

Fishery Data Series No. 01-20

**Southeast Alaska Steelhead Studies, 2000:
Situk River Weir and Surveys of Regional
Index Streams**

by

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December 2001

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition.

| Weights and measures (metric) | | General | | Mathematics, statistics, fisheries | |
|---------------------------------------|--------------------|---|---|---|-------------------------|
| Centimeter | cm | All commonly accepted abbreviations. | e.g., Mr., Mrs., a.m., p.m., etc. | Alternate hypothesis | H_A |
| Deciliter | dL | | | base of natural logarithm | e |
| Gram | g | All commonly accepted professional titles. | e.g., Dr., Ph.D., R.N., etc. | catch per unit effort | CPUE |
| Hectare | ha | and | & | Coefficient of variation | CV |
| Kilogram | kg | at | @ | Common test statistics | F, t, χ^2 , etc. |
| Kilometer | km | Compass directions: | | Confidence interval | C.I. |
| liter | L | | | Correlation coefficient | R (multiple) |
| meter | m | east | E | correlation coefficient | r (simple) |
| metric ton | mt | north | N | Covariance | cov |
| milliliter | ml | south | S | degree (angular or temperature) | ° |
| millimeter | mm | west | W | degrees of freedom | df |
| | | Copyright | © | divided by | ÷ or / (in equations) |
| | | Corporate suffixes: | | Equals | = |
| | | Company | Co. | expected value | E |
| | | Corporation | Corp. | fork length | FL |
| | | Incorporated | Inc. | greater than | > |
| | | Limited | Ltd. | greater than or equal to | ≥ |
| | | et alii (and other people) | Et al. | harvest per unit effort | HPUE |
| | | et cetera (and so forth) | Etc. | less than | < |
| | | exempli gratia (for example) | e.g., | less than or equal to | ≤ |
| | | id est (that is) | i.e., | logarithm (natural) | ln |
| | | latitude or longitude | Lat. or long. | logarithm (base 10) | log |
| | | monetary symbols (U.S.) | \$, ¢ | logarithm (specify base) | log ₂ , etc. |
| | | months (tables and figures): first three letters | Jan,...,Dec | mid-eye-to-tail fork | MEF |
| | | number (before a number) | # (e.g., #10) | minute (angular) | ' |
| | | pounds (after a number) | # (e.g., 10#) | multiplied by | x |
| | | registered trademark | ® | not significant | NS |
| | | trademark | ™ | null hypothesis | H_0 |
| | | United States (adjective) | U.S. | Percent | % |
| | | United States of America (noun) | USA | Probability | P |
| | | U.S. state and District of Columbia abbreviations | Use two-letter abbreviations (e.g., AK, DC) | Probability of a type I error (rejection of the null hypothesis when true) | α |
| | | | | Probability of a type II error (acceptance of the null hypothesis when false) | β |
| | | | | second (angular) | " |
| | | | | standard deviation | SD |
| | | | | standard error | SE |
| | | | | standard length | SL |
| | | | | total length | TL |
| | | | | Variance | var |
| Weights and measures (English) | | | | | |
| cubic feet per second | ft ³ /s | | | | |
| foot | ft | | | | |
| gallon | gal | | | | |
| inch | in | | | | |
| mile | mi | | | | |
| ounce | oz | | | | |
| pound | lb | | | | |
| quart | qt | | | | |
| yard | yd | | | | |
| Spell out acre and ton. | | | | | |
| Time and temperature | | | | | |
| day | d | | | | |
| degrees Celsius | °C | | | | |
| degrees Fahrenheit | °F | | | | |
| hour (spell out for 24-hour clock) | h | | | | |
| minute | min | | | | |
| second | s | | | | |
| Spell out year, month, and week. | | | | | |
| Physics and chemistry | | | | | |
| all atomic symbols | | | | | |
| alternating current | AC | | | | |
| ampere | A | | | | |
| calorie | cal | | | | |
| direct current | DC | | | | |
| hertz | Hz | | | | |
| horsepower | hp | | | | |
| hydrogen ion activity | pH | | | | |
| parts per million | ppm | | | | |
| parts per thousand | ppt, ‰ | | | | |
| volts | V | | | | |
| watts | W | | | | |

FISHERY DATA SERIES NO. 01-20

**SOUTHEAST ALASKA STEELHEAD STUDIES, 2000:
SITUK RIVER WEIR AND SURVEYS OF REGIONAL INDEX STREAMS**

by

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ABSTRACT

Regionwide monitoring of trends in steelhead *Oncorhynchus mykiss* spawning abundance in 11 index streams in Southeast Alaska was continued in 2000. Each of these index streams was surveyed for steelhead abundance by a two- or three-person team using snorkel gear during April and May 2000. Peak steelhead counts in the 10 systems monitored since 1997 totaled 624 which was lower than in 1997-1999 and less than half of the peak count of 1,400 in 1997. Survey conditions were generally good in 2000, so survey conditions probably did not affect the counts.

The Situk River produces the largest run of steelhead in Southeast Alaska. Between 8 May and 9 August 2000, 6,709 steelhead were counted as they emigrated downstream through a weir located about 2 km upstream of the Lower Landing on the Situk River. This count was slightly below the 5-year average of 7,503 fish, and 27% below the count in 1999, which was the largest count since the 1950's. Float surveys on the Situk River downstream of Situk Lake counted a maximum of 3,557 steelhead, 53% of the total counted at the weir.

The average total lengths of female and male steelhead from the Situk River were 773 mm (SE = 3) and 749 mm (SE = 6), respectively. Of the 657 fish sampled, 12 or 2% were ≥ 36 inches (914 mm) in total length; 8 of these large fish were female and 4 were male.

Key words: steelhead, *Oncorhynchus mykiss*, emigration, abundance, Situk River, Eagle Creek, Harris River, Humpback Creek, Ketchikan Creek, McDonald Lake, White River, Slippery Creek, Petersburg Creek, Sitkoh Creek, Ford Arm Creek, Peterson Creek, Pleasant Bay Creek, weir, timing, sex, length, PIT tag, abundance indices, snorkel survey, index stream.

INTRODUCTION

Southeast Alaska has 331 identified steelhead *Oncorhynchus mykiss* populations, most of which are believed to contain 200 or fewer spawning adults. Major sport fisheries occur on larger systems such as the Naha, Karta, and Thorne rivers near Ketchikan, which support up to 1,000 spawning steelhead, and on the Situk River, which supports annual returns of 5,000 to 9,000 or more steelhead. Steelhead harvests in Southeast Alaska generally increased from the late 1970s through 1989, but then began to decline (Mills 1993). As fishery managers and participants reported lower escapements, an emergency order prohibiting steelhead harvests in the Situk River was enacted in 1991. In 1992, harvests were prohibited by emergency order in 24 popular systems, and in 1993, the Situk and 47 other systems were closed to steelhead harvest. In 1994, the Alaska Board of Fisheries enacted conservative regulations for steelhead in Southeast Alaska, and since 1994, anglers have been limited regionwide to a harvest of 2 steelhead per year with a minimum size limit of 36 inches (914 mm).

Intensive research on steelhead stocks in Southeast Alaska has largely been limited to Petersburg Creek (Jones 1972–1976, 1983) and the Situk River (Johnson 1990, 1991, 1996; Didier and Marshall 1991; Johnson and Marshall 1991; Glynn 1992; Glynn and Elliott 1993). Estimates of migratory timing, abundance, and age composition have also been made in a few other systems (Harding and Jones 1990, 1991, 1992; Jones et al. 1991; Yanusz 1997). Creel surveys of steelhead fisheries have also been conducted (Freeman and Hoffman 1989, 1990, 1991; Hubartt 1989, 1990; Hoffman et al. 1990; Harding and Jones 1991, 1993, 1994; Schmidt 1992), and enhancement has been studied in one system (Freeman 1992, 1995).

Although a few counts of steelhead in selected systems had been made for many years systematic foot surveys were initiated in 1994 to monitor annual trends in peak escapement in 17 streams. Since then, survey methodology has evolved, and the streams and reaches selected to survey have changed as observers gained experience with each system (Johnson and Jones 1998, 1999, 2000). The 11 index streams surveyed for steelhead in 2000 were dispersed across Southeast Alaska (Figure 1).



Figure 1.—Locations of the steelhead index systems in Southeast Alaska surveyed in 2000 and the Situk River. Humpback Creek is not now an index site, but it is still being evaluated for potential use in the index system.

Substantial changes in survey methods were instituted in 1997 to increase the proportion of steelhead observed in index streams and to better identify dates of peak instream abundance (Johnson and Jones 1998). All surveys were converted to snorkel surveys because Shardlow et al. (1987) found that among the most common survey methods, snorkel surveys by experienced observers yield the highest counts. During late April through May 2000, the primary objective of the steelhead survey project was to count by weekly snorkel surveys the number of steelhead in standardized sections of these 11 index streams.

As noted above, the Situk River has the largest steelhead run in Southeast Alaska, and studies were intensified in 1994 to provide consistent long-term assessment of this stock (Johnson 1996; Johnson and Jones 1998, 1999, 2000). Located east of Yakutat, the Situk River is 35.2 km long

and drains 2 lakes with a combined surface area of about 397 ha (Figure 2). Prior to 1993, counts of Situk River steelhead were recorded incidentally at a weir installed 1.9 km (1.2 mi) upstream of Lower Landing for the purpose of counting sockeye *O. nerka* and chinook salmon *O. tshawytscha* (Figure 2). These counts of steelhead were considered incomplete counts of total abundance, as the migratory timing of the target salmon species only partially overlapped that of the emigrating steelhead. Sonar was also used to count Situk River steelhead immigrants in the spring of 1989 and 1990 but was too labor-intensive to be readily implemented on an annual basis (Johnson 1990, 1991).

A weir was installed specifically to count emigrant steelhead in 1993, but spring floods washed out the weir and prevented a complete count. Annual weir counts have since been

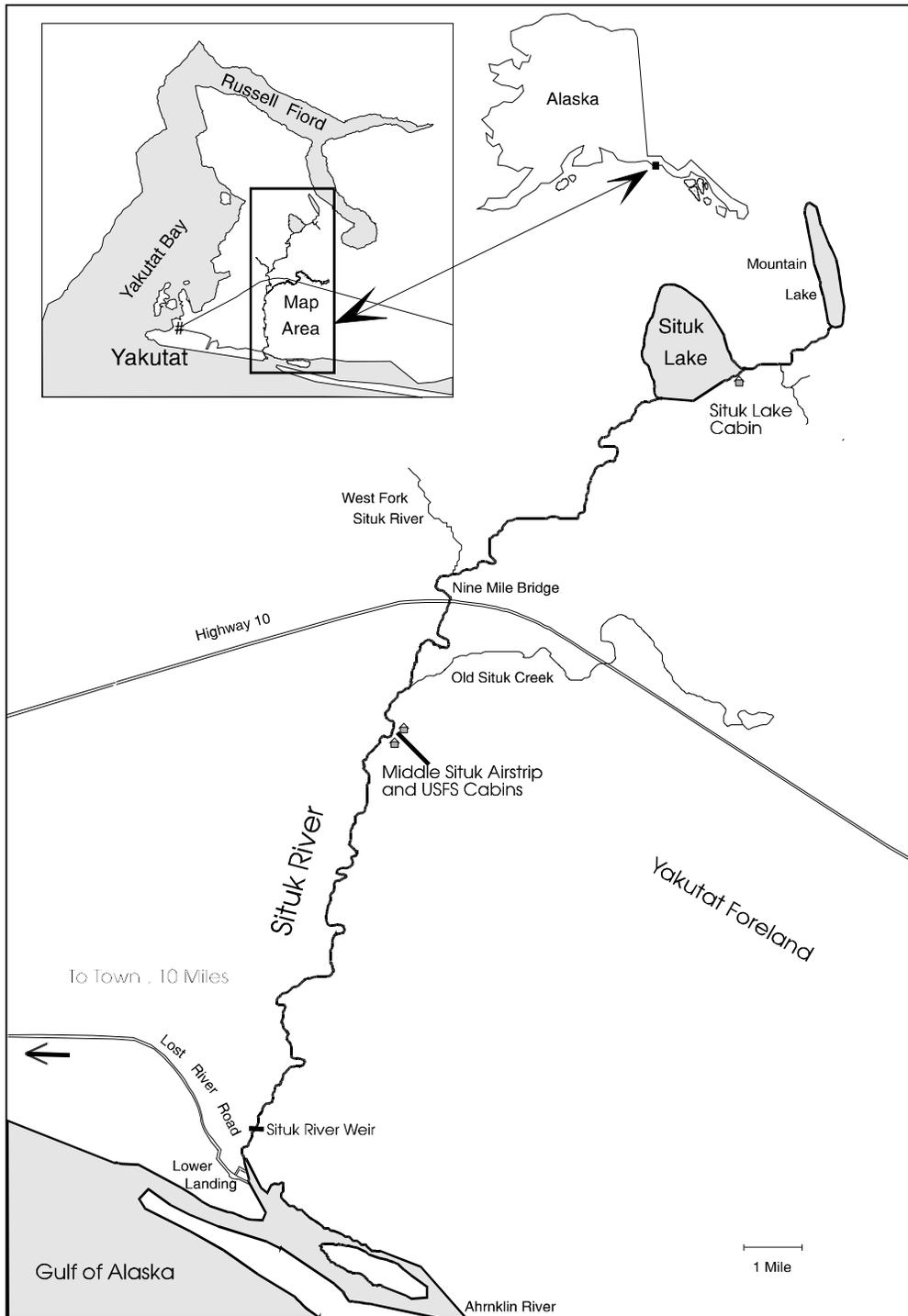


Figure 2.—Location of weir used to count emigrating steelhead from the Situk River drainage, Southeast Alaska, 2000.

complete, primarily because in 1995, a resistance board weir was installed which withstands most flooding events.

