Géis Tóo'e': King Salmon River
2005 Michie Creek Chinook Salmon Field Investigations

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ABSTRACT

This report details the stewardship and research activities that were conducted in upper Michie Creek during the open water season of 2005. The primary purpose of the stewardship activities was to maintain salmon habitat in this watercourse by monitoring beaver activity and other potential barriers and breaching them when required. Research included the collection of benthic, hydrological and thermal data. In addition, the relative health of both wild and enhanced juvenile Chinook salmon populations that utilize upper Michie Creek was investigated.

It is believed that water flow conditions in 2005 in the upper Michie Creek spawning area were adequate to allow spawning success of Chinook salmon. Remedial efforts to remove beaver dams were not required in 2005, probably due to the higher flows. This allowed unrestricted access of migrating adult salmon into the upper Michie Creek spawning area. Surface temperatures in the Whitehorse fish ladder and the Yukon River mainstem downstream of the Whitehorse Rapids dam were lower than in 2004. Juvenile salmon investigations concluded that there was no apparent effect of hatchery plantings on the survival or growth of wild juvenile Chinook salmon, at densities of wild salmon found in upper Michie Creek and under the environmental conditions that occurred during the open water season of 2005. Based on coded wire tag recoveries in 2005, spawning adults of hatchery origin in upper Michie Creek and the M'Clintock River came from fry releases in 2000, 2001 and 2002. Tag recoveries also indicate there was little straying of spawning adults between release sites in upper Michie Creek and the M'Clintock River. The majority of recovered tags were from the 2002 plantings in upper Michie Creek.

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INTRODUCTION

This project is a continuation of a multi-year program of stewardship activities and related research on Chinook salmon that utilize habitat located in upper Michie Creek, a tributary of the M'Clintock River. The watershed lies within the Traditional Territory of the Kwanlin Dun First Nation and is located in the southern Yukon Territory. The M'Clintock River represents a portion of the headwaters of the Yukon River Basin and supports one of the longest spawning runs of anadromous Chinook salmon in North America, with annual migrations of over 3000 km. The continued maintenance of the Michie Creek Chinook salmon population is an important management objective for both the Kwanlin Dun people and the Department of Fisheries and Oceans Canada.

The salmon have long been important to the people of the Kwanlin Dun First Nation (KDFN) whose traditional territory encompasses the watershed. For generations, the rich salmon resources associated with the Yukon and McClintock River provided food for many families. Early explorers also noted the abundant salmon of the area in the late 1800's (Dawson 1887; Cox 1997). In recent times, the salmon population has declined and the Kwanlin Dun people are no longer able to harvest this food source. Causal factors have been largely speculative, although over-harvesting during migrations and disruption of habitat caused by the construction of the Whitehorse Rapids dam have been implicated. The continued maintenance of a Michie Creek Chinook salmon spawning population is an important management objective for both the Kwanlin Dun people and Fisheries and Oceans Canada. This Upper Yukon River population is thought to be genetically distinct from other tributaries of the Yukon River and is one of the longest spawning runs in North America with migrations of over 3,000 kilometres.

BACKGROUND

With the building of the Whitehorse Rapids dam and hydroelectric station in 1957, historic Chinook salmon migrations into the upper Yukon River had an uncertain future. The dam was a complete barrier in 1958 and by the spring of 1959 a fish ladder was constructed to allow passage of migrating fish past the dam (Gordon *et al* 1960; Williams, pers. com., 2002). The Whitehorse Rapids fish ladder, a structure that is 366 meters long and rises over 15 meters has been in operation since. Technical details of the

ladder are described in Gordon *et al* (1960). Each year spawning Chinook salmon ascend the fish ladder to access spawning habitat primarily in Michie Creek, a major tributary of the M'Clintock River.

In 1984 a hatchery was constructed as a mitigative response to the installation of a forth turbine at the Whitehorse Rapids dam. Since construction annual releases have ranged between 84,000 and 441,500 Chinook salmon fry. Release locations have primarily been above the dam and particularly in the M'Clintock River and Michie Creek. The primary purpose of the hatchery is to offset mortalities of juvenile Chinook salmon passing over the dam's spillway and particularly, through the turbines. Over the longer term it is believed these releases will increase the spawning population above the dam. Currently, all hatchery origin fish are adipose clipped and coded wire tagged for identification.

Chinook spawning migrations through the fish ladder have averaged about 900 fish since annual counts were established in 1961 (Appendix III). The lowest count of migrating adults was recorded in 1976 of only 121 fish. The highest count of 2,958 fish was recorded in 1996. The large year to year fluctuations in counts make long term trends difficult to interpret. None-the-less, numbers of migrating fish through the ladder appear to have increased in recent times based on the 1995-2005 average of 1,579 fish. Returning adults originating from hatchery plantings are also variable. Based on counts through the fish ladder from 1992 to 2005, hatchery fish now account for 60 percent of the adult spawning migration. The sex ratio of the adult spawning migration through the fish ladder is also highly skewed in favour of jacks and small males (Milligan, pers. com., 2005).

Since the construction of the Whitehorse Rapids dam Chinook salmon has been a focus of study in the upper Yukon River basin. Investigations have included the study of juvenile out-migration (von Finster *et al* 1988; Moodie *et al* 2000), juvenile habitat preferences and distribution (Hunka and Schuyler 1988; Bradford *et al* 2001; Pumphrey 2003), estimates of juvenile turbine mortality (Hryciuk 1973), adult enumeration in the M'Clintock River (Matthews 1994; Matthews 1999a), adult radio tagging (Cleugh and Russell 1980; Mathews 1999b), biophysical inventories (Brown 1976; Cleugh *et al* 1978) and archival research of salmon stocks of the upper Yukon River basin (Cox 1997). In

addition, numerous foot and aerial surveys have been conducted at known and potential spawning locations in the upper watershed (Milligan, pers. com., 2003).

OBJECTIVES

In keeping with its vision of resource stewardship and to continue to build capacity, the Kwanlin Dun First Nation is continuing studies to successfully understand salmon resources in their Traditional Territory. The long term goal of the First Nation is to participate with management agencies in the rebuilding of salmon populations to their fullest sustainable levels and protect salmon habitat from conflicting land uses. KDFN continues to train people in fisheries field techniques and involve staff in field investigations and project management which contributes to the First Nation taking on an increasing role in the stewardship and management of land and resources within its Traditional Territory. The following were specific objectives of the 2005 Michie Creek Chinook salmon field investigations:

1. To continue field research and perform watershed monitoring through data collection and analysis of the interactions between wild and hatchery juvenile Chinook salmon in Michie Creek;

2. To examine, document, and maintain access to Michie Creek spawning habitat by adult Chinook salmon in this watercourse;

3. To undertake adult spawning enumerations, dead pitch and redd surveys in upper Michie Creek.

The First Nation has also commenced a watershed planning initiative for the M'Clintock drainage which encourages participation of community members. This planning initiative will address various management issues and risks to salmon and their habitat in the watershed.

STUDY AREA

The M'Clintock River watershed rises in the mountains of the Yukon Plateau north of Marsh Lake, about 110 km east of Whitehorse. The drainage basin is in KDFN traditional territory and lies within the Boreal Cordillera ecozone that is composed of rolling hills and plateaus that are dissected by streams. The region has been previously

glaciated and contains widespread deposits of glacial origin. A detailed description of the surficial geography is included in the M'Clintock Watershed Management Plan (KDFN 2003).

The watershed contains several lakes (5-500 ha), numerous tributaries, and wetlands to form a drainage area of approximately 1,650 km^2. Surface waters originating in the M'Clintock watershed flow into Marsh Lake, a large headwater lake of the Yukon River basin. Information is limited about the distribution of freshwater fish species in much of the drainage. Clough *et al* (1978) reported catches of northern pike, lake or humpback whitefish, longnose sucker, Arctic grayling and slimy sculpin in the Michie Creek drainage. In a recent study of M'Clintock and Michie lakes the presence of lake trout, round whitefish and burbot have also been confirmed (KDFN 2003).

White and black spruces are the most common forest type of the ecozone with sedge tussocks and/or sphagnum common in the wetlands. At higher elevations, scrub birch and willow occur in subalpine sections. The climate in this region is characterized as an interior subalpine type with long cold winters and summers that are brief and cool (Environment Canada 2003).

Michie Creek is the largest tributary in the M'Clintock drainage basin and is the primary spawning area of migrating Chinook salmon above the Whitehorse Rapids dam. Physical habitat descriptions of the spawning habitat in upper Michie Creek have been previously described (KDFN 2003). The study area for this project is a reach of Michie Creek between the outlet of Michie Lake and the Byng Creek confluence, a distance of about 5 km of stream (Figure 1).

METHODS

Five field surveys and two aerial flights were made into the upper Michie Creek Chinook spawning area between May and September, 2005. Field surveys were completed on May 26, June 16, July 14, August 11 and September 1. Aerial surveys required the use of a helicopter and were flown on August 2 and 27. For each field survey access was gained into the Michie Creek spawning site using ATV's. Field equipment and camp supplies were transported by trailer to a staging area on the west basin of Michie Lake (Figure 1).

Instantaneous water discharge in upper Michie Creek was estimated during each field survey at site M1. A section of stream channel that had a uniform cross section was used for the estimate. A Global Flow Probe determined mean column velocities of the stream. Discharge was subsequently calculated using measured velocities and crosssectional areas. A Solinst combination water level and temperature data logger and a Solinst atmospheric barometer were used to monitor stream temperature and level at site M1 in upper Michie Creek. A description of the installation methodology is contained in KDFN (2005). Hobo® Water Temperature Pro data loggers were installed during the spring of 2005 in the Whitehorse Rapids fish ladder and in the Yukon River mainstem downstream of the Whitehorse Rapids dam. Three StowAway® Tidbit data loggers that were installed in 2004 at locations in Byng and Michie creeks failed to re-launch during the spring of 2005. All data loggers were attached to a brick and secured with aircraft cable to the closest bank or stationary structure. Locations were marked with flagging tape and GPS coordinates were noted. Data was downloaded in the field onto a laptop computer. Mean daily surface water temperatures were computed from hourly water temperatures and presented graphically.

Benthic organisms were collected during each field survey at site M1. Collections were made in triplicate with a 500 micron mesh surber sampler. The stream bed material within the sampler was cleaned by hand to a depth of approximately 10 cm. All captured invertebrates and associated detritus were placed in labelled one litre containers and preserved with 10% formalin. Sample collections were shipped to an invertebrate biologist for sorting, identification and enumeration. Results are summarized in Appendix I. As in previous years, benthic invertebrate data was analyzed using the Shannon Wiener Diversity Index as described by Pielou (1966).

A minimum of 10 Gee type minnow traps were utilized during each field survey. Minnow traps were set in a variety of habitat features including root wads, cutbanks and woody debris. Soak times were recorded for each individual trap. All captured juvenile Chinook salmon were sampled in accordance with the *Yukon River Panel Protocol for collection and reporting of data from juvenile salmon sampled in Canadian R&E Projects* (Yukon River Panel 2005). Age was determined by using length frequency distributions described by Duncan and Bradford (2004). For comparative purposes a sub-

sample of hatchery reared juvenile Chinook salmon were measured at the Whitehorse Rapids fish hatchery on June 1. In addition, juvenile Chinook length data from May 27 and June 3 collected from the McIntyre Creek incubation box was also used. Morphological data for sampled Chinook juveniles is presented in Appendix II. Condition factors were calculated using methods described in Everhart (1975).

