

Fishery Data Series No. 93-30

Karta River Steelhead: 1992 Escapement and Creel Survey Studies

by

**Roger Harding
and
Doug Jones**

September 1993

Alaska Department of Fish and Game

Division of Sport Fish



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ABSTRACT

The adult steelhead (*Oncorhynchus mykiss*) escapement to Karta River in 1992 was counted at a weir located about 1 kilometer upstream of the mouth of the river. One hundred and eighty-five fish were counted from April 7 to May 31; 50% of the immigration had occurred by April 25, 1992. The 1992 escapement was 15% of the 1989 escapement of 1,220 adult steelhead. One hundred and seventy-six steelhead were sampled for length and sex, and 171 were sampled for age. Sixty-seven percent of the sampled fish were female and averaged 748 millimeters long (standard deviation = 58 millimeters); males constituted 33% of the escapement and averaged 761 millimeters long (standard deviation = 69 millimeters).

First-time spawners constituted 63% of the sampled escapement; 37% were repeat spawners. Seventy-one percent of the seven different age classes of repeat spawners were ages 3.2S1 and 4.2S1. A total of 347 steelhead kelts passed downstream through the weir at Karta River by May 31, 1992.

Thirteen anglers were interviewed in the on-site creel survey between April 8 and May 31; they fished a total of 105 hours to catch an estimated seven steelhead (two steelhead were kept and five were released). Twelve parties who used their reservation at a U.S. Forest Service cabin at Karta River between April 8 and May 31 responded to the postal survey; two parties did not respond. Forty-two anglers from the twelve parties fished 1,101 hours to catch 156 steelhead (148 were released and 8 were kept). The total seasonal angler effort (includes anglers who responded to the postal survey prior to and after the on-site creel plus the on-site creel survey) was 1,939 hours; 214 steelhead were caught (196 were released and 18 were kept).

KEY WORDS: Karta River, steelhead, *Oncorhynchus mykiss*, escapement, kelt, weir, creel survey, Ketchikan, Southeast Alaska, Prince of Wales Island, AWL, age-weight-length, rainbow trout, effort, catch, and harvest.

INTRODUCTION

There are 87 river systems known to contain steelhead on Prince of Wales Island (PWI). Most systems have fewer than 200 returning adults, but the largest rivers (the Thorne River and the Karta River systems) probably have returns in excess of 1,000 adults. The Karta River system comprises Karta and Salmon Lakes and numerous tributaries, including Andersen, Senator Wirth, Flagstaff, and McGilvery Creeks. Three U.S. Forest Service (USFS) recreation cabins are located within the Karta River drainage and are connected via a maintained trail (Figure 1).

In 1983, Jones (1984) estimated an escapement of 1,022 steelhead (weir counts of 375 immigrants and 497 emigrants) in the Karta River, and in 1989, a weir was used to count and mark 1,220 upstream migrating steelhead (Hoffman et al. 1990). During the same study, 842 kelts passed downstream and 742 of these fish were marked at the weir, indicating that most fish in the system were from the spring immigration. In 1989, anglers spent an estimated 1,568 (SE=210) angler-hours (to harvest an estimated 50 (SE = 19) steelhead in the Karta River (Hoffman et al. 1990).

The harvest of steelhead on PWI has increased 360% between 1981 and 1991 (Mills 1992), and anecdotal evidence from long-time anglers indicates a significant decrease in abundance in some PWI streams. As a result of these and similar concerns across Southeast Alaska, a program to periodically estimate the abundance of steelhead in the Karta River was initiated in 1989. These estimates might serve as an indicator of stock strength for steelhead on PWI.

The research objectives for 1992 were:

- 1) to count the escapement of steelhead into the Karta River system between April 6 and May 31, 1992;
- 2) to estimate the length and age compositions for adult steelhead returning to the Karta River system between April 6 and May 31, 1992; and
- 3) to estimate angler effort, catch, and harvest of steelhead in Karta between April 6 and June 12, 1992.

In addition to these objectives, fish passing the weir were also inspected for scars and wounds, and genetic samples were collected in support of another study.

METHODS

Adult Escapement

An aluminum channel and picket weir was erected 1 km above the mouth of Karta River (Figure 1) and was operated to enumerate upstream migrating adult steelhead. Emigrating steelhead were also counted and water temperature ($^{\circ}\text{C}$) and water level (cm) were measured daily.

Age Composition, Length, and Sex

All adult steelhead passed upstream through the weir were captured in a sampling trap, removed via dip net, measured to the nearest 1 mm fork-length (tip of snout

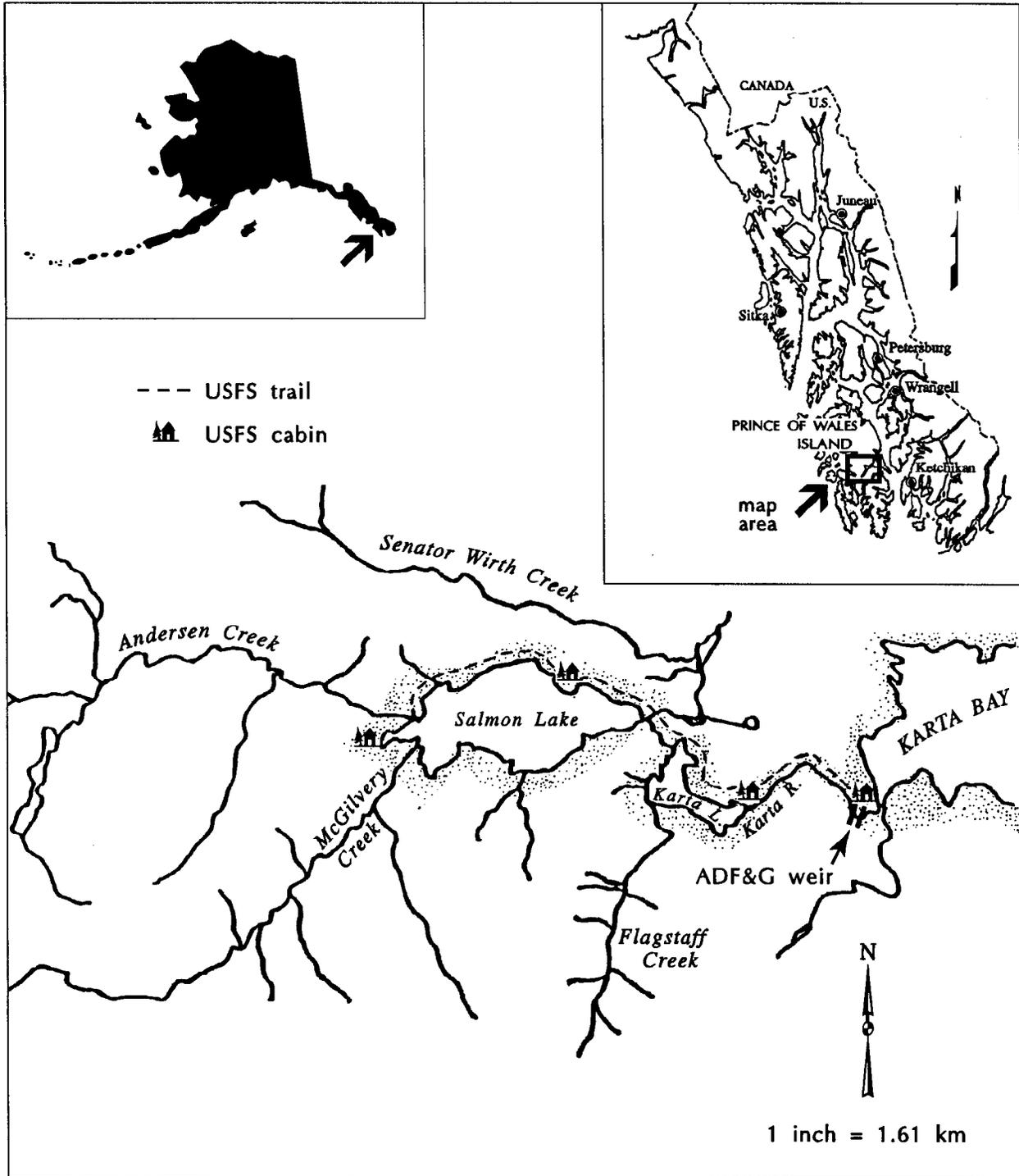


Figure 1. Study area location on Karta River, Prince of Wales Island, Alaska.

to fork of tail), and scales were removed for age analysis. Date, time of passage through the weir, sample number, sex (if possible), condition, and comments were also recorded.