Because the Situk River is relatively wide and shallow and most steelhead kelts move at night, the kelts are not easily captured at the weir. Capturing all emigrants at the Situk River weir without affecting run timing and mortality while staying within budgetary constraints does not appear to be possible. However, significant hardware modifications were implemented in 1997–1998, improving capture and holding capabilities (Johnson and Jones 1998, 1999). On three occasions during each of those 2 years, all (or most) emigrating steelhead were sampled in discrete batches over an entire evening's emigration. Differences were noted between those fish emigrating during the early evening and the late part of the evening. In general, large fish, exhibiting fungal growth and darker coloration, were the first fish to pass through the weir during these "total" sample events. More importantly, substantial differences in sex composition occurred between the 2 time periods early in the season. These differences would lead to biased estimates for the season if corrective procedures were not implemented. As a result, fish from both early evening and late evening portions of the emigration were sampled to estimate sex and length composition objectives. We also wanted to determine what proportion of fish had attained the minimum legal size for harvest (36 inches).

The Situk River portion of this study thus had three objectives: (1) count emigrant steelhead past a weir; (2) estimate the proportion of emigrant steelhead ≥ 36 inches in total length; and (3) estimate the sex and length composition of emigrant steelhead.

Long-term data for Situk steelhead escapements also include indices of abundance obtained from float survey counts. Overall, float surveys of the entire river, under favorable conditions, count about 70% of the kelt emigration (Johnson and Jones 1999).

Water levels were quite stable during 2000, and as a result, we were able to conduct four total river float surveys for comparison with weir counts of emigrant steelhead. These data will help estimate an expansion factor and associated

variance for estimating steelhead abundance if weir counts of the total run are unavailable.

METHODS

SOUTHEAST ALASKA SNORKEL SURVEYS

Snorkel surveys were scheduled to provide indices of peak steelhead abundance for 11 streams in Southeast Alaska in 2000 (Figure 1). These streams, with the exception of Slippery Creek, had all been surveyed for steelhead since 1997 (Johnson and Jones 1998, 1999, 2000). At least 55% of the anadromous portions of 7 streams were surveyed, with 19% to 48% of the other 4 surveyed (Appendix A1). Two previously surveyed index systems, Humpback Creek and Marten Creek, were dropped in 2000. Humpback Creek was dropped because peak counts had been wildly erratic in this system (range of 4 to 91). Because of its low peak counts (range of 14 to 18 fish) in 1997 to 1999, Marten Creek was replaced by Slippery Creek in 2000.

As in prior years, we attempted to survey index streams weekly, up to 4 times (depending on the stream), from late April through May when instream abundance was expected to peak. If the peak count occurred during the last survey, an additional survey was scheduled. If a survey was missed because of unsuitable weather, the missed survey was performed as soon as conditions permitted, and the survey schedule was adjusted as possible, so that a near-weekly counting interval was maintained. Snorkel surveys of Starrigavan Creek near Sitka were also conducted for a second year to continue the evaluation of its potential use as an index system.

Surveys were conducted by at least 2 employees wearing dry suits and snorkel gear. One surveyor was always a senior, trained observer. Data from each survey in each stream were recorded by discrete sections (reaches) of the river (Appendix A1). If a shoreside (third) party was available, counts were verbally conveyed to them, and they tabulated and then recorded the counts by reach as the survey progressed. When a shoreside party was not available, one or both snorkelers recorded the counts by reach with a waterproof (wax-based) marker on a small plastic diver's slate

until it could be transcribed to conventional data forms.

Observers, as a team, counted all adult steelhead observed during the survey. The surveyors attempted to stay abreast of each other in the stream and coordinated their observations to obtain maximum coverage. When passing through high concentrations of steelhead, both observers counted the number of steelhead in their area of responsibility before consulting with each other on their counts. If either or both surveyors felt that a questionable count was made in a particular pool or stretch of river, the area was recounted. Since steelhead were often not too disturbed, recounts of a pool or run were usually possible.

The level of surface illumination, subsurface light transmission at a depth of 0.5 m, surface water temperature (°C), and weather conditions (cloud cover, wind, and precipitation) were recorded at the beginning of the survey. Surface illumination and subsurface light transmission were recorded using a Sekonic L-188WH light meter protected by a waterproof underwater housing. The meter was set to an ASA value of 100, and the EV (exposure value) scale at the bottom of the light meter was recorded. On each index system, water levels were recorded at a permanent benchmark established in 1997. This benchmark was either a permanent mark on a bridge abutment, a U.S. Geological Survey (USGS) gauging station, or a mark carved in bedrock.

SITUK RIVER WEIR STUDIES

A bipod and picket weir with a center “resistance board” section about 40 ft wide was installed on the Situk River 1.2 mi (1.9 km) upstream of the Lower Landing (Figure 2) and made “fish tight” on the evening of 8 May. Each day, steelhead were counted as they passed downstream through an opening in the resistance board section. As during 1999, steelhead were sampled for biological information on designated days in a downstream weir trap. Johnson and Jones (1999) provide specifics regarding the weir and trap configuration and operation.

To satisfy precision levels established for the project, 612 steelhead were to be sampled for scales, length, and sex over the entire emigration

(Cochran 1977). To reach that goal, samples were to be collected twice a week (Monday and Thursday). A sampling goal for the week was to be estimated each Monday from current weir counts and the average cumulative proportions sampled over the past 4 years at a similar point in the emigration. Technicians were to attempt collection of 50% of the weekly sample during the early portion of the daily emigration on Monday night (excluding any weak fish that accumulated at the weir during the day) and 50% during the late portion of the daily emigration on Thursday night. If less than 25% of the goal for the week (50% for the day) was obtained during the first early or late portion sampling day, then the emigration was to be sampled on the following night. When emigration rates were very low (as in the first and last several weeks when daily rates were only a few fish per night), all of the emigrants that could easily be trapped were to be sampled.

Biological measurements taken from each fish included sex, total length (TL) to the nearest 5 mm, and color classification. Color classifications included bright, medium, or dark. Presence or absence of fungus was also noted on each fish, as were any wounds or scars and their general type. Four scales were taken from the “preferred” area on both sides of the fish (Welanders 1940). We do not intend to age scales from this study until more “known age” scales are collected.

Captured bright male and female steelhead meeting specific selection criteria were injected beneath the skin with a 20 mm PIT (Passive Integrated Transponder) tag in the pelvic fin region using an 8-gauge veterinary syringe and needle. Selection criteria were: 1) absence of potentially life-threatening injuries or body fungus and, 2) total length of 730 mm or less. The 730 mm maximum size limit was used to maximize the accuracy of initial age determination (two ocean age or less and initial spawning cycle). The color and condition criteria were likewise selected to maximize the probability of at-sea survival, and subsequent likelihood of future recapture. The pelvic area tag placement was selected to minimize the likelihood of anyone ingesting the tag. The injection wound was sealed with an application of “super glue”.

PIT tags were initially scanned, labeled by unique identification number, and applied. The PIT tag identification number was entered into the “comments” field of the sampling form at the time of tag injection.

In future seasons, the PIT reader scanner antenna will be attached to the sampling tray such that the tag bearing area of any fish sampled will pass within the 12-inch scan range of the antenna during the sampling procedure.

Summary statistics generated from biological sampling included estimates of sex and length composition. The sex composition of emigrants was estimated:

$$\hat{p}_a = \frac{n_a}{n} \quad (1)$$

$$\text{var}(\hat{p}_a) = \left(1 - \frac{n}{N}\right) \frac{\hat{p}_a(1 - \hat{p}_a)}{n - 1} \quad (2)$$

where p_a = proportion of the population with estimated sex a , n_a = number of sampled fish with estimated sex a , n = number of fish sampled for sex, and N = number of fish counted at the weir. Because all (or most) emigrants were enumerated, an fpc (finite population correction) = $(1 - n/N)$ was included in the estimator. The standard error of p_a was $\text{var}(\hat{p}_a)^{1/2}$.

The mean length (y) of emigrants was estimated:

$$\bar{y} = \frac{1}{n} \sum_i y_i \quad (3)$$

$$\text{var}(\bar{y}) = \left(1 - \frac{n}{N}\right) \frac{\sum_i (y_i - \bar{y})^2}{n(n - 1)} \quad (4)$$

where i denotes an individual fish. An fpc was again used since all fish were counted at the weir. The standard error $se(\bar{y}) = \text{var}(\bar{y})^{1/2}$. Another statistic, the standard deviation $sd(y)$ was also calculated as a measure of the dispersion of the y values:

$$sd(y) = \left(\sum (y_i - \bar{y})^2 / (n - 1)\right)^{1/2} \quad (5)$$

SITUK RIVER FLOAT COUNTS

Four total-river float surveys (Situk Lake downstream to the Lower Landing) were conducted during the spring of 2000. Survey timing was based on peak steelhead counts obtained during past float surveys. To further study steelhead distribution during float counts, the Situk River was divided into 22 sections: 9 in the upper river and 13 in the lower river (see Appendix A2 of Johnson and Jones 1998). The beginning and end of each section was based on prominent, easily distinguished, features. The length in miles of each section was measured from aerial photographs. Float survey procedures are presented in Johnson and Jones (1998).

RESULTS

SOUTHEAST ALASKA SNORKEL SURVEYS

Thirty-nine (39) snorkel surveys were conducted on steelhead index streams during April and May, 2000 (Table 1 and Appendix A2). Peak steelhead counts ranged from 15 in Ketchikan Creek to 134 in Ford Arm Creek. The number of surveys made on index systems ranged from 2 in Sitkoh Creek to 5 on Ketchikan Creek. Only Sitkoh Creek had less than the 3 or 4 minimum desired. This system had some high water conditions which meant additional surveys had to be cancelled for safety concerns.

In addition, surveys were made of 3 other systems (Appendix A2). Three snorkel surveys of Humpback Creek yielded a peak count of only 7 steelhead. Snorkel/foot surveys (one person snorkeling and one on foot) on 5 May and 16 May yielded counts of 6 and 4 steelhead, respectively, in Starrigavan Creek. Starrigavan Creek has been logged extensively, and there is considerable blow-down in the stream, making snorkel counts difficult. One Karta River foot count on March 9 encountered a total of 14 steelhead. Dark and slow-moving water in Karta River make this creek unsuitable as an index system because fish were very difficult to observe. Actively swimming snorkelers (in slow-moving water) usually spook steelhead before they can be accurately counted.

Table 1.—Index streams for steelhead surveyed along with dates of peak counts and peak numbers of steelhead counted, 2000.

| STREAM NAME | NO. OF SURVEYS | PEAK COUNT DATE | PEAK COUNT OF STEELHEAD | GENERAL LOCATION |
|--------------------------|----------------|-----------------|-------------------------|--------------------|
| Eagle Creek ^a | 4 | 5 May | 82 | Prince of Wales I. |
| Harris River | 3 | 4 May | 79 | Prince of Wales I. |
| Ketchikan Creek | 5 | 23 May | 15 | Revillagigedo I. |
| White River | 3 | 6 May | 38 | Revillagigedo I. |
| McDonald Lake Creek | 4 | 25 May | 47 | Southern mainland |
| Slippery Creek | 3 | 18 May | 42 | Kuiu Island |
| Petersburg Creek | 4 | 16 May | 42 | Kupreanof Island |
| Pleasant Bay Creek | 4 | 4 May | 48 | Admiralty Island |
| Ford Arm Creek | 4 | 26 May | 134 | Chichagof Island |
| Sitkoh Creek | 2 | 4 May | 112 | Chichagof Island |
| Peterson Creek | 3 | 5 May / 12 May | 27 | Northern mainland |

^a A limited survey also took place on 8 March.