For dead pitch, CWT recovery and redd surveys, upper Michie Creek was walked on August 31 and September 1. Spawning habitat below the M'Clintock River waterfall and the Michie Creek confluence was surveyed by boat on August 27. Redd locations were identified in the stream bed by their oval shape, size and distinct appearance free of algae and sediment. They were counted and georeferenced by GPS. Carcasses were enumerated, sampled and heads from hatchery fish were removed and labelled.

The first aerial survey on August 2 was to identify potential barriers that would limit upstream access of Chinook salmon to known spawning sites on Michie Creek and the M'Clintock River. The flight was timed to correspond with the first observation of migrating salmon through the Whitehorse Rapids Fish Ladder. Features such as active beaver dams and associated ponding and logjams were georeferenced during the flight. All identified barriers during this project were managed in accordance with the *Yukon River Panel's Protocol for Obstruction Management* (Yukon River Panel 2005). The second aerial flight occurred on August 27 and enumerated spawning salmon in upper Michie Creek.

RESULTS

Water Flow and Temperature

The combination level/temperature recorder in upper Michie Creek malfunctioned throughout the summer of 2005. The device stopped logging on May 10 and after being re-launched on May 25 all subsequent data appeared suspect. None-the-less, instantaneous flow measurements taken at site M1 in Michie Creek during each field trip in 2005 were used to compare discharge recorded for the same site in 2004 (Figure 2). The discharge pattern was similar between years with peak flow recorded in late May. Discharge in 2005 was greater than in 2004 at each flow measurement. Sustained flows of approximately 1.48 m^3 sec^{-1} through the Chinook spawning period from August into

September was recorded in 2004. Flows approximated 2.26 m^3 sec^{-1} for the same period in 2005. Rainfall during the months of June, July and August recorded in Whitehorse during 2004 were well below the 30 year average reported by Environment Canada (2006).

Water temperatures recorded at monitoring sites in the mainstem of the Yukon River downstream of the Whitehorse Rapids dam and in the Whitehorse Rapids fish ladder were cooler in 2005 compared to 2004 for the same period (Figures 3 and 4). The exception was during two weeks in early June. For the balance of the summer and throughout the Chinook migration period (July 29 to September 6) water temperatures were about 1 to 2 º C lower in 2005 than those recorded in 2004. A sharp decline in water temperature of about 4 º C was noted on July 29 at the Whitehorse Rapids fish ladder. Overall, there was less variation in water temperatures in 2005. Two thermal peaks were recorded in 2005, the first in mid July and the latter in mid August. Water temperatures in the fish ladder during the adult Chinook migration between July 29 and September 6 averaged 14.5 º C, ranging from 11.5 º C to 16.6 º C.

Benthic Organisms

The results from analysis of benthic collections in 2005 at site M-1 in upper Michie Creek are summarized in Table 1. Results suggest a more diverse and abundant benthic community as the summer progressed. Benthic density in May was an order of magnitude lower than results in September. Diversity remained consistently high from June through to September sampling periods. Streambed invertebrate density ranged from 4,467 (m^2) organisms in May to a high of 65,880 organisms (m^2) in September.

The dominant benthic group during sampling in May were bivalves with subdominant groups represented by diptera (flies), coleoptera (beetles) and hydracarina (mites). During June and for all the subsequent sampling episodes, dipterans were the dominant group representing between 24 to 41 percent of the organisms collected. Subdominat groups from mid to late summer included ephemeroptera (mayflies) and tricoptera (caddisflies). Overall, benthic sampling results suggest species richness at site M-1 in Michie Creek is high with a maximum of 74 identified taxonomic groups representing 45 different families.

Riparian and Aquatic Vegetation

Botanicals that were identified in 2005 near site M-1 in upper Michie Creek are summarized in Table 2. The upper reaches of Michie Creek were dominated by lowland forests of mature white spruce (*Picea glauca*). Other tree species in the riparian area include balsam poplar (*Populus balsamifera*) and the occasional Bebb's willow (*Salix bebbiana*). Fairly dense undergrowth was found along the streambanks and was dominated by shrubs and forbs. The gravels of the riffles along the mainstem of the stream were mostly free of vegetation. Pools, backwaters and the quieter waters immediately adjacent to the streambanks were colonized by several aquatic and semi-aquatic vascular plant species.

Juvenile Chinook Salmon (jcs)

Hatchery jcs of age 0^+ averaged 69 mm in fork length and 2.6 gm in weight just prior to release into the wild in 2005. The average size of wild 0^+ jcs in Michie Creek just prior to the hatchery plantings were 38 mm in fork length and 0.6 gm in weight. A length frequency histogram comparing hatchery and wild 0^+ aged jcs is presented in Figure 5. During the 68 days of growth between May 26 and September 1, the average weight and fork length of sampled wild jcs in Michie Creek increased by 3.1 gm and 38 mm, respectively. A comparison of fitted growth curves of wild 0^+ jcs that were minnow trapped in upper Michie Creek from 2003 to 2005 is presented in Figure 6.

In 2005, jcs dominated the catch in minnow traps at site M-1 in upper Michie Creek with a total of 153 captured. This was the least number of captures since the yearly minnow trapping program was established in 2003. A comparison of jcs catches for each survey year is presented in Figure 7.

Accompanying catches of other fish species during the summer of 2005 in decreasing frequency included longnose sucker, slimy sculpin, burbot and Arctic grayling. Juvenile Chinook salmon catches were low during each trapping episode, ranging from an average of 1.5 to 4.3 fish for each trap over a 24 hour soak period (Table 3). Hatchery origin jcs from plantings into Michie Creek on June 13 were only represented in the minnow trap catch on September 1. During this sampling episode a single adipose clipped hatchery origin jcs of age 0^+ was captured representing less than 1

percent of the overall catch. A total of 4 wild 1^+ juvenile Chinook salmon were captured during the minnow trapping episode on July 14.

The average condition factor determined for wild jcs aged 0^+ during May was 1.00 (Table 4). It is cautioned that condition factors derived for such small fish are intrinsically less accurate than for larger fish (Murphy and Willis 1996). None-the-less, average condition for this age class reached a high of 1.12 in August and dropped to 0.97 in early September. Wild jcs aged 1^+ had condition factors averaging 1.38 in July although sample size was small (Figure 8). Average condition factor determined for jcs from the Whitehorse Rapids hatchery in May was 0.81.

Adult Chinook Salmon

The first Chinook salmon to migrate through the Whitehorse Rapids fish ladder in 2005 did so on July 23 (Milligan, pers. com., 2005). On August 2, a reconnaissance flight over the upper Michie Creek spawning area failed to observe adult fish or identify barriers that would obstruct salmon migration. A foot survey of upper Michie Creek on August 10 revealed several adult salmon staging in a deep pool associated with an abandoned beaver dam near site M1. An additional 6 adult chinook were observed downstream in a deep scour pool at the Michie-Byng confluence. By August 11, adult chinook had moved upstream of site M1 into areas where redds have in past years been observed. Very few salmon redds or evidence of digging were evident during this survey suggesting migrating adults were just beginning to stage at spawning sites in upper Michie Creek.

The aerial over-flight of upper Michie Creek on August 27 enumerated 340 adult salmon between Michie Lake and the Byng Creek confluence. Salmon redds at this time were clearly discernable from the air. A subsequent redd survey by foot of this section of stream on August 31 enumerated 131 redds.

A single adult salmon was observed in Byng Creek during the over-flight on August 27. A foot survey of Byng Creek on September 1 enumerated 4 adult salmon and 6 redds just upstream of the Michie Creek confluence. A float survey of M'Clintock River on August 27 from below the waterfall barrier on the M'Clintock River mainstem to the Michie Creek confluence, enumerated 54 adult Chinook salmon and 30 salmon

redds. The last adult Chinook salmon passed through the Whitehorse Rapids fish ladder on Sept 6.

In total, 28 salmon carcasses of hatchery origin were sampled with the resulting coded wire tags (CWT) extracted form their heads. Male carcasses were more numerous representing 71 percent of the sample. Interpreted CWT's indicate origins of the 2005 spawning run are from tagging programs at the Whitehorse Rapids hatchery in 2000, 2001 and 2002 (Table 5). The majority of recovered tags were from carcasses collected from Michie Creek.

No barriers to fish movement were located in 2005. While some beaver dams continued to be active, based on the observations of fresh cuttings, all continued to allow passage of migrating adult Chinook salmon throughout the spawning period (Figure 9). Some of the beaver dams that were active in 2004 were inactive in 2005. The only remediation that was conducted in 2005 was on a logjam on upper Byng Creek. The logjam is located just below the trail crossing and was notched with a chainsaw to augment upstream passage of fish (Figure 10).

DISCUSSION

Water Flow and Temperature

The malfunction of the combination level/temperature recorder in upper Michie Creek made flow comparisons to previous years more subjective. Studies have previously established that the annual flow regime does reflect the quality of salmonid spawning habitat in any specific year (Smith 1973; Bjornn and Reiser 1991). It has been reported that optimal usable spawning and egg incubation velocities for Chinook salmon is thought to range of 0.3 to 0.9 m sec^{-1} based on habitat suitability indices (HSI) produced from published reports primarily on streams in south western North America (Raleigh *et al* 1986). While spawning and incubation flow preferences for Yukon River Chinook have yet to be established, the single measurement of 0.78 m sec^{-1} on August 10 in 2005 approximated the 2004 measurement of 0.70 m sec^{-1} and is within the range reported by Raleigh *et al* (1986).

Water discharge in upper Michie Creek during 2005 can only be inferred from the measurements that were taken over the course of the summer. Based on these

measurements it appears that summer stream flows were noticeably greater in 2005 than those recorded in 2004. With upper Michie Creek flows being influenced by several upstream lakes and wetlands, large flow fluctuations between sampling episodes are unlikely and measured values are believed to be representative of the flows. Michie Lake, the largest waterbody in the drainage, provides storage during high precipitation or snowmelt events and combined with groundwater inputs results in the dampening of water level fluctuations (von Finster, pers. com., 2004).

As with flow, a water temperature log of upper Michie Creek is not available. None-the-less, water temperatures in upper Michie Creek during the summer of 2005 were thought to be slightly cooler than in 2004 based on monitoring sites further downstream. With the cooler water temperatures in upper Michie Creek relative to 2004, it is unlikely that surface water temperatures would have approached the upper threshold of tolerance for Chinook eggs.

The mainstem of the Yukon River below the Whitehorse Rapids dam and in the Whitehorse Rapids fish ladder recorded cooler temperatures throughout the summer of 2005. Water temperatures were once again similar between the fish ladder and the Yukon River mainstem. Temperatures averaged 14.4 º C in the fish ladder during the adult migration in 2005. This average temperature is within the preferred range for migration of 10.6 to 19.4 º C reported for other populations of Chinook salmon that migrate in the fall (Bjornn and Reiser 1991). The most conspicuous event on the 2005 thermograph for the fish ladder is the dramatic decrease in water temperature on July 29. This decline, unlike the sharp decline in 2004, was not recorded at the monitoring site in the Yukon River mainstem. It is believed that the sensor was exposed to the air due to a decline in flow in the ladder on that day.