Eight scales were collected, four from each side of the fish, from an area two scale rows above the lateral line on a diagonal line from the posterior end of the dorsal fin to the anterior end of the anal fin. Scale samples were mounted on gum cards, and triacetate impressions of the scales (7,000 kg/cm² pressure at a temperature of 97°C for 30 seconds) were prepared for use in determining age. Water temperature (nearest 1°C) and depth (nearest 0.5 cm) were measured 5 m downstream from the weir each morning.

Steelhead scales were aged using methods described by Narver and Withler (1977). Repeat spawners were classified with an "S" after the ocean age to denote a successful spawning and survival. For example, a steelhead aged as 3.2S1 was 6 years old: it spent 3 years (winters) in fresh water before emigration as a smolt and two years (winters) in salt water, then returned to fresh water as an adult, spawned ("S"), and survived another year in salt water before returning to fresh water on its second spawning run. First-time spawning steelhead are fish without an "S" in their total age designation.

The mean and standard deviations for the lengths measured were calculated using standard procedures for normally distributed data (SAS 1985).

Angler Effort, Catch, and Harvest Study

Two surveys, an on-site creel survey and a postal survey, were used to estimate total 1992 angler effort, harvest, and catch of steelhead by anglers on the Karta River. Data from the two surveys were combined to estimate the total effort, catch, and harvest.

On-site Creel Survey:

A stratified two-stage direct expansion survey (Cochran 1977) and was used to estimate total angler effort, harvest, and catch of steelhead by anglers exiting the Karta River at tidewater (i.e., did not use a USFS cabin). Stratification was based on season (five 14-day periods) and time of day (morning vs. evening), making ten distinct strata. Within strata, "days" (i.e., morning or evening sample periods) were primary sampling units, and anglers within days were secondary sampling units. All anglers exiting the river during the sample "day" were interviewed if possible.

Sampling effort was constrained to ≤ 37.5 hours (1 person) per week. Since more anglers were expected to exit during the evening, 60% of available sampling effort was allocated to the evening strata. Similarly, since most of the total catch was expected to occur in the first and second seasonal strata (between April 6 and May 3), sampling effort was increased slightly during these periods. Thus, 10 to 13 days ($\frac{1}{2}$ -day periods) were randomly selected for sampling during each 14-day season.

Each angler interviewed was asked how many hours were fished during their trip (to the nearest 0.25 hour), the number of fish kept and/or released by species, and whether a USFS cabin was reserved and used during the fishing trip. If anglers had the cabin reserved and used the cabin, the sampling information was not used in the direct expansion survey; instead, it was included in the postal survey of USFS cabin users described below.

Angler catch in stratum h was estimated with the following formula. Similarly, estimates of effort and harvest were estimated by substituting the appropriate effort or harvest statistics in place of angler catch in equations 1 through 5, below.

$$\hat{C}_h = D_h \bar{C}_h \quad (1)$$

$$\bar{C}_h = \frac{\sum_{i=1}^{d_h} \hat{C}_{hi}}{d_h} \quad (2)$$

$$\hat{C}_{hi} = M_{hi} \bar{C}_{hi} \quad (3)$$

$$\bar{C}_{hi} = \frac{\sum_{j=1}^{m_{hi}} c_{hij}}{m_{hi}} \quad (4)$$

where c_{hij} is the harvest by angler j in sampling day i stratum h, m_{hi} is the number of anglers interviewed in day i, M_{hi} is the number of anglers completing trips in day i, d_h is the number of days sampled in stratum h, and D_h is the number of days in stratum h.

The variance of the harvest by stratum was estimated by the approach outlined in Cochran (1977), equation 11.24, page 303.

$$V[\hat{C}_h] = (1 - f_{1h}) D_h^2 \frac{\sum_{i=1}^{d_h} (\hat{C}_{hi} - \bar{C}_h)^2}{d_h (d_h - 1)} + D_h \sum_{i=1}^{d_h} M_{hi}^2 (1 - f_{2hi}) \frac{\sum_{j=1}^{m_{hi}} (c_{hij} - \bar{C}_{hi})^2}{d_h m_{hi} (m_{hi} - 1)} \quad (5)$$

where f_{1h} is the sampling fraction for days and f_{2hi} is the sampling fraction for anglers. Effort and harvest estimates for seasonal strata were totalled to provide estimates for the entire season. The variance of the summed estimates is the sum of the variances.

Postal Survey:

A postal survey was used to estimate the angler effort, harvest, and catch of steelhead trout at Karta River by people using USFS cabins. The names of registered USFS cabin users were obtained from the USFS. A survey questionnaire was then sent (August 17) to all registered "party heads" to determine if their reservation was used, the number of individuals in the party who fished, the number of hours and days fished by each party member, and the numbers of fish caught and kept and caught and released, by species. If a response to this questionnaire was not received within three weeks, a second questionnaire was sent along with a reminder. A final questionnaire was sent via registered mail

if a response was not received after another three weeks. The questionnaire and responses for 1992 are found in Jones (*In prep*).

The total reported harvest H_r at each cabin is the sum over mailings $m = 1..3$:

$$H_r = \sum_{m=1}^3 H_{r,m} \quad (6)$$

The response to each mailing was similar and the total harvest H at each cabin was calculated

$$H = \left(\frac{N}{N_r} \right) H_r \quad (7)$$

where N_r - number of responding parties and N - number of parties on the USFS reservation list. Calculation of total effort and total catch at each cabin by species was calculated as above after substituting the appropriate effort or catch statistics in place of angler harvest.

RESULTS

Escapement

The weir was fish-tight on April 7, 1992. A total of 185 steelhead was counted upstream through the weir between April 7 and May 31, 1992, with 50% of the escapement occurring by April 25 (Figure 2 and Appendix A1).

Three hundred and forty-seven steelhead kelts were counted moving downstream through the weir after spawning (Appendix A1, Figure 3). The first fish passed downstream through the weir on April 12, and the peak of observed downstream migration occurred on May 18, when 75 fish were counted. The downstream count exceeded the upstream count by 162, and steelhead were still present in the system when the weir was removed on June 1.

Water temperatures ranged from 2.0°C on April 12 to 13.0°C on May 29, but temperatures were generally above 4.0°C during the entire period April 4-June 1, 1992. Stream water levels ranged from >100 cm (water over gauge) on May 4 to a low of 1 cm on May 22 (Appendix A1).

Age Composition, Length, and Sex

Ninety-six percent of the 185 immigrant steelhead (178 fish) were sampled (Appendix A2). Fifty-eight of these fish were males and 120 were females; scales from 56 males and 115 females (or 171 fish) were collected for age analysis. Seven of these 171 scale samples (three from males and four from females) could not be aged, and freshwater age could not be determined for 22 of the remaining 164.

Sixty-three percent (n=104) of the sampled fish were first-time spawners; 24% were age 4.3, 15% were age 4.2, 4% were age 3.3, 4% were age 3.2, 3% were age 5.2, and 1% were age 5.3 (Table 1, Figure 4). Sixty of the aged immigrants (35%) were repeat spawners and represented ten different age classes, including freshwater/unreadable or regenerated (Table 1, Figure 4). Ages 3.2S1 and 4.2S1

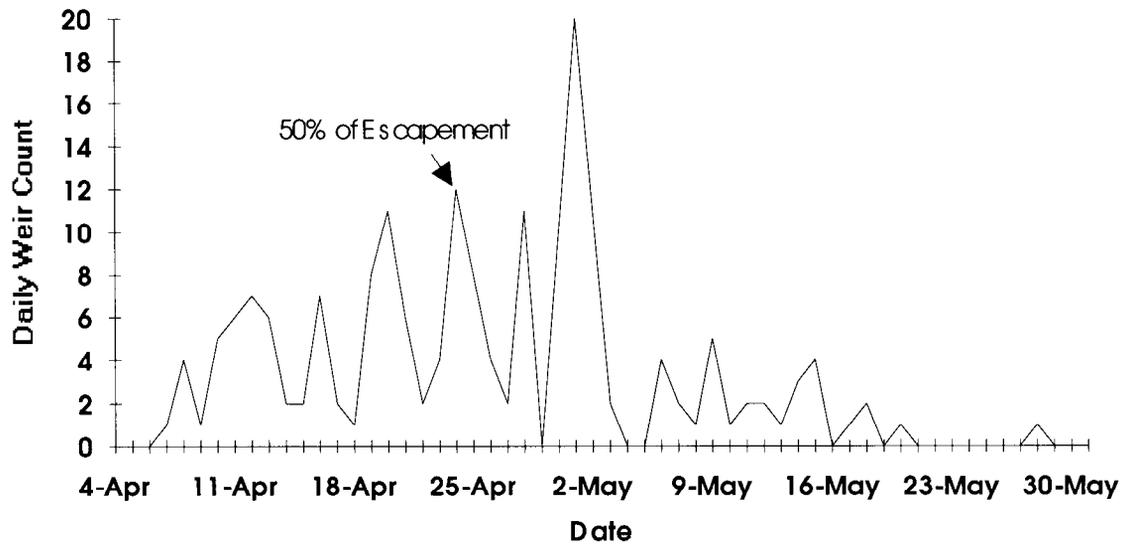


Figure 2. Escapement timing for steelhead at the Karta River weir, 1992.

