# Results of the Chinook Assessment Study Conducted on the Klinaklini River During 1998

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1999

**Canadian Manuscript Report of Fisheries and Aquatic Sciences XXXX**

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Fisheries and Aquatic Sciences XXXX

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Cat. No. Fs 97-4/XXXXX ISSN

Correct citation for this publication:

Sturhahn, J. C., and D. A. Nagtegaal. 1999. Results of the chinook Assessment study conducted on the Klinaklini River during 1998. Can. Manuscr. Rep. Fish. Aquat. Sci. XXXX: 69 p.

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## ABSTRACT

Sturhahn, J. C., and D. A. Nagtegaal. 1999 . Results of the chinook assessment study conducted on the Klinaklini River during 1998. Can. Manuscr. Rep. Fish. Aquat. Sci. XXXX 69 p.

In 1998, the Biological Sciences Branch, Pacific Biological Station, continued a study of chinook salmon (*Oncorhynchus tshawytscha*) productivity in the Klinaklini River. Major components of this study include: I) enumeration and distribution of spawners, ii) collection of biological and environmental information, and iii) evaluation of fishwheel as a stock assessment tool. A counting fence was constructed on Mussel Creek, a live mark-recapture study was conducted by tagging chinook at the fishwheel and recapturing fish at a fence on Mussel Creek, and a radio telemetry study was conducted to determine spawner distribution for chinook as well as coho. Total return of adult chinook to the Klinaklini River was estimated to be 9,980 (95% CL: 7,365 – 12,595) in 1998. Spawner distribution within the watershed was determined to be 45% in Mussel Cr., 28% in Dice Cr., and 13% in Ice Cr. The majority of chinook spawners were aged as four and five year olds and approximately 59% of the chinook caught in the fishwheel were considered to be ocean-type. Total coho returns to the Klinaklini River were estimated at 26,901 (95% CL: 20,659 – 33,143) in 1998. Spawner distribution was determined to be 38% in Dice Cr., 22% in Mussel Cr., and 16% in Clearwater Creek. The majority of coho spawners were aged as three year olds and approximately 77% of the coho caught in the fishwheel were considered to be stream-type.

Key words: Klinaklini, Mussel Creek, chinook, stock assessment, fishwheel, mark-recapture,

# RÉSUMÉ

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## INTRODUCTION

The Strait of Johnstone gives passage to several Canadian stock groupings of chinook salmon (*Oncorhynchus tshawytscha*). Various factors allow differentiation between stocks including run timing of spawning migration, ocean distribution of catch, and age at maturity of the stocks. Chinook from the Fraser River above Hope, B.C. are spring and summer migration chinook, and are far-north migrating chinook caught primarily in Alaska and northern B.C. The lower Fraser River chinook spawn predominantly in the Harrison River and are fall migrant, white-fleshed chinook. These fish are caught in the Strait of Georgia and off the west coast of Vancouver Island. The upper Strait of Georgia stock is also a fall migrant stock but is a far-north migrating stock and has older ages at maturity than the Harrison or lower Strait stocks. The lower Strait of Georgia stock is a late summer-fall migrant stock, which has a more restricted northward distribution, and is a younger maturing stock.

Chinook stocks are invaluable to both commercial and recreational fisheries of the Pacific northwest (Collicut and Shardlow, 1995). In spite of protective measures, the numbers of chinook salmon have continued to decline, and this species was recently added to the list of threatened and endangered species in the United States (Waples, 1991). The problem of declining stocks is similarly serious on the West Coast of Canada, and has potential ramifications regarding the sustainability of British Columbia's fishing industry (Argue et al, 1983). In an effort to raise overall chinook populations to historical levels, a chinook rebuilding plan was initiated in 1985 through the Pacific Salmon Treaty between the United States and Canada (TCCHINOOK 87-4). This plan established a mandate requiring both parties to stop the decline in escapements to naturally-spawning chinook stocks and attain escapement goals in selected lower Strait of Georgia chinook indicator stocks (Cowichan, Nanaimo, Squamish) and upper Striat of Georgia indicator stocks (Klinaklini, Kakweiken, Nimpkish, Wakeman, and Kingcome). In addition, various "key streams" were selected to represent the overall status of chinook bearing streams along the B.C. coast. These keystreams (Robertson, Quinsam/Campbell, Kitsumkalem, Harrison, Big Qualicum) provide ongoing information to fisheries managers with respect to accurate estimates of escapement as well as estimates of the relative contribution of hatchery and naturally-reared production to these stocks.

Salmonid enumeration studies have been conducted on the lower Klinaklini watershed since 1949 and consisted initially of stream walks as well as overflight counts of the few clear indicator streams in a largely clouded glacial system. These clear tributaries include Mussel Cr. (gazetted as Devereux Cr.), Icy, Dice, and Jump Creek. All five salmonid species are supported by the Klinaklini system as well as steelhead, cutthroat, Dolly Varden, mountain whitefish, prickly sculpin, redside shiner, longnose sucker, and lamprey ammocetes (Rimmer and Axford, 1990). It is believed that there are three chinook runs to the Klinaklini system based on migration timing (Berry 1991). As part of environmental impact assessments conducted by Interfor, Mike Berry[1] has collected and documented a considerable amount of anecdotal information concerning salmonid populations within the Klinaklini watershed.

[1] Alby Systems Ltd., P.O. Box 71, Alert Bay, B.C. V0N-1A0

In 1981, the Dept. of Fisheries and Oceans began a study to determine the viability of building salmonid enhancement facilities on Devereux Creek which joins the Klinaklini River 8 km from the mouth. Aquatic Resources Ltd. conducted spawning studies and collected baseline information for pink, chum, sockeye, coho and chinook from Glendale Creek, the Ahnuhati River, the Klinaklini River, as well as from Tom Browne Creek (Fielden and Slaney 1982). This work was continued in 1983 by E.V.S. Consultants (Whelen and Morgan 1984). Throughout this period, physical data, including water temperature, relative level and quality, population biological characteristics, and spawning habitat biophysical characteristics were also collected.

Preliminary surveys of juvenile salmonid habitat utilization and evaluations of potential rearing area were completed on all study watercourses (Fielden et al. 1985). Other enhancement plans were considered for Knight Inlet with the goal of increasing salmonid production in the area. These included a pink spawning channel at Glendale Creek, a chum/pink spawning channel on the Ahnuhati River, juvenile chinook and coho outplanting to the Ahnuhati and Klinaklini Rivers, and coho outplanting to Tom Browne and Glendale Creeks.

As a result of this work, a pilot enhancement facility was built on Mussel Creek in 1985 and chinook and coho broodstock were collected. Approximately 265,000 chinook eggs were incubated of which 63% were released as coded-wire tagged fry and 24% as 4-5 g tagged smolts. For various reasons the facility was dismantled the following year. A total of five coded-wire tagged chinook were recovered from 1987-1989, three from Alaskan fisheries and two from northern sport and troll fisheries.

Fishwheels have been used as an effective means for capturing live salmon in BC rivers since the late 1870's. Fishwheels were used up until the mid 1930's when excessive catch threatened the livelihood of those involved in traditional net fisheries. As a result of successful lobbying by the net fisheries in 1934, fishwheels were banned from operating in BC, however, fishwheels have recently been developed as a tool for fisheries managers and biologists in tagging of migrating salmon stocks (Link and English, 1994). A fishwheel was constructed for use in the Klinaklini River system in an effort to capture, tag, and sample chinook salmon as well as to evaluate overall escapement.

Renewed interest by FOC in 1997 resulted in a further and ongoing stock assessment study on the Klinaklini system. This report represents the second year of this study with objectives including:

1. continued evaluation of the suitability of using a fishwheel to index the abundance and timing of chinook, coho, chum, pink, and sockeye returns to the Klinaklini system,
2. estimate total escapement and spawner distribution for chinook and coho,
3. collect biological data for all salmonids, and
4. record environmental information.

# METHODOLOGY

## STUDY AREA

Knight Inlet is a mainland fjord which begins about 220 km north of Vancouver on the British Columbia coast and extends inland for approximately 120 km (Fig. 1). The fjord itself is steep sided and averages 3 km in width with depths to 530 m. The Knight Inlet watershed is bounded by mountains on either side and receives runoff from a 7,800 $km^2$ area.

The Klinaklini River is the largest river system in the Mainland Coast Planning unit and is composed of the east and west arms which meet at a confluence 25 km upstream from the estuary. The west Klinaklini is a fairly short river section which is fed directly by the Klinaklini glacier while the east Klinaklini passes through a canyon area and then up into the B.C. interior. The lower reaches, extending approximately 30 km, are extremely braided with a multitude of sand and gravel bars, meanders, oxbows and side channels. The Klinaklini River is a cold, glacial system and is the main contributor of glacial flour to Knight Inlet.

Mussel Creek (Devereux Creek) is a clearwater stream which joins the Klinaklini River approximately 8 km from the mouth (Fig. 2). It drains a watershed of 74 $km^2$ , is 19 km long, and is stabilized by a series of lakes which feed it. A series of rapids below Mussel Lake drop 120 m over a distance of 1.75 km and constitute a potential barrier to pink, chum, chinook, and some sockeye (Rimmer and Axford, 1990). The lower reaches of the creek yield a gentle gradient with shallow runs connecting deeper pools where salmon typically hold before moving upstream to the spawning grounds. Mussel Cr. is quite overgrown except for the lower section which offers good overhead visibility and has been used for aerial enumeration purposes.

Mussel Creek and the lower Klinaklini are accessed by logging roads which are maintained in excellent condition as they are the main lines for a logging operation.

International Forest Products operates a logging camp (Wahkash Contracting) along a side-channel of the Klinaklini River that is situated 2 km upstream from the estuary. The camp has a bunkhouse, several panabode homes, cookhouse, communication (satellite phone), and a large workshop repair facility. Access to the camp is by float plane from Campbell River.

## FISHWHEEL

### Design

The fishwheel design used on the Klinaklini system was similar to the fishwheels that have been used on the Yukon, Taku and Nass rivers in recent years (Milligan et al. 1985; Link et al. 1993). There were several modifications made to adapt the standard three basket fishwheel design to meet the specific requirements for the Klinaklini glacial system. Table 1 contains a list of materials used and schematic diagrams of the unit are displayed in Figures 3 and 4.

A rotating three basket welded aluminum fishwheel design was used for the 1997 Klinaklini River chinook assessment as well as for 1998. The fishwheel consisted of three basic components; platform, axle/basket assembly and the holding tanks. All welding was preformed with a MIG[2] process, utilizing a root pass and a cover pass procedure. During the survey period there were no failures of welds made by this procedure.

**Platform**

Resembling a catamaran, (Fig. 3) the two 9.4 m long pontoons each have a 11.8cm wide tread plate surface, supported by a 10.6 cm wide by 5.9 cm deep polystyrene foam floatation encased in 4.9 mm aluminum sheet. The bow (upstream) of the pontoons is tapered 45 degrees to allow water flow to pass easily (Fig. 4). Past experience with rotary screw trap pontoons utilizing a simple 45-degree slope proved minimal water resistance while being a cost effective construction method. During operation the fishwheel pontoons are attached to a solid object upstream utilizing 14.7 mm galvanized steel cables. Structural members used to hold the pontoons apart at the bow and stern double as crosswalks joining the port and starboard pontoons. They are each constructed of two 1.2 cm x 1.2 cm aluminum tubes covered with 7.9 cm wide tread plate surface. The crosswalks are bolted to the pontoons with four 1.5 cm x 1.9 cm plated bolts at each corner creating a rigid fishwheel platform.

**Axle/Basket assembly**

On the inside of each pontoon, near its middle is a 2.8 m tall mast constructed of two 1.2 cm "H" beams to hoist the fishwheel axle/basket assembly (Fig. 4). A 636 kg hand winch is mounted on each mast requiring two people cranking simultaneously to raise or lower the axle/basket assembly. The axle spans from mast to mast, and is made from a 3.5 m, 0.9 cm schedule 40 steel pipe. The fishwheel baskets connect to the axle by fitting into sockets made from 0.8 cm tubes 2.4 cm long welded in a row 0.59 m on centre along the length of the axle. As there are three baskets there are also three rows of sockets placed 120 degrees apart. Nylon (UHMW)[3] blocks mounted within each mast are the bearing surface that the axle rotates within. Each block is 4.7 cm square with a 1.2 cm hole in it's center to receive the axle. Each fishwheel basket is 3.5 m wide and 3.5 m long. They are built with seven evenly spaced 4.9 mm schedule 40 aluminum pipe running the length of the basket. Each basket attaches to seven axle sockets at one end and is curved at the other end to form a scoop. The baskets are framed by a leading edge; intermediate cross member and axle cross member. The baskets are covered with a 0.8 cm knotless fishing net, soaked in water before installation to alleviate stretching and sagging during operation. Taught guy lines (9.8 mm galvanized cable) connected the leading edges of the baskets to each other to achieve rigidity of the three baskets.

**Holding tanks:**

There are two live tanks; each attached to the outside of the port and starboard pontoons at their middle by means of a continuous hinge. Each live tank was originally built 0.6 m wide, 1.2 m deep, and 2.9 m long, made from 4.9 mm aluminum sheet with an expanded metal type grate

[2] Mixed Inert gas
[3] Ultra High Molecular Weight Polyethylene

that would slide vertically at each end. This design proved deficient in two areas. First, the square end of the live tank fell victim to an uprooted tree travelling downstream. The remedy was to fold the walls together forming a doubly thick 45-degree slope that deflected debris. In addition, triangular gussets were installed on the top of the tank to bolster its' lateral strength. Secondly, due to extreme silt conditions, there was considerable silt build up on the floor of the live tank in a short period of time. The solution was to drill a series of 5 cm holes through the floor. Minor amounts of silt did build up by settling on the remaining flat surface between the holes but was not considered to be a problem.

Another problem encountered was the expanded metal gates. The expanded metal had a sharp edge that captured fish would cut their snout on as they looked for an escape. While the tanks were being modified in the field, gates 0.6 m by 1.2 m, made from 2.5 cm pipe were installed. One served as a rear gate, sliding vertically, the other was welded horizontally to the outside of the tank with the top of the gate at water level to allow fresh aerated water into the live tank. After the installation of the pipe gates, there were no further snout injuries reported. Recovery tanks were specifically designed and built to hold stressed adult chinook fish until they recovered sufficiently to be released with a radio transmitter. The recovery tanks are 0.6 m wide, 0.9 m deep and 2.3 m long made of 4.9 mm aluminum sheet. They are attached aft of the live tanks by means of a continuous hinge the same as the live tanks so all tanks can be swung from their vertical position to horizontal to facilitate transport of the fishwheel without disassembly. The bottoms of these tanks were also perforated with 5 cm holes.

**Safety features:**

As a safety precaution, aluminum pipe handrails encircle the fishwheel platform on the outside and the inside. Without the handrails, personnel could have a tendency to "cut the corner" when walking around the fishwheel, possibly being injured by rotating baskets. Another dangerous point on the fishwheel is when the baskets pass the mast in a knife-like action. Handrails ensured that both areas were guarded. During this summer's survey there where no personal injuries as a result of the operation of the fishwheel.

**Installation:**

The fishwheel was transported to Knight Inlet via a barge, transported 8 km on a logging road to the assembly beach. Once assembled it was easily pulled .5 km upstream with a boat using two 50 hp jet-drive outboard motors. Using two 17.7 m x 0.9 cm galvanized cable bridles the fishwheel was attached to a double wrap basket hitch around the bridge pier on the deep side of the river. As the attachment point was near the edge of the river it was necessary to use a "stiff-leg" (a 6.4 cm schedule 40 x 5.9 m aluminum pipe) to position the fishwheel in the flow of the river. The stiff-leg was attached to the bow of the starboard pontoon with a type of ball and socket joint to allow movement. The shore end was jammed into large riprap and tied off for security. The fishwheel fished approximately 5.6 m off the shore in about 4.4 m of water.

**Operation**

The fishwheel was operated 24 hours per day for the duration of the study. Catch by species, biological data, water depth, flow rate, water clarity (secchi), temperature, and fishwheel RPM were processed twice a day (7 AM and 7PM) and recorded for each 12 hour period. Water depth was measured from a staff gauge mounted on a concrete bridge support structure. Water Survey Canada has a remote discharge recorder at the fishwheel site that electronically monitored the water depth and discharge as well. All fish were counted and sampled by dipnetting the fish from the holding tanks, transferring each fish to a large cooler partially filled with water, and processing the fish for biological information prior to release.

**Catch and Effort**

Fishwheel catch per unit effort was measured as the catch per 12 hour period corresponding to a day and night period. Fishwheel rpm and water velocity were also recorded to determine the relationship between catchability and these two variables.

**Radio Telemetry**

The radio-telemetry component of this study involved catching and radio tagging chinook and coho at the fishwheel. Fish movement was recorded using stationary receivers at remote sites, on foot, and by boat. Radio tags applied were Advanced Telemetry Systems[4] (ATS) pulse coded aquatic transmitters. These tags have a continuous operational life of 140 days, are 16 mm in diameter and 51 mm in length, and weigh approximately 25 g. The frequency range of the chinook tags was 149.340 to 149.600 Mhz set at .02 Mhz intervals. The frequency range for the coho tags was 148.101 to 148.283 set at .02 Mhz intervals. The radio tag receivers used were model R2100 and the dataloggers used were the DCCII model D5041 by ATS. Remote sites were powered by a 12 V deep cycle battery.

Radio tags were applied to chinook throughout most of the run (Jul 10-Aug 12) while coho were radio-tagged over an eight day period (Sep14-22). Each tag was inserted down the throat of the fish by means of a plastic prod with the antenna protruding from the corner of the mouth. Except for the potential of tag regurgitation, insertion of the transmitter into the stomach appears to be the best method of tag attachment, with minimum effect on swimming performance and behavior (Mellas and Haynes 1985). All tagging and recovery location information was compiled by tag code number, fish condition, size, sex, location and date. Processing of each fish generally took less than 30 seconds and all fish were in excellent condition at the time of release. Handling stress was minimal partially due to the fact that water temperature was only 7 degrees Celsius.

**Secondary Tagging**

All chinook that were radio tagged at the fishwheel were also tagged with a Ketchum curl-lock sheep ear tag[5] for secondary external identification. In addition, a hole punch was made in the operculum to be used as a tag loss indicator. Fish that were recaptured could then be readily identified as a radio-tagged fish and provide an opportunity to measure the tag loss rate of the Ketchum tag.

**Tracking Effort and Tag Recovery**

[4] Advanced Telemetry Systems, Inc., 470 First Ave North, Isanti MN U.S.A.
[5] Ketchum Manufacturing Ltd., Ottawa, Ontario, Canada

Two stationary remote tracking sites were chosen to monitor upstream movement beyond the workable limits of this study. Remote tracking sites on the West Klinaklini (Icy Creek) and Mussel Creek were equipped with a receiver/datalogger and power source enclosed within a weatherproof metal box and attached to a mounted YAGI antenna via a coaxial cable. The mobile tracking unit, used to monitor the movement of tagged chinook from the estuary to the East and West Klinaklini confluence, included the same model receiver/datalogger enclosed in a backpack with a handheld 3 element YAGI antenna. This mobile tracking unit was either mounted on the jet boat for tracking along the mainstem Klinaklini or simply carried by hand when walking along access points on the main tributaries (Mussel Cr., Dice Cr., Icy Cr.).

During all tracking, receivers were set at a gain of 64 which allowed for each of the frequencies to be scanned for several seconds to record the information. Up to 10 different radio tag codes were recorded on the same frequency for chinook tags while 5 different radio tag codes were recorded on the same frequency for coho tags. If a signal was detected, the receiver attempted to decode the signal, then reported the tag code and signal strength visually before it stored the data in the internal memory. Data recorded from the stationary and mobile tracking units were automatically stored in internal memory. The stationary sites, providing continuous coverage of fish movement, were checked every three days, the information downloaded to a portable computer, and the batteries replaced. After each mobile tracking session, the data were downloaded to the laptop computer as well. The data stored for each signal received included the following information:

1. Julian date
2. Universal time
3. Channel number
4. Power level of signal strength
5. Antenna code
6. Tag code

After downloading, the information was then imported into an Excel spreadsheet, edited for spurious signals, and the location of the signal was then added to the data file. The information was sorted by tag code so that each encounter was recorded by date and location.

**Efficiency**

A subsample of chinook, coho, chum and pink salmon caught in the fishwheel were tagged using the Ketchum curl-lock sheep ear tag and released approximately 0.5 km below the fishwheel. Recoveries at the fishwheel were recorded and tag recovery proportions used to estimate fishwheel efficiency.

**Biological Sampling**

All chinook salmon at the fishwheel were sampled for post-orbital hypural (POH) length, sex, fish condition, age, and DNA analysis. Fish condition was recorded as good fair or poor depending on external damage and overall health of the fish. Five scales per fish were collected for ageing purposes. DNA samples were collected by taking a hole punch from the operculum and storing it in 70% Ethanol. Samples were stored by week of capture and by collection site (fishwheel or Mussel Cr. fence) to determine whether any differences would be evident between the fish in the mainstem Klinaklini and Mussel Cr.

DNA samples were also collected from a sub-sample of chum and coho caught in the fishwheel. Post-orbital hypural length, sex, fish condition, and age were recorded for a sub-sample of coho, sockeye, pink and chum caught in the fishwheel.

## MUSSEL CREEK FENCE

### Installation and Operation

A resistance board weir similar in design to that described in Nagtegaal et al. (1994) was installed in Mussel Cr. just above the Klinaklini East main logging road (Fig. 2).

Several fence panels in near the middle of the creek were removed allowing fish to pass upstream. Wherever possible, fish moving upstream of the fence were visually identified, counted and inspected for ketchum tags.

### Biological Sampling

Fish were sampled by beach seining just below the fence. Seined fish were live sampled and processed prior to re-release above the fence. All seined chinook were biosampled for POH length, sex, and tag number. A random subsample of chinook was sampled for age composition. All coho, pink, chum, and sockeye salmon were sampled for tag number only. Seining at the fence became impossible when grizzly bears moved into the area.

## POPULATION ESTIMATES

Population estimates were determined for Mussel Creek in several ways. The fence count was used as a minimum estimate and the number of tagged chinook observed was used to give a proportion of total chinook returning to the Klinaklini which moved into Mussel Cr.
Population estimates for the overall system were determined using fishwheel catch efficiencies.

## RESULTS

### FISHWHEEL

The fishwheel was in operation for the duration of the project between July 4 and Oct 24, 1998. Since there was virtually no movement of chinook at the beginning or the end of time the fishwheel was in operation, it is believed that the entire chinook run was monitored. Coho continued to be caught in the fishwheel until the end of the project although in low numbers. A total of 1004 chinook, 2101 coho, 501 chum, 1493 pink, 914 sockeye, and 3 steelhead were captured by the fishwheel (Table 2). Several marked fish were observed in the fishwheel catch including 1 coho with a left ventricle fin clip and 1 coho with an adipose fin clip. The latter fish was retained and the head removed for CWT analysis.

Fishwheel operation was very successful in transferring fish from the baskets to holding tanks on either side of the pontoons. There were instances however, when failed fish capture was observed and this was due to higher flow conditions which increased the fishwheel rotation greater than 2 rpm. Due to the increased rotational speed of the wheel and the height at which the wheel was raised, fish caught in the basket could not slide fast enough down the trough in the basket to the holding pen. In addition, several fish were seen hitting the lower handrail when the wheel axle was raised more than 6 inches above the water line. Minimal failed fish capture was observed when fishwheel rotation ranged from 1-2 rpm. An improvised slide situated on the pontoon aided the transition of fish from the basket into the holding tank.

Fish captured in the fishwheel were in excellent condition except for a small number (< 5%) with observable marks likely caused by seals. Seals were observed catching salmon across the river from the fishwheel and frequented the area. In addition, several seals were sighted further up the river past the Mussel Cr. Confluence.

Catch during daylight hours was greater than catch during night hours and daytime catch represented 61% of the overall fishwheel catch (Table 3).