Benthic Organisms

Spring is generally thought to be outside the window of maximum benthic production (Davidge, pers. com., 2004) and collected data appears to support this concept. The high benthic diversity in upper Michie Creek was maintained through June and into September. The density of organisms in the stream was relatively high from at

least the middle of July to early September. The highest density of organisms was recorded on September 1.

Similar to the 2004 results, upper Michie Creek continues to display a diverse benthic community, having upwards to 74 taxonomic groups represented by 45 different families. Calculated Shannon-weaver benthic diversity indices for Michie Creek ranged from 1.25 to 1.51 in 2005. These values are high when compared to diversity indices reported for other Chinook spawning streams in the Yukon River basin (KDFN 2005). There is little indication that hatchery plantings are negatively influencing the benthic diversity or density in upper Michie Creek.

Riparian and Aquatic Vegetation

Compared to other habitats, systematic inventories of riparian corridors along salmon spawning streams have not received study in Yukon. The study of terrestrial and aquatic interfaces have been limited to wetlands that include fens, bogs, swamps, marshes and shallow water areas where some initial research has been targeted (Government of Yukon 1999). It is widely known that spawning Pacific salmon transport marine-derived nutrients into streams and rivers. Subsequently, these marine-derived nutrients are incorporated into freshwater and terrestrial food webs through decomposition and predation. The implications of nutrients on plant ecology and riparian diversity are presently unknown. A total of 41 plant species were identified during the inventory of upper Michie Creek. The streambanks had the most diverse plant community with 20 species identified. A total of 15 species were found below the high water mark and along gravel bars. Aquatic vascular plants represented the least diverse group with only 6 species identified. Generally, the riparian plant community in upper Michie Creek is thought to be relatively diverse for the locality (Withers, pers. com., 2005).

Juvenile Chinook Salmon

As in years past, minnow trapping resulted in the capture of two age classes (0^+ and 1^+) of wild juvenile Chinook salmon. Age 0^+ fry dominated the catch during all sampling episodes. Several wild 1^+ jcs were captured during July. These fish were from the 2004 brood year having overwintered in the watershed.

Hatchery origin fish were completely absent in the catch except for a single capture during the September 1 sampling episode. Its size suggests it originated from the 45,000 clipped hatchery origin jcs were planted into upper Michie Creek in early June. The hatchery juvenile appeared in good health based on a high condition factor and was noticeably larger than the average size of captured wild jcs of the same age. The low catch rate is suggestive that the majority of hatchery origin fish move away quickly from release sites, likely downstream.

The low catches of hatchery origin jcs relative to wild fish throughout the summer of 2005 in upper Michie Creek is consistent with previous findings (KDFN 2005). This artefact supports the hypothesis that hatchery fish begin out-migration soon after release in the wild. It is believed the large size of the hatchery fry may be a factor in triggering out-migration as they average just under twice the length of either wild fry or those raised in stream side incubation boxes. Wild fry attain a comparable length only after a summer period of growth. Scale patterns of hatchery origin adult Chinook taken from the Whitehorse Rapids fish ladder also show a limited freshwater residency period (Etherton, pers. com., 2003). Growth of upper Michie Creek Chinook fry as expressed as length at age in 2005 was greater than in 2003 and 2004. While many variables affect growth, the cooler regional temperatures, higher flows and lower juvenile densities in 2005 may have had a positive influence. In summary, there was no apparent affect of hatchery plantings of jcs on the survival or growth of the wild jcs, at the densities of wild jcs found in Michie Creek and under the environmental conditions that occurred during the summer of 2005.

Adult Chinook Salmon

From the various visitations to the upper Michie spawning site, the spawning period in 2005 was thought to commence upon the arrival of adults around August 10. The digging of redds began shortly after this date. It is believed that spawning was largely concluded by September 1 based on the numerous redds and carcasses that were observed. The distribution of redds between the Michie Lake outlet and the confluence with Byng Creek was similar years past. In most cases spawning sites were either single redds or compound, with several egg pockets in a single disturbed area. A series of spawning dunes was observed just downstream of the Michie Lake outlet, comprising of

gravel bars extending most or all the way across the channel and at right angles to the direction of flow.

With the large run of Chinook through the Whitehorse Fish ladder the recovery of whole carcasses was very successful in 2005. A total of 28 hatchery origin carcasses were sampled from upper Byng Creek, Michie Creek and the M'Clintock River. Based on interpretations from recovered coded wire tags (CWT's), hatchery fish contributed to the 2005 spawning population in the M'Clintock drainage from plantings in the drainage during 2000, 2001 and 2002. More specifically, the majority of recovered CWT's was from plantings in upper Michie Creek during 2002. Results also demonstrated that there was little straying between release sites in upper Michie Creek and the M'Clintock River. Very few spawning redds, carcasses or CWT's were collected or observed in Byng Creek.

Remedial efforts were not required to remove beaver dams in 2005. While beaver activity was apparent it is believed that higher water levels in 2005 prevented dam construction. Based on the distribution of redds and field observations there were no obstructions that restricted movement of migrating adult Chinook salmon to upper Michie Creek in 2005. The only remedial action that was taken was on a large logjam just downstream of the access trail on Byng Creek, a few kilometres from Michie Creek confluence. The logjam was notched and will be monitored in the future.

CONCLUSIONS

1. Water discharge in the upper Michie Creek spawning area was significantly greater than those recorded in 2004 from late May to the end of August.

2. Upper Michie Creek water temperatures were cooler in 2005 compared to 2004 during the Chinook spawning period.

3. Water temperatures in the Whitehorse Rapids fish ladder and in the Yukon River mainstem were cooler in 2005 compared to 2004.

4. Michie Creek continues to display one of the most diverse benthic communities in the Whitehorse region.

5. Benthic density and diversity is lowest during the spring and increases during the summer months in upper Michie Creek.

6. There is little indication that hatchery plantings of Chinook juveniles influenced the benthic diversity or density in upper Michie Creek in 2005.

7. Growth of Michie Creek Chinook fry as expressed as size at age in 2005 was greater than in 2003 and 2004.

8. Hatchery reared juvenile Chinook salmon were about twice the size of wild and incubation box reared juveniles in early June of 2005.

9. The bulk of the hatchery juvenile Chinook salmon planted into upper Michie during 2005 most likely began downstream movement shortly after release.

10. There was no apparent affect of hatchery plantings of jcs on the survival or growth of the wild jcs, at the densities of wild jcs found in Michie Creek and under the environmental conditions that occurred during the summer of 2005.

11. Catch, effort and condition statistics for juvenile Chinook salmon captured in minnow traps were consistently low during the open water season in upper Michie Creek in 2005.

12. Hatchery origin Chinook contributed to the 2005 spawning population in the M'Clintock drainage from plantings in the drainage during 2000, 2001 and 2002.

13. The majority of recovered coded wire tags were from plantings in upper Michie Creek during 2002.

14. Coded wire tag recoveries indicate there was little straying of spawning adults between release sites in upper Michie Creek and the M'Clintock River.

15. There were no obstructions that restricted movement of migrating adult Chinook salmon to upper Michie Creek in 2005.

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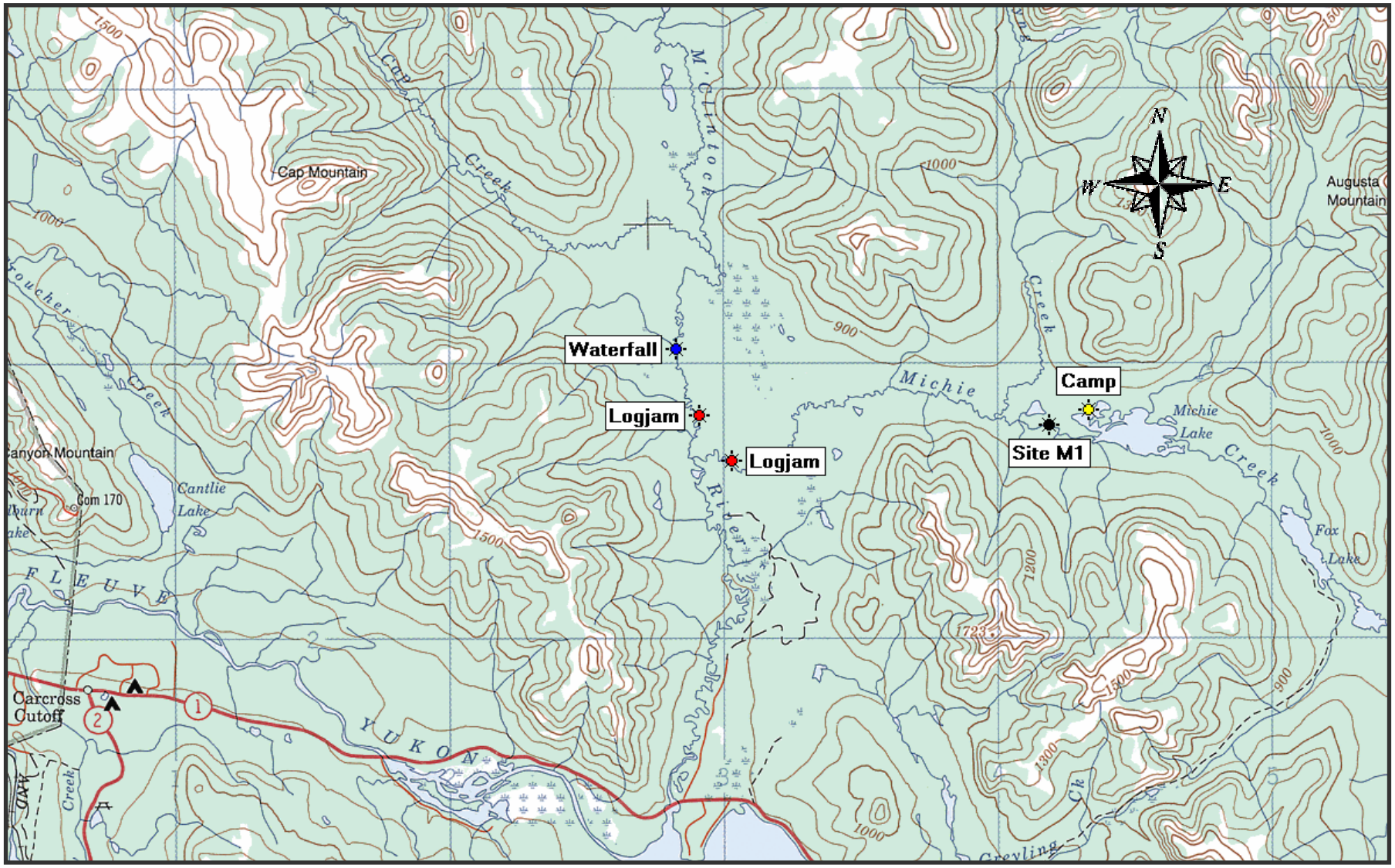

Figure 1 M'Clintock River and upper Michie Creek Study Area.