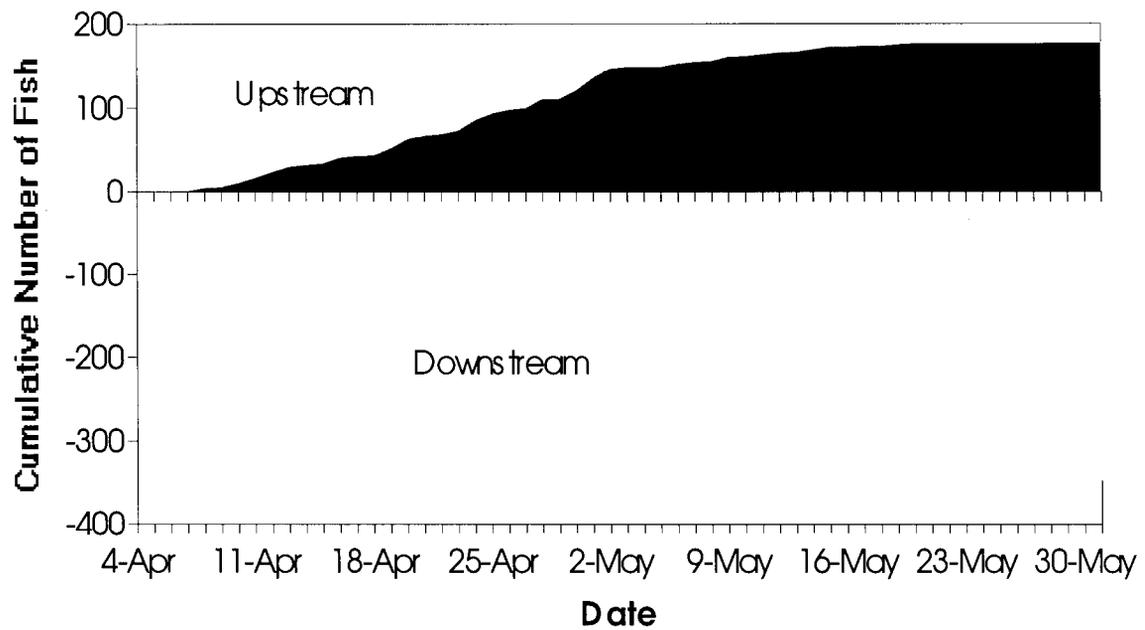


Figure 3. Cumulative number of steelhead counted through the Karta River weir in 1992.

Table 1. Age composition, mean length, and sex of steelhead sampled at Karta River weir, 1992.

| Age class | Female | | | Male | | | Comb. n | % of Total |
|----------------------------|---------------------|-----|------|---------------------|----|------|---------|------------|
| | Length ^a | n | SD | Length ^a | n | SD | | |
| First-time spawners | | | | | | | | |
| 3.2 | 680 | 4 | 93.9 | 645 | 3 | 27.8 | 7 | 4.3 |
| 3.3 | 758 | 5 | 24.9 | 823 | 2 | 46.0 | 7 | 4.3 |
| 4.2 | 685 | 13 | 55.0 | 687 | 12 | 32.7 | 25 | 15.2 |
| 4.3 | 765 | 23 | 29.3 | 796 | 16 | 61.8 | 39 | 23.8 |
| 5.2 | 665 | 2 | 49.5 | 733 | 3 | 69.6 | 5 | 3.1 |
| 5.3 | 783 | 2 | 67.2 | | | | 2 | 1.2 |
| R.2 ^b | 691 | 5 | 83.7 | 753 | 2 | 24.8 | 7 | 4.3 |
| R.3 ^b | 747 | 9 | 49.4 | 781 | 3 | 47.6 | 12 | 7.3 |
| Subtotal | 732 | 63 | 61.1 | 747 | 41 | 73.6 | 104 | 63.4 |
| Repeat spawners | | | | | | | | |
| 3.2S1 | 729 | 8 | 50.8 | 790 | 4 | 12.5 | 12 | 7.3 |
| 3.2S1S1 | 793 | 2 | 60.1 | | | | 2 | 1.2 |
| 3.3S1 | 806 | 3 | 49.9 | | | | 3 | 1.8 |
| 4.2S1 | 767 | 19 | 40.7 | 812 | 5 | 26.5 | 24 | 14.6 |
| 4.1S1S1 | 759 | 1 | | | | | 1 | 0.6 |
| 4.2S1S1 | 799 | 5 | 51.8 | 770 | 1 | | 6 | 3.7 |
| 5.2S1 | 740 | 2 | 56.6 | 795 | 1 | | 3 | 1.8 |
| R.2S1 ^b | 765 | 6 | 38.5 | 848 | 1 | | 7 | 4.3 |
| R.2S1S1 ^b | 770 | 1 | | | | | 1 | 0.6 |
| R.3S1S1S1 ^b | 845 | 1 | | | | | 1 | 0.6 |
| Subtotal | 768 | 48 | 48.0 | 803 | 12 | 26.1 | 60 | 36.6 |
| Unreadable | 778 | 4 | 42.1 | 790 | 3 | 45.8 | 7 | |
| TOTAL | 748 | 115 | 57.9 | 761 | 56 | 68.8 | 171 | 100.0 |

^a Fork length measured to nearest 5 mm.

^b R = scales regenerated; freshwater age undetermined.

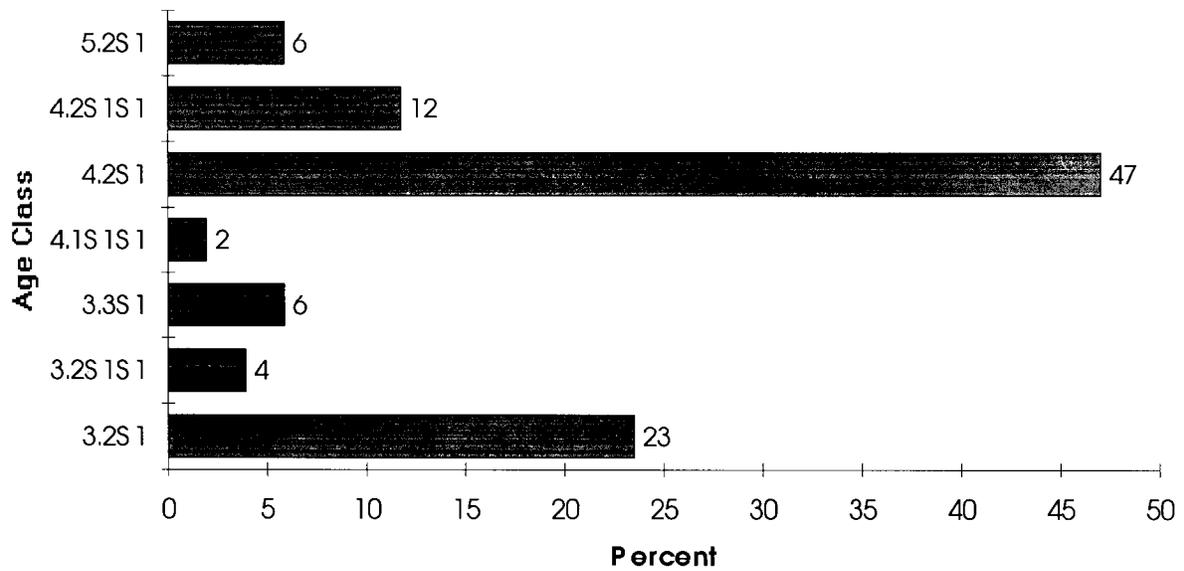
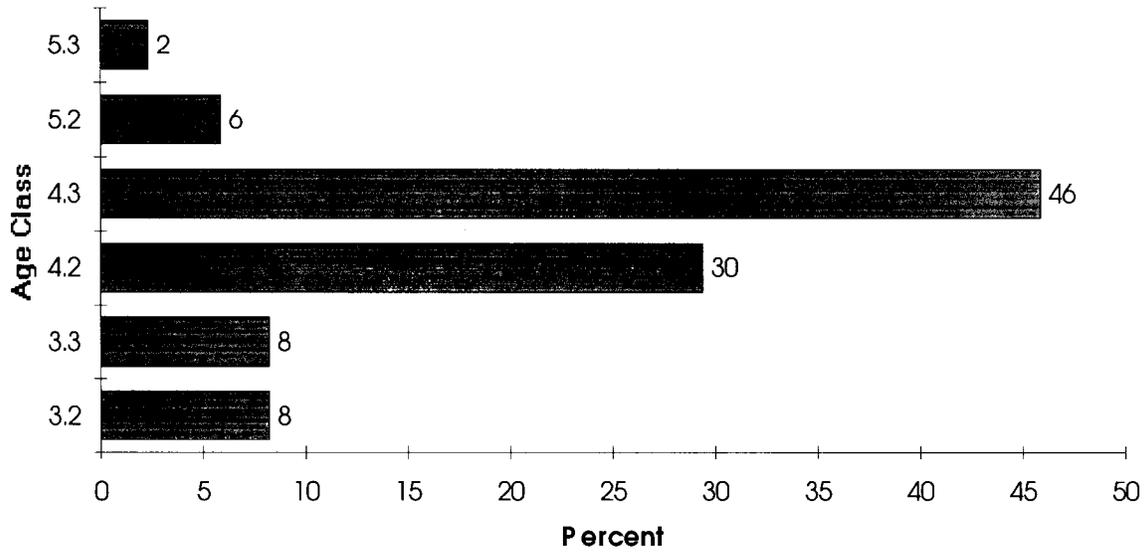