A total of 426 live adult chinook were aged while size (post orbital-hypural length) and sex were recorded for 448 chinook of which 29 % were adult males, 56% were females, and 15% were jacks. The mean length of adult male chinook was 64.0 cm and 64.2 cm for female chinook (Table 4). Chinook caught in the fishwheel were identified as either 4 or 5 year olds with an age range of 2 to 6 years; four ocean-type and four stream-type age groups were sampled (Table 5). Collectively, stream-type age groups comprised 41% of the aged samples and ocean-type accounted for 59%. Fish were not sampled for flesh color, although in a previous study (Whelen and Morgan 1984) red chinook comprised 52% of the population.

A total of 270 live adult coho were aged while size and sex were recorded for 2076 coho of which 45% were adult males, 49% were females, and 6% were jacks. The mean length of adult male coho was 55.7 cm and 54.5 cm for female coho (Table 4). Coho scales were aged in the same manner as the chinook scales and collectively ocean-type age groups comprised only 0.4 % of the aged samples while stream-type accounted for the remaining 99.6%. The majority of coho were 2 year olds comprising 77.4 % of the aged sample.

Environmental data was collected at the fishwheel including temperature, secchi depth, flow rate, fishwheel RPM, and river depth (Table 6). The Klinaklini River is largely a glacial fed system and is influenced by summer temperatures and the resulting glacial melt. This factor combined with precipitation resulted in consistently low river temperatures and increased river flow in the spring and summer months. Peak flows were recorded for the Klinaklini River in the end of July, 1999 which is consistent with the 30 year mean (Fig. 5). Water clarity was recorded in the form of secchi depth and clarity varied minimally throughout the project duration. The average secchi depth throughout the study period was 22 cm.

Fishwheel trap avoidance was determined to be minimal as water clarity was poor. Noise associated with the motion of the fishwheel may have been a factor in trap avoidance and this would have been greater at high river flows due to increased fishwheel noise.

Fishwheel rotational speed was directly related to the flow rate of the river (Fig. 6) and in turn, the rotational speed of the fishwheel had a notable effect on catch. Fishwheel RPM was compared to catch for chinook and a direct relationship was found between total catch and Fishwheel RPM (Fig. 7). It was observed that total catch increased with decreased fishwheel RPM for all species tested and this suggests a potential decrease in trap avoidance and greater catch efficiency at slower speeds. The rotational speed of the fishwheel could be partially controlled by raising or lowering the baskets within the limits of the upright framework. Optimal speed appears to fall within the range of 1.5 to 2.5 RPM. During peak flows the fishwheel had a tendency to exceed the ideal range and in these situations it was difficult to maintain optimal rotational speed. Improved control could be attained by increasing the lower limits of the framework and lowering the axle below the water line, allowing the baskets to act as a self-braking mechanism.

Fishwheel efficiency was estimated for chinook, coho, pink, chum, and sockeye (Table 7). Salmon were tagged at the fishwheel, released 0.5 km below the wheel, and recoveries at the fishwheel recorded. Fishwheel efficiency was greatest for chinook at approx. 10% and lowest for pink at approx. 2%. The catch efficiencies for coho, sockeye, and chum were approx. 8%, 7%, and 5% respectively. Fishwheel efficiency may display a relationship between overall fish size and catch efficiency with the larger species incurring the higher catch efficiency rates than the smaller species.

## RADIO TELEMETRY

A total of 52 chinook were equipped with radio tags between July 10 and August 12, 1998 although 96% of tags were applied between July10-29, 1998 (Table 8). A total of 49 coho were also radio tagged between Sep 14 and Sep 22 (Table 9). All tagged fish were caught in the fishwheel and released in good condition. It was assumed that the stress of handling and processing fish was minimal since no tagged fish was recaptured repetitively nor were any radio-tagged fish found to hold in any given area for prolonged periods following the tagging procedure.

A jet boat was used for tracking tagged fish and enabled technicians to radio track fish from the estuary of the Klinaklini River to just below the East and West Klinaklini confluence. Tracking fish in the upper reaches of the Klinaklini was dependent on water flow and depth. In addition, only the lower reaches of Dice Cr. and Icy Cr. were suitable for jet boat tracking. Access to the middle and upper reaches of Dice Cr. and Icy Cr. was accomplished from logging road bridge crossings. Helicopter tracking proved unsuccessful on these side channels in the past and was not attempted in 1998. Tracking on the lower Mussel Cr. section below the fence was conducted frequently on foot.

Stationary radio telemetry stations were constructed in order to record fish movement past strategic river locations. One of these stations was located on the West Klinaklini near the Icy Cr. confluence. This station was moved to a new location on Sep. 19, 1998 because of a lack of tag detections. The new telemetry station was stationed on an old hydro tower approx. 2 km above the Mussel Cr. confluence. This site provided a higher vantage point for the antennae and enabled fish moving past the Mussel Cr. confluence to be recorded. The second radio telemetry station was situated at the Mussel Cr. bridge as this stream has been known to hold large numbers of chinook as well as coho. These stationary telemetry stations remained in operation until Dec. 8, 1998 when they were removed for the winter.

Daily radio tracking efforts via jet boat ended with project termination on Oct 24, however, two additional trips were made in to Knight Inlet to gather additional radio tracking data from the stationary receivers. In addition, tracking was conducted via stream walks and truck tracking. These trips took place on Nov 17, and Dec 8, 1998 and allowed observation of active coho spawning sites. Coho spawning took place in the lower side channels first such as Dice Cr. and as time progressed coho spawning moved to the higher tributaries from Clearwater Cr. to Basalt Cr. (Table 10). Although not all tags were tracked to their presumed final destination, a total of 10 chinook tags were successfully decoded while 13 coho were successfully decoded (Table 11). Numerous fish were tracked throughout the study without actually deciphering the individual code (Tables 12, 13).

## MUSSEL CR. FENCE

It was the initial intention to monitor all fish movement through Mussel Cr. fence in order to compile detailed enumeration, to monitor individuals tagged at the fishwheel for mark-recapture analysis, and to conduct biosampling for comparison with fishwheel results. In order to conduct an accurate mark-recapture assessment fish movement past the fence required close monitoring. Several factors made this impossible. These factors included: fish reluctance to move through the fence, high grizzly bear activity, and limited personnel.

On several occasions seining was conducted below the fence in order to allow for enumeration and tag identification however direct bear threats made this option unfeasible. In addition, carcass recovery was not possible because of the very short time between fish mortality and consumption by predators especially bears. This was evident on many creek walks where peak spawning die-off would normally have resulted in many visible fish carcasses along the river banks. Only very rarely was a carcass found as a result of stream walks.

Fish movement through the fence on Mussel Cr. was sporadic and salmon tended to hold in pools below the fence during July and August. This behaviour has been observed in the past prior to the establishment of a fence above the Mussel Cr. bridge. As a result, it is assumed that the fence had minimal impact on fish movement upstream. The trap at the fence was not monitored on a 24 hour basis but instead it was opened at various times during the day and night in an attempt to allow fish movement upstream (Table 14). In an effort to force fish upstream and gather biological data, seining was conducted below the fence. Seined fish were sampled and inspected for tags before being released above the fence. This was successful in the early summer however the presence of grizzly bears posed an imminent danger in August and no further seining efforts were conducted. Numbers of salmon holding in the pools below the fence increased through July and August before the fish moved upstream throughout September. Fence panels were removed allowing fish to move upstream and as much information as possible was collected through visual observation from the bridge.

A beach seining operation was conducted in the pools below the fence and fish were sampled prior to re-release above the fence. Seined fish were added to daily fence counts (Table 14). In total, 1017 adult chinook, 103 adult coho, 87 pink, 16 chum, and 108 sockeye were enumerated at the fence. Mean size of adult male chinook was 64.6 cm and female chinook was 65.9 cm (Table 15). Age composition of fish sampled in Mussel Cr. was comparable to the fishwheel sample (Table 5). The majority (87%) of chinook were aged as 4 and 5 year olds. Stream-type chinook comprised 42% of the sample and 58% were considered to be ocean-type. Beach seining was terminated on Aug. 11, 1999 due to increased bear activity and danger to technicians. Beyond this date the fence was opened intermittently and fish were enumerated as they passed upstream.

Water depth and temperature measurements were taken in Mussel Cr. throughout the study period (Fig. 8). The mean water temperature from July to October was 16 degrees Celsius and the mean depth at the fence site for the same period was 0.43 m.

## POPULATION ESTIMATES

A total of 1017 chinook were observed to pass the Mussel Cr. counting fence to give a minimum population estimate. The observed mark recapture rate at Mussel Cr. was 12.7 % and based on fishwheel numbers would suggest a chinook escapement of 1267 (Table 20). Population estimates for the whole system were based on fishwheel catch efficiencies and were determined for chinook, coho, pink, sockeye, and chum salmon as follows: 9,980 chinook with lower and upper 95% confidence limits of 7,365 and 12,595 respectively, 26,901 coho with lower and upper 95% confidence limits of 20,659 and 33,143 respectively, 13,912 sockeye, 72,126 pink, and 9,543 chum (Table 16).

## SPAWNER DISTRIBUTION

Potential chinook and coho spawner distributions were determined using the proportions of total tag detections for different tributaries as recorded by the radio tracking receiver. This technique was used to estimate the proportion of the total chinook run which spawned in Mussel Cr. as compared to the tag/untag ratios as determined by seining at the Devereux fence. Radio tag detection distribution suggests 44.6% of chinook spawned in Mussel Cr. while approx. 28% spawned in Dice Creek (Table 17). It should be noted that individual tags were rarely decoded and therefore repetitive detection of individual tags was common. The tag/untag ratios obtained via seining in Mussel Cr. suggest 4.6% of chinook spawned in this tributary. Coho tracking distributions suggest 38.2 % of coho spawned in Dice Cr., 21.8 % spawned in Mussel Cr., 16.4 % spawned in Clearwater Cr. and 7.3 % spawned in Basalt Creek (Table 18).

**Potential Errors:**

There are several conditions which must be met to reduce potential error of population estimates based on mark-recapture (Ricker 1975). To minimize bias, fish tagging and recovery occurred concurrently and was stratified by sex. Some potential sources of error include the following:

1. The marked fish suffer the same natural mortality as the unmarked.
   There was no indication of fish mortality caused by marking.
2. The marked fish are as vulnerable to the fishing being carried on as are the unmarked ones.
   It was assumed that marked fish were equally as likely to be caught as unmarked fish.
3. The marked fish do not lose their mark.
   Secondary marks (opercular punches) were used in addition to the staple tags reducing the likelihood for marked fish to go unnoticed.
4. The marked fish become randomly mixed with the unmarked.
   It was assumed that marked fish mixed sufficiently with unmarked as the tagged fish were released approx. .5 km below the fishwheel.
5. All marks are recognized and reported on recovery.
   All fish caught in the fishwheel were inspected for primary or secondary marks.
6. There is only a negligible amount of recruitment to the catchable population during the time recoveries are being made.
   The condition of negligible recruitment is one that was likely not met and leads to potential population overestimation.

## DISCUSSION

**USE OF FISHWHEEL AS A STOCK ASSESSMENT TOOL**

The fishwheel was successful in capturing sufficient numbers of chinook to be used for tagging studies, biological sampling, and mark-recapture study for a population estimate. Virtually all fish captured were in excellent condition and incurred minimal stress due to the simplicity of the handling procedure and the cold water temperatures.

The success or failure of a fishwheel depends on several key factors. A project, jointly funded by the Ministry of Environment, Lands and Parks and the Fraser River Action Committee of the Department of Fisheries and Oceans, studied various fishwheel designs and attempted to collate available information on optimal working design and environment for fishwheel operation (Mikkelsen, 1995). A wide variety of issues were considered including manoeuvrability, floatation, safety features, mechanical advantage, efficiency, the site chosen, water depth, clarity and flow, rotational speed of baskets and the optimal number of baskets. Consideration of the following seven aspects were taken into account in this study; physical site, water flow, depth and clarity, number of baskets, basket rotational speed, and the use of a fish lead.

Selection of an appropriate site was integral to the success of the program. The position of the fishwheel had to meet several criteria. These included; a position close to the mouth of the Klinaklini where it could be assumed that all chinook spawning occurred above this point, shoreline topography that was amenable to proper positioning relative to the flow of the river and offered easy accessibility, water depth that was slightly deeper than the sampling depth of the fishwheel, water velocity that remained within the range of operational capability of the fishwheel, and a position in the river that would provide some protection from downstream movement of large debris that could damage the fishwheel. Water depth, velocity, and shoreline features were recorded for several sites along the lower reaches of the Klinaklini R. and a suitable site just below the million dollar bridge (Fig. 2) was found that met all the above criteria.

Water clarity must also play a major role in the catching power of a fishwheel. It is understood that avoidance and reaction time to escape the fishwheel decreases as visibility decreases. Secchi depth measurements ranged from 12 to 35 cm indicating that visibility was very poor and as a result likely eliminating the possibility of fish avoidance.

Mikkelsen (1995) plotted fishwheel efficiency against the number of baskets and determined that a four-basket fishwheel was twice as efficient as a two-basket one. It was pointed out the relative gain in overall efficiency decreases with the addition of more baskets. Our observations indicated that, especially at higher flows, the physical action of these moving baskets and the disturbance that is made churning through the water causes a noise factor that potentially could scare the fish away. In our situation, a three-basket wheel provided a balance between optimal efficiency and minimal disturbance.

Fishwheel rotational speed was also compared with efficiency (Mikkelsen,1995). Results showed that doubling the speed from 2 to 4 rpm does not double the efficiency but, depending on the water depth, may actually decrease efficiency. Indications were that rotational speed in the range of 2 - 3 rpm provided the best efficiency, and it was noted that visibility remained a key factor. The results from this study confirmed that rotational speed is linked to fishwheel efficiency.   In our situation, we observed that optimal efficiency was attained at speeds between 1.5 - 2.5 rpm (Fig 7). The correlation between differing size fish within species and catch efficiency rates has been demonstrated in the past as fishwheels have proven to be more efficient in capturing the smaller chinook salmon than larger chinooks (Meehan, 1961)

Many of the aspects of fishwheel design and operation as explained above suggest that it could be a good in-river assessment tool.   There are limitations, several as yet undetermined, that have significant impact on the effectiveness and efficiency of this tool, and it will take several more years of information to assess these limitations.

**ESCAPEMENT**

Chinook escapement for the whole Klinaklini system was estimated via fishwheel efficiency extrapolation.  Fishwheel efficiency data provided an estimate of 9,980 (95% confidence limits: 7,365-12,595).   An examination of some of the potential errors associated with mark-recapture showed no obvious problems with the study design.  The requirement of negligible recruitment, however, is not easily monitored and may have resulted in potential population overestimation.  The 1998 chinook escapement estimate is nearly double that of the previous years estimate of 4,906 although study design and fishwheel orientation were nearly identical (Fig. 9).

Aerial surveys are particularly useful for obtaining counts of spawners quickly and efficiently in areas where access to the spawning grounds is difficult or impossible by other means, and when the streams to be surveyed are too numerous or widespread to obtain sufficient counts by conventional ground-based methods.  Although flights are normally conducted at peak spawning periods, a peak count does not represent the total escapement, due to variability in spawning time and duration.  As a result, aerial overflights provide and index at best and should be treated as such (Cousens et al, 1982). Aerial overflight information was collected for the Klinaklini River in 1998 and offers an escapement estimate based on species counts and distribution for specific times and locations.  Aerial counts yielded an estimate of 1,500 for total chinook escapement as compared to the fishwheel efficiency estimate of 9,980 (Table 19). Aerial overflight counts have been shown to underestimate overall escapement by as much as 60% as compared to methods such as Petersen mark-recapture (Tschaplinski and Hyatt, 1991).

**SPAWNER DISTRIBUTION**

Potential chinook and coho spawner distribution was determined using frequency of radio tag detection (Tables 17, 18).  Radio tracking efforts were focussed in an effort to locate tributary spawners; however, mainstem spawning may take place as well.  The majority (44.6%) of chinook detections was recorded in Mussel Creek while Dice Creek yielded 27.7% of all detections.  The remaining signals were recorded in Mussel Lake, Ice Creek, Clearwater Creek, Basalt Creek, and several unnamed tributaries.  It is unknown as to why radio tag information suggests a very large proportion of chinook spawned in Mussel Creek while fishwheel tagging resulted in only a 4.6% mark rate at Mussel Creek.  Tag loss was investigated as to a possible reason for this discrepancy, however, tag loss between the fishwheel and the Mussel Cr. Fence was only 4.4 % (Table 20).  Tag loss for 1997 was 1.1% of the total number of fish tagged.  Although no confidence limits were calculated, these proportions correspond with fish seen in these areas during stream walks.  Coho spawning began in the lower tributaries such as Dice Cr. and moved to the higher tributaries such as Basalt creek displaying a staggered progression.

**RADIO TAGGING**

Detection of radio tags was frequently possible at distances in excess of 500 m with occasional tag detection at distances up to 3 km. Radio waves can be reflected quite strongly by cliffs, hillsides, and even individual rocks and trees giving a false impression of a tag's bearing (Kenward, 1987). When the range of tag detection increases as a result of reflection it becomes very difficult to discern fish location especially whether a fish is in the mainstem as opposed to a nearby tributary. The problem of overlap also arises where a unique tag is decoded in multiple locations, which are considerable distances apart. A resolution to this problem has yet to be discovered.

Results obtained via radio tracking showed that fish frequently move up and down within the mainstem of the Klinaklini before moving into tributaries to spawn. In addition, it was observed that some fish arrive in the mainstem several months before actually spawning. One coho was tagged at the fishwheel in mid Sept. and was observed spawning in Basalt Cr. on Dec. 9, 1998.

## ACKNOWLEDGEMENTS

We would like to express our appreciation to a number of people who made this study possible. Accommodation and meals were provided by Wahkash Contracting Ltd. and International Forest Products Ltd., whose representatives, Tim Whales, Jim Heppner, John Uzzell, Matt Roberts, and Don Neill, provided valuable assistance, access to their fuel supply, the use of their workshop facility and storage shed. Joint funding through Interfor, HRSEP, DFO, and a Human Resources Development program (HRDC) to re-train and create employment opportunities for displaced fishermen supported the Klinaklini project. We would like to thank Glen Nichol and Julie Edwards who co-ordinated KTFC participation with HRSEP funding and field technicians Sandy Johnson (Gilford Island Band) and Lee Alfred (Alert Bay Band) who were involved in the collection of field data from the fishwheel, enumeration fence, and radio tracking. Rob Chudleigh and Dave Bailey were part of the HRDC program and we appreciated their assistance in all aspects of data collection throughout the project. DFO field research technicians Duaine Hardie, James Patterson, and Dave Nagtegaal provide invaluable assistance in all aspects of the program and biologist Ted Carter was instrumental in establishing program design as well providing support and guidance. Dave Key, Pisces Research Corps, facilitated design and construction of the fishwheel, provided technical assistance for the fishwheel, and counting fence, and was involved in the installation and removal of the equipment. We thank Greg Savard, DFO Fish Management; who provided historical escapement information for the Klinaklini system and to Lynne Campo who provided environmental data.

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Table 1. Materials list for construction of the fishwheel.

**Pontoons:**
5 – 1/8” x 5’ x 12’ 5052 aluminum sheet
4 – 1/8” x 5’ x 16’ 3002 aluminum tread sheet
1 – 3/8” x 3” x 20’ aluminum flat bar

**Mast:**
2 – 3” x 20’ I Beam aluminum
¼ sheet - 1/8”x 4’ x 8’ 5052 aluminum sheet
¼ length – 3/8” x 3’ x 20’ aluminum flat bar
2 – 1400 lb. boat trailer winches
50’ ¼” galvanized cable
2 – 2” double pulleys
1 – 2” single pulleys
4 – ¼” cable clamps
8 – 1 ½” x 6” x 12” Nylon Blocks (UHMW)

**Crosswalks:**
4 – 1/8” x 3” x 3” x 20’ aluminum tubing
1 – 1/8” x 4’ x 12’ 5052 aluminum sheet

**Handrails:**
500’ – 1 ¼” schedule 40 6063 aluminum pipe
100’ – 1 ¼” schedule 40 6061 aluminum pipe

**Axle:**
1 - 2” x 20’ schedule 40 steel pipe
¼ - 2” x 20’ schedule 40 steel pipe
¼ - 2 ½” x 20’ schedule 40 steel pipe
4 - 2 15/16” locking collars
1 - 3/8” x 3’ x 20’ aluminum flat bar
4 - 3/8” x 6” NC plated bolts c/w locking nuts

**Baskets:**
27 - 1 ¼” schedule 40 6061 aluminum pipe
100’ - 3/8” galvanized cable
25 - 3/8” cable clamps
6 - 3/8” x 6” turnbuckles
6 - 5/16” shackles
15 – 3/8” x 4” NC plated bolts c/w locking nuts

**Slides:**
3 sheets - 1/8”x 4’ x 8’ 5052 aluminum sheet
30 – ¼” NC plated bolts c/w locking nuts and flat washers

Table 1 (cont.)

