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DISTRIBUTION, TIMING, FATE AND NUMBERS OF CHINOOK SALMON RETURNING TO THE NASS RIVER WATERSHED IN 1993

prepared by

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ABSTRACT

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Extensive radio tagging and escapement surveys were conducted, as part of the 1993 Nisga'a Interim Measures Program (IMP), to obtain reliable run timing and escapement estimates for all chinook salmon stocks in the Nass River watershed. A total of 350 radio tags were applied to adult chinook salmon in the lower Nass River and tracked throughout the watershed using a combination of stationary receivers; and foot, boat, helicopter and truck-based telemetry surveys. Eight fixed-station receivers were established at strategic locations to automatically record upstream and downstream movements of radio-tagged fish. Multiple antennas were used to determine the direction of travel for fish passing the receivers stationed at the junction of major tributaries. We were able to determine spawning destinations for 67% of the fish tagged and 95% of the active tags that escaped in-river fisheries. The radio-tag data also permitted an estimate of in-river harvests. The total escapement of adult chinook to spawning areas was roughly 24,800 fish. The total chinook return to the Nass River in 1993 before all in-river harvests was estimated to be approximately 38,000 fish.

A secondary, but important finding of this study was that 48% of chinook tagged with both spaghetti tags and radio tags lost their spaghetti tags. In comparison, 3% of radio-tagged fish regurgitated (lost) their tags. Our surveys also indicated that in 1993, 41% of the radio-tagged chinook spawning on the Meziadin River above the fishway bypassed the fishway and that observers conducting counts recorded only 60% of the tagged chinook that passed through the fishway. In addition, 23% of the tagged fish spawned below the fishway. Therefore, the observers at the fishway counted only 27% of the radio-tagged chinook spawning on the Meziadin River in 1993.

RÉSUMÉ

Koski, W. R., R. F. Alexander, and K. K. English. 1996. Distribution, timing, fate and numbers of chinook salmon returning to the Nass River watershed in 1993. Can. Manuscr. Rep. Fish. Aquat. Sci. 2371: 143 p.

Des campagnes de recensement des spécimens radio-étiquetés et des taux d'échappement ont été effectuées dans le cadre du Programme de mesures provisoires des Nisga'a, afin d'obtenir des données fiables sur les temps de migration et les taux d'échappement pour l'ensemble des stocks de saumon quinnat du bassin de la rivière Nass. Au total, 350 radio-émetteurs ont été insérés sur des spécimens de saumons quinnats adultes dans le cours inférieur de la rivière Nass, et pistés à travers le bassin hydrographique au moyen de postes récepteurs fixes; des campagnes de télémesure ont également été effectuées au sol (à pied et par camion), par bateau et par hélicoptère. Huit récepteurs fixes ont été installés dans divers points stratégiques pour suivre les mouvements anadromiques et catadromiques des spécimens radio-étiquetés. Plusieurs antennes ont été utilisées pour déterminer le sens de déplacement des poissons traversant les champs de captage des récepteurs situés aux points de confluence des principaux tributaires. Nous avons pu localiser les frayères de 67 % des poissons étiquetés et de 95 % des spécimens étiquetés ayant échappé aux opérations de pêche fluviatile. Les données recueillies par les radio-étiquettes nous ont également permis d'estimer les chiffres de capture fluviatile. L'effectif d'échappement total des saumons quinnats adultes jusqu'aux frayères a été établi à environ 24 800 individus. L'effectif de remonte total du saumon quinnat dans la rivière Nass pour l'année 1993, avant prélèvement par les diverses opérations de pêche fluviatile, a été établi à environ 38 000 individus.

De manière indirecte mais tout aussi importante, cette étude a permis d'établir que 48 % des saumons quinnats portant et une étiquette « spaghetti » et une radio-étiquette avaient perdu leur étiquette « spaghetti », alors que 3 % des spécimens portant uniquement une radio-étiquette avaient régurgité (ou perdu) leur étiquette. Notre étude a également révélé qu'en 1993, 41 % des saumons quinnats radio-étiquetés venus frayer dans la rivière Meziadin, en amont de la passe migratoire, avaient contourné la passe, et que les recenseurs n'avaient détecté que 60 % des saumons quinnats étiquetés ayant emprunté la passe migratoire. De plus, on a découvert que 23 % des poissons étiquetés avaient frayé en aval de la passe. On en a donc déduit que les recenseurs n'avaient dénombré que 27 % des saumons quinnats radio-étiquetés venus frayer dans la rivière Meziadin en 1993.

INTRODUCTION

The Nass River system is the third largest river system in British Columbia and is a major producer of chinook salmon (*Oncorhynchus tshawytscha*). Chinook are heavily utilized by commercial, native and sport fisheries and many chinook populations along the Pacific coast, including the Nass River stocks, were greatly reduced in the 1980's from their historic levels (Anonymous 1983). Hence a high level of concern has been expressed for Nass River chinook populations.

The Nisga'a Tribal Council (NTC) is currently negotiating a land claim settlement with the federal and provincial governments that may include an allocation of a part of the fisheries resources of the Nass River system to the Nisga'a. Thus, all parties have a requirement to know the following:

1. the number of chinook salmon entering the Nass River and its tributaries;
2. where all or most of these fish spawn;
3. the timing of runs of different stocks of chinook salmon.

The Department of Fisheries and Oceans (DFO) have conducted annual surveys of chinook spawners in some of the tributaries of the Nass River, but these surveys do not provide accurate estimates of total escapement. Their counts are incomplete because:

1. some fish cannot be counted in turbid systems;
2. counts are usually conducted only once or twice each year and may not always reflect the total or peak number of fish present in each system;
3. not all spawning areas are surveyed; and
4. only partial counts are conducted for most of the systems surveyed.

Although the DFO counts provide some information on relative run sizes over long periods of time, they do not provide sufficiently detailed information to manage fish stocks effectively over a shorter time frame.

In December 1991, the federal government and the NTC signed an agreement wherein DFO would provide funding for a fisheries Interim Measures Program (IMP). The program included a wide variety of fisheries projects designed and directed by technical representatives of the NTC and the governments of Canada and British Columbia. Two of these projects, chinook radio tagging and chinook escapement surveys, were specifically designed to address the first three data requirements outlined above. The first year of the chinook studies was conducted during 1992 and is reported in Koski et al. (1996). That study provided a more complete assessment of chinook salmon escapement and distribution than previous studies and estimated that the 1992 DFO index count represented only 44% of the 1992 escapement. The DFO data suggest that there is considerable year-to-year variation in the overall chinook escapement and in the contributions of individual stocks to the total escapement. Furthermore, because the DFO surveys are temporally and spatially limited, they probably do not represent a fixed percentage of the total run. Thus, several years of complete chinook escapement estimates are required to evaluate the DFO counts in relation

to the total escapement and to provide the data required for planning sustainable harvesting of chinook salmon.

This report presents the results of the second year of studies of chinook salmon distribution and numbers in the Nass River system. The 1993 chinook studies were conducted with a reduced field effort from the 1992 studies. However, like the 1992 study, this study was significantly enhanced by information and opportunities provided through other IMP projects, as well as by knowledge obtained during the 1992 study. The in-river sport and native catch monitoring surveys provided information on the timing of fish movements in the lower river and harvest estimates for some fisheries. The Nass River fishwheel project provided an excellent supply of healthy adult chinook salmon for radio tagging, and field crews working at the Meziadin fishway obtained daily counts of chinook passing through the fishway.

Study Area

The Nass River drains 8,000 km^2 and is the third largest watershed in British Columbia. The river originates in the Skeena Mountains and flows south and southwest for 400 km, entering the Pacific Ocean at Portland Inlet on the north coast of British Columbia (Fig. 1).

The Nass River supports significant populations of chinook, sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), chum (*O. keta*), and pink salmon (*O. gorbuscha*), as well as steelhead (*O. mykiss*). Chinook salmon spawning areas are found throughout the Nass River watershed. Figure 1 shows 28 Nass River tributaries surveyed for chinook salmon in 1993. Fourteen of these have been identified by the DFO as containing chinook spawning areas (Table 1, Jantz et al. 1989).

The life history information for chinook salmon is generally known and some stock specific data are available about the timing of movements into freshwater and about the timing of spawning in the Nass River system. Two life-history types of chinook salmon have been found in the Nass River (Godfrey 1968; Healey 1983, 1991). Godfrey (1968) indicates that 58% of the chinook returning to the Nass River during 1964-66 were ocean-type fish and only 42% were stream-type. Link and English (1996) found that in 1993, 99% of adult chinook salmon captured in fishwheels at Gitwinksihlkw were stream-type. Studies in other areas have indicated that the contribution of stream- and ocean-type chinook to a spawning run can vary from year to year. Healey (1991) states that there is a tendency, at least in areas south of the Nass River, for stream-type chinook to return to the river earlier than ocean-type fish; however, he did not provide data on the entry dates of these two spawning types into the Nass River. Thus dates of entry and spawning for Nass River chinook stocks may vary from year to year depending on the contribution of the two life history types to the escapement for that year. If ocean-type fish do enter the Nass River later than stream-type, it appears that the current run of chinook to the Nass River consists of primarily stream-type chinook. Koski et al. (1996) and Link et al. (1996) found that most chinook entered the

Nass River in late June to early July in 1992 and that a very small number entered in August. This change in life-history types would be expected given that some lower-river chinook stocks such as the one in Ishkeenickh River appear to have been severely reduced.

A summary of data collected by DFO from 1950 to 1988 (Jantz et al. 1989) suggests that chinook salmon begin to enter the Nass River system in early June and continue to enter until mid-September with the peak period of entry being highly dependent on the stock. Spawning begins in late July and continues until early October with peak spawning occurring in mid-August to early September. Die-off begins in early August and is usually completed by the end of September, but can be as late as mid-November (Jantz et al. 1989).

Chinook spawning escapement estimates have averaged 8,991 for the period 1983-92 and ranged from 3,309 in 1991 to 16,265 in 1986 (Jantz et al. 1989; Jantz, pers. comm.[4]; Wagner, pers. comm.[5]). Table 1 provides a list of the escapement estimates by tributary for the period 1983-92. Four tributaries of the Nass River -- the Damdochax, Kwinageese, Meziadin and Cranberry/Kiteen systems -- are reported to contain the majority of the chinook spawning areas. These four systems have been estimated to contain 51-89% of the estimated total annual Nass River escapement from 1983-92 (Table 1). Based on the 10-yr average estimates to each system (including only years when the system was surveyed) the escapements have averaged 10,581 and the four major systems have contributed 69% to this total (Table 1).

The 1992 chinook IMP study (Koski et. al. 1996) indicated that the DFO index counts seriously underestimate the chinook escapement to the Nass River. The index counts estimated the 1992 escapement to be 6,730 chinook, whereas the more comprehensive study of Koski et al. (1996) estimated the escapement to be 2.5 times higher (16,800). The Koski et al. (1996) study indicated that the Bell-Irving system contributed more to the 1992 total escapement than any other single tributary (4,400 vs 3,300 for Damdochax), yet it had not been previously identified as an important spawning area. Mainstem spawners in both the upper and lower Nass River also contributed small numbers to the total escapement estimate. Visual surveys could not detect these mainstem fish because they hold and spawn in turbid water.

METHODS

Study Design

Data from several sources were integrated and used to monitor movements and numbers of chinook in various parts of the Nass River and its tributaries. However, in 1993

[4] DFO, Prince Rupert, B.C.; pers. comm. to Karl English 1 Feb. 1993

[5] DFO, Prince Rupert, B.C.; pers. comm. to William Koski 21 Feb. 1994

the general approach was to use radio-telemetry, carcass examination and mark-recapture methods to estimate the number of chinook in the Nass River system. Chinook salmon were radio tagged on the lower Nass River and their movements up-river into spawning areas were documented using fixed-station receivers located at strategic locations along the river and aerial and ground-based telemetry surveys. Following the peak of spawning, ground surveys were conducted to examine carcasses and determine the ratios of tagged-to-untagged fish. These ratios were used to estimate numbers of fish present in various areas using mark-recapture methods.

Radio Telemetry

The radio-telemetry component of the study involved catching and radio tagging chinook salmon, in the lower part of the river between Gitwinksihlkw and Old Aiyansh (Fig. 2) and tracking them using a combination of stationary radio-tag receivers; foot, boat and truck-based surveys; aerial surveys; and tag recoveries on the spawning areas after the fish had died. The many different sources of information were integrated into one large database which archives the locations, dates and time when each tagged fish was tracked during field surveys.

Tagging Effort

Fishwheels were the primary tool used to capture chinook to radio tag. Tangle nets were used to supplement fishwheel catches early and late in the season. This was necessary because data presented by Link et al. (1996) suggest that fishwheels catch a lower percentage of the fish present when numbers are low. Table 2 summarizes the fishing effort using nets and details of net fishing effort are provided in Table A-1. Daily summaries of the hours fished by the three fishwheels are presented in Table A-2. Link and English (1996) describe the fishing effort by the fishwheels in more detail.

We attempted to radio tag all healthy fish greater than 72 cm long that were captured prior to 22 June. Some fish greater than 72 cm could not be radio tagged because their stomach was too small to hold the radio tag without applying pressure to the back of the stomach. Starting 22 June, we limited radio tagging to half of the large, healthy chinook caught from fishwheel 1 to ensure that we would have sufficient radio tags to mark fish throughout the run. Radio-tagged fish were also tagged with white spaghetti tags so that they could visibly be recognized by persons counting fish passing through the Meziadin fishway and by persons counting live fish during escapement surveys.

Spaghetti Tagging

Chinook salmon captured in the fishwheels that were not required for the radio-tagging program were tagged with blue Floy spaghetti tags (FT-4 spaghetti tag, Floy Tag & Manufacturing Inc., Seattle, Washington, USA). The tagging procedures are described in detail in Koski et al. (1996) and Link et al. (1996).

Methods of Capturing Fish

Chinook salmon were captured primarily in the fishwheels. Both early and late in the season, set and drift tangle nets were used to supplement catches. During these periods, the fishwheels were either not operating or were operating inefficiently.

Fishwheels: Large wooden fishwheels, similar to those used on the Yukon and Taku rivers (Meehan 1961; Milligan et al. 1985; McGregor et al. 1991), were built in 1992 (Link et al. 1996) to investigate their utility as a live-capture technique and as a method of monitoring the timing and relative numbers of anadromous fish species and stocks entering the Nass River. The 1992 study confirmed that they are an ideal method of obtaining fish for tagging studies because fish are rarely injured during capture, the wheels fish continuously and they catch fish roughly in proportion to their abundance as the fish move up the river. Thus, the fishwheels were the primary source of fish to tag in 1993. The fishwheels used in 1993 were structurally modified from those used in 1992 so that they were more durable, less susceptible to damage from floating debris and high water velocities and easier to move. They were also more efficient at catching fish. Link and English (1996) provide a complete description of the fishwheels and their use during 1993 on the Nass River.

Set Nets: Stationary tangle nets (15 cm mesh, 3 m deep and 45 m long) were used at Grease Harbour, Sandy River, Ginlulak Dump and Fishery Bay to capture fish for radio tagging (Fig. 2). The nets were constantly attended except during the brief periods when the taggers moved to the release site to tag and release fish.

Drift Nets: Along some sections of the river (i.e., near the sawmill at Gitwinksihlkw and near Old Aiyansh, Fig. 2) it was more efficient to capture fish by drifting than by using stationary nets. The same nets were used for drift fishing and for sets. The net was set so that it would form a slight bow with the ends of the net being farther downstream than the middle. The net was allowed to drift downstream with one person holding one end of the net. When a fish entered the net, the net was retrieved. On several occasions, two and occasionally three fish became entangled before the net could be recovered. The fish were lifted into the boat one at a time, removed from the net, and placed into a canvas holding pen. They were then handled as described below.

Radio-tagging Procedures

Two slightly different initial handling procedures were used depending on the method of capture of the fish. Chinook salmon that were caught in nets were placed in a canvas holding tank and transported to a calm area before they were moved to the tagging tray. Fish caught in the fishwheels were removed from the holding pens with a dip net and placed directly into the tagging tray. The tagging tray was a padded V-shaped trough filled with water. When immersed in water, fish generally became calm. This made handling easier and reduced the likelihood of fish being injured. Fish were not anaesthetized because some

chinook were likely to be caught by the in-river net fishery or by sport fisherman and the effects of the available anaesthetics on the edibility of the fish are unknown. Processing included tagging the fish with a spaghetti tag, measuring the fish (nose-fork length), noting the presence of scars and marks and placing a radio tag down the throat of the fish with the antenna protruding from the corner of its mouth. The antenna was bent at the corner of the mouth so that the protruding part trailed along the side of the fish. The spaghetti tag number and the frequency and coded signal of the radio tag were recorded for each individual fish. Processing of each individual fish generally took less than twenty seconds and very rarely took more than one minute.

Tracking Methods

We determined the movements of radio-tagged fish using data collected from tracking episodes conducted from boats, trucks, helicopters and on foot. In addition, we set up fixed-station receivers that automatically detected and recorded radio-tagged fish that passed them. The tracking effort by each of these methods is summarized in Table 3.

Radio-tag Receivers and Tags: The radio-tag receiver used during this study was the SRX_400 built by LOTEK Engineering Inc. of Newmarket, Ontario, with their CODE_LOG version W16 data processing and storage program. The radio tag was the LOTEK model CFRT-7A digitally coded tag. This tag had a 310-d life and was 16.2 mm in diameter, 83 mm long, weighed 29 grams in air and weighted 12.8 grams in water. The frequency range of the tags was 149.320-149.580 MHz. This tag could be detected at 1 km from ground level if the fish was in 4-5 m of water and farther if the tag was in shallower water or the antenna was higher. When flying at 500 m above ground level (AGL) we were able to pick up transmitters on fish in shallow water (1-3 m) from 8-10 km.

During all tracking the receiver was set to scan each frequency for six seconds during which time one to two pulses would be transmitted by a tag (the pulses are five seconds apart); the receiver then searched the next frequency. If a signal was received the receiver decoded the signal, reported the tag code and signal strength and stored the data in internal memory. As many as 12-15 different fish can be recorded on the same frequency during the same scan cycle (six seconds) so that the probability of a fish not being detected is low if only a few fish are present on a single channel. The receivers, fitted with a single antenna, could scan our six chinook frequencies and decode over 70 different radio-tagged fish within a 36 s period. During aerial tracking surveys we were able to optimize tag detection and recording by varying our altitude and speed.

Data from all types of surveys were automatically stored in an internal memory in the receiver and were transferred to a computer file on a portable computer whenever a survey was completed or a fixed station was visited. The data stored for each signal received by the receiver included the following:

1. date;
2. time (h/min/s);
3. channel or frequency;
4. power level of signal;
5. antenna (if more than one antenna was hooked up to the receiver); and
6. signal code.

Six different frequencies (149.32, 149.36, 149.40, 149.44, 149.48 and 149.52 MHz; a few chinook were also mistakenly tagged with steelhead tags at 149.38 and 149.58 MHz) each containing up to 51 different digital codes were used to distinguish between 306 different radio tags used during this study. When tags were recovered from in-river fisheries, another fish was tagged with the same tag; a few tags were deployed as many as three times during 1993. Tags to be applied to fish were selected so that different codes, and not more than a few tags on each frequency, were applied to fish caught on the same date. This precaution was taken to increase the detection efficiency of the receivers if fish captured at the same time or place remained together.

Fixed Stations: Eight fixed-station (FS) receivers were established at strategic locations to automatically monitor the timing and the identities of fish moving up the Nass River (Fig. 1). The location of sites was selected to monitor fish entering known spawning systems. Two fixed-station receivers were set up on the lower Meziadin River to determine what proportion of the chinook used the fishway versus those that jumped the falls to reach spawning areas on middle and upper reaches of Meziadin River. One station was established 0.5 km above the fishway using a conventional communications antenna. The second was established in the fishway using two under-water antennas made from co-axial cable. They detected only fish that were in the fishway and within 10 m either side of the antenna. To have passed without being detected a chinook would have had to swim 40 m through two fishway cells in less than 30 s (six frequencies were monitored).

Each fixed station consisted of one, two, or three antennas and the SRX-400 receiver which was powered by a 12-V deep discharge (RV) battery. Remote stations also had a solar panel to charge the battery. This reduced the helicopter time required to change batteries at the stations during the early and late parts of the field season. The battery and receiver were enclosed in a weather-proof container and could operate for 3-4 wk without servicing. We checked the operation of each station, checked or replaced the 12-V battery and downloaded the data from the receiver once every 2 wk except during the peak of the run when we checked stations every 5-6 d (lower river) or 7-9 d (upper river). The more frequent visits were required to download data from the receivers internal memory which would have become full when many fish were present near the stations.

Koski et al. (1996) describe the operation of the antenna switching units for detecting and determining the direction of movement of fish and the probability of detecting fish. Nine frequencies were monitored (six chinook and three steelhead frequencies); versus ten in

1992. During the period of peak fish movements a 1-1.5 min delay was used between scan cycles to reduce the amount of data obtained.

Tracking by fixed stations provided the most continuous coverage of fish movements of the five tracking methods that were used. A total of 992 site-days of monitoring was obtained from the fixed stations (Table 3). However, monitoring of fixed stations after 25 September (196 site-days, excluding Tseax River) was part of the steelhead program and would not have been conducted if steelhead were not being monitored. The data from the fixed stations provided precise data on the arrival and departure times and dates that fish passed each site. These data could not have been obtained using the other tracking methods.

Aerial Tracking: Aerial tracking was conducted from a Bell 206 helicopter with a single 4-element Yagi antenna attached to the cargo skid on the right side of the aircraft. The aircraft flew along the river and its tributaries at 80-130 km/h and at 90-300 m above-ground-level (AGL). The location of each fish was determined in real time by a Global Positioning System (GPS) receiver and data logger and the approximate position and the identity of each fish were recorded manually on data sheets, as well as automatically in the internal memories of the receiver and GPS. The exact position of the fish was later confirmed by comparing signal strengths and the GPS positions that were machine-recorded. During most surveys, two receivers were operated on different channels so that the probability of passing a fish without recording it was reduced. Aerial tracking was conducted whenever we flew and in 1993 most aerial telemetry data were obtained incidental to travelling to and from fixed-station receivers or carcass examination sites.

Aerial tracking was most valuable to document the locations of chinook after they had entered their spawning streams (Table 3). Our few surveys conducted to detect fish in spawning areas that were not covered by fixed-station receivers were conducted during late July to mid-September. A complete list of aerial telemetry surveys can be found in Table B-1.

Boat Tracking: The section of the lower Nass River from fixed-station 1 (FS1) to Fishery Bay (Fig. 2) was tracked by boat once each week from early June to mid-September.

Boat-based tracking was conducted from a 5.8-m long welded aluminum boat that was powered by an outboard motor with a jet propulsion unit. The jet powered boat was required to obtain access to numerous shallow side channels that were used by fish. The tracking antenna (4-element Yagi) was mounted at the top of a 3-m long aluminum pole that stood inside a PVC pipe mounted along the side of the console. The PVC pipe isolated the antenna from direct contact with the boat and facilitated its removal during transit or when tracking was not being conducted.

All boat surveys were conducted from upstream to downstream. The boat motor was generally turned off and the boat drifted while tracking was conducted because the outboard motor created electronic noise that was picked up by the receiver. When fish were present in

an area, the boat was stopped or permitted to drift through that area until all fish were recorded. The boat was then moved 1-2 km downstream and the procedure was repeated. During the period from late June to late July, when large numbers of fish were present in the areas tracked by boat, we drifted from FS1 to Fishery Bay (Fig. 2).

Truck and Foot Tracking: Tracking was also conducted from a truck and on foot on an opportunistic basis. Most foot survey data were collected when visiting fixed-station receivers to download data. However, some data were collected while conducting carcass examinations of chinook salmon along the Damdochax, Bell-Irving, Kwinageese, Meziadin, Seaskinnish and Cranberry systems. Truck surveys were conducted of the Tseax River, Zolzap Creek and Slough, and mainstem Nass River near Gitwinksihlkw. The same antenna that was used for boat tracking was used from the truck; a collapsible three-element Yagi antenna was used during foot surveys.

Data Processing

The data from each site or survey were screened for spurious signals using existing computer programs and were incorporated into the radio-tag database. Spurious signals were identified among the logged data by low signal strength, few or no repetitions, or by the fact that the tag was not deployed.

The data (more than 1 million lines) were then converted into a dBase format (Foxpro 2) and condensed to one record for each fish at each location on each day. Programs were written to identify implausible movements or positions, match survey times and locations with fish tracking records, and summarize the data for presentation in tables and figures.

Escapement Field Surveys

General Approach

The purpose of the escapement field surveys was to determine the proportion of chinook salmon that were radio tagged in individual tributaries and in the overall Nass River system so that the chinook escapement could be estimated using mark-recapture techniques similar to that done by Koski et al (1996). Effort was concentrated on a few major chinook spawning areas that had been identified by Koski et al. (1996) as being likely to provide maximum data relative to the effort expended. However, an effort was made to obtain some data from systems where fish were widely dispersed and where data collection was difficult in order to assess biases that may exist as a result of using data from only a few systems. Our lack of in-season aerial surveys of spawning tributaries resulted in our missing the peak spawning periods in some of the tributaries where we attempted to examine carcasses.

The number of surveys completed each week depended on the weather conditions, availability of aircraft and personnel, budget considerations and logistical constraints which included coordination with other studies.

Survey Procedures

Aerial surveys were used to count chinook salmon in Ishkeenickh River and ground surveys were used to examine carcasses and recover radio and spaghetti tags in other systems. These techniques are described in detail below.

Aerial Surveys: Two aerial surveys of Ishkeenickh River were conducted by Michael Link and the authors. The procedures were identical to those described by Koski et al. (1996). These surveys were conducted because the system was too far down-river of the tagging site to provide a useful mark-recapture estimate. The system was of special interest because numbers of spawning chinook appear to have declined sharply in recent years (see Table 1).

Ground Surveys: Ground surveys were conducted by a crew of 2-4 surveyors walking alongside and through the stream to examine carcasses of chinook salmon for radio and spaghetti tags (carcass counts). At the same time, live fish were counted and classified as either spawning or holding. Sizes of dense groups of live fish were estimated. (Refer to Table D-1 for dataform used).

Each carcass was examined for radio and spaghetti tags or for holes indicating lost spaghetti tags. Carcasses were counted and categorized as adults (>50 cm, nose-fork length) or jacks (males <50 cm, nose-fork length). After carcasses were examined they were thrown on the bank adjacent to the river or onto piles of debris to indicate that they had been examined and counted if they were encountered during later surveys.

Carcasses of radio-tagged fish were examined for general physical condition, sex, spawning condition and the age of the carcass. The stomachs and digestive tracts of several fresh carcasses were examined to determine if radio-tag placement or retention resulted in any physical injury. Any physical abnormalities or injuries were recorded and these notes were compared to notes taken at the time of tagging to determine if they occurred after tagging. The spawning status of females was assessed by examining the gonads in carcasses; they were recorded as fully spawned if the gonads were completely empty, partially spawned if some eggs remained and non spawners if the gonads were intact and all eggs appeared to be retained. The age of the carcass was estimated using the degree of deterioration of the carcass. The following general criteria were used to estimate the number of days since the fish died:

1. bright red gills, little or no *rigor mortis* (1 d);
2. gills dull red with white patches, carcass stiff or beginning to loosen, flesh firm (2-3 d);
3. gills white, fungus layer on skin, flesh very soft (4-5 d);
4. gills white/grey, heavy covering of fungus, flesh mushy (6-7 d).

The rate of deterioration varied slightly among systems and throughout the period of the spawning run so that ages determined for particular systems or particular periods varied slightly from the above criteria. The estimated ages based on the above criteria varied by as much as two days. Carcasses that had been examined during the previous survey provided a basis for estimating the age of fish that had died between survey periods. These carcasses gave an indication of the rate of carcass deterioration that was specific to that time and that system. The date that a radio-tagged fish died was used in conjunction with the date that the fish entered that system to provide an estimate of its total residence time within the tributary.

Systems Surveyed

As mentioned previously, different amounts of effort were used to estimate chinook escapement to different tributaries or stocks of the Nass River system during 1993. The number of fish that entered each major spawning tributary was monitored using the fixed-station receivers that were located on the tributaries (Table 3). Aerial telemetry surveys were used to determine the number of tagged fish into smaller systems such as Tchitin, Seaskinnish and Anudol and the distribution of fish within the Bell-Irving and Cranberry tributaries (Table 4). Major carcass examination efforts were conducted on Damdochax (Fig. 3), Kwinageese (Fig. 4), Meziadin (Fig. 5) and Cranberry systems (Fig. 6). Carcass examinations were also conducted on Oweege, Snowbank, Seaskinnish and Tseax systems (Table 4).

The fishway on Meziadin River was monitored by DFO from 16 July to 1 October 1993. Methods of operation and conducting counts were similar to other years (see Southgate et al. 1988; Koski et al. 1996). The fishway was normally closed to fish passage when observers were not present so that fish passing through the fishway could be counted. However, because people dip-netted fish from the fishway when DFO personnel were not present, the counting gate was left open during a few occasions when DFO personnel left the site. During these periods the fish were allowed to pass without being counted or being examined for tags. In previous years, the gates were closed and fish passage was blocked whenever observers were absent. Radio- and spaghetti-tagged chinook salmon were counted, recorded and allowed to pass through the counting area without being handled.

Analytical Techniques

Chinook escapement for the entire Nass River system and individual tributaries, where intensive carcass surveys were conducted, were estimated using the adjusted Petersen estimate from Ricker (1975):

$$N = \frac{(M+1) \cdot (C+1)}{R+1} \qquad (1)$$

where N is the population estimate, M is the number of tagged fish in the river system as determined by radio telemetry surveys and fixed-station receivers, C is the number of fish examined for tags during ground surveys in that system, and R is the number of tags recovered in the sample C.

For tributaries that were not intensively surveyed to determine tag rates, we prorated the total Nass escapement estimate using the portion of the total radio tags tracked to each tributary.

Where appropriate, the 95% confidence limits for Petersen estimate were calculated by replacing the number of recoveries (R) in formula (1) with the fiducial limits taken from the Poisson distribution (p 79, Ricker 1975). The fiducial limits of R were obtained by substituting R for χ in Appendix II of Ricker (p 343, 1975).

Stratification of Data: Stratification of population estimates by stock and sub-stock (e.g., by tributary or by age and/or sex within tributaries) components can often reduce the potential for systematic biases (Bocking et al. 1991). Fish from different stocks may have passed our tagging sites at different times and, consequently, fish from different stocks may have been tagged at different rates. The data on the timing of movements of fish from different stocks suggest that this should not have been a serious source of bias for the stocks that moved up the river beyond Grease Harbour (see RESULTS -- Upstream Movements); however, the observed tag rates in the different tributaries sampled suggests that some biases did exist. For estimates of specific stock sizes we attempted to minimize these biases by analyzing the data from different stocks separately where we recovered four or more fish from that stock during carcass examinations.

The problem of accurately enumerating chinook jacks was largely avoided by the size limitations associated with the radio tagging. Jacks were defined as those chinook less than 50 cm in fork-length. Since radio tags could not be applied to any chinook less than 72 cm, no jacks were tagged. Consequently, our population estimates only represent adult chinook.

We were unable to stratify by sex because the sex of many of the tagged individuals was uncertain. It was difficult to determine the sex of the tagged fish at the lower-river tagging sites where the fish had only recently left the ocean. Fish were often silver-bright and secondary sexual characteristics, like a kype or a ridged back, had not developed.

Mark-Recapture Assumptions: Biases in Petersen estimates can occur when the principal assumptions of the estimation procedure are violated (p. 81-82, Ricker 1975). The relevant assumptions are:

1. The marked fish suffer the same natural and fishing mortality as the unmarked fish;
2. The marked fish are equally vulnerable to the recapture technique as are the unmarked fish;

3. The marked fish do not lose their marks;
4. The marks are applied randomly over the entire run; and/or marked fish become randomly mixed with the unmarked fish; and/or the recovery effort is proportional to the number of fish present in different reaches of the system; and
5. All marks are recognized and reported on recovery.

Our assessment of the validity of each of these assumptions is presented below (see DISCUSSION).

RESULTS

Radio Telemetry

Radio Tagging

Radio tags were placed in 350 chinook salmon during 1993. Tagging was conducted over a period of five months from 9 May to 11 October (Tables A-1 - A-3), but 90% of the fish (315) were tagged during a five-week period from 6 June to 10 July 1993 (Table 5). Almost all (97%) of the fish that were tagged were caught in the fishwheels. Nets were used to supplement the fish caught by the fishwheels both early and late in the season when fishwheels were not catching fish. Chinook were known to be present because they were being caught by food fishermen (Bocking and English 1996). No fish were caught in a fishwheel near Gitwinksihlkw from 9-16 May, although small numbers were caught by food fisherman from New Aiyansh and Gitwinksihlkw. Three chinook were caught using a drift net and tagged on 12 May. High water levels throughout the rest of May stopped fish movements and chinook did not start to move until early June. The fishwheels were not operated during the 17-31 May period, but only six chinook were estimated to have been caught by fisherman from New Aiyansh and Gitwinksihlkw during this period and no fish were caught during attempts to catch fish using nets on 28 May. Thus very few fish are believed to have passed during this period.

Water levels started to drop slowly on 30 May and dropped rapidly during 9-11 June (Fig 8). Small numbers of chinook appear to have moved up-river during early June. Because only one fishwheel was fishing 1-9 June we used a drift net up-river of the fishwheel on 8 June to supplement the catch during this period. Two fishwheels (the third fishwheel was not used for radio tagging) operated almost full time until the end of July. By mid-July the spring run of chinook had ended, although the fishwheels were still catching small numbers of chinook; many of these were coloured fish that were destined for spawning areas in the lower river and were milling in the area.

A small summer run of chinook passed the fishwheels in early to mid-August. By then we had exhausted our supply of radio tags and tags were applied as they were returned

by fishermen. Nets were used to apply tags to a few of these fish later in August and September when tags were returned to us.

The number of active radio tags during each week was less than the total number of chinook that had been tagged to that date because fish were caught or tags were regurgitated. Table A-4 lists the radio tags that were recaptured during the study and were available to be redeployed. Table 6 shows the number of tags that we estimated were transmitting at the end of each period and could have been picked up during our surveys. A high proportion (four of eight) of the few fish that were tagged in May and early June were removed from the list of active tags before they reached their destination.

Fish that were tagged on the lower river late in the season were almost exclusively lower river fish; whereas, those tagged during the main part of the run from mid-June to mid-July included all of the stocks.

Because the run was larger than expected, and because fewer tags were available in 1993 than in 1992, we were not able to tag at an uniform rate throughout the chinook run. When 197 of the original 306 tags had been applied by 22 June and the run had not yet peaked, we reduced our application rate to one half of the healthy fish from fishwheel 1. Until 22 June, all of the fish from both fishwheels 1 and 2 were radio tagged. Fishwheel 1 caught much larger numbers of chinook than fishwheel 2. Therefore, fish from the latter half of the run were tagged at approximately half of the rate as fish from the first half.

Figure 7 suggests that there were two pauses in the chinook run during 1993; 16-19 June and 24 June. The pause during 16-19 June was caused by a small, but sudden rise in water level. However the water level was stable (it actually fell a few cm) from 23-26 June. The chinook run appears to have been building to a peak on 26 June (Fig. 7) and numbers of sockeye caught were higher on 24 and 25 June than on earlier and later dates. These facts suggest that chinook were removed from the fishwheel on 23 (probably 10-20) and 24 June (probably about 30). The most abundant stocks at this time (Cranberry and Damdochax) would have been under-tagged due to their removal from the pool of fish to tag on 23-24 June which was near the peak of the run.

Spaghetti Tagging

All healthy chinook salmon that were not radio tagged were spaghetti tagged. A total of 478 adult and eight jack chinook were spaghetti tagged between 4 June and 15 August 1993 (Table 7, A-5). Thirty-two of them were recaptured in the fishwheel and released (Table A-6). Fifty of them were recovered by the lower-river food fishery (42), middle-river aboriginal fishery (1) and sport fishermen (7), respectively before they reached their spawning destination and an additional large number (40-50) were probably caught by the middle-river fishery and not reported to us. Table 8 summarizes the numbers of active tags based on recoveries by us, but does not include probable recoveries by the middle-river aboriginal fishery. Forty-one of the spaghetti tags that were not removed by the in-river

fisheries were recovered in spawning destinations at Damdochax (15), Kwinageese (13), Bell (1), Meziadin (6), Cranberry (5) and Tseax (1); (Table A-6). In addition, seven spaghetti tags were counted, but not recovered from chinook passing through the Meziadin fishway.

Tracking Methods

During this study we obtained more than one million individual records of chinook salmon locations. These data were condensed to 4,783 records of chinook salmon locations (including tagging information, recapture information and a few records of fish recorded more than once and at slightly different locations on the same day) that were unique to fish, date and tracking method. A total of 1,889 (39%) of the unique records were obtained from our fixed-station receivers and 2,403 (50%) from mobile tracking (Table 9, Table C-1). As the fish moved up the main river, different tracking methods became important for documenting the movements. During June most fish were tracked from the boat, and as the fish moved up the river during July and early August most tracking was done by the fixed-station receivers. Finally, when fish arrived on the spawning areas, most fish were tracked by helicopter and ground surveys.

Fate of Tagged Fish

We were able to determine the spawning destinations of 236 of the 350 fish (67%) that were tagged; this was 95% of the 248 fish that escaped in-river fisheries and suffered no loss (Table 10). Ninety-five radio-tagged fish were captured in the lower-river food fishery (44), middle-river fishery (46) and by sport fishermen (5) before they arrived at their spawning destinations. An additional nine radio-tagged fish were captured by sport fisheries and six were suspected of being removed by unidentified fisheries, after they arrived in spawning tributaries. Thus, at most 221 (63%) of the radio-tagged fish that passed our tagging site may have spawned.

Up-river Movements

When the water levels declined in early June, large numbers of chinook salmon started to move up the Nass River. Chinook passing the tagging site near Gitwinksihlkw, appeared to do so evenly throughout the run and in proportion to their contribution to the whole run. There are a few weak patterns evident in the 1993 data (Fig. 7):

1. Bell-Irving and Damdochax fish form a major part of the early fish that have up-river destinations (this also occurred in 1992);
2. Bell-Irving fish were largely absent from the latter half of the run;
3. a few Kwinageese and Cranberry fish arrived later than other up-river stocks; and
4. most fish passing the tagging site after 6 July were destined for the lower river.

Fixed-station Data: Up-river movements were protracted in 1993 and the Damdochax and Bell-Irving stocks seemed to lead the general movement (Fig. 9, 10 and Table C-1); however, small numbers of fish were involved during the initial up-river movements. Most of the fish moving up-river by each of our fixed-station receivers passed each site over a period of 30-40 d which is considerably more protracted than in 1992 when the duration of movement was 10 d. Fishwheel data indicate that the peak movements of chinook past Gitwinksihlkw were from 8 June - 7 July. During this period there was a 4-d pause from 16-19 June when rising water levels slowed chinook movements (Fig. 7 and 8). The dip on 23-24 June is believed to have been caused by vandalism at the fishwheels and is discussed above in the RESULTS - Radio Tagging section.

The initial up-river movements were slow and averaged less than 2 km/d from the tagging site to the Grease Harbour fixed station. The initial slow movement may have been due to fish dropping back downstream after being tagged. Peak movements past FS1 were on 2 July, but the hiatus observed on the lower river just before the peak was less pronounced at FS1 (Fig. 7 and 9). Rates of movement between the three lower-river fixed stations were approximately 5-7 km/d except for Meziadin fish that moved slower (4 km/d; Table 11). After chinook passed FS9 their rates of movement increased to 10-19 km/d (Table 11). As the fish moved up-river the peak of movement was not as clearly defined and movements were spread out over a longer period.

Fish that were entering a tributary that was a spawning destination or that had overshot their spawning destination tended to remain at the junction of that tributary and the mainstem Nass for a longer time than those continuing up the mainstem (Table 11). The Nass-Kwinageese junction was the only junction where fish approaching their destination did not appear to hold for several days; their mean holding time was 0.8 d. Cranberry fish held at the Nass-Cranberry junction for an average of 4.4 d, Bell-Irving fish held at the Bell-Nass junction for 4.1 d and Damdochax fish held at the Damdochax-Nass junction for 3.2 d.

Destinations: We were able to determine spawning destinations for 236 of the chinook that were radio tagged. The most important spawning tributaries were the Cranberry/Kiteen system (52 tags, 22%), Bell-Irving system (40 tags, 17%), Damdochax system (38 tags, 16%), Kwinageese (28 tags, 12%), Meziadin River (22 tags, 9%) and Tseax River (19 tags, 8%; Table 10). Except for the large number of tags in the Bell-Irving system, which was also noted in 1992 by Koski et al. (1996), these estimates are within the ranges of historical escapement proportions (Table 1).

Additional information was collected on the timing of fish movements to specific tributaries from fixed stations on the Tseax, Kiteen and Meziadin rivers (Table C-2). The Tseax station provided clear evidence that a substantial portion of the fish entering this tributary did so in mid-October. In contrast, most of the Kiteen chinook entered that tributary in late-July and early-August. The two fixed stations on the Meziadin (one in the fishway and one upstream of the falls) provided the first reliable information on the portion of Meziadin chinook stocks which use the fishway (discussed below).

Spawning-area Residence Time: The fixed-station receivers permitted us to document the arrival date of individual fish into tributaries such as Damdochax Creek, Kwinageese River and Meziadin River. When a radio-tagged fish was recovered and its date of death was estimated we were able to estimate the residence time of that fish in the system (Tables A-7 to A-9). The departure date of a few live fish was also determined from the fixed-station data, but these fish are not included. These data were not required for this study, but are presented because they are important biological information that are required for many other escapement studies.

Ground Surveys

Ground surveys were conducted in each of the major tributaries and in several of the smaller tributaries to determine the ratio of marked-to-unmarked fish for the entire Nass River system, and in a few cases, for tributaries where sufficient data could be obtained. In total 3,715 chinook carcasses were examined and 32 radio tags were recovered in eight different tributaries. Therefore, the overall ratio of radio tags to carcasses, based on the adjusted Petersen approach $(C+1)/(R+1)$, was 1:112.6.

Damdochax Creek

Damdochax Creek was selected for conducting intensive carcass examinations because it normally contains an abundant supply of spawning fish that are spatially and temporally concentrated (Fig. 3). Four surveys were conducted from 25 August to 20 September and 2086 carcasses were examined (Table 12). Fifty-five percent of these carcasses were examined on 9 September which was shortly after the peak of die-off. Excluding the first survey when only 72 fish were examined and no tags were found, the adjusted tag rate was remarkably constant throughout the season; it varied from 1:104 to 1:115. The overall adjusted tag rate for the Damdochax system was 1:130.