Figure 4. Percent age composition of first-time (above) and repeat (below) spawning steelhead in Karta River, 1992. Only completely determined age classes are shown.

accounted for 60% of the repeat spawners. Females averaged 748 mm fork length (SD = 58 mm) and males averaged 761 mm fork length (SD = 68.8 mm)(Table 1).

Two adult female steelhead, which had been tagged in 1989 with uniquely numbered anchor T-bar tags, were captured at the weir in 1992. The first fish (tag number 133643) passed upstream through the weir on April 20, 1992, six days earlier than in 1989. In 1989, this fish passed upstream through the weir on April 26 and passed downstream on May 20. It was 774 mm long in 1992 and was aged at 4.2S1S1 (only two spawning checks were observed). In 1989, this fish had a mid-eye to fork (METF) length of 640 mm (no scale available from 1989). The second fish (tag number 133812) passed upstream through the weir on May 12, 1992, thirteen days earlier than in 1989, when it passed upstream on April 29 and downstream on May 20. It was 845 mm long in 1992 and was aged at R.3S1S1S1; in 1989 it measured 705 mm METF (no scale available from 1989).

Adult steelhead returning to Karta River were examined at the weir for fresh or healed scars and wounds. These wounds were classified into seven categories based on descriptions and pictures presented in the Division of Commercial Fisheries Field Operations Manual (ADF&G, *unpublished*). Thirty-seven percent of the 185 fish examined at the weir were classified as having some type of wound (Table 2). The majority (21%) of scarred fish were classified as Category A, scars which are widely believed to be caused by an encounter with a gill net. In other categories the origin of scars is unknown, but they are believed to have been caused by fish, sea mammals, or other fishing activity.

In 1992, technicians collected genetic samples from steelhead smolt and resident rainbow trout in Karta River. A graduate student will compare the Karta River genetic samples with samples from fish in other streams (Cheryl Seifert, ADF&G, personal communication). A summary of length and age of juvenile steelhead sampled for genetic baseline data is presented in Appendix A3 and A4.

Angler Effort, Catch, and Harvest Study

On-site Creel Survey:

The on-site study was started as planned on April 8 but was terminated on May 31 (rather than June 7) due to a shortage of funds.

Thirteen anglers were observed during the survey and all were interviewed. Data from these anglers were expanded to an estimated effort of 105 hours (SE = 11.1) to catch an estimated seven steelhead. Two (SE = 0.3) of the seven fish were kept, and the remaining five (SE = 1.0) were released.

Postal Creel Survey:

Most of the anglers fishing Karta River in 1992 used one of the three USFS cabins. Between April 8 and May 31, 1992 (during weir and on-site creel studies), 42 anglers fished a total of 1,101 hours during 187 fishing days to catch 156 steelhead; 8 steelhead were kept and 148 were released.

The seasonal totals (which include data from earlier and later than the on-site creel) for the postal survey include 34 parties comprising 91 anglers. These anglers fished a total of 1,834 hours in the Karta River system to catch an estimated 207 steelhead; they released all but 16 fish for an overall release rate of 92%.

Table 2. Summary of marks and scars observed on adult steelhead sampled at Karta River weir, 1992.

| Category ^a and status | n | % of scarred fish | % of sampled escapement ^b |
|----------------------------------|----|-------------------|--------------------------------------|
| A unknown ^c | 1 | 1 | 1 |
| A healed | 38 | 56 | 21 |
| B healed | 1 | 1 | 1 |
| C fresh | 1 | 1 | 1 |
| D fresh | 2 | 3 | 1 |
| E fresh | 4 | 6 | 2 |
| F unknown ^c | 1 | 1 | 1 |
| F healed | 1 | 1 | 1 |
| G unknown ^c | 2 | 3 | 1 |
| G healed | 13 | 19 | 7 |
| <u>Fish with 2 scars</u> | | | |
| G fresh / A healed | 1 | 1 | 1 |
| G healed / A healed | 2 | 3 | 1 |
| C fresh / A healed | 1 | 1 | 1 |
| Total number scarred fish | 68 | | 37 |

^a Category A: One or more fairly well delineated linear marks between the head and the dorsal fins, approximately perpendicular to the longitudinal body axis and encircling or partially encircling the body. Probably caused by gill net (Dave Gaudet, ADF&G, Juneau, personal communication).

Category B: A series of approximately parallel mark or scrape lines over a substantial portion of the body; two or more series of such marks occurring at different angles may give the appearance of crosshatching marks.

Category C: A fairly well delineated scrape band generally occurring between the head and the dorsal fin, approximately perpendicular to the longitudinal body axis or angled slightly backward from top to bottom of body and containing a nearly oval-shaped open wound, normally in the upper portion of the body.

Category D: Extensive descaling of at least 25% or more of one or both sides of the body but with no delineated marks or wounds.

Category E: Open, gaping wounds or puncture marks located anywhere on the body either with no marks and scrapes or with adjacent irregular "scratch" or "claw" marks, but no marks as described above in categories A-D.

Category F: Scars/marks not fitting the descriptions in any other category.

Category G: A fresh or healed appearing wound on either side of the body; usually a couple of inches in length, and angled dorsally and forward toward the head of the fish, from the anterior insertion of the dorsal fin to the front of the anal fin and behind the ventral fin. May also occur elsewhere on the fish, but angle of cut is usually consistent with ones described above. The fresh wound will have flesh exposed the whole length of cut. The healed scar will have an "indentation or pucker" type scar wherever it is located.

^b Total sampled escapement = 185.

^c Fresh or healed information not present in data.

DISCUSSION

The 1992 steelhead escapement of 185 to Karta River was only 15% of the 1989 escapement of 1,220. Some immigrant and emigrant steelhead were not counted in 1992 because of late installation and early removal of the weir (installed 2 weeks later in 1992 than in 1989 and removed 12 days earlier). Since the downstream count exceeded the upstream count by 162, it is assumed that some of the emigrants had entered the system prior to the weir installation, either as spring immigrants or fall-run immigrants. However, the 1992 escapement timing was very similar to that observed in 1989 (Figure 5) (Hoffman et al. 1990), when only 64 steelhead, or 5% of the 1989 escapement, had passed through the weir by April 6. This suggests that the number of spring immigrants not counted because of the late weir installation was probably small.