**Stiff-leg:**
1 - 2 ½" x 20' schedule 40 6061 aluminum pipe

**Live tanks:**
4 - 1/8" x 5' x 10' 5052 aluminum sheet
3 - 1/4" x 2' x 20' aluminum flat bar
5 - ¾" x 20' schedule 40 6061 aluminum pipe
1 - 5/8" x 20' steel rod

**Recovery tanks:**
4 - 1/8" x 4' x 8' 5052 aluminum sheet
3 - 1/4" x 2' x 20' aluminum flat bar
5 - ¾" x 20' schedule 40 6061 aluminum pipe
1 - 5/8" x 20' steel rod

Table 2. Daily fishwheel counts, Klinaklini River, 1998.

| Date | Chinook | | Coho | | Chum | Pink | Sock | Total |
|---|---|---|---|---|---|---|---|---|
| | Adult | Jack | Adult | Jack | | | | |
| 04-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-Jul | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 06-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| 07-Jul | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 4 |
| 08-Jul | 8 | 0 | 0 | 0 | 0 | 3 | 0 | 11 |
| 09-Jul | 5 | 0 | 0 | 0 | 0 | 0 | 8 | 13 |
| 10-Jul | 18 | 0 | 0 | 0 | 0 | 0 | 4 | 22 |
| 11-Jul | 2 | 0 | 0 | 0 | 0 | 0 | 12 | 14 |
| 12-Jul | 2 | 1 | 0 | 0 | 0 | 0 | 10 | 13 |
| 13-Jul | 1 | 1 | 0 | 0 | 1 | 0 | 8 | 11 |
| 14-Jul | 4 | 1 | 0 | 0 | 0 | 0 | 9 | 14 |
| 15-Jul | 18 | 9 | 0 | 0 | 0 | 1 | 19 | 47 |
| 16-Jul | 3 | 0 | 0 | 0 | 0 | 0 | 5 | 8 |
| 17-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 |
| 18-Jul | 3 | 0 | 0 | 0 | 0 | 0 | 4 | 7 |
| 19-Jul | 2 | 1 | 0 | 0 | 0 | 0 | 7 | 10 |
| 20-Jul | 13 | 2 | 0 | 0 | 1 | 0 | 15 | 31 |
| 21-Jul | 12 | 4 | 0 | 0 | 1 | 0 | 23 | 40 |
| 22-Jul | 10 | 1 | 0 | 0 | 1 | 1 | 35 | 48 |
| 23-Jul | 23 | 5 | 0 | 0 | 2 | 0 | 16 | 46 |
| 24-Jul | 29 | 6 | 1 | 0 | 3 | 0 | 10 | 49 |
| 25-Jul | 23 | 7 | 0 | 1 | 4 | 1 | 21 | 57 |
| 26-Jul | 19 | 7 | 0 | 0 | 2 | 0 | 6 | 34 |
| 27-Jul | 6 | 0 | 0 | 0 | 1 | 0 | 2 | 9 |
| 28-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-Jul | 12 | 1 | 0 | 0 | 0 | 0 | 1 | 14 |
| 30-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 31-Jul | 14 | 1 | 3 | 0 | 1 | 0 | 0 | 19 |
| 01-Aug | 26 | 0 | 4 | 0 | 2 | 1 | 2 | 35 |
| 02-Aug | 21 | 1 | 0 | 0 | 1 | 1 | 2 | 26 |
| 03-Aug | 19 | 4 | 0 | 0 | 3 | 6 | 10 | 42 |
| 04-Aug | 93 | 29 | 2 | 0 | 9 | 11 | 16 | 160 |
| 05-Aug | 34 | 11 | 5 | 0 | 5 | 7 | 16 | 78 |
| 06-Aug | 31 | 13 | 9 | 0 | 8 | 20 | 22 | 103 |
| 07-Aug | 25 | 20 | 5 | 0 | 0 | 22 | 24 | 96 |
| 08-Aug | 22 | 14 | 6 | 0 | 7 | 24 | 18 | 91 |
| 09-Aug | 25 | 14 | 5 | 1 | 7 | 23 | 18 | 93 |
| 10-Aug | 25 | 4 | 6 | 0 | 3 | 13 | 10 | 61 |
| 11-Aug | 12 | 0 | 7 | 0 | 8 | 20 | 17 | 64 |
| 12-Aug | 8 | 0 | 4 | 0 | 0 | 14 | 6 | 32 |
| 13-Aug | 22 | 1 | 9 | 0 | 9 | 17 | 9 | 67 |
| 14-Aug | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-Aug | 7 | 0 | 6 | 0 | 7 | 4 | 17 | 41 |
| 16-Aug | 21 | 6 | 13 | 0 | 7 | 24 | 22 | 93 |
| 17-Aug | 35 | 14 | 31 | 0 | 10 | 106 | 55 | 251 |

Table 2 (cont.) Daily fishwheel counts, Klinaklini River, 1998.

| Date | Chinook | | Coho | | Chum | Pink | Sock | Total |
|---|---|---|---|---|---|---|---|---|
| | Adult | Jack | Adult | Jack | | | | |
| 18-Aug | 18 | 5 | 30 | 2 | 5 | 98 | 39 | 197 |
| 19-Aug | 27 | 12 | 36 | 3 | 4 | 186 | 59 | 327 |
| 20-Aug | 12 | 3 | 25 | 1 | 7 | 56 | 27 | 131 |
| 21-Aug | 15 | 1 | 43 | 3 | 1 | 106 | 30 | 199 |
| 22-Aug | 6 | 1 | 37 | 1 | 2 | 86 | 38 | 171 |
| 23-Aug | 7 | 2 | 41 | 5 | 5 | 28 | 23 | 111 |
| 24-Aug | 4 | 1 | 49 | 0 | 4 | 86 | 26 | 170 |
| 25-Aug | 3 | 1 | 31 | 3 | 1 | 72 | 9 | 120 |
| 26-Aug | 5 | 2 | 40 | 4 | 3 | 46 | 14 | 114 |
| 27-Aug | 3 | 0 | 27 | 4 | 2 | 82 | 19 | 137 |
| 28-Aug | 6 | 0 | 29 | 2 | 0 | 24 | 10 | 71 |
| 29-Aug | 1 | 0 | 33 | 1 | 1 | 23 | 10 | 69 |
| 30-Aug | 5 | 0 | 33 | 0 | 2 | 24 | 11 | 75 |
| 31-Aug | 2 | 1 | 34 | 0 | 2 | 29 | 12 | 80 |
| 01-Sep | 2 | 0 | 21 | 1 | 3 | 13 | 5 | 45 |
| 02-Sep | 2 | 0 | 22 | 0 | 3 | 11 | 2 | 40 |
| 03-Sep | 4 | 1 | 32 | 1 | 1 | 12 | 5 | 56 |
| 04-Sep | 4 | 0 | 45 | 4 | 4 | 31 | 7 | 95 |
| 05-Sep | 2 | 0 | 37 | 9 | 6 | 38 | 7 | 99 |
| 06-Sep | 0 | 1 | 27 | 7 | 4 | 2 | 10 | 51 |
| 07-Sep | 2 | 0 | 16 | 3 | 3 | 8 | 2 | 34 |
| 08-Sep | 1 | 0 | 37 | 1 | 3 | 14 | 2 | 58 |
| 09-Sep | 0 | 0 | 33 | 1 | 7 | 30 | 6 | 77 |
| 10-Sep | 0 | 0 | 29 | 1 | 2 | 13 | 6 | 51 |
| 11-Sep | 0 | 0 | 26 | 1 | 2 | 6 | 4 | 39 |
| 12-Sep | 0 | 0 | 46 | 1 | 4 | 11 | 10 | 72 |
| 13-Sep | 1 | 1 | 47 | 0 | 6 | 3 | 11 | 69 |
| 14-Sep | 0 | 0 | 48 | 3 | 8 | 17 | 5 | 81 |
| 15-Sep | 0 | 0 | 60 | 0 | 5 | 4 | 8 | 77 |
| 16-Sep | 0 | 0 | 37 | 1 | 3 | 1 | 1 | 43 |
| 17-Sep | 0 | 0 | 37 | 2 | 2 | 0 | 0 | 41 |
| 18-Sep | 0 | 0 | 42 | 0 | 8 | 3 | 1 | 54 |
| 19-Sep | 1 | 0 | 53 | 1 | 1 | 3 | 1 | 60 |
| 20-Sep | 0 | 0 | 42 | 2 | 4 | 2 | 1 | 51 |
| 21-Sep | 0 | 0 | 37 | 5 | 1 | 1 | 1 | 45 |
| 22-Sep | 0 | 1 | 34 | 2 | 5 | 2 | 0 | 44 |
| 23-Sep | 0 | 0 | 24 | 1 | 3 | 1 | 0 | 29 |
| 24-Sep | 0 | 0 | 18 | 1 | 2 | 0 | 1 | 22 |
| 25-Sep | 0 | 0 | 28 | 0 | 5 | 0 | 1 | 34 |
| 26-Sep | 0 | 0 | 20 | 3 | 9 | 0 | 1 | 33 |
| 27-Sep | 0 | 0 | 10 | 0 | 6 | 0 | 0 | 16 |
| 28-Sep | 0 | 0 | 13 | 2 | 0 | 0 | 0 | 15 |

Table 2 (cont.). Daily fishwheel counts, Klinaklini River, 1998.

| Date | Chinook | | Coho | | Chum | Pink | Sock | Total |
|---|---|---|---|---|---|---|---|---|
| | Adult | Jack | Adult | Jack | | | | |
| 29-Sep | 0 | 0 | 8 | 1 | 3 | 0 | 0 | 12 |
| 30-Sep | 0 | 0 | 13 | 1 | 3 | 0 | 0 | 17 |
| 01-Oct | 0 | 0 | 6 | 1 | 5 | 1 | 0 | 13 |
| 02-Oct | 0 | 0 | 15 | 0 | 5 | 0 | 0 | 20 |
| 03-Oct | 0 | 0 | 23 | 2 | 8 | 0 | 0 | 33 |
| 04-Oct | 0 | 0 | 21 | 4 | 5 | 0 | 1 | 31 |
| 05-Oct | 0 | 0 | 14 | 1 | 3 | 0 | 0 | 18 |
| 06-Oct | 1 | 0 | 23 | 2 | 12 | 0 | 0 | 38 |
| 07-Oct | 0 | 0 | 20 | 0 | 12 | 0 | 0 | 32 |
| 08-Oct | 1 | 0 | 67 | 0 | 32 | 0 | 0 | 100 |
| 09-Oct | 0 | 0 | 72 | 0 | 39 | 0 | 0 | 111 |
| 10-Oct | 0 | 0 | 81 | 1 | 30 | 0 | 0 | 112 |
| 11-Oct | 0 | 0 | 34 | 1 | 13 | 0 | 0 | 48 |
| 12-Oct | 0 | 0 | 17 | 3 | 5 | 0 | 1 | 26 |
| 13-Oct | 0 | 0 | 13 | 2 | 11 | 0 | 0 | 26 |
| 14-Oct | 0 | 0 | 23 | 1 | 8 | 0 | 0 | 32 |
| 15-Oct | 1 | 0 | 7 | 1 | 14 | 0 | 0 | 23 |
| 16-Oct | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 3 |
| 17-Oct | 0 | 0 | 6 | 1 | 9 | 0 | 0 | 16 |
| 18-Oct | 0 | 0 | 1 | 0 | 15 | 0 | 0 | 16 |
| 19-Oct | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 20-Oct | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-Oct | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 |
| 22-Oct | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 5 |
| 23-Oct | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 6 |
| 24-Oct | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 4 |
| Totals: | 792 | 212 | 1995 | 106 | 501 | 1493 | 914 | 6013 |

Table 3. Daytime and night-time fishwheel catches by species[1], 1998.

| | | | Day Catches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Start | Finish | CN | JX | CO | JX | CH | PK | SK | ST | DV |
| 60798 | 630 | 1828 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| 70798 | 700 | 1900 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 80798 | 730 | 1920 | 8 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| 90798 | 700 | 1900 | 3 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 1 |
| 100798 | 700 | 1900 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110798 | 700 | 1900 | 2 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 |
| 120798 | 700 | 1900 | 1 | 1 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |
| 130798 | 600 | 1700 | 0 | 1 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |
| 140798 | 630 | 1530 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| 150798 | 700 | 1930 | 9 | 3 | 0 | 0 | 0 | 1 | 18 | 1 | 0 |
| 160798 | 630 | 1630 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| 170798 | 630 | 1700 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| 180798 | 630 | 1800 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| 190798 | 630 | 1930 | 1 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| 200798 | 600 | 1900 | 12 | 1 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| 210798 | 600 | 1900 | 9 | 3 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| 220798 | 630 | 1930 | 7 | 1 | 0 | 0 | 1 | 1 | 24 | 0 | 1 |
| 230798 | 645 | 1915 | 23 | 4 | 0 | 0 | 2 | 0 | 10 | 0 | 0 |
| 240798 | 630 | 1945 | 29 | 5 | 1 | 0 | 2 | 0 | 9 | 0 | 0 |
| 250798 | 600 | 1830 | 19 | 6 | 0 | 1 | 4 | 1 | 20 | 0 | 0 |
| 260798 | 630 | 1830 | 16 | 5 | 0 | 0 | 1 | 1 | 3 | 0 | 0 |
| 270798 | 630 | 2000 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 290798 | 730 | 1815 | 10 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 310798 | 700 | 1800 | 14 | 1 | 3 | 0 | 1 | 0 | 0 | 1 | 0 |
| 10898 | 800 | 2130 | 26 | 0 | 4 | 0 | 2 | 1 | 2 | 0 | 0 |
| 30898 | 900 | 1830 | 19 | 4 | 0 | 0 | 3 | 6 | 10 | 0 | 0 |
| 40898 | 600 | 1900 | 31 | 22 | 2 | 0 | 2 | 6 | 2 | 0 | 0 |
| 50898 | 1100 | 1900 | 27 | 9 | 5 | 0 | 4 | 4 | 12 | 0 | 0 |
| 60898 | 945 | 800 | 21 | 11 | 8 | 0 | 7 | 18 | 16 | 0 | 0 |
| 70898 | 745 | 1800 | 15 | 13 | 3 | 0 | 0 | 22 | 22 | 0 | 0 |
| 80898 | 800 | 1830 | 20 | 12 | 6 | 0 | 6 | 22 | 17 | 0 | 0 |
| 90898 | 800 | 1815 | 13 | 14 | 2 | 1 | 7 | 13 | 5 | 0 | 0 |
| 100898 | 630 | 1830 | 20 | 2 | 6 | 0 | 1 | 8 | 7 | 0 | 1 |
| 110898 | 845 | 1600 | 10 | 0 | 6 | 0 | 2 | 11 | 12 | 0 | 0 |
| 120898 | 800 | 1630 | 8 | 0 | 4 | 0 | 0 | 14 | 6 | 2 | 0 |
| 130898 | 700 | 1900 | 14 | 1 | 6 | 0 | 6 | 5 | 5 | 1 | 0 |
| 140898 | 830 | 1900 | 4 | 0 | 4 | 0 | 2 | 1 | 2 | 0 | 0 |
| 160898 | 930 | 2000 | 6 | 1 | 5 | 0 | 1 | 1 | 6 | 0 | 0 |
| 170898 | 1200 | 1900 | 8 | 9 | 17 | 0 | 5 | 43 | 25 | 0 | 0 |
| 180898 | 800 | 1830 | 8 | 5 | 24 | 2 | 3 | 77 | 33 | 1 | 0 |
| 190898 | 600 | 1700 | 12 | 5 | 28 | 3 | 2 | 126 | 45 | 0 | 0 |
| 200898 | 800 | 1900 | 5 | 1 | 23 | 1 | 4 | 22 | 6 | 0 | 0 |
| 210898 | 900 | 1930 | 4 | 0 | 34 | 3 | 1 | 34 | 16 | 0 | 0 |
| 220898 | 900 | 1700 | 2 | 0 | 25 | 1 | 1 | 50 | 10 | 0 | 0 |
| 230898 | 900 | 1900 | 4 | 2 | 38 | 5 | 4 | 0 | 18 | 1 | 0 |
| 240898 | 1130 | 1900 | 0 | 0 | 35 | 0 | 2 | 41 | 10 | 0 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 250898 | 900 | 1930 | 0 | 1 | 29 | 3 | 1 | 48 | 3 | 0 | 0 |

Table 3 (cont.)

| Date | Start | Finish | Day Catches CN | JX | CO | JX | CH | PK | SK | ST | DV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 260898 | 830 | 1930 | 4 | 1 | 32 | 2 | 0 | 27 | 7 | 0 | 0 |
| 270898 | 900 | 1900 | 0 | 0 | 17 | 4 | 0 | 38 | 11 | 0 | 0 |
| 280898 | 1000 | 1930 | 5 | 0 | 23 | 2 | 0 | 11 | 6 | 0 | 0 |
| 290898 | 1315 | 1915 | 0 | 0 | 27 | 1 | 1 | 14 | 8 | 0 | 0 |
| 300898 | 800 | 1830 | 3 | 0 | 29 | 0 | 1 | 18 | 8 | 0 | 0 |
| 310898 | 715 | 1830 | 1 | 1 | 24 | 0 | 2 | 22 | 9 | 0 | 0 |
| 10998 | 715 | 1845 | 2 | 0 | 18 | 0 | 2 | 8 | 2 | 0 | 0 |
| 20998 | 700 | 1915 | 2 | 0 | 18 | 0 | 2 | 7 | 1 | 0 | 0 |
| 30998 | 700 | 1930 | 3 | 1 | 29 | 1 | 1 | 11 | 4 | 0 | 0 |
| 40998 | 730 | 1920 | 4 | 0 | 41 | 4 | 3 | 26 | 6 | 0 | 0 |
| 50998 | 730 | 1630 | 0 | 0 | 20 | 8 | 3 | 23 | 6 | 0 | 0 |
| 60998 | 800 | 1700 | 0 | 1 | 8 | 3 | 2 | 2 | 2 | 0 | 0 |
| 70998 | 700 | 1630 | 0 | 0 | 10 | 1 | 0 | 1 | 1 | 0 | 0 |
| 80998 | 600 | 1800 | 1 | 0 | 29 | 0 | 3 | 13 | 1 | 0 | 0 |
| 90998 | 700 | 1000 | 0 | 0 | 21 | 0 | 5 | 20 | 2 | 0 | 0 |
| 100998 | 700 | 1900 | 0 | 0 | 29 | 1 | 2 | 13 | 6 | 0 | 1 |
| 110998 | 730 | 830 | 0 | 0 | 8 | 0 | 2 | 5 | 2 | 0 | 0 |
| 120998 | 730 | 1600 | 0 | 0 | 16 | 0 | 2 | 8 | 4 | 0 | 0 |
| 130998 | 800 | 1600 | 1 | 1 | 9 | 0 | 4 | 3 | 4 | 0 | 0 |
| 140998 | 730 | 1830 | 0 | 0 | 21 | 0 | 5 | 10 | 1 | 0 | 0 |
| 150998 | 700 | 1530 | 0 | 0 | 23 | 0 | 1 | 3 | 2 | 0 | 0 |
| 160998 | 730 | 1600 | 0 | 0 | 15 | 0 | 3 | 1 | 0 | 0 | 0 |
| 170998 | 730 | 1600 | 0 | 0 | 10 | 0 | 1 | 0 | 0 | 0 | 0 |
| 180998 | 730 | 900 | 0 | 0 | 18 | 0 | 6 | 1 | 0 | 0 | 0 |
| 190998 | 730 | 1600 | 0 | 0 | 19 | 1 | 0 | 1 | 0 | 0 | 0 |
| 200998 | 730 | 1400 | 0 | 0 | 18 | 0 | 3 | 2 | 1 | 0 | 0 |
| 210998 | 730 | 1700 | 0 | 0 | 21 | 1 | 0 | 0 | 1 | 0 | 0 |
| 220998 | 730 | 1730 | 0 | 0 | 18 | 0 | 5 | 2 | 0 | 0 | 0 |
| 230998 | 730 | 1600 | 0 | 0 | 15 | 0 | 1 | 0 | 0 | 0 | 0 |
| 240998 | 730 | 1600 | 0 | 0 | 8 | 1 | 0 | 0 | 1 | 0 | 0 |
| 61098 | 800 | 1600 | 1 | 0 | 16 | 0 | 5 | 0 | 0 | 0 | 0 |
| 71098 | 800 | 1600 | 0 | 0 | 10 | 0 | 7 | 0 | 0 | 0 | 0 |
| 81098 | 800 | 1600 | 1 | 0 | 24 | 0 | 14 | 0 | 0 | 0 | 0 |
| 91098 | 800 | 1600 | 0 | 0 | 45 | 0 | 28 | 0 | 0 | 0 | 0 |
| 101098 | 800 | 1600 | 0 | 0 | 48 | 1 | 23 | 0 | 0 | 0 | 0 |
| 111098 | 800 | 1600 | 0 | 0 | 27 | 1 | 7 | 0 | 0 | 0 | 0 |
| Sum: | | | 488 | 152 | 1083 | 52 | 221 | 870 | 546 | 8 | 4 |
| Ave: | | | 5.88 | 1.83 | 13 | 0.63 | 2.66 | 10.5 | 6.58 | 0.1 | 0.05 |

[1] Species designation:
CN: chinook, JX: jacks, CO: coho, CH: chum, PK: pink, SK: sockeye, ST: steelhead.

Table 3 (cont.)

| | | | Night Catches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Start | Finish | CN | JX | CO | JX | CH | PK | SK | ST | DV |
| 50798 | 1600 | 615 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80798 | 1930 | 700 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 90798 | 1930 | 645 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| 100798 | 1900 | 645 | 7 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 110798 | 1845 | 645 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| 120798 | 1845 | 645 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| 130798 | 1845 | 630 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 |
| 140798 | 1700 | 645 | 4 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| 150798 | 1530 | 645 | 7 | 5 | 0 | 0 | 0 | 0 | 5 | 0 | 1 |
| 160798 | 1930 | 630 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| 170798 | 1645 | 630 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| 180798 | 1700 | 630 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 190798 | 1700 | 630 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| 210798 | 1900 | 600 | 4 | 1 | 0 | 0 | 1 | 0 | 4 | 1 | 0 |
| 220798 | 1900 | 615 | 3 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| 230798 | 1945 | 615 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |
| 240798 | 2000 | 615 | 4 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 |
| 250798 | 2000 | 600 | 4 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 260798 | 1900 | 600 | 3 | 3 | 0 | 0 | 1 | 0 | 2 | 0 | 0 |
| 270898 | 1900 | 600 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 290798 | 2030 | 700 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 300798 | 1845 | 630 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40898 | 1900 | 545 | 62 | 7 | 0 | 0 | 7 | 5 | 14 | 0 | 0 |
| 50898 | 2000 | 1045 | 7 | 2 | 0 | 0 | 1 | 3 | 4 | 0 | 0 |
| 60898 | 1945 | 830 | 10 | 2 | 1 | 0 | 1 | 2 | 6 | 0 | 0 |
| 70898 | 1945 | 700 | 10 | 7 | 2 | 0 | 0 | 0 | 2 | 0 | 0 |
| 80898 | 1845 | 645 | 2 | 4 | 0 | 0 | 1 | 2 | 1 | 0 | 0 |
| 90898 | 1900 | 730 | 12 | 0 | 3 | 0 | 0 | 10 | 13 | 0 | 0 |
| 100898 | 1900 | 630 | 5 | 2 | 0 | 0 | 2 | 5 | 3 | 0 | 0 |
| 110898 | 1600 | 845 | 2 | 0 | 1 | 0 | 6 | 9 | 5 | 0 | 1 |
| 130898 | 1900 | 700 | 8 | 0 | 3 | 0 | 3 | 12 | 4 | 0 | 0 |
| 150898 | 1900 | 730 | 7 | 0 | 6 | 0 | 7 | 4 | 13 | 0 | 0 |
| 160898 | 1900 | 815 | 15 | 5 | 8 | 0 | 6 | 23 | 16 | 0 | 1 |
| 170898 | 1900 | 1130 | 27 | 5 | 14 | 0 | 5 | 63 | 32 | 0 | 0 |
| 180898 | 2100 | 630 | 10 | 0 | 6 | 0 | 2 | 21 | 6 | 0 | 0 |
| 190898 | 1830 | 600 | 15 | 7 | 9 | 0 | 2 | 60 | 14 | 0 | 0 |
| 200898 | 2100 | 830 | 7 | 2 | 2 | 0 | 3 | 34 | 21 | 0 | 0 |
| 210898 | 1900 | 830 | 11 | 1 | 9 | 0 | 0 | 72 | 14 | 0 | 0 |
| 220898 | 2030 | 730 | 4 | 1 | 12 | 0 | 1 | 36 | 28 | 0 | 0 |
| 230898 | 2100 | 700 | 3 | 0 | 3 | 0 | 1 | 10 | 5 | 0 | 0 |
| 240898 | 2130 | 1045 | 4 | 1 | 14 | 0 | 2 | 45 | 16 | 0 | 0 |
| 250898 | 2100 | 715 | 3 | 0 | 2 | 0 | 0 | 24 | 6 | 0 | 0 |
| 260898 | 2100 | 700 | 1 | 1 | 8 | 2 | 0 | 19 | 7 | 0 | 0 |
| 270898 | 2130 | 815 | 3 | 0 | 10 | 0 | 2 | 44 | 8 | 0 | 0 |
| 280898 | 2100 | 900 | 1 | 0 | 6 | 0 | 0 | 13 | 4 | 0 | 0 |
| 290898 | 2130 | 1245 | 1 | 0 | 6 | 0 | 0 | 9 | 2 | 0 | 0 |

Table 3 (cont.)