SITUK RIVER WEIR AND FLOAT COUNTS

Between 8 May and 9 August, 6,709 steelhead were counted at the weir as they emigrated from the Situk River (Figure 3; Appendix A3). Peak emigration occurred 29 May, when 730 steelhead were counted downstream through the weir.

Total river float counts were conducted on 4 occasions. (Appendix A4, Figure 4). Detailed environmental conditions measured during the float counts are listed in Appendix A5. The highest total river count of 3,557 steelhead occurred on 18 - 19 May, when conditions were fair to good (53% of total weir count). In general, fish were concentrated within the lower river from the weir (about river mile 1.2) upstream to river mile 8.3 (Figure 4) at the time of the peak survey.

SITUK RIVER STEELHEAD BIOLOGICAL SAMPLING

We sampled a total of 657 steelhead for biological characteristics in 2000. The daily proportion of steelhead sampled is presented in Figure 3.

Seventy percent (70%) of the fish sampled were females averaging 773 mm (SE = 3 mm) in length

(Table 2). Females ranged in length from 520 mm to 935 mm. The average total length of male steelhead was 749 mm (SE = 6 mm), from a range of 380 mm to 950 mm. Generally, dark fish tended to be longer than bright fish regardless of sex (Table 3). Males were also generally much darker in color than females.

Of the 657 steelhead sampled during the 2000 emigration, 162 (25%) exhibited at least 1 wound or scar, 22 exhibited at least 2 different types of wounds, and 1 carried 3 distinctly different types of wounds or scars. Seventy-four (11%) of the (once) wounded fish had fishhook related (carrying hooks or torn mouth parts or mouth puncture) injuries and 6 fish were gillnet scarred. The majority (37) of the single source wounds were of the open, gaping wound or puncture mark type. Of the 657 steelhead sampled, 12 or 1.8% (SE = 0.65%) were at least 36 inches in total length. Based on this sample and the 6,709 emigrants counted at the Situk River weir, an estimated 123 (SE = 35) fish \geq 36 inches emigrated through the weir during 2000.

A total of 12 steelhead mortalities washed up on the weir during 2000; 2 were female and 10 were male. Four of the males were dark in coloration, and the rest were medium colored. One of the females was medium and the other was dark. All

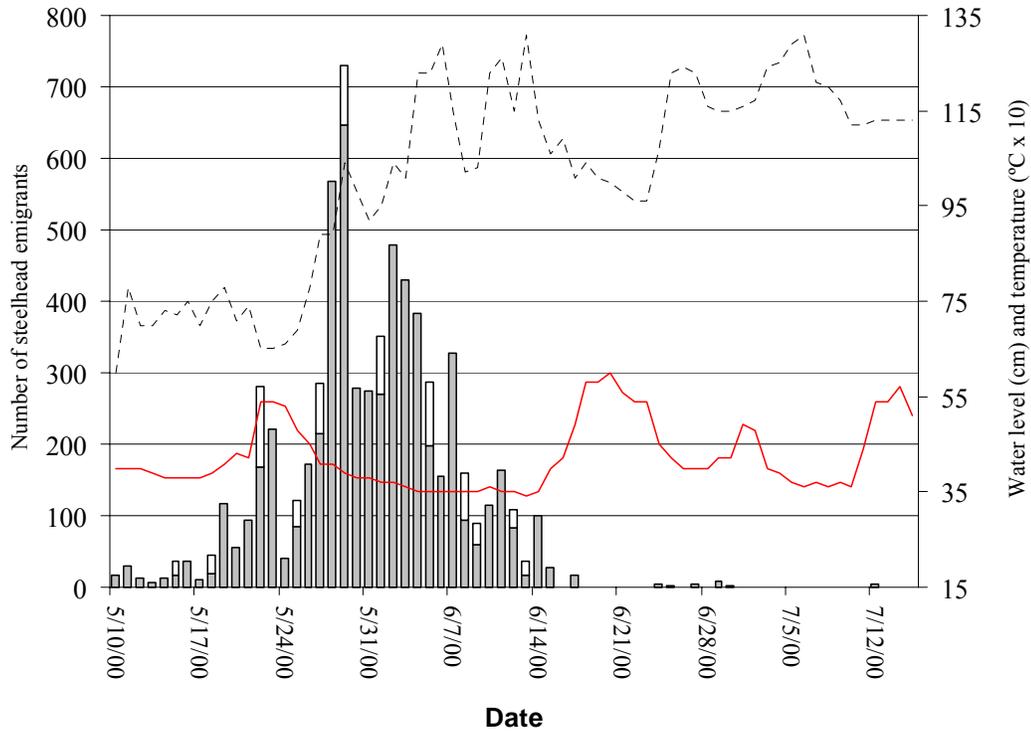


Figure 3.—Daily counts of emigrant steelhead (bars), sampled steelhead (light portion of bars), water level readings (solid line), and water temperature x 10 (dashed line), at the Situk River weir, 2000.

of these fish exhibited external fungal growth. The average total length of these steelhead mortalities was 825 mm, larger than the average size of the other sampled kelts (766 mm).

A total of 108 steelhead met the predetermined tagging criteria and were implanted with a PIT tag during the 2000 season. The PIT tag identification number and the associated biological data for each fish tagged are presented in Appendix A6.

DISCUSSION

We now have consistent snorkel survey data for 10 index systems for 1997–2000 (Table 4). Summing the peak surveys for the 10 index streams monitored consistently results in a total count of 1,400 steelhead in 1997, 957 in 1998, 983 in 1999 and 624 in 2000. Seven of the 10 systems had record low counts in 2000 and the

overall peak total was 35% below the previous low in 1997. Only Ford Arm Creek had counts above the prior two years and it was still well below the peak count in 1997. Peak count data from snorkel surveys done in 1996 in Peterson (36 fish), Pleasant Bay (168 fish) and Sitkoh (270 fish) creeks were also higher than in 2000. Spring stream conditions were generally good in 2000 so we think the counts were probably representative of lower abundance.

We dropped Humpback Creek from the index, at least temporarily, because of inexplicably high variations in counts (20, 91, 24, 4, 7) over the last 5 years. However, Management staff in Ketchikan are continuing to count steelhead in Humpback Creek to try and learn why the counts vary so greatly.

Emigration timing of steelhead in the Situk River was very similar to 1998 (Figure 5) and an average for recent years.

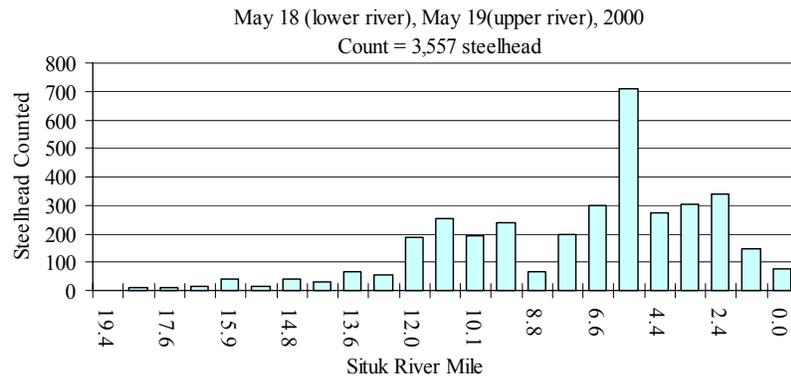
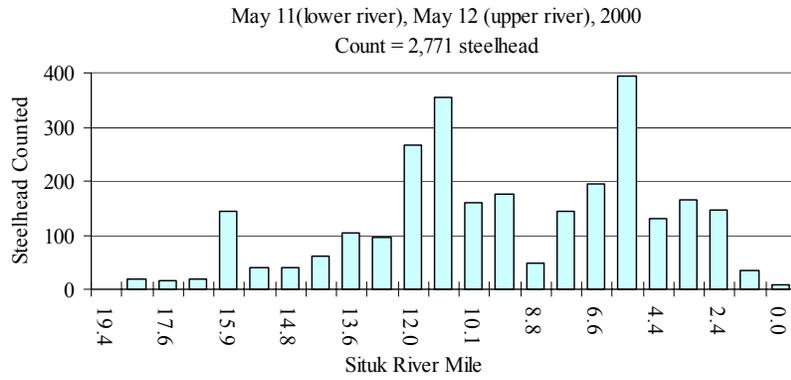
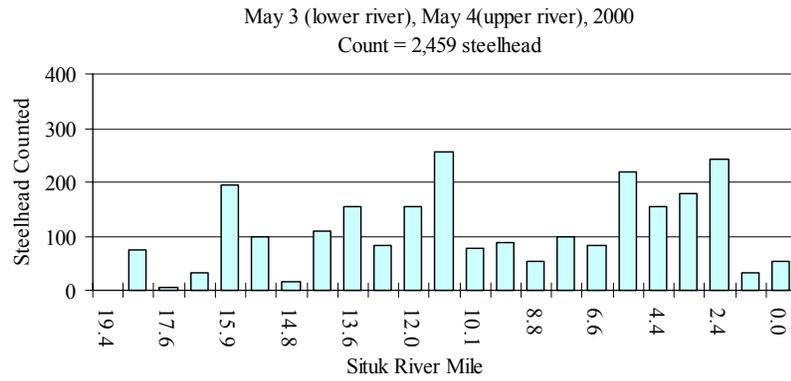
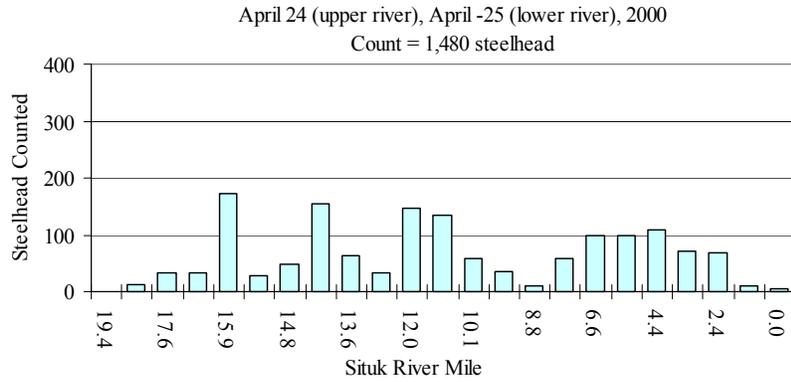


Figure 4.—Steelhead density per river-mile, Situk River float surveys, 2000.

Table 2.—Biological statistics by sex for all Situk River steelhead sampled randomly, 2000.

| | M | F | All |
|----------------------------|------|------|------|
| Sample size | 195 | 462 | 657 |
| % by sex | 30 | 70 | 100 |
| SE % by sex | 1.8 | 1.8 | — |
| Mean length (mm) | 749 | 773 | 766 |
| SD (length) | 89.2 | 66.6 | 74.8 |
| SE (mean length) | 6.3 | 2.9 | 2.8 |
| Number of fish ≥ 36 " | 8 | 4 | 12 |
| % of fish ≥ 36 " | 4.1 | 0.9 | 1.8 |
| SE % of fish ≥ 36 " | 0.2 | 0.1 | 0.5 |
| Bright | 55 | 413 | 468 |
| Medium | 98 | 34 | 132 |
| Dark | 42 | 15 | 57 |
| With fungus | 55 | 0 | 55 |
| Without fungus | 140 | 462 | 657 |

The 2000 emigration was 27% lower than in 1999, which was the highest ever in recent history (Table 5). The 2000 emigration was slightly higher than in 1998 and 1995.

Mean lengths generally show no specific trends over recent comparable years, but a small increase in the proportion of females since 1997 is suggested (Table 6). Because inriver/spawning mortality rates are unknown, the number of fish in the Situk River escapement (i.e., emigration + mortalities + harvest) that are in the size range allowed for harvest (≥ 36 inches) is unknown. Few Situk steelhead are harvested annually in the sport fishery (1997–1999 range = 11 to 101, Howe et al. 2001). However, the number of emigrants ≥ 36 in length has declined from 6% in 1997 to 1.8% in 2000. Similarly, the proportion of steelhead exhibiting external fungal growth and fish that are dark in coloration also declined. These trends are consistent with the idea that the run in recent years is richer in younger-aged fish. The incidence of wounded fish declined to 25% in 2000 from 51% in 1999 (Johnson and Jones 2000).