Kwinageese River

Ground surveys to examine carcasses were conducted along the upper reaches of Kwinageese River (Fig. 4) on 10 and 17 September. Peak numbers of dead fish occurred about the time of the 10 September survey when we examined 647 fish and found eight tags; the adjusted tag rate for this day was 1:72 fish (Table 13). The overall adjusted tag rate was also 1:72.

Bell-Irving System

A low level of effort was put into carcass examinations in the Bell-Irving system because of its remoteness and the temporally and spatially dispersed spawning activities of chinook on the Bell system. Our carcass recoveries in this system were also reduced because of large amounts of bear activity on both Oweegee and Teigen creeks and extremely low

water levels which probably reduced residence times in the spawning areas. Reduced residence times made it difficult to estimate dates of die-off.

We planned our first visit to Snowbank and Teigen creeks in late August based on our 1992 data that suggested earlier spawning than that reported in Jantz et al. (1989). They reported the following timing of activities for chinook in Teigen Creek: arrival in early August (mid-August for Teigen), start of spawning in late August, peak spawning in early September and die-off in late September. However, the peak of die-off occurred before 28 August and we examined 62 carcasses with no radio tags (Table 14). Although 220 live fish were counted on 28 August (Table D-2), only 28 carcasses were left for us to examine on 4 September; one of these fish had a hole below the dorsal fin indicating that it had lost a spaghetti tag. Only one of the 220 live fish seen on 28 August had a white spaghetti tag, indicating that it was a radio-tagged fish. No blue spaghetti tags were seen.

Only 20 chinook carcasses were examined in Oweegee Creek and none had radio or spaghetti tags. In addition, 95 live fish were seen that did not have any tags. Spawning activity of chinook was slightly later in Oweegee Creek than in Teigen Creek, but the peak of die-off was before our first survey on 4 September. The timing of spawning activity in Oweegee Creek was several weeks earlier than that reported in Jantz et al. (1989). However, low water levels on Oweegee Creek, in combination with heavy bear predation during August and September of 1993, may have delayed or prevented spawning activity in Oweegee Creek. Most of the spawning fish were seen in or near the mouth of the creek.

We did not examine sufficient numbers of carcasses to determine a mark rate specific to the Bell-Irving system. No radio tags were found in 110 carcasses examined in Bell tributaries. However, 315 live fish were also seen, and only one of these fish had a white spaghetti tag. Even allowing for loss of spaghetti tags, the tag rate in the Bell-Irving system appears to have been as low or lower than in Damdochax Creek.

Meziadin River

The fishway was monitored from 16 July to 5 October (78 d); 433 adult and 64 jack chinook salmon were counted passing through the fishway (Table E-1). Six white (radio-tagged) and 11 blue-spaghetti-tagged fish were counted among the 433 fish. Based on these visual counts the adjusted ratio of tagged-to-untagged chinook was 1:62 (radio tags only). Unlike 1992, when 43% of the adult chinook moved through the fishway during a four-day period from 27-30 July, small but steady numbers of chinook passed through the fishway from 16 July to 16 September 1993. Figure 12 shows the cumulative proportion of adult chinook that passed through the fishway each day.

A major effort was made to examine carcasses on Meziadin River in order to assess the fishway counts in relation to the total escapement. A total of 352 carcasses were examined; four fish had radio tags (Table 15). The adjusted tag rate was 1:71, which was similar to that observed in the fishway. Most chinook were holding in deep water during the

first ground survey on 8 September. The peak of die-off was before the survey on 21 September, and few live fish remained after the last survey on 26 September.

A comparison of the radio tags detected by the fixed station located in the fishway with those of visually detected fish permitted an estimation of the number of tagged (and untagged) fish that were missed during visual counts. None of the six radio tags that were detected visually were missed by the fixed station; however, the fixed station picked up four tags that were not recorded visually (Table 16). Seventeen radio-tagged fish were detected at the fixed-station receiver up-river of the fishway. This implies that seven (41%) of the 17 radio-tagged fish by-passed the fishway and jumped over the falls.

There were too few data to determine why observers missed four of the radio-tagged fish. Two of the chinook missed by the observers at the fishway were recovered on the spawning grounds. One of them still had its spaghetti tag and the other did not. Thus, at least one of the fish that they missed may have lost its spaghetti tag before it passed through the fishway. However, our numerous recoveries of spaghetti tags laying in the gravel on the spawning grounds suggests that most spaghetti tags that are lost are detached during spawning activities.

Cranberry River

A total of 153 chinook carcasses were examined during ground surveys conducted from 31 August to 10 September; and none of these fish had radio tags, spaghetti tags or marks indicating they had been tagged (Table 17). In addition, 141 live fish with one white spaghetti tag (radio tag) were counted on 31 August. Our surveys in Cranberry were after the peak of die-off. Survey data from 1992 and 1993 suggest that there are several temporal and spatial components to the spawning activity in the Cranberry River. This would have made examination of larger numbers of carcasses difficult and costly. In addition, we suspect that the low water levels in 1993 may have delayed spawning by some fish.

The carcass survey data did not permit an estimate of the mark rate in Cranberry River, but the observations of both live and dead fish suggest that the mark rate in Cranberry River was probably closer to that of Damdochax and Bell-Irving than that of Meziadin and Kwinageese.

Seaskinnish Creek

During two surveys of Seaskinnish Creek, 120 chinook carcasses were examined. Two radio-tagged and no blue spaghetti-tagged fish were found (Table 14). During the first survey 147 live fish were also counted; including one white and one blue spaghetti tagged fish (Tables D-2 and D-3). The first survey was conducted before the peak of the die-off and the second about a week after.

Tseax River and Slough

The Tseax system has the latest spawning run of Nass River chinook stocks (Jantz et al. 1989). In 1993 the peak of the die-off was approximately 24 October. Tseax fish arrive during and after other stocks and could either be over- or under-represented among the tagged fish. Because some chinook remain in the main river near our tagging site for an extended period, they are more likely to be tagged. On the other hand, many of the fish that spawned in Tseax may have arrived in the Nass River late in the summer and may not have been proportionally represented among our radio-tagged fish.

One radio-tagged fish was found among 98 carcasses examined in Tseax River and Slough. A flash storm washed out many of the remaining fish before they could be examined following the peak of die-off. The conditions in the upper Tseax River make counting and observing tags very difficult; therefore, we are not confident that spaghetti tags could have been seen on many of the fish that were counted. Live counts cannot be used to evaluate the mark rate in Tseax River.

Escapement and Harvest Estimates

The mark rate information from carcass examinations were combined with the data on the fates of the radio-tagged fish to estimate the numbers of fish that spawned (escapement) or that were taken by the various fisheries on the Nass River. Separate estimates were made for sport harvests, lower river and middle river aboriginal harvests and other harvests. Catch estimates for most fisheries were derived by multiplying the number of radio tags recovered or suspected to have been caught by the overall Nass mark rate (26686/236, Table 19). Catch estimates for fisheries within the Meziadin River were based on the Meziadin mark rate (1624/22).

Sport-fishery Harvests

In 1993 data from the radio tagging of chinook were more useful than in 1992 for estimating sport harvests because more of the anglers fishing on Cranberry and Tseax rivers were aware of the radio-tagging program than the previous year. Captures of sixteen (15 different) radio-tagged fish were reported to us. Captures consisted of two from the mouth of Meziadin River, 11 (10 different fish, i.e., one fish was released and then recaptured) from Cranberry River (three of these were released unharmed), two from the mouth of Tchitin River and one from Tseax River. A seventeenth fish regurgitated its tag at the mouth of Tchitin River (Table 10). Because the spaghetti tag was not returned, we assume that the fish was either not captured or was released (a common practice by fishermen at that location).

In summary, 13 radio-tagged fish were known to be caught and kept by sport fishermen, three were caught and released unharmed, and although unlikely, as many as five others could have been caught and kept. The estimate of the total number of chinook caught

by sport fishermen was 1,392 based on the 13 fish caught and kept. The distribution of tag recoveries suggest that 374 of these fish were caught before they entered a tributary (226 at near Tchitin River and 148 at the mouth of the Meziadin River), 113 were caught in Tseax River and 905 were caught in Cranberry River (Table 20). The breakdown of captures by system is not precise because of the small number of recaptures in some systems and the extent to which these estimates are biased is unknown. The overall radio-tag estimate for sport catch may be less biased than other methods of estimating these harvests because it does not rely on accurate reporting of effort or success. However, harvest estimates derived from small numbers of recoveries are likely to be overestimates. Bocking and English (1994) estimated the combined sport catch of chinook for the Cranberry, Tchitin and Tseax systems to be 983 fish; the radio-tag estimate for the same area is 1,244 chinook. The true harvest is probably somewhere between these two estimates.

Lower-river Aboriginal Fishery

Data from radio-tagged fish can also be used to estimate the number of fish caught in specific Nass River aboriginal fisheries. Catch estimates were made for all fisheries upstream of Greenville Bridge. Six radio tags were recovered in aboriginal fisheries below the Greenville Bridge but these data were not used to compute catch estimates because the fish were radio tagged more than 20 miles upstream of these fisheries. A total of 38 radio-tagged fish are believed to have been caught in aboriginal fisheries between Greenville Bridge and Grease Harbour; 31 of these were reported to us. Of the seven suspected tag recoveries, 6 are believed to have been caught at traditional fishing sites near Sandy River, Gitwinksihlkw, and Gitlakdamix; and one tag appears to have been regurgitated at a traditional fishing site near Gitwinksihlkw. Using the overall Nass mark rate, 38 radio tag recoveries represents a total harvest of 4,297 chinook. Given the large number of tags recovered in traditional fishing areas close to the tagging site, we suspect that many of these tagged fish did not have sufficient time to mix with the unmarked population prior to recapture. Therefore, the radio tag recovery data are likely to overestimate the true harvest in this fishery. The most reliable estimate for the chinook harvested by aboriginal fishermen between Greenville Bridge and Grease Harbour is 3,060 obtained through a systematic catch monitoring program (Bocking and English 1996). The total catch estimate for all aboriginal fisheries between Kincolith and Grease Harbour was 5,964 (Bocking and English 1996).

Middle-river Aboriginal Fishery

The data from radio-tagged chinook also provided an opportunity to monitor the catch by aboriginal fisheries on the middle section of the mainstem of the Nass River that were not effectively monitored by DFO or Nisga'a programs. A total of 46 radio-tagged fish were last recorded in areas adjacent to aboriginal fishing sites above Grease Harbour. Five of these were last recorded between Grease Harbour and Nass Bridge while the remainder were last recorded at sites between Nass Bridge and Meziadin Junction. Based on the prorated estimates of escapement to the relevant tributaries, an estimated 575 and 4,717 chinook were removed by these two fisheries, respectively (total of 5292, Table 21). A few additional

chinook may have been harvested by this same group on Cranberry River (see Sport-fishery Harvests above).

Other Harvests

Occasionally chinook are harvested by an aboriginal food fishery on Cranberry River or they are taken by unknown fishers on Meziadin River, Seaskinnish Creek and Cranberry River. The data from radio-tagged fish permit an estimate of the overall loss to escapement by these fisheries. In 1993, two radio-tagged chinook were harvested from the upper section of Meziadin River by an unknown fishery. This could represent a harvest of 148 chinook based on the Meziadin mark rate ($2 \times 1624/22$). This area is closed to all angling. In addition, four radio-tagged chinook disappeared from Cranberry River as a result of an unknown harvest (see Sport-fishery Harvests above). Our best estimate for the harvest represented by the removal of these four tags would be 452 fish ($4 \times 26686/236$). Therefore, the total harvest by these unknown fisheries was estimated to be 600 chinook (Table 20).

Tributary Estimates

We examined sufficient numbers of fish in three tributaries to make estimates of escapement using the tributary specific mark rates. The estimate of the escapement to Damdochax was 5,086 with 95% confidence limits of 3,155 and 8,659; the estimate of escapement to Kwinageese was 2,103 (95% confidence limits of 1,191 to 4,055); and the estimate of escapement to Meziadin was 1,624 (725 and 4,060). The escapement to each major tributary or section of the river was also estimated using the overall Nass mark rate (Table 19). However, we have less confidence in escapement estimates for the latter tributaries because of the potential for differing mark rates for fish with different destinations. All stocks appeared to pass our tagging site together, and therefore mark rates should be similar in all tributaries. However, we observed large differences among mark rates in the Damdochax, Kwinageese and Meziadin systems. Given the potential for differences in tag rates, calculations of confidence intervals are not valid.

Meziadin River: Observers counting fish moving through the Meziadin fishway in 1993 recorded only 35% of the radio-tagged chinook that moved into spawning areas above the fishway. Furthermore, some fish spawn below the fishway (five radio-tagged fish in 1993); therefore, the fishway counts represented only 27% of the total number of chinook that entered the Meziadin River in 1993. The fishway observations of six radio-tagged fish among 433 adult chinook (1:72) was similar to that observed in our carcass surveys (1:88).

All radio-tagged fish that entered the Meziadin, Cranberry and Tseax systems were used to calculate the mark-recapture estimate. Thus the estimate includes some of the fish that were caught in sport, food and other fisheries. In order to calculate the actual escapement we had to subtract the sport, food fishery and other catches from the numbers that entered the system (Table 20).

Two radio-tagged fish were harvested from the upper Meziadin River by an unmonitored fishery. Based on the Meziadin mark rate, an estimated 148 chinook may have been harvested; the escapement is, therefore, 1,476 chinook (Table 20). The harvest by sport fishermen was taken at the mouth of the river, before chinook entered Meziadin River. Although a large fraction of these fish may have been destined for Meziadin River, they were not included with the fish that entered Meziadin because some may have been destined for upriver locations.

Cranberry River: Our best estimate of the net escapement to the Cranberry system was 4,923 chinook. It was calculated by subtracting a sport fishery harvest of 905 and other undefined harvests of 452 chinook from the mark-recapture estimate of 6,280 chinook that entered Cranberry River (Table 20). The catch estimate derived from creel census data accounted for a harvest of 453 chinook from the Cranberry River (Bocking and English 1994). Given the difficulties associated with surveying fishing activity on the Cranberry River, we suspect that the creel survey data underestimate the total catch.

Tseax River: The number of chinook estimated to have entered Tseax River was 2,294 based on tracking 19 radio-tagged fish to this system. Only one radio tag was returned to us by a sport fishermen, thereby, suggesting a fairly small harvest (133 fish, Table 20). Our extensive creel surveys on the Tseax River provide a much more reliable estimate of the sport harvest (367 chinook, Bocking and English 1994). The combination of a small survey area, limited access and close proximity to Gitlakdamix make it much easier to survey than the Cranberry River. Consequently, our best estimate of the net escapement to the Tseax River was 1,927 (Table 21).

Ishkeenickh River: Two aerial surveys were conducted of the Ishkeenickh River; the first was on 26 July and the second on 9 August. Survey conditions were fair during the second survey when the most fish were seen and the surveyor estimated that his counting efficiency was 30-50% (Table D-2). No holding and 95 spawning fish were observed and one radio-tagged fish was recorded in the system on that date. Typically, the spawning activity of Ishkeenickh River chinook peaks in late August (Jantz et al. 1989) but Koski et al. (1996) documented probable spawning in early August in 1992.

We estimated the escapement to the Ishkeenickh River as 248 adult chinook (99 observed and adjusted by 40%, the average observer efficiency; Table D-2) based on the data from the aerial counts of live fish. This estimate is probably low because it does not include an estimate of the number of fish that entered the stream after the survey date. Only one of two radio-tagged fish that entered Ishkeenickh River had done so by the 9 August survey; this confirms that additional chinook entered after 9 August. The estimate based on the radio-tag data is almost identical (226) to the estimate based on the aerial counts, but we have little confidence in the radio-tagging data to provide a realistic estimate for this tributary because the tagging location was far upstream of Ishkeenickh and the number of tags entering this system was small.

Overall Escapement Estimate

Our best estimate of the numbers of chinook arriving at spawning destinations in the entire Nass River system is 24,814 (i.e., gross escapement to tributaries less tributary specific harvests; Table 21). Escapement estimates for Damdochax, Kwinageese and Meziadin were derived from tributary specific mark rates (Table 19). Escapement to other spawning areas were based on prorating the remaining contribution to escapement according to the number of radio tags detected in that system (Table 19).

DISCUSSION

The major goal of the 1993 radio-tagging program was to estimate the chinook salmon escapement to the Nass River system in 1993. Secondary objectives were to confirm the proportions of the run that entered major spawning areas and to collect information on in-river run timing. Our escapement estimate is based on tracking radio-tagged fish to their spawning destinations and determining their fates in combination with a Petersen mark-recapture design. Consequently, the following discussion focus on the major assumptions associated with these mark-recapture estimates in an attempt to identify and assess potential sources of bias.

Until the IMP program was initiated in 1992, the counts of fish passing through the fishway were the primary method used to estimate the escapement to Meziadin River. The counts at the fishway underestimated the true escapement because: 1) some fish bypassed the fishway by jumping over the falls; 2) some fish may have moved through the fishway before it was staffed or during periods when the gate was left open; and 3) some fish may have been missed by personnel conducting the counts.

There is a falls adjacent to the entrance of the fishway that was believed to be impassable to most fish previous to this study. This falls is approximately 65 m wide and 5 m in height. During the salmon migration, numerous fish are seen jumping at the base of the falls and occasionally salmon are observed jumping over the falls (our observations; Stephan Jacob, LGL Limited, pers. comm.). The proportion of chinook that jump over the falls has never been estimated, but previous to this study was believed to be small.

The proportions of fish that are missed by observers, that jump the falls and bypass the fishway and that spawn below the fishway all need to be confirmed by future studies. The 1993 sample sizes are small and there may be substantial year-to-year variation in the portions of fish that are not counted for various reasons. The water levels were unusually low in 1993 and the effect of the low water on the ability of fish to jump over the falls is unknown. In addition, the sockeye escapement to Meziadin was extremely large and the proportion of chinook that were missed by observers may have been larger than normal because of the large numbers of fish passing through the fishway. It is also possible that larger numbers of chinook than normal jumped over the falls and bypassed the fishway

because the fishway was filled with fish for an extended period due to the extremely large numbers of sockeye attempting to pass through it.

Mark-Recapture Estimates

Biases in Petersen estimates can occur when the principal assumptions of the estimation procedure are violated (p. 81-82, Ricker 1975). The relevant assumptions and how our study attempted to meet and/or test their validity are outlined below.

1. *The marked fish suffer the same natural and fishing mortality as the unmarked fish.*

The tagging and natural mortality rates have been estimated from the data. All but nine of 350 radio-tagged chinook salmon were tracked and/or accounted for subsequent to release. The major source of mortality among the radio-tagged fish was capture during the in-river net and sport fisheries. From the extensive tracking surveys, it was possible to monitor the behaviour of the tagged fish and to determine their mortality rate. We were also able to determine or guess at the causes of mortality of many of the radio-tagged fish for which the exact cause of death was unknown.

We assumed that any early mortality of radio-tagged fish was the result of tagging. Once fish had survived for more than a week we assumed any further mortality was due to natural causes or fishing. Studies of the effects of implanting ultrasonic tags in juveniles fish indicate that they recovered quickly (<4 h) and permanently (permanently was 1-4 weeks in their study) if the tags were less than 5% of the body weight of the fish (Moser et al. 1990). During our study, tags were much less than 5% of the weight of the fish and only one radio-tagged fish (0.3%) died within a few days of being tagged. It was assumed to have died as a result of capture and handling.

The effects of any early tag mortality on the escapement estimates were eliminated by the data analysis methods that were used; only tagged fish that entered a specific stream were used in the estimation procedure. By the time that fish had entered their respective spawning streams, they had travelled for 2 to 18 weeks and over distances of 10 to 300 km. Once the tagged fish had survived this upstream migration, we assumed that their mortality rate would be similar to unmarked fish. This seems reasonable given that only 1% (3 of 350) of the tagged fish died of unknown causes before they arrived at their spawning destinations and they died 3-8 wk after release.

2. *The marked fish are equally vulnerable to the recapture technique as are the unmarked fish.*

In this study, the bulk of the recoveries came from carcass examinations. During ground surveys all dead fish were carefully examined for spaghetti and radio tags. We also examined each fish for holes indicating that the fish may have lost a spaghetti tag. Other

enumeration efforts at Meziadin fishway provided estimates of chinook passage and a few observations of radio-tagged fish. The mark rate for Meziadin was estimated using carcass examinations above the fishway and it was compared to a mark rate from the visual counts. These two rates were similar (1:88 vs 1:72).

3. *The marked fish do not lose their marks.*

This assumption can be tested using our data and any biases can be reduced or eliminated. Radio-tagged fish were marked with two tags, a radio transmitter and a spaghetti tag. We examined each carcass carefully for both tags. Surveyors opened the mouth of each carcass, peered down the throat and looked behind each operculum for the radio-transmitter antenna. The area on the back of the fish below and behind the dorsal fin was scraped clean with the sharp end of a fish pew and examined closely for holes that would have been present even if spaghetti tags had been lost, which they were (Table 18). Thus most of our marked fish would have been identified even if they lost both tags.

The only forms of tag loss that would affect our escapement estimates were tags that stopped transmitting or tags that moved into areas that were not surveyed and, therefore, not detected. In 1993, all of the radio tags that we recovered were operating normally when they were recovered. In addition, we were able to assign a fate to all but nine of the fish that were tagged. A few of the nine fish may have moved into tributaries below our tagging site and not been detected because we did not conduct surveys of some of the small tributaries on the lower river. However, it is likely that most of these fish left the Nass River after being tagged.

4. *The marks are applied randomly over the entire run; and/or marked fish become randomly mixed with the unmarked fish; and/or the recovery effort is proportional to the number of fish present in different reaches of the system.*

The 1993 run was larger than in 1992 and we had fewer tags to apply. As a result we changed our tag rate during the middle of the study (Fig. 7). During the first half of the run our radio-tag application rate was approximately twice that of the second half. However, the combination of random selection of fish for tagging and the apparent co-migration of all stocks past the tagging site (Fig. 7), should have reduced the potential for substantial differences in the mark rate between stocks.

This assumption is further supported by the potential for marked fish to mix with the unmarked population. The radio tags were applied to fish between 10 and 300 km from the spawning grounds, a distance that required 2-3 wk of travel time, and spawning was 4-18 wk after the fish were tagged. We believe this was sufficient time and distance for fish to have become randomly mixed.

Carcass data were obtained from Damdochax Creek throughout the spawning season. Excluding the first survey, when only 72 fish were examined and no tags were found, the adjusted tag rate was remarkably constant throughout the season; it varied from 1:115 to 1:104. This suggests that any biases associated with the change in the rate of tag application during the season had been minimized by thorough mixing of the fish when they moved upriver.

The tag rates in the Kwinageese and Meziadin systems (1 tag:71-72 fish) are much higher than the overall system rate and the reason is not readily apparent in Figure 7. Kwinageese and Meziadin fish appear to have started moving up-river a few days later than the other stocks (Fig. 9) and scattered Kwinageese fish were tagged over a week after Damdochax, Bell-Irving and Meziadin were last tagged. Significant numbers of Damdochax (and Bell-Irving) chinook may have moved by the tagging site in early June when our primary fishwheel (#1) was not operating and during a few days in mid-June when both of our fishwheels were vandalized. During mid-June peak numbers of Damdochax fish appear to have been moving by our tagging site. These tagging biases would result in lower tag rates for Damdochax, Bell-Irving and Cranberry than Kwinageese and Meziadin. The tag rate for Meziadin River may have been increased by selective harvesting of untagged chinook during the aboriginal harvests below the fishway. Fishermen claimed that they released any healthy radio-tagged chinook that they caught. We are sceptical that they did given the large number of radio-tagged fish harvested by them. However, release of any radio-tagged fish would have caused an increase in the mark rate for Meziadin River chinook.

5. *All marks are recognized and reported on recovery.*

We did not re-examine carcasses for missed tags to test this assumption. However, the surveyors were experienced at doing carcass recovery work and ample time was allocated to examining carcasses. Furthermore, because surveyors looked for two tags on each fish (radio and spaghetti tags), they were unlikely to overlook both tags.

Run Timing

The timing and duration of the chinook runs were very different in 1992 and 1993 (Fig. 7 and 11). In 1992, significant up-river movements past the tagging site did not begin until 18 June, but in 1993 they started almost two weeks earlier. Despite this earlier start in 1993, significant movements continued until about 8 July which is similar to the end date in 1992 (11 July). There were no major rises in water level in 1993, but a small rise in water levels 16-19 June slowed up-river movements for 4 d. In 1992 a sharp rise in water levels from 28 June to 4 July virtually stopped all up-river movements.

Data collected from the Meziadin fishway over the past 25 years indicate that the initial movements into Meziadin River were normal in 1993. However, as the season progressed the movements into Meziadin River were one of the latest on record (Fig. 12). Three factors may have contributed to chinook remaining below the fishway until late into

the season. First, in previous years aboriginal fishermen were not present at Meziadin fishway, and their constant fishing in 1993 may have discouraged chinook from entering the fishway. Second, low water levels may have discouraged entry into the fishway and may have prevented fish from jumping over the falls. Finally, the sockeye escapement to Meziadin River was the second largest[6] on record, and there was a build-up of sockeye in and below the fishway. This build-up of fish may have discouraged entry into the fishway by chinook, particularly when combined with activities by aboriginal fishermen.

Harvest Rates

The radio-tag data were used to estimate harvests of chinook that occurred within the Nass watershed above Greenville Bridge (Table 20 and 21). Some of these harvests were also estimated by catch monitoring programs (Bocking and English 1994, 1996). The radio-tag estimates of the number of chinook harvested in lower river aboriginal fisheries and sport fisheries were generally higher than those derived from catch monitoring programs (as indicated above). The radio-tag estimates were based on tracking and determined the fate of tags that were not returned, as well as data from tags that were returned. As indicated above, we believe that the catch estimates based on radio-tag recovery data over-estimate the aboriginal harvest between Greenville Bridge and Grease Harbour because of biases in tag recovery. For fisheries above Grease Harbour, radio-tag data provide less biased and, in some cases, the only estimates of the total harvest. The radio-tag sport catch estimates probably include catches of fish over the legal limits (that would not be reported during interviews) and catches of anglers that may not have been included in the total number of fishermen when estimating sport catches. However, catch estimates for some tributaries which are based on fewer than five radio tag recoveries are less reliable than the catch monitoring data. The radio-tag data also permitted an estimate of unmonitored fisheries on the Meziadin and Cranberry rivers (600, Tables 20 and 21).

The radio-tag data provided an estimate of the harvest of chinook by the middle-river aboriginal fishery where harvesting effort was substantially expanded in 1993. New fishing camps and fish smoking facilities were established at Nass Bridge, Arbour Bridge and near the mouth of the Meziadin River. Intensive fishing was observed at each of these sites from mid-June through early September in 1993. The total harvest for these fisheries was estimated to be in excess of 5,200 chinook based on the suspected removal and destruction of 46 radio tags. In 1992, only 10 of 260 radio tagged fish that migrated past Grease Harbour were suspected to have been removed by these fisheries. All of the remaining 250 fish were tracked to their spawning destinations. Given the 1992 mark rate of 1:61, the 1992 harvest by this fishery was estimated to be approximately 612 chinook or 12% of the 1993 estimated harvest. When interviewed, some of these fishermen claimed that they released all healthy tagged fish that they caught; if they did, then their actual harvests were much higher in 1993.

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[6]The largest sockeye return to the Meziadin was in 1992 when two counting chutes were operated and over 592,118 fish were counted through the fishway. In 1993, only one counting chute was operated and a total of 389,323 adult sockeye were counted through the fishway.

The only alternative explanations for the disappearance of these radio tags would be removal by sport fishermen or tag failure. It is extremely unlikely that the small mainstem sport fishery would have been responsible for the removal of more than 2 or 3 of these radio tags, and given the cooperation observed in other areas, at least some of these tags would have been returned for a reward if they had been taken by sport fishermen. Tag failure may have accounted for some of the missing tags in 1992, when our spawning ground surveys and Columbia River studies using the same tag type confirmed that roughly 10% of these tags had a faulty battery circuit. This problem was corrected by Lotek in 1993, and to our knowledge, no defective tags were confirmed in 1993.

Given the above escapement and harvest estimates, the total return to the Nass River would have been in excess of 38,000 chinook in 1993 (Table 21). This run was substantially larger than 1992, but the total harvest rate for river fisheries (35%) was similar to that estimated for 1992 (35%). In 1993, the Nisga'a in-river gillnet fishery harvested 16% of the chinook that entered the Nass River which is down from 27% in 1992. The sport fishery harvest share was similar for each year, taking roughly 10% of the Cranberry stock and 4% of the total return.

While there were no major concerns concerning the tributary specific escapement estimates for 1993, harvest rates appear to be fairly high (43-49%) on the Meziadin and Cranberry river stocks. The combined food, sport fishery and unknown harvests on these stocks need to be monitored closely because of their potential to impact spawning populations during years of lower run size. The results from 1993 provide a clear indication that the middle-river aboriginal harvest could be substantial and must be monitored to ensure that total stock size can be determined each year. Our proration of the total middle-river harvest to specific stocks, based on an assumption of equal vulnerability, probably underestimates the contribution of Meziadin and Cranberry river stocks to this fishery. Migration rate and residence time data indicate that these stocks normally reside in this fishery for 3-4 d longer than other co-migrating stocks (Table 11). In addition, low water levels in 1993 may have further delayed chinook movements into the Meziadin River (Figure 12). Thus, Meziadin River chinook may have been even more vulnerable to fisheries at the mouth of the Meziadin River.

Future Studies

The 1992 and 1993 Nass River radio-tagging program has confirmed that radio-telemetry data can provide reliable estimates of overall escapement to a large river system. They can also provide estimates of harvest rates by various user groups. Some of these data cannot be obtained by other methods because they involve uncooperative fishermen. Several recommendations concerning the conduct of similar studies here and elsewhere have arisen from the 1992 and 1993 studies. They are:

1. Sufficient numbers of tags should be available to apply a steady tag rate throughout the study. We suggest attempting to maintain a tag rate of

1-1.5%; the tag rate should be higher if total run size is small (<10,000) and could be lower if the total run size is large (>50,000). This will result in some tags not being applied if the run size is small. Changes in tag rates during the study reduce the reliability of the overall estimate and require increased recovery effort to document varying mark rates in different systems. Minor problems during the tagging period may be magnified when tag rates are not constant.

2. Groups conducting harvests on the system should be informed of the program and encouraged to return radio tags and information on the method, time and location of capture. We offered a $25 reward for return of tags and information. The tags that are returned can be redeployed. This reduces the cost of conducting the program and provides useful information on the various harvests.

3. Sufficient resources need to be allotted to conducting carcass examinations on spawning grounds and in tracking tags during the season. On the Nass River, the Cranberry and Bell-Irving systems require that some helicopter time be budgeted to recover carcasses because spawning is temporally and spatially spread out and sufficient numbers of carcasses cannot be examined during foot surveys.

4. Radio-tag data do not provide good estimates of escapement for the lower Nass River because of the location of the tagging sites. Because the lower-river fishery may have a heavier impact on some lower-river stocks (e.g., Ishkeenickh) than on up-river stocks, some method of monitoring these stocks should be developed. Visual surveys need to be conducted of some of the lower river tributaries such as Kincolith and Ishkeenickh rivers and Ksedin and Anudol creeks, as well as continuing surveys of Seaskinnish Creek and Tseax River.

5. Spaghetti tags are not suitable for tagging studies of chinook salmon that rely on recoveries on the spawning grounds. A high proportion of the tags appear to be removed during spawning activities.

The cost of conducting an annual radio-tagging program on the Nass River is beyond the financial resources of the monitoring programs that are currently in place. However, the number of chinook spawning in the Nass River could be estimated using a mark-recapture methodology that would involve tagging chinook from the fishwheels with operculum tags and conducting carcass examinations in several representative tributaries. The overall estimate of the number returning to the Nass River would have to be reduced by harvest estimates to provide an estimate of spawning escapement. This would require co-operation by the various fisheries to estimate in-river harvests. Estimates for individual tributaries could not be derived from this type of study because the number of tagged fish entering each

system would not be known. However, the combination of a total system mark-recapture study with visual index counts for selected tributaries would provide a more reliable estimates of chinook escapement than the current and historical fishery officer surveys.

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TABLES

Table 1. Estimates of chinook salmon escapement to the Nass River and its tributaries, 1983-92; 1983-88 data from Jantz et al. (1989), 1989-92 data from Jantz (pers. comm.). Annual totals assume zero escapement to systems not surveyed.

System	Escapement estimates[a]										10-year average[b]
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
Damdochax R.	950	1200	1000	4000		2000	2000	1000	750	2500	1711
Cranberry River	2000	3500	3000	6000	4000		3000	4500	550	1500	3117
Kiteen River	50	200		500	500		300	400	150	100	275
Kwinageese River	500	500		2500	500	1500	4000	2000	800	1000	1478
Meziaden River	550	700	599	900	550	772	900	900	600	870	734
Oweegee Creek	200	400	400		50	100			12		194
Snowbank Creek			50								50
Teigen Creek			200	100	75			12	5		78
Hodder Creek				15							15
Tchitin River	25	20						50	50	400	109
Seaskinnish Creek	400	300	700	200	200	200	50	175	100	100	243
Tseax River	900	2100	350	1000	850	850	1200	1000	200		939
Tseax Slough	200	500	300	250			200	100	25		225
Ishkeenickh	1000	1200	600	300	250	250	175	400	67	250	449
Kincolith River	300	500	200	300	300	300	250	800			369
Nass Mainstem	500	500									500
Brown Bear Creek			3								3
Iknouk River	P	300		200	P			50		10	140
Total Nass River	**7575**	**11920**	**7402**	**16265**	**7275**	**5972**	**12075**	**11387**	**3309**	**6730**	**8991[c]**	**10628**

[a] Blanks indicate system was not surveyed (chinook presence unknown); P indicates chinook present but escapement not estimated.

[b] Excludes years when the system was not surveyed.

[c] Average of Total Nass estimated chinook escapements 1983-92.

Table 2. Summary of tangle-net effort applied to catch chinook salmon for a radio-tagging study on the Nass River, 12 May - 11 October 1993. Effort is presented as the number of hours spent attempting to catch and tag fish by capture method and by section of the Upper Stratum of the Nisga'a in-river fishery.

Week ending	Capture method		Section of the Upper Stratum[a]			Total effort
	Set net	Drift net	Lower	Middle	Upper	
15-May	0.0	3.4	0.0	1.7	1.7	3.4
22-May	0.0	0.0	0.0	0.0	0.0	0.0
29-May	1.5	1.8	1.5	1.0	0.8	3.3
05-Jun	0.0	0.0	0.0	0.0	0.0	0.0
12-Jun	0.0	3.0	0.0	1.8	1.2	3.0
19-Jun	0.0	0.0	0.0	0.0	0.0	0.0
26-Jun	0.0	0.0	0.0	0.0	0.0	0.0
03-Jul	0.0	0.0	0.0	0.0	0.0	0.0
10-Jul	0.0	0.0	0.0	0.0	0.0	0.0
17-Jul	0.0	0.0	0.0	0.0	0.0	0.0
24-Jul	0.0	0.0	0.0	0.0	0.0	0.0
31-Jul	0.0	0.0	0.0	0.0	0.0	0.0
07-Aug	0.0	0.0	0.0	0.0	0.0	0.0
14-Aug	0.0	0.0	0.0	0.0	0.0	0.0
21-Aug	0.0	0.0	0.0	0.0	0.0	0.0
28-Aug	0.0	3.0	0.0	3.0	0.0	3.0
04-Sep	0.0	1.9	0.0	1.9	0.0	1.9
11-Sep	0.0	0.8	0.0	0.8	0.0	0.8
18-Sep	0.0	0.0	0.0	0.0	0.0	0.0
25-Sep	0.0	0.9	0.0	0.9	0.0	0.9
02-Oct	0.0	0.8	0.0	0.8	0.0	0.8
09-Oct	5.1[b]	2.1	4.2[b]	1.3	1.7	7.2
16-Oct	0.0	2.9	0.0	0.8	2.1	2.9
Total	**6.6**	**20.6**	**5.7**	**14.0**	**7.5**	**27.2**

[a] Upper section is from Grease Harbour to the outflow of Tseax Slough; Middle section is from the outflow of Tseax Slough to the outflow of Zolzap Slough; Lower section is below the outflow of Zolzap Slough

[b] Set nets were placed in the Lower Stratum (Fishery Bay and Ginlulak) on 8 October 1993.

Table 3. Summary of radio-tag tracking effort on the Nass River, 1993. Effort is presented as the number of days or part days that tracking was conducted using each method.

Week	Mobile tracking			Mainstem stations						Tributary stations				
ending	Boat	Aerial	Foot	FS1	FS3	FS9	FS4	FS7	FSD	FST	FS2	FSM	FSF	Total
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05-Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	1
12-Jun	1	0	0	3	0	0	0	0	0	0	0	0	0	4
19-Jun	0	1	0	7	6	0	0	0	0	0	0	4	4	22
26-Jun	2	0	0	7	7	0	0	0	0	0	0	7	7	30
03-Jul	2	2	2	7	7	7	4	4	0	0	1	7	7	50
10-Jul	2	1	2	7	7	7	7	7	0	0	7	7	7	61
17-Jul	2	1	1	7	7	7	7	7	0	0	7	7	7	60
24-Jul	2	1	1	7	7	7	7	7	0	0	7	7	7	60
31-Jul	1	1	1	7	7	7	7	7	0	0	7	7	7	59
07-Aug	1	1	1	7	7	7	7	7	0	0	7	7	7	59
14-Aug	1	1	2[a]	7	7	7	7	7	0	0	7	7	7	60
21-Aug	2	1	1	7	7	7	7	7	0	0	7	7	7	60
28-Aug	0	2	3[a]	7	7	7	7	7	0	6	1	7	7	61
04-Sep	1	2	5[a]	7	7	7	4	7	0	7	0	7	7	61
11-Sep	1	4	3	7	7	7	2	7	0	7	0	7	7	59
18-Sep	2	1	1	7	7	7	7	7	0	7	0	7	7	60
25-Sep	0	1	1	7	7	7	7	2	5	7	0	7	7	58
02-Oct	0	1	1	7	7	7	7	0	7	7	0	1	1	46
09-Oct	0	0	0	7	7	7	7	0	7	7	0	0	0	42
16-Oct	0	0	0	7	7	7	7	0	7	7	0	0	0	42
23-Oct	0	0	0	7	7	6	7	0	7	7	0	0	0	41
30-Oct	0	0	0	7	7	0	2	0	7	7	0	0	0	30
06-Nov	0	2	0	7	6	4	4	0	7	5	0	0	0	35
Total	**21**	**23**	**25**	**150**	**145**	**122**	**114**	**83**	**47**	**74**	**51**	**103**	**103**	**1061**

[a] Foot tracks on 11, 26, and 31 August 1993 include some tracking with a truck.

FS1=Grease Harbour, FS3=Cranberry/Nass Junction, FS9=Bell-Irving/Nass Junction, FS4=Kwinageese/Nass Junction, FS7=Damdochax/Nass Junction, FSD=1km below FS7, FST=Tseax River, FS2=Kiteen River, FSM=Meziadin River (upstream of fishway), and FSF=Meziadin fishway.

Table 4. Summary of aerial and ground survey effort to estimate chinook salmon escapement to the Nass River, 1993. Effort is presented as the number of days or part days that tracking was conducted using each method.

System		Number of days			
		Counts of live fish		Carcass	
Tributary	Survey period	Aerial	Foot/fishway[a]	examination	Telemetry[a]
Damdochax					
Damdochax	25 Aug - 3 Nov	0	3	4	7
Wiminasik	9-Sep	0	1	1	0
Cranberry	31 Jul - 20 Sep	0	3	3	8
Kiteen	7 - 20 Sep	0	0	0	3
Kwinageese	18 Aug - 3 Nov	0	0	2	7
Meziadin River	22 Aug - 26 Sep	0	4	4	5
Meziadin fishway	16 Jul - 1 Oct	NA	78	NA	NA
Bell-Irving					
Mainstem	28 Aug - 3 Nov	0	0	0	3
Oweegee	4 Sep - 3 Nov	0	2	2	3
Taft	10 Sep - 3 Nov	0	0	0	2
Snowbank/Teigen	28 Aug - 3 Nov	0	2	2	4
Others	10 Sep - 3 Nov	0	0	0	2
Upper Nass Mainstem	2 Aug - 4 Nov	0	0	0	10
Lower Nass Mainstem	2 Aug - 4 Nov	0	0	0	20
Lower Nass Tributaries					
Tchitin	9 Aug - 3 Nov	0	0	0	2
Seaskinnish	5 Aug - 4 Nov	0	2	2	13
Tseax	9 Aug - 4 Nov	0	2	2	9
Anudol	5 Aug - 3 Nov	0	0	0	7
Ishkeenickh	26 Jul - 3 Nov	2	0	0	4
Kincolith	not surveyed	0	0	0	0
Total		**2**	**97**	**22**	**109**

[a] Includes partial and opportunistic surveys.
NA = not applicable

Table 5. Numbers of chinook salmon radio tagged on the Nass River, 9 May - 11 October 1993. Numbers are summarized by method of capture and section of the Upper Stratum for weekly periods.

Week ending	Capture method			Upper Stratum[b]		Total fish tagged
	Drift net	FW1	FW2	Middle	Upper	
15-May	3[a]	0	0	1	2	3
22-May	0	0	0	0	0	0
29-May	0	0	0	0	0	0
05-Jun	0	0	5	5	0	5
12-Jun	6	14	29	44	5	49
19-Jun	0	47	19	66	0	66
26-Jun	0	117	3	120	0	120
03-Jul	0	56	0	56	0	56
10-Jul	0	17	7	24	0	24
17-Jul	0	10	0	10	0	10
24-Jul	0	5	0	5	0	5
31-Jul	0	5	0	5	0	5
07-Aug	0	2	0	2	0	2
14-Aug	0	0	0	0	0	0
21-Aug	0	0	1	1	0	1
28-Aug	1	0	2	3	0	3
04-Sep	0	0	0	0	0	0
11-Sep	0	0	0	0	0	0
18-Sep	0	0	0	0	0	0
25-Sep	1[a]	0	0	1	0	1
02-Oct	0	0	0	0	0	0
09-Oct	0	0	0	0	0	0
16-Oct	0	0	0	0	0	0
Total	**11**	**273**	**66**	**343**	**7**	**350**

[a] The first chinook was tagged on 12 May and the last chinook was tagged on 23 September. Fishing was conducted from 9 May (fishwheel 2) to 11 October (drift fishing).

[b] Upper section is from Grease Harbour to the outflow of Tseax Slough; Middle section is from the outflow of Tseax Slough to the outflow of Zolzap Slough.

Table 6. Numbers of chinook salmon that were radio tagged and recovered during weekly periods, 9 May - 11 October 1993.