5 0 5 10 15 km

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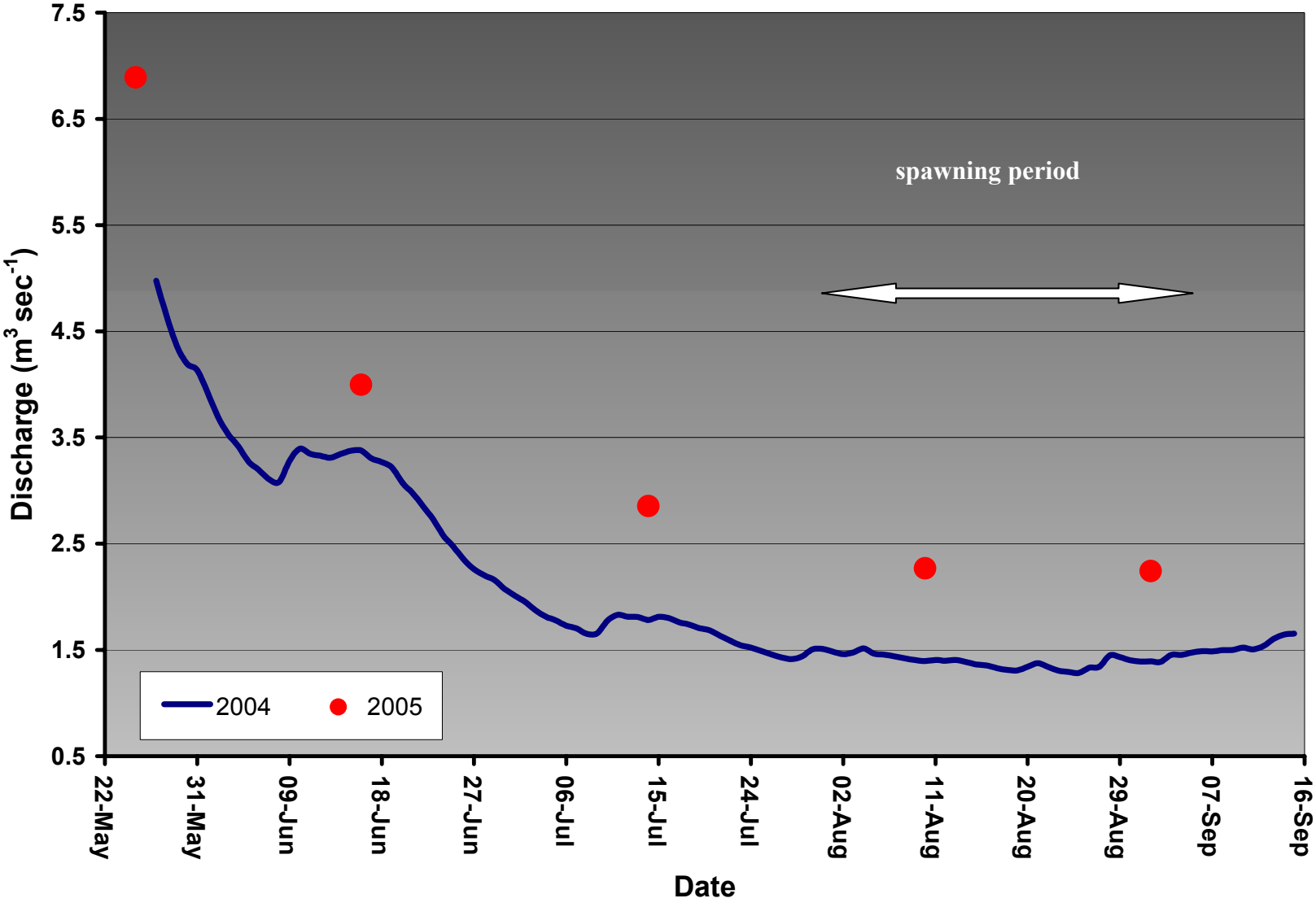

Figure 2 Comparison of average daily discharge in 2004 and several instantaneous discharge measurements in 2005 recorded at site M1 of upper Michie Creek from May to September.

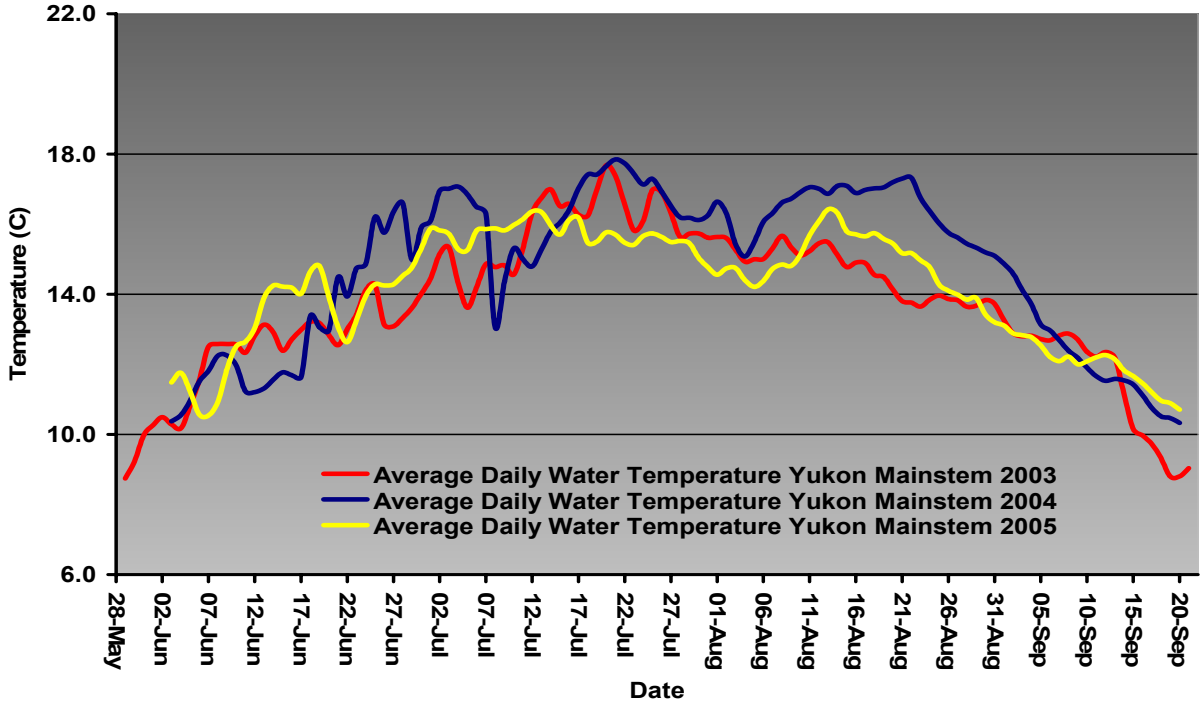

Figure 3 Comparison of 2003, 2004 and 2005 water temperatures in the mainstem of the Yukon River below the Whitehorse Rapids Dam from May to September.

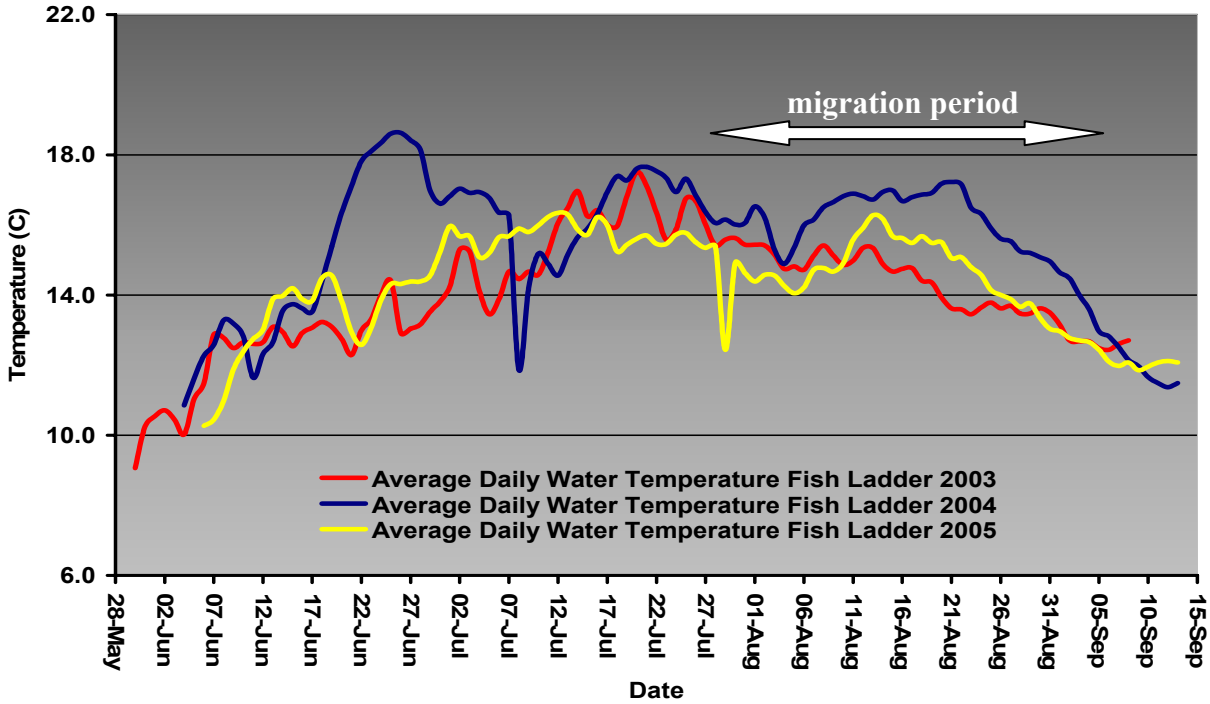

Figure 4 Comparison of 2003, 2004 and 2005 water temperatures in the Whitehorse Rapids fish ladder during from May to September.

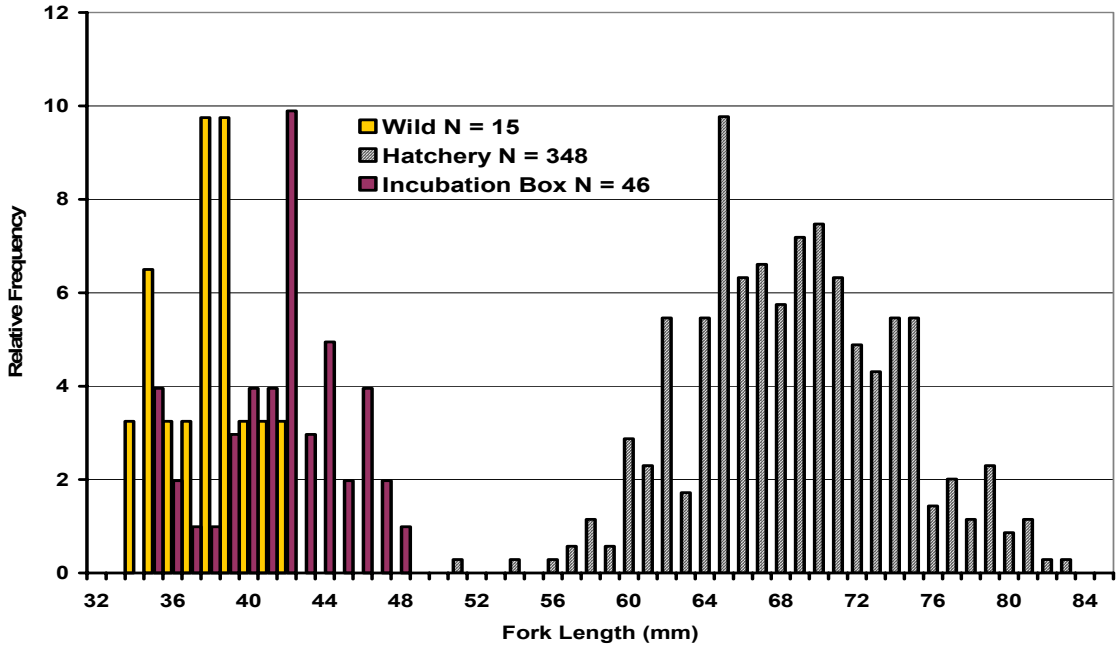

Figure 5 Length-frequency of wild, hatchery and incubation box reared upper Yukon River jcs (O^+). Wild jcs were sampled at site M1 in upper Michie Creek on May 26, 2005. Hatchery reared jcs for release into the M'Clintock watershed were sampled at the Whitehorse Rapids fish hatchery on June 2, 2005. Incubation box reared jcs were sampled on May 27 and June 3, 2005.