The 108 steelhead implanted with a PIT tag and released during 2000 was close to the number pro-

Table 3.—Average total length (mm) for male and female steelhead, by color classification, in the Situk River, 2000.

| Sex | Statistic | Bright | Medium | Dark |
|--------|-------------|--------|--------|------|
| Male | Sample size | 55 | 98 | 42 |
| | Mean length | 698 | 750 | 811 |
| | SD | 79.8 | 79.6 | 82.4 |
| | SE | 10.7 | 8.0 | 12.7 |
| Female | Sample size | 413 | 34 | 15 |
| | Mean length | 773 | 754 | 823 |
| | SD | 66 | 62.5 | 67.3 |
| | SE | 3.3 | 10.7 | 17.4 |

Table 4.—Peak steelhead survey counts for index systems monitored from 1997–2000.

| Stream | 1997 | 1998 | 1999 | 2000 |
|-----------------------------|-------|------|------|------------------|
| Peterson Creek | 26 | 29 | 38 | 27 |
| Pleasant Bay | 155 | 81 | 132 | 48 |
| Ketchikan Creek | 48 | 47 | 19 | 15 |
| McDonald Lake | 145 | 86 | 100 | 47 |
| White River | 84 | 93 | 60 | 38 |
| Slippery Creek ^a | - | - | - | 42 |
| Petersburg Creek | 123 | 152 | 115 | 42 |
| Eagle Creek | 90 | 56 | 118 | 82 |
| Harris River | 104 | 156 | 192 | 79 |
| Ford Arm Creek | 296 | 103 | 89 | 134 |
| Sitkoh Creek | 329 | 154 | 120 | 112 |
| Total | 1,400 | 957 | 983 | 624 ^b |

^a Slippery Creek not sampled in 1997 - 1999.

^b Slippery Creek peak count not included in total.

jected (100) prior to the season. Eventually, a database will be developed including images of scales collected during successive sampling events to document changes in scale edge structure over time.

Situk River float count data for the lower river would have again underestimated 2000 run strength as only 53% of the run was counted (Table 5). This was due to only fair to good float count conditions (subsurface visibility was less

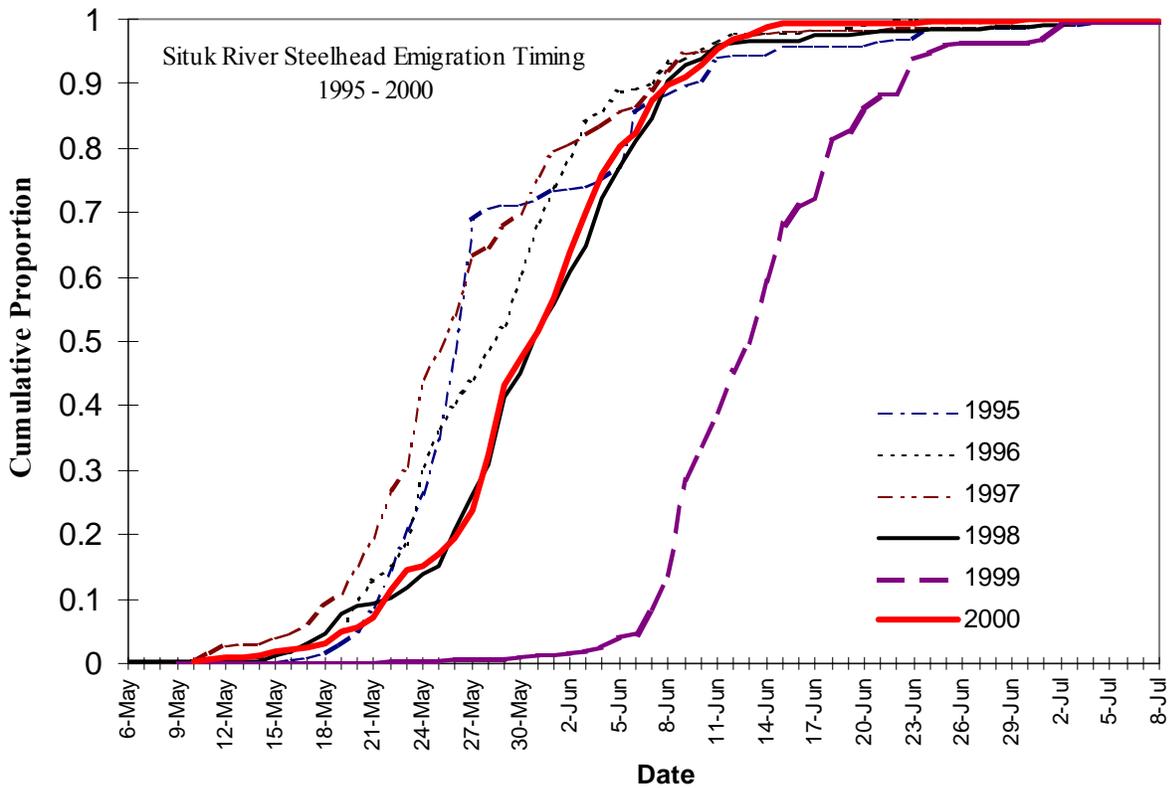


Figure 5.—Cumulative proportions of Situk River weir daily steelhead counts, 1995–2000.

Table 5.—Weir count, peak float count, proportion of total steelhead observed, and subjective survey conditions during 7 years of both weir operation and standardized float surveys for entire river and lower river, 1994–2000.

| YEAR | WEIR COUNT | ENTIRE RIVER | | LOWER RIVER | | SUBJECTIVE SURVEY CONDITIONS | |
|------|------------|--------------------|---------------------|------------------|---------------------|---|--------------------------|
| | | Peak float count | Proportion observed | Peak float count | Proportion observed | Entire river (upper ^a / lower ^b) | Lower river ^b |
| 1994 | 7,854 | 4,702 | 0.60 | 4,383 | 0.56 | v. good / good | good |
| 1995 | 6,608 | 6,235 | 0.94 | 5,189 | 0.78 | exc. / exc. | excellent |
| 1996 | 8,510 | 5,934 | 0.70 | 5,867 | 0.69 | exc. / fair | fair |
| 1997 | 7,328 | 4,943 | 0.67 | 4,377 | 0.60 | good / good-exc. | good-exc. |
| 1998 | 5,786 | N/A | N/A | 3,282 | 0.57 | not counted | excellent |
| 1999 | 9,204 | N/A | N/A | 3,778 | 0.41 | not counted | fair |
| 2000 | 6,709 | 3,557 | 0.53 | 3,284 | 0.49 | good | good/fair |
| Mean | 7,428 | 4,859 ^c | 0.69 ^c | 4,309 | 0.59 | | |
| SE | 0 | | 0.15 | | 0.12 | | |

^a From Situk Lake to Nine Mile bridge.

^b From Nine Mile bridge to Lower Landing.

^c Does not include 1998 or 1999.

Table 6.—Comparison of biological statistics for all Situk River steelhead sampled randomly, 1997–2000.

| | 1997 | 1998 | 1999 | 2000 |
|--|-------|-------|-------|-------|
| Emigration count | 7,328 | 5,786 | 9,204 | 6,709 |
| Sample size | 797 | 1,136 | 697 | 657 |
| % Male | 41 | 36 | 36 | 31 |
| % Female | 59 | 64 | 64 | 69 |
| Mean length (mm) | 791 | 765 | 794 | 766 |
| SD (length) | 83 | 80 | 62 | 75 |
| SE (mean length) | 3 | 2 | 2 | 3 |
| No. sampled ≥ 36" | 48 | 38 | 17 | 12 |
| % of sample ≥ 36 " | 6.0 | 3.0 | 2.4 | 1.8 |
| % Bright | 57 | 66 | 74 | 71 |
| % Medium | 18 | 19 | 15 | 20 |
| % Dark | 25 | 14 | 12 | 9 |
| % With fungus | 29 | 15 | 13 | 8 |
| % Without fungus | 71 | 85 | 87 | 92 |

than ideal, and fish were probably concentrated above the Nine Mile bridge). As in previous years, float timing, river water depth, and the ability of the observers to accurately count large groups of fish passing the boat (during late season surveys up to 7,000 steelhead can be concentrated in a small section of the lower river), also affected steelhead counting accuracy. Recent increases in angler and boat densities during the peak of the steelhead season continue to degrade subsurface visibility in the river. This was noticeable again during 2000 when water levels were generally marginal.

We recommend that float surveys continue. Additional data will improve estimates of the proportion of the total Situk River steelhead population observed during float surveys. The long-term database of observations since 1987 (Table 7) should be maintained. These data, in conjunction with data from Table 5, will be valuable if the weir is removed in the future and also can be used to estimate past run sizes. Johnson and Jones (1999) provide a more detailed discussion of comparisons of float counts with weir counts of steelhead escapement in the Situk River.

Table 7.—Date, location, and peak counts of steelhead during Situk River float surveys, 1987–2000.

| YEAR | UPPER RIVER | | LOWER RIVER | | TOTAL |
|------|-------------|------|-------------|------|-------|
| | RIVER | DATE | RIVER | DATE | |
| 1987 | 1,123 | 5/11 | 2,083 | 5/12 | 3,206 |
| 1988 | 430 | 5/15 | 2,165 | 5/25 | 2,595 |
| 1989 | 1,016 | 5/20 | 1,235 | 5/21 | 2,251 |
| 1990 | 502 | 5/16 | 1,138 | 5/17 | 1,640 |
| 1991 | 386 | 5/14 | 593 | 5/12 | 979 |
| 1992 | 220 | 5/16 | 663 | 5/16 | 883 |
| 1993 | 369 | 5/19 | 3,130 | 5/18 | 3,499 |
| 1994 | 319 | 5/21 | 4,383 | 5/21 | 4,702 |
| 1995 | 1,406 | 5/8 | 4,829 | 5/9 | 6,235 |
| 1996 | 566 | 5/21 | 5,368 | 5/21 | 5,934 |
| 1997 | 848 | 5/4 | 4,095 | 5/5 | 4,943 |
| 1998 | N/A | N/A | 3,282 | 5/27 | 3,282 |
| 1999 | N/A | N/A | 3,778 | 6/9 | 3,778 |
| 2000 | 273 | 5/19 | 3,284 | 5/18 | 3,557 |

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LITERATURE CITED

- Cochran, W. G. 1977. Sampling techniques, third edition. John Wiley and Sons, New York.
- Didier, A. J., Jr., and R. P. Marshall. 1991. Incidental harvest and voluntary release of steelhead and chinook salmon in the Situk River commercial set gillnet fishery during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-19. Anchorage.

- Freeman, G. M. 1992. An evaluation of juvenile hatchery steelhead in the Ward Creek system, Ketchikan, Alaska, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-55. Anchorage.
- Freeman, G. M. 1995. An evaluation of steelhead enhancement in the Ward Creek drainage, Ketchikan Alaska, 1991–1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-2. Anchorage.
- Freeman, G. M. and S. H. Hoffman. 1989. Steelhead creel census on the Klawock River, Southeast Alaska, 1987–1988. Alaska Department of Fish and Game, Fishery Data Series No. 118. Juneau.
- Freeman, G. M. and S. H. Hoffman. 1990. Steelhead creel census and recreation survey on the Thorne River, Southeast Alaska, 1988–1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-34. Anchorage.
- Freeman, G. M. and S. H. Hoffman. 1991. Thorne River steelhead creel and recreation survey, Southeast Alaska, 1989–1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-30. Anchorage.
- Glynn, B. 1992. Situk River steelhead and chinook salmon creel surveys and weir, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-47. Anchorage.
- Glynn, B., and S. Elliott. 1993. Situk river steelhead trout counts, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-29. Anchorage.
- Harding, R. and D. Jones. 1990. Peterson Creek and lake system steelhead evaluation, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-37. Anchorage.
- Harding, R. and D. Jones. 1991. Peterson Creek and lake system steelhead evaluation, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-31. Anchorage.
- Harding, R. and D. Jones. 1992. Peterson Creek and lake system steelhead evaluation, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-46. Anchorage.
- Harding, R. and D. Jones. 1993. Karta River steelhead: 1992 escapement and creel survey studies. Alaska Department of Fish and Game, Fishery Data Series No. 93-30. Anchorage.
- Harding, R. and D. Jones. 1994. Sitkoh Creek steelhead: 1993 escapement and harvest. Alaska Department of Fish and Game, Fishery Data Series No. 94-36. Anchorage.
- Hoffman, S. H., J. Koerner, and D. Magnus. 1990. Steelhead habitat preference, creel census, and recreation survey on the Karta River, Southeast Alaska, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-45. Anchorage.
- Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-08, Anchorage.
- Hubartt, D. 1989. Ward Creek steelhead creel survey, Ketchikan, Alaska, 1988. Alaska Department of Fish and Game, Fishery Data Series No. 119. Juneau.
- Hubartt, D. 1990. Ward Creek steelhead creel survey, Ketchikan, Alaska, October 1988–May 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-40. Anchorage.
- Johnson, R. E. 1990. Steelhead trout studies: Situk River, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-47. Anchorage.
- Johnson, R. E. 1991. Situk River steelhead studies, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-49. Anchorage.
- Johnson, R. E. 1996. Situk River steelhead trout studies, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 96-1. Anchorage.
- Johnson, R. E. and R. P. Marshall. 1991. Harvest estimates for selected sport fisheries in Yakutat, Alaska in 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-42. Anchorage.
- Johnson, R. E. and J. D. Jones 1998. Southeast Alaska steelhead studies, 1997: Situk River weir and surveys of index streams. Alaska Department of Fish and Game, Fishery Data Series No. 98-45. Anchorage.
- Johnson, R. E. and J. D. Jones 1999. Southeast Alaska steelhead studies, 1998: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 99-33. Anchorage.
- Johnson, R. E. and J. D. Jones 2000. Southeast Alaska steelhead studies, 1998: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 00-16. Anchorage.
- Jones, D. E. 1972. A study of steelhead-cutthroat trout in Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1971-1972. Project F-9-4. 13(G-II-I).

