	38.46	100.00	0.0	38.47	100.00
9/19	7,146	99.99	0	0.0	38.46	100.00	0.0	38.47	100.00
9/20	7,147	100.00	0	0.0	38.46	100.00	0.0	38.47	100.00

[1/] Date tag was recovered from the escapement site.
[2/] Date tag was deployed from the tag site.
[3/] Number of tags recovered.
[4/] Number of tags recovered by weight.