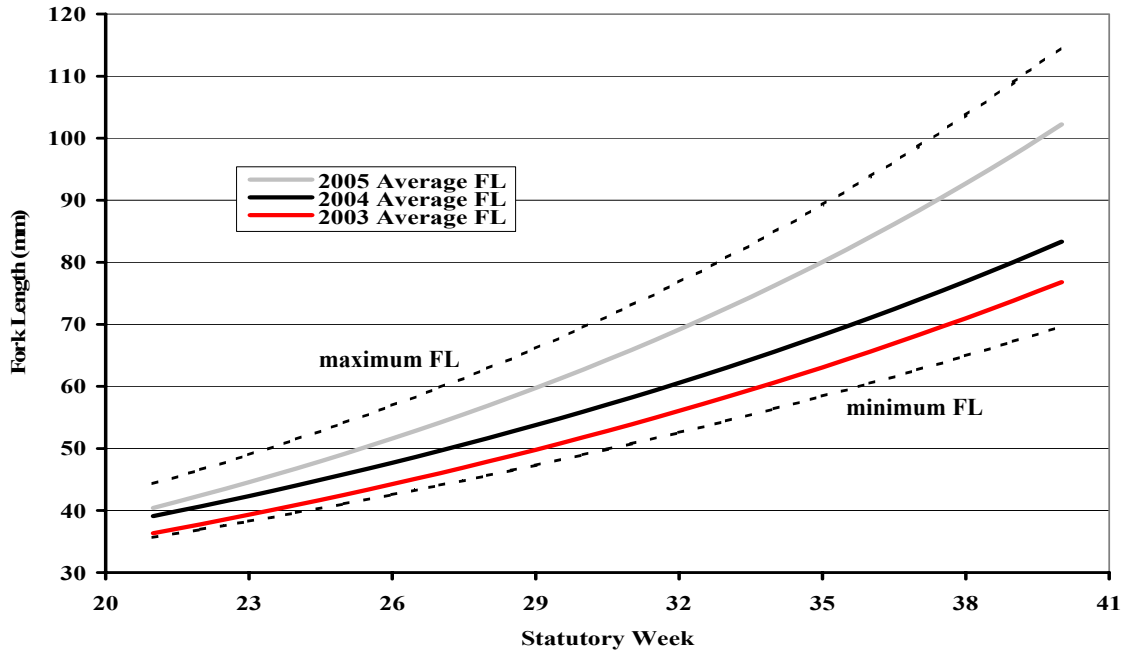

Figure 6 Fitted growth curves of juvenile Chinook salmon (0+) derived from mean fork length data from minnow trapping of upper Michie Creek during the summers of 2003, 2004 and 2005.

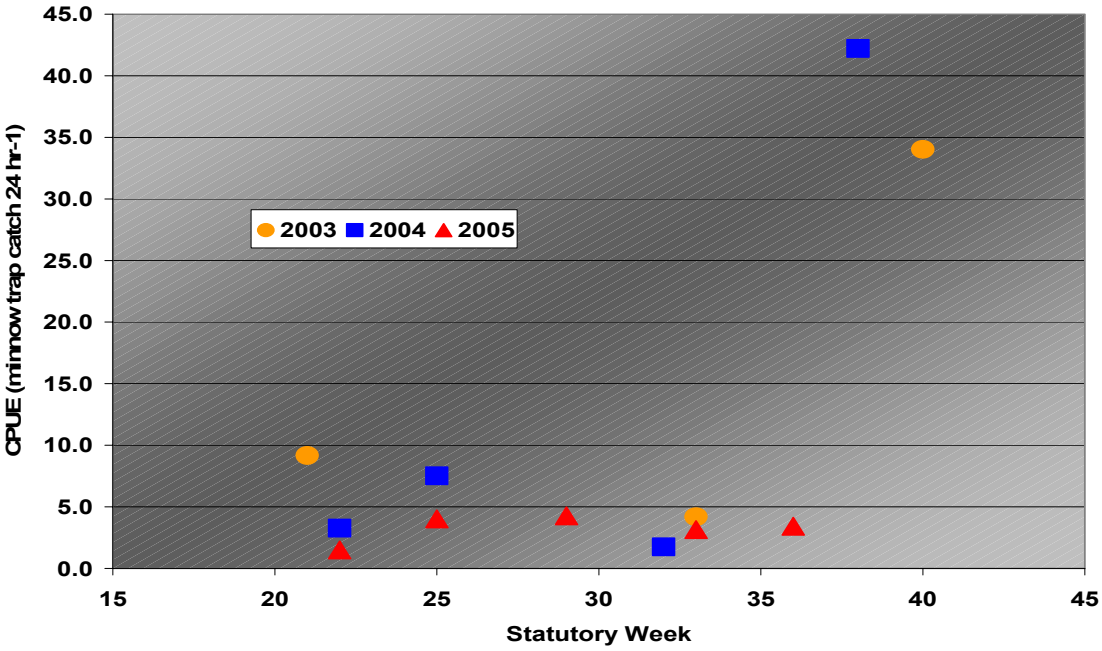

Figure 7 Comparison of juvenile Chinook salmon catches from minnow trapping episodes during the summers of 2003, 2004 and 2005.

Figure 8 Wild juvenile Chinook salmon (1^+ in age) that was captured at site M1 in upper Michie Creek on July 14, 2005.

Figure 9 Inactive beaver dam in the upper Michie Creek spawning area that remained in disrepair during the summer of 2005.

Figure 10 Logjam in upper Byng Creek showing mitigative notching to provide fish passage, August 2005.

Table 1 Results of benthic invertebrate collections at site M-1 before and after the introduction of hatchery jcs into upper Michie Creek on June 8, 2004.

Parameter	May 26	June 16	July 14	Aug 11	Sept 1
Sample Method	Surber	Surber	Surber	Surber	Surber
Number of Replicates	3	3	3	3	3
Number of Taxa Present	62	74	73	71	73
Number of Families Present	35	38	41	45	43
Diversity	1.25	1.51	1.48	1.47	1.41
Density	4,467 m^2	15,074 m^2	45,839 m^2	25,667 m^2	65,880 m^2
Dominant Group	Bivalvae (40 %)	Diptera (24 %)	Diptera (41 %)	Diptera (30 %)	Diptera (33 %)
Sub-Dominant Group #1	Diptera (17 %)	Hydracarina (15 %)	Ephemeroptera (20 %)	Ephemeroptera (20 %)	Ephemeroptera (21 %)
Sub-Dominant Group #2	Coleoptera (9 %)	Coleoptera (13 %)	Tricoptera (11 %)	Tricoptera (19 %)	Tricoptera (19 %)
Sub-Dominant Group #3	Hydracarina (5 %)	Coelenterata (9 %)	Plecoptera (6 %)	Bivalvae (6 %)	Plecoptera (9 %)

Table 2 Species list of botanicals found at the upper Michie Creek spawning area during June and July, 2005.

Habitat Type	Scientific Name	Common Name
Streambanks	*Alnus incana*	river alder
	Salix arbusculoides	little-tree willow
	Salix alaxensis	felt-leaf willow
	Salix glauca	grey-leaf willow
	Salix pseudomonticola	false mountain willow
	Salix pulchra	diamond-leaf willow
	Rubus idaeus	raspberry
	Ribes hudsonianum	northern black currant
	Ribes lacustre	bristly black currant
	Rosa acicularis	prickly rose
	Viburnum edule	highbush cranberry
	Potentilla fruticosa	shrubby cinquefoil
	Potentilla palustris	marsh five-finger
	Rubus arcticus	nagoon berry
	Epilobium angustifolium	fireweed
	Anemone richardsonii	yellow anemone
	Polemonium acutiflorum	tall Jacob's ladder
	Mertensia paniculata	lungwort
	Cornus canadensis	bunchberry
	Equisetum arvense	common horsetail
Floodplains and gravel bars	*Salix pseudomonticola*	false mountain willow
	Carex aquatilis	water sedge
	Carex media	Norway sedge
	Equisetum arvense	common horsetail
	Mentha arvensis	field mint
	Viola epipsila ssp. *repens*	dwarf marsh violet
	Geum macrophyllum ssp. perincisum	large-leaved avens
	Rorippa palustris	yellow cress
	Deschampsia caespitosa	tufted hair grass
	Poa palustris	fowl bluegrass
	Calamagrostis canadensis	blue-joint reed-grass
	Galeopsis tetrahit ssp. *bifida*	hemp-nettle
	Ranunculus macounii	Macoun's buttercup
	Lomatogonium rotatum ssp. *tenuifolium*	star gentian
	Rumex occidentalis	western dock
Aquatic	*Myriophyllum sibiricum*	spiked water-milfoil
	Ranunculus hyperboreus	arctic buttercup
	Potamogeton alpinus ssp. *tenuifolius*	alpine pondweed
	Callitriche verna	vernal water starwort
	Cicuta virosa	Mackenzie's water-hemlock
	Mimulus guttatus	yellow monkeyflower

Table 3 Catch and effort statistics of wild juvenile Chinook salmon captured in minnow traps from site M-1 in Michie Creek, 2005.

Parameter	May 26	June 16	July 14	Aug 11	Sept 1
No. Minnow Traps	10	10	10	10	10
Average Soak Time (hr)	22.1	22.0	21.9	22.0	23.1
Wild Juvenile Chinook Catch	14	37	39	29	33
CPUE (fish/trap/24hr)	1.5	4.0	4.3	3.2	3.4

Table 4 Biological characteristics of different age classes of jcs captured in minnow traps at site M-1 in upper Michie Creek, 2005. Included for comparison are jcs sampled at the Whitehorse Rapids fish hatchery (marked by asterisks).

Parameter		May 26	June 16	July 14	Aug 11	Sept 1
0^+ Wild Michie Creek Juvenile Chinook Salmon	**Mean length (mm)**	38	52	69	75	76
	Mean weight (gm)	0.6	1.5	3.7	4.8	4.3
	Mean CF	1.00	1.08	1.10	1.12	0.97
	N	14	37	35	29	33
1^+ Wild Michie Creek Juvenile Chinook Salmon	**Mean length (mm)**	-	-	95	-	-
	Mean weight (gm)	-	-	12.1	-	-
	Mean CF	-	-	1.32	-	-
	N	-	-	4	-	-
0^+ Hatchery Juvenile Chinook Salmon	**Mean length (mm)**	69*	-	-	-	85
	Mean weight (gm)	2.6*	-	-	-	6.6
	Mean CF	0.81*	-	-	-	1.07
	N	348*	-	-	-	1

* Hatchery jcs measured on June 2nd at the Whitehorse Rapids fish hatchery.