- Jones, D. E. 1973. Steelhead and sea-run cutthroat trout life history in southeast Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1972-1973. Project AFS-42. 14(AFS-42-1).
- Jones, D. E. 1974. Life history of steelhead trout in southeast Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1973-1974. Project AFS-42. 15(AFS-42-2).
- Jones, D. E. 1975. Life history of steelhead trout. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1974-1975. Project AFS-42. 16(AFS-42-3-A).
- Jones, D. E. 1976. Life history of steelhead trout. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1975-1976. Project AFS-42. 17(AFS-42-4-A).
- Jones, D. E. 1983. A study of cutthroat-steelhead in Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983. Volume 24 (AFS-42-10-A), Juneau.
- Jones, J. D., R. Harding, and A. Schmidt. 1991. Sitkoh Creek steelhead study, 1990. Alaska Department of Fish and Game, Fisheries Data Series No. 91-32. Anchorage.
- Knapp, L. 1952. Annual Report Yakutat District, 1952. U.S. Fish and Wildlife Service.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-40. Anchorage.
- Schmidt, A. E. 1992. Sitkoh Creek steelhead study, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-31. Anchorage.
- Shardlow, T., R. Hilborn, and D. Lightly. 1987. Components analysis of instream escapement methods for Pacific salmon (*Oncorhynchus* spp.). *Can. J. Fish. Aquat. Sci.*, Vol. 44, 1031-1037.
- Welander, A. D. 1940. A study of the development of the scale of the chinook salmon (*Oncorhynchus tshawytscha*). Master's thesis, University of Washington, Seattle.
- Yanusz, R. J. 1997. Sea-run cutthroat trout, sea-run Dolly Varden, and steelhead population status at Sitkoh Creek, Southeast Alaska, during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-23. Anchorage.

APPENDIX A

Appendix A1.–Steelhead index stream name, stream number, general location, length and percent of stream surveyed, and number of survey reaches, 2000.

| Index stream name | Stream number | General location | Distance surveyed / total (feet) ^a | Percent of stream surveyed | Number of reaches |
|---------------------|---------------|------------------|---|----------------------------|-------------------|
| Ford Arm Creek | 113-73-10030 | Sitka | 4,582/24,002 | 19 | 2 |
| Sitkoh Creek | 113-59-10004 | Sitka | 16,192/20,136 | 80 | 3 |
| Peterson Creek | 111-50-10010 | Juneau | 3,663/7,553 | 48 | 1 |
| Pleasant Bay Creek | 111-12-10005 | Juneau | 9,495/12,405 | 77 | 3 |
| Petersburg Creek | 106-44-10600 | Petersburg | 22,401/72,983 | 31 | 2 |
| Slippery Creek | 109-43-10030 | Petersburg | 9,618/11,491 | 84 | 3 |
| Eagle Creek | 107-40-10055 | POW | 28,716/49,136 | 58 | 4 |
| Harris River | 102-60-10820 | POW | 38,758/96,466 | 40 | 5 |
| McDonald Lake Creek | 101-80-10068 | Ketchikan | 11,259/11,259 | 100 | 4 |
| Ketchikan Creek | 101-47-10250 | Ketchikan | 4,096/4,096 | 100 | 3 |
| White River | 101-44-10024 | Ketchikan | 19,719/35,750 | 55 | 3 |

^a Feet to be surveyed/feet of anadromous stream.

Appendix A2.– Counts of steelhead from 2000 surveys by stream, date, and reach of stream along with measured habitat variables. (Light levels are EV values from a light meter calibrated to ASA 100).

| Stream name | Date | Reach | Distance surveyed (miles) | Survey type ^a | # live | # redds | Weather codes ^b | Observers ^c | Surface light | Surface light trans | Temp. (°C) | Comments ^d |
|-------------------|----------|-------|---------------------------|--------------------------|--------|---------|----------------------------|------------------------|---------------|---------------------|------------|------------------------------|
| Ford Arm | 05/08/00 | 1 | Length | S | 64 | | C | TB, TT | | | 5.6 | |
| Ford Arm | 05/08/00 | 2 | Length | S | 22 | | C | TB, TT | | | 5.6 | |
| Ford Arm | 05/08/00 | 3 | Length | S | 0 | | C | TB, TT | | | 5.6 | |
| Ford Arm | 05/15/00 | 1 | Length | S | 64 | | O | TB,RH,KK | | | 7.7 | |
| Ford Arm | 05/15/00 | 2 | Length | S | 68 | | O | TB,RH,KK | | | 7.7 | |
| Ford Arm | 05/15/00 | 3 | Length | S | 0 | | O | TB,RH,KK | | | 7.7 | |
| Ford Arm | 05/26/00 | 1 | Length | S | 60 | | C | TB | | | 8.5 | |
| Ford Arm | 05/26/00 | 2 | Length | S | 74 | | C | TB | | | 8.5 | |
| Ford Arm | 05/26/00 | 3 | Length | S | 0 | | C | TB | | | 8.5 | |
| Ford Arm | 06/01/00 | 1 | Length | S | 35 | | C | TB | | | 7.9 | |
| Ford Arm | 06/01/00 | 2 | Length | S | 54 | | C | TB | | | 7.9 | |
| Ford Arm | 06/01/00 | 3 | Length | S | 0 | | C | TB | | | 7.9 | |
| Sitkoh | 05/04/00 | 1 | Length | S | 8 | | C | TB,TT,DM | | | 6.1 | |
| Sitkoh | 05/04/00 | 2 | Length | S | 45 | | C | TB,TT,DM | | | 6.1 | |
| Sitkoh | 05/04/00 | 3 | Length | S | 59 | | C | TB,TT,DM | | | 6.1 | |
| Sitkoh | 05/17/00 | 1-2 | Length | S | 108 | | R | TB,RH | | | 7.6 | |
| Starrigavan | 05/05/00 | 1 | Length | S | 0 | | C | TB | | | | |
| Starrigavan | 05/05/00 | 2 | Length | S | 2 | | C | TB | | | | |
| Starrigavan | 05/05/00 | 3 | Length | S | 4 | | C | TB | | | | |
| Starrigavan | 05/16/00 | 1 | Length | S | 0 | | O | TB,KK | | | | |
| Starrigavan | 05/16/00 | 2 | Length | S | 4 | | O | TB,KK | | | | |
| Starrigavan | 05/16/00 | 3 | Length | S | 0 | | O | TB,KK | | | | |
| Eagle Creek | 03/08/00 | | 0.5 | S | 12 | 0 | O | SH | | | 2.2 | Eagle Ck only lake to Canyon |
| Luck Ck/Eagle Cr. | 04/25/00 | | | S | 57 | | | BC | | | | |

-continued-

Appendix A2.—Page 2 of 4.

| Stream name | Date | Reach | Distance | Survey type ^a | # live | # redds | Weather codes ^b | Observers ^c | Surface | | | Comments ^d |
|-------------------|----------|-------|------------------|--------------------------|--------|---------|----------------------------|------------------------|---------|-------------|------------|-----------------------|
| | | | surveyed (miles) | | | | | | light | light trans | Temp. (°C) | |
| Luck Ck/Eagle Cr. | 05/05/00 | | | S | 82 | | | BC | | | | |
| Luck Ck/Eagle Cr. | 05/12/00 | | | S | 61 | | | BC | | | | |
| Harris River | 04/24/00 | | | S | 52 | | | BC | | | | |
| Harris River | 05/04/00 | | | S | 79 | | | BC | | | | |
| Harris River | 05/16/00 | | | S | 69 | | | BC | | | | |
| Petersburg Creek | 05/04/00 | 1 | | F | 7 | 2 | C | DB | | | 6 | |
| Petersburg Creek | 05/04/00 | 2 | | F | 3 | 3 | C | DB | | | | |
| Petersburg Creek | 05/07/00 | 1 | | F | 6 | 2 | O | DB | | | 6 | Depth 32 |
| Petersburg Creek | 05/07/00 | 2 | | F | 3 | 2 | O | DB | | | | |
| Petersburg Creek | 05/10/00 | 1 | | S | 11 | 3 | C | DB,RB | | | 7 | |
| Petersburg Creek | 05/10/00 | 2 | | S | 26 | 3 | C | DB,RB | | | | |
| Petersburg Creek | 05/16/00 | 1 | | S | 14 | 3 | O | DB,TT | | | 8 | Depth 31 |
| Petersburg Creek | 05/16/00 | 2 | | S | 28 | 4 | O | DB,TT | | | | |
| Slippery Creek | 05/02/00 | 1 | | S | 0 | 2 | | KM,RB | | | 10 | Stream Gauge 1.3 |
| Slippery Creek | 05/02/00 | 2 | | S | 19 | 0 | | KM,RB | | | | |
| Slippery Creek | 05/02/00 | 3 | | | | | | | | | | Not surveyed |
| Slippery Creek | 05/11/00 | 1 | | S | 12 | 0 | | KM,RB | | | 12 | Stream Gauge 1.6 |
| Slippery Creek | 05/11/00 | 2 | | S | 21 | 0 | | KM,RB | | | | |
| Slippery Creek | 05/11/00 | 3 | | | | | | | | | | Not surveyed |
| Slippery Creek | 05/18/00 | 1 | | S | 11 | | | DB,RB | | | 12 | Stream Gauge 1.0 |
| Slippery Creek | 05/18/00 | 2 | | S | 22 | | | DB,RB | | | | |
| Slippery Creek | 05/18/00 | 3 | | S | 9 | | | | | | | |
| Humpback Creek | 04/24/00 | 1 | | S | 7 | 2 | O | SH,GF,AH | 10 | 9 | 5 | Water Level 32 |
| Humpback Creek | 04/24/00 | 2 | | S | 0 | 0 | O | SH,GF,AH | 10 | 9 | 5 | Water Level 32 |
| Humpback Creek | 04/24/00 | 3 | | S | 0 | 0 | O | SH,GF,AH | 10 | 9 | 5 | Water Level 32 |
| Humpback Creek | 05/05/00 | 1 | | S | 3 | 0 | O | SH,MW,AH | 8 | 7 | 5 | Water Level 32 |
| Humpback Creek | 05/05/00 | 2 | | S | 1 | 3 | O | SH,MW,AH | 8 | 7 | 5 | Water Level 32 |
| Humpback Creek | 05/05/00 | 3 | | S | 0 | 0 | O | SH,MW,AH | 8 | 7 | 5 | Water Level 32 |
| Humpback Creek | 05/18/00 | 1 | | S | 0 | 3 | O/C | GF,AH,AP | 9 | 8 | 10 | Water 6" above normal |

-continued-

Appendix A2.–Page 3 of 4.