| | | | Night Catches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Start | Finish | CN | JX | CO | JX | CH | PK | SK | ST | DV |
| 300898 | 2100 | 745 | 2 | 0 | 4 | 0 | 1 | 6 | 3 | 0 | 0 |
| 310898 | 2100 | 715 | 1 | 0 | 10 | 0 | 0 | 7 | 3 | 0 | 0 |
| 10998 | 1830 | 715 | 0 | 0 | 4 | 1 | 1 | 6 | 3 | 0 | 0 |
| 20998 | 1845 | 700 | 0 | 0 | 4 | 0 | 1 | 4 | 1 | 0 | 0 |
| 30998 | 1920 | 700 | 1 | 0 | 3 | 0 | 0 | 1 | 1 | 0 | 0 |
| 40998 | 1930 | 730 | 0 | 0 | 4 | 0 | 1 | 5 | 1 | 0 | 0 |
| 50998 | 1915 | 730 | 2 | 0 | 17 | 1 | 3 | 15 | 1 | 0 | 0 |
| 60998 | 1630 | 800 | 0 | 0 | 18 | 5 | 2 | 14 | 8 | 0 | 0 |
| 70998 | 1700 | 700 | 2 | 0 | 6 | 2 | 3 | 7 | 1 | 0 | 0 |
| 80898 | 1630 | 700 | 0 | 0 | 8 | 1 | 0 | 1 | 1 | 0 | 0 |
| 90998 | 1600 | 700 | 0 | 0 | 12 | 1 | 2 | 10 | 4 | 0 | 0 |
| 110998 | 1600 | 730 | 0 | 0 | 18 | 1 | 0 | 1 | 2 | 0 | 0 |
| 120998 | 1600 | 730 | 0 | 0 | 30 | 1 | 2 | 3 | 6 | 0 | 0 |
| 130998 | 1600 | 730 | 0 | 0 | 38 | 0 | 2 | 0 | 7 | 1 | 0 |
| 140998 | 1830 | 630 | 0 | 0 | 27 | 3 | 3 | 7 | 4 | 0 | 0 |
| 150998 | 1530 | 800 | 0 | 0 | 37 | 0 | 4 | 1 | 6 | 0 | 0 |
| 160998 | 1600 | 800 | 0 | 0 | 22 | 1 | 0 | 0 | 1 | 0 | 0 |
| 170998 | 1600 | 730 | 0 | 0 | 27 | 2 | 1 | 0 | 0 | 0 | 0 |
| 180998 | 1600 | 1700 | 0 | 0 | 24 | 0 | 2 | 2 | 1 | 0 | 0 |
| 190998 | 1600 | 730 | 1 | 0 | 34 | 0 | 1 | 2 | 1 | 0 | 0 |
| 200998 | 1400 | 730 | 0 | 0 | 25 | 2 | 1 | 0 | 0 | 0 | 0 |
| 210998 | 1700 | 730 | 0 | 0 | 19 | 4 | 1 | 1 | 0 | 0 | 0 |
| 220998 | 1745 | 730 | 0 | 1 | 15 | 2 | 1 | 0 | 0 | 0 | 0 |
| 230998 | 1600 | 730 | 0 | 0 | 9 | 1 | 2 | 1 | 0 | 0 | 0 |
| 240998 | 1600 | 730 | 0 | 0 | 10 | 0 | 2 | 0 | 0 | 0 | 0 |
| 61098 | 1600 | 800 | 0 | 0 | 7 | 2 | 7 | 0 | 0 | 0 | 0 |
| 71098 | 1600 | 800 | 0 | 0 | 10 | 0 | 5 | 0 | 0 | 0 | 0 |
| 81098 | 1600 | 800 | 0 | 0 | 43 | 0 | 18 | 0 | 0 | 0 | 0 |
| 91098 | 1600 | 800 | 0 | 0 | 27 | 0 | 11 | 0 | 0 | 0 | 0 |
| 101098 | 1600 | 800 | 0 | 0 | 33 | 0 | 7 | 0 | 0 | 0 | 0 |
| 111098 | 1600 | 800 | 0 | 0 | 7 | 0 | 6 | 0 | 0 | 0 | 0 |
| Sum: | | | 289 | 60 | 677 | 32 | 146 | 620 | 359 | 2 | 3 |
| Ave: | | | 3.75 | 0.78 | 8.79 | 0.42 | 1.9 | 8.05 | 4.66 | 0.03 | 0.04 |

Table 4. Length-frequency of chinook sampled at the fishwheel, Klinaklini R., 1998

| | Chinook | | | Coho | | | Pink | | | Chum | | | Sockeye | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (cm) | Males | Jacks | Females | Males | Jacks | Females | Males | Jacks | Females | Males | Jacks | Females | Males | Jacks | Females |
| 22 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 27 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 1 |
| 28 | 0 | 3 | 0 | 0 | 8 | 0 | 9 | 0 | 15 | 0 | 0 | 0 | 0 | 2 | 1 |
| 29 | 0 | 2 | 0 | 2 | 5 | 0 | 20 | 0 | 14 | 0 | 0 | 0 | 0 | 2 | 0 |
| 30 | 0 | 2 | 0 | 2 | 5 | 0 | 22 | 1 | 29 | 0 | 0 | 0 | 1 | 3 | 0 |
| 31 | 1 | 5 | 0 | 3 | 10 | 0 | 62 | 0 | 56 | 0 | 0 | 0 | 1 | 0 | 0 |
| 32 | 0 | 3 | 0 | 1 | 17 | 0 | 54 | 0 | 65 | 0 | 0 | 0 | 0 | 1 | 1 |
| 33 | 0 | 9 | 0 | 1 | 21 | 0 | 83 | 0 | 69 | 0 | 0 | 0 | 1 | 0 | 3 |
| 34 | 2 | 2 | 0 | 0 | 5 | 3 | 92 | 0 | 90 | 1 | 0 | 0 | 0 | 0 | 0 |
| 35 | 3 | 6 | 1 | 2 | 10 | 6 | 87 | 0 | 105 | 0 | 0 | 0 | 1 | 1 | 1 |
| 36 | 0 | 5 | 0 | 3 | 2 | 6 | 86 | 0 | 103 | 0 | 0 | 0 | 2 | 0 | 1 |
| 37 | 1 | 2 | 0 | 8 | 6 | 10 | 75 | 0 | 67 | 0 | 0 | 0 | 5 | 0 | 2 |
| 38 | 1 | 10 | 0 | 10 | 3 | 8 | 70 | 0 | 56 | 0 | 0 | 0 | 2 | 0 | 2 |
| 39 | 1 | 2 | 0 | 6 | 5 | 6 | 53 | 0 | 35 | 0 | 0 | 0 | 2 | 1 | 8 |
| 40 | 0 | 4 | 0 | 8 | 5 | 12 | 25 | 0 | 19 | 0 | 0 | 0 | 10 | 0 | 12 |
| 41 | 0 | 3 | 1 | 8 | 2 | 13 | 17 | 0 | 5 | 0 | 0 | 0 | 15 | 0 | 14 |
| 42 | 1 | 3 | 0 | 18 | 1 | 19 | 13 | 0 | 5 | 0 | 0 | 0 | 11 | 0 | 17 |
| 43 | 0 | 3 | 0 | 17 | 1 | 14 | 10 | 0 | 3 | 0 | 0 | 0 | 10 | 0 | 19 |
| 44 | 0 | 1 | 0 | 12 | 0 | 19 | 7 | 0 | 2 | 0 | 0 | 0 | 10 | 0 | 31 |
| 45 | 0 | 0 | 2 | 16 | 0 | 17 | 3 | 0 | 0 | 0 | 0 | 1 | 15 | 0 | 20 |
| 46 | 3 | 0 | 2 | 22 | 0 | 24 | 0 | 0 | 3 | 1 | 0 | 0 | 22 | 0 | 33 |
| 47 | 1 | 0 | 1 | 16 | 0 | 28 | 0 | 0 | 2 | 0 | 0 | 0 | 32 | 0 | 53 |
| 48 | 1 | 1 | 2 | 22 | 0 | 19 | 1 | 0 | 0 | 0 | 0 | 1 | 33 | 0 | 68 |
| 49 | 0 | 0 | 2 | 22 | 0 | 31 | 1 | 0 | 0 | 2 | 0 | 3 | 43 | 0 | 61 |
| 50 | 3 | 0 | 4 | 23 | 0 | 38 | 0 | 0 | 1 | 3 | 0 | 2 | 54 | 0 | 53 |
| 51 | 3 | 0 | 2 | 23 | 0 | 39 | 0 | 0 | 0 | 3 | 0 | 4 | 35 | 0 | 34 |
| 52 | 3 | 0 | 4 | 26 | 0 | 31 | 0 | 0 | 0 | 7 | 0 | 8 | 28 | 0 | 34 |
| 53 | 4 | 0 | 7 | 37 | 0 | 31 | 0 | 0 | 0 | 12 | 0 | 15 | 21 | 0 | 21 |
| 54 | 4 | 0 | 7 | 42 | 0 | 54 | 1 | 0 | 0 | 13 | 0 | 15 | 20 | 0 | 15 |
| 55 | 7 | 0 | 7 | 48 | 0 | 50 | 1 | 0 | 0 | 16 | 0 | 14 | 13 | 0 | 10 |
| 56 | 3 | 0 | 11 | 45 | 0 | 70 | 0 | 0 | 0 | 22 | 0 | 26 | 9 | 0 | 6 |
| 57 | 1 | 0 | 0 | 43 | 0 | 72 | 0 | 0 | 0 | 33 | 0 | 28 | 5 | 0 | 4 |

Table 4 (cont.)

| Length (cm) | Chinook Males | Chinook Jacks | Chinook Females | Coho Males | Coho Jacks | Coho Females | Pink Males | Pink Jacks | Pink Females | Chum Males | Chum Jacks | Chum Females | Sockeye Males | Sockeye Jacks | Sockeye Females |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | 0 | 0 | 7 | 47 | 0 | 65 | 0 | 0 | 0 | 25 | 0 | 16 | 5 | 0 | 3 |
| 59 | 3 | 0 | 7 | 71 | 0 | 73 | 0 | 0 | 0 | 27 | 0 | 17 | 0 | 0 | 1 |
| 60 | 1 | 0 | 6 | 75 | 0 | 67 | 0 | 0 | 0 | 33 | 0 | 10 | 0 | 0 | 1 |
| 61 | 3 | 0 | 4 | 56 | 0 | 42 | 0 | 0 | 0 | 15 | 0 | 5 | 1 | 0 | 0 |
| 62 | 4 | 0 | 9 | 46 | 0 | 42 | 0 | 0 | 0 | 22 | 0 | 4 | 0 | 0 | 0 |
| 63 | 2 | 0 | 11 | 37 | 0 | 53 | 0 | 0 | 0 | 19 | 0 | 1 | 0 | 0 | 0 |
| 64 | 1 | 0 | 12 | 37 | 0 | 23 | 0 | 0 | 0 | 26 | 0 | 1 | 0 | 0 | 0 |
| 65 | 3 | 0 | 12 | 27 | 0 | 17 | 0 | 0 | 0 | 11 | 0 | 1 | 0 | 0 | 1 |
| 66 | 3 | 0 | 15 | 21 | 0 | 10 | 0 | 0 | 0 | 6 | 0 | 1 | 0 | 0 | 0 |
| 67 | 6 | 0 | 16 | 12 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 68 | 4 | 0 | 11 | 5 | 0 | 6 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 |
| 69 | 4 | 0 | 14 | 5 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| 70 | 6 | 0 | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 71 | 7 | 0 | 14 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 72 | 5 | 0 | 9 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 73 | 4 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 74 | 6 | 0 | 10 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 75 | 6 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 76 | 1 | 0 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 77 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 78 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 79 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 81 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 82 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 83 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 84 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 85 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 86 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 87 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 88 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 89 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total: | 132 | 66 | 250 | 944 | 110 | 1022 | 799 | 1 | 751 | 305 | 0 | 175 | 408 | 13 | 532 |
| Mean Length | 64.0 | 35.9 | 64.2 | 55.7 | 33.3 | 54.5 | 35.2 | 30 | 34.7 | 59 | N/A | 56.4 | 48.6 | 30.1 | 47.7 |

Table 5. Age-frequency of chinook and coho sampled at Mussel Creek and at the fishwheel, Klinaklini R., 1998.

| | Mussel Creek | | | Klinaklini Fishwheel | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age[1] | Chinook | | | Chinook | | | | Coho | | | |
| | Frequency | PCT | | Frequency | | | PCT | Frequency | | | PCT |
| | | | | M | F | J | | M | F | J | |
| 0.1 | 0 | 0.0 | | 0 | 0 | 8 | 2.2 | 0 | 0 | 0 | 0.0 |
| 0.2 | 4 | 7.3 | | 3 | 8 | 1 | 3.2 | 0 | 0 | 0 | 0.0 |
| 0.3 | 22 | 40.0 | | 20 | 70 | 3 | 25.1 | 0 | 1 | 0 | 0.4 |
| 0.4 | 6 | 10.9 | | 13 | 15 | 0 | 7.5 | 0 | 0 | 0 | 0.0 |
| 1.1 | 3 | 5.5 | | 10 | 4 | 47 | 16.4 | 52 | 134 | 23 | 77.4 |
| 1.2 | 9 | 16.4 | | 26 | 34 | 3 | 17.0 | 0 | 0 | 0 | 0.0 |
| 1.3 | 11 | 20.0 | | 35 | 64 | 0 | 26.7 | 0 | 0 | 0 | 0.0 |
| 1.4 | 0 | 0.0 | | 1 | 6 | 0 | 1.9 | 0 | 0 | 0 | 0.0 |
| 2.1 | 0 | 0.0 | | 0 | 0 | 0 | 0.0 | 20 | 32 | 8 | 22.2 |
| | | | | | | | | | | | |
| Total | 55 | 100.0 | | 108 | 201 | 62 | 100.0 | 72 | 167 | 31 | 100.0 |

[1] Age notation consists of fresh water years followed by salt water years, the sum of which gives total age

Table 6. Environmental data collected at the fishwheel site, Klinaklini R., 1998.

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | Flow START | Flow END | Flow DIFF | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-Jul-98 | 7:00 | 4.0 | 18 | 338000 | 350172 | 12172 | 1.0903 | 12.3 | 2.46 | 590 |
| | 19:00 | 5.0 | 16 | 350180 | 361392 | 11212 | 1.0043 | 12.1 | 2.42 | 588 |
| 5-Jul-98 | 7:00 | 5.0 | 16 | 361700 | 372773 | 11073 | 0.9919 | 11 | 2.20 | 587 |
| | 19:00 | 7.0 | 18 | 372800 | 383990 | 11190 | 1.0024 | 11.5 | 2.30 | 586 |
| 6-Jul-98 | 7:00 | 7.0 | 18 | 384000 | 394952 | 10952 | 0.981 | 12.5 | 2.50 | 591 |
| | 19:00 | 7.0 | 19 | 395030 | 406825 | 11795 | 1.0566 | 11.5 | 2.30 | 590 |
| 7-Jul-98 | 7:00 | 6.0 | 19.0 | 406850 | 417939 | 11089 | 0.9933 | 10.5 | 2.10 | 588 |
| | 19:00 | 8.0 | 15.0 | 417920 | 428851 | 10931 | 0.9792 | 10.5 | 2.10 | 587 |
| 8-Jul-98 | 7:00 | 6.0 | 16.0 | 428870 | 439299 | 10429 | 0.9342 | 9.8 | 1.96 | 580 |
| | 19:00 | 8.0 | 15.0 | 439320 | 449258 | 9938 | 0.8902 | 10 | 2.00 | 577 |
| 9-Jul-98 | 7:00 | 6.0 | 16.0 | 449270 | 459119 | 9849 | 0.8822 | 9.5 | 1.90 | 570 |
| | 19:00 | 7.0 | 16.0 | 459130 | 468959 | 9829 | 0.8804 | 9.5 | 1.90 | 570 |
| 10-Jul-98 | 7:00 | 6.0 | 15.0 | 468950 | 478179 | 9229 | 0.8267 | 8.5 | 1.70 | 566 |
| | 19:00 | 7.0 | 16.0 | 478180 | 487820 | 9640 | 0.8635 | 9 | 1.80 | 570 |
| 11-Jul-98 | 7:00 | 6.0 | 17.0 | 487810 | 497185 | 9375 | 0.8398 | 9.5 | 1.90 | 570 |
| | 19:00 | 7.0 | 19.0 | 497110 | 506629 | 9519 | 0.8527 | 8 | 1.60 | 568 |
| 12-Jul-98 | 7:00 | 6.0 | 18.0 | 506650 | 515865 | 9215 | 0.8254 | 9 | 1.80 | 561 |
| | 20:00 | 6.0 | 18.0 | 515870 | 524972 | 9102 | 0.8153 | 9 | 1.80 | 558 |
| 13-Jul-98 | 7:30 | 5.0 | 19.0 | 524980 | 533902 | 8922 | 0.7992 | 8 | 1.60 | 549 |
| | 19:00 | 7.0 | 20.0 | 533900 | 542105 | 8205 | 0.735 | 8.25 | 1.65 | 535 |
| 14-Jul-98 | 7:30 | 6.0 | 33.0 | 542137 | 550076 | 7939 | 0.7111 | 7.9 | 1.58 | 520 |
| | 19:00 | 6.0 | 30.0 | 550071 | 557064 | 6993 | 0.6264 | 7.1 | 1.42 | 507 |
| 15-Jul-98 | 7:30 | 5.5 | 32.0 | 557066 | 563931 | 6865 | 0.6149 | 6.75 | 1.35 | 512 |
| | 19:00 | 6.0 | 32.0 | 563935 | 570773 | 6838 | 0.6125 | 7.2 | 1.44 | 516 |
| 16-Jul-98 | 7:30 | 6.0 | 31.0 | 570775 | 578412 | 7637 | 0.6841 | 7.75 | 1.55 | 528 |
| | 19:00 | 6.0 | 26.0 | 578699 | 587590 | 8891 | 0.7964 | 9.76 | 1.95 | 551 |
| 17-Jul-98 | 7:00 | 6.0 | 17.0 | 587625 | 598664 | 11039 | 0.9888 | 11.59 | 2.32 | 594 |
| | 19:00 | 8.0 | 13.0 | 707500 | 720836 | 13336 | 1.1946 | 12.6 | 2.52 | 600 |
| 18-Jul-98 | 7:00 | 6.0 | 15.0 | 733592 | 745536 | 11944 | 1.0699 | 11.8 | 2.36 | 604 |
| | 19:00 | 6.0 | 12.0 | 745556 | 758051 | 12495 | 1.1193 | 11.33 | 2.27 | 600 |
| 19-Jul-98 | 7:00 | 6.0 | 14.0 | 826499 | 841700 | 15201 | 1.3617 | 13.33 | 2.67 | 608 |
| | 19:00 | 7.0 | 10.0 | 841700 | 856250 | 14550 | 1.3033 | 10.56 | 2.11 | 605 |
| 20-Jul-98 | 7:00 | 6.0 | 13.0 | 856252 | 868256 | 12004 | 1.0753 | 10.28 | 2.06 | 585 |
| | 19:30 | 6.0 | 13.0 | 868250 | 878865 | 10615 | 0.9509 | 9.5 | 1.90 | 572 |
| 21-Jul-98 | 7:30 | 5.0 | 10.0 | 878800 | 888450 | 9650 | 0.8644 | 8 | 1.60 | 566 |
| | 19:00 | 7.0 | 14.5 | 888450 | 899124 | 10674 | 0.9561 | 9 | 1.80 | 574 |
| 22-Jul-98 | 7:00 | 6.0 | 14.5 | 899170 | 909604 | 10434 | 0.9346 | 9.3 | 1.86 | 574 |
| | 19:00 | 7.0 | 17.0 | 909620 | 920739 | 11119 | 0.996 | 11 | 2.20 | 588 |
| 23-Jul-98 | 7:00 | 6.0 | 13.0 | 920730 | 930242 | 9512 | 0.8521 | 8.7 | 1.74 | 578 |
| | 19:00 | 7.0 | 17.0 | 930230 | 942171 | 11941 | 1.0696 | 11 | 2.20 | 591 |
| 24-Jul-98 | 7:00 | 6.0 | 15.5 | 942180 | 954059 | 11879 | 1.0641 | 10.2 | 2.04 | 589 |
| | 19:00 | 6.0 | 18.0 | 954060 | 966926 | 12866 | 1.1525 | 10 | 2.00 | 593 |

Table 6 (cont.)

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | START | Flow END | DIFF | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 25-Jul-98 | 7:00 | 6.0 | 18.0 | 966940 | 979069 | 12129 | 1.0865 | 10 | 2.00 | 589 |
| | 19:00 | 7.0 | 14.0 | 979070 | 989581 | 10511 | 0.9415 | 9 | 1.80 | 593 |
| 26-Jul-98 | 7:00 | 7.0 | 14.0 | 989600 | 1900 | 12299 | 1.1017 | 10 | 2.00 | 590 |
| | 19:30 | 7.0 | 14.0 | 1900 | 14953 | 13053 | 1.1692 | 11 | 2.20 | 612 |
| 27-Jul-98 | 7:00 | 6.0 | 15.0 | 14960 | 29047 | 14087 | 1.2619 | 13.2 | 2.64 | 621 |
| | 20:00 | 8.0 | 14.0 | 30000 | 49000 | 19000 | 1.702 | 0 | 0.00 | 635 |
| 28-Jul-98 | 8:00 | 8.0 | 12.0 | 49900 | 64779 | 14879 | 1.3328 | | 0.00 | 632 |
| | 19:00 | 9.0 | 9.0 | | | | | 14.9 | 2.98 | 632 |
| 29-Jul-98 | 8:00 | 9.0 | 11.0 | | | | | 14.7 | 2.94 | 636 |
| | 19:00 | 8.0 | 10.0 | | | | | 13.7 | 2.74 | 630 |
| 30-Jul-98 | 7:00 | 6.0 | 12.0 | | | | | 15 | 3.00 | 624 |
| | 19:00 | 8.0 | 12.0 | | | | | 16.3 | 3.26 | 616 |
| 31-Jul-98 | 7:00 | 6.0 | 11.0 | | | | | 13.5 | 2.70 | 605 |
| | 19:00 | | | | | | | | 0.00 | |
| 1-Aug-98 | 7:30 | 8.5 | 15.0 | | | | | 12.3 | 2.46 | 595 |
| | 19:00 | 9.0 | 12.0 | | | | | 11.2 | 2.24 | 575 |
| 2-Aug-98 | 7:30 | | | | | | | | 0.00 | |
| | 19:00 | 9.0 | 11.5 | | | | | | 0.00 | 548 |
| 3-Aug-98 | 7:00 | | | | | | | | 0.00 | |
| | 19:00 | 7.0 | 16.5 | | | | | 11.2 | 2.24 | 559 |
| 4-Aug-98 | 7:00 | 6.0 | 21.0 | | | | | 11.5 | 2.30 | 551 |
| | 19:00 | 7.5 | 16.0 | | | | | 11.2 | 2.24 | 558 |
| 5-Aug-98 | 7:00 | 7.0 | 21.0 | | | | | 10.5 | 2.10 | 557 |
| | 19:00 | 6.0 | 16.0 | | | | | 11.5 | 2.30 | 568 |
| 6-Aug-98 | 8:00 | 6.0 | 17.8 | | | | | 10.5 | 2.10 | 550 |
| | 19:00 | 6.5 | 18.5 | | | | | 10.2 | 2.04 | 547 |
| 7-Aug-98 | 8:30 | 5.5 | 16.5 | | | | | 9.7 | 1.94 | 542 |
| | 19:00 | 7.0 | 17.2 | | | | | 10 | 2.00 | 539 |
| 8-Aug-98 | 10:30 | 6.0 | 18.2 | | | | | 9 | 1.80 | 530 |
| | 19:00 | 7.0 | 18.0 | | | | | 9 | 1.80 | 529 |
| 9-Aug-98 | 7:30 | 6.0 | 21.5 | | | | | 9 | 1.80 | 526 |
| | 19:30 | 6.0 | 22.5 | | | | | 9.2 | 1.84 | 528 |
| 10-Aug-98 | 7:30 | 5.0 | 21.0 | | | | | 11 | 2.20 | 551 |
| | 20:00 | 7.0 | 17.0 | | | | | 10.75 | 2.15 | 560 |
| 11-Aug-98 | 7:00 | 6.0 | 16.6 | 0 | 11392 | 11392 | 1.0205 | 10.1 | 2.02 | 550 |
| | 19:30 | 8.0 | 16.0 | 11392 | 22418 | 11026 | 0.9877 | 10 | 2.00 | 540 |
| 12-Aug-98 | 7:00 | 6.0 | 19.0 | 22225 | 34033 | 11808 | 1.0577 | 10.33 | 2.07 | 560 |
| | 16:00 | 7.0 | 19.0 | 46994 | 59979 | 12985 | 1.1632 | 11.33 | 2.27 | 580 |
| 13-Aug-98 | 7:00 | 6.0 | 16.0 | 59959 | 74430 | 14471 | 1.2963 | 12 | 2.40 | 580 |
| | 19:00 | 7.0 | 16.0 | 75000 | 89854 | 14854 | 1.3306 | 13 | 2.60 | 580 |

Table 6 (cont.)