Table 5 Information about the origin and release location of coded wire tags recovered from adult salmon in M'Clintock River and upper Michie Creek spawning areas during the fall of 2005.

Parameter		2005 Coded Wire Tag (CWT) Recovery Location		
		Byng Creek	Michie Creek	M'Clintock River
CWT Release Year	2000	0	0	1
	2001	1	5	2
	2002	1	17	2
CWT Release Location	Byng Creek	1	1	0
	Michie Creek	1	21	0
	M'Clintock River	0	0	5

APPENDIX I

BENTHIC INVERTEBRATE DATA

APPENDIX I BENTHIC INVERTEBRATE DATA

Species	Average Count (3 samples) May 26	Average Count (3 samples) June 16	Average Count (3 samples) July 14	Average Count (3 samples) Aug 11	Average Count (3 samples) Sept 1
Ephemeroptera					
Baetis sp	4	44	488	74	458
Cinygmula sp	2	4	175	291	534
Drunella flavilinea	2	9	7	1	2
Drunella grandis		3	1	1	3
Epeorus sp	1	5	5	8	16
Ephemerellidae J	1	4	52	46	58
Paraleptophlebia sp		11	83	39	195
Rhithrogena sp		1			
Plecoptera					
Capnia sp				2	
Claasenia sabulosa		2			
Hesperoperla sp		16	4	2	7
Leuctra sp	1				
Pteronarcys dorsata		2		1	2
Skwala paralella	5		11	10	12
Sweltsa sp group	11	51	114	65	281
Zapada sp	1	8	121	54	232
Trichoptera Unid Juv	6	20	75	87	513
Trichoptera P	1	3	2	17	1
Brachycentrus sp	4	20	203	65	128
Dicosmoecus sp			1		
Ecclisomyia sp	1				
Glossosoma sp	3	2	51	157	323
Hydropsyche sp	2	6	70	66	94
Hydroptila sp	1	2	10	18	28
Hydroptilidae Juv		16	8	26	
Lepidostoma sp	2	2		1	4
Micrasema sp	1	1		4	1
Oxyethira sp	1				1
Rhyacophilidae Juv		1	10	3	7
Rhyacophila (acropedes or vao)	1	2	4		7
Diptera Unid A		1		1	2

APPENDIX I BENTHIC INVERTEBRATE DATA

Species	Average Count (3 samples) May 26	Average Count (3 samples) June 16	Average Count (3 samples) July 14	Average Count (3 samples) Aug 11	Average Count (3 samples) Sept 1
Ceratopogonidae					
Bezzia sp	8	21	6	5	9
Chironomidae A	1	2	4		5
Chironomidae P	3	47	82	11	102
Chironomidae L	8	20	337	322	111
Boreoheptagyia sp	1				
Brillia sp					1
Cardiocladius sp	1	2	5	1	
Corynoneura sp	6	4	48	21	37
Cricotopus sp	9	47	181	66	235
Diamesa sp	1	9	168	28	103
Eukiefferiella sp	1	3	11	7	26
Euryhapsis sp			15	8	17
Micropsectra sp		4	4	4	
Microtendipes sp				2	1
Phaenopsectra sp	1				
Rheotanytarsus sp	4	23	108	30	68
Thienemanniella sp		53	28		16
Thienemannimyia	3	32	38	84	26
Empididae P		1			
Chelifera sp	1	5	13	6	13
Hemerodromia sp			8		
Weidemannia sp			8		8
Psychodidae					
Pericoma sp		2	12	29	45
Simulidae					
Cnephia sp L	2	4	105		36
Prosimulium sp L			1		8
Prosimulium sp P		1	2	3	4
Simulium sp L	9	27	334	4	864
Simulium sp P		6	2	1	8
Tipulidae					
Antocha sp	2	5	178	29	205
Dicranota sp	1	3	13	8	7
Gonomyia sp				1	
Hexatoma sp	3	2	8	3	5

APPENDIX I BENTHIC INVERTEBRATE DATA

Species	Average Count (3 samples) May 26	Average Count (3 samples) June 16	Average Count (3 samples) July 14	Average Count (3 samples) Aug 11	Average Count (3 samples) Sept 1
Rhabdomastix sp		2			
Coleoptera					
Elmidae A		2	5		6
Heterlimnius sp	14	40	31	29	39
Zaitzevia sp	22	136	212	57	168
Homoptera					
Aphididae					5
Cicadellidae		2	1	1	
Hymenoptera A	1				
Thysanoptera		2			
Aranaea			8	1	
Hydracarina Unid J		6	6	15	8
Lebertia sp	6	20	17	5	21
Neumannia sp				1	
Sperchon sp	2	15	43	16	52
Torrenticola sp	2	18	28	9	14
Unioncola sp	1	7	20	6	11
Wandesia sp		3			1
Oribatei	11	130	103	31	35
Cladocera					
Acroperus harpae			8		
Alona sp		4	8		
Chydorus sphaericus		4			
Daphnia sp J	1				
Copepoda					
Cyclopoida	2				
Harpacticoida	1			16	

APPENDIX I BENTHIC INVERTEBRATE DATA

Species	Average Count (3 samples) May 26	Average Count (3 samples) June 16	Average Count (3 samples) July 14	Average Count (3 samples) Aug 11	Average Count (3 samples) Sept 1
Ostracoda					
Candona sp	15	46	86	89	211
Hirudinea					
Placobdella sp					2
Oligochaeta					
Enchytraeidae	13	6	18	10	4
Naididae					
Chaetogaster sp	1	24	4	16	8
Nais sp	5	51	80	26	126
Tubificidae		1	1		
Turbellaria unid J		4		24	
Bivalvia					
Pisidium sp	159	104	173	149	226
Gastropoda Unid dam	1		8	9	5
Fossaria modicella	2		12	13	30
Gyraulus parvus	2	4	10	13	23
Physella gyrina	1		2	4	4
Valvata sincera	7	17	13	39	32
Nematoda	4	35	6	17	3
Coelenterata					
Hydra sp	12	119	12	5	32
Salmonid egg		1*			
Totals	**402**	**1357**	**4127**	**2310**	**5929**

* not included in benthic analysis

APPENDIX II

JUVENILE CHINOOK SALMON DATA

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
1	Whitehorse Fish Hatchery	02-Jun-05	Chinook	51	1.1	0+	yes
2	Whitehorse Fish Hatchery	02-Jun-05	Chinook	54	2.2	0+	yes
3	Whitehorse Fish Hatchery	02-Jun-05	Chinook	56	1.9	0+	yes
4	Whitehorse Fish Hatchery	02-Jun-05	Chinook	57	1.4	0+	yes
5	Whitehorse Fish Hatchery	02-Jun-05	Chinook	57	1.4	0+	yes
6	Whitehorse Fish Hatchery	02-Jun-05	Chinook	58	1.8	0+	yes
7	Whitehorse Fish Hatchery	02-Jun-05	Chinook	58	1.8	0+	yes
8	Whitehorse Fish Hatchery	02-Jun-05	Chinook	58	1.6	0+	yes
9	Whitehorse Fish Hatchery	02-Jun-05	Chinook	58	2.3	0+	yes
10	Whitehorse Fish Hatchery	02-Jun-05	Chinook	59	1.9	0+	yes
11	Whitehorse Fish Hatchery	02-Jun-05	Chinook	59	2	0+	yes
12	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.9	0+	yes
13	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.3	0+	yes
14	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	3	0+	yes
15	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	2.1	0+	yes
16	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.6	0+	yes
17	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.4	0+	yes
18	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.3	0+	yes
19	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	2.1	0+	yes
20	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	1.9	0+	yes
21	Whitehorse Fish Hatchery	02-Jun-05	Chinook	60	2	0+	yes
22	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	3.3	0+	yes
23	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	1.6	0+	yes
24	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	1.8	0+	yes
25	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	1.8	0+	yes
26	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	2.3	0+	yes
27	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	1.8	0+	yes
28	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	1.7	0+	yes
29	Whitehorse Fish Hatchery	02-Jun-05	Chinook	61	2.1	0+	yes
30	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.6	0+	yes
31	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.4	0+	yes
32	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.1	0+	yes
33	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.4	0+	yes
34	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.8	0+	yes
35	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.7	0+	yes
36	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.8	0+	yes
37	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.9	0+	yes
38	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.7	0+	yes
39	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.8	0+	yes
40	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.9	0+	yes
41	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.1	0+	yes
42	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.3	0+	yes
43	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2	0+	yes
44	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.6	0+	yes
45	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.2	0+	yes
46	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.2	0+	yes
47	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	1.9	0+	yes
48	Whitehorse Fish Hatchery	02-Jun-05	Chinook	62	2.3	0+	yes
49	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	1.9	0+	yes
50	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	1.6	0+	yes
51	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	2.4	0+	yes
52	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	1.6	0+	yes
53	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	1.8	0+	yes
54	Whitehorse Fish Hatchery	02-Jun-05	Chinook	63	1.8	0+	yes
55	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.6	0+	yes
56	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.7	0+	yes
57	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.9	0+	yes
58	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.8	0+	yes
59	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.2	0+	yes

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
60	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.9	0+	yes
61	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2	0+	yes
62	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.2	0+	yes
63	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.1	0+	yes
64	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.8	0+	yes
65	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.8	0+	yes
66	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.3	0+	yes
67	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.2	0+	yes
68	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.7	0+	yes
69	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.8	0+	yes
70	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.7	0+	yes
71	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.1	0+	yes
72	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	2.3	0+	yes
73	Whitehorse Fish Hatchery	02-Jun-05	Chinook	64	1.9	0+	yes
74	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	3.1	0+	yes
75	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.1	0+	yes
76	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.4	0+	yes
77	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.3	0+	yes
78	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.4	0+	yes
79	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2	0+	yes
80	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
81	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.7	0+	yes
82	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
83	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2	0+	yes
84	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.7	0+	yes
85	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.5	0+	yes
86	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
87	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.4	0+	yes
88	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
89	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	1.8	0+	yes
90	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2	0+	yes
91	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	1.9	0+	yes
92	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
93	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
94	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
95	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.3	0+	yes
96	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.5	0+	yes
97	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.1	0+	yes
98	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	3.3	0+	yes
99	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	3.2	0+	yes
100	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	3.2	0+	yes
101	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.7	0+	yes
102	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.4	0+	yes
103	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
104	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.1	0+	yes
105	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.2	0+	yes
106	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	1.8	0+	yes
107	Whitehorse Fish Hatchery	02-Jun-05	Chinook	65	2.3	0+	yes
108	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
109	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
110	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	3	0+	yes
111	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.3	0+	yes
112	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.5	0+	yes
113	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.9	0+	yes
114	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.3	0+	yes
115	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.3	0+	yes
116	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.2	0+	yes
117	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
118	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.2	0+	yes
119	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	1.9	0+	yes
120	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2	0+	yes