| Stream name | Date | Reach | Distance | Survey type ^a | # live | # redds | Weather codes ^b | Observers ^c | Surface | | | Comments ^d |
|-----------------|----------|-------|------------------|--------------------------|--------|---------|----------------------------|------------------------|---------------|-------------|------------|--|
| | | | surveyed (miles) | | | | | | Surface light | light trans | Temp. (°C) | |
| Humpback Creek | 05/18/00 | 2 | | S | 0 | 3 | O | GF,AH,AP | 9 | 8 | 10 | Water 6" above normal |
| Humpback Creek | 05/18/00 | 3 | | S | 0 | 1 | O | GF,AH,AP | 9 | 8 | 10 | Water 6" above normal |
| Karta River | 03/09/00 | | | R&R | 7 | 0 | O | SH | | | 3 | 3 anglers 3 hrs, 6 spring SH & 1 fall SH |
| Ketchikan Creek | 04/26/00 | 1 | 0.2 | S | 1 | 0 | O | SH,AH | 8.5 | 7.5 | 6 | 5 RB, Water Level 32 |
| Ketchikan Creek | 04/26/00 | 2 | 0.2 | S | 1 | 0 | O | SH,AH | 8.5 | 7.5 | 6 | 1 RB |
| Ketchikan Creek | 05/04/00 | 1 | 0.8 | S | 4 | | O | SH,MW | 8 | 9 | 8 | 35 RB, water level 33 |
| Ketchikan Creek | 05/04/00 | 2 | 0.2 | S | 3 | | O | SH,MW | 8 | 9 | 8 | 35 RB, water level 33 |
| Ketchikan Creek | 05/15/00 | 1 | 0.2 | S | 7 | | C | MW,AP | 9 | 9 | 10 | 30 RB, Water Level 31 |
| Ketchikan Creek | 05/15/00 | 2 | 0.2 | S | 3 | | C | MW,AP | 9 | 9 | 10 | 20 RB |
| Ketchikan Creek | 05/23/00 | 1 | 0.2 | S | 10 | 0 | O | SH,GF | 7 | 6 | 7 | 1,100 hatchery SH smolt |
| Ketchikan Creek | 05/23/00 | 2 | 0.2 | S | 5 | 1 | O | SH,GF | 7 | 6 | 7 | 40+ RB, 50 DV |
| Ketchikan Creek | 05/31/00 | 1 | 0.8 | S | 9 | | C | SH,GF | 9 | 8 | | Water 4.1, 12 RB |
| Ketchikan Creek | 05/31/00 | 2 | 0.2 | S | 2 | 1 | C | SH,GF | | | | 21 RB |
| McDonald Lake | 04/27/00 | 1 | | S | 5 | 0 | O | SH,AH,VS | 8 | 7 | 8 | Water 32, 9 RB |
| McDonald Lake | 04/27/00 | 2 | | S | 5 | 0 | O | SH,AH,VS | | | | 2 RB |
| McDonald Lake | 04/27/00 | 3 | | S | 12 | 0 | O | SH,AH,VS | | | | 32 RB |
| McDonald Lake | 04/27/00 | 4 | | S | 6 | 0 | R | SH,AH,VS | | | | 6 RB |
| McDonald Lake | 05/09/00 | 1 | | S | 6 | | C | SH,AH | 9.5 | 9 | 5 | Water 32, 6 RB |
| McDonald Lake | 05/09/00 | 2 | | S | 22 | | C | SH,AH | | | | 12 RB |
| McDonald Lake | 05/09/00 | 3 | | S | 2 | | C | SH,AH | | | | 50 RB |
| McDonald Lake | 05/09/00 | 4 | | S | 6 | | C | SH,AH | | | | 8 RB |
| McDonald Lake | 05/25/00 | 1 | | S | 17 | 0 | C | GF,AP,JS | 8 | 8 | 10 | |
| McDonald Lake | 05/25/00 | 2 | | S | 16 | 8 | C | GF,AP,JS | | | | |
| McDonald Lake | 05/25/00 | 3 | | S | 9 | 0 | C | GF,AP,JS | | | | 6 of total in lake |
| McDonald Lake | 05/25/00 | 4 | | S | 5 | 3 | C | GF,AP,JS | | | | visibility slightly impaired |
| McDonald Lake | 06/01/00 | 1 | | S | 14 | 0 | C | SH,GF | 9 | 9 | | Lots of RB to 18" |
| McDonald Lake | 06/01/00 | 2 | | S | 13 | 7 | C | SH,GF | 9 | 9 | | |

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Appendix A2.—Page 4 of 4.

| Stream name | Date | Reach | Distance surveyed (miles) | Survey type ^a | # live | # redds | Weather codes ^b | Observers ^c | Surface | | | Comments ^d |
|--------------------|----------|-------|---------------------------|--------------------------|--------|---------|----------------------------|------------------------|---------------|-------------|------------|-----------------------------|
| | | | | | | | | | Surface light | light trans | Temp. (°C) | |
| McDonald Lake | 06/01/00 | 3 | | S | 6 | 1 | C | SH,GF | 9 | 9 | | DV- 300+ |
| McDonald Lake | 06/01/00 | 4 | | S | 2 | 0 | C | SH,GF | 9 | 9 | | few RB |
| White River | 04/25/00 | 1 | | S | 8 | 0 | C | SH,GF | 9 | 8 | 6 | Water Level 32 |
| White River | 04/25/00 | 2 | | S | 1 | 0 | C | SH,GF | | | | |
| White River | 04/25/00 | 3 | | S | 16 | 0 | C | SH,GF | | | | |
| White River | 05/06/00 | 1 | | S | 11 | | O | SH,MW | 7.5 | 6.5 | 8 | Water Level 32 |
| White River | 05/06/00 | 2 | | S | 9 | 3 | O | SH,MW | | | | |
| White River | 05/06/00 | 3 | | S | 18 | | O | SH,MW | | | | |
| White River | 05/16/00 | 1 | | S | 1 | 3 | O | GF,AP | 12 | 11 | 8 | Water 3 inch below abutment |
| White River | 05/16/00 | 2 | | S | 3 | 4 | O | GF,AP | | | | |
| White River | 05/16/00 | 3 | | S | 19 | 5 | O | GF,AP | | | | |
| Peterson Creek | 05/05/00 | 1 | | S | 27 | | C | MS, BG | | | | Water Level -33 |
| Peterson Creek | 05/12/00 | 1 | | S | 27 | | C | MS, BG | | | 9.5 | Water Level -37 |
| Peterson Creek | 05/26/00 | 1 | | S | 6 | | | MS, BG | | | 9 | Water Level -42 |
| Pleasant Bay Creek | 04/28/00 | 1 | | S | 3 | | C | MS,BG,DJ | 11.3 | 9.8 | 5 | Water Level -38 |
| Pleasant Bay Creek | 04/28/00 | 2 | | S | 16 | | C | MS,BG,DJ | | | | |
| Pleasant Bay Creek | 05/04/00 | 1 | | S | 23 | 3 | C | MS,BG,DJ | 13.0 | 10.0 | 6 | Water Level -28 |
| Pleasant Bay Creek | 05/04/00 | 2 | | S | 25 | 0 | C | MS,BG,DJ | | | | |
| Pleasant Bay Creek | 05/10/00 | 1 | | S | 16 | 3 | C | MS,BG,DJ | 11.5 | 9.5 | 7 | Water Level -30 |
| Pleasant Bay Creek | 05/10/00 | 2 | | S | 10 | 3 | C | MS,BG,DJ | | | | |
| Pleasant Bay Creek | 05/18/00 | 1 | | S | 7 | 9 | O | MS,BG,DJ | 12.0 | 10.0 | 7 | Water Level -10 |
| Pleasant Bay Creek | 05/18/00 | 2 | | S | 14 | 3 | O | MS,BG,DJ | | | | |

^a S = snorkel, F = foot, R&R = rod and reel

^b C = clear, O = overcast, R = rain, O/C = Overcast with breaks

^c Primary observer(s) initials: MS (Mark Schwan), BG (Brian Glynn), KK (Kurt Kondzela), RH (Roger Harding), DJ (Doug Jones), AS (Art Schmidt), MW (Mike Wood), BC (Bob Chadwick), GF (Glenn Freeman), TB (Tom Brookover), TT (Troy Tydingco), AP (Andy Piston), VG (Vera Goudima), DB (Dean Beers), TQ (Todd Qualls), DM (Dave Magnus).

^d Abbreviations: DV = Dolly Varden *Salvelinus malma*, SH = steelhead, RB = rainbow trout *O. mykiss*

Appendix 3.—Daily steelhead emigration count, steelhead biological samples taken, and water level and temperature data, Situk River weir, 2000.

| Date | Steelhead down | Morts (incl.) | Cumulative proportion | Number sampled | Not sampled | Cumulative % sampled | Water level (cm) | Water temp. (°C) |
|---------|----------------|---------------|-----------------------|----------------|-------------|----------------------|------------------|------------------|
| 5/9/00 | 0 | 0 | 0.000 | 0 | 0 | 0% | - | 6.8 |
| 5/10/00 | 18 | 0 | 0.003 | 0 | 18 | 0% | 40 | 6.0 |
| 5/11/00 | 29 | 0 | 0.007 | 0 | 29 | 0% | 40 | 7.8 |
| 5/12/00 | 13 | 0 | 0.009 | 0 | 13 | 0% | 40 | 7.0 |
| 5/13/00 | 7 | 0 | 0.010 | 0 | 7 | 0% | 39 | 7.0 |
| 5/14/00 | 13 | 0 | 0.012 | 0 | 13 | 0% | 38 | 7.3 |
| 5/15/00 | 37 | 0 | 0.017 | 20 | 17 | 17% | 38 | 7.2 |
| 5/16/00 | 36 | 0 | 0.023 | 0 | 36 | 13% | 38 | 7.5 |
| 5/17/00 | 11 | 0 | 0.024 | 0 | 11 | 12% | 38 | 7.0 |
| 5/18/00 | 45 | 0 | 0.031 | 25 | 20 | 22% | 39 | 7.5 |
| 5/19/00 | 116 | 0 | 0.048 | 0 | 116 | 14% | 41 | 7.8 |
| 5/20/00 | 56 | 0 | 0.057 | 0 | 56 | 12% | 43 | 7.1 |
| 5/21/00 | 94 | 0 | 0.071 | 0 | 94 | 9% | 42 | 7.4 |
| 5/22/00 | 281 | 1 | 0.113 | 113 | 168 | 21% | 54 | 6.5 |
| 5/23/00 | 222 | 0 | 0.146 | 0 | 222 | 16% | 54 | 6.5 |
| 5/24/00 | 41 | 0 | 0.152 | 0 | 41 | 16% | 53 | 6.6 |
| 5/25/00 | 122 | 0 | 0.170 | 36 | 86 | 17% | 48 | 6.9 |
| 5/26/00 | 173 | 0 | 0.196 | 0 | 173 | 15% | 45 | 7.8 |
| 5/27/00 | 285 | 0 | 0.238 | 70 | 215 | 17% | 41 | 8.9 |
| 5/28/00 | 569 | 0 | 0.323 | 0 | 569 | 12% | 41 | 8.9 |
| 5/29/00 | 730 | 0 | 0.432 | 83 | 647 | 12% | 39 | 10.4 |
| 5/30/00 | 278 | 0 | 0.473 | 0 | 278 | 11% | 38 | 9.8 |
| 5/31/00 | 275 | 0 | 0.514 | 0 | 275 | 10% | 38 | 9.2 |
| 6/1/00 | 352 | 0 | 0.567 | 81 | 271 | 11% | 37 | 9.5 |
| 6/2/00 | 478 | 0 | 0.638 | 0 | 478 | 10% | 37 | 10.4 |
| 6/3/00 | 429 | 0 | 0.702 | 0 | 429 | 9% | 36 | 10.1 |
| 6/4/00 | 384 | 0 | 0.759 | 0 | 384 | 8% | 35 | 12.3 |
| 6/5/00 | 287 | 0 | 0.802 | 89 | 198 | 10% | 35 | 12.3 |
| 6/6/00 | 155 | 0 | 0.825 | 0 | 155 | 9% | 35 | 12.9 |
| 6/7/00 | 327 | 4 | 0.874 | 0 | 327 | 9% | 35 | 11.5 |
| 6/8/00 | 159 | 2 | 0.898 | 65 | 94 | 10% | 35 | 10.2 |
| 6/9/00 | 90 | 3 | 0.911 | 30 | 60 | 10% | 35 | 10.3 |
| 6/10/00 | 114 | 1 | 0.928 | 0 | 114 | 10% | 36 | 12.3 |
| 6/11/00 | 163 | 0 | 0.952 | 0 | 163 | 10% | 35 | 12.6 |
| 6/12/00 | 108 | 1 | 0.968 | 25 | 83 | 10% | 35 | 11.5 |
| 6/13/00 | 36 | 3 | 0.974 | 20 | 16 | 10% | 34 | 13.1 |
| 6/14/00 | 99 | 2 | 0.989 | 0 | 99 | 10% | 35 | 11.3 |
| 6/15/00 | 28 | 1 | 0.993 | 0 | 28 | 10% | 40 | 10.6 |
| 6/16/00 | 0 | 2 | 0.993 | 0 | 0 | 10% | 42 | 10.9 |
| 6/17/00 | 16 | 0 | 0.995 | 0 | 16 | 10% | 49 | 10.1 |
| 6/18/00 | 0 | 0 | 0.995 | 0 | 0 | 10% | 58 | 10.4 |
| 6/19/00 | 0 | 1 | 0.995 | 0 | 0 | 10% | 58 | 10.1 |
| 6/20/00 | 1 | 2 | 0.995 | 0 | 1 | 10% | 60 | 10.0 |
| 6/21/00 | 0 | 0 | 0.995 | 0 | 0 | 10% | 56 | 9.8 |
| 6/22/00 | 0 | 0 | 0.995 | 0 | 0 | 10% | 54 | 9.6 |
| 6/23/00 | 0 | 0 | 0.995 | 0 | 0 | 10% | 54 | 9.6 |