Week ending	Number tagged	Stationary tags	Number recaptured [a]		Suspected recaptures [a]		Total active tags
			From period	During period	From period	During period	
15-May	3	0	2	1	0	0	2
22-May	0	0	0	0	0	0	2
29-May	0	0	0	0	0	0	2
05-Jun	5	0	2	0	1	0	7
12-Jun	49	0	3	1	11	0	55
19-Jun	66	0	6	2	12	1	118
26-Jun	120	3	19	2	17	2	231
03-Jul	56	1	6	18	6	7	261
10-Jul	24	3	3	3	2	2	277
17-Jul	10	1	1	4	2	4	278
24-Jul	5	2	2	3	0	4	274
31-Jul	5	0	0	5	0	14	260
07-Aug	2	0	0	1	0	2	259
14-Aug	0	0	0	1	0	6	252
21-Aug	1	0	0	1	0	2	250
28-Aug	3	0	0	1	0	2	250
04-Sep	0	0	0	0	0	0	250
11-Sep	0	0	0	0	0	1	249
18-Sep	0	0	0	1	0	1	247
25-Sep	1	0	0	0	0	1	247
02-Oct	0	0	0	0	0	2	245
09-Oct	0	0	0	0	0	0	245
16-Oct	0	0	0	0	0	0	245
Total	**350**	**10**	**44**	**44**	**51**	**51**	**245** [b]

[a] Excludes tags recovered in spawning destinations.

[b] Nine fish that were radio tagged were never tracked.

Table 7. Numbers of chinook salmon spaghetti tagged on the Nass River, 9 May - 11 October 1993. Numbers are summarized for each fishwheel for weekly periods.

Week ending	Fishwheel			Total fish tagged
	FW1	FW2	FW3	
15-May	0	0	0	0
22-May	0	0	0	0
29-May	0	0	0	0
05-Jun	0	1[a]	0	1
12-Jun	3	7	0	10
19-Jun	18	9	0	27
26-Jun	73	15	21	109
03-Jul	80	88	19	187
10-Jul	49	28	2	79
17-Jul	23	6	0	29
24-Jul	16	3	0	19
31-Jul	3	1	0	4
07-Aug	11	0	0	11
14-Aug	7	2	0	9
21-Aug	0	1[a]	0	1
28-Aug	0	0	0	0
04-Sep	0	0	0	0
11-Sep	0	0	0	0
18-Sep	0	0	0	0
25-Sep	0	0	0	0
02-Oct	0	0	0	0
09-Oct	0	0	0	0
16-Oct	0	0	0	0
Total	**283**	**161**	**42**	**486**[b]

[a] The first chinook was tagged with a spaghetti tag on 4 June and the last on 15 August. Fishing was conducted 9 May (fishwheel 2) to 11 October (drift fishing).

[b] 206 of the chinook were less than 72 cm, but only 8 were jacks (<50 cm; 1-yr ocean fish).

Table 8. Numbers of chinook salmon that were spaghetti tagged and recovered during weekly periods, 9 May - 11 October 1993.

Week ending	Number tagged	Number recaptured [a]		Total active tags
		From period	During period	
15-May	0	0	0	0
22-May	0	0	0	0
29-May	0	0	0	0
05-Jun	1	0	0	1
12-Jun	10	0	0	11
19-Jun	27	2	0	38
26-Jun	109	15	1	146
03-Jul	187	23	26	307
10-Jul	79	6	1	385
17-Jul	29	2	11	403
24-Jul	19	0	4	418
31-Jul	4	0	3	419
07-Aug	11	0	0	430
14-Aug	9	2	2	437
21-Aug	1	0	2	436
28-Aug	0	0	0	436
04-Sep	0	0	0	436
11-Sep	0	0	0	436
18-Sep	0	0	0	436
25-Sep	0	0	0	436
02-Oct	0	0	0	436
09-Oct	0	0	0	436
16-Oct	0	0	0	436
Total	**486**	**50**	**50**	**436**

[a] Excludes tags recovered in spawning destinations, and a large number of tags that were probably caught and not reported by the middle-river native fishery.

Table 9. Summary of numbers of chinook salmon tracked using different tracking methods during radio-tagging studies on the Nass River, 1993. For each day, an individual fish that was detected is included only once for each tracking method.

Week	Mobile tracking			Mainstem stations						Tributary stations				
ending	Boat	Aerial	Foot	FS1	FS3	FS9	FS4	FS7	FSD	FST	FS2	FSF	FSM	Total
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05-Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	1
12-Jun	11	0	0	1	0	0	0	0	0	0	0	0	0	12
19-Jun	0	3	0	8	0	0	0	0	0	0	0	0	0	11
26-Jun	141	0	0	31	3	0	0	0	0	0	0	0	0	175
03-Jul	170	147	3	135	70	0	0	0	0	0	0	0	0	525
10-Jul	83	187	21	121	130	29	8	0	0	0	1	0	2	582
17-Jul	63	153	16	109	118	74	7	3	0	0	1	0	5	549
24-Jul	33	116	20	44	89	70	14	13	0	0	7	3	5	414
31-Jul	18	123	31	19	59	87	28	14	0	0	2	3	6	390
07-Aug	26	144	20	8	30	48	9	35	0	0	9	4	4	337
14-Aug	17	77	21	3	8	25	14	9	0	0	0	18	7	199
21-Aug	28	29	0	2	5	13	15	14	0	0	2	7	2	117
28-Aug	0	73	30	1	3	0	0	3	0	15	0	5	7	137
04-Sep	14	47	53	1	3	2	0	0	0	14	0	3	20	157
11-Sep	21	158	36	1	1	0	0	4	0	15	0	3	18	257
18-Sep	35	50	13	0	0	0	0	2	0	14	0	0	17	131
25-Sep	22	22	6	0	0	0	0	0	1	14	0	0	26	91
02-Oct	0	38	4	0	0	0	0	0	0	10	0	0	4	56
09-Oct	0	0	0	0	0	0	0	0	0	19	0	0	0	19
16-Oct	0	0	0	0	0	0	0	0	0	19	0	0	0	19
23-Oct	0	0	0	0	0	0	0	0	0	19	0	0	0	19
30-Oct	0	0	0	0	0	0	0	0	0	13	0	0	0	13
06-Nov	0	79	0	0	0	0	0	0	0	2	0	0	0	81
Total	**683**	**1446**	**274**	**484**	**519**	**348**	**95**	**97**	**1**	**154**	**22**	**46**	**123**	**4292**

Table 10. Destination or fate of chinook salmon that were radio tagged on the Nass River, 1993.

System Tributary of system	Number of fish tracked		Percent of fish tracked to their destination	
Damdochax Creek	38		16.1	
Cranberry River	52		22.0	
Kiteen River		6		2.5
Kwinageese River	28		11.9	
Meziadin River	22		9.3	
Bell-Irving River (All)	40		16.9	
Taft Creek		5		2.1
Snowbank-Teigen Creeks		18		7.6
Oweegee Creek		8		3.4
Upper Nass Mainstem	5		2.1	
Lower Nass Mainstem	3		1.3	
Lower Nass Tributaries	48		20.3	
Seaskinnish River		9		3.8
Tseax River and Slough		19		8.1
Anudol Creek		5		2.1
Total tracked to destination	**236**		**100**	
Strays - fish never tracked	9			
Non-tagging mortality	3			
Alive but no destination	0			
Native fisheries	90	(91) [c]		
Recaptures before destination		40		
Suspected recaptures not reported [a]		47		
Suspected tags lost at capture [b]		3		
Sport fishery	5	(17) [c]		
Recaptures before destination		4		
Regurgitation at fishing site [b]		1		
Tagging losses	7			
Died shortly after tagging		1		
Regurgitations at tagging site		6		
Tag died en route to destination		0		
Total number radio tagged	**350**			

[a] Tags disappeared at a fishery location.
[b] Tags became stationary at a fishery location.
[c] The number in parentheses includes tags that were (or suspected to be) recaptured in a spawning tributary and are included among those tracked to their final destination. One fish was recaptured twice and three fish caught by sport fishermen were released unharmed.

Table 11. Average residence times of chinook salmon at fixed-station receiver sites on the Nass River, 1993, and average speeds of travel between those sites. Estimates provided where sample sizes exceed 5 fish.

Destination	TS-FS1	FS1	FS1-FS3	FS3	FS3-FS9	FS9	FS9-FS4	FS4	FS4-FS7	FS7
Lower Nass River										
Time (d)	15.1	2.5	5.8	8.7						
Speed (km/d)	1.5		5.2							
Cranberry										
Time (d)	12.7	0.6	5.5	4.4						
Speed (km/d)	1.7		5.5							
Meziadin										
Time (d)	14.7	0.2	7.6	1.6						
Speed (km/d)	1.5		3.9							
Bell-Irving										
Time (d)	12.0	0.3	4.4	0.9	16.0	4.1				
Speed (km/d)	1.8		6.8		5.9					
Kwinageese										
Time (d)	14.9	0.3	5.0	0.8	16.7	0.6	0.8	0.8		
Speed (km/d)	1.5		6.0		5.7		18.8			
Damdochax										
Time (d)	13.6	0.2	5.5	1.3	16.3	0.7	1.0	0.1	7.1	3.2
Speed (km/d)	1.6		5.5		5.8		15.0		10.6	

TS - Indicates the tagging site near Gitwinksihlkw; see Fig. 1 for the location of other sites.

Table 12. Summary of counts of chinook salmon carcasses in Damdochax Creek, 1993.

Reach[a]	Date	Carcasses examined	Recovery of radio-tagged carcasses			Recovery of spaghetti-tagged carcasses			Adjuste radio-tag rate
			Males	Females	Total	Males	Females	Total	
5	25-Aug	59	0	0	0	0	0	0	
4	25-Aug	13	0	0	0	0	0	0	
Total	**25-Aug**	**72**	**0**	**0**	**0**	**0**	**0**	**0**	**NA**
1-3	1-Sep	89	2	0	2	0	1	1	
4-5	1-Sep	360	0	1	1	1	1	2	
Total	**1-Sep**	**449**	**2**	**1**	**3**	**1**	**2**	**3**	**1:113**
3	9-Sep	199	0	0	0	0	0	0	
4-5	9-Sep	925	2	6	8	1	5	6	
6	9-Sep	28	0	1	1	0	0	0	
Total	**9-Sep**	**1152**	**2**	**7**	**9**	**1**	**5**	**6**	**1:115**
5	20-Sep	348	2	0	2	2	0	2	
4	20-Sep	65	1	0	1	0	0	0	
Total	**20-Sep**	**413**	**3**	**0**	**3**	**2**	**0**	**2**	**1:104**
All surveys		**2086**	**7**	**8**	**15**	**4**	**7**	**11**	**1:130**

[a] Reach 1 & 2 - mouth to 3 km downstream of Slomaldo; Reach 3 - Slowmaldo to 3 km downstream; Reach 4 - Sansixmor Creek to Slowmaldo Creek; Reach 5 - Damdochax Lake to Sansixmor Creek; Reach 6 - Wiminasik Lake to Damdochax Lake.

Table 13. Summary of counts of chinook salmon carcasses in Kwinageese River, 1993.

Reach [a]	Date	Carcasses examined	Recovery of radio-tagged carcasses			Recovery of spaghetti-tagged carcasses			Adjusted radio-tag rate
			Males	Females	Total	Males	Females	Total	
2	10-Sep	7	0	0	0	0	0	0	
3	10-Sep	475	1	5	6	4	2	6	
4	10-Sep	165	0	2	2	0	0	0	
Total	**10-Sep**	**647**	**1**	**7**	**8**	**4**	**2**	**6**	**1:72**
3	17-Sep	125	0	2	2	0	0	0	
4	17-Sep	24	0	0	0	0	0	0	
Total	**17-Sep**	**149**	**0**	**2**	**2**	**0**	**0**	**0**	**NA**
	All surveys	**796**	**1**	**9**	**10**	**4**	**2**	**6**	**1:72**

[a] Reach 1 - mouth to Shanalope Creek junction; Reach 2 - Shanalope Creek to 1992 campsite; Reach 3 - 1992 campsite to Halfway Lake; Reach 4: Halfway Lake to Fred Wright Lake.

Table 14. Summary of counts of chinook salmon carcasses in Teigen, Oweegee, and Seaskinnish creeks and Tseax River, 1993.

Location [a]	Date	Carcasses examined	Recovery of radio-tagged carcasses			Recovery of spaghetti-tagged carcasses			Adjusted radio-tag rate
			Males	Females	Total	Males	Females	Total	
Teigen	28-Aug	62	0	0	0	0	0	0	
	4-Sep	28	0	0	0	1	0	1	
	Total	**90**	**0**	**0**	**0**	**1**	**0**	**1**	**NA**
Oweegee	4-Sep	16	0	0	0	0	0	0	
	10-Sep	4	0	0	0	0	0	0	
	Total	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**NA**
Seaskinnish	3-Sep	84	1	0	1	0	0	0	
	12-Sep	36	0	1	1	0	0	0	
	Total	**120**	**1**	**1**	**2**	**0**	**0**	**0**	**NA**
Tseax	7-Sep	1	0	0	0	0	0	0	
	12-Oct	82	1	0	1	0	0	0	
	26-Oct	15	0	0	0	0	0	0	
	Total	**98**	**1**	**0**	**1**	**0**	**0**	**0**	**NA**

[a] See Table D-2 for survey locations.

Table 15. Summary of counts of chinook salmon carcasses in Meziadin River, 1993.

Reach[a]	Date	Carcasses examined	Recovery of radio-tagged carcasses			Recovery of spaghetti-tagged carcasses			Adjusted radio-tag rate
			Males	Females	Total	Males	Females	Total	
1	5-Sep	1	0	0	0	0	0	0	NA
4	8-Sep	1	0	0	0	0	0	0	NA
3	14-Sep	13	0	0	0	0	0	0	
2	14-Sep	10	0	0	0	0	0	0	
1	14-Sep	2	0	0	0	0	0	0	
Total	**14-Sep**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**NA**
3	21-Sep	189	0	3	3	2	0	2	
2	21-Sep	56	0	0	0	0	0	0	
Total	**21-Sep**	**245**	**0**	**3**	**3**	**2**	**0**	**2**	**NA**
3	26-Sep	59	1	0	1	1	0	1	
2	26-Sep	21	0	0	0	0	0	0	
Total	**26-Sep**	**80**	**1**	**0**	**1**	**1**	**0**	**1**	**NA**
	All surveys	**352**	**1**	**3**	**4**	**3**	**0**	**3**	**1:71**

[a] Reach 1 - below fishway; Reach 2 - above fishway to lower rapids; Reach 3 - lower rapids to the upper rapids Reach 4 - above upper rapids to the lake.

Table 16. Summary of radio-tagged chinook detected moving into Meziadin River, 1993.

	Radio tag		Nose-fork	Detection dates			
Spaghetti tag	Channel	Code	length (cm)	FSF	Fish ladder	FSM[a]	Comments
21070	1	35	106.0	-	N.A.	9-Jul	fish may have jumped falls
21033	5	35	97.0	-	N.A.	11-Jul	spaghetti recovered, upper Meziadin.
21100	9	34	87.0	23-Jul	23-Jul	23-Jul	
21259	3	35	104.0	-	-	27-Jul	fish may have jumped falls
21082	9	12	89.0	-	-	29-Jul	fish may have jumped falls
21266	7	10	75.0	26-Jul	-	6-Aug	
21280	7	9	90.0	7-Aug	-	8-Aug	
21285	9	13	88.0	-	-	9-Aug	fish may have jumped falls
21292	11	28	96.0	-	-	9-Aug	fish may have jumped falls
21071	7	46	87.0	-	-	15-Aug	fish may have jumped falls
21073	9	14	97.0	10-Aug	17-Aug	19-Aug	spaghetti recovered, upper Meziadin.
21216	7	15	76.0	14, 15, 22-Aug	-	22-Aug	radio recovered, no spaghetti, upper Meziadin.
21197	11	35	73.0	29-Aug	29-Aug	29-Aug	radio tag removed at fish ladder
21126	9	18	92.0	28-Jul	-	30-Aug	spaghetti recovered, upper Meziadin.
21043	9	19	95.0	1-Sep	1-Sep	1-Sep	
21011	5	9	98.0	25-Jul; 12,13-Aug; 4-Sep	4-Sep	4-Sep	
21274	11	36	93.0	20-Aug; 5-7-Sep	8-Sep	8-Sep	
Total fish:		**17**		**10**	**6**	**17**	

N.A.The fishway was not staffed before 16 July 1993.
- Not detected.
[a] The first date of detection of the radio tag.

Table 17. Summary of counts of chinook salmon carcasses in Cranberry River, 1993.

Reach[a]	Date	Carcasses examined	Recovery of radio-tagged carcasses			Recovery of spaghetti-tagged carcasses			Adjusted radio-tag rate
			Males	Females	Total	Males	Females	Total	
3	31-Aug	49	0	0	0	1	0	1	
3	31-Aug	8	0	0	0	0	0	0	
Total	**31-Aug**	**57**	**0**	**0**	**0**	**1**	**0**	**1**	**NA**
2	5-Sep	2	0	0	0	0	0	0	NA
2-3	7-Sep	19	0	0	0	0	0	0	
2	7-Sep	37	0	0	0	0	0	0	
1-2	7-Sep	13	0	0	0	0	1	1	
Total	**7-Sep**	**69**	**0**	**0**	**0**	**0**	**1**	**1**	**NA**
1	10-Sep	25	0	0	0	0	0	0	NA
	All surveys	**153**	**0**	**0**	**0**	**1**	**1**	**2**	**NA**

[a] Reach 1 - Nass River to 1st hwy bridge; Reach 2 - 1st hwy crossing to 2nd hwy crossing; Reach 3 - 2nd hwy crossing to logging bridge; See Fig. 6.

Table 18. Summary of tags lost by chinook salmon examined during carcass recovery surveys, 1993. Fish were tagged on the lower Nass River either with radio and white spaghetti tags, or with blue spaghetti tags, and were recovered on spawning areas.

	Fish with radio and white spaghetti tags							Fish with blue spaghetti tags		
	Tags missing							Tags missing		
Survey locations [a]	White spaghetti	Radio tag	Either tag	Males	Females	Total examined	Spaghetti loss (%)	Spaghetti [c] missing	Tag loss (%)	Total examined
Damdochax Creek	11	0	11	6	5	16 [b]	68.8	1	8.3	12
Kwinageese River	2	0	2	0	2	10	20.0	0	0.0	6
Teigen Creek	0	0	0	0	0	0	NA	1	NA	1
Meziadin River	1	0	1	1	0	4	25.0	1	NA	3
Cranberry River	0	0	0	0	0	0	NA	2	NA	2
Seaskinnish Creek	1	1	2	1	1	2	NA	0	0.0	0
Tseax River	1	0	1	1	0	1	NA	0	0.0	0
All locations	**16**	**1**	**17**	**9**	**8**	**33** [b]	**48.5**	**5**	**20.8**	**24**

[a] See Fig. 1 for system locations.

[b] Includes one carcass examined incidental to carcass recovery surveys.

[c] Assumed missing spaghetti tags were blue but fish could have been missing both radio and white spaghetti tags.

Table 19. Chinook salmon escapement estimates for the Nass River and its tributaries in 1993 (bold numbers are our best estimates).

System Tributary	Radio tags (M)	Percent of total tags	Fish exam. (C)	Tags recovered Radio (R)	Tags recovered Both spag.	Adjusted tag rate (C+1)/(R+1) Radios	Adjusted tag rate (C+1)/(R+1) Both	Petersen estimate (N)	Prorated range of escapement estimates: Damdochax carcasses 130.4	Kwinageese carcasses 72.5	Meziadin carcasses 70.6	All systems 112.6	Best estimate of escapement
Upper Nass Mainstem	5	2	0	0	0				655	364	354	565	**604** [a]
Damdochax total	38	16	2086	15	26	130.4	77.3	**5086**	4976	2767	2694	4297	**5086**
Kwinageese total	28	12	796	10	16	72.5	46.9	**2103**	3667	2039	1985	3166	**2103**
Bell-Irving total	40	17	110	0	1				5238	2912	2836	4523	**4831** [a]
Mainstem	9								1179	655	638	1018	
Oweegee	8								1048	582	567	905	
Taft	5								655	364	354	565	
Snowbank/Teigen	18								2357	1311	1276	2035	
Meziadin total [b]	22	9	352	4	7	70.6	44.1	**1624**	2881	1602	1560	2488	**1624**
Above fishway	17								2226	1238	1205	1922	
Below fishway	5								655	364	354	565	
Cranberry total [b]	52	22	153	0	2				6810	3786	3687	5880	**6280** [a]
Cranberry R [b]	46								6024	3349	3261	5202	
Kiteen R [b]	6								786	437	425	678	
Seaskinnish	9	4	120	2	2				1179	655	638	1018	**1087** [a]
Tseax [b]	19	8	98	1	1				2488	1383	1347	2148	**2294** [a]
Lower Nass Mainstem	3	1	0	0	0				393	218	213	339	**362** [a]
Other Lower Nass Tribs	20	8	0	0	0				2619	1456	1418	2262	**2415** [a]
White River	1								131	73	71	113	
Tchitin	2								262	146	142	226	
Anudol	5								655	364	354	565	
Ishkeenickh	2								262	146	142	226	
Other	10								1310	728	709	1131	
Total for all systems	**236**	**100**	**3715**	**32**	**55**	**112.6**	**66.4**	**26686**	**30905**	**17183**	**16732**	**26686**	**26686**

[a] Estimates for tributaries with <4 recaptures were derived by prorating (using the proportion of radio-tagged fish) the escapement not accounted for by tributaries with >3 recaptures.

[b] These estimates represent the escapement before harvests on Meziadin, Cranberry, Kiteen and Tseax rivers (see Table 20).

Table 20. Estimates of harvests of chinook from selected tributaries of the Nass River in 1993. The estimate of the number of chinook entering a system is based on the number of radio-tagged fish that entered that system. Harvests are based on radio-tag returns and the number of radio-tagged fish that disappeared before the spawning period.

Tributary	Number of chinook entering system	Sport harvests	Unknown harvests	Escapement
Meziadin	1624	148[a]	148[b]	1476
Cranberry	5880	905	452[c]	4523
Tseax	2148	113	0	2035
Tchitin	226	226[a]	0	226
Total	**9878**	**1392**	**600**	**8260**

[a] Sport fisheries at these locations capture chinook before they enter the system, and may include fish from other stocks.

[b] Estimate based on the suspected removal of two radio tagged fish and the Meziadin mark rate.

[c] Estimate based on the suspected removal of four radio tagged fish and overall Nass mark rate. It is likely that some or all of these fish were harvested in the Cranberry River food fishery.

Table 21. Best estimates of chinook salmon escapement and in-river harvests for various Nass River tributaries in 1993.

Tributary/section of the Nass River	Gross Escapement	Tributary Harvests	Net [a] Escapement	In-River Harvests: First Nations [c] Lower	First Nations [c] Middle	Sport	Other	Total	Total Return	In-River Harvest Rate
Upper Nass mainstem	604		604	135	156			291	895	33%
Damdochax	5086		5086	1137	1311			2448	7534	32%
Kwinageese	2103		2103	470	542			1012	3115	32%
Bell	4831		4831	1080	1245			2325	7156	32%
Meziadin	1624	148	1476	363	419	148 [d]	148	1078	2554	42%
Cranberry	6280	1357	4923	1404	1619	905	452	4380	9303	47%
Seaskinnish	1087		1087	243				243	1330	18%
Tseax	2294	367 [b]	1927	513		367 [b]		880	2807	31%
Other lower Nass tributaries	2415		2415	540		226 [d]		766	3181	24%
Lower Nass mainstem	362		362	81				81	443	18%
Total	**26686**	**1872**	**24814**	**5964**	**5292**	**1646**	**600**	**13504**	**38318**	**35%**

[a] Escapement after removals by all fisheries.

[b] Catch estimate derived from creel survey data (Bocking and English 1994a).

[c] Based on the asumption that a stock's contribution to a mainstem harvest is proportional to its contribution to the gross escapement (from Table 19) for stocks in that fishery.

[d] Some of the chinook harvested at these locations may have been destined for upstream locations.

FIGURES

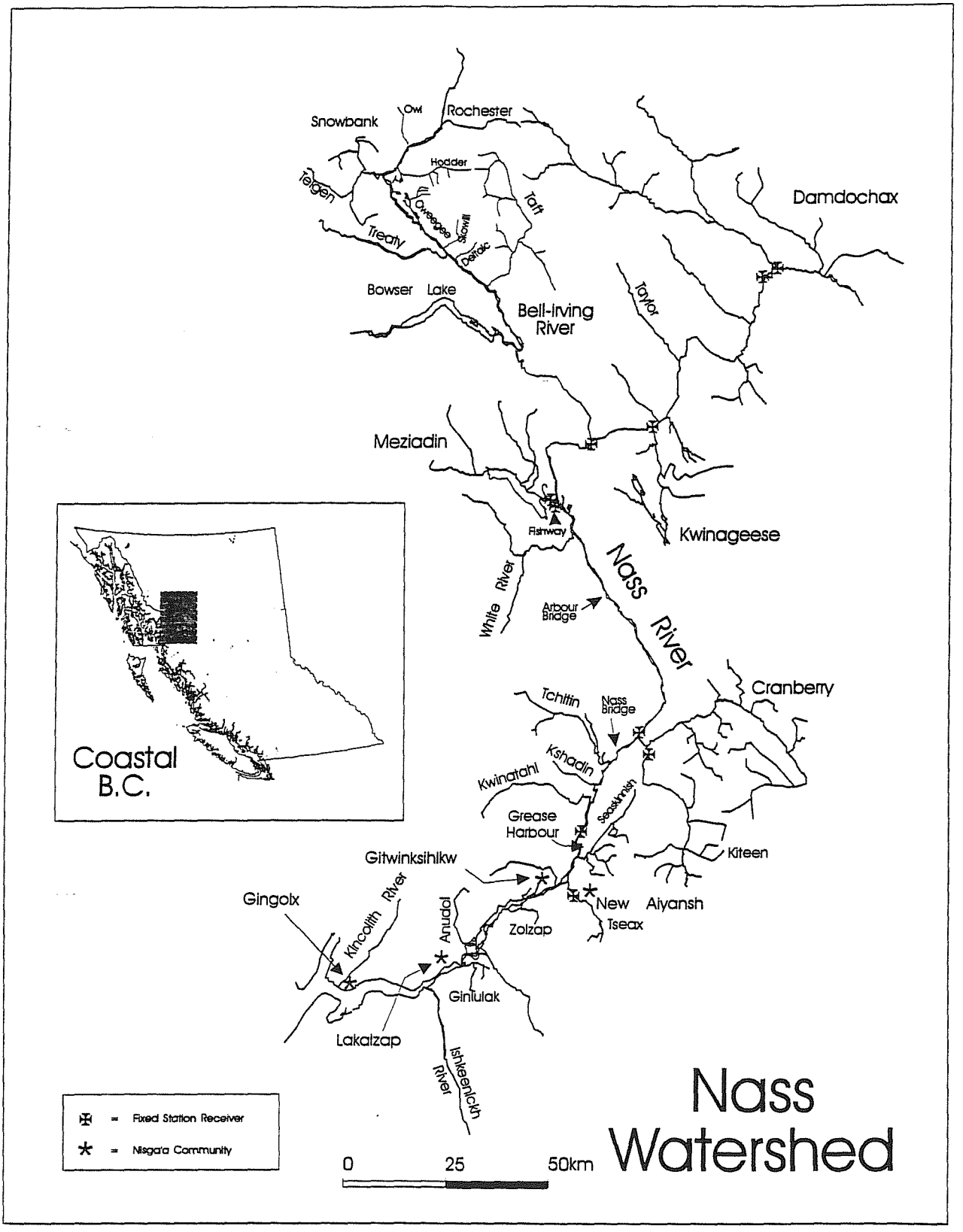

Figure 1. Map of study area with locations of fixed-station receivers and the 28 chinook salmon spawning streams surveyed in 1993.

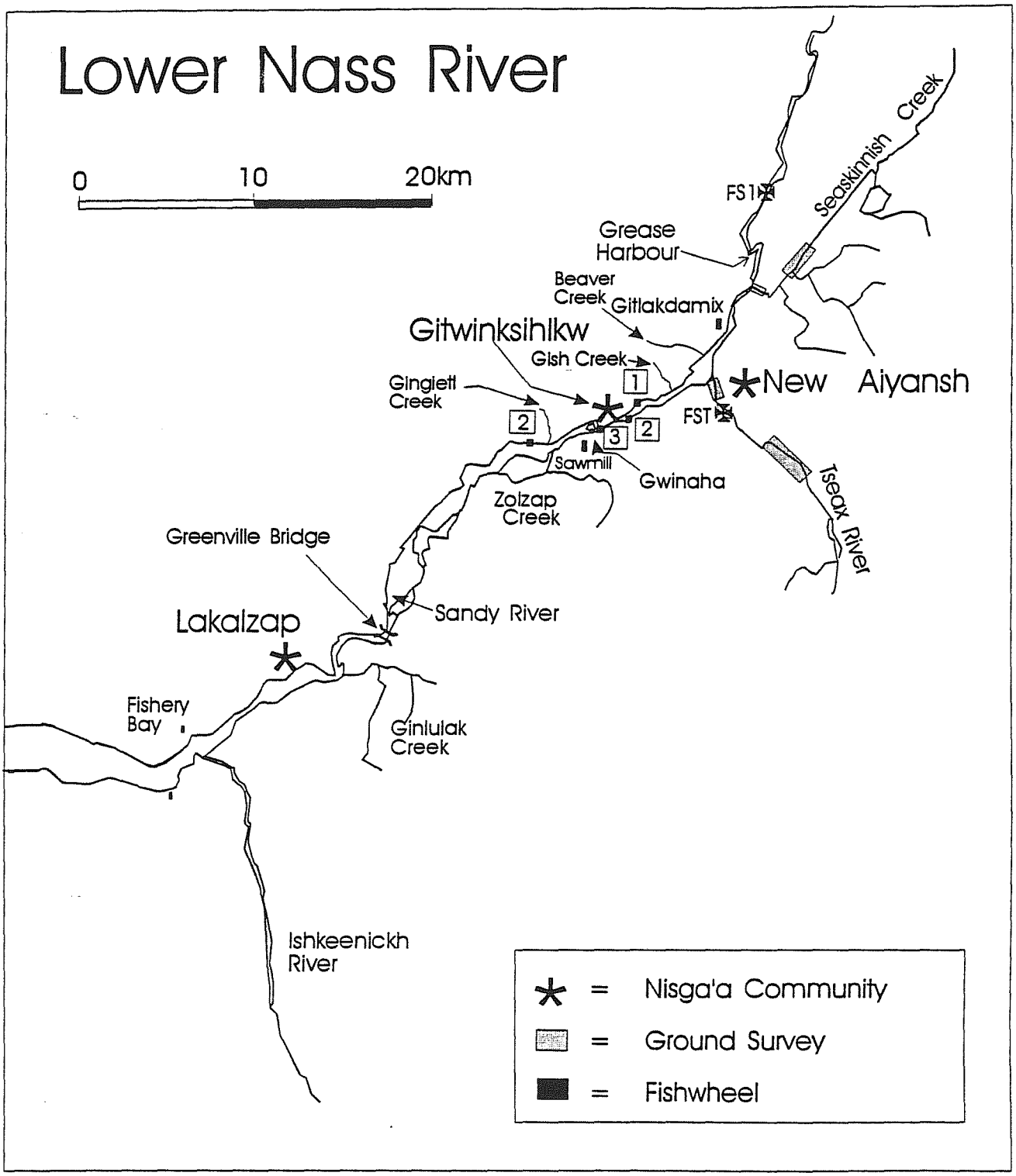

Figure 2. Map of lower Nass River with locations of fishwheels, tangle-net fishing sites, fixed-station receivers and ground surveys to examine chinook carcasses.

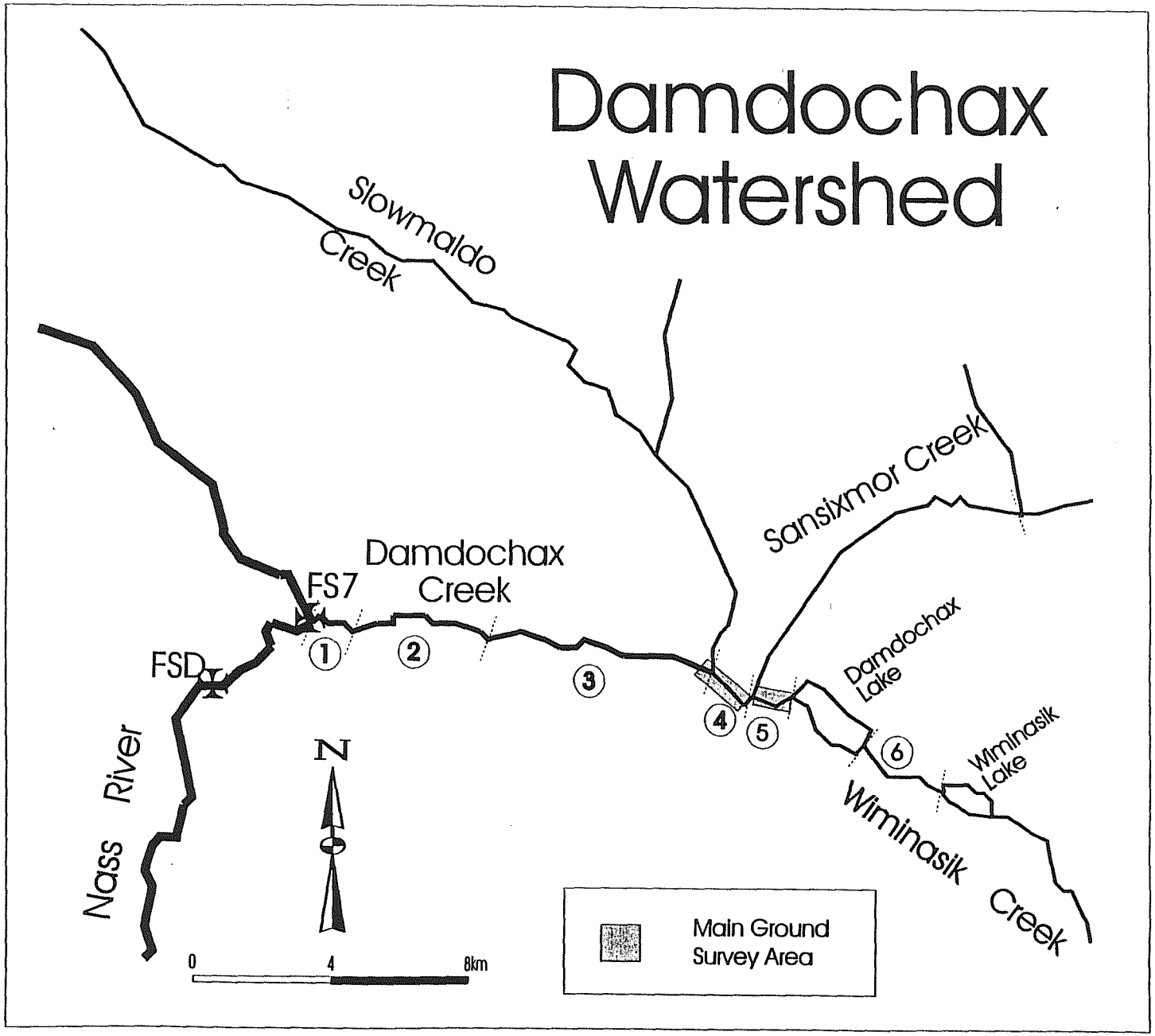

Figure 3. Reach boundaries and landmarks on Damdochax Creek.

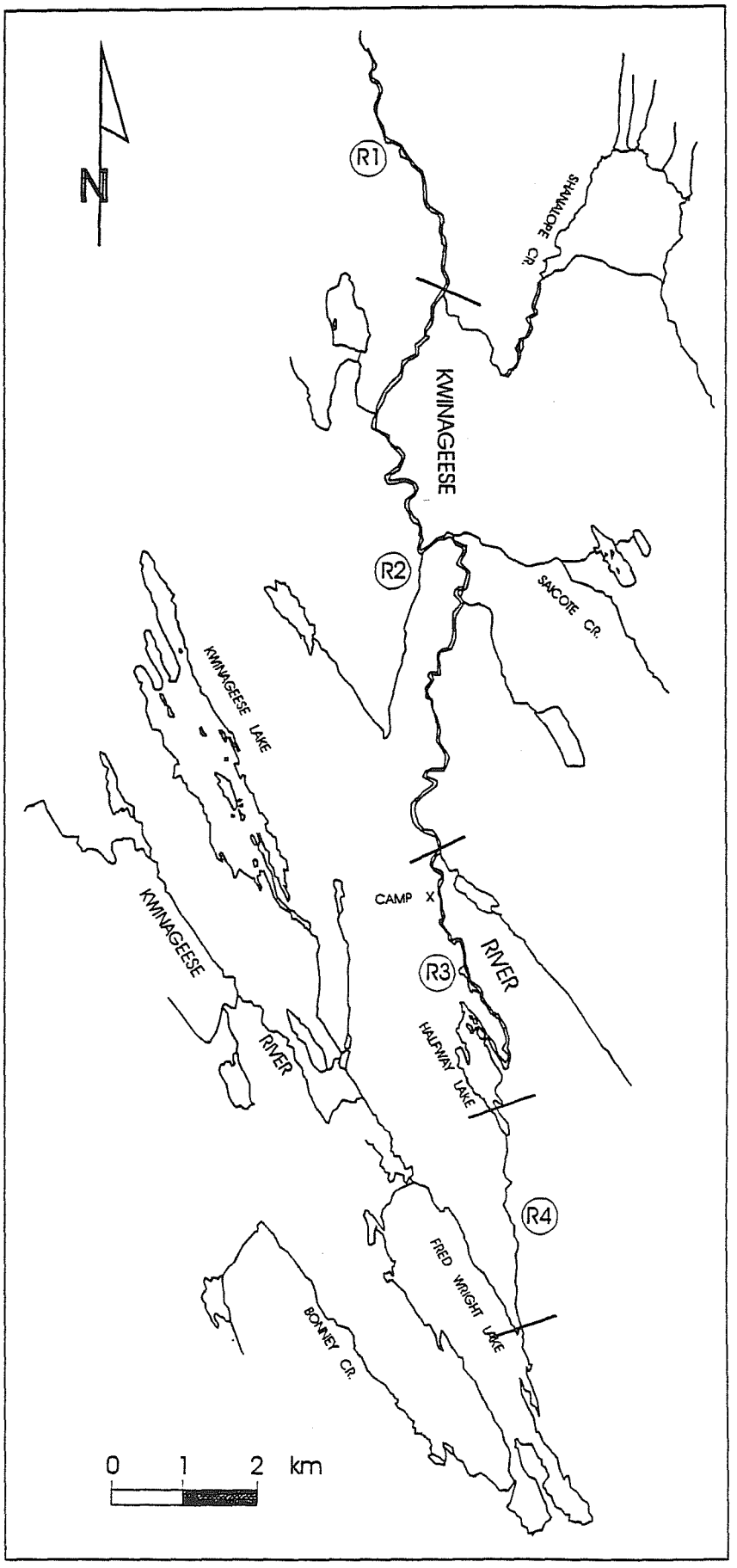

Figure 4. Reach boundaries and landmarks on Kwinageese River.

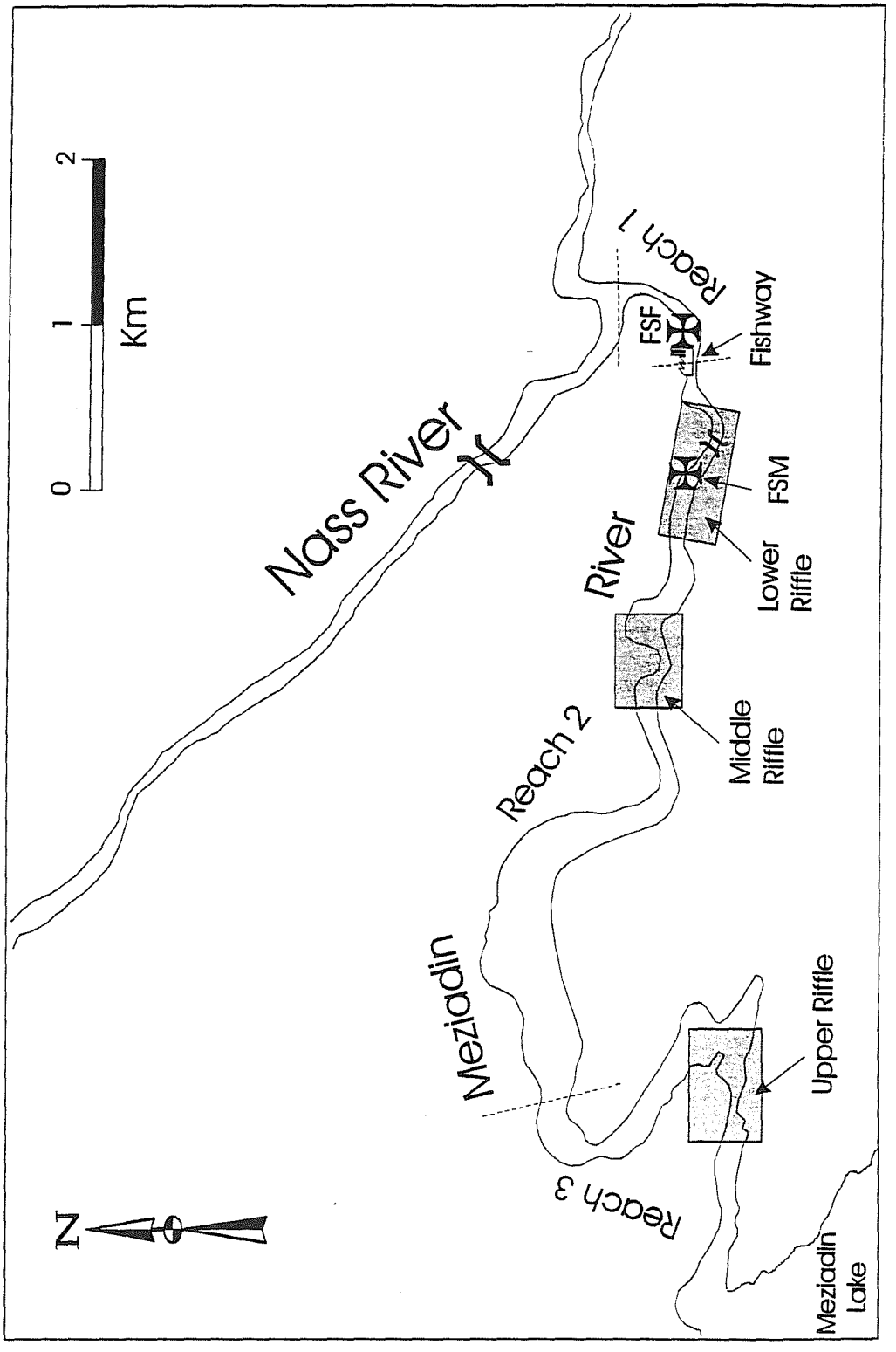

Figure 5. Reach boundaries and landmarks on Meziadin River.