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | Flow START | Flow END | Flow DIFF | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 15-Aug-98 | 7:00 | 6.0 | 14.0 | 105070 | 117751 | 12681 | 1.1359 | 11.1 | 2.22 | 575 |
| | 19:00 | | | | | | | | 0.00 | |
| 16-Aug-98 | 7:00 | 5.0 | 17.0 | 117737 | 125675 | 7938 | 0.7111 | 11.2 | 2.24 | 360 |
| | 19:00 | 6.0 | 18.0 | 125679 | 133930 | 8251 | 0.7391 | 8 | 1.60 | 418 |
| 17-Aug-98 | 7:00 | 6.0 | 28.0 | 133950 | 136164 | 2214 | 0.1983 | 7.2 | 1.44 | 498 |
| | 19:00 | 5.0 | 31.2 | 136130 | 143790 | 7660 | 0.6862 | 7.2 | 1.44 | 491 |
| 18-Aug-98 | 6:30 | 6.0 | 25.0 | 143800 | 151498 | 7698 | 0.6896 | 7.2 | 1.44 | 506 |
| | 18:30 | 6.0 | 18.0 | 151510 | 158517 | 7007 | 0.6277 | 7 | 1.40 | 492 |
| 19-Aug-98 | | 6.0 | 21.5 | 158580 | 165963 | 7383 | 0.6613 | 7.5 | 1.50 | 503 |
| | 18:30 | 7.0 | 20.5 | 165980 | 173961 | 7981 | 0.7149 | 7.7 | 1.54 | 509 |
| 20-Aug-98 | | 6.0 | 22.5 | 176930 | 182569 | 5639 | 0.5051 | 8 | 1.60 | 504 |
| | 18:00 | 7.0 | 20.5 | 165980 | 173961 | 7981 | 0.7149 | 7.7 | 1.54 | 509 |
| 21-Aug-98 | | 5.0 | 20.5 | 192060 | 201034 | 8974 | 0.8039 | 8.2 | 1.64 | 525 |
| | 16:00 | 5.0 | 23.0 | 201031 | 210625 | 9594 | 0.8594 | 8.7 | 1.74 | 527 |
| 22-Aug-98 | 7:00 | 6.0 | 24.0 | 210620 | 219132 | 8512 | 0.7625 | 8.5 | 1.70 | 520 |
| | 18:30 | 7.0 | 22.5 | 219140 | 228333 | 9193 | 0.8235 | 9 | 1.80 | 524 |
| 23-Aug-98 | 8:00 | 5.0 | 24.2 | 228350 | 236772 | 8422 | 0.7544 | 8.5 | 1.70 | 517 |
| | 19:30 | 7.0 | 24.5 | 236750 | 244389 | 7639 | 0.6843 | 7.7 | 1.54 | 501 |
| 24-Aug-98 | 8:30 | 6.0 | 27.3 | 244370 | 251647 | 7277 | 0.6519 | 8.2 | 1.64 | 496 |
| | 19:30 | 6.0 | 28.5 | 251660 | 259239 | 7579 | 0.6789 | 8.5 | 1.70 | 502 |
| 25-Aug-98 | 7:30 | 5.0 | 26.0 | 259240 | 266118 | 6878 | 0.6161 | 7.2 | 1.44 | 497 |
| | 19:30 | 5.0 | 26.4 | 266130 | 273436 | 7306 | 0.6544 | 7.7 | 1.54 | 494 |
| 26-Aug-98 | 7:00 | 6.0 | 26.4 | 273410 | 280808 | 7398 | 0.6627 | 7.5 | 1.50 | 496 |
| | | 6.0 | 23.4 | 280820 | 287840 | 7020 | 0.6288 | 7.5 | 1.50 | 494 |
| 27-Aug-98 | 7:30 | 5.0 | 30.5 | 287830 | 295063 | 7233 | 0.6479 | 7.7 | 1.54 | 493 |
| | 19:00 | 6.0 | 27.5 | 295090 | 302414 | 7324 | 0.6561 | 8.5 | 1.70 | 497 |
| 28-Aug-98 | 7:30 | 5.0 | 24.4 | 302430 | 309957 | 7527 | 0.6742 | 8.2 | 1.64 | 504 |
| | 19:30 | 7.0 | 27.0 | 309940 | 318860 | 8920 | 0.799 | 9.2 | 1.84 | 519 |
| 29-Aug-98 | 8:00 | 6.0 | 17.3 | 318860 | 328320 | 9460 | 0.8474 | 11 | 2.20 | 525 |
| | | 5.0 | 26.7 | 328340 | 339152 | 10812 | 0.9685 | 9.2 | 1.84 | 542 |
| 30-Aug-98 | 8:00 | 5.0 | 28.0 | 339260 | 349715 | 10455 | 0.9365 | 9.2 | 1.84 | 537 |
| | | 7.0 | 27.1 | 349720 | 360134 | 10414 | 0.9329 | 9.2 | 1.84 | 537 |
| 31-Aug-98 | 7:30 | 5.0 | 28.1 | 360160 | 370155 | 9995 | 0.8953 | 9.2 | 1.84 | 534 |
| | 18:30 | 6.0 | 17.0 | 370160 | 380727 | 10567 | 0.9466 | 10.5 | 2.10 | 540 |
| 1-Sep-98 | 7:30 | 6.0 | 18.4 | 380727 | 392016 | 11289 | 1.0112 | 11 | 2.20 | 550 |
| | 18:40 | 6.0 | 16.0 | 392016 | 403436 | 11420 | 1.023 | 11.6 | 2.32 | 548 |
| 2-Sep-98 | 7:00 | 6.0 | 16.0 | 403427 | 414898 | 11471 | 1.0275 | 11 | 2.20 | 556 |
| | 20:00 | 6.0 | 15.0 | 414896 | 427967 | 13071 | 1.1709 | 12.2 | 2.44 | 570 |
| 3-Sep-98 | 7:00 | 5.9 | 17.0 | 427967 | 439921 | 11954 | 1.0708 | 10.9 | 2.18 | 558 |
| | 19:30 | 6.0 | 16.2 | 439920 | 451389 | 11469 | 1.0274 | 10.5 | 2.10 | 550 |

Table 6 (cont.)

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | Flow | | | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | START | END | DIFF | | | | |
| 4-Sep-98 | 7:30 | 4.9 | 16.0 | 451385 | 461792 | 10407 | 0.9322 | 9.3 | 1.86 | 537 |
| | 19:20 | 6.0 | 16.0 | 461792 | 470219 | 8427 | 0.7549 | 8.8 | 1.76 | 512 |
| 5-Sep-98 | 7:30 | 5.0 | 21.0 | 470223 | 477670 | 7447 | 0.6671 | 7 | 1.40 | 505 |
| | 16:30 | 6.0 | 17.0 | 477680 | 484178 | 6498 | 0.5821 | 6 | 1.20 | 494 |
| 6-Sep-98 | 8:00 | 5.2 | 21.0 | 484077 | 490839 | 6762 | 0.6057 | 6.8 | 1.36 | 496 |
| | 17:00 | 5.0 | 20.5 | 490839 | 498435 | 7596 | 0.6804 | 7.6 | 1.52 | 500 |
| 7-Sep-98 | 7:00 | 5.6 | 15.0 | 498425 | 509404 | 10979 | 0.9835 | 10.8 | 2.16 | 556 |
| | 17:00 | 6.0 | 16.0 | 509423 | 521016 | 11593 | 1.0385 | 11 | 2.20 | 558 |
| 8-Sep-98 | 7:00 | 5.0 | 16.0 | 521028 | 531111 | 10083 | 0.9032 | 8.9 | 1.78 | 537 |
| | 17:00 | 5.0 | 17.7 | 531118 | 539022 | 7904 | 0.708 | 8.1 | 1.62 | 510 |
| 9-Sep-98 | 7:00 | 5.0 | 18.5 | 539023 | 545693 | 6670 | 0.5975 | 6.1 | 1.22 | 490 |
| | 17:00 | 6.0 | 18.5 | 545720 | 551005 | 5285 | 0.4734 | 5.6 | 1.12 | 473 |
| 10-Sep-98 | 7:00 | 5.0 | 20.5 | 551005 | 556743 | 5738 | 0.514 | 6 | 1.20 | 478 |
| | 17:00 | 5.5 | 18.5 | 556743 | 562490 | 5747 | 0.5148 | 5.8 | 1.16 | 478 |
| 11-Sep-98 | 7:00 | 4.0 | 23.0 | 562491 | 568408 | 5917 | 0.53 | 6 | 1.20 | 498 |
| | 17:00 | 6.0 | 20.7 | 568420 | 575463 | 7043 | 0.6309 | 8 | 1.60 | 504 |
| 12-Sep-98 | 7:00 | 6.0 | 21.0 | 575460 | 583060 | 7600 | 0.6808 | 7.5 | 1.50 | 405 |
| | 16:00 | 6.0 | 20.3 | 583068 | 589470 | 6402 | 0.5735 | 6.6 | 1.32 | 493 |
| 13-Sep-98 | 7:00 | 5.0 | 21.0 | 589471 | 597200 | 7729 | 0.6923 | 7.6 | 1.52 | 507 |
| | 16:00 | 7.0 | 21.7 | 597200 | 604585 | 7385 | 0.6615 | 8.6 | 1.72 | 502 |
| 14-Sep-98 | 7:00 | 6.0 | 22.0 | 604577 | 610857 | 6280 | 0.5625 | 6 | 1.20 | 496 |
| | 16:00 | 7.0 | 24.0 | 610855 | 617020 | 6165 | 0.5522 | 4.8 | 0.96 | 495 |
| 15-Sep-98 | 7:00 | 5.0 | 27.0 | 625422 | 631646 | 6224 | 0.5575 | 7.1 | 1.42 | 470 |
| | 16:00 | 6.0 | 23.0 | 633061 | 639498 | 6437 | 0.5766 | 7.3 | 1.46 | 466 |
| 16-Sep-98 | 7:00 | 6.0 | 23.0 | 639496 | 646200 | 6704 | 0.6005 | 8.7 | 1.74 | 468 |
| | 16:00 | 6.0 | 23.0 | 646197 | 652729 | 6532 | 0.5851 | 6.5 | 1.30 | 478 |
| 17-Sep-98 | 7:00 | 5.0 | 24.0 | 652735 | 659935 | 7200 | 0.645 | 8.2 | 1.64 | 480 |
| | 16:00 | 6.0 | 27.0 | 659935 | 667228 | 7293 | 0.6533 | 8.2 | 1.64 | 478 |
| 18-Sep-98 | 7:00 | 5.5 | 27.0 | 667230 | 675449 | 8219 | 0.7362 | 8.8 | 1.76 | 4.91 |
| | 16:00 | 6.0 | 27.0 | 675480 | 683248 | 7768 | 0.6958 | 9.1 | 1.82 | 4.9 |
| 19-Sep-98 | 7:00 | 5.5 | 27.0 | 683260 | 690823 | 7563 | 0.6775 | 8.2 | 1.64 | 4.74 |
| | 16:00 | 7.5 | 26.0 | 690892 | 697702 | 6810 | 0.61 | 7.6 | 1.52 | 4.6 |
| 20-Sep-98 | 7;00 | 5.0 | 31.0 | 667709 | 705106 | 37397 | 3.3499 | 8.3 | 1.66 | 465 |
| | 16;00 | 7.0 | 28.0 | 705106 | 711384 | 6278 | 0.5624 | 7.4 | 1.48 | 460 |
| 21-Sep-98 | 7;00 | 4.5 | 33.0 | 711391 | 718918 | 7527 | 0.6742 | 7.6 | 1.52 | 460 |
| | 16;00 | 7.0 | 35.0 | 718908 | 725549 | 6641 | 0.5949 | 6.1 | 1.22 | 446 |
| 22-Sep-98 | 7;00 | 4.5 | 33.0 | 7553 | 14302 | 6749 | 0.6046 | 7.5 | 1.5 | 448 |
| | 16;00 | 7.0 | 33.0 | 14316 | 19974 | 5658 | 0.5068 | 7.8 | 1.56 | 442 |
| 23-Sep-98 | 7;00 | 4.5 | 35.0 | 19980 | 26432 | 6452 | 0.5779 | 6.4 | 1.28 | 450 |
| | 16;00 | 7.0 | 35.0 | 26440 | 32372 | 5932 | 0.5314 | 6.8 | 1.36 | 440 |
| 24-Sep-98 | 7;00 | 5.0 | 32.0 | 32377 | 39146 | 6769 | 0.6063 | 7.7 | 1.54 | 462 |
| | 16;00 | 5.8 | 34.0 | 39140 | 46057 | 6917 | 0.6196 | 7.2 | 1.44 | 468 |

Table 6 (cont.)

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | Flow START | END | DIFF | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 16;00 | 5.5 | 30.0 | 77482 | 84692 | 7210 | 0.6458 | 8.1 | 1.62 | 558 |
| 25-Sep-98 | 7;00 | 4.0 | 29.0 | 46079 | 52705 | 6626 | 0.5935 | 7.5 | 1.5 | 460 |
| | 16;00 | 7.0 | 34.0 | 52722 | 59380 | 6658 | 0.5964 | 7.5 | 1.5 | 454 |
| 26-Sep-98 | 7;00 | 4.0 | 28.0 | 59366 | 64648 | 5282 | 0.4731 | 6.2 | 1.24 | 440 |
| | 16;00 | 6.0 | 29.0 | 64644 | 70888 | 6244 | 0.5593 | 6.4 | 1.28 | 438 |
| 27-Sep-98 | 7;00 | 4.5 | 30.0 | 70891 | 77487 | 6596 | 0.5908 | 7.1 | 1.42 | 450 |
| 28-Sep-98 | 7:00 | 4.5 | 32.0 | 84697 | 91918 | 7221 | 0.6468 | 8.6 | 1.72 | 460 |
| | 16:00 | 5.5 | 32.0 | 91918 | 99405 | 7487 | 0.6707 | 7.2 | 1.44 | 480 |
| 29-Sep-98 | 7:00 | 4.0 | 32.0 | 99418 | 105093 | 5675 | 0.5083 | 6.2 | 1.24 | 450 |
| | 16:00 | 6.0 | 33.0 | 105099 | 109613 | 4514 | 0.4043 | 5.3 | 1.06 | 420 |
| 30-Sep-98 | 7:00 | 4.0 | 34 | 109613 | 114767 | 5142 | 0.4606 | 5.6 | 1.12 | 420 |
| | 16:00 | 6.0 | 34.0 | 114770 | 121018 | 6248 | 0.5597 | 7.1 | 1.42 | 430 |
| 1-Oct-98 | 0:00 | 5.0 | 27.0 | 121015 | 128746 | 7731 | 0.6925 | 8.9 | 8.9 | 450 |
| 2-Oct-98 | 11:00 | 4.0 | 26.0 | 128726 | 135576 | 6850 | 0.6136 | 6.8 | 1.36 | 488 |
| | 16:00 | 5.0 | 23.0 | 135577 | 142382 | 6805 | 0.6096 | 6.5 | 1.3 | 478 |
| 3-Oct-98 | 8:00 | 4.0 | 32.0 | 142406 | 148405 | 5999 | 0.5374 | 6.6 | 1.32 | 447 |
| | 16:00 | 5.5 | 32.0 | 148431 | 155789 | 7358 | 0.6591 | 6.6 | 1.32 | 434 |
| 4-Oct-98 | 8:00 | 4.0 | 32.0 | 155791 | 161136 | 5345 | 0.4788 | 5.3 | 1.06 | 423 |
| | 16:00 | 5.5 | 32.0 | 161140 | 165247 | 4107 | 0.3679 | 4.3 | 0.86 | 415 |
| 5-Oct-98 | 8:00 | 4.0 | 32.0 | 165255 | 169394 | 4139 | 0.3708 | 4.6 | 0.92 | 418 |
| | 16:00 | 5.5 | 32.0 | | | | | | 0 | 420 |
| 6-Oct-98 | 8:00 | 5.0 | 19.0 | 168191 | 175687 | 7496 | 0.6715 | 8.3 | 8.3 | 4.8 |
| | 16:00 | 6.0 | 21.5 | 175793 | 183466 | 7673 | 0.6873 | 8.9 | 1.78 | 491 |
| 7-Oct-98 | 8:00 | 6.0 | 21.0 | 183479 | 193681 | 10202 | 0.9139 | 10.4 | 2.08 | 518 |
| | 16:00 | 6.0 | 17.0 | 193687 | 205763 | 12076 | 1.0817 | 11.6 | 2.32 | 544 |
| 8-Oct-98 | 8:00 | 5.0 | 21.0 | 205750 | 217158 | 11408 | 1.0219 | 9.3 | 1.86 | 553 |
| | 16:00 | 6.0 | 18.0 | 217178 | 227769 | 10591 | 0.9487 | 9.4 | 1.88 | 542 |
| 9-Oct-98 | 8:00 | 4.0 | 17.0 | 227776 | 235465 | 7689 | 0.6888 | 7.1 | 1.42 | 508 |
| | 16:00 | 5.0 | 19.5 | 235467 | 242809 | 7342 | 0.6577 | 7 | 1.4 | 490 |
| 10-Oct-98 | 8:00 | 4.0 | 16.5 | 242810 | 249124 | 6314 | 0.5656 | 6 | 1.2 | 463 |
| | 16:00 | 6.0 | 16.0 | 249148 | 255689 | 6541 | 0.5859 | 7.8 | 1.56 | 450 |
| 11-Oct-98 | 8:00 | 4.0 | 15.5 | 255693 | 261567 | 5874 | 0.5262 | 5 | 1 | 436 |
| | 16:00 | 5.0 | 17.0 | 261565 | 266778 | 5213 | 0.467 | 5.3 | 1.06 | 427 |
| 12-Oct-98 | 8:00 | 5.0 | 20.0 | 266782 | 271871 | 5089 | 0.4559 | 5.3 | 1.06 | 412 |
| | 16:00 | 4.5 | 22.0 | 271866 | 276137 | 4271 | 0.3826 | 4.3 | 0.86 | 416 |
| 13-Oct-98 | 8:00 | 5.0 | 20.0 | 276142 | 279381 | 3239 | 0.2901 | 5.7 | 1.14 | 430 |
| | 16:00 | 6.0 | 20.0 | 279382 | 283616 | 4234 | 0.3793 | 5.9 | 1.18 | 432 |
| 14-Oct-98 | 8:00 | 5.0 | 20.0 | 283617 | 288134 | 4517 | 0.4046 | 5.3 | 1.06 | 434 |
| | 16:00 | 5.0 | 22.0 | 288137 | 292604 | 4467 | 0.4001 | 5 | 1 | 425 |
| 15-Oct-98 | 8:00 | 4.0 | 22.0 | 292604 | 294657 | 2053 | 0.1839 | 3.5 | 0.7 | 407 |
| | 16:00 | 6.0 | 24.0 | 294662 | 296763 | 2101 | 0.1882 | 3.1 | 0.62 | 398 |
| 16-Oct-98 | 8:00 | 4.0 | 24.0 | 296766 | 298240 | 1474 | 0.132 | 2.5 | 0.5 | 392 |
| | 16:00 | 5.0 | 24.0 | 298241 | 299811 | 1570 | 0.1406 | 2.1 | 0.42 | 386 |
| 17-Oct-98 | 8:00 | 5.0 | 20.0 | 299822 | 303168 | 3346 | 0.2997 | 5 | 1 | 410 |
| | 16:00 | 6.0 | 26.0 | 303169 | 306943 | 3774 | 0.3381 | 6.2 | 1.24 | 415 |

Table 6 (cont.)

| DATE | TIME | TEMP. (Deg. C) | SECCHI DEPTH (cm) | Flow START | Flow END | Flow DIFF | FLOW RATE (mps) | REV'S FOR 5 MIN. | RPM | DEPTH GUAGE (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-Oct-98 | 8:00 | 4.0 | 24.0 | 306946 | 310040 | 3094 | 0.2772 | 4.3 | 0.86 | 395 |
| | 16:00 | 5.8 | 24.0 | 310040 | 312131 | 2091 | 0.1873 | 2.5 | 0.5 | 385 |
| 19-Oct-98 | 8:00 | 4.0 | 24.0 | 312131 | 313265 | 1134 | 0.1016 | 0 | 0 | 375 |
| | 17:40 | 6.0 | 26.0 | 313268 | 314050 | 782 | 0.07 | 0 | 0 | 372 |
| 20-Oct-98 | 8:30 | 5.0 | 29.0 | 314090 | 315433 | 1343 | 0.1203 | 1 | 0.2 | 372 |
| | 17:40 | 5.0 | 28.0 | 315430 | 317214 | 1784 | 0.1598 | 0 | 0 | 374 |
| 21-Oct-98 | 8:15 | 5.0 | 29.0 | 317220 | 319131 | 1911 | 0.1712 | 3 | 0.6 | 373 |
| | 17:30 | 6.0 | 31.0 | 319455 | 321365 | 1910 | 0.1711 | 3 | 0.6 | 372 |
| 22-Oct-98 | 8:20 | 4.0 | 27.0 | 321387 | 323401 | 2014 | 0.1804 | 1 | 0.2 | 374 |
| | 17:00 | 6.0 | 31.0 | 323401 | 325597 | 2196 | 0.1967 | 1 | 0.2 | 372 |
| 23-Oct-98 | 8:40 | 4.0 | 34.0 | 325603 | 327720 | 2117 | 0.1896 | 3 | 0.6 | 370 |
| | 16:00 | 6.0 | 28.0 | 327720 | 329322 | 1602 | 0.1435 | 3 | 0.6 | 370 |
| 24-Oct-98 | 8:00 | 6.0 | 18.0 | 320320 | 331379 | 11059 | 0.9906 | 2 | 0.4 | 365 |

Table 7. Summary of fishwheel mark-recapture efficiency test by species, 1998. (As recovered at the fishwheel)

| Species | Tagged | Recaptured[1] | Recapture Rate (%) | Mean days at large |
|---|---|---|---|---|
| Chinook | 517 | 52 | 10.06 | 19.9 |
| Coho | 871 | 68 | 7.81 | 15.0 |
| Sockeye | 274 | 18 | 6.57 | 6.4 |
| Pink | 241 | 5 | 2.1 | 4.6 |
| Chum | 324 | 17 | 5.25 | 3.1 |
| Total: | 2,227 | 160 | | |
| Mean: | | | 6.36 | 9.8 |

[1]Fish captured at fishwheel, tagged, released 0.5 km below the fishwheel, and again recovered at the fishwheel

Table 8. Radio tagging information for chinook released at the fishwheel site.