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
121	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
122	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.1	0+	yes
123	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	1.9	0+	yes
124	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
125	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.6	0+	yes
126	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.8	0+	yes
127	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2.4	0+	yes
128	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	2	0+	yes
129	Whitehorse Fish Hatchery	02-Jun-05	Chinook	66	1.9	0+	yes
130	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.2	0+	yes
131	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	3.1	0+	yes
132	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	3.3	0+	yes
133	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.6	0+	yes
134	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.7	0+	yes
135	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.6	0+	yes
136	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.2	0+	yes
137	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.4	0+	yes
138	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.3	0+	yes
139	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2	0+	yes
140	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.2	0+	yes
141	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.2	0+	yes
142	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.3	0+	yes
143	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.8	0+	yes
144	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.3	0+	yes
145	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.2	0+	yes
146	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.3	0+	yes
147	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.6	0+	yes
148	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.1	0+	yes
149	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.4	0+	yes
150	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.6	0+	yes
151	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.3	0+	yes
152	Whitehorse Fish Hatchery	02-Jun-05	Chinook	67	2.9	0+	yes
153	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.5	0+	yes
154	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	3.1	0+	yes
155	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.2	0+	yes
156	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2	0+	yes
157	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2	0+	yes
158	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.5	0+	yes
159	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.4	0+	yes
160	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.3	0+	yes
161	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2	0+	yes
162	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.8	0+	yes
163	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.9	0+	yes
164	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	3	0+	yes
165	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.2	0+	yes
166	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.7	0+	yes
167	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.5	0+	yes
168	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	3	0+	yes
169	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.6	0+	yes
170	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2	0+	yes
171	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.2	0+	yes
172	Whitehorse Fish Hatchery	02-Jun-05	Chinook	68	2.3	0+	yes
173	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.4	0+	yes
174	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.4	0+	yes
175	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.8	0+	yes
176	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.6	0+	yes
177	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.1	0+	yes
178	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.9	0+	yes
179	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.5	0+	yes
180	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	3.3	0+	yes
181	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.3	0+	yes

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
182	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.2	0+	yes
183	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.7	0+	yes
184	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.4	0+	yes
185	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	3.2	0+	yes
186	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.9	0+	yes
187	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.7	0+	yes
188	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.5	0+	yes
189	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.5	0+	yes
190	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.8	0+	yes
191	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.2	0+	yes
192	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.5	0+	yes
193	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.4	0+	yes
194	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	3	0+	yes
195	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.6	0+	yes
196	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.6	0+	yes
197	Whitehorse Fish Hatchery	02-Jun-05	Chinook	69	2.1	0+	yes
198	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.1	0+	yes
199	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.9	0+	yes
200	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.5	0+	yes
201	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.9	0+	yes
202	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.3	0+	yes
203	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.5	0+	yes
204	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.4	0+	yes
205	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.8	0+	yes
206	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.5	0+	yes
207	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.1	0+	yes
208	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.6	0+	yes
209	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3	0+	yes
210	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.7	0+	yes
211	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.3	0+	yes
212	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.5	0+	yes
213	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.1	0+	yes
214	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3	0+	yes
215	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.9	0+	yes
216	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.5	0+	yes
217	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.4	0+	yes
218	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.8	0+	yes
219	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.2	0+	yes
220	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.3	0+	yes
221	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.1	0+	yes
222	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	3.2	0+	yes
223	Whitehorse Fish Hatchery	02-Jun-05	Chinook	70	2.9	0+	yes
224	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes
225	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes
226	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.8	0+	yes
227	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes
228	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.1	0+	yes
229	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.5	0+	yes
230	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.1	0+	yes
231	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.3	0+	yes
232	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.7	0+	yes
233	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.7	0+	yes
234	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.6	0+	yes
235	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.8	0+	yes
236	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.1	0+	yes
237	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes
238	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.7	0+	yes
239	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.1	0+	yes
240	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3	0+	yes
241	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3	0+	yes
242	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
243	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	3.2	0+	yes
244	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.9	0+	yes
245	Whitehorse Fish Hatchery	02-Jun-05	Chinook	71	2.7	0+	yes
246	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.3	0+	yes
247	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.3	0+	yes
248	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.9	0+	yes
249	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.7	0+	yes
250	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.7	0+	yes
251	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.5	0+	yes
252	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.5	0+	yes
253	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.7	0+	yes
254	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.5	0+	yes
255	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.2	0+	yes
256	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.2	0+	yes
257	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.5	0+	yes
258	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.7	0+	yes
259	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.3	0+	yes
260	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.3	0+	yes
261	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	3.2	0+	yes
262	Whitehorse Fish Hatchery	02-Jun-05	Chinook	72	2.7	0+	yes
263	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.3	0+	yes
264	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.2	0+	yes
265	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.1	0+	yes
266	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	2.8	0+	yes
267	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	2.8	0+	yes
268	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	2.8	0+	yes
269	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3	0+	yes
270	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.1	0+	yes
271	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3	0+	yes
272	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	2.9	0+	yes
273	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.1	0+	yes
274	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.1	0+	yes
275	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3.3	0+	yes
276	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	2.8	0+	yes
277	Whitehorse Fish Hatchery	02-Jun-05	Chinook	73	3	0+	yes
278	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.3	0+	yes
279	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.9	0+	yes
280	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	4	0+	yes
281	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.2	0+	yes
282	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.1	0+	yes
283	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.1	0+	yes
284	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.9	0+	yes
285	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.1	0+	yes
286	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.1	0+	yes
287	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.2	0+	yes
288	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.7	0+	yes
289	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.9	0+	yes
290	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3	0+	yes
291	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.8	0+	yes
292	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.7	0+	yes
293	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.2	0+	yes
294	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.2	0+	yes
295	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	3.3	0+	yes
296	Whitehorse Fish Hatchery	02-Jun-05	Chinook	74	2.9	0+	yes
297	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	2.2	0+	yes
298	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	4	0+	yes
299	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.7	0+	yes
300	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	2.6	0+	yes
301	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.2	0+	yes
302	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.3	0+	yes
303	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.2	0+	yes

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
304	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.4	0+	yes
305	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.2	0+	yes
306	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.4	0+	yes
307	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3	0+	yes
308	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	2.3	0+	yes
309	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.3	0+	yes
310	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.2	0+	yes
311	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3	0+	yes
312	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.3	0+	yes
313	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.5	0+	yes
314	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.4	0+	yes
315	Whitehorse Fish Hatchery	02-Jun-05	Chinook	75	3.6	0+	yes
316	Whitehorse Fish Hatchery	02-Jun-05	Chinook	76	3.7	0+	yes
317	Whitehorse Fish Hatchery	02-Jun-05	Chinook	76	3.2	0+	yes
318	Whitehorse Fish Hatchery	02-Jun-05	Chinook	76	3.5	0+	yes
319	Whitehorse Fish Hatchery	02-Jun-05	Chinook	76	3.5	0+	yes
320	Whitehorse Fish Hatchery	02-Jun-05	Chinook	76	3.5	0+	yes
321	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	3.6	0+	yes
322	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	4	0+	yes
323	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	2.7	0+	yes
324	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	3.5	0+	yes
325	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	3.1	0+	yes
326	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	3.3	0+	yes
327	Whitehorse Fish Hatchery	02-Jun-05	Chinook	77	3.4	0+	yes
328	Whitehorse Fish Hatchery	02-Jun-05	Chinook	78	3.5	0+	yes
329	Whitehorse Fish Hatchery	02-Jun-05	Chinook	78	3.8	0+	yes
330	Whitehorse Fish Hatchery	02-Jun-05	Chinook	78	3.4	0+	yes
331	Whitehorse Fish Hatchery	02-Jun-05	Chinook	78	4.1	0+	yes
332	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	4.4	0+	yes
333	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.5	0+	yes
334	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.8	0+	yes
335	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.8	0+	yes
336	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.7	0+	yes
337	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.6	0+	yes
338	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.9	0+	yes
339	Whitehorse Fish Hatchery	02-Jun-05	Chinook	79	3.9	0+	yes
340	Whitehorse Fish Hatchery	02-Jun-05	Chinook	80	1.9	0+	yes
341	Whitehorse Fish Hatchery	02-Jun-05	Chinook	80	4	0+	yes
342	Whitehorse Fish Hatchery	02-Jun-05	Chinook	80	3.9	0+	yes
343	Whitehorse Fish Hatchery	02-Jun-05	Chinook	81	4.4	0+	yes
344	Whitehorse Fish Hatchery	02-Jun-05	Chinook	81	4.4	0+	yes
345	Whitehorse Fish Hatchery	02-Jun-05	Chinook	81	4.1	0+	yes
346	Whitehorse Fish Hatchery	02-Jun-05	Chinook	81	4.8	0+	yes
347	Whitehorse Fish Hatchery	02-Jun-05	Chinook	82	4.3	0+	yes
348	Whitehorse Fish Hatchery	02-Jun-05	Chinook	83	4.2	0+	yes
349	Michie Creek	26-May-05	Chinook	34	0.3	0+	no
350	Michie Creek	26-May-05	Chinook	35	0.5	0+	no
351	Michie Creek	26-May-05	Chinook	35	0.4	0+	no
352	Michie Creek	26-May-05	Chinook	36	0.4	0+	no
353	Michie Creek	26-May-05	Chinook	37	0.4	0+	no
354	Michie Creek	26-May-05	Chinook	38	0.7	0+	no
355	Michie Creek	26-May-05	Chinook	38	0.6	0+	no
356	Michie Creek	26-May-05	Chinook	38	0.5	0+	no
357	Michie Creek	26-May-05	Chinook	39	0.6	0+	no
358	Michie Creek	26-May-05	Chinook	39	0.5	0+	no
359	Michie Creek	26-May-05	Chinook	39	0.6	0+	no
360	Michie Creek	26-May-05	Chinook	40	0.7	0+	no
361	Michie Creek	26-May-05	Chinook	41	0.7	0+	no
362	Michie Creek	26-May-05	Chinook	42	0.9	0+	no
363	Michie Creek	16-Jun-05	Chinook	45	0.9	0+	no
364	Michie Creek	16-Jun-05	Chinook	46	1.0	0+	no