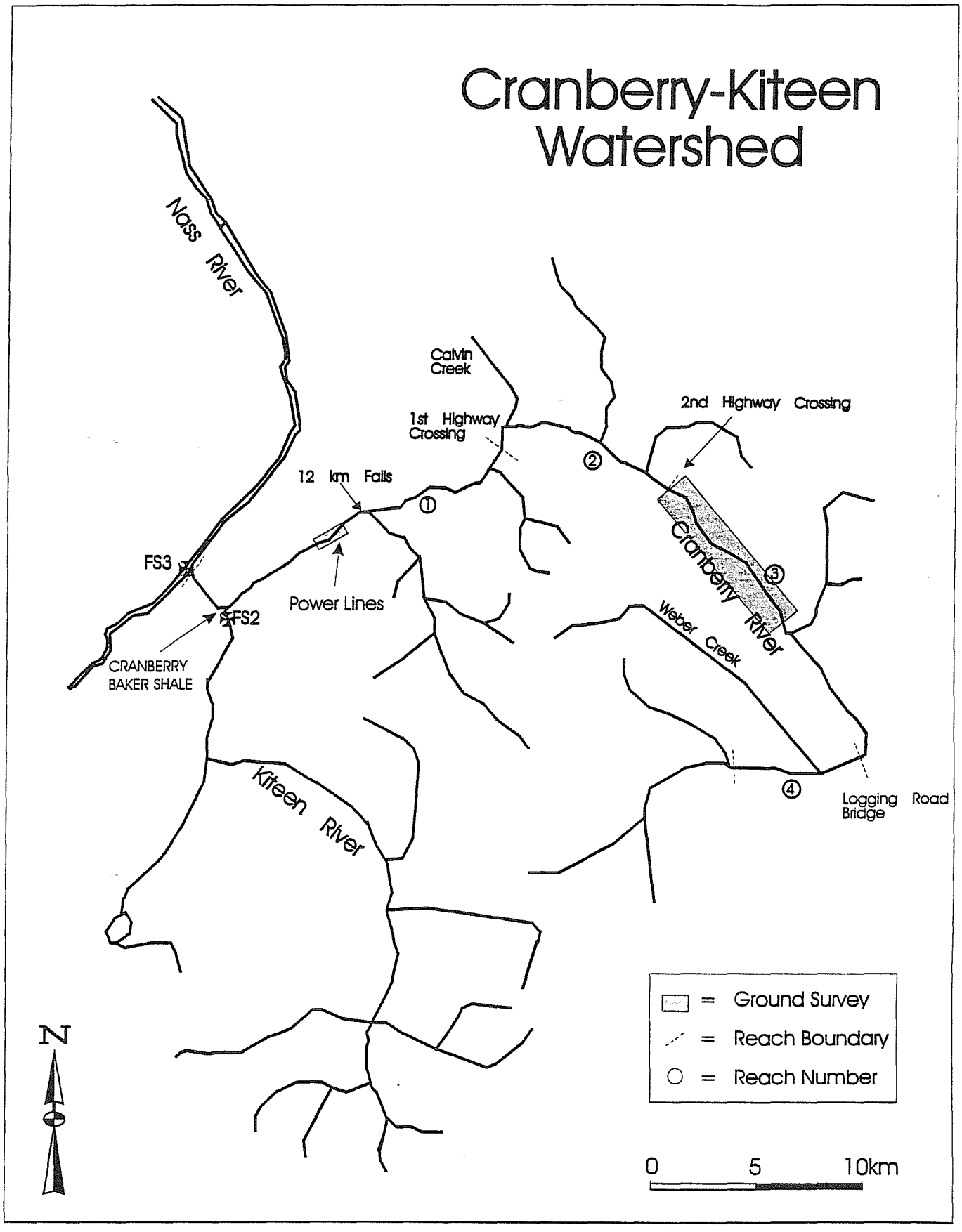

Figure 6. Reach boundaries and landmarks on Cranberry River.

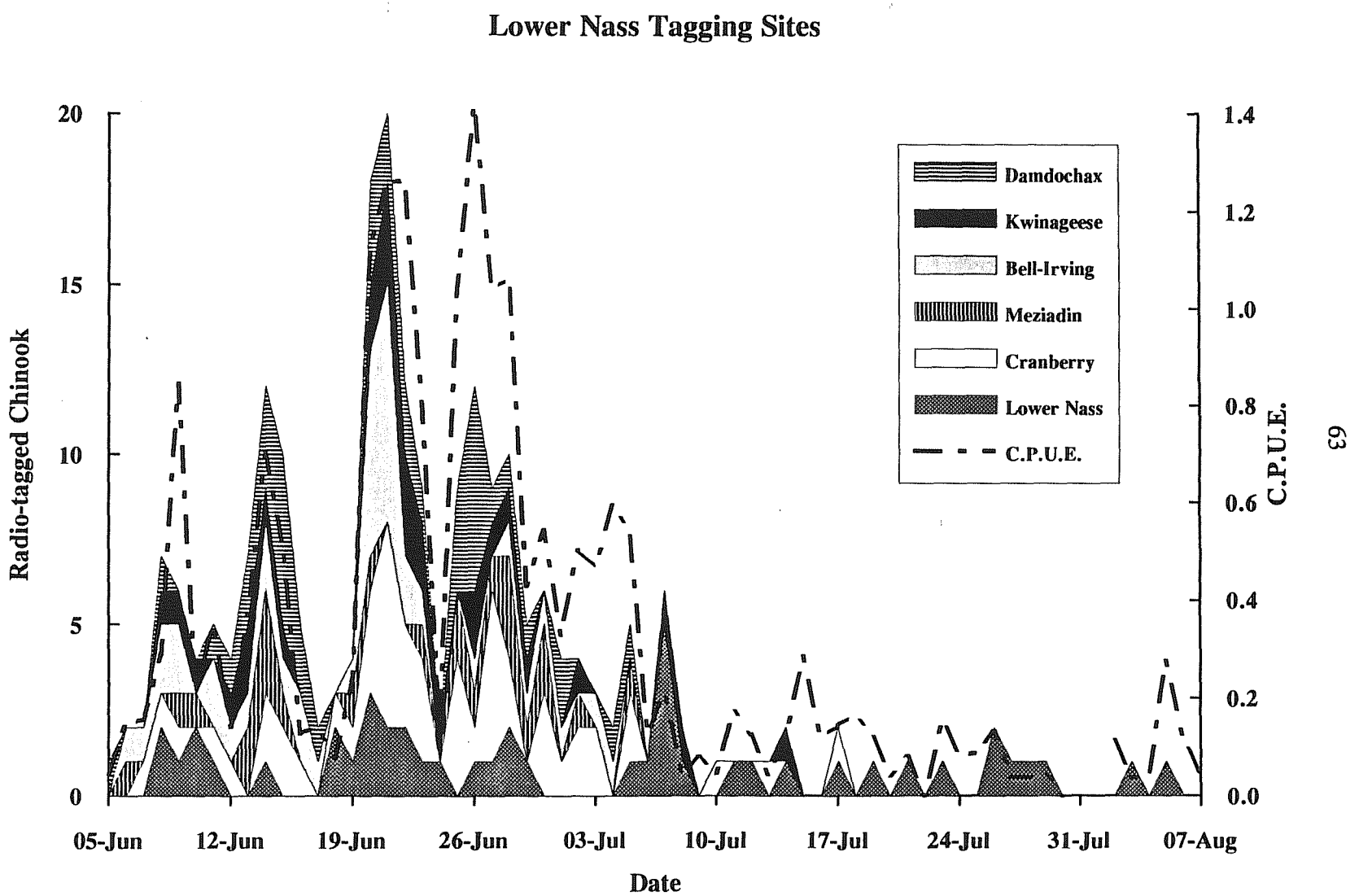

Figure 7. Spawning destinations of chinook salmon that were radio-tagged on the lower Nass River during 1993 according to their date of capture. Catch-per-unit-effort (C.U.P.E) by fishwheel 1 at Gitwinksihlkw is also shown.

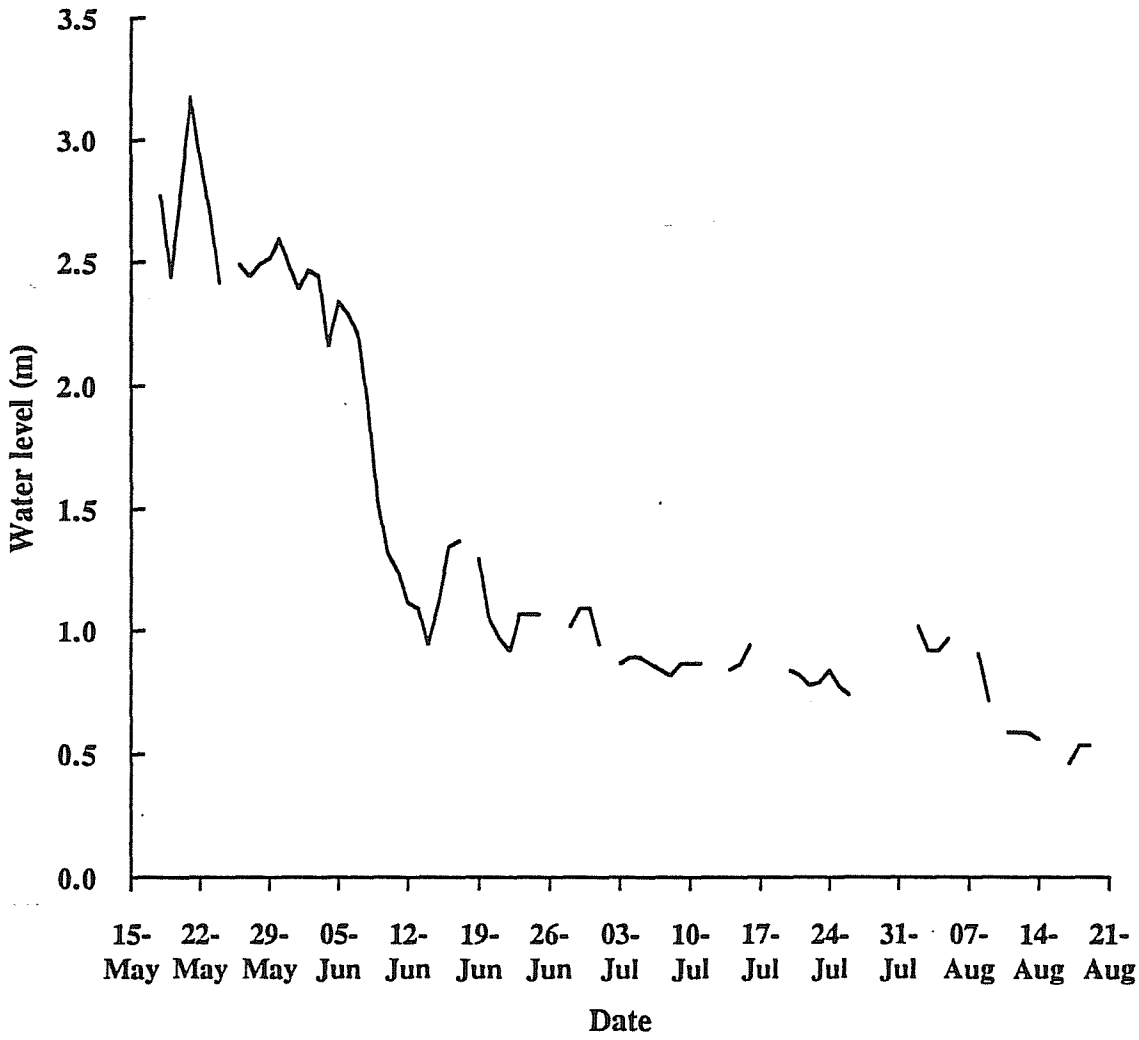

Figure 8. The level of the Nass River measured at the "A-frame" at the mouth of Tseax Slough, 1993.

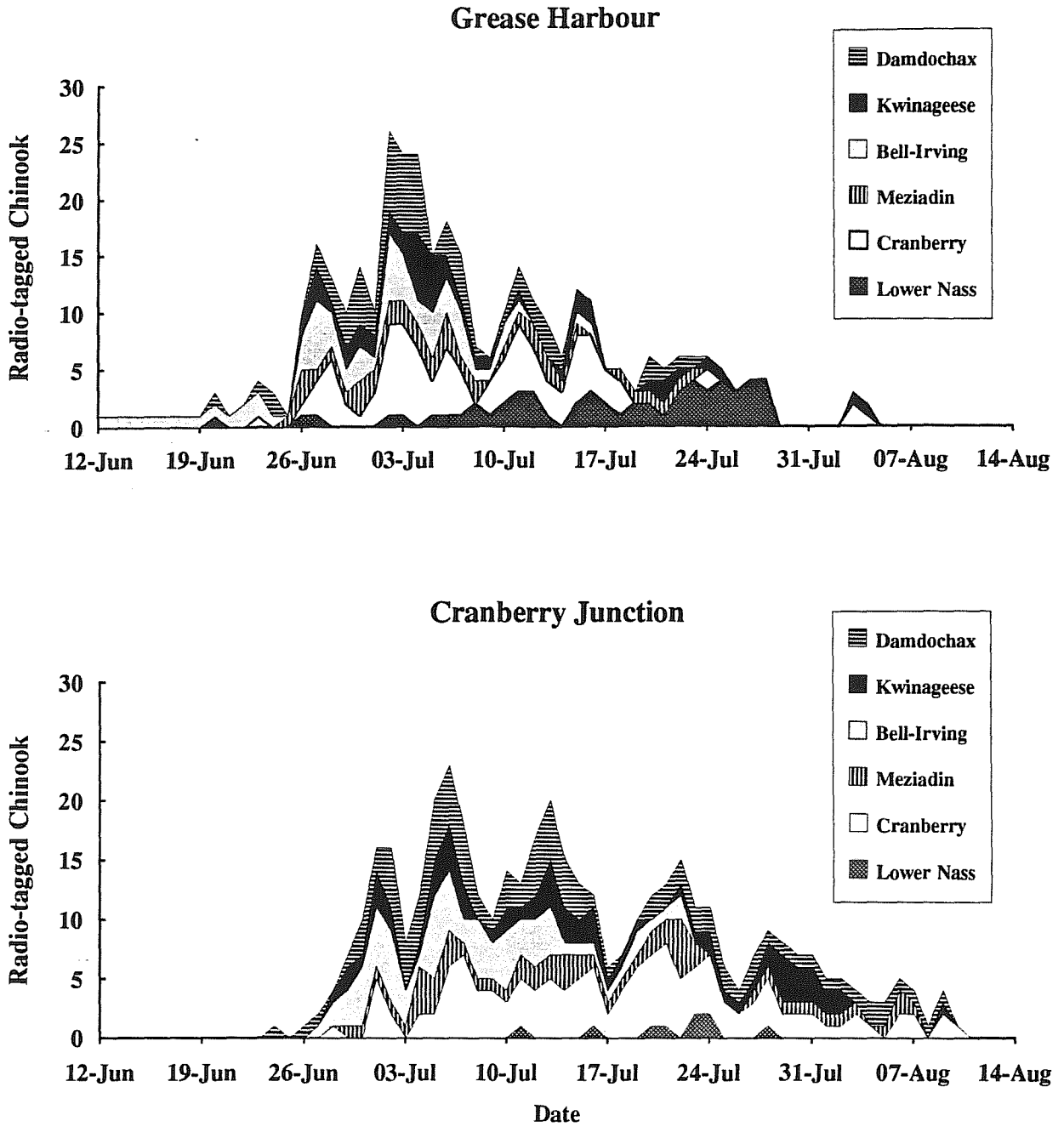

Figure 9. Timing of movement of radio-tagged fish of different stocks by fixed-station receivers at Grease Harbour (FS1) and Cranberry Junction (FS3).

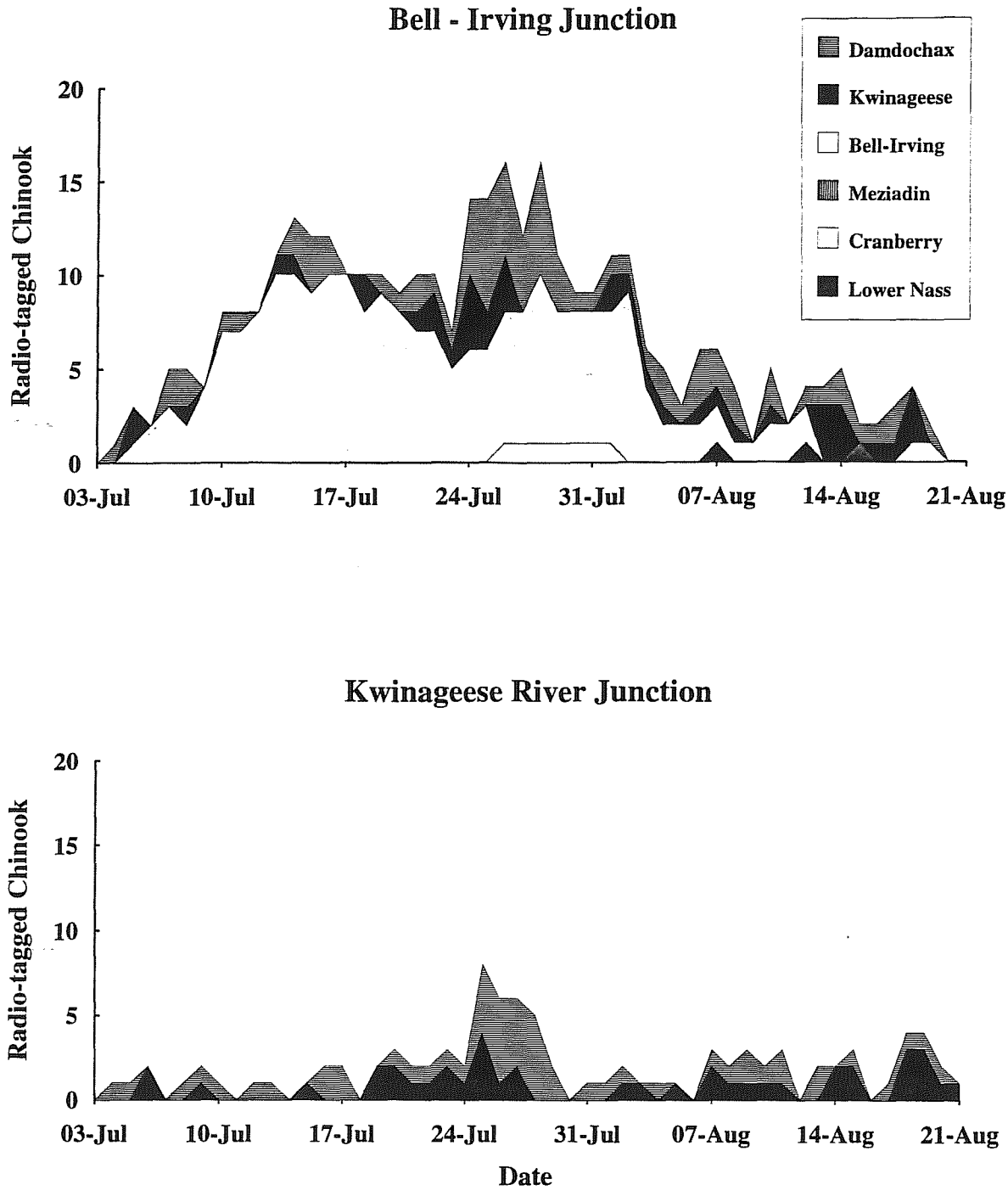

Figure 10. Timing of movement of radio-tagged fish of different stocks by fixed-site receivers at the Bell-Irving Junction (FS9) and the Kwinageese Junction (FS4).

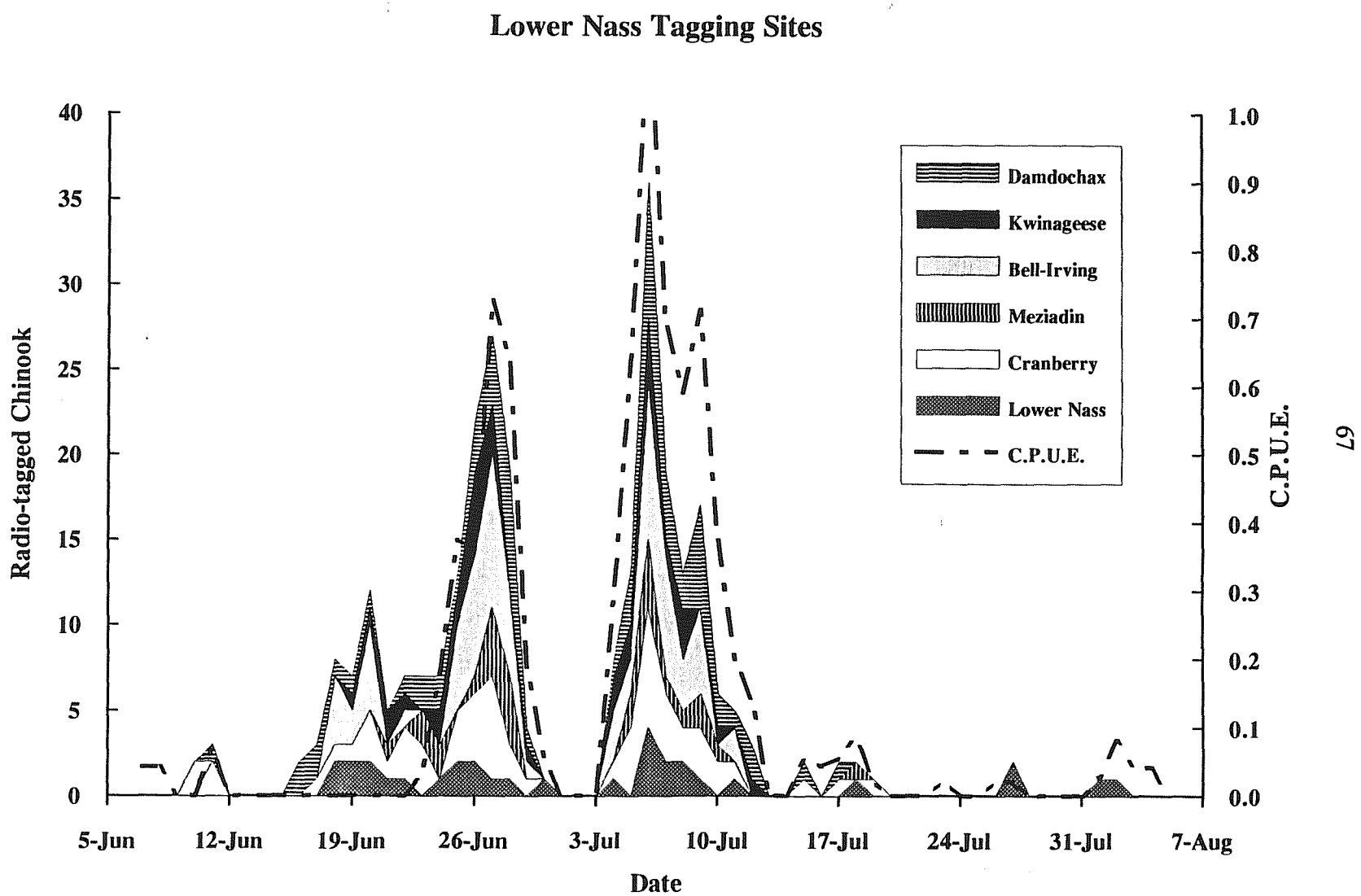

Figure 11. Spawning destinations of chinook salmon that were radio-tagged on the lower Nass River during 1992 according to their date of capture. Combined catch-per-unit-effort (C.U.P.E) by fishwheels 1 and 2 at Gitwinksihlkw is also shown.

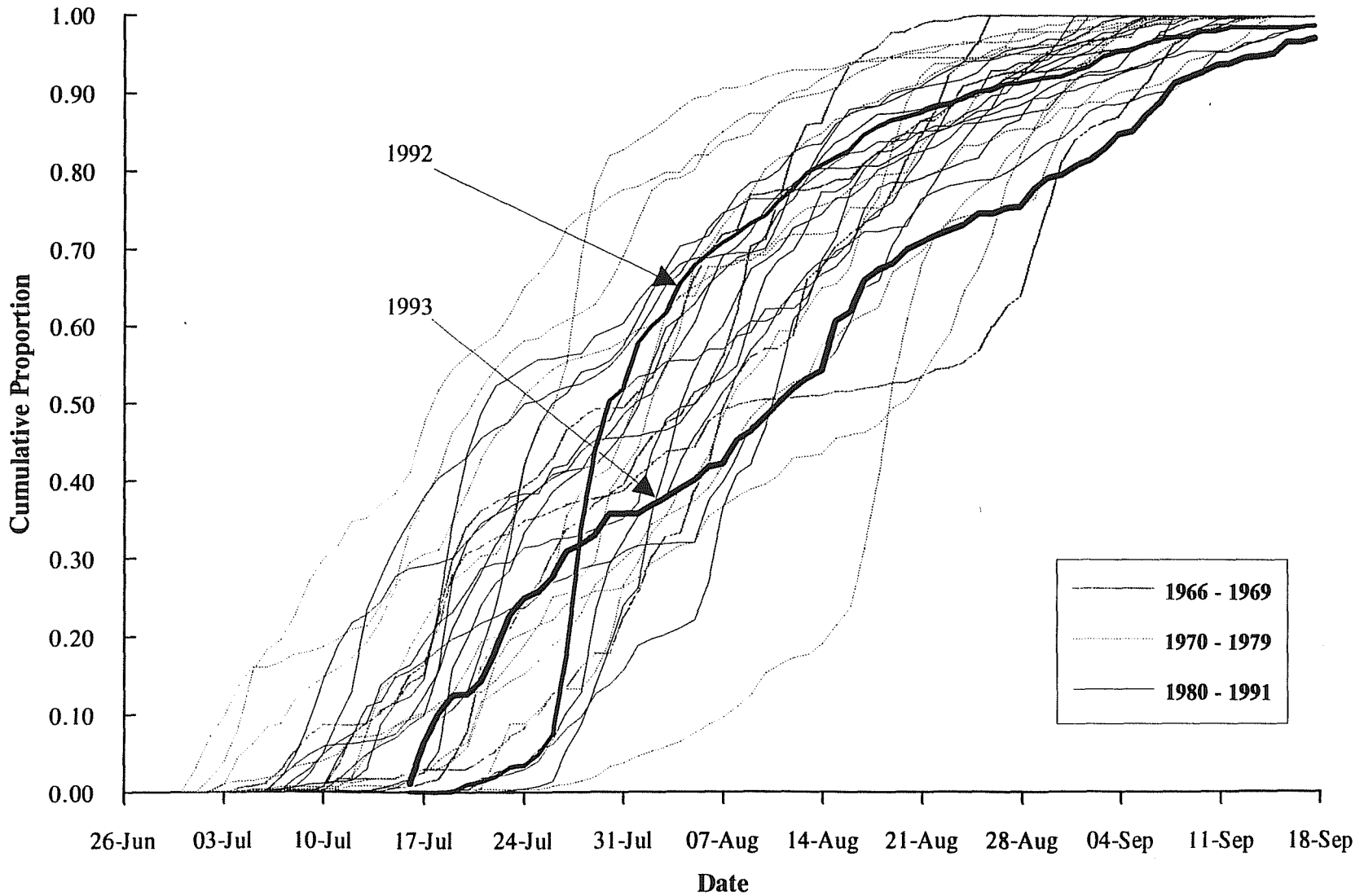

Figure 12. Run timing of chinook salmon through the Meziadin fishway, expressed as a cumulative proportion of the total fishway count, 1966-93.

APPENDICES

Table A-1. Fishing effort and numbers of chinook salmon caught in tangle nets and radio tagged on the Nass River, 12 May - 11 October 1993. Effort is the number of hours attempting to catch fish.

		Set net		Drift net				
		Time		Time	Number of			
Date	Location	fished (h:min)	Number tagged	fished (h:min)	Sets	Adults	Fish <72 cm	Tagged fish
12-May	Gwinaha			1:40	5	1	0	1
12-May	Beaver Creek			1:00	4	2	0	2
14-May	Beaver Creek			0:44	2	0	0	0
28-May	Gitlakdamix			0:20	1	0	0	0
28-May	Sawmill			0:30	2	0	0	0
28-May	Gwinaha			0:19	1	0	0	0
28-May	Beaver Creek			0:25	2	0	0	0
28-May	Zaul Zap Slough			0:16	1	0	0	0
28-May	Sandy River	1:30	0					
8-Jun	Gitlakdamix			1:48	2	1	0	1
8-Jun	Beaver Creek			1:12	4	5	0	5
26-Aug	Gwinaha			3:00	4	1	0	1
30-Aug	Gwinaha			1:52	3	0	0	0
6-Sep	Gwinaha			0:30	1	0	0	0
7-Sep	Gwinaha			0:20	1	0	0	0
23-Sep	Gwinaha			0:55	3	1	0	1
30-Sep	Gwinaha			0:49	2	0	0	0
5-Oct	Gwinaha			0:28	1	0	0	0
5-Oct	Gish Creek			0:22	1	0	0	0
7-Oct	Gwinaha			0:25	1	0	0	0
7-Oct	Beaver Creek			0:21	1	0	0	0
7-Oct	FS1 area			0:16	1	0	0	0
7-Oct	Grease Harbour	0:54	0					
7-Oct	Seaskinnish Creek			0:12	1	0	0	0
8-Oct	Fishery Bay	1:31	0					
8-Oct	Ginlulak Dump	2:38	0					
11-Oct	Beaver Creek			2:06	3	0	0	0
11-Oct	Gwinaha			0:48	2	0	0	0
	Total	**6:33**	**0**	**20:38**	**49**	**11**	**0**	**11**

Table A-2. Fishing effort and numbers of chinook salmon caught and tagged at three fishwheels operated near Gitwinksihlkw on the lower Nass River, 1993. Effort is the number of hours that the fishwheel was fishing.

	Number of Chinook			Tagged			Effort (h)			
Date	Adults	Jacks [a]	Total	Radio	Spaghetti	Total	Wheel 1	Wheel 2	Wheel 3	Total
9-May	0	0	0	0	0	0	0.0	12.0	0.0	12.0
10-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
11-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
12-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
13-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
14-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
15-May	0	0	0	0	0	0	0.0	24.0	0.0	24.0
16-May	0	0	0	0	0	0	0.0	12.0	0.0	12.0
17-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
18-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
19-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
20-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
21-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
22-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
23-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
24-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
25-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
26-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
27-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
28-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
29-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
30-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
31-May	0	0	0	0	0	0	0.0	0.0	0.0	0.0
1-Jun	0	0	0	0	0	0	0.0	12.0	0.0	12.0
2-Jun	1	0	1	1	0	1	0.0	24.0	0.0	24.0
3-Jun	1	0	1	1	0	1	0.0	24.0	0.0	24.0
4-Jun	3	0	3	2	1	3	0.0	24.0	0.0	24.0
5-Jun	1	0	1	1	0	1	0.0	24.0	0.0	24.0
6-Jun	3	0	3	3	0	3	0.0	24.0	0.0	24.0

Table A-2. Fishing effort and numbers of chinook salmon caught and tagged at three fishwheels operated near Gitwinksihlkw on the lower Nass River, 1993. Effort is the number of hours that the fishwheel was fishing.

	Number of Chinook			Tagged			Effort (h)			
Date	Adults	Jacks [a]	Total	Radio	Spaghetti	Total	Wheel 1	Wheel 2	Wheel 3	Total
7-Jun	4	2	6	4	2	6	0.0	24.0	0.0	24.0
8-Jun	5	0	5	5	0	5	0.0	24.0	0.0	24.0
9-Jun	10	3	13	10	3	13	12.0	24.0	0.0	36.0
10-Jun	5	1	6	5	1	6	24.0	24.0	0.0	48.0
11-Jun	9	3	12	9	3	12	16.0	9.7	0.0	25.7
12-Jun	7	1	8	7	1	8	24.0	24.0	0.0	48.0
13-Jun	14	5	19	13	6	19	24.0	24.0	0.0	48.0
14-Jun	19	5	24	19	5	24	24.0	24.0	0.0	48.0
15-Jun	15	5	20	14	6	20	24.0	24.0	0.0	48.0
16-Jun	8	5	13	8	5	13	24.0	24.0	0.0	48.0
17-Jun	4	1	5	4	1	5	24.0	10.3	0.0	34.3
18-Jun	3	4	7	3	4	7	24.0	0.0	0.0	24.0
19-Jun	5	0	5	5	0	5	24.0	0.0	0.0	24.0
20-Jun	30	4	34	30	4	34	24.0	11.0	0.0	35.0
21-Jun	30	2	32	25	7	32	24.0	24.0	0.0	48.0
22-Jun	31	12	43	19	24	43	24.0	24.0	0.0	48.0
23-Jun	21	2	23	12	11	23	24.0	24.0	0.0	48.0
24-Jun	3	2	5	3	2	5	24.0	24.0	6.0	54.0
25-Jun	41	12	53	15	38	53	24.0	24.0	24.0	72.0
26-Jun	34	5	39	16	23	39	24.0	24.0	24.0	72.0
27-Jun	44	5	49	15	34	49	24.0	24.0	24.0	72.0
28-Jun	38	13	51	12	39	51	24.0	24.0	24.0	72.0
29-Jun	28	4	32	6	26	32	24.0	24.0	24.0	72.0
30-Jun	26	12	38	8	30	38	24.0	24.0	24.0	72.0
1-Jul	13	5	18	5	13	18	24.0	24.0	24.0	72.0
2-Jul	18	12	30	5	25	30	24.0	24.0	24.0	72.0
3-Jul	11	14	25	5	20	25	24.0	24.0	24.0	72.0

Table A-2. Fishing effort and numbers of chinook salmon caught and tagged at three fishwheels operated near Gitwinksihlkw on the lower Nass River, 1993. Effort is the number of hours that the fishwheel was fishing.

	Number of Chinook			Tagged			Effort (h)			
Date	Adults	Jacks [a]	Total	Radio	Spaghetti	Total	Wheel 1	Wheel 2	Wheel 3	Total
4-Jul	19	4	23	3	20	23	24.0	24.0	24.0	72.0
5-Jul	20	9	29	8	21	29	24.0	24.0	24.0	72.0
6-Jul	4	8	12	1	11	12	24.0	24.0	24.0	72.0
7-Jul	10	11	21	8	13	21	24.0	24.0	24.0	72.0
8-Jul	3	6	9	2	7	9	24.0	22.0	24.0	70.0
9-Jul	4	1	5	1	4	5	24.0	24.0	24.0	72.0
10-Jul	1	2	3	1	2	3	24.0	24.0	24.0	72.0
11-Jul	6	3	9	2	7	9	24.0	24.0	24.0	72.0
12-Jul	3	3	6	1	5	6	24.0	24.0	24.0	72.0
13-Jul	1	1	2	1	1	2	24.0	24.0	24.0	72.0
14-Jul	4	3	7	3	4	7	24.0	24.0	24.0	72.0
15-Jul	5	0	5	0	5	5	24.0	24.0	24.0	72.0
16-Jul	2	2	4	1	3	4	24.0	24.0	24.0	72.0
17-Jul	3	3	6	2	4	6	24.0	24.0	24.0	72.0
18-Jul	4	3	7	1	6	7	24.0	24.0	24.0	72.0
19-Jul	3	2	5	1	4	5	24.0	24.0	24.0	72.0
20-Jul	1	0	1	0	1	1	24.0	24.0	24.0	72.0
21-Jul	1	3	4	1	3	4	24.0	24.0	12.0	60.0
22-Jul	2	0	2	0	2	2	24.0	24.0	12.0	60.0
23-Jul	4	0	4	2	2	4	24.0	24.0	0.0	48.0
24-Jul	1	0	1	0	1	1	24.0	24.0	16.0	64.0
25-Jul	1	1	2	0	2	2	24.0	24.0	24.0	72.0
26-Jul	3	0	3	2	1	3	19.5	24.0	0.0	43.5
27-Jul	1	1	2	1	1	2	24.0	24.0	0.0	48.0
28-Jul	1	0	1	1	0	1	24.0	24.0	0.0	48.0
29-Jul	1	0	1	1	0	1	24.0	24.0	0.0	48.0
30-Jul	0	0	0	0	0	0	10.0	7.5	0.0	17.5

Table A-2. Fishing effort and numbers of chinook salmon caught and tagged at three fishwheels operated near Gitwinksihlkw on the lower Nass River, 1993. Effort is the number of hours that the fishwheel was fishing.

	Number of Chinook			Tagged			Effort (h)			
Date	Adults	Jacks [a]	Total	Radio	Spaghetti	Total	Wheel 1	Wheel 2	Wheel 3	Total
31-Jul	0	0	0	0	0	0	0.0	0.0	0.0	0.0
1-Aug	0	0	0	0	0	0	0.0	0.0	0.0	0.0
2-Aug	0	0	0	0	0	0	14.0	0.0	10.0	24.0
3-Aug	1	0	1	1	0	1	24.0	0.0	5.0	29.0
4-Aug	1	0	1	0	1	1	24.0	0.0	5.0	29.0
5-Aug	6	0	6	1	5	6	24.0	0.0	5.0	29.0
6-Aug	3	1	4	0	4	4	24.0	0.0	5.0	29.0
7-Aug	1	0	1	0	1	1	24.0	24.0	5.0	53.0
8-Aug	1	0	1	0	1	1	24.0	24.0	5.0	53.0
9-Aug	4	0	4	0	4	4	24.0	24.0	5.0	53.0
10-Aug	2	0	2	0	2	2	9.0	24.0	5.0	38.0
11-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
12-Aug	1	0	1	0	1	1	0.0	24.0	0.0	24.0
13-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
14-Aug	1	0	1	0	1	1	0.0	24.0	0.0	24.0
15-Aug	2	0	2	0	2	2	0.0	24.0	0.0	24.0
16-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
17-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
18-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
19-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
20-Aug	1	0	1	1	0	1	0.0	24.0	0.0	24.0
21-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
22-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
23-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
24-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
25-Aug	1	0	1	1	0	1	0.0	24.0	0.0	24.0
26-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0

Table A-2. Fishing effort and numbers of chinook salmon caught and tagged at three fishwheels operated near Gitwinksihlkw on the lower Nass River, 1993. Effort is the number of hours that the fishwheel was fishing.

	Number of Chinook			Tagged			Effort (h)			
Date	Adults	Jacks [a]	Total	Radio	Spaghetti	Total	Wheel 1	Wheel 2	Wheel 3	Total
27-Aug	1	0	1	1	0	1	0.0	24.0	0.0	24.0
28-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
29-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
30-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
31-Aug	0	0	0	0	0	0	0.0	24.0	0.0	24.0
1-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
2-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
3-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
4-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
5-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
6-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
7-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
8-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
9-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
10-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
11-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
12-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
13-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
14-Sep	0	0	0	0	0	0	0.0	24.0	0.0	24.0
15-Sep	0	0	0	0	0	0	0.0	9.0	0.0	9.0
Totals	**619**	**206**	**825** [b]	**339**	**486**	**825**	**1400.5**	**2433.5**	**744.0**	**4578.0**

[a] Jacks were classified as all fish less than 72 cm; fish smaller than 72 cm were too small to radio tag.

[b] An additional 94 chinook were caught and released without being tagged (see Link and English 1994).