| SHEEP EAR TAG | M | F | CODE | CHANNEL | FREQUENCY | ACTIVATED |
|---|---|---|---|---|---|---|
| 1238 / F | 0 | 1 | 1 | 2 | 149.340 | July 10 / 98 |
| 1240 / M | 1 | 0 | 2 | 2 | 149.340 | July 10 / 98 |
| 1266 / F | 0 | 1 | 3 | 2 | 149.340 | July 11 / 98 |
| 5011 / F | 0 | 1 | 4 | 2 | 149.340 | July 12 / 98 |
| 5025 / M | 1 | 0 | 5 | 2 | 149.340 | July 14 / 98 |
| 5055 / F | 0 | 1 | 6 | 2 | 149.340 | July 14 / 98 |
| 5072 / F | 0 | 1 | 7 | 2 | 149.340 | July 15 / 98 |
| 5073 / F | 0 | 1 | 8 | 2 | 149.340 | July 15 / 98 |
| 5084 / F | 0 | 1 | 9 | 3 | 149.360 | July 16/98 |
| 5096 / M | 1 | 0 | 10 | 3 | 149.360 | July 18/98 |
| 5087 / F | 0 | 1 | 11 | 3 | 149.360 | July 16/98 |
| 5098 / F | 0 | 1 | 12 | 3 | 149.360 | July 18/98 |
| 5102 / F | 0 | 1 | 13 | 3 | 149.360 | July 18/98 |
| 5103 / F | 0 | 1 | 14 | 3 | 149.360 | July 19/98 |
| 5123 / F | 0 | 1 | 15 | 3 | 149.360 | |
| 5106 / F | 0 | 1 | 94 | 11 | 149.520 | July 19/98 |
| 5117 / M | 1 | 0 | 95 | 11 | 149.520 | July 20/98 |
| 5121 / M | 1 | 0 | 96 | 11 | 149.520 | July 20/98 |
| 1430 / M | 1 | 0 | 97 | 11 | 149.520 | July 21/98 |
| 1422 / F | 0 | 1 | 98 | 11 | 149.520 | July 21/98 |
| 1434 / M | 1 | 0 | 99 | 11 | 149.520 | July 21/98 |
| 1447 / F | 0 | 1 | 100 | 11 | 149.520 | July 22/98 |
| 1491 / M | 1 | 0 | 101 | 11 | 149.520 | July 22/98 |
| 1086 / M | 1 | 0 | 102 | 11 | 149.520 | July 22/98 |
| 5154 / M | 1 | 0 | 103 | 11 | 149.520 | July 22/98 |
| 5169 / M | 1 | 0 | 104 | 13 | 149.560 | July 23/98 |
| 5173 / M | 1 | 0 | 105 | 13 | 149.560 | July 23/98 |
| 5204 / M | 1 | 0 | 106 | 13 | 149.560 | July 24/98 |
| 5206 / F | 0 | 1 | 107 | 13 | 149.560 | July 24/98 |
| 5214 / F | 0 | 1 | 108 | 13 | 149.560 | July 24/98 |
| 5209 / M | 1 | 0 | 109 | 13 | 149.560 | July 24/98 |
| 5218 / F | 0 | 1 | 110 | 13 | 149.560 | July 24/98 |
| 5220 / M | 1 | 0 | 111 | 13 | 149.560 | July 24/98 |
| 5321 / F | 0 | 1 | 112 | 13 | 149.560 | July 26/98 |
| 5222 / M | 1 | 0 | 113 | 13 | 149.560 | July 24/98 |
| 5223 / M | 1 | 0 | 114 | 14 | 149.580 | July 24/98 |
| 5269 / F | 0 | 1 | 115 | 14 | 149.580 | July 25 /98 |
| 5314 / M | 1 | 0 | 116 | 14 | 149.580 | July 26/98 |
| 5318 / M | 1 | 0 | 117 | 14 | 149.580 | July 26/98 |
| 5331 / M | 1 | 0 | 118 | 14 | 149.580 | July 26/98 |
| 5336 / F | 0 | 1 | 119 | 14 | 149.580 | July 26/98 |
| 5349 / F | 0 | 1 | 120 | 14 | 149.580 | July 27/98 |
| 5354 / F | 0 | 1 | 121 | 14 | 149.580 | July 27/98 |
| 5357 / F | 0 | 1 | 122 | 14 | 149.580 | July 28/98 |
| 5358 / F | 0 | 1 | 123 | 14 | 149.580 | July 29/98 |
| 5359 / M | 1 | 0 | 124 | 15 | 149.600 | July 29/98 |
| 5361 / M | 1 | 0 | 125 | 15 | 149.600 | July 29/98 |
| 5363 / M | 1 | 0 | 126 | 15 | 149.600 | July 29/98 |
| 4248 / F | 0 | 1 | 127 | 15 | 149.600 | August 12/98 |
| 4268 / F | 0 | 1 | 128 | 15 | 149.600 | August 12/98 |
| 5253 / M | 1 | 0 | 90 | 8 | 149.460 | July 25/98 |
| 5266 / F | 0 | 1 | 93 | 8 | 149.460 | July 25/98 |
| Totals by sex | 24 | 28 | | | | |

Table 9. Radio tagging information for coho released at the fishwheel site.

| SHEEP EAR TAG | M | F | CODE | FREQUENCY | ACTIVATED | Comments |
|---|---|---|---|---|---|---|
| 4195 | 1 | | 155 | 148.182 | 14-Sep-98 | |
| 4196 | 1 | | 175 | 148.182 | 14-Sep-98 | |
| 4197 | 1 | | 165 | 148.182 | 14-Sep-98 | |
| 4839 | 1 | | 185 | 148.182 | 14-Sep-98 | |
| 4841 | | 1 | 195 | 148.182 | 14-Sep-98 | |
| 4842 | 1 | | 175 | 148.142 | 14-Sep-98 | |
| 4843 | | 1 | 165 | 148.142 | 14-Sep-98 | |
| 4847 | 1 | | 195 | 148.142 | 14-Sep-98 | |
| 4844 | | 1 | 185 | 148.142 | 14-Sep-98 | |
| 4846 | | 1 | 155 | 148.142 | 14-Sep-98 | |
| 4889 | 1 | | 155 | 148.101 | 15-Sep-98 | |
| | | | 165 | 148.101 | 15-Sep-98 | **tag dropped overboard** |
| 4885 | | 1 | 175 | 148.101 | 15-Sep-98 | |
| 4884 | | 1 | 185 | 148.101 | 15-Sep-98 | |
| 4894 | | 1 | 195 | 148.101 | 15-Sep-98 | |
| 4890 | | 1 | 155 | 148.122 | 15-Sep-98 | |
| 4881 | 1 | | 165 | 148.122 | 15-Sep-98 | |
| 4882 | 1 | | 175 | 148.122 | 15-Sep-98 | |
| 4198 | | 1 | 185 | 148.122 | 15-Sep-98 | |
| 4883 | 1 | | 195 | 148.122 | 15-Sep-98 | |
| 6151 | | 1 | 155 | 148.162 | 16-Sep-98 | |
| 6157 | 1 | | 165 | 148.162 | 16-Sep-98 | |
| 6150 | 1 | | 175 | 148.162 | 16-Sep-98 | |
| 6160 | 1 | | 185 | 148.162 | 16-Sep-98 | |
| 6164 | | 1 | 195 | 148.162 | 16-Sep-98 | |
| 6110 | | 1 | 155 | 148.202 | 16-Sep-98 | |
| 4811 | 1 | | 165 | 148.202 | 16-Sep-98 | |
| 6106 | | 1 | 175 | 148.202 | 16-Sep-98 | |
| 6111 | | 1 | 185 | 148.202 | 16-Sep-98 | |
| 4812 | | 1 | 195 | 148.202 | 15-Sep-98 | |
| 6137 | | 1 | 155 | 148.223 | 18-Sep-98 | |
| 6139 | | 1 | 165 | 148.223 | 19-Sep-98 | |
| 6133 | | 1 | 175 | 148.223 | 20-Sep-98 | |
| 6141 | 1 | | 185 | 148.223 | 21-Sep-98 | |
| 6134 | 1 | | 195 | 148.223 | 22-Sep-98 | |
| 6200 | 1 | | 155 | 148.242 | 17-Sep-98 | |
| 6175 | | 1 | 165 | 148.242 | 17-Sep-98 | |
| 6177 | 1 | | 175 | 148.242 | 17-Sep-98 | |
| 6125 | 1 | | 185 | 148.242 | 17-Sep-98 | |
| 6178 | 1 | | 195 | 148.242 | 17-Sep-98 | |
| 6194 | 1 | | 155 | 148.262 | 17-Sep-98 | |
| 6185 | | 1 | 165 | 148.262 | 17-Sep-98 | |
| 6181 | | 1 | 175 | 148.262 | 17-Sep-98 | |
| 6183 | | 1 | 185 | 148.262 | 17-Sep-98 | |
| 6186 | | 1 | 195 | 148.262 | 17-Sep-98 | |
| 6113 | | 1 | 155 | 148.283 | 16-Sep-98 | |
| 6112 | | 1 | 165 | 148.283 | 16-Sep-98 | |
| 6109 | 1 | | 175 | 148.283 | 16-Sep-98 | |
| 6114 | 1 | | 185 | 148.283 | 16-Sep-98 | |
| 6115 | 1 | | 195 | 148.283 | 16-Sep-98 | |
| Totals by sex | 24 | 25 | | | | |

Table 10. Observed spawning activity in the Klinaklini River system, 1998.

| Location | Date | Coho Spawners | Chinook Spawners | Number of Redds |
|---|---|---|---|---|
| Clearwater creek (W 15 km) | 22-Oct-98 | 1 | 0 | |
| Clearwater creek (W 15 km) | 18-Nov-98 | 65 | 0 | |
| Clearwater creek (W 15 km) | 8-Dec-98 | 20 | 0 | |
| Dice creek bridge #1 | 20-Oct-98 | 0 | 1 | 10 |
| Dice creek bridge #1 | 18-Nov-98 | 2 | 0 | |
| Dice creek bridge #2 | 20-Oct-98 | 7 | 0 | 5 |
| Dice creek bridge #2 | 18-Nov-98 | 11 | 0 | 15 |
| First bridge past slough on main | 18-Nov-98 | 6 | 0 | 5 |
| First bridge past slough on main | 8-Dec-98 | 2 | 0 | |
| creek at W 6 km | 18-Nov-98 | 10 | 0 | |
| Basalt creek (W 24 Km) | 18-Nov-98 | 50 | 0 | |
| Basalt creek (W 24 Km) | 9-Dec-98 | 104 | 0 | 30 |
| Total observed | | 278 | 1 | 65 |

Table 11. Decoded tagging information for chinook and coho released at the fishwheel site.

| Species | Code | Frequency | Date Tagged | Date Tracked | M | F | Location |
|---|---|---|---|---|---|---|---|
| chinook | 106 | 149.560 | 24/07/98 | 18/09/98 | 1 | | million $ bridge |
| chinook | 120 | 149.580 | 27/07/98 | 18/09/98 | | 1 | 2 km up Dice creek |
| chinook | 124 | 149.600 | 29/07/98 | 18/09/98 | 1 | | Dice creek confluence |
| chinook | 124 | 149.600 | 29/07/98 | 21/09/98 | 1 | | main klinaklini |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| chinook | 126 | 149.600 | 29/07/98 | 18/09/98 | 1 | | Dice creek confluence |
| chinook | 126 | 149.600 | 29/07/98 | 21/09/98 | 1 | | main klinaklini |
| chinook | 103 | 149.520 | 22/07/98 | 18/09/98 | 1 | | main klinaklini (10 km) |
| chinook | 103 | 149.520 | 22/07/98 | 21/09/98 | 1 | | main klinaklini |
| chinook | 2 | 149.340 | 10/07/98 | 13/08/98 | 1 | | Devereux creek |
| chinook | 2 | 149.340 | 10/07/98 | 18/09/98 | 1 | | main klinaklini (12 km) |
| chinook | 95 | 149.520 | 20/07/98 | 16/09/98 | 1 | | Devereux creek |
| chinook | 7 | 149.340 | 15/07/98 | 13/08/98 | | 1 | Devereux creek |
| chinook | 4 | 149.340 | 12/07/98 | 13/08/98 | | 1 | Devereux creek |
| chinook | 10 | 149.360 | 18/07/98 | 24/08/98 | 1 | | main klinaklini |
| coho | 160 | 148.142 | 14/09/98 | 25/09/98 | | 1 | Devereux creek |
| coho | 160 | 148.142 | 14/09/98 | 04/10/98 | | 1 | Devereux creek |
| coho | 160 | 148.142 | 14/09/98 | 07/10/98 | | 1 | Devereux creek |
| coho | 160 | 148.142 | 14/09/98 | 16/10/98 | | 1 | Devereux creek |
| coho | 160 | 148.142 | 14/09/98 | 18/11/98 | | 1 | million $ bridge |
| coho | 160 | 148.142 | 14/09/98 | 08/12/98 | | 1 | million $ bridge |
| coho | 180 | 148.122 | 15/09/98 | 12/10/98 | | 1 | Devereux creek |
| coho | 150 | 148.182 | 14/09/98 | 11/09/98 | 1 | | Devereux creek |
| coho | 150 | 148.182 | 14/09/98 | 10/10/98 | 1 | | Devereux creek |
| coho | 150 | 148.182 | 14/09/98 | 12/10/98 | 1 | | Devereux creek |
| coho | 155 | 148.182 | 14/09/98 | 16/09/98 | 1 | | Devereux creek |
| coho | 170 | 148.283 | 16/09/98 | 22/09/98 | 1 | | hydro station |
| coho | 160 | 148.182 | 14/09/98 | 15/10/98 | 1 | | hydro station |
| coho | 160 | 148.182 | 14/09/98 | 20/10/98 | 1 | | hydro station |
| coho | 160 | 148.182 | 14/09/98 | 17/11/98 | 1 | | Devereux creek bridge |
| coho | 160 | 148.182 | 14/09/98 | 18/11/98 | 1 | | million $ bridge |
| coho | 160 | 148.182 | 14/09/98 | 18/11/98 | 1 | | Dice creek bridge #1 |
| coho | 160 | 148.182 | 14/09/98 | 18/11/98 | 1 | | Dice creek bridge #2 |
| coho | 160 | 148.182 | 14/09/98 | 8/12/1998 | 1 | | million $ bridge |
| coho | 170 | 148.182 | 14/09/98 | 9/12/1998 | 1 | | Basalt creek |
| coho | 190 | 148.162 | 16/09/98 | 17/11/98 | 1 | | Devereux creek bridge |
| coho | 190 | 148.162 | 16/09/98 | 17/11/98 | 1 | | Devereux Lake |
| coho | 190 | 148.162 | 16/09/98 | 9/12/1998 | 1 | | Devereux Lake |
| coho | 160 | 148.101 | 15/09/98 | 18/11/98 | 1 | | million $ bridge |
| coho | 160 | 148.101 | 15/09/98 | 8/12/1998 | 1 | | million $ bridge |
| coho | 180 | 148.142 | 14/09/98 | 18/11/98 | | 1 | Dice creek bridge #1 |
| coho | 180 | 148.142 | 14/09/98 | 18/11/98 | | 1 | Dice creek bridge #2 |
| coho | 180 | 148.142 | 14/09/98 | 08/12/98 | | 1 | Dice creek bridge #1 |
| coho | 180 | 148.142 | 14/09/98 | 08/12/98 | | 1 | Dice creek bridge #2 |
| coho | 170 | 148.202 | 16/09/98 | 18/11/98 | | 1 | Dice creek bridge #1 |
| coho | 160 | 148.122 | 15/09/98 | 08/12/98 | 1 | | Dice creek bridge #1 |
| coho | 150 | 148.142 | 14/09/98 | 09/12/98 | | 1 | Basalt creek |

Table 12. Summary of chinook radio telemetry tracking data for undecoded tags.

| Frequency | Date tagged | Date tracked | Tags detected | Location |
|---|---|---|---|---|
| 149.340 | 10-Jul-98 to 15-Jul-98 | 26-Jul-98 | 1 | Mussel confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 27-Aug-98 | 1 | Mussel confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 28-Aug-98 | 1 | Mussel confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 28-Aug-98 | 1 | native village |

| | | | | |
|---|---|---|---|---|
| 149.340 | 10-Jul-98 to 15-Jul-98 | 29-Aug-98 | 1 | Mussel confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 18-Sep-98 | 1 | Mussel creek |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 18-Sep-98 | 1 | Dice creek confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 20-Sep-98 | 2 | main Klinakini (12 km) |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 20-Sep-98 | 1 | main Klinaklini (14 km) |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 20-Sep-98 | 1 | Mussel creek bridge |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 7-Oct-98 | 1 | native village |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 7-Oct-98 | 1 | Mussel creek confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 8-Oct-98 | 1 | Mussel creek bridge |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 9-Oct-98 | 1 | native village |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 9-Oct-98 | 1 | Mussel creek confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 22-Oct-98 | 1 | Dice valley (2 km) |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 22-Oct-98 | 1 | Dice valley (4 km) |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 22-Oct-98 | 1 | main Klinaklini (2 km above hydro tower) |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 22-Oct-98 | 1 | Mussel creek confluence |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 22-Oct-98 | 2 | native village |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 149.340 | 10-Jul-98 to 15-Jul-98 | 8-Dec-98 | 1 | Mussel creek bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 26-Jul-98 | 1 | Million $ bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 28-Aug-98 | 1 | Mussel confluence |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 29-Aug-98 | 1 | Fish Wheel |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 18-Sep-98 | 1 | Dice creek confluence |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 18-Sep-98 | 2 | Million $ bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 20-Sep-98 | 1 | Million $ bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 7-Oct-98 | 1 | old hydro tower |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 7-Oct-98 | 1 | native village |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 8-Oct-98 | 1 | Mussel creek confluence |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 22-Oct-98 | 1 | Dice creek valley (3 km) |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 22-Oct-98 | 3 | Million $ bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 22-Oct-98 | 1 | native village |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 17-Nov-98 | 2 | Million $ bridge |
| 149.360 | 16-Jul-98 to 19-Jul-98 | 18-Nov-98 | 2 | Million $ bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 26-Jul-98 | 1 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 27-Aug-98 | 1 | Mussel confluence |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 27-Aug-98 | 1 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 28-Aug-98 | 1 | Mussel confluence |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 28-Aug-98 | 1 | 1 km above estuary |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 29-Aug-98 | 1 | Mussel confluence |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 20-Sep-98 | 1 | main Klinaklini (12 km) |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 20-Sep-98 | 1 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 06-Oct-98 | 1 | Mussel creek confluence |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 07-Oct-98 | 1 | Mussel creek confluence |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 07-Oct-98 | 1 | native village |

Table 12 (cont.)

| Frequency | Date tagged | Date tracked | Tags detected | Location |
|---|---|---|---|---|
| 149.520 | 19-Jul-98 to 22-Jul-98 | 08-Oct-98 | 1 | west main Klinaklini (13 km) |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 08-Oct-98 | 1 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 09-Oct-98 | 1 | native village |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 22-Oct-98 | 1 | Dice creek valley (3 km) |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 22-Oct-98 | 1 | 2 km above old hydro tower |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 22-Oct-98 | 1 | 1 km below native village |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 18-Nov-98 | 1 | Dice creek bridge #1 |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 08-Dec-98 | 2 | Mussel creek bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 08-Dec-98 | 2 | Million $ bridge |
| 149.520 | 19-Jul-98 to 22-Jul-98 | 08-Dec-98 | 1 | Dice creek bridge #1 |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 27-Aug-98 | 1 | Ice creek confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 27-Aug-98 | 1 | Mussel creek bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 27-Aug-98 | 1 | Mussel confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 28-Aug-98 | 1 | Mussel bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 29-Aug-98 | 1 | Mussel confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 18-Sep-98 | 2 | Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 20-Sep-98 | 1 | main Klinaklini (16 km bridge) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 20-Sep-98 | 1 | main Klinaklini (12 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 20-Sep-98 | 1 | Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 07-Oct-98 | 1 | old hydro tower |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 07-Oct-98 | 1 | Mussel creek confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 07-Oct-98 | 1 | Dice creek confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 07-Oct-98 | 1 | native village |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Oct-98 | 1 | Mussel Lake (17 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Oct-98 | 1 | Mussel confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Oct-98 | 1 | Mussel bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Oct-98 | 1 | west main Klinaklini (13 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Oct-98 | 1 | main Klinaklini (13 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 09-Oct-98 | 1 | west main Klinaklini (16 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 09-Oct-98 | 1 | main Klinaklini (10 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 09-Oct-98 | 1 | main Klinaklini (14 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 1 | Dice creek valley (3 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 1 | 2 km above old hydro tower |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 1 | hydro tower |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 1 | Mussel confluence |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 2 | Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 2 | 3 km below Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 22-Oct-98 | 1 | 1 km below native village |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 17-Nov-98 | 3 | Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 18-Nov-98 | 3 | Million $ bridge |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 18-Nov-98 | 1 | Dice creek bridge #1 |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 18-Nov-98 | 1 | Clearwater creek (W 15 km) |
| 149.560 | 23-Jul-98 to 26-Jul-98 | 08-Dec-98 | 1 | Million $ bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 26-Jul-98 | 1 | Fish Wheel |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 26-Jul-98 | 1 | Dice creek confluence |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 27-Aug-98 | 1 | Mussel creek bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 27-Aug-98 | 1 | Mussel creek confluence |

Table 12 (cont.)

| Frequency | Date tagged | Date tracked | Tags detected | Location |
|---|---|---|---|---|
| 149.580 | 24-Jul-98 to 29-Jul-98 | 28-Aug-98 | 1 | Mussel creek bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 29-Aug-98 | 1 | Mussel creek confluence |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 18-Sep-98 | 2 | 2 km up Dice creek |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 20-Sep-98 | 1 | main Klinaklini (14 km) |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 07-Oct-98 | 1 | old hydro tower |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 07-Oct-98 | 1 | Dice creek |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 08-Oct-98 | 1 | main Klinaklini (13 km) |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 09-Oct-98 | 1 | west main Klinaklini (16 km bridge) |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 20-Oct-98 | 1 | Dice creek bridge #2 |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 22-Oct-98 | 1 | Ice creek bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 22-Oct-98 | 1 | 2 km above old hydro tower |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 22-Oct-98 | 1 | old hydro tower |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 17-Nov-98 | 1 | Million $ bridge |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 18-Nov-98 | 1 | west main Klinaklini (6 km creek) |
| 149.580 | 24-Jul-98 to 29-Jul-98 | 08-Dec-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 26-Jul-98 | 1 | Million $ bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 27-Aug-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 28-Aug-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 28-Aug-98 | 1 | native village |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 29-Aug-98 | 1 | 2 km above Mussel creek confluence |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 18-Sep-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 20-Sep-98 | 1 | main Klinaklini (11 km) |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 20-Sep-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 07-Oct-98 | 1 | old hydro tower |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 07-Oct-98 | 1 | Mussel creek confluence |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 07-Oct-98 | 1 | native village |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 08-Oct-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 08-Oct-98 | 1 | Mussel creek confluence |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 09-Oct-98 | 1 | Native village |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 20-Oct-98 | 1 | Dice creek bridge #2 |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 22-Oct-98 | 2 | Dice creek valley (3 km) |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 22-Oct-98 | 1 | 2 km above old hydro tower |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 22-Oct-98 | 1 | old hydro tower |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 22-Oct-98 | 1 | Mussel creek confluence |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 22-Oct-98 | 1 | 3 km below Million $ bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 149.600 | 25-Jul-98 to 12-Aug-98 | 08-Dec-98 | 1 | Mussel creek bridge |
| 149.460 | 25-Jul-98 | 07-Oct-98 | 1 | Dice creek confluence |
| 149.460 | 25-Jul-98 | 08-Oct-98 | 1 | Mussel creek confluence |
| 149.460 | 25-Jul-98 | 08-Oct-98 | 1 | Mussel creek bridge |
| 149.460 | 25-Jul-98 | 09-Oct-98 | 1 | main Klinaklini (13 km) |
| 149.460 | 25-Jul-98 | 09-Oct-98 | 1 | native village |
| 149.460 | 25-Jul-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 149.460 | 25-Jul-98 | 22-Oct-98 | 1 | Ice creek bridge |
| 149.460 | 25-Jul-98 | 22-Oct-98 | 1 | Dice valley (3 km) |
| 149.460 | 25-Jul-98 | 08-Dec-98 | 1 | Dice creek bridge #1 |

Table 13. Summary of coho radio telemetry tracking data for undecoded tags.

| Frequency | Date tagged | Date tracked | Tags detected | Location |
|---|---|---|---|---|
| 148.182 | 14-Sep-98 | 7-Oct-98 | 1 | Native village |
| 148.182 | 14-Sep-98 | 8-Oct-98 | 1 | Mussel creek confluence |
| 148.182 | 14-Sep-98 | 8-Oct-98 | 1 | Mussel creek bridge |
| 148.182 | 14-Sep-98 | 9-Oct-98 | 1 | Mussel creek confluence |
| 148.182 | 14-Sep-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | Dice valley (3 km) |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | Dice valley upper bridge |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | 2 km above old hydro tower |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | old hydro tower |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | Mussel creek confluence |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | Million $ bridge |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 148.182 | 14-Sep-98 | 22-Oct-98 | 1 | 4 km below Million $ bridge |
| 148.182 | 14-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.182 | 14-Sep-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 148.182 | 14-Sep-98 | 18-Nov-98 | 1 | west main Klinaklini (creek 6 km) |
| 148.182 | 14-Sep-98 | 18-Nov-98 | 1 | Basalt creek |
| 148.182 | 14-Sep-98 | 8-Dec-98 | 1 | Dice creek bridge #1 |
| 148.142 | 14-Sep-98 | 7-Oct-98 | 1 | Dice creek |
| 148.142 | 14-Sep-98 | 8-Oct-98 | 1 | main Klinaklini (13 km) |
| 148.142 | 14-Sep-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 148.142 | 14-Sep-98 | 22-Oct-98 | 1 | old hydro tower |
| 148.142 | 14-Sep-98 | 22-Oct-98 | 1 | Mussel creek confluence |
| 148.142 | 14-Sep-98 | 22-Oct-98 | 1 | Million $ bridge |
| 148.142 | 14-Sep-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 148.142 | 14-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.101 | 15-Sep-98 | 7-Oct-98 | 1 | Dice creek confluence |
| 148.101 | 15-Sep-98 | 9-Oct-98 | 1 | native village |
| 148.101 | 15-Sep-98 | 20-Oct-98 | 1 | Dice creek bridge #1 |
| 148.101 | 15-Sep-98 | 22-Oct-98 | 1 | Dice valley (3 km) |
| 148.101 | 15-Sep-98 | 22-Oct-98 | 1 | Million $ bridge |
| 148.101 | 15-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.101 | 15-Sep-98 | 17-Nov-98 | 1 | Mussel creek bridge |
| 148.122 | 15-Sep-98 | 7-Oct-98 | 1 | old hydro tower |
| 148.122 | 15-Sep-98 | 7-Oct-98 | 1 | Mussel creek confluence |
| 148.122 | 15-Sep-98 | 7-Oct-98 | 1 | boat launch |
| 148.122 | 15-Sep-98 | 7-Oct-98 | 1 | native village |
| 148.122 | 15-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (6 km creek) |
| 148.122 | 15-Sep-98 | 9-Oct-98 | 1 | Fish wheel |
| 148.122 | 15-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini ( 8 km) |
| 148.122 | 15-Sep-98 | 9-Oct-98 | 1 | native village |
| 148.122 | 15-Sep-98 | 22-Oct-98 | 1 | Dice creek valley (3 km) |
| 148.162 | 16-Sep-98 | 7-Oct-98 | 1 | Dice creek confluence |
| 148.162 | 16-Sep-98 | 8-Oct-98 | 1 | west main Klinaklini (13 km) |
| 148.162 | 16-Sep-98 | 22-Oct-98 | 2 | Dice creek valley (3 km) |
| 148.162 | 16-Sep-98 | 18-Nov-98 | 1 | Dice creek bridge #1 |
| 148.162 | 16-Sep-98 | 18-Nov-98 | 1 | Dice creek bridge #2 |
| 148.162 | 16-Sep-98 | 18-Nov-98 | 1 | west main Klinaklini (creek 6 km) |
| 148.162 | 16-Sep-98 | 8-Dec-98 | 1 | Dice creek bridge #2 |