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
365	Michie Creek	16-Jun-05	Chinook	47	1.2	0+	no
366	Michie Creek	16-Jun-05	Chinook	47	1.0	0+	no
367	Michie Creek	16-Jun-05	Chinook	48	1.5	0+	no
368	Michie Creek	16-Jun-05	Chinook	48	1.1	0+	no
369	Michie Creek	16-Jun-05	Chinook	48	1.1	0+	no
370	Michie Creek	16-Jun-05	Chinook	48	1.1	0+	no
371	Michie Creek	16-Jun-05	Chinook	48	1.1	0+	no
372	Michie Creek	16-Jun-05	Chinook	48	1.3	0+	no
373	Michie Creek	16-Jun-05	Chinook	48	1.2	0+	no
374	Michie Creek	16-Jun-05	Chinook	48	1.4	0+	no
375	Michie Creek	16-Jun-05	Chinook	48	1.2	0+	no
376	Michie Creek	16-Jun-05	Chinook	49	1.3	0+	no
377	Michie Creek	16-Jun-05	Chinook	49	1.4	0+	no
378	Michie Creek	16-Jun-05	Chinook	49	1.1	0+	no
379	Michie Creek	16-Jun-05	Chinook	50	1.4	0+	no
380	Michie Creek	16-Jun-05	Chinook	50	1.3	0+	no
381	Michie Creek	16-Jun-05	Chinook	52	1.5	0+	no
382	Michie Creek	16-Jun-05	Chinook	52	1.4	0+	no
383	Michie Creek	16-Jun-05	Chinook	52	1.4	0+	no
384	Michie Creek	16-Jun-05	Chinook	53	1.6	0+	no
385	Michie Creek	16-Jun-05	Chinook	53	1.7	0+	no
386	Michie Creek	16-Jun-05	Chinook	53	1.6	0+	no
387	Michie Creek	16-Jun-05	Chinook	53	1.6	0+	no
388	Michie Creek	16-Jun-05	Chinook	54	1.6	0+	no
389	Michie Creek	16-Jun-05	Chinook	54	1.9	0+	no
390	Michie Creek	16-Jun-05	Chinook	55	1.8	0+	no
391	Michie Creek	16-Jun-05	Chinook	55	1.9	0+	no
392	Michie Creek	16-Jun-05	Chinook	55	1.8	0+	no
393	Michie Creek	16-Jun-05	Chinook	55	1.9	0+	no
394	Michie Creek	16-Jun-05	Chinook	55	1.9	0+	no
395	Michie Creek	16-Jun-05	Chinook	55	1.8	0+	no
396	Michie Creek	16-Jun-05	Chinook	56	1.7	0+	no
397	Michie Creek	16-Jun-05	Chinook	59	2.3	0+	no
398	Michie Creek	16-Jun-05	Chinook	60	2.6	0+	no
399	Michie Creek	16-Jun-05	Chinook	61	2.4	0+	no
400	Michie Creek	14-Jul-05	Chinook	57	1.9	0+	no
401	Michie Creek	14-Jul-05	Chinook	58	2.3	0+	no
402	Michie Creek	14-Jul-05	Chinook	60	2.3	0+	no
403	Michie Creek	14-Jul-05	Chinook	61	2.4	0+	no
404	Michie Creek	14-Jul-05	Chinook	62	2.4	0+	no
405	Michie Creek	14-Jul-05	Chinook	62	2.5	0+	no
406	Michie Creek	14-Jul-05	Chinook	63	2.5	0+	no
407	Michie Creek	14-Jul-05	Chinook	64	3.0	0+	no
408	Michie Creek	14-Jul-05	Chinook	65	3.0	0+	no
409	Michie Creek	14-Jul-05	Chinook	65	3.1	0+	no
410	Michie Creek	14-Jul-05	Chinook	65	3.3	0+	no
411	Michie Creek	14-Jul-05	Chinook	66	3.1	0+	no
412	Michie Creek	14-Jul-05	Chinook	67	3.2	0+	no
413	Michie Creek	14-Jul-05	Chinook	67	3.3	0+	no
414	Michie Creek	14-Jul-05	Chinook	68	3.7	0+	no
415	Michie Creek	14-Jul-05	Chinook	68	3.4	0+	no
416	Michie Creek	14-Jul-05	Chinook	69	3.4	0+	no
417	Michie Creek	14-Jul-05	Chinook	69	3.9	0+	no
418	Michie Creek	14-Jul-05	Chinook	69	3.6	0+	no
419	Michie Creek	14-Jul-05	Chinook	70	3.3	0+	no
420	Michie Creek	14-Jul-05	Chinook	70	3.8	0+	no
421	Michie Creek	14-Jul-05	Chinook	71	4.2	0+	no
422	Michie Creek	14-Jul-05	Chinook	71	3.7	0+	no
423	Michie Creek	14-Jul-05	Chinook	71	4.2	0+	no
424	Michie Creek	14-Jul-05	Chinook	71	4.0	0+	no
425	Michie Creek	14-Jul-05	Chinook	71	4.1	0+	no

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
426	Michie Creek	14-Jul-05	Chinook	72	4.3	0+	no
427	Michie Creek	14-Jul-05	Chinook	72	4.2	0+	no
428	Michie Creek	14-Jul-05	Chinook	74	4.4	0+	no
429	Michie Creek	14-Jul-05	Chinook	74	4.3	0+	no
430	Michie Creek	14-Jul-05	Chinook	75	5.0	0+	no
431	Michie Creek	14-Jul-05	Chinook	78	5.1	0+	no
432	Michie Creek	14-Jul-05	Chinook	81	5.0	0+	no
433	Michie Creek	14-Jul-05	Chinook	82	6.4	0+	no
434	Michie Creek	14-Jul-05	Chinook	82	6.3	0+	no
435	Michie Creek	14-Jul-05	Chinook	108	17.8	1+	no
436	Michie Creek	14-Jul-05	Chinook	113	20.8	1+	no
437	Michie Creek	14-Jul-05	Chinook	115	19.6	1+	no
438	Michie Creek	14-Jul-05	Chinook	122	25.1	1+	no
439	Michie Creek	11-Aug-05	Chinook	65	2.9	0+	no
440	Michie Creek	11-Aug-05	Chinook	70	3.8	0+	no
441	Michie Creek	11-Aug-05	Chinook	70	3.8	0+	no
442	Michie Creek	11-Aug-05	Chinook	71	4.0	0+	no
443	Michie Creek	11-Aug-05	Chinook	71	4.2	0+	no
444	Michie Creek	11-Aug-05	Chinook	72	4.3	0+	no
445	Michie Creek	11-Aug-05	Chinook	72	4.1	0+	no
446	Michie Creek	11-Aug-05	Chinook	72	4.2	0+	no
447	Michie Creek	11-Aug-05	Chinook	72	4.4	0+	no
448	Michie Creek	11-Aug-05	Chinook	72	4.0	0+	no
449	Michie Creek	11-Aug-05	Chinook	73	4.1	0+	no
450	Michie Creek	11-Aug-05	Chinook	73	4.2	0+	no
451	Michie Creek	11-Aug-05	Chinook	73	4.1	0+	no
452	Michie Creek	11-Aug-05	Chinook	73	4.2	0+	no
453	Michie Creek	11-Aug-05	Chinook	73	4.3	0+	no
454	Michie Creek	11-Aug-05	Chinook	74	4.9	0+	no
455	Michie Creek	11-Aug-05	Chinook	75	4.5	0+	no
456	Michie Creek	11-Aug-05	Chinook	76	4.8	0+	no
457	Michie Creek	11-Aug-05	Chinook	76	5.1	0+	no
458	Michie Creek	11-Aug-05	Chinook	76	4.8	0+	no
459	Michie Creek	11-Aug-05	Chinook	76	4.9	0+	no
460	Michie Creek	11-Aug-05	Chinook	76	4.8	0+	no
461	Michie Creek	11-Aug-05	Chinook	78	5.7	0+	no
462	Michie Creek	11-Aug-05	Chinook	80	5.9	0+	no
463	Michie Creek	11-Aug-05	Chinook	80	5.8	0+	no
464	Michie Creek	11-Aug-05	Chinook	80	6.2	0+	no
465	Michie Creek	11-Aug-05	Chinook	81	5.8	0+	no
466	Michie Creek	11-Aug-05	Chinook	83	6.7	0+	no
467	Michie Creek	11-Aug-05	Chinook	93	9.6	0+	no
468	Michie Creek	01-Sep-05	Chinook	63	2.5	0+	no
469	Michie Creek	01-Sep-05	Chinook	66	2.8	0+	no
470	Michie Creek	01-Sep-05	Chinook	67	2.7	0+	no
471	Michie Creek	01-Sep-05	Chinook	70	3.4	0+	no
472	Michie Creek	01-Sep-05	Chinook	70	3.5	0+	no
473	Michie Creek	01-Sep-05	Chinook	71	3.7	0+	no
474	Michie Creek	01-Sep-05	Chinook	71	3.2	0+	no
475	Michie Creek	01-Sep-05	Chinook	72	3.7	0+	no
476	Michie Creek	01-Sep-05	Chinook	72	3.6	0+	no
477	Michie Creek	01-Sep-05	Chinook	73	4.0	0+	no
478	Michie Creek	01-Sep-05	Chinook	75	3.8	0+	no
479	Michie Creek	01-Sep-05	Chinook	75	3.9	0+	no
480	Michie Creek	01-Sep-05	Chinook	75	4.8	0+	no
481	Michie Creek	01-Sep-05	Chinook	75	4.5	0+	no
482	Michie Creek	01-Sep-05	Chinook	76	4.0	0+	no
483	Michie Creek	01-Sep-05	Chinook	77	4.4	0+	no
484	Michie Creek	01-Sep-05	Chinook	77	4.5	0+	no
485	Michie Creek	01-Sep-05	Chinook	77	4.0	0+	no
486	Michie Creek	01-Sep-05	Chinook	78	4.2	0+	no

APPENDIX II JUVENILE CHINOOK SALMON BIOLOGICAL DATA

Fish #	Sampling Location	Date	Species	Length (mm)	Weight (g)	Age (years)	Adipose Clip
487	Michie Creek	01-Sep-05	Chinook	78	4.3	0+	no
488	Michie Creek	01-Sep-05	Chinook	78	4.6	0+	no
489	Michie Creek	01-Sep-05	Chinook	78	4.0	0+	no
490	Michie Creek	01-Sep-05	Chinook	78	5.3	0+	no
491	Michie Creek	01-Sep-05	Chinook	78	5.4	0+	no
492	Michie Creek	01-Sep-05	Chinook	78	5.1	0+	no
493	Michie Creek	01-Sep-05	Chinook	79	4.6	0+	no
494	Michie Creek	01-Sep-05	Chinook	79	4.0	0+	no
495	Michie Creek	01-Sep-05	Chinook	79	5.2	0+	no
496	Michie Creek	01-Sep-05	Chinook	80	4.1	0+	no
497	Michie Creek	01-Sep-05	Chinook	81	5.0	0+	no
498	Michie Creek	01-Sep-05	Chinook	81	5.4	0+	no
499	Michie Creek	01-Sep-05	Chinook	85	6.6	0+	yes
500	Michie Creek	01-Sep-05	Chinook	89	7.1	0+	no
501	Michie Creek	01-Sep-05	Chinook	90	7.1	0+	no

APPENDIX III

FISHWAY COUNTS 1961 TO 2005

APPENDIX III FISHWAY COUNTS 1961-2005

Year	Count	Percent Hatchery Contribution
1961	1,068	0
1962	1,500	0
1963	483	0
1964	595	0
1965	903	0
1966	563	0
1967	533	0
1968	414	0
1969	334	0
1970	625	0
1971	856	0
1972	391	0
1973	224	0
1974	273	0
1975	313	0
1976	121	0
1977	277	0
1978	725	0
1979	1,184	0
1980	1,383	0
1981	1,555	0
1982	473	0
1983	905	0
1984	1,042	0
1985	508	0
1986	557	0
1987	327	0
1988	405	16
1989	549	19
1990	1,407	24
1991	1,266	51
1992	758	84
1993	668	73
1994	1,577	54
1995	2,103	57
1996	2,958	35
1997	2,084	24
1998	777	95
1999	1,118	74
2000	677	69
2001	988	36
2002	605	39
2003	1,443	70
2004	1,989	76
2005	2,632	57

APPENDIX III FISHWAY COUNTS 1961-2005