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti tag number	Radio tag[a] Channel	Code	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release time	Release Location
21001	3	50	91.0	?	drift	12-May	10:00	Beaver Creek
21002	3	10	87.0	?	drift	12-May	10:03	Beaver Creek
21003	3	19	92.0	?	drift	12-May	12:43	Gingietl Creek
21004	9	11	96.5	m	fishwheel	02-Jun	10:07	Wheel # 2
21006	5	32	95.0	f	fishwheel	03-Jun	18:20	Wheel # 2
21007	7	29	101.0	f	fishwheel	04-Jun	20:00	Wheel # 2
21008	1	14	97.0	m	fishwheel	04-Jun	20:10	Wheel # 2
21005	1	21	79.5	m	fishwheel	05-Jun	20:00	Wheel # 2
21010	1	91	89.0	f	fishwheel	06-Jun	10:23	Wheel # 2
21011	5	9	98.0	m	fishwheel	06-Jun	10:25	Wheel # 2
21012	1	2	97.0	f	fishwheel	06-Jun	16:20	Wheel # 2
21013	5	38	98.0	f	fishwheel	07-Jun	07:45	Wheel # 2
21014	11	25	84.0	m	fishwheel	07-Jun	17:50	Wheel # 2
21015	9	16	86.5	m	fishwheel	07-Jun	17:53	Wheel # 2
21016	7	3	83.5	m	fishwheel	07-Jun	18:00	Wheel # 2
21017	5	17	86.0	f	fishwheel	08-Jun	08:45	Wheel # 2
21018	3	12	92.0	f	fishwheel	08-Jun	08:55	Wheel # 2
21019	3	28	80.0	f	fishwheel	08-Jun	08:57	Wheel # 2
21020	5	44	85.5	m	fishwheel	08-Jun	08:58	Wheel # 2
21021	11	30	77.0	m	drift	08-Jun	13:55	Beaver Creek
21022	9	27	85.0	f	drift	08-Jun	14:00	Beaver Creek
21023	11	19	82.0	m	drift	08-Jun	14:03	Beaver Creek
21024	7	40	97.0	f	drift	08-Jun	14:37	Beaver Creek
21025	7	7	80.5	m	drift	08-Jun	15:14	Gitlakdamix
21026	3	31	97.5	?	drift	08-Jun	16:34	Beaver Creek
21027	9	39	77.0	m	fishwheel	08-Jun	18:40	Wheel # 2
21028	11	1	86.0	f	fishwheel	09-Jun	09:10	Wheel # 2
21029	1	18	86.0	f	fishwheel	09-Jun	09:12	Wheel # 2
21030	3	15	94.0	f	fishwheel	09-Jun	09:15	Wheel # 2
21031	1	22	97.5	f	fishwheel	09-Jun	09:17	Wheel # 2
21032	1	41	84.0	f	fishwheel	09-Jun	09:20	Wheel # 2
21033	5	35	97.0	m	fishwheel	09-Jun	09:22	Wheel # 2
21034	1	49	92.0	m	fishwheel	09-Jun	18:35	Wheel # 2
21035	9	43	91.0	f	fishwheel	09-Jun	18:40	Wheel # 2
21036	7	26	99.0	f	fishwheel	09-Jun	18:45	Wheel # 2
21037	7	45	100.0	m	fishwheel	09-Jun	18:47	Wheel # 2
21038	11	14	105.0	m	fishwheel	10-Jun	09:30	Wheel # 1
21039	11	24	88.0	f	fishwheel	10-Jun	09:33	Wheel # 1
21041	11	4	104.0	m	fishwheel	10-Jun	09:35	Wheel # 1
21042	9	48	83.0	m	fishwheel	10-Jun	18:30	Wheel # 1
21043	9	19	95.0	f	fishwheel	10-Jun	18:40	Wheel # 1
21044	9	21	82.0	f	fishwheel	11-Jun	09:40	Wheel # 1
21045	7	33	98.0	f	fishwheel	11-Jun	10:20	Wheel # 2
21046	1	8	88.0	f	fishwheel	11-Jun	19:40	Wheel # 1
21047	7	47	105.0	f	fishwheel	11-Jun	19:43	Wheel # 1
21048	9	29	80.0	m	fishwheel	11-Jun	19:45	Wheel # 1
21049	11	11	98.0	f	fishwheel	11-Jun	19:55	Wheel # 2

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21050	7	42	85.0	m	fishwheel	11-Jun	19:58	Wheel # 2
21051	5	13	78.0	m	fishwheel	11-Jun	21:00	Wheel # 1
21052	5	34	95.0	m	fishwheel	11-Jun	21:10	Wheel # 1
21053	11	18	83.0	f	fishwheel	12-Jun	09:02	Wheel # 1
21054	7	50	102.0	m	fishwheel	12-Jun	09:05	Wheel # 1
21055	9	17	88.0	f	fishwheel	12-Jun	09:25	Wheel # 2
21056	1	32	101.0	m	fishwheel	12-Jun	09:35	Wheel # 2
21057	3	30	84.0	f	fishwheel	12-Jun	09:40	Wheel # 2
21058	5	3	98.0	f	fishwheel	12-Jun	15:40	Wheel # 2
21059	5	37	84.0	m	fishwheel	12-Jun	17:01	Wheel # 1
21060	3	6	88.0	m	fishwheel	13-Jun	08:45	Wheel # 2
21061	11	10	89.5	f	fishwheel	13-Jun	08:55	Wheel # 2
21062	3	20	85.0	m	fishwheel	13-Jun	09:35	Wheel # 1
21063	5	1	97.0	f	fishwheel	13-Jun	10:35	Wheel # 1
21064	1	26	75.0	m	fishwheel	13-Jun	10:40	Wheel # 1
21065	11	2	90.0	m	fishwheel	13-Jun	10:50	Wheel # 1
21066	11	22	75.0	m	fishwheel	13-Jun	19:15	Wheel # 2
21067	5	16	95.0	f	fishwheel	13-Jun	13:55	Wheel # 2
21068	1	5	79.0	m	fishwheel	13-Jun	19:50	Wheel # 1
21069	11	9	100.0	m	fishwheel	13-Jun	19:55	Wheel # 1
21070	1	35	106.0	m	fishwheel	13-Jun	20:05	Wheel # 1
21071	7	46	87.0	m	fishwheel	13-Jun	20:15	Wheel # 1
21072	7	27	89.0	m	fishwheel	13-Jun	20:20	Wheel # 1
21073	9	14	97.0	m	fishwheel	14-Jun	08:20	Wheel # 1
21074	5	7	82.0	m	fishwheel	14-Jun	08:20	Wheel # 1
21075	11	31	85.0	f	fishwheel	14-Jun	08:20	Wheel # 1
21076	3	40	88.0	m	fishwheel	14-Jun	08:20	Wheel # 1
21077	1	23	81.0	m	fishwheel	14-Jun	08:20	Wheel # 1
21078	3	36	86.0	f	fishwheel	14-Jun	08:20	Wheel # 1
21079	9	15	97.0	f	fishwheel	14-Jun	09:15	Wheel # 2
21080	7	25	86.0	f	fishwheel	14-Jun	19:50	Wheel # 2
21081	3	44	92.0	f	fishwheel	14-Jun	19:30	Wheel # 2
21082	9	12	89.0	m	fishwheel	14-Jun	19:30	Wheel # 2
21083	1	19	88.0	f	fishwheel	14-Jun	19:50	Wheel # 1
21084	11	41	93.0	m	fishwheel	14-Jun	19:50	Wheel # 1
21085	5	18	87.0	m	fishwheel	14-Jun	19:50	Wheel # 1
21086	1	13	100.0	f	fishwheel	14-Jun	19:50	Wheel # 1
21087	5	11	75.0	m	fishwheel	14-Jun	19:50	Wheel # 1
21088	3	50	89.0	m	fishwheel	14-Jun	19:50	Wheel # 1
21089	7	28	100.0	f	fishwheel	14-Jun	19:50	Wheel # 1
21090	3	10	84.0	m	fishwheel	14-Jun	19:50	Wheel # 1
21091	9	26	97.0	f	fishwheel	14-Jun	19:50	Wheel # 1
21099	7	20	90.0	f	fishwheel	15-Jun	17:34	Wheel # 1
21092	5	8	107.0	m	fishwheel	15-Jun	08:15	Wheel # 1
21093	11	48	92.0	f	fishwheel	15-Jun	08:17	Wheel # 1
21094	3	42	89.0	f	fishwheel	15-Jun	08:28	Wheel # 1
21095	7	21	87.0	f	fishwheel	15-Jun	08:50	Wheel # 2

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21096	3	3	92.0	f	fishwheel	15-Jun	08:55	Wheel # 2
21097	9	32	84.0	m	fishwheel	15-Jun	09:18	Wheel # 2
21098	1	4	83.0	f	fishwheel	15-Jun	17:30	Wheel # 1
21100	9	34	87.0	f	fishwheel	15-Jun	17:37	Wheel # 1
21101	7	30	96.0	f	fishwheel	15-Jun	17:39	Wheel # 1
21102	11	47	91.0	f	fishwheel	15-Jun	17:42	Wheel # 1
21103	9	24	84.0	f	fishwheel	15-Jun	17:52	Wheel # 1
21104	9	35	83.0	f	fishwheel	15-Jun	17:55	Wheel # 1
21105	7	38	102.0	m	fishwheel	15-Jun	17:57	Wheel # 1
21106	9	22	95.0	f	fishwheel	16-Jun	08:00	Wheel # 1
21107	11	45	87.0	f	fishwheel	16-Jun	08:30	Wheel # 1
21108	3	91	88.0	m	fishwheel	16-Jun	08:45	Wheel # 2
21109	7	39	87.0	f	fishwheel	16-Jun	18:00	Wheel # 2
21110	7	37	90.0	f	fishwheel	16-Jun	18:06	Wheel # 2
21111	1	16	98.0	f	fishwheel	16-Jun	18:09	Wheel # 2
21112	5	29	85.0	f	fishwheel	16-Jun	18:15	Wheel # 2
21113	11	5	75.0	m	fishwheel	16-Jun	18:20	Wheel # 2
21114	5	33	87.0	f	fishwheel	17-Jun	08:50	Wheel # 1
21115	1	43	98.0	m	fishwheel	17-Jun	07:30	Wheel # 1
21116	1	46	98.0	f	fishwheel	17-Jun	10:20	Wheel # 2
21117	3	2	73.0	m	fishwheel	17-Jun	10:23	Wheel # 2
21118	9	9	101.0	m	fishwheel	18-Jun	21:30	Wheel # 1
21119	5	27	94.0	f	fishwheel	18-Jun	21:32	Wheel # 1
21120	7	1	102.0	f	fishwheel	18-Jun	21:32	Wheel # 1
21121	5	19	93.0	f	fishwheel	19-Jun	06:30	Wheel # 1
21122	3	13	96.0	f	fishwheel	19-Jun	10:00	Wheel # 1
21123	1	15	107.0	f	fishwheel	19-Jun	18:00	Wheel # 1
21124	9	28	79.0	f	fishwheel	19-Jun	18:15	Wheel # 1
21125	11	12	85.0	f	fishwheel	19-Jun	19:10	Wheel # 1
20042	5	45	89.0	m	fishwheel	20-Jun	21:15	Wheel # 1
20043	3	5	98.0	m	fishwheel	20-Jun	21:15	Wheel # 1
20044	5	22	84.0	m	fishwheel	20-Jun	21:15	Wheel # 1
20045	11	3	79.0	m	fishwheel	20-Jun	22:10	Wheel # 1
20046	1	24	73.0	m	fishwheel	20-Jun	22:30	Wheel # 2
21126	9	18	92.0	f	fishwheel	20-Jun	08:30	Wheel # 1
21127	7	41	88.0	f	fishwheel	20-Jun	08:33	Wheel # 1
21128	5	40	84.0	f	fishwheel	20-Jun	08:39	Wheel # 1
21129	1	11	102.0	m	fishwheel	20-Jun	08:42	Wheel # 1
21130	3	14	88.0	f	fishwheel	20-Jun	08:45	Wheel # 1
21131	5	26	101.0	m	fishwheel	20-Jun	08:48	Wheel # 1
21132	7	44	100.0	m	fishwheel	20-Jun	08:51	Wheel # 1
21133	9	10	76.0	m	fishwheel	20-Jun	08:54	Wheel # 1
21134	1	36	97.0	m	fishwheel	20-Jun	08:57	Wheel # 1
21135	7	49	92.0	f	fishwheel	20-Jun	09:03	Wheel # 1
21136	1	25	93.0	f	fishwheel	20-Jun	09:00	Wheel # 1
21137	11	7	82.0	m	fishwheel	20-Jun	09:06	Wheel # 1
21138	5	23	87.0	f	fishwheel	20-Jun	21:00	Wheel # 1

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21139	7	31	97.0	f	fishwheel	20-Jun	21:03	Wheel # 1
21140	11	6	92.0	f	fishwheel	20-Jun	21:06	Wheel # 1
21141	3	17	95.0	f	fishwheel	20-Jun	21:06	Wheel # 1
21142	1	50	106.0	m	fishwheel	20-Jun	21:12	Wheel # 1
21143	11	38	73.0	m	fishwheel	20-Jun	21:15	Wheel # 1
21144	9	42	94.0	f	fishwheel	20-Jun	21:18	Wheel # 1
21145	1	91	94.0	f	fishwheel	20-Jun	21:15	Wheel # 1
21146	7	32	102.0	m	fishwheel	20-Jun	21:15	Wheel # 1
21147	3	47	73.0	m	fishwheel	20-Jun	21:15	Wheel # 1
21148	9	30	91.0	f	fishwheel	20-Jun	21:15	Wheel # 1
21149	5	21	91.0	f	fishwheel	20-Jun	21:15	Wheel # 1
21150	3	34	88.0	m	fishwheel	20-Jun	21:15	Wheel # 1
21151	9	37	92.0	m	fishwheel	21-Jun	09:00	Wheel # 1
21152	3	4	86.0	f	fishwheel	21-Jun	09:00	Wheel # 1
21153	1	48	86.0	f	fishwheel	21-Jun	09:00	Wheel # 1
21154	9	20	97.0	f	fishwheel	21-Jun	09:45	Wheel # 1
21155	5	39	85.0	m	fishwheel	21-Jun	09:45	Wheel # 1
21156	7	35	87.0	m	fishwheel	21-Jun	09:45	Wheel # 1
21157	3	16	95.0	f	fishwheel	21-Jun	10:05	Wheel # 1
21158	11	8	98.0	m	fishwheel	21-Jun	10:05	Wheel # 1
21159	3	29	102.0	m	fishwheel	21-Jun	10:10	Wheel # 1
21160	7	13	109.0	m	fishwheel	21-Jun	10:40	Wheel # 1
21161	1	40	83.0	f	fishwheel	21-Jun	10:40	Wheel # 1
21162	5	36	91.0	f	fishwheel	21-Jun	10:40	Wheel # 1
21163	9	7	91.0	f	fishwheel	21-Jun	10:40	Wheel # 1
21164	5	12	87.0	f	fishwheel	21-Jun	10:55	Wheel # 1
21165	11	15	89.0	f	fishwheel	21-Jun	11:10	Wheel # 2
21166	5	49	79.0	m	fishwheel	21-Jun	11:15	Wheel # 1
21167	1	44	86.0	f	fishwheel	21-Jun	11:15	Wheel # 1
21168	7	11	89.0	f	fishwheel	21-Jun	11:15	Wheel # 1
21169	7	14	110.0	m	fishwheel	21-Jun	11:15	Wheel # 1
21170	3	18	82.0	f	fishwheel	21-Jun	19:00	Wheel # 1
21171	7	19	91.0	f	fishwheel	21-Jun	19:00	Wheel # 1
21172	5	41	86.0	m	fishwheel	21-Jun	19:00	Wheel # 1
21173	1	10	87.0	m	fishwheel	21-Jun	19:00	Wheel # 1
21174	9	25	76.0	f	fishwheel	21-Jun	19:00	Wheel # 1
21175	3	26	89.0	m	fishwheel	21-Jun	19:00	Wheel # 1
21177	9	2	94.0	f	fishwheel	22-Jun	08:30	Wheel # 1
21178	11	21	86.0	f	fishwheel	22-Jun	08:30	Wheel # 1
21179	1	3	82.0	f	fishwheel	22-Jun	09:15	Wheel # 1
21180	3	33	98.0	f	fishwheel	22-Jun	09:18	Wheel # 1
21181	11	16	97.0	f	fishwheel	22-Jun	09:18	Wheel # 1
21182	7	4	103.0	m	fishwheel	22-Jun	09:25	Wheel # 1
21183	9	1	96.0	m	fishwheel	22-Jun	09:27	Wheel # 1
21184	11	37	89.0	f	fishwheel	22-Jun	09:27	Wheel # 1
21185	9	47	96.0	f	fishwheel	22-Jun	09:29	Wheel # 1
21186	3	43	82.0	f	fishwheel	22-Jun	09:29	Wheel # 1

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21187	7	8	72.0	m	fishwheel	22-Jun	17:59	Wheel # 1
21188	5	42	100.0	f	fishwheel	22-Jun	10:00	Wheel # 2
21189	3	23	99.0	f	fishwheel	22-Jun	17:59	Wheel # 1
21191	11	50	?	?	fishwheel	22-Jun	17:59	Wheel # 1
21192	1	29	89.0	m	fishwheel	22-Jun	17:59	Wheel # 1
21190	1	28	?	?	fishwheel	22-Jun	17:59	Wheel # 1
21193	5	48	77.0	m	fishwheel	22-Jun	17:59	Wheel # 1
21194	3	46	73.0	m	fishwheel	22-Jun	17:59	Wheel # 1
21195	9	45	94.0	m	fishwheel	22-Jun	17:59	Wheel # 1
21196	5	91	96.0	f	fishwheel	23-Jun	09:00	Wheel # 1
21197	11	35	73.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21198	3	8	98.0	f	fishwheel	23-Jun	09:00	Wheel # 1
21199	7	24	90.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21200	11	32	91.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21201	9	31	97.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21202	1	38	96.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21203	1	34	102.0	m	fishwheel	23-Jun	09:00	Wheel # 1
21204	5	30	81.0	f	fishwheel	23-Jun	09:00	Wheel # 1
21205	7	27	103.0	m	fishwheel	23-Jun	19:00	Wheel # 1
21206	3	41	88.0	f	fishwheel	23-Jun	19:15	Wheel # 1
21207	3	7	81.0	m	fishwheel	23-Jun	19:25	Wheel # 1
21208	5	25	95.0	m	fishwheel	24-Jun	08:30	Wheel # 1
21209	11	13	94.0	f	fishwheel	24-Jun	08:30	Wheel # 1
21210	1	12	91.0	m	fishwheel	24-Jun	17:00	Wheel # 1
21211	11	44	96.0	f	fishwheel	25-Jun	09:17	Wheel # 1
21212	9	36	79.0	f	fishwheel	25-Jun	09:25	Wheel # 1
21213	1	17	94.0	f	fishwheel	25-Jun	09:35	Wheel # 1
21214	9	40	91.0	f	fishwheel	25-Jun	09:40	Wheel # 1
21216	7	15	76.0	m	fishwheel	25-Jun	09:45	Wheel # 1
21217	11	26	90.0	f	fishwheel	25-Jun	09:40	Wheel # 1
21218	11	42	89.0	f	fishwheel	25-Jun	10:03	Wheel # 1
21219	5	20	97.0	f	fishwheel	25-Jun	09:50	Wheel # 1
21220	5	2	109.0	f	fishwheel	25-Jun	14:20	Wheel # 1
21221	5	47	85.0	f	fishwheel	25-Jun	14:45	Wheel # 1
21222	1	45	95.0	m	fishwheel	25-Jun	20:15	Wheel # 1
21223	11	43	83.0	m	fishwheel	25-Jun	20:17	Wheel # 1
21224	7	18	88.0	f	fishwheel	25-Jun	20:15	Wheel # 1
21225	7	5	99.0	f	fishwheel	25-Jun	20:15	Wheel # 1
21226	3	1	89.0	f	fishwheel	25-Jun	20:15	Wheel # 1
21227	1	39	96.0	f	fishwheel	26-Jun	09:35	Wheel # 1
21228	11	49	103.0	f	fishwheel	26-Jun	09:34	Wheel # 1
21229	3	21	87.0	f	fishwheel	26-Jun	09:34	Wheel # 1
21230	9	3	100.0	f	fishwheel	26-Jun	09:34	Wheel # 1
21231	9	6	94.0	f	fishwheel	26-Jun	09:34	Wheel # 1
21232	5	10	97.0	f	fishwheel	26-Jun	09:34	Wheel # 1
21233	1	37	96.0	m	fishwheel	26-Jun	10:40	Wheel # 1
21234	7	22	79.0	f	fishwheel	26-Jun	18:00	Wheel # 1

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21235	3	11	96.0	f	fishwheel	26-Jun	18:00	Wheel # 1
21236	1	9	95.0	m	fishwheel	26-Jun	18:00	Wheel # 1
21237	9	23	93.0	m	fishwheel	26-Jun	18:00	Wheel # 1
21238	3	37	97.0	f	fishwheel	26-Jun	18:00	Wheel # 1
21239	9	46	91.0	f	fishwheel	26-Jun	18:00	Wheel # 1
21240	5	14	84.0	m	fishwheel	26-Jun	18:00	Wheel # 1
21241	11	29	113.0	m	fishwheel	26-Jun	18:00	Wheel # 1
21242	7	16	95.0	f	fishwheel	26-Jun	18:00	Wheel # 1
21243	5	46	86.0	f	fishwheel	27-Jun	09:05	Wheel # 1
21244	3	27	93.0	m	fishwheel	27-Jun	09:12	Wheel # 1
21245	1	7	110.0	m	fishwheel	27-Jun	09:19	Wheel # 1
21246	7	34	105.0	m	fishwheel	27-Jun	09:26	Wheel # 1
21247	1	20	91.0	m	fishwheel	27-Jun	09:34	Wheel # 1
21248	11	17	84.0	f	fishwheel	27-Jun	09:45	Wheel # 1
21249	11	20	92.0	f	fishwheel	27-Jun	09:48	Wheel # 1
21250	3	32	104.0	m	fishwheel	27-Jun	19:00	Wheel # 1
21251	7	48	90.0	m	fishwheel	27-Jun	19:12	Wheel # 1
21252	5	5	99.0	f	fishwheel	27-Jun	19:29	Wheel # 1
21253	9	41	102.0	f	fishwheel	27-Jun	19:34	Wheel # 1
21254	9	38	95.0	f	fishwheel	27-Jun	19:38	Wheel # 1
21255	5	31	80.0	m	fishwheel	27-Jun	19:46	Wheel # 1
21256	11	40	73.0	m	fishwheel	27-Jun	19:53	Wheel # 1
21257	1	47	85.0	m	fishwheel	27-Jun	19:59	Wheel # 1
21259	3	35	104.0	m	fishwheel	28-Jun	08:30	Wheel # 1
21260	7	6	91.0	f	fishwheel	28-Jun	08:30	Wheel # 1
21261	3	24	85.0	m	fishwheel	28-Jun	08:30	Wheel # 1
21262	5	4	100.0	m	fishwheel	28-Jun	08:30	Wheel # 1
21264	11	33	85.0	f	fishwheel	28-Jun	08:30	Wheel # 1
21265	9	8	100.0	m	fishwheel	28-Jun	08:30	Wheel # 1
21266	7	10	75.0	m	fishwheel	28-Jun	19:15	Wheel # 1
21267	1	6	103.0	m	fishwheel	28-Jun	19:15	Wheel # 1
21268	3	25	87.0	m	fishwheel	28-Jun	19:15	Wheel # 1
21269	9	44	93.0	m	fishwheel	28-Jun	19:15	Wheel # 1
21270	7	43	90.0	m	fishwheel	28-Jun	19:15	Wheel # 1
21271	5	28	95.0	f	fishwheel	28-Jun	19:15	Wheel # 1
21272	11	34	108.0	m	fishwheel	29-Jun	08:30	Wheel # 1
21273	9	33	93.0	f	fishwheel	29-Jun	08:36	Wheel # 1
21274	11	36	93.0	m	fishwheel	29-Jun	08:49	Wheel # 1
21275	1	27	80.0	f	fishwheel	29-Jun	19:00	Wheel # 1
21276	11	23	109.0	f	fishwheel	29-Jun	19:27	Wheel # 1
21277	1	42	90.0	m	fishwheel	29-Jun	19:39	Wheel # 1
21278	5	15	99.0	f	fishwheel	30-Jun	08:30	Wheel # 1
21279	3	48	88.0	f	fishwheel	30-Jun	08:30	Wheel # 1
21280	7	9	90.0	f	fishwheel	30-Jun	08:30	Wheel # 1
21281	9	50	97.0	m	fishwheel	30-Jun	08:30	Wheel # 1
21282	3	39	105.0	m	fishwheel	30-Jun	19:14	Wheel # 1
21283	5	24	82.0	f	fishwheel	30-Jun	19:18	Wheel # 1

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag[a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21284	3	38	82.0	m	fishwheel	30-Jun	19:29	Wheel # 1
21285	9	13	88.0	f	fishwheel	30-Jun	19:34	Wheel # 1
21286	11	27	88.0	m	fishwheel	01-Jul	09:15	Wheel # 1
21287	5	50	83.0	f	fishwheel	01-Jul	09:45	Wheel # 1
21288	11	46	88.0	f	fishwheel	01-Jul	17:21	Wheel # 1
21289	9	5	93.0	f	fishwheel	01-Jul	17:20	Wheel # 1
21290	7	23	93.0	f	fishwheel	01-Jul	17:20	Wheel # 1
21291	5	6	79.0	m	fishwheel	02-Jul	09:15	Wheel # 1
21292	11	28	96.0	m	fishwheel	02-Jul	09:15	Wheel # 1
21293	1	31	89.0	f	fishwheel	02-Jul	18:20	Wheel # 1
21294	7	36	87.0	m	fishwheel	02-Jul	18:20	Wheel # 1
21295	1	33	108.0	f	fishwheel	02-Jul	18:20	Wheel # 1
21296	7	12	93.0	m	fishwheel	03-Jul	08:30	Wheel # 1
21297	9	4	99.0	m	fishwheel	03-Jul	08:30	Wheel # 1
21298	11	39	100.0	m	fishwheel	03-Jul	08:30	Wheel # 1
21299	3	45	98.0	m	fishwheel	03-Jul	08:30	Wheel # 1
21300	9	49	96.0	f	fishwheel	03-Jul	08:30	Wheel # 1
20345	1	30	86.0	f	fishwheel	04-Jul	18:05	Wheel # 1
21301	7	2	96.0	m	fishwheel	04-Jul	08:30	Wheel # 1
21302	5	38	98.0	m	fishwheel	04-Jul	08:30	Wheel # 1
21305	4	17	97.0	f	fishwheel	05-Jul	19:30	Wheel # 1
21306	11	23	99.0	m	fishwheel	05-Jul	11:29	Wheel # 1
21307	5	6	101.0	f	fishwheel	05-Jul	11:29	Wheel # 2
21308	11	32	99.0	m	fishwheel	05-Jul	11:17	Wheel # 2
21309	7	5	79.0	f	fishwheel	05-Jul	11:00	Wheel # 2
21310	7	48	95.0	f	fishwheel	05-Jul	10:07	Wheel # 1
21311	5	43	78.0	f	fishwheel	05-Jul	08:30	Wheel # 1
21312	3	22	101.0	f	fishwheel	05-Jul	10:05	Wheel # 1
21304	3	5	111.0	m	fishwheel	06-Jul	14:00	Wheel # 1
21314	1	12	73.0	f	fishwheel	07-Jul	09:10	Wheel # 1
21315	1	36	81.0	m	fishwheel	07-Jul	09:40	Wheel # 2
21316	1	13	92.0	m	fishwheel	07-Jul	14:30	Wheel # 1
21317	5	32	72.0	m	fishwheel	07-Jul	14:35	Wheel # 1
21318	7	17	91.0	f	fishwheel	07-Jul	19:25	Wheel # 2
21319	11	50	80.0	m	fishwheel	07-Jul	19:45	Wheel # 2
21320	11	15	85.0	f	fishwheel	07-Jul	20:15	Wheel # 1
21313	3	9	89.0	f	fishwheel	07-Jul	09:00	Wheel # 1
21321	11	26	110.0	m	fishwheel	08-Jul	09:35	Wheel # 1
21322	11	13	?	?	fishwheel	08-Jul	10:00	Wheel # 2
21325	11	43	79.0	f	fishwheel	09-Jul	13:00	Wheel # 1
21323	11	48	85.0	m	fishwheel	10-Jul	19:00	Wheel # 1
21324	9	30	87.0	f	fishwheel	11-Jul	10:38	Wheel # 1
21326	9	36	81.0	f	fishwheel	11-Jul	18:20	Wheel # 1
21327	1	47	83.0	f	fishwheel	12-Jul	09:20	Wheel # 1
21328	5	18	84.0	m	fishwheel	13-Jul	09:00	Wheel # 1
21330	1	49	82.0	f	fishwheel	14-Jul	09:28	Wheel # 1
21331	1	14	88.0	m	fishwheel	14-Jul	18:00	Wheel # 1

Table A-3. Information regarding chinook salmon that were radio tagged on the lower Nass River, 1993.

Spaghetti	Radio tag [a]		Nose-fork	Sex	Method	Tagging	Release	Release
tag number	Channel	Code	length (cm)		of capture	date	time	Location
21332	11	7	79.0	m	fishwheel	14-Jul	19:30	Wheel # 1
21340	1	25	94.0	f	fishwheel	16-Jul	09:15	Wheel # 1
21335	11	6	90.0	f	fishwheel	17-Jul	17:30	Wheel # 1
21341	7	5	85.0	f	fishwheel	17-Jul	09:15	Wheel # 1
21346	14	73	95.0	f	fishwheel	18-Jul	11:30	Wheel # 1
21347	11	9	103.0	m	fishwheel	19-Jul	09:15	Wheel # 1
21350	9	49	?	f	fishwheel	21-Jul	18:55	Wheel # 1
21358	5	10	87.0	m	fishwheel	23-Jul	09:35	Wheel # 1
21359	9	50	86.0	f	fishwheel	23-Jul	09:40	Wheel # 1
21360	11	15	86.0	m	fishwheel	26-Jul	08:40	Wheel # 1
21363	3	26	96.0	f	fishwheel	26-Jul	17:03	Wheel # 1
21361	9	40	95.0	m	fishwheel	27-Jul	08:55	Wheel # 1
21362	9	9	86.0	f	fishwheel	28-Jul	08:00	Wheel # 1
21369	1	25	88.0	f	fishwheel	29-Jul	19:30	Wheel # 1
21372	11	39	86.0	f	fishwheel	03-Aug	21:20	Wheel # 1
21376	3	22	97.0	m	fishwheel	05-Aug	08:11	Wheel # 1
21397	5	1	74.0	f	fishwheel	20-Aug	09:15	Wheel # 2
NA	14	59	79.0	f	fishwheel	25-Aug	12:15	Wheel # 2
21402	14	58	88.0	f	drift	27-Aug	08:41	Wheel # 2
21406	14	57	85.0	f	fishwheel	27-Aug	09:40	Wheel # 2
21417	11	35	89.0	f	drift	23-Sep	12:18	Gwinaha

[a] Channel 1 = 149.320 MHz and channels increase by .02 MHz (i.e. channel 2 = 149.340; 3 = 149.36
NA = Not applied or recorded.

Table A-4. Information concerning radio-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Radio tag		Spaghetti tag		Recovered	Radio tag			Size	Date	Arrival	Days in	
date	Channel	Code	No.	Present	by	recovered	Location[a]	Sex	(cm)	died	date	system	Spawned
Nisga'a food fishery													
12-May	3	50	21001	Y	Frank Tait	yes	FF	?	91.0	12-May			no
10-Jun	3	10	21002	Y	Edward Azak	yes	FF	?	87.0	10-Jun			no
14-Jun	7	27	21072	Y	Clifford Azak	yes	FF	M	89.0	14-Jun			no
18-Jun	1	91	21010	N	Phillip Azak	yes	FF	F	89.0	18-Jun			no
20-Jun	5	38	21013	Y	Bruce Huldane	yes	FF	F	98.0	20-Jun			no
26-Jun	11	32	21200	Y	Charles Swanson	yes	FF	M	91.0	26-Jun			no
27-Jun	1	13	21086	Y	Edward Azak	yes	FF	F	100.0	27-Jun			no
27-Jun	1	12	21210	Y	Alice Gilles	yes	FF	M	91.0	27-Jun			no
27-Jun	9	36	21212	Y	Soloman Watts	yes	FF	F	79.0	27-Jun			no
27-Jun	11	26	21217	Y	Clifford Azak	yes	FF	F	90.0	27-Jun			no
27-Jun	11	15	21165	Y	Clifford Azak	yes	FF	F	89.0	27-Jun			no
28-Jun	3	5	20043	Y	Michael Moore	yes	FF	M	98.0	28-Jun			no
30-Jun	5	18	21085	Y	Cynthia Nyce	yes	FF	M	87.0	30-Jun			no
30-Jun	11	43	21223	Y	Richard Morgan	yes	FF	M	83.0	30-Jun			no
1-Jul	11	48	21093	Y	Richard Morgan	yes	FF	F	92.0	01-Jul			no
2-Jul	7	5	21225	Y	Clyde Azak	yes	FF	F	99.0	02-Jul			no
2-Jul	5	6	21291	Y	Dave Griffin	yes	FF	M	79.0	01-Jul			no
2-Jul	7	48	21251	Y	Clifford Azak	yes	FF	M	90.0	02-Jul			no
2-Jul	9	30	21148	Y	Lawrence Adams	yes	FF	F	91.0	02-Jul			no
2-Jul	11	23	21276	Y	Clyde Azak	yes	FF	F	109.0	02-Jul			no
3-Jul	1	36	21134	?	Dave Griffin	yes	FF	M	97.0	03-Jul			no
3-Jul	1	14	21008	?	Frank Tait	yes	FF	M	97.0	03-Jul			no
4-Jul	1	25	21136	Y	Carl Barton	yes	FF	F	93.0	04-Jul			no
5-Jul	1	47	21257	Y	Albert Stephens	yes	FF	M	85.0	05-Jul			no
6-Jul	11	7	21137	Y	Joe Grandison	yes	FF	M	82.0	06-Jul			no
11-Jul	1	49	21034	?	Frank Tait	yes	FF	M	92.0	11-Jul			no
12-Jul	7	5	21309	Y	Clyde Azak	yes	FF	F	79.0	12-Jul			no
12-Jul	11	6	21140	Y	Clyde Azak	yes	FF	F	92.0	12-Jul			no

Table A-4. Information concerning radio-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Radio tag		Spaghetti tag		Recovered	Radio tag			Size	Date	Arrival	Days in	
date	Channel	Code	No.	Present	by	recovered	Location[a]	Sex	(cm)	died	date	system	Spawned
14-Jul	11	9	21069	Y	Roberta Clayton	yes	FF	M	100.0	14-Jul			no
19-Jul	5	10	21232	Y	Clyde Azak	yes	FF	F	97.0	19-Jul			no
19-Jul	9	49	21300	Y	Clyde Azak	yes	FF	F	96.0	19-Jul			no
23-Jul	11	15	21320	Y	Clifford Azak	yes	FF	F	85.0	23-Jul			no
25-Jul	1	25	21340	Y	Paul Gosselin	yes	FF	F	94.0	25-Jul			no
25-Jul	3	22	21312	Y	Paul Gosselin	yes	FF	F	101.0	25-Jul			no
1-Aug	14	73	21346	?	Lakalzap fisherman	no	FF	F	95.0	01-Aug			no
14-Aug	5	1	21063	Y	Sally Nyce	yes	FF	F	97.0	14-Aug			no
20-Oct	5	10	21358	Y	George Alexcee	yes	FF	M	87.0	20-Oct			no
Middle-river fishery													
18-Aug	9	3	21230	Y	Food fishery	no	MRF	F	100.0	?	30-Jun	?	?
27-Aug	9	41	21253	?	Carolyn Himmelrigh	yes	MRF	F	102.0	?	13-Jul	?	?
17-Sep	9	37	21151	?	Food fishery	no	MRF	M	92.0	?	13-Jul	?	no
Tseax River													
4-Jul	11	13	21209	?	Jared Morven	yes	Ts-SF	F	94.0	04-Jul	?	?	no
12-Oct	3	22	21376	N	Clyde Azak	yes	Ts	M	97.0	05-Oct	23-Aug	44	yes
Seaskinnish Creek													
3-Sep	1	24	20046	N	Clyde Azak	yes	Se	M	73.0	24-Aug	12-Jul	44	yes
12-Sep	5	27	21119	Y	Bill Koski	no	Se	F	94.0	03-Sep	05-Jul	61	yes
Mouth of Tchitin River													
30-Jun	11	50	21191	Y	John Hamilton	yes	Tc-SF	?	?	30-Jun	?	?	no
1-Jul	5	32	21006	Y	Michelle Dickens	yes	Tc-SF	F	95.0	01-Jul	?	?	no
Cranberry River													
18-Jul	9	16	21015	Y	unknown	released	C-SF	M	86.5	alive	01-Jul	?	?
18-Jul	7	13	21160	Y	unknown	no	C-SF	M	109.0	18-Jul	10-Jul	?	no

Table A-4. Information concerning radio-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Radio tag		Spaghetti tag		Recovered	Radio tag			Size	Date	Arrival	Days in	
date	Channel	Code	No.	Present	by	recovered	Location [a]	Sex	(cm)	died	date	system	Spawned
19-Jul	9	50	21281	N	Gunter Zweifler	yes	C-SF	M	97.0	19-Jul	16-Jul	4	no
20-Jul	7	50	21054	Y	Tom Smith	yes	C-SF	M	102.0	20-Jul	28-Jun	23	no
21-Jul	3	26	21175	?	Dave Dorish	yes	C-SF	M	89.0	21-Jul	08-Jul	14	no
21-Jul	9	40	21214	Y	Scott Weaver	yes	C-SF	F	91.0	21-Jul	20-Jul	2	no
24-Jul	1	29	21192	Y	Larry Christensen	released	C-SF	M	89.0	alive	24-Jul	?	?
24-Jul	9	9	21118	N	Bobby Bahr	yes	C-SF	M	101.0	24-Jul	06-Jul	19	no
26-Jul	11	39	21298	Y	Haus Luginbunt	yes	C-SF	M	100.0	26-Jul	24-Jul	2	no
27-Jul	1	29	21192	Y	Dave Sedgwick	yes	C-SF	M	89.0	alive	24-Jul	?	?
31-Aug	5	31	21255	Y	Trinity Smith	yes	C-SF	M	80.0	31-Aug	07-Jul	56	no
Meziadin River and mouth													
25-Jul	1	91	21145	Y	Ken Valcourt	yes	M-SF	F	94.0	25-Jul	24-Jul	2	no
19-Aug	3	8	21198	N	Eckard's Guiding	yes	M-SF	F	98.0	19-Aug	14-Aug	6	no
29-Aug	11	35	21197	Y	Jim Hansen	yes	MF	M	73.0	alive	13-Aug	?	no
19-Sep	11	32	21308	NA	Keith Shaffer	yes	M	M	99.0	?	?	?	?
21-Sep	5	35	21033	Y	Bill Koski	yes	M	F	97.0	17-Sep	11-Jul	69	partially
21-Sep	9	18	21126	Y	Bill Koski	yes	M	F	92.0	11-Sep	30-Jul	44	yes
21-Sep	9	14	21073	Y	Bill Koski	yes	M	F	97.0	17-Sep	19-Aug	30	yes
26-Sep	7	15	21216	N	Bill Koski	yes	M	M	76.0	24-Sep	22-Aug	34	yes
Kwinageese River													
10-Sep	1	3	21179	N	Clyde Azak	yes	K	F	82.0	05-Sep	27-Jul	41	yes
10-Sep	3	44	21081	Y	Richard Alexander	yes	K	F	92.0	08-Sep	07-Jul	64	yes
10-Sep	3	4	21152	Y	Lawrence Stevens	yes	K	F	86.0	03-Sep	26-Jul	40	yes
10-Sep	5	37	21059	N	Paul Gosselin	yes	K	F	84.0	05-Sep	16-Jul	52	yes
10-Sep	5	46	21243	Y	Lawrence Stevens	yes	K	F	86.0	04-Sep	27-Jul	40	yes
10-Sep	7	49	21135	Y	Clyde Azak	yes	K	F	92.0	06-Sep	24-Jul	45	yes

Table A-4. Information concerning radio-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Radio tag		Spaghetti tag		Recovered	Radio tag			Size	Date	Arrival	Days in	
date	Channel	Code	No.	Present	by	recovered	Location[a]	Sex	(cm)	died	date	system	Spawned
10-Sep	11	47	21102	Y	Paul Gosselin	yes	K	F	91.0	07-Sep	28-Jul	42	yes
10-Sep[b]	11	37	21184	Y	Clyde Azak	yes	K	M	89.0	07-Sep	04-Aug	35	yes
10-Sep[b]	11	2	21065	NA	Paul Gosselin	no	K	M	90.0	?	23-Jul	?	?
17-Sep	1	40	21161	Y	Bill Koski	yes	K	F	83.0	07-Sep	11-Aug	28	yes
17-Sep	1	14	21331	Y	Paul Gosselin	yes	K	F	88.0	16-Sep	20-Aug	28	yes
Damdochax Creek													
1-Sep	5	7	21074	Y	Richard Alexander	yes	D	M	82.0	23-Aug	12-Aug	12	yes
1-Sep	5	13	21051	N	Richard Alexander	yes	D	M	78.0	21-Aug	28-Jul	25	yes
1-Sep	9	25	21174	N	Clyde Azak	yes	D	F	76.0	29-Aug	12-Aug	18	no
9-Sep	1	5	21068	N	Clyde Azak	yes	D	F	79.0	06-Sep	08-Aug	30	yes
9-Sep	1	11	21129	N	Paul Gosselin	yes	D	M	102.0	30-Aug	03-Aug	28	yes
9-Sep	3	2	21117	N	Clyde Azak	yes	D	F	73.0	05-Sep	05-Aug	32	yes
9-Sep	5	42	21188	Y	Paul Gosselin	yes	D	F	100.0	02-Sep	17-Aug	17	yes
9-Sep[b]	5	2	21220	NA	Paul Gosselin	yes	D	F	109.0	?	02-Aug	?	?
9-Sep	7	22	21234	Y	Lawrence Stevens	yes	D	F	79.0	05-Sep	26-Aug	11	yes
9-Sep	7	21	21095	Y	Danny Wagner	yes	D	F	87.0	?	26-Jul	?	?
9-Sep	9	31	21201	N	Paul Gosselin	yes	D	M	97.0	04-Sep	08-Aug	28	yes
9-Sep	11	10	21061	N	Paul Gosselin	yes	D	F	89.5	02-Sep	03-Aug	31	yes
9-Sep	11	31	21075	Y	Clyde Azak	yes	D	F	85.0	05-Sep	30-Jul	38	yes
14-Sep[b]	1	44	21167	N	Ken Belford	yes	D	F	86.0	?	05-Aug	?	yes
14-Sep[b]	7	16	21242	NA	Ken Belford	yes	D	F	95.0	?	23-Aug	?	?
20-Sep[b]	1	21	21005	NA	Bill Koski	no	D	M	79.5	?	25-Jul	?	?
20-Sep	1	27	21275	N	Clyde Azak	yes	D	M	80.0	15-Sep	16-Aug	31	yes
20-Sep	3	25	21268	N	Bill Koski	yes	D	M	87.0	09-Sep	03-Aug	38	yes
20-Sep[b]	5	47	21221	NA	Clyde Azak	no	D	F	85.0	?	08-Aug	?	?
20-Sep	7	30	21101	N	Bill Koski	yes	D	M	96.0	12-Sep	21-Jul	54	yes
24-Sep[b]	1	21	21005	NA	Ken Belford	yes	D	M	79.5	?	25-Jul	?	?
19-Oct[b]	5	47	21221	NA	Ken Belford	yes	D	F	85.0	?	08-Aug	?	?

Table A-4. Information concerning radio-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Radio tag		Spaghetti tag		Recovered	Radio tag			Size	Date	Arrival	Days in	
date	Channel	Code	No.	Present	by	recovered	Location [a]	Sex	(cm)	died	date	system	Spawned
Bell-Irving River													
28-Aug [b]	5	33	21114	NA	Richard Alexander	no	T	F	87.0	?	08-Aug	?	?
11-Sep [b]	7	2	21301	NA	Gary Hottot	yes	O	M	96.0	?	10-Aug	?	?
Fishwheel recaptures													
21-Jun	5	17	21017	Y	Fishwheel	no	FW1	F	86.0	alive			?
25-Jun	5	26	21131	Y	Fishwheel	no	FW3	M	101.0	alive			?
28-Jun	9	3	21230	Y	Fishwheel	no	FW1	F	100.0	alive			?
28-Jun	3	5	20043	Y	Fishwheel	no	FW2	F	98.0	alive			?
28-Jun	1	10	21173	Y	Fishwheel	no	FW3	M	87.0	alive			?
29-Jun	3	13	21122	Y	Fishwheel	no	FW1	F	96.0	alive			?
29-Jun	3	47	21147	Y	Fishwheel	no	FW1	M	73.0	alive			?
1-Jul	11	6	21140	Y	Fishwheel	no	FW2	F	92.0	alive			?
2-Jul	3	10	21090	Y	Fishwheel	no	FW1	M	84.0	alive			?
2-Jul	5	2	21220	Y	Fishwheel	no	FW1	F	109.0	alive			?
2-Jul	9	15	21079	Y	Fishwheel	no	FW1	F	97.0	alive			?
2-Jul	11	11	21049	Y	Fishwheel	no	FW1	F	98.0	alive			?
2-Jul	9	10	21133	Y	Fishwheel	no	FW3	F	76.0	alive			?
3-Jul	3	18	21170	Y	Fishwheel	no	FW2	F	82.0	alive			?
4-Jul	9	47	21185	Y	Fishwheel	no	FW2	M	96.0	alive			?
5-Jul	9	47	21185	Y	Fishwheel	no	FW1	M	96.0	alive			?
6-Jul	1	24	20046	Y	Fishwheel	no	FW1	M	73.0	alive			?
6-Jul	3	16	21157	Y	Fishwheel	no	FW1	F	95.0	alive			?
14-Jul	3	21	21229	Y	Fishwheel	no	FW1	F	87.0	alive			?
19-Jul	9	49	21300	Y	Fishwheel	no	FW1	F	96.0	alive			?