Table 13 (cont.)

| Frequency | Date tagged | Date tracked | Tags detected | Location |
|---|---|---|---|---|
| 148.162 | 16-Sep-98 | 9-Dec-98 | 1 | west main Klinaklini (20 km bridge) |
| 148.202 | 16-Sep-98 | 7-Oct-98 | 1 | Native village |
| 148.202 | 16-Sep-98 | 7-Oct-98 | 1 | boat launch |
| 148.202 | 16-Sep-98 | 7-Oct-98 | 1 | Dice creek confluence |
| 148.202 | 16-Sep-98 | 8-Oct-98 | 1 | Mussel creek confluence |
| 148.202 | 16-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (7 km creek) |
| 148.202 | 16-Sep-98 | 20-Oct-98 | 1 | Dice creek bridge #2 |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | Dice valley (3 km) |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | Dice valley upper bridge |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | old hydro tower |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | Mussel creek confluence |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 148.202 | 16-Sep-98 | 22-Oct-98 | 1 | 4 km below Million $ bridge |
| 148.202 | 16-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.202 | 16-Sep-98 | 18-Nov-98 | 1 | Million $ bridge |
| 148.202 | 16-Sep-98 | 18-Nov-98 | 1 | Dice creek bridge #2 |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 7-Oct-98 | 1 | old hydro tower |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 7-Oct-98 | 1 | boat launch |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 7-Oct-98 | 1 | Native village |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (16 km) |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (12 km) |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 9-Oct-98 | 1 | Fish wheel |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 22-Oct-98 | 1 | Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 22-Oct-98 | 1 | 4 km below Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 18-Nov-98 | 1 | Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 18-Nov-98 | 1 | Clearwater creek (w 15 km) |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 8-Dec-98 | 1 | Million $ bridge |
| 148.223 | 18-Sep-98 to 22-Sep-98 | 9-Dec-98 | 1 | Clearwater creek (w 15 km) |
| 148.242 | 17-Sep-98 | 7-Oct-98 | 1 | old hydro tower |
| 148.242 | 17-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (10 km) |
| 148.242 | 17-Sep-98 | 9-Oct-98 | 1 | west main Klinaklini (8 km) |
| 148.262 | 17-Sep-98 | 7-Oct-98 | 1 | old hydro tower |
| 148.262 | 17-Sep-98 | 9-Oct-98 | 1 | native village |
| 148.262 | 17-Sep-98 | 22-Oct-98 | 1 | 2 km below Million $ bridge |
| 148.262 | 17-Sep-98 | 22-Oct-98 | 1 | 1 km below native village |
| 148.262 | 17-Sep-98 | 17-Nov-98 | 1 | Million $ bridge |
| 148.262 | 17-Sep-98 | 18-Nov-98 | 1 | Million $ bridge |
| 148.262 | 17-Sep-98 | 9-Dec-98 | 1 | west main Klinaklini (20 km bridge) |
| 148.283 | 16-Sep-98 | 22-Oct-98 | 1 | west main Klinaklini (10 km) |

Table 14. Mussel Creek fence and seine enumeration counts, 1998.

| | Chinook | | | Coho | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Adult | R[1] | Jack | Adult | R[1] | Jack | Chum | R[1] | Pink | Sock |
| 13/07/98 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16/07/98 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18/07/98 | 5 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 21/07/98 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 23/07/98 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7/08/98 | 24 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8/08/98 | 50 | 7 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/08/98 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 11/08/98 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/08/98 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| 13/08/98 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| 16/08/98 | 20 | 0 | 8 | 8 | 0 | 5 | 7 | 0 | 24 | 20 |
| 17/08/98 | 191 | 1 | 32 | 14 | 0 | 15 | 1 | 0 | 35 | 18 |
| 18/08/98 | 10 | 0 | 0 | 3 | 0 | 3 | 2 | 0 | 21 | 6 |
| 19/08/98 | 129 | 3 | 32 | 7 | 0 | 1 | 1 | 0 | 0 | 4 |
| 20/08/98 | 25 | 0 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21/08/98 | 47 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22/08/98 | 59 | 7 | 15 | 7 | 1 | 0 | 2 | 1 | 0 | 2 |
| 28/08/98 | 21 | 5 | 1 | 9 | 1 | 1 | 0 | 0 | 0 | 3 |
| 30/08/98 | 120 | 3 | 17 | 36 | 2 | 0 | 2 | 0 | 0 | 9 |
| 2/09/98 | 96 | 5 | 2 | 3 | 0 | 0 | 1 | 0 | 0 | 9 |
| 3/09/98 | 190 | 11 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 18 |
| 4/09/98 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5/09/98 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 5/09/98 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 24/09/98 | 4 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 |
| Totals | 1017 | 45 | 149 | 103 | 4 | 25 | 16 | 1 | 87 | 108 |

[1]Recaps (Visually observed operculum tags applied at the fishwheel) are included in total counts.

Table 15. Length-frequency of fish sampled at Mussel Creek bridge, 1998.

| Length (mm) | Chinook | | | Coho | | | Pink | | Chum | | | Sockeye | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | Jacks | Females | Males | Jacks | Females | Males | Females | Males | Jacks | Females | Males | Females |
| 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 260 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 300 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 310 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| 320 | 0 | 1 | 0 | 0 | 1 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 |
| 330 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 0 | 0 |
| 340 | 0 | 2 | 0 | 0 | 0 | 0 | 7 | 6 | 1 | 0 | 0 | 0 | 0 |
| 350 | 0 | 2 | 0 | 0 | 1 | 1 | 6 | 4 | 0 | 0 | 0 | 0 | 0 |
| 360 | 0 | 5 | 0 | 0 | 0 | 0 | 7 | 6 | 0 | 0 | 0 | 0 | 0 |
| 370 | 0 | 1 | 0 | 0 | 1 | 0 | 10 | 6 | 0 | 0 | 0 | 1 | 0 |
| 380 | 0 | 2 | 0 | 0 | 1 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 |
| 390 | 0 | 3 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 1 | 0 |
| 400 | 0 | 1 | 1 | 0 | 0 | 0 | 6 | 4 | 0 | 0 | 0 | 1 | 0 |
| 410 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 1 |
| 420 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 3 | 0 | 0 | 0 | 0 | 3 |
| 430 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 440 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 450 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 460 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 2 |

Table 15 (cont.)

| Length (mm) | Chinook | | | Coho | | | Pink | | Chum | | | Sockeye | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | Jacks | Females | Males | Jacks | Females | Males | Females | Males | Jacks | Females | Males | Females |
| 470 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 3 |
| 480 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 |
| 490 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 6 | 6 |
| 500 | 1 | 1 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| 510 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| 520 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 2 |
| 530 | 2 | 0 | 1 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| 540 | 2 | 0 | 2 | 3 | 0 | 3 | 0 | 0 | 1 | 0 | 1 | 2 | 0 |
| 550 | 2 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 560 | 2 | 0 | 1 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 1 |
| 570 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 580 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 590 | 2 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 600 | 6 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 610 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 620 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 640 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650 | 2 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660 | 1 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 680 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 720 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 730 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 750 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 770 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 15 (cont.)

| Length (mm) | Chinook | | | Coho | | | Pink | | Chum | | | Sockeye | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | Jacks | Females | Males | Jacks | Females | Males | Females | Males | Jacks | Females | Males | Females |
| 790 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 800 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 810 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 820 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 830 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 840 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 850 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 860 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 870 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 890 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 910 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 920 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total: | 59 | 32 | 100 | 24 | 5 | 25 | 66 | 45 | 6 | 1 | 6 | 31 | 33 |
| Mean Length: | 645.8 | 371.9 | 659.0 | 545.8 | 370.0 | 510.4 | 367.9 | 366.9 | 526.7 | 495.0 | 585.0 | 491.0 | 480.9 |

Table 16. Salmonid population estimates based on fishwheel mark-recapture efficiency, Klinaklini River, 1998.

| | | | | 95% Confidence Limit | |
|---|---|---|---|---|---|
| Species | Catch at Fishwheel | Efficiency (%) | Population Estimate | Lower | Upper |
| chinook | 1,004 | 10.06 | 9,980 | 7,365 | 12,595 |
| coho | 2,101 | 7.81 | 26,901 | 20,659 | 33,143 |
| sockeye | 914 | 6.57 | 13,912 | 7,722 | 20,102 |
| pink | 1,493 | 2.1 | 72,126 | 14,530 | 129,722 |
| chum | 501 | 5.25 | 9,543 | 5,214 | 13,982 |

Table 17. Projected distribution of chinook spawners in the Klinaklini River system, 1998.

| Location | # of tag detections[1] | percent of total detections |
|---|---|---|
| Mussel creek | 37 | 44.6 |
| Mussel Lake | 1 | 1.2 |
| Dice creek | 23 | 27.7 |
| Ice creek | 11 | 13.3 |
| Clearwater creek | 5 | 6.0 |
| Basalt creek | 1 | 1.2 |
| Other | 5 | 6.0 |
| Total | 83 | |

[1] includes repetitive detection of individual tags

Table 18. Projected distribution of coho spawners in the Klinaklini River system, 1998.

| Location | # of tag detections[1] | percent of total detections |
|---|---|---|
| Mussel creek | 12 | 21.8 |
| Mussel Lake | 1 | 1.8 |
| Dice creek | 21 | 38.2 |
| Ice creek | 2 | 3.6 |
| Clearwater creek | 9 | 16.4 |
| Basalt creek | 4 | 7.3 |
| Other | 6 | 10.9 |
| Total | 55 | |

[1] includes repetitive detection of individual tags

Table 19.  Visual survey data collected for the Klinaklini system by Fishery 0fficers**Error! Bookmark not defined.** stationed in the Campbell R. subdistrict.

| | | | Chinook | | | | |
|---|---|---|---|---|---|---|---|
| | | | Jacks | | Adults | | |
| | Method[1] | Date | Count | Estimate | Count | Estimate | River Segment[2] |
| 1979 | H | Sept. 15 | | | | | Mussel |
| Estimate for Season[3] | | | | | | 7500 | |
| 1980 | F | Aug. 29 | | | | | Mussel |
| Estimate for Season | | | | | | 7500 | |
| 1981 | F | July 26 | | | | 120 | Mussel |
| | F | Aug. 29 | | | | 900 | Mussel |
| | F | Sept. 22 | | | | 630 | Mussel |
| | F | Oct. 5 | | | | 295 | Mussel |
| Estimate for Season | | | | | | 1000 | |
| 1982 | No observation | | | | | | |
| Estimate for Season | | | | | | 2500 | |
| 1983 | H | July 23 | | | | | Mussel |
| | H | Oct. 28 | | | | | Mussel |
| Estimate for Season | | | | | | 1220 | |
| 1984 | H | | | | | 1000 | Mussel[4] |
| Estimate for Season[3] | | | | | | 1000 | |
| 1985 | H | June 25 | | | | | Mussel |
| | H | Aug. 7 | | | | | Mussel |
| | H | 15 | | | | | Mussel |
| | H | Sept. 15 | | | | 650 | Mussel |
| Estimate for Season | | | | | | 650 | |
| 1986 | H | Oct. 15 | | | | 500 | Mussel |
| Estimate for Season | | | | | | 500 | |

Table 19. (cont.)

| | | | Chinook | | | | |
|---|---|---|---|---|---|---|---|
| | | | Jacks | | Adults | | |
| | Method[1] | Date | Count | Estimate | Count | Estimate | River Segment[2] |
| 1987 | H | June 25 | | | | 1 | Mussel |
| | H | Aug. 7 | | | | 5 | Mussel |
| | H | 15 | | | | 50 | Mussel |
| | H | Sept. 15 | | | | 600 | Mussel |
| Estimate for Season | | | | | | ??? | |
| 1988 | H | Sept. 12 | | | | 1000 | Mussel |
| Estimate for Season | | | | | | 1000 | |
| 1989 | H | Oct. 2 | | | | 250 | Mussel |
| Estimate for Season | | | | | | 250 | |
| 1990 | No observations | | | | | | |
| Estimate for Season | | | | | | 1200 | |
| 1991 | H | July 12 | | | | 45 | Mussel |
| | H | 22 | | | | 110 | Mussel |
| | H | Aug. 16 | | | | 57 | Mussel |
| | H | Sept. 21 | | | | 114 | Mussel |
| | H | Oct. 9 | | | | 8 | Mussel |
| Estimate for Season | | | | | | 500 | |
| 1992 | H | Aug. 13 | | | | 650 | Mussel |
| | H | Sept. 18 | | | | 700 | Mussel |
| Estimate for Season | | | | | | 700 | |
| 1993 | H | Aug. 29 | | | | 585 | Mussel |
| | H | Sept. 29 | | | | 99 | Mussel |
| | H | 29 | | | | 60 | Icey |
| | H | Oct. 26 | | | | 65 | Mussel |
| Estimate for Season | | | | | | 809 | |

Table 19. (cont.)

| | Method[1] | Date | Jacks Count | Jacks Estimate | Adults Count | Adults Estimate | River Segment[2] |
|---|---|---|---|---|---|---|---|
| 1994 | H | Sept. 17 | | | 719 | 719 | Mussel |
| | H | Nov. 11 | | | 30 | 30 | Icy/Dice |
| | H | Nov. 11 | | | 690 | 690 | Mussel |
| Estimate for Season[3] | | | | | | 720 | |
| 1995 | H | Aug. 4 | | | 69 | 250 | Mussel |
| | H | Aug. 4 | | | 6 | 10 | Icy/Dice |
| | H | Aug. 25 | | | 800 | 800 | Mussel |
| | H | Sept. 22 | | | 1400 | 1400 | Mussel |
| | H | Sept. 22 | | | 450 | 450 | Icy/Dice |
| | H | Oct. 30 | | | 11 | 11 | Icy/Dice |
| | H | Oct. 30 | | | 20 | 20 | Jumper |
| Estimate for Season | | | | | | 3290 | |
| 1996 | H | Aug. 22 | | | 257 | 800 | Mussel |
| | H | 22 | | | 0 | 0 | Icy/Dice |
| | H | Oct. 18 | | | 776 | 2300 | Mussel |
| Estimate for Season[3] | | | | | | 2600 | Icy/Dice/ Mussel |
| 1997 | H | | | | | | |
| Estimate for Season[3] | | | | | | 2100 | Icy/Dice/ Mussel |
| 1998 | H | | | | | | |
| Estimate for Season[3] | | | | | | 1500 | Icy/Dice/ Mussel |

[1] S - Swim survey, H - Helicopter survey, F - boat survey
[2] Refer to Fig. 2
[3] Total escapement estimate for adult chinook
[4] In November a 200 m slide into Mussel Cr. Likely destroyed most of the chinook spawn.

Table 20. Mussel Creek mark-recapture of chinook salmon tagged at the fishwheel and recovered via seining.[1]

| | | Tagged chinook | |
|---|---|---|---|
| Date | Untagged chinook | Tag intact | Tag Lost |
| 13/07/98 | 4 | 0 | 0 |
| 16/07/98 | 6 | 0 | 0 |
| 18/07/98 | 6 | 0 | 1 |
| 21/07/98 | 4 | 2 | 0 |
| 07/08/98 | 34 | 0 | 0 |
| 08/08/98 | 51 | 4 | 3 |
| 28/08/98 | 21 | 4 | 2 |
| | | | |
| Total | 126 | 10 | 6 |
| Tag recovery (%) | | 12.70% | |

[1]Each seined fish was physically examined for tag presence and signs of tag loss (ie. Opercular tear)

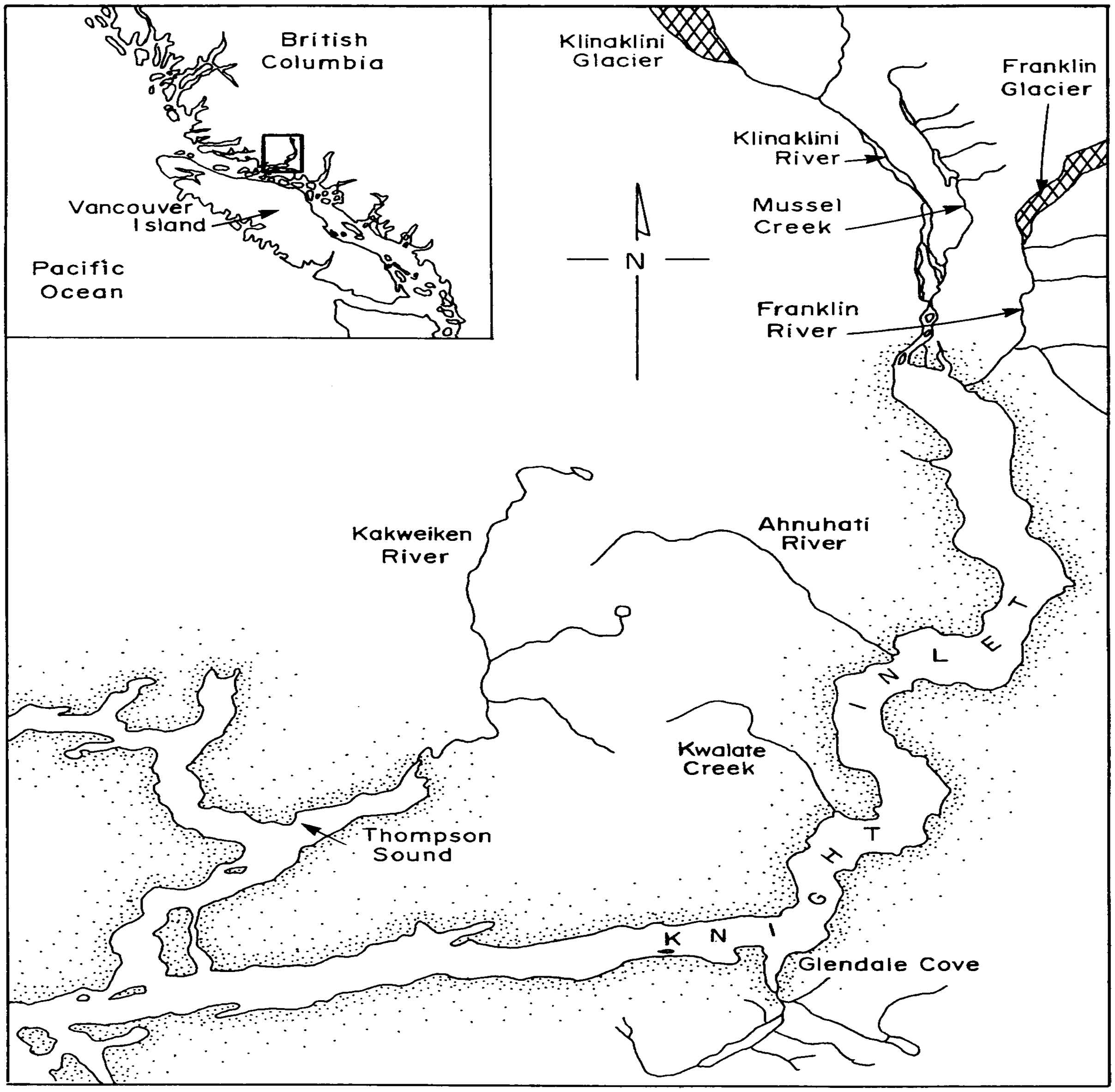


Fig. 1 Knight Inlet study area.

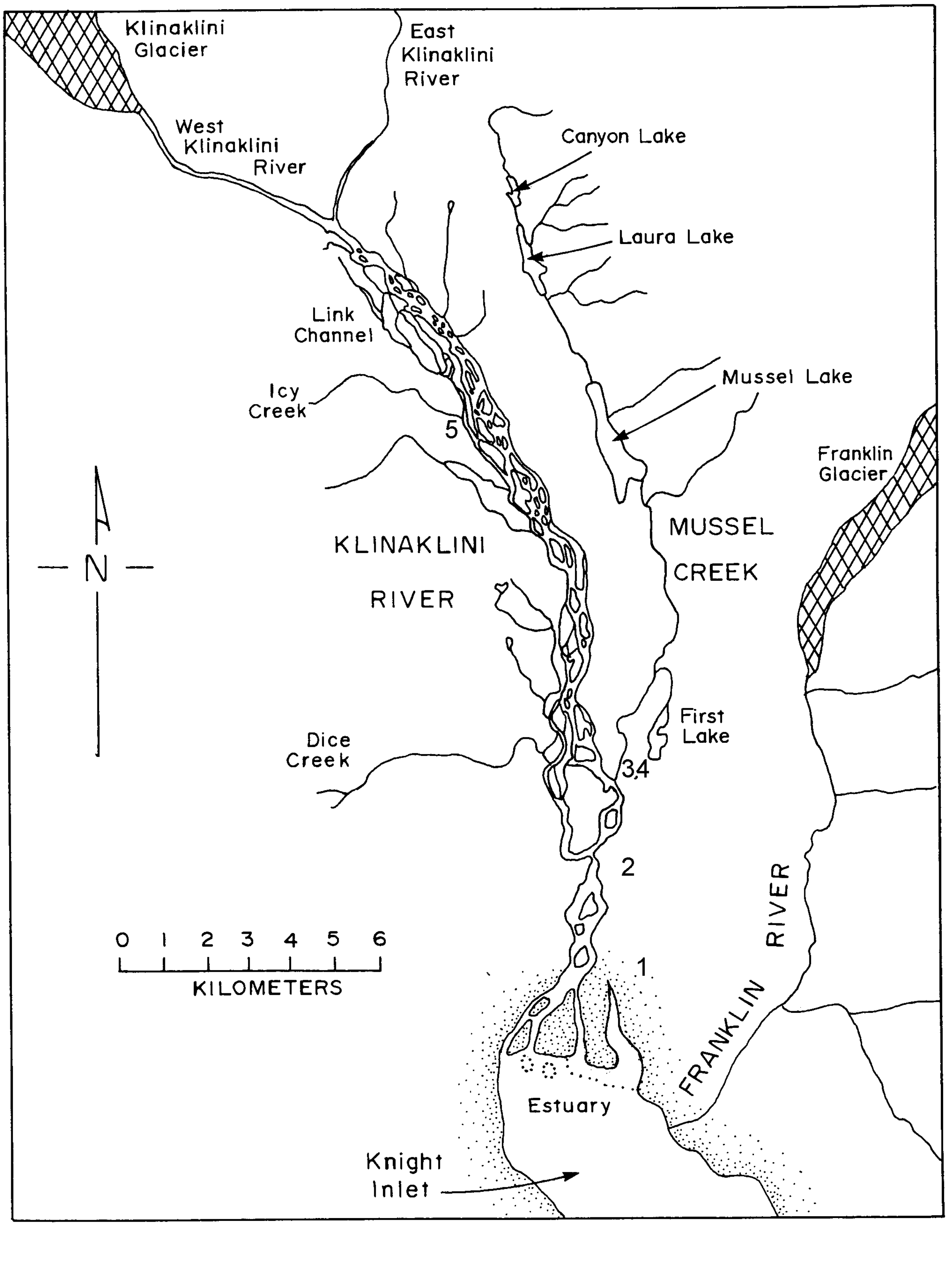


Fig. 2. Location of 1)Interfor camp, 2)fishwheel, 3)counting fence, 4)Mussel Cr. stationary tracking Site, 5)Icy Cr. stationary tracking site.