The 1992 downstream count of emigrating steelhead is also a minimum count. In 1989, the Karta weir was operated 12 days longer than in 1992, and during that time (June 1-12, 1989) 375 steelhead, or 45% of the total 1989 downstream count of 842, passed through the weir. When the weir was removed in 1992, steelhead were still leaving the system, and 8% of the total emigrants were counted on the last day of operation (May 31). Despite our concerns, comments from anglers and our own stream observations indicated that few steelhead were left in Karta River when the weir was removed.

Anglers had contacted the Department regarding low escapement levels and low catch rates they had observed in other PWI streams, Revillagigedo Island, and on mainland streams. Many anglers provided accurate written accounts of over a decade of their steelhead fishing experiences. Based on angler concern and low escapement counts at the Karta River weir, the Department issued an Emergency Order (EO) on May 5, 1992 requiring that all steelhead caught in the Karta River be released. Three days later another EO was issued closing an additional 19 streams in southern Southeast Alaska to steelhead harvest.

Angling effort in the Karta River increased from 1,568 hours in 1989 to 1,939 (105 hours from on-site creel and 1,834 hours from 1992 postal survey) in 1992—a 24% increase (Table 3). Angler effort, catch, and harvest estimates are minimum estimates, since the on-site survey was limited to April 8 through May 31, 1992. However, only 13 anglers were interviewed who did not have a USFS cabin reservation between April 8 and May 31, and it is believed that few, if any, anglers fished before the creel started on April 8, 1992. Therefore, the combined effort, catch, and harvest data from the on-site and postal creel surveys are our best estimate of total angler effort, catch, and harvest for 1992.

Catches were about 19% higher in 1992, but the rate at which anglers released fish increased from 71% in 1989 to 91% in 1992; although, the harvest of steelhead in Karta River was prohibited by Emergency Order (EO) on May 5, 1992. The catch per unit effort (CPUE) was the same as in 1989 at 0.11 steelhead per hour; a comparison of steelhead creel censuses done in Southeast Alaska is given in Table 3.

RECOMMENDATIONS

Based on the low escapement observed in 1992, a steelhead conservation problem exists at Karta River. The EO closure issued for Karta River should remain in

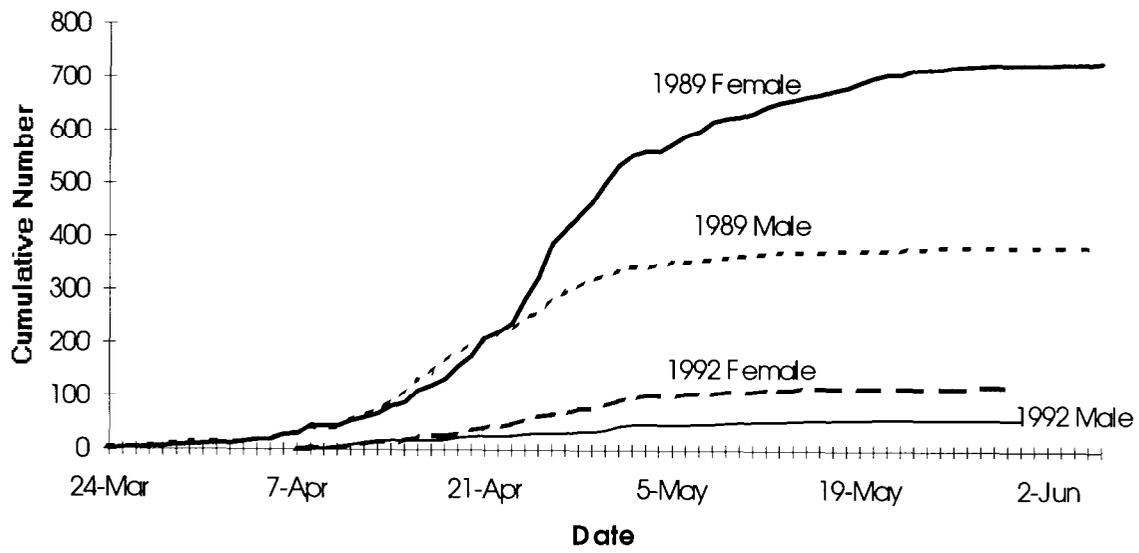


Figure 5. Cumulative number of adult steelhead passed through Karta River weir in 1989 and 1992.

Table 3. Steelhead catch rates in selected Alaska streams, 1982 through 1992.

| Year | Location | Effort | Steelhead | | CPUE ^a | Ratio released to kept |
|-------------------|----------|--------|-----------------|----------|-------------------|------------------------|
| | | | Kept | Released | | |
| 1982 ^b | Anchor | 29,079 | 375 | 667 | 0.04 | 1.8 |
| 1985 ^c | Situk | 10,434 | 362 | 2,695 | 0.29 | 7.4 |
| 1986 ^d | Situk | 12,283 | 287 | 2,094 | 0.19 | 7.3 |
| 1987 ^e | Situk | 10,542 | 391 | 3,797 | 0.40 | 9.7 |
| 1988 ^f | Situk | 16,379 | 423 | 4,991 | 0.33 | 11.8 |
| 1989 ^g | Situk | 10,988 | 361 | 2,055 | 0.22 | 5.7 |
| 1990 ^h | Situk | 14,907 | 392 | 1,317 | 0.11 | 3.4 |
| 1991 ⁱ | Situk | 4,618 | NA ⁱ | 1,055 | 0.23 | NA ⁱ |
| 1988 ^k | Thorne | 2,331 | 67 | 93 | 0.07 | 1.4 |
| 1990 ^l | Thorne | 3,070 | 111 | 142 | 0.08 | 1.3 |
| 1988 ^m | Ward | 3,638 | 359 | 971 | 0.37 | 2.7 |
| 1989 ⁿ | Ward | 4,778 | 384 | 293 | 0.14 | 0.8 |
| 1989 ^o | Karta | 1,568 | 50 | 124 | 0.11 | 2.5 |
| 1992 | Karta | 1,939 | 18 | 196 | 0.11 | 10.9 |
| 1989 ^p | Peterson | 2,121 | 22 | 17 | 0.02 | 0.8 |
| 1990 ^q | Peterson | 2,865 | 18 | 16 | 0.01 | 0.9 |
| 1990 ^r | Sitkoh | 1,205 | 35 | 243 | 0.23 | 6.9 |
| 1991 ^s | Sitkoh | 848 | 19 | 297 | 0.36 | 15.6 |

^a CPUE = [kept + released] ÷ effort.

^b Wallis and Balland (1984).

^c Mecum and Suchanek (1986). Survey missed the early part of the run. Informal surveys indicated that at least 2,230 hours of effort were expended to harvest 66 steelhead and release another 1,889 steelhead between 4/15 and 4/29 (Bob Johnson, ADF&G, Division of Sport Fish, Yakutat, personal communication).

^d Mecum and Suchanek (1987).

^e Bingham et al. (1988).

^f Suchanek and Bingham (1989).

^g Johnson and Marshall (1990).

^h Bob Johnson, ADF&G, Division of Sport Fish, Yakutat (personal communication).

ⁱ Glynn (1992). Survey is for peak of season only (April 8-June 2).

^j Harvest of steelhead prohibited by emergency order.

^k Freeman and Hoffman (1990) (September 26, 1988 through June 4, 1989).

^l Freeman and Hoffman (1991) (October 23, 1989 through June 3, 1990).

^m Hubbartt (1989) (February 29, 1988 through June 19, 1988).

ⁿ Hubbartt (1990) (October 10, 1988 through May 21, 1989).

^o Hoffman et al. (1990).

^p Harding and Jones (1990).

^q Harding and Jones (1991).

^r Jones et al. (1991).

^s Schmidt (1992).

effect until steelhead stocks reach a level at which they can be managed for sustained yield. Further EO closures may need to include other streams where steelhead stocks have declined.