[a] FF=Nisga'a Fishery, FW=fishwheel, SF=sport fishery, C=Cranberry, D=Damdochax, K=Kwinageese, M=Meziadin, MF=Meziadin Fishway, MRF=Middle-river food fishery, O=Oweegee, S=Snowbank, Se=Seaskinnish, T=Teigen, and Ts=Tseax.

[b] Spaghetti tag or radio tag recovered without carcass on spawning ground.

? - Unknown

NA - Not applicable

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20001	67.5	m	fishwheel	7-Jun	7:45	FW 2
20002	67.0	m	fishwheel	7-Jun	7:45	FW 2
20003	65.0	m	fishwheel	9-Jun	9:05	FW 2
20004	59.0	m	fishwheel	9-Jun	9:05	FW 2
20005	70.0	?	fishwheel	9-Jun	18:30	FW 2
20006	71.0	m	fishwheel	10-Jun	9:30	FW 1
20007	63.0	m	fishwheel	11-Jun	11:05	FW 2
20008	69.0	m	fishwheel	11-Jun	11:05	FW 2
20009	65.5	m	fishwheel	11-Jun	19:48	FW 1
20010	61.0	m	fishwheel	12-Jun	17:00	FW 1
20011	62.0	m	fishwheel	13-Jun	9:05	FW 2
20012	58.0	m	fishwheel	13-Jun	10:45	FW 1
20013	65.0	m	fishwheel	13-Jun	10:54	FW 1
20014	61.0	m	fishwheel	13-Jun	19:20	FW 2
20015	69.0	m	fishwheel	13-Jun	20:00	FW 1
20017	94.0	f	fishwheel	13-Jun	20:18	FW 1
20018	71.0	m	fishwheel	14-Jun	8:20	FW 1
20019	61.0	m	fishwheel	14-Jun	8:20	FW 1
20020	65.0	m	fishwheel	14-Jun	9:15	FW 2
20021	68.0	m	fishwheel	14-Jun	19:50	FW 1
20022	67.0	m	fishwheel	14-Jun	19:50	FW 1
20023	66.0	m	fishwheel	15-Jun	8:35	FW 1
20024	67.0	m	fishwheel	15-Jun	9:20	FW 2
20025	69.0	m	fishwheel	15-Jun	17:27	FW 1
20026	66.0	m	fishwheel	15-Jun	19:02	FW 1
20027	60.0	m	fishwheel	15-Jun	18:04	FW 1
20028	76.0	m	fishwheel	15-Jun	18:56	FW 2
20029	68.0	m	fishwheel	16-Jun	8:45	FW 2
20030	62.0	m	fishwheel	16-Jun	8:45	FW 2
20031	57.0	m	fishwheel	16-Jun	9:20	FW 2
20032	65.0	m	fishwheel	16-Jun	17:00	FW 1
20033	69.0	m	fishwheel	16-Jun	17:00	FW 1
20034	66.0	m	fishwheel	17-Jun	10:20	FW 2
20035	69.0	m	fishwheel	18-Jun	21:34	FW 1
20036	69.0	m	fishwheel	18-Jun	21:36	FW 1
20037	58.0	m	fishwheel	18-Jun	21:40	FW 1
20038	67.0	m	fishwheel	18-Jun	21:48	FW 1
20039	65.0	m	fishwheel	20-Jun	8:33	FW 1
20040	68.0	m	fishwheel	20-Jun	8:54	FW 1
20041	64.0	m	fishwheel	20-Jun	21:45	FW 1
20047	56.0	m	fishwheel	20-Jun	22:10	FW 2
20048	64.0	m	fishwheel	21-Jun	11:15	FW 1
20049	69.0	m	fishwheel	21-Jun	19:00	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20050	79.0	m	fishwheel	21-Jun	19:30	FW 1
20051	72.0	m	fishwheel	21-Jun	19:58	FW 2
20052	111.0	m	fishwheel	21-Jun	20:00	FW 2
20053	99.0	f	fishwheel	21-Jun	20:00	FW 2
20054	88.0	f	fishwheel	21-Jun	20:10	FW 2
20055	58.0	m	fishwheel	22-Jun	9:40	FW 1
20056	63.0	m	fishwheel	22-Jun	9:29	FW 1
20057	45.0	m	fishwheel	22-Jun	9:47	FW 1
20058	71.0	f	fishwheel	22-Jun	10:00	FW 2
20059	65.0	m	fishwheel	22-Jun	10:00	FW 2
20060	60.0	f	fishwheel	22-Jun	17:15	FW 1
20061	87.0	f	fishwheel	22-Jun	17:15	FW 1
20062	94.0	m	fishwheel	22-Jun	17:15	FW 1
20063	95.0	f	fishwheel	22-Jun	17:15	FW 1
20064	70.0	f	fishwheel	22-Jun	17:30	FW 1
20065	83.0	f	fishwheel	22-Jun	17:30	FW 1
20066	69.0	f	fishwheel	22-Jun	17:30	FW 1
20067	51.0	f	fishwheel	22-Jun	17:30	FW 1
20068	87.0	m	fishwheel	22-Jun	17:30	FW 1
20069	94.0	m	fishwheel	22-Jun	17:30	FW 1
20070	67.0	f	fishwheel	22-Jun	17:30	FW 1
20071	90.0	m	fishwheel	22-Jun	17:30	FW 1
20072	67.0	m	fishwheel	22-Jun	17:30	FW 1
20073	52.0	m	fishwheel	22-Jun	17:59	FW 1
20074	94.0	m	fishwheel	22-Jun	18:20	FW 1
20075	95.0	f	fishwheel	22-Jun	18:20	FW 1
20076	95.0	m	fishwheel	22-Jun	18:35	FW 2
20077	86.0	m	fishwheel	22-Jun	18:35	FW 2
20078	84.0	f	fishwheel	22-Jun	18:55	FW 2
20079	86.0	f	fishwheel	23-Jun	9:00	FW 1
20080	79.0	m	fishwheel	23-Jun	9:00	FW 1
20081	73.0	f	fishwheel	23-Jun	9:00	FW 1
20082	78.0	f	fishwheel	23-Jun	9:00	FW 1
20083	38.0	m	fishwheel	23-Jun	9:00	FW 1
20084	72.0	f	fishwheel	23-Jun	9:00	FW 1
20085	96.0	m	fishwheel	23-Jun	10:30	FW 2
20086	94.0	f	fishwheel	23-Jun	19:02	FW 1
20087	94.0	f	fishwheel	23-Jun	19:05	FW 1
20088	93.0	m	fishwheel	23-Jun	19:10	FW 1
20089	67.0	m	fishwheel	23-Jun	19:20	FW 1
20090	70.0	m	fishwheel	24-Jun	8:30	FW 1
20111	66.0	?	fishwheel	24-Jun	17:40	FW 1
20091	87.0	f	fishwheel	25-Jun	9:17	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20092	71.0	m	fishwheel	25-Jun	9:25	FW 1
20093	82.0	f	fishwheel	25-Jun	9:35	FW 1
20094	93.0	f	fishwheel	25-Jun	9:40	FW 1
20095	89.0	f	fishwheel	25-Jun	9:40	FW 1
20096	60.0	f	fishwheel	25-Jun	9:45	FW 1
20097	92.0	m	fishwheel	25-Jun	9:50	FW 1
20098	102.0	f	fishwheel	25-Jun	10:03	FW 1
20099	89.0	m	fishwheel	25-Jun	11:15	FW 3
20100	90.0	f	fishwheel	25-Jun	11:15	FW 3
20101	81.0	m	fishwheel	25-Jun	11:15	FW 3
20102	96.0	m	fishwheel	25-Jun	11:15	FW 3
20103	63.0	m	fishwheel	25-Jun	11:30	FW 3
20104	64.0	m	fishwheel	25-Jun	11:30	FW 3
20105	85.0	m	fishwheel	25-Jun	11:30	FW 3
20106	61.0	m	fishwheel	25-Jun	11:30	FW 3
20107	88.0	m	fishwheel	25-Jun	11:30	FW 3
20108	82.0	f	fishwheel	25-Jun	11:30	FW 3
20109	88.0	f	fishwheel	25-Jun	11:30	FW 3
20110	93.0	m	fishwheel	25-Jun	11:30	FW 3
20112	94.0	f	fishwheel	25-Jun	11:30	FW 3
20113	75.0	m	fishwheel	25-Jun	11:30	FW 3
20114	87.0	f	fishwheel	25-Jun	14:20	FW 1
20115	97.0	f	fishwheel	25-Jun	14:45	FW 1
20116	65.0	m	fishwheel	25-Jun	20:15	FW 1
20117	83.0	m	fishwheel	25-Jun	20:15	FW 1
20118	85.0	f	fishwheel	25-Jun	20:15	FW 1
20119	95.0	f	fishwheel	25-Jun	20:15	FW 1
20120	58.0	m	fishwheel	25-Jun	20:15	FW 1
20121	65.0	m	fishwheel	25-Jun	21:00	FW 1
20122	56.0	m	fishwheel	25-Jun	21:20	FW 2
20123	66.0	m	fishwheel	25-Jun	21:20	FW 2
20124	91.0	m	fishwheel	25-Jun	21:45	FW 3
20125	88.0	m	fishwheel	25-Jun	21:45	FW 3
20126	70.0	m	fishwheel	25-Jun	21:45	FW 3
20127	79.0	m	fishwheel	25-Jun	21:45	FW 3
20128	78.0	m	fishwheel	25-Jun	21:45	FW 3
20129	68.0	m	fishwheel	25-Jun	21:55	FW 3
20130	54.0	m	fishwheel	26-Jun	9:00	FW 3
20131	62.0	m	fishwheel	26-Jun	9:34	FW 1
20132	79.0	f	fishwheel	26-Jun	9:34	FW 1
20133	97.5	m	fishwheel	26-Jun	9:34	FW 1
20134	79.0	f	fishwheel	26-Jun	9:34	FW 1
20135	86.0	f	fishwheel	26-Jun	9:34	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20136	69.0	m	fishwheel	26-Jun	9:34	FW 1
20137	97.0	f	fishwheel	26-Jun	10:40	FW 1
20138	85.0	f	fishwheel	26-Jun	10:40	FW 1
20139	87.0	m	fishwheel	26-Jun	18:00	FW 1
20140	69.0	m	fishwheel	26-Jun	18:00	FW 1
20141	91.0	m	fishwheel	26-Jun	18:00	FW 1
20142	95.0	m	fishwheel	26-Jun	18:00	FW 1
20143	93.0	?	fishwheel	26-Jun	18:00	FW 1
20144	84.0	m	fishwheel	26-Jun	18:00	FW 1
20145	100.0	f	fishwheel	26-Jun	18:00	FW 1
20146	87.0	f	fishwheel	26-Jun	18:00	FW 1
20147	102.0	f	fishwheel	26-Jun	18:00	FW 1
20148	63.0	m	fishwheel	26-Jun	18:00	FW 1
20149	79.0	m	fishwheel	26-Jun	18:00	FW 1
20150	106.0	m	fishwheel	26-Jun	19:00	FW 1
20151	90.0	f	fishwheel	26-Jun	19:10	FW 2
20156	95.0	f	fishwheel	26-Jun	19:10	FW 2
20152	55.0	m	fishwheel	27-Jun	9:00	FW 1
20153	94.0	f	fishwheel	27-Jun	9:10	FW 1
20154	62.0	m	fishwheel	27-Jun	9:15	FW 1
20155	93.0	f	fishwheel	27-Jun	9:22	FW 1
20157	82.0	m	fishwheel	27-Jun	9:29	FW 1
20158	70.0	m	fishwheel	27-Jun	9:31	FW 1
20159	91.0	f	fishwheel	27-Jun	9:39	FW 1
20160	62.0	m	fishwheel	27-Jun	9:40	FW 1
20161	49.0	m	fishwheel	27-Jun	9:42	FW 1
20162	70.0	m	fishwheel	27-Jun	9:47	FW 1
20163	102.0	m	fishwheel	27-Jun	10:25	FW 3
20164	91.0	f	fishwheel	27-Jun	10:27	FW 3
20165	94.0	f	fishwheel	27-Jun	10:35	FW 3
20166	94.0	f	fishwheel	27-Jun	10:35	FW 3
20167	86.0	m	fishwheel	27-Jun	10:39	FW 3
20168	83.0	f	fishwheel	27-Jun	10:40	FW 3
20169	72.0	m	fishwheel	27-Jun	10:42	FW 3
20170	84.0	f	fishwheel	27-Jun	10:44	FW 3
20171	93.0	f	fishwheel	27-Jun	10:46	FW 3
20172	70.0	m	fishwheel	27-Jun	19:10	FW 1
20173	67.0	m	fishwheel	27-Jun	19:24	FW 1
20174	88.0	f	fishwheel	27-Jun	19:32	FW 1
20175	69.0	m	fishwheel	27-Jun	19:36	FW 1
20176	91.0	m	fishwheel	27-Jun	19:44	FW 1
20177	96.0	f	fishwheel	27-Jun	19:49	FW 1
20178	95.0	m	fishwheel	27-Jun	19:53	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20179	83.0	m	fishwheel	27-Jun	20:10	FW 2
20180	82.0	m	fishwheel	27-Jun	20:20	FW 2
20181	82.0	f	fishwheel	27-Jun	20:23	FW 2
20182	85.0	m	fishwheel	27-Jun	20:25	FW 2
20183	61.0	m	fishwheel	27-Jun	20:27	FW 2
20184	62.0	m	fishwheel	27-Jun	20:34	FW 2
20185	104.0	f	fishwheel	27-Jun	20:35	FW 2
20186	86.0	m	fishwheel	27-Jun	20:37	FW 2
20187	64.0	m	fishwheel	28-Jun	8:30	FW 1
20188	83.0	m	fishwheel	28-Jun	10:00	FW 2
20189	95.0	f	fishwheel	28-Jun	10:00	FW 2
20190	88.0	m	fishwheel	28-Jun	10:00	FW 2
20191	85.0	m	fishwheel	28-Jun	10:00	FW 2
20192	90.0	m	fishwheel	28-Jun	10:00	FW 2
20193	67.0	m	fishwheel	28-Jun	10:00	FW 2
20194	89.0	f	fishwheel	28-Jun	10:00	FW 2
20195	67.0	m	fishwheel	28-Jun	10:00	FW 2
20196	92.0	f	fishwheel	28-Jun	10:00	FW 2
20197	62.0	m	fishwheel	28-Jun	10:00	FW 2
20198	69.0	f	fishwheel	28-Jun	10:00	FW 2
20199	93.0	m	fishwheel	28-Jun	19:15	FW 1
20200	98.0	f	fishwheel	28-Jun	19:15	FW 1
20201	96.0	m	fishwheel	28-Jun	19:15	FW 1
20202	104.0	m	fishwheel	28-Jun	19:15	FW 1
20203	67.0	m	fishwheel	28-Jun	19:15	FW 1
20204	102.0	f	fishwheel	28-Jun	19:15	FW 1
20205	88.0	m	fishwheel	28-Jun	19:15	FW 1
20206	90.0	f	fishwheel	28-Jun	19:15	FW 1
20207	103.0	m	fishwheel	28-Jun	19:15	FW 1
20208	91.0	f	fishwheel	28-Jun	19:15	FW 1
20209	63.0	m	fishwheel	28-Jun	19:15	FW 1
20210	101.0	f	fishwheel	28-Jun	20:40	FW 2
20211	93.0	m	fishwheel	28-Jun	20:40	FW 2
20212	111.0	m	fishwheel	28-Jun	20:40	FW 2
20213	64.0	m	fishwheel	28-Jun	20:40	FW 2
20214	74.0	f	fishwheel	28-Jun	20:40	FW 2
20215	91.0	m	fishwheel	28-Jun	20:40	FW 2
20216	86.0	f	fishwheel	28-Jun	20:40	FW 2
20217	101.0	m	fishwheel	28-Jun	20:40	FW 2
20218	64.0	m	fishwheel	28-Jun	20:40	FW 2
20219	66.0	m	fishwheel	28-Jun	20:40	FW 2
20220	91.0	m	fishwheel	28-Jun	20:40	FW 2
20221	46.0	m	fishwheel	28-Jun	20:40	FW 2

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20222	93.0	f	fishwheel	28-Jun	20:40	FW 2
20223	66.0	m	fishwheel	28-Jun	21:40	FW 3
20224	65.0	m	fishwheel	28-Jun	21:40	FW 3
21263	101.0	m	fishwheel	28-Jun	8:30	FW 1
20225	98.0	f	fishwheel	29-Jun	8:31	FW 1
20226	99.0	m	fishwheel	29-Jun	8:39	FW 1
20227	63.0	m	fishwheel	29-Jun	10:30	FW 2
20228	90.0	f	fishwheel	29-Jun	10:45	FW 2
20229	91.0	m	fishwheel	29-Jun	10:46	FW 2
20230	93.0	f	fishwheel	29-Jun	10:57	FW 2
20231	82.0	f	fishwheel	29-Jun	11:15	FW 3
20232	79.0	m	fishwheel	29-Jun	11:20	FW 3
20233	84.0	f	fishwheel	29-Jun	11:23	FW 3
20234	67.0	m	fishwheel	29-Jun	19:25	FW 1
20235	88.0	f	fishwheel	29-Jun	19:33	FW 1
20236	96.0	f	fishwheel	29-Jun	19:41	FW 1
20239	79.0	f	fishwheel	29-Jun	20:05	FW 2
20240	77.0	f	fishwheel	29-Jun	20:09	FW 2
20241	73.0	f	fishwheel	29-Jun	19:55	FW 2
20242	73.0	m	fishwheel	29-Jun	20:01	FW 2
20243	77.0	f	fishwheel	29-Jun	20:14	FW 2
20244	89.0	f	fishwheel	29-Jun	20:15	FW 2
20245	96.0	f	fishwheel	29-Jun	20:16	FW 2
20246	94.0	f	fishwheel	29-Jun	20:20	FW 2
20247	97.0	m	fishwheel	29-Jun	20:23	FW 2
20248	71.0	m	fishwheel	29-Jun	20:31	FW 2
20249	73.0	m	fishwheel	29-Jun	20:45	FW 3
20250	68.0	m	fishwheel	29-Jun	20:47	FW 3
20251	89.0	f	fishwheel	29-Jun	20:52	FW 3
20252	88.0	f	fishwheel	29-Jun	20:54	FW 3
20253	86.0	f	fishwheel	30-Jun	8:30	FW 1
20254	95.0	f	fishwheel	30-Jun	8:30	FW 1
20255	64.0	m	fishwheel	30-Jun	8:30	FW 1
20256	70.0	f	fishwheel	30-Jun	8:30	FW 1
20257	80.0	f	fishwheel	30-Jun	8:30	FW 1
20258	92.0	f	fishwheel	30-Jun	8:30	FW 2
20259	82.0	f	fishwheel	30-Jun	8:30	FW 1
20260	89.0	f	fishwheel	30-Jun	8:30	FW 2
20261	93.0	f	fishwheel	30-Jun	8:30	FW 2
20262	85.0	f	fishwheel	30-Jun	8:30	FW 2
20263	99.0	m	fishwheel	30-Jun	8:30	FW 2
20264	103.0	m	fishwheel	30-Jun	8:30	FW 2
20265	93.0	f	fishwheel	30-Jun	10:35	FW 2

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20266	87.0	f	fishwheel	30-Jun	8:30	FW 2
20267	66.0	m	fishwheel	30-Jun	12:10	FW 2
20268	62.0	m	fishwheel	30-Jun	19:00	FW 1
20269	91.0	m	fishwheel	30-Jun	19:16	FW 1
20270	58.0	m	fishwheel	30-Jun	19:21	FW 1
20271	70.0	m	fishwheel	30-Jun	19:31	FW 1
20272	64.0	m	fishwheel	30-Jun	19:41	FW 1
20273	96.0	f	fishwheel	30-Jun	19:53	FW 2
20274	66.0	m	fishwheel	30-Jun	20:00	FW 2
20275	81.0	m	fishwheel	30-Jun	20:05	FW 2
20276	63.0	m	fishwheel	30-Jun	20:09	FW 2
20277	66.0	m	fishwheel	30-Jun	20:11	FW 2
20278	77.0	m	fishwheel	30-Jun	20:15	FW 2
20279	86.0	f	fishwheel	30-Jun	20:16	FW 2
20280	75.0	m	fishwheel	30-Jun	20:18	FW 2
20281	71.0	m	fishwheel	30-Jun	20:19	FW 2
20282	57.0	m	fishwheel	30-Jun	20:21	FW 2
20283	74.0	m	fishwheel	1-Jul	9:30	FW 1
20284	95.0	m	fishwheel	1-Jul	9:50	FW 1
20285	64.0	m	fishwheel	1-Jul	10:30	FW 2
20286	80.0	f	fishwheel	1-Jul	10:35	FW 2
20287	60.0	m	fishwheel	1-Jul	10:45	FW 2
20288	68.0	m	fishwheel	1-Jul	10:50	FW 2
20289	92.0	f	fishwheel	1-Jul	11:10	FW 2
20290	67.0	m	fishwheel	1-Jul	19:20	FW 1
20291	56.0	m	fishwheel	1-Jul	19:20	FW 1
20292	93.0	f	fishwheel	1-Jul	19:20	FW 1
20293	92.0	f	fishwheel	1-Jul	20:15	FW 2
20294	74.0	m	fishwheel	1-Jul	20:15	FW 2
20295	80.0	f	fishwheel	1-Jul	20:15	FW 2
20296	60.0	m	fishwheel	2-Jul	9:00	FW 1
20297	61.0	m	fishwheel	2-Jul	9:15	FW 1
20298	63.0	m	fishwheel	2-Jul	9:15	FW 1
20299	68.0	m	fishwheel	2-Jul	9:15	FW 1
20300	66.0	m	fishwheel	2-Jul	9:15	FW 1
20301	68.0	m	fishwheel	2-Jul	9:15	FW 1
20302	85.0	f	fishwheel	2-Jul	10:10	FW 1
20303	71.0	f	fishwheel	2-Jul	10:25	FW 2
20304	90.0	f	fishwheel	2-Jul	10:25	FW 2
20305	83.0	m	fishwheel	2-Jul	10:25	FW 2
20306	76.0	m	fishwheel	2-Jul	10:25	FW 2
20307	93.0	f	fishwheel	2-Jul	10:25	FW 2
20308	87.0	f	fishwheel	2-Jul	11:00	FW 2

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20309	87.0	f	fishwheel	2-Jul	11:10	FW 3
20310	90.0	m	fishwheel	2-Jul	18:20	FW 1
20311	87.0	m	fishwheel	2-Jul	18:20	FW 1
20312	59.0	m	fishwheel	2-Jul	18:20	FW 1
20313	94.0	f	fishwheel	2-Jul	18:20	FW 1
20314	96.0	f	fishwheel	2-Jul	18:20	FW 1
20315	98.0	f	fishwheel	2-Jul	18:20	FW 1
20316	59.0	m	fishwheel	2-Jul	19:05	FW 1
20317	54.0	m	fishwheel	2-Jul	19:15	FW 2
20318	91.0	f	fishwheel	2-Jul	19:15	FW 2
20319	70.0	m	fishwheel	2-Jul	19:15	FW 2
20320	68.0	m	fishwheel	2-Jul	19:40	FW 2
20321	69.0	m	fishwheel	3-Jul	8:30	FW 1
20322	62.0	m	fishwheel	3-Jul	8:30	FW 1
20323	80.0	f	fishwheel	3-Jul	8:30	FW 1
20324	70.0	m	fishwheel	3-Jul	8:30	FW 1
20325	70.0	m	fishwheel	3-Jul	8:30	FW 1
20326	105.0	m	fishwheel	3-Jul	10:15	FW 2
20327	89.0	f	fishwheel	3-Jul	10:15	FW 1
20328	59.0	m	fishwheel	3-Jul	18:00	FW 1
20329	90.0	m	fishwheel	3-Jul	18:00	FW 1
20330	66.0	m	fishwheel	3-Jul	18:00	FW 1
20331	65.0	m	fishwheel	3-Jul	18:00	FW 1
20332	64.0	m	fishwheel	3-Jul	18:00	FW 1
20333	61.0	m	fishwheel	3-Jul	18:00	FW 1
20334	70.0	m	fishwheel	3-Jul	18:00	FW 1
20335	94.0	m	fishwheel	3-Jul	19:30	FW 1
20336	56.0	m	fishwheel	3-Jul	19:30	FW 1
20337	65.0	m	fishwheel	3-Jul	19:30	FW 1
20338	52.0	m	fishwheel	3-Jul	19:35	FW 2
20339	62.0	m	fishwheel	3-Jul	19:35	FW 2
20340	79.0	f	fishwheel	3-Jul	19:50	FW 2
20341	92.0	f	fishwheel	4-Jul	8:30	FW 1
20342	88.0	f	fishwheel	4-Jul	10:20	FW 1
20343	86.0	m	fishwheel	4-Jul	10:50	FW 2
20344	83.0	f	fishwheel	4-Jul	11:25	FW 2
20346	85.0	f	fishwheel	4-Jul	18:05	FW 1
20347	92.0	f	fishwheel	4-Jul	18:05	FW 1
20348	72.0	m	fishwheel	4-Jul	18:05	FW 1
20350	95.0	f	fishwheel	4-Jul	18:05	FW 1
20351	71.0	f	fishwheel	4-Jul	18:05	FW 1
20352	67.0	m	fishwheel	4-Jul	18:05	FW 1
20353	68.0	m	fishwheel	4-Jul	18:05	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20354	86.0	f	fishwheel	4-Jul	18:05	FW 1
20355	90.0	f	fishwheel	4-Jul	18:05	FW 1
20356	102.0	f	fishwheel	4-Jul	18:05	FW 1
20357	101.0	f	fishwheel	4-Jul	18:05	FW 1
20358	93.0	m	fishwheel	4-Jul	18:05	FW 1
20359	71.0	f	fishwheel	4-Jul	20:00	FW 1
20360	86.0	m	fishwheel	4-Jul	20:03	FW 2
20361	72.0	f	fishwheel	4-Jul	20:03	FW 2
20362	114.0	m	fishwheel	4-Jul	21:15	FW 2
20363	71.0	f	fishwheel	5-Jul	8:30	FW 1
20364	61.0	f	fishwheel	5-Jul	8:30	FW 1
20365	74.0	m	fishwheel	5-Jul	10:09	FW 1
20366	68.0	m	fishwheel	5-Jul	10:10	FW 1
20367	64.0	m	fishwheel	5-Jul	10:50	FW 2
20368	69.0	m	fishwheel	5-Jul	11:17	FW 2
20369	69.0	f	fishwheel	5-Jul	18:30	FW 1
20370	70.0	m	fishwheel	5-Jul	18:30	FW 1
20371	95.0	m	fishwheel	5-Jul	18:30	FW 1
20372	61.0	m	fishwheel	5-Jul	18:30	FW 1
20373	81.0	m	fishwheel	5-Jul	19:30	FW 1
20374	76.0	m	fishwheel	5-Jul	19:30	FW 1
20375	99.0	f	fishwheel	5-Jul	19:46	FW 1
20376	73.0	m	fishwheel	5-Jul	19:48	FW 1
20377	73.0	m	fishwheel	5-Jul	19:50	FW 1
20378	68.0	m	fishwheel	5-Jul	19:52	FW 1
20379	102.0	m	fishwheel	5-Jul	19:54	FW 1
20380	103.0	f	fishwheel	5-Jul	20:10	FW 2
20381	72.0	f	fishwheel	5-Jul	20:17	FW 2
20382	87.0	f	fishwheel	5-Jul	20:19	FW 2
20383	81.0	m	fishwheel	5-Jul	20:27	FW 2
20384	95.0	m	fishwheel	6-Jul	8:00	FW 1
20385	97.0	m	fishwheel	6-Jul	9:15	FW 1
20386	61.0	m	fishwheel	6-Jul	9:35	FW 2
20387	68.0	m	fishwheel	6-Jul	9:35	FW 2
20388	63.0	m	fishwheel	6-Jul	10:00	FW 2
20389	65.0	m	fishwheel	6-Jul	14:05	FW 1
20390	67.0	m	fishwheel	6-Jul	15:40	FW 2
20391	67.0	m	fishwheel	6-Jul	15:45	FW 2
20392	93.0	f	fishwheel	6-Jul	16:05	FW 3
20393	63.0	m	fishwheel	6-Jul	19:40	FW 1
20394	55.0	m	fishwheel	6-Jul	19:43	FW 1
20395	68.0	f	fishwheel	7-Jul	8:00	FW 1
20396	65.0	f	fishwheel	7-Jul	9:35	FW 2

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20397	62.0	m	fishwheel	7-Jul	10:00	FW 2
20398	59.0	m	fishwheel	7-Jul	14:58	FW 1
20399	64.0	f	fishwheel	7-Jul	15:00	FW 1
20400	64.0	f	fishwheel	7-Jul	16:10	FW 1
20402	59.0	m	fishwheel	7-Jul	18:30	FW 2
20403	77.0	f	fishwheel	7-Jul	19:25	FW 2
20404	64.0	m	fishwheel	7-Jul	18:30	FW 2
20405	99.0	f	fishwheel	7-Jul	19:25	FW 2
20406	62.0	m	fishwheel	7-Jul	20:15	FW 1
20407	70.0	m	fishwheel	7-Jul	21:00	FW 1
20408	70.0	m	fishwheel	7-Jul	21:00	FW 1
20409	69.0	m	fishwheel	8-Jul	8:00	FW 1
20410	65.0	m	fishwheel	8-Jul	9:40	FW 1
20411	66.0	m	fishwheel	8-Jul	10:30	FW 2
20412	60.0	m	fishwheel	8-Jul	11:00	FW 2
20413	62.0	m	fishwheel	8-Jul	18:00	FW 1
20414	63.0	f	fishwheel	8-Jul	20:20	FW 1
20415	73.0	m	fishwheel	8-Jul	20:40	FW 2
20416	94.0	f	fishwheel	9-Jul	13:30	FW 2
20417	69.0	m	fishwheel	9-Jul	14:25	FW 3
20418	75.0	m	fishwheel	9-Jul	21:30	FW 1
20419	90.0	f	fishwheel	9-Jul	21:40	FW 2
20420	66.0	m	fishwheel	10-Jul	8:30	FW 1
20421	60.0	m	fishwheel	10-Jul	20:15	FW 2
20422	44.0	m	fishwheel	11-Jul	9:20	FW 1
20423	72.0	f	fishwheel	11-Jul	9:20	FW 1
20424	63.0	m	fishwheel	11-Jul	10:47	FW 1
20425	86.5	m	fishwheel	11-Jul	11:15	FW 2
20426	65.0	m	fishwheel	11-Jul	18:55	FW 1
20427	100.0	f	fishwheel	11-Jul	19:15	FW 2
20428	86.0	f	fishwheel	11-Jul	20:30	FW 2
20349	73.0	f	fishwheel	12-Jul	19:08	FW 1
20429	82.0	m	fishwheel	12-Jul	9:20	FW 1
20431	56.0	m	fishwheel	12-Jul	10:50	FW 1
20432	44.0	m	fishwheel	12-Jul	18:10	FW 1
? [a]	57.0	m	fishwheel	12-Jul	19:15	FW 2
20433	?	?	fishwheel	13-Jul	19:00	FW 2
20434	61.0	m	fishwheel	14-Jul	9:25	FW 1
20435	64.0	f	fishwheel	14-Jul	10:15	FW 1
20447	57.0	m	fishwheel	14-Jul	18:00	FW 1
20448	72.0	m	fishwheel	14-Jul	20:05	FW 2
20449	99.0	f	fishwheel	15-Jul	9:00	FW 1
20450	97.0	f	fishwheel	15-Jul	9:50	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20451	80.0	m	fishwheel	15-Jul	18:00	FW 1
20452	94.0	m	fishwheel	15-Jul	19:50	FW 1
20453	91.0	f	fishwheel	15-Jul	20:40	FW 1
20454	71.0	m	fishwheel	16-Jul	20:00	FW 1
20455	73.0	m	fishwheel	16-Jul	21:20	FW 1
20456	59.0	m	fishwheel	16-Jul	21:26	FW 1
20457	58.0	m	fishwheel	17-Jul	9:15	FW 1
20458	107.0	m	fishwheel	17-Jul	9:15	FW 1
20459	69.0	m	fishwheel	17-Jul	17:30	FW 1
20460	63.0	m	fishwheel	17-Jul	17:30	FW 1
20461	50.0	m	fishwheel	18-Jul	9:20	FW 1
20462	87.0	f	fishwheel	18-Jul	9:20	FW 1
20463	101.0	f	fishwheel	18-Jul	9:20	FW 1
20464	80.0	f	fishwheel	18-Jul	9:20	FW 1
20465	42.0	m	fishwheel	18-Jul	11:35	FW 2
20466	46.0	m	fishwheel	18-Jul	17:55	FW 1
20467	61.0	m	fishwheel	19-Jul	18:00	FW 1
20468	84.0	f	fishwheel	19-Jul	18:00	FW 1
20469	105.0	f	fishwheel	19-Jul	18:00	FW 1
20470	69.0	m	fishwheel	19-Jul	19:00	FW 1
20471	86.0	f	fishwheel	20-Jul	9:55	FW 1
20472	65.0	m	fishwheel	21-Jul	6:00	FW 1
20473	62.0	m	fishwheel	21-Jul	6:00	FW 1
20474	68.0	m	fishwheel	21-Jul	19:45	FW 1
20475	86.0	f	fishwheel	22-Jul	22:15	FW 2
20476	99.0	f	fishwheel	22-Jul	22:15	FW 2
? [a]	86.0	f	fishwheel	22-Jul	22:15	FW 2
20477	80.0	f	fishwheel	23-Jul	11:15	FW 1
20478	103.0	m	fishwheel	23-Jul	21:45	FW 1
20479	100.0	f	fishwheel	24-Jul	20:23	FW 1
20480	97.0	f	fishwheel	25-Jul	8:10	FW 1
20481	63.0	f	fishwheel	25-Jul	8:45	FW 1
20485	87.0	m	fishwheel	26-Jul	18:16	FW 2
20487	65.0	f	fishwheel	27-Jul	18:45	FW 1
20486	103.0	f	fishwheel	4-Aug	8:41	FW 1
20488	88.0	f	fishwheel	5-Aug	8:11	FW 1
20489	100.0	m	fishwheel	5-Aug	9:22	FW 1
20490	97.0	f	fishwheel	5-Aug	17:30	FW 1
20491	77.0	m	fishwheel	5-Aug	17:30	FW 1
20492	93.0	f	fishwheel	5-Aug	18:44	FW 1
20493	109.0	f	fishwheel	6-Aug	8:00	FW 1
20494	92.0	f	fishwheel	6-Aug	8:00	FW 1
20495	91.0	f	fishwheel	6-Aug	8:00	FW 1

Table A-5. Information regarding chinook salmon that were spaghetti tagged on the lower Nass River during 1993.

Spaghetti tag number	Nose-fork length (cm)	Sex	Method of capture	Tagging date	Release	
					Time	Location
20496	71.0	m	fishwheel	6-Aug	10:06	FW 1
20497	98.0	f	fishwheel	7-Aug	19:47	FW 1
20498	97.0	f	fishwheel	8-Aug	8:55	FW 1
20499	82.0	m	fishwheel	9-Aug	8:05	FW 1
20500	89.0	f	fishwheel	9-Aug	18:35	FW 1
20501	95.0	f	fishwheel	9-Aug	19:20	FW 1
20502	90.0	m	fishwheel	9-Aug	19:20	FW 1
20503	94.0	f	fishwheel	10-Aug	8:33	FW 1
20504	90.0	m	fishwheel	10-Aug	8:39	FW 1
21392	105.0	f	fishwheel	12-Aug	9:13	FW 2
20505	88.0	f	fishwheel	14-Aug	18:25	FW 2
20506	92.0	f	fishwheel	15-Aug	7:30	FW 2
20510	84.0	f	fishwheel	15-Aug	19:20	FW 2

[a] Fish were spaghetti tagged but released with no number present.

Table A-6. Information concerning spaghetti-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Spaghetti tag		Captured	Spaghetti			Size	Date	
date	No.	Present	by	recovered	Location[a]	Sex	(cm)	died	Spawned
Nisga'a food fishery									
24-Jun	20041	Y	Bruce Azak	yes	FF	M	64.0	24-Jun	no
27-Jun	20122	Y	Edward Azak	yes	FF	M	56.0	27-Jun	no
28-Jun	20067	Y	Charles Swanson	yes	FF	F	51.0	28-Jun	no
28-Jun	20137	Y	Charles Swanson	yes	FF	F	97.0	28-Jun	no
30-Jun	20051	Y	Richard Morgan	yes	FF	M	72.0	30-Jun	no
30-Jun	20102	Y	Clyde Azak	yes	FF	M	96.0	30-Jun	no
30-Jun	20127	Y	Bruce Stevens	yes	FF	M	79.0	30-Jun	no
30-Jun	20167	Y	Steve Bolton	yes	FF	M	86.0	30-Jun	no
30-Jun	20169	Y	Soloman Watts	yes	FF	M	72.0	30-Jun	no
30-Jun	20171	Y	Vern Azak	yes	FF	F	93.0	30-Jun	no
30-Jun	20251	Y	Steve Bolton	yes	FF	F	89.0	30-Jun	no
30-Jun	20261	Y	Charles Adams	yes	FF	F	93.0	30-Jun	no
30-Jun	20280	Y	Charles Adams	yes	FF	M	75.0	30-Jun	no
1-Jul	20013	Y	Dave Griffin	yes	FF	?	?	1-Jul	no
1-Jul	20142	Y	Soloman Watts	yes	FF	?	?	1-Jul	no
1-Jul	20197	Y	Soloman Watts	yes	FF	M	62.0	1-Jul	no
1-Jul	20199	Y	Keith Azak	yes	FF	M	93.0	1-Jul	no
1-Jul	20260	Y	Albert Stephens	yes	FF	F	89.0	1-Jul	no
1-Jul	20299	Y	Dave Griffin	yes	FF	M	68.0	1-Jul	no
1-Jul	20335	Y	Dave Griffin	yes	FF	M	94.0	1-Jul	no
2-Jul	20048	Y	Clyde Azak	yes	FF	M	64.0	2-Jul	no
2-Jul	20053	Y	Charles Swanson	yes	FF	F	99.0	2-Jul	no
2-Jul	20180	Y	Bruce Haldane	yes	FF	M	82.0	2-Jul	no
2-Jul	20282	Y	Clyde Azak	yes	FF	M	57.0	2-Jul	no
2-Jul	20287	Y	Clyde Azak	yes	FF	M	60.0	2-Jul	no
3-Jul	20198	Y	John Robinson	yes	FF	F	69.0	3-Jul	no
7-Jul	20249	Y	Albert Stephens	yes	FF	M	73.0	7-Jul	no
12-Jul	20081	Y	Clyde Azak	yes	FF	F	73.0	12-Jul	no
12-Jul	20411	Y	Ernie Morven	yes	FF	M	66.0	12-Jul	no
12-Jul	20412	Y	Clyde Azak	yes	FF	M	60.0	12-Jul	no
13-Jul	20100	Y	Kelly Stephens	yes	FF	F	90.0	13-Jul	no
14-Jul	20395	Y	Paul Martin	yes	FF	F	68.0	14-Jul	no
16-Jul	20273	Y	Robert Stewart	yes	FF	F	96.0	16-Jul	no
20-Jul	20322	Y	Clarence Stevens	yes	FF	M	62.0	20-Jul	no
20-Jul	20418	Y	Clarence Stevens	yes	FF	M	75.0	20-Jul	no
21-Jul	20457	Y	Phillip Morven	yes	FF	M	58.0	21-Jul	no
24-Jul	20391	Y	Dave Griffin	yes	FF	M	67.0	24-Jul	no
25-Jul	20426	Y	Paul Gosselin	yes	FF	M	65.0	25-Jul	no
26-Jul	20111	Y	Paul Martin	yes	FF	?	66.0	26-Jul	no
29-Jul	20324	Y	Gerry Clayton	yes	FF	M	70.0	29-Jul	no
12-Aug	20504	Y	Clarence Vickers	yes	FF	M	90.0	12-Aug	no
14-Aug	20499	Y	Clarence Vickers	yes	FF	M	82.0	14-Aug	no

Table A-6. Information concerning spaghetti-tagged chinook salmon recovered on the Nass River, 1993.

Recapture date	Spaghetti tag No.	Present	Captured by	Spaghetti recovered	Location [a]	Sex	Size (cm)	Date died	Spawned
Tseax River									
23-Sep	20490	Y	Gary Dyer	yes	Ts-FF	F	97.0	23-Sep	no
Mouth of Tchitin River									
3-Jul	20058	Y	Ron Tetreau	no	Tc-SF	F	71.0	3-Jul	no
13-Jul	20220	Y	Gordon Wolf	yes	Tc-SF	M	91.0	13-Jul	no
13-Jul	20293	Y	Gordon Wolf	no	Tc-SF	F	92.0	released	?
13-Jul	20229	Y	Harold Anstey	yes	Tc-SF	M	91.0	13-Jul	no
Cranberry River									
20-Jul	20133	Y	Jim Fetterly	yes	C-SF	M	97.5	20-Jul	no
22-Jul	20172	Y	Ken Kilbreath	yes	C-SF	M	70.0	22-Jul	no
24-Jul	20342	Y	Mario Domenis	yes	C-SF	F	88.0	24-Jul	no
24-Jul	20410	Y	Larry Christensen	yes	C-SF	M	65.0	24-Jul	no
26-Aug	20409	Y	George Schultze	yes	C-SF	M	69.0	26-Aug	no
Meziadin River and mouth									
14-Jul	20030	Y	Eckard's Guiding	yes	M-SF	M	62.0	14-Jul	no
15-Jul	20073	Y	Eckard's Guiding	yes	M-SF	M	52.0	15-Jul	no
30-Jul	20214	Y	Jim and Ian	no	MF	F	74.0	alive	?
16-Aug	20341	Y	Eckard's Guiding	yes	M-SF	F	92.0	16-Aug	no
17-Aug	20212	Y	Food fishery	no	MRF	M	111.0	17-Aug	no
19-Aug	20163	Y	Jim and Ian	no	MF	M	102.0	alive	?
25-Aug	20223	Y	Jim and Ian	no	MF	M	66.0	alive	?
1-Sep	20244	Y	Jim and Ian	no	MF	F	89.0	alive	?
21-Sep	20303	Y	Richard Alexander	yes	M	M	71.0	17-Sep	yes
21-Sep	20321	Y	Bill Koski	yes	M	M	69.0	15-Sep	yes
Kwinageese River									
10-Sep [c]	20005	NA	Paul Gosselin	yes	K	?	?	?	?
10-Sep	20027	Y	Paul Gosselin	yes	K	M	60.0	08-Sep	yes
10-Sep [c]	20050	NA	Clyde Azak	yes	K	M	79.0	?	?
10-Sep	20068	Y	Paul Gosselin	yes	K	M	87.0	06-Sep	yes
10-Sep [c]	20072	NA	Paul Gosselin	yes	K	M	67.0	?	?
10-Sep	20086	Y	Lawrence Stevens	yes	K	F	94.0	05-Sep	yes
10-Sep	20125	Y	Paul Gosselin	yes	K	M	88.0	07-Sep	yes
10-Sep	20164	Y	Paul Gosselin	yes	K	F	91.0	06-Sep	yes
10-Sep [c]	20188	NA	Clyde Azak	yes	K	M	83.0	?	?
10-Sep [c]	20227	NA	Clyde Azak	yes	K	M	63.0	?	?
10-Sep [c]	20253	NA	Clyde Azak	yes	K	F	86.0	?	?
10-Sep	20339	Y	Clyde Azak	yes	K	M	64.0	07-Sep	yes
17-Sep [c]	20116	NA	Paul Gosselin	yes	K	M	65.0	?	?