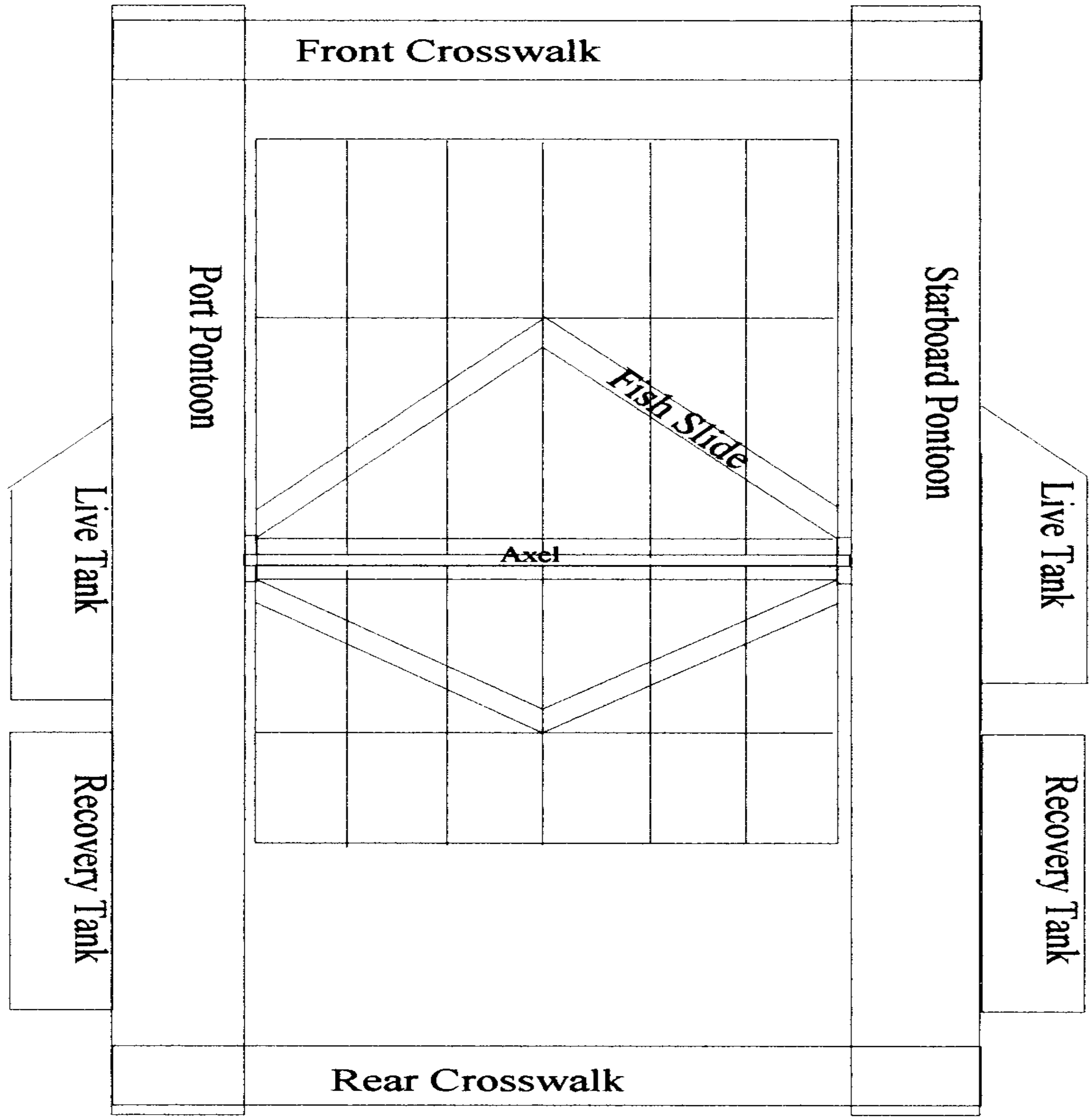


Fig. 3. Schematic diagram of fishwheel (aerial view).

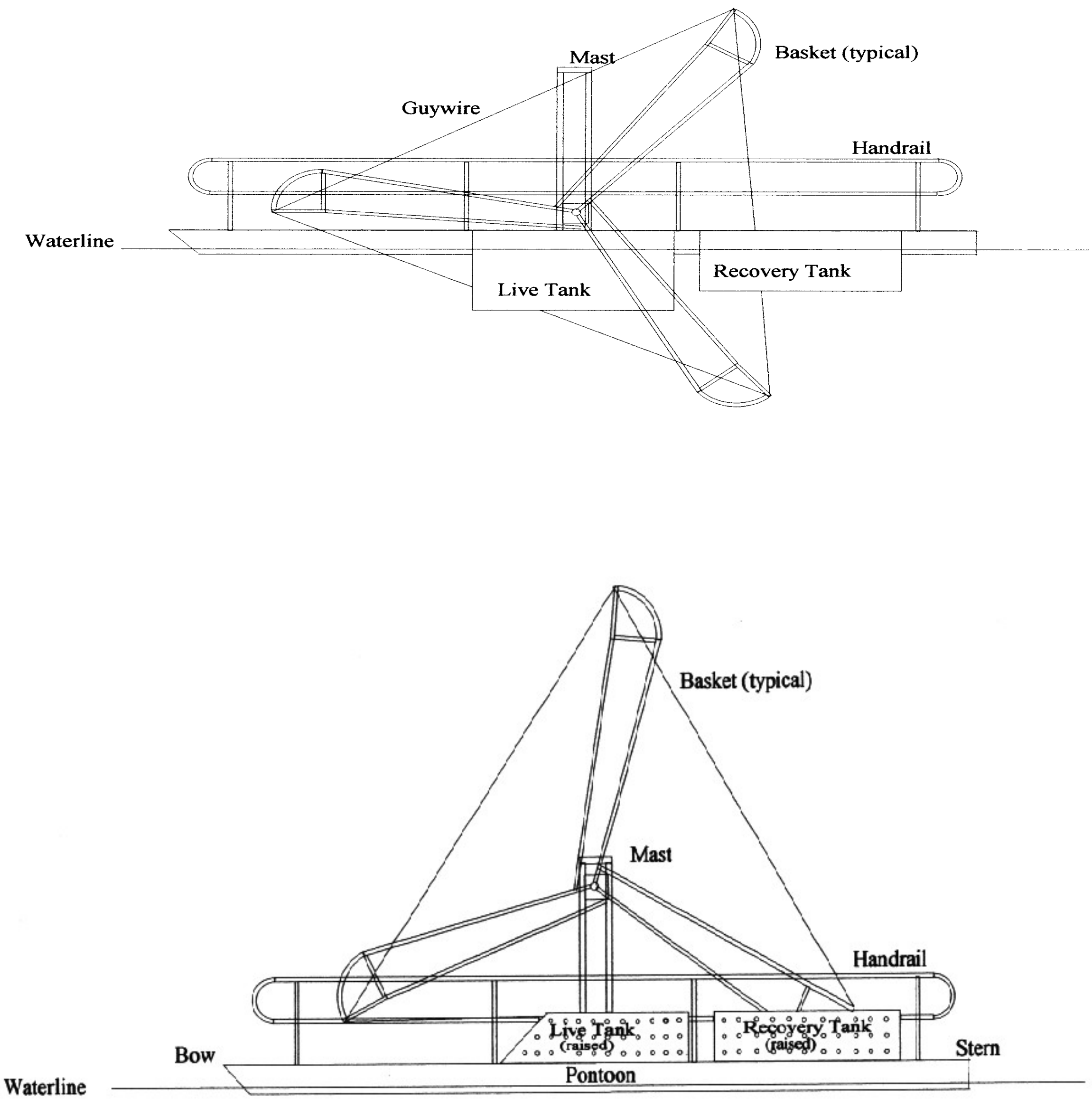


Fig 4. Schematic diagram of fishwheel in the lowered (top) and raised (bottom) position.

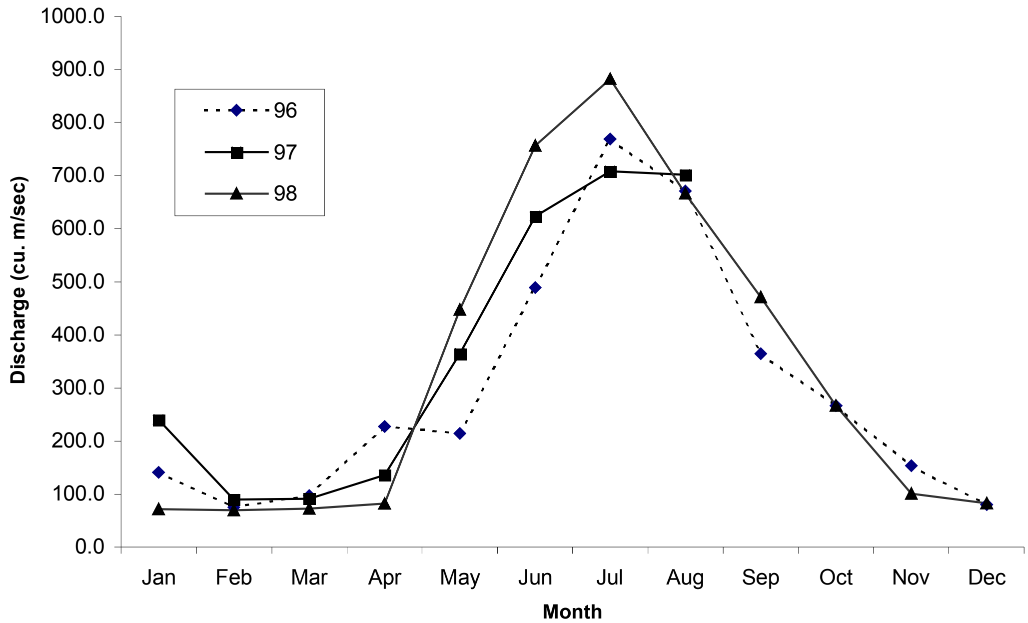


Fig. 5 Klinaklini River discharge.

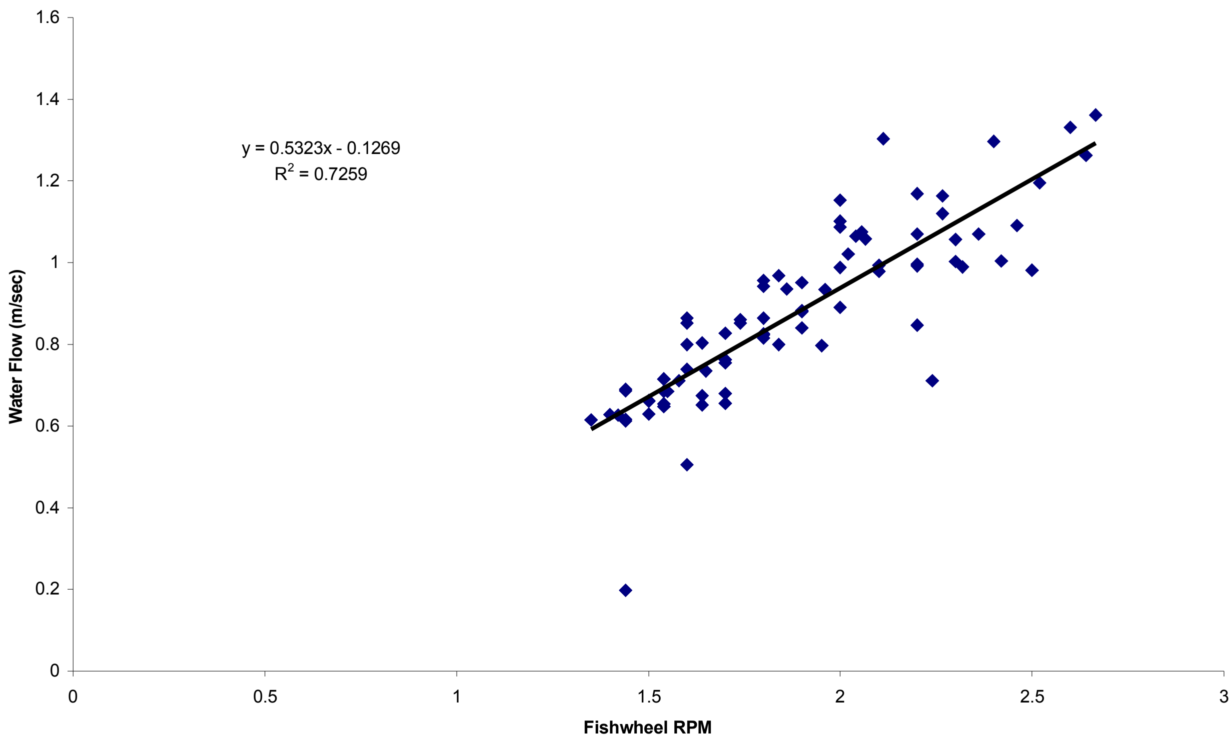


Fig. 6. Fishwheel rotational speed related to water flow, Klinaklini R., 1998.

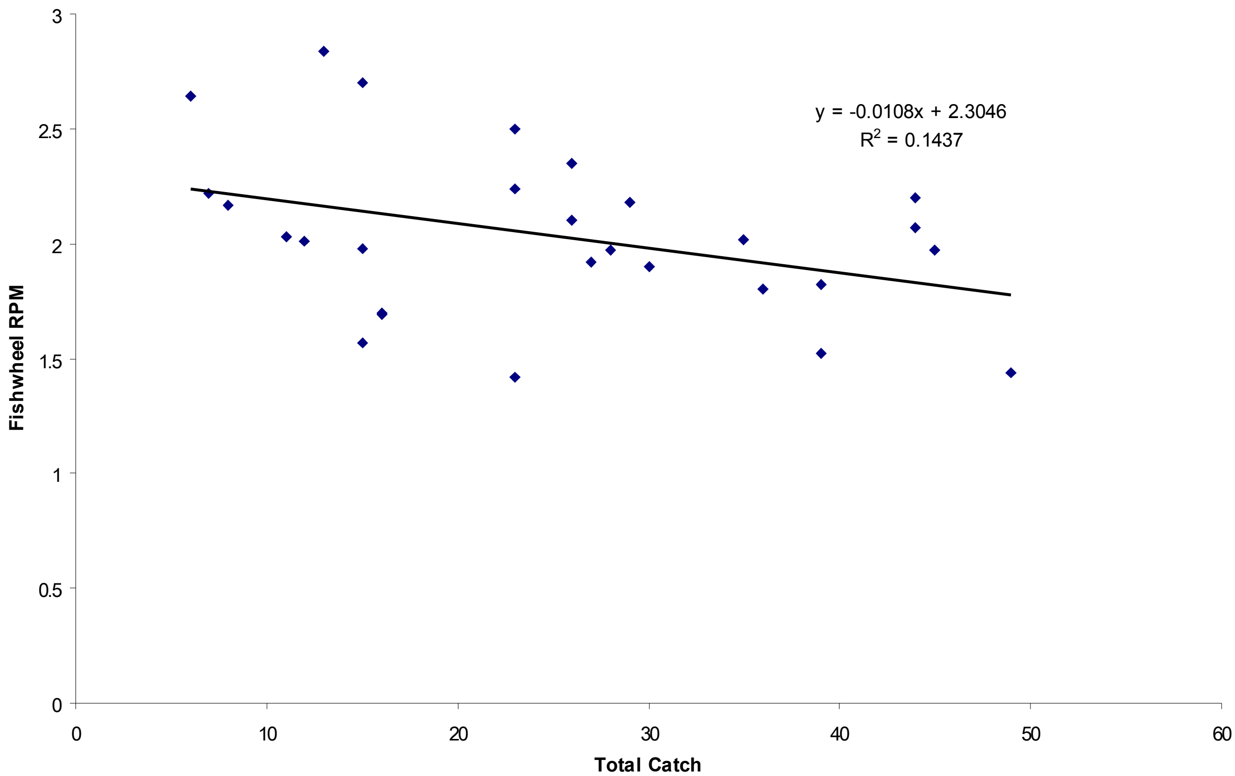


Fig. 7. Fishwheel rotational speed related to catch for chinook salmon, Klinaklini R., 1998.

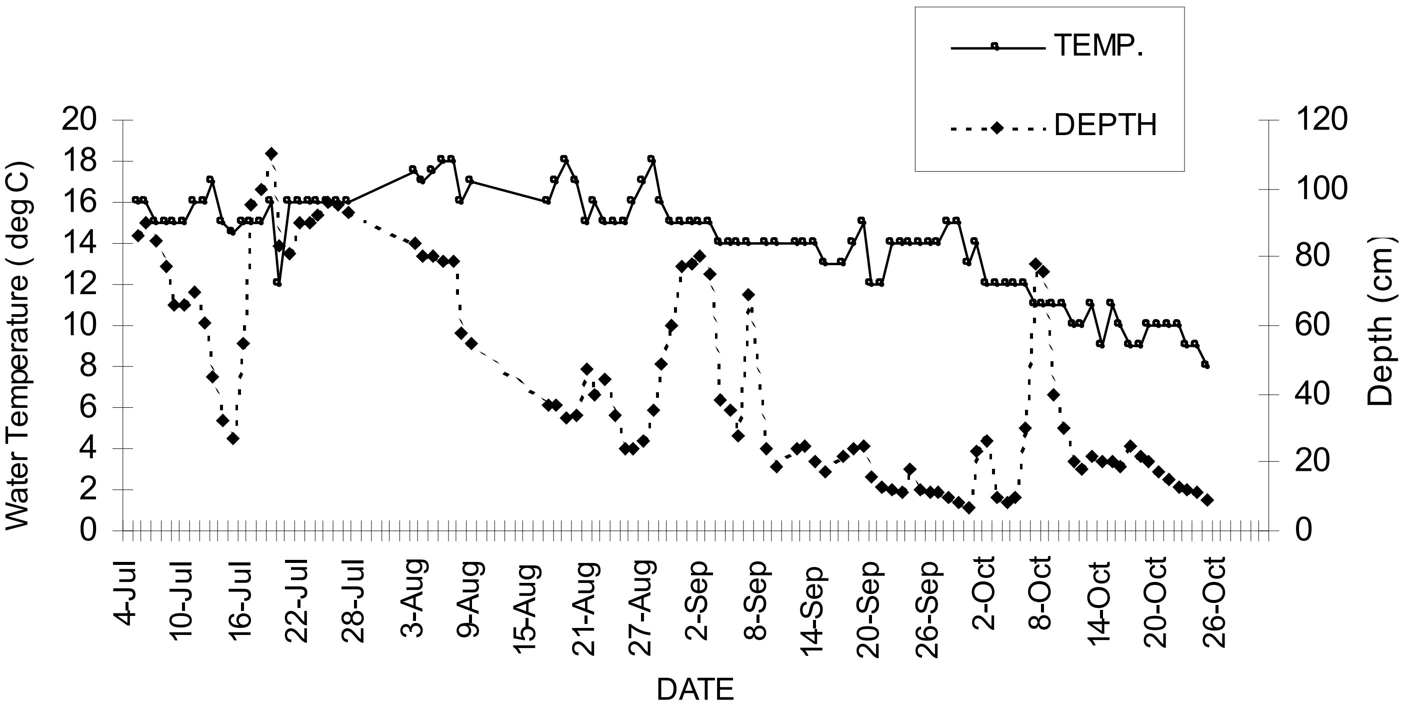


Fig. 8. Mussel Creek environmental data, 1998.

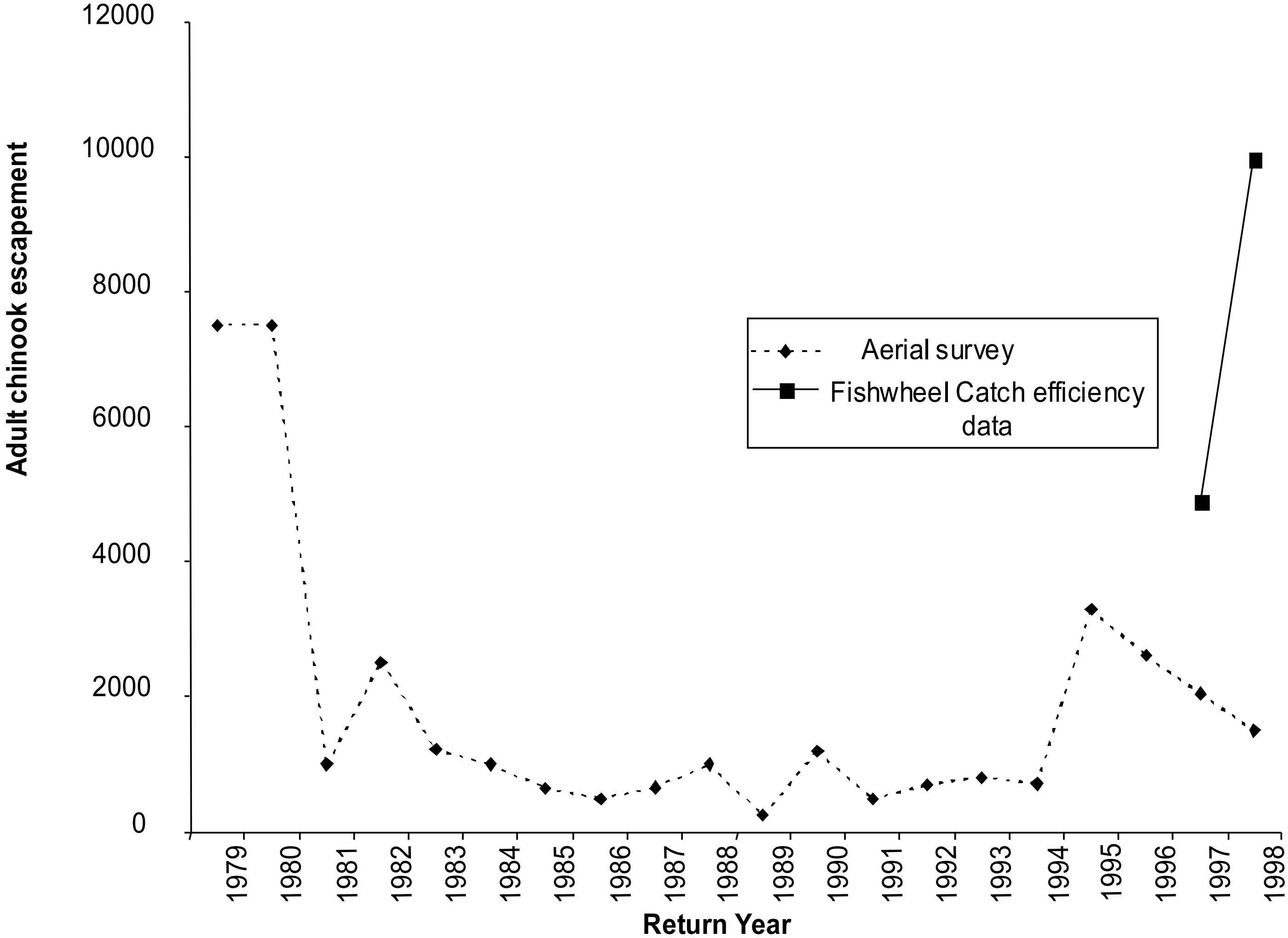


Fig. 9. Chinook escapement estimates, Klinaklini system, 1979-98.