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APPENDIX A

Appendix A1. Daily and cumulative weir counts for upstream and downstream migrating adult steelhead at Karta River, 1992.

| Date | Upstream | | | | Downstream | | Daily water | |
|--------|----------|---|------|------|------------|------|-------------|------------|
| | F | M | Unk. | Cum. | Down | Cum. | Temp. (°C) | Level (cm) |
| 4-Apr | 0 | 0 | 0 | 0 | 0 | 0 | 4.0 | 54.0 |
| 5-Apr | 0 | 0 | 0 | 0 | 0 | 0 | 4.0 | 44.5 |
| 6-Apr | 0 | 0 | 0 | 0 | 0 | 0 | 4.0 | 35.0 |
| 7-Apr | 0 | 1 | 0 | 1 | 0 | 0 | 4.0 | 27.5 |
| 8-Apr | 2 | 2 | 0 | 5 | 0 | 0 | 3.0 | 20.5 |
| 9-Apr | 1 | 0 | 0 | 6 | 0 | 0 | 3.5 | 14.5 |
| 10-Apr | 2 | 3 | 0 | 11 | 0 | 0 | 3.0 | 10.0 |
| 11-Apr | 3 | 3 | 0 | 17 | 0 | 0 | 4.0 | 9.5 |
| 12-Apr | 3 | 4 | 0 | 24 | 1 | 1 | 2.0 | 6.5 |
| 13-Apr | 4 | 2 | 0 | 30 | 0 | 1 | 4.0 | 4.0 |
| 14-Apr | 0 | 2 | 0 | 32 | 0 | 1 | 5.0 | 3.5 |
| 15-Apr | 2 | 0 | 0 | 34 | 1 | 2 | 5.0 | 5.5 |
| 16-Apr | 7 | 0 | 0 | 41 | 0 | 2 | 4.5 | 16.5 |
| 17-Apr | 2 | 0 | 0 | 43 | 0 | 2 | 5.0 | 20.0 |
| 18-Apr | 0 | 1 | 0 | 44 | 0 | 2 | 5.0 | 24.5 |
| 19-Apr | 3 | 5 | 0 | 52 | 0 | 2 | 5.0 | 31.5 |
| 20-Apr | 9 | 2 | 0 | 63 | 0 | 2 | 5.0 | 52.0 |
| 21-Apr | 4 | 1 | 1 | 69 | 0 | 2 | 5.0 | 44.0 |
| 22-Apr | 2 | 0 | 0 | 71 | 0 | 2 | 4.5 | 39.0 |
| 23-Apr | 3 | 1 | 0 | 75 | 0 | 2 | 5.0 | 31.0 |
| 24-Apr | 9 | 3 | 0 | 87 | 0 | 2 | 5.0 | 26.0 |
| 25-Apr | 7 | 1 | 0 | 95 | 0 | 2 | 5.0 | 21.5 |
| 26-Apr | 4 | 0 | 0 | 99 | 0 | 2 | 5.0 | 18.0 |
| 27-Apr | 2 | 0 | 0 | 101 | 0 | 2 | 5.0 | 14.0 |
| 28-Apr | 8 | 3 | 0 | 112 | 0 | 2 | 6.0 | 12.0 |
| 29-Apr | 0 | 0 | 0 | 112 | 0 | 2 | 7.0 | 11.0 |
| 30-Apr | 7 | 3 | 0 | 122 | 2 | 4 | 6.0 | 9.5 |
| 1-May | 8 | 7 | 5 | 142 | 7 | 11 | 8.0 | 9.0 |
| 2-May | 8 | 3 | 0 | 153 | 4 | 15 | 7.5 | 31.0 |
| 3-May | 2 | 0 | 0 | 155 | 4 | 19 | 8.0 | 61.0 |
| 4-May | 0 | 0 | 0 | 155 | 0 | 19 | 8.0 | 100.0 |
| 5-May | 0 | 0 | 0 | 155 | 57 | 76 | 8.0 | 83.0 |
| 6-May | 3 | 1 | 0 | 159 | 0 | 76 | 8.0 | 53.0 |
| 7-May | 1 | 1 | 0 | 161 | 0 | 76 | 8.5 | 40.0 |
| 8-May | 1 | 0 | 0 | 162 | 0 | 76 | 8.5 | 30.0 |

-continued-

| Date | Upstream | | | | Downstream | | Daily water | |
|--------------|------------|-----------|----------|------|------------|------|-------------|------------|
| | F | M | Unk. | Cum. | Down | Cum. | Temp. (°C) | Level (cm) |
| 9-May | 3 | 2 | 0 | 167 | 2 | 78 | 8.5 | 24.0 |
| 10-May | 0 | 1 | 0 | 168 | 5 | 83 | 8.5 | 20.0 |
| 11-May | 1 | 1 | 0 | 170 | 0 | 83 | 8.0 | 18.0 |
| 12-May | 2 | 0 | 0 | 172 | 0 | 83 | 9.5 | 14.0 |
| 13-May | 1 | 0 | 0 | 173 | 0 | 83 | 9.0 | 13.0 |
| 14-May | 1 | 2 | 0 | 176 | 0 | 83 | 9.5 | 10.0 |
| 15-May | 2 | 1 | 1 | 180 | 6 | 89 | 10.0 | 7.5 |
| 16-May | 0 | 0 | 0 | 180 | 28 | 117 | NA | 7.5 |
| 17-May | 0 | 1 | 0 | 181 | 11 | 128 | NA | 5.5 |
| 18-May | 2 | 0 | 0 | 183 | 75 | 203 | NA | 4.0 |
| 19-May | 0 | 0 | 0 | 183 | 0 | 203 | NA | 4.0 |
| 20-May | 0 | 1 | 0 | 184 | 12 | 215 | NA | 3.5 |
| 21-May | 0 | 0 | 0 | 184 | 1 | 216 | NA | 2.0 |
| 22-May | 0 | 0 | 0 | 184 | 15 | 231 | 12.0 | 1.0 |
| 23-May | 0 | 0 | 0 | 184 | 18 | 249 | 11.0 | 0.0 |
| 24-May | 0 | 0 | 0 | 184 | 13 | 262 | 12.0 | 5.0 |
| 25-May | 0 | 0 | 0 | 184 | 3 | 265 | 12.0 | 11.0 |
| 26-May | 0 | 0 | 0 | 184 | 0 | 265 | 12.0 | 15.5 |
| 27-May | 0 | 0 | 0 | 184 | 28 | 293 | 12.0 | 16.0 |
| 28-May | 1 | 0 | 0 | 185 | 19 | 312 | 12.0 | 16.0 |
| 29-May | 0 | 0 | 0 | 185 | 7 | 319 | 13.0 | 15.0 |
| 30-May | 0 | 0 | 0 | 185 | 0 | 319 | 12.5 | 16.0 |
| 31-May | 0 | 0 | 0 | 185 | 28 | 347 | 11.0 | 24.5 |
| 1-Jun | 0 | 0 | 0 | 185 | 0 | 347 | 11.5 | 25.5 |
| Total | 120 | 58 | 7 | | 347 | | | |

Appendix A2. Length, age, and sex of adult steelhead sampled at Karta River weir, 1992.