Table A-6. Information concerning spaghetti-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Spaghetti tag		Captured	Spaghetti			Size	Date	
date	No.	Present	by	recovered	Location [a]	Sex	(cm)	died	Spawned
Damdochax Creek									
1-Sep	20022	Y	Clyde Azak	yes	D	M	67.0	?	?
1-Sep	20177	Y	Richard Alexander	yes	D	F	96.0	23-Aug	yes
1-Sep	20307	Y	Clyde Azak	yes	D	F	93.0	?	?
9-Sep	20040	Y	Lawrence Stevens	yes	D	F	68.0	05-Sep	yes
9-Sep	20082	Y	Clyde Azak	yes	D	F	78.0	05-Sep	yes
9-Sep [c]	20149	NA	Richard Alexander	yes	D	M	79.0	?	?
9-Sep	20201	Y	Paul Gosselin	yes	D	F	96.0	07-Sep	yes
9-Sep [c]	20325	NA	Richard Alexander	yes	D	M	70.0	?	?
9-Sep	20385	Y	Lawrence Stevens	yes	D	F	97.0	04-Sep	yes
9-Sep	20399	Y	Clyde Azak	yes	D	M	64.0	05-Sep	yes
9-Sep	20463	Y	Paul Gosselin	yes	D	F	101.0	26-Aug	yes
12-Sep	20204	Y	Ken Belford	yes	D	M	102.0	?	yes
20-Sep [c]	20187	NA	Clyde Azak	yes	D	M	64.0	?	?
20-Sep [c]	20404	NA	Clyde Azak	yes	D	M	64.0	?	?
20-Sep	20424	Y	Bill Koski	yes	D	M	63.0	12-Sep	yes
20-Sep	tag [b]	Y	Bill Koski	yes	D	M	?	16-Sep	yes
Bell-Irving River									
4-Sep [c]	20269	NA	Richard Alexander	yes	O	M	91.0	?	?
Fishwheel recaptures									
15-Jun	20004	Y	Fishwheel	no	FW2	M	59.0	alive	?
27-Jun	20036	Y	Fishwheel	no	FW2	M	69.0	alive	?
28-Jun	20179	Y	Fishwheel	no	FW1	M	83.0	alive	?
2-Jul	20107	Y	Fishwheel	no	FW3	M	88.0	alive	?
3-Jul	20286	Y	Fishwheel	no	FW1	F	80.0	alive	?
4-Jul	20113	Y	Fishwheel	no	FW1	M	75.0	alive	?
5-Jul	20132	Y	Fishwheel	no	FW1	F	79.0	alive	?
5-Jul	20157	Y	Fishwheel	no	FW3	M	82.0	alive	?
6-Jul	20239	Y	Fishwheel	no	FW1	F	79.0	alive	?
7-Jul	20035	Y	Fishwheel	no	FW1	M	69.0	alive	?
7-Jul	20165	Y	Fishwheel	no	FW1	F	94.0	alive	?
9-Jul	20032	Y	Fishwheel	no	FW1	M	65.0	alive	?
9-Jul	20402	Y	Fishwheel	no	FW1	M	59.0	alive	?
11-Jul	20245	Y	Fishwheel	no	FW1	F	96.0	alive	?
12-Jul	20271	Y	Fishwheel	no	FW2	M	70.0	alive	?
12-Jul	20319	Y	Fishwheel	no	FW1	M	70.0	alive	?
12-Jul	20355	Y	Fishwheel	no	FW2	F	90.0	alive	?
12-Jul	20369	Y	Fishwheel	no	FW2	F	69.0	alive	?
13-Jul	20391	Y	Fishwheel	no	FW1	M	67.0	alive	?
14-Jul	20217	Y	Fishwheel	no	FW2	M	101.0	alive	?
14-Jul	20228	Y	Fishwheel	no	FW1	F	90.0	alive	?
14-Jul	20328	Y	Fishwheel	no	FW1	M	59.0	alive	?
14-Jul	20405	Y	Fishwheel	no	FW1	F	99.0	alive	?
15-Jul	20312	Y	Fishwheel	no	FW1	M	59.0	alive	?
15-Jul	20414	Y	Fishwheel	no	FW1	F	63.0	alive	?

Table A-6. Information concerning spaghetti-tagged chinook salmon recovered on the Nass River, 1993.

Recapture	Spaghetti tag		Captured	Spaghetti			Size	Date	
date	No.	Present	by	recovered	Location [a]	Sex	(cm)	died	Spawned
18-Jul	20359	Y	Fishwheel	no	FW1	F	71.0	alive	?
18-Jul	20393	Y	Fishwheel	no	FW1	M	63.0	alive	?
22-Jul	20465	Y	Fishwheel	no	FW1	M	42.0	alive	?
24-Jul	20381	Y	Fishwheel	no	FW1	F	72.0	alive	?
26-Jul	20052	Y	Fishwheel	no	FW2	M	111.0	alive	?
10-Aug	20402	Y	Fishwheel	no	FW1	M	59.0	alive	?
15-Aug	20506	Y	Fishwheel	no	FW2	F	92.0	alive	?

[a] FF=Nisga'a Fishery, FW=fishwheel, SF=sport fishery, C=Cranberry, D=Damdochax, K=Kwinageese, M=Meziadin, MF=Meziadin Fishway, MRF=Middle-river aboriginal fishery, O=Oweegee, S=Snowbank, Se=Seaskinnish, T=Teigen, and Ts=Tseax.

[b] D.F.O. anchor tag number: 592-04452.

[c] Spaghetti tag recovered without carcass on spawning ground.

NA - Not applicable

Table A-7. Radio tag data used to estimate residence times of chinook in Damdochax Creek, 1993.

Date recovered	Spaghetti tag no.	Arrival date[a]	Date died	Residence time (d)
Females (n=7)				
1-Sep	21174	12-Aug	29-Aug	18
9-Sep	21075	30-Jul	5-Sep	38
9-Sep	21061	3-Aug	2-Sep	31
9-Sep	21117	5-Aug	5-Sep	32
9-Sep	21068	8-Aug	6-Sep	30
9-Sep	21188	17-Aug	2-Sep	17
9-Sep	21234	26-Aug	5-Sep	11
			Mean	25.29
			SD	9.89
Males (n=7)				
1-Sep	21051	27-Jul	21-Aug	26
1-Sep	21074	11-Aug	23-Aug	13
9-Sep	21129	2-Aug	30-Aug	29
9-Sep	21201	7-Aug	4-Sep	29
20-Sep	21101	20-Jul	12-Sep	55
20-Sep	21268	2-Aug	9-Sep	39
20-Sep	21275	15-Aug	15-Sep	32
			Mean	31.86
			SD	12.86

Males and females (n = 14)

Mean	28.57
SD	11.54
Upper 95% CL	34.62
Lower 95% CL	22.53

[a] Arrival was determined by a fixed-station receiver positioned at the confluence of the Nass River and Damdochax Creek. A fish was considered to have entered Damdochax Creek when it moved upstream into the creek and was no longer recorded at the station (FS7).

Table A-8. Radio tag data used to estimate residence times of chinook in Kwinageese River, 1993.

Date recovered	Spaghetti tag no.	Arrival date [a]	Date died	Residence time (d)
Females (n=9)				
10-Sep	21081	7-Jul	8-Sep	64
10-Sep	21059	16-Jul	5-Sep	52
10-Sep	21135	24-Jul	6-Sep	45
10-Sep	21179	26-Jul	5-Sep	42
10-Sep	21152	26-Jul	3-Sep	40
10-Sep	21243	27-Jul	4-Sep	40
10-Sep	21102	28-Jul	7-Sep	42
17-Sep	21161	11-Aug	7-Sep	28
17-Sep	21331	20-Aug	16-Sep	28
			Mean	42.33
			SD	11.14
Males (n=1)				
10-Sep	21184	4-Aug	7-Sep	35

Males and females (n = 10)	
Mean	41.60
SD	10.75
Upper 95% CL	48.26
Lower 95% CL	34.94

[a] Arrival was determined by a fixed-station receiver positioned at the confluence of the Nass River and Kwinageese River. A fish was considered to have entered Kwinageese River when it moved upstream into the creek and was no longer recorded at the station (FS4).

Table A-9. Radio tag data used to estimate residence times of chinook in Meziadin River, 1993.

Date recovered	Spaghetti tag no.	Arrival date[a]	Date died	Residence time (d)
Females (n=3)				
21-Sep	21033	11-Jul	17-Sep	69
21-Sep	21126	30-Jul	11-Sep	44
21-Sep	21073	19-Aug	17-Sep	30
			Mean	47.67
			SD	19.76
Males (n=1)				
26-Sep	21216	14-Aug	24-Sep	34
Males and females (n = 4)				
		Mean		40.83
		SD		17.52
		Upper 95% CL		58.00
		Lower 95% CL		23.67

[a] Arrival was determined by the fixed-station receiver positioned 1 km up river from the fishway. A fish was considered to have entered Meziadin River when it was first detected at FSM.

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Anudol Creek	Nt	Radio track	29-Jun	14:09	14:11
Anudol Creek	Nt	Radio track	29-Jun	15:01	15:03
Anudol Creek	Nt	Radio track	06-Jul	15:28	15:40
Anudol Creek	Nt	Radio track	13-Jul	14:49	14:57
Anudol Creek	Nt	Radio track	22-Jul	15:26	15:32
Anudol Creek	Nt	Radio track	05-Aug	15:39	15:47
Anudol Creek	Nt	Transiting track	09-Aug	09:23	09:26
Anudol Creek	Nt	Radio track	12-Aug	14:12	14:15
Anudol Creek	Nt	Radio track	19-Aug	12:38	12:40
Anudol Creek	Nt	Radio track	02-Sep	13:12	13:15
Anudol Creek	Nt	Radio track	13-Sep	16:06	16:24
Anudol Creek	Nt	Transiting track	03-Nov	14:40	14:41
Anudol Creek	Nt	Transiting track	03-Nov	15:25	15:26
Bowser River	Bt	Radio track	10-Sep	11:42	11:46
Cranberry River	Nt	Transiting track	14-Jun	13:23	13:27
Cranberry River	Nt	Radio track	03-Jul	16:40	17:40
Cranberry River	Nt	Radio track	08-Jul	12:51	12:58
Cranberry River	Nt	Radio track	08-Jul	13:21	13:25
Cranberry River	Nt	Radio track	08-Jul	12:59	13:05
Cranberry River	Nt	Radio track	08-Jul	13:19	13:20
Cranberry River	Nt	Radio track	08-Jul	13:06	13:10
Cranberry River	Nt	Radio track	08-Jul	13:17	13:18
Cranberry River	Nt	Radio track	08-Jul	13:11	13:16
Cranberry River	Nt	Radio track	10-Jul	11:27	12:46
Cranberry River	Nt	Radio track	17-Jul	14:00	14:25
Cranberry River	Nt	Radio track	24-Jul	17:50	18:00
Cranberry River	Nt	Radio track	31-Jul	10:20	10:45
Cranberry River	Nt	Radio track	06-Aug	12:50	13:30
Cranberry River	Nt	Radio track	14-Aug	09:38	09:45
Cranberry River	Nt	Radio track	14-Aug	09:46	10:15
Cranberry River	Nt	Radio track	22-Aug	16:00	16:10
Cranberry River	Nt	Escapement	31-Aug	09:27	18:00
Cranberry River	Nt	Radio track	07-Sep	14:25	14:26
Cranberry River	Nt	Radio track	07-Sep	14:27	14:43
Cranberry River	Nt	Radio track	07-Sep	18:35	18:56
Cranberry River	Nt	Radio track	07-Sep	19:50	19:51
Cranberry River	Nt	Radio track	07-Sep	14:44	14:47
Cranberry River	Nt	Radio track	07-Sep	17:16	17:18
Cranberry River	Nt	Radio track	07-Sep	14:48	15:04
Cranberry River	Nt	Radio track	07-Sep	16:45	17:15
Cranberry River	Nt	Radio track	07-Sep	15:05	15:45
Cranberry River	Nt	Radio track	17-Sep	15:28	15:42
Cranberry River	Nt	Radio track	17-Sep	15:24	15:27

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Cranberry River	Nt	Radio track	17-Sep	15:08	15:23
Cranberry River	Nt	Radio track	17-Sep	13:31	14:09
Cranberry River	Nt	Radio track	17-Sep	14:48	15:07
Cranberry River	Nt	Radio track	20-Sep	09:53	09:57
Damdochax Creek	Nt	Transiting track	25-Aug	12:26	12:27
Damdochax Creek	Nt	Escapement	25-Aug	12:28	14:46
Damdochax Creek	Nt	Escapement	01-Sep	11:30	18:56
Damdochax Creek	Nt	Transiting track	01-Sep	10:31	10:34
Damdochax Creek	Nt	Transiting track	01-Sep	11:06	11:09
Damdochax Creek	Nt	Transiting track	01-Sep	13:26	16:10
Damdochax Creek	Nt	Transiting track	01-Sep	10:35	11:05
Damdochax Creek	Nt	Escapement	08-Sep	10:39	11:06
Damdochax Creek	Nt	Escapement	09-Sep	13:07	16:03
Damdochax Creek	Nt	Escapement	09-Sep	10:35	13:06
Damdochax Creek	Nt	Escapement	20-Sep	10:36	10:43
Damdochax Creek	Nt	Radio track	20-Sep	14:55	15:05
Damdochax Creek	Nt	Transiting track	29-Sep	09:47	09:49
Damdochax Creek	Nt	Transiting track	29-Sep	10:33	10:35
Damdochax Creek	Nt	Transiting track	29-Sep	09:50	09:52
Damdochax Creek	Nt	Transiting track	29-Sep	10:30	10:32
Damdochax Creek	Nt	Transiting track	03-Nov	10:22	10:27
Damdochax Creek	Nt	Transiting track	03-Nov	10:33	10:37
Damdochax Creek	Nt	Transiting track	03-Nov	10:28	10:32
Deltaic Creek	Bt	Radio track	10-Sep	12:16	12:20
Hodder Creek	Bt	Radio track	10-Sep	13:15	13:20
Ishkeenickh River	Nt	Radio track	26-Jul	08:47	09:30
Ishkeenickh River	Nt	Radio track	09-Aug	08:49	09:18
Ishkeenickh River	Nt	Radio track	12-Aug	16:26	16:35
Ishkeenickh River	Nt	Radio track	03-Nov	14:54	15:19
Kiteen River	Ct	Radio track	07-Sep	19:52	19:59
Kiteen River	Ct	Radio track	17-Sep	13:24	13:28
Kiteen River	Ct	Radio track	20-Sep	09:48	09:52
Kitwanga	NA	Radio track	17-Sep	14:19	14:45
Kwinageese River	Nt	Transiting track	18-Aug	12:50	12:58
Kwinageese River	Nt	Radio track	01-Sep	09:29	10:01
Kwinageese River	Nt	Transiting track	09-Sep	09:07	09:16
Kwinageese River	Nt	Radio track	10-Sep	09:26	09:37
Kwinageese River	Nt	Radio track	10-Sep	08:56	09:01
Kwinageese River	Nt	Radio track	10-Sep	09:24	09:25
Kwinageese River	Nt	Radio track	10-Sep	08:51	08:55
Kwinageese River	Nt	Transiting track	17-Sep	11:17	11:24
Kwinageese River	Nt	Transiting track	17-Sep	12:11	12:16
Kwinageese River	Nt	Transiting track	17-Sep	08:54	08:59

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Kwinageese River	Nt	Transiting track	29-Sep	09:00	09:02
Kwinageese River	Nt	Transiting track	29-Sep	08:58	08:59
Kwinageese River	Nt	Transiting track	29-Sep	08:55	08:57
Kwinageese River	Nt	Transiting track	29-Sep	08:48	08:54
Kwinageese River	Nt	Radio track	03-Nov	13:15	13:17
Kwinageese River	Nt	Radio track	03-Nov	13:18	13:19
Kwinageese River	Nt	Radio track	03-Nov	13:20	13:25
Kwinageese River	Nt	Radio track	03-Nov	13:26	13:32
Meziadin River	Nt	Radio track	24-Jul	13:23	13:35
Meziadin River	Nt	Radio track	31-Jul	14:00	14:09
Meziadin River	Nt	Radio track	06-Aug	19:20	19:32
Meziadin River	Nt	Radio track	09-Aug	15:57	15:58
Meziadin River	Nt	Radio track	09-Aug	15:54	15:56
Meziadin River	Nt	Radio track	14-Aug	14:40	14:41
Meziadin River	Nt	Radio track	22-Aug	12:05	12:11
Meziadin River	Nt	Radio track	29-Aug	15:00	15:09
Meziadin River	Nt	Radio track	05-Sep	14:05	14:13
Meziadin River	Nt	Escapement	08-Sep	14:08	16:27
Meziadin River	Nt	Escapement	14-Sep	16:21	16:32
Meziadin River	Nt	Escapement	14-Sep	11:28	11:53
Oweegee Creek	Bt	Escapement	04-Sep	14:36	15:50
Oweegee Creek	Bt	Escapement	04-Sep	14:09	14:35
Oweegee Creek	Bt	Radio track	10-Sep	12:55	12:58
Oweegee Creek	Bt	Radio track	10-Sep	12:59	13:03
Oweegee Creek	Bt	Radio track	10-Sep	13:04	13:06
Oweegee Creek	Bt	Transiting track	03-Nov	09:39	09:40
Owl Creek	Bt	Radio track	10-Sep	13:25	13:42
Seaskinnish Creek	Nt	Transiting track	14-Jun	16:35	16:36
Seaskinnish Creek	Nt	Transiting track	27-Jun	15:54	15:57
Seaskinnish Creek	Nt	Radio track	30-Jun	10:54	11:01
Seaskinnish Creek	Nt	Transiting track	30-Jun	19:45	19:48
Seaskinnish Creek	Nt	Radio track	05-Jul	12:32	12:42
Seaskinnish Creek	Nt	Radio track	12-Jul	13:14	13:20
Seaskinnish Creek	Nt	Radio track	19-Jul	11:52	12:07
Seaskinnish Creek	Nt	Radio track	29-Jul	13:23	13:30
Seaskinnish Creek	Nt	Radio track	05-Aug	12:17	12:23
Seaskinnish Creek	Nt	Radio track	09-Aug	17:08	17:21
Seaskinnish Creek	Nt	Radio track	20-Aug	15:43	15:48
Seaskinnish Creek	Nt	Radio track	25-Aug	17:04	17:08
Seaskinnish Creek	Nt	Radio track	02-Sep	15:10	15:35
Seaskinnish Creek	Nt	Escapement	03-Sep	09:35	19:35
Seaskinnish Creek	Nt	Radio track	06-Sep	14:49	14:56
Seaskinnish Creek	Nt	Radio track	13-Sep	12:33	12:45

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Seaskinnish Creek	Nt	Radio track	17-Sep	15:55	16:06
Seaskinnish Creek	Nt	Radio track	22-Sep	16:21	16:41
Seaskinnish Creek	Nt	Transiting track	29-Sep	18:11	18:16
Seaskinnish Creek	Nt	Transiting track	03-Nov	14:10	14:11
Seaskinnish Creek	Nt	Radio track	04-Nov	10:34	10:36
Seaskinnish Creek	Nt	Radio track	04-Nov	10:37	10:46
Skowill Creek	Bt	Radio track	10-Sep	12:51	12:54
Snowbank Creek	Bt	Transiting track	28-Aug	10:23	10:26
Snowbank Creek	Bt	Radio track	10-Sep	14:06	14:14
Snowbank Creek	Bt	Transiting track	10-Sep	14:48	14:50
Snowbank Creek	Bt	Transiting track	03-Nov	09:43	09:45
Taft Creek	Bt	Radio track	10-Sep	11:55	12:11
Taft Creek	Bt	Transiting track	03-Nov	09:29	09:30
Teigen Creek	Bt	Transiting track	28-Aug	10:27	11:00
Teigen Creek	Bt	Escapement	28-Aug	10:50	21:05
Teigen Creek	Bt	Escapement	04-Sep	10:18	17:10
Teigen Creek	Bt	Radio track	10-Sep	14:15	14:47
Treaty Creek	Bt	Radio track	10-Sep	12:23	12:46
Treaty Creek	Bt	Transiting track	03-Nov	09:35	09:36
Taylor River	Nt	Transiting track	03-Nov	10:02	10:19
Tchitin River	Nt	Radio track	10-Jul	16:20	16:45
Tchitin River	Nt	Radio track	09-Aug	10:26	10:43
Tchitin River	Nt	Transiting track	03-Nov	08:40	08:46
Tseax River	Nt	Radio track	09-Aug	09:35	09:37
Tseax River	Nt	Radio track	09-Aug	09:42	09:44
Tseax River	Nt	Radio track	09-Aug	09:38	09:41
Tseax River	Nt	Radio track	11-Aug	11:36	12:20
Tseax River	Nt	Radio track	26-Aug	10:41	12:00
Tseax River	Nt	Radio track	04-Nov	10:09	10:10
Tseax River	Nt	Radio track	04-Nov	10:28	10:29
Tseax River	Nt	Radio track	04-Nov	10:11	10:27
Tseax River (slough)	Nt	Radio track	30-Jun	11:58	12:02
Tseax River (slough)	Nt	Radio track	05-Jul	13:25	13:42
Tseax River (slough)	Nt	Radio track	12-Jul	14:00	14:22
Tseax River (slough)	Nt	Radio track	19-Jul	13:09	13:13
Tseax River (slough)	Nt	Radio track	29-Jul	14:12	14:35
Tseax River (slough)	Nt	Radio track	05-Aug	13:00	13:23
Tseax River (slough)	Nt	Transiting track	09-Aug	09:33	09:34
Tseax River (slough)	Nt	Radio track	20-Aug	16:35	16:40
Tseax River (slough)	Nt	Radio track	06-Sep	15:31	15:50
Tseax River (slough)	Nt	Radio track	13-Sep	13:25	13:54
Tseax River (slough)	Nt	Radio track	22-Sep	17:12	17:18
Tseax River (slough)	Nt	Transiting track	03-Nov	14:28	14:29

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Tseax River (slough)	Nt	Radio track	04-Nov	10:07	10:08
Tseax River (slough)	Nt	Radio track	04-Nov	10:30	10:31
White River	Nt	Radio track	09-Aug	10:44	11:00
Zolzap Creek (slough)	Nt	Radio track	24-Jun	12:48	13:10
Zolzap Creek (slough)	Nt	Transiting track	30-Jun	08:16	08:22
Zolzap Creek (slough)	Nt	Transiting track	30-Jun	10:19	10:20
Zolzap Creek (slough)	Nt	Radio track	08-Jul	14:05	14:08
Zolzap Creek (slough)	Nt	Transiting track	09-Aug	09:27	09:30
Zolzap Creek (slough)	Nt	Radio track	11-Aug	13:35	13:45
Zolzap Creek (slough)	Nt	Radio track	26-Aug	12:20	12:30
Zolzap Creek (slough)	Nt	Transiting track	03-Nov	14:34	14:35
Zolzap Creek (slough)	Nt	Radio track	03-Nov	15:30	15:38
Nass River mainstem	1	Radio track	29-Jun	14:21	15:00
Nass River mainstem	1	Radio track	06-Jul	15:51	16:54
Nass River mainstem	1	Transiting track	09-Aug	08:39	08:48
Nass River mainstem	1	Transiting track	09-Aug	09:19	09:22
Nass River mainstem	1	Transiting track	12-Aug	11:28	11:32
Nass River mainstem	1	Radio track	12-Aug	14:26	16:25
Nass River mainstem	1	Radio track	12-Aug	16:36	16:45
Nass River mainstem	1	Radio track	19-Aug	12:45	13:08
Nass River mainstem	1	Radio track	19-Aug	13:12	13:30
Nass River mainstem	1	Radio track	19-Aug	13:09	13:11
Nass River mainstem	1	Radio track	02-Sep	13:32	14:15
Nass River mainstem	1	Radio track	13-Sep	16:32	17:42
Nass River mainstem	1	Transiting track	03-Nov	14:42	14:53
Nass River mainstem	1	Transiting track	03-Nov	15:20	15:24
Nass River mainstem	2	Radio track	04-Jun	09:56	11:44
Nass River mainstem	2	Radio track	10-Jun	18:21	19:57
Nass River mainstem	2	Radio track	23-Jun	16:06	16:52
Nass River mainstem	2	Radio track	24-Jun	07:18	12:47
Nass River mainstem	2	Radio track	29-Jun	10:31	14:08
Nass River mainstem	2	Radio track	29-Jun	14:12	14:20
Nass River mainstem	2	Radio track	29-Jun	15:04	16:30
Nass River mainstem	2	Transiting track	30-Jun	08:13	08:15
Nass River mainstem	2	Transiting track	30-Jun	08:23	10:18
Nass River mainstem	2	Transiting track	30-Jun	10:21	10:30
Nass River mainstem	2	Radio track	30-Jun	12:33	13:00
Nass River mainstem	2	Radio track	05-Jul	14:14	14:36
Nass River mainstem	2	Radio track	06-Jul	13:11	15:27
Nass River mainstem	2	Radio track	06-Jul	15:41	15:51
Nass River mainstem	2	Transiting track	08-Jul	13:50	14:04
Nass River mainstem	2	Transiting track	08-Jul	14:09	14:15
Nass River mainstem	2	Radio track	12-Jul	14:45	15:04

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	2	Radio track	13-Jul	12:21	14:48
Nass River mainstem	2	Radio track	19-Jul	14:07	14:21
Nass River mainstem	2	Radio track	22-Jul	13:27	15:25
Nass River mainstem	2	Radio track	29-Jul	15:11	15:20
Nass River mainstem	2	Radio track	05-Aug	13:43	15:38
Nass River mainstem	2	Radio track	05-Aug	15:48	16:00
Nass River mainstem	2	Transiting track	09-Aug	08:21	08:38
Nass River mainstem	2	Transiting track	09-Aug	09:31	09:32
Nass River mainstem	2	Transiting track	09-Aug	09:45	09:47
Nass River mainstem	2	Radio track	12-Aug	12:35	14:11
Nass River mainstem	2	Radio track	12-Aug	14:16	14:25
Nass River mainstem	2	Radio track	19-Aug	10:30	12:37
Nass River mainstem	2	Radio track	19-Aug	12:41	12:44
Nass River mainstem	2	Radio track	20-Aug	18:07	18:27
Nass River mainstem	2	Radio track	26-Aug	12:15	12:19
Nass River mainstem	2	Radio track	02-Sep	11:50	13:11
Nass River mainstem	2	Radio track	02-Sep	13:16	13:31
Nass River mainstem	2	Radio track	06-Sep	16:11	16:30
Nass River mainstem	2	Radio track	13-Sep	14:36	16:05
Nass River mainstem	2	Radio track	13-Sep	16:25	16:31
Nass River mainstem	2	Radio track	23-Sep	10:21	10:49
Nass River mainstem	2	Transiting track	03-Nov	14:32	14:33
Nass River mainstem	2	Transiting track	03-Nov	14:36	14:29
Nass River mainstem	2	Transiting track	03-Nov	15:27	15:29
Nass River mainstem	2	Transiting track	03-Nov	15:39	15:40
Nass River mainstem	3	Radio track	10-Jun	17:18	18:20
Nass River mainstem	3	Transiting track	14-Jun	12:49	12:55
Nass River mainstem	3	Transiting track	14-Jun	16:31	16:34
Nass River mainstem	3	Transiting track	23-Jun	12:25	16:05
Nass River mainstem	3	Transiting track	27-Jun	15:52	15:53
Nass River mainstem	3	Transiting track	30-Jun	07:50	08:12
Nass River mainstem	3	Radio track	30-Jun	09:48	10:53
Nass River mainstem	3	Radio track	30-Jun	11:02	11:57
Nass River mainstem	3	Transiting track	30-Jun	11:06	11:08
Nass River mainstem	3	Radio track	30-Jun	12:03	12:32
Nass River mainstem	3	Transiting track	30-Jun	19:43	19:44
Nass River mainstem	3	Radio track	05-Jul	11:36	12:31
Nass River mainstem	3	Radio track	05-Jul	12:43	13:24
Nass River mainstem	3	Radio track	05-Jul	13:43	14:13
Nass River mainstem	3	Transiting track	08-Jul	08:37	08:39
Nass River mainstem	3	Transiting track	08-Jul	13:37	13:49
Nass River mainstem	3	Radio track	12-Jul	12:36	13:13
Nass River mainstem	3	Radio track	12-Jul	13:21	13:59

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	3	Radio track	12-Jul	14:23	14:44
Nass River mainstem	3	Transiting track	13-Jul	08:12	08:14
Nass River mainstem	3	Transiting track	13-Jul	17:28	17:50
Nass River mainstem	3	Radio track	19-Jul	11:03	11:51
Nass River mainstem	3	Radio track	19-Jul	12:08	13:08
Nass River mainstem	3	Radio track	19-Jul	13:14	14:06
Nass River mainstem	3	Transiting track	20-Jul	08:14	08:18
Nass River mainstem	3	Transiting track	26-Jul	10:10	10:12
Nass River mainstem	3	Transiting track	26-Jul	17:05	17:20
Nass River mainstem	3	Radio track	29-Jul	11:51	13:22
Nass River mainstem	3	Radio track	29-Jul	13:31	14:11
Nass River mainstem	3	Radio track	29-Jul	14:36	15:11
Nass River mainstem	3	Transiting track	02-Aug	08:41	08:43
Nass River mainstem	3	Radio track	05-Aug	11:43	12:16
Nass River mainstem	3	Radio track	05-Aug	12:24	12:59
Nass River mainstem	3	Radio track	05-Aug	13:24	13:42
Nass River mainstem	3	Transiting track	09-Aug	09:48	09:51
Nass River mainstem	3	Transiting track	09-Aug	10:09	10:14
Nass River mainstem	3	Transiting track	09-Aug	17:07	17:07
Nass River mainstem	3	Transiting track	09-Aug	17:22	17:23
Nass River mainstem	3	Transiting track	18-Aug	08:23	08:24
Nass River mainstem	3	Radio track	20-Aug	14:49	15:42
Nass River mainstem	3	Radio track	20-Aug	15:49	16:34
Nass River mainstem	3	Radio track	20-Aug	16:41	18:06
Nass River mainstem	3	Transiting track	25-Aug	08:48	08:50
Nass River mainstem	3	Transiting track	25-Aug	16:42	17:03
Nass River mainstem	3	Transiting track	25-Aug	17:09	17:11
Nass River mainstem	3	Transiting track	02-Sep	14:02	14:05
Nass River mainstem	3	Transiting track	02-Sep	15:08	15:09
Nass River mainstem	3	Transiting track	02-Sep	15:36	15:42
Nass River mainstem	3	Radio track	06-Sep	13:59	14:48
Nass River mainstem	3	Radio track	06-Sep	14:57	15:30
Nass River mainstem	3	Radio track	06-Sep	15:51	16:10
Nass River mainstem	3	Transiting track	10-Sep	08:19	08:22
Nass River mainstem	3	Radio track	13-Sep	11:30	12:32
Nass River mainstem	3	Radio track	13-Sep	12:46	13:24
Nass River mainstem	3	Radio track	13-Sep	13:55	14:35
Nass River mainstem	3	Radio track	22-Sep	15:32	16:20
Nass River mainstem	3	Radio track	22-Sep	16:42	17:11
Nass River mainstem	3	Radio track	22-Sep	17:19	18:16
Nass River mainstem	3	Transiting track	29-Sep	08:27	08:29
Nass River mainstem	3	Transiting track	29-Sep	18:08	18:10
Nass River mainstem	3	Transiting track	29-Sep	18:17	18:20

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	3	Transiting track	03-Nov	08:32	08:34
Nass River mainstem	3	Transiting track	03-Nov	14:08	14:09
Nass River mainstem	3	Transiting track	03-Nov	14:12	14:14
Nass River mainstem	3	Transiting track	03-Nov	14:25	14:27
Nass River mainstem	3	Transiting track	03-Nov	14:30	14:31
Nass River mainstem	3	Transiting track	03-Nov	15:41	15:47
Nass River mainstem	3	Transiting track	03-Nov	16:37	16:39
Nass River mainstem	3	Transiting track	04-Nov	08:24	08:27
Nass River mainstem	3	Transiting track	04-Nov	10:05	10:06
Nass River mainstem	3	Transiting track	04-Nov	10:32	10:33
Nass River mainstem	3	Transiting track	04-Nov	10:47	10:48
Nass River mainstem	4	Transiting track	14-Jun	12:56	13:13
Nass River mainstem	4	Transiting track	14-Jun	16:21	16:30
Nass River mainstem	4	Transiting track	27-Jun	08:39	8:51
Nass River mainstem	4	Transiting track	27-Jun	15:39	15:51
Nass River mainstem	4	Transiting track	30-Jun	11:11	11:18
Nass River mainstem	4	Transiting track	30-Jun	19:03	19:40
Nass River mainstem	4	Transiting track	08-Jul	08:42	08:49
Nass River mainstem	4	Transiting track	08-Jul	13:26	13:34
Nass River mainstem	4	Transiting track	13-Jul	08:17	08:30
Nass River mainstem	4	Transiting track	13-Jul	17:13	17:26
Nass River mainstem	4	Transiting track	20-Jul	08:21	08:30
Nass River mainstem	4	Transiting track	26-Jul	10:15	10:19
Nass River mainstem	4	Transiting track	26-Jul	10:24	10:25
Nass River mainstem	4	Transiting track	26-Jul	16:55	16:56
Nass River mainstem	4	Transiting track	26-Jul	16:59	17:05
Nass River mainstem	4	Transiting track	02-Aug	08:46	08:47
Nass River mainstem	4	Transiting track	02-Aug	08:52	08:57
Nass River mainstem	4	Transiting track	09-Aug	10:17	10:23
Nass River mainstem	4	Transiting track	09-Aug	16:57	17:04
Nass River mainstem	4	Transiting track	18-Aug	08:25	08:32
Nass River mainstem	4	Transiting track	18-Aug	08:37	08:38
Nass River mainstem	4	Transiting track	25-Aug	08:51	09:04
Nass River mainstem	4	Transiting track	25-Aug	16:12	16:27
Nass River mainstem	4	Transiting track	25-Aug	16:32	16:41
Nass River mainstem	4	Transiting track	02-Sep	14:06	14:25
Nass River mainstem	4	Transiting track	02-Sep	14:30	14:31
Nass River mainstem	4	Transiting track	02-Sep	14:56	14:57
Nass River mainstem	4	Transiting track	02-Sep	15:02	15:06
Nass River mainstem	4	Radio track	07-Sep	14:12	14:24
Nass River mainstem	4	Transiting track	09-Sep	08:37	08:44
Nass River mainstem	4	Transiting track	10-Sep	08:23	08:30
Nass River mainstem	4	Transiting track	10-Sep	08:35	08:39

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	4	Transiting track	17-Sep	08:19	08:30
Nass River mainstem	4	Transiting track	29-Sep	08:30	08:32
Nass River mainstem	4	Transiting track	29-Sep	08:37	08:38
Nass River mainstem	4	Transiting track	29-Sep	17:57	17:58
Nass River mainstem	4	Transiting track	29-Sep	18:02	18:07
Nass River mainstem	4	Transiting track	03-Nov	08:35	08:39
Nass River mainstem	4	Transiting track	03-Nov	13:46	13:57
Nass River mainstem	4	Transiting track	03-Nov	14:02	14:05
Nass River mainstem	4	Transiting track	04-Nov	09:41	09:45
Nass River mainstem	4	Transiting track	04-Nov	08:28	08:32
Nass River mainstem	4	Transiting track	04-Nov	08:37	08:38
Nass River mainstem	4	Transiting track	04-Nov	09:46	09:47
Nass River mainstem	4	Transiting track	04-Nov	09:52	10:04
Nass River mainstem	5	Transiting track	14-Jun	13:14	13:22
Nass River mainstem	5	Transiting track	27-Jun	08:52	09:04
Nass River mainstem	5	Transiting track	27-Jun	14:59	15:13
Nass River mainstem	5	Transiting track	30-Jun	11:19	11:37
Nass River mainstem	5	Transiting track	30-Jun	18:49	19:02
Nass River mainstem	5	Transiting track	08-Jul	08:57	09:11
Nass River mainstem	5	Transiting track	08-Jul	11:36	11:53
Nass River mainstem	5	Transiting track	13-Jul	08:36	08:51
Nass River mainstem	5	Transiting track	20-Jul	09:32	09:47
Nass River mainstem	5	Transiting track	26-Jul	11:49	12:01
Nass River mainstem	5	Transiting track	02-Aug	09:54	10:12
Nass River mainstem	5	Transiting track	09-Aug	16:09	16:21
Nass River mainstem	5	Transiting track	18-Aug	09:14	09:31
Nass River mainstem	5	Transiting track	25-Aug	09:05	09:22
Nass River mainstem	5	Transiting track	09-Sep	08:45	09:00
Nass River mainstem	5	Transiting track	10-Sep	08:40	08:42
Nass River mainstem	5	Transiting track	17-Sep	08:37	08:47
Nass River mainstem	5	Transiting track	29-Sep	08:39	08:45
Nass River mainstem	5	Transiting track	29-Sep	15:46	15:58
Nass River mainstem	5	Transiting track	03-Nov	13:43	13:45
Nass River mainstem	5	Transiting track	04-Nov	09:32	09:35
Nass River mainstem	6	Transiting track	27-Jun	09:05	09:14
Nass River mainstem	6	Transiting track	27-Jun	09:15	09:17
Nass River mainstem	6	Transiting track	30-Jun	11:38	11:45
Nass River mainstem	6	Transiting track	30-Jun	18:40	18:48
Nass River mainstem	6	Transiting track	30-Jun	11:46	11:49
Nass River mainstem	6	Transiting track	08-Jul	09:12	09:20
Nass River mainstem	6	Transiting track	08-Jul	11:33	11:35
Nass River mainstem	6	Transiting track	08-Jul	09:21	09:23
Nass River mainstem	6	Transiting track	08-Jul	11:16	11:32

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	6	Transiting track	13-Jul	08:52	09:00
Nass River mainstem	6	Transiting track	13-Jul	09:01	09:02
Nass River mainstem	6	Transiting track	20-Jul	09:48	09:58
Nass River mainstem	6	Transiting track	20-Jul	09:59	10:00
Nass River mainstem	6	Transiting track	26-Jul	12:02	12:10
Nass River mainstem	6	Transiting track	26-Jul	12:11	12:12
Nass River mainstem	6	Transiting track	26-Jul	16:33	16:54
Nass River mainstem	6	Transiting track	02-Aug	10:13	10:22
Nass River mainstem	6	Transiting track	02-Aug	10:23	10:25
Nass River mainstem	6	Transiting track	09-Aug	16:03	16:08
Nass River mainstem	6	Transiting track	09-Aug	11:01	11:02
Nass River mainstem	6	Transiting track	09-Aug	16:01	16:02
Nass River mainstem	6	Transiting track	18-Aug	09:32	09:40
Nass River mainstem	6	Transiting track	18-Aug	09:41	09:42
Nass River mainstem	6	Transiting track	25-Aug	09:23	09:31
Nass River mainstem	6	Transiting track	25-Aug	09:32	09:33
Nass River mainstem	6	Transiting track	10-Sep	08:43	08:45
Nass River mainstem	6	Transiting track	29-Sep	08:46	08:47
Nass River mainstem	6	Transiting track	29-Sep	15:40	15:45
Nass River mainstem	6	Transiting track	29-Sep	15:38	15:39
Nass River mainstem	6	Transiting track	03-Nov	13:33	13:42
Nass River mainstem	6	Transiting track	04-Nov	09:36	09:37
Nass River mainstem	6	Transiting track	04-Nov	09:38	09:40
Nass River mainstem	7	Transiting track	27-Jun	09:18	09:30
Nass River mainstem	7	Transiting track	30-Jun	11:50	11:58
Nass River mainstem	7	Transiting track	08-Jul	09:28	09:37
Nass River mainstem	7	Transiting track	13-Jul	09:08	09:17
Nass River mainstem	7	Transiting track	20-Jul	10:04	10:13
Nass River mainstem	7	Transiting track	26-Jul	12:15	12:27
Nass River mainstem	7	Transiting track	26-Jul	16:25	16:32
Nass River mainstem	7	Transiting track	02-Aug	10:29	10:43
Nass River mainstem	7	Transiting track	09-Aug	11:05	11:17
Nass River mainstem	7	Transiting track	09-Aug	15:43	15:53
Nass River mainstem	7	Transiting track	18-Aug	09:46	09:56
Nass River mainstem	7	Transiting track	25-Aug	09:37	09:52
Nass River mainstem	7	Transiting track	10-Sep	10:48	10:59
Nass River mainstem	7	Transiting track	29-Sep	15:29	15:35
Nass River mainstem	7	Transiting track	03-Nov	08:47	09:20
Nass River mainstem	8	Transiting track	27-Jun	11:30	11:56
Nass River mainstem	8	Transiting track	30-Jun	11:59	12:03
Nass River mainstem	8	Transiting track	08-Jul	10:28	10:35
Nass River mainstem	8	Transiting track	13-Jul	09:20	09:25
Nass River mainstem	8	Transiting track	13-Jul	11:41	11:46

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	8	Transiting track	20-Jul	11:40	11:49
Nass River mainstem	8	Transiting track	26-Jul	13:22	13:29
Nass River mainstem	8	Transiting track	26-Jul	16:20	16:24
Nass River mainstem	8	Transiting track	02-Aug	12:00	12:24
Nass River mainstem	8	Transiting track	09-Aug	12:04	12:14
Nass River mainstem	8	Transiting track	18-Aug	10:31	10:37
Nass River mainstem	8	Transiting track	25-Aug	10:09	11:07
Nass River mainstem	8	Transiting track	10-Sep	09:52	10:00
Nass River mainstem	8	Transiting track	29-Sep	12:41	12:47
Nass River mainstem	8	Transiting track	03-Nov	12:35	12:39
Nass River mainstem	8	Transiting track	03-Nov	13:11	13:14
Nass River mainstem	9	Transiting track	30-Jun	12:04	12:30
Nass River mainstem	9	Transiting track	13-Jul	09:28	09:56
Nass River mainstem	9	Transiting track	13-Jul	10:41	10:58
Nass River mainstem	9	Transiting track	20-Jul	12:30	12:57
Nass River mainstem	9	Transiting track	26-Jul	14:14	14:39
Nass River mainstem	9	Transiting track	26-Jul	16:01	16:19
Nass River mainstem	9	Transiting track	02-Aug	13:02	13:28
Nass River mainstem	9	Transiting track	09-Aug	12:51	13:20
Nass River mainstem	9	Transiting track	18-Aug	11:13	11:44
Nass River mainstem	9	Transiting track	18-Aug	12:29	12:49
Nass River mainstem	9	Transiting track	25-Aug	11:22	12:25
Nass River mainstem	9	Transiting track	25-Aug	14:47	14:58
Nass River mainstem	9	Transiting track	25-Aug	15:12	15:15
Nass River mainstem	9	Transiting track	01-Sep	10:18	10:30
Nass River mainstem	9	Transiting track	01-Sep	11:10	11:15
Nass River mainstem	9	Transiting track	01-Sep	13:15	13:25
Nass River mainstem	9	Transiting track	01-Sep	16:11	16:20
Nass River mainstem	9	Transiting track	29-Sep	09:08	09:22
Nass River mainstem	9	Transiting track	29-Sep	10:36	11:08
Nass River mainstem	9	Transiting track	03-Nov	10:20	10:21
Nass River mainstem	9	Transiting track	03-Nov	10:38	10:39
Nass River mainstem	9	Transiting track	03-Nov	11:32	11:58
Nass River mainstem	MezM	Radio track	28-Jun	16:00	16:10
Nass River mainstem	MezM	Radio track	06-Jul	14:50	15:10
Nass River mainstem	MezM	Transiting track	08-Jul	09:24	09:27
Nass River mainstem	MezM	Transiting track	13-Jul	09:03	09:07
Nass River mainstem	MezM	Radio track	17-Jul	19:15	19:25
Nass River mainstem	MezM	Transiting track	20-Jul	10:01	10:03
Nass River mainstem	MezM	Radio track	24-Jul	13:36	13:48
Nass River mainstem	MezM	Transiting track	26-Jul	12:13	12:14
Nass River mainstem	MezM	Radio track	31-Jul	14:10	14:30
Nass River mainstem	MezM	Transiting track	02-Aug	10:26	10:28

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Nass River mainstem	MezM	Radio track	06-Aug	19:33	19:50
Nass River mainstem	MezM	Transiting track	09-Aug	11:03	11:04
Nass River mainstem	MezM	Transiting track	09-Aug	15:59	16:00
Nass River mainstem	MezM	Radio track	14-Aug	14:42	14:50
Nass River mainstem	MezM	Transiting track	18-Aug	09:43	09:45
Nass River mainstem	MezM	Radio track	22-Aug	12:12	12:30
Nass River mainstem	MezM	Transiting track	25-Aug	09:34	09:36
Nass River mainstem	MezM	Radio track	29-Aug	15:10	15:30
Nass River mainstem	MezM	Radio track	05-Sep	14:14	14:40
Nass River mainstem	MezM	Escapement	14-Sep	16:33	16:44
Nass River mainstem	MezM	Radio track	26-Sep	15:18	15:38
Nass River mainstem	MezM	Transiting track	29-Sep	15:36	15:37
Nass River mainstem	NassBr	Radio track	10-Jul	17:05	17:36
Nass River mainstem	NassBr	Transiting track	26-Jul	10:22	10:23
Nass River mainstem	NassBr	Transiting track	26-Jul	16:57	16:58
Nass River mainstem	NassBr	Radio track	31-Jul	18:10	18:30
Nass River mainstem	NassBr	Transiting track	02-Aug	08:50	08:51
Nass River mainstem	NassBr	Radio track	14-Aug	17:15	17:45
Nass River mainstem	NassBr	Transiting track	18-Aug	08:35	08:36
Nass River mainstem	NassBr	Transiting track	25-Aug	16:28	16:29
Nass River mainstem	NassBr	Transiting track	02-Sep	14:28	14:29
Nass River mainstem	NassBr	Transiting track	02-Sep	14:58	14:59
Nass River mainstem	NassBr	Transiting track	10-Sep	08:33	08:34
Nass River mainstem	NassBr	Transiting track	29-Sep	08:35	08:36
Nass River mainstem	NassBr	Transiting track	29-Sep	17:59	18:00
Nass River mainstem	NassBr	Transiting track	03-Nov	13:58	13:59
Nass River mainstem	NassBr	Transiting track	04-Nov	08:35	08:36
Nass River mainstem	NassBr	Transiting track	04-Nov	09:48	09:49
Nass River mainstem	TchitinM	Radio track	10-Jul	14:49	15:19
Nass River mainstem	TchitinM	Transiting track	26-Jul	10:20	10:21
Nass River mainstem	TchitinM	Transiting track	02-Aug	08:48	08:49
Nass River mainstem	TchitinM	Transiting track	09-Aug	10:24	10:25
Nass River mainstem	TchitinM	Transiting track	18-Aug	08:33	08:34
Nass River mainstem	TchitinM	Transiting track	25-Aug	16:30	16:31
Nass River mainstem	TchitinM	Transiting track	02-Sep	14:26	14:27
Nass River mainstem	TchitinM	Transiting track	02-Sep	15:00	15:01
Nass River mainstem	TchitinM	Transiting track	10-Sep	08:31	08:32
Nass River mainstem	TchitinM	Transiting track	29-Sep	08:33	08:34
Nass River mainstem	TchitinM	Transiting track	29-Sep	18:00	18:01
Nass River mainstem	TchitinM	Transiting track	03-Nov	14:00	14:01
Nass River mainstem	TchitinM	Transiting track	04-Nov	08:33	08:34
Nass River mainstem	TchitinM	Transiting track	04-Nov	09:50	09:51
Bell-Irving mainstem	BM1	Radio track	10-Sep	11:28	11:41

Table B-1. Systematic and incidental telemetry surveys conducted in the Nass River drainage, 1993. The primary purpose (priority), dates and times of each survey are listed.