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Appendix A3.–Page 2 of 2.

| Date | Steelhead down | Morts (incl.) | Cumulative proportion | Number sampled | Not sampled | Cumulative % sampled | Water level (cm) | Water temp. (°C) |
|---------|----------------|---------------|-----------------------|----------------|-------------|----------------------|------------------|------------------|
| 6/24/00 | 4 | 0 | 0.996 | 0 | 4 | 10% | 45 | 10.7 |
| 6/25/00 | 3 | 0 | 0.996 | 0 | 3 | 10% | 42 | 12.3 |
| 6/26/00 | 1 | 0 | 0.996 | 0 | 1 | 10% | 40 | 12.4 |
| 6/27/00 | 5 | 0 | 0.997 | 0 | 5 | 10% | 40 | 12.3 |
| 6/28/00 | 0 | 0 | 0.997 | 0 | 0 | 10% | 40 | 11.6 |
| 6/29/00 | 8 | 0 | 0.998 | 0 | 8 | 10% | 42 | 11.5 |
| 6/30/00 | 2 | 0 | 0.999 | 0 | 2 | 10% | 42 | 11.5 |
| 7/1/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 49 | 11.6 |
| 7/2/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 48 | 11.7 |
| 7/3/00 | 1 | 0 | 0.999 | 0 | 1 | 10% | 40 | 12.4 |
| 7/4/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 39 | 12.5 |
| 7/5/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 37 | 12.9 |
| 7/6/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 36 | 13.1 |
| 7/7/00 | 1 | 0 | 0.999 | 0 | 1 | 10% | 37 | 12.1 |
| 7/8/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 36 | 12.0 |
| 7/9/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 37 | 11.7 |
| 7/10/00 | 0 | 0 | 0.999 | 0 | 0 | 10% | 36 | 11.2 |
| 7/11/00 | 1 | 0 | 0.999 | 0 | 1 | 10% | 44 | 11.2 |
| 7/12/00 | 5 | 0 | 1.000 | 0 | 5 | 10% | 54 | 11.3 |
| 7/13/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 54 | 11.3 |
| 7/14/00 | 1 | 0 | 1.000 | 0 | 1 | 10% | 57 | 11.3 |
| 7/15/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 51 | 11.3 |
| 7/16/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 48 | 11.3 |
| 7/17/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 48 | 11.7 |
| 7/18/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 48 | 11.9 |
| 7/19/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 48 | 11.9 |
| 7/20/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 47 | 11.7 |
| 7/21/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 47 | 11.5 |
| 7/22/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 62 | 10.5 |
| 7/23/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 75 | 10.5 |
| 7/24/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 66 | 11.2 |
| 7/25/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 60 | 10.6 |
| 7/26/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 53 | 11.1 |
| 7/27/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 49 | 10.9 |
| 7/28/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 46 | 11.3 |
| 7/29/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 43 | 11.3 |
| 7/30/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 42 | 11.3 |
| 7/31/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | 40 | 11.5 |
| 8/1/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/2/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/3/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/4/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/5/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/6/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/7/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |
| 8/8/00 | 0 | 0 | 1.000 | 0 | 0 | 10% | | |

Appendix A4.–Situk River steelhead index float survey count data, 2000.

| River section | River mile | Length of area | | Count 1 | | | Count 2 | | | Count 3 | | | Count 4 | | |
|---------------|------------|----------------|------|--|-------|-------|----------------------------------|-------|-------|------------------------------------|-------|-------|------------------------------------|-------|-------|
| | | | | April 24 (upper) / April 25 (lower) | | | May 3 (lower) / May 4 (upper) | | | May 11 (lower) / May 12 (upper) | | | May 18 (lower) / May 19 (upper) | | |
| | | km | mi | count | SH/km | SH/mi | count | SH/km | SH/mi | count | SH/km | SH/mi | count | SH/km | SH/mi |
| Upper | 19.4 | | | | | | | | | | | | | | |
| | 18.6 | 1.3 | 0.8 | 13 | 10 | 16 | 75 | 58 | 94 | 20 | 15 | 25 | 8 | 6 | 10 |
| | 17.6 | 1.6 | 1.0 | 32 | 20 | 32 | 5 | 3 | 5 | 17 | 11 | 17 | 9 | 6 | 9 |
| | 16.8 | 1.3 | 0.8 | 32 | 25 | 40 | 31 | 24 | 39 | 20 | 15 | 25 | 15 | 12 | 19 |
| | 15.9 | 1.4 | 0.9 | 171 | 122 | 190 | 194 | 139 | 216 | 145 | 104 | 161 | 39 | 28 | 43 |
| | 15.4 | 0.8 | 0.5 | 29 | 36 | 58 | 100 | 125 | 200 | 40 | 50 | 80 | 14 | 18 | 28 |
| | 14.8 | 1.0 | 0.6 | 48 | 48 | 80 | 15 | 15 | 25 | 39 | 39 | 65 | 39 | 39 | 65 |
| | 14.4 | 0.7 | 0.4 | 154 | 220 | 385 | 109 | 156 | 273 | 62 | 89 | 155 | 29 | 41 | 73 |
| | 13.6 | 1.2 | 0.8 | 64 | 53 | 80 | 154 | 128 | 193 | 105 | 88 | 131 | 65 | 54 | 81 |
| | 13.1 | 0.8 | 0.5 | 33 | 41 | 66 | 84 | 105 | 168 | 96 | 120 | 192 | 55 | 69 | 110 |
| Lower | 12.0 | 1.7 | 1.1 | 148 | 87 | 135 | 155 | 91 | 141 | 268 | 158 | 244 | 187 | 110 | 170 |
| | 10.9 | 1.9 | 1.2 | 133 | 70 | 111 | 255 | 134 | 213 | 355 | 187 | 296 | 253 | 133 | 211 |
| | 10.1 | 1.3 | 0.8 | 57 | 44 | 71 | 77 | 59 | 96 | 159 | 122 | 199 | 190 | 146 | 238 |
| | 9.3 | 1.3 | 0.8 | 36 | 28 | 45 | 87 | 67 | 109 | 177 | 136 | 221 | 237 | 182 | 296 |
| | 8.8 | 0.8 | 0.5 | 9 | 11 | 18 | 54 | 68 | 108 | 49 | 61 | 98 | 65 | 81 | 130 |
| | 8.3 | 0.8 | 0.5 | 59 | 74 | 118 | 100 | 125 | 200 | 143 | 179 | 286 | 199 | 249 | 398 |
| | 6.6 | 2.6 | 1.6 | 98 | 38 | 61 | 84 | 32 | 53 | 195 | 75 | 122 | 301 | 116 | 188 |
| | 5.2 | 2.3 | 1.4 | 100 | 43 | 71 | 219 | 95 | 156 | 394 | 171 | 281 | 711 | 309 | 508 |
| | 4.4 | 1.3 | 0.8 | 109 | 84 | 136 | 154 | 118 | 193 | 132 | 102 | 165 | 273 | 210 | 341 |
| | 3.6 | 1.3 | 0.8 | 72 | 55 | 90 | 178 | 137 | 223 | 166 | 128 | 208 | 304 | 234 | 380 |
| | 2.4 | 2.0 | 1.2 | 68 | 34 | 57 | 243 | 122 | 203 | 147 | 74 | 123 | 341 | 171 | 284 |
| | 1.2 | 1.8 | 1.1 | 9 | 5 | 8 | 33 | 18 | 30 | 35 | 19 | 32 | 147 | 82 | 134 |
| | 0.0 | 2.0 | 1.2 | 6 | 3 | 5 | 53 | 27 | 44 | 7 | 4 | 6 | 76 | 38 | 63 |
| Totals | | 31.2 | 19.3 | 1,480 | | | 2,459 | | | 2,771 | | | 3,557 | | |

Appendix A5.–Situk River float survey conditions, 2000.

| Situk River Float Survey Conditions, 2000 | | | | | Luminosity ^c | | Cloud Cover | | | | Wind | | | | Precipitation | | | | Turbidity/Color | | | | Overall Conditions Could not see well into - | | | | Total Count | Observers ^d | |
|---|----------------------|-------|---------------------------|------------------|-------------------------|-------|-------------------|-----------------|-----------------|-----------|----------|----------|------------|------|---------------|----------|------------|------|-----------------|-------|--------|------|---|------------|---------------|----------------------|-------------|------------------------|-------|
| Date | Section ^a | Time | Water Height ^b | Water Temp. (°C) | Air | Water | Complete Overcast | Mostly Overcast | Partly Overcast | No Clouds | Constant | Frequent | Occasional | None | Constant | Frequent | Occasional | None | Very Heavy | Heavy | Slight | None | Average Pools | Deep Pools | Deepest Pools | No reduction in Vis. | | | |
| 4/24/00 | 1 | 12:45 | 34.3 | 3.8 | 12.0 | 10.0 | | X | | | | X | | | | | X | | | | X | | | | X | | | 576 | RJ,MT |
| 4/25/00 | 2 | 12:05 | 36.0 | 3.9 | 14.2 | 10.8 | | | X | | | X | | | | | X | | | | X | | | X | | | | | RJ,MT |
| 4/25/00 | 3 | | - | 4.8 | 14.2 | 11.0 | | | X | | | X | | | | | X | | X | | | | X | | | | 904 | RJ,MT | |
| 5/4/00 | 1 | 10:50 | 39.5 | 5.1 | 15.5 | 11.0 | | X | | | | X | | | | | X | | | | X | | | X | | | 767 | MT,LD | |
| 5/3/00 | 2 | 10:04 | 39.5 | 4.0 | 15.0 | 10.5 | | | X | | | | X | | | | X | | | | X | | | X | | | | | MT,LD |
| 5/3/00 | 3 | 12:50 | - | 5.2 | 14.5 | 11.0 | | | X | | | X | | | | | X | | | | X | | | X | | | 1,692 | MT,LD | |
| 5/10/00 | 2 | 10:40 | 42.3 | 7.2 | 15.0 | 11.5 | | | X | | | X | | | | | X | | | | X | | | X | | | | | MT,LD |
| 5/10/00 | 3 | 13:21 | - | 7.8 | 16.5 | 12.0 | | | X | | | X | | | | | X | | | | X | | | X | | | 2,227 | MT,LD | |
| 5/11/00 | 1 | 11:10 | 42.5 | 10.1 | 15.5 | 12.5 | | | X | | | X | | | | | X | | | | X | | | X | | | 544 | MT,LD | |
| 5/19/00 | 1 | 12:15 | 41.5 | 8.5 | 16.0 | 9.0 | X | | | | | X | | | X | | | | | X | | | | X | | | 273 | MT, BW | |
| 5/18/00 | 2 | 10:25 | 42.5 | 8.2 | 16.0 | 10.0 | | X | | | | X | | | | X | | | | | | | | X | | | | MT,LD | |
| 5/18/00 | 3 | 13:30 | - | 7.9 | 16.0 | 9.0 | | X | | | | X | | | X | | | | | X | | | | X | | | 3,284 | MT,LD | |

^a Section 1 = Outlet of Situk Lake downstream to Nine Mile Bridge, Section 2 = Nine Mile Bridge downstream to river mile 5.2, Section 3 = River mile 5.2 downstream to Lower Landing.

^b Measured from the concrete seam in the Nine Mile Bridge support to the surface of the river.

^c Luminosity - Incident light exposure value measured at ISO 100.