| Date | Length ^a | Age | Sex | Comments |
|--------|---------------------|------------|-----|---|
| 7-Apr | 840 | 4.2S1 | M | RIPE, DARK, NO SCAR |
| 8-Apr | 692 | 4.2 | M | NO SCALES ON #4, RIPE, SEMI DARK, CAT.6 |
| 8-Apr | 770 | 4.2S1S1 | M | RIPE, DARK, NO SCAR |
| 8-Apr | 755 | R.2S1 | F | BRIGHT, NOT RIPE, NO SCAR |
| 8-Apr | 840 | R.2S1 | F | BRIGHT, HEALED SCARS POSTERIOR DORSAL, CAT.7 NOT RIPE |
| 9-Apr | 785 | 4.2 | F | BRIGHT, NOT RIPE, CAT.7 |
| 10-Apr | 780 | 3.2S1 | F | BRIGHT, NOT RIPE, CAT.7H |
| 10-Apr | 830 | 4.2S1 | M | BRIGHT, NOT RIPE, 7H SCAR |
| 10-Apr | 830 | 4.3 | M | RIPE, SEMI-DARK, 7H SCAR |
| 10-Apr | 750 | 4.3 | M | RIPE, BRIGHT, NO SCAR |
| 10-Apr | 792 | 3.2 | F | NOT RIPE, BRIGHT, 1H SCAR |
| 11-Apr | 850 | 4.3 | M | RIPE, SEMI-BRIGHT, NO SCAR |
| 11-Apr | 770 | R.2 | M | RIPE, SEMI-BRIGHT, CAT.1 |
| 11-Apr | 765 | 4.2 | F | BRIGHT, NOT RIPE, NO SCAR |
| 11-Apr | 790 | R.2 | F | BRIGHT, NOT RIPE, NO SCAR |
| 11-Apr | 835 | 4.3 | M | RIPE, SEMI-BRIGHT, NO SCAR |
| 11-Apr | 775 | 3.3 | F | NOT RIPE, BRIGHT, NO SCAR |
| 12-Apr | 792 | 4.3 | F | SEMI-BRIGHT, NOT RIPE, NO SCAR |
| 12-Apr | 715 | 3.2S1 | F | BRIGHT, NOT RIPE, NO SCAR |
| 12-Apr | 755 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 12-Apr | 780 | UNREADABLE | M | SEMI-BRIGHT, RIPE, NO SCAR |
| 12-Apr | 696 | 4.2 | M | SEMI-DARK, RIPE, NO SCAR |
| 12-Apr | 710 | 4.2 | M | SEMI-BRIGHT, NOT RIPE, NO SCAR |
| 12-Apr | 656 | 5.2 | M | SEMI-BRIGHT, NOT RIPE, NO SCAR |
| 13-Apr | 750 | 5.2 | M | SEMI-DARK, NOT RIPE, 1H SCAR |
| 13-Apr | 885 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 13-Apr | 820 | 4.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 13-Apr | 748 | R.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 13-Apr | 745 | 4.2S1 | F | BRIGHT, NOT RIPE, NO SCAR |
| 14-Apr | 790 | 4.2S1 | M | DARK, RIPE, FRESH 1" SCAR ON BELLY, 5F |
| 14-Apr | 840 | 4.3 | M | SEMI-DARK, NOT RIPE, NO SCAR |
| 15-Apr | 700 | 4.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 15-Apr | 720 | 4.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 16-Apr | 830 | 5.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 16-Apr | 753 | R.3 | F | BRIGHT, NOT RIPE, 25% SCAR, 4F |
| 16-Apr | 778 | UNREADABLE | F | BRIGHT, NOT RIPE, NO SCAR |
| 16-Apr | 726 | UNREADABLE | F | SEMI-BRIGHT, NOT RIPE, DESCALED, 4F SCAR |
| 16-Apr | 751 | 4.3 | F | SEMI-BRIGHT, NOT RIPE, NO SCAR |
| 16-Apr | 684 | 4.2 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 17-Apr | 760 | 4.2S1 | F | SEMI-BRIGHT, NOT RIPE, CAUGHT IN FYKE NET |
| 17-Apr | 715 | 4.2S1 | F | BRIGHT, NOT RIPE, CAUGHT IN FYKE NET, 1H SCAR |

-continued-

| Date | Length ^a | Age | Sex | Comments |
|--------|---------------------|---------|-----|---|
| 18-Apr | 820 | 4.2S1 | M | SEMI-DARK, RIPE, NO SCAR |
| 19-Apr | 673 | 4.2 | M | BRIGHT, RIPE, NO SCAR |
| 19-Apr | 735 | R.2 | M | SEMI-BRIGHT, RIPE, 7H SCAR |
| 19-Apr | 775 | 4.3 | F | BRIGHT, NOT RIPE, NO SCAR |
| 19-Apr | 620 | 3.2 | M | BRIGHT, RIPE, NO SCAR |
| 19-Apr | 795 | R.3 | F | BRIGHT, NOT RIPE, 7H SCAR |
| 19-Apr | 792 | 5.2 | M | SEMI-BRIGHT, RIPE, 1H SCAR |
| 19-Apr | 760 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 19-Apr | 865 | 4.3 | M | SEMI-DARK, NOT RIPE, NO SCAR |
| 20-Apr | 774 | R.2 | F | BRIGHT, RIPE, NO SCAR |
| 20-Apr | 660 | 4.2 | F | BRIGHT, NOT RIPE, NO SCAR |
| 20-Apr | 805 | 4.2S1 | F | BRIGHT, NOT RIPE, 7F SCAR, ALSO MINOR 1H SCAR |
| 20-Apr | 775 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 20-Apr | 753 | 4.3 | F | BRIGHT, NOT RIPE, 7H SCAR |
| 20-Apr | 774 | 4.2S1S1 | F | BRIGHT, NOT RIPE, NO SCAR, FLOY #133643 GREEN |
| 20-Apr | 728 | 4.3 | F | BRIGHT, NOT RIPE, 7H SCAR |
| 20-Apr | 608 | 4.2 | F | SEMI-DARK, 7H AND 1H SCARS, RIPE |
| 20-Apr | 675 | 3.2 | M | SEMI-DARK, RIPE, NO SCARS |
| 20-Apr | 710 | 3.2S1 | F | SEMI-BRIGHT, NOT RIPE, NO SCARS |
| 20-Apr | 790 | 3.3 | M | SEMI-DARK, RIPE, NO SCARS |
| 21-Apr | 750 | R.3 | F | SEMI-BRIGHT, NOT RIPE, 1H SCAR |
| 21-Apr | 780 | 3.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 21-Apr | 780 | 5.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 21-Apr | 640 | 3.2 | M | DARK, RIPE, NO SCARS |
| 21-Apr | 750 | R.2S1 | F | SEMI-BRIGHT, NOT RIPE, NO SCARS |
| 22-Apr | 785 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 22-Apr | 755 | 3.2S1 | F | SEMI-BRIGHT, RIPE, 1H SCAR |
| 23-Apr | 760 | 4.3 | M | SEMI-DARK, RIPE, 1H SCAR |
| 23-Apr | 755 | 4.2S1 | F | BRIGHT, NOT RIPE, 5F SCAR |
| 23-Apr | 735 | R.3 | F | BRIGHT, NOT RIPE, 7H SCAR, AND TRAP SCAR LOWER JAW |
| 23-Apr | 680 | R.3 | F | BRIGHT, NOT RIPE, TRAP SCAR LOWER JAW |
| 24-Apr | 750 | 3.2S1S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 24-Apr | 785 | 4.2S1S1 | F | BRIGHT, NOT RIPE |
| 24-Apr | 890 | 4.2S1S1 | F | BRIGHT, NOT RIPE, TRAP SCAR |
| 24-Apr | 660 | 4.2 | F | BRIGHT, NOT RIPE |
| 24-Apr | 700 | 4.2 | M | SEMI-DARK, RIPE, NO SCARS |
| 24-Apr | 700 | 5.2S1 | F | BRIGHT, NOT RIPE, 7H SCAR |
| 24-Apr | 748 | 4.3 | M | SEMI-BRIGHT, RIPE |
| 24-Apr | 709 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 24-Apr | 761 | 4.2S1S1 | F | SEMI-BRIGHT, NOT RIPE |
| 24-Apr | 770 | R.3 | F | BRIGHT, NOT RIPE |
| 24-Apr | 775 | 4.3 | M | SEMI-BRIGHT, RIPE, 7H SCAR (SUPERFICIAL) |
| 24-Apr | 860 | 3.3S1 | F | BRIGHT, RIPE |