System	Area[a]	Survey Type	Date	Start time	End time
Bell-Irving mainstem	BM1	Radio track	10-Sep	11:47	11:54
Bell-Irving mainstem	BM1	Radio track	10-Sep	12:12	12:15
Bell-Irving mainstem	BM1	Radio track	10-Sep	12:21	12:22
Bell-Irving mainstem	BM1	Radio track	10-Sep	12:47	12:50
Bell-Irving mainstem	BM1	Transiting track	03-Nov	09:21	09:28
Bell-Irving mainstem	BM1	Transiting track	03-Nov	09:31	09:34
Bell-Irving mainstem	BM2	Transiting track	28-Aug	10:21	10:22
Bell-Irving mainstem	BM2	Radio track	10-Sep	13:07	13:14
Bell-Irving mainstem	BM2	Radio track	10-Sep	13:21	13:24
Bell-Irving mainstem	BM2	Radio track	10-Sep	13:43	13:48
Bell-Irving mainstem	BM2	Radio track	10-Sep	14:04	14:05
Bell-Irving mainstem	BM2	Transiting track	10-Sep	14:51	15:00
Bell-Irving mainstem	BM2	Transiting track	03-Nov	09:37	09:38
Bell-Irving mainstem	BM2	Transiting track	03-Nov	09:41	09:42
Bell-Irving mainstem	BM2	Transiting track	03-Nov	09:47	09:52

[a] 1=Fishery Bay to Greenville bridge, 2=Greenville bridge to Gitwinksihlkw, 3=Gitwinksihlkw to Grease Harbour, 4=Grease Harbour to Cranberry R., 5=Cranberry R to Arbour bridge, 6=Arbour bridge to Meziadin R., 7=Meziadin R. to Bell-Irving R., 8=Bell-Irving to Kwinageese R., 9=Kwinageese R.to Damdochax Cr., 10=Upper Nass (above Damdochax), BM1=Bell-Irving R. to Oweegee Cr., BM2=above Oweegee Cr., Nt=Nass R. tributary, Bt=Bell-Irving R. tributary, Ct=Cranberry tributary, NA=not applicable, Nass Br=Nass bridge, MezM=Meziadin R. and Nass R. junction, and TchitinM=Tchitin R. and Nass R. junction.

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 1 (Grease Harbour)									
10-Jun									0
11-Jun									0
12-Jun				1					1
13-Jun				1					1
14-Jun				1					1
15-Jun				1				1	2
16-Jun				1					1
17-Jun				1					1
18-Jun				1					1
19-Jun				1					1
20-Jun	1			1		1		1	4
21-Jun				1				1	2
22-Jun				2					2
23-Jun		1		2		1			4
24-Jun				1		2			3
25-Jun			1					1	2
26-Jun	1	1	3	3	2		1	3	14
27-Jun	1	3	1	6	3	2	1	4	21
28-Jun		6	1	3	1	2		3	16
29-Jun		2	1	2	2	3		2	12
30-Jun		1	3	3	2	5	1		15
1-Jul		3	2	1	2	2		1	11
2-Jul	1	8	2	6	2	7		4	30
3-Jul	1	8	2	4	2	7	2	4	30
4-Jul		7	2	2	6	7	1	7	32
5-Jul	1	3	2	4	5			5	20
6-Jul	1	6	3	3	2	3		2	20
7-Jul	1	4	1	4	1	4		3	18
8-Jul	2		2	1	1	1		3	10
9-Jul	1	3		1	1			2	8
10-Jul	2	4	1	2		1		3	13
11-Jul	3	6	1	1	1	2		5	19
12-Jul	3	4	2			2		5	16

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 1 (cont)									
13-Jul	1	3	2			3	1	6	16
14-Jul		3	1		1	1	1	6	13
15-Jul	2	6	1	1	2			9	21
16-Jul	3	5		1	2			4	15
17-Jul	2	3					1	3	9
18-Jul	1	3	1					4	9
19-Jul	2		1					1	4
20-Jul	2		1		1	2			6
21-Jul	1		1		2	1			5
22-Jul	3		1		1	1		1	7
23-Jul	4		1			1		1	7
24-Jul	3	2			1				6
25-Jul	4				1				5
26-Jul	3								3
27-Jul	4							1	5
28-Jul	4							1	5
29-Jul								1	1
30 Jul - 2 Aug									0
3-Aug		2			1			1	4
4-Aug		1			1			1	3
5-Aug									0
6-Aug								1	1
7-Aug									0
8-Aug								1	1
9-11 Aug									0
12-Aug								1	1
13-Aug								1	1
14-Aug									0
15-Aug									0
16-Aug									0
17-Aug	2								2
18-27 Aug									0

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 1 (cont)									
28-Aug	1								1
29 Aug - 2 Sep									0
3-Sep		1							1
4-7 Sep									0
8-Sep					1				1
9-24 Sep									0
Fixed-station 3 (Cranberry River mouth)									
10-13 Jun									0
14-22 Jun									0
23-Jun									0
24-Jun						1		1	2
25-Jun									0
26-Jun						1			1
27-Jun				1		1			2
28-Jun		1		2	1				4
29-Jun			1	3	2	1		1	8
30-Jun			1	5	1	3		1	11
1-Jul		5	1	5	3	2		2	18
2-Jul		2	1	6	2	5	1	2	19
3-Jul			1	3		4			8
4-Jul		2	4	1	1	4		1	13
5-Jul		2	3	7	3	5		2	22
6-Jul		6	3	5	4	5	1	1	25
7-Jul		7	1	2	3	5	2	1	21
8-Jul		4	1	5		2	2	4	18
9-Jul		4	1	3	1	1	2	1	13
10-Jul		3	1	5	2	3	1	3	18
11-Jul	1	4	2	3	1	2	1	3	17
12-Jul		4	2	4	2	5	1	3	21

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 3 (cont)									
13-Jul		5	2	4	4	5	2	2	24
14-Jul		4	3	1	3	4	1	2	18
15-Jul		5	2	1	2	3	1	2	16
16-Jul	1	5	1	1	3	1	1	2	15
17-Jul		2	1	1	1	1		1	7
18-Jul		4	1	1	1			1	8
19-Jul		6	1	2	1			1	11
20-Jul	1	6	2	1		2		1	13
21-Jul	1	7	2	1		2		1	14
22-Jul		5	5	2	1	2		1	16
23-Jul	2	4	2		1	2		1	12
24-Jul	2	5			2	2	1	3	15
25-Jul		3			1	2	1	2	9
26-Jul		2			1	1		2	6
27-Jul		3	1		1	2		2	9
28-Jul	1	4	1		2	1		1	10
29-Jul		2	1		4	1		1	9
30-Jul		2	1		3	1		1	8
31-Jul		2	1		3	1		1	8
1-Aug		1	1		2	1			5
2-Aug		1	1		2	1			5
3-Aug		2	1			1			4
4-Aug		1				2			3
5-Aug			1			2			3
6-Aug		2	2			1			5
7-Aug		2	1			1		1	5
8-Aug						1		1	2
9-Aug		2			1	1			4
10-Aug		1							1
11-13 Aug									0
14-Aug								1	1
15-Aug									0
16-Aug									0
17-Aug	1								1

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 3 (cont)									
18-Aug									0
19-Aug									0
20-Aug	1					1			2
21-Aug	1					1			2
22-Aug	1								1
23-Aug	1								1
24-Aug									0
25-Aug									0
26-Aug	1								1
27-29 Aug									0
30-Aug	1								1
31-Aug									0
1-Sep									0
2-Sep		1							1
3-Sep		1							1
4-7 Sep									0
8-Sep					1				1
9-24 Sep									0
Fixed-station 9 (Bell-Irving River mouth)									
10-26 Jun									0
27 Jun - 3 Jul									0
4-Jul						1			1
5-Jul				1	2				3
6-Jul				2					2
7-Jul				3		2			5
8-Jul				2	1	2			5
9-Jul				4					4
10-Jul				7		1	1		9
11-Jul				7		1			8
12-Jul				8					8
13-Jul				10	1				11

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 9 (cont)									
14-Jul				10	1	2			13
15-Jul				9		3			12
16-Jul				10		2			12
17-Jul				10					10
18-Jul				8	2				10
19-Jul				9		1			10
20-Jul				8		1			9
21-Jul				7	1	2			10
22-Jul				7	2	1			10
23-Jul				5	1	1			7
24-Jul				6	4	4			14
25-Jul				6	2	6			14
26-Jul		1		7	3	5			16
27-Jul		1		7		4			12
28-Jul		1		9		6			16
29-Jul		1		7		3			11
30-Jul		1		7		1			9
31-Jul		1		7		1			9
1-Aug		1		7	2	1			11
2-Aug				9	1	1			11
3-Aug				4	1	1			6
4-Aug				2	1	2			5
5-Aug				2		1			3
6-Aug				2	1	3			6
7-Aug	1			2	1	2			6
8-Aug				1	1	2			4
9-Aug				1					1
10-Aug				2	1	2			5
11-Aug				2					2
12-Aug	1			2		1			4
13-Aug					3	1			4
14-Aug					3	2			5
15-Aug	1					1			2

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 9 (cont)									
16-Aug					1	1			2
17-Aug					1	2			3
18-Aug				1	3				4
19-Aug				1		1			2
20 Aug - 2 Sep									0
3-Sep					1	1			2
4-24 Sep									0
Fixed-station 4 (Kwinageese River mouth)									
10-29 Jun									0
30 Jun - 3 Jul									0
4-Jul						1			1
5-Jul						1			1
6-Jul					2				2
7-Jul									0
8-Jul						1			1
9-Jul					1	1			2
10-Jul						1			1
11-Jul									0
12-Jul						1			1
13-Jul						1			1
14-Jul									0
15-Jul					1				1
16-Jul						2			2
17-Jul						2			2
18-Jul									0
19-Jul					2				2
20-Jul					2	1			3
21-Jul					1	1			2
22-Jul					1	1			2
23-Jul					2	1			3

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 4 (cont)									
24-Jul					1	1			2
25-Jul					4	4			8
26-Jul					1	5			6
27-Jul					2	4			6
28-Jul						5			5
29-Jul						2			2
30-Jul									0
31-Jul						1			1
1-Aug						1			1
2-Aug					1	1			2
3-Aug					1				1
4-Aug						1			1
5-Aug					1				1
6-Aug									0
7-Aug					2	1			3
8-Aug					1	1			2
9-Aug					1	2			3
10-Aug					1	1			2
11-Aug					1	2			3
12-Aug									0
13-Aug						2			2
14-Aug					2				2
15-Aug					2	1			3
16-Aug									0
17-Aug						1			1
18-Aug					3	1			4
19-Aug					3	1			4
20-Aug					1	1			2
21-Aug					1				1
22 Aug - 1 Sep									0
2-9 Sep									0
10-24 Sep									0

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 7 (Damdochax River mouth)									
10-29 Jun									0
30 Jun - 15 Jul									0
16-Jul						1			1
17-Jul						2			2
18-Jul						1			1
19-Jul						1			1
20-Jul						2			2
21-Jul						2			2
22-Jul						3			3
23-Jul						2			2
24-Jul						2			2
25-Jul						2			2
26-Jul						2			2
27-Jul						2			2
28-Jul						3			3
29-Jul						2			2
30-Jul									0
31-Jul						3			3
1-Aug						6			6
2-Aug						9			9
3-Aug						8			8
4-Aug						5			5
5-Aug						2			2
6-Aug						2			2
7-Aug						3			3
8-Aug						1			1
9-Aug						1			1
10-Aug						1			1
11-Aug						2			2
12-Aug						1			1
13-Aug						1			1
14-Aug						2			2
15-Aug						2			2

Table C-1. Daily numbers of chinook salmon of different stocks recorded by fixed-station receivers on the mainstem Nass River, 10 June - 24 September 1993. See Figure 1 for receiver locations. Shaded dates indicate that the receiver was not operating.

Date	Lower Nass	Cranberry	Meziadin	Bell-Irving	Kwinageese	Damdochax	No destination	Miscellaneous [a]	All stocks
Fixed-station 7 (cont)									
16-Aug						3			3
17-Aug						2			2
18-Aug						3			3
19-Aug						1			1
20-Aug						1			1
21-Aug						2			2
22-Aug						2			2
23-24 Aug									0
25-Aug						1			1
26 Aug - 5 Sep									0
6-Sep						1			1
7-8 Sep									0
9-Sep						1			1
10-Sep						1			1
11-Sep						1			1
12-Sep									0
13-Sep						1			1
14-15 Sep									0
16-Sep [b]						1			1
17-24 Sep									0

[a] Miscellaneous includes all recaptures from sport and native fisheries, and miscellaneous mainstem spawners.
[b] FS7 moved 1 km downstream and refered to as FSD (20 September 1993).

Table C-2. Daily numbers of chinook salmon recorded by fixed-station receivers on tributaries to the Nass River, 17 June - 31 October 1993. See Figure 1 for receiver locations. Shaded areas indicate that the receiver was not operating.

	Fixed-station locations				
	Tseax R.	Kiteen R.	Meziadin R.		
Date	(FST)	(FS2)	(FSF)	(FSM)	Total
17-Jun - 2-Jul					0
3-Jul - 8-Jul					0
09-Jul				1	1
10-Jul		1		1	2
11-Jul		1		2	3
12-Jul				2	2
13-Jul				1	1
14-Jul					0
15-Jul					0
16-Jul					0
17-Jul					0
18-Jul				1	1
19-Jul		1			1
20-Jul		2		1	3
21-Jul		1			1
22-Jul		1			1
23-Jul		1	2	2	5
24-Jul		1	1	1	3
25-Jul			1	1	2
26-Jul			1		1
27-Jul				1	1
28-Jul			1	1	2
29-Jul				1	1
30-Jul				1	1
31-Jul		2		1	3
01-Aug		2		1	3
02-Aug		2		1	3
03-Aug		1	1	1	3
04-Aug		2	1		3
05-Aug		2			2
06-Aug				1	1
07-Aug			2		2
08-Aug			1	1	2
09-Aug			2	3	5
10-Aug			3	3	6
11-Aug			1		1
12-Aug			6		6
13-Aug			3		3
14-Aug			2		2
15-Aug			2	1	3
16-Aug					0
17-Aug			1		1

Table C-2. Daily numbers of chinook salmon recorded by fixed-station receivers on tributaries to the Nass River, 17 June - 31 October 1993. See Figure 1 for receiver locations. Shaded areas indicate that the receiver was not operating.

	Fixed-station locations				
	Tseax R.	Kiteen R.	Meziadin R.		
Date	(FST)	(FS2)	(FSF)	(FSM)	Total
18-Aug			1		1
19-Aug		1	1	1	3
20-Aug			2		2
21-Aug		1			1
22-Aug			1	1	2
23-Aug	3				3
24-Aug	3			1	4
25-Aug	3				3
26-Aug	2		1	1	4
27-Aug	2		1	2	5
28-Aug	2		2	2	6
29-Aug	2		1	2	5
30-Aug	2			3	5
31-Aug	2			2	4
01-Sep	2		1	4	7
02-Sep	2			3	5
03-Sep	2			3	5
04-Sep	2		1	3	6
05-Sep	2		1	3	6
06-Sep	2		1	2	5
07-Sep	2		1	2	5
08-Sep	2			3	5
09-Sep	2			2	4
10-Sep	2			4	6
11-Sep	3			2	5
12-Sep	3			2	5
13-Sep	2			2	4
14-Sep	2			2	4
15-Sep	2			3	5
16-Sep	2			2	4
17-Sep	2			3	5
18-Sep	1			3	4
19-Sep	1			4	5
20-Sep	2			4	6
21-Sep	2			4	6
22-Sep	2			4	6
23-Sep	3			4	7
24-Sep	2			4	6
25-Sep	2			3	5
26-Sep	1			4	5
27-Sep	1				1
28-Sep	2				2

Table C-2. Daily numbers of chinook salmon recorded by fixed-station receivers on tributaries to the Nass River, 17 June - 31 October 1993. See Figure 1 for receiver locations. Shaded areas indicate that the receiver was not operating.

	Fixed-station locations				
	Tseax R.	Kiteen R.	Meziadin R.		
Date	(FST)	(FS2)	(FSF)	(FSM)	Total
29-Sep	1				1
30-Sep	2				2
01-Oct	1				1
02-Oct	2				2
03-Oct	1				1
04-Oct	2				2
05-Oct	4				4
06-Oct	3				3
07-Oct	3				3
08-Oct	3				3
09-Oct	3				3
10-Oct	3				3
11-Oct	3				3
12-Oct	4				4
13-Oct	2				2
14-Oct	3				3
15-Oct	2				2
16-Oct	2				2
17-Oct	2				2
18-Oct	2				2
19-Oct	3				3
20-Oct	3				3
21-Oct	2				2
22-Oct	5				5
23-Oct	2				2
24-Oct	2				2
25-Oct	2				2
26-Oct	2				2
27-Oct	3				3
28-Oct	2				2
29-Oct	1				1
30-Oct	1				1
31-Oct	1				1
Total	**153**	**22**	**46**	**124**	**345**

Table D-1. Definitions of codes used with the data sheet used during escapement surveys on the Nass River, 1993.

Water visibility:	1 = clear, can see bottom and fish clearly. 2 = cloudy, still can see fish in shallow water (<1.5m) 3 = cloudy, can see fish in 0.5 m of water 4 = very cloudy, cannot see fish in water unless they are on very shallow riffles. 5 = can only count jumpers.
Light conditions:	A = no glare, sun behind clouds or mountains, no shadows. B = sun high in sky, few shadows, very bright, good light penetration through water. C = sun low in sky, extensive shadows and glare. D = windy, ripples or chop on water. E = low overcast and extensive glare
Count method:	The number in this column refers to the largest group of fish whose abundance was estimated. For example, a 50 in this column means the largest group whose size was estimated was 50 fish. In all cases, the group estimate was arrived at as outlined in the methods section of the text.
Ground speed:	If no wind - the air speed of the helicopter. If a tail wind - calculated by adding airspeed and windspeed. If a head wind - calculated by subtracting wind speed from airspeed.
Observer efficiency:	The surveyor's estimate of his counting efficiency (see text for an explanation).

Chinook Escapement 1993

System _____ Date _____

Surveyors _____

_____

Time	Water visibility	Light cond.	Count method	Live chinook				Dead chinook		
				Holding	On redds	Radio tags	Blue spag	Number	Radio tags	Blue spag
Reach 1 description _____										
Total reach # 1										
Reach 2 description _____										
Total reach # 2										
Reach 3 description _____										
Total reach # 3										
Total										

Pilot _____ Air speed _____ Elevation of count _____

Dir of travel _____ Wind dir _____ Wind speed _____

Cloud/precip _____ Temp _____ Est of % fish counted _____

Comments _____

_____

Figure D-1. The data sheet used during ground and aerial escapement surveys for chinook salmon on the Nass River, 1993.

Table D-2. Survey methods, survey conditions and counts of live and dead adult chinook salmon in the Nass River drainage, 1993.

System / Tributary	Survey	Survey location				Live fish				Carcasses				
							Observer	Tags					Tags	
Date	method	Start	Finish	Visibility	Light cond	Total counts	efficiency estimate	White spag.	Blue spag.	Not Examined	not examined	Total	Radio	Blue
Damdochax River														
25-Aug	Ground	Damdochax Lk	Sansixmor Ck	1.0	B	NA	NA	NA	NA	59	5	64	0	0
25-Aug	Ground	Sansixmor Ck	Slowmaldo Ck	1.0	B	NA	NA	NA	NA	13	2	15	0	0
	Total									**72**	**7**	**79**	**0**	**0**
01-Sep	Ground	Mouth	Slowmaldo Ck	1.0	B	43	85	0	0	89	8	97	2	1
01-Sep	Ground	Damdochax Lk	Slowmaldo Ck	1.0	B	1096	85	9	14	360	0	360	1	2
	Total					**1139**		**9**	**14**	**449**	**8**	**457**	**3**	**3**
09-Sep	Ground	Damdochax Lk	Slowmaldo Ck	1.0	B	519	90	2	4	925	0	925	8	6
09-Sep	Ground	Slowmaldo Ck	2.5 km below Slowmaldo	1.0	B	58	90	4	0	199	0	199	0	0
09-Sep	Ground	Wiminasik Lk	Damdochax Lk	1.0	B	43		0	0	28	0	28	1	0
	Total					**620**		**6**	**4**	**1152**	**0**	**1152**	**9**	**6**
20-Sep	Ground	Damdochax Lk	Sansixmor Ck	1.0	A	0	95	0	0	348	0	348	2	2
20-Sep	Ground	Sansixmor Ck	Slowmaldo Ck	1.0	A	0	95	0	0	65	0	65	1	0
	Total					**0**		**0**	**0**	**413**	**0**	**413**	**3**	**2**
Total Damdochax						**1759**		**15**	**18**	**2086**	**15**	**2101**	**15**	**11**
Kwinageese River														
10-Sep	Ground	1992 campsite	Halfway Lk	2.0	A	248	80	1	3	475	0	475	6	6
	Ground	1992 campsite	3 km below campsite	2.0	A	3	80	0	0	7	0	7	0	0
	Ground	Halfway Lk	1 km above lk	2.0	A	77	80	0	0	165	0	165	2	0
	Total					**328**		**1**	**3**	**647**	**0**	**647**	**8**	**6**
17-Sep	Ground	Halfway Lk	1992 campsite	1.0	B	20	95	0	1	125	15	140	2	0
17-Sep	Ground	1 km above lk	Halfway Lk	1.0	B	13	95	0	0	24	6	30	0	0
	Total					**33**		**0**	**1**	**149**	**21**	**170**	**2**	**0**
Total Kwinageese						**361**		**1**	**4**	**796**	**21**	**817**	**10**	**6**
Bell-Irving Tributaries														
Teigen Creek														
28-Aug	Ground	Mouth	4 km upstream	2.0	B	70	80	1	0	31	7	38	0	0
28-Aug	Ground	1 km below lake	4 km downstream	2.0	B	150	80	0	0	31	20	51	0	0
	Total					**220**		**1**	**0**	**62**	**27**	**89**	**0**	**0**
04-Sep	Ground	Mouth	3 km upstream	3.0	C	13	50	0	0	22	10	32	0	1
04-Sep	Ground	3 km below lake	2 km downstream	3.0	C	12	50	0	0	6	1	7	0	0
	Total					**25**		**0**	**0**	**28**	**11**	**39**	**0**	**1**

Table D-2. Survey methods, survey conditions and counts of live and dead adult chinook salmon in the Nass River drainage, 1993.

System / Tributary	Survey	Survey location				Live fish				Carcasses				
							Observer	Tags						
					Light	Total	efficiency	White	Blue	Not			Tags	
Date	method	Start	Finish	Visibility	cond	counts	estimate	spag.	spag.	Examined	examined	Total	Radio	Blue
Oweegee Creek														
04-Sep	Ground	Mouth Ck	0.2 km upstream	1.0	B	23	98	0	0	1	2	3	0	0
04-Sep	Ground	Mouth Ck	Nass R	1.0	B	72	99	0	0	15	20	35	0	0
	Total					95		0	0	16	22	38	0	0
10-Sep	Ground	Mouth Ck	Nass R	2	B	4	80	0	0	4	10	14	0	0
Total Bell-Irving						344		1	0	110	70	180	0	1
Meziadin River														
05-Sep	Incidental	Mouth		NA	NA	NA	NA	NA	NA	1	0	1	0	0
08-Sep	Ground	Above upper riffle	0.5 km below riffle	2.0	B	165	50	1	0	1	0	1	0	0
14-Sep	Raft	Above upper riffle	1 km below riffle	1 to 4	B	73	50	0	0	13	0	13	0	0
14-Sep	Raft	Second riffle	Road	1 to 4	B	47	50	0	0	10	0	10	0	0
14-Sep	Raft	Base of fishway	Mouth	1 to 4	B	15		0	0	2	0	2	0	0
	Total					135		0	0	25	0	25	0	0
21-Sep	Boat	Above upper riffle	1 km below upper riffle	1 to 2	B	74	80	0	0	189	19	208	3	2
21-Sep	Ground	0.1 km above bridge	0.1 km below bridge	1.0	B	25	95	0	0	33	1	34	0	0
21-Sep	Boat	0.1 km above bridge	Above lower riffle	2.0	C	33	80	0	0	23	0	23	0	0
	Total					132		0	0	245	20	265	3	2
26-Sep	Ground	Above upper riffle	0.1 km below riffle	1.0	B	3	70	0	0	59	6	65	1	1
26-Sep	Ground	0.1 km above bridge	0.1 km below bridge	1.0	B	7		0	0	21	0	21	0	0
	Total					10		0	0	80	6	86	1	1
Total Meziadin						442		1	0	352	26	378	4	3
Cranberry River														
31-Aug	Ground	55.4574 N 128.2526 W	55.5008 N 128.2938 W	1 to 2	C	80	80	0	0	49	18	67	0	1
31-Aug	Ground	55.5280 N 128.3070 W	55.5568 N 128.3618 W	2.0	B	61	90	1	0	8	2	10	0	0
	Total					141		1	0	57	20	77	0	1
05-Sep	Incidental	Mouth of Calvin Ck		NA	NA	0	NA	0	0	2	0	2	0	0
07-Sep	Ground	55.4944 N 128.2764 W	55.5348 N 128.4360 W	1.0	B	7	80	0	0	19	11	30	0	0
07-Sep	Ground	55.5817 N 128.5756 W	55.5785 N 128.5766 W	1.0	B	2	50	0	0	37	0	37	0	0
07-Sep	Ground	55.5282 N 128.7835 W	55.5293 N 128.7811 W	2.0	C	0	50	0	0	13	3	16	0	1
	Total					9		0	0	69	14	83	0	1

Table D-2. Survey methods, survey conditions and counts of live and dead adult chinook salmon in the Nass River drainage, 1993.

System / Tributary / Date	Survey method	Survey location: Start	Survey location: Finish	Visibility	Light cond	Live fish: Total counts	Live fish: Observer efficiency estimate	Live fish: Tags: White spag.	Live fish: Tags: Blue spag.	Carcasses: Not examined	Carcasses: Examined	Carcasses: Total	Carcasses: Tags: Radio	Carcasses: Tags: Blue
10-Sep	Ground	1.6 km E powerline	2.0 km W powerline	2	B	2	80	0	0	25	19	44	0	0
Total Cranberry						152		1	0	153	53	206	0	2
Lower Nass Systems														
Seaskinnish Creek														
03-Sep	Ground	Nass R	Canyon chute	2.0	C	39	85	1	0	46	0	46	1	0
03-Sep	Ground	Canyon chute	Seask. bridge	2.0	C	108	80	0	1	38	0	38	0	0
	Total					147		1	1	84	0	84	1	0
12-Sep	Ground	Nass R	Canyon chute	1	A	10	95	0	0	36	13	49	1	0
Total Seaskinnish						157		1	1	120	13	133	2	0
Tseax River														
07-Sep	Incidental	Tseax Lk		NA	NA	NA		0	0	1	0	1	0	0
12-Oct	Ground	91 k bridge	Dickens bridge	2.0	B	311		0	1	58	0	58	1	0
12-Oct	Ground	Main road	below mouth of Tseax	2.0	B	140	NA	0	0	24	0	24	0	0
	Total					451		0	1	82	0	82	1	0
26-Oct	Ground	91 k bridge	Dickens bridge	2	A	95	NA	0	0	15	0	15	0	0
Total Tseax						546		0	1	98	0	98	1	0
Ishkeenickh River														
26-Jul	Helicopter	Nass R	54.9417 N 129.5851 W	2.0	B	1				NA	0	0		
		54.9417 N 129.5851 W	Bridge	2.0	B	32				NA	0	0		
		Bridge	54.8950 N 129.5650 W	2.0	B	4				NA	0	0		
		54.8950 N 129.5650 W	Lachballach Ck	2.0	B	0				NA	0	0		
		Lachballach Ck	Lachballach Lk	1.0	B	0				NA	0	0		
	Total					37	20-60			NA	0	0		
09-Aug	Helicopter	Nass R	54.9417 N 129.5851 W	2.0	A	29				NA	2	2		
		54.9417 N 129.5851 W	Bridge	2.0	C	14				NA	1	1		
		Bridge	54.8950 N 129.5650 W	2.0	A	52				NA	1	1		
	Total					95	30-50			NA	4	4		
Total Ishkeenickh						132				NA	4	4		

Table D-3. Summary of radio and spaghetti tags recovered from the Nass River Watershed, 1993.

	Carcasses examined							Live fish observed				Tag found on stream bed			
	No. with							No. with							
Date	Radio+ white spag.	Radio+ no spag.	No radio+ white spag.	Blue spag.	Unknown spag.	Total tags	No. examined	White spag.	Blue spag.	Total spag.	No. observed	Radio	White spag.	Blue spag.	Total tags
Tseax River															
7-Sep	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
12-Oct	0	1	0	0	0	1	82	0	1	1	451	0	0	0	0
26-Oct	0	0	0	0	0	0	15	0	0	0	95	0	0	0	0
Total	**0**	**1**	**0**	**0**	**0**	**1**	**98**	**0**	**1**	**1**	**546**	**0**	**0**	**0**	**0**
Seaskinnish Creek															
3-Sep	0	1	0	0	0	1	84	1	1	2	147	0	0	0	0
12-Sep	0	0	1	0	0	1	36	0	0	0	10	0	0	0	0
Total	**0**	**1**	**1**	**0**	**0**	**2**	**120**	**1**	**1**	**2**	**157**	**0**	**0**	**0**	**0**
Cranberry River															
31-Aug	0	0	0	0	1	1	57	1	0	1	141	0	0	0	0
5-Sep	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
7-Sep	0	0	0	0	1	1	69	0	0	0	9	0	0	0	0
10-Sep	0	0	0	0	0	0	25	0	0	0	2	0	0	0	0
Total	**0**	**0**	**0**	**0**	**2**	**2**	**153**	**1**	**0**	**1**	**152**	**0**	**0**	**0**	**0**
Meziadin River															
30-Jul	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
19-Aug	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
25-Aug	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
29-Aug	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
1-Sep	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
5-Sep	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Table D-3. Summary of radio and spaghetti tags recovered from the Nass River Watershed, 1993.

	Carcasses examined							Live fish observed				Tag found on stream bed			
	No. with							No. with							
Date	Radio+ white spag.	Radio+ no spag.	No radio+ white spag.	Blue spag.	Unknown spag.	Total tags	No. examined	White spag.	Blue spag.	Total spag.	No. observed	Radio	White spag.	Blue spag.	Total tags
8-Sep	0	0	0	0	0	0	1	1	0	1	165	0	0	0	0
14-Sep	0	0	0	0	0	0	25	0	0	0	135	0	0	0	0
21-Sep	3	0	0	2	0	5	245	0	0	0	132	0	0	0	0
26-Sep	0	1	0	0	1	2	80	0	0	0	10	0	0	0	0
Total	**3**	**1**	**0**	**2**	**1**	**7**	**352**	**2**	**4**	**6**	**447**	**0**	**0**	**0**	**0**
Kwinageese River															
10-Sep	6	2	0	6	0	14	647	1	3	4	328	0	1	6	7
17-Sep	2	0	0	0	0	2	149	0	1	1	33	0	0	1	1
Total	**8**	**2**	**0**	**6**	**0**	**16**	**796**	**1**	**4**	**5**	**361**	**0**	**1**	**7**	**8**
Damdochax Creek															
25-Aug	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0
1-Sep	1	2	0	3	0	6	449	9	14	23	1139	0	0	0	0
9-Sep	4	5	0	6	0	15	1152	6	4	10	620	1	0	2	3
12-Sep	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0
14-Sep	0	1	0	0	0	1	1	0	0	0	0	1	0	0	1
20-Sep	0	3	0	1	1	5	413	0	0	0	0	0	2	2	4
24-Sep	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
19-Oct	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	**5**	**11**	**0**	**11**	**1**	**28**	**2088**	**15**	**18**	**33**	**1759**	**4**	**2**	**4**	**10**

Table D-3. Summary of radio and spaghetti tags recovered from the Nass River Watershed, 1993.

	Carcasses examined							Live fish observed				Tag found on stream bed			
	No. with							No. with							
Date	Radio+ white spag.	Radio+ no spag.	No radio+ white spag.	Blue spag.	Unknown spag.	Total tags	No. examined	White spag.	Blue spag.	Total spag.	No. observed	Radio	White spag.	Blue spag.	Total tags
Teigen Creek															
28-Aug	0	0	0	0	0	0	62	1	0	1	220	0	1	0	1
4-Sep	0	0	0	0	1	1	28	0	0	0	25	0	0	0	0
Total	**0**	**0**	**0**	**0**	**1**	**1**	**90**	**1**	**0**	**1**	**245**	**0**	**1**	**0**	**1**
Oweegee Creek															
4-Sep	0	0	0	0	0	0	16	0	0	0	95	0	0	1	1
10-Sep	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0
11-Sep	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**99**	**1**	**0**	**1**	**2**
All systems	**16**	**16**	**1**	**19**	**5**	**57**	**3717**	**21**	**28**	**49**	**3766**	**5**	**4**	**12**	**21**

Table E-1. Daily counts of tagged and untagged chinook salmon and steelhead that passed through the Meziadin fishway, 9 July - 1 October 1993. Radio tags detected at fixed-station receivers on (FSF), and above the fishway (FSM), are also presented.

	Fishway observations[a]						Radio tag detections[b]		
	Chinook			White spag.		Blue spag.	FSF	FSM	
Date	Adults	Jacks	Steelhead	Chinook	Steelhead	Chinook	Chinook	Chinook	Steelhead
9-Jul								1	
10-Jul									
11-Jul								1	
12-Jul									
13-Jul									
14-Jul									
15-Jul									
16-Jul	5	0	0						
17-Jul	23	0	0						
18-Jul	16	0	0						
19-Jul	10	0	0						
20-Jul	1	2	0						
21-Jul	7	1	0						
22-Jul	17	1	0						
23-Jul	20	0	0	1			1	1	
24-Jul	9	3	0						
25-Jul	4	2	0						
26-Jul	8	0	0				1		
27-Jul	14	0	0					1	
28-Jul	4	2	0				1		
29-Jul	5	3	0					1	
30-Jul	12	2	0			1			
31-Jul	0	0	0						
1-Aug	0	0	0						
2-Aug	5	0	0						
3-Aug	4	0	0						
4-Aug	5	1	0						
5-Aug	5	2	0						
6-Aug	7	0	0					1	
7-Aug	2	0	0				1		
8-Aug	13	1	0					1	
9-Aug	5	0	0			1		2	
10-Aug	8	0	0				1		
11-Aug	8	0	0						
12-Aug	8	0	0						
13-Aug	6	0	0						
14-Aug	4	2	0						
15-Aug	28	4	0					1	
16-Aug	5	1	0						
17-Aug	18	0	0	1		1			
18-Aug	6	3	0						
19-Aug	3	5	0			1		1	
20-Aug	8	1	0						
21-Aug	4	3	0						
22-Aug	4	1	0				1	1	
23-Aug	3	1	0						

Table E-1. Daily counts of tagged and untagged chinook salmon and steelhead that passed through Meziadin fishway, 9 July - 1 October 1993. Radio tags detected at fixed-station receivers (FSF), and above the fishway (FSM), are also presented.

	Fishway observations[a]						Radio tag detections[b]		
	Chinook			White spag.		Blue spag.	FSF	FSM	
Date	Adults	Jacks	Steelhead	Chinook	Steelhead	Chinook	Chinook	Chinook	Steelhead
24-Aug	3	0	0						
25-Aug	6	0	0			1			
26-Aug	0	0	0						
27-Aug	3	1	0						
28-Aug	1	2	0						
29-Aug	10	0	0	1			1	1	
30-Aug	6	1	0					1	
31-Aug	2	0	0						
1-Sep	5	0	0	1		1	1	1	
2-Sep	3	0	0			1			
3-Sep	6	1	0		1				1
4-Sep	8	0	0	1			1	1	
5-Sep	2	0	0						
6-Sep	9	3	0			2			
7-Sep	7	7	0				1		
8-Sep	11	1	0	1				1	
9-Sep	3	2	0						
10-Sep	3	0	0						
11-Sep	4	1	0						
12-Sep	1	0	1		1				
13-Sep	3	1	0						
14-Sep	1	1	0						
15-Sep	1	0	0						
16-Sep	7	0	3						
17-Sep	0	0	0						
18-Sep	2	0	0						1
19-Sep	1	0	0						
20-Sep	2	0	2						
21-Sep	2	1	3			1			
22-Sep	0	1	0						
23-Sep	0	0	1						
24-Sep	2	0	0						
25-Sep	0	0	0						
26-Sep	1	0	0						
27-Sep	1	0	0						
28-Sep	0	0	0						
29-Sep	2	0	2			1			
30-Sep	1	0	4						
1-Oct	0	0	0						
Total	**433**	**64**	**16**	**6**	**2**	**11**	**10**	**17**	**2**

[a] Shaded area represents no observations conducted. Fishway observations began 16 July, with a crew change on 4 September 1993.

[b] Radio tag detections for FSF are the last date a particular tag was detected, and for FSM, the first date that a particular tag was detected. Radio-tagged steelhead were not monitored at FSF.