^d Initials: RJ = Robert Johnson, MT = Mike Tracey, LD = Larry Derby, BW = Becky Wilson

Appendix A6.–Situk River steelhead PIT tag data, 2000.

| Date | Sex | TTL Length | Scale Card Number | Scale 1 | Scale 2 | Color* | Scar** | PIT Tag Code |
|---------|-----|------------|-------------------|---------|---------|--------|--------|-----------------|
| 5/22/00 | F | 710 | 13 | 3 | 4 | 1 | 0 | 985100005739545 |
| 5/22/00 | F | 700 | 14 | 7 | 8 | 1 | 0 | 985100005739113 |
| 5/22/00 | M | 710 | 15 | 3 | 4 | 1 | 16 | 985100005738544 |
| 5/22/00 | F | 720 | 19 | 3 | 4 | 1 | 0 | 985100005738527 |
| 5/22/00 | F | 700 | 21 | 3 | 4 | 1 | 0 | 985100005739194 |
| 5/22/00 | F | 715 | 21 | 7 | 8 | 1 | 0 | 985100005738531 |
| 5/22/00 | F | 695 | 22 | 7 | 8 | 1 | 0 | 985100005740006 |
| 5/22/00 | F | 705 | 22 | 9 | 10 | 1 | 0 | 985100005739323 |
| 5/22/00 | F | 710 | 23 | 3 | 4 | 1 | 0 | 985100005740272 |
| 5/22/00 | F | 705 | 25 | 1 | 2 | 1 | 0 | 985100005738765 |
| 5/22/00 | M | 650 | 25 | 9 | 10 | 1 | 0 | 985100005739325 |
| 5/22/00 | F | 730 | 27 | 7 | 8 | 1 | 0 | 985100005738926 |
| 5/22/00 | F | 725 | 28 | 5 | 6 | 1 | 0 | 985100005738132 |
| 5/22/00 | F | 690 | 29 | 1 | 2 | 1 | 0 | 985100005739171 |
| 5/22/00 | F | 730 | 29 | 7 | 8 | 1 | 0 | 985100005739211 |
| 5/22/00 | F | 640 | 30 | 1 | 2 | 1 | 0 | 985100005738667 |
| 5/22/00 | F | 730 | 31 | 1 | 2 | 1 | 0 | 985100005739923 |
| 5/22/00 | F | 670 | 31 | 3 | 4 | 2 | 0 | 985100005740178 |
| 5/22/00 | M | 625 | 31 | 5 | 6 | 1 | 0 | 985100005738638 |
| 5/29/00 | F | 680 | 56 | 5 | 6 | 1 | 10 | 985100005738286 |
| 5/29/00 | F | 715 | 57 | 5 | 6 | 1 | 0 | 985100005739646 |
| 5/29/00 | M | 610 | 58 | 7 | 8 | 1 | 0 | 985100005739956 |
| 5/29/00 | M | 720 | 59 | 3 | 4 | 1 | 0 | 985100005738924 |
| 5/29/00 | F | 720 | 60 | 5 | 6 | 1 | 0 | 985100005912313 |
| 5/29/00 | M | 725 | 61 | 3 | 4 | 1 | 0 | 985100005738983 |
| 5/29/00 | F | 705 | 61 | 7 | 8 | 1 | 0 | 985100005738930 |
| 5/29/00 | M | 690 | 61 | 9 | 10 | 1 | 0 | 985100005739639 |
| 5/29/00 | M | 695 | 62 | 5 | 6 | 1 | 0 | 985100005738037 |
| 5/29/00 | F | 705 | 63 | 1 | 2 | 1 | 0 | 985100005737987 |
| 5/29/00 | F | 710 | 63 | 9 | 10 | 1 | 0 | 985100005737885 |
| 5/29/00 | F | 725 | 64 | 1 | 2 | 1 | 0 | 985100005739664 |
| 5/29/00 | F | 545 | 64 | 7 | 8 | 1 | 0 | 985100005918449 |
| 5/29/00 | M | 640 | 65 | 5 | 6 | 1 | 0 | 985100005738726 |

| Date | Sex | TTL Length | Scale Card Number | Scale 1 | Scale 2 | Color* | Scar** | PIT Tag Code |
|---------|-----|------------|-------------------|---------|---------|--------|--------|-----------------|
| 5/29/00 | F | 730 | 66 | 9 | 10 | 1 | 0 | 985100005738074 |
| 5/29/00 | F | 700 | 67 | 7 | 8 | 1 | 0 | 985100005740167 |
| 5/29/00 | F | 670 | 68 | 5 | 6 | 1 | 0 | 985100005740111 |
| 5/29/00 | F | 660 | 68 | 9 | 10 | 1 | 0 | 985100005738101 |
| 5/29/00 | F | 720 | 69 | 9 | 10 | 1 | 0 | 985100005738960 |
| 5/29/00 | F | 690 | 70 | 5 | 6 | 1 | 0 | 985100005739320 |
| 5/29/00 | F | 690 | 72 | 5 | 6 | 1 | 0 | 985100005740024 |
| 6/1/00 | M | 725 | 73 | 7 | 8 | 1 | 0 | 985100005917759 |
| 6/1/00 | F | 625 | 74 | 5 | 6 | 1 | 0 | 985100005919089 |
| 6/1/00 | F | 640 | 75 | 7 | 8 | 1 | 0 | 985100005912938 |
| 6/1/00 | F | 720 | 76 | 9 | 10 | 1 | 0 | 985100005919235 |
| 6/1/00 | M | 690 | 81 | 3 | 4 | 1 | 0 | 985100005918726 |
| 6/1/00 | M | 660 | 82 | 1 | 2 | 1 | 0 | 985100005919215 |
| 6/1/00 | F | 630 | 82 | 3 | 4 | 1 | 0 | 985100005901198 |
| 6/1/00 | M | 690 | 82 | 5 | 6 | 1 | 0 | 985100005900923 |
| 6/1/00 | M | 675 | 82 | 9 | 10 | 1 | 0 | 985100005918436 |
| 6/1/00 | M | 720 | 83 | 1 | 2 | 1 | 0 | 985100005911707 |
| 6/1/00 | F | 700 | 83 | 9 | 10 | 1 | 0 | 985100005972726 |
| 6/1/00 | M | 670 | 84 | 1 | 2 | 1 | 0 | 985100005900620 |
| 6/1/00 | F | 730 | 84 | 7 | 8 | 1 | 15 | 985100005917717 |
| 6/1/00 | M | 630 | 85 | 3 | 4 | 1 | 0 | 985100005917587 |
| 6/1/00 | F | 680 | 86 | 3 | 4 | 1 | 0 | 985100005913279 |
| 6/1/00 | M | 730 | 87 | 9 | 10 | 1 | 0 | 985100005912082 |
| 6/1/00 | F | 695 | 88 | 1 | 2 | 1 | 0 | 985100005913410 |
| 6/5/00 | F | 630 | 96 | 1 | 2 | 1 | 0 | 985100005918805 |
| 6/5/00 | F | 700 | 96 | 7 | 8 | 1 | 8 | 985100005901181 |
| 6/5/00 | M | 690 | 97 | 3 | 4 | 1 | 0 | 985100005918452 |
| 6/5/00 | M | 655 | 97 | 5 | 6 | 1 | 0 | 985100005899804 |
| 6/5/00 | F | 670 | 97 | 7 | 8 | 1 | 0 | 985100005912267 |
| 6/5/00 | M | 700 | 97 | 9 | 10 | 1 | 0 | 985100005901426 |
| 6/5/00 | F | 710 | 98 | 1 | 2 | 1 | 0 | 985100005900382 |
| 6/5/00 | F | 710 | 98 | 3 | 4 | 1 | 0 | 985100005900427 |
| 6/5/00 | F | 725 | 98 | 7 | 8 | 1 | 0 | 985100005972880 |

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Appendix A6.–Page 2 of 2.

| Date | Sex | TTL Length | Scale Card Number | Scale 1 | Scale 2 | Color* | Scar** | PIT Tag Code |
|--------|-----|------------|-------------------|---------|---------|--------|--------|-----------------|
| 6/5/00 | F | 675 | 98 | 9 | 10 | 1 | 0 | 985100005917537 |
| 6/5/00 | F | 635 | 99 | 1 | 2 | 1 | 0 | 985100005918093 |
| 6/5/00 | F | 685 | 100 | 1 | 2 | 1 | 0 | 985100005972395 |
| 6/5/00 | F | 705 | 100 | 3 | 4 | 1 | 8 | 985100005911991 |
| 6/5/00 | F | 670 | 100 | 7 | 8 | 1 | 0 | 985100005917612 |
| 6/5/00 | M | 695 | 100 | 9 | 10 | 1 | 0 | 985100005917619 |
| 6/5/00 | F | 520 | 101 | 1 | 2 | 1 | 0 | 985100005900664 |
| 6/5/00 | M | 655 | 101 | 3 | 4 | 1 | 0 | 985100005911751 |
| 6/5/00 | F | 680 | 101 | 5 | 6 | 1 | 0 | 985100005899640 |
| 6/5/00 | F | 730 | 101 | 7 | 8 | 1 | 0 | 985100005918249 |
| 6/5/00 | M | 725 | 103 | 7 | 8 | 1 | 0 | 985100005973557 |
| 6/5/00 | F | 690 | 105 | 1 | 2 | 1 | 0 | 985100005911761 |
| 6/5/00 | F | 735 | 105 | 5 | 6 | 1 | 0 | 985100005739572 |
| 6/5/00 | M | 670 | 105 | 9 | 10 | 1 | 0 | 985100005738049 |
| 6/5/00 | F | 710 | 107 | 3 | 4 | 1 | 0 | 985100005739007 |
| 6/5/00 | F | 640 | 107 | 7 | 8 | 1 | 0 | 985100005739074 |
| 6/8/00 | M | 700 | 108 | 7 | 8 | 1 | 0 | 985100005918933 |
| 6/8/00 | F | 650 | 108 | 9 | 10 | 1 | 2 | 985100005912727 |
| 6/8/00 | M | 730 | 109 | 5 | 6 | 1 | 0 | 985100005918413 |
| 6/8/00 | F | 710 | 110 | 9 | 10 | 1 | 0 | 985100005900484 |
| 6/8/00 | M | 685 | 110 | 9 | 10 | 1 | 0 | 985100005911956 |

| Date | Sex | TTL Length | Scale Card Number | Scale 1 | Scale 2 | Color* | Scar** | PIT Tag Code |
|---------|-----|------------|-------------------|---------|---------|--------|--------|-----------------|
| 6/8/00 | M | 695 | 111 | 9 | 10 | 1 | 0 | 985100005919114 |
| 6/8/00 | F | 665 | 112 | 9 | 10 | 1 | 0 | 985100005918335 |
| 6/8/00 | F | 620 | 113 | 3 | 4 | 1 | 0 | 985100005917865 |
| 6/8/00 | F | 670 | 114 | 1 | 2 | 1 | 0 | 985100005917788 |
| 6/8/00 | F | 715 | 115 | 1 | 2 | 1 | 0 | 985100005911852 |
| 6/8/00 | M | 640 | 116 | 1 | 2 | 1 | 0 | 985100005900494 |
| 6/8/00 | F | 630 | 117 | 7 | 8 | 1 | 0 | 985100005917571 |
| 6/8/00 | M | 560 | 117 | 9 | 10 | 1 | 0 | 985100005918216 |
| 6/8/00 | F | 655 | 118 | 5 | 6 | 1 | 0 | 985100005913213 |
| 6/8/00 | F | 690 | 120 | 7 | 8 | 1 | 0 | 985100005918401 |
| 6/12/00 | M | 670 | 127 | 5 | 6 | 1 | 0 | 985100005913336 |
| 6/12/00 | M | 675 | 127 | 9 | 10 | 1 | 0 | 985100005918988 |
| 6/12/00 | F | 680 | 128 | 5 | 6 | 1 | 0 | 985100005912632 |
| 6/12/00 | F | 670 | 129 | 5 | 6 | 1 | 0 | 985100005918291 |
| 6/12/00 | F | 730 | 129 | 9 | 10 | 1 | 1 | 985100005918466 |
| 6/12/00 | F | 685 | 130 | 7 | 8 | 1 | 0 | 985100005912118 |
| 6/12/00 | M | 680 | 131 | 5 | 6 | 1 | 0 | 985100005901376 |
| 6/13/00 | M | 630 | 132 | 7 | 8 | 1 | 0 | 985100005918831 |
| 6/13/00 | F | 660 | 133 | 7 | 8 | 1 | 0 | 985100005913006 |
| 6/13/00 | F | 710 | 134 | 1 | 2 | 1 | 0 | 985100005901040 |
| 6/13/00 | F | 680 | 134 | 3 | 4 | 1 | 0 | 985100005737980 |

* Color Codes: 1 = bright, 2 = dusky or transitional,
3 = dark

** Scar Codes: 1 = Gillnet mark around body
2 = Net web mark on body
8 = Hook mark anywhere on body
10 = Claw scrape-type scar
15 = Torn caudal fin
16 = Fishing lure on body