-continued-

| Date | Length ^a | Age | Sex | Comments |
|--------|---------------------|---------|-----|---|
| 25-Apr | 747 | 3.3 | F | BRIGHT, RIPE, 5F SCAR |
| 25-Apr | 791 | 4.2S1 | F | BRIGHT, NOT RIPE |
| 25-Apr | 770 | 4.3 | F | BRIGHT, NOT RIPE |
| 25-Apr | 670 | R.3 | F | BRIGHT, NOT RIPE |
| 25-Apr | 795 | 4.3 | F | BRIGHT, NOT RIPE |
| 25-Apr | 718 | 4.2 | M | BRIGHT, RIPE, 7H SCAR |
| 25-Apr | 750 | 4.2 | F | BRIGHT, RIPE |
| 25-Apr | 621 | 3.2S1 | F | BRIGHT, RIPE |
| 26-Apr | 750 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 26-Apr | 781 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 26-Apr | 770 | 3.3 | F | BRIGHT, NOT RIPE, 7H SCAR |
| 26-Apr | 765 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 27-Apr | 759 | 4.1S1S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 27-Apr | 735 | 5.3 | F | BRIGHT, NOT RIPE |
| 28-Apr | 745 | 3.2S1 | F | BRIGHT, NOT RIPE, OTTER KILL IN TRAP, GSI SAMPLE (A1) |
| 28-Apr | 779 | 3.2S1 | M | SEMI-DARK, RIPE |
| 28-Apr | 778 | 4.3 | F | BRIGHT, RIPE, 1H SCAR |
| 28-Apr | 778 | 4.2S1 | M | SEMI-DARK, RIPE, 1H SCAR |
| 28-Apr | 805 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 28-Apr | 830 | 4.3 | M | SEMI-DARK, RIPE, NO SCARS |
| 28-Apr | 750 | 4.3 | F | BRIGHT, NOT RIPE, 1H & 7H SCARS |
| 28-Apr | 810 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 28-Apr | 765 | R.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 28-Apr | 749 | 4.2S1 | F | BRIGHT, RIPE, 1H SCAR |
| 30-Apr | 755 | 4.3 | F | BRIGHT, NOT RIPE, NO SCARS |
| 30-Apr | 795 | 3.3S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 30-Apr | 835 | 3.2S1S1 | F | SEMI-BRIGHT, NOT RIPE, 7H SCAR |
| 30-Apr | 735 | 4.3 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 30-Apr | 725 | 4.2 | M | SEMI-DARK, RIPE, 1H SCAR |
| 30-Apr | 720 | 3.3 | F | SEMI-BRIGHT, RIPE, 2H SCAR |
| 30-Apr | 795 | R.3 | M | SEMI-DARK, RIPE, NO SCARS, 2 SCALES LOST ROW 10 |
| 30-Apr | 785 | 3.2S1 | M | SEMI-DARK, RIPE, NO SCARS |
| 30-Apr | 825 | R.3 | F | BRIGHT, NOT RIPE, NO SCARS |
| 30-Apr | 780 | 4.2S1 | F | BRIGHT, NOT RIPE, 3F SCAR |
| 1-May | 855 | 3.3 | M | SEMI-DARK, RIPE, NO SCARS, 1 SCALE LOST ROW 8 |
| 1-May | 795 | 5.2S1 | M | DARK, RIPE, NO SCARS |
| 1-May | 728 | R.3 | M | SEMI-BRIGHT, RIPE, 1H SCAR |
| 1-May | 775 | 4.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 1-May | 750 | 4.3 | F | BRIGHT, RIPE, NO SCARS |
| 1-May | 762 | 3.3S1 | F | BRIGHT, NOT RIPE, 3F & 1H SCARS |
| 1-May | 860 | 4.3 | M | SEMI-BRIGHT, NOT RIPE, NO SCARS |
| 1-May | 722 | 3.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 1-May | 762 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 1-May | 795 | 4.3 | M | SEMI-BRIGHT, NOT RIPE, NO SCARS |

-continued-

| Date | Length ^a | Age | Sex | Comments |
|--------|---------------------|------------|-----|--|
| 1-May | 750 | UNREADABLE | M | SEMI-DARK, RIPE, NO SCARS |
| 1-May | 734 | 4.2S1 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 1-May | 725 | 3.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 785 | 4.2S1S1 | F | BRIGHT, RIPE, NO SCARS |
| 2-May | 715 | 4.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 640 | R.2 | F | SEMI-BRIGHT, NOT RIPE, NO SCAR |
| 2-May | 595 | 3.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 620 | 4.2 | M | BRIGHT, RIPE, NO SCARS |
| 2-May | 689 | 4.2 | M | BRIGHT, RIPE, 5F SCAR |
| 2-May | 620 | R.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 788 | 4.3 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 748 | 4.3 | F | SEMI-BRIGHT, NOT RIPE, 1H SCAR |
| 2-May | 770 | R.2S1S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 2-May | 789 | 3.2S1 | M | SEMI-BRIGHT, NOT RIPE, NO SCARS |
| 6-May | 663 | 4.2 | M | DARK, RIPE, 1H SCAR |
| 6-May | 785 | 4.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 6-May | 625 | 4.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 6-May | 829 | UNREADABLE | F | BRIGHT, RIPE, 7H SCAR |
| 7-May | 800 | 4.3 | M | SEMI-DARK, RIPE, NO SCARS, OTTER WAS IN TRAP |
| 7-May | 630 | R.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 8-May | 730 | 4.2 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 9-May | 777 | 3.2S1 | F | BRIGHT, NOT RIPE, NO SCARS |
| 9-May | 640 | 4.2 | M | SEMI-DARK, NOT RIPE, NO SCARS |
| 9-May | 805 | 4.3 | F | BRIGHT, RIPE, NO SCARS |
| 9-May | 780 | UNREADABLE | F | BRIGHT, NOT RIPE, 1H SCAR |
| 9-May | 695 | 4.3 | M | SEMI-BRIGHT, RIPE, NO SCARS |
| 10-May | 720 | 4.2 | M | DARK, RIPE, 1H SCAR |
| 11-May | 808 | 3.2S1 | M | SEMI-DARK, RIPE, NO SCARS |
| 11-May | 660 | 4.2 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 12-May | 845 | R.3S1S1S1 | F | BRIGHT, RIPE, NO SCARS, FLOY TAG #133812 |
| 12-May | 610 | 3.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 13-May | 630 | 5.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 14-May | 655 | 4.3 | M | SEMI-BRIGHT, RIPE, NO SCARS |
| 14-May | 855 | 4.3 | M | SEMI-DARK, RIPE, NO SCARS |
| 14-May | 700 | 5.2 | F | SEMI-BRIGHT, NOT RIPE, NO SCARS |
| 15-May | 750 | R.2S1 | F | SEMI-BRIGHT, RIPE, 1H SCAR |
| 15-May | 660 | 4.2 | F | BRIGHT, NOT RIPE, NO SCARS |
| 15-May | 840 | UNREADABLE | M | SEMI-DARK, NOT RIPE, NO SCARS |
| 17-May | 820 | R.3 | M | SEMI-BRIGHT, RIPE, NO SCARS, 1 SCALE MISSING ROW 4 |
| 18-May | 670 | 4.2 | F | BRIGHT, RIPE, NO SCARS |
| 18-May | 648 | 4.2 | F | BRIGHT, NOT RIPE, 1H SCAR |
| 20-May | 848 | R.2S1 | M | SEMI-DARK, NOT RIPE, 6H SCAR |
| 28-May | 730 | | F | SEMI-BRIGHT, NOT RIPE, NO SCARS |

^a Fork length measured to nearest 5 mm.

Appendix A3. Freshwater age and length of downstream migrating steelhead smolt sampled at Karta River weir, 1992.

| Freshwater age | Mean length (mm) | SD | Min. length (mm) | Max. length (mm) | n | % |
|----------------|------------------|------|------------------|------------------|----|----|
| 3 | 179.8 | 16.4 | 160 | 215 | 8 | 10 |
| 4 | 210.1 | 17.5 | 177 | 270 | 52 | 67 |
| 5 | 236.3 | 24.8 | 210 | 310 | 15 | 19 |
| 6 | 300.0 | | 300 | 300 | 1 | 1 |
| ? ^a | 245.0 | 21.2 | 230 | 260 | 2 | 3 |
| Overall | 214.1 | 26.4 | 160 | 310 | 78 | |

^a Ages undetermined.

Appendix A4. Freshwater age composition, mean length, and sex of steelhead smolt sampled at Karta River weir, 1992.

| Freshwater age | Female | | | Male | | | Combined |
|----------------|-------------|----|------|-------------|----|------|----------|
| | Mean length | n | SD | Mean length | n | SD | n |
| 3 | 173.8 | 4 | 4.8 | 185.8 | 4 | 22.6 | 8 |
| 4 | 213.1 | 29 | 17.2 | 206.3 | 23 | 17.4 | 52 |
| 5 | 241.5 | 11 | 26.6 | 222.0 | 4 | 11.7 | 15 |
| 6 | | | | 300.0 | 1 | | 1 |
| ? ^a | | | | 245.0 | 2 | 21.2 | 2 |
| Overall | 216.6 | 44 | 26.4 | 210.7 | 34 | 26.3 | 78 |

^a Ages undetermined

Appendix A5. List of data files and analysis programs developed for the steelhead escapement and creel survey studies at Karta River, 1992.^a

| Data file | Description |
|--------------|---|
| KAR92AWL.DBF | dBase data file of steelhead length, age, sex, and date and time of upstream passage through weir. |
| KAR92DWN.DBF | dBase data file of downstream kelt counts, including date, time, and water level and temperature. |
| KAR92JUV.DBF | dBase data file of juvenile and adult rainbow/steelhead captured and genetically sampled; includes date, length, and sex. |
| KAR92WAT.DBF | dBase data file of daily water temperature, level, and weather observations. |
| KAR92WER.DBF | dBase data file of daily and cumulative weir counts; includes time of passage. |
| KAR92SEX.DBF | dBase data file of upstream steelhead counts by sex; includes those fish passed through weir but not measured. |

^a Data files are archived at and available from, the Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage, Alaska 99518